Multiparameter Instrument for the total water and wastewater analysis

BA61101e

MultiLab P5


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.

- 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 .

- 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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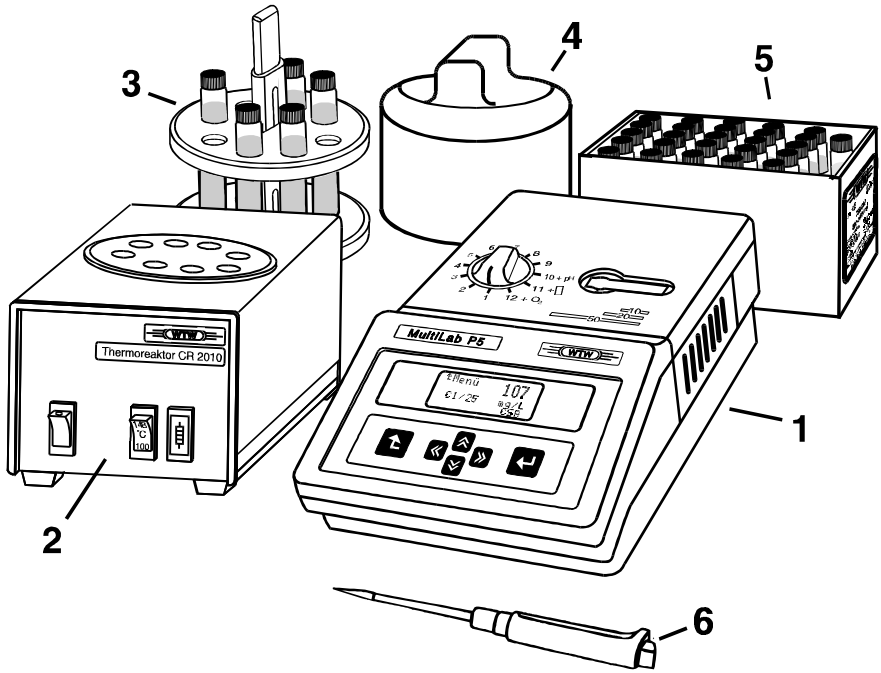
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This operation manual refers to the Software status B (20.12.95). It is subject to minor modifications, especially method changes, without notice.

Recommended basic equipment for photometrical measurement



1 Multiparameter Instrument MultiLab P5

2 Incubator CR 2010

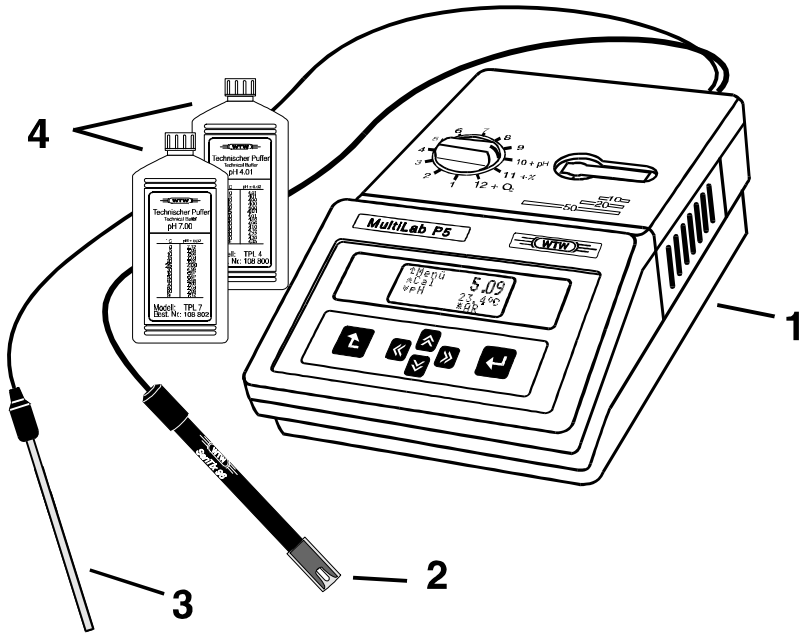
3 Quick-Fill reaction vial rack RKS 2000

4 Safety hood SHH 2000

5 Reaction vial test

6 Piston stroke pipette

Recommended basic equipment for pH / ISE measurement



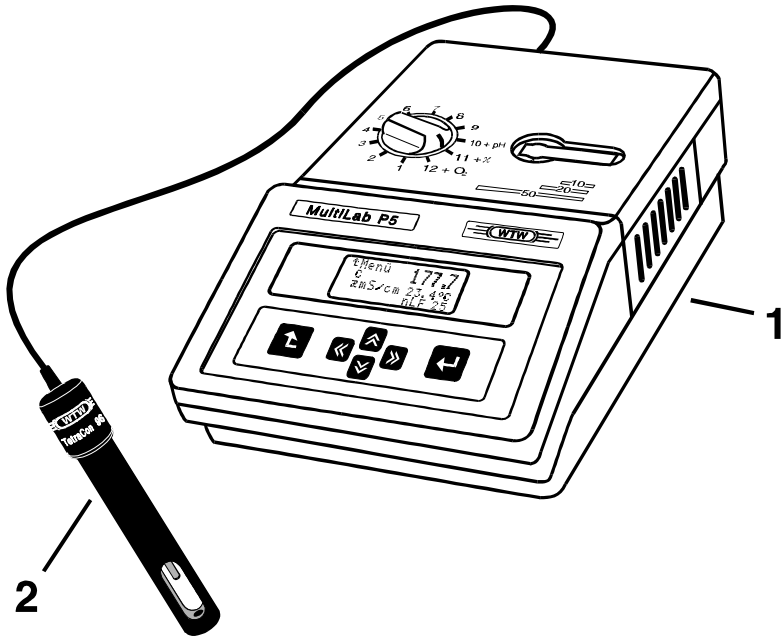
1 Multiparameter instrument MultiLab P5

2 Single or combined electrode

3 Temperature probe TFK 150

4 at least two standard buffer solutions or standard solutions

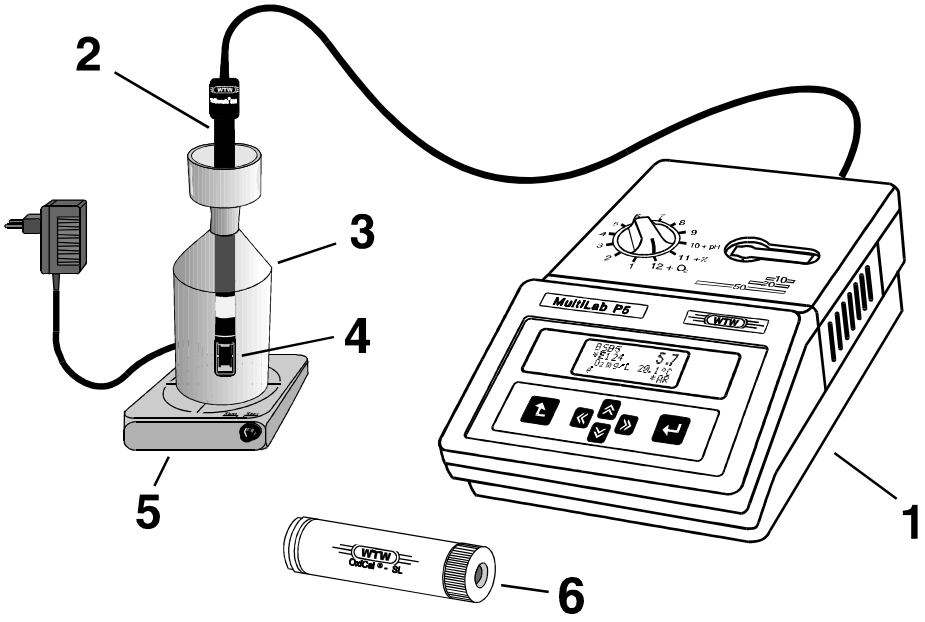
Recommended basic equipment for conductivity measurement



1 Multiparameter instrument MultiLab P5

2 4-electrode standard measuring cell TetraCon 96

Recommended basic equipment for oxygen measurement



1 Multiparameter instrument MultiLab P5
2 Oxygen 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.



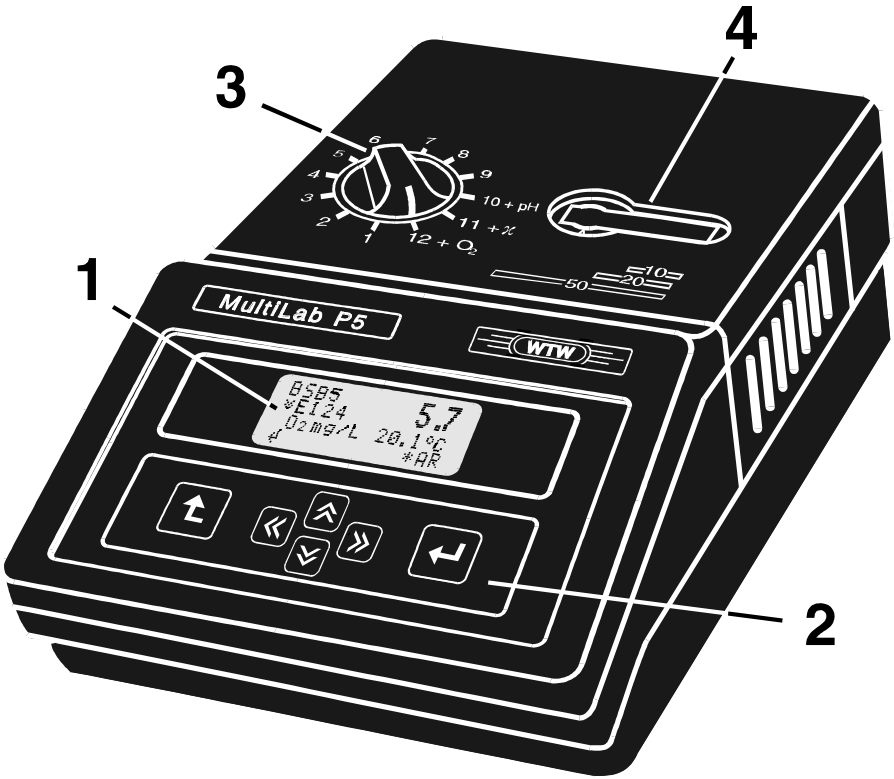
Actions of the user,
no instrument operation.

Displays in the text:

Display-graphic	Signs are displayed in the photometer.
bold-cursive	important hints, refer directly to the adjoining display.
bold	general emphasis for important information

General hints and information are framed.

Front view



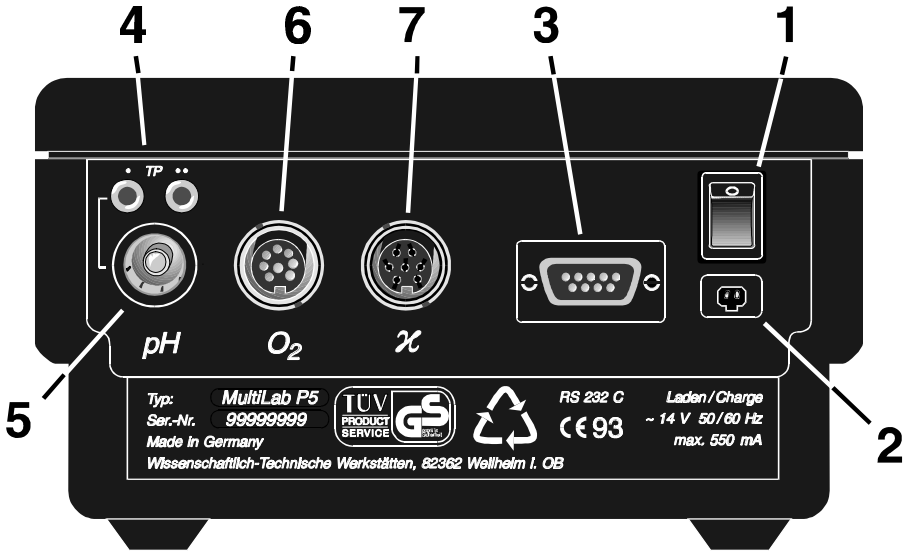
1 Display

2 Foil keyboard

3 Selector switch

4 Cuvette compartment

Rear view



1 ON/OFF-switch

2 Socket for mains plug transformer

3 V24/RS232 C interface

4 Banana socket for temperature probe or reference electrode

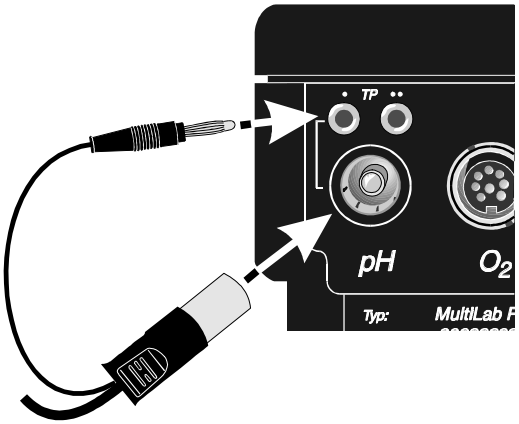
5 Socket for electrodes with plug acc. to DIN 19262

6 DIN socket 8-pin for oxygen probe

7 DIN socket 7-pin for conductivity measuring cell

pH electrodes

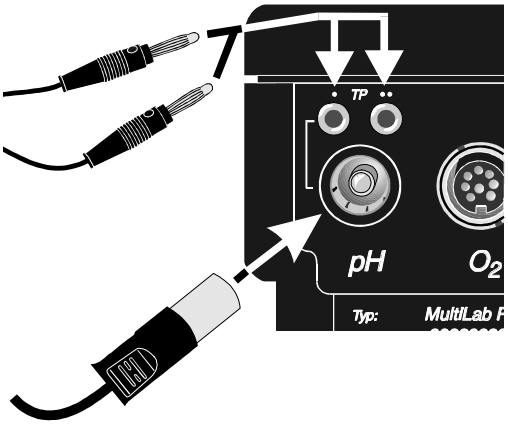
pH combined electrode with integrated temperature probe



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

Connect banana plug to banana socket TP • .

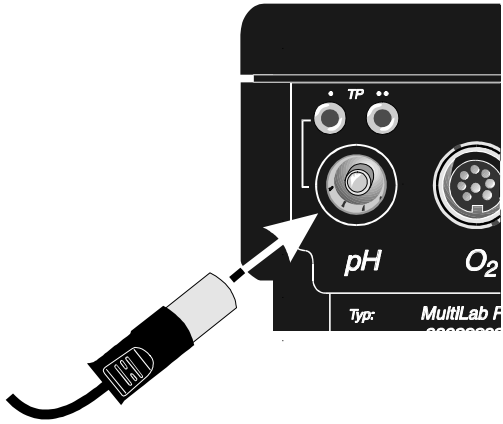
pH or Redox combined electrode with temperature probe TFK 150



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

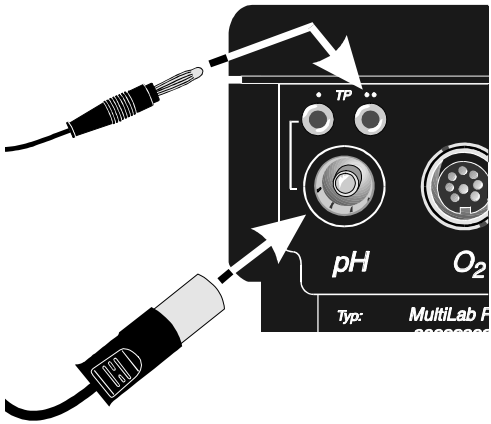
Connect banana plugs of the **temperature probe** to the banana sockets.

pH or Redox combined electrode



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

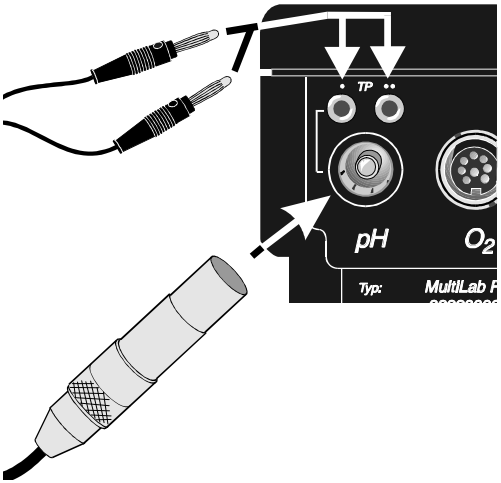
pH electrodes (pH and reference electrode)



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

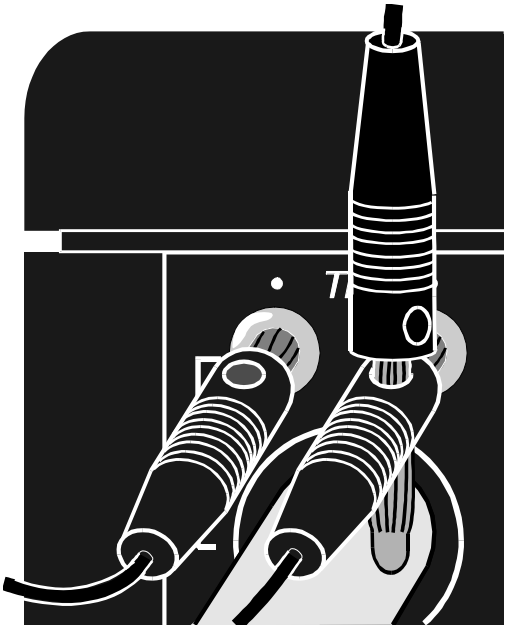
Connect banana plug of the **reference electrode** to banana socket TP •• .

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



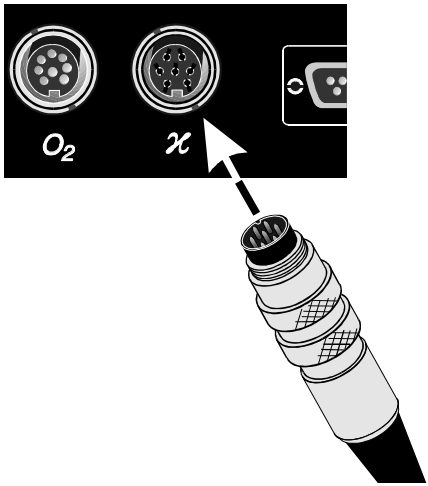
Connect DIN plug of the **measuring electrode** to the pH socket.

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



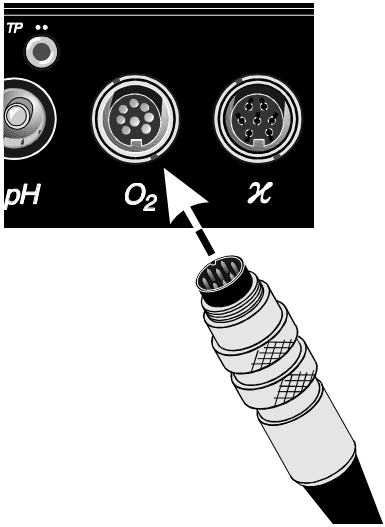
Slide banana plug of the **reference electrode** in the hole of the banana plug in socket TP ••.

Conductivity cell



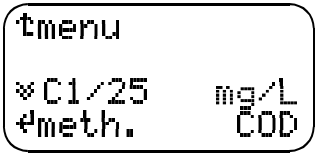
Connect plug of the **conductivity cell** to the 7 pin DIN-socket and tighten.

Oxygen probe



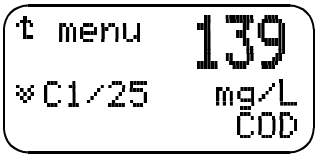
Connect plug of the **oxygen probe** to the 8 pin DIN socket and tighten.

Display (Examples of standard displays)



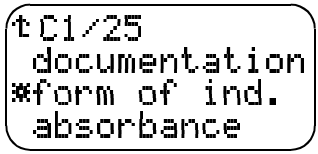
Information on
Measurement:
mg/L: Dimension.
COD: Indication form.

Information on
User guidance:
: Change to menu "Additional functions".
: Select method.
: Measurement of the selected method, e.g. C1/25 COD vial test.



Information on
test value:
139: Test value.
mg/L: Dimension.
COD: Indication form.

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



Additional functions:
⁂: Function "***Indication form***" preset.

Selection of other functions by depressing ⁂ or ⁂.

Abbreviations in the display

A	Absorbance measurement
F	Correction of the charge factor
‼	Correction of the sample blank value
V	Dilution
Meth.	Selection of method
rtime	Reaction time
AR	AutoRead
TP	Temperatur sensor
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
➔ Shift of numbers or preset adjustments with one digit.



Accepts the adjustments.



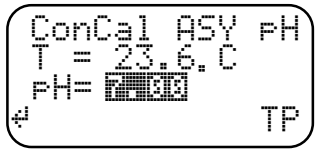
Accepts the adjustments.



Scroll mode with directional keys:
Keeping the keys depressed causes scrolling of all adjustable symbols and all cursor positions respectively.

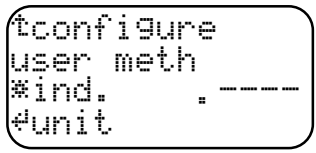
This mode is only switched on with the following menus:





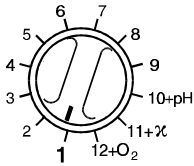
Scroll mode for **pH** calibration procedure **ConCal**:
Setting of pH value for ASY and SLO.

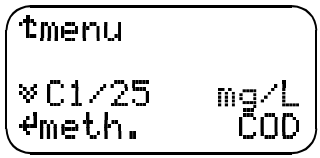




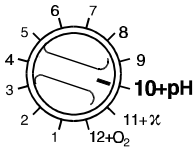
Scroll mode for **configuration of own methods**:
For settings "dimension", "unit" and "indication form".

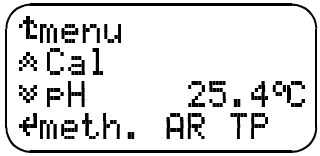
Selector switch



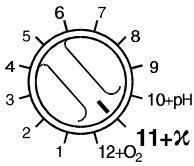


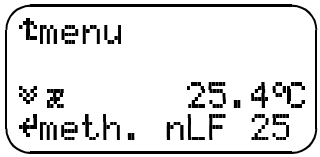
Positions 1-9: **photometric tests**.



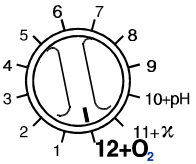


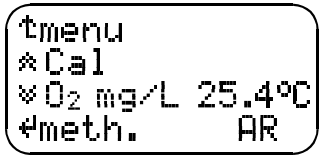
Position 10:
pH measurement, mV and ion-sensitive measurem. (**NH_4^+** and **F^-**), **photometric tests**.





Position 11:
Conductivity, **salinity measurement** and **photometric tests**.





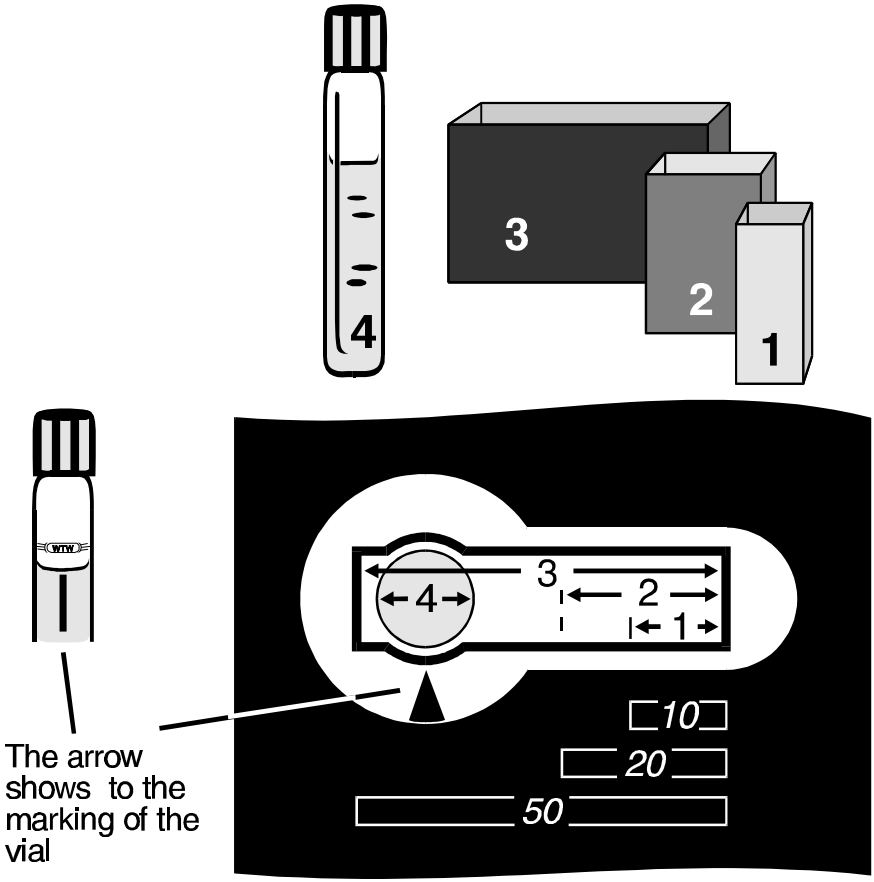
Position 12:
Oxygen measurement and **BOD determination**.

12. Filter not engaged.
With a supplemented 12. filter own **photometric tests** are programmable.

Arranged filters:

Position Selector switch	Wave length nm	Preset methods	
1	445	C1/25	COD 160
2	585	C2/25	COD 1500
3	340	N1/25	Nitrate 50
4	540	N4/25	Nitrite 2
5	690	A5/25	Ammonium
6	520	14542	Nitrate
7	405	14546	Phosphate
8	495	14556	Nitrate
9	620	14561	Cyanide
10	660	pH	
11	820	LF	
12	frei	O_2	

Cuvette compartment and cuvettes



Cuvettes:

1 10 mm rectangular cuvette

2 20 mm rectangular cuvette

3 50 mm rectangular cuvette

4 14 mm vial

Minimum cuvette filling

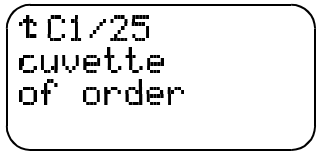
Cuvette	Min. **Filling capacity [ml]**	Min. **Filling height [mm]**
● 14 mm vial	2.6 ml	20 mm
☐ 10 mm rectangular cuvette	2.0 ml	20 mm
☐ 20 mm rectangular cuvette	4.0 ml	20 mm
☐ 50 mm rectangular cuvette	10 ml	20 mm

Placing of cuvettes in the cuvette compartment



Place cuvettes into cuvette compartment acc. to indications on the MultiLab P5.
In case of wrong placing of the cuvette incorrect measurements may occur.
Place cuvettes in the compartment **down to stop** .

The error message:



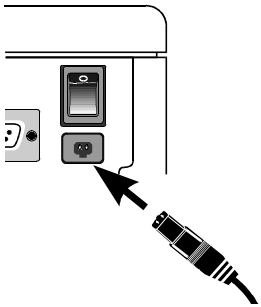
indicates a wrong insertion.



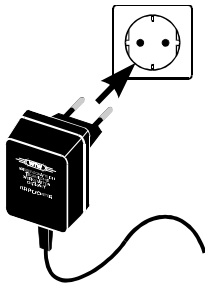
Insert cuvette again and take care of right and correct position.

Mains power supply

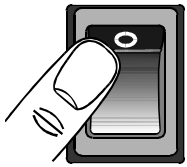
The line voltage and the working voltage indicated on the line adapter must correspond!



Connect **line adaptor** to the **power supply socket** of the MultiLab P5.



Plug line adaptor in the mains **socket**.



Switch on the MultiLab P5.

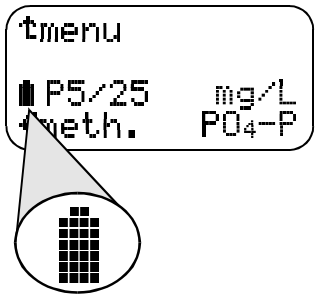
Only the pH electrode and the conductivity cell may be immersed into the same solution!
For first measurement after putting into operation the result of the test value is displayed some seconds later than during normal operation.

Accumulator charging

Charging the accumulator:
- Connect line adaptor

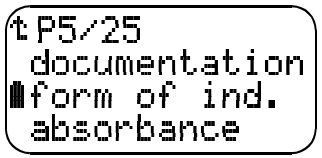
Charging time is approx. **16 hours** (**48 hours** for **first** putting into operation).
If the meter is not operated the fully charged accumulator remains charged for approx.**3 months**.

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



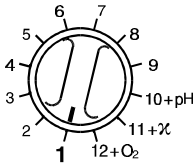
If this symbol is displayed the accumulator must be charged.

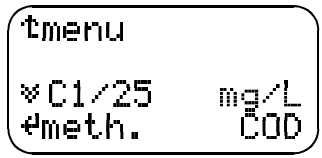
or



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

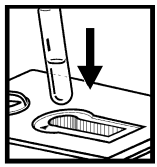
Measurement

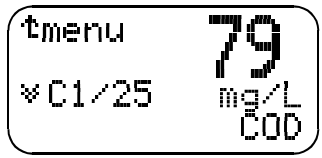




Select filter position (refer to method list). Ready to measure e.g. COD-vial test C1/25.

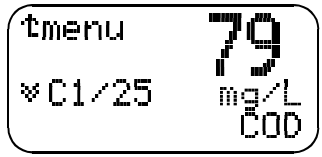
C1/25 = Model number.





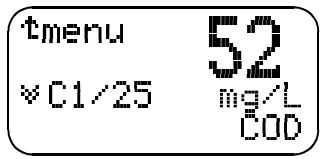
Insert vial/cuvette. Display of test value.

Serial measurements



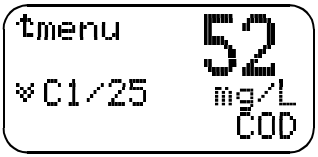
Last test value.





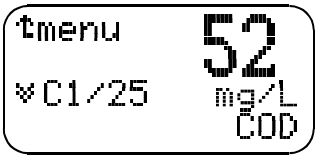
Insert further vials/cuvettes. Test value is displayed.

Repeat measurement



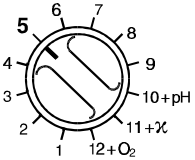
Last test value.

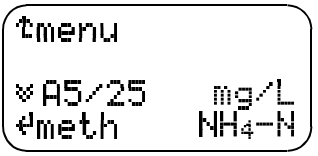




For repeating measurement the cuvette (vial) remains in the cuvette compartment.

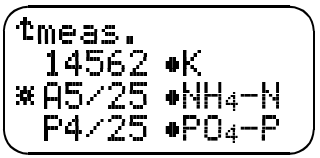
Select other methods





Adjust filter position, e.g. position 5.
Ready to measure for vial test Ammonium A5/25.

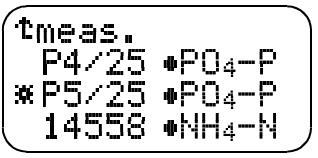




Select other method.
※ adjusted method, e.g. A5/25.

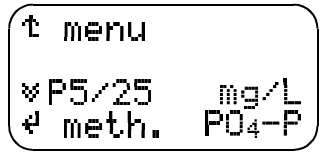
- ***Vial tests***.
- ***Reagent tests***.



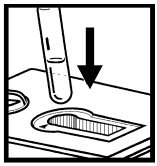


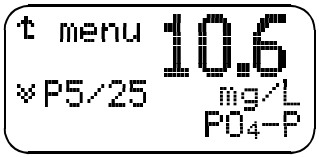
※ adjusted method, e.g. P5/25.





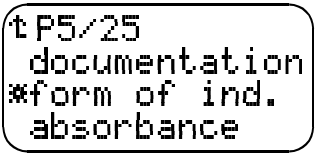
Ready for method P5/25 Phosphate.





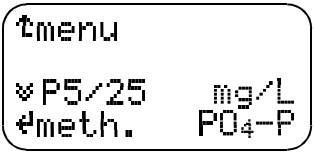
Insert vial.
Test value is displayed.





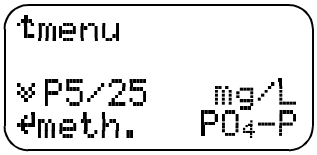
Change to menu "additional functions".





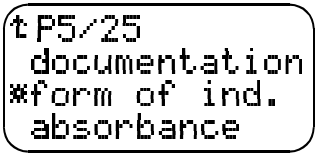
Back to menu "Measurement":
Select other method or measure adjusted method, e.g. P5/25 Phosphate.

Select indication form and dimension



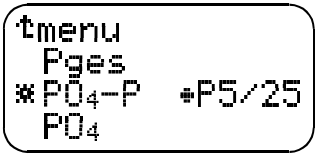
Example:
Change from ***mg/L*** PO_4-P to ***mmol/L*** PO_4.





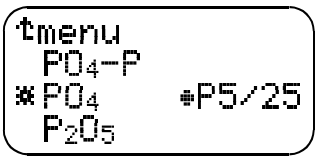
※ Function ***indication form*** selected.





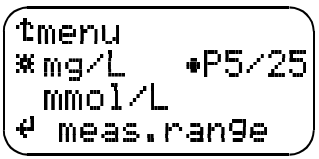
※ Indication form ***PO_4-P*** adjusted.





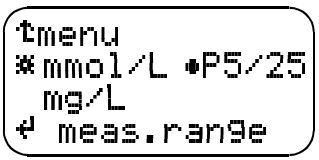
※ Adjust indication form ***PO_4*** .





※ Dimension ***mg/L*** is adjusted.





※ Adjust dimension ***mmol/L***.

With ↵ display of meas. range (s.b.) or
with ↑ back to menu "Additional functions".

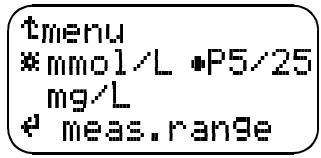
Indication of measuring range

If no cuvette/vial is inserted the MultiLab P5 indicates the measuring range of the **standard cuvette/vial** (depends on the test).

Reaction vial tests: **Vials** required, other cuvettes cause the display

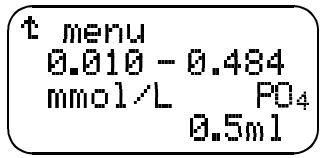


Reagent tests: The MultiLab P5 recognizes automatically the thickness of the inserted cuvette. It **considers automatically the cuvette typ during calculation of the test value and determination of the measuring ranges**.
For some tests a simple calculation of the measuring ranges is not possible, in this case the special data are stored.



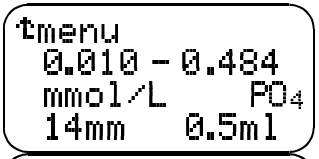
✱ Dimension adjusted, e.g. ***mmol/L***.

↵



Display of the meas. range:
PO4*: form of indication,*
mmol/L*: dimension,*
0.010 - 0.484*:Meas. range,*
0.5ml*: sample volume.*

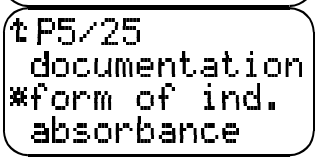
When cuvette/vial is inserted:



Indication of the cuvette/vial, e.g.:
***14mm**: vial 14 mm.*

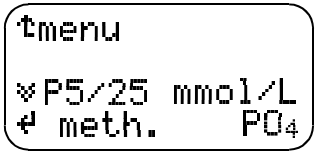
⇐





Back to menu "Additional functions".





Back to measurement. Ready to measure for reaction vial test ***P5/25*** Phosphate.

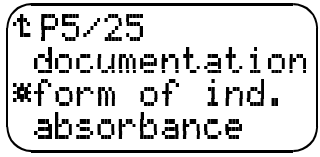
***PO4**: Form of indication,*
***mmol/L**: Dimension*.

Entering of lot factors

With entering of lot factors the user has the possibility to correct differences of the used test caused by production .
The actual lot factors F1 and F2 are specified on the labels of the different test kits.

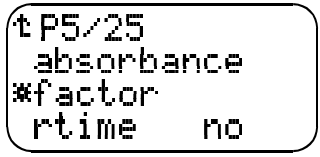
Given values: F1 = 1.00, F2 = 0.000.





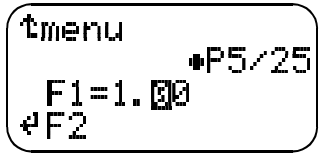
※ Function ***indication form*** selected.





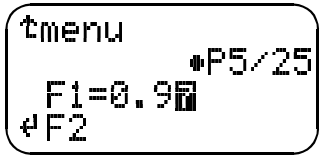
※ Select function ***Factor***.





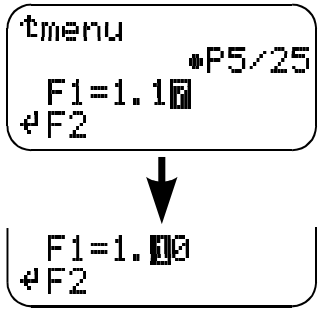
※ Pre-adjusted factor ***F1 = 1.00***.





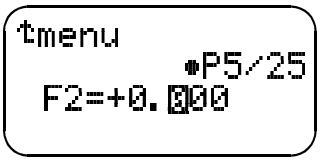
Adjust lot factor ***F1***.

Range: 0.90 - 1.10.



In case of faulty input outside of the admissible range:
Confirmation of factor input with ↵ or termination of input with ↑ effects the resetting of the value to the next limiting value, e.g. from 1.17 to 1.10.
Resetting from ***F1*** (s.a.) is possible.

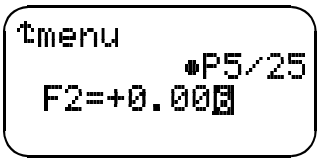




Storage of the actual values from ***F1*** and change to lot factor ***F2:***

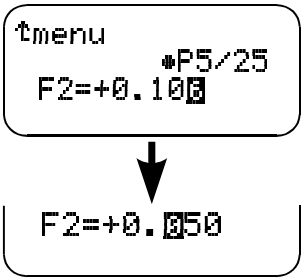
※ Preset factor ***F2 = 0.000***.





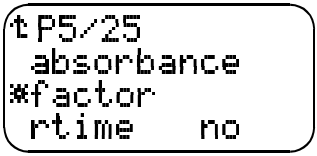
Adjust lot factor ***F2***.

Range: -0.050 - +0.050.



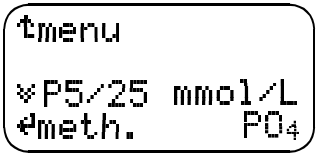
In case of faulty input of the admissible range:
Confirmation of factor input with ↵ or termination of input with ↑ effects the resetting of the value to the next limiting value, e.g. from +0.106 to +0.050.
Resetting of ***F2*** (s.a.) is possible.



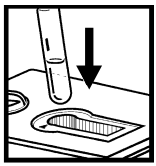


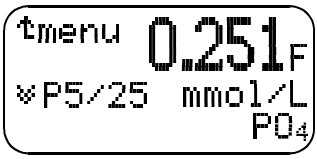
Back to menu "Additional functions".





Back to measurement. Ready to measure for reaction vial test ***P5/25*** Phosphate.



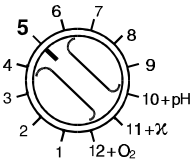


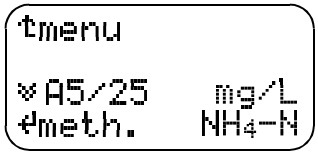
Indication for ***changed factors***:

F beside test value.

Selection of sample volume (WTW)

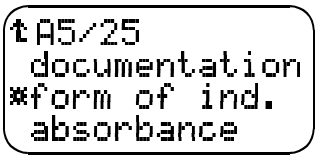
Besides the reagent set the measuring range also depends on the used sample volume. For some reaction vial tests different volumes are available.





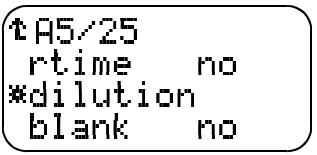
Example:
Change of sample volume for WTW-test A5/25 Ammonium.





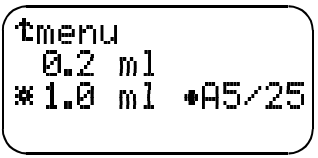
※ Function ***indication form*** selected.





※ Select function ***dilution***.





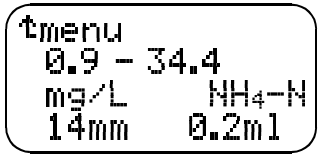
※ Preset ***sample volume 1.0 ml***.





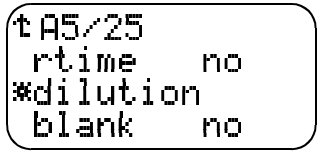
Select ***other*** sample volume.





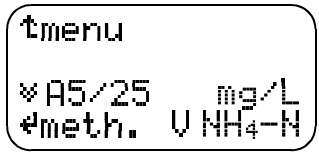
Confirm input.
Display of changed meas. range ***0.9 - 34.4 mg/L***.



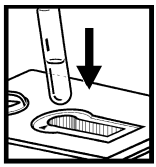


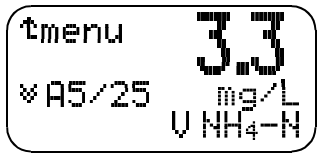
Back to menu "Additional functions".





Back to measurement.
Indication for ***changed sample volume:***
⇐V before indication form.

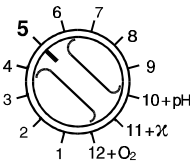


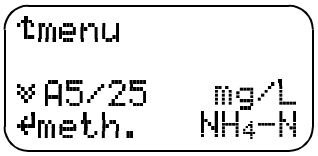


Display of test value.
Indication for **changed *sample volume:***
⇐V before indication form.

Entering of the dilution (MERCK)

Use **distilled water** for dilution!



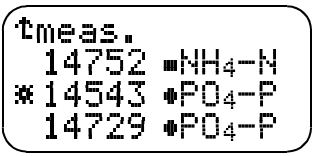


Example:
Input of a dilution for MERCK-test 14543 Phosphate



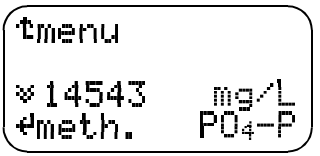
then





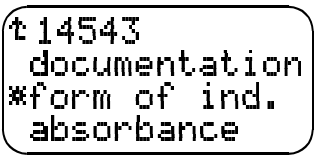
Select method 14543 Phosphate.





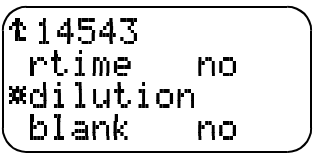
Reaction vial test 14543 Phosphate selected.





※ Function ***indication form*** selected.





※ Select function ***dilution***.



menu
dilution
1+00
meas. range

Adjusted dilution:
1 parts sample + 0 parts distilled water
(= ***sample undiluted***).



menu
dilution
1+20
meas.range

Input dilution, e.g. 1 part sample + 20 parts distilled water.

(Number 1 for sample is set fixed.)



menu
1.1 - 84.0
mg/L PO_4-P
14mm 5.0ml

Display of meas. range:
Changed meas. range from ***1.1 - 84.0 mg/L PO_4-P***.



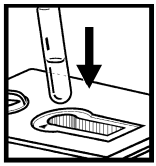
14543
rtime no
*dilution
blank no

Back to menu "Additional functions".



menu
14543 mg/L
meth. V PO_4-P

Back to measurement.
Indication for ***dilution:***
V before indication form.
⇐



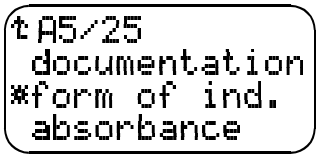
menu 25.2
14543 mg/L
V PO_4-P

Display of test value.
Indication for ***dilution:***
V before indication form.
⇐

Switch on reaction time

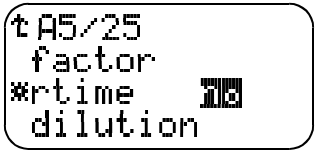
Method dependent reaction times are fixed stored in the photometer. The clock in the photometer can be switched on and off.





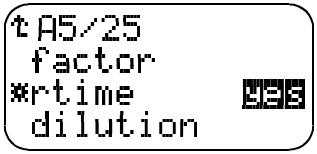
※ Function ***indication form*** selected.
(Example A5/25 Ammonium, selector switch to pos. 5).





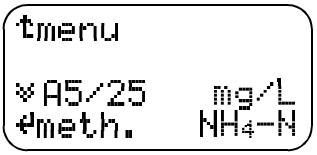
※ Select function ***reaction time***.
Reaction time is ***switched off.***





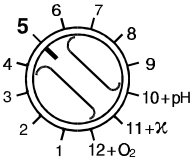
Reaction time is ***switched on***.

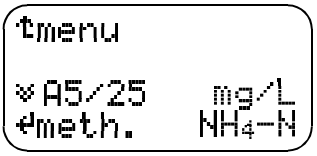




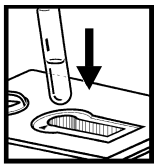
Back to measurement (see the following examples).

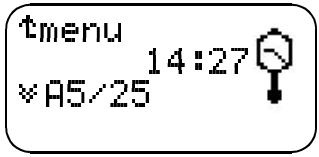
Start a reaction time





Example A5/25 Ammonium with ***actuated reaction time.***





Clock is working even without inserted vial/cuvette.

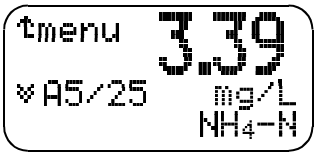
or





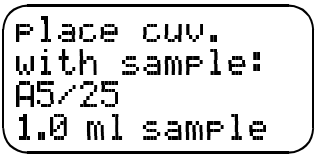
Wait for time or measure with

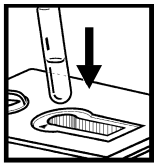


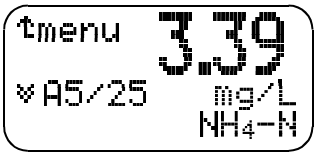


After reaction time (**signal sound!**) measurement is performed.
Test value is displayed.

If vial/cuvette is not inserted the following is displayed:

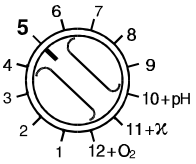


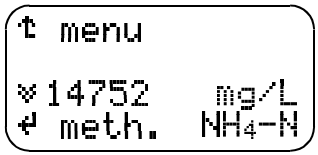




Indication of test value.

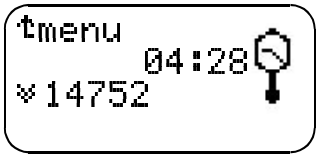
Several reaction times for a procedure





Example test 14752 MERCK Ammonium with ***actuated reaction time***.

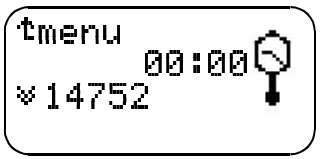




Clock is working even without inserted vial/cuvette.

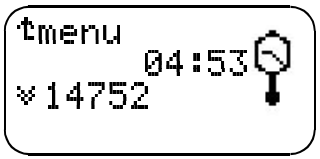
oder





After first reaction time (**signal sound!**) proceed acc. to analysis instructions.





Second reaction time begins.

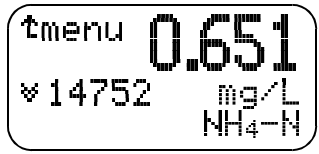
or





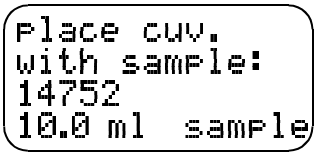
Wait for time or measure with

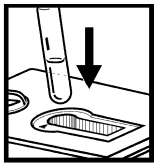


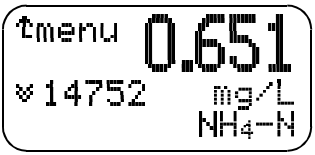


After reaction time (**signal sound!**) measurement is performed.
Test value is displayed.

If vial/cuvette is not inserted the following is displayed:





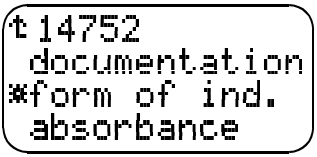


Indication of test value.



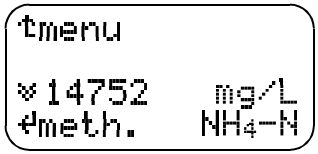
Reaction time expires **only once**.
For **setting** the function reaction time call up again the used procedure:



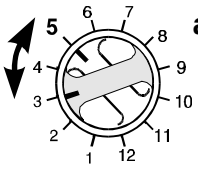


Back to menu "Additional functions".





Back to menu "Measurement".
Again ready to measure for the adjusted method with several reaction times.

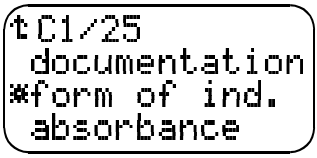


alternative quick method:

- Selector switch to other position,
- Turn back to initial position.

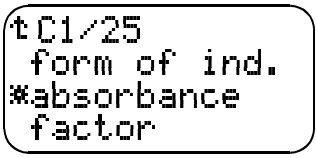
Absorbance measurement





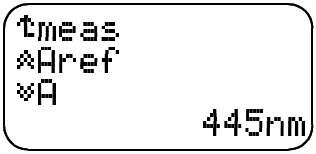
※ Function ***indication form*** selected.
(Selector switch to pos. 1).



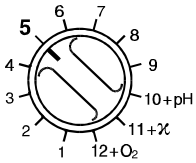


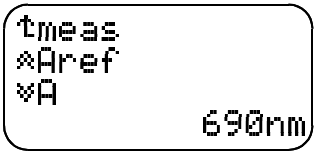
※ Function ***Absorbance*** selected.





Adjusted wavelength
e.g. ***445 nm***.

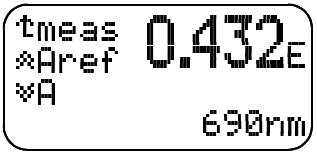




Select filter,
e.g. position ***5*** (690 nm).

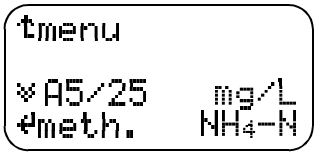
Wavelength nm	Position selector switch
340	3
405	7
445	1
495	8
520	6
540	4
585	2
620	9
660	10
690	5
820	11
free	12





Insert vial/cuvette with sample:
Test value is displayed.
Absorbance measurement:
A beside the test value.

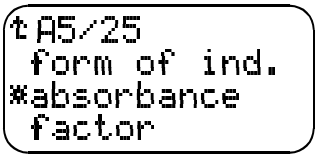




Back to measurement.

Measurement of absorbance against a reference value

The measurement of absorbance against a reference value considers disturbing influences of colorations or turbidities of the sample.
The measurement of the reference value is performed before measurement of the sample. To erase the reference value quit the procedure or switch off the instrument.

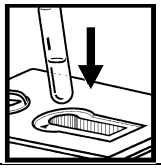


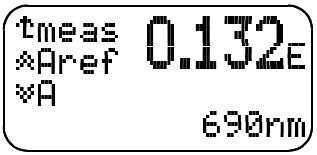
⁂ Function ***Absorbance*** selected.





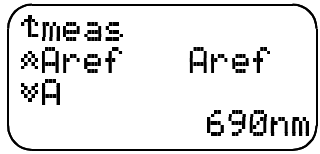
Adjusted wavelength e.g. ***690 nm***.



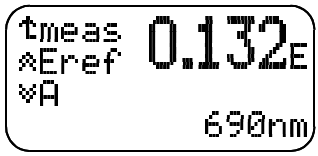


Insert vial/cuvette with ***reference solution*** :
Absorbance value is displayed.

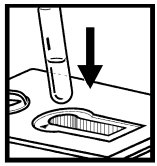


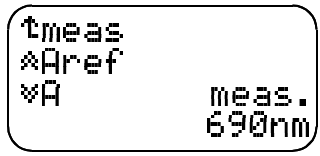


Measurement of absorbance as ***reference value Eref***.

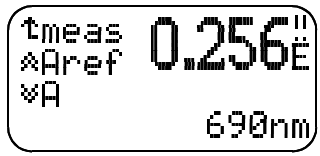


The ***reference value*** is e.g. 0.132 E and is stored.

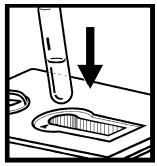


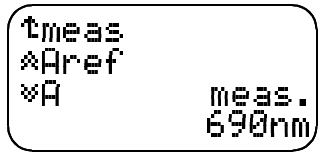


Insert vial/cuvette with ***test solution***.
Measurement of absorbance of the ***sample***.

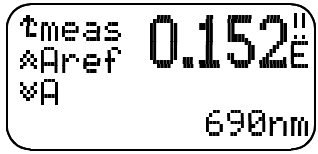


Display of corrected ***absorbance*** of the ***sample***.
⁞ = Reference value is subtracted from test value.





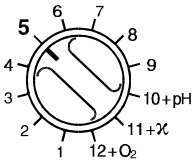
Insert further vials/cuvettes **with *test solutions.***
Measurement of absorbance of the ***sample***.

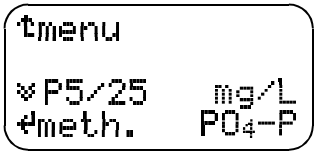


Display of corrected ***absorbance*** of the ***sample***. The correction is carried out with the ***last stored*** reference value.
⁞ = Reference value is subtracted from test value.

Sample blank value correction

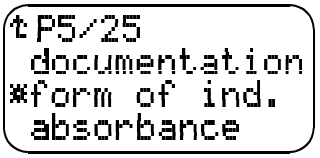
The sample blank value correction considers the disturbing influence of colours or turbidities of the sample.
The determination of the sample blank value is performed before measurement of the sample solution.





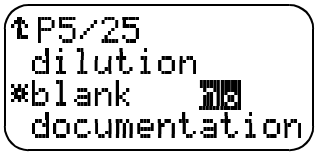
Example: Vial test P5/25 on filter position 5.





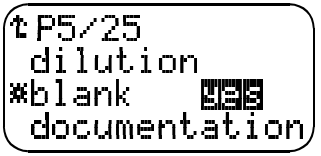
※ Function ***Indication form*** selected.





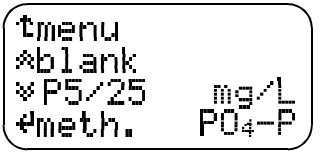
※ Select function ***Blank values***.
Sample blank value correction i**s *switched off***.



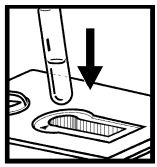


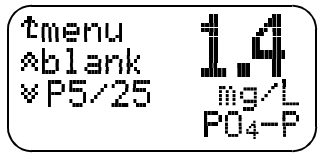
Sample blank value correction is ***switched on***





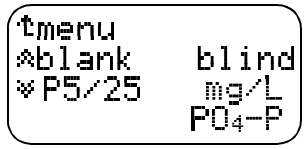
Back to measurement.



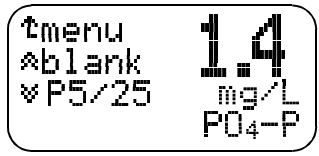


Insert vial/cuvette with ***sample blank solution***: Display of test value*.*

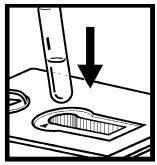




Measurement as ***sample blank value.***

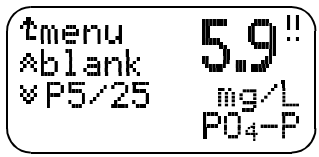


The ***sample blank value*** is 1.4 mg/L PO_4-P and is stored.





Insert vial/cuvette with ***test solution***.
Measurem. of the ***sample***.



Display of corrected ***sample test value***.

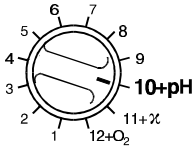
!! = Sample blank value is subtracted from test value.



A blank value correction takes place only at **the first following** measurement.
For correction of further samples **measure the specific sample blank value before.**

Calibration with standard buffer solutions: "AutoCalTEC"

Connect pH electrode and temperature probe.




```
menu
Cal
pH          25.4 C
meth.       AR TP
```

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

```
pH
 ConCal
AutoCalTEC
 AutoCalDIN
```

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 **first** buffer solution.

```
AutoCalTEC pH
 23.6       5 mV
   C
stop       AR TP
```

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



Test value is "frozen".

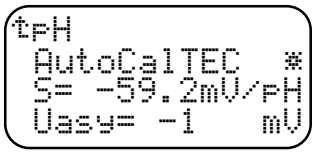


Rinse pH electrode and temperature probe and immerse into **second** buffer solution.



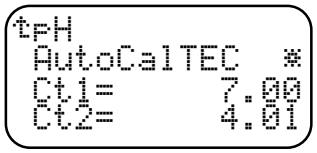


Start measurement.



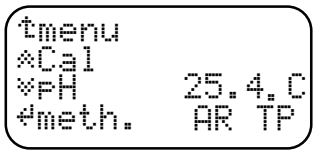
Wait until electrode data are displayed. The data are stored with date and time.





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

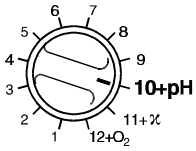


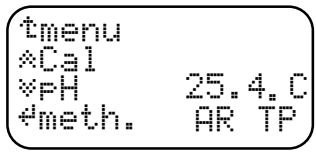


Back to pH menu.

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

pH measurement with AutoRead (AR)

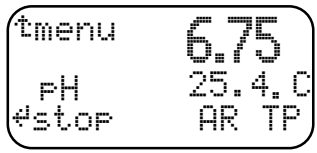




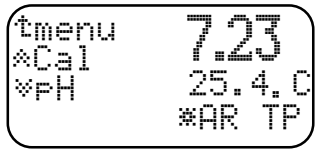


Rinse pH electrode and temperature probe and immerse into sample solution.



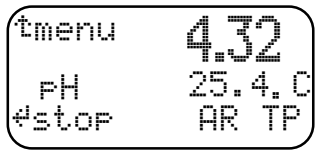


Select pH measurement. The measurement runs until a stable test value is reached (**Signal sound**).



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

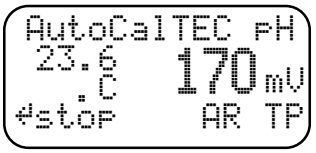




Next measurement.

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

Example: Calibration



Calibration is running.

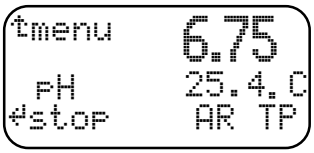




⇐

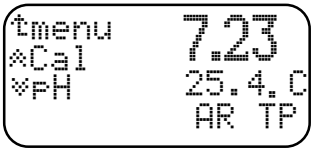
Termination of calibration: There is no ※ symbol behind AutoCal TEC, even if the calibration was terminated with <u>one</u> buffer only.

Example: pH measurement



pH measurement is running.



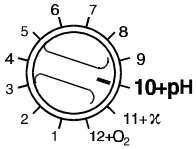


Termination of measurement, no ※ before AR.
⇐

Operation without temperature probe

The MultiLab P5 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




```
menu
Cal
pH
meth.    AR
```



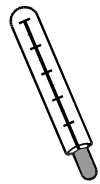
```
pH
 ConCal
*AutoCalTEC
 AutoCalDIN
```

Select calibration.



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





Determine temperature of sample solution.



```
AutoCalTEC pH
T=+0020   .C

Ct1       AR
```

Select input of temperature.





Enter temperature:

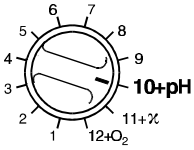
» «: Select figure.
» »: Set figure.

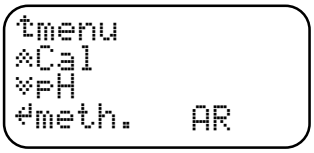




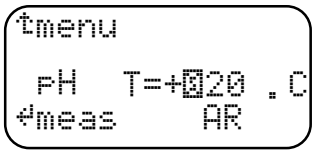
To go on: see Calibration with AutoCal TEC.

pH measurement without temperature probe







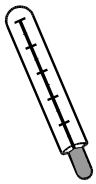


Select pH measurement without temperature probe.

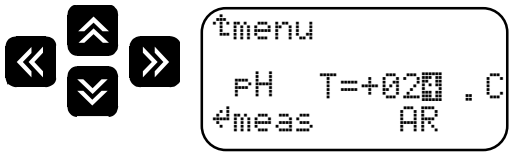


Immerse pH electrode into sample.





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

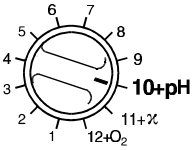
3 different calibration procedures are available:

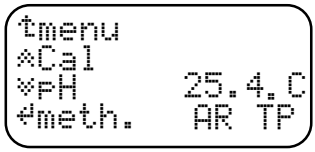
1) **AutoCal TEC**:Calibration with two WTW technical buffer solutions

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

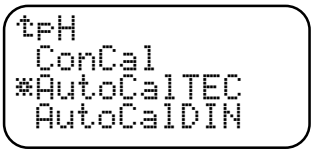
3) **ConCal**: Conventional calibration with adjustment of asymmetry (Offset) at pH = 7 and slope with two buffer solutions.

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**.

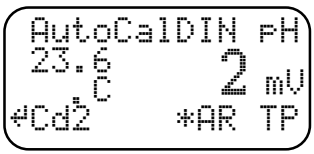


Rinse pH electrode and temperature probe and immerse into **first** buffer solution.





Start measurement.

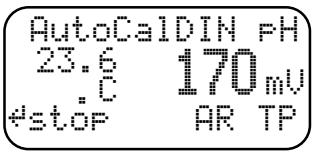


Wait until * appears before the AR. (**Signal sound**).

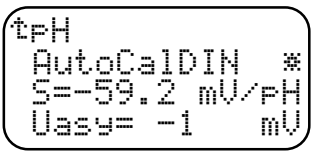


Rinse pH electrode and temperature probe and immerse into the **second** buffer solution.



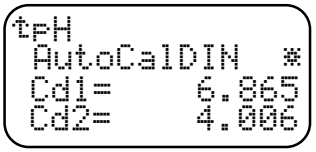


Start measurement.



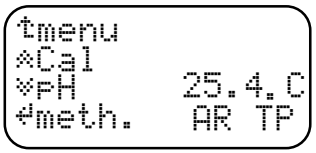
Wait until the electrode data are displayed. The data are stored with date and time.





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

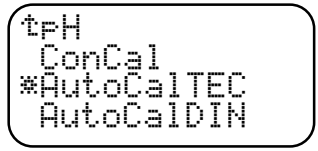




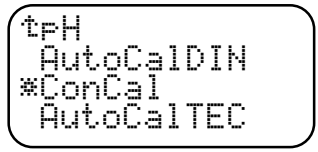
Back to pH measurement.

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***.



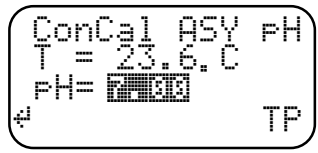
Rinse pH electrode and temperature probe and immerse into **neutral** buffer solution.





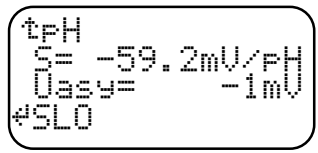
Start measurement.
Wait for stable test values.





Adjust pH value for the measured temperature.





Theoretical or last with another calibration mode determined slope 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.





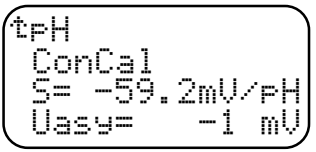
Start measurement.
Wait for stable test values.





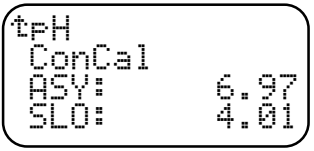
Adjust pH value for the measured temperature.





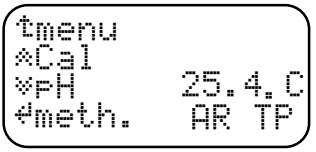
Display of electrode data.
The data are stored with date and time.





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





Back to pH menu.

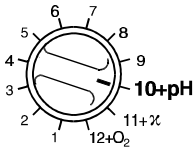
Additional functions

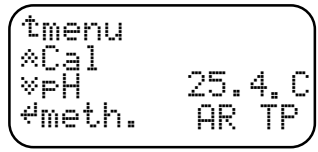
Switching on/off the drift control AR (AutoRead)

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!

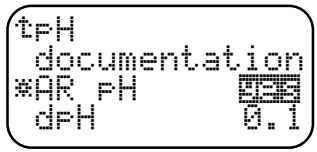
AutoRead AR:
Measuring period 30 s up to 10 minutes, max. drift < 0.1 mV/30s





Position 10: pH menu.





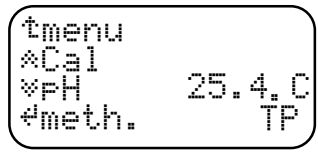
Menu "additional functions" of pH measurement:
yes: Drift control ***AR*** selected.





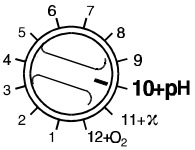
Switch off drift control.
no: Drift control ***AR*** switched off.

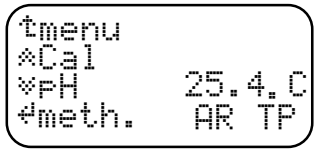




Back to pH menu.

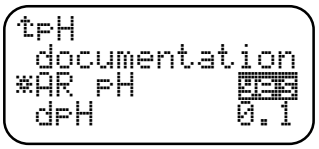
Resolution of the pH measurement





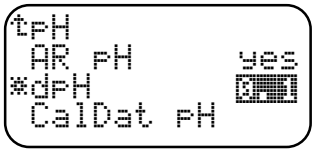
Position 10: pH menu.





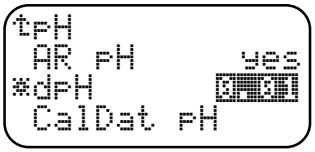
Select menu "Additional functions".





Select resolution ***dpH***.





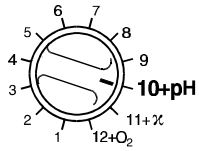
Set resolution.
Selectable: ***dpH 0.01***, ***dpH 0.1***.





Back to pH menu.

Reading the calibration data




```
↑menu
※Cal
※pH        25.4 C
↓meth.     AR TP
```

Position 10: pH menu.



```
↑pH
 documentation
※AR pH
 dpH          0.1
```

Select menu "Additional functions".



```
↑pH
 dpH          0.1
※CalDat pH
 documentation
```

Select ***CalDat pH***.



```
↑menu
 AutoCalTEC   ※
 S=-59.2 mV/pH
 Uasy= -1    mV
```

Indication of ***calibration data***.



```
↑menu
 AutoCalTEC   ※
 Ct1=      7.00
 Ct2=      4.01
```

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



```
↑menu
 AutoCalTEC   ※
22.03.94 10:45
```

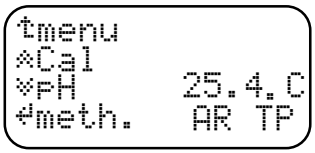
Indication of ***calibration date***.





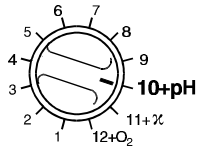
Back to menu "Additional functions".





Back to pH menu.

Absolute mV measurement




```
↑menu
✱Cal
↓pH        25.4 C
↵meth.     AR TP
```

Position 10: pH menu.



```
↑meas.
 14697 .a-Ten
✱pH
 mV
```

Method change.
pH measurement selected.



```
↑meas.
 pH
✱mV
 ISE N
```

Select ***mV measurement***.



```
↑menu

↓mV        25.4 C
↵meth.        TP
```

Entry to ***mV measurement***.

⇐ Temperature probe connected.



```
↑menu      123

 mV        25.4 C
              TP
```

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



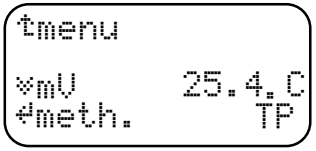
```
↑mV
 documentation
✱ mV          ▓▓
 dmV           1
```

Back to menu "Additional functions of mV measurement".

Documentation of test values: refer to chapter documentation

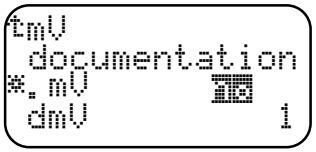
Relative mV measurement against offset voltage without temperature compensation





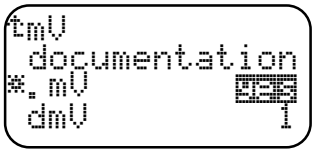
mV menu.





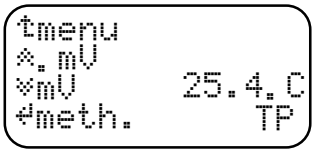
Menu "additional functions" of mV measurement: ***Offset voltage*** mV ***no*** selected.





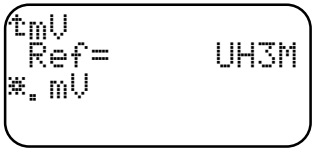
Select ***Offset voltage*** mV ***yes***.





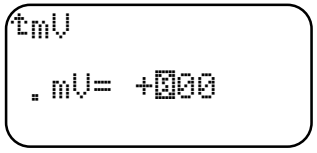
Back to mV menu.





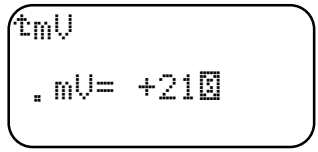
Offset voltage in the range -999 mV to +999 mV. (Standard resolution).





Select setting of offset voltage.

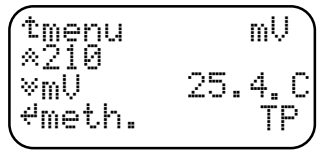




Set offset voltage.

» «: Select figure
^ v: Set figure.





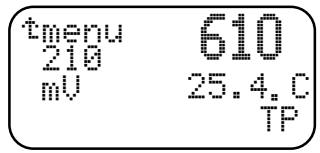
Back to mV menu.

Effect of the offset voltage:

Test value + Offset voltage = Displayed value

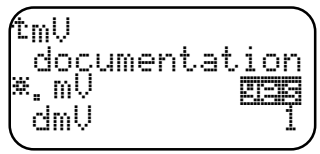
Example 1: 400 mV + 210 mV = 610 mV
Example 2:- 549 mV + 436 mV = - 113 mV





Start measurement.
Measurement runs continuously.





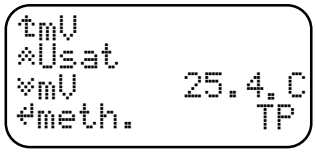
Back to menu "Additional functions of mV measurement".

Documentation of test values: refer to chapter documentation

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

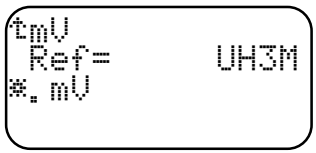
Note: Offset voltage ▪ mV ***yes*** must be selected before (see previous chapter: "Relative mV measurement against offset voltage without temperature compensation".)

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

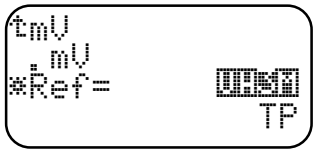


mV menu.



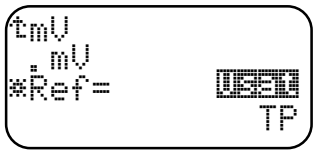






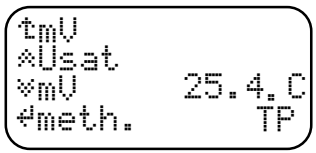
Set Ag/AgCl-reference voltage with temperature compensation and kind of electrolyte solution.





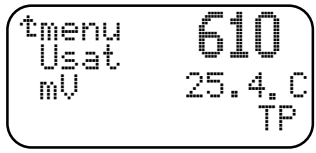
Select reference electrode.
Selection:
UH3M: 3M KCl,
UH1M: 1M KCl,
Usat: 3M KCl saturated with AgCl.





Back to mV menu.



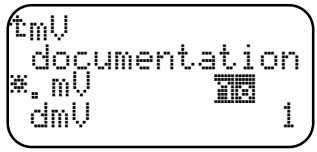


The measurement is done continuously under consideration of the temperature dependence of the used reference electrode.

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

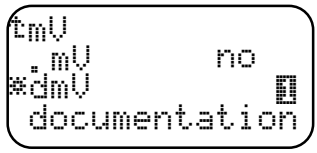
High resolution mV measurement





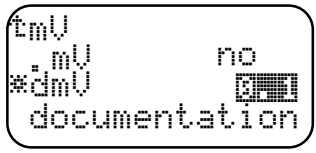
Menu "additional functions" of mV measurement: Offset voltage ***no*** selected.





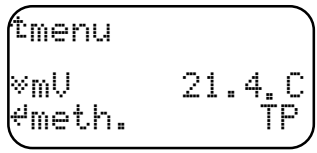
Select ***resolution*** dmV.





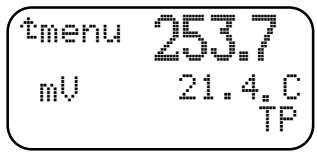
Set ***resolution.***
Selectable***: 0.1 mV***
1 mV.





Back to mV menu.



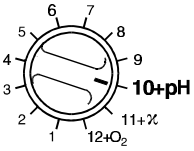


Start measurement.
The ***mV measurement*** is continuously performed with ***higher resolution***.

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 characteristics.
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.




```
tmenu
^Cal
vpH        25.4 C
<meth.     AR TP
```

Position 10: pH menu.



```
tmeas.
 14697 .a-Ten
*pH
 mV
```

Method change.



```
tmeas.
 mV
*ISE N
 ISE F
```

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



```
tmenu
^Cal
vNH4-N     25.4 C
<meth.        TP
```

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



```
ISE CAL NH4-N
C1=▮10.00mg/L
↵          25.4°C
```

Select calibration.



```
ISE CAL NH4-N
C1=009.▮0mg/L
↵          25.4°C
```

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



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



```
ISE CAL NH4-N
C1= 9.70 mg/L
U1=  -  80.4mV
↵C2       25.4°C
```

Start measurement. Wait for stable test values.



```
ISE CAL NH4-N
C2=▮00.00mg/L
↵          25.4°C
```

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



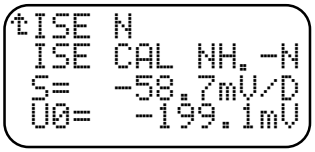
Rinse electrode and temperature probe and immerse into **second** standard solution.



```
ISE CAL NH4-N
C2= 95.00mg/L
U2=  - 139.1mV
↵CalDat  25.4°C
```

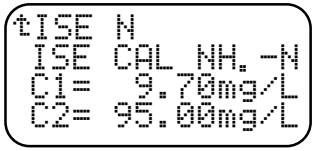
Start measurement. Wait for stable test values.





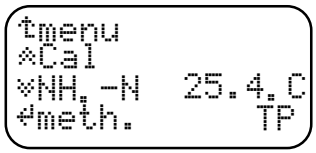
Display of ***calibration data*** which are stored with date and time.





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



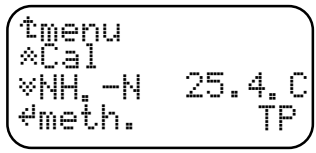


Back to ***NH_4-N*** menu.

Measurement

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

After calibration:

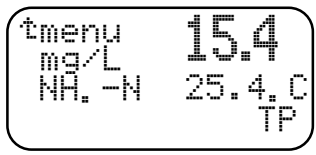


NH_4-N menu.



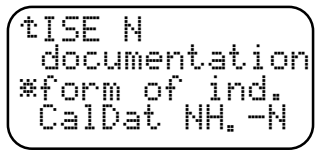
Rinse electrode and temperature probe and immerse into sample solution.





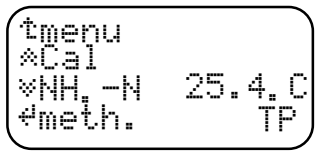
Start measurement.
NH_4-N measurement runs continuously.





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

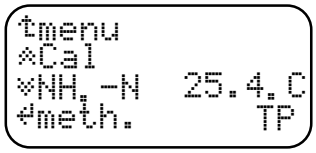




Back to ***NH_4-N*** menu.

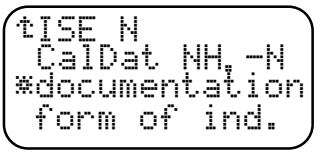
Additional functions

Adjustment of indication form



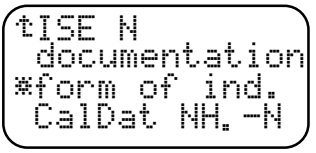
NH_4-N menu.





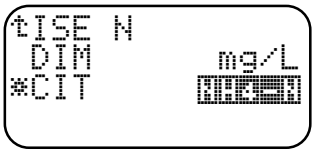
Menu "Additional functions".





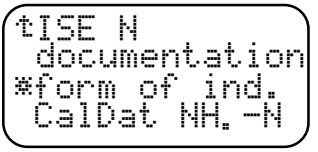
Select ***indication form***.





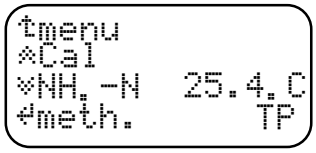
Enter menu indication form.
With » « select indication form:
NH_4 or ***NH_4-N***.





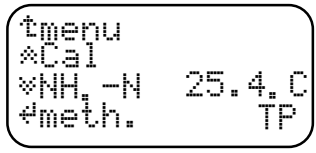
Back to menu "additional functions" of the Ammonium measurement.





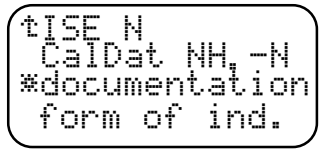
Back to ***NH_4-N*** menu.

Reading of the calibration data



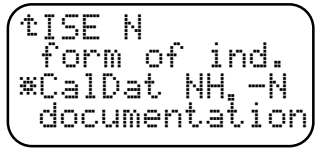
NH_4-N menu.





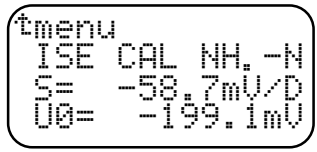
Select menu "additional functions" of the Ammonium measurement.





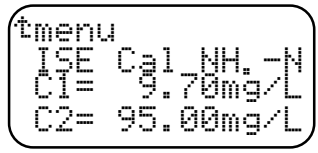
Select ***CalDat NH_4-N***.





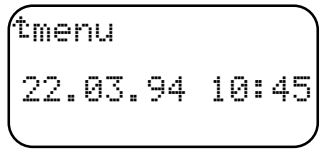
Display of calibration data ***Slope S*** and ***Axial section U0***.





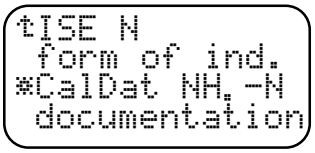
Display of the used ***standard solutions***.





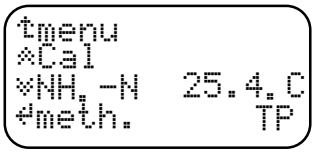
Display of ***calibration date***.





Back to menu "additional functions" of NH_4 measurement.

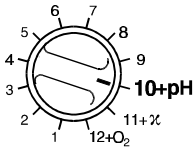




Back to ***NH_4-N*** menu.

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.




```
↑menu
»Cal
»pH        25.4 C
↵meth.     AR TP
```

Position 10: pH menu.



```
↑meas.
 14697 .a-Ten
*pH
 mV
```

Method change.



```
↑meas.
 ISE N
*ISE F
 ISE
```

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



```
↑menu
»Cal
»F-        25.4 C
↵meth.        TP
```

Confirm ***Fluoride*** measurement.

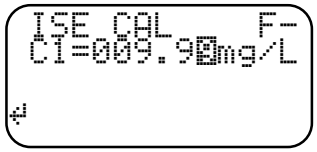


```
 ISE CAL      F-
 C1=0▒0.00mg/L

↵
```

Select calibration.



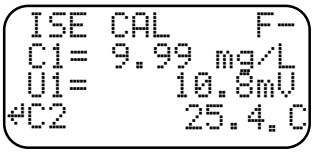


Enter the concentration of the first standard solution.
» «: Select figure
» »: Set figure.



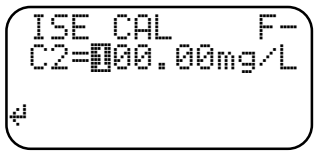
Rinse electrode and temperature probe and immerse into **first** standard solution.





Start measurement. Wait for stable test values.



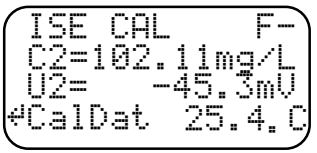


Select concentration of the second calibration standard solution.
» «: Select figure
» »: Set figure.



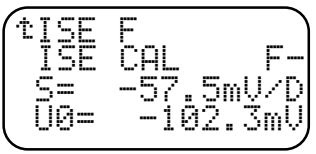
Rinse electrode and temperature probe and immerse into **second** standard solution.





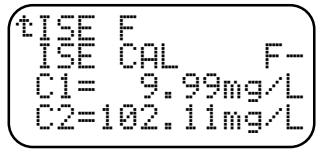
Start measurement. Wait for stable test values.





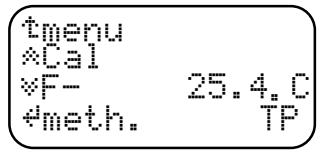
Display of ***calibration data***.





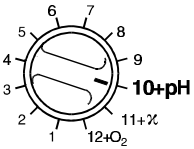
Indication of the used ***standard solutions***.
⁂ and ⁘ switch to-and-fro between the calibration data.





Back to fluoride menu.

Fluoride measurement




```
↑menu
»Cal
»pH        25.4 C
↵meth.     AR TP
```

Position 10: pH menu.



```
↑meas.
 14697 .a-Ten
»pH
 mV
```

Method change.



```
↑meas.
 ISE N
»ISE F
 ISE
```

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



```
↑menu
»Cal
»F-        25.4 C
↵meth.        TP
```

Entry to ***Fluorid*** menu.



Rinse electrode and temperature probe and immerse into sample solution.

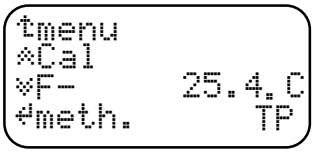


```
↑menu      35.7
 mg/L
 F-        25.4 C
              TP
```

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

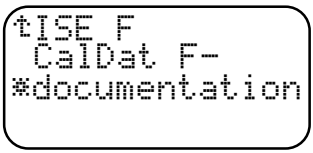
Additional functions

Reading of the calibration data



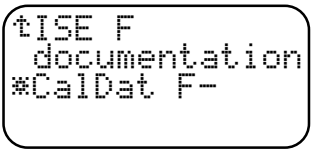
Fluoride menu.





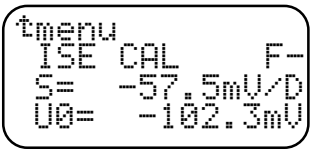
Select additional functions.





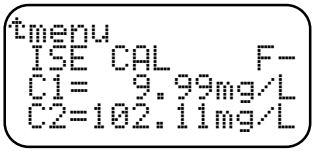
Select ***CalDat F-***.





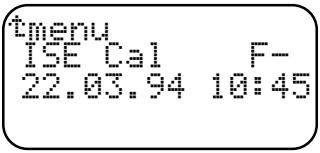
Display of ***calibration data***.





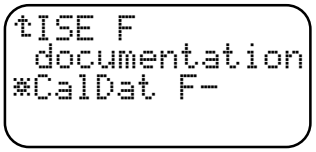
Indication of used ***standard solutions***.





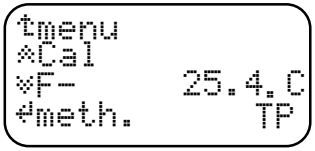
Display of ***calibration date***.





Back to menu "additional functions" of Fluoride measurement.

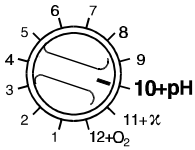




Back to fluoride menu.

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.




```
↑menu
»Cal
»pH        25.4.C
↵meth.     AR TP
```

Position 10: pH menu.



```
↑meas.
 14697 .a-Ten
*pH
 mV
```

Method change.



```
↑meas.
 ISE F
*ISE
 14779 .HS
```

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



```
↑menu
»Cal
»ISE       25.4.C
↵meth.        TP
```

Entry to ***ISE*** menu.



```
 ISE CAL
 CI= 000.00

↵          25.4.C
```

Select calibration.



```
ISE CAL
C1= 11.20

↵          25.4.C
```

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



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



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

Start measurement. Wait for stable test values.



```
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 values.



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

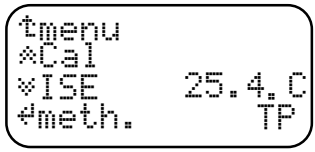
Display of ***calibration data***.



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

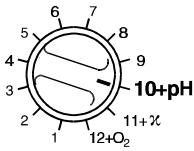
Indication of used ***standard solutions***. » and « switch to-and-fro between the calibration data.

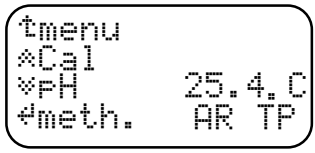




Back to ISE menu.

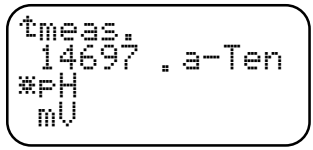
Any ionselective measurement





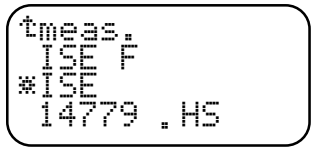
Position 10: pH menu.





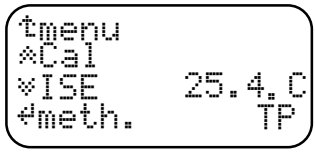
Method change.





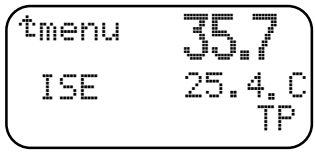
`ISE` = Select ***ionselective*** measurement.





Entry to ***ISE***.

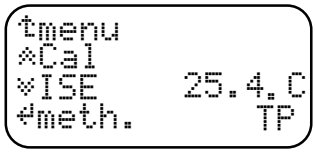




Start measurement.
ISE measurement runs ***continuously***.

Additional functions

Reading of the calibration data



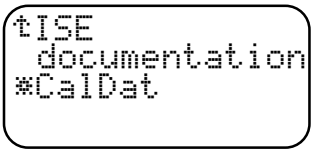
ISE menu.





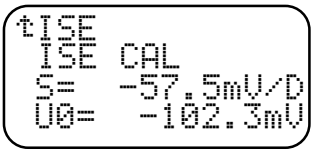
Menu "Additional functions" of ISE measurement selected.





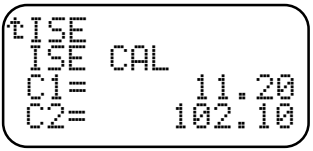
Select ***CalDat***.





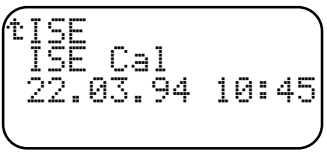
Display of the ***calibration data***.





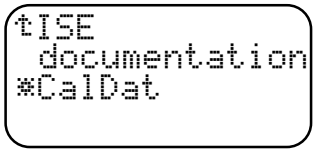
Indication of the used ***standard solutions***.





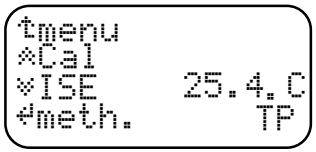
Display of the ***calibration date***.





Back to menu "additional functions".





Back to ISE measurement.

Connectable measuring cells

Recommended meas. cells:

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

Description	Model	o.-no.
Conductivity meas. cell with integrated temperature sensor 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 ± 2%	

Description	Model	o.-no.
Trace-conductivity meas. cell with integrated temp.sensor	***LR001/T***	**302 530**
Instrument meas. range	Cell constant cm^{-1}	
0.001 µS/cm... 30 µS/cm	0.01 ± 2%	

Description	Model	o.-no.
4-electrode conductivity meas. cell, glass/platinum with integrated temp. sensor	***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)

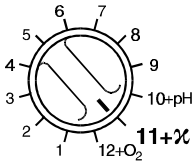
Measurement solution type	Temperature function TC	Reference temperature
natural water (ground-, surface- and drinking water)	set nlF	to be set
distilled water	set nlF	to be set
Other aqueous solutions	determine	to be set
Salinity (seawater)	automatic nlF acc. to IOT*	automatic 20°C
non-aqueous solutions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

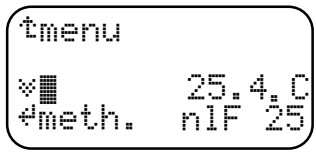
*International Oceanographic Table
(UNESCO Technical Papers in marine sciences 36)

Measurement

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

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





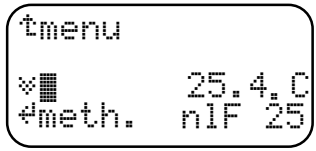
Menu ***conductivity measurement***.





Conductivity measurement runs ***continuously***.





Back to menu ***conductivity measurement***.

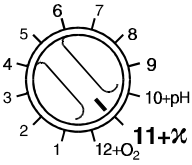
The conductivity menu comprises the following points:

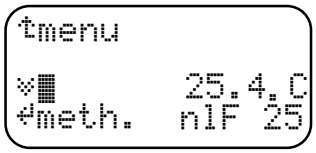
1. Adjust ("**C**") or determine ("**C Cal**") **cell constant** with subsequent selection of meas. range. Only the meas. ranges which are valid for the actual cell constant are displayed.
2. Adjust **temperature function** ("**TC**") or determine ("**TC Cal**").
3. Set **reference temperature Tref**.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

Set cell constant C and measuring range

Possible measuring ranges:

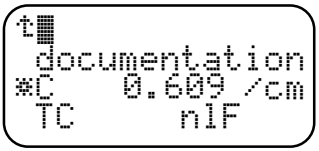
Measuring range	Recommended measuring cells			
	LR001/T	LR01/T	TetraCon® 96	TetraCon® L
0.000 - 3.000 µS/cm	☑	☑		
0.00 - 30.00 µS/cm	☑	☑		
0.0 - 300.0 µS/cm		☑	☑	☑
0 - 3000 µS/cm			☑	☑
0.00 - 30.00 mS/cm			☑	☑
0.0 - 300.0 mS/cm			☑	☑
0 - 70 (Salinity)			☑	☑





Method **conductivity measurement**.





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





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

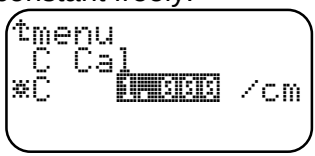




Select cell constant
Selectable are ***0.01 /cm, 0.1/cm and 1.000/cm.***

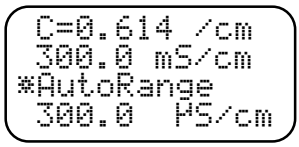
To set the cell constant freely:





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





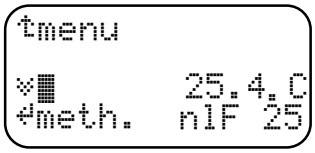
With ^ and v select:
Automatic selection of measuring range ***AutoRange*** or one of the following ***fixed measuring ranges***:
up to 300.0 µS/cm,
up to 3000 µS/cm,
up to 30.00 µS/cm,
up to 3.000 µS/cm,
up to 30.00 mS/cm,
up to 300.0 mS/cm,
up to 70 (Salinity).





Back to menu "Additional functions" of conducitivity measurement.

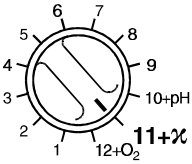


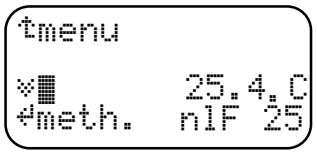


Back to conductivity menu.

Determination of cell constant C: "C Cal"

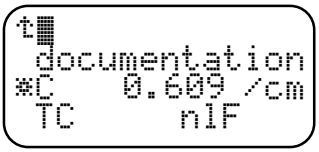
For meas. cells with cell constant from approx. 0.5/cm to 1.5/cm.





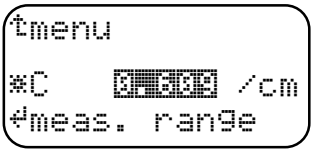
Conductivity menu.





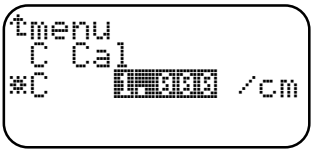
Menu "additional functions" for conductivity measurem.





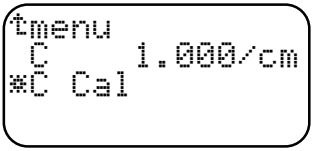
Entry to "Setting of cell constant". Pre-adjustment: ***fixed cell constant 0.609/cm***.





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



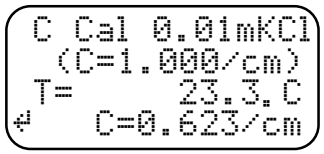


Select C Cal.



Immerse measuring cell into 0.01m KCl.

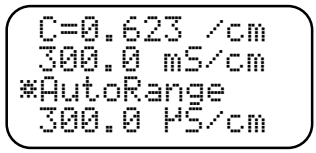




Measure.
⇐ previous cell constant

⇐ ***determined cell constant.***





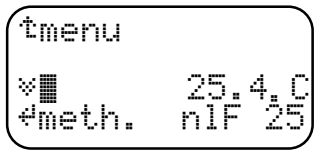
Select measuring range.
With ⩔ ⩒ select automatic selection of measuring range or fixed measuring range.





Back to menu "Additional functions".

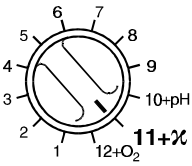


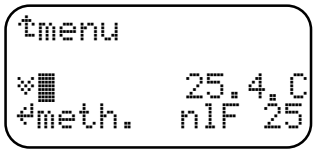


Back to conductivity menu.

Setting the 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.





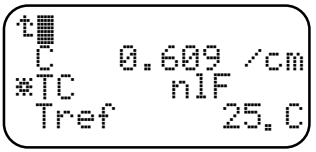
Conductivity menu.





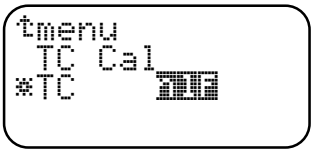
Menu "additional functions" for conductivity measurement.





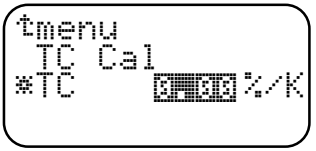
Select ***Temperature function nlF***.





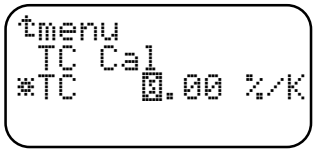
Select ***Change of temperature function***.





Select ***Linear temperature function***.





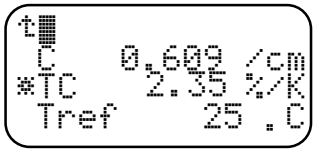
Set value.
» «: Select figure
^ v: Set figure.
Setting range
0.00... 3.50 %/K





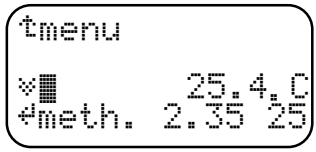
Confirm input.





Back to menu "additional functions".





Back to conductivity menu.

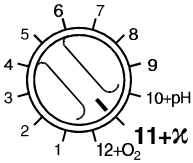
Determination of the coefficient for a linear temperature function: "TC Cal"

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}).




```
tmenu

*              25.4 C
↵meth.    nlF 25
```

Conductivity menu.



```
t
 documentation
*C     0.609 /cm
 TC       nlF
```

Menu"additional functions".



```
t
 C     0.609 /cm
*TC       nlF
 Tref      25.0 C
```

Select ***temperature function nlF***.



```
tmenu
 TC Cal
*TC
```

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



```
tmenu
 TC        nlF
*TC Cal
```

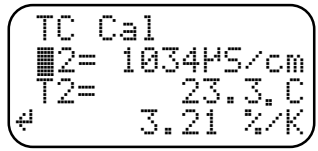
`TC Cal`: Select ***determination*** of a ***linear temperature function***.



```
 TC Cal
 1=  1034µS/cm
 T1=     23.3 C
↵2
```

Start procedure. Wait for stable measurement.



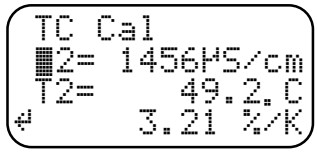


Store pair of values 1.
Start determination of ***pair of values 2***.



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

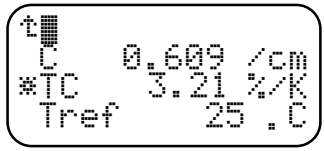




Wait for stability of measured value .

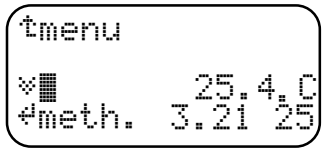
⇐ determined temperature coefficient





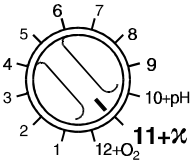
Accept *calculated* ***temperature coefficient.*** Back to menu "Additional functions".

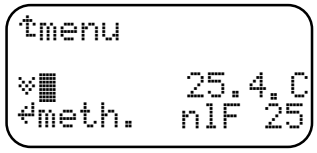




Back to conductivity menu.

Selection of reference temperature Tref





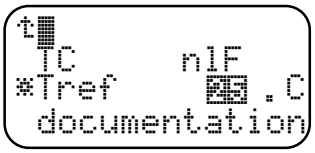
Conductivity menu.





Menu "additional functions" of conductivity measurement.





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





*Set **reference temperature 20°C***.





*Select **freely adjustable reference temperature***





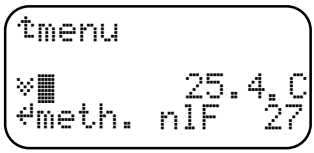
Set reference temperature.
» «: Select figure
^ v: Set figure.





Confirm setting.

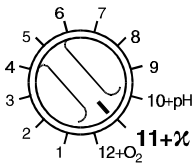


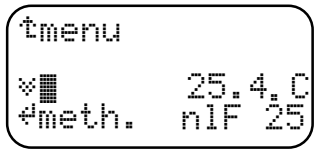


Back to Conductivity menu.

Measurement of salinity

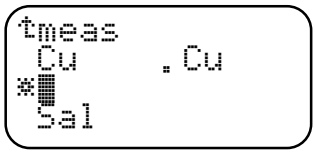
General information on salinity measurement:
Application report no. 53021.





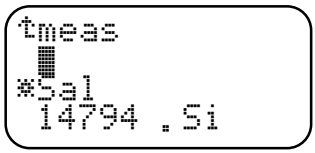
Conductivity menu.





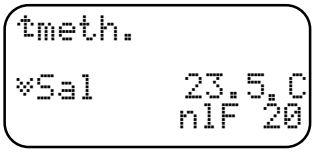
Change method.





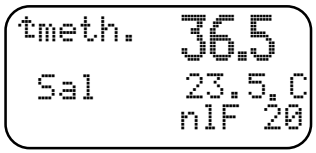
Select ***salinity***.





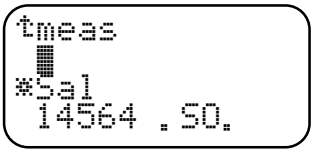
Selection confirmed.





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





Change method.

Further information on conductivity measurement

Fehler! Textmarke nicht definiert. Supervision of conductivity systems according to ISO 9000;
GLP requirements.
WTW application report no. 395054

Fehler! Textmarke nicht definiert. Conductometric salinity measurement.
WTW application report no. 993109

Fehler! Textmarke nicht definiert. Temperature compensation of conductivity values.
WTW application report no. 1194055

Calibration with OxiCal®-SL or OxiCal®-P

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

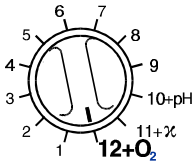
Polarisation time (Meter switched on, probe connected):

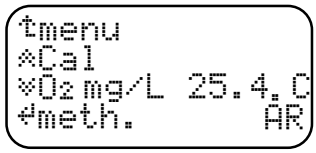
- With initial setup or after cleaning: approx. 25-50 minutes,
- With short interruptions up to 1 h: approx. 5-20 minutes



Dry oxygen 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!)





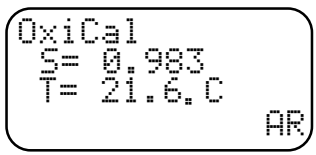
Menu ***Oxygen measurement.***





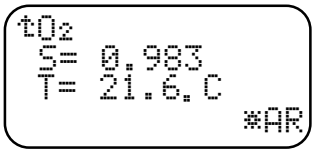
Select ***calibration function*** OxiCal.





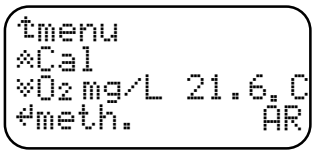
Start calibration in air calibration beaker.
AR: Measured values "running".
Admissible slope:
S = 0.6... 1.25.

Wait for AutoRead.



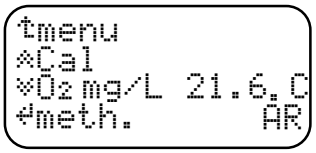
Wait until * appears before the AR.
Calibration finished (**signal sound**). The determined data are stored.





Back to menu oxygen measurement.

Measurem. of oxygen concentration in water

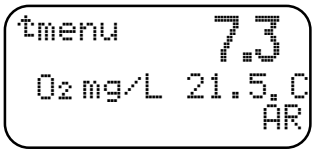


Menu oxygen measurement.

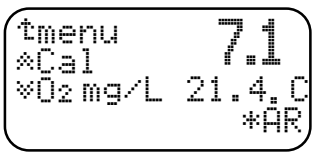


Immerse oxygen probe into sample solution !
Care for incident flow!





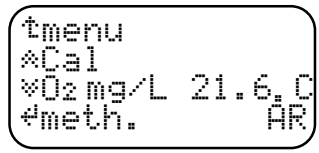
Start measurement.
AR = Measurement with AR is running.
Interruption is possible by changing to menu or actuation of selector switch.



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

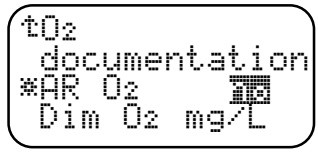
Documentation of meas. values: refer to chapter documentation.

Measurement of oxygen concentration without AutoRead



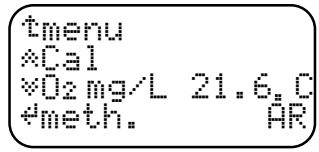
Menu oxygen measurement.





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



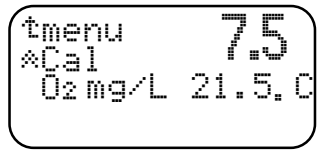


Confirm and go back to menu oxygen measurement.



Immerse oxygen probe into sample solution!
Care for incident flow!





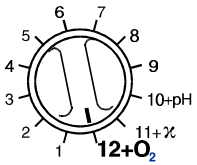
Measurement is running ***continuously***.
Interruption is possible by changing to menu or to calibration as well as actuation of selector switch.

Other calibration procedures and corrections

H_2O-Cal: Calibration in air-saturated water



Immerse oxygen probe into air-saturated water!
Care for incident flow!




```
↕menu
✱Cal
✱O2 mg/L 25.4 C
↵meth.      AR
```

Menu oxygen measurement.



```
↕O2
 Sal
✱OxiCal
 H2O-Cal
```

Select calibration.



```
↕O2
 OxiCal
✱H2O-Cal
 O2-Ref
```

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



```
H2O-Cal
 S= 0.983
 T= 21.6 C
          AR
```

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

```
↕O2
 S= 0.983
 T= 21.6 C
         ✱AR
```

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



```
↕menu
✱Cal
✱O2 mg/L 25.4 C
↵meth.      AR
```

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.



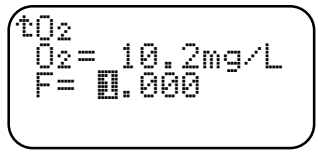
Immerse oxygen probe into solution with known oxygen concentration!
Care for incident flow!





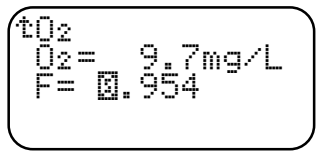
Select calibration.
With ⩓ or ⩔ select calibration procedure ***O_2 reference***.





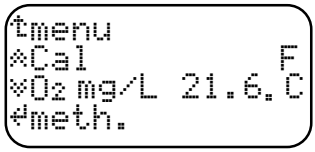
Confirm selection.
Display of the ***current oxygen concentration***.





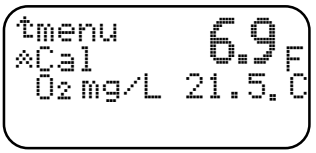
Change factor until the correct oxygen concentration is set.
⩒ ⩓: Select figure
⩓ ⩔: Set figure.





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!**

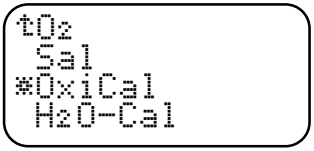
The solubility factor has no influence on the oxygen partial pressure and the saturation measurement.

Salinity correction (no calibration procedure)



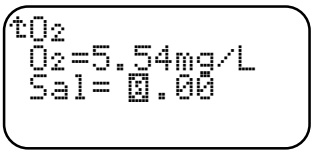
Immerse oxygen probe into air-saturated water! Care for incident flow!





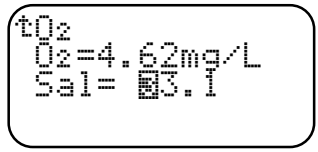
Select calibration.
With ⩓ or ⩔ select salinity.





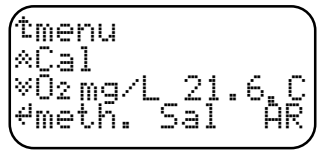
Confirm selection.
Display of the ***current oxygen concentration***.





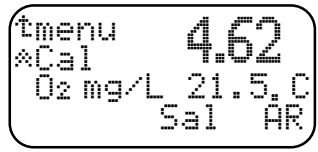
Set *salinity value* for the water.
» «: Select figure
» »: Set figure.





Confirm setting and back to menu oxygen measurement.





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

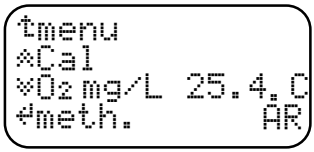


The adjusted **salinity remains active even after switching off the instrument!**

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

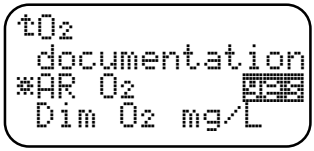
Additional functions

Switching AutoRead on and off



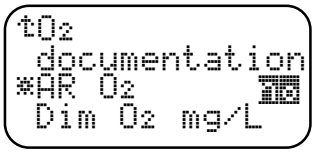
Menu oxygen measurement.





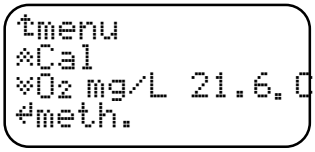
Select menu "additional functions".





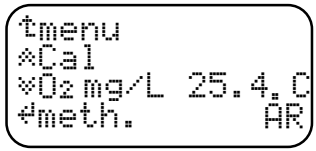
Select ***AutoRead no***.





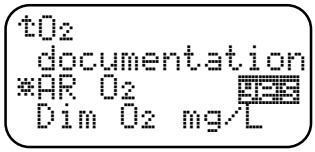
Confirm and back to measurement.

Dimension change and resolution



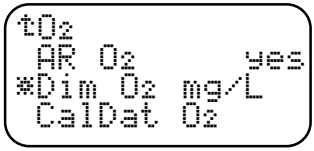
Menu oxygen measurement.





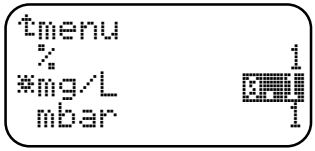
Select menu "additional functions".





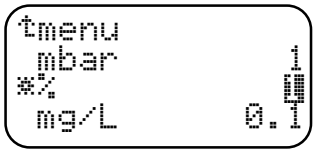
Select ***dimension***.





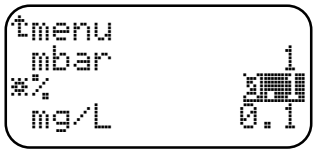
Enter menu Dimension.





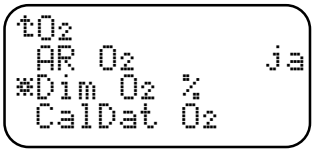
Select dimension.





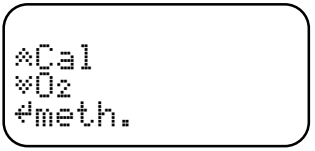
Select ***resolution***.





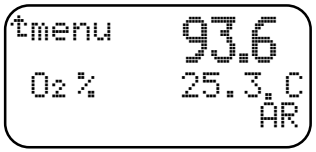
Confirm and back to menu.





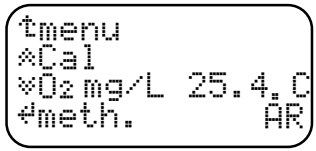
Back to menu oxygen measurement.





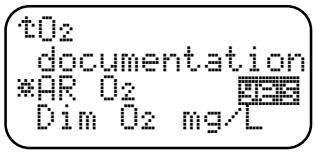
Start measurement. Measurement runs continuously.

Reading of calibration data



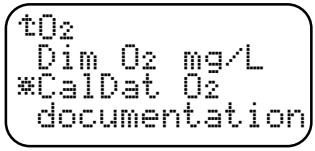
Menu oxygen measurement.





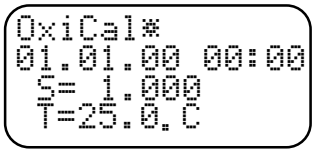
Select menu "additional functions".





Select ***CalDat O_2***.





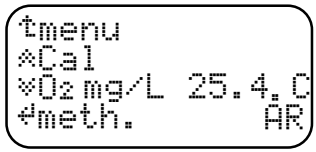
Display of ***calibration data***.
The display shows the default values.





Back to menu "Additional functions".





Back to menu oxygen measurement.

The MultiLab P5 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 P5.

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.

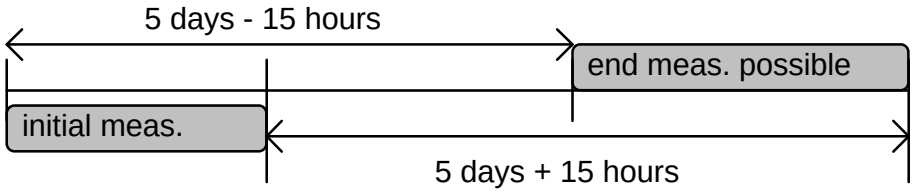
The display indications in the operation course are **German** (BSB_5) or **English** (BOD). With these measuring programs it is **not possible** to change the language setting via the "Configuration" menu.

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

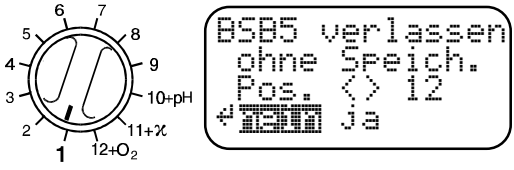
Max. storage location: 1800 meas. values.
Max. sample quantity: 100.
Max. dilutions: 5.
Double end value determination.
Bottle number 000 means: this bottle doesn't exist or the data should be erased.

Time interval:



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

Switching the selector switch during program operation effects if required:



Selection of "***ja***" (yes): ***Exit*** *BSB5 program without storing*.
Remaining in program: Back positioning of the filter selector switch, the third line in the display is erased. Now "***nein***" (no) can be selected.

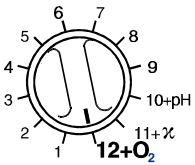
If required, pressing ↰ during program operation causes:

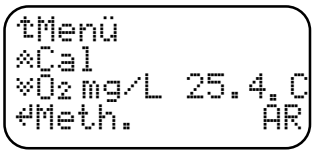




Please check the quality of the used oxygen probe before measurement.

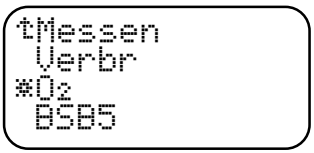
Initial measurement





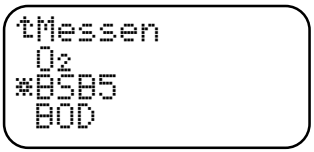
Menu oxygen measurement.





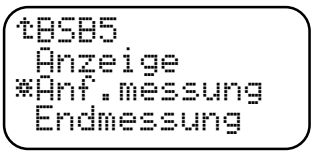
Select method change.





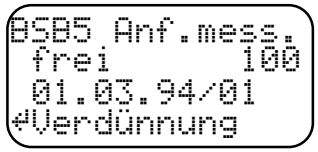
Select ***BSB5***.





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





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

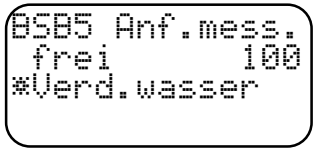




Select quantity of ***dilutions***.
Given number 5.
Adjustment range 1 to 5.
With ⩓ or ⩔ set number.

Display when dilution water has not yet been measured:





Measurement of dilution water selected.

Display when dilution water has already been measured:

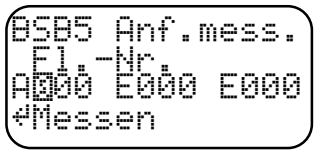




Selection between ***dilution water*** ("Verd. wasser") and ***sample measurement*** *("Probe")* with ⩓ or ⩔.

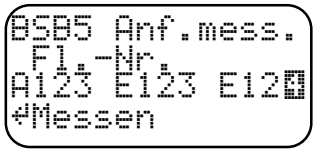
Measurement of dilution water:





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



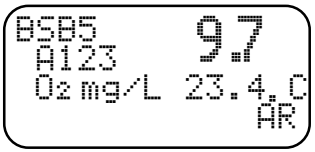


Enter ***bottle numbers*** (Fl.-Nr.) for initial and end measurement of the dilution water.

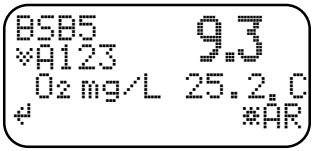
» «: Select figure

^ v: Set figure.





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



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





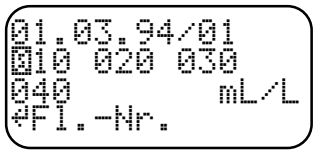
Measured value of the dilution water with date and time is stored.



Incubate!

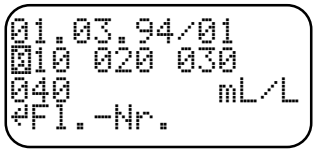
Measurement of dilutions starts:





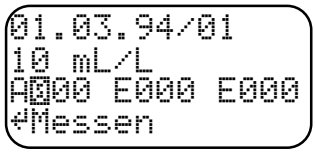
Proposition for dilution. Default values as displayed, or indication of last input values.





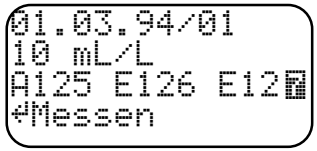
Change proposition for dilution as occasion demands.





Bottle numbers.



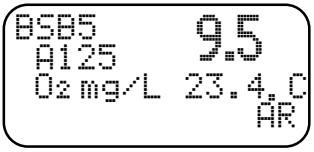


Enter bottle numbers.
» «: Select figure
^ v: Set figure.

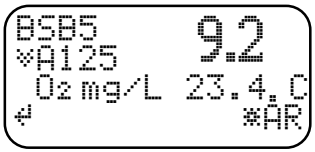


Immerse oxygen probe into bottle A125.





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



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

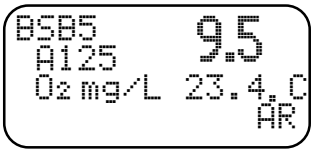




Store measured value and start time. Start next measurement.

or





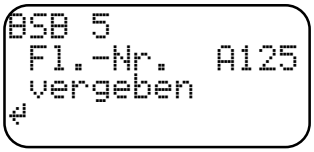
Re-measurement.



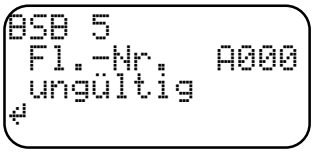
Incubate!

Perform **measurement for all dilutions**.

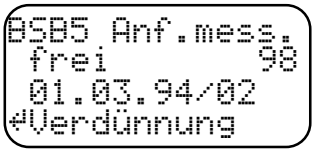
B**ottle number** entered **twice**:



Invalid bottle number:

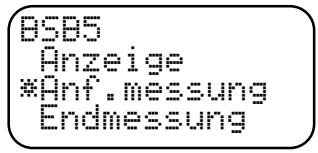


After the **initial measurements have been finished**:



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



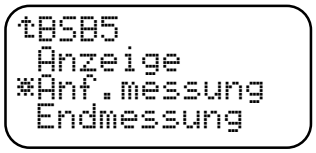


Back to BSB 5 menu.

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

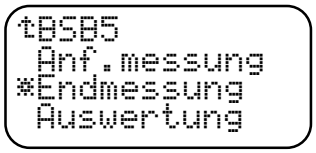
Final measurement

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.



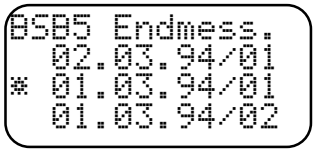
BSB 5 menu.





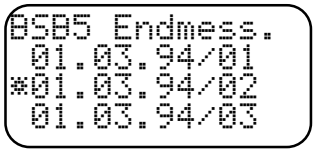
Select BSB 5 ***final measurement*** *("Endmessung")*.





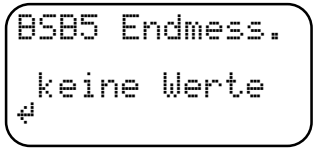
Entry to BSB 5 final measurement. Display of ***samples for final measurement***.



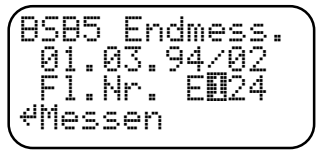


Select sample.

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





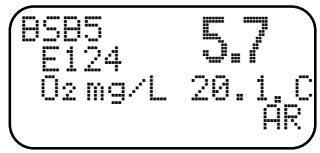


Instrument proposes a bottle, e.g. E124.
Given number may be changed.

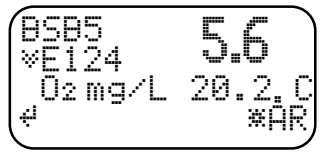


Immerse probe into bottle no. E124.





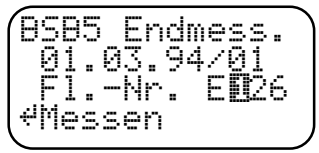
Start measurement for e.g. bottle E124.



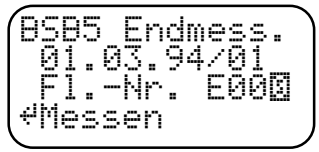
Wait until ※ appears before the AR (**signal sound**).

The MultiLab P5 controls the quantity of final measurements.

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

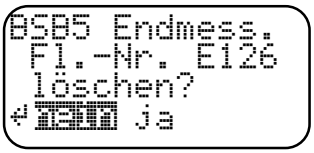






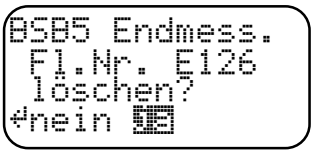
Lost or defective bottle: Overwrite number 126 with 000.





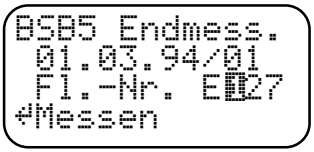
Safety query.





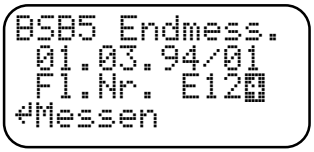
Confirm erasure.





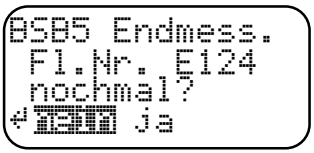
Ask for next measurement. Proposition of next bottle.

Re-measurement:



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

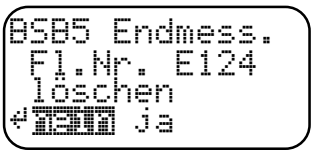




Do not measure bottle ***again*** has been selected.

The different possibilities:

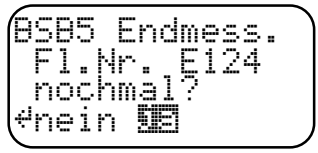




Do not erase bottle no. has been selected.

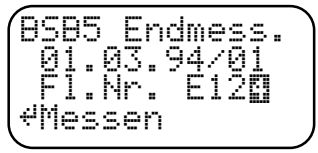
or





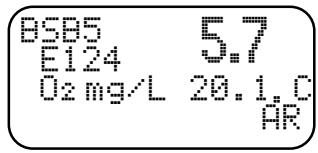
Measure bottle ***again*** has been selected.





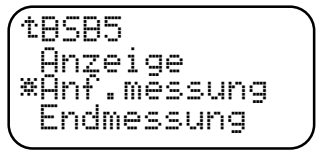
Re-measurement of bottle e.g. E124 selected.





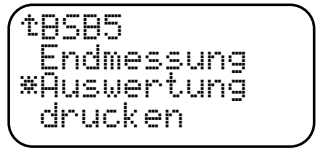
Re-measurement of bottle 124 started.

Evaluation



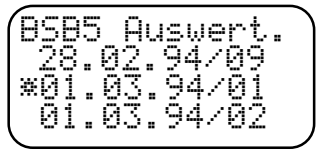
BSB 5 menu.





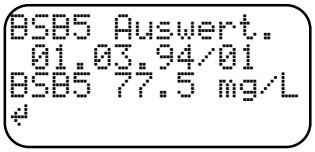
Select BSB 5 ***evaluation*** ("Auswertung").





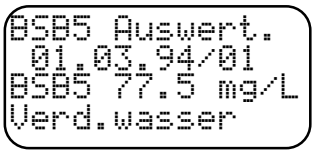
BSB 5 evaluation selected. Display of ***data records for evaluation***. With ⩓ or ⩔ select data record.





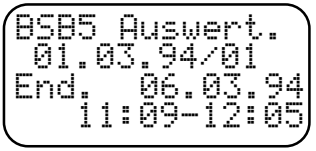
Display of the determined ***BSB5 value.***





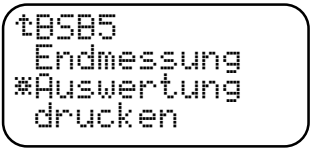
Display of all ***single data.*** The display corresponds to the printout.





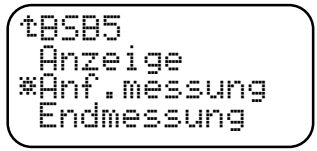
Display of further data.





Terminate evaluation and back to BSB 5 menu.

Display of measured values



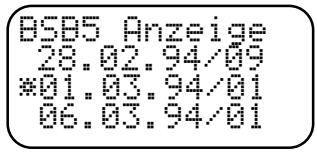
BSB 5 menu.





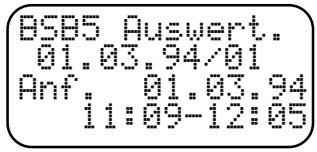
Select BSB 5 ***indication*** ("Anzeige").





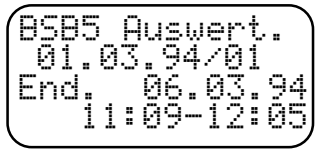
Display ***of all data records*** (also initial measurements of just started BSB determinations).





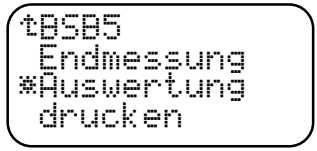
Display of ***single data***. The display corresponds to the printout.





Display of further data.



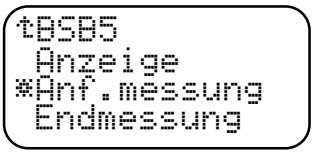


Back to BSB 5 menu.

Erasure of measured values

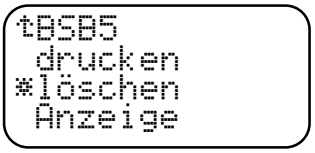
Display of all samples with the following characterization:

	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**.



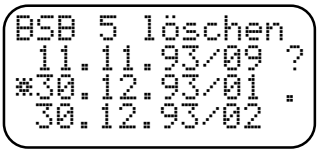
BSB 5 menu.





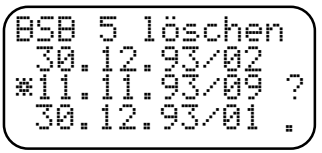
Select ***erasure*** ("löschen") of BSB 5 values.





Display of all samples.





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





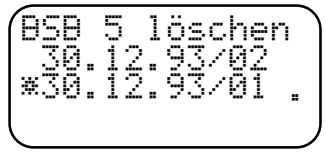
Safety inquiry for ***not yet evaluated*** samples.





Select erasure ("ja").

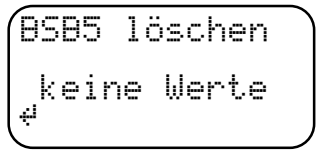




Confirm erasure.

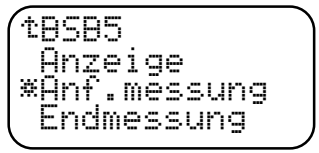
Erase until:





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.



```
BSB 5
 Auswertung
*drucken
 löschen
```

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



```
BSB5 drucken
 28.02.94/09
*01.03.94/01
 01.03.94/02
```

Select sample.



```
BSB5 drucken
 28.02.94/09
*01.03.94/01
 01.03.94/02
```

Print.

Example of an evaluation (80 characters per line)

Sample:01.03.94/01 BSB5:**184 mg/l**

	Sample volume Vi in 1 l dilution	Sample part ϕi	Oxygen concentration mg/l			Oxygen demand mg/l	
Initial measurement: 01.03.94 10:43-12:05 Final meas.: 06.03.94 14:05-15:10	ml/l	ml/ml	Begin-ning	End 1	End 2	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

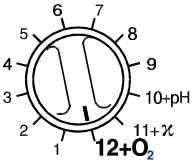
Exceptions (in brackets) have not been used for evaluation.

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
✱Cal
✱O2 mg/L 25.4 °C
↓meth.      AR
```

Method oxygen measurement.



```
↑measure
 cons.
✱O2
 BOD5
```

Method change.



```
↑menu
 BOD
✱cons.
 O2
```

Select ***oxygen consumption rate***



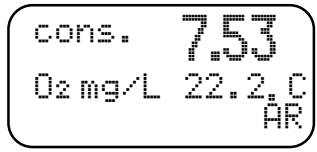
Immerse probe into sample solution!



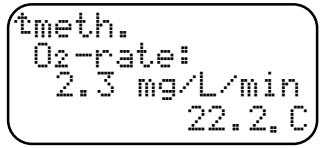
```
cons.    7.92
O2 mg/L 22.1 °C
           AR
```

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

Wait for result.



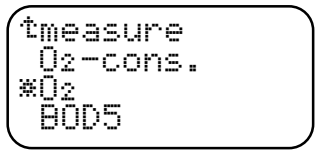
Display of the ***current oxygen concentration*** and the measured ***temperature***.



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

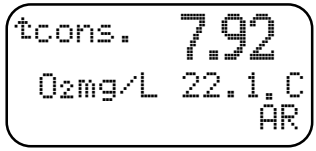
Re-measurement:





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.

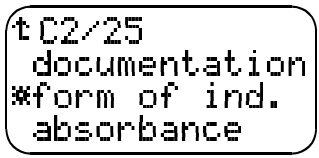


S059s: ***Time controlled automatic storage.***
Time runs backwards.

Call-up of menu "Documentation"

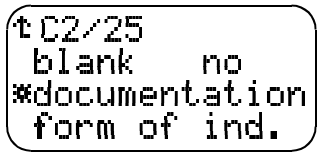
Photometry:





* Function ***indication form*** selected.
(Selector switch set to e.g. position 2,
test C2/25 COD).





* Select function ***documentation***.

pH measurement:



then

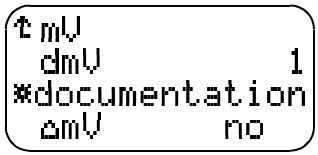




Select documentation **pH**.

mV measurement:





Select documentation **mV**.

ISE measurement:

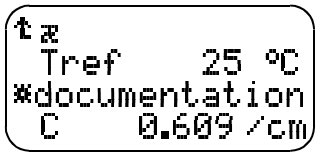




Select documentation **ISE**.

Conductivity measurement:

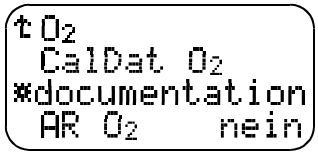




Select documentation **Conductivity** (or **Salinity**).

Oxygen measurement:



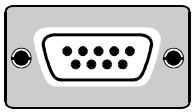


Select documentation **O_2**.

Printing

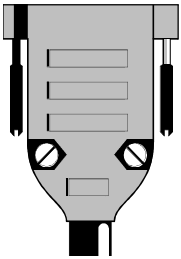
The following presettings are possible:

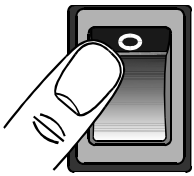
- 80 or 27 characters per line
- Printout with or without date and time
- Mode of test value numbering
- Automatic printing after measurement or on keypressing only





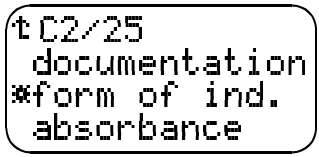
Connect **printer cable**.
Use cable AK 3000.





1. Switch on **printer**.
2. Switch on **MultiLab P5**.





※ Function ***indication form*** selected.
(selector switch set to e.g. position 2,
test C2/25 COD).



```
tC2/25
 blank    no
*documentation
 form of ind.
```

※ Select function ***documentation***.



```
tmenu
 printer
*none
 storage
```

Entry to menu documentation.

※ Preset: "***no***" documentation.



```
tmenu
 storage
*printer
  none
```

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



```
tmenu
 doc printer
*80 signs
 27 signs
```

Confirm selection.

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



```
tmenu
 doc printer
*27 signs
 80 signs
```

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



```
tmenu
 doc printer
*date/time
  without d/t
```

Confirm selection.

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



```
tmenu
 doc printer
*without d/t
 date/time
```

※ Select ***representation form***.









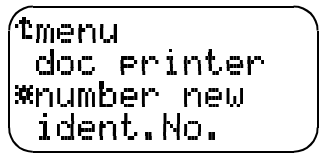
Confirm selection.

※ 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.

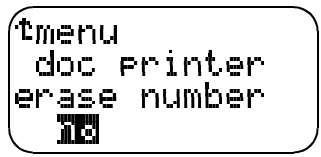




※ Set function "***Number new***".

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.



```
tmenu
  doc printer
erase number
  yes
```

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



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

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

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



```
tmenu
 doc printer
*ident. No.
 no.cont.001
```

※ 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.".



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

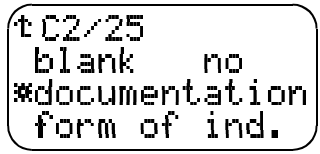
※ Function "***automatically***" is set.
Print test values ***automatically***.



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

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





Back to menu "additional functions".

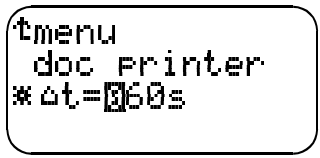
Time controlled printout of pH, mV, ISE N, ISE F, Conductivity, Salinity and Dissolved Oxygen





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



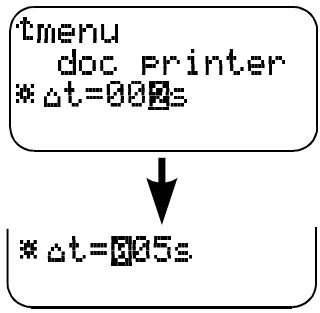


Time controlled automatic printout selected.
※ Time interval "Δt=060 s " is set.
Print of test values ***after 60 sec. automatically***.



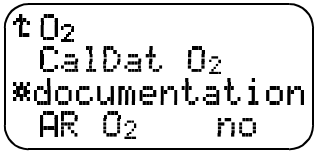


※ Set interval, z.B. "Δt=010 s".
Print of test values ***after 10 sec. automatically***.



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 !**



※ 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)

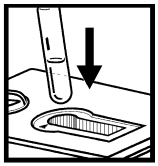
```
AutoCalDIN
Cal Error
11.03.94 09:34
```

Printing of results





Back to menu "Measurement", e.g. method C2/25.





Insert vial.
Display of test value.

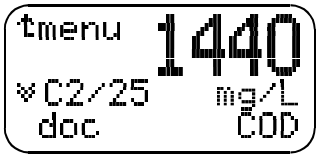
Dok : Send data with desired presettings to the ***printer by keypressing.***



Printing of test value.

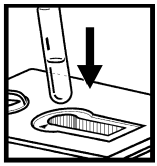
or

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



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

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





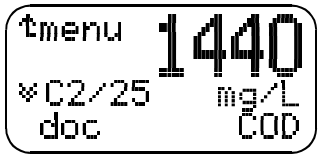
Insert vial.
Menu " Set ***ident. no.***" is displayed.





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 desired adjustments 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 C1/25 30.04.93 17:46:32     83    mg/L    CSB
002 C2/25 03.05.93 09:03:02     1500  mg/L    CSB
003 A5/25 04.05.93 09:33:00 !F  1.46  mg/L    NH4-N
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
006 O2    03.05.93 13:25:25     80.0  mg/L
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 C1/25 30.04.93 17:46:32
     83     mg/L      CSB
002 C2/25 03.05.93 09:03:02
     1500   mg/L      CSB
003 A5/25 04.05.93 09:33:00
!F   1.46   mg/L      NH4-N
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
006 O2    03.05.93 13:25:25
     80.0  mg/l
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
```

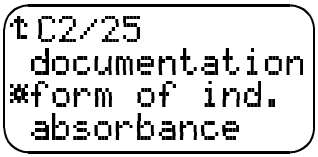
Storage

To store results in memory for later documentation.

Example: Storage of data at site in the MultiLab P5 and output to a printer or PC in the office.

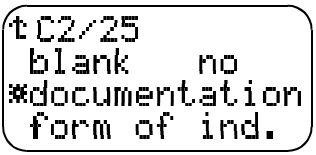
- **Max. 1000** results can be stored, in case of a higher quantity of measuring values the **last** 1000 values remain in the memory.
- **Free storage locations are displayed** in a **descending** sequence (1000, 999, 998.. 2, 1), after 1000 stored values the number starts again from the beginning (..2, 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 control the functions "no. cont." or "number new".





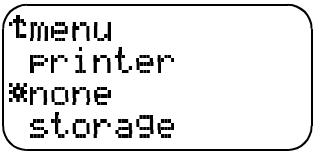
※ Function ***indication form*** selected.
(Selector switch set e.g. to position 2,
test C2/25 COD).





※ Select function ***Documentation***.





※ Preset:
"***no***" documentation.



```
tmenu
 none
*storage
 printer
```

※ Select funtion 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. cont 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. no. 112)*
after already performed measurements with set documentation.



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

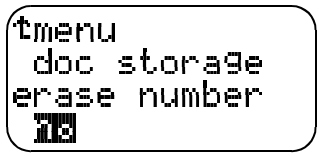


```
tmenu
 doc storage
*number new
 ident.No.
```

※ Set function "***number new***".

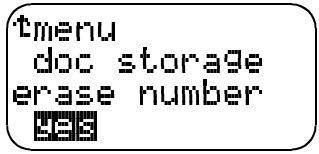
Function "***Number new***" selected and confirmed :
Step to selection menu ***"Erase Number"***





※ 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 the function **"no. cont."**.



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

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



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

※ Set function "***press button***".
Stores test values on ***keypressing***.

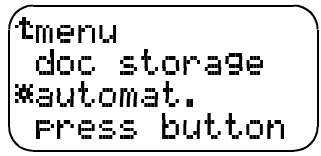


```
tC2/25
 blank    no
*documentation
 form of ind.
```

Back to menu "Additional functions".

Time controlled storage of pH, mV, ISE N, ISE F, Conductivity, Salinity and Oxygen





※ Function "***automatic***" is set.
Stores test values ***automatically***.



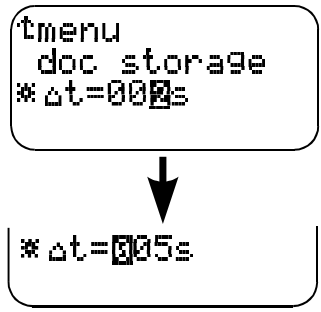


Time controlled automatic storage selected.
※ Time interval "Δt=060 s " is set.
Stores test value ***after 60 s automatically***.



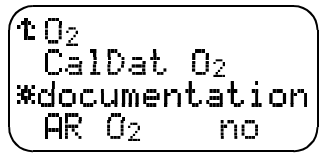


※ Set interval, z.B. "Δt=010s".
Stores test value ***after 10 s automatically***.



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



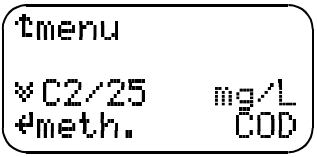


Back to menu "Additional functions".
(e.g. Oxygen measurem.).

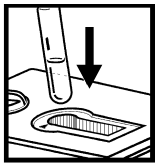
During the continuous measurement with time controlled storage **do not press a key or keep it depressed** which is not displayed as a selection (e.g. ↵ or arrow keys).
Pressing a key which is not allowed stops the built-in clock during key operation.

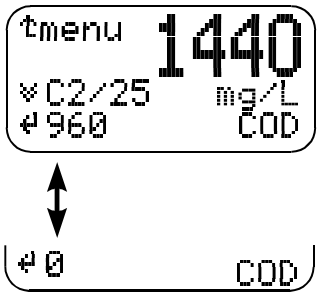
Storage of results





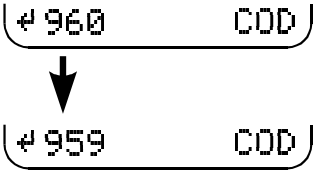
Back to menu "Measurement".
e.g. method C2/25.





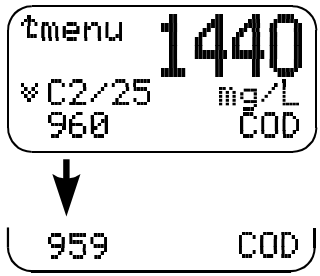
Insert vial/cuvette.
Display of test value.
↵960: ***By keypressing store*** the data in the desired presettings.
960*: Number of next test value storage location*

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.

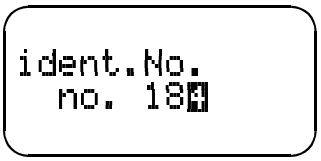
Storage of results, function "Ident. no" switched on





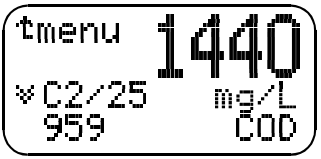
Insert vial/cuvette.
Menu set "***Ident. No.***" is displayed.





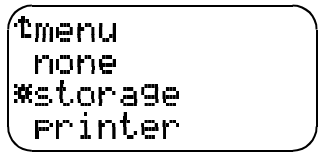
Set ***ident. No.***,
e.g. no. 184.
The instrument assigns the entered sample code to the last measured sample





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.





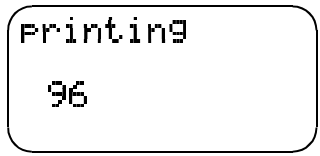
※ Function "***Numbers***" preselected.



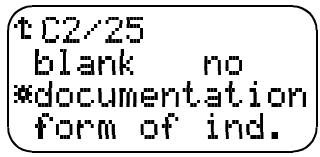


※ Select function "***output***"



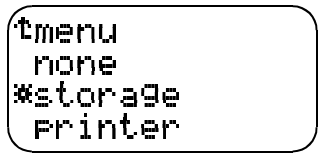


Confirm input.
Printing of test values (Memory counter follows on).



Printing is terminated.

Printing of list of methods



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



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

※ Function "***Numbers***" preset.



```
tmenu
 doc storage
*meth.list
 erase
```

※ Select function "***Meth. List***".



```
printing

 7
```

Confirm input.
Printing of the actual list of all methods.
Duration depends on length of the list approx. 10-20 s.

```
tC2/25
 blank    no
*documentation
 form of ind.
```

Printing is finished.

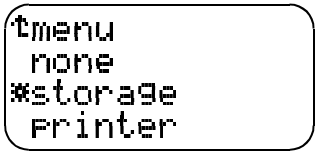
Printout Method list: Example Pos. of selector switch 2 (585 nm).

C2/25	100	-	1500	mg/L	COD	2	1	14	585
14541	100	-	1500	mg/L	COD	2	2	14	585
14555	500	-	10000	mg/L	COD	2	3	14	585
14561	0.025	-	0.500	mg/L	CN	2	4	14	585
14800	0.025	-	0.500	mg/L	CN	2	5	10	585
14553	0.10	-	8.00	mg/L	Cu	2	6	14	585
14767	0.20	-	6.00	mg/L	Cu	2	7	10	585
14500	0.1	-	10.0	mg/L	HCHO	2	8	14	585



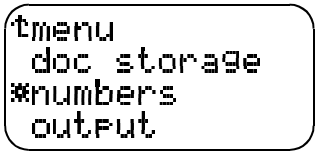
Printout of the selected methods only, **fade-out methods do not** appear!

Erasure of test values



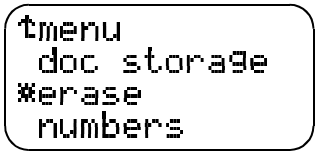
※ Select function documentation "***Storage***".





※ Function "***Numbers***" preselected.



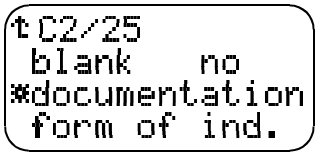


※ Select function "***erase***".



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

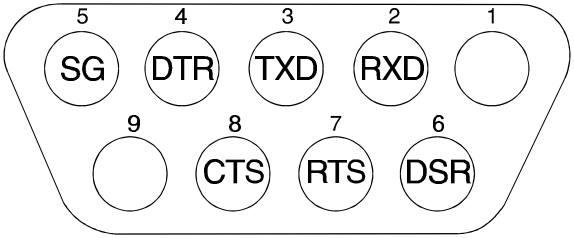




Confirm input.
All data in the test value memory ***are erased***.

RS 232 C-interface

Pin connections



MultiLab P5	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 MLP5 > Display shows Remote

```
LOGON
MLP5 >
```

CLOC Switches back to normal operation

```
MLP5 >
Display switches from Remote to actual method
```

CLIS Read out method list of set positions.

```
01 14561   0.020 -    0.500 mg/L     CN     9  1 14 620
02 14557   0.10  -    1.50  mg/L     F      9  2 14 620
03 T       1     -  100              FAU    9  3 50 620
04 FB620   5     -  100     1/m      DFZ    9  4 20 620
MLP5 >
```

Photometer

Command	Function *dependent on position of selector switch*

CMES	Measurement and transmission of sample value
	`14561 22.02.94 08:45:27 * -0.010 mg/L CN`
	`MLP5 >`

CEXT	Measurement and transmission of the extinction value
	`Ext. 22.02.94 18:33:52 0.012 E 620nm`
	`MLP5 >`

CBLA	Measurement and transmission of the sample blank value . The following concentration measurement considers the sample blank value.
	Erasure of the stored sample blank value by changement of the method at the selector switch , by discontinuance of "Remote"-operation or by input of an own method.
	`14561 22.02.94 08:45:27 * -0.010 mg/L CN`
	`MLP5 >`
	cmes ⇒ `14561 22.02.94 08:45:30 ! 0.040 mg/L CN`
	`MLP5 >`

Command	Function ***un****dependent on position of selector switch*
CEME	Input of an own method (refer to "Input of own methods ") `MLP5 >`
CCLR	Erasure of an own method (refer to "Erasure of own methods") `MLP5 >`
CFIL	Input of data of a 12. filter (refer to "Input of a 12. filter") `MLP5 >`

pH *undependent on the position of the selector switch!*

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
MLP5 >
```

```
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
MLP5 >
```

```
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
MLP5 >
```

```
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
MLP5 >
```

```
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
MLP5 >
```

```
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
MLP5 >
```

in case of missing calibration values appears:

```
AutoCalDIN
Cal Error
11.03.94 09:34
MLP5 >
```

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
MLP5 >
```

in case of missing calibration values appears:

```
ISE F
Cal Error
11.03.94 09:34
MLP5 >
```

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
MLP5 >
```

in case of missing calibration values appears:

```
ISE N
Cal Error
11.03.94 09:34
MLP5 >
```

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
MLP5 >
```

in case of missing calibration values appears:

```
ISE
Cal Error
11.03.94 09:34
MLP5 >
```

Conductivity *undependent on the position of selector switch!*

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
MLP5 >
```

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
MLP5 >
```

`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
MLP5 >
```

CLF14 Meas. range 0.0...300.0 µS

```
Cond  22.02.94 09:00:28     0.0   uS/cm          21.9 °C
MLP5 >
```

CLF15 Meas. range 0...3000 µS

```
Cond  22.02.94 09:00:28     0     uS/cm          21.9 °C
MLP5 >
```

CLF16 Meas. range 0.00...30.00 mS

```
Cond  22.02.94 09:00:28     0.00  mS/cm          21.9 °C
MLP5 >
```

CLF17 Meas. range 0.0...300.0 mS

```
Cond  22.02.94 09:00:28     0.0   mS/cm          21.9 °C
MLP5 >
```

CSAL Meas. range 0.0...70.0

```
Sal   22.02.94 09:00:28     0.0                  21.9 °C
MLP5 >
```

RC Read-out of cell constant

```
0.690/cm
MLP5 >
```

RTC Read-out of temperature coefficient

```
nlF
MLP5 >
```

RREF Read-out of reference temperature

```
25°C
MLP5 >
```

Oxygen *independent on the position of selector switch!*

Command	Function

CCON Measure the oxygen concentration

```
O2    22.02.94 09:19:40  *  8.6    mg/L          21.9 °C
MLP5 >
```

CPO2 Measurement of oxygen partial pressure

```
O2    22.02.94 09:19:40  *  168    mbar          21.9 °C
MLP5 >
```

CSAT Measurement of saturation

```
O2    22.02.94 09:19:40  *  107    %             21   °C
MLP5 >
```

RCAL Read out the calibration data

```
OxiCal 01.01.00 00:00:00 1.000 Srel 20.0 °C
MLP5 >
```

RBNR Read-out of the BOD5 samples

```
22.02.94/01
MLP5 >
```

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

Error message

INVALID COMMAND Wrong or not interpretable command

Print format of test values

Printer 80 characters/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 signs: !** (for sample blank value or offset correction), **F** (for slope correction),***** (for measurements out of the meas. range)
1 space
9 characters **test value**
1 space
8 characters **unit**
1 space
5 characters **indication form**
1 space
4 characters **temperature** (not for photometric measurements)
1 space
2 characters **°C** (not for photometric measurements)

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

Input of own methods

The data transmission of the own method is done in a string. The different data blocks of the string are separated by spaces:

5 characters ***method indication***

1 space

5 characters ***wave length***

1 space

9 characters ***unit***

1 space

12 characters ***indication form***

1 space

12 characters ***zero point****:* Exponential graph is possible.
admissible signs are: " **+** ", " **-** ", " **.** ", " **e** ",
and all numbers from **0 ... 9**.

1 space

12 characters ***slope****:* refer to zero point.

1 space

12 characters ***beginning of meas. range***

1 space

12 characters ***beginning of meas. range***

1 space

2 characters ***reference cuvette***

1 space

5 characters ***resolution***

Example:

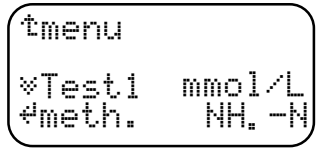
CEMETest1 690nm mmol/L NH4-N 0.987e-3 2.12345 0.1 22.3 14 0.1

The recognition of an error leads to error message "INVALID COMMAND".

The following inputs lead to error message "INVALID COMMAND" as well:

- Slope = 0 *or* > 32000
- Zero pointt > 32000
- Beginning of meas. range < 0 *or* > 32000
- End of meas. range < 0 *or* > 32000
- End of meas. range £ Beginning of meas. range
- Ref. cuvette different 10 mm, 14 mm, 20 mm or 50 mm
- Wave length does not correspond to the instrument
- Resolution not 0.1, 0.01, ...

After successful input the instrument displays the received method :





The instrument **limits independently** the meas. range (no remote indication!), when the entered method data allow **extinction values > 3 resp. > 2,5** (at 340 nm).

Totally **50 own** methods are possible, max. 40 per filter position. The **51st own method on one filter** causes "Meth. Error"; in this case another method should be erased before input of the new method.

Erasure of own methods

CCLR erases all own methods

```
MLP5 >
```

CCLR Test1 erases these own methods

```
MLP5 >
```

Input of a 12th filter

CFIL 777nm Input of the wavelength

```
MLP5 >
```

Software Multi-ACHAT for Windows

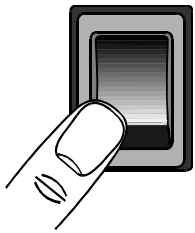
The software Multi-ACHAT (WTW-Product) supports all interface commands of the MultiLab P5.

Windows is required.

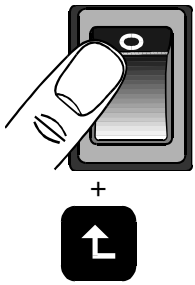
Some infrequently used functions are summarized in this chapter .

- Setting the **language**
- Setting **date and time**
- Alteration of the **sequence** of the method
- Input of own methods
- Information conc. **software status**
- Recovery of default settings (**RESET**)

Call-up of menu "Configuration"



Switch off the instrument.

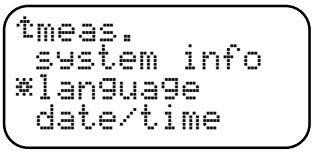


Switch on instrument and **simultaneously** depress ↵. Release ↵ after sound.

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**



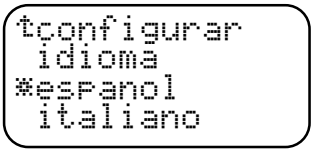
※ Menu ***"Configuration"***.





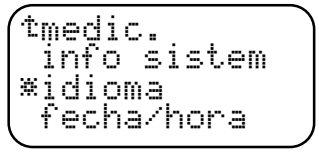
※ Enter menu ***Language.***





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





※ Confirm input.
Display of all menus in Spanish.





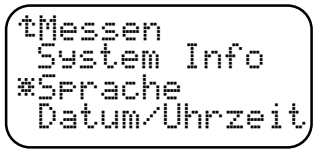
Return to German display: Call up function "***idioma espanol***" again.





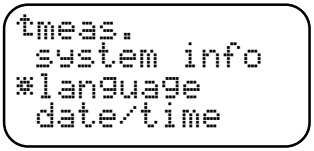
※ Select ***deutsch***.





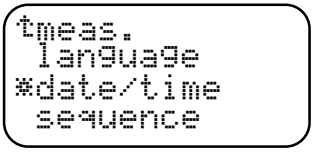
※ Confirm input.
Displays of all menus in German.

Date and time



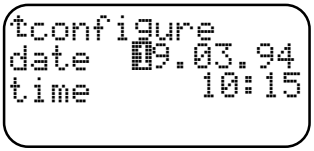
Menu "Configuration".





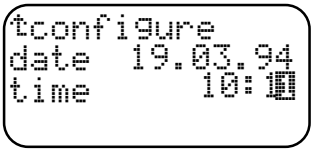
※ Select function ***"Date/time"***





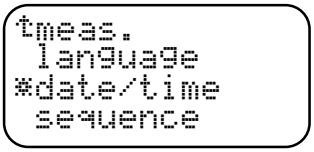
Display of the current data.The first number of the day is marked.





Update data.

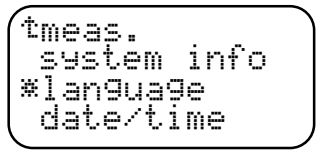




Back to main menu "Configuration".

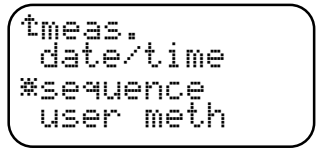
Alter sequence of methods

The preset sequence of the methods can be altered to user's requirements; e.g. all Merck-tests can be faded out.



Menu "Configuration".

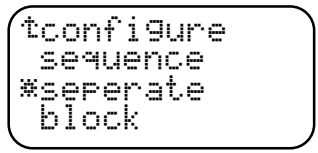




* Select function "***sequence***".

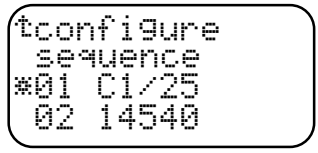
Select **Change of methods** (Recommendation: in case of long lists note or print out the sequence before).
The sorting is done **automatically**.





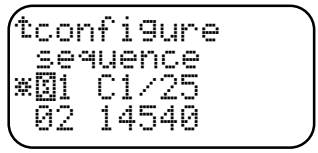
* Function "***separate***" selected.





Display ***Method list***.





*Input ***new number*** or set to zero.







```
tconfigure
 sequence
*00 C1/25
 02 14540
```

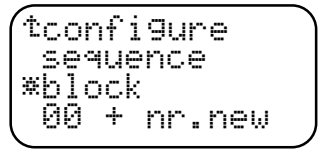
Sorting over.

```
tmeas.
 date/time
*sequence
 user meth
```

* Function "Sequence" selected. **New sequence is stored**.

Block wise fade out:





※ Function "***Block***" selected.





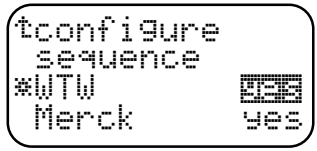
※ all **WTW tests** are **faded in**.





※ all **WTW tests** are **faded out**.



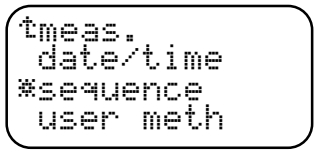


※ all WTW tests are faded in again.



Sorting over.

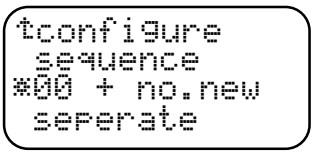




Back to configuration.

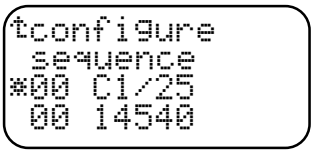
Selection of few methods:





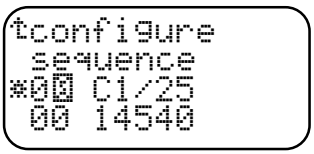
※ Function "***00 + new no.***": The instrument sets all numbers to 00, then input the individual numb. again





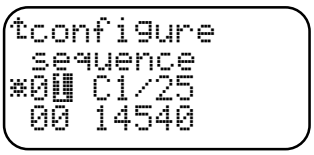
Method list.





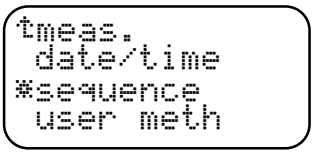
※ Input number or set to zero with ↵.





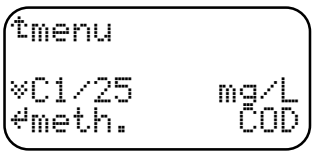
Number 01 input.





Back to menu.





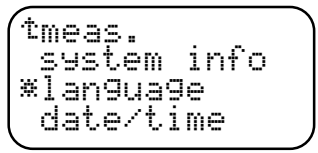
Back to function "Measurement".

User specific methods

At input of "description", "unit" and "indication form" the keys have scroll **function**.

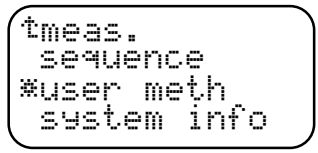
Observe filter position !

Characteristics



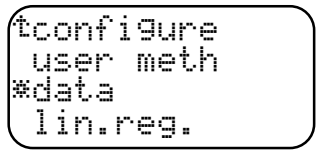
Menu "Configuration".





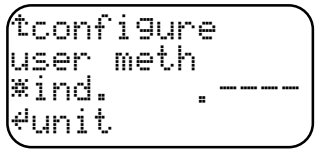
* Select function "***User meth***".





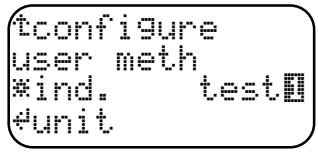
* Input ***characteristics.*** Data must be known.





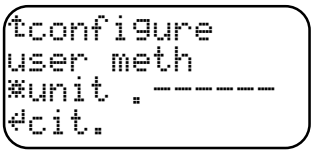
Input 5-digit ***description.***





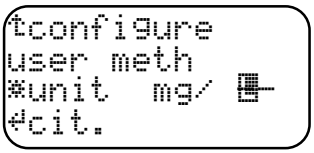
e. g. test1.





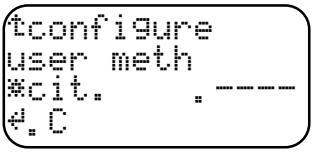
Input max. 7-digit ***unit.***





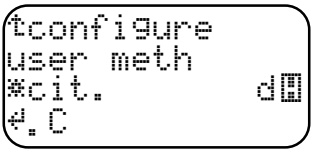
e. g. mg/L.





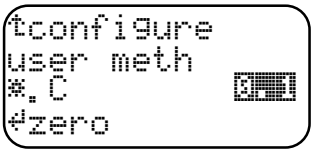
Input *indication form* ("cit.").





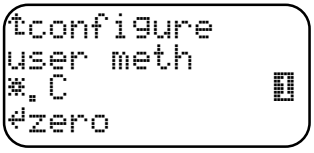
e. g. dH.





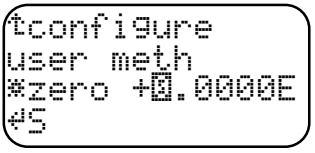
Select *resolution*.





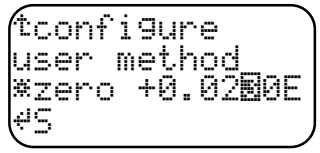
e. g. 1.





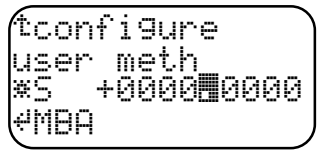
Input *zero point* with correct digit sign





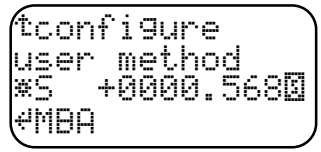
e. g. +0.023.





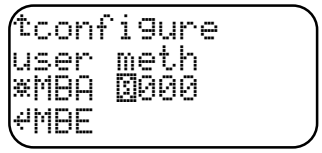
Input *slope* (E/c) with correct digit sign.





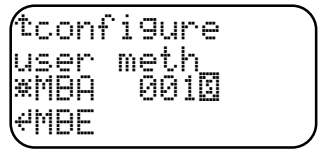
e. g. +0.568.





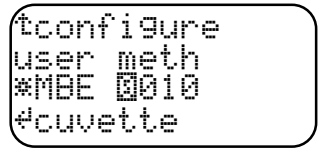
Input beginning of meas. range. Amount of indicated figures depends on the resolution.





e. g. 10.





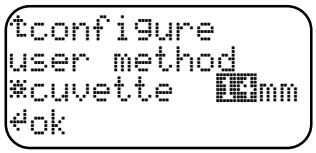
Input *end of meas. range*.





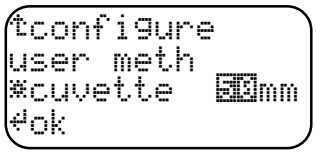
e. g. 1000.





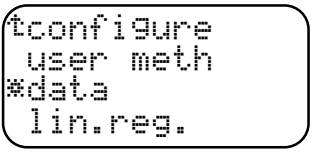
Input *reference cuvette*.





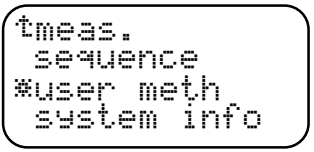
e. g. 50.





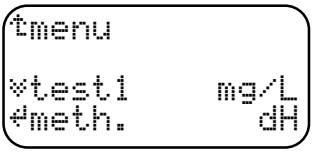
⁕ Method ***is stored***.





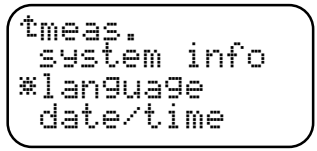
Back to "user meth"





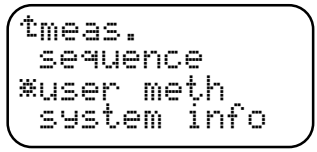
Back to function "Measurement". Ready to measure own method.

Linear adjustment with 10 test values



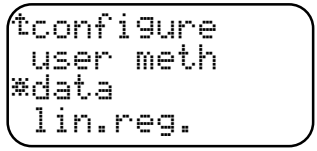
Menu "Configuration".





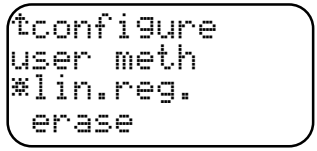
* Select function "***User meth***".





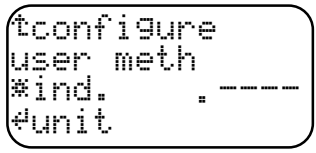
* ***Characteristic data*** selected.





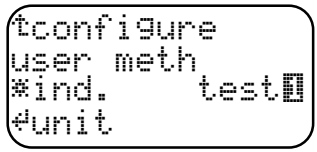
* Select ***linear regression***.





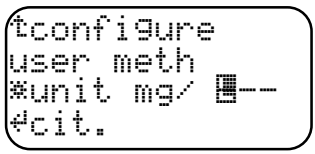
Input 5-digit *description*.





e. g. test1.



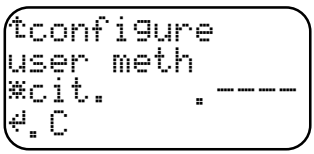


Input max. 7-digit ***unit***.



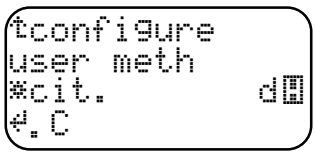
e. g. mg/L.





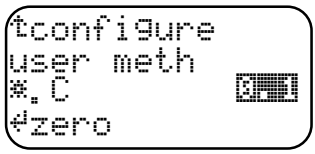
Input 5 digit ***indication form***.





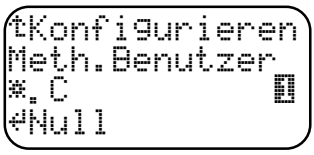
e. g. dH.





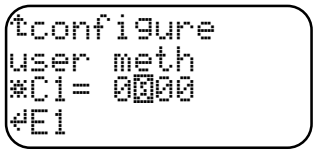
Select *resolution*.





e. g. 1.





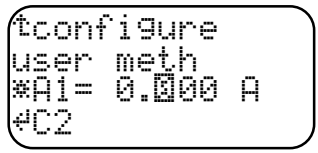
* Input ***first concentration***.





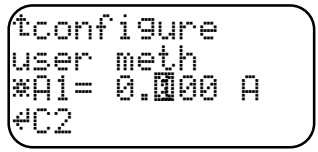
※ Input first concentration, e.g. 100.





※ Input ***first absorbance***.

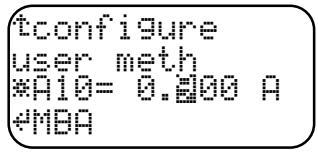




※ Input first absorbance, e.g. 0.100.

Input further 9 pairs of values acc. to above schema.





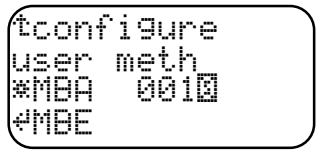
※ Input ***last absorbance***, e.g. 0.900.





Input *beginning of meas. range*. Quantity of the indicated numbers depends on the resolution.





e. g. 10.



```
↑configure
user meth
*MBE 0010
↵cuvette
```

Input end of measuring range.



```
↑configure
user meth
*MBE 1000
↵cuvette
```

e. g. 1000.



```
↑configure
user meth
*cuvette  10mm
↵ok
```

Input *Reference cuvette*.



```
↑configure
user meth
*cuvette  50mm
↵ok
```

e. g. 50.



```
↑configure
user meth
*lin.reg.
 erase
```

⁕ Method ***stored***.



```
↑meas.
 sequence
*user meth
 system info
```

⁕ Characteristic data selected.

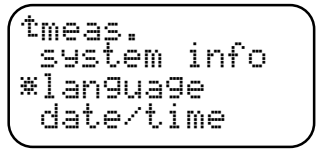


```
↑menu

*test1     mg/L
↵meth.       dH
```

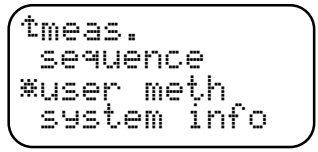
Back to function "Measurement". Ready to measure own method.

Erasion of characteristic data



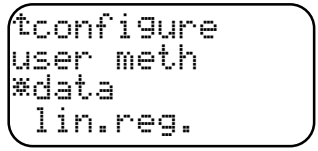
Menu "Configuration".





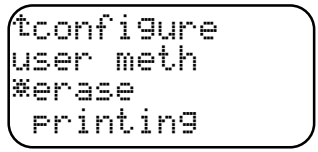
* Select function "***User meth***".





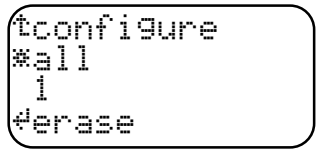
* ***Characteristic data*** selected.





* Select ***erasion***.





* erasion of ***all*** methods selected.



The function "erasion of **all methods**" collects **all own methods on all filter positions!**



```
configure
*1
 all
erase
```

* Select ***erasion of one*** method.



```
configure

 ind.     .----
erase
```

Input *method description*.



```
configure

 ind.     test
erase
```

Method description.



Sorting over.



```
configure
*1
 all
erase
```

Possibly erasion of other ones.



```
meas.
 sequence
*user meth
 system info
```

Back to function "User meth".

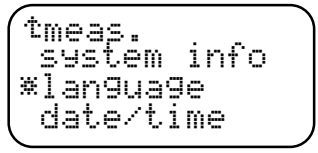


```
menu

C1/25     mg/L
meth.      COD
```

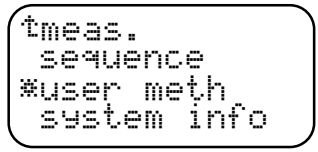
Back to function "Measurement".

Printing of characteristic data



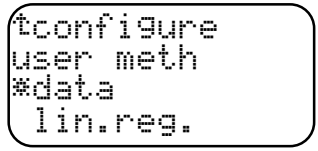
Menu "Configuration".





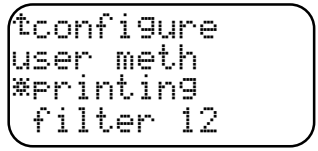
* Select function "***User meth***".





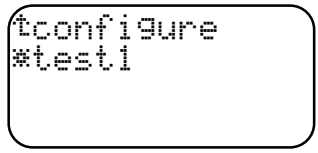
* ***Characteristic data*** selected.





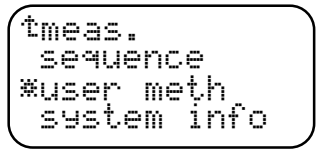
* Select ***printing***.





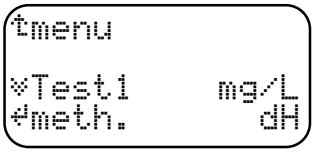
Method characteristics are printed.





Back to function "User meth".





Back to function "Measurement".

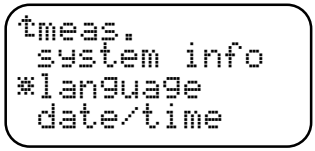
Printout of own method:
(Example)

```
MultiLab P5
Software: A 28.03.94
04.01.15 16:07:00

Test1
445nm
2.0   -  20.0 [mg/L]
NH4-N
E0=  0.022000
S=   0.046000
14mm
```

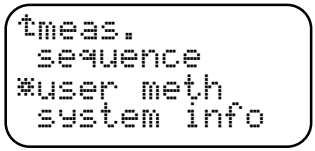
Filter 12

Input after installation of a 12th filter. Input regardless of actual filter position.



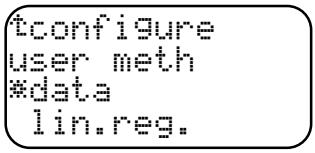
Menu "Configuration".





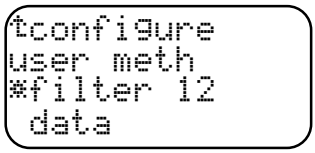
* Select function "***User meth***".





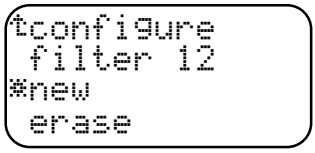
* ***Characteristic data*** selected.





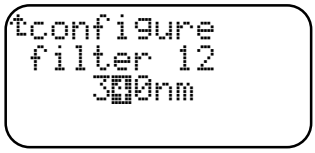
* Select ***Filter 12***.





* Filter 12 ***new*** selected.





* Input filter 12 ***wavelength***.



```
tconfigure
 filter 12
    360nm
```

e. g 360nm.



```
tconfigure
user meth
*filter 12
 data
```

Back to function "Filter 12".



```
tmeas.
 sequence
*user meth
 system info
```

Back to function "User meth".



```
tmenu

vC1/25     mg/L
^meth.      COD
```

Back to function "Measurement".



```
tC1/25
 documentation
*form of ind.
 absorbance
```

Menu "Additional functions" selected.



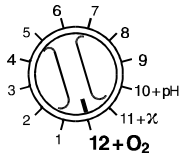
```
tC1/25
 form of ind.
*absorbance
 factor
```

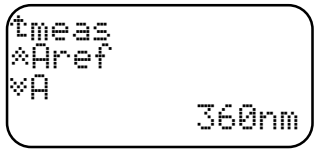
* Select function "***Absorbance***".



```
tmeas
*Aref
vA
          445nm
```

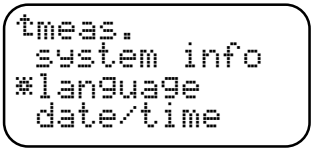
Menu "Absorbance measurement" e.g. on position 1.





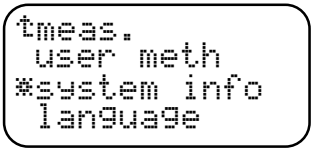
⇐ new filter description.

System Info (Software status)



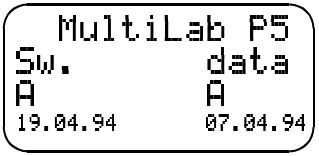
Menu "Configuration".





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

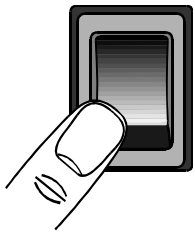




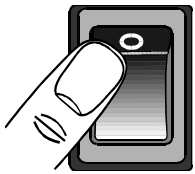
Date and version number can be different from the example.

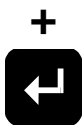
Reset

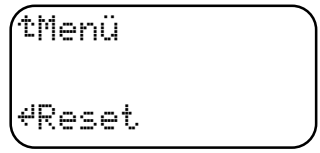
Reset to to default settings is possible in single steps. "Reset all" is the sum of all single steps.
Own methods and test values remain stored.
Below all possibilities are listed. ↵ starts the selected Reset.



Switch off instrument.







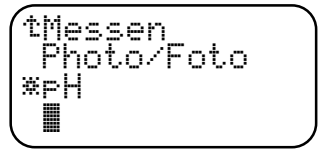
Switch on instrument and **simultaneously** depress ↵. After acoustic signal release ↵.





* Reset ***Photometry***.





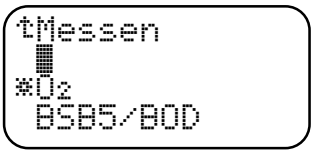
* Reset ***pH/mV/ISE***-measurement.





※ Reset ***conductivity measurement***.





※ Reset ***oxygen measurement***.





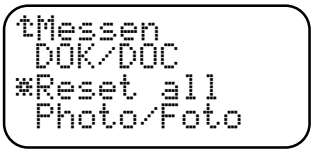
※ Reset ***BSB5/BOD***.





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



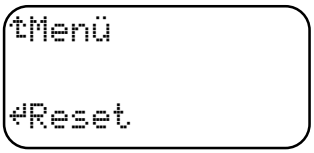


※ Reset ***all.***



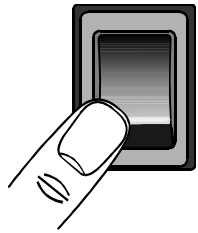
Perform Reset.





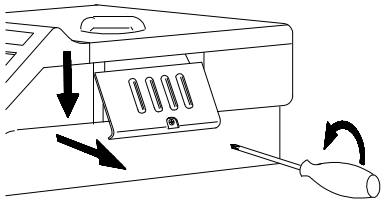
Changing the lamp





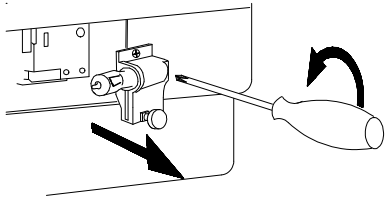
Switch off the instrument!

A zero adjustment must be carried out after changing the lamp!



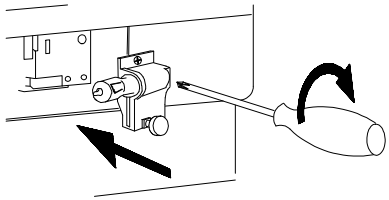
Turn out screw.

Remove lid.



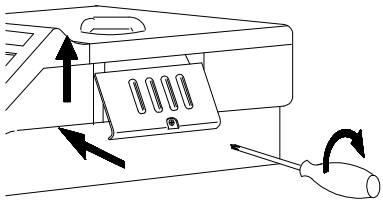
Turn out screw.

Remove lamp.



Insert new lamp.
Do not touch glass bulbs of the lamp with your fingers!

Screw on lamp.



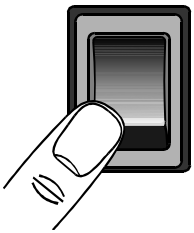
Insert lid.

Screw on lid.

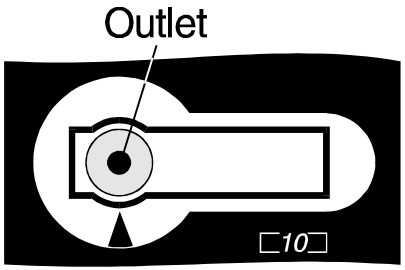
Action in case of broken cuvette in the cuvette compartment

Never turn up the MultiLab P5 in order to pour out the liquid that has run out!

The MultiLab P5 is equipped with a drain device below the cuvette department (outlet in compartment and absorbing tank with bottom drain in the instrument), which provides a contact of the liquid with electronic components.
If the MultiLab P5 is turned up the collected liquid in the absorbing tank runs into the instrument and causes short circuits!

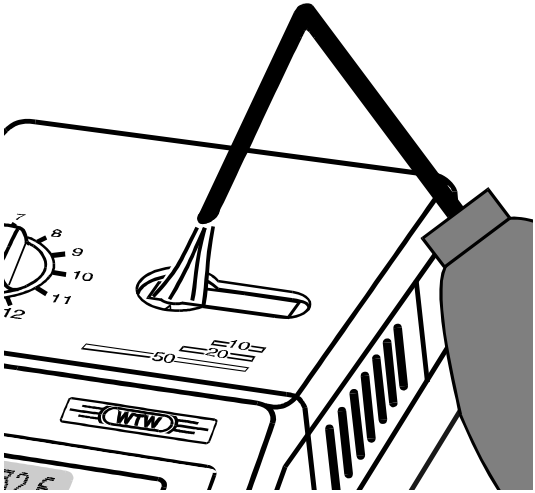


Switch off the instrument.



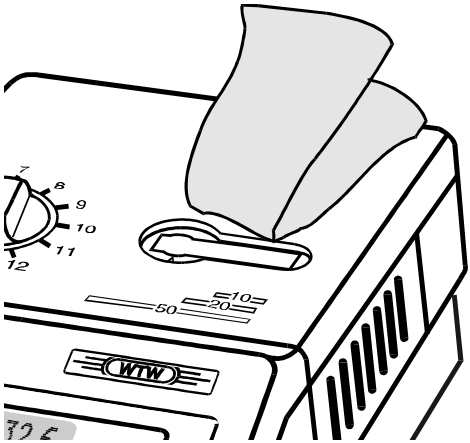
Let drain the liquid (leaks out at the bottom side of the photometer).

Remove glass parts (e.g. with a pincette)**.**



Carefully rinse cuvette compartment**.**

Let drain rinsing liquid**.**



Dry cuvette compartment (e.g. with a soft towel) or let it dry**.**

After drying the photometer is prepared for operation.

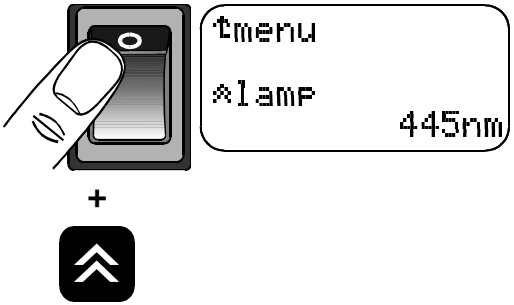
Performance of instrument zero adjustment

INSTRUMENT ZERO ADJUSTMENT ONLY AFTER CHANGING LAMP or FILTER, or AFTER RECEIVING ERROR MESSAGE "ERROR 1"!

In delivery condition all zero adjustments of the instrument have been carried out carefully and stored. For ***MEASUREMENT*** in practice ***NO ZERO ADJUSTMENT*** required!

The values of the zero adjustments remain stored until the next adjustment.
The instrument **doesn't** recognize **a wrong zero adjustment** ! Zero adjustment should be carried out by skilled persons only.

Perform **zero adjustment** of the instrument with **mains power supply** only!

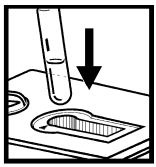


Connect line adaptor (see chapter mains power supply).

Switch on instrument and **simultaneously** press .

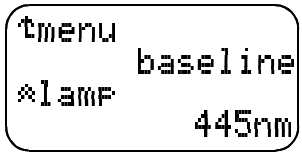
Release .

Lamp: *Zero adjust after changing the lamp.*
I = *445 nm*, filter pos. 1.



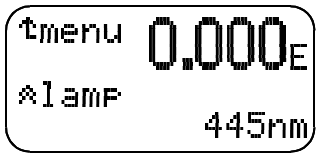
Insert vial/cuvette containing **distilled water** (clean, not scratched!).
Attend to **minimum filling capacity** (s.b.)!





Start ***zero adjustment*** .

Wait



Zero adjustment is finished.

The zero adjustment after changing the lamp of the MultiLab P 5 must be carried out **separately** for **all used vial/cuvette types and filter positions**.
Attend to the below mentioned **min. filling capacity for each vial/cuvette type** for an orderly zero adjustment !

Cuvette	Min. **filling capacity [ml]**	Min. **filling height [mm]**
● 14 mm vial	2.6 ml	20 mm
☐ 10 mm rectangular cuvette	2.0 ml	20 mm
☐ 20 mm rectangular cuvette	4.0 ml	20 mm
☐ 50 mm rectangular cuvette	10 ml	20 mm

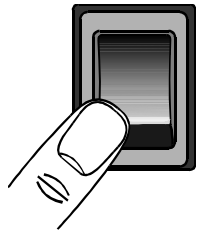
A regular **control** of rhe instrument can be carried out by absorbance measurement with **clean** and **not scratched vial/cuvettes filled** with **FD water** (FD = fully demineralized):

- For all wave lengths, except 340 nm, the measured absorbance should be ±0.010 A.
- For 340 nm the measured absorbance is ±0.030 A.

Differences from these values may be subject to cuvette defects or mechanical reasons (smaller differences) or are caused by wrongly performed zero adjustments (differences dependent on the cuvette volume are more or less high).
Note the determined values in order to state possible alterations. In case of further questions or problems contact us.

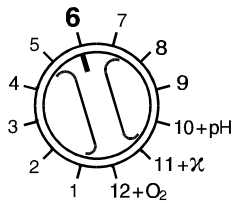
Installation of filter 12



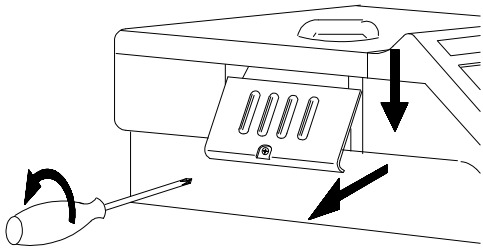


First **switch off** the instrument!

Do not touch the filter glass with your fingers

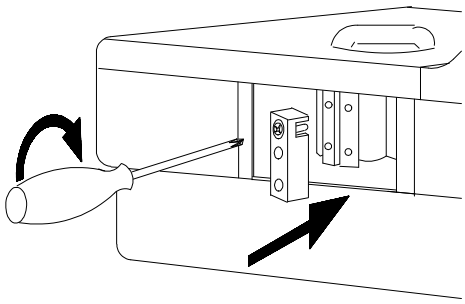


Selector switch to position 6.



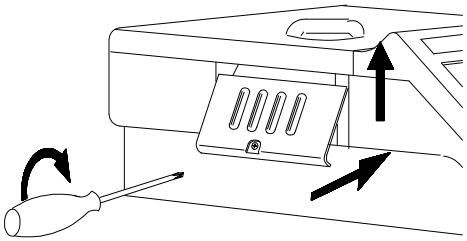
Turn out screw.

Remove lid



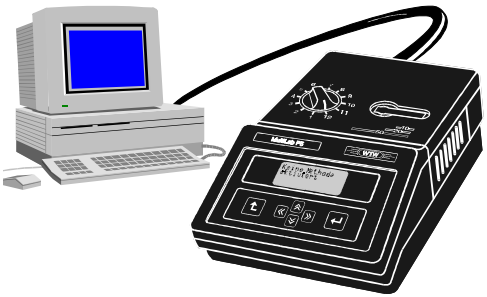
Insert filter.

Screw on filter.



Insert lid.

Screw on lid

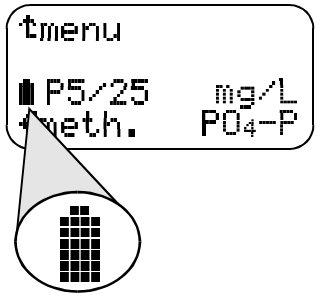


Input filter data by PC,
e.g. via software ACHAT from WTW.

Carry out **zero adjustment** for the supplementary filter!

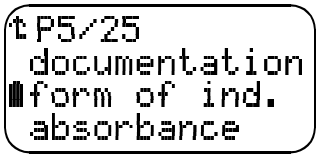
Input of the filter data is also possible directly via keyboard (s.chapter "Configuration: User specific methods").

Accu



Symbol for state of charge *is lit: Charge accumulator.*

Charging the accu*:* ***is faded out approx 3 min. after connection of mains plug transformer.***

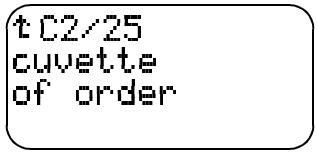


The symbol for state of charge replaces the marking sign in the selected menus.



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

Control elements



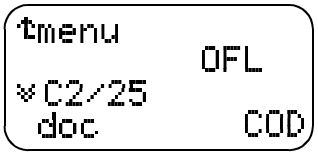
Wrong positioning *of the* ***cuvette****:*
The rectangular cuvette is ***not*** inserted ***right-flushed*** *in the cuvette compartment.*



Wrong cuvette*:*
Rectangular cuvette instead of vial has been used for reaction vial test.

Photometry

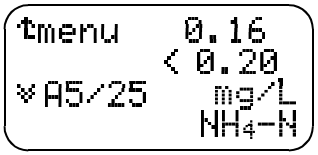
Measurement



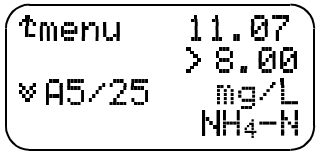
Generally: Overflow
Cause / Action:
- Lamp defective / Change lamp
- AD converter overloaded / Dilute sample
- AD converter defective / Send meter to WTW for repair



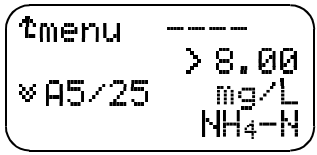
Generally:
Zero adjustment missing.
Action:
Perform zero adjustment
(see page 208)!



Measurement:
Measured value is below the **measuring range**.
The displayed measured value (e.g. 0.16 mg/L) is an assessed value.
Action:
- Give result as assessed value
- Use reagent set with lower measuring range
- Select vial/cuvette with thicker layer.

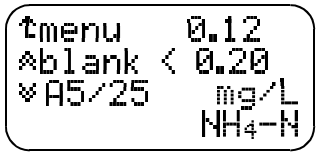


Measurement:
Measured value exceeds measuring range of the reagent set.
The displayed measured value (e.g. 11.07 mg/L) is an assessed value.
Action:
- Give result as assessed value
- Use reagent set with higher measuring range
- Select vial/cuvette with thinner layer.

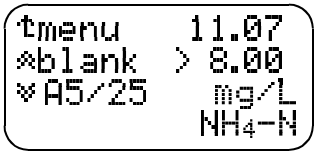


Measurement:
Measured value exceeds measuring range of the reagent set.
It is not possible to compute an assessed value.
Action:
- Pre-dilute sample
- Use reagent set with higher measuring range

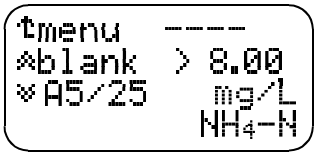
Measurement with blank value adjustment



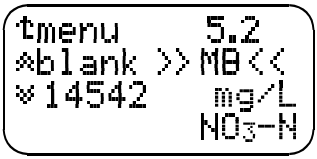
Sample blank value adjustment:
Small influence of the sample blank value. The sample blank value adjustment ist only necessary for very precise measurements or for measurements with very low concentrations.



Sample blank value adjustment:
Very big influence of the sample blank value. The measuring accuracy is considerably reduced.
Cause/Action:
- Reduce sample blank value
- Sample turbid / Filter sample, e. g. ultrafiltration
- Sample colored / Remove coloring, e. g. oxidation

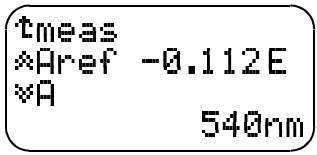


Sample blank value adjustment:
Very big influence of the sample blank value. Measurement is impossible.
Cause/Action:
- Reduce sample blank value
- Sample turbid / Filter sample, e. g. ultrafiltration
- Sample colored / Remove coloring, e. g. oxidation

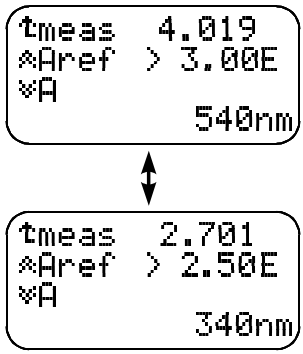


Sample blank value adjustment:
Sample blank value reduces the measuring range for the measurement.
Action:
- Decrease sample blank value
- Dilute sample

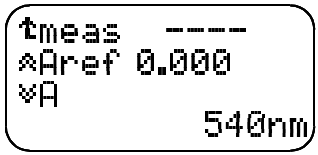
Absorbance measurement



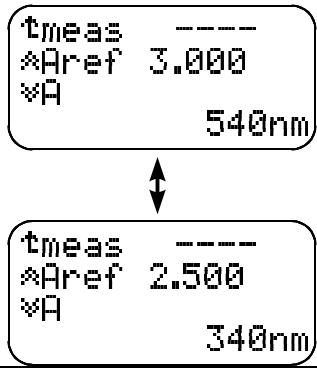
Absolute measurement: Zero point of meter misadusted.
Action:
Perform zero adjustment.



Absolute and relative measurement: Measuring range of meter is exceeded. An assessed value is displayed.
- Dilute sample
- Select other wavelength
- Give result as assessed value

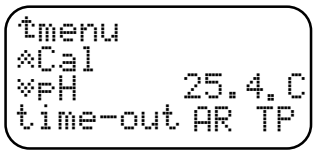


Absolute und relative measurement: Measured value below measuring range of meter. Measurement is not possible.
- Dilute sample
- Select other wavelength



Absolute und relative measurement: Measured value above measuring range of meter. Measurement is not possible.
- Dilute sample
- Select other wavelength

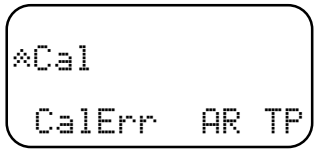
pH



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

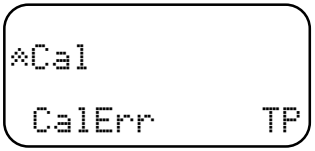


Calibration: Calibration data outside of admissible ranges.

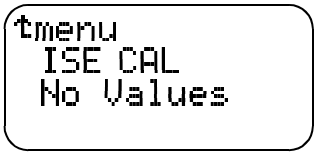
Admissible slope range:
-62 mV ... -50 mV
Possible cause / Action:
- Wrong buffer solutions
  / Change buffer solutions, see set buffer combination
- Old buffer solutions / Change buffer solution, see preservability date
- Old electrode / Change electrode
- Short circuit / Change electrode or repair 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

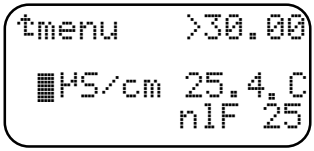


Calibration: Slope outside of admissible range.
Admissible range: -62 ... +62 mV
Possible cause / Action:
- Cable broken
  / Change measuring or reference electrode or repair meter
- Unsuitable standard solutions
  / Change standard solutions
- Defective or missing reference electrode
  /Change reference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

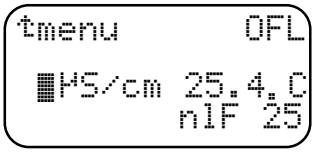


Measurement: Missing calibration data.
Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate

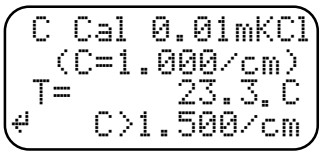
Conductivity



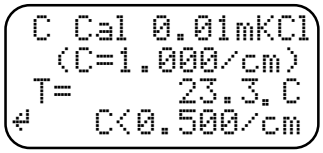
Measurement: The measured value is outside the selected measuring range.
Possible cause / Action:
- Measuring range too small
  / Select bigger measuring range or automatic selection of measuring range



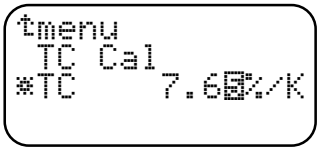
Measurement: The measured value is above the biggest measuring range.
Possible cause / Action:
- The conductivity of the sample solution is above 500 µS/cm
  / Use meter with a bigger measuring range



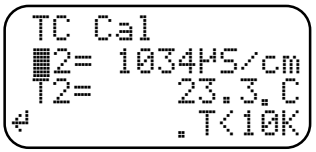
Determine cell constant: The cell constant is above 1.500/cm. With confirmation the old value remains.
Possible cause / Action:
- Wrong measuring cell / Use a measuring cell recommended for the meter
- Contaminated or old electrodes
  / Clean electrodes
- Wrong or destroyed control solution (use potassium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



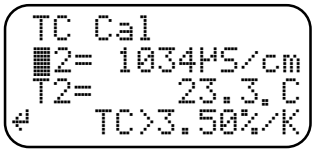
Determine cell constant: The cell constant is below 0.500/cm. With confirmation the old value remains.
Possible cause / Action:
- Measuring cell with cell constant below 0.500/cm / The control of cells with a cell constant below 0.5/cm is not useful and, therefore, not contained in the program.
- Wrong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



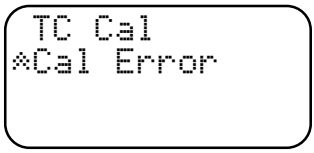
Input temperature coefficient: The input value is above 3.50%/K.
Action:
- Check whether the value is correct (coefficients above 3.50%/K are very rare)
- For measurement in pure water from ion exchange facilities use the nLF function.



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

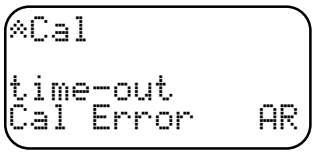


Determined temperature coefficient higher than 3.50 %/K.
Possible cause:
- The temperature coefficient of the sample solution is above 3.50%/K
  / Set temperature coefficient to 0 %/K and perform the compensation manually.
  Note: Temperature coefficients above 3.5 %/K are very rare.
- The sample solution 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.

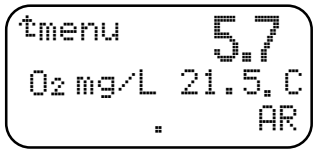
Dissolved oxygen



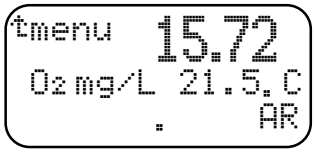
Calibration: Measured value not stable.
Possible cause / Action:
- Membrane contaminated / Clean membrane or regenerate probe
- Membrane moist / Dab membrane dry
- Temperature probe moist / Dab temperature probe dry
- Temperature difference between probe and calibration vessel too high / Wait for temperature 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

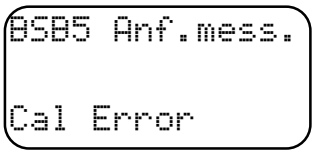


Measurement and calibration:
Electrolyte solution used up.
Action: Regenerate probe.

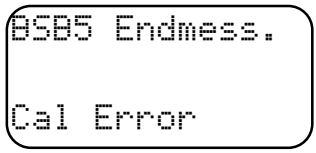


Calibration: Slope outside of admissible range.
Admissible range: 0.6 up to 1.25
Possible cause / Action:
- Membrane contaminated / Clean membrane or change membrane head
- Membrane moist / Dab membrane dry
- Gold electrode contaminated / Regenerate probe
- Silver electrode contaminated / Regenerate 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

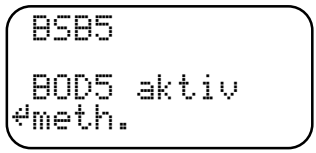
BSB5



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

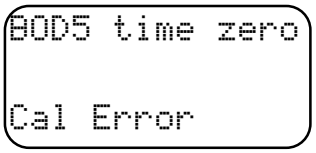


Final measurement:
Missing calibration data.
- Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate

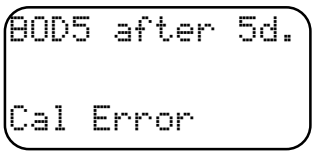


Procedure BSB5 measurement:
Databank set up for measurements according to the ISO standard.
Action: Erase databank.
ATTENTION, all data of BOD5 measurements will be lost!

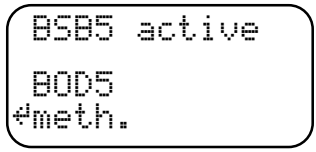
BOD



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

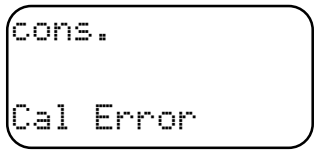


Final measurement:
Missing calibration data.
- Possible cause / Action:
- RESET performed / Calibrate
- Initial setup / Calibrate

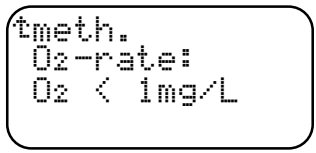


Procedure BOD5 measurement: Databank set up for measurements according to the DIN standard.
Action: Erase databank.
ATTENTION, all data of BSB5 measurements will be lost!

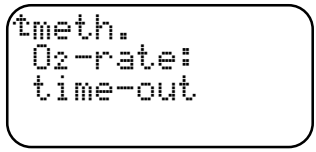
Consumption rate



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

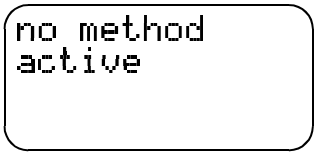


Measurement: Initial value below 1 mg/l.
Cause / Action:
- Sample solution not sufficiently aired / Air sampe solution and measure once again

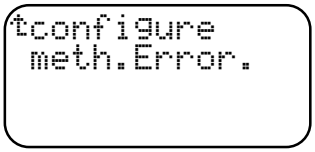


Measurement: There is no data usable for evaluation.
Action: Air sample solution and measured once again.

Configuration



Method sequence:
All positions of the method list are set to 00.

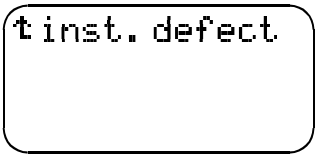


Incorrect method data.

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 P5 with the below mentioned default settings. **Charge factors** and the **dilution** of a sample, entered by the user, are accepted directly for the calculation of the result. They can store results for a later **documentation**.
(Words printed in bold refer to the corresponding chapters).

Language		**German**
Sequence		**factory adjusted** (s. method list)
Dimension	Photometry	**mg/L** (except special methods with own dimension)
	Conductivity	**µS/cm** or **mS/cm** (AutoRange)
	Dissolved oxygen	**mg/L**
Resolution	photometry	**method dependent** (see method list)
	pH	**0.1**
	mV	**1 mV**
	Conductivity	**dependent on the meas. range**
	Dissolved oxygen	**0.1 mg/L**
Factors		**F1 = 1.00** **F2 = 0.000**
Reaction time		**no**
Dilution		**no**
Blank values		**no**

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 signs/line** **with date/time** **No. to 001** **automatically** (photometry) **automatically time controlled** **Δt = 60s (**pH, cond. and oxygen)
Storage:	**Nr. to 001** **automatically** (photometry) **automatically time controlled** **Δt = 60s (**pH, cond. and oxygen)
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**

Reconstitution of default settings: see chapter "Reset"

Fixed filters (selector switch)

Set **positions**:

Position selector switch	Wave length nm
1	445
2	585
3	340
4	540
5	690
6	520
7	405
8	495
9	620
10	660
11	820
12	free

Set **wavelength**:

Wave length nm	Position selector switch
340	3
405	7
445	1
495	8
520	6
540	4
585	2
620	9
660	10
690	5
820	11
free	12

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
Cuvette compartment	14 mm vials 10 mm, 20 mm and 50 mm rectangular cuvettes

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

Connections	
Power supply	Mains plug 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
Mains supply transformer	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 mains transformer	Input: 205 V .. 255 V~ , 50..60 Hz Output: 12 V .. 15.5 V~ Variant: Mains supply transformer 105V .. 130 V~, 50..60 Hz, output as above.
Accumulator operation	Built-in accumulator: 5 NiCd-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

Cuvette compartment	14 mm vials 10 mm, 20 mm and 50 mm rectangular cuvettes

Photometer

Optical measuring principle	Reference beam-absorption meas.
Light source	Tungsten-halogen lamp, preadjusted
Receiver	Silica photo diodes
Optical filters	340 nm, 405 nm, 445 nm, 495 nm, 520 nm, 540 nm, 585 nm, 620 nm, 660 nm, 690 nm, 820 nm 1 filterposition free, retrofitting filter on request half-valve breath 10 nm ± 2nm, accuracy ± 2 nm
Photometric reproducibility	≤ 0.001 E at 1.000 E
Photometric resolution	0.001 E
Meas. range extinction	-0.500 E at 3.000 E (2.500 E at 340 nm)
Stored methods	see method list page 245 ff.
Own methods	50 methods retrofittable
Adjustment	permanently stored
Cuvette recognition	automatically
Meas time	< 3 s
Time measurement	Reaction times
Meas. modes	Concentration (method dependent, indication form adjustable), absorbance

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 Default 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- Default 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 Default 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 calibratiom with neutral buffers (Uasy) and eventually 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. Sign for reaching the stability: ⁂.

AutoCalTEC	WTW-Technical buffers 2.00, 4.01, 7.00,10.00 (25°C). Test value indication after stability or manual interruption Sign for reaching the stability: ⁂.

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
Sensor 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 (T_1, T_2, p)

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)
Temperature compensation only slow NTC with OxiCal	automatically with double thermistor system
Air pressure correction AutoBar	automatically from 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

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

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
EN 50082-2
NAMUR Recommendation, 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 P5

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

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

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

List of determinations

mm	nm	Model	Meas. range	Unit	Indic.-form	Determination	Pos.	No.
10	540	14825	0.200 - 1.500	mg/l	Al	Aluminium	4	10
14	690	A5/25	0.20 - 8.00	mg/l	NH_4-N	Ammonium	5	1
14	690	14558	0.20 - 7.80	mg/l	NH_4-N	Ammonium	5	4
14	690	14544	0.8 - 21.7	mg/l	NH_4-N	Ammonium	5	5
14	690	14559	4.0 - 77.0	mg/l	NH_4-N	Ammonium	5	6
10	690	14752	0.100 - 2.700	mg/l	NH_4-N	Ammonium	5	7
		ISE N	0.14 - 1400	mg/l	NH_4-N	Ammonium	10	3
14	520	14833	0.10 - 5.00	mg/l	Pb	Lead	6	8
10	540	14839	0.050 - 0.800	mg/l	B	Boron	4	12
		BOD	0.0 - 300.0	mg/l	O_2	BOD5	12	3
		BSB5	0.0 - 300.0	mg/l	O_2	BSB5 (BOD5)	12	2
14	520	14834	0.025 - 1.000	mg/l	Cd	Cadmium	6	9
20	540	14815	5 - 160	mg/l	Ca	Calcium	4	9
10	520	14828	0.10 - 8.00	mg/l	Cl_2	Chlorine	6	4
20	445	14755	1.0 - 15.0	mg/l	Cl	Chloride	1	6
10	520	14755	10 - 150	mg/l	Cl	Chloride	6	5
14	540	14552	0.05 - 2.00	mg/l	Cr	Chromium	4	6
10	540	14758	0.10 - 3.00	mg/l	Cr	Chromium	4	7
10	445	Cr	20 - 400	g/l	CrO_3	Chrom .bath	1	7
14	445	C1/25	15 - 160	mg/l	CSB	COD	1	1
14	445	14540	10 - 150	mg/l	CSB	COD	1	2
14	585	C2/25	100 - 1500	mg/l	CSB	COD	2	1
14	585	14541	100 - 1500	mg/l	CSB	COD	2	2
14	585	14555	500 - 10000	mg/l	CSB	COD	2	3
14	340	14560	4.0 - 40.0	mg/l	CSB	COD	3	2
10	585	14800	0.025 - 0.500	mg/l	CN	Cyanide	2	5
14	585	14561	0.025 - 0.500	mg/l	CN	Cyanide	2	4
14	540	14549	0.10 - 4.00	mg/l	Fe	Iron	4	4
10	540	14761	0.10 - 4.00	mg/l	Fe	Iron	4	5
50	445	FB445	0.5 - 50.0		DFZ	Colour	1	9
50	520	FB520	0.5 - 50.0		DFZ	Colour	6	3
50	620	FB620	0.5 - 50.0		DFZ	Colour	9	3
14	620	14557	0.10 - 1.50	mg/l	F	Fluoride	9	1
		ISE F	0.19 - 1900	mg/l	F	Fluoride	10	4
14	585	14500	0.10 - 9.00	mg/l	HCHO	Formaldehyde	2	8
10	540	14821	0.50 - 12.00	mg/l	Au	Gold	4	13

mm	nm	Model	Meas. range	Unit	Ind.form	Determination	Pos.	No.
10	340	H	10 - 900		HZ	Hazen	3	4
10	540	14797	0.20 - 5.00	mg/l	N_2H_4	Hydrazine	4	11
10	660	14779	0.02 - 4.00	mg/l	HS	Hydrogen-sulfide	10	6
		ISE	0.01 - 9999				10	5
10	340	I	0.05 - 3.00		IFZ	Iodine number	3	5
10	445	I	1.0 - 50.0		IFZ	Iodine number	1	8
14	690	14562	5.0 - 50.0	mg/l	K	Potassium	5	14
14	585	14553	0.10 - 8.00	mg/l	Cu	Copper	2	6
10	585	14767	0.20 - 6.00	mg/l	Cu	Copper	2	7
14	690	Cu	10.0 - 50.0	g/l	Cu	Copper bath	5	13
10	820	Cu	10.0 - 80.0	g/l	Cu	Copper bath	11	5
		κ	0.00 - 300000	µS/cm	Kappa	Conductivity	11	1
10	445	14770	0.50 - 10.00	mg/l	Mn	Manganese	1	5
		mV	-1250 - +1250	mV	mV	mV	10	2
14	445	14554	0.10 - 6.00	mg/l	Ni	Nickel	1	3
20	445	14785	0.20 - 5.00	mg/l	Ni	Nickel	1	4
10	690	Ni	10.0 - 120.0	g/l	Ni	Nickel bath	5	12
14	340	N1/25	0.5 - 22.6	mg/l	NO_3-N	Nitrate	3	1
14	340	14563	1.0 - 22.5	mg/l	NO_3-N	Nitrate	3	3
14	520	14542	0.5 - 18.0	mg/l	NO_3-N	Nitrate	6	1
10	520	14773	1.00 - 20.00	mg/l	NO_3-N	Nitrate	6	2
14	495	14556	0.10 - 3.40	mg/l	NO_3-N	Nitrate	8	2
14	540	N4/25	0.006 - 0.460	mg/l	NO_2-N	Nitrite	4	1
14	540	14547	0.020 - 0.600	mg/l	NO_2-N	Nitrite	4	2
10	540	14776	0.020 - 1.000	mg/l	NO_2-N	Nitrite	4	3
		Cons.	0.0 - 300.0	mg/l	O_2	O_2-consumpt.	12	4
		pH	0.00 - 14.00		pH	pH	10	1
14	495	14551	0.10 - 2.50	mg/l	Phen	Phenole	8	3
14	690	P4/25	0.05 - 1.50	mg/l	PO_4-P	Phosphate	5	2
14	690	P5/25	0.3 - 15.0	mg/l	PO_4-P	Phosphate	5	3
14	690	14543	0.05 - 4.00	mg/l	PO_4-P	Phosphate	5	8
14	690	14729	1.0 - 24.0	mg/l	PO_4-P	Phosphate	5	9
10	690	14848	0.10 - 5.00	mg/l	PO_4-P	Phosphate	5	10
14	405	14546	0.5 - 25.0	mg/l	PO_4-P	Phosphate	7	1
10	405	14842	1.00 - 30.00	mg/l	PO_4-P	Phosphate	7	2
		Sal	0.0 - 70.0		Sal	Salinity	11	2
		O_2	0.0 - 300.0	mg/l	O_2	Oxygen	12	1
10	540	14831	0.50 - 3.50	mg/l	Ag	Silver	4	14

mm	nm	Model	Meas. range	Unit	Indic. form	Determination	Pos.	No.
10	660	14794	0.50 - 5.00	mg/l	Si	Silicium	10	7
14	690	14794	0.10 - 5.00	mg/l	Si	Silicium	5	11
50	820	14794	0.010 - 0.800	mg/l	Si	Silicium	11	4
14	520	14537	0.5 - 18.0	mg/l	N	Nitrogen	6	10
14	520	14548	20 - 240	mg/l	SO_4	Sulphate	6	6
10	520	14791	25.0 - 300.0	mg/l	SO_4	Sulphate	6	7
14	820	14564	100 - 1000	mg/l	SO_4	Sulphate	11	3
14	405	14394	1.0 - 18.0	mg/l	SO_3	Sulphite	7	3
14	660	14697	0.05 - 2.00	mg/l	a-Ten	Tenside anionic	10	8
50	620	T	1 - 100		FNU	Turbidity	9	2
10	540	14832	0.05 - 2.50	mg/l	Zn	Zinc	4	8
14	495	14566	0.20 - 5.00	mg/l	Zn	Zinc	8	1

List of filter- and method positions

mm	nm	Model	Meas. range			Unit	Ind.form	Determination	Pos.	No.
14	445	C1/25	15	-	160	mg/l	COD	COD	1	1
14	445	14540	10	-	150	mg/l	COD	COD	1	2
14	445	14554	0.10	-	6.00	mg/l	Ni	Nickel	1	3
20	445	14785	0.20	-	5.00	mg/l	Ni	Nickel	1	4
10	445	14770	0.50	-	10.00	mg/l	Mn	Manganese	1	5
20	445	14755	1.0	-	15.0	mg/l	Cl	Chloride	1	6
10	445	Cr	20	-	400	g/l	CrO_3	Chrome bath	1	7
10	445	I	1.0	-	50.0		IFZ	Jodine number	1	8
50	445	FB445	0.5	-	50.0		DFZ	Colour	1	9
14	585	C2/25	100	-	1500	mg/l	COD	COD	2	1
14	585	14541	100	-	1500	mg/l	COD	COD	2	2
14	585	14555	500	-	10000	mg/l	COD	COD	2	3
14	585	14561	0.025	-	0.500	mg/l	CN	Cyanide	2	4
10	585	14800	0.025	-	0.500	mg/l	CN	Cyanide	2	5
14	585	14553	0.10	-	8.00	mg/l	Cu	Copper	2	6
10	585	14767	0.20	-	6.00	mg/l	Cu	Copper	2	7
14	585	14500	0.10	-	9.00	mg/l	HCHO	Formaldehyde	2	8
14	340	N1/25	0.5	-	22.6	mg/l	NO_3-N	Nitrate	3	1
14	340	14560	4.0	-	40.0	mg/l	COD	COD	3	2
14	340	14563	1.0	-	22.5	mg/l	NO_3-N	Nitrate	3	3
10	340	H	10	-	900		HZ	Hazen	3	4
10	340	I	0.05	-	3.00		IFZ	Iodine number	3	5
14	540	N4/25	0.006	-	0.460	mg/l	NO_2-N	Nitrite	4	1
14	540	14547	0.020	-	0.600	mg/l	NO_2-N	Nitrite	4	2
10	540	14776	0.020	-	1.000	mg/l	NO_2-N	Nitrite	4	3
14	540	14549	0.10	-	4.00	mg/l	Fe	Iron	4	4
10	540	14761	0.10	-	4.00	mg/l	Fe	Iron	4	5
14	540	14552	0.05	-	2.00	mg/l	Cr	Chromium	4	6
10	540	14758	0.10	-	3.00	mg/l	Cr	Chromium	4	7
10	540	14832	0.05	-	2.50	mg/l	Zn	Zinc	4	8
20	540	14815	5	-	160	mg/l	Ca	Calcium	4	9
10	540	14825	0.200	-	1.500	mg/l	Al	Aluminium	4	10
10	540	14797	0.20	-	5.00	mg/l	N_2H_4	Hydrazine	4	11
10	540	14839	0.050	-	0.800	mg/l	B	Boron	4	12
10	540	14821	0.50	-	12.00	mg/l	Au	Gold	4	13
10	540	14831	0.50	-	3.50	mg/l	Ag	Silver	4	14

mm	nm	Model	Meas. range	Unit	Ind.form	Determination	Pos.	No.
14	690	A5/25	0.20 - 8.00	mg/l	NH_4-N	Ammonium	5	1
14	690	P4/25	0.05 - 1.50	mg/l	PO_4-P	Phosphate	5	2
14	690	P5/25	0.3 - 15.0	mg/l	PO_4-P	Phosphate	5	3
14	690	14558	0.20 - 7.80	mg/l	NH_4-N	Ammonium	5	4
14	690	14544	0.8 - 21.7	mg/l	NH_4-N	Ammonium	5	5
14	690	14559	4.0 - 77.0	mg/l	NH_4-N	Ammonium	5	6
10	690	14752	0.100 - 2.700	mg/l	NH_4-N	Ammonium	5	7
14	690	14543	0.05 - 4.00	mg/l	PO_4-P	Phosphate	5	8
14	690	14729	1.0 - 24.0	mg/l	PO_4-P	Phosphate	5	9
10	690	14848	0.10 - 5.00	mg/l	PO_4-P	Phosphate	5	10
14	690	14794	0.10 - 5.00	mg/l	Si	Silicium	5	11
10	690	Ni	10.0 - 120.0	g/l	Ni	Nickel bath	5	12
14	690	Cu	10.0 - 50.0	g/l	Cu	Copper bath	5	13
14	690	14562	5.0 - 50.0	mg/l	K	Potassium	5	14
14	520	14542	0.5 - 18.0	mg/l	NO_3-N	Nitrate	6	1
10	520	14773	1.00 - 20.00	mg/l	NO_3-N	Nitrate	6	2
50	520	FB520	0.5 - 50.0		DFZ	Colour	6	3
10	520	14828	0.10 - 8.00	mg/l	Cl_2	Chlorine	6	4
10	520	14755	10 - 150	mg/l	Cl	Chlorid	6	5
14	520	14548	20 - 240	mg/l	SO_4	Sulphate	6	6
10	520	14791	25.0 - 300.0	mg/l	SO_4	Sulphate	6	7
14	520	14833	0.10 - 5.00	mg/l	Pb	Lead	6	8
14	520	14834	0.025 - 1.000	mg/l	Cd	Cadmium	6	9
14	520	14537	0.5 - 18.0	mg/l	N	Nitrogen	6	10
14	405	14546	0.5 - 25.0	mg/l	PO_4-P	Phosphate	7	1
10	405	14842	1.00 - 30.00	mg/l	PO_4-P	Phosphate	7	2
14	405	14394	1.0 - 18.0	mg/l	SO_3	Sulphite	7	3
14	495	14566	0.20 - 5.00	mg/l	Zn	Zinc	8	1
14	495	14556	0.10 - 3.40	mg/l	NO_3-N	Nitrate	8	2
14	495	14551	0.10 - 2.50	mg/l	Phen	Phenol	8	3
14	620	14557	0.10 - 1.50	mg/l	F	Fluoride	9	1
50	620	T	1 - 100		FNU	Turbidity	9	2
50	620	FB620	0.5 - 50.0		DFZ	Colour	9	3
		pH	0.00 - 14.00		pH	pH	10	1
		mV	-1250 - +1250	mV	mV	mV	10	2
		ISE N	0.14 - 1400	mg/l	NH_4-N	Ammonium	10	3
		ISE F	0.19 - 1900	mg/l	F	Fluoride	10	4
		ISE	0.01 - 9999				10	5

mm	nm	Model	Meas. range	Unit	Indic.-form	Determination	Pos.	No.
10	660	14779	0.02 - 4.00	mg/l	HS	Hydrogen-sulfide	10	6
10	660	14794	0.50 - 5.00	mg/l	Si	Silicium	10	7
14	660	14697	0.05 - 2.00	mg/l	a-Ten	anionic tensides	10	8
		$\varkappa$	0.00 - 300000	µS/cm	Kappa	Conductivity	11	1
		Sal	0.0 - 70.0		Sal	Salinity	11	2
14	820	14564	100 - 1000	mg/l	SO_4	Sulphate	11	3
50	820	14794	0.010 - 0.800	mg/l	Si	Silicium	11	4
10	820	Cu	10.0 - 80.0	g/l	Cu	Copper bath	11	5
		O_2	0.0 - 300.0	mg/l	O_2	Oxygen	12	1
		BSB5	0.0 - 300.0	mg/l	O_2	BOD5	12	2
		BOD	0.0 - 300.0	mg/l	O_2	BOD5	12	3
		Verbr	0.0 - 300.0	mg/l	O_2	O_2-consumpt.	12	4

The measuring values are presented in dependence on the **upper limit** of the selected measuring range. The resolution normally is 1 ‰ of the end value of the measuring range.

