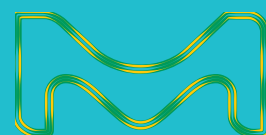


# Spectroquant® Move 100



EN



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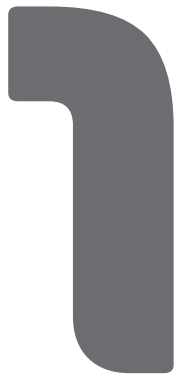
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### 5.8 Calculating the Langelier saturation index

### 5.9 Technical specifications



# Getting started

## 1.1 Package contents

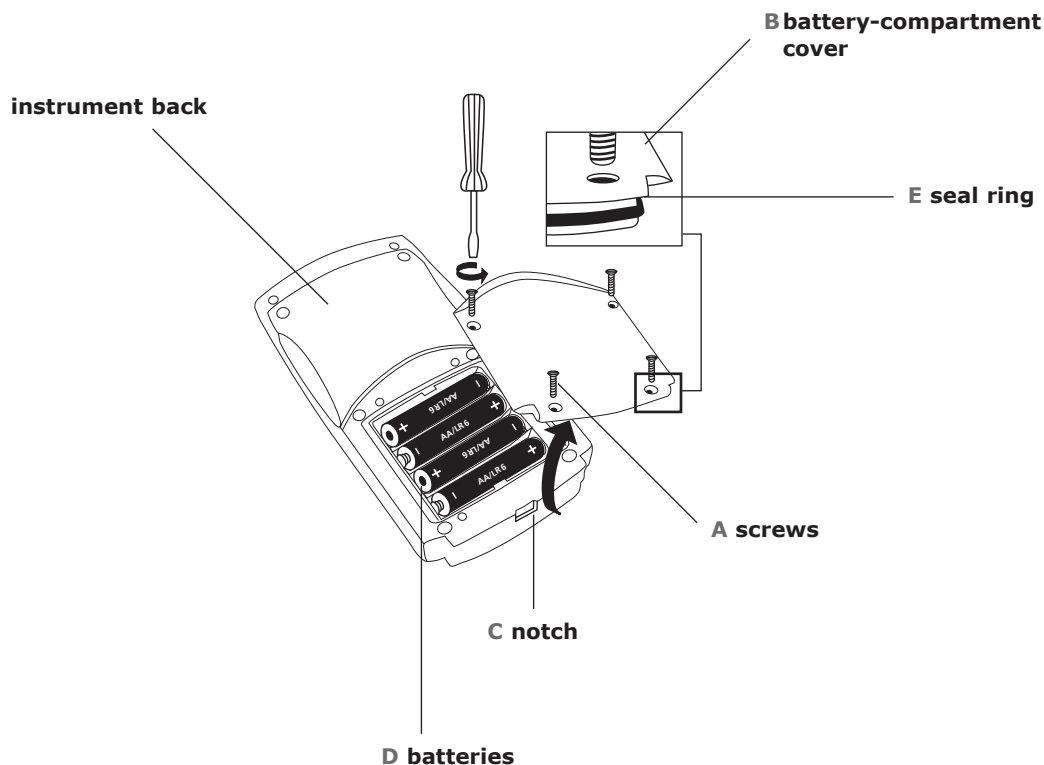
The standard contents of the Spectroquant® Move 100 Colorimeter package comprise the following items:

- 1 Colorimeter in a plastic carrying case**
- 4 Batteries (type AA/LR6) (a)**
- 1 Adapter for 16-mm  $\varnothing$  round cells (b)**
- 3 Round cells with cap,  $\varnothing$  16 mm (c)**
- 3 Round cells with cap,  $\varnothing$  24 mm (d)**
- 1 Screwdriver (e)**
- 1 Operating-instructions manual**
- 1 Certificate of compliance**



## 1.2 Inserting the batteries

Before operating the system for the first time, the batteries included in the package must be installed.



1. Ensure that the Spectroquant® Move 100 Colorimeter is switched off.
2. Remove, where applicable, the cell from the measurement compartment.
3. Place the unit on its front on a clean, flat surface.
4. Remove the 4 screws (A) on the battery-compartment cover (B) on the bottom of the unit.
5. Lift off battery-compartment cover (B) at the notch (C) and remove.
6. Remove old batteries (D).
7. Insert 4 new batteries .  
**Ensuring the correct polarity!**
8. Place the seal ring (E) in the groove of the battery-compartment cover (B).
9. Position the battery-compartment cover (B) on the instrument, taking care not to dislodge the seal ring (E).  
**The colorimeter is completely watertight only when the seal ring (E) is properly positioned and the battery-compartment cover (B) is tightly screwed into place!**
10. Replace the screws and tighten with moderate pressure.

## 1.2.1 Replacement of batteries

Refer to page 6 for how to replace used batteries.

**Recommendation**

Do not use rechargeable batteries!

## 1.2.2 Saving data - Important notes

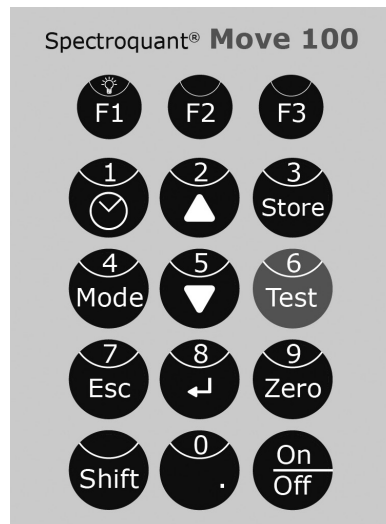
The batteries save data (stored results and photometer setting). During battery change the data in the Spectroquant® Move 100 is saved for 2 minutes. If the change time exceeds 2 minutes all stored data and settings are lost
















**Recommendation**

For replacement a screwdriver and new batteries must be available.

# 1.3 Overview of the key functions

en



-  Switching the unit on and off
-  Press the shift key to go to the number keys 0 - 9  
Hold the shift key and press desired number key(s)  
e. g. **[Shift] + [1][1]**
-  Back to method selection / to parent menu
-  Function key: Function explained at the corresponding place in the text
-  Function key: Function explained at the corresponding place in the text
-  Function key: Function explained at the corresponding place in the text
-  Confirmation of selections
-  Menu for settings and other functions
-   Moves cursor (visible on the display as the ">>" symbol) up or down
-  Save a displayed result
-  Zero-calibration function
-  Run a measurement
-  Display of date and time / user countdown
-  Decimal point



# 1.4 Starting the colorimeter the first time

Before working with the photometer insert the batteries (delivery contents). See chapter 1.2 **“Inserting the batteries”**.

Switch on the colorimeter by pressing the **[On/Off]** button.  
The unit runs an electronic self-check test.



The display then shows:

```
Please initialise  
the storagesystem  
with MODE 34 ←
```

Pressing the [ ← ] key takes the colorimeter to method selection.



Any data already saved in the unit must be deleted (mode 34, see chapter 1.7, **“Delete data”**), the user-method system must be initialized (mode 69, see section 5.6.5, **“Initializing the user-method system (concentration and polynomials)”**), and the date and time should be reset (mode 12, see section 1.8, **“Setting the date and time”**).

The Spectroquant® Move 100 is supplied with English preset as the standard language setting. Before making the first measurement you should therefore reset the unit to the language of your choice. To do this go from the method list and change to the mode menu by pressing the **[Mode]** key.



The display shows:

```
<MODE Menu>  
cancel: ESC
```

After a short time the selection list appears:

```
>> 10:Language  
11:Key-beep  
12:Clock  
... ..  
... ..
```

# 1.5 Overview of the mode menu

Mode No.	Mode function	Brief description	Section
10	Language	Setting the language	1.6
11	Key-beep	Activating the acoustic key-acknowledgment tone	3.3.1
12	Clock	Setting the date and time	1.8
13	Countdown	Activating/deactivating the countdown for reaction times	3.3.3
14	Signal-beep	Activating/deactivating the acoustic signal at the end of a measurement	3.3.2
20	Print	Printing all saved measurement results	5.3.2
21	Print, date	Printing measurement results from a defined date range	5.3.3
22	Print, Code-No.	Printing measurement results from a defined code-No. range	5.3.4
23	Print, method	Printing measurement results from a defined method	5.3.5
29	Printing params.	Setting the printer options	5.3.1
30	Storage	Viewing all saved measurement results	2.8.1
31	Storage, date	Viewing measurement results from a defined date range	2.8.2
32	Storage, Code-No.	Viewing measurement results from a defined code-No. range	2.8.3
33	Storage, method	Viewing measurement results from a defined method	2.8.4
34	Delete data	Deleting saved measurement results	1.7+2.9
45	User calibration	Saving user-specific calibration	5.7.1
46	Clear use calibr.	Deleting user-specific calibration	5.7.2
50	Profi-Mode	Activating the expert-user function (laboratory function)	3.2
60	Methods list	Processing the user-specific method list	3.1.1
61	Mlist all on	User-specific method list, activate all methods	3.1.2
62	Mlist all off	User-specific method list, deactivate all methods	3.1.3
64	User concentr.	User methods, Entry of a concentration method	5.6.1
65	User polynoms	User methods, Entry of a user polynomial	5.6.2
66	User m. clear	User methods, Deleting a user method	5.6.3
67	User m. print	User methods, Printing data for a user method	5.6.4
69	User m. init.	User methods, Initializing the user-method system	5.6.5
70	Langelier	Calculation of the Langelier saturation index	5.8
71	Temperature	Setting the temperature (°C or °F) for Langelier mode 70	5.8
80	LCD contrast	Setting the display contrast	3.4
81	LCD brightness	Setting the display brightness	3.5
91	System-Info	Information on the Move 100, e. g. current unit configuration	3.6

The individual mode functions are selected in the following manner:

Press the **[Mode]** key.



Enter the digits for the desired function, e.g.: **[Shift] + [1] [0]** for setting the language, or



press the **[▲]** or **[▼]** arrow keys to select the desired function from the display list.



Confirm your selection by pressing **[↵]**.



Make your settings as described in the respective sections of this manual.

Press the **[Esc]** key to exit the mode menu.



## 1.6 Setting the language

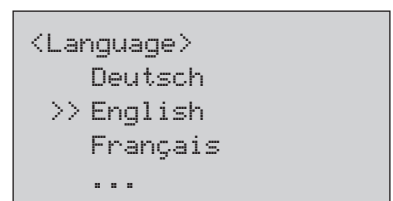
Press the keys **[Mode]**, **[Shift] + [1] [0]**.



Confirm your selection by pressing **[↵]**.



The display shows:



Select the desired language using the arrow keys **[▲]** or **[▼]**.



Confirm your selection by pressing **[↵]**.



(Pressing the **[Esc]** key takes you back to the method-selection menu.)



# 1.7 Deleting data

Press the keys **[Mode]**, **[Shift]** + **[3]** **[4]** to delete any stored data.



Confirm by pressing **[Shift]** + **[1]** and **[↵]**.



Press the keys **[Shift]** + **[0]** and **[↵]** to abort the process.



In the event that you press the keys **[Shift]** + **[1]** by mistake, you can exit the menu by pressing the **[Esc]** key if you wish to save the data from deletion.



# 1.8 Setting the date and time

Press the keys **[Mode]**, **[Shift]** + **[1]** **[2]**.



Confirm your selection by pressing **[↵]**.



The display shows:



The date and time are entered in the following sequence:

year, month, day, e.g.: May 14, 2018 =

**[Shift]** + **[1]** **[8]** **[0]** **[5]** **[1]** **[4]**



hours, minutes, e.g.: 15 Uhr, 7 Minuten =

**[Shift]** + **[1]** **[5]** **[0]** **[7]**.



Confirm your selection by pressing **[↵]**.



### Note

When you confirm the entry by pressing **[↵]** the seconds are automatically set to zero.



Press the **[Esc]** key to return the instrument to the method selection mode without changing the date / time.



## 1.9 Time and date display

Press the [“Clock”] key.



The display now shows the current time and date.

The unit returns to the previous routine after approx. 15 seconds

or when you press the key [ ↵ ] or [Esc].



## 1.10 Automatic switch-off

The Spectroquant® Move 100 switches off automatically 20 minutes after the last time a key was pressed. In the last 30 seconds before it switches off, the unit emits an acoustic signal. During these 30 seconds you can press a key to prevent the unit from switching off automatically.

The automatic switch-off function is inactive while the unit is performing operations (running countdown, printing). After the operation in question has ended, the 20-minute waiting time before the automatic switch-off function starts running anew.

## 1.11 Display backlight

Press the keys [Shift] + [F1] to turn the display backlight on or off.

The backlight is switched off automatically during the measurement.



# 2 Operating mode

## 2.1 Selecting the method

Switch on the Spectroquant® Move 100 by pressing the **[On/Off]** key.



The display shows the selection list of the stored methods:

```
>>10 Acid cap. 01758
    20 Aluminium 14825
    21 Aluminium 00594
    ...         ...
    ...         ...
```

There are two ways to select the desired method:

a) by entering the method number directly, e.g.: **[Shift] + [1] [6] [3]** for COD 14541



b) by pressing the **[▲]** or **[▼]** arrow keys to select the desired method from the displayed list.



Confirm your selection by pressing **[↵]**.



**Note**

Pressing the **[F1]** key switches between the compact and the detailed method-selection list.



Example for the detailed method-selection list:

- Line 1: Method number, method name, item number
- Line 2: Measuring range
- Line 3: Type of test (cell test or test)
- Line 4: Cells used (16 mm/24 mm)

```
163 COD 14541
25-1500 mg/l
Cell Test
16 mm
```

**Note**

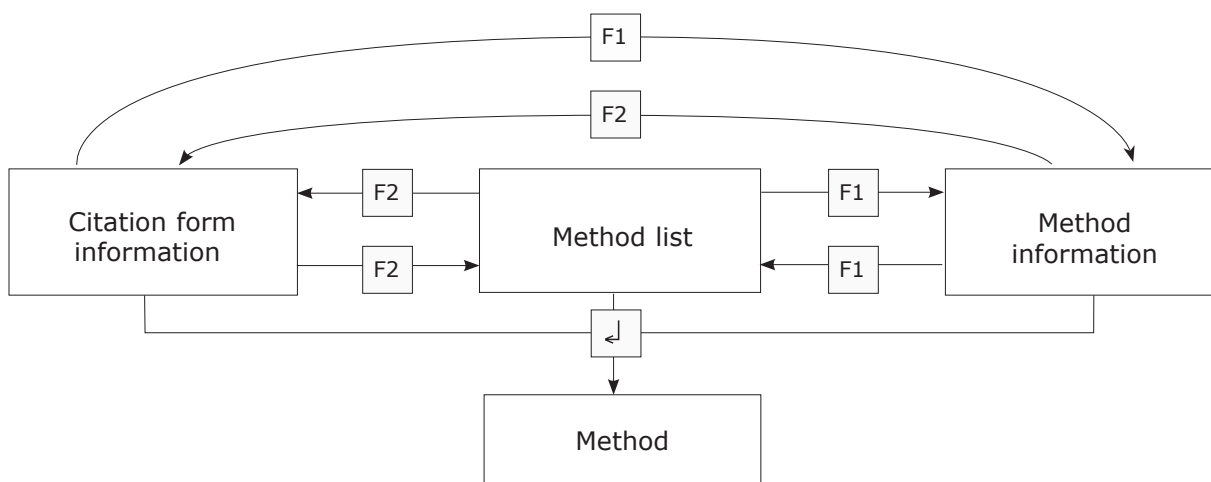
Pressing the **[F2]** key the display shows a list with available chemical species and corresponding ranges (changing citation form see section 2.4, "Altering the citation form").



Example:

- Line 1: Method number, Method name, item number
- Line 2: Range with citation form 1
- Line 3: Range with citation form 2
- Line 4: Range with citation form 3 ...

```
380 Phosphate 14543
xx-xxx mg/l P04-P
xx-xxx mg/l P04
xx-xxx mg/l P205
```



**Note**

The five-digit item number (e.g. 14541) gives the five digits in the middle of the Spectroquant® catalogue/ordering number 1.XXXXX.0001, in this case 1.14541.0001. In some cases in which the assignment is self-evident (e.g. monochloramine) or else in which all Spectroquant® tests available for one parameter can be used (e.g. chlorine), this number is not shown.

For an overview of all programmed methods please refer to the included CD, section 5.1, "Overview of preprogrammed methods and analytical procedures".



## 2.2 Measuring with test kits

A detailed description of the procedure for the selected method is given on the provided CD in section 5.1, "Overview of preprogrammed methods and analytical procedures". The procedures may differ slightly from those described in the respective package inserts.

After selecting the method, prepare the blank and sample for measurement.

In the case of analysis specifications in which reaction times must be observed, a timer (countdown) is integrated in the method programme. (In such cases the cells must not be inserted into the measurement compartment.)

After the method has been selected the display shows:

Example: Method 90 (Bromine 00605)

```
90 Bromine 00605
0.10-5.00 mg/l Br2
countdown 1
      1:00
Start: ←
```

If you wish to exit the menu at this stage, simply press the [ ← ] key twice (= abort countdown) and then the [Esc] key once.

After the method has been selected, the countdown function is started by pressing the [ ← ] key. The remaining time is shown continuously. An acoustic signal is emitted in the last 10 seconds before the countdown expires. After the countdown has run out, proceed as described in the analysis procedures.

In some methods there are several reaction times that have to be considered; these are shown and processed in the proper sequence.



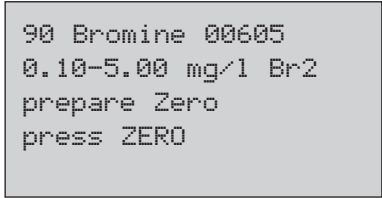
```
90 Bromine 00605
0.10-5.00 mg/l Br2
countdown 1
      0:59      ←
```



**Note**

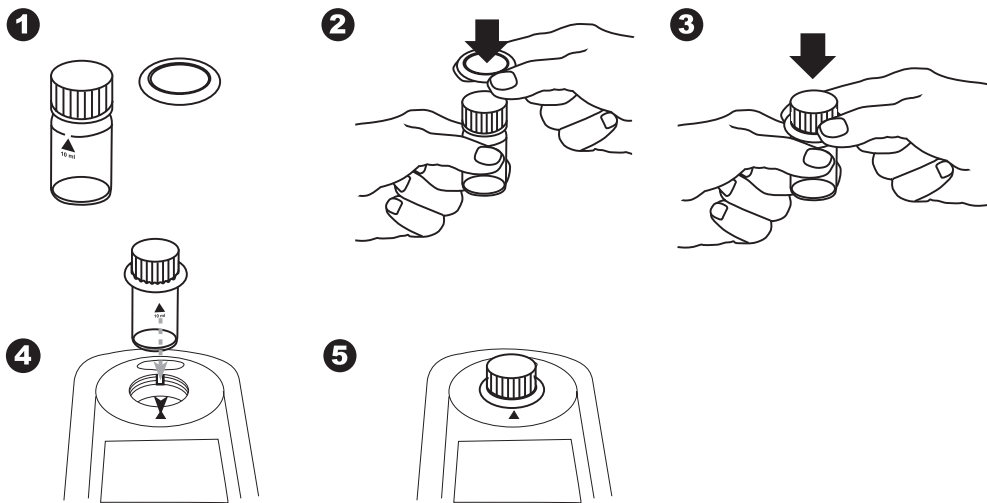
The running countdown can be skipped by pressing the [ ↵ ] key once. The measurement is made immediately. In this case the user must observe the necessary reaction time him-/herself. (Failure to observe the specified reaction time can lead to erroneous results.) Further options to deactivate the countdown procedure: mode No. 13 or Profi mode (mode No. 50).

After the countdown has expired the display shows:



Place the prepared blank in the measurement compartment with the mark on the cell pointing towards the mark on the unit case.

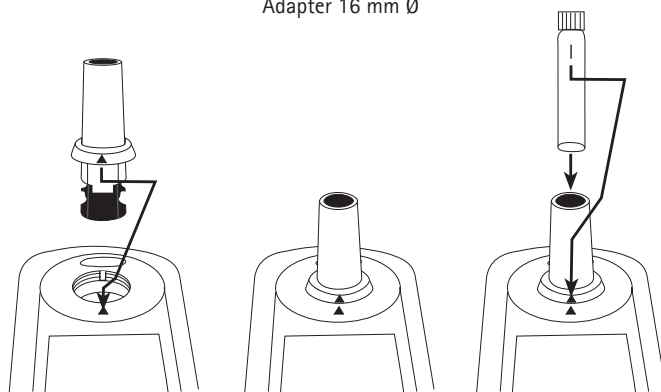
**Positioning the cell (ø 24 mm)**



**Align the triangular mark on the cell with that on the Spectroquant® Move 100. To afford better protection against sunlight, press the o-ring firmly into place.**

## Insertion of the adapter and positioning the cell (Ø 16 mm)

Adapter 16 mm Ø



**Align the triangular mark on the adapter with that on the Spectroquant® Move 100. To afford better protection against sunlight, press the o-ring firmly into place.**

**Align the line mark above the item number of the cell with the triangular mark on the Spectroquant® Move 100.**

Press the **[Zero]** key.



The display shows:

```
90 Bromine 00605
0.10-5.00 mg/l Br2
Zero accepted
prepare Test
press TEST
```

Insert the prepared sample into the measurement compartment with the cell mark aligned with the mark on the unit case.

Press the **[Test]** key.



The result is displayed in the following manner:  
Example: Method 90 (Bromine 00605)

Line 1: Method number, method name, item number  
Line 2: Measuring range  
Line 3: Result (expressed as the concentration)

```
90 Bromine 00605
0.10-5.00 mg/l Br2
2.11 mg/l Br2
```

In the event the result lies outside the respective measuring range, the following message appears on the display:

the concentration of the sample lies below the measuring range

or, respectively,

the concentration of the sample lies above the measuring range.

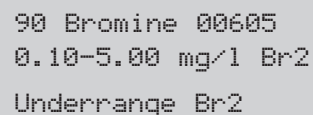
After the result has been displayed,

- the citation form can be changed for some methods (see section. 2.4)
- it can be saved  
it can be saved (saving measurement results, see section 2.7; retrieving saved measurement results, see section 2.8)
- it can be printed out (see section 5.3)
- further measurements can be made using the same or a new zero setting:
- If you wish to measure other samples using the same method:

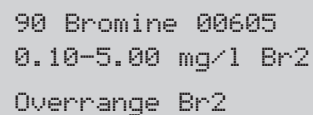
Press the **[Test]** key.

The display shows:

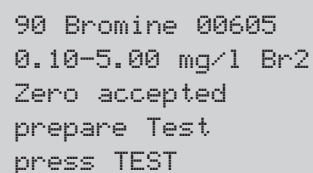
Confirm by pressing **[Test]**.



```
90 Bromine 00605  
0.10-5.00 mg/l Br2  
Underrange Br2
```



```
90 Bromine 00605  
0.10-5.00 mg/l Br2  
Overrange Br2
```



```
90 Bromine 00605  
0.10-5.00 mg/l Br2  
Zero accepted  
prepare Test  
press TEST
```



- If you wish to measure other samples with a new zero setting:

Press the **[Zero]** key to reset to zero.



The display shows:

```
90 Bromine 00605
0.10-5.00 mg/l Br2
countdown 1
          1:00
Start: ←
```

- a new method can be selected: pressing the **[Esc]** key takes the photometer back to the method-selection mode;



you can also enter a new method number directly,  
e.g.: **[Shift] + [1] [6] [3]** for COD 14541.



Confirm your selection by pressing **[↵]**.



## 2.3 Differentiation

Some methods permit further differentiation (e.g. chlorine). After selecting the method, e.g. 131 Chlorine Test, you are prompted to state the type of measurement (e.g. differentiated, free, or total).

```
Chlorine Test
>> diff
    free
    total
      ↑ ↓ ←
```

Use the **[▲]** or **[▼]** arrow keys to select the desired measurement type.



Confirm your selection by pressing **[↵]**.

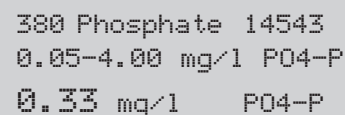


## 2.4 Altering the citation form

Wherever this is appropriate, it is possible to alter the citation form (see section 5.1, "Overview of preprogrammed methods and analytical procedures" for possible reference-form alternatives).

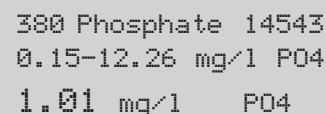
After the first sample has been measured using a specific method and the result is shown on the display, you can alter the citation form in the following manner:

Result shown on display using Method 380 (Phosphate 14543) as an example:



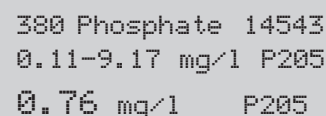
```
380 Phosphate 14543
0.05-4.00 mg/l P04-P
0.33 mg/l P04-P
```

Pressing the **[▼]** arrow key gives you the option to select a citation form. The result shown on the display changes to this:



```
380 Phosphate 14543
0.15-12.26 mg/l P04
1.01 mg/l P04
```

Pressing the **[▼]** arrow key again shows the next citation form:



```
380 Phosphate 14543
0.11-9.17 mg/l P205
0.76 mg/l P205
```

Pressing the **[▲]** arrow key takes you back to the previous citation form.



The citation form last shown on the display remains valid for all consequent measurements.

For an already stored result it is not possible to change the citation form. The last displayed citation form is kept by the instrument and will be displayed if this method is used the next time.

If there is the possibility to change the citation form for a method it is described in the analytical procedure.

## 2.5 Measuring absorbances

Besides measuring concentrations using a selected method, the unit is also capable of measuring absorbances. For this you call up the desired wavelength by entering the corresponding method number or by choosing from the method-selection list.

Measuring range: -2600 mAbs to +2600 mAbs

Method No.	Designation
600	mAbs 430 nm
610	mAbs 530 nm
620	mAbs 560 nm
630	mAbs 580 nm
640	mAbs 610 nm
650	mAbs 660 nm

The display shows e.g.:

```
600 A 430 nm
-2600 - +2600 mAbs

prepare Zero
press ZERO
```

Always zero the photometer using a filled cell (e.g. with DI water).

The display shows e.g.:

```
600 A 430 nm
-2600 - +2600 mAbs
Zero accepted
prepare Test
press TEST
```

Then measure the sample.

The display shows e.g.:

500 mAbs = 0.500 A (absorbance units)

```
600 A 430 nm
-2600 - +2600 mAbs

500 mAbs
```

### Tip

Reaction times for your own measurements in the absorbance mode can be more easily observed by using the user-countdown function (see the following section 2.6, "User countdown").

## 2.6 User countdown (timer function)

This function enables the user to employ a self-defined countdown time.

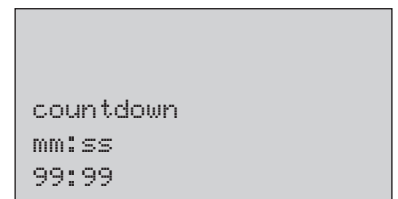
Press the ["Clock"] key.

The display shows the current time and date.



Press the ["Clock"] key anew.

The display shows:



Either press [↵] key to accept the last used user countdown

or

press the [Shift] and any number key to start entering a new value.

Enter the time in double digits, in the sequence minutes and seconds,

e.g.: 2 minutes, 0 seconds =

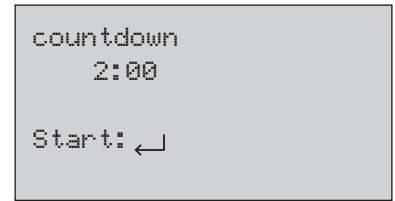
[Shift] + [0][2][0][0].



Confirm your selection by pressing [↵].



The display shows:



Press the [ ↵ ] key to start the countdown.



After the countdown has expired, the unit returns to the previous routine.

**Note**

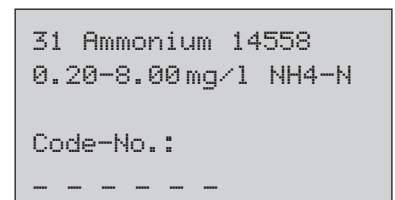
The user-countdown function is available even when the preset countdown function is deactivated.

## 2.7 Saving measurement results

Press the [Store] key while the result is shown on the display.



The display shows:  
Example: Method 31 (Ammonium 14558)



The user is able to enter a six-digit code at this stage. (The code No. can be used to show e.g. information regarding the user or the sampling site.)

Confirm the code No. by pressing [ ↵ ].



If you do not wish to enter a code No., simply confirm by pressing [ ↵ ]. (This results in the automatic assignment of a code No. starting with 0.)



The entire data set is then stored together with the date, time, code No., method, and result.



The display shows:

**Note**

The number of available memory records is also shown on the display. Subsequently the measurement result is shown again.

```
31 Ammonium 14558
0.20-8.00mg/l NH4-N
Stored!
storage: 997
free records left
```

When fewer than 30 free memory records are available, the display shows:

```
31 Ammonium 14558
0.20-8.00mg/l NH4-N
Stored!
storage: only 29
free records left
```

It is advisable to delete the data memory as soon as possible when no longer required (see section 2.9, "Deleting saved measurement results").

When all memory records are occupied, it is not possible to save any further results.



## 2.8 Retrieving saved measurement results

### 2.8.1 Retrieving all saved measurement results

Press the keys **[Mode]**, **[Shift] + [3]** **[0]**.



Confirm your selection by pressing **[↵]**.



The display shows:

```
<Storage>
display all data
Start: ↵ cancel: ESC
print: F3
print all: F2
```

Confirm by pressing **[↵]**.



The data sets are then shown in reverse chronological sequence, starting with the most recently saved measurement result.

Pressing the **[▼]** key takes you to the next data set.



Pressing the **[▲]** key takes you back to the previous data set.



Pressing the **[F3]** key prints out the result shown on the display.



Pressing the **[F2]** key prints out all results.



Exit by pressing the **[Esc]** key.



If there are no data saved in the memory, the display shows:

```
<Storage>
display all data

no data
```

## 2.8.2 Retrieving saved measurement results from a defined date range

Press the keys **[Mode]**, **[Shift]** + **[3]** **[1]**.



Confirm your selection by pressing **[↵]**.



The display shows:

```
<Storage>
sorted: date
from yy-mm-dd
  _-_-_-
```

Enter the starting date in the sequence year, month, day,

e.g.: June 14, 2018 =

**[Shift]** + **[1]** **[8]** **[0]** **[6]** **[1]** **[4]**.



Confirm by pressing **[↵]**.



The display shows:

```
<Storage>
sorted: date
to yy-mm-dd
  _-_-_-
```

Enter the end date in the sequence year, month, day,

e.g.: June 19, 2018 =

**[Shift]** + **[1]** **[8]** **[0]** **[6]** **[1]** **[9]**.



Confirm by pressing **[↵]**.



The display shows:

```
<Storage>
sorted: date
from 2018-06-14
to   2018-06-19
Start:↵ cancel:ESC
print:F3
print all:F2
```



Pressing the [ ↵ ] key shows the saved test results for the defined period of time.



Pressing the [F3] key prints out the result shown on the display.



Pressing the [F2] key prints out all selected results.



Exit by pressing the [Esc] key.



**Note**

To show test results obtained on just one day, enter the same date for both start and end date.

### 2.8.3 Retrieving saved measurement results from a defined code-No. range

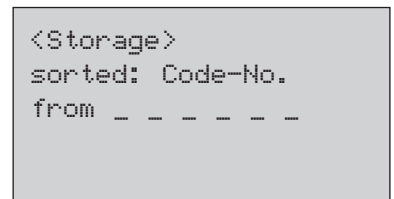
Press the keys [Mode], [Shift] + [3] [2].



Confirm your selection by pressing [ ↵ ].



The display shows:



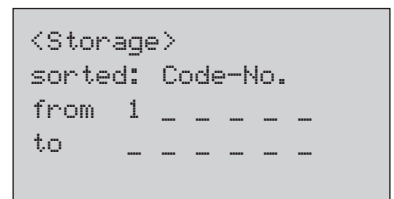
Enter the start code No. (max. 6 digits), e.g.: [Shift] + [1].



Confirm by pressing [ ↵ ].



The display shows:



Enter the end code No. (max. 6 digits),  
e.g.: **[Shift] + [1] [0]**.



Confirm by pressing **[ ↵ ]**.



The display shows:

```
<Storage>
sorted: Code-No.
from 000001
to 000010
Start: ↵ cancel:ESC
print:F3
print all:F2
```



Pressing the **[ ↵ ]** key shows all saved test  
results for the selected code-No. range.



Pressing the **[F3]** key prints out the result  
shown on the display.



Pressing the **[F2]** key prints out all selected  
results.



Exit by pressing the **[Esc]** key.



**Note**

To show test results with one and the same  
code No., enter the same number for both the  
start and the end code No.  
To show all test results without the code No.  
(code No. = 0), enter a zero **[Shift] + [0]** for  
both the start and the end code No.

## 2.8.4 Retrieving saved measurement results from a defined method

Press the keys **[Mode]**, **[Shift]** + **[3]** **[3]**.



Confirm your selection by pressing **[↵]**.



The display shows e. g.:

```
<Storage>
>>10 Acid cap. 01758
  20 Aluminium 14825
  21 Aluminium 00594
  ...
```

Select the desired method from the list or otherwise enter the method number directly, e. g. 21 (aluminium 00594).

Confirm your selection by pressing **[↵]**.



In the case of differentiated methods make the corresponding new selection and confirm by pressing the **[↵]** key.

The display shows:

```
<Storage>
method
21 Aluminium 00594
Start:↵ cancel:ESC
print:F3
print all:F2
```

Pressing the **[↵]** key shows all saved test results for the selected method.



Pressing the **[F3]** key prints out the result shown on the display.



Pressing the **[F2]** key prints out all selected results.



Exit by pressing the **[Esc]** key.



## 2.9 Deleting saved measurement results

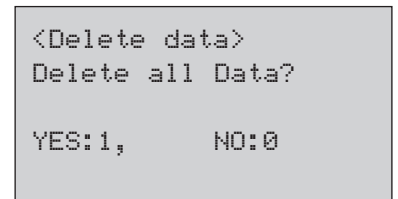
Press the keys **[Mode]**, **[Shift]** + **[3]** **[4]**.



Confirm your selection by pressing **[↵]**.



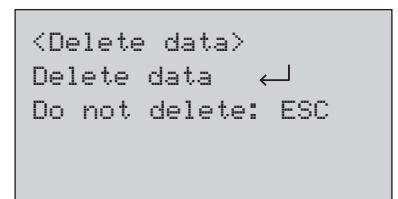
The display shows:



Pressing the keys **[Shift]** + **[0]** saves the data for further use.



Pressing the keys **[Shift]** + **[1]** the following acknowledgment is displayed:



Press **[↵]** key to delete.



Or cancel without deleting data by pressing **[Esc]** key.



### Note

All saved measurement results are deleted by this operation, irrespective of the method.

# 3 Other functions

## 3.1 User-specific method list

In the unit's delivery configuration the method-selection list displays all available methods. Additionally the user can configure the method-selection list to suit his/her specific requirements.

After an update all new methods are automatically added to the user list.

For software-technical reasons at least one method must be activated in the user-specific method list. The unit automatically activates the first method stored in the sorting list. For this reason another method must be activated before the automatically activated method can be deactivated.



### 3.1.1 Processing the user-specific method list

Press the keys **[Mode]**, **[Shift]** + **[6]** **[0]**.



Confirm your selection by pressing **[ ↵ ]**.



The display shows:

```
<Methods list>
selected: *
toggle: F2
save:     ↵
cancel: ESC ↵
```

Start by pressing the **[ ↵ ]** key.



The complete method list appears on the display.

```
<Method list>
>>10*Acid cap. 01758
 20*Aluminium 14825
 21*Aluminium 00594
...
```

Methods showing a dot (•) following the method number appear in the method-selection list, while methods without the dot are not shown.

Press the **[▲]** or **[▼]** keys to position the cursor next to the method to be processed.



Use the **[F2]** key to switch between "activated" (•) and "deactivated" ( ). Deactivated methods are then shown without the dot.



```
<Method list>
>>10*Acid cap. 01758
 20 Aluminium 14825
 21*Aluminium 00594
...
```



Select the next method and follow the above procedure to adjust the list to match your requirements until all methods show the desired settings.

Confirm your selection for saving by pressing [ ↵ ].



Pressing the [Esc] key



enables you to exit this mode at any time without adopting the alterations.

**Tip**

In the event that you wish for only a few methods to be shown in the method-selection list, it is advisable to first execute mode 62 "Mlist all off" (deactivate all methods) and then to process the method-selection list using mode 60 "Method list". All you then need do is select the methods that you would like to include in the method-selection list for later use by marking them with the dot (•). The names of the user polynomials (1-25) and user concentrations (1-10) all appear in the method list, even when they are not programmed. Unprogrammed methods cannot be activated!

### 3.1.2 User-specific method list: Activate all methods

This mode function activates all methods and the complete method-selection list appears when the unit is switched on.

Press the keys [Mode], [Shift] + [6] [1].



Confirm your selection by pressing [ ↵ ].



The display shows:

```
<Mlist all on>
Switch on all
methods
YES:1,      NO:0
```

Pressing the keys **[Shift] + [1]** shows all methods in the method-selection list.



Pressing the keys **[Shift] + [0]** saves the current method-selection list for later use.



The unit then returns to the mode menu.

### 3.1.3 User-specific method list: Deactivate all methods

For software-technical reasons at least one method must be activated in the user-specific method list. The unit automatically activates the first method stored in the sorting list.

Press the keys **[Mode], [Shift] + [6] [2]**.



Confirm your selection by pressing **[↵]**.



The display shows:

```
<Mlist all off>
Switch off all
methods
YES:1,      NO:0
```

Pressing the keys **[Shift] + [1]** shows just one method in the method list.



Pressing the keys **[Shift] + [0]** saves the current method list for later use.



The unit then returns to the mode menu.

## 3.2 Profi mode

As a rule the methods include the following information:

- a) Method
- b) Measuring range
- c) Date and time
- d) Differentiation of measurement results
- e) Detailed operator instruction
- f) Observance of reaction times (countdown)

When the Profi mode is activated, the colorimeter restricts itself to a minimum of use. g. idance. Items d, e, and f are omitted.

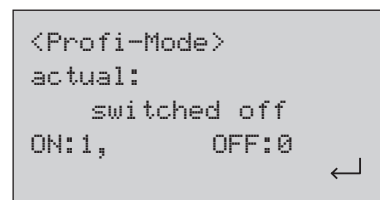
Press the keys **[Mode]**, **[Shift]** + **[5]** **[0]**.



Confirm your selection by pressing **[↵]**.



The display shows:



Pressing the keys **[Shift]** + **[0]** key deactivates the Profi mode.



Pressing the keys **[Shift]** + **[1]** key activates the Profi mode.



The display shows:

```
<Profi-Mode>
actual:
  switched off
ON:1,      OFF:0
switched on ←
```

or

```
<Profi-Mode>
actual:
  switched off
ON:1,      OFF:0
switched off
```

Confirm by pressing [ ↵ ].



**Note**

It is also possible to save results in the Profi mode. When results are saved here, the display also shows the message: "Profi mode". This selected setting remains activated even when the unit is switched off until a new setting is made.

## 3.3 Acoustic signals

### 3.3.1 Activating/deactivating the key beep

Press the keys [Mode], [Shift] + [1] [1].



Confirm your selection by pressing [ ↵ ].



The display shows:

```
<Key-beep>
ON:1,      OFF:0
←
```

Pressing the keys [Shift] + [0] deactivates the key beep function.



Pressing the keys **[Shift] + [1]** activates the key beep function.



Confirm by pressing [↵].



**Note**

In connection with methods that include a reaction time, the unit emits an acoustic signal in the last 10 seconds before the countdown expires even when the key beep function is inactive.

### 3.3.2 Activating/deactivating the signal beep

It takes the colorimeter approx. 8 seconds to perform a zero calibration and measurements. It emits a brief signal beep at the end of a measurement.

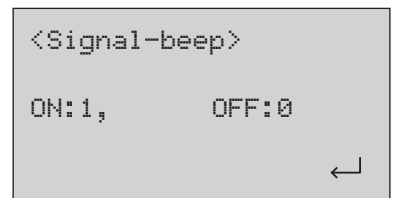
Press the keys **[Mode], [Shift] + [1] [4]**.



Confirm your selection by pressing [↵].



The display shows:



Pressing the keys **[Shift] + [0]** deactivates the signal beep function.



Pressing the keys **[Shift] + [1]** key activates the signal beep function.



Confirm by pressing [↵].



**Note**

In connection with methods that include a reaction time, the unit emits an acoustic signal in the last 10 seconds before the countdown expires even when the signal beep function is inactive.

### 3.3.3 Activating/deactivating the countdown function (observance of reaction times)

Certain methods require the observance of reaction times. These waiting times are stored as standard settings in the respective methods in the form of a timer (countdown) function. The countdown can be deactivated for all methods involved in the following manner:

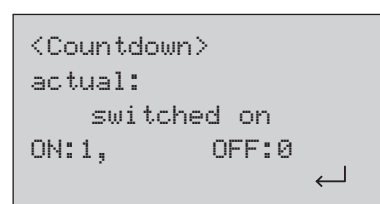
Press the keys **[Mode]**, **[Shift]** + **[1]** **[3]**.



Confirm your selection by pressing **[ ↵ ]**.



The display shows:



Pressing the keys **[Shift]** + **[0]** deactivates the countdown function.



Pressing the keys **[Shift]** + **[1]** activates the countdown function.



Confirm by pressing **[ ↵ ]**.



#### **Note**

It is possible to interrupt the working countdown by pressing the **[ ↵ ]** key (application e.g. serial analysis).

The "user countdown" is also available if the countdown is switched off.

When the countdown function is inactive, the necessary reaction time must be observed by the user him-/herself. Failure to observe the specified reaction time can lead to erroneous results.

## 3.4 Setting the display contrast

Press the keys **[Mode]**, **[Shift]** + **[8]** **[0]**.



Confirm your selection by pressing **[↵]**.



The display shows:



Pressing the **[▲]** key enhances the contrast of the LC display about one unit.



Pressing the **[▼]** key reduces the contrast of the LC display about one unit.



Pressing the **[Store]** key enhances the contrast of the LC display about ten units.



Pressing the **[Test]** reduces the contrast of the LC display about ten units.



Confirm by pressing **[↵]**.



The contrast can be selected between 0 and 254 units, here: 180.



## 3.5 Setting the display brightness

Press the keys **[Mode]**, **[Shift]** + **[8]** **[1]**.



Confirm your selection by pressing **[↵]**.



The display shows:



Pressing the **[▲]** key enhances the brightness of the LC display about one unit.



Pressing the **[▼]** key reduces the brightness of the LC display about one unit.



Pressing the **[Zero]** key enhances the brightness of the LC display about ten units.



Pressing the **[Test]** reduces the brightness of the LC display about ten units.



Confirm by pressing **[↵]**.



The brightness can be selected between 0 and 254 units, here: 200.

## 3.6 System info

Press the keys **[Mode]**, **[Shift]** + **[9]** **[1]**.



Confirm your selection by pressing **[↵]**.



The display shows:

```
<System-Info>
Software:
  U012.010.3.003.050

more:↓, cancel: ESC
```

This mode provides details on the current software version, the number of measurements that have already been made, and the number of free memory records.

Pressing the **[▼]** displays the number of performed tests and free memory capacity.



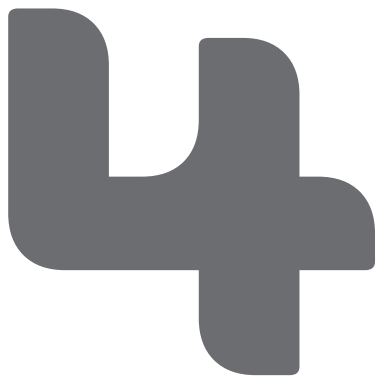
The display shows:

```
<System-Info>
Number of Tests:
  139
free records left:
  999

cancel: ESC
```




Press the **[Esc]** key to return to the mode menu.





# Trouble-shooting

## 4.1 User messages on the display / Error messages

Display message	Possible causes	Measures
Battery warning		
	Warning signal every 3 minutes	The battery capacity will be out soon
	Warning signal every 12 seconds	Change the batteries
	Warning signal, the colorimeter switches itself off	Change the batteries
E40 User cal. here not possible	If the test result appears with Overage/ Underrange, a user calibration is not possible Check sources of error, e.g.: user error (correct procedure, observance of the reaction time, ...)	Use a test with a standard of lower/higher concentration
Jus Overage E4, Jus Underrange E4	When the user makes calibrations, the setting of the specified value is possible only within defined limits: These were exceeded or, respectively, not reached	Check error sources, e.g.: user error (correct procedure, Observance of reaction time,...) standard (sample weight, dilution, age, pH,...) Repeat adjustment
Overrange	Measuring range exceeded	Where possible dilute sample or select another measuring range
	Turbidities in the sample	Heed possible interferences
	Light entering measurement compartment	Seal ring attached to cell lid? Repeat measurement with seal ring attached

Display message	Possible causes	Measures
Overrange E1	During the user calibration the upper measuring-range limit was exceeded while setting to the specified value	Carry out test with a standard of lower concentration
Underrange	Result below measuring range	State result with lower than x mg/l x = Lower limit of measuring range; if necessary use a different analytical method
Underrange E1	During the user calibration the lower measuring-range limit was not met while setting to the specified value	Carry out test with a standard of a higher concentration
Zero not accepted	Too much, too little incident light	Zero cell in place? Insert zero cell, repeat measurement Clean measurement compartment Repeat zero calibration
Printer Timeout	Printer inactive, no connection	Connect the printer via Spectroquant® Data Transfer module Check contacts Switch on printer
Storage-system error Use Mode 34	Power supply for storage system interrupted or not available	Insert or replace the batteries. Then execute mode 34 to delete the data.
<pre>... ???</pre> <p>Example 1</p> <pre>130 Chlorine CT 0.05-5.00 mg/l Cl2  0,60 mg/l free Cl ???</pre> <p>Example 2</p> <pre>130 Chlorine CT 0.05-5.00 mg/l Cl2  Underrange free Cl ???</pre>	<p>It is not possible to calculate a value (e.g.: bound chlorine)</p>	<p>Correctly measured? If not, repeat</p> <p>Example 1: While the values displayed differ in terms of magnitude, in consideration of the tolerances they are identical. In this case there is no bound chlorine present in the sample.</p> <p>Example 2: The result for free chlorine lies outside the measuring range, which is why the value for free chlorine cannot be calculated. Since no detectable free chlorine is present, the proportion of bound chlorine can be assumed to be the total chlorine content.</p>

## Display message Possible causes

### Example 3

```
130 Chlorine CT  
0.05-5.00 mg/l Cl2  
  
0,60 mg/l free Cl  
??? comb. Cl  
Overrange total Cl
```

## Measures

### Example 3:

The result for total chlorine lies outside the measuring range, which is why the unit is not able to calculate the value for bound chlorine. In this case the sample must be diluted to obtain the total chlorine content.

## 4.2 Avoiding errors in photometric measurements

1. The cells and cap must be cleaned thoroughly after each analysis run to prevent errors due to cross-contamination. Even the smallest residues of reagents will lead to erroneous results.
2. The outer walls of the cells must be clean and dry before the analysis is carried out. Fingerprints or water droplets on the light-path surfaces of the cells will lead to erroneous results.
3. The cells for the zero calibration and the test itself must always be inserted into the measurement compartment in such a way that the white triangle or, respectively, the line of the graduation is correctly aligned with the corresponding mark on the case (see page 17 or 18).
4. The zero calibration and the test itself must both be made with the cell cap in place. The cell cap of the 24-mm cell must be fitted with a seal ring.
5. The formation of air bubbles on the inner walls of the cell will lead to erroneous results. In this case attach the cell cap to the cell and swirl the cell to eliminate any air bubbles before carrying out the test.

6. Care must be taken to prevent any water from entering the measurement compartment. Any entry of water into the case of the colorimeter may result in the destruction of electronic components and in damage due to corrosion.
7. Any contamination of the optical components in the measurement compartment will lead to erroneous results. The light-path surfaces of the measurement compartment must be checked at regular intervals and cleaned wherever necessary. Use moist wipes and cotton-wool buds for these cleaning operations.
8. Major differences in temperature between the colorimeter and the local environment can lead to erroneous results, e. g. due to condensation on the optical components and on the cell.
9. When operating the colorimeter make sure that it is protected from direct sunlight.

# Important information



**The colorimeter was developed for use in the laboratory for water analysis.**

The accuracy of the instrument is only valid if the instrument is used in an environment with controlled electromagnetic disturbances according to DIN 61326. Wireless devices, e.g. wireless phones, must not be used near the instrument.

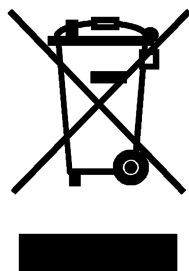
## **Important disposal instructions for batteries and accumulators**

EC Guideline 2006/66/EC requires users to return all used and worn-out batteries and accumulators.

They must not be disposed of in normal domestic waste. Because our products include batteries and accumulators in the delivery package our advice is as follows:

Used batteries and accumulators are not items of domestic waste. They must be disposed of in a proper manner. Your local authority may have a disposal facility; alternatively you can hand them in at any shop selling batteries and accumulators.

You can also return them to the company which supplied them to you; the company is obliged to accept them.



## **Important Information**

**To Preserve, Protect and Improve the Quality of the Environment**

**Disposal of Electrical Equipment in the European Union**

Because of the European Directive 2012/19/EU your electrical instrument must not be disposed of with normal household waste!



# 5

## CD-ROM

### 5.1 Overview of preprogrammed methods and analytical procedures

Meth. No.	Parameter	Cat. No.	Measuring range	Blank	Type of test	Type of cell
10	Acid cap. 01758	1.01758.0001	0.40 - 8.00 mmol/l OH	RB	Cell test	16 mm
20	Aluminium 14825	1.14825.0001*	20 - 700 µg/l Al	RB	Cell test	16 mm
21	Aluminium 00594	1.00594.0001	0.05 - 0.50 mg/l Al	RB	Test	24 mm
30	Ammonium 14739	1.14739.0001	10 - 2000 µg/l NH <sub>4</sub> -N	RB	Cell test	16 mm
31	Ammonium 14558	1.14558.0001	0.20 - 8.00 mg/l NH <sub>4</sub> -N	RB	Cell test	16 mm
32	Ammonium 14559	1.14559.0001	4.0 - 80.0 mg/l NH <sub>4</sub> -N	RB	Cell test	16 mm
33	Ammonium 14752	1.14752.0001*	0.02 - 1.30 mg/l NH <sub>4</sub> -N	RB	Test	24 mm
34	Ammonium 00683	1.00683.0001	1.0 - 50.0 mg/l NH <sub>4</sub> -N	RB	Test	16 mm
40	AOX 00675	1.00675.0001	0.05 - 2.50 mg/l AOX	RB	Cell test	16 mm
50	Arsenic 01747	1.01747.0001	5 - 100 µg/l As	RB	Test	16 mm
70	BOD 00687	1.00687.0001	0.5 - 3000 mg/l BOD	H <sub>2</sub> O	Cell test	16 mm
80	Boron 00826	1.00826.0001	0.05 - 2.00 mg/l B	RB	Cell test	16 mm
90	Bromine 00605	1.00605.0001	0.10 - 5.00 mg/l Br <sub>2</sub>	H <sub>2</sub> O	Test	24 mm
100	Cadmium 14834	1.14834.0001	25 - 1000 µg/l Cd	RB	Cell test	16 mm
101	Cadmium 01745	1.01745.0001	5 - 500 µg/l Cd	RB	Test	24 mm
110	Calcium 00858	1.00858.0001	10 - 250 mg/l Ca	RB	Cell test	16 mm
111	Calcium 14815	1.14815.0001	5 - 160 mg/l Ca	RB	Test	16 mm
120	Chloride 14730	1.14730.0001	5 - 125 mg/l Cl	RB	Cell test	16 mm
121	Chloride 14897	1.14897.0001	10 - 250 mg/l Cl	RB	Test	16 mm
122	Chloride 01804	1.01804.0001	0.5 - 15.0 mg/l Cl	RB	Cell Test	16 mm
123	Chloride 01807	1.01807.0001	0.50 - 5.00 mg/l Cl	RB	Test	24 mm
130	Cl <sub>2</sub> CT 0.05-5.00	1.00595.0001 (free) 1.00597.0001 (free + total)	0.05 - 5.00 mg/l Cl <sub>2</sub>	H <sub>2</sub> O	Cell test	16 mm

\* in contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled

RB = own reagent blank value



Meth. No.	Parameter	Cat. No.	Measuring range	Blank	Type of test	Type of cell
131	Cl <sub>2</sub> 0.02-4.50	1.00598.0002 (free) 1.00598.0001 (free) 1.00602.0001 (total) 1.00602.0002 (total) 1.00599.0001 (free + total)	0.02 - 4.50 mg/l Cl <sub>2</sub>	H <sub>2</sub> O	Test	24 mm
134	Cl <sub>2</sub> 0.10-6.00	1.00598.0002 (free) 1.00598.0001 (free) 1.00602.0001 (total) 1.00602.0002 (total) 1.00599.0001 (free + total)	0.10 - 6.00 mg/l Cl <sub>2</sub>	H <sub>2</sub> O	Test	16 mm
132	Cl <sub>2</sub> LR 0.10-6.00	1.00086.0001 + 1.00087.0001 (free) 1.00086.0001 + 1.00087.0001 + 1.00088.0001 (total)	0.10 - 6.00 mg/l Cl <sub>2</sub>	H <sub>2</sub> O	Cell test	16 mm
133	Cl <sub>2</sub> LR 0.02-4.50	1.00086.0001 + 1.00087.0001 (free) 1.00086.0001 + 1.00087.0001 + 1.00088.0001 (total)	0.02 - 4.50 mg/l Cl <sub>2</sub>	H <sub>2</sub> O	Test	24 mm
140	ClO <sub>2</sub> 0.05-8.50	1.00608.0001	0.05 - 8.50 mg/l ClO <sub>2</sub>	H <sub>2</sub> O	Test	24 mm
141	ClO <sub>2</sub> 0.20-10.00	1.00608.0001	0.20 - 10.00 mg/l ClO <sub>2</sub>	H <sub>2</sub> O	Test	16 mm
150	Chromate 14552	1.14552.0001	0.05 - 2.00 mg/l Cr	H <sub>2</sub> O	Cell test	16 mm
151	Chromate 14758	1.14758.0001*	10 - 1400 µg/l Cr	H <sub>2</sub> O	Test	24 mm
210	Cobalt 17244	1.17244.0001	0.05 - 2.00 mg/l Co	RB	Cell test	16 mm
168	COD 01796	1.01796.0001	5.0 - 80.0 mg/l COD	RB	Cell test	16 mm
160	COD 14540	1.14540.0001	10 - 150 mg/l COD	RB	Cell test	16 mm
161	COD 14895	1.14895.0001	15 - 300 mg/l COD	RB	Cell test	16 mm
162	COD 14690	1.14690.0001	50 - 500 mg/l COD	RB	Cell test	16 mm
163	COD 14541	1.14541.0001	25 - 1500 mg/l COD	RB	Cell test	16 mm
164	COD 14691	1.14691.0001	300 - 3500 mg/l COD	RB	Cell test	16 mm
165	COD 14555	1.14555.0001	0.50 - 10.00 g/l COD	RB	Cell test	16 mm
169	COD 01797	1.01797.0001	5.00 - 90.00 g/l COD	RB	Cell test	16 mm
166	COD 09772	1.09772.0001	10 - 150 mg/l COD	RB	Cell test	16 mm
167	COD 09773	1.09773.0001	100 - 1500 mg/l COD	RB	Cell test	16 mm
570	COD 17058	1.17058.0001	5.0 - 60.0 mg/l COD	RB	Cell test	16 mm
571	COD 17059	1.17059.0001	50 - 3000 mg/l COD	RB	Cell test	16 mm
170	Color	-	25 - 1000 mg/l Pt/Co (Hazen)	H <sub>2</sub> O	Method	24 mm
180	Copper 14553	1.14553.0001	0.05 - 8.00 mg/l Cu	H <sub>2</sub> O	Cell test	16 mm
181	Copper 14767	1.14767.0001	0.10 - 6.00 mg/l Cu	H <sub>2</sub> O	Test	16 mm
192	Cyanide 02531	1.02531.0001	10 - 350 µg/l CN	H <sub>2</sub> O	Cell test	16 mm
190	Cyanide 14561	1.14561.0001	10 - 350 µg/l CN	H <sub>2</sub> O	Cell test	16 mm
191	Cyanide 09701	1.09701.0001*	5 - 200 µg/l CN	H <sub>2</sub> O	Test	24 mm
201	Cyan. acid 19253	1.19253.0001	2 - 160 mg/l CyA	SB	Test	24 mm
220	Fluoride 14557	1.14557.0001	0.10 - 1.50 mg/l F	RB	Cell test	16 mm
222	Fluoride 00809	1.00809.0001	0.10 - 1.80 mg/l F	RB	Cell test	16 mm
225	Fluoride 17243	1.17243.0001	0.10 - 2.50 mg/l F	RB	Cell test	16 mm
221	Fluoride 14598	1.14598.0001	0.10 - 2.00 mg/l F	RB	Test	16 mm
223	Fluoride 00822	1.00822.0001	0.08 - 2.00 mg/l F	RB	Test	24 mm
224	Fluoride 17236	1.17236.0001*	0.08 - 2.00 mg/l F	RB	Test	16 mm
230	Hydrazine 09711	1.09711.0001*	10 - 1200 µg/l N <sub>2</sub> H <sub>4</sub>	RB	Test	24 mm
560	HydroPerox 18789	1.18789.0001	0.02 - 5.50 mg/l H <sub>2</sub> O <sub>2</sub>	RB	Test	16 mm
240	Iodine 00606	1.00606.0001	0.10 - 5.00 mg/l I <sub>2</sub>	H <sub>2</sub> O	Test	24 mm
252	Iron 00796	1.00796.0001	0.10 - 5.00 mg/l Fe	H <sub>2</sub> O	Test	16 mm

\* in contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled

RB = own reagent blank value

SB = sample blank value

<b>Meth. No.</b>	<b>Parameter</b>	<b>Cat. No.</b>	<b>Measuring range</b>	<b>Blank</b>	<b>Type of test</b>	<b>Type of cell</b>
250	Iron 14549	1.14549.0001	0.05 - 4.00 mg/l Fe	H <sub>2</sub> O	Cell test	16 mm
251	Iron 14761	1.14761.0001* 1.14761.0002*	0.01 - 2.00 mg/l Fe	H <sub>2</sub> O	Test	24 mm
260	Lead 14833	1.14833.0001	0.10 - 5.00 mg/l Pb	RB	Cell test	16 mm
261	Lead 09717	1.09717.0001	0.05 - 5.00 mg/l Pb	RB	Test	24 mm
270	Magnesium 00815	1.00815.0001	5.0 - 75.0 mg/l Mg	RB	Cell test	16 mm
280	Manganese 00816	1.00816.0001	0.10 - 5.00 mg/l Mn	H <sub>2</sub> O	Cell test	16 mm
281	Manganese 01739	1.01739.0001	0.05 - 1.80 mg/l Mn	RB	Test	24 mm
282	Manganese 14770	1.14770.0001*	0.05 - 6.00 mg/l Mn	H <sub>2</sub> O	Test	24 mm
283	Manganese 01846	1.01846.0001	0.05 - 1.80 mg/l Mn	RB	Test	24 mm
290	Molybdenum 00860	1.00860.0001	0.02 - 1.00 mg/l Mo	H <sub>2</sub> O	Cell test	16 mm
291	Molybdenum 19252	1.19252.0001	0.5 - 45.0 mg/l Mo	H <sub>2</sub> O	Test	24 mm
300	Monochloramine	1.01632.0001	0.10 - 5.00 mg/l Cl <sub>2</sub>	H <sub>2</sub> O	Test	24 mm
310	Nickel 14554	1.14554.0001	0.10 - 6.00 mg/l Ni	H <sub>2</sub> O	Cell test	16 mm
311	Nickel 14785	1.14785.0001*	0.05 - 5.00 mg/l Ni	RB	Test	24 mm
320	Nitrate 14542	1.14542.0001	0.5 - 15.0 mg/l NO <sub>3</sub> -N	RB	Cell test	16 mm
321	Nitrate 14773	1.14773.0001	0.5 - 15.0 mg/l NO <sub>3</sub> -N	RB	Test	16 mm
322	Nitrate 14556	1.14556.0001	0.10 - 3.00 mg/l NO <sub>3</sub> -N	RB	Cell test	16 mm
323	Nitrate 01842	1.01842.0001	0.3 - 30.0 mg/l NO <sub>3</sub> -N	RB	Test	24 mm
330	Nitrite 14547	1.14547.0001	10 - 700 µg/l NO <sub>2</sub> -N	H <sub>2</sub> O	Cell test	16 mm
331	Nitrite 14776	1.14776.0001* 1.14776.0002*	5 - 400 µg/l NO <sub>2</sub> -N	H <sub>2</sub> O	Test	24 mm
332	Nitrite 00609	1.00609.0001	1.0 - 90.0 mg/l NO <sub>2</sub> -N	H <sub>2</sub> O	Cell test	16 mm
340	Nitrogen 14537	1.14537.0001	0.5 - 15.0 mg/l N	RB	Cell test	16 mm
550	Oxygen 14694	1.14694.0001	0.5 - 12.0 mg/l O <sub>2</sub>	H <sub>2</sub> O	Cell test	16 mm
555	Oxyg. scavengers	1.19251.0001	20 - 500 µg/l DEHA	RB	Test	24 mm
350	Ozone 0.02-3.00	1.00607.0001 1.00607.0002	0.02 - 3.00 mg/l O <sub>3</sub>	H <sub>2</sub> O	Test	24 mm
351	Ozone 0.10-4.00	1.00607.0001 1.00607.0002	0.10 - 4.00 mg/l O <sub>3</sub>	H <sub>2</sub> O	Test	16 mm
360	pH 01744	1.01744.0001	6.4 - 8.8	H <sub>2</sub> O	Cell test	16 mm
370	Phenol 14551	1.14551.0001	0.10 - 2.50 mg/l C <sub>6</sub> H <sub>5</sub> OH	RB	Cell test	16 mm
371	Phenol 00856	1.00856.0001	0.10 - 5.00 mg/l C <sub>6</sub> H <sub>5</sub> OH	RB	Test	24 mm
387	Phosphate 00474	1.00474.0001	0.05 - 4.00 mg/l PO <sub>4</sub> -P	H <sub>2</sub> O	Cell test	16 mm
380	Phosphate 14543	1.14543.0001	0.05 - 4.00 mg/l PO <sub>4</sub> -P	H <sub>2</sub> O	Cell test	16 mm
388	Phosphate 00475	1.00475.0001	0.5 - 20.0 mg/l PO <sub>4</sub> -P	H <sub>2</sub> O	Cell test	16 mm
381	Phosphate 14729	1.14729.0001	0.5 - 20.0 mg/l PO <sub>4</sub> -P	H <sub>2</sub> O	Cell test	16 mm
382	Phosphate 00616	1.00616.0001	3.0 - 100.0 mg/l PO <sub>4</sub> -P	H <sub>2</sub> O	Cell test	16 mm
389	Phosphate 00673	1.00673.0001	3.0 - 100.0 mg/l PO <sub>4</sub> -P	H <sub>2</sub> O	Cell test	16 mm
383	Phosphate 14848	1.14848.0001*	0.01 - 2.50 mg/l PO <sub>4</sub> -P	H <sub>2</sub> O	Test	24 mm
384	Phosphate 00798	1.00798.0001	1.0 - 60.0 mg/l PO <sub>4</sub> -P	H <sub>2</sub> O	Test	16 mm
385	Phosphate 14842	1.14842.0001	0.5 - 30.0 mg/l PO <sub>4</sub> -P	RB	Test	16 mm
386	Phosphate 14546	1.14546.0001	0.5 - 25.0 mg/l PO <sub>4</sub> -P	RB	Cell test	16 mm
400	Potassium 14562	1.14562.0001	5.0 - 50.0 mg/l K	H <sub>2</sub> O	Cell test	16 mm
401	Potassium 00615	1.00615.0001	30 - 300 mg/l K	H <sub>2</sub> O	Cell test	16 mm
410	Residual hardness 14683	1.14683.0001	0.50 - 5.00 mg/l Ca	RB	Cell test	16 mm
420	Silicate 14794	1.14794.0001*	0.11 - 8.56 mg/l SiO <sub>2</sub>	H <sub>2</sub> O	Test	24 mm
421	Silicate 00857	1.00857.0001	11 - 1070 mg/l SiO <sub>2</sub>	H <sub>2</sub> O	Test	16 mm
422	Silicate 01813	1.01813.0001	0.004 - 0.500 mg/l SiO <sub>2</sub>	RB	Test	24 mm
430	Sodium 00885	1.00885.0001	10 - 300 mg/l Na	RB	Cell test	16 mm
444	Sulfate 02532	1.02532.0001	2.0 - 50.0 mg/l SO <sub>4</sub>	RB	Cell test	16 mm
440	Sulfate 14548	1.14548.0001	5 - 250 mg/l SO <sub>4</sub>	H <sub>2</sub> O	Cell test	16 mm

\* in contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled

RB = own reagent blank value

Meth. No.	Parameter	Cat. No.	Measuring range	Blank	Type of test	Type of cell
445**	Sulfate 02537	1.02537.0001	10 - 300 mg/l SO <sub>4</sub>	H <sub>2</sub> O	Test	16 mm
446**	Sulfate 02537	1.02537.0001	10 - 300 mg/l SO <sub>4</sub>	H <sub>2</sub> O	Test	16 mm
450	Sulfide 14779	1.14779.0001	0.10 - 1.50 mg/l S	H <sub>2</sub> O	Test	16 mm
460	Sulfite 14394	1.14394.0001	1.0 - 20.0 mg/l SO <sub>3</sub>	RB	Cell test	16 mm
461	Sulfite 01746	1.01746.0001	1.0 - 60.0 mg/l SO <sub>3</sub>	RB	Test	16 mm
473	Surfact-a 02552	1.02552.0001	0.10 - 2.00 mg/l SDSA	RB	Cell test	16 mm
471	Surfact-c 01764	1.01764.0001	0.05 - 1.50 mg/l	RB	Cell test	16 mm
472	Surfact-n 01787	1.01787.0001	0.10 - 7.50 mg/l	RB	Cell test	16 mm
480	Susp. solids	-	50 - 750 mg/l	H <sub>2</sub> O	Method	24 mm
490	Tin 14622	1.14622.0001	0.10 - 2.50 mg/l Sn	H <sub>2</sub> O	Cell test	16 mm
510	Total hardness 00961	1.00961.0001	5 - 215 mg/l Ca	RB	Cell test	16 mm
520	Turbidity	-	1 - 100 FAU	H <sub>2</sub> O	Method	24 mm
531	Volatile org. acids	1.01749.0001	50 - 3000 mg/l	RB	Cell test	16 mm
		1.01809.0001	50 - 3000 mg/l	RB	Test	16 mm
540	Zinc 00861	1.00861.0001	25 - 1000 µg/l Zn	RB	Cell test	16 mm
541	Zinc 14566	1.14566.0001	0.20 - 5.00 mg/l Zn	RB	Cell test	16 mm
600	A 430 nm				Absorbance	
610	A 530 nm				Absorbance	
620	A 560 nm				Absorbance	
630	A 580 nm				Absorbance	
640	A 610 nm				Absorbance	
650	A 660 nm				Absorbance	

\* in contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled

\*\* For batches with a minimum shelf life **till** 2021/10/31: select method number 445.

For batches with a minimum shelf life **after** 2021/10/31: select method number 446.

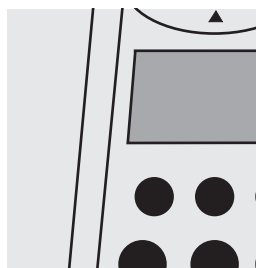
RB = own reagent blank value

# Acid Capacity to pH 4.3 (Total Alkalinity)

101758

Cell Test

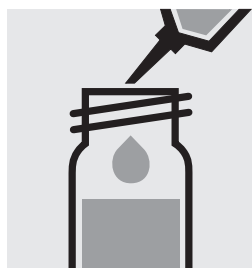
**Measuring range:** 0.40 – 8.00 mmol/l OH<sup>-</sup> 16-mm cell  
20 – 400 mg/l CaCO<sub>3</sub> 16-mm cell



Select method (1)(0).



Pipette 4.0 ml each of **AC-1** into two round cells.



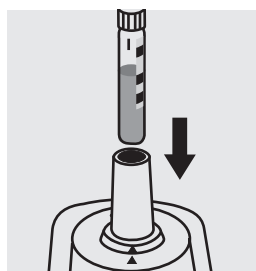
Add to one cell 1.0 ml of the sample with pipette, close with the screw cap, and mix.



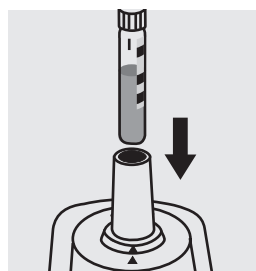
Add to the second cell 1.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Add to each cell 0.50 ml of **AC-2** with pipette, close with the screw cap, and mix.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a sodium hydroxide solution 1.0 mol/l, Cat.No. 109141, can be used after diluting accordingly (see section "Standard solutions").

# Aluminium

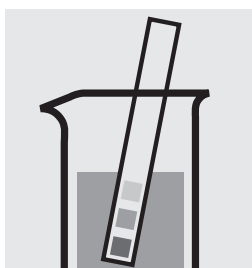
114825

Test

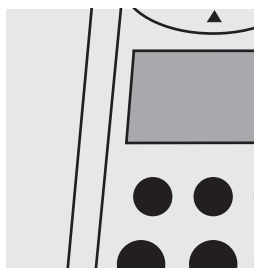
Measuring range: 20–700 µg/l Al

24-mm cell

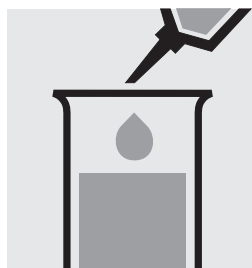
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



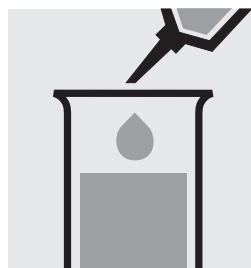
Check the pH of the sample, specified range: pH 3 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



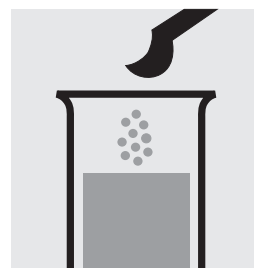
Select method (2)(0).



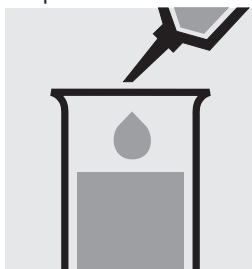
Pipette 10 ml of the sample into a test tube.



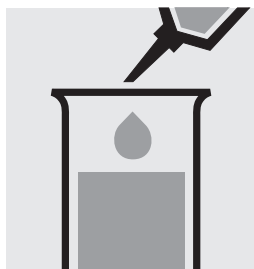
Pipette 10 ml of distilled water into a second test tube. (Blank)



Add to each test tube 2 level blue microspoons of **AI-1** and dissolve the solid substance.



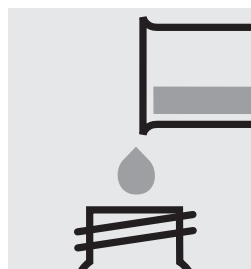
Add to each test tube 2.4 ml of **AI-2** with pipette and mix.



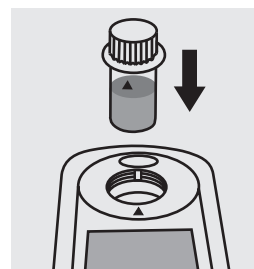
Add to each test tube 0.5 ml of **AI-3** with pipette and mix.



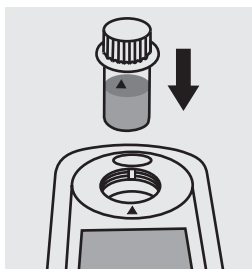
Reaction time: 2 minutes  
Press (←) to start the countdown.



Transfer each solution into a separate 24-mm cell, close with the screw caps.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100, Cat.No. 118701, or the Standard solutions for photometric applications, CRM, Cat.Nos. 132225 and 132226.

The measurement results are expressed in µg/l.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119770, concentration 1000 mg/l Al, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

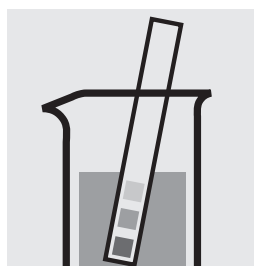
# Aluminium

100594

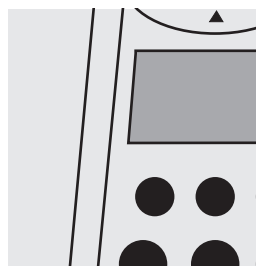
Cell Test

Measuring range: 0.05 – 0.50 mg/l Al

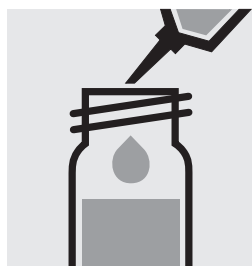
16-mm cell



Check the pH of the sample, specified range: pH 3 – 10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(1).



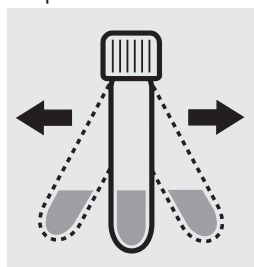
Pipette 6.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 6.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



Add to each cell 1 level blue microspoon of **Al-1K**, close with the screw cap.



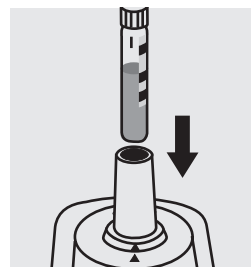
Shake both cells vigorously to dissolve the solid substance.



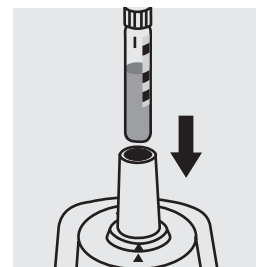
Add to each test tube 0.25 ml of **Al-2K** with pipette, close with the screw cap, and mix.



Reaction time: 5 minutes  
Press (Start) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100, Cat.No. 118701, or the Standard solutions for photometric applications, CRM, Cat.Nos. 132225 and 132226.

The measurement results are expressed in µg/l.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119770, concentration 1000 mg/l Al, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

# Ammonium

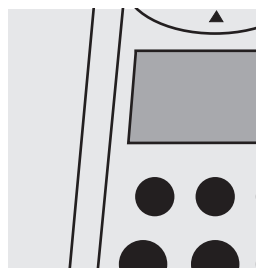
**114739**

Cell Test

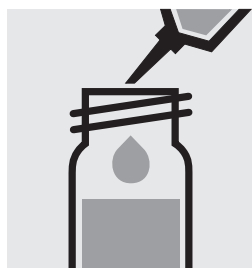
Measuring range: 10 – 2000 µg/l NH <sub>4</sub> -N	16-mm cell
13 – 2576 µg/l NH <sub>4</sub>	16-mm cell
10 – 2000 µg/l NH <sub>3</sub> -N	16-mm cell
12 – 2432 µg/l NH <sub>3</sub>	16-mm cell



Check the pH of the sample, specified range: pH 4 – 13.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



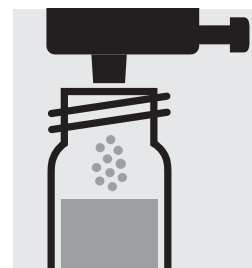
Select method (3)(0).



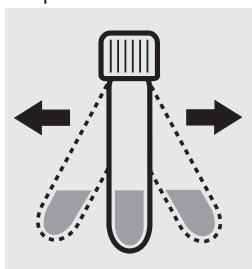
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



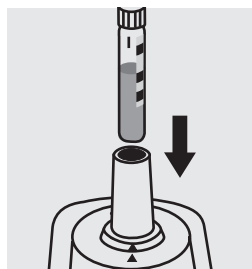
Add to each cell 1 dose of **NH<sub>4</sub>-1K** using the blue dose-metering cap, close with the screw cap.



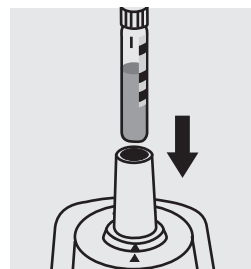
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 15 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high ammonium concentrations in the sample produce turquoise-colored solutions (measurement solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50, Cat.No. 114695, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125022, 125023, and 132227.  
The measurement results are expressed in µg/l.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH<sub>4</sub><sup>+</sup>, can also be used after diluting accordingly.

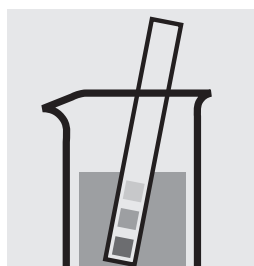
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

# Ammonium

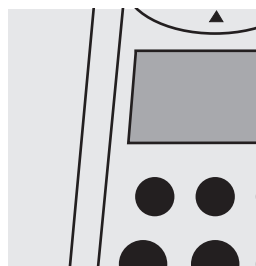
**114558**

Cell Test

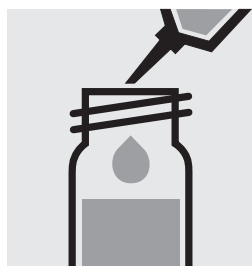
<b>Measuring range:</b> 0.20 – 8.00 mg/l NH <sub>4</sub> -N	16-mm-cell
0.26 – 10.30 mg/l NH <sub>4</sub>	16-mm-cell
0.20 – 8.00 mg/l NH <sub>3</sub> -N	16-mm-cell
0.24 – 9.73 mg/l NH <sub>3</sub>	16-mm-cell



Check the pH of the sample, specified range: pH 4 – 13.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



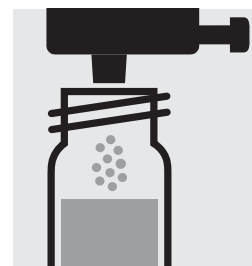
Select method (3)(1).



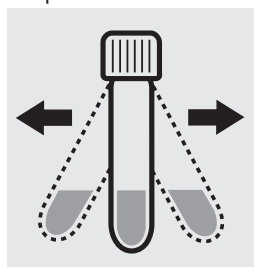
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 1.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



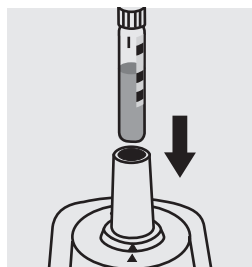
Add to each cell 1 dose of **NH<sub>4</sub>-1K** using the blue dose-metering cap, close with the screw cap.



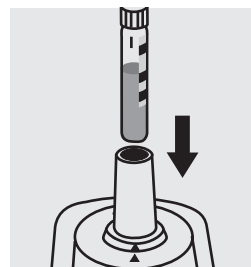
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 15 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high ammonium concentrations in the sample produce turquoise-colored solutions (measurement solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125022, 125023, 125024, and 125025.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH<sub>4</sub><sup>+</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

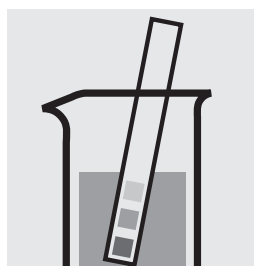


# Ammonium

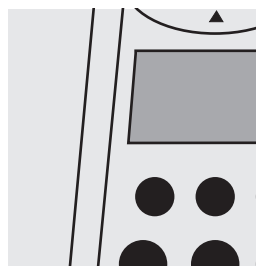
**114559**

Cell Test

<b>Measuring range:</b> 4.0 – 80.0 mg/l NH <sub>4</sub> -N	16-mm-cell
5.2 – 103.0 mg/l NH <sub>4</sub>	16-mm-cell
4.0 – 80.0 mg/l NH <sub>3</sub> -N	16-mm-cell
4.9 – 97.3 mg/l NH <sub>3</sub>	16-mm-cell



Check the pH of the sample, specified range: pH 4 – 13. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



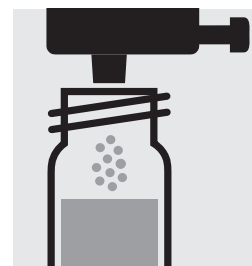
Select method (3)(2).



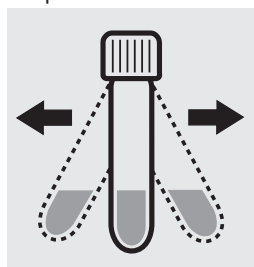
Pipette 0.10 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 0.10 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



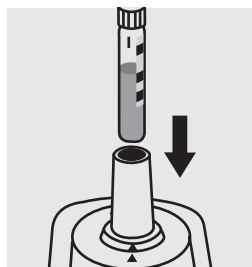
Add to each cell 1 dose of **NH<sub>4</sub>-1K** using the blue dose-metering cap, close with the screw cap.



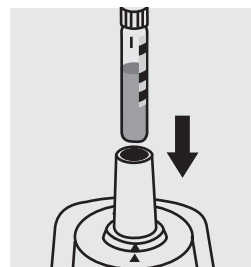
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 15 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high ammonium concentrations in the sample produce turquoise-colored solutions (measurement solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 70, Cat.No. 114689, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125025, 125026, and 125027.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH<sub>4</sub><sup>+</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

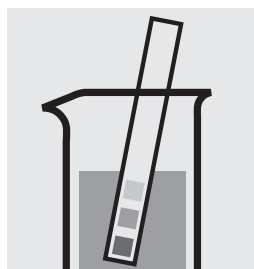
# Ammonium

# 114752

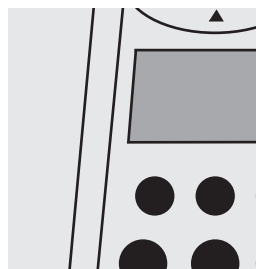
## Test

<b>Measuring range:</b> 0.02 – 1.30 mg/l NH <sub>4</sub> -N	24-mm cell
0.03 – 1.67 mg/l NH <sub>4</sub>	24-mm cell
0.02 – 1.30 mg/l NH <sub>3</sub> -N	24-mm cell
0.02 – 1.64 mg/l NH <sub>3</sub>	24-mm cell

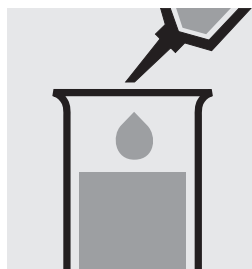
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



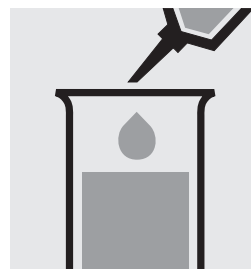
Check the pH of the sample, specified range: pH 4 – 13. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



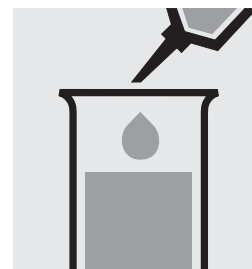
Select method (3)(3).



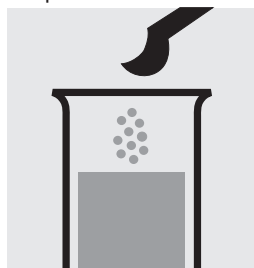
Pipette 10 ml of the sample into a test tube.



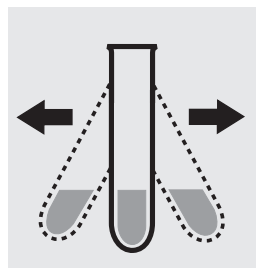
Pipette 10 ml of distilled water into a second test tube. (Blank)



Add to each test tube 1.2 ml of NH<sub>4</sub>-1 with pipette and mix.



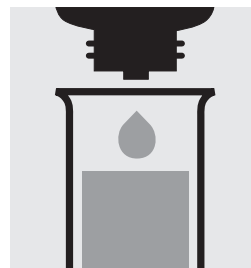
Add to each test tube 2 level blue microspoons of NH<sub>4</sub>-2.



Shake both test tubes vigorously to dissolve the solid substance.



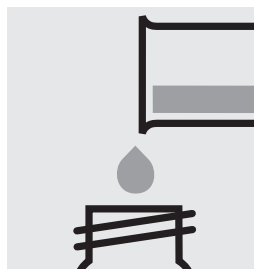
Reaction time: 5 minutes  
Press (←) to start the countdown.



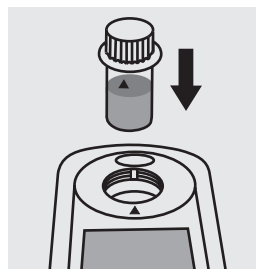
Add to each test tube 8 drops of NH<sub>4</sub>-3 and mix.



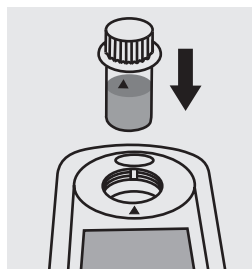
Reaction time: 5 minutes  
Press (←) to start the countdown.



Transfer each solution into a separate 24-mm cell, close with the screw caps.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

Very high ammonium concentrations in the sample produce turquoise-colored solutions (measurement solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50, Cat.No. 114695, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125022, 125023, and 132227. Use 10 ml R-1 instead of the sample.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH<sub>4</sub><sup>+</sup>, can also be used after diluting accordingly.

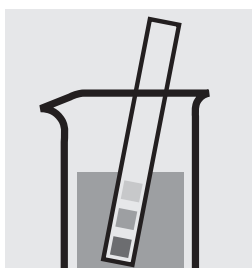
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended. Use 10 ml sample + 0.1 ml R-2.

# Ammonium

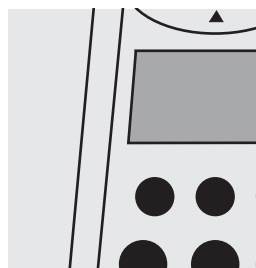
100683

Test

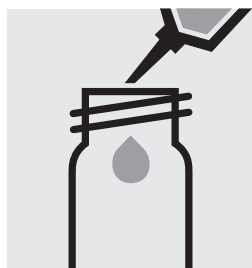
Measuring range: 1.0 – 50.0 mg/l $\text{NH}_4\text{-N}$	16-mm cell
1.3 – 64.4 mg/l $\text{NH}_4$	16-mm cell
1.0 – 50.0 mg/l $\text{NH}_3\text{-N}$	16-mm cell
1.2 – 60.8 mg/l $\text{NH}_3$	16-mm cell



Check the pH of the sample, specified range: pH 4 – 13.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (3)(4).



Pipette 5.0 ml each of  $\text{NH}_4\text{-1}$  into two 16-mm cells.



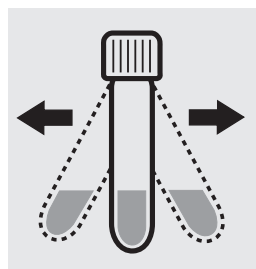
Add to one cell 0.20 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 0.20 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



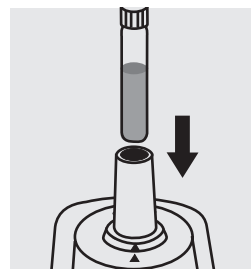
Add to each cell 1 level blue microspoon of  $\text{NH}_4\text{-2}$ , close with the screw cap.



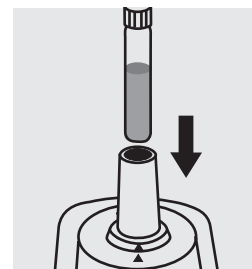
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 15 minutes  
Press (Start) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

## Important:

Very high ammonium concentrations in the sample produce turquoise-colored solutions (measurement solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 70, Cat.No. 114689, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125025 and 125026.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l  $\text{NH}_4^+$ , can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

# AOX

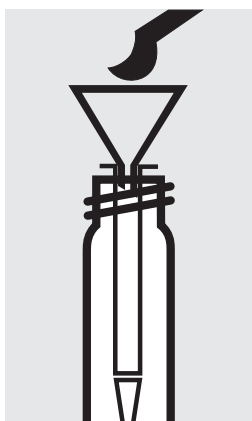
## Adsorbable Organic Halogens (x)

100675

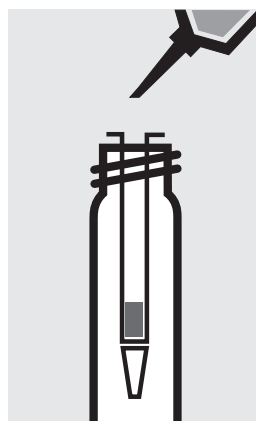
Cell Test

Measuring range: 0.05 – 2.50 mg/l AOX      16-mm cell

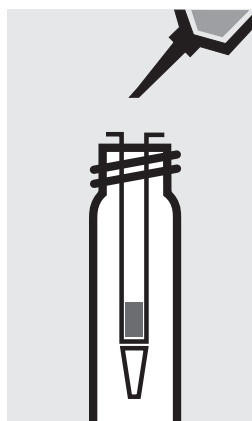
### Preparation of the adsorption column:



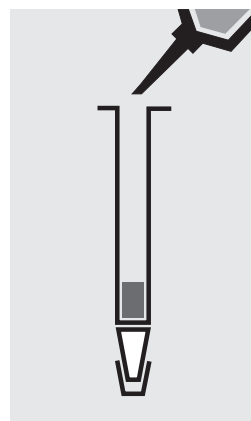
Place the column in an empty cell. Fill 1 level blue microspoon of **AOX-1** into the column using the glass funnel.



Run 3 separate 1-ml portions of **AOX-2** through the column. Discard the wash solution.



Run 3 separate 1-ml portions of **AOX-3** through the column. Discard the wash solution.

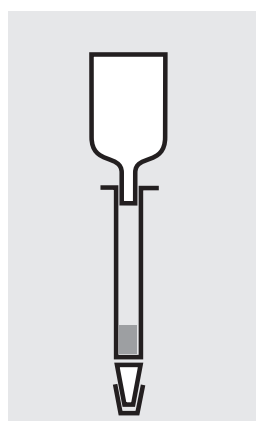


Close the bottom end of the column with the stopper. Apply to the column 1 ml of **AOX-3**. Close the top end of the column with the stopper and swirl to eliminate air bubbles. Remove the stopper on the top end and fill the column to the brim with **AOX-3**.

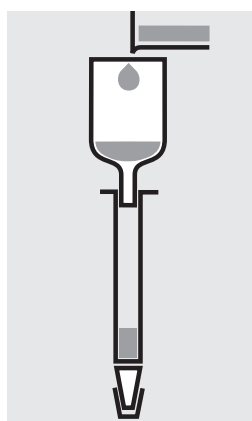
### Sample enrichment:



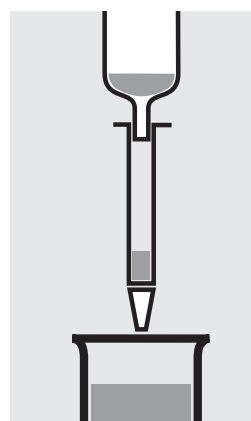
Check the pH of the sample, specified range: pH 6 – 7. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



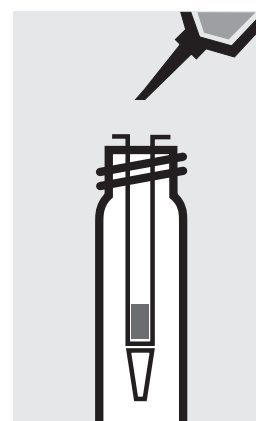
Attach the glass reservoir to the prepared column (closed at the bottom end).



Fill 100 ml of the sample and 6 drops of **AOX-4** into the reservoir.



Remove the stopper from the column outlet and run the sample through completely.



Detach the column from the reservoir. Apply 3 separate 1-ml portions of **AOX-3**. Discard the wash solution.

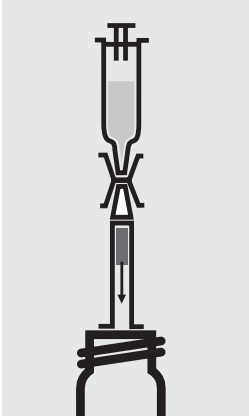
# AOX

Adsorbable Organic Halogens (x)

100675

Cell Test

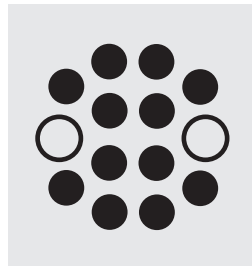
## Digestion:



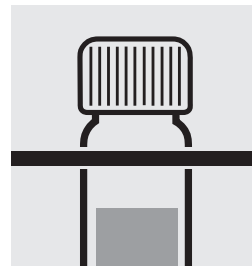
Fill the 10-ml syringe with 10 ml of reagent **AOX-5** and attach the syringe with the column outlet using the connector. Place the top end of the column on an empty cell and rinse the charcoal filling of the column into an empty 16-mm cell.



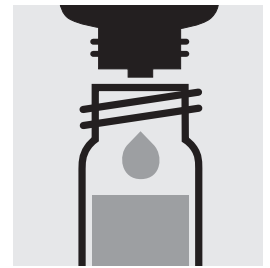
Add 2 level green microspoons of **AOX-6**, close with the screw cap, and mix.



Heat the cell at 120 °C in the thermoreactor for 30 minutes.

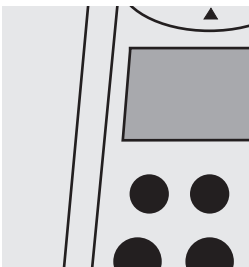


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



Add 5 drops of **AOX-4**, close the cell, and mix; clear supernatant: **pretreated sample**.

## Determination:



Select method (4)0.



Pipette 0.20 ml each of **AOX-1K** into two reaction cells, close with the screw cap, and mix.



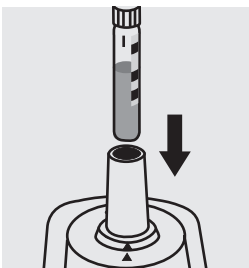
Add to one cell 7.0 ml of **pretreated sample** (without charcoal) with glass pipette, close with the screw cap, and mix.



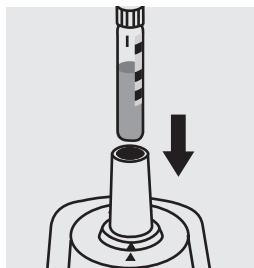
Add to the second cell 7.0 ml distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Reaction time: 15 minutes  
Press to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Test)**.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) Spectroquant® AOX Standard, Cat.No. 100680, concentration 0.2 – 2.0 mg/l can be used.

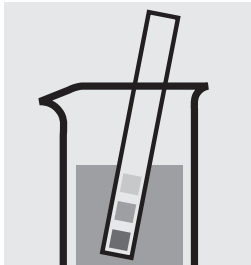
# Arsenic

101747

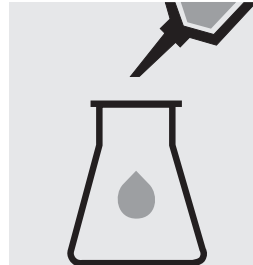
Test

Measuring range: 5 – 100 µg/l As

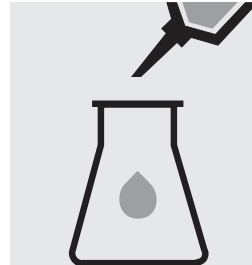
16-mm cell



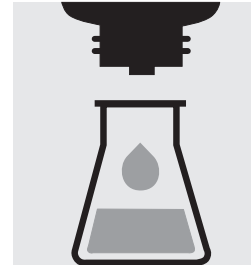
Check the pH of the sample, specified range: pH 0 – 13.



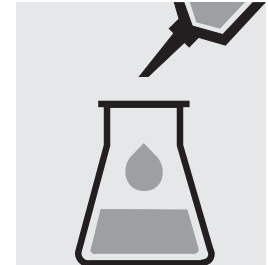
Place 350 ml of the sample into an Erlenmeyer flask with ground joint.



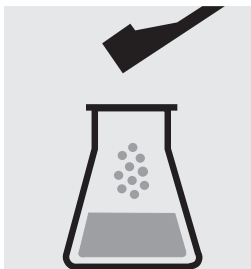
Place 350 ml of distilled water into a second Erlenmeyer flask with ground joint. (Blank)



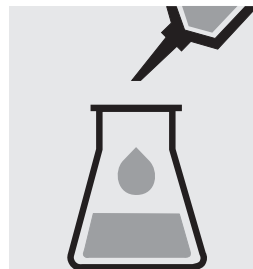
Add to each Erlenmeyer flask 5 drops of **As-1** and mix.



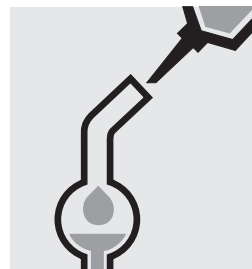
Add to each Erlenmeyer flask 20 ml of **As-2** with pipette and mix.



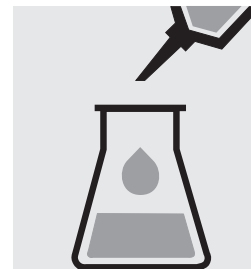
Add to each Erlenmeyer flask 1 level green dosing spoon of **As-3** and dissolve.



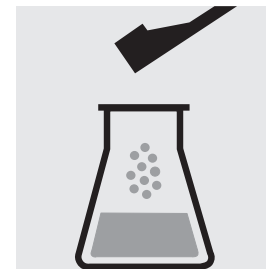
Add to each Erlenmeyer flask 1.0 ml of **As-4** with pipette and mix.



Pipette 5.0 ml each of **As-5** into two absorption tubes.



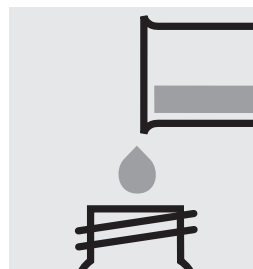
Add to each Erlenmeyer flask 1.0 ml of **As-6** with pipette to the solution in the Erlenmeyer flask and mix.



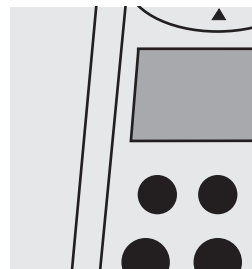
Add to each Erlenmeyer flask 3 level red dosing spoons of **As-7**. **Immediately** attach the absorption tubes to the Erlenmeyer flasks.



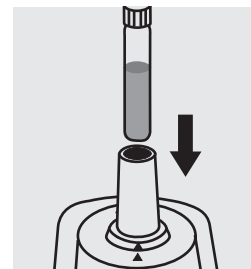
Leave to stand for 2 hours. During this time carefully swirl the flask several times or stir slowly with a magnetic stirrer.



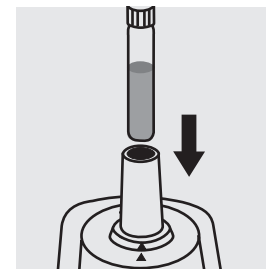
Transfer the solutions from the absorption tubes into two separate 16-mm cell, close with the screw cap.



Select method (5)0.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use arsenic standard solution Certipur®, Cat.No. 119773, concentration 1000 mg/l As or the Standard solution for photometric applications, CRM, Cat.No. 133002, can be used after diluting accordingly. The measurement results are expressed in µg/l.

# BOD

## Biochemical Oxygen Demand

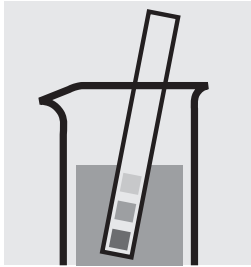
100687

Cell Test

**Measuring range:** 0.5 – 3000<sup>1)</sup> mg/l O<sub>2</sub>      16-mm cell

<sup>1)</sup> after corresponding dilution (details see package insert)

### Preparation and incubation:



Check the pH of the sample, specified range: pH 6 – 8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Fill 2 oxygen reaction bottles each with **pretreated sample** and 2 glass beads to overflowing. Close bubble-free with the slanted ground-glass stoppers.



Fill 2 oxygen reaction bottles each with **inoculated nutrient-salt solution** and 2 glass beads to overflowing. Close bubble-free with the slanted ground-glass stoppers.

### Measurement of initial oxygen concentration

= **Result 1**  
(measurement sample)  
= **Result 1**  
(blank)



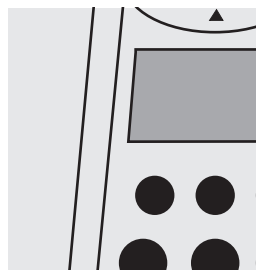
Incubate one bottle of **pretreated sample** and one of **inoculated nutrient-salt solution** closed in a thermostatic incubation cabinet at 20 ± 1°C for 5 days.

### Determination:

### Measurement of final oxygen concentration

= **Result 2**  
(measurement sample)  
= **Result 2**  
(blank)

After incubation, use one bottle of **pretreated sample** and one of **inoculated nutrient-salt solution** for the measurement of the final oxygen concentration.



Select method (7) (0).



Add to each oxygen reaction bottle 5 drops of **BOD-1K** and then 10 drops of **BOD-2K**, close bubble-free, and mix for approx. 10 seconds.



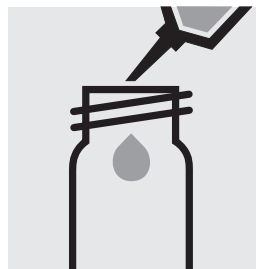
Reaction time:  
1 minute



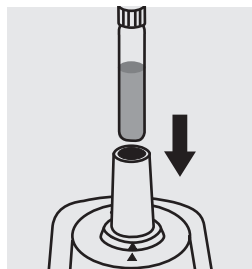
Add to each oxygen reaction bottle 10 drops of **BOD-3K**, reclose, and mix.



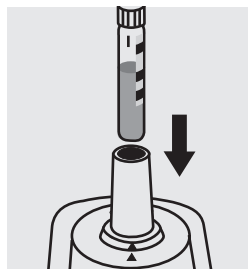
Transfer each solution into a separate 16-mm cell, close with the screw caps.



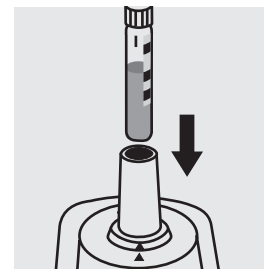
Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Insert the blank cell into the cell compartment. Press (Zero).



Insert the blank cell (nutrient-salt solution) into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Calculation:

BOD of measurement sample:  
Result 1 – Result 2 (measurement sample) = A in mg/l

BOD of blank:  
Result 1 – Result 2 (blank) = B in mg/l

BOD of original sample in mg/l = (A - B) • dilution factor

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) Spectroquant BOD Standard (analogous to EN 1899), Cat.No. 100718, can be used.

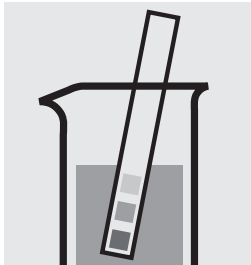
# Boron

100826

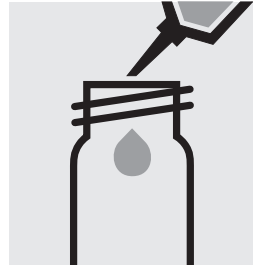
Cell Test

Measuring range: 0.05 – 2.00 mg/l B

16-mm cell



Check the pH of the sample, specified range: pH 2 – 12. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



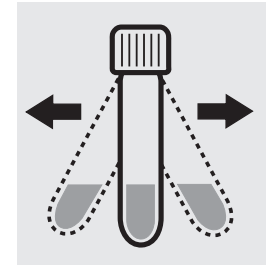
Pipette 1.0 ml each of **B-1K** into two reaction cells, close with the screw cap, and mix.



Add to one cell 4.0 ml of the sample with pipette, close with the screw cap.



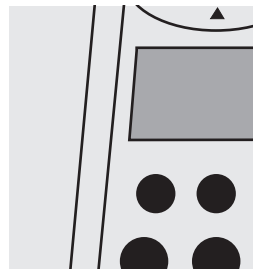
Add to the second cell 4.0 ml of distilled water with pipette, close with the screw cap. (Blank cell)



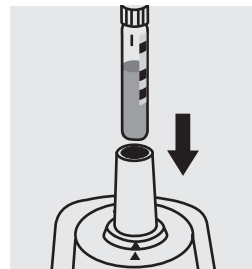
Shake both cells vigorously to dissolve the solid substance.



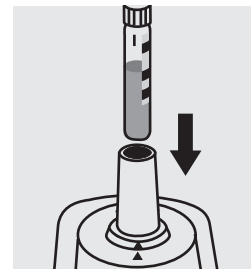
Reaction time:  
60 minutes



Select method **(8)(0)**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Test)**.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use boron standard solution Certipur<sup>®</sup>, Cat.No. 119500, concentration 1000 mg/l B can also be used after diluting accordingly or also the Standard solution for photometric applications, CRM, Cat.No. 133005.



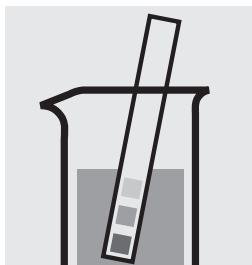
# Bromine

100605

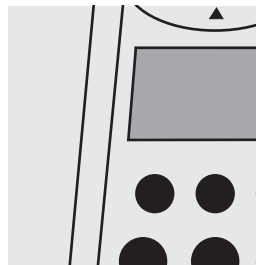
Test

Measuring range: 0.10–5.00 mg/l Br<sub>2</sub>

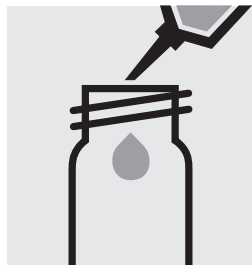
24-mm cell



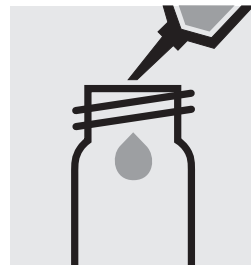
Check the pH of the sample, specified range: pH 4 – 8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (9)(0).



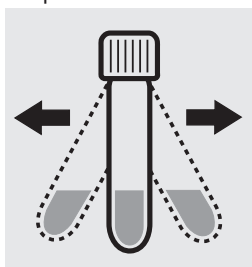
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



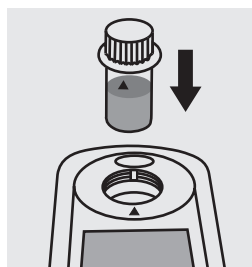
Add 1 level blue micro-spoon of Br<sub>2</sub>-1, close with the screw cap.



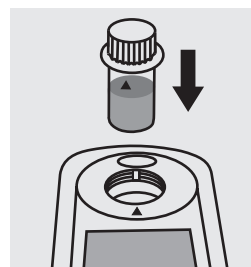
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high bromine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Cadmium

**114834**

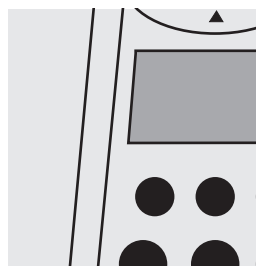
Cell Test

Measuring range: 25 – 1000 µg/l Cd

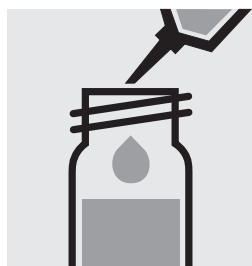
16-mm cell



Check the pH of the sample, specified range: pH 3 – 11.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(0)(0).



Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



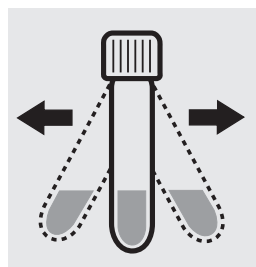
Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



Add 0.20 ml each of **Cd-1K** with pipette, close with the screw cap, and mix.



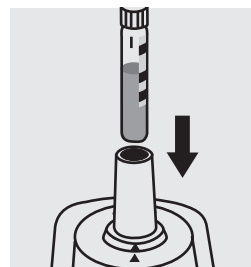
Add to each cell 1 level green microspoon of **Cd-2K**, close with the screw cap.



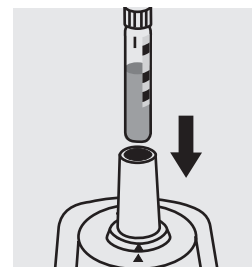
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 2 minutes  
Press (Start) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

**Important:**

For the determination of **total cadmium** a pretreatment with Crack Set 10C, Cat.No. 114688 or Crack Set 10, Cat.No. 114687, and thermoreactor is necessary.

**Quality assurance:**

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700, or the Standard solution for photometric applications, CRM, Cat.No. 132228.  
The measurement results are expressed in µg/l.

Ready-to-use cadmium standard solution Certipur®, Cat.No. 119777, concentration 1000 mg/l Cd, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Cadmium

101745

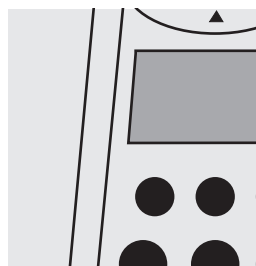
Test

Measuring range: 5 – 500 µg/l Cd

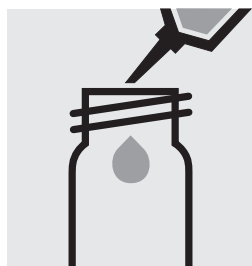
24-mm cell



Check the pH of the sample, specified range: pH 3 – 11.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(0)(1).



Pipette 1.0 ml each of **Cd-1** into two 24-mm cells.



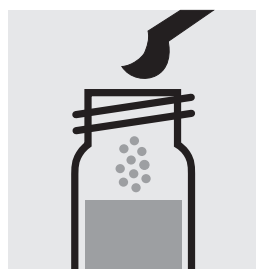
Add to one cell 10 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 10 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



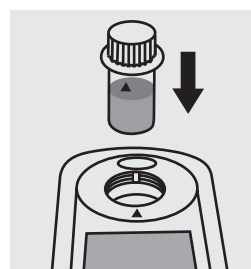
Add to each cell 0.20 ml of **Cd-2** with pipette, close with the screw cap, and mix.



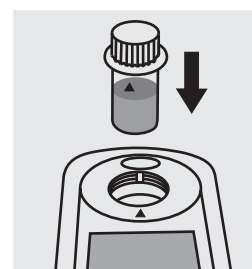
Add to each cell 1 level green microspoon of **Cd-3**, close with the screw cap, and dissolve the solid substance.



Reaction time: 2 minutes  
Press (Start) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

For the determination of **total cadmium** a pretreatment with Crack Set 10C, Cat.No. 114688 or Crack Set 10, Cat.No. 114687, and thermoreactor is necessary.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90, Cat.No. 118700, or the Standard solution for photometric applications, CRM, Cat. No. 132228.

The measurement results are expressed in µg/l.

Ready-to-use cadmium standard solution Certipur®, Cat.No. 119777, concentration 1000 mg/l Cd, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

# Calcium

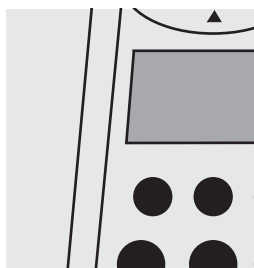
100858

Cell Test

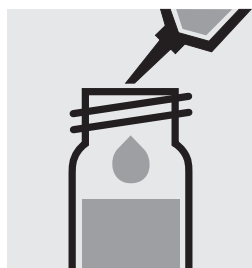
Measuring range: 10 – 250 mg/l Ca	16-mm cell
14 – 350 mg/l CaO	16-mm cell
25 – 625 mg/l CaCO <sub>3</sub>	16-mm cell



Check the pH of the sample, specified range: pH 3 – 9.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (1)(1)(0).



Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 1.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix.  
(Blank cell)



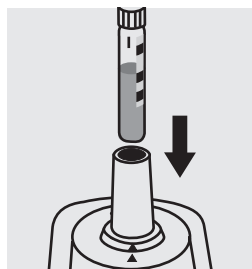
Add to each cell 1.0 ml of **Ca-1K** with pipette, close with the screw cap, and mix.



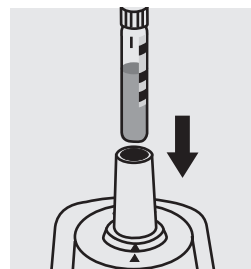
Reaction time: **exactly 3 minutes**  
Press (←) to start the countdown.



Add to each cell 0.50 ml of **Ca-2K** with pipette, close with the screw cap, and mix.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

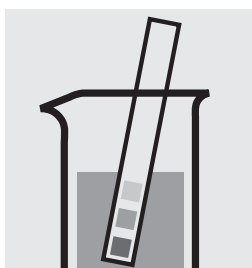
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Calcium

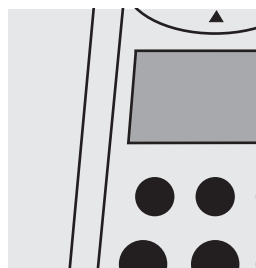
114815

Test

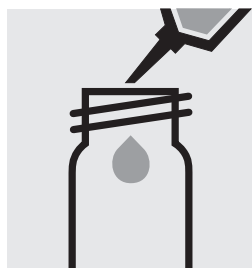
<b>Measuring range:</b> 5 – 160 mg/l Ca	16-mm cell
7 – 224 mg/l CaO	16-mm cell
13 – 400 mg/l CaCO <sub>3</sub>	16-mm cell



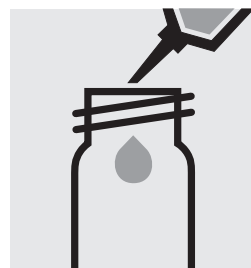
Check the pH of the sample, specified range: pH 4 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (1)(1)(1).



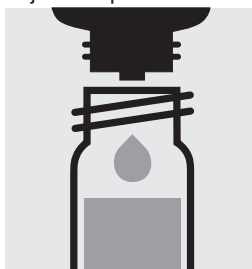
Pipette 0.10 ml of the sample into a 16-mm cell.



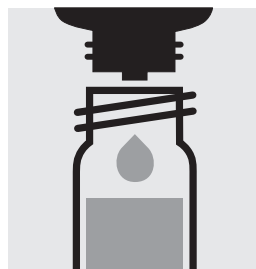
Pipette 0.10 ml of distilled water into a second 16-mm cell. (Blank cell)



Add to each cell 5.0 ml of **Ca-1** with pipette, close with the screw cap, and mix.



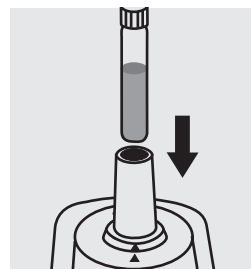
Add to each cell 4 drops of **Ca-2**, close with the screw cap, and mix.



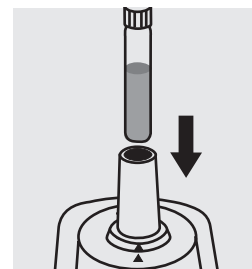
Add to each cell 4 drops of **Ca-3**, close with the screw cap, and mix.



Reaction time: 8 minutes, **measure immediately**. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use calcium standard solution Certipur®, Cat.No. 119778, concentration 1000 mg/l Ca, can be used after diluting accordingly.

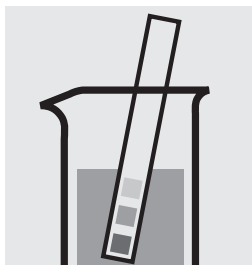
# Chloride

114730

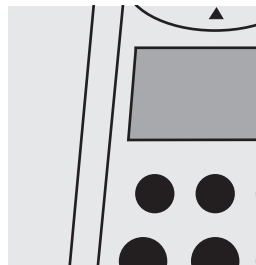
Cell Test

Measuring range: 5 – 125 mg/l Cl

16-mm cell



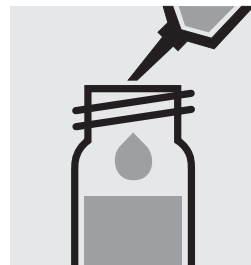
Check the pH of the sample, specified range: pH 1 – 12. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



Select method (1)(2)(0).



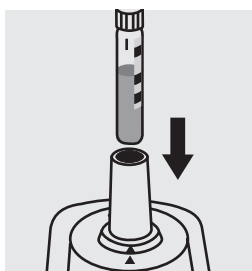
Pipette 0.50 ml each of **Cl-1K** into two reaction cells, close with the screw cap, and mix.



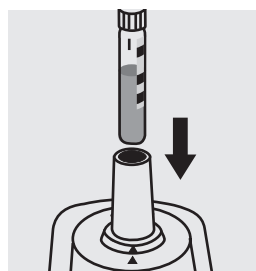
Add to one cell 1.0 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 1.0 ml of distilled water, close with the screw cap, and mix. (Blank cell)



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 and 20, Cat.Nos. 114676 and 114675, or the Standard solutions for photometric applications, CRM, Cat.Nos. 132229 and 132230.

Ready-to-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Chloride

114897

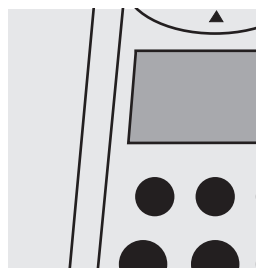
Test

Measuring range: 10–250 mg/l Cl

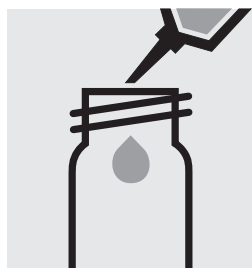
16-mm cell



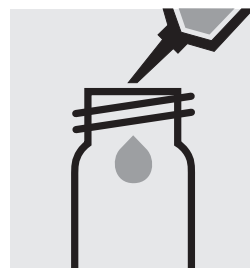
Check the pH of the sample, specified range: pH 1 – 12.  
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



Select method (1)(2)(1).



Pipette 1.0 ml of the sample into a 16-mm cell.



Pipette 1.0 ml of distilled water into a second 16-mm cell. (Blank cell)



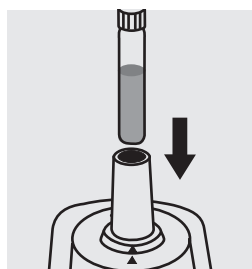
Add to each cell 2.5 ml of **CI-1** with pipette, close with the screw cap, and mix.



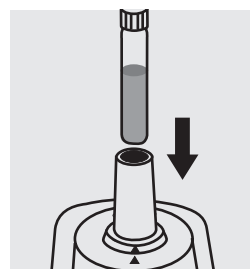
Add to each cell 0.50 ml of **CI-2** with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 60, Cat.No. 114696, or the Standard solutions for photometric applications, CRM, Cat.Nos. 132229 and 132230.

Ready-to-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 60) is highly recommended.

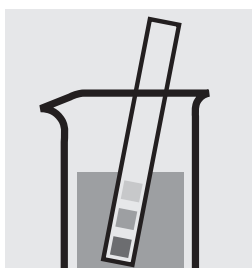
# Chloride

101804

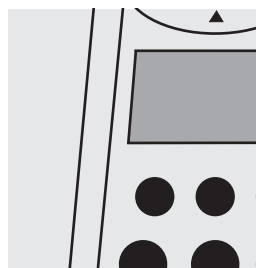
Cell Test

Measuring range: 0.5–15.0 mg/l Cl

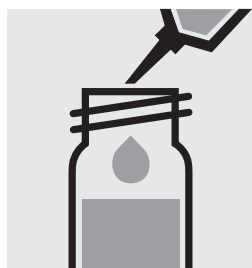
16-mm cell



Check the pH of the sample, specified range: pH 3 – 11.  
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



Select method (1)(2)(2).



Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.



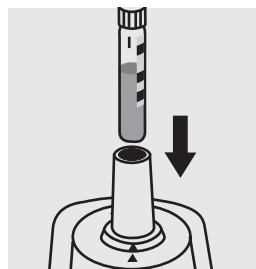
Pipette 10 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



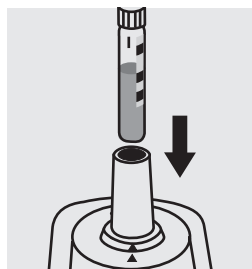
Add 0.25 ml each of **Cl-1K** with pipette, close with the screw cap, and mix.



Reaction time: 10 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup>, can be used after diluting accordingly or also the Standard solutions for photometric applications, CRM, Cat.Nos. 132229, 133010 and 133011.



# Chloride

101807

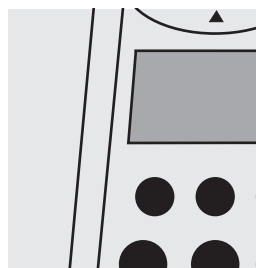
Test

Measuring range: 0.50–5.00 mg/l Cl

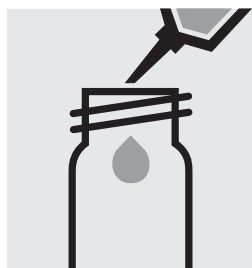
24-mm cell



Check the pH of the sample, specified range: pH 3 – 11.  
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



Select method (1)(2)(3).



Pipette 0.20 ml each of **CI-1** into two 24-mm cells.



Add 10 ml of the sample with pipette, close with the screw cap, and mix.



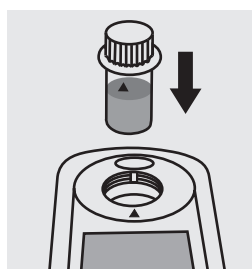
Add to the second cell 10 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) with pipette, close with the screw cap, and mix. (Blank cell)



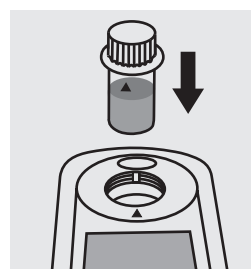
Add to each cell 0.20 ml of **CI-2** with pipette, close with the screw cap, and mix.



Reaction time: 10 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup>, can be used after diluting accordingly or also the Standard solutions for photometric applications, CRM, Cat.Nos. 133010 and 133011.

# Chlorine

100595

## Determination of free chlorine

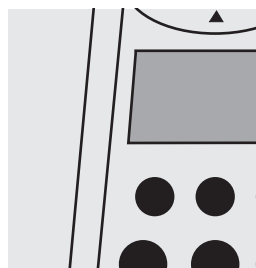
Cell Test

Measuring range: 0.05 – 5.00 mg/l Cl<sub>2</sub>

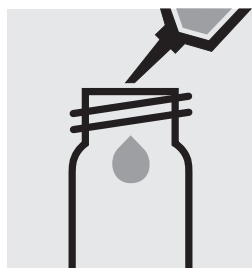
16-mm cell



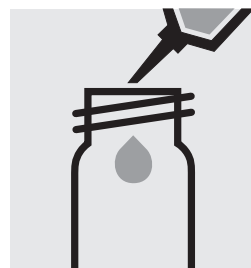
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(3)(0), select subitem >>free.



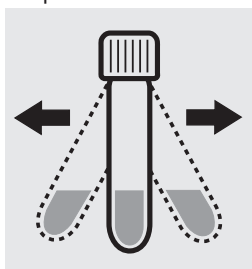
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a round cell.



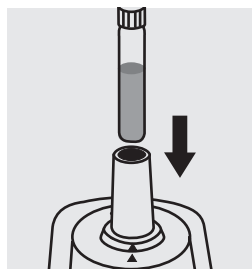
Add 1 level blue micro-spoon of Cl<sub>2</sub>-1, close with the screw cap.



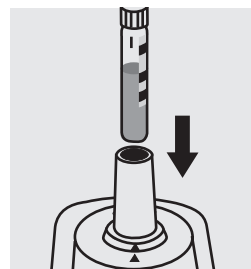
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

# Chlorine

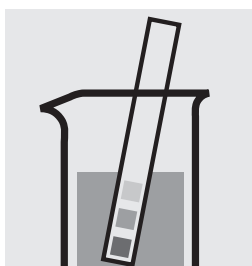
100597

## Determination of free chlorine

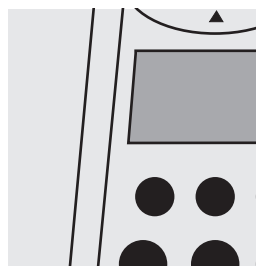
Cell Test

Measuring range: 0.05 – 5.00 mg/l Cl<sub>2</sub>

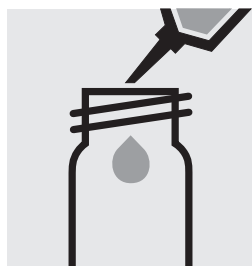
16-mm cell



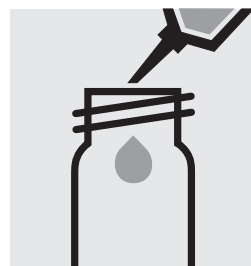
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **130**, select subitem >>free.



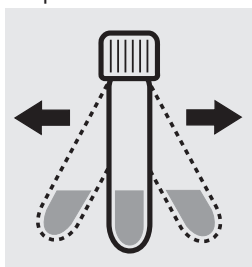
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a round cell.



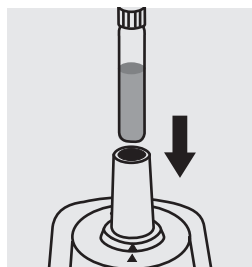
Add 1 level blue micro-spoon of **Cl<sub>2</sub>-1**, close with the screw cap.



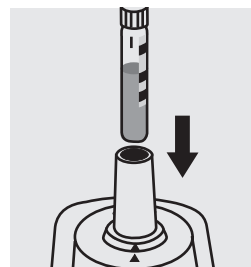
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

# Chlorine

100597

Determination of total chlorine

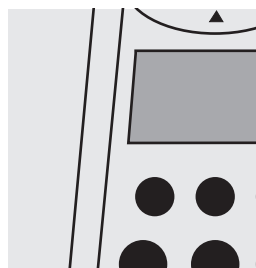
Cell Test

Measuring range: 0.05 – 5.00 mg/l Cl<sub>2</sub>

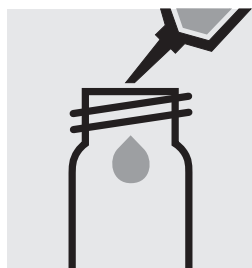
16-mm cell



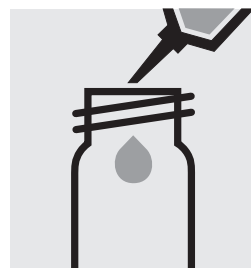
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



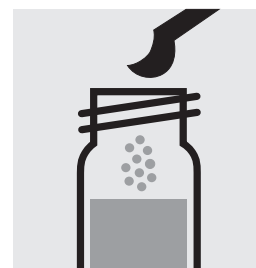
Select method (1)(3)(0), select subitem >>total.



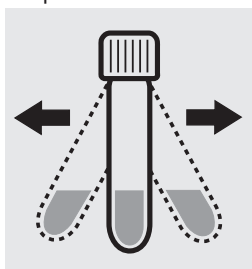
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



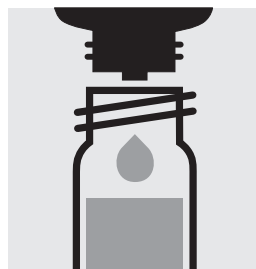
Pipette 5.0 ml of the sample into a round cell.



Add 1 level blue micro-spoon of Cl<sub>2</sub>-1, close with the screw cap.



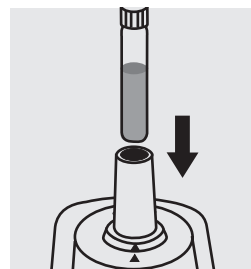
Shake the cell vigorously to dissolve the solid substance.



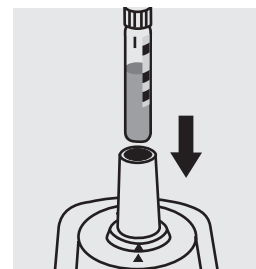
Add 2 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section "Standard solutions").

# Chlorine

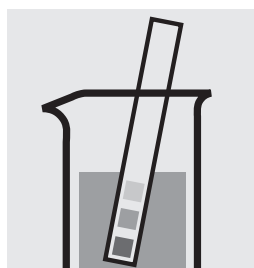
Determination of free chlorine, total chlorine,  
and combined chlorine

100597

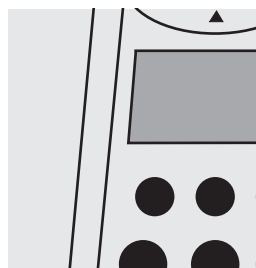
Cell Test

Measuring range: 0.05 – 5.00 mg/l Cl<sub>2</sub>

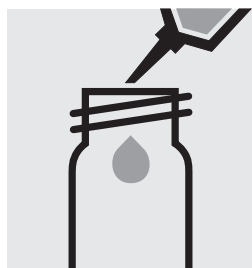
16-mm cell



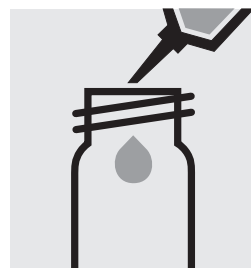
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **1300**, select subitem >>diff.



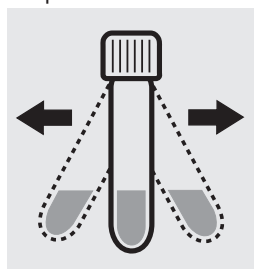
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a round cell.



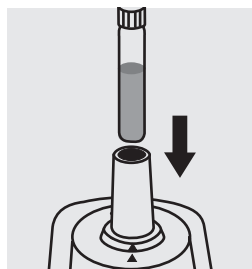
Add 1 level blue micro-spoon of Cl<sub>2</sub>-1, close with the screw cap.



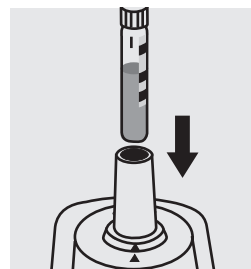
Shake the cell vigorously to dissolve the solid substance.



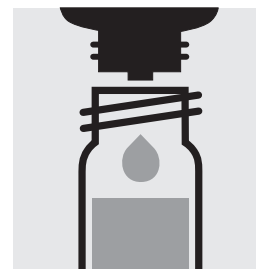
Reaction time: 1 minute  
Press **←** to start the countdown.



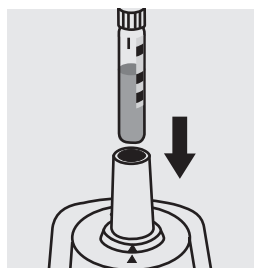
Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**. (= T1)



Remove sample cell from the photometer, open, add 2 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



Insert anew the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**. (= T2)

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.  
For on-the-spot determinations where there are no suitable facilities for rinsing, the cell contents can be transferred to a new 16-mm cell before the addition of reagent Cl<sub>2</sub>-2. Use this second cell **only** for the determination of **total chlorine!**

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Chlorine

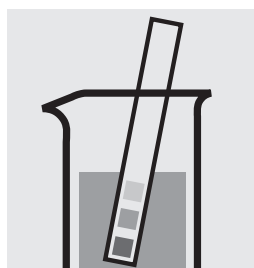
100598

## Determination of free chlorine

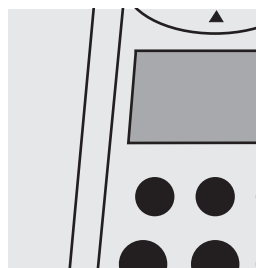
Test

Measuring range: 0.02–4.50 mg/l Cl<sub>2</sub>

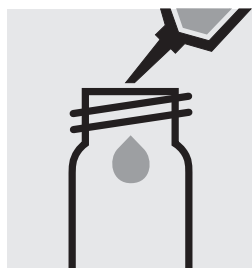
24-mm cell



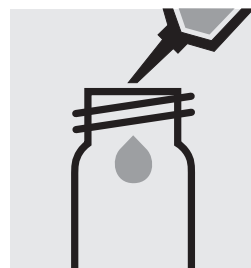
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



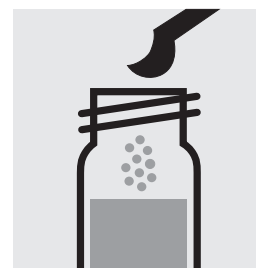
Select method **131**, select subitem >>free.



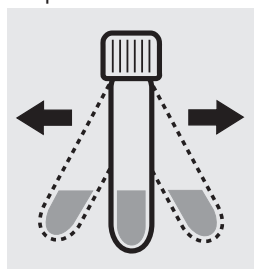
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



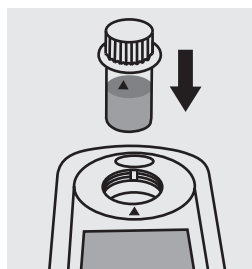
Add 1 level blue micro-spoon of **Cl<sub>2</sub>-1**, close with the screw cap.



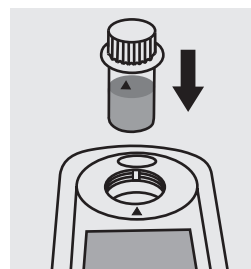
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Chlorine

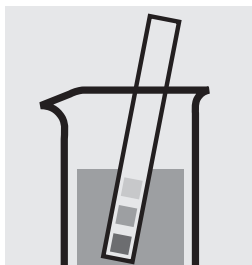
100598

## Determination of free chlorine

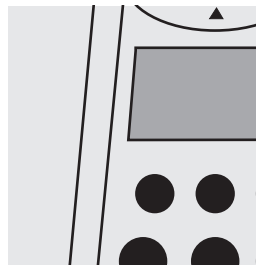
Test

Measuring range: 0.10–6.00 mg/l Cl<sub>2</sub>

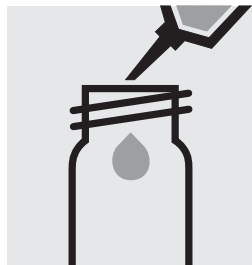
16-mm cell



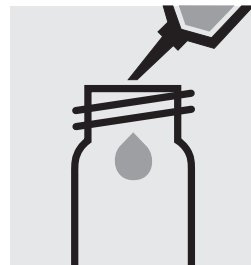
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **1****3****4**, select subitem >>free.



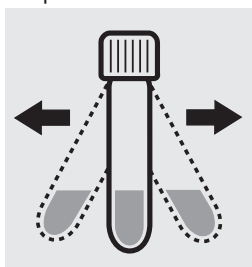
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 16-mm cell.



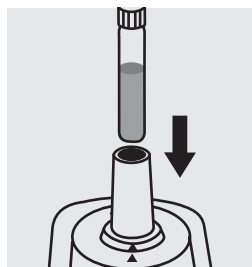
Add 1 level blue micro-spoon of **Cl<sub>2</sub>-1**, close with the screw cap.



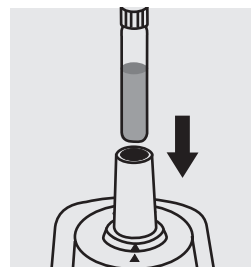
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Press **Test**.

### Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Chlorine

100602

Determinatin of total chlorine

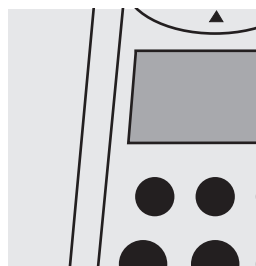
Test

Measuring range: 0.02–4.50 mg/l Cl<sub>2</sub>

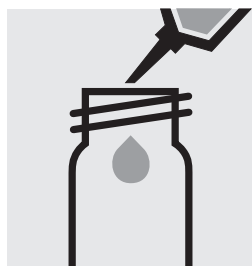
24-mm cell



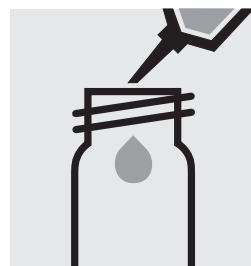
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



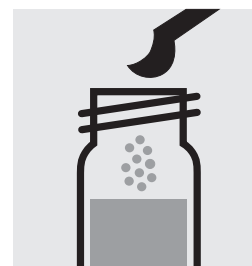
Select method **131**, select subitem >>total.



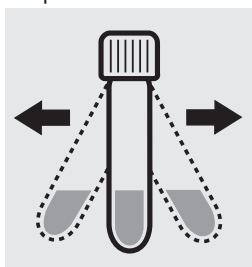
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



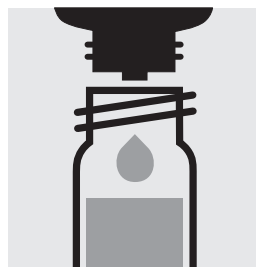
Pipette 10 ml of the sample into a 24-mm cell.



Add 1 level blue micro-spoon of **Cl<sub>2</sub>-1**, close with the screw cap.



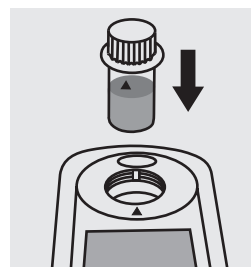
Shake the cell vigorously to dissolve the solid substance.



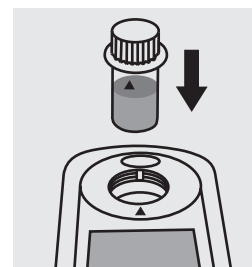
Add 2 drops of **Cl<sub>2</sub>-2**, close with the screw cap, and mix.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section "Standard solutions").



# Chlorine

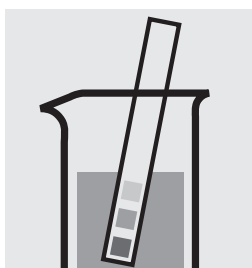
100602

Determinatin of total chlorine

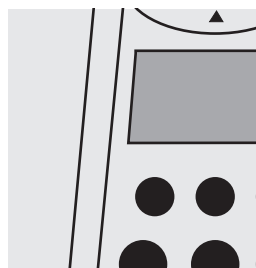
Test

Measuring range: 0.10–6.00 mg/l Cl<sub>2</sub>

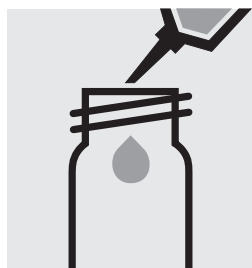
16-mm cell



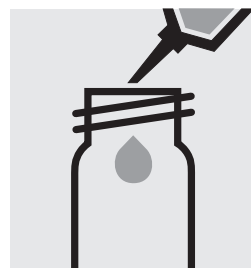
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



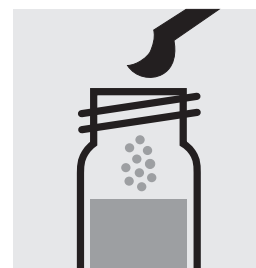
Select method **1****3****4**, select subitem >>total.



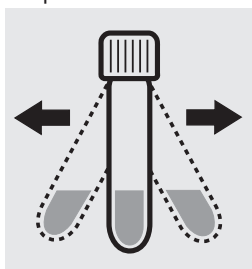
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap.  
(Blank cell)



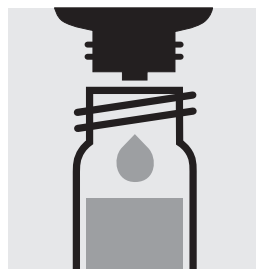
Pipette 10 ml of the sample into a 16-mm cell.



Add 1 level blue micro-spoon of **Cl<sub>2</sub>-1**, close with the screw cap.



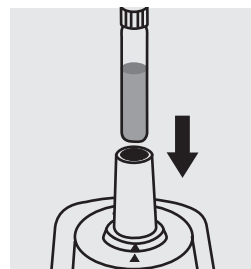
Shake the cell vigorously to dissolve the solid substance.



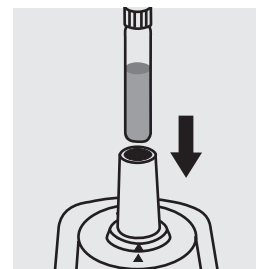
Add 2 drops of **Cl<sub>2</sub>-2**, close with the screw cap, and mix.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment.  
Press **Zero**.



Insert the cell containing the sample into the cell compartment. Press **Test**.

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section "Standard solutions").

# Chlorine

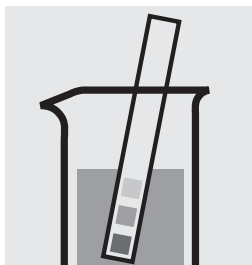
100599

## Determination of free chlorine

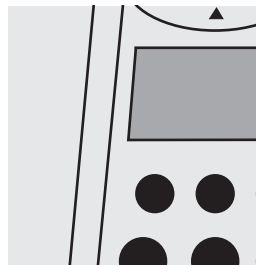
Test

Measuring range: 0.02 – 4.50 mg/l Cl<sub>2</sub>

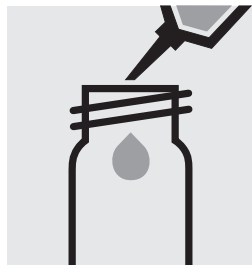
24-mm cell



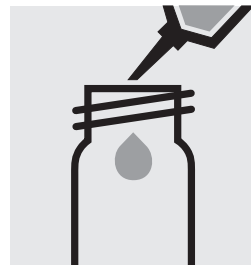
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **131**, select subitem >>free.



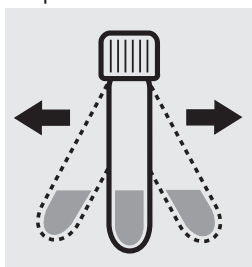
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



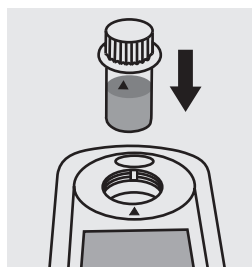
Add 1 level blue micro-spoon of **Cl<sub>2</sub>-1**, close with the screw cap.



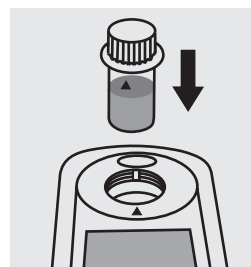
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

# Chlorine

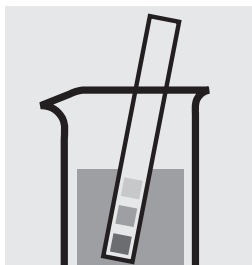
100599

## Determination of free chlorine

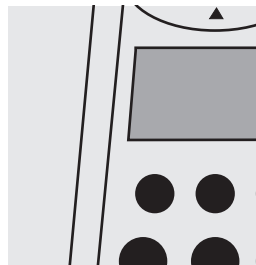
Test

Measuring range: 0.10–6.00 mg/l Cl<sub>2</sub>

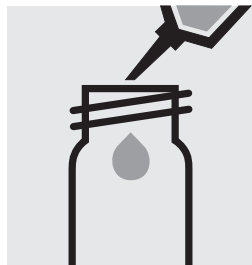
16-mm cell



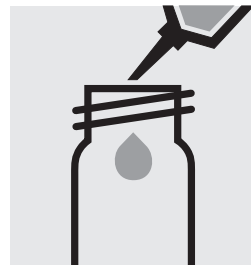
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **1****3****4**, select subitem >>free.



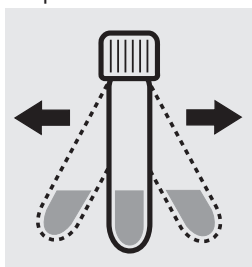
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 16-mm cell.



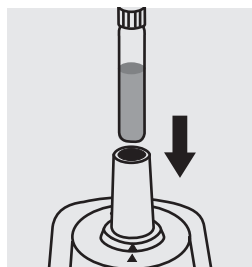
Add 1 level blue micro-spoon of **Cl<sub>2</sub>-1**, close with the screw cap.



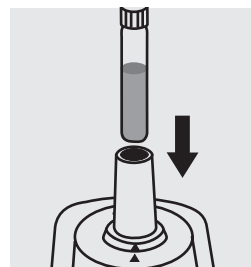
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Press **Test**.

### Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Chlorine

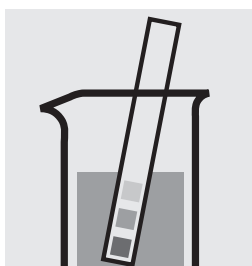
100599

Determination of total chlorine

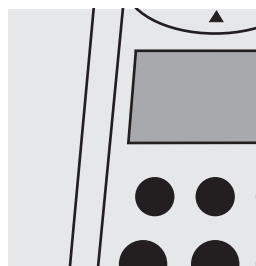
Test

Measuring range: 0.02–4.50 mg/l Cl<sub>2</sub>

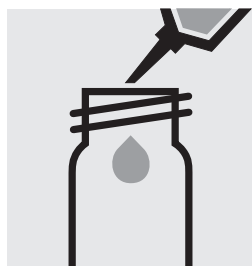
24-mm cell



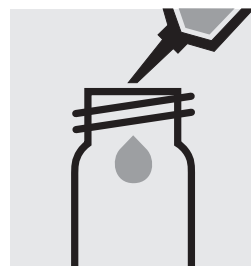
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **1****3****1**, select subitem >>total.



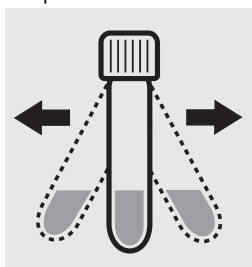
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



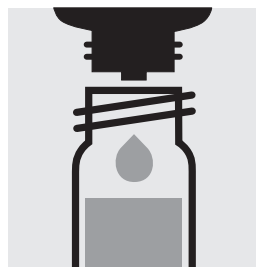
Pipette 10 ml of the sample into a 24-mm cell.



Add 1 level blue micro-spoon of **Cl<sub>2</sub>-1**, close with the screw cap.



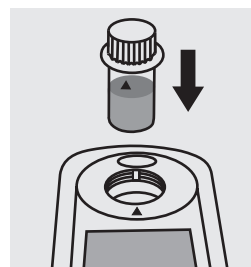
Shake the cell vigorously to dissolve the solid substance.



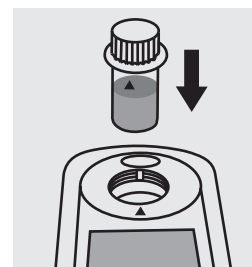
Add 2 drops of **Cl<sub>2</sub>-2**, close with the screw cap, and mix.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section "Standard solutions").

# Chlorine

100599

## Determination of total chlorine

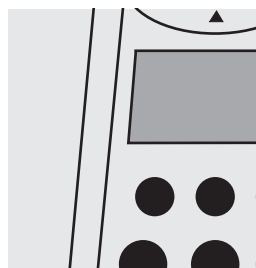
Test

Measuring range: 0.10–6.00 mg/l Cl<sub>2</sub>

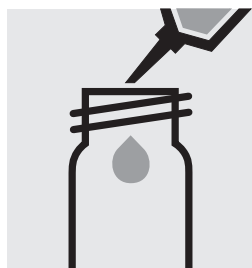
16-mm cell



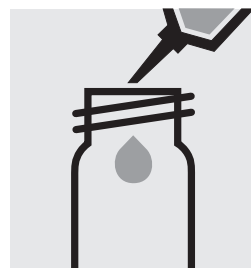
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **1****3****4**, select subitem >>total.



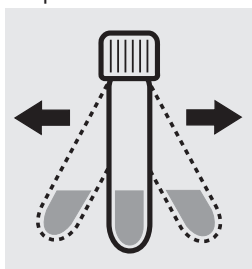
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap.  
(Blank cell)



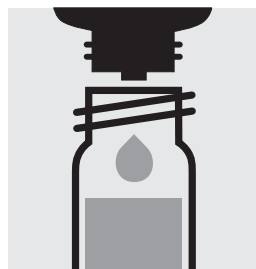
Pipette 10 ml of the sample into a 16-mm cell.



Add 1 level blue micro-spoon of **Cl<sub>2</sub>-1**, close with the screw cap.



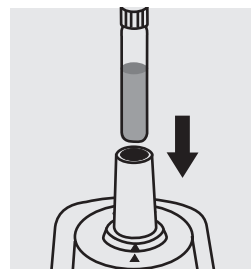
Shake the cell vigorously to dissolve the solid substance.



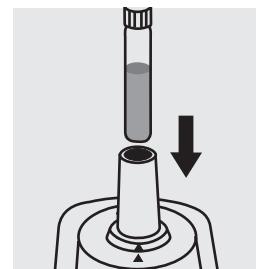
Add 2 drops of **Cl<sub>2</sub>-2**, close with the screw cap, and mix.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment.  
Press **Zero**.



Insert the cell containing the sample into the cell compartment. Press **Test**.

### Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section "Standard solutions").

# Chlorine

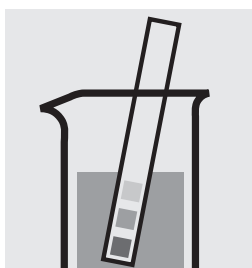
Determination of free chlorine, total chlorine,  
and combined chlorine

100599

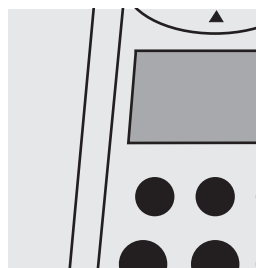
Test

Measuring range: 0.02–4.50 mg/l Cl<sub>2</sub>

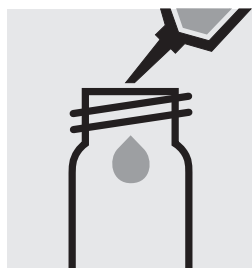
24-mm cell



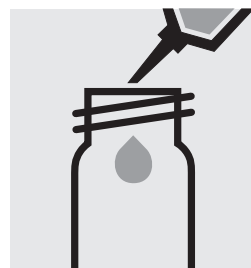
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



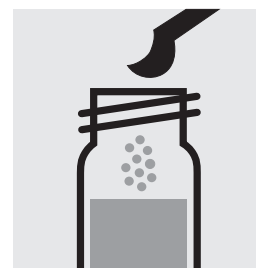
Select method (1)(3)(1), select subitem >>diff.



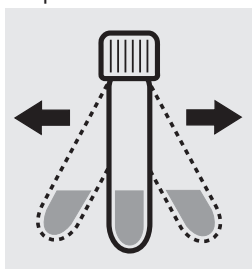
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



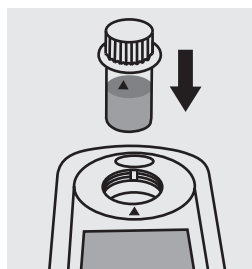
Add 1 level blue micro-spoon of Cl<sub>2</sub>-1, close with the screw cap.



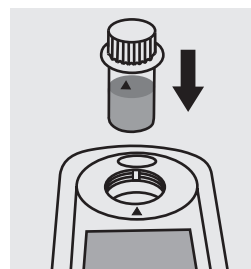
Shake the cell vigorously to dissolve the solid substance.



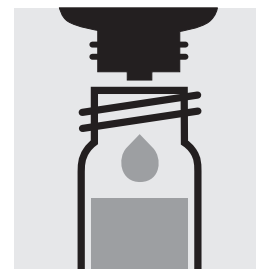
Reaction time: 1 minute  
Press (←) to start the countdown.



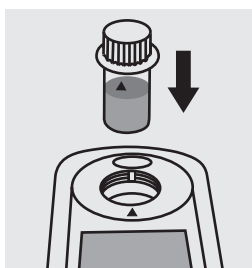
Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test). (= T1)



Remove the sample cell from the photometer, open, add 2 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



Insert anew the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test). (= T2)

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.  
For on-the-spot determinations where there are no suitable facilities for rinsing, the cell contents can be transferred to a new 24-mm cell before the addition of reagent Cl<sub>2</sub>-2. Use this second cell **only** for the determination of **total chlorine!**

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Chlorine

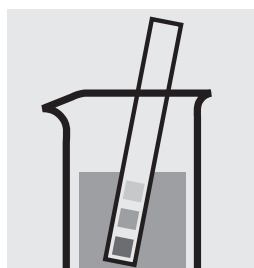
100599

Determination of free chlorine, total chlorine,  
and combined chlorine

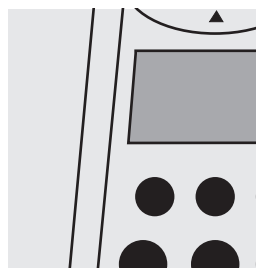
Test

Measuring range: 0.10–6.00 mg/l Cl<sub>2</sub>

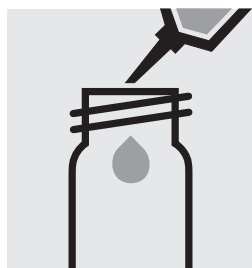
16-mm cell



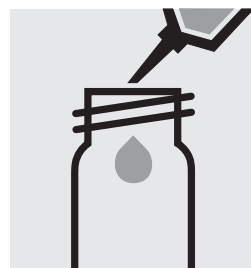
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **1****3****4**, select subitem >>diff.



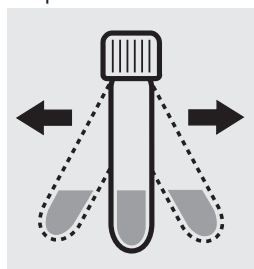
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap.  
(Blank cell)



Pipette 10 ml of the sample into a 16-mm cell.



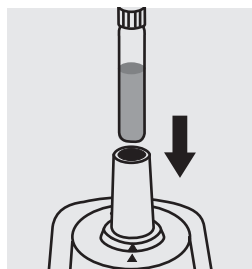
Add 1 level blue micro-spoon of Cl<sub>2</sub>-1, close with the screw cap.



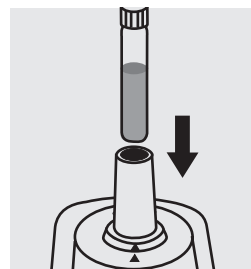
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press **←** to start the countdown.



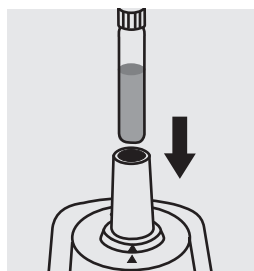
Insert the blank cell into the cell compartment.  
Press **Zero**.



Insert the cell containing the sample into the cell compartment. Press **Test**. (= T1)



Remove the sample cell from the photometer, open, add 2 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



Insert anew the cell containing the sample into the cell compartment.  
Press **Test**. (= T2)

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.

For on-the-spot determinations where there are no suitable facilities for rinsing, the cell contents can be transferred to a new 24-mm cell before the addition of reagent Cl<sub>2</sub>-2. Use this second cell **only** for the determination of **total chlorine!**

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

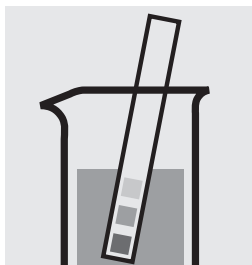
# Chlorine (with liquid reagents)

100086/100087

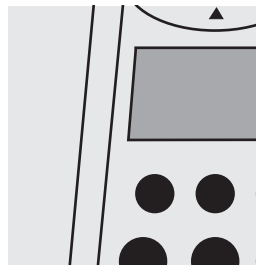
## Determination of free chlorine

Cell Test

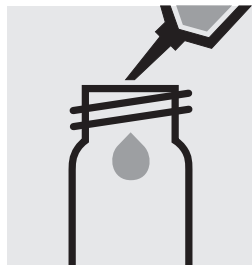
Measuring range: 0.10 – 6.00 mg/l Cl<sub>2</sub>      16-mm cell



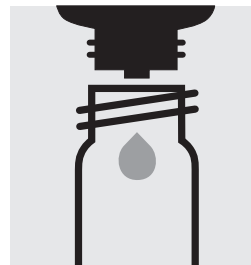
Check the pH of the sample, specified range: pH 4 – 8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ①③②, select subitem >>free.



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Place 6 drops of Cl<sub>2</sub>-1 into a round cell.



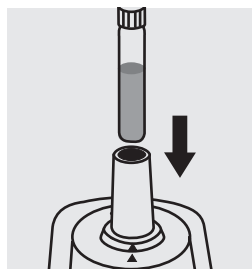
Add 3 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



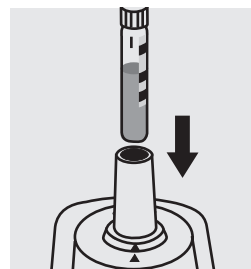
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press to start the countdown.



Insert the blank cell into the cell compartment. Press .



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press .

### Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").



# Chlorine (with liquid reagents)

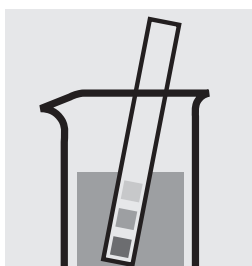
100086/100087

## Determination of free chlorine

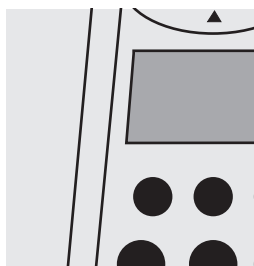
Test

Measuring range: 0.02 – 4.50 mg/l Cl<sub>2</sub>

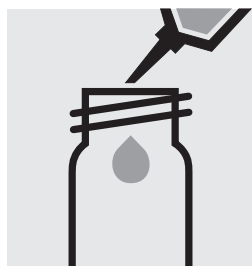
24-mm cell



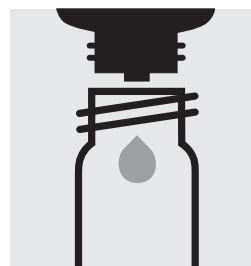
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(3)(3), select subitem >>free.



Fill approx. 10 ml of distilled water into an empty 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Place 6 drops of Cl<sub>2</sub>-1 into a 24-mm cell.



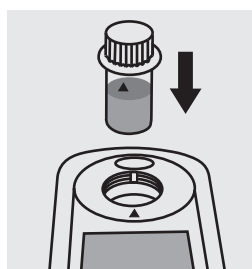
Add 3 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



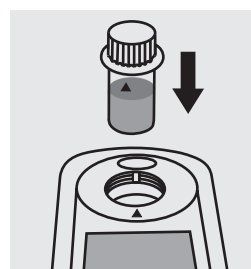
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

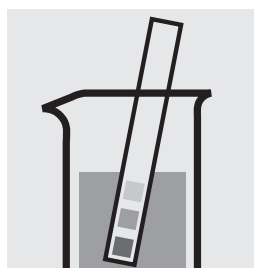
# Chlorine (with liquid reagents)

100086/100087/  
100088

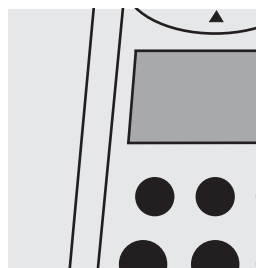
Determination of total chlorine

Cell Test

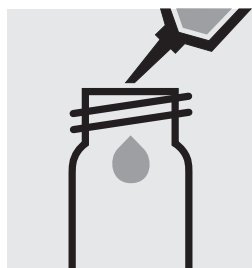
Measuring range: 0.10 – 6.00 mg/l Cl<sub>2</sub> 16-mm cell



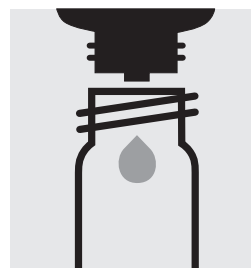
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(3)(2), select subitem >>total.



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



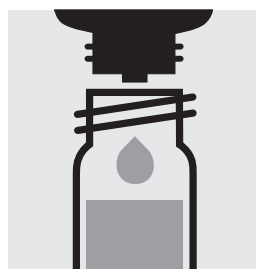
Place 6 drops of Cl<sub>2</sub>-1 into a round cell.



Add 3 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



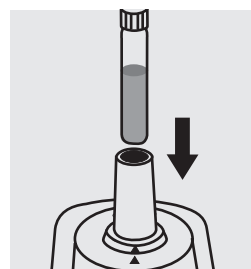
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



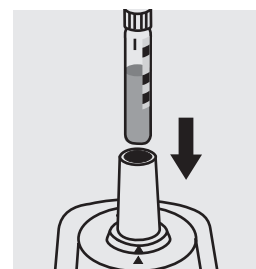
Add 2 drops of Cl<sub>2</sub>-3, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section "Standard solutions").

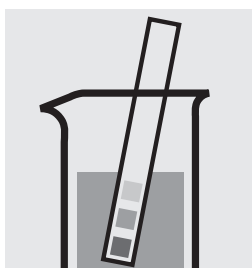
# Chlorine (with liquid reagents)

100086/100087/  
100088

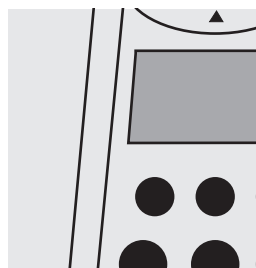
Determination of total chlorine

Test

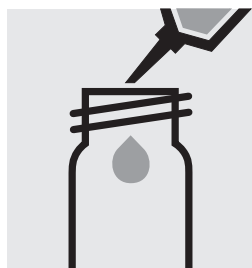
Measuring range: 0.02 – 4.50 mg/l Cl<sub>2</sub>      24-mm cell



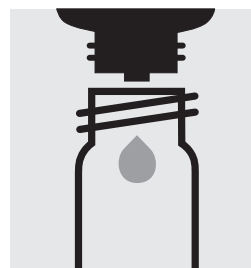
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ①③③, select subitem >>total.



Fill approx. 10 ml of distilled water into an empty 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



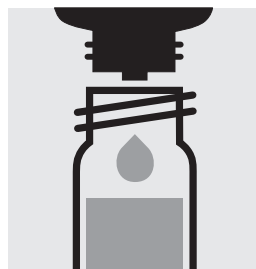
Place 6 drops of Cl<sub>2</sub>-1 into a 24-mm cell.



Add 3 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



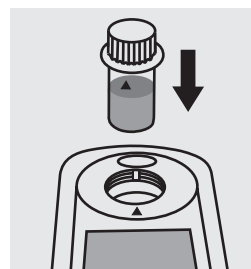
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



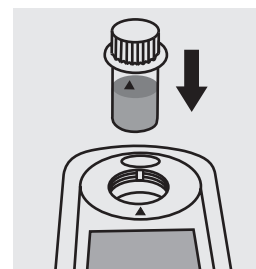
Add 2 drops of Cl<sub>2</sub>-3, close with the screw cap, and mix.



Reaction time: 1 minute  
Press to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section "Standard solutions").

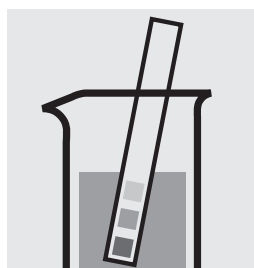
# Chlorine (with liquid reagents)

Determination of free chlorine,  
total chlorine, and combined chlorine

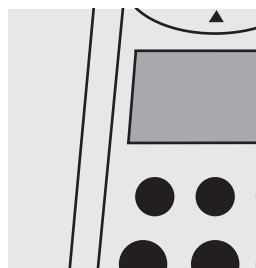
100086/100087/  
100088

Cell Test

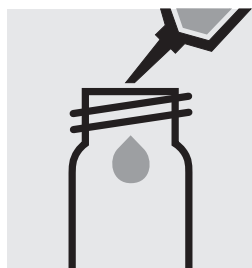
Measuring range: 0.10 – 6.00 mg/l Cl<sub>2</sub>      16-mm cell



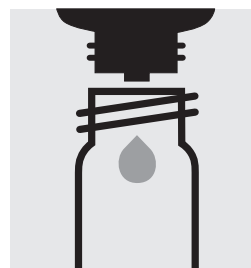
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(3)(2), select subitem >>diff.



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Place 6 drops of Cl<sub>2</sub>-1 into a round cell.



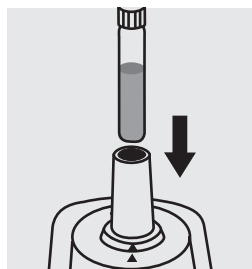
Add 3 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



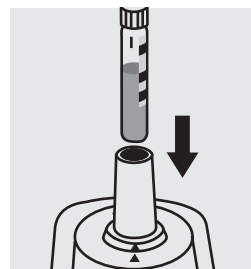
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



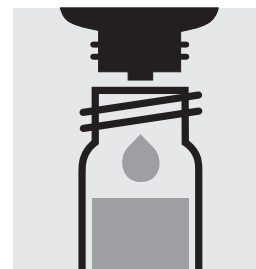
Reaction time: 1 minute  
Press (←) to start the countdown.



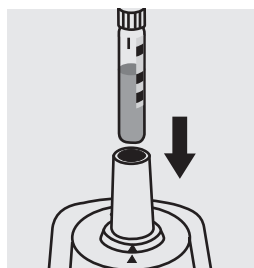
Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test). (= T1)



Remove the sample cell from the photometer, open, add 2 drops of Cl<sub>2</sub>-3, close with the screw cap, and mix.



Insert anew the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test). (= T2)

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).  
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.  
For on-the-spot determinations where there are no suitable facilities for rinsing, the cell contents can be transferred to a new 16-mm cell before the addition of reagent Cl<sub>2</sub>-3. Use this second cell **only** for the determination of **total chlorine!**

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

# Chlorine (with liquid reagents)

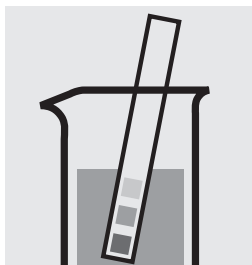
Determination of free chlorine,  
total chlorine, and combined chlorine

100086/100087/  
100088

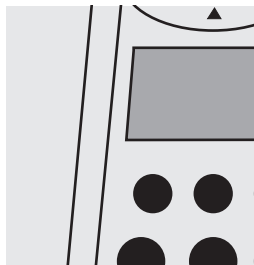
Test

Measuring range: 0.02 – 4.50 mg/l Cl<sub>2</sub>

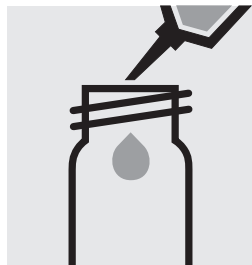
24-mm cell



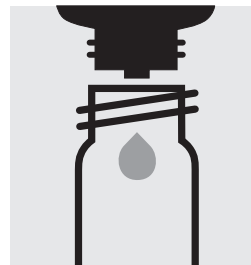
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(3)(3), select subitem >>diff.



Fill approx. 10 ml of distilled water into an empty 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Place 6 drops of Cl<sub>2</sub>-1 into a 24-mm cell.



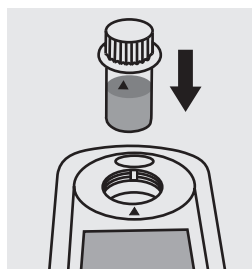
Add 3 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



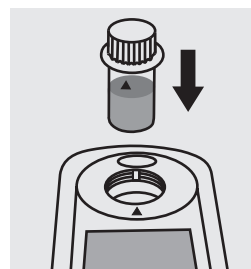
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



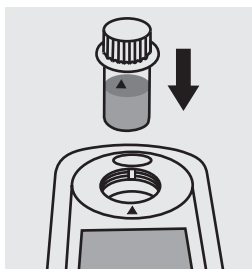
Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test). (= T1)



Remove the sample cell from the photometer, open, add 2 drops of Cl<sub>2</sub>-3, close with the screw cap, and mix.



Insert anew the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test). (= T2)

## Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.

For on-the-spot determinations where there are no suitable facilities for rinsing, the cell contents can be transferred to a new 24-mm cell before the addition of reagent Cl<sub>2</sub>-3. Use this second cell **only** for the determination of **total chlorine!**

## Quality assurance:

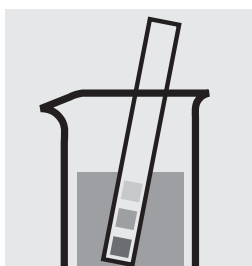
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

# Chlorine Dioxide

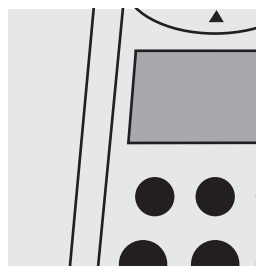
100608

Test

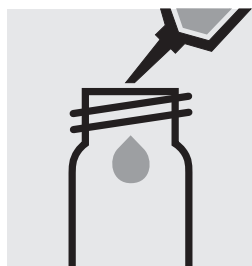
Measuring range: 0.05 – 8.50 mg/l  $\text{ClO}_2$  24-mm cell



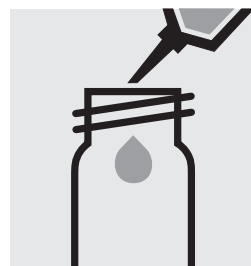
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(4)(0).



Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



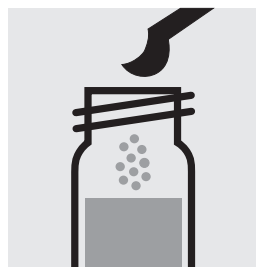
Pipette 10 ml of the sample into a 24-mm cell.



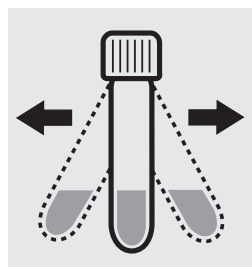
Add 2 drops of  $\text{ClO}_2\text{-1}$ , close with the screw cap, and mix.



Reaction time: 2 minutes  
Press (←) to start the countdown.



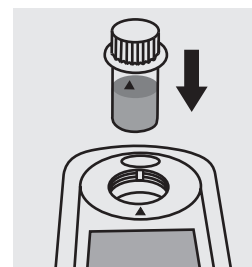
Add 1 level blue microspoon of  $\text{ClO}_2\text{-2}$ , close with the screw cap.



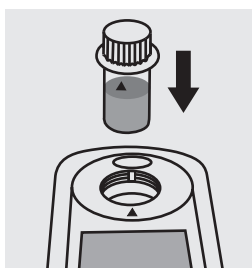
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

Very high chlorine dioxide concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Chlorine Dioxide

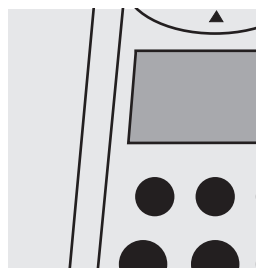
100608

Test

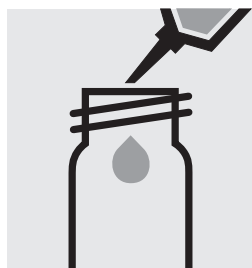
Measuring range: 0.20 – 10.00 mg/l ClO<sub>2</sub> 16-mm cell



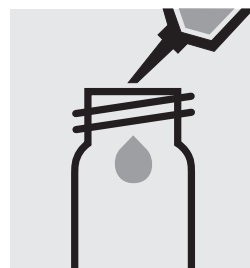
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(4)(1).



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 16-mm cell.



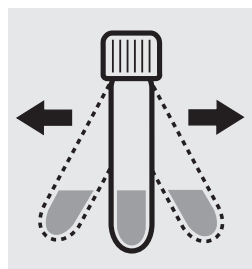
Add 2 drops of CIO<sub>2</sub>-1, close with the screw cap, and mix.



Reaction time: 2 minutes  
Press (←) to start the countdown.



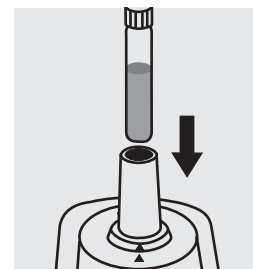
Add 1 level blue microspoon of CIO<sub>2</sub>-2, close with the screw cap.



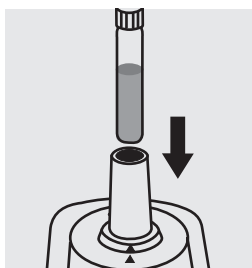
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

## Important:

Very high chlorine dioxide concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

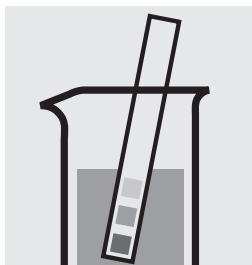
# Chromate

114552

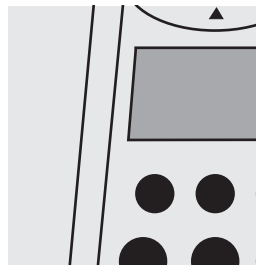
## Determination of chromium(VI)

Cell Test

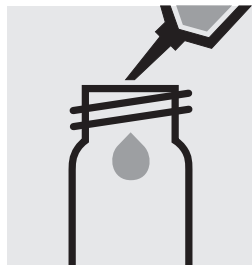
Measuring range: 0.05 – 2.00 mg/l Cr	16-mm cell
0.11 – 4.46 mg/l CrO <sub>4</sub>	16-mm cell



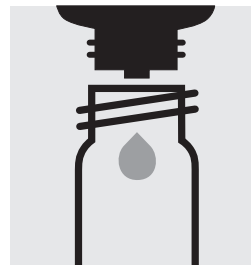
Check the pH of the sample, specified range: pH 1 – 9.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



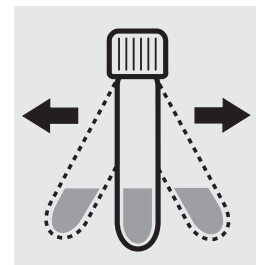
Select method (1)(5)(0).



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Add 6 drops of **Cr-3K** into a reaction cell, close with the screw cap.



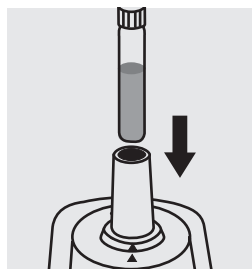
Shake the cell vigorously to dissolve the solid substance and leave to stand for **1 minute**.



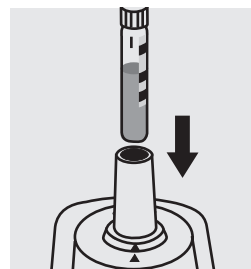
Add 5.0 ml of the sample with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use chromate standard solution Certipur®, Cat.No. 119780, concentration 1000 mg/l CrO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly or also the Standard solution for photometric applications, CRM, Cat.No. 133013.



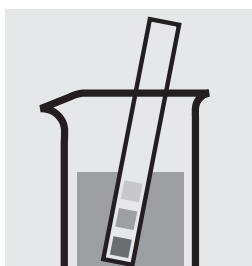
# Chromate

Determination of total chromium  
= sum of chromium(VI) and chromium(III)

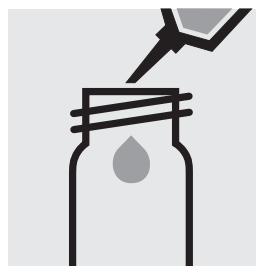
114552

Cell Test

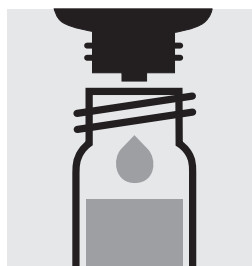
Measuring range: 0.05 – 2.00 mg/l Cr	16-mm cell
0.11 – 4.46 mg/l CrO <sub>4</sub>	16-mm cell



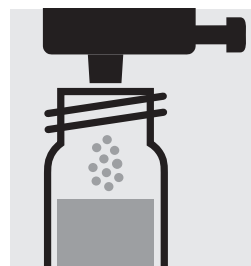
Check the pH of the sample, specified range: pH 1 – 9.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



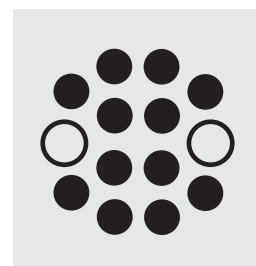
Pipette 10 ml of the sample into an empty 16-mm cell.



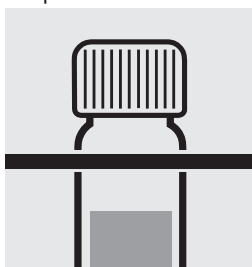
Add 1 drop of **Cr-1K**, close with the screw cap, and mix.



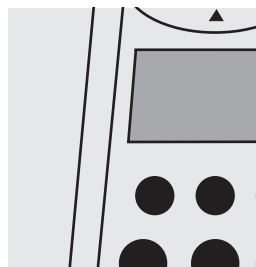
Add 1 dose of **Cr-2K** using the blue dose-metering cap, close the reaction cell with the screw cap.



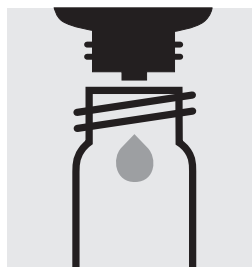
Heat the cell in the thermoreactor at 120 °C (100 °C) for 1 hour.



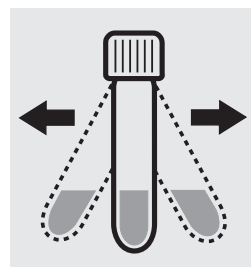
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.



Select method (1)(5)(0).



Add 6 drops of **Cr-3K** into a reaction cell, close with the screw cap.



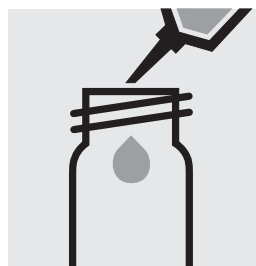
Shake the cell vigorously to dissolve the solid substance and leave to stand for **1 minute**.



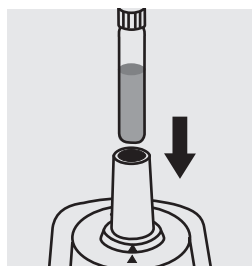
Add 5.0 ml of the **pretreated sample** with pipette, close with the screw cap, and mix.



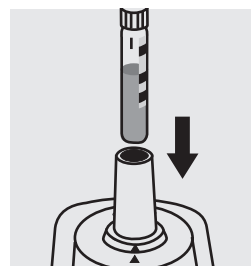
Reaction time: 1 minute  
Press (←) to start the countdown.



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

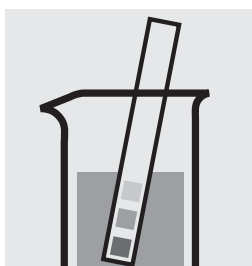
To check the measurement system (test reagents, measurement device, and handling) ready-to-use chromate standard solution Certipur®, Cat.No. 119780, concentration 1000 mg/l CrO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly or also the Standard solution for photometric applications, CRM, Cat.No. 133013.

# Chromate

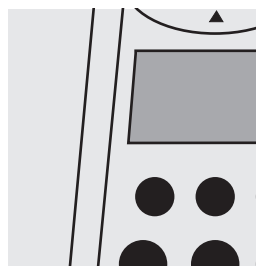
**114758**

## Determination of chromium(VI)

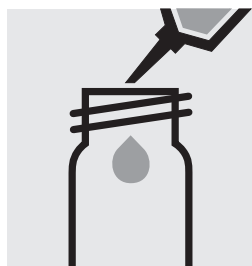
Test

**Measuring range:** 10 – 1400 µg/l Cr      24-mm cell22 – 3123 µg/l CrO<sub>4</sub>      24-mm cell**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.

Check the pH of the sample, specified range: pH 1 – 9.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(5)(1).



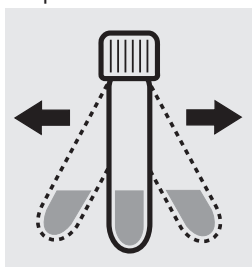
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Place 2 level grey micro-spoons of **Cr-1** into a dry 24-mm cell.



Add 12 drops of **Cr-2**, close with the screw cap.



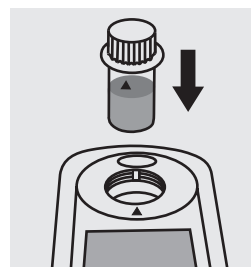
Shake the cell vigorously to dissolve the solid substance.



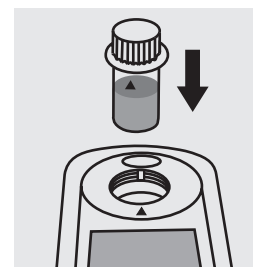
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

**Important:**

For the determination of **total chromium = sum of chromium(VI) and chromium(III)** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

**Quality assurance:**

To check the measurement system (test reagents, measurement device, and handling) ready-to-use chromate standard solution Certipur®, Cat.No. 119780, concentration 1000 mg/l CrO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly or also the Standard solutions for photometric applications, CRM, Cat.Nos. 133012 and 133013. The measurement results are expressed in µg/l.

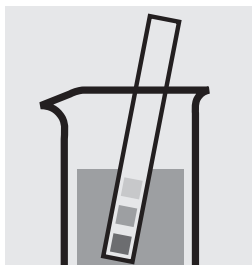
# Cobalt

117244

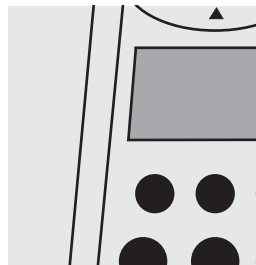
Cell Test

Measuring range: 0.05 – 2.00 mg/l Co

16-mm cell



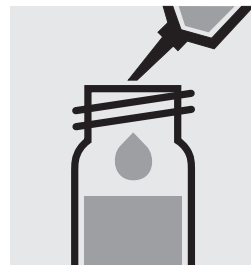
Check the pH of the sample, specified range: pH 2.5 – 7.5. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



Select method (2)(1)(0).



Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



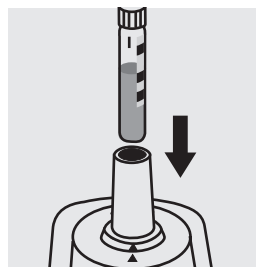
Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



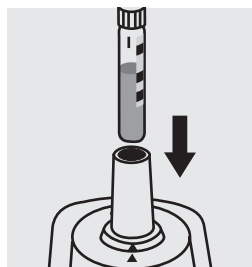
Add to each cell 0,50 ml of **Co-1K** with pipette, close with the screw cap, and mix.



Reaction time: 10 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use cobalt standard solution Certipur®, Cat.No. 119785, concentration 1000 mg/l Co, can be used after diluting accordingly.

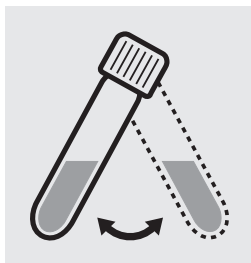
# COD

## Chemical Oxygen Demand

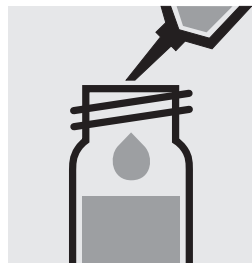
101796

Cell Test

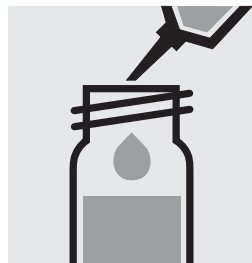
Measuring range: 5.0–80.0 mg/l COD or O<sub>2</sub> 16-mm cell



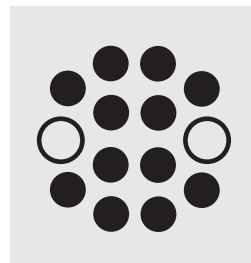
Suspend the bottom sediment in two cells by swirling.



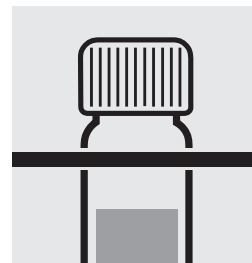
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



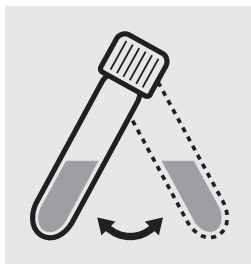
**Carefully** pipette 2.0 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



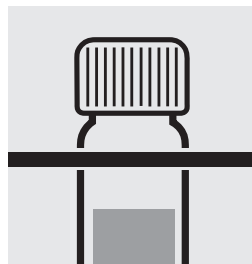
Heat both cells in the thermoreactor at 148 °C for 2 hours.



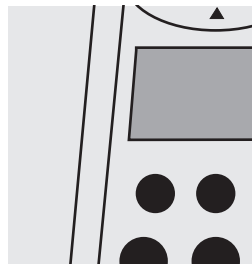
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



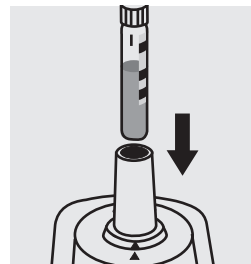
Swirl both cells after 10 minutes.



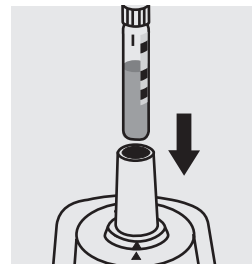
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **168**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50, Cat.No. 114695, or the Standard solution for photometric applications, CRM, Cat.No. 125028.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

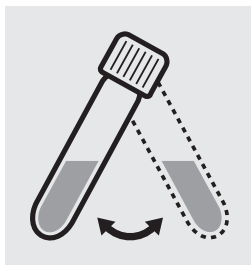
# COD

## Chemical Oxygen Demand

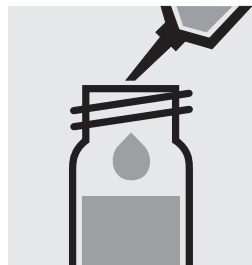
114540

Cell Test

Measuring range: 10–150 mg/l COD or O<sub>2</sub> 16-mm cell



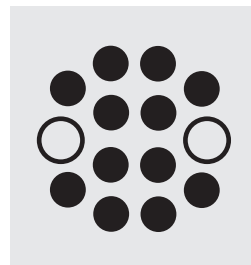
Suspend the bottom sediment in two cells by swirling.



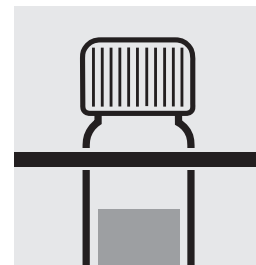
**Carefully** pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



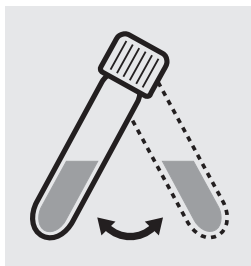
**Carefully** pipette 3.0 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



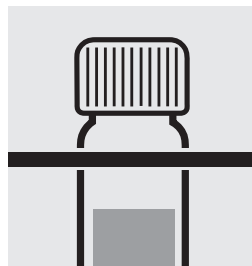
Heat both cells in the thermoreactor at 148 °C for 2 hours.



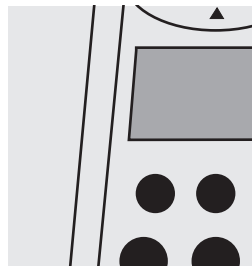
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



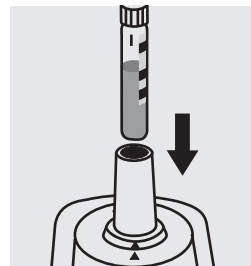
Swirl both cells after 10 minutes.



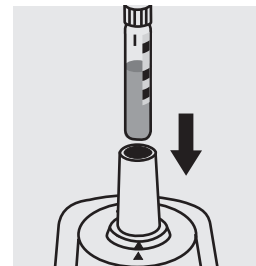
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **160**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solution for photometric applications, CRM, Cat.No. 125029.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

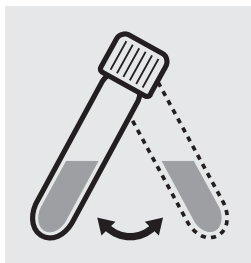
# COD

## Chemical Oxygen Demand

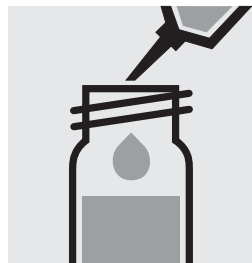
114895

Cell Test

Measuring range: 15–300 mg/l COD or O<sub>2</sub> 16-mm cell



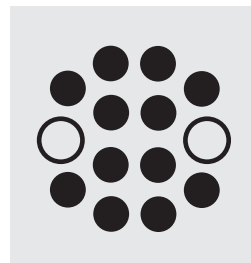
Suspend the bottom sediment in two cells by swirling.



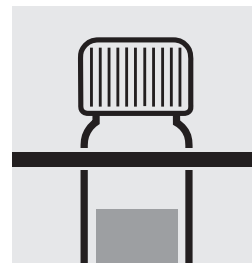
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



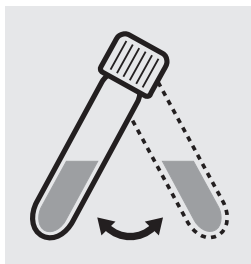
**Carefully** pipette 2.0 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



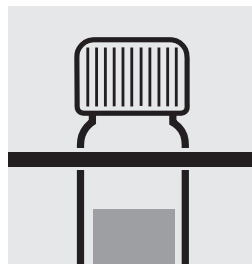
Heat both cells in the thermoreactor at 148 °C for 2 hours.



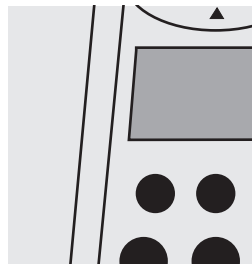
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



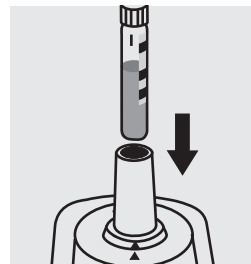
Swirl both cells after 10 minutes.



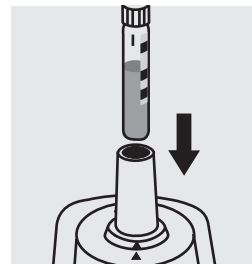
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **161**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 60, Cat.No. 114696, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125029 and 125030.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 60) is highly recommended.

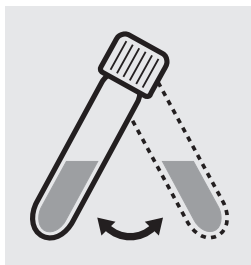
# COD

## Chemical Oxygen Demand

114690

Cell Test

Measuring range: 50–500 mg/l COD or O<sub>2</sub> 16-mm cell



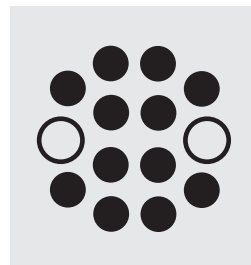
Suspend the bottom sediment in two cells by swirling.



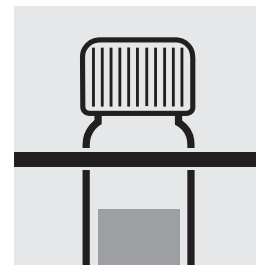
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



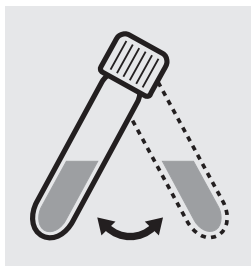
**Carefully** pipette 2.0 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



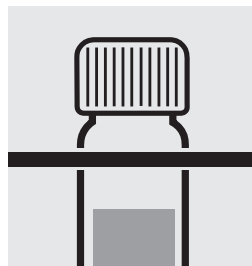
Heat both cells in the thermoreactor at 148 °C for 2 hours.



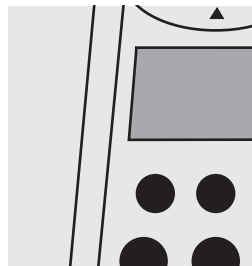
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



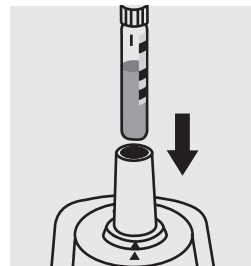
Swirl both cells after 10 minutes.



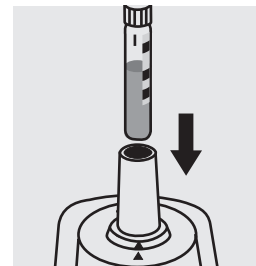
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **①⑥②**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 60, Cat.No. 114696, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125029, 125030, and 125031.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 60) is highly recommended.

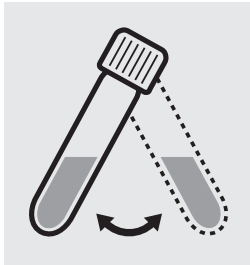
# COD

## Chemical Oxygen Demand

114541

Cell Test

Measuring range: 25–1500 mg/l COD or O<sub>2</sub> 16-mm cell



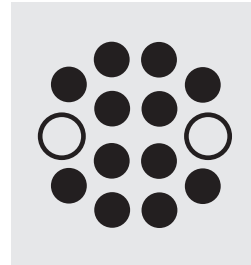
Suspend the bottom sediment in two cells by swirling.



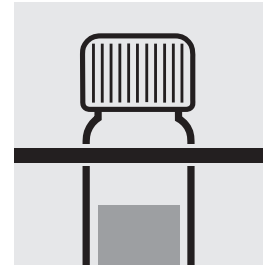
**Carefully** pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



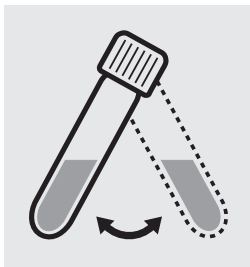
**Carefully** pipette 3.0 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**  
(Blank cell)



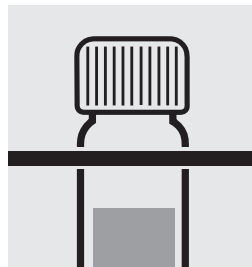
Heat both cells in the thermoreactor at 148 °C for 2 hours.



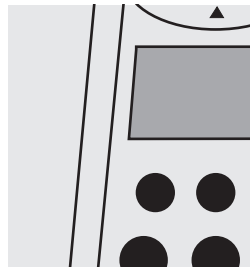
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



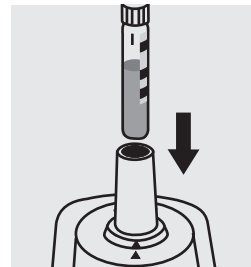
Swirl both cells after 10 minutes.



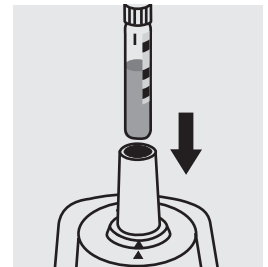
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method ①⑥③.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20, Cat.No. 114675, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125029, 125030, 125031, and 125032.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.



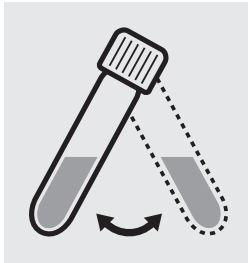
# COD

## Chemical Oxygen Demand

114691

Cell Test

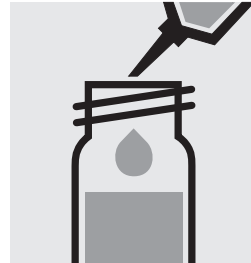
Measuring range: 300–3500 mg/l COD or O<sub>2</sub> 16-mm cell



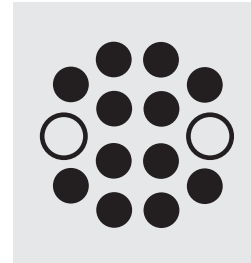
Suspend the bottom sediment in two cells by swirling.



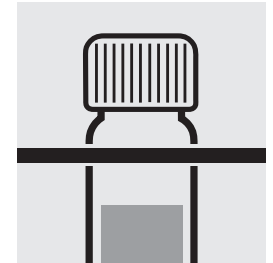
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



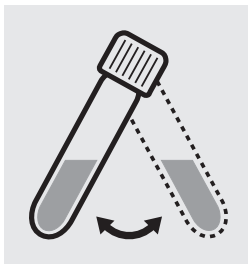
**Carefully** pipette 2.0 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**  
(Blank cell)



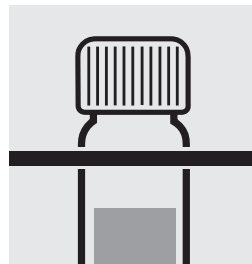
Heat both cells in the thermoreactor at 148 °C for 2 hours.



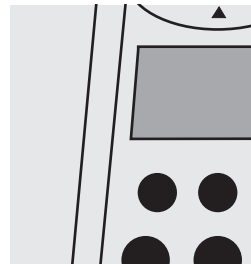
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



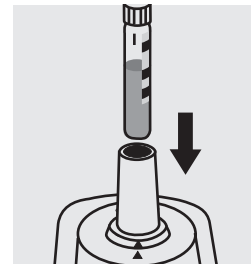
Swirl both cells after 10 minutes.



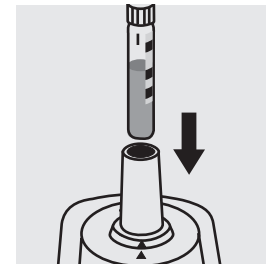
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method ①⑥④.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 80, Cat.No. 114738, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125031, 125032, and 125033.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 80) is highly recommended.

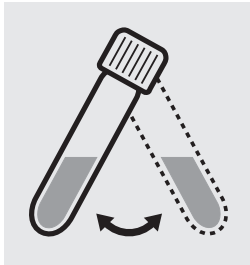
# COD

## Chemical Oxygen Demand

114555

Cell Test

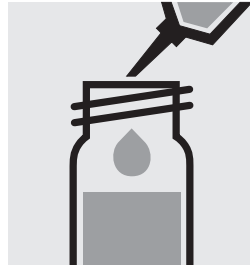
Measuring range: 0.50–10.00 g/l COD or O<sub>2</sub> 16-mm cell



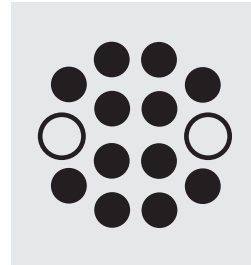
Suspend the bottom sediment in two cells by swirling.



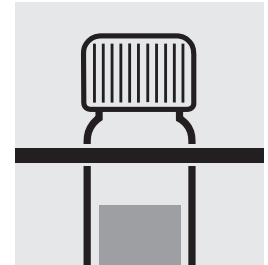
**Carefully** pipette 1.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



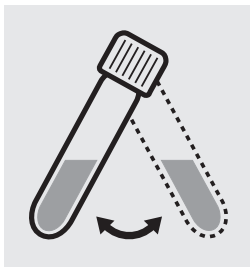
**Carefully** pipette 1.0 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**  
(Blank cell)



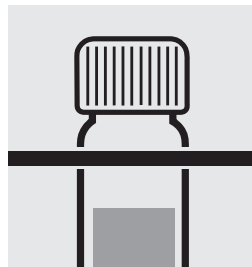
Heat both cells in the thermoreactor at 148 °C for 2 hours.



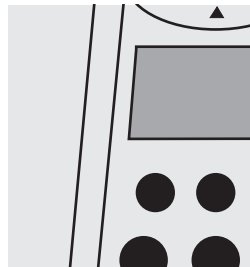
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



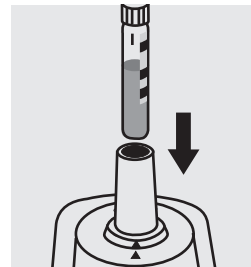
Swirl both cells after 10 minutes.



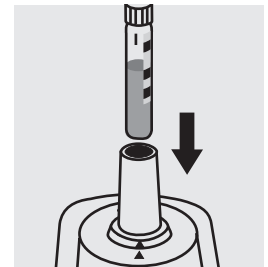
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method (1)(6)(5).



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Test)**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 70, Cat.No. 114689, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125032, 125033, and 125034.

The measurement results are expressed in g/l COD.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

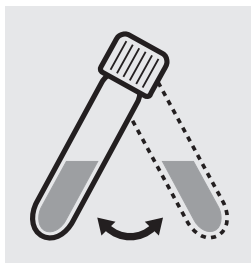
# COD

## Chemical Oxygen Demand

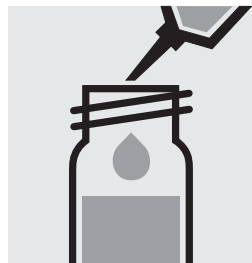
101797

Cell Test

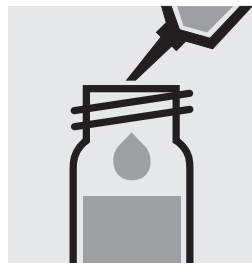
Measuring range: 5.00–90.00 g/l COD or O<sub>2</sub> 16-mm cell



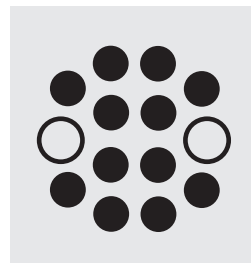
Suspend the bottom sediment in two cells by swirling.



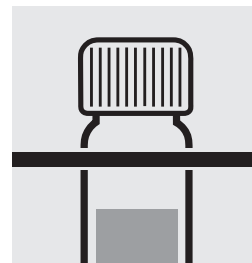
**Carefully** pipette 0.10 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



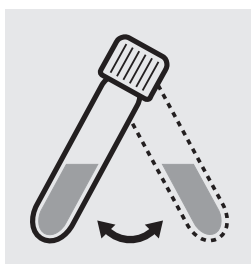
**Carefully** pipette 0.10 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**  
(Blank cell)



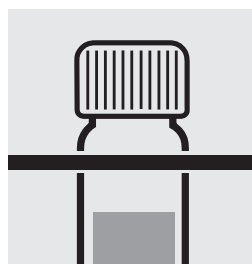
Heat both cells in the thermoreactor at 148 °C for 2 hours.



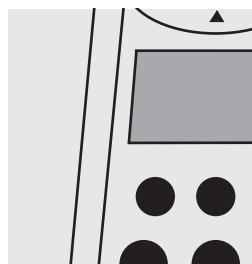
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



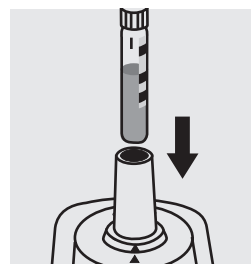
Swirl both cells after 10 minutes.



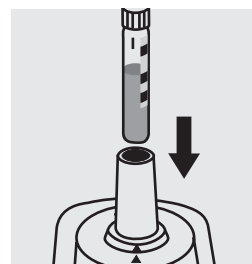
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **169**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use the Standard solutions for photometric applications, CRM, Cat.Nos. 125034 and 125035. The measurement results are expressed in g/l COD.

To check for sample-dependent effects the use of addition solutions is highly recommended.

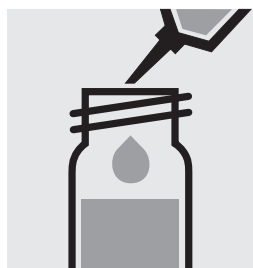
# COD (Hg-free)

Chemical Oxygen Demand

109772

Cell Test

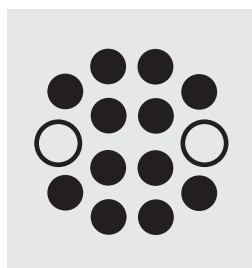
Measuring range: 10–150 mg/l COD or O<sub>2</sub> 16-mm cell



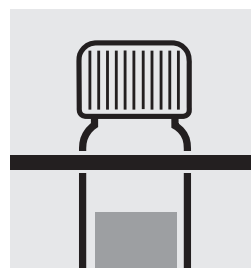
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



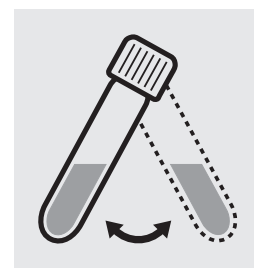
Carefully pipette 2.0 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



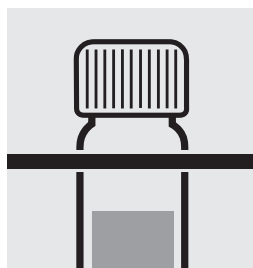
Heat both cells in the thermoreactor at 148 °C for 2 hours.



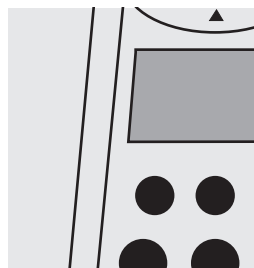
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



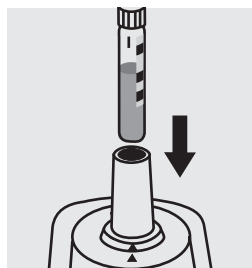
Swirl both cells after 10 minutes.



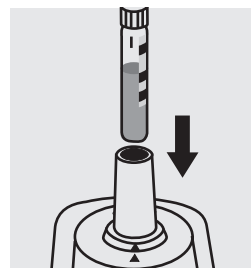
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **166**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use the Standard solutions for photometric applications, CRM, Cat.Nos. 125028 and 125029.

To check for sample-dependent effects the use of addition solutions is highly recommended.

# COD (Hg-free)

Chemical Oxygen Demand

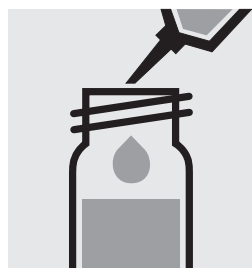
109773

Cell Test

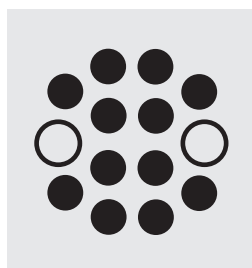
Measuring range: 100–1500 mg/l COD or O<sub>2</sub> 16-mm cell



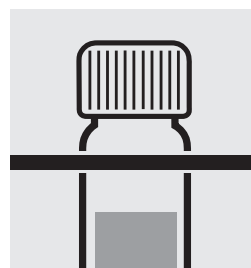
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



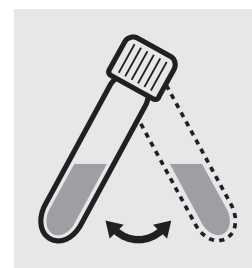
**Carefully** pipette 2.0 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



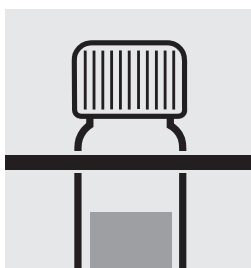
Heat both cells in the thermoreactor at 148 °C for 2 hours.



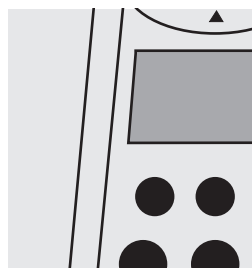
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



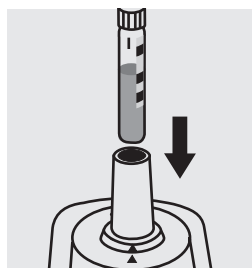
Swirl both cells after 10 minutes.



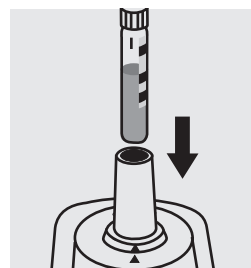
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method (1)(6)(7).



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Test)**.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use the Standard solutions for photometric applications, CRM, Cat.Nos. 125029, 125030, 125031, and 125032.

To check for sample-dependent effects the use of addition solutions is highly recommended.

# COD

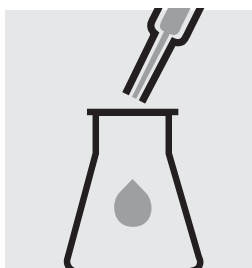
Chemical Oxygen Demand  
for seawater / high chloride contents

117058

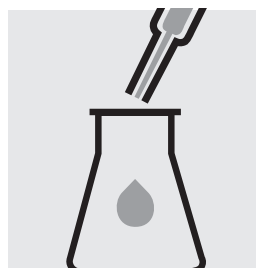
Cell Test

Measuring range: 5.0–60.0 mg/l COD or O<sub>2</sub> 16-mm cell

## Chloride depletion:



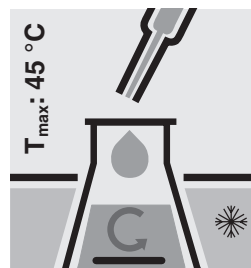
Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



Pipette with glass pipette 20 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.



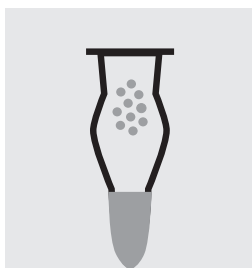
Add to each a magnetic stirring rod, and cool in the ice bath.



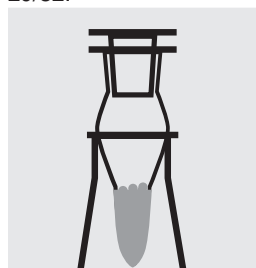
Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.



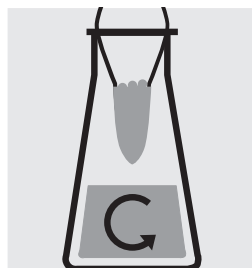
Cool both Erlenmeyer flasks to room temperature in the ice bath.



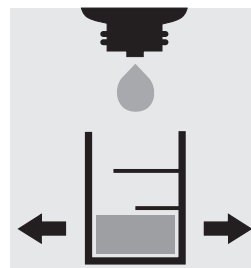
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



Close the absorption tubes with the glass stoppers, and attach to the top of the Erlenmeyer flasks.



Stir at 250 rpm for 2 h at room temperature: depleted sample / depleted blank



Check the chloride content of the depleted sample using MColorTest™ Chloride Test (Cat. No. 111132) according to the application (see the website):  
Specified value  
<2000 mg/l Cl<sup>-</sup>.

## Chloride determination (acc. the application instructions - abridged version):

Fill 5.0 ml of sodium hydroxide solution 2 mol/l, Cat. No. 109136, into the test vessel of the MColorTest™ Chloride Test, Cat. No. 111132.

Carefully allow to run from the pipette 0.5 ml of depleted sample down the inside of the tilted test vessel onto the sodium hydroxide solution and mix (**Wear eye protection! The cell becomes hot!**).

Add 2 drops of reagent Cl-1 and swirl. The sample directly turns yellow in color. (Reagent Cl-2 is not required.)

Holding the reagent bottle vertically, slowly add reagent Cl-3 dropwise to the sample while swirling until its color changes from yellow to blue-violet. Shortly before the color changes, wait a few seconds after adding each drop.

**Result in mg/l chloride = number of drops x 250**

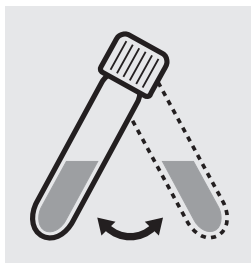
# COD

Chemical Oxygen Demand  
for seawater / high chloride contents

117058

Cell Test

## Determination:



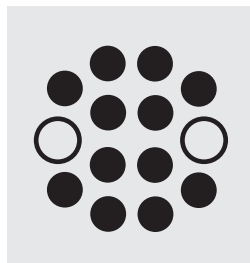
Suspend the bottom sediment in two cells by swirling.



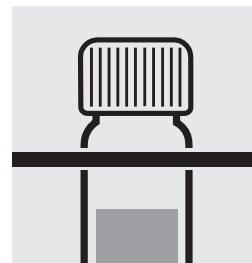
**Carefully** pipette 5.0 ml of the **depleted sample** into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



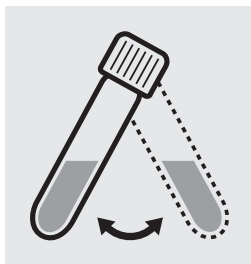
**Carefully** pipette 5.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**  
(Blank cell)



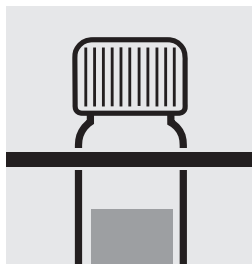
Heat both cells in the thermoreactor at 148 °C for 2 hours.



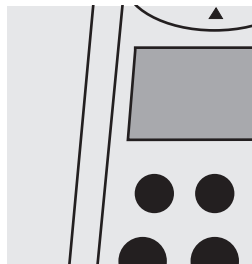
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



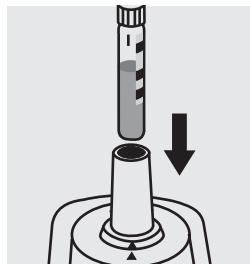
Swirl both cells after 10 minutes.



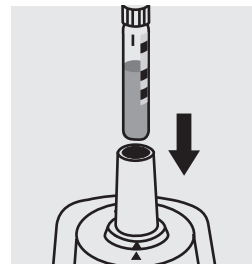
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **(5)(7)(0)**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Test)**.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a COD/chloride standard solution must be prepared from Potassium hydrogen phthalate, Cat.No. 102400 and Sodium chloride, Cat.No. 106406 (see section "Standard solutions").

# COD

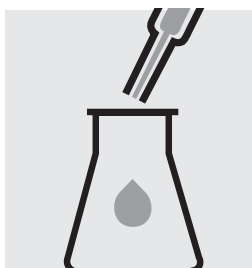
Chemical Oxygen Demand  
for seawater / high chloride contents

117059

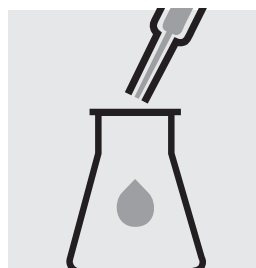
Cell Test

Measuring range: 50–3000 mg/l COD or O<sub>2</sub> 16-mm cell

## Chloride depletion:



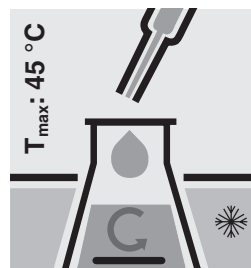
Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



Pipette with glass pipette 20 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.



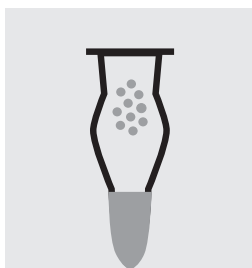
Add to each a magnetic stirring rod, and cool in the ice bath.



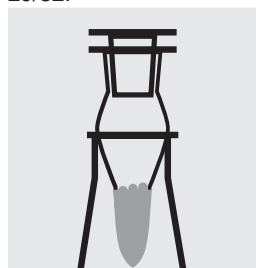
Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.



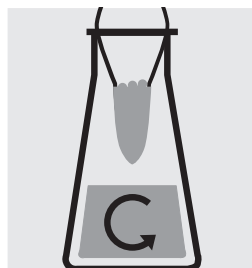
Cool both Erlenmeyer flasks to room temperature in the ice bath.



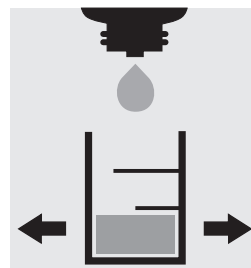
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



Close the absorption tubes with the glass stoppers, and attach to the top of the Erlenmeyer flasks.



Stir at 250 rpm for 2 h at room temperature: depleted sample / depleted blank



Check the chloride content of the depleted sample using the MColortest™ Chloride Test (Cat. No. 111132) as per the application instructions (see the website): specified value <250 mg/l Cl<sup>-</sup>.

## Chloride determination (acc. the application instructions - abridged version):

Fill 5.0 ml of sodium hydroxide solution 2 mol/l, Cat. No. 109136, into the test vessel of the MColortest™ Chloride Test, Cat. No. 111132.

Carefully allow to run from the pipette 0.5 ml of depleted sample down the inside of the tilted test vessel onto the sodium hydroxide solution and mix (**Wear eye protection! The cell becomes hot!**).

Add 2 drops of reagent Cl-1 and swirl. The sample directly turns yellow in color. (Reagent Cl-2 is not required.)

Holding the reagent bottle vertically, slowly add reagent Cl-3 dropwise to the sample while swirling until its color changes from yellow to blue-violet. Shortly before the color changes, wait a few seconds after adding each drop.

**Result in mg/l chloride = number of drops x 250**



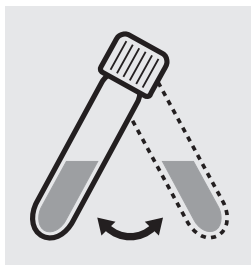
# COD

Chemical Oxygen Demand  
for seawater / high chloride contents

117059

Cell Test

## Determination:



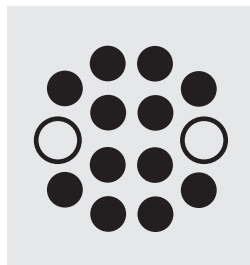
Suspend the bottom sediment in two cells by swirling.



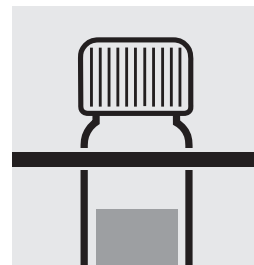
**Carefully** pipette 3.0 ml of the **depleted sample** into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



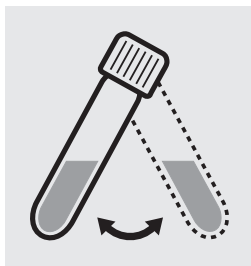
**Carefully** pipette 3.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**  
(Blank cell)



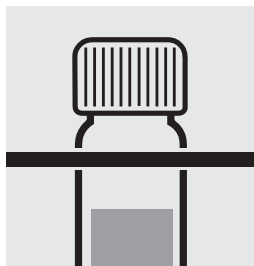
Heat both cells in the thermoreactor at 148 °C for 2 hours.



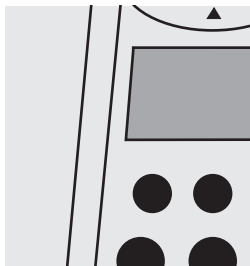
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



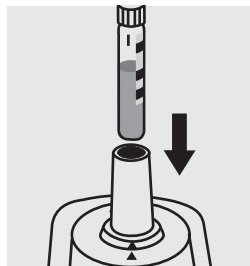
Swirl both cells after 10 minutes.



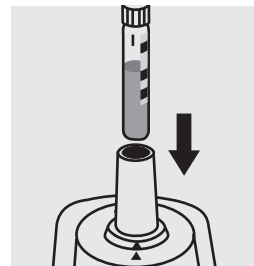
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **(5)(7)(1)**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Test)**.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a COD/chloride standard solution must be prepared from Potassium hydrogen phthalate, Cat.No. 102400 and Sodium chloride, Cat.No. 106406 (see section "Standard solutions").

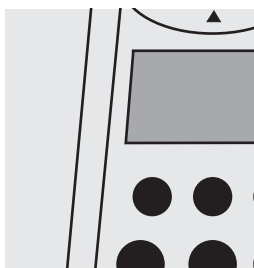
# Color (Platinum-Cobalt Standard Method)

analogous to DIN EN ISO 6271:2015, Water Research Vol. 30, No. 11, 2771-2775, 1996

Measuring range: 25 – 1000 mg/l Pt/Co (Hazen)

430 nm

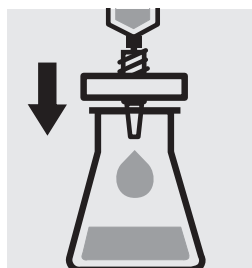
24-mm cell



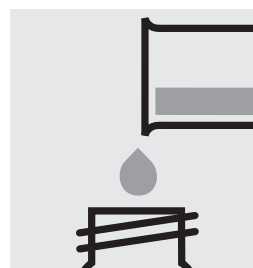
Select method 170.



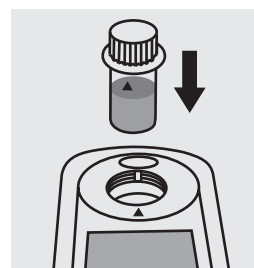
Fill approx. 10 ml of distilled water into a 24-mm cell, close with the screw cap. (Blank cell)



Filter sample solution through a membrane filter with 0.45 µm pore size.

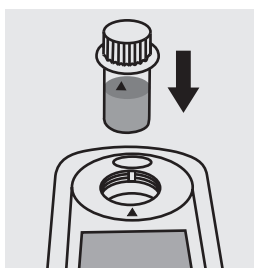


Transfer the solution into a 24-mm cell, close with the screw cap.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.

**Notes:**  
Filtered sample = true color.  
Unfiltered sample = apparent color.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

## Quality assurance:

To check the measurement system (measurement device, handling) ready-to-use Platinum Cobalt Color Reference Solution (Hazen 500) Certipur®, Cat.No. 100246, concentration 500 mg/l Pt, can be used.

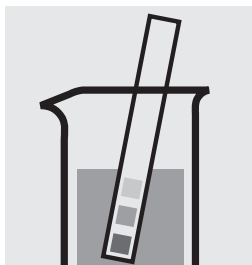
# Copper

**114553**

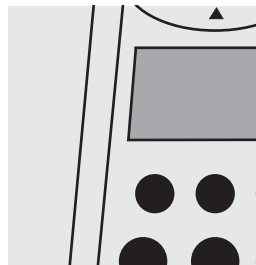
Cell Test

Measuring range: 0.05–8.00 mg/l Cu

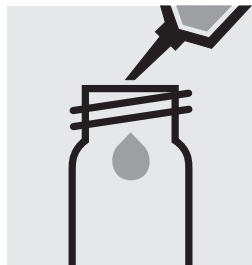
16-mm cell



Check the pH of the sample, specified range: pH 4 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



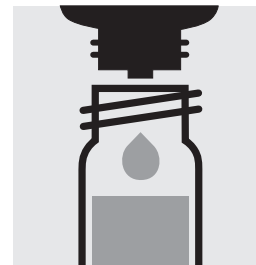
Select method (1)(8)(0).



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



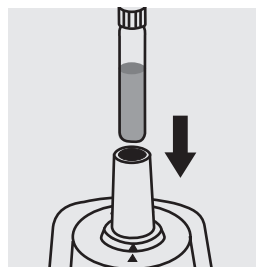
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



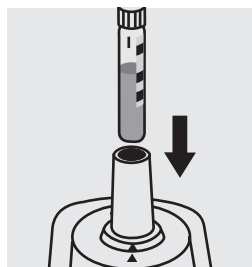
Add 5 drops of **Cu-1K**, close with the screw cap, and mix.



Reaction time: 5 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high copper concentrations in the sample produce turquoise-colored solutions (measurement solution should be blue) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

For the determination of **total copper** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700.

Ready-to-use copper standard solution Certipur®, Cat.No. 119786, concentration 1000 mg/l Cu, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

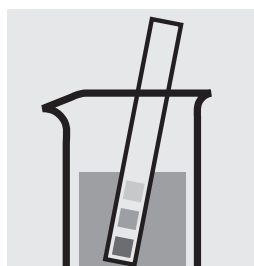
# Copper

114767

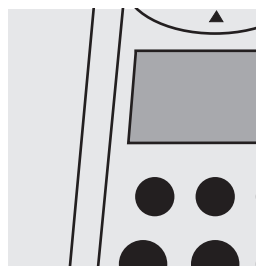
Test

Measuring range: 0.10–6.00 mg/l Cu

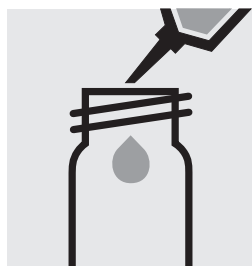
16-mm cell



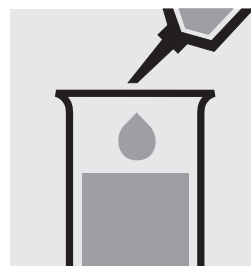
Check the pH of the sample, specified range: pH 4 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



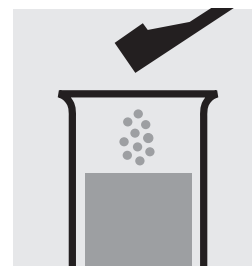
Select method **181**.



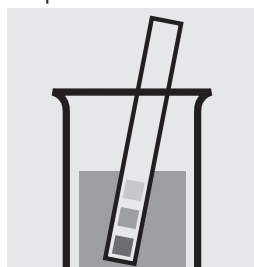
Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



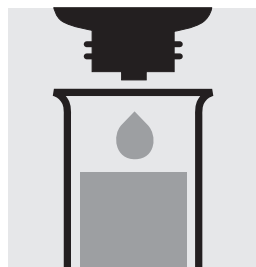
Pipette 5.0 ml of the sample into a test tube.



Add 1 green dosing spoon of **Cu-1** and dissolve the solid substance.



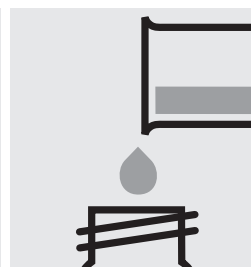
Check the pH of the sample, specified range: pH 7.0 – 9.5. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



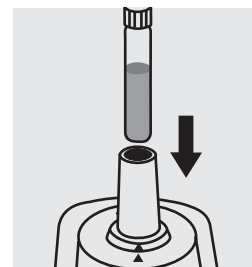
Add 5 drops of **Cu-2** and mix.



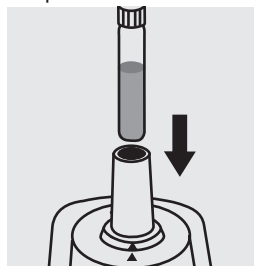
Reaction time: 5 minutes. Press **Start** to start the countdown.



Transfer the solution into a 16-mm cell, close with the screw cap.



Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Press **Test**.

## Important:

Very high copper concentrations in the sample produce turquoise-colored solutions (measurement solution should be blue) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

For the determination of **total copper** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700.

Ready-to-use copper standard solution Certipur®, Cat.No. 119786, concentration 1000 mg/l Cu, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Cyanide

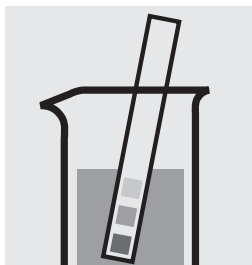
102531

## Determination of free cyanide

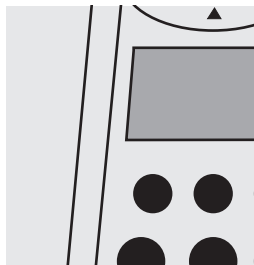
Cell Test

Measuring range: 10–350 µg/l CN

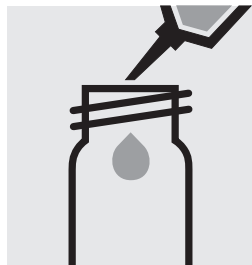
16-mm cell



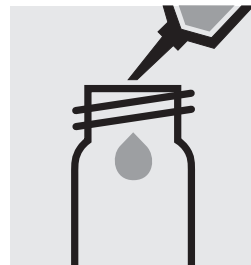
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(9)(2).



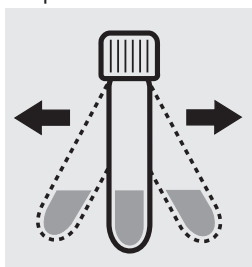
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and dissolve the solid substance.



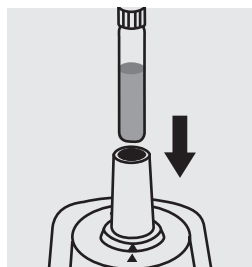
Add 1 level blue micro-spoon of **CN-1K**, close with the screw cap.



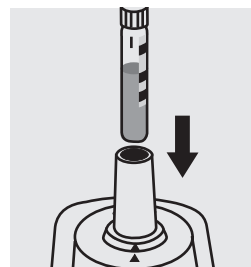
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 10 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur®, Cat.No. 119533, concentration 1000 mg/l CN<sup>-</sup>, can be used after diluting accordingly. The measurement results are expressed in µg/l.

# Cyanide

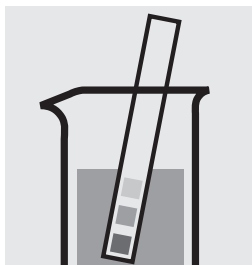
114561

Determination of free cyanide

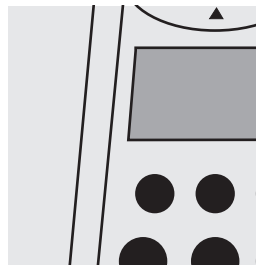
Cell Test

Measuring range: 10–350 µg/l CN

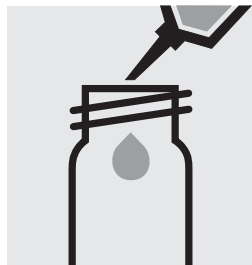
16-mm cell



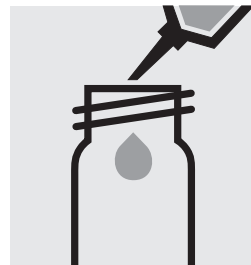
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(9)(0).



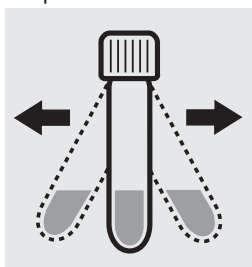
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and dissolve the solid substance.



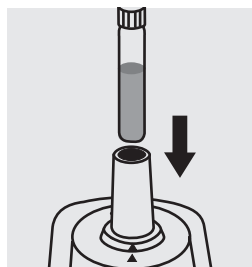
Add 1 level blue micro-spoon of **CN-3K**, close with the screw cap.



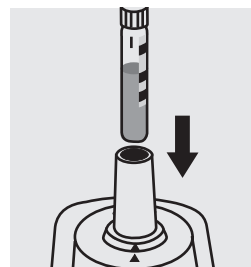
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 10 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur®, Cat.No. 119533, concentration 1000 mg/l CN<sup>-</sup>, can be used after diluting accordingly. The measurement results are expressed in µg/l.

# Cyanide

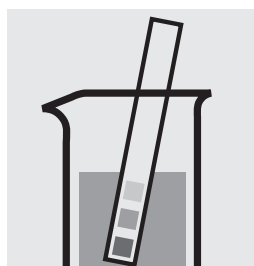
114561

Determination of readily liberated cyanide

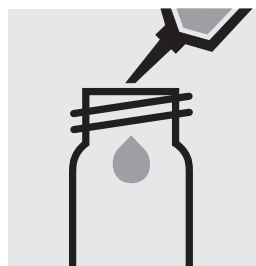
Cell Test

Measuring range: 10–350 µg/l CN

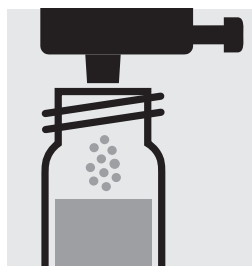
16-mm cell



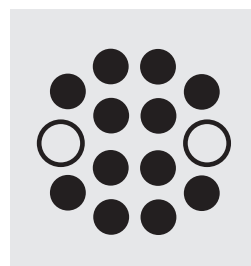
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



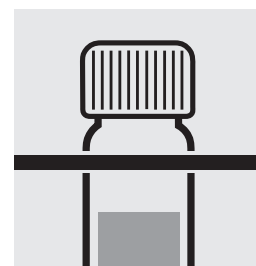
Pipette 10 ml of the sample into an empty 16-mm cell.



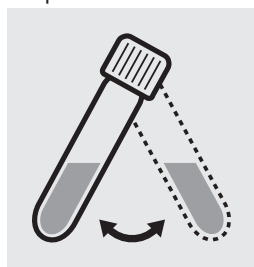
Add 1 dose of **CN-1K** using the green dose-metering cap, close with the screw cap.



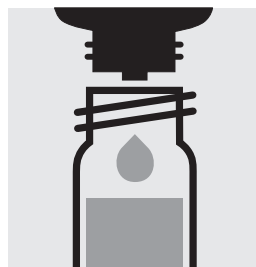
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



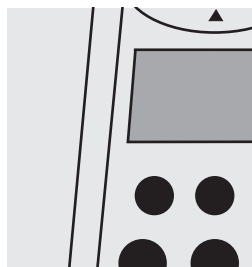
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



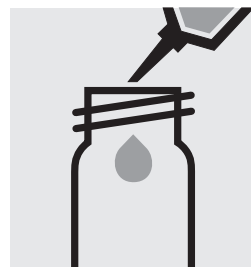
Swirl the cell before opening.



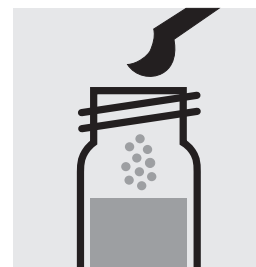
Add 3 drops of **CN-2K**, close with the screw cap, and mix: **pretreated sample**.



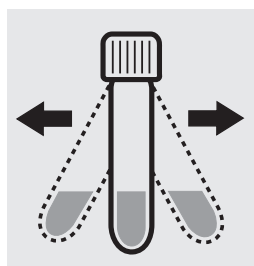
Select method (1)(9)(0).



Pipette 5.0 ml of the **pretreated sample** into a reaction cell, close with the screw cap, and dissolve the solid substance.



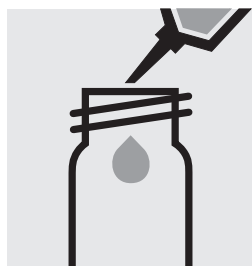
Add 1 level blue micro-spoon of **CN-3K**, close with the screw cap.



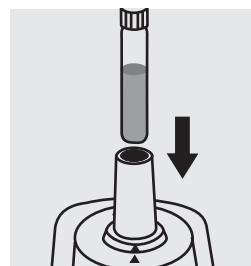
Shake the cell vigorously to dissolve the solid substance.



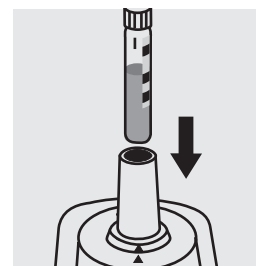
Reaction time: 10 minutes  
Press (←) to start the countdown.



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur®, Cat.No. 119533, concentration 1000 mg/l CN<sup>-</sup>, can be used after diluting accordingly. The measurement results are expressed in µg/l.

# Cyanide

109701

## Determination of free cyanide

Test

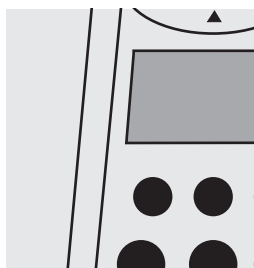
Measuring range: 5 – 200 µg/l CN

24-mm cell

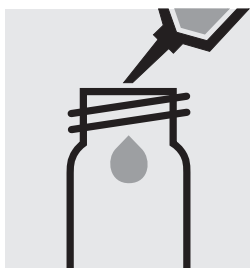
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



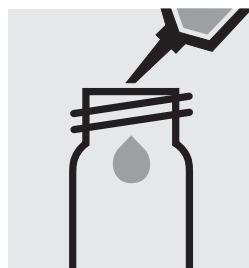
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(9)(1).



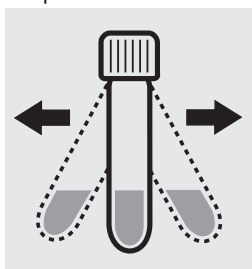
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



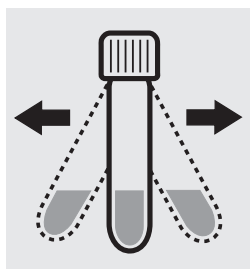
Add 2 level green microspoons of **CN-3**, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



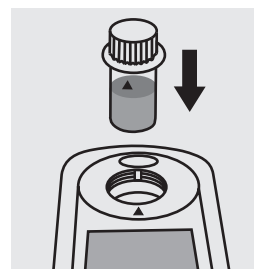
Add 2 level blue microspoons of **CN-4**, close with the screw cap.



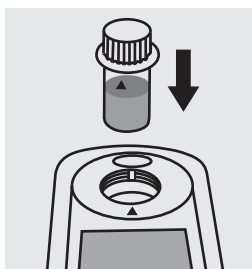
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 10 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur®, Cat.No. 119533, concentration 1000 mg/l CN<sup>-</sup>, can be used after diluting accordingly. The measurement results are expressed in µg/l.



# Cyanide

109701

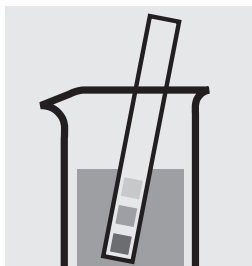
## Determination of readily liberated cyanide

Test

Measuring range: 5–200 µg/l CN

24-mm cell

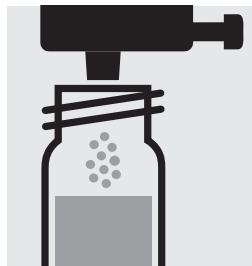
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



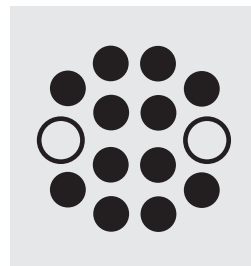
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



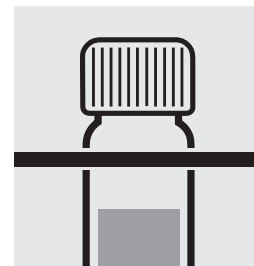
Pipette 10 ml of the sample into a 16-mm cell.



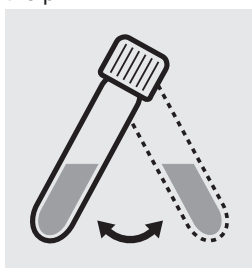
Add 1 dose of **CN-1** using the green dose-metering cap, close with the screw cap.



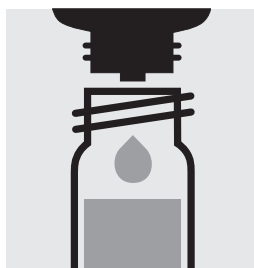
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



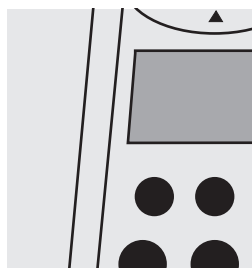
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



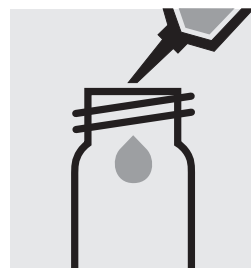
Swirl the cell before opening.



Add 3 drops of **CN-2K**, close with the screw cap, and mix: **pretreated sample**.



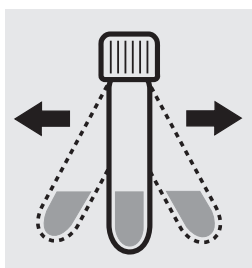
Select method **191**.



Transfer the **pretreated sample** into a 24-mm cell.



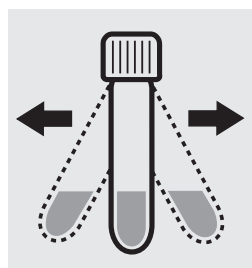
Add 2 level green microspoons of **CN-3**, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



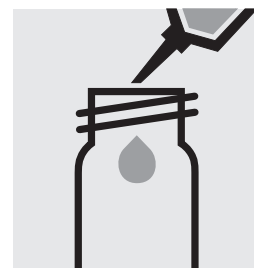
Add 2 level blue microspoons of **CN-4**, close with the screw cap.



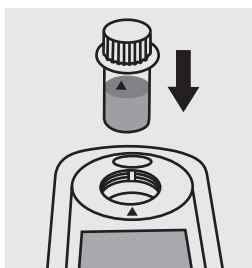
Shake the cell vigorously to dissolve the solid substance.



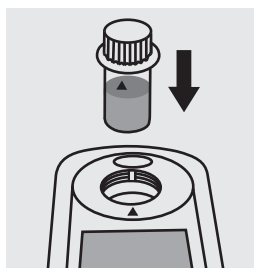
Reaction time: 10 minutes  
Press **←** to start the countdown.



Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Test)**.

### Quality assurance:

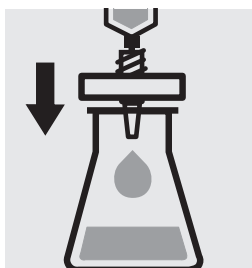
To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur®, Cat.No. 119533, concentration 1000 mg/l CN<sup>-</sup>, can be used after diluting accordingly. The measurement results are expressed in µg/l.

# Cyanuric Acid

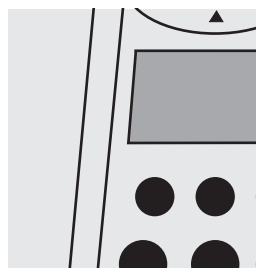
119253

Test

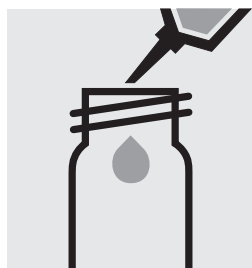
Measuring range: 2 – 160 mg/l cyanuric acid 24-mm cell



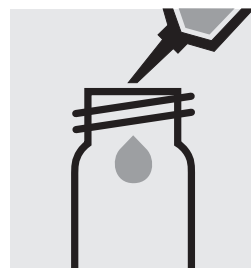
Filter turbid samples.



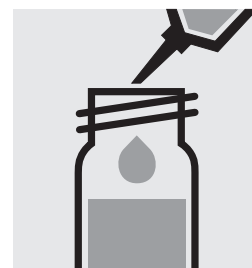
Select method (2)(0)(1).



Pipette **5.0 ml of distilled water** (Water for analysis EMSURE®, Cat.No. 116754, is recommended) + **5.0 ml of the sample** into a 24-mm cell (**do not add any reagents!**), close with the screw cap, and mix. (Blank cell)



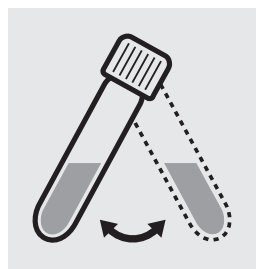
Pipette 5.0 ml of the sample into a 24-mm cell.



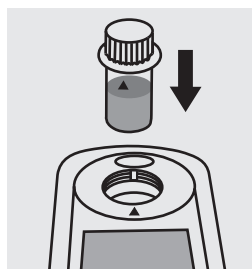
Add **5.0 ml of distilled water** (Water for analysis EMSURE®, Cat.No. 116754, is recommended) with pipette, close with the screw cap, and mix.



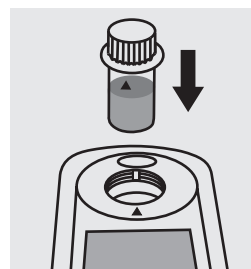
Add 1 reagent tablet **Cyanuric Acid**, crush with stirring rod, and close with the screw cap.



Swirl the cell to dissolve the solid substance.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a cyanuric acid standard solution must be prepared from Cyanuric acid, Cat.No. 820358 (see section "Standard solutions").

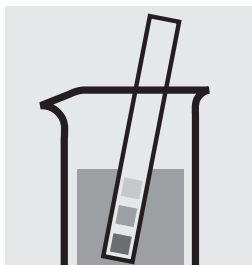
# Fluoride

114557

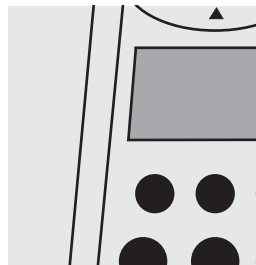
Cell Test

Measuring range: 0.10 – 1.50 mg/l F

16-mm cell



Check the pH of the sample, specified range: pH 3 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(2)(0).



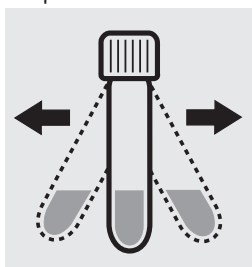
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



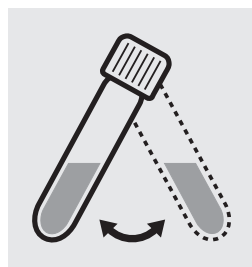
Add to each cell 1 dose of **F-1K** using the blue dose-metering cap, close with the screw cap.



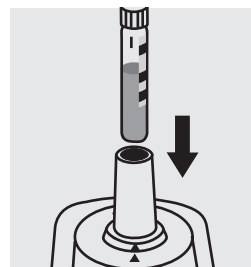
Shake both cells vigorously to dissolve the solid substance.



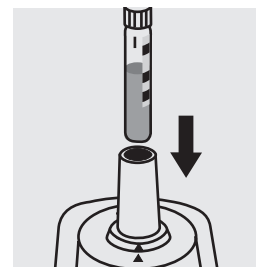
Reaction time: 5 minutes.  
Press (←) to start the countdown.



Swirl both cells before measurement.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high fluoride concentrations in the sample produce brown-colored solutions (measurement solution should be violet) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly.

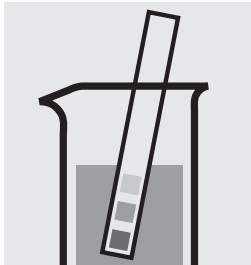
# Fluoride

100809

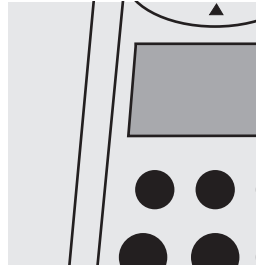
Cell Test

Measuring range: 0.10 – 1.80 mg/l F

16-mm cell



Check the pH of the sample, specified range: pH 3 – 8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(2)(2).



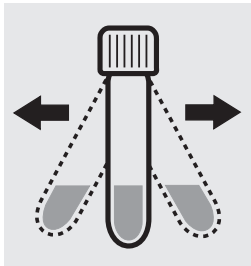
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



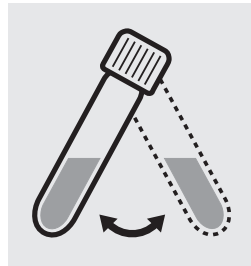
Add to each cell 1 level blue microspoon of F-1K, close with the screw cap.



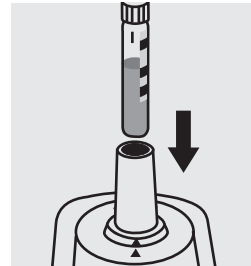
Shake both cells vigorously to dissolve the solid substance.



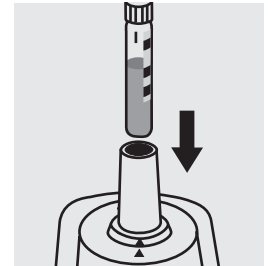
Reaction time: 15 minutes  
Press (←) to start the countdown.



Swirl both cells before measurement.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high fluoride concentrations in the sample produce brown-colored solutions (measurement solution should be violet) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly or also the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235 and 132236.

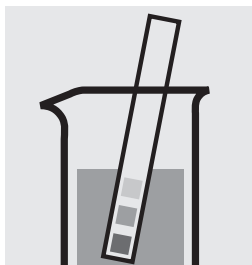
# Fluoride

117243

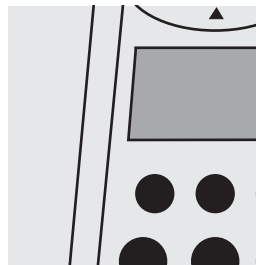
Cell Test

Measuring range: 0.10–2.50 mg/l F

16-mm cell



Check the pH of the sample, specified range: pH 2 – 12. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (2)(2)(5).



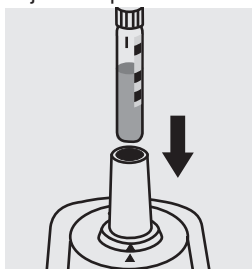
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



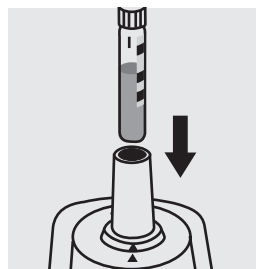
Pipette 5.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a second reaction cell, close with the screw cap, and mix. (Blank cell)



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly or also the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235 and 132236.

# Fluoride

114598

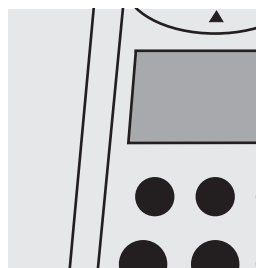
Test

Measuring range: 0.10 – 2.00 mg/l F

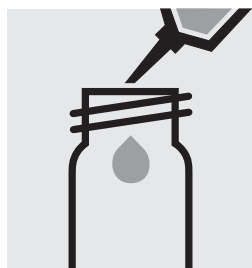
16-mm cell



Check the pH of the sample, specified range: pH 3 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(2)(1).



Pipette 2.0 ml each of F-1 into two 16-mm cells.



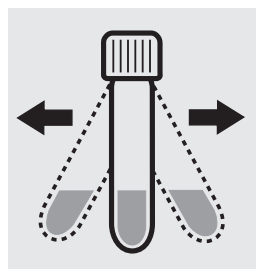
Add to one cell 5.0 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 5.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



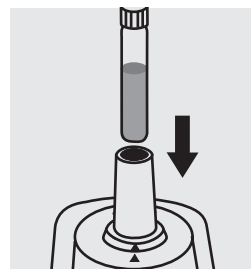
Add to each cell 1 level blue microspoon of F-2, close with the screw cap.



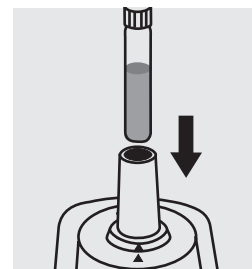
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 5 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

## Important:

Very high fluoride concentrations in the sample produce brown-colored solutions (measurement solution should be violet) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly or also the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235 and 132236.

# Fluoride

100822

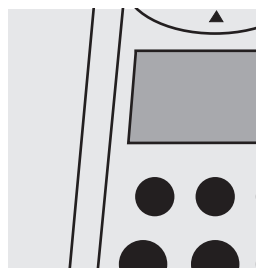
Test

Measuring range: 0.08 – 2.00 mg/l F

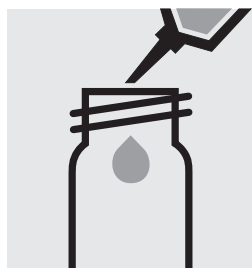
24-mm cell



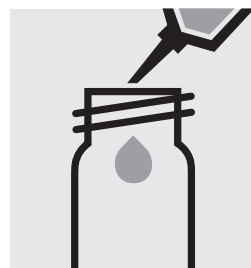
Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(2)(3).



Pipette 10 ml of the sample into a 24-mm cell.



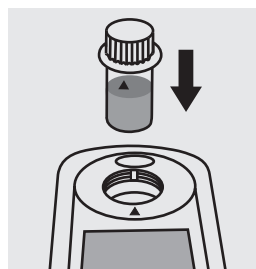
Pipette 10 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a second 24-mm cell. (Blank cell)



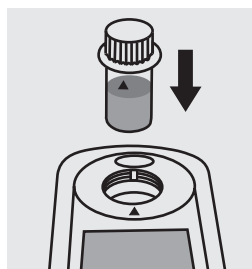
Add to each cell 2.0 ml of F-1 with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly or also the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235 and 132236.

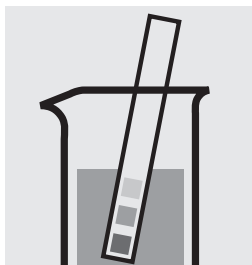
# Fluoride

# 117236

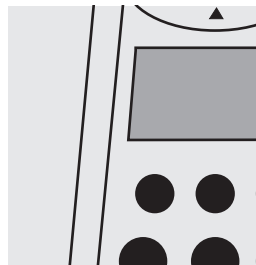
## Test

Measuring range: 0.05 – 1.50 mg/l F

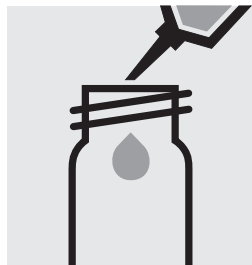
24-mm cell



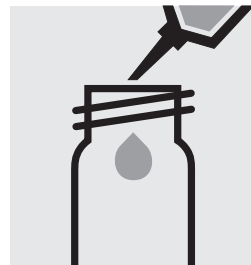
Check the pH of the sample, specified range: pH 2 – 12.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (2)(2)(4).



Pipette 10 ml of the sample into a 24-mm cell.



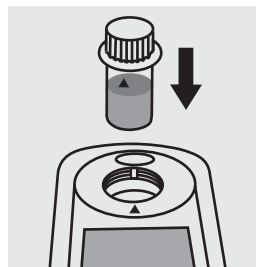
Pipette 10 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a second 24-mm cell. (Blank cell)



Add to each cell 2.0 ml of F-1 with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly or also the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235 and 132236.



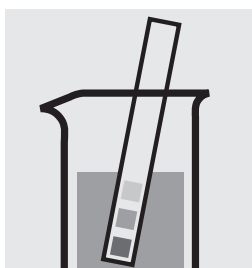
# Hydrazine

109711

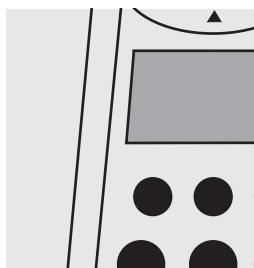
Test

**Measuring range:** 10– 1200 µg/l N<sub>2</sub>H<sub>4</sub>      24-mm cell

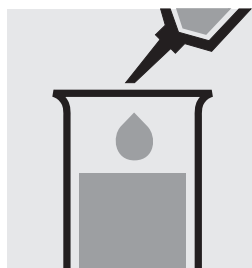
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



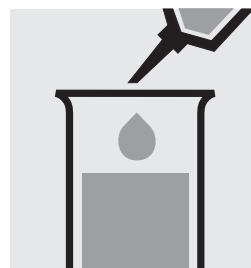
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



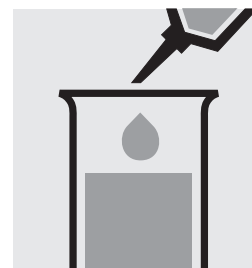
Select method (2)(3)(0).



Pipette 10 ml of the sample into a test tube.



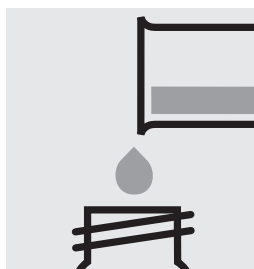
Pipette 10 ml of distilled water into a second test tube. (Blank)



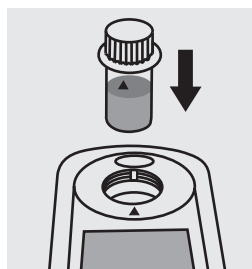
Add to each test tube 4.0 ml of **Hy-1** with pipette and mix.



Reaction time: 5 minutes  
Press (←) to start the countdown.



Transfer each solution into a separate 24-mm cell, close with the screw caps.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

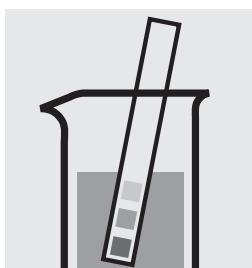
To check the measurement system (test reagents, measurement device, and handling) a hydrazine standard solution must be prepared from Hydrazinium sulfate GR, Cat.No. 104603 (see section “Standard solutions”). The measurement results are expressed in µg/l.

# Hydrogenperoxide

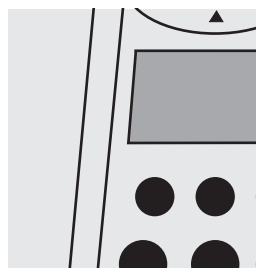
118789

Test

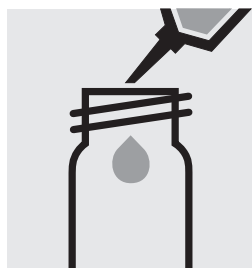
Measuring range: 0.02 – 5.50 mg/l  $H_2O_2$  16-mm cell



Check the pH of the sample, specified range: pH 4 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (5)(6)(0).



Pipette 0.50 ml each of  $H_2O_2$ -1 into two 16-mm cells.



Add to one cell 8.0 ml of the sample with pipette, close with the screw cap, and mix.



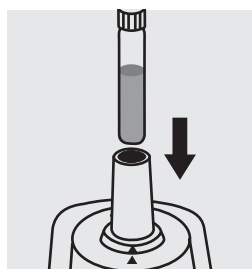
Add to the second cell 8.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



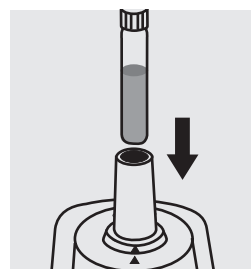
Add to each cell 0.50 ml of  $H_2O_2$ -2 with pipette, close with the screw cap, and mix.



Reaction time: 10 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a hydrogenperoxide standard solution must be prepared from Perhydrol® 30 %  $H_2O_2$  GR, Cat.No. 107209 (see section "Standard solutions").

# Iodine

100606

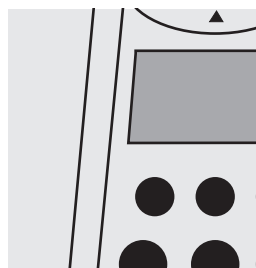
Test

Measuring range: 0.10–5.00 mg/I<sub>2</sub>

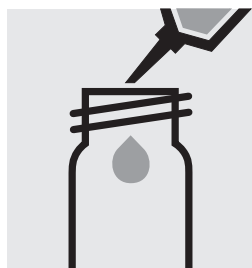
24-mm cell



Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(4)(0).



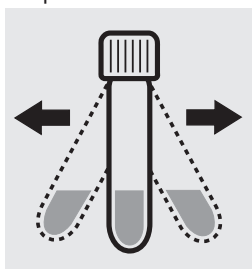
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



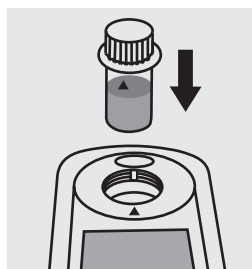
Add 1 level blue micro-spoon of I<sub>2</sub>-2, close with the screw cap.



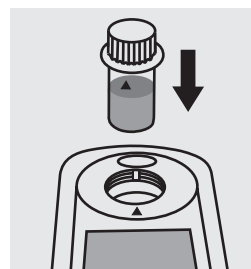
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high iodine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

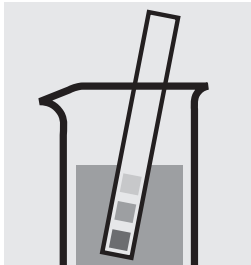
# Iron

**114549**

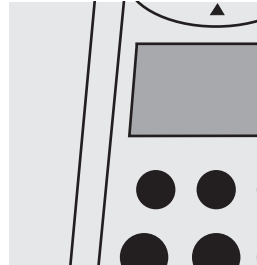
Cell Test

Measuring range: 0.05 – 4.00 mg/l Fe

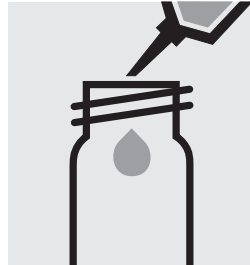
16-mm cell



Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



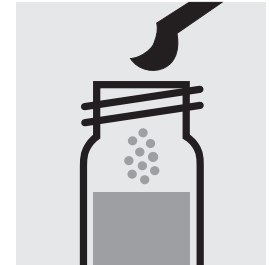
Select method (2)(5)(0).



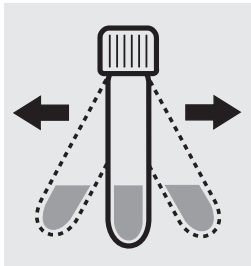
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



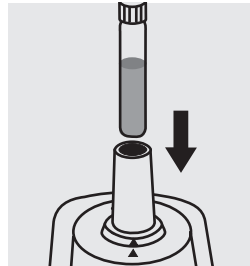
Add 1 level blue micro-spoon of **Fe-1K**, close with the screw cap.



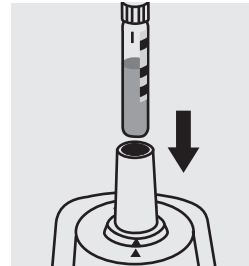
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 3 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

**Important:**

For the determination of **total iron** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

**Quality assurance:**

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700, or also the Standard solutions for photometric applications, CRM, Cat.Nos. 133018, 133019 and 133020.

Ready-to-use iron standard solution Certipur®, Cat.No. 119781, concentration 1000 mg/l Fe, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

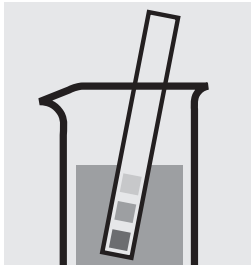
# Iron

114761

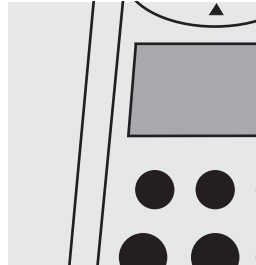
Test

Measuring range: 0.01–2.00 mg/l Fe      24-mm cell

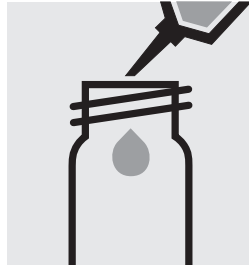
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



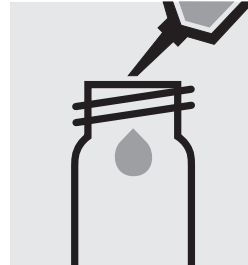
Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



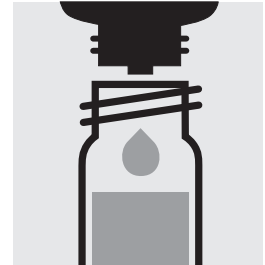
Select method (2)(5)(1).



Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



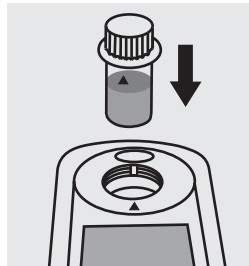
Add 6 drops of **Fe-1**, close with the screw cap, and mix.



Reaction time: 3 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

For the determination of **total iron** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700, or also the Standard solutions for photometric applications, CRM, Cat.Nos. 133014, 133018, 133019 and 133020.

Ready-to-use iron standard solution Certipur®, Cat.No. 119781, concentration 1000 mg/l Fe, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Iron

100796

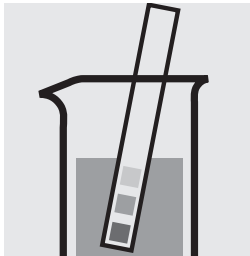
## Determination of iron(II) and iron(III)

Test

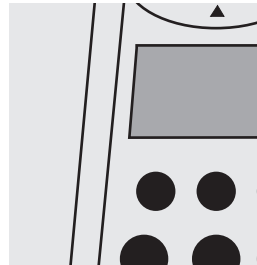
Measuring range: 0.10–5.00 mg/l Fe

16-mm cell

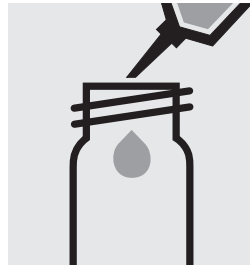
### Determination of iron(II)



Check the pH of the sample, specified range: pH 2 – 8.  
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



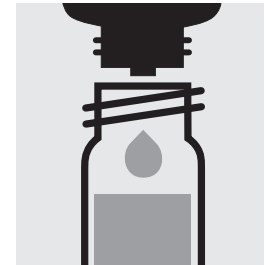
Select method **2(5)2**.



Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 8.0 ml of the sample into a 16-mm cell.



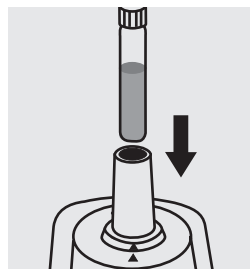
Add 1 drop of **Fe-1**, close with the screw cap, and mix.



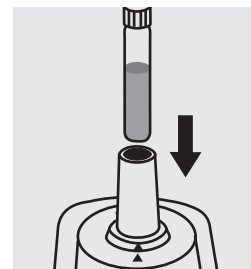
Add 0.50 ml of **Fe-2** with pipette, close with the screw cap, and mix.



Reaction time: 5 minutes  
Press **←** to start the countdown.



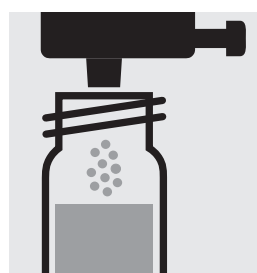
Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Press **Test**.

### Determination of iron(II) + (III)

Same preparation as described above. After adding of **Fe-2** continue with **Fe-3**.



Add 1 dose of **Fe-3** using the blue dose-metering cap, close with the screw cap, and dissolve the solid substance.



Reaction time: 10 minutes, then measure.

### Calculation of iron(III)

$$\begin{aligned} &\text{Result B (Fe II+III)} \\ &- \text{Result A (Fe II)} \\ \hline &= \text{mg/l Fe(III)} \end{aligned}$$

#### Important:

For the determination of **total iron** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

#### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700, or also the Standard solutions for photometric applications, CRM, Cat.Nos. 133018, 133019 and 133020.

Ready-to-use iron standard solution Certipur®, Cat.No. 119781, concentration 1000 mg/l Fe(III), can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

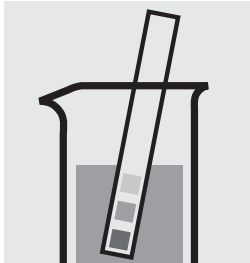
# Lead

**114833**

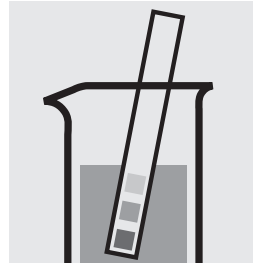
Cell Test

Measuring range: 0.10–5.00 mg/l Pb

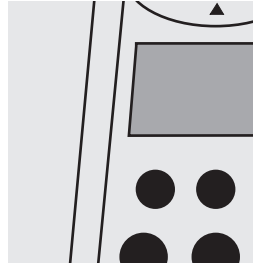
16-mm cell

**Samples of total hardness 0–10°d**

Check the total hardness of the sample



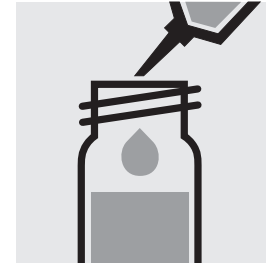
Check the pH of the sample, specified range: pH 3 – 6.  
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



Select method **(2)(6)(0)**.



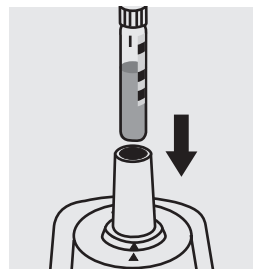
Add 5 drops each of **Pb-1K** into two reaction cells, close with the screw cap, and mix.



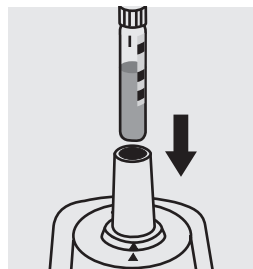
Add to one cell 5.0 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 5.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.

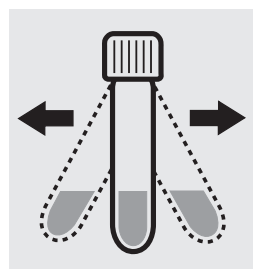


Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Test)**.

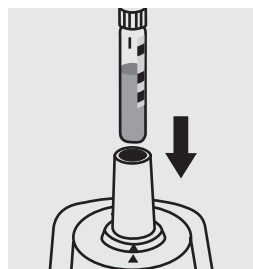
= **Result A**

**Samples of total hardness > 10°d**

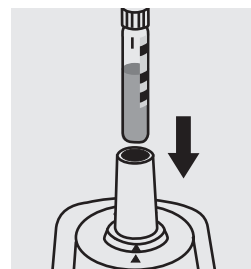
Add 1 level grey micro-spoon each of **Pb-2K** to the already measured cells, close with the screw cap.



Shake both cells vigorously to dissolve the solid substance.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Test)**.

= **Result B**

**Result A**  
– **Result B**  
= **mg/l Pb**

**Important:**

For the determination of **total lead** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687, and thermoreactor is necessary.

**Quality assurance:**

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 40 and 100, Cat.Nos. 114692 and 118701.

Ready-to-use lead standard solution Certipur®, Cat.No. 119776, concentration 1000 mg/l Pb, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

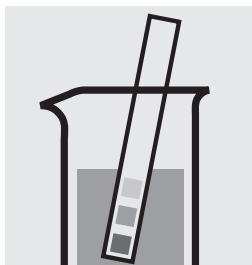
# Lead

# 109717

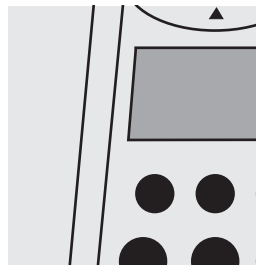
## Test

Measuring range: 0.05 – 5.00 mg/l Pb

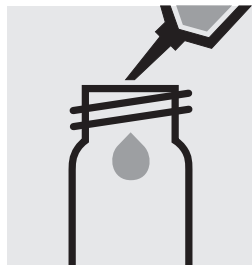
24-mm cell



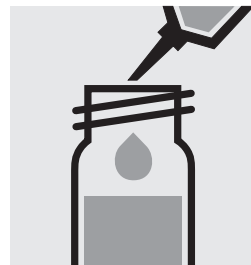
Check the pH of the sample, specified range: pH 3 – 6.  
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



Select method (2)(6)(1).



Pipette 0.50 ml each of **Pb-1** into two 24-mm cells.



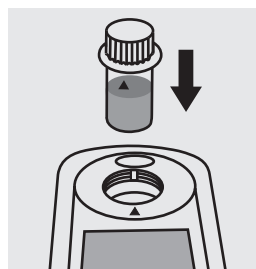
Add to each cell 0.50 ml **Pb-2** with pipette, close with the screw cap, and mix.



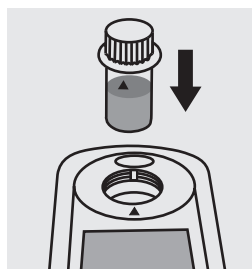
Add to one cell 8.0 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 8.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

For the determination of **total lead** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687, and thermoreactor is necessary.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 40 and 100, Cat.Nos. 114692 and 118701, or the Standard solution for photometric applications, CRM, Cat.No. 133002.

Ready-to-use lead standard solution Certipur®, Cat.No. 119776, concentration 1000 mg/l Pb, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.



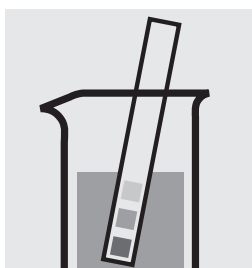
# Magnesium

100815

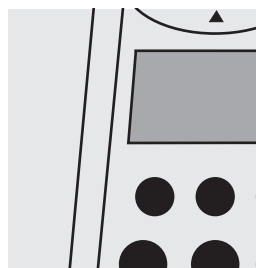
Cell Test

Measuring range: 5.0–75.0 mg/l Mg

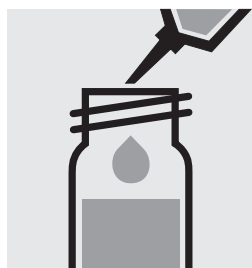
16-mm cell



Check the pH of the sample, specified range: pH 3 – 9.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (2)(7)(0).



Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



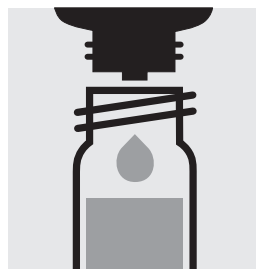
Pipette 1.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



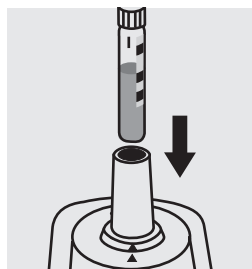
Add to each cell 1.0 ml of **Mg-1K** with pipette, close with the screw cap, and mix.



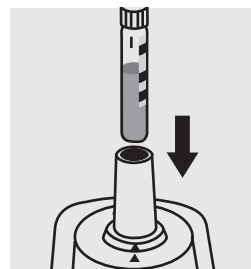
Reaction time:  
**exactly 3 minutes**  
Press (←) to start the countdown.



Add to each cell 3 drops of **Mg-2K**, close with the screw cap, and mix.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Manganese

100816

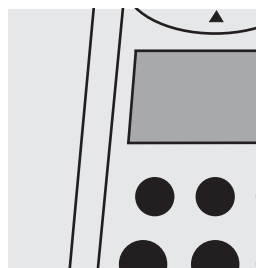
Cell Test

Measuring range: 0.10–5.00 mg/l Mn

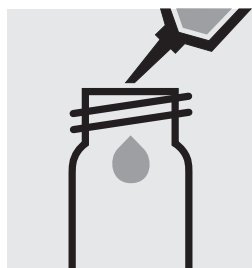
16-mm cell



Check the pH of the sample, specified range: pH 2 – 7.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(8)(0).



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



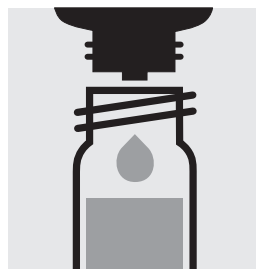
Pipette 7.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 2 drops of **Mn-1K**, close with the screw cap, and mix.



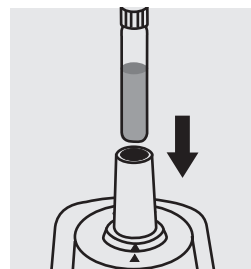
Reaction time: 2 minutes  
Press (←) to start the countdown.



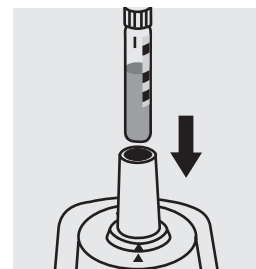
Add 3 drops of **Mn-2K**, close with the screw cap, and mix.



Reaction time: 10 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700, or the Standard solutions for photometric applications, CRM, Cat.Nos. 132238 and 132239.

Ready-to-use manganese standard solution Certipur®, Cat.No. 119789, concentration 1000 mg/l Mn, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Manganese

101739

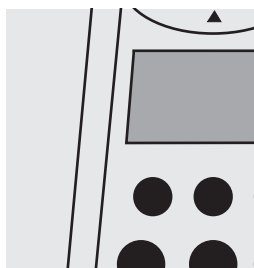
Test

Measuring range: 0.05–1.80 mg/l Mn

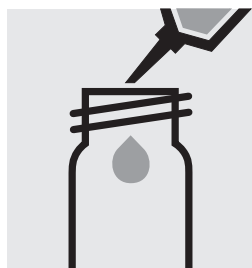
24-mm cell



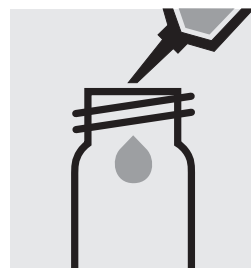
Check the pH of the sample, specified range: pH 3 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(8)(1).



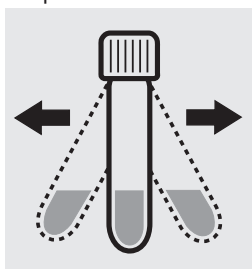
Pipette 8.0 ml of the sample into a 24-mm cell.



Pipette 8.0 ml of distilled water into a second 24-mm cell. (Blank cell)



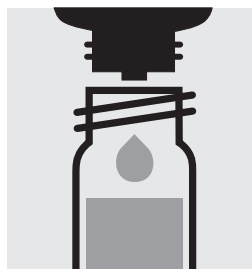
Add to each cell 1 level grey microspoon of **Mn-1**, close with the screw cap.



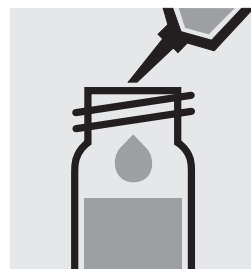
Shake both cells vigorously to dissolve the solid substance.



Add to each cell 2.0 ml of **Mn-2** with pipette, close with the screw cap, and mix.



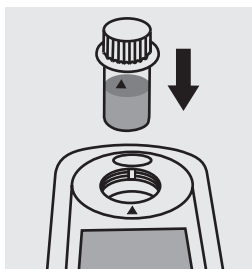
Add to each cell 3 drops of **Mn-3**, close with the screw cap, and mix.



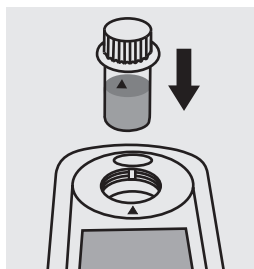
Add **swiftly** to each cell 0.25 ml of **Mn-4** with pipette, close with the screw cap, and mix **immediately**.



Reaction time: 10 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use manganese standard solution Certipur®, Cat.No. 119789, concentration 1000 mg/l Mn, can be used after diluting accordingly.

# Manganese

114770

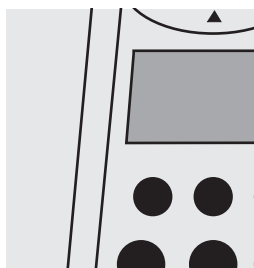
Test

Measuring range: 0.05–6.00 mg/l Mn      24-mm cell

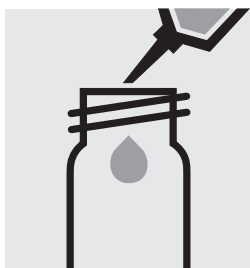
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



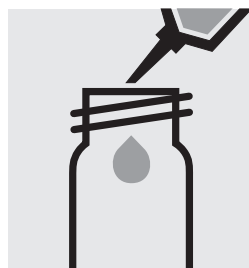
Check the pH of the sample, specified range: pH 2 – 7.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(8)(2).



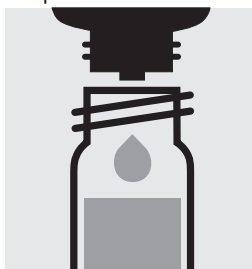
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



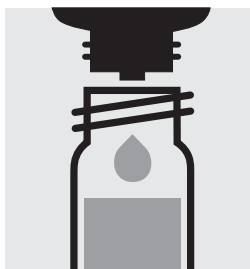
Add 8 drops of **Mn-1**, close with the screw cap, and mix. Check the pH, specified pH: approx. 11.5.



Add 4 drops of **Mn-2**, close with the screw cap, and mix. Check the pH, specified pH: approx. 11.5.



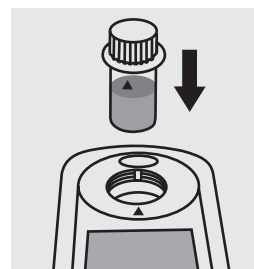
Reaction time: 2 minutes  
Press (←) to start the countdown.



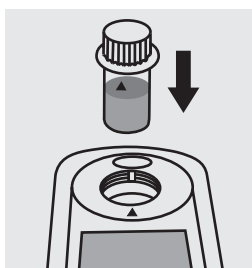
Add 4 drops of **Mn-3**, close with the screw cap, and mix.



Reaction time: 10 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700, or the Standard solutions for photometric applications, CRM, Cat.Nos. 132238 and 132239. Use 10 ml R-1 instead of the sample.

Ready-to-use manganese standard solution Certipur®, Cat.No. 119789, concentration 1000 mg/l Mn, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended. Use 10 ml sample + 0.1 ml R-2.

# Manganese

101846

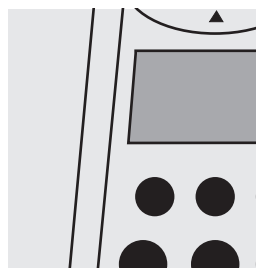
Test

Measuring range: 0.05–1.80 mg/l Mn

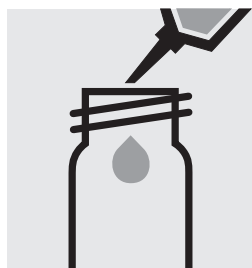
24-mm cell



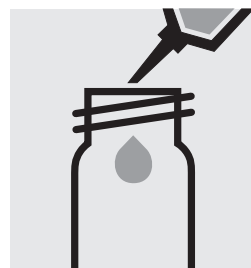
Check the pH of the sample, specified range: pH 3 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(8)(3).



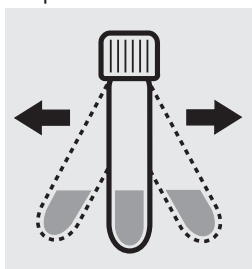
Pipette 8.0 ml of the sample into a 24-mm cell.



Pipette 8.0 ml of distilled water into a second 24-mm cell. (Blank cell)



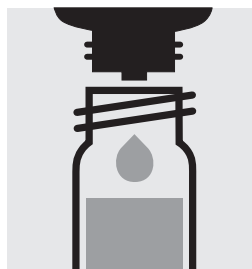
Add to each cell 1 level grey microspoon of **Mn-1**, close with the screw cap.



Shake both cells vigorously to dissolve the solid substance.



Add to each cell 2.0 ml of **Mn-2** with pipette, close with the screw cap, and mix.



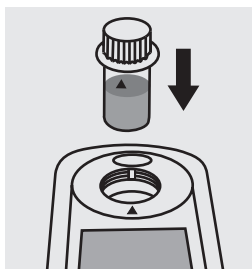
Add **carefully** to each cell 3 drops of **Mn-3**, close with the screw cap, and mix.



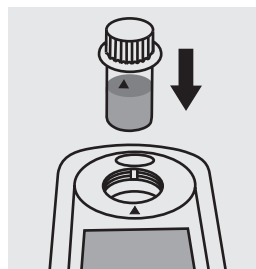
Add to each cell 0.25 ml of **Mn-4** with pipette, close with the screw cap, and mix **carefully** (**Foams! Wear eye protection!**).



Reaction time: 10 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90, Cat.No. 118700, or the Standard solutions for photometric applications, CRM, Cat.Nos. 132237, 132238 and 132239.

Ready-to-use manganese standard solution Certipur®, Cat.No. 119789, concentration 1000 mg/l Mn, can also be used after diluting accordingly.

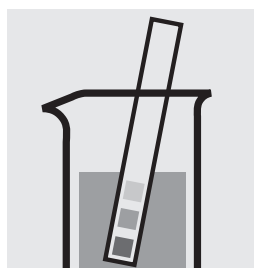
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

# Molybdenum

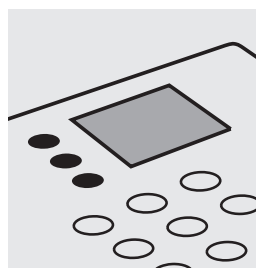
100860

Cell Test

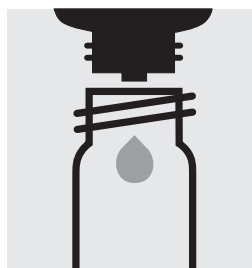
<b>Measuring range:</b> 0.02 – 1.00 mg/l Mo	16-mm cell
0.03 – 1.67 mg/l MoO <sub>4</sub>	16-mm cell
0.04 – 2.15 mg/l Na <sub>2</sub> MoO <sub>4</sub>	16-mm cell



Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



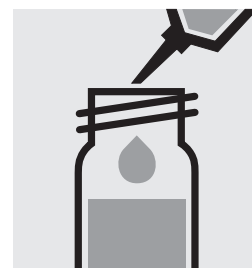
Select method (2)(9)(0).



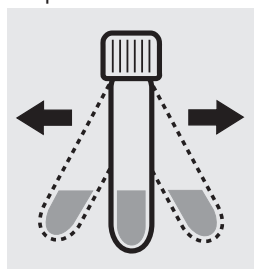
Add 2 drops each of **Mo-1K** to two reaction cells and mix.



Add to one cell 10 ml of the sample with pipette, close with the screw cap.



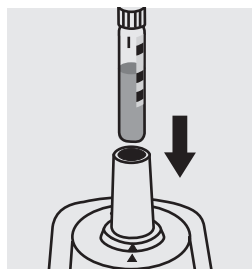
Add to the second cell 10 ml of distilled water with pipette, close with the screw cap. (Blank cell)



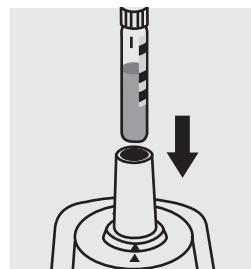
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 2 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

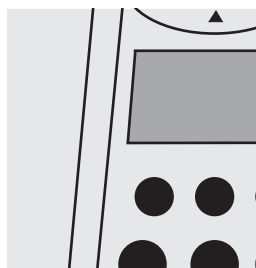
To check the measurement system (test reagents, measurement device, and handling) a ready-to-use molybdenum standard solution Certipur®, Cat.No. 170227, concentration 1000 mg/l Mo, can be used after diluting accordingly.

# Molybdenum

119252

Test

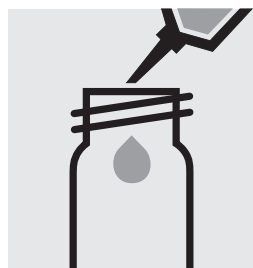
Measuring range: 0.5 – 45.0 mg/l Mo	24-mm cell
0.8 – 75.0 mg/l MoO <sub>4</sub>	24-mm cell
1.1 – 96.6 mg/l Na <sub>2</sub> MoO <sub>4</sub>	24-mm cell



Select method (2)(9)(1).



Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



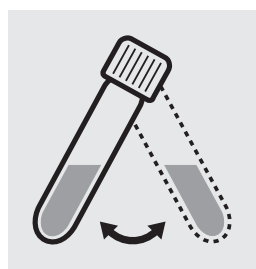
Add 1 powder pack of **Molybdenum HR1**, close with the screw cap, and dissolve the solid substance.



Add 1 powder pack of **Molybdenum HR2**, close with the screw cap, and dissolve the solid substance.



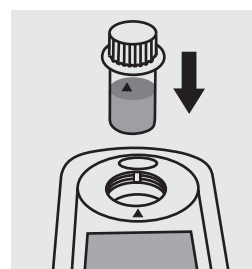
Add 1 powder pack of **Molybdenum HR3** and close with the screw cap.



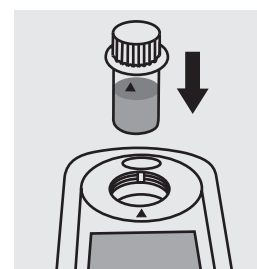
Swirl the cell to dissolve the solid substance.



Reaction time: 5 minutes, **measure immediately**. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a ready-to-use molybdenum standard solution Certipur®, Cat.No. 170227, concentration 1000 mg/l Mo, can be used after diluting accordingly.

# Monochloramine

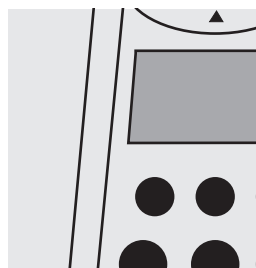
# 101632

## Test

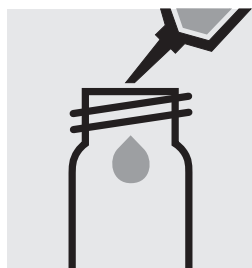
Measuring range: 0.10–5.00 mg/l Cl <sub>2</sub>	24-mm cell
0.07–3.63 mg/l NH <sub>2</sub> Cl	24-mm cell
0.02–0.99 mg/l NH <sub>2</sub> Cl-N	24-mm cell



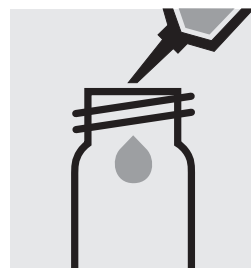
Check the pH of the sample, specified range: pH 4 – 13. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (3)(0)(0).



Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



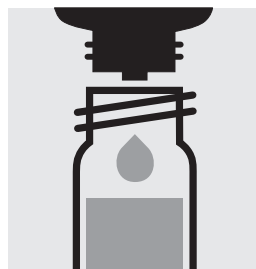
Pipette 10 ml of the sample into a 24-mm cell.



Add 0.60 ml of **MCA-1** with pipette, close with the screw cap, and mix.



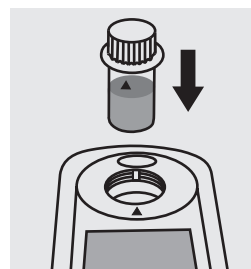
Reaction time: 5 minutes  
Press (←) to start the countdown.



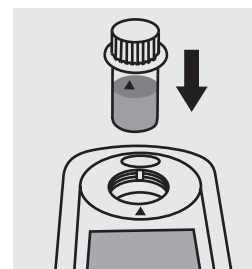
Add 4 drops of **MCA-2**, close with the screw cap, and mix.



Reaction time: 10 minutes  
Press (Enter) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

Very high monochloramine concentrations in the sample produce turquoise-colored solutions (measurement solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared (see section “Standard solutions”).



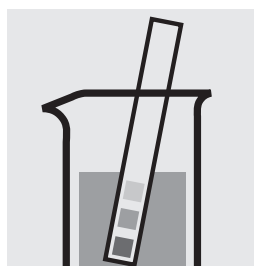
# Nickel

**114554**

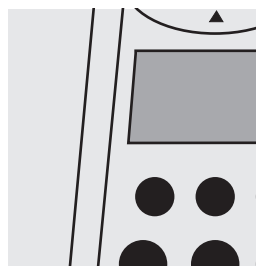
Cell Test

Measuring range: 0.10–6.00 mg/l Ni

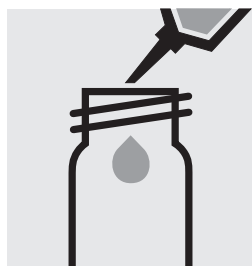
16-mm cell



Check the pH of the sample, specified range: pH 3 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **3** **1** **0**.



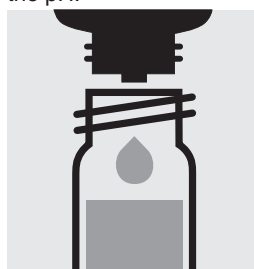
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



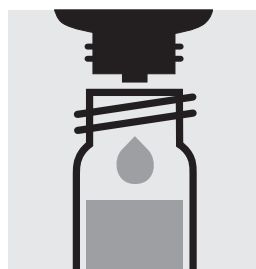
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Reaction time: 1 minute  
Press **Start** to start the countdown.



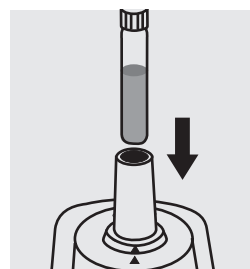
Add 2 drops of **Ni-1K**, close with the screw cap, and mix. Check the pH of the solution, specified range: pH 10 – 12



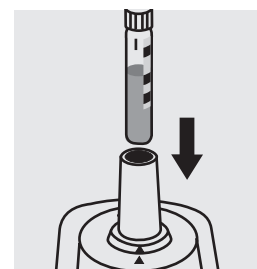
Add 2 drops of **Ni-2K**, close with the screw cap, and mix.



Reaction time: 2 minutes  
Press **Start** to start the countdown.



Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

## Important:

For the determination of **total nickel** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 40 and 100, Cat.Nos. 114692 and 118701.

A nickel standard solution Titrisol®, Cat.No. 109989, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Nickel

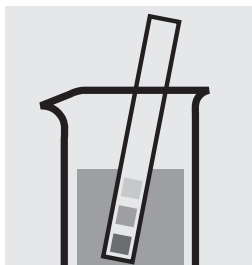
# 114785

## Test

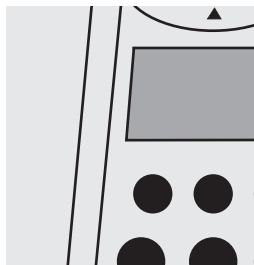
**Measuring range:** 0.05–5.00 mg/l Ni

24-mm cell

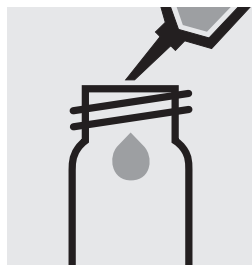
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



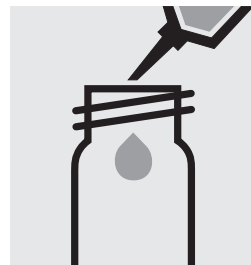
Check the pH of the sample, specified range: pH 3 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (3)(1)(1).



Pipette 10 ml of the sample into a 24-mm cell.



Pipette 10 ml of distilled water into a second 24-mm cell.  
(Blank cell)



Add to each cell 2 drops of **Ni-1**, close with the screw cap, and mix. If the color disappears, continue adding drop by drop until a slight yellow coloration persists.



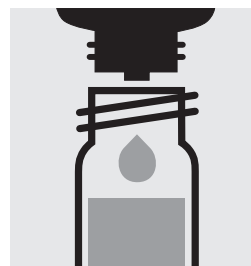
Reaction time:  
1 minute  
Press (←) to start the countdown.



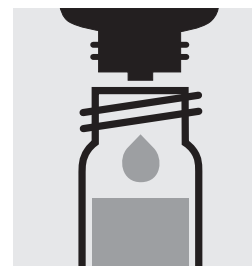
Add to each cell 4 drops of **Ni-2**, close with the screw cap, and mix.



Check the pH, specified range: pH 10 – 12



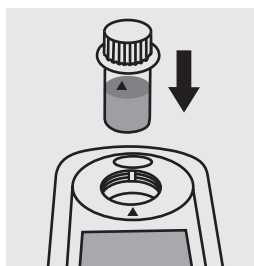
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



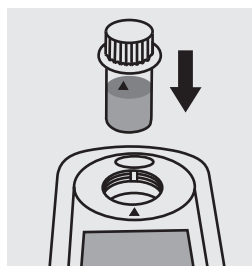
Add to each cell 4 drops of **Ni-3**, close with the screw cap, and mix.



Reaction time:  
2 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

For the determination of **total nickel** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 40 and 100, Cat.Nos. 114692 and 118701.

Use 10 ml R-1 instead of the sample.

A nickel standard solution Titrisol®, Cat.No. 109989, can also be used after diluting accordingly.

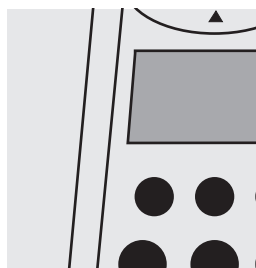
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended. Use 10 ml sample + 0.2 ml R-2.

# Nitrate

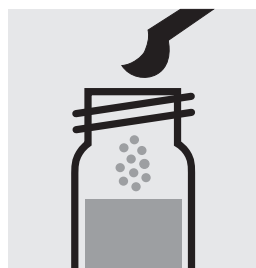
114542

Cell Test

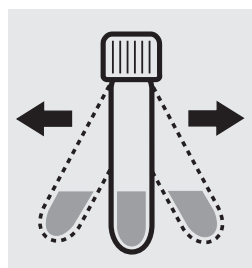
Measuring range: 0.5 – 15.0 mg/l NO <sub>3</sub> -N	16-mm cell
2.2 – 66.4 mg/l NO <sub>3</sub>	16-mm cell



Select method (3)(2)(0).



Add 1 level microspoon each of **NO<sub>3</sub>-1K** into two reaction cells, close with the screw cap.



**Shake both cells vigorously for 1 minute** to dissolve the solid substance.



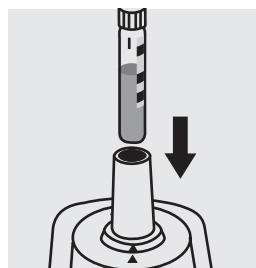
Add to one cell very slowly 1.5 ml of the sample with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!**



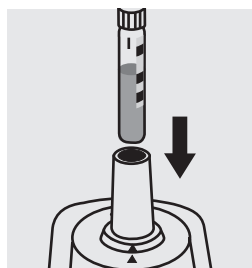
Add to the second cell very slowly 1.5 ml of distilled water with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!**  
(Blank cell)



Reaction time: 10 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20, Cat.No. 114675, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125037, 132241 and 132242.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, can also be used after diluting accordingly.

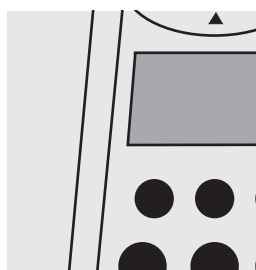
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

# Nitrate

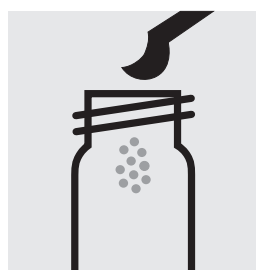
114773

Test

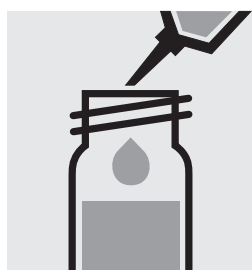
Measuring range: 0.5–15.0 mg/l NO <sub>3</sub> -N	16-mm cell
2.2–66.4 mg/l NO <sub>3</sub>	16-mm cell



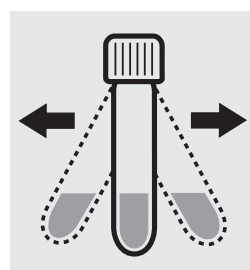
Select method (3)(2)(1).



Place 1 level micro-spoon each of NO<sub>3</sub>-1 into two dry 16-mm cells.



Add to each cell 5.0 ml of NO<sub>3</sub>-2 with pipette, close with the screw cap



**Shake** both cells **vigorously for 1 minute** to dissolve the solid substance.



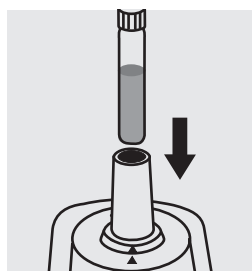
Add to one cell very slowly 1.5 ml of the sample with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!**



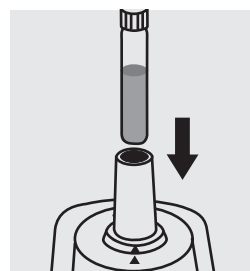
Add to the second cell very slowly 1.5 ml of distilled water with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!** (Blank cell)



Reaction time: 10 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 and 20, Cat.No. 114676 and 114675, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125036, 125037, 132241 and 132242.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

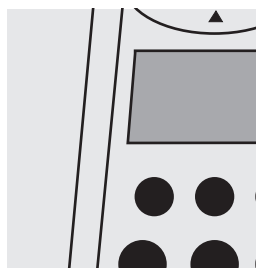
# Nitrate

in seawater

114556

Cell Test

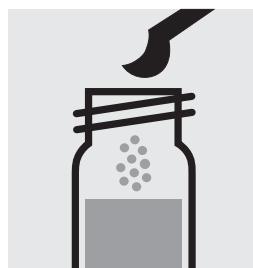
Measuring range: 0.10 – 3.00 mg/l NO <sub>3</sub> -N	16-mm cell
0.4 – 13.3 mg/l NO <sub>3</sub>	16-mm cell



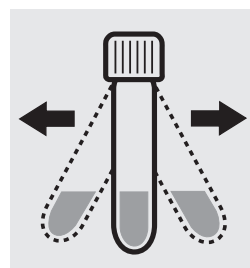
Select method (3)(2)(2).



Pipette 2.0 ml of distilled water into a reaction cell, **do not mix**. (Blank cell)



Add 1 level blue micro-spoon of **NO<sub>3</sub>-1K**, **immediately** close the blank cell tightly with the screw cap. **Caution, foams strongly (eye protection, protective gloves)!**



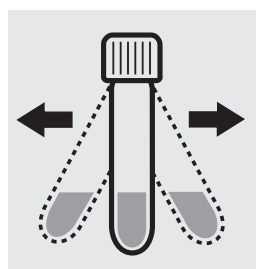
Shake the blank cell **vigorously for 5 seconds** to dissolve the solid substance.



Pipette 2.0 ml of the sample into a second reaction cell, **do not mix**. (Sample cell)



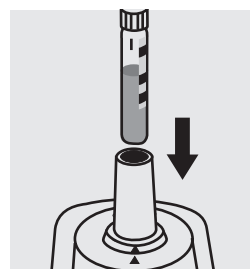
Add 1 level blue micro-spoon of **NO<sub>3</sub>-1K**, **immediately** close the sample cell tightly with the screw cap. **Caution, foams strongly (eye protection, protective gloves)!**



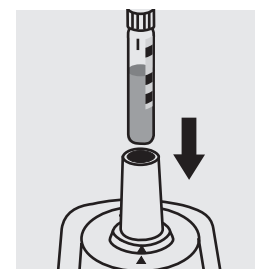
Shake the sample cell **vigorously for 5 seconds** to dissolve the solid substance.



Reaction time: 30 minutes  
Press (Start) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125036, 125037, 132240 and 132241.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, can also be used after diluting accordingly.

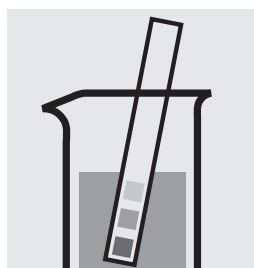
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

# Nitrate

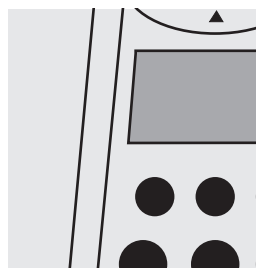
# 101842

## Test

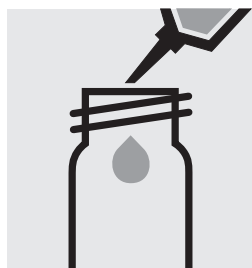
Measuring range: 0.3–30.0 mg/l NO <sub>3</sub> -N	24-mm cell
1.3–132.8 mg/l NO <sub>3</sub>	24-mm cell



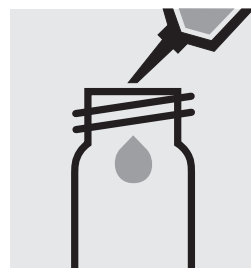
Check the pH of the sample, specified range: pH 3 – 9.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (3)(2)(3).



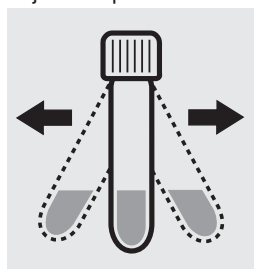
Pipette 10 ml of the sample into a 24-mm cell.



Pipette 10 ml of distilled water into a second 24-mm cell.  
(Blank cell)



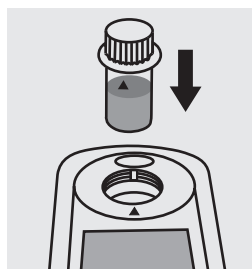
Add to each cell 1 level blue microspoon of NO<sub>3</sub>-1, **immediately** close tightly with the screw cap.



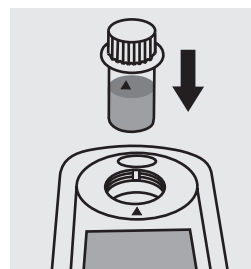
**Shake** both cells **vigorously for 1 minute** to dissolve the solid substance.



Reaction time: 5 minutes, **measure immediately**.  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

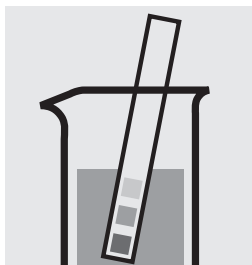
To check the measurement system (test reagents, measurement device, and handling) a ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, can be used after diluting accordingly.

# Nitrite

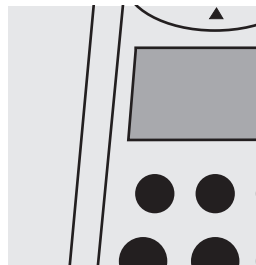
114547

Cell Test

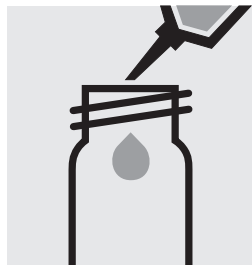
Measuring range: 10 – 700 $\mu\text{g/l NO}_2\text{-N}$	16-mm cell
33 – 2299 $\mu\text{g/l NO}_2$	16-mm cell



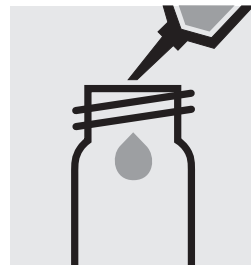
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



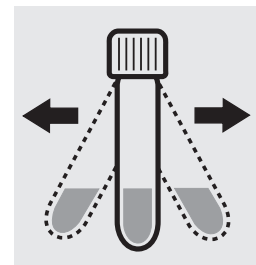
Select method (3)(3)(0).



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



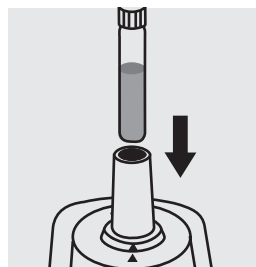
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap.



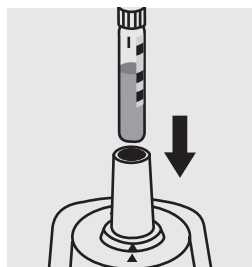
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 10 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrite standard solution Certipur<sup>®</sup>, Cat.No. 119899, concentration 1000 mg/l  $\text{NO}_2^-$ , can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125041.

# Nitrite

114776

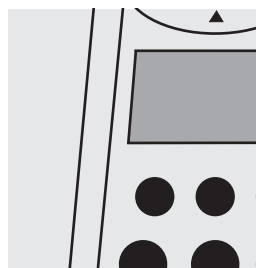
Test

**Measuring range:** 5– 400 µg/l NO<sub>2</sub>-N      24-mm cell  
16– 1313 µg/l NO<sub>2</sub>      24-mm cell

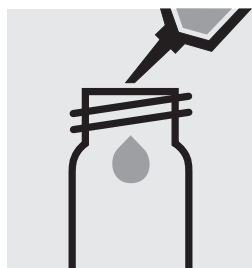
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (3)(3)(1).



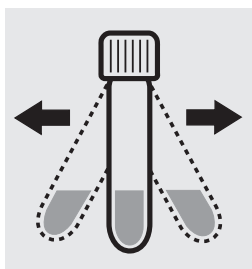
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a 24-mm cell.



Add 2 level blue microspoons of **NO<sub>2</sub>-1**, close with the screw cap.



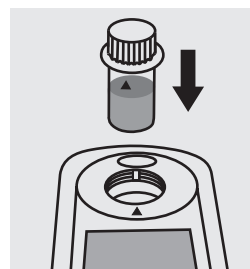
Shake the cell vigorously to dissolve the solid substance.



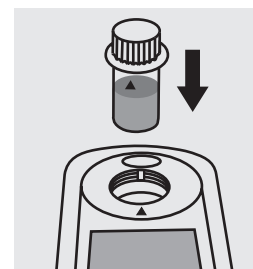
Check the pH, specified range: pH 2.0 – 2.5. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Reaction time: 10 minutes. Press (⏪) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrite standard solution Certipur®, Cat.No. 119899, concentration 1000 mg/l NO<sub>2</sub><sup>-</sup>, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125041.

The measurement results are expressed in µg/l.

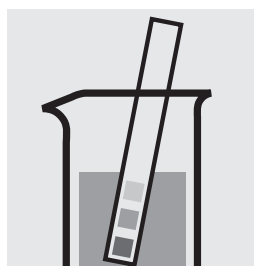


# Nitrite

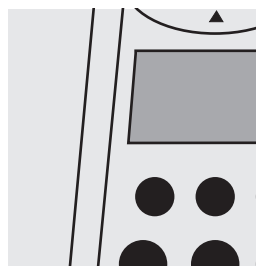
100609

Cell Test

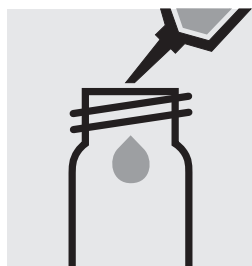
Measuring range: 1.0– 90.0 mg/l NO <sub>2</sub> -N	16-mm cell
3.3–295.2 mg/l NO <sub>2</sub>	16-mm cell



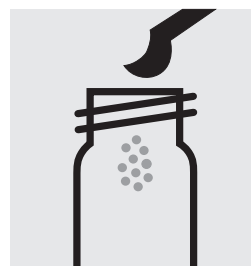
Check the pH of the sample, specified range: pH 1 – 12.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



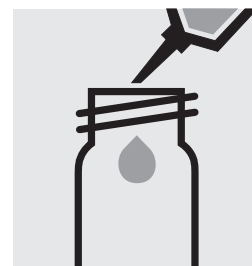
Select method (3)(3)(2).



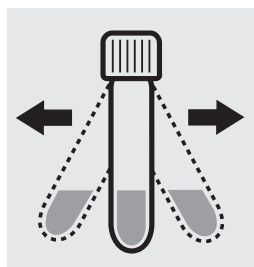
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap.  
(Blank cell)



Add 2 level blue microspoons of NO<sub>2</sub>-1K into a reaction cell.



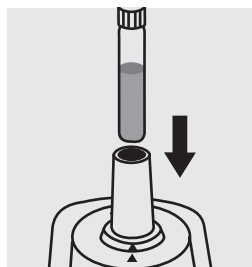
Add 8.0 ml of the sample with pipette and close with the screw cap.



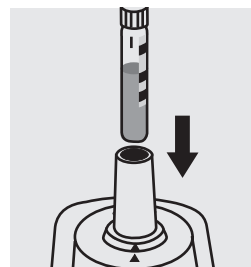
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 20 minutes, **measure immediately**.  
Press (↵) to start the countdown.  
**Do not shake or swirl** the cell before the measurement.



Insert the blank cell into the cell compartment.  
Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.  
Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrite standard solution Certipur®, Cat.No. 119899, concentration 1000 mg/l NO<sub>2</sub>, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125042.

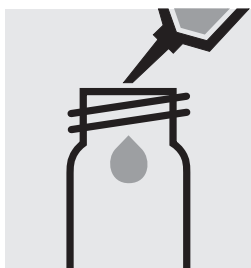
# Nitrogen (total)

114537

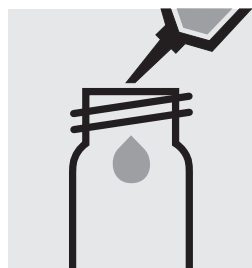
Cell Test

Measuring range: 0.5–15.0 mg/l N

16-mm cell



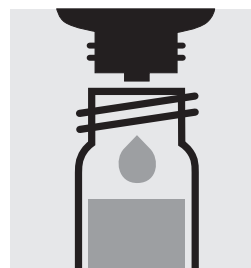
Pipette 10 ml of the sample into an empty 16-mm cell.



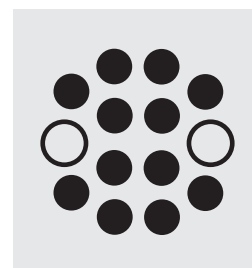
Pipette 10 ml of distilled water into a second empty 16-mm cell. (Blank)



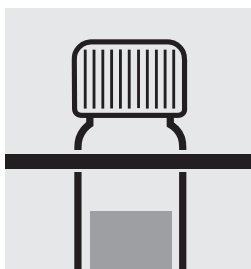
Add to each cell 1 level blue microspoon of **N-1K**.



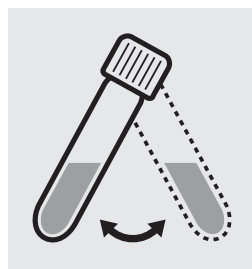
Add to each cell 6 drops of **N-2K**, close with the screw cap, and mix



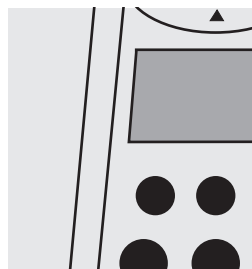
Heat both cells in the thermoreactor at 120 °C (100 °C) for 1 hour.



Remove both cells from the thermoreactor and place in a test-tube rack to cool to room temperature:  
**pretreated sample / blank.**



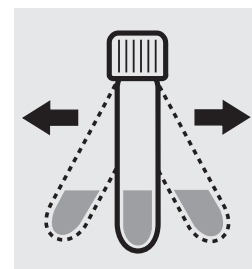
Swirl both cells after 10 minutes.



Select method **340**.



Add 1 level microspoon each of **N-3K** into two reaction cells, close with the screw cap.



**Shake both cells vigorously for 1 minute** to dissolve the solid substance.



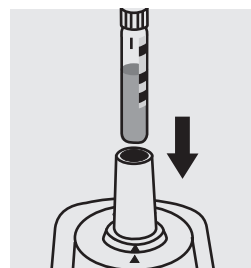
Add to one cell very slowly 1.5 ml of the **pretreated sample** with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!**



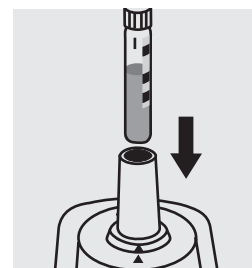
Add to the second cell very slowly 1.5 ml of the **pretreated blank** with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!** (Blank cell)



Reaction time: 10 minutes  
Press **Start** to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50, Cat.No. 114695, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125043 and 125044.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

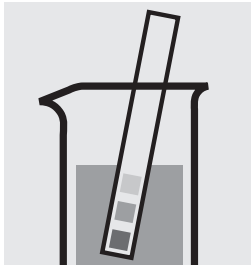
# Oxygen

114694

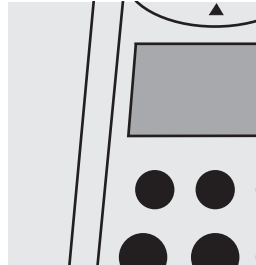
Cell Test

Measuring range: 0.5– 12.0 mg/l O<sub>2</sub>

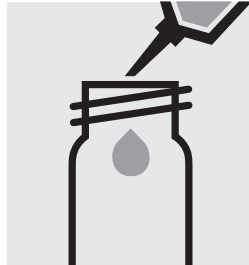
16-mm cell



Check the pH of the sample, specified range: pH 6 – 8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (5)(5)(0).



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Fill watersample into a reaction cell to overflowing and make sure, that no air bubbles are present.



Place the filled cell in a test-tube rack.



Add with microspoon 1 glass bead.



Add 5 drops of O<sub>2</sub>-1K.



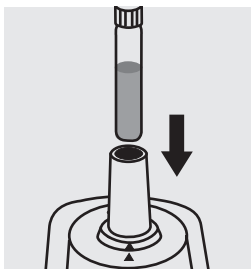
Add 5 drops of O<sub>2</sub>-2K, close the cell with the screw cap, and shake for 10 seconds.



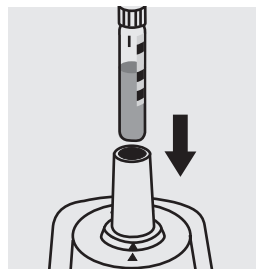
Reaction time: 1 minute  
Press (←) to start the countdown.



Add 10 drops of O<sub>2</sub>-3K, close the cell with the screw cap, mix, and clean from outside.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

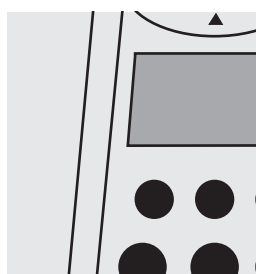
To check the measurement system (test reagents, measurement device, and handling) a oxygen standard solution must be prepared (application see the website).

# Oxygen Scavengers

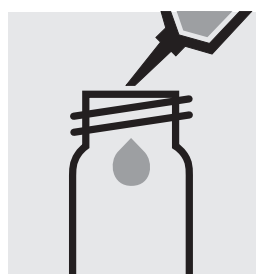
119251

Test

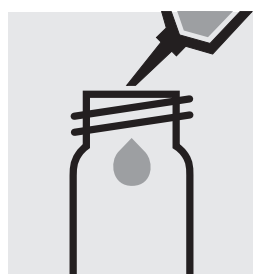
<b>Measuring range:</b> 20 – 500 µg/l DEHA*	24-mm cell
* N,N-diethylenhydroxylamine	
27 – 667 µg/l Carbohy*	24-mm cell
* carbohydrazide	
53 – 1315 µg/l Hydro*	24-mm cell
* hydroquinone	
78 – 1950 µg/l ISA*	24-mm cell
* isoascorbic acid	
87 – 2170 µg/l MEKO*	24-mm cell
* methylethylketoxime	



Select method (5)(5)(5).



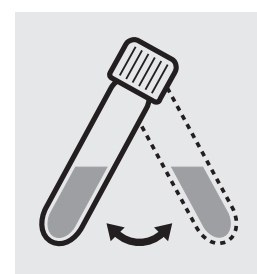
Pipette 10 ml of the sample into a 24-mm cell.



Pipette 10 ml of distilled water into a second 24-mm cell. (Blank cell)



Add to each cell 1 powder pack of **Oxyscav 1** and close with the screw cap.



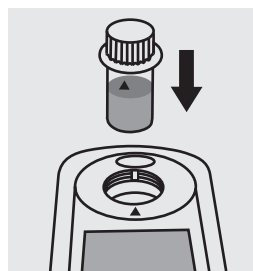
Swirl both cells to dissolve the solid substance.



Add to each cell 0.20 ml of **Oxyscav 2** with pipette, close with the screw cap, and mix.



Reaction time: 10 minutes, **protect from light in the process, measure immediately.** Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) an oxygen scavengers standard solution must be prepared from N,N-diethylhydroxylamine, Cat.No. 818473 (see section "Standard solutions"). The measurement results are expressed in µg/l.

# Ozone

100607

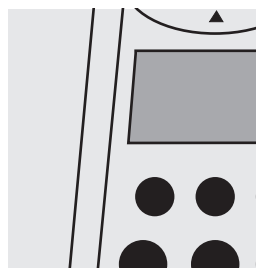
Test

Measuring range: 0.02–3.00 mg/l O<sub>3</sub>

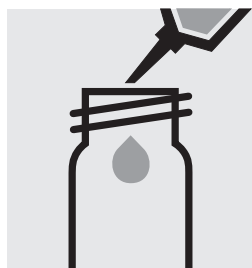
24-mm cell



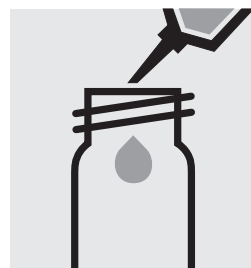
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



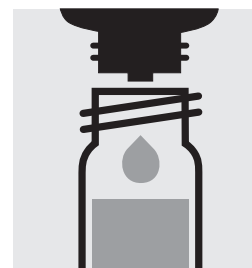
Select method (3)(5)(0).



Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



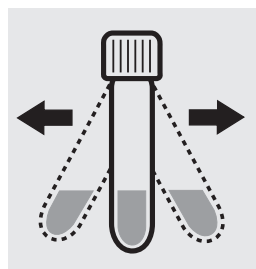
Pipette 10 ml of the sample into a 24-mm cell.



Add 2 drops of O<sub>3</sub>-1, close with the screw cap, and mix.



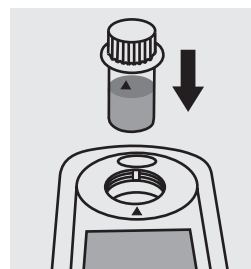
Add 1 level blue micro-spoon of O<sub>3</sub>-2, close with the screw cap.



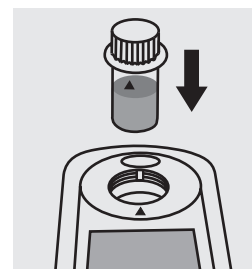
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

Very high ozone concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Ozone

100607

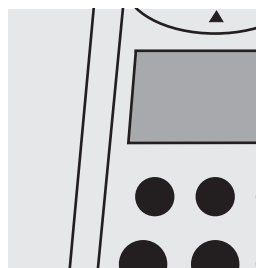
Test

Measuring range: 0.10 – 4.00 mg/l O<sub>3</sub>

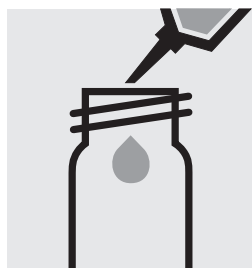
16-mm cell



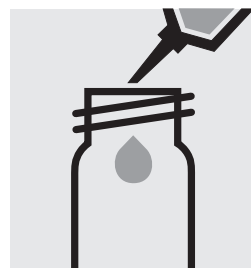
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (3)(5)(1).



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



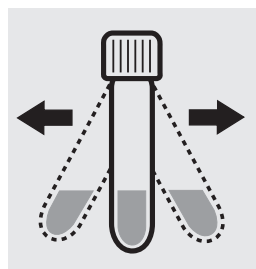
Pipette 10 ml of the sample into a 16-mm cell.



Add 2 drops of O<sub>3</sub>-1, close with the screw cap, and mix.



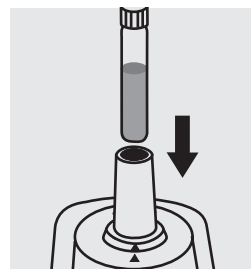
Add 1 level blue micro-spoon of O<sub>3</sub>-2, close with the screw cap.



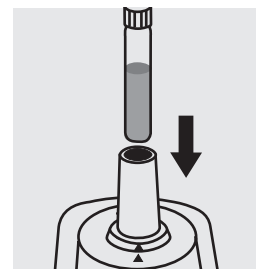
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

## Important:

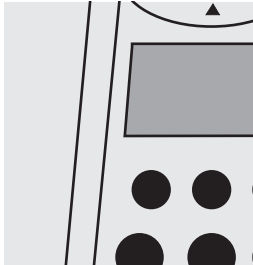
Very high ozone concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

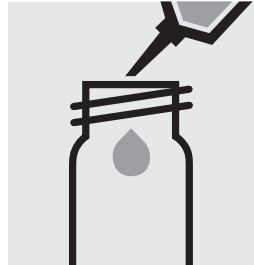
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

Measuring range: pH 6.4 – 8.8

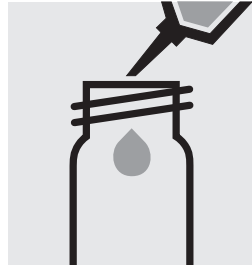
16-mm cell



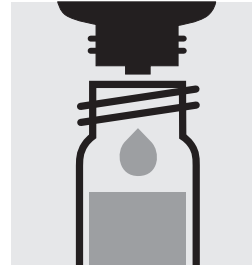
Select method **360**.



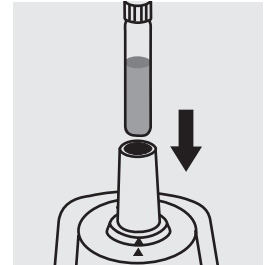
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



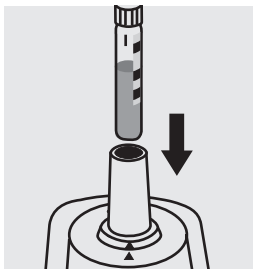
Pipette 10 ml of the sample into a round cell.



Add 4 drops of **pH-1**, close with the screw cap, and mix. **Attention!** The reagent bottle must be held **vertically by all means!**



Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) buffer solution pH 7.00 Certipur®, Cat.No. 109407, can be used.

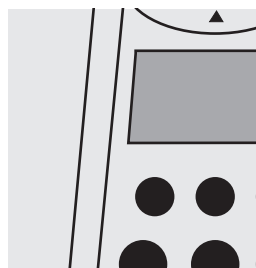
# Phenol

**114551**

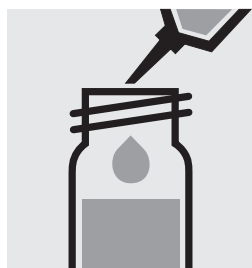
Cell Test

**Measuring range:** 0.10 – 2.50 mg/l C<sub>6</sub>H<sub>5</sub>OH 16-mm cell

Check the pH of the sample, specified range: pH 2 – 11. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (3)(7)(0).



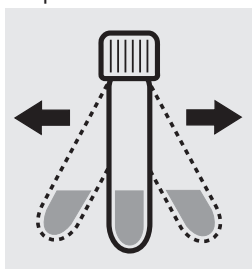
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 10 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



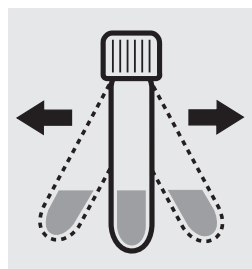
Add to each cell 1 level grey microspoon of **Ph-1K**, close with the screw cap.



Shake both cells vigorously to dissolve the solid substance.



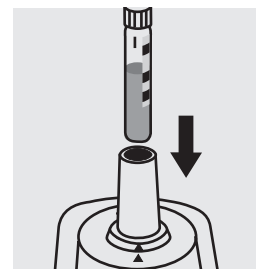
Add to each cell 1 level green microspoon of **Ph-2K**, close with the screw cap.



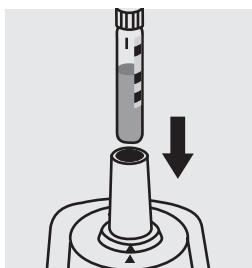
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 1 minute. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

**Important:**

Very high phenol concentrations in the sample result in a weakening of the color and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

**Quality assurance:**

To check the measurement system (test reagents, measurement device, and handling) a phenol standard solution must be prepared from Phenol GR, Cat.No. 100206 (see section "Standard solutions").



# Phenol

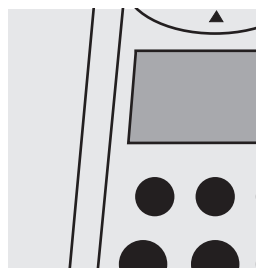
100856

Test

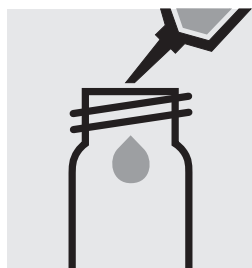
Measuring range: 0,10 – 5,00 mg/l C<sub>6</sub>H<sub>5</sub>OH 24-mm cell



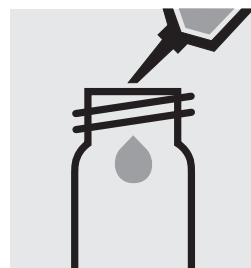
Check the pH of the sample, specified range: pH 2 – 11. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (3)(7)(1).



Pipette 10 ml of the sample into a 24-mm cell.



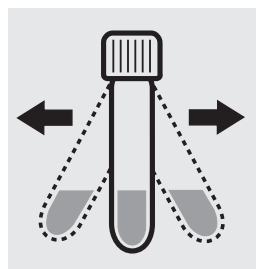
Pipette 10 ml of distilled water into a second 24-mm cell. (Blank cell)



Add to each cell 1.0 ml of **Ph-1** with pipette, close with the screw cap, and mix.



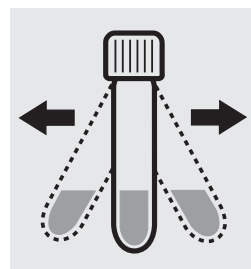
Add to each cell 1 level grey microspoon of **Ph-2**, close with the screw cap, and mix.



Shake both cells vigorously to dissolve the solid substance.



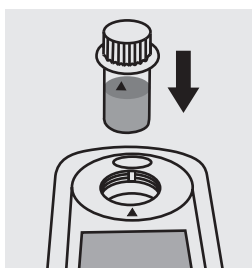
Add to each cell 1 level grey microspoon of **Ph-3**, close with the screw cap, and mix.



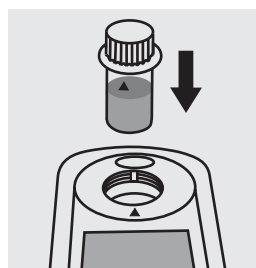
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 10 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a phenol standard solution must be prepared from Phenol GR, Cat.No. 100206 (see section "Standard solutions").

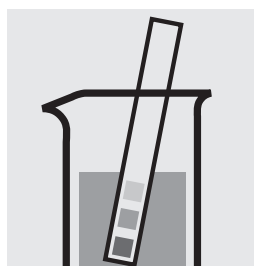
# Phosphate

100474

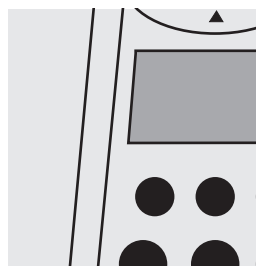
## Determination of orthophosphate

Cell Test

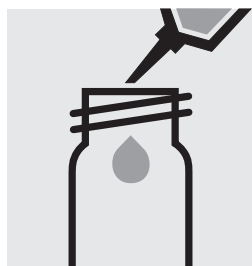
<b>Measuring range:</b> 0.05 – 4.00 mg/l PO <sub>4</sub> -P	16-mm cell
0.15 – 12.26 mg/l PO <sub>4</sub>	16-mm cell
0.11 – 9.17 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (3)(8)(7).



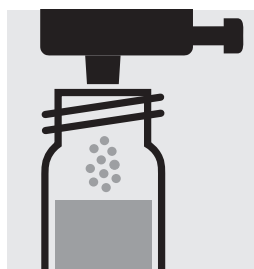
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



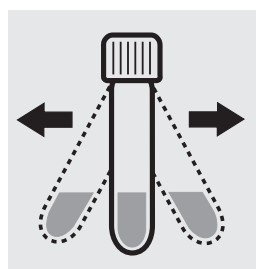
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-1K**, close with the screw cap, and mix.



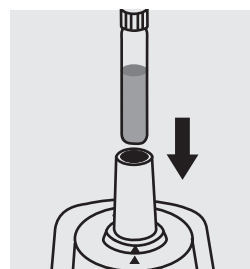
Add 1 dose of **P-2K** using the blue dose-metering cap, close with the screw cap.



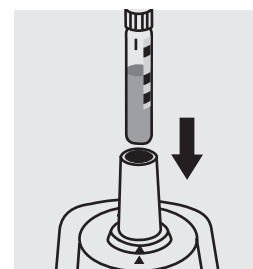
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press (Zero) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676.

Ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

# Phosphate

114543

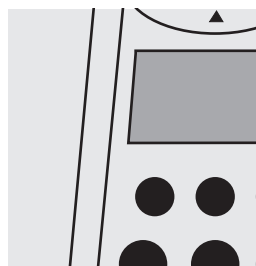
## Determination of orthophosphate

Cell Test

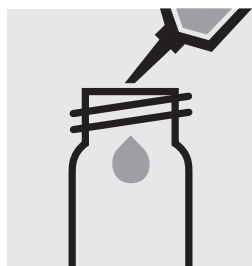
<b>Measuring range:</b> 0.05 – 4.00 mg/l PO <sub>4</sub> -P	16-mm cell
0.15 – 12.26 mg/l PO <sub>4</sub>	16-mm cell
0.11 – 9.17 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (3)(8)(0).



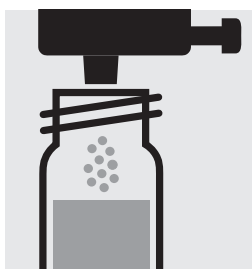
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



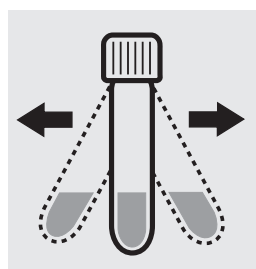
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-2K**, close with the screw cap, and mix.



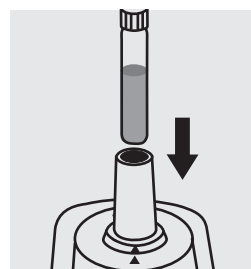
Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



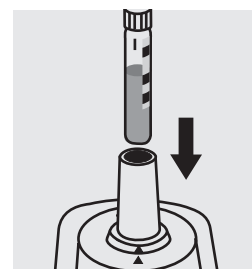
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press (Start) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676.

Ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

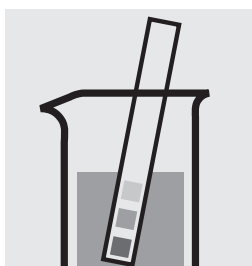
# Phosphate

Determination of total phosphorus  
= sum of orthophosphate, polyphosphate, and organophosphate

114543

Cell Test

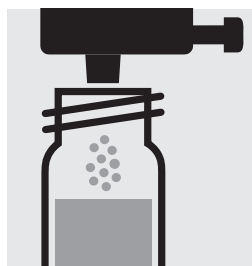
Measuring range: 0.05 – 4.00 mg/l P	16-mm cell
0.15 – 12.26 mg/l PO <sub>4</sub>	16-mm cell
0.11 – 9.17 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



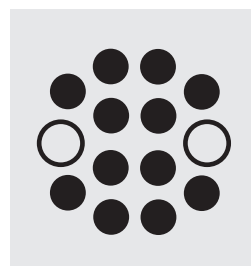
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



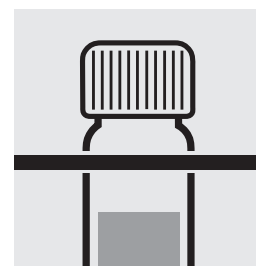
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



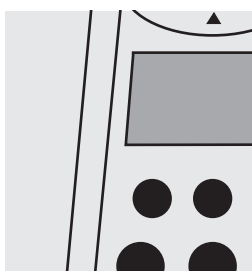
Add 1 dose of **P-1K** using the green dose-metering cap, close with the screw cap.



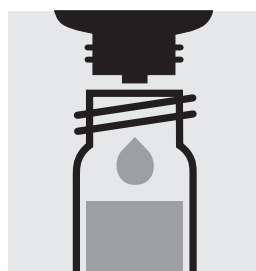
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



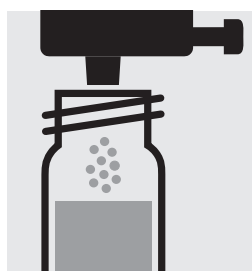
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



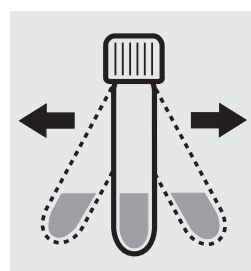
Select method (3)(8)(0).



Add 5 drops of **P-2K**, close with the screw cap, and mix.



Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



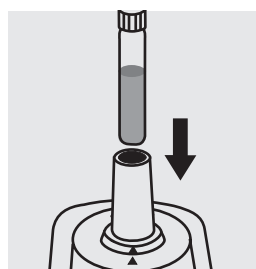
Shake the cell vigorously to dissolve the solid substance.



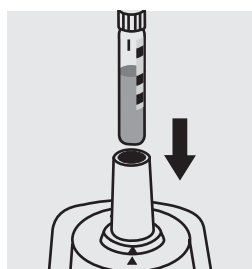
Reaction time: 5 minutes. Press (←) to start the countdown.



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solution for photometric applications, CRM, Cat.No. 125046.

Ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

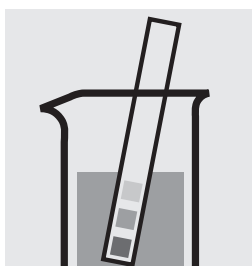
# Phosphate

100475

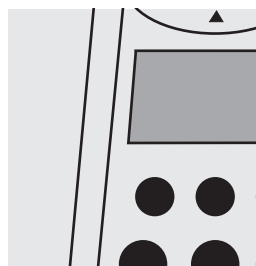
## Determination of orthophosphate

Cell Test

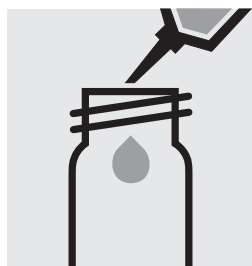
Measuring range: 0.5–20.0 mg/l PO <sub>4</sub> -P	16-mm cell
1.5–61.3 mg/l PO <sub>4</sub>	16-mm cell
1.1–45.8 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (3)(8)(8).



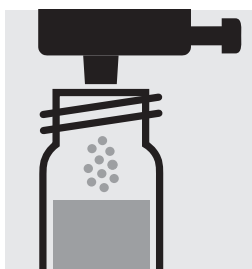
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



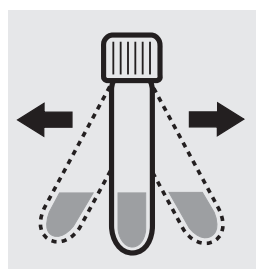
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-1K**, close with the screw cap, and mix.



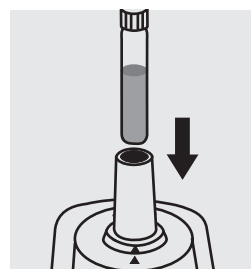
Add 1 dose of **P-2K** using the blue dose-metering cap, close with the screw cap.



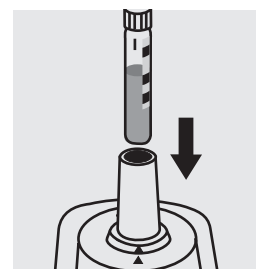
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press (Zero) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 and 80, Cat.Nos. 114675 and 114738.

Ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

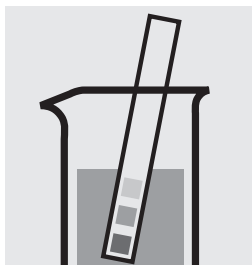
# Phosphate

**114729**

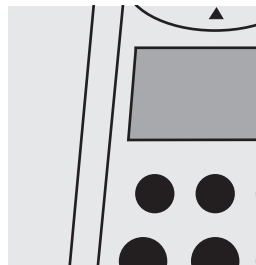
Determination of orthophosphate

Cell Test

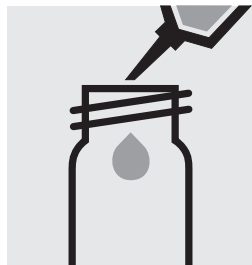
Measuring range: 0.5–20.0 mg/l PO <sub>4</sub> -P	16-mm cell
1.5–61.3 mg/l PO <sub>4</sub>	16-mm cell
1.1–45.8 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (3)(8)(1).



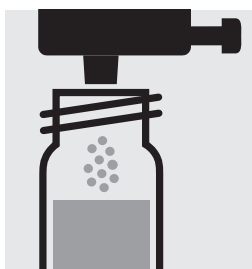
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



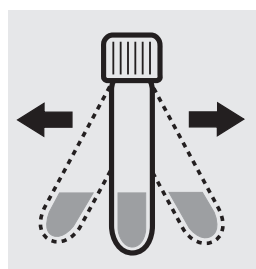
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-2K**, close with the screw cap, and mix.



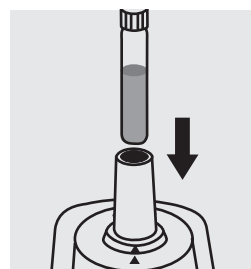
Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



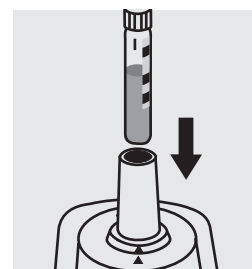
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press (Start) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 and 80, Cat.Nos. 114675 and 114738.

Ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

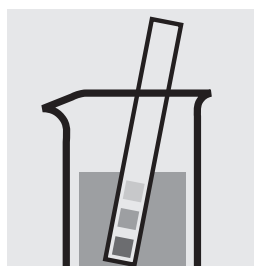
# Phosphate

Determination of total phosphorus  
= sum of orthophosphate, polyphosphate, and organophosphate

114729

Cell Test

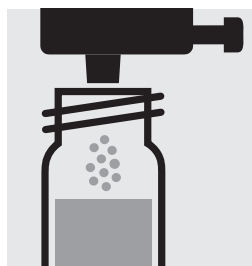
Measuring range: 0.5–20.0 mg/l P	16-mm cell
1.5–61.3 mg/l PO <sub>4</sub>	16-mm cell
1.1–45.8 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



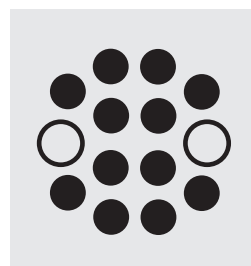
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



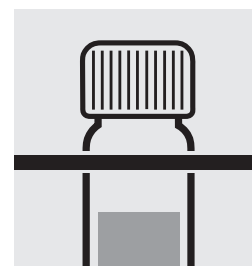
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



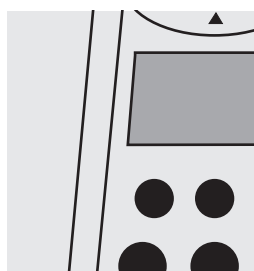
Add 1 dose of **P-1K** using the green dose-metering cap, close with the screw cap.



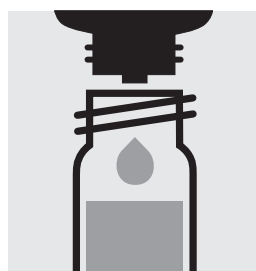
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



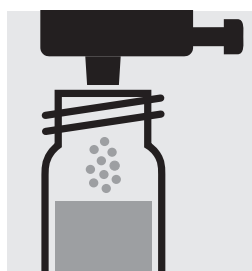
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



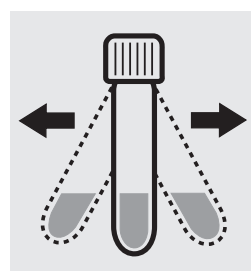
Select method (3)(8)(1).



Add 5 drops of **P-2K**, close with the screw cap, and mix.



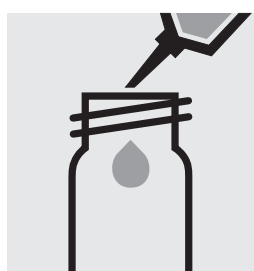
Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



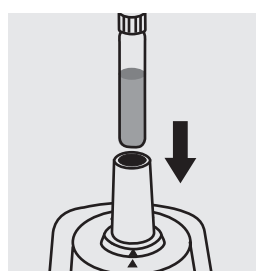
Shake the cell vigorously to dissolve the solid substance.



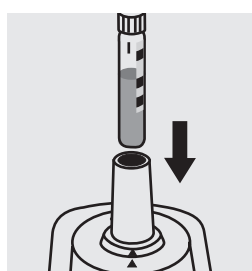
Reaction time: 5 minutes. Press (←) to start the countdown.



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 and 80, Cat.Nos. 114675 and 114738, or as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 125047 and 125048.

Ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

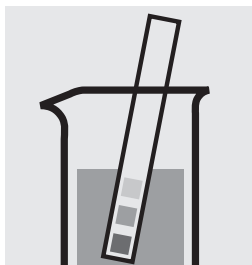
# Phosphate

100616

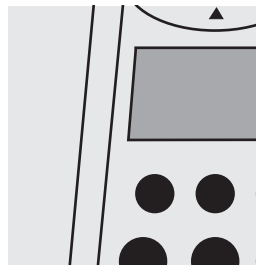
## Determination of orthophosphate

Cell Test

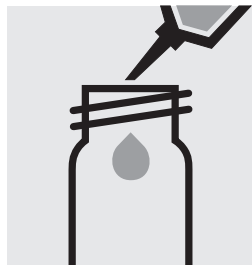
<b>Measuring range:</b> 3.0 – 100.0 mg/l PO <sub>4</sub> -P	16-mm cell
9 – 307 mg/l PO <sub>4</sub>	16-mm cell
7 – 229 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



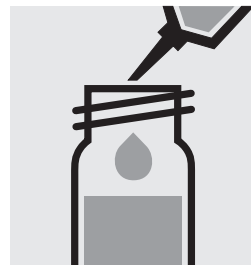
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



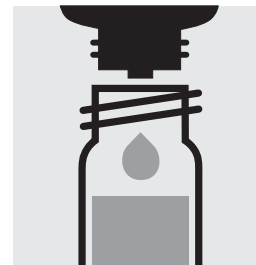
Select method (3)(8)(2).



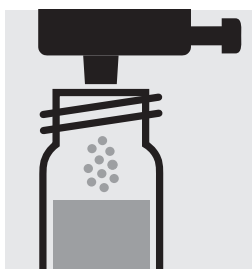
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



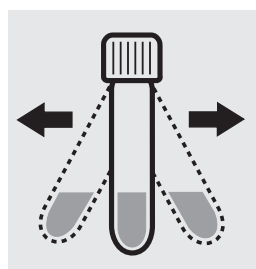
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of PO<sub>4</sub>-1K, close with the screw cap, and mix.



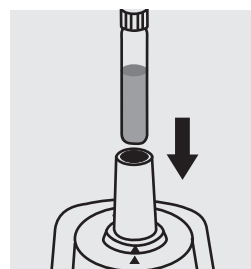
Add 1 dose of PO<sub>4</sub>-2K using the blue dose-metering cap, close with the screw cap.



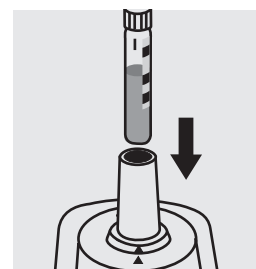
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.



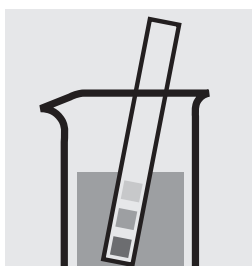
# Phosphate

100673

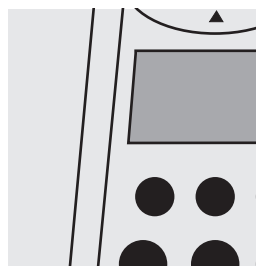
## Determination of orthophosphate

Cell Test

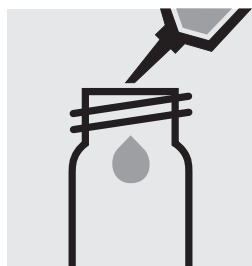
<b>Measuring range:</b> 3.0 – 100.0 mg/l PO <sub>4</sub> -P	16-mm cell
9 – 307 mg/l PO <sub>4</sub>	16-mm cell
7 – 229 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



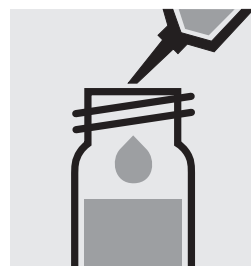
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (3)(8)(9).



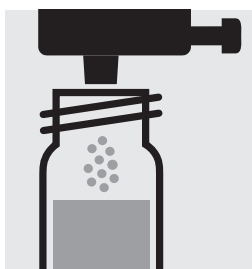
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



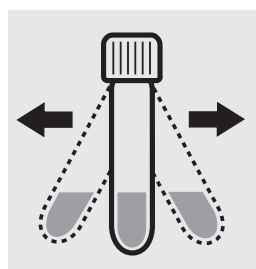
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-2K**, close with the screw cap, and mix.



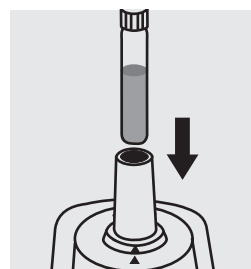
Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



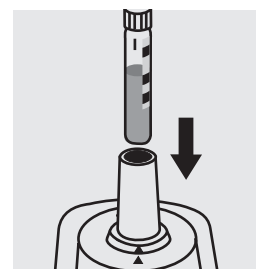
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press (Start) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

# Phosphate

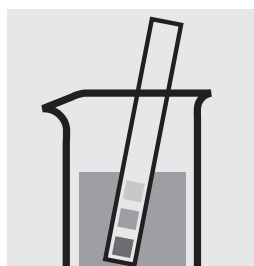
100673

Determination of total phosphorus

= sum of orthophosphate, polyphosphate, and organophosphate

Cell Test

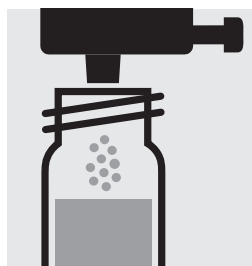
Measuring range: 3.0 – 100.0 mg/l P	16-mm cell
9 – 307 mg/l PO <sub>4</sub>	16-mm cell
7 – 229 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



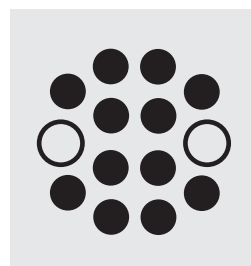
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



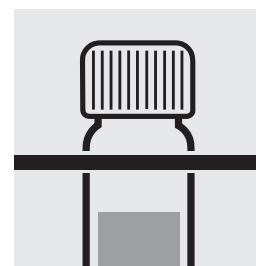
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



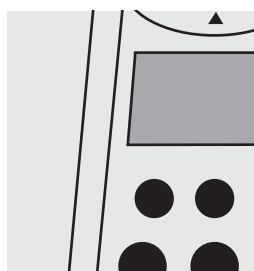
Add 1 dose of **P-1K** using the green dose-metering cap, close with the screw cap.



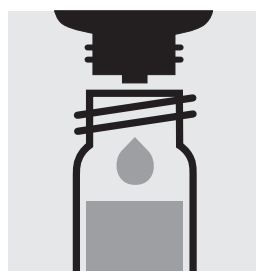
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



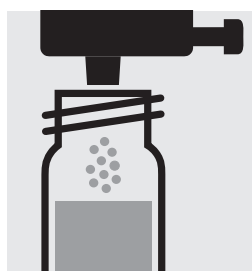
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



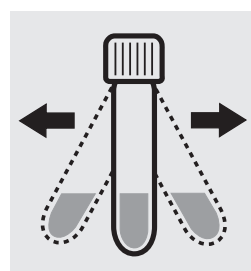
Select method (3)(8)(9).



Add 5 drops of **P-2K**, close with the screw cap, and mix.



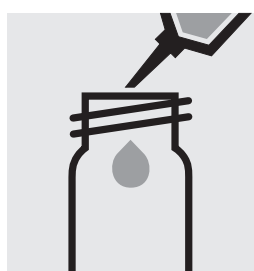
Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



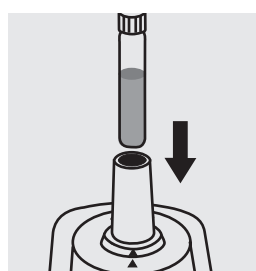
Shake the cell vigorously to dissolve the solid substance.



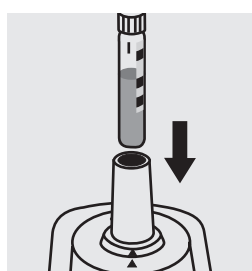
Reaction time: 5 minutes. Press (←) to start the countdown.



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 125047, 125048, and 125049.

# Phosphate

**114848**

## Determination of orthophosphate

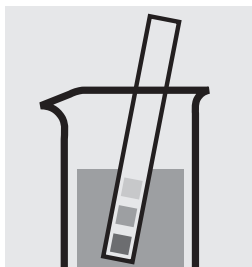
Test

**Measuring range:** 0.01 – 2.50 mg/l PO<sub>4</sub>-P      24-mm cell

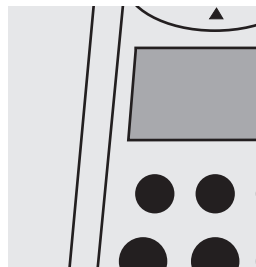
0.03 – 7.66 mg/l PO<sub>4</sub>      24-mm cell

0.02 – 5.73 mg/l P<sub>2</sub>O<sub>5</sub>      24-mm cell

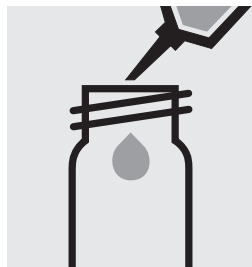
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



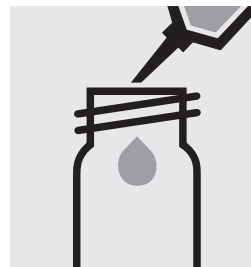
Check the pH of the sample, specified range: pH 0 – 10.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (3)(8)(3).



Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



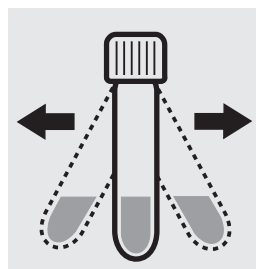
Pipette 10 ml of the sample into a 24-mm cell.



Add 10 drops of PO<sub>4</sub>-1, close with the screw cap, and mix.



Add 2 level blue microspoons of PO<sub>4</sub>-2, close with the screw cap.



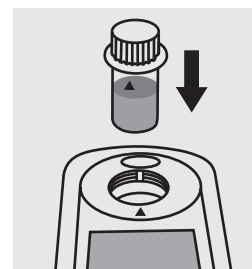
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes.  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687, and thermoreactor is necessary.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676. Use 10 ml R-1 instead of the sample.

Ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended. Use 10 ml sample + 0.1 ml R-2.

# Phosphate

100798

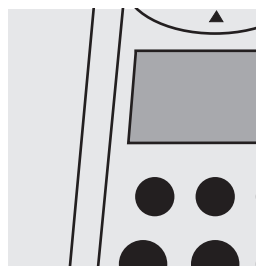
## Determination of orthophosphate

Test

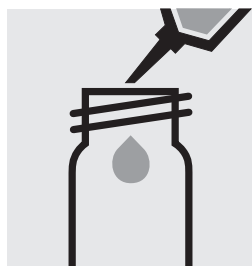
Measuring range: 1.0– 60.0 mg/l PO <sub>4</sub> -P	16-mm cell
3.1– 184.0 mg/l PO <sub>4</sub>	16-mm cell
2.3– 137.5 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



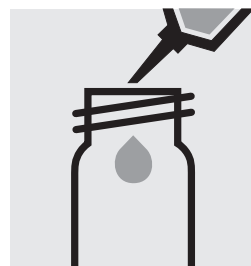
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (3)(8)(4).



Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



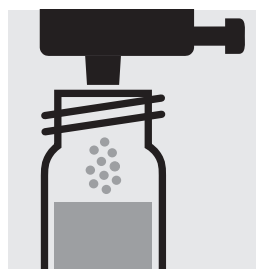
Pipette 8.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a 16-mm cell.



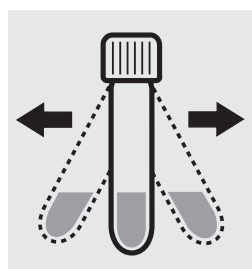
Add 0.50 ml of the sample with pipette, close with the screw cap, and mix.



Add 0.50 ml of **PO<sub>4</sub>-1** with pipette, close with the screw cap, and mix.



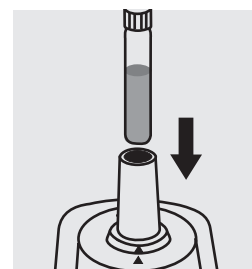
Add 1 dose of **PO<sub>4</sub>-2** using the blue dose-metering cap, close with the screw cap.



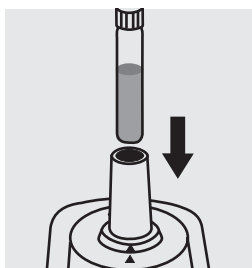
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

### Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

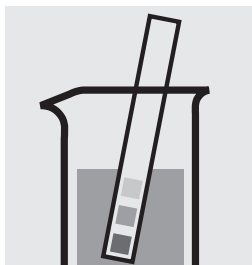
# Phosphate

114842

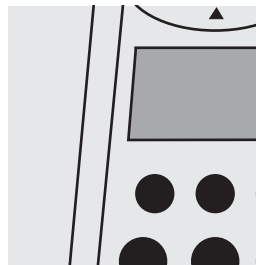
## Determination of orthophosphate

Test

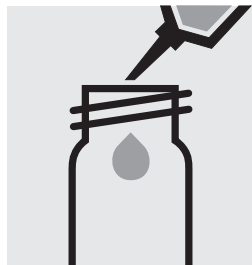
Measuring range: 0.5–30.0 mg/l PO <sub>4</sub> -P	16-mm cell
1.5–92.0 mg/l PO <sub>4</sub>	16-mm cell
1.1–68.7 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



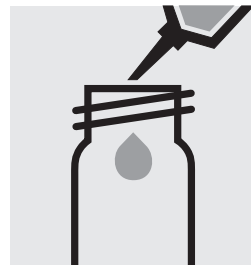
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (3)(8)(5).



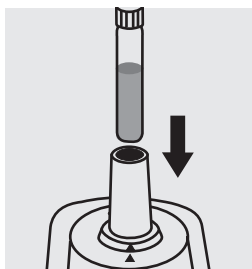
Pipette 5.0 ml of the sample into a 16-mm cell.



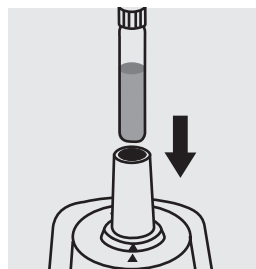
Pipette 5.0 ml of distilled water into a second 16-mm cell. (Blank cell)



Add to each cell 1.2 ml of PO<sub>4</sub>-1 with pipette, close with the screw cap, and mix.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

### Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

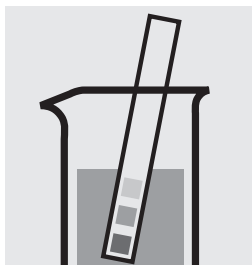
# Phosphate

114546

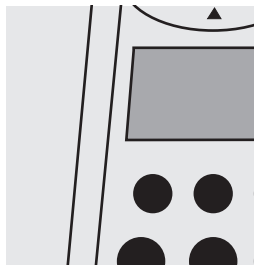
## Determination of orthophosphate

Cell Test

Measuring range: 0.5–25.0 mg/l PO <sub>4</sub> -P	16-mm cell
1.5–76.7 mg/l PO <sub>4</sub>	16-mm cell
1.1–57.3 mg/l P <sub>2</sub> O <sub>5</sub>	16-mm cell



Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



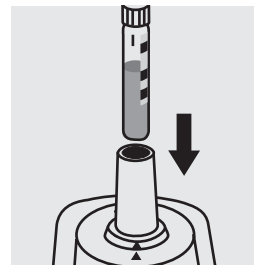
Select method (3)(8)(6).



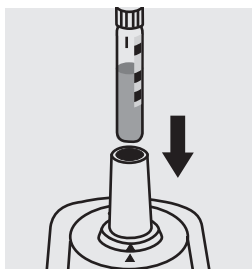
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

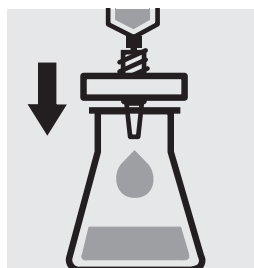
# Potassium

114562

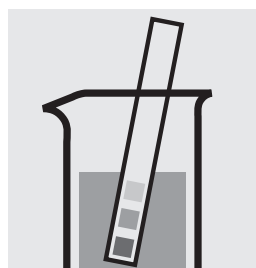
Cell Test

Measuring range: 5.0–50.0 mg/l K

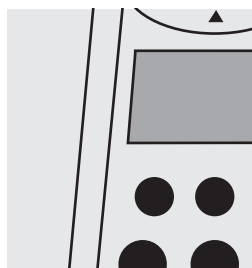
16-mm cell



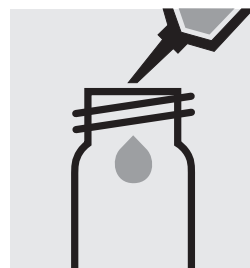
Filter turbid samples.



Check the pH of the sample, specified range: pH 3 – 12. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (4)(0)(0).



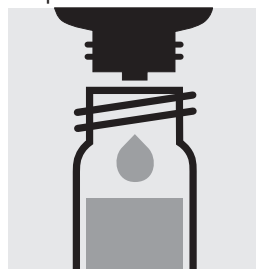
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



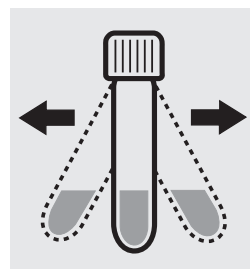
Check the pH, specified range: pH 10.0 – 11.5.



Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.



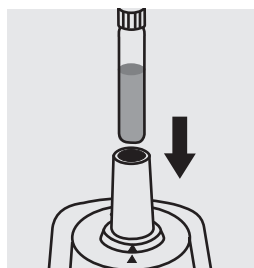
Add 1 level blue micro-spoon of **K-2K**, close the cell with the screw cap.



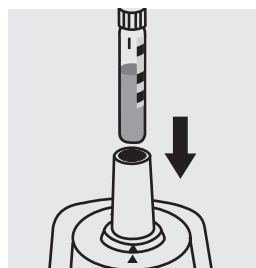
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample **without re-shaking the cell** into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use potassium standard solution Certipur®, Cat.No. 170230, concentration 1000 mg/l K, can be used after diluting accordingly.

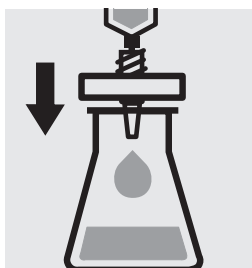
# Potassium

100615

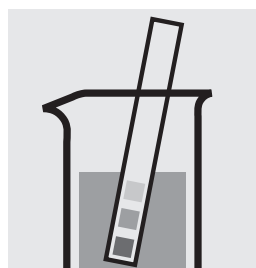
Cell Test

Measuring range: 30–300 mg/l K

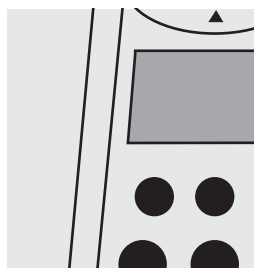
16-mm cell



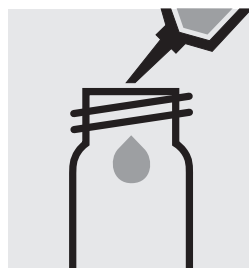
Filter turbid samples.



Check the pH of the sample, specified range: pH 3 – 12. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (4)(0)(1).



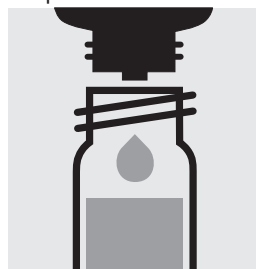
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 0.50 ml of the sample into a reaction cell, close with the screw cap, and mix.



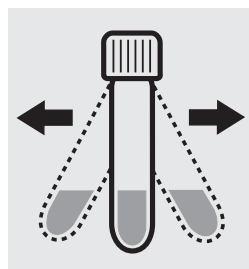
Check the pH, specified range: pH 10.0 – 11.5.



Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.



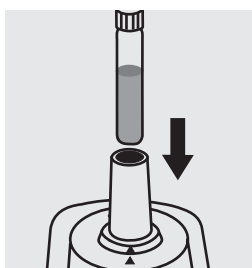
Add 1 level blue micro-spoon of **K-2K**, close the cell with the screw cap.



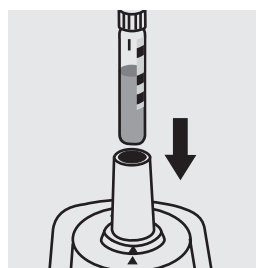
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample **without re-shaking the cell** into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use potassium standard solution Certipur®, Cat.No. 170230, concentration 1000 mg/l K, can be used after diluting accordingly.

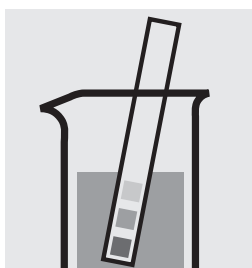


# Residual Hardness

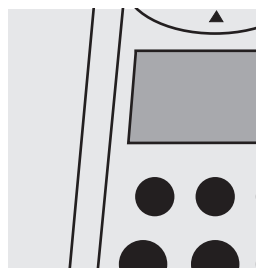
# 114683

## Cell Test

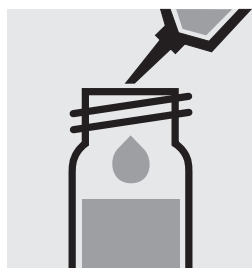
Measuring range: 0.50 – 5.00 mg/l Ca	16-mm cell	Measuring range: 0.07 – 0.70 °d	16-mm cell
0.70 – 7.00 mg/l CaO	16-mm cell	0.12 – 1.25 °f	16-mm cell
1.2 – 12.5 mg/l CaCO <sub>3</sub>	16-mm cell	0.09 – 0.87 °e	16-mm cell



Check the pH of the sample, specified range: pH 5 – 8.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (4)(1)(0).



Pipette 4.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



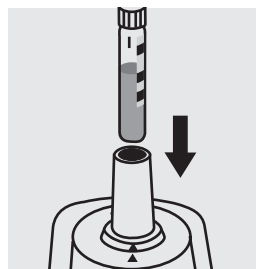
Pipette 4.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



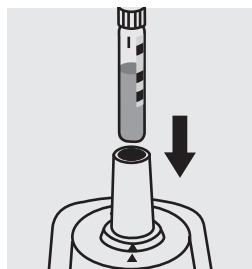
Add to each cell 0.20 ml of **RH-1K** with pipette, close with the screw cap, and mix.



Reaction time: 10 minutes, **measure immediately**. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use calcium standard solution Certipur®, Cat.No. 119778, concentration 1000 mg/l Ca, can be used after diluting accordingly. (Pay attention to pH value!)

# Silicate (Silicic Acid)

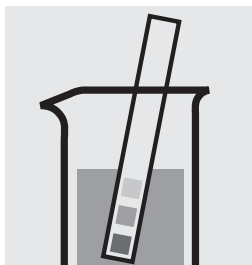
114794

Test

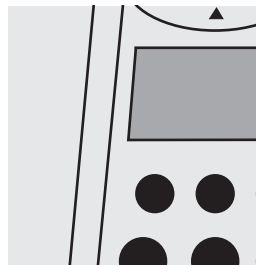
Measuring range: 0.11 – 8.56 mg/l SiO<sub>2</sub> 24-mm cell

0.05 – 4.00 mg/l Si 24-mm cell

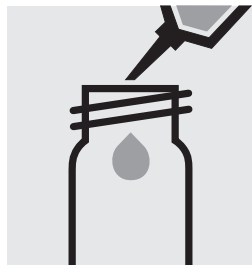
**Attention:** In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



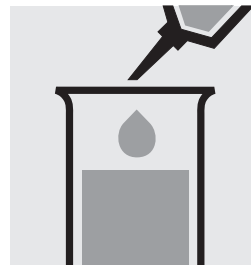
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



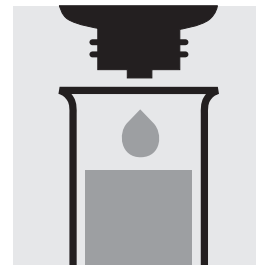
Select method (4)(2)(0).



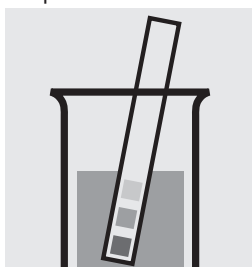
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a test tube.



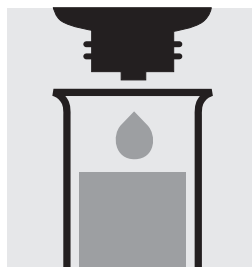
Add 6 drops of **Si-1** and mix.



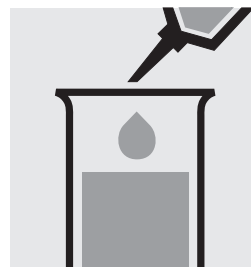
Check the pH, specified range: pH 1.2 – 1.6.



Reaction time: 3 minutes  
Press (Enter) to start the countdown.



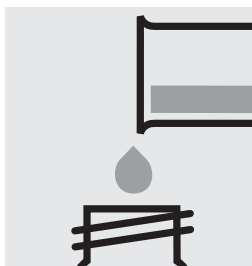
Add 6 drops of **Si-2** and mix.



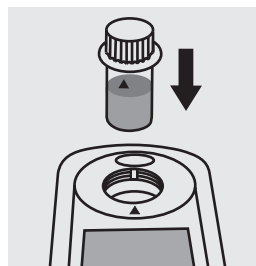
Add 1.0 ml of **Si-3** with pipette and mix.



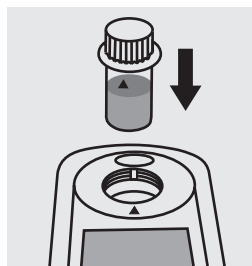
Reaction time: 10 minutes  
Press (←) to start the countdown.



Transfer the solution into a 24-mm cell, close with the screw cap.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

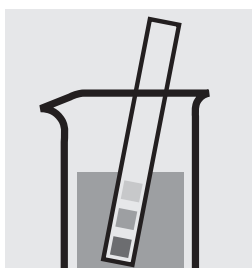
To check the measurement system (test reagents, measurement device, and handling) ready-to-use silicon standard solution Certipur®, Cat.No. 170236, concentration 1000 mg/l Si, can be used after diluting accordingly or the Standard solutions for photometric applications, CRM, Cat.Nos. 132243 and 132245 (Attention! Do **not** store standard solutions in glass vessels - see section "Standard solutions").

# Silicate (Silicic Acid)

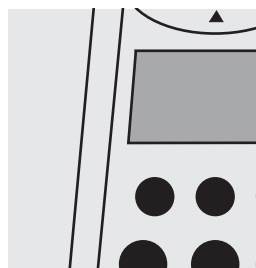
100857

Test

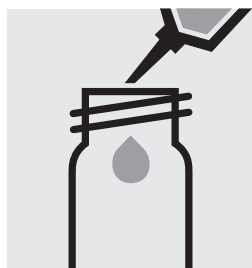
Measuring range: 11 – 1070 mg/l SiO <sub>2</sub>	16-mm cell
5 – 500 mg/l Si	16-mm cell



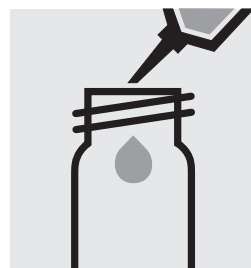
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method 4 2 1.



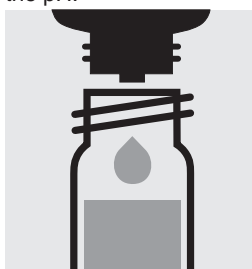
Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a 16-mm cell.



Add 0.50 ml of the sample with pipette, close with the screw cap, and mix.



Add 4 drops of **Si-1**, close with the screw cap, and mix.



Add 2.0 ml of **Si-2** with pipette, close with the screw cap, and mix.



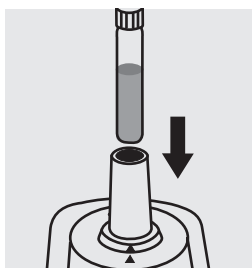
Reaction time: 2 minutes  
Press to start the countdown.



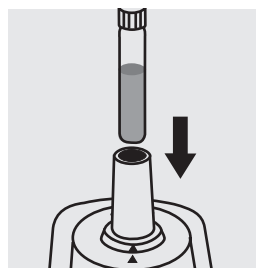
Add 4 drops of **Si-3**, close with the screw cap, and mix.



Reaction time: 2 minutes  
Press to start the countdown.



Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Press **Test**.

## Quality assurance:

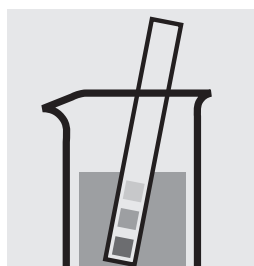
To check the measurement system (test reagents, measurement device, and handling) ready-to-use silicon standard solution Certipur®, Cat.No. 170236, concentration 1000 mg/l Si, can be used after diluting accordingly (Attention! Do **not** store standard solutions in glass vessels - see section "Standard solutions").

# Silicate (Silicic Acid)

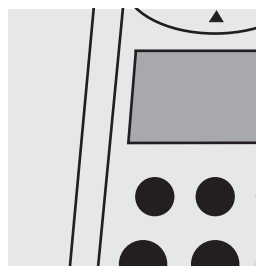
101813

Test

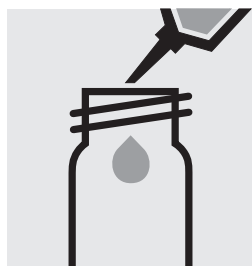
Measuring range: 0.004–0.500 mg/l SiO <sub>2</sub>	24-mm cell
0.002–0.234 mg/l Si	24-mm cell



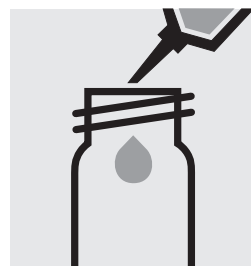
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (4)(2)(2).



Pipette 10 ml of the sample into a plastic vessel (**Flat-bottomed tubes, Cat.No. 117988**).



Pipette 10 ml of distilled water (Water Ultrapur, Cat.No. 101262, is recommended) into a second plastic vessel (**Flat-bottomed tubes, Cat.No. 117988**). (Blank)



Add to each vessel 0.10 ml of **Si-1** with pipette, close with the screw cap, and mix.



Check the pH, specified range: pH 1.2 – 1.6.



Reaction time: 5 minutes. Press (←) to start the countdown.



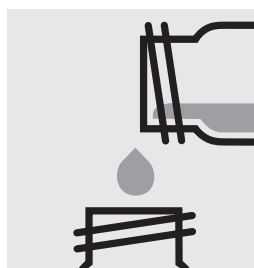
Add to each vessel 0.10 ml of **Si-2** with pipette, close with the screw cap, and mix.



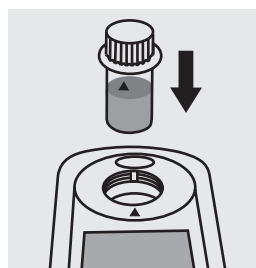
Add to each vessel 0.50 ml of **Si-3** with pipette, close with the screw cap, and mix.



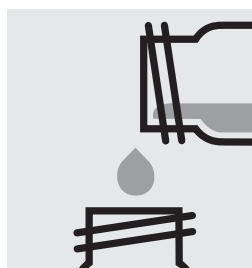
Reaction time: 5 minutes. Press (←) to start the countdown.



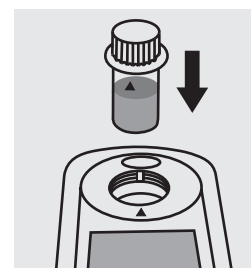
Transfer the blank into a 24-mm cell, close with the screw cap and measure **immediately**.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Transfer the measurement sample into a 24-mm cell, close with the screw cap and measure **immediately**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

**No glass equipment** may be used in the course of the determination (e.g. pipettes etc.)!

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use silicon standard solution Certipur®, Cat.No. 170236, concentration 1000 mg/l Si, can be used after diluting accordingly or the Standard solution for photometric applications, CRM, Cat.No. 132244 (Attention! Do **not** store standard solutions in glass vessels - see section "Standard solutions").

# Sodium

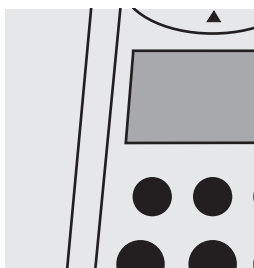
in nutrient solutions

100885

Cell Test

Measuring range: 10–300 mg/l Na

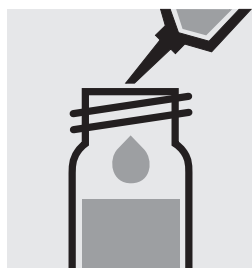
16-mm cell



Select method (4)(3)(0).



Pipette 0.50 ml each of **Na-1K** into two reaction cells, close with the screw cap, and mix.



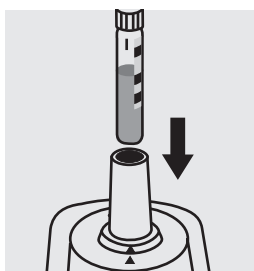
Add to one cell 0.50 ml of the sample with pipette, close with the screw cap, and mix.



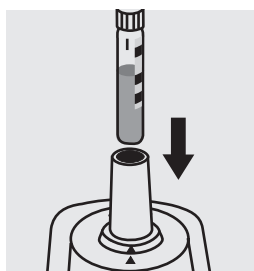
Add to the second cell 0.50 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup> (corresponds to 649 mg/l Na), can be used after diluting accordingly (see section “Standard solutions”).

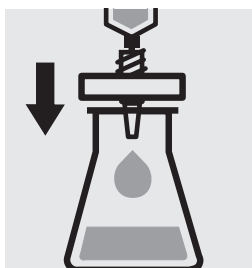
# Sulfate

102532

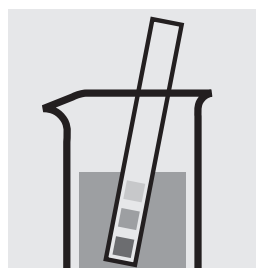
Cell Test

Measuring range: 2.0–50.0 mg/l SO<sub>4</sub>

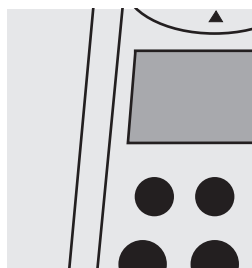
16-mm cell



Filter turbid samples.



Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (4)(4)(4).



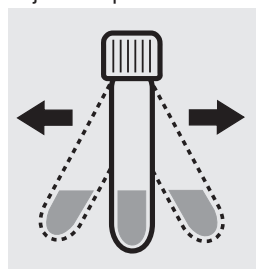
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.



Pipette 10 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



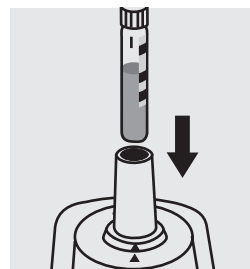
Add to each cell 1 level green microspoon of SO<sub>4</sub>-1K, close the cell with the screw cap.



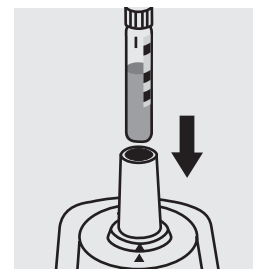
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 2 minutes, **measure immediately**. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly.

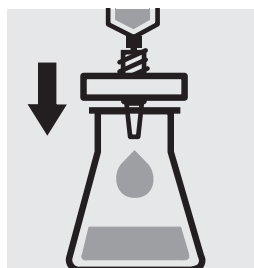
# Sulfate

114548

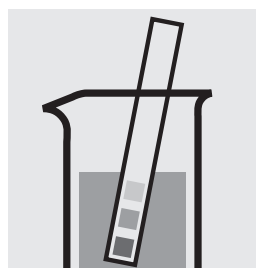
Cell Test

Measuring range: 5–250 mg/l SO<sub>4</sub>

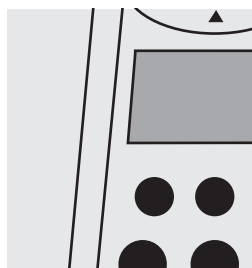
16-mm cell



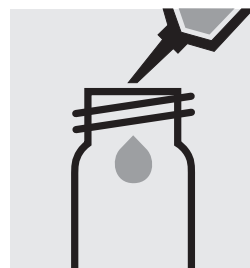
Filter turbid samples.



Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (4)(4)(0).



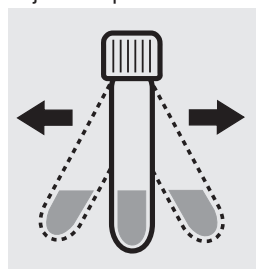
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



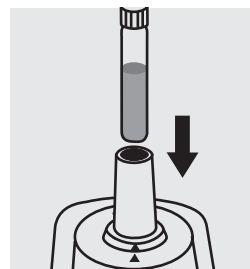
Add 1 level green micro-spoon of SO<sub>4</sub>-1K, close the cell with the screw cap.



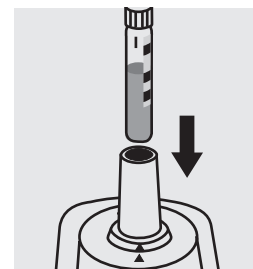
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 2 minutes, **measure immediately**. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solutions for photometric applications, CRM, Cat.No.S. 125050 and 125051.

Ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

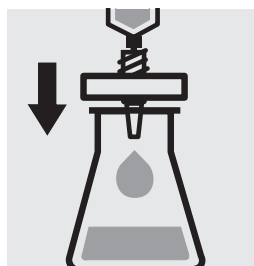
# Sulfate

100617

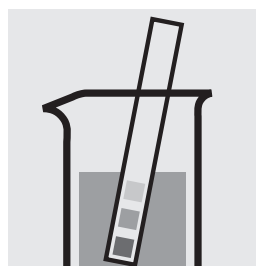
Cell Test

Measuring range: 50–500 mg/l SO<sub>4</sub>

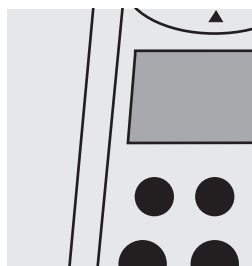
16-mm cell



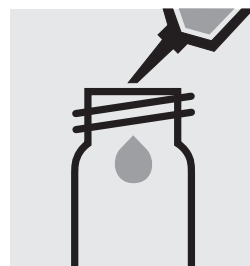
Filter turbid samples.



Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



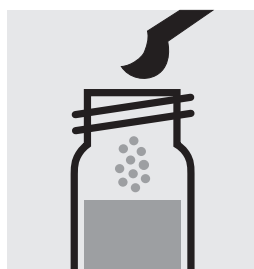
Select method (4)(4)(1).



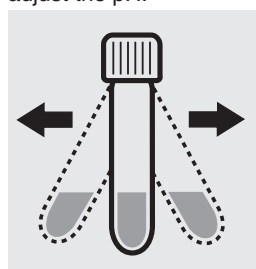
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



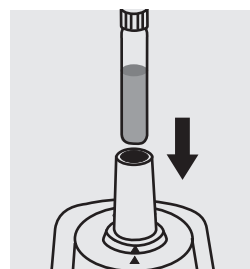
Add 1 level green micro-spoon of SO<sub>4</sub>-1K and close the cell with the screw cap.



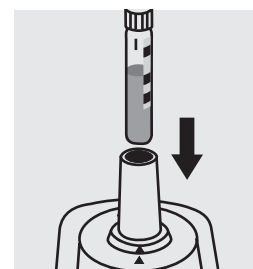
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 2 minutes, **measure immediately**. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125051 and 125052.

Ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

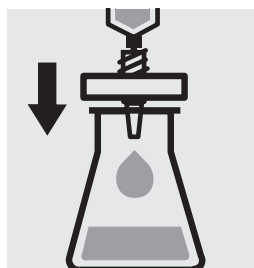


# Sulfate

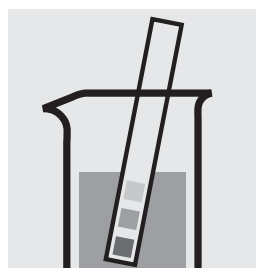
114564

Cell Test

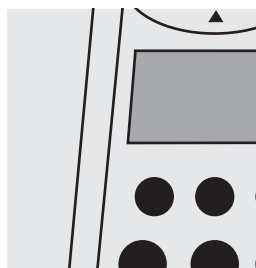
Measuring range: 100–1000 mg/l SO<sub>4</sub> 16-mm cell



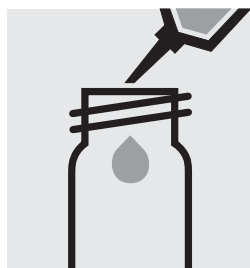
Filter turbid samples.



Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (4)(4)(2).



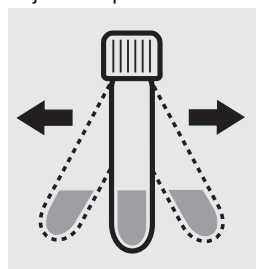
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



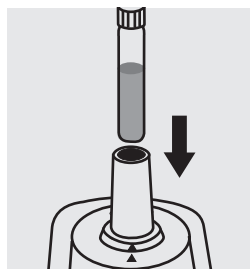
Add 1 level green micro-spoon of SO<sub>4</sub>-1K, close the cell with the screw cap.



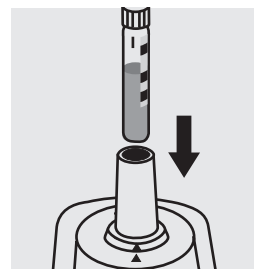
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 2 minutes, **measure immediately**. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20, Cat.No. 114675, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125051, 125052 and 125053.

Ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

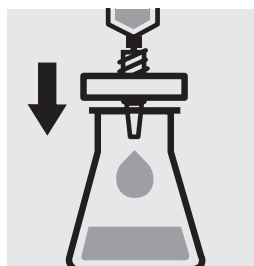
# Sulfate

101812

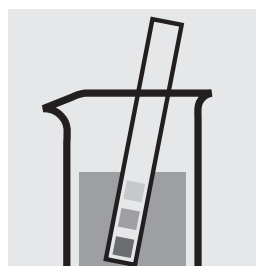
Test

Measuring range: 1.0–25.0 mg/l SO<sub>4</sub>

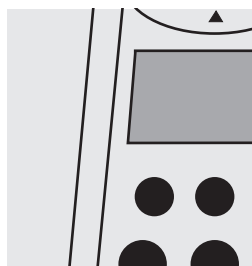
24-mm cell



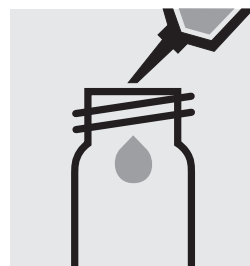
Filter turbid samples.



Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (4)(4)(3).



Pipette 0.50 ml each of SO<sub>4</sub>-1 into two 24-mm cells.



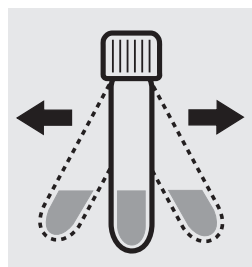
Add to one cell 10 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 10 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



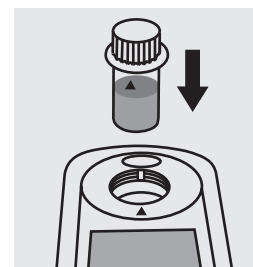
Add to each cell 1 level green microspoon of SO<sub>4</sub>-2, close the cell with the screw cap.



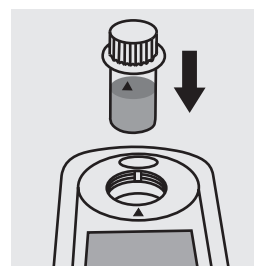
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 2 minutes, **measure immediately**. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly.

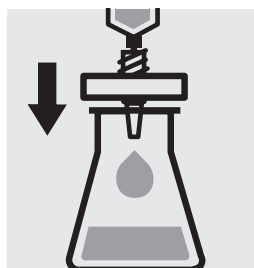
# Sulfate

102537

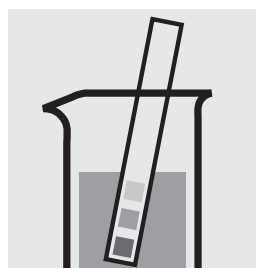
Test

Measuring range: 10–300 mg/l SO<sub>4</sub>

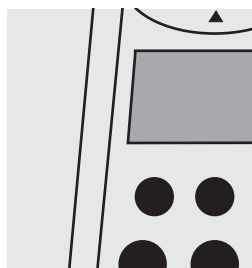
16-mm cell



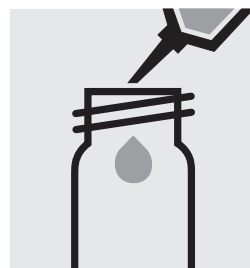
Filter turbid samples.



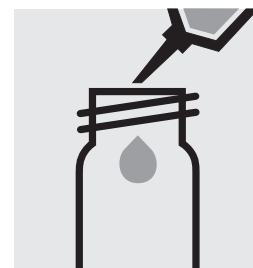
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method or (4)(4)(5) or (4)(4)(6).\*



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



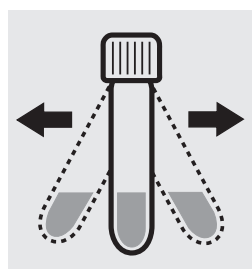
Pipette 0.50 ml of SO<sub>4</sub>-1 into a 16-mm cell.



Add 5.0 ml of the sample with pipette, close with the screw cap, and mix.



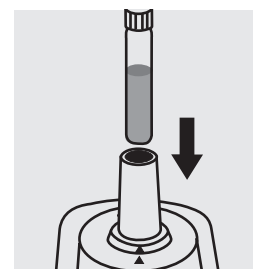
Add 1 level blue micro-spoon of SO<sub>4</sub>-2 and close the cell with the screw cap.



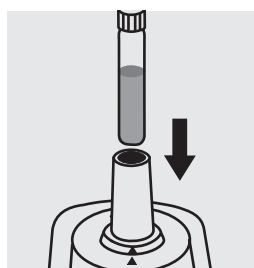
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 2 minutes, **measure immediately**. Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Press (Test).

\* For batches with a minimum shelf life **till** 2021/10/31: select method number 445. For batches with a minimum shelf life **after** 2021/10/31: select method number 446.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125050 and 125051.

Ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

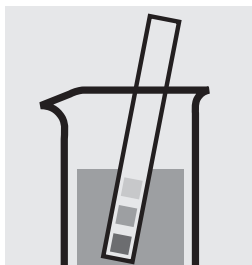
# Sulfide

114779

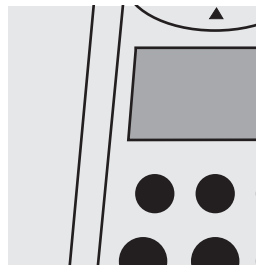
Test

Measuring range: 0.10 – 1.50 mg/l S

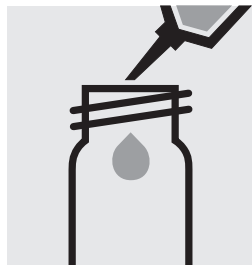
16-mm cell



Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **450**.



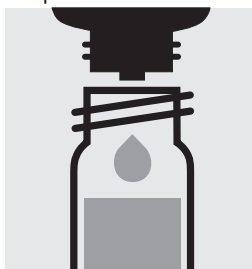
Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



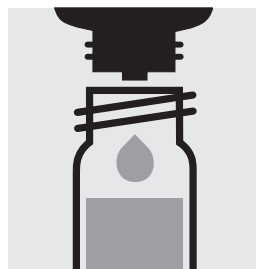
Pipette 5.0 ml of the sample into a 16-mm cell.



Add 1 drop of **S-1**, close with the screw cap, and mix.



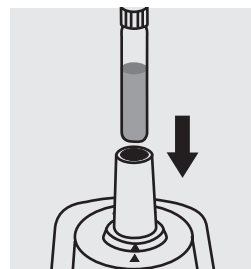
Add 5 drops of **S-2**, close with the screw cap, and mix.



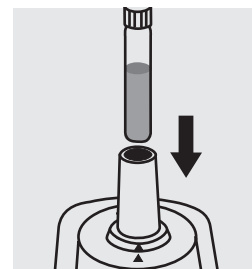
Add 5 drops of **S-3**, close with the screw cap, and mix.



Reaction time: 1 minute  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Press **Test**.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a sulfide standard solution must be prepared from sodium sulfide GR (see section "Standard solutions").

# Sulfite

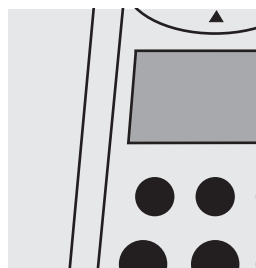
114394

Cell Test

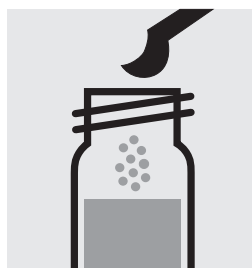
Measuring range: 1.0 – 20.0 mg/l SO <sub>3</sub>	16-mm cell
0.8 – 16.0 mg/l SO <sub>2</sub>	16-mm cell



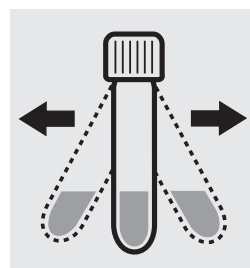
Check the pH of the sample, specified range: pH 4 – 9.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (4)(6)(0).



Add 1 level grey micro-spoon each of **SO<sub>3</sub>-1K** into two reaction cells, close with the screw cap.



Shake both cells vigorously to dissolve the solid substance.



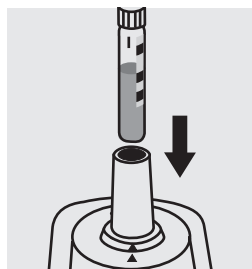
Add to one cell 3.0 ml of the sample with pipette, close with the screw cap, and mix.



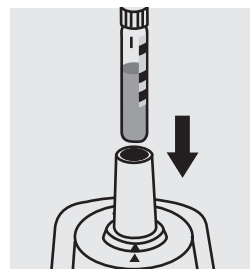
Add to the second cell 3.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Reaction time: 2 minutes.  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

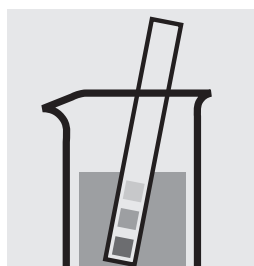
To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR, Cat.No. 106657 (see section “Standard solutions”).

# Sulfite

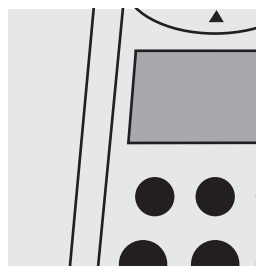
101746

Test

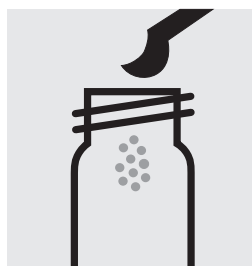
Measuring range: 1.0 – 60.0 mg/l SO <sub>3</sub>	16-mm cell
0.8 – 48.0 mg/l SO <sub>2</sub>	16-mm cell



Check the pH of the sample, specified range: pH 4 – 9.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



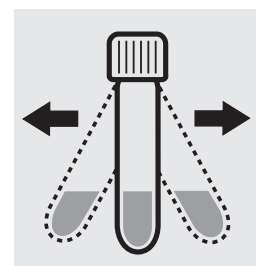
Select method 461.



Place 1 level grey microspoon each of SO<sub>3</sub>-1 into two dry 16-mm cells.



Add to each cell 3.0 ml of SO<sub>3</sub>-2 with pipette, close with the screw cap.



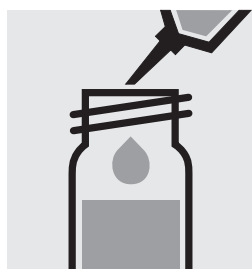
Shake both cells vigorously to dissolve the solid substance.



Add to each cell 5.0 ml of distilled water with pipette, close with the screw cap, and mix.



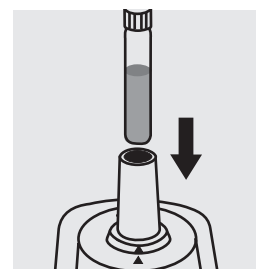
Add to one cell 2.0 ml of the sample with pipette, close with the screw cap, and mix.



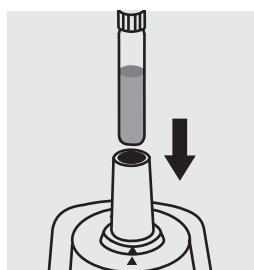
Add to the second cell 2.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Reaction time: 2 minutes  
Press to start the countdown.



Insert the blank cell into the cell compartment. Press .



Insert the cell containing the sample into the cell compartment. Press .

## Quality assurance:

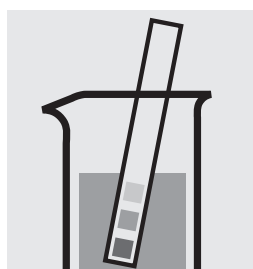
To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR, Cat.No. 106657 (see section “Standard solutions”).

# Surfactants (anionic)

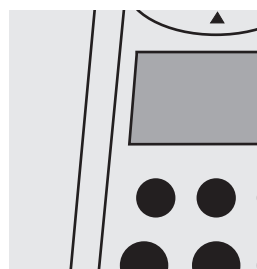
102552

Cell Test

<b>Measuring range:</b> 0.10–2.00 mg/l SDAS*	16-mm cell
*sodium 1-dodecanesulfonate	
0.06 – 2.56 mg/l SDBS*	
*sodium dodecylbenzenesulfonate	
0.05 – 2.12 mg/l SDS*	
*sodium dodecyl sulfate	
0.08 – 3.26 mg/l SDOSSA*	
*sodium dioctyl sulfosuccinate	



Check the pH of the sample, specified range: pH 5 – 10.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (4)(7)(3).



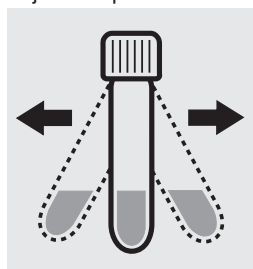
Pipette 5.0 ml of the sample into a reaction cell, **do not mix!**



Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, **do not mix!** (Blank cell)



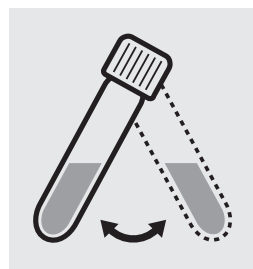
Add to each cell 2 drops of **T-1K**, close with the screw cap.



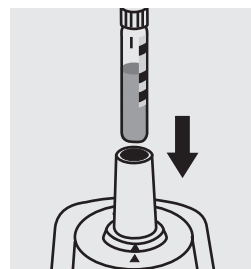
Shake both cells **vigorously for 30 seconds**.



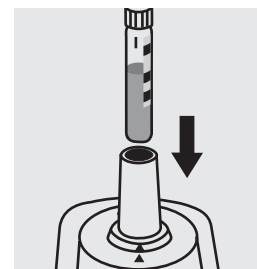
Reaction time: 10 minutes  
Press (←) to start the countdown.



Swirl both cells before the measurement.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from dodecane-1-sulfonic acid sodium salt GR, Cat.No. 112146 (see section “Standard solutions”).

# Surfactants (cationic)

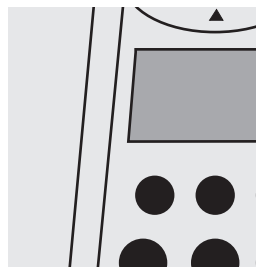
101764

Cell Test

**Measuring range:** 0.05–1.50 mg/l surfactants (cationic) 16-mm cell  
(calculated as N-cetyl-N,N,N-trimethylammonium bromide)



Check the pH of the sample, specified range: pH 3 – 8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (4)(7)(1).



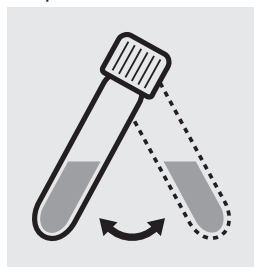
Pipette 5.0 ml of the sample into a reaction cell, **do not mix!**



Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, **do not mix!** (Blank cell)



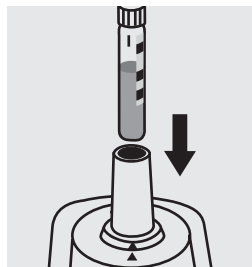
Add to each cell 0.50 ml of **T-1K** with pipette, close with the screw cap.



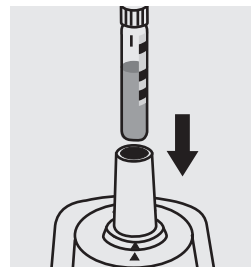
Swirl both cells for 30 seconds.



Reaction time: 5 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from Cetyltrimethylammonium Bromide, Cat.No. 219374 (see section “Standard solutions”).



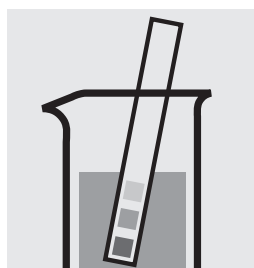
# Surfactants (nonionic)

101787

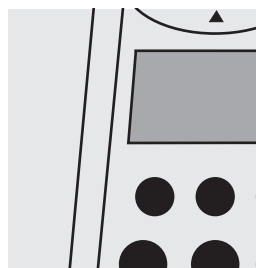
Cell Test

**Measuring range:** 0.10–7.50 mg/l surfactants (nonionic)  
(calculated as Triton® X-100)

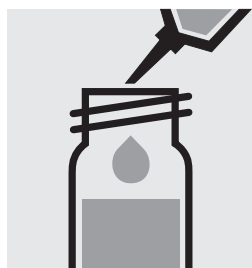
16-mm cell



Check the pH of the sample, specified range: pH 3 – 9.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



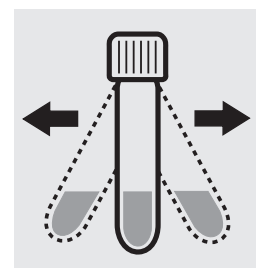
Select method (4)(7)(2).



Pipette 4.0 ml of the sample into a reaction cell, close with the screw cap.



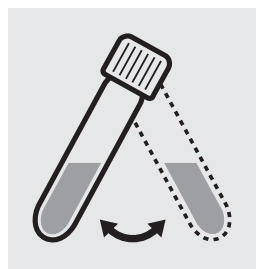
Pipette 4.0 ml of distilled water into a second reaction cell, close with the screw cap. (Blank cell)



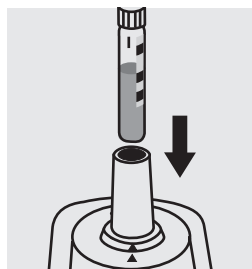
Shake both cells **vigorously for 1 minute**.



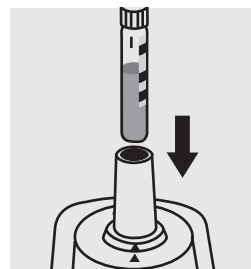
Reaction time: 2 minutes  
Press (←) to start the countdown.



Swirl both cells before the measurement.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

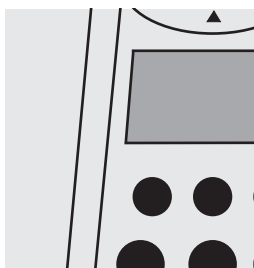
To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from Triton® X-100, Cat.No. 112298 (see section “Standard solutions”).

The Standard solutions for photometric applications, CRM, Cat.Nos. 133022 and 133023 can also be used.

# Suspended Solids

Measuring range: 50 – 750 mg/l of suspended solid

24-mm cell



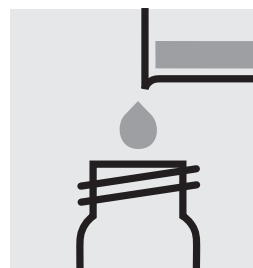
Select method (4)(8)(0).



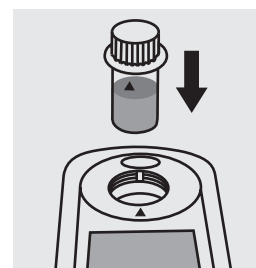
Fill approx. 10 ml of distilled water into a 24-mm cell, close with the screw cap. (Blank cell)



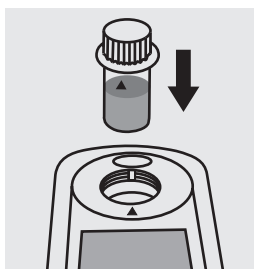
Homogenize 500 ml of sample for 2 minutes in a mixer running at high speed.



Transfer the solution into a 24-mm cell, close with the screw cap.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

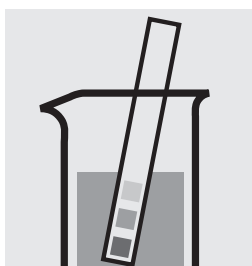
# Tin

114622

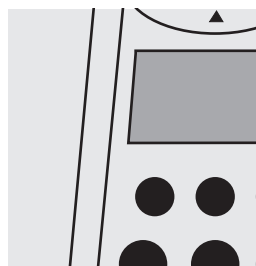
Cell Test

Measuring range: 0.10–2.50 mg/l Sn

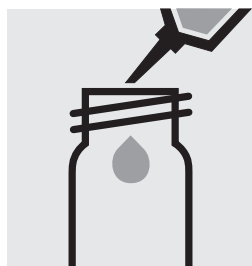
16-mm cell



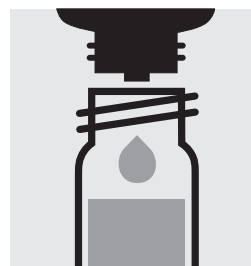
Check the pH of the sample, specified range: pH <3.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method (4)(9)(0).



Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Add 6 drops of **Sn-1K** into a reaction cell, close with the screw cap, and mix.



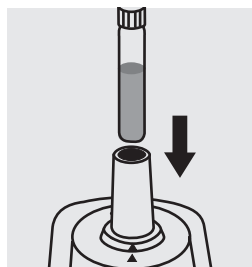
Add 5.0 ml of the sample with pipette, close with the screw cap, and mix.



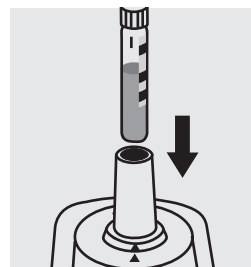
Check the pH, specified range: pH 1.5 – 3.5.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



Reaction time: 15 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Quality assurance:

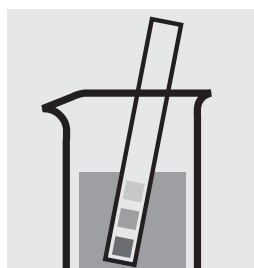
To check the measurement system (test reagents, measurement device, and handling) a tin standard solution must be prepared from ready-to-use tin standard solution Certipur®, Cat.No. 170242, concentration 1000 mg/l Sn (see section “Standard solutions”).

# Total Hardness

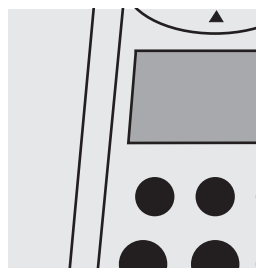
# 100961

## Cell Test

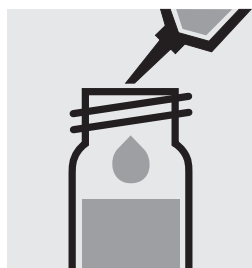
<b>Measuring range:</b> 5 – 215 mg/l Ca	16-mm cell	<b>Measuring range:</b> 0.7 – 30.1 °d	16-mm cell
7 – 301 mg/l CaO	16-mm cell	1.2 – 53.7 °f	16-mm cell
12 – 537 mg/l CaCO <sub>3</sub>	16-mm cell	0.9 – 37.6 °e	16-mm cell



Check the pH of the sample, specified range: pH 3 – 9.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (5)(1)(0).



Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



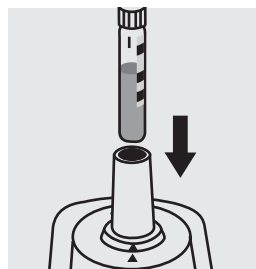
Pipette 1.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



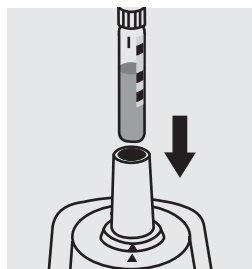
Add to each cell 1.0 ml of H-1K with pipette, close with the screw cap, and mix.



Reaction time: 3 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

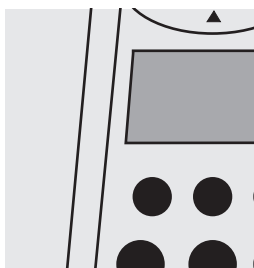
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Turbidity

analogous to EN ISO 7027

Measuring range: 1 – 100 FAU

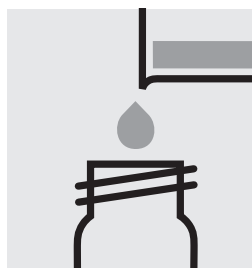
24-mm cell



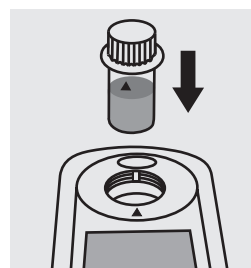
Select method (5)(2)(0).



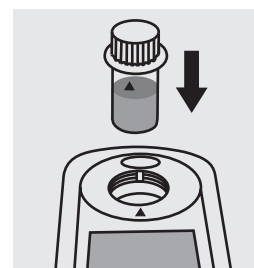
Fill approx. 10 ml of distilled water into a 24-mm cell, close with the screw cap. (Blank cell)



Transfer the sample into a 24-mm cell, close with the screw cap.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



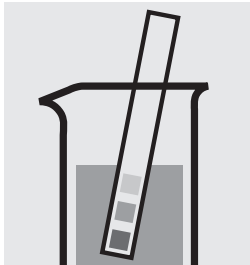
Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

# Volatile Organic Acids

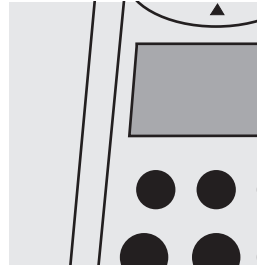
101749

Cell Test

<b>Measuring range:</b> 50 – 3000 mg/l volatile organic acid	(calculated as acetic acid)	16-mm cell
71 – 4401 mg/l volatile organic acid	(calculated as butyric acid)	16-mm cell



Check the pH of the sample, specified range: pH 2 – 12.



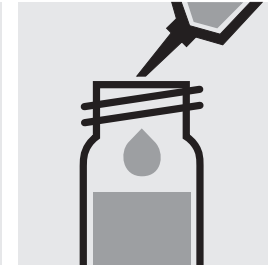
Select method **531**.



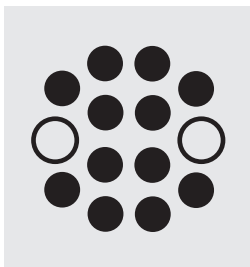
Pipette 0.50 ml each of **OA-1K** into two reaction cells.



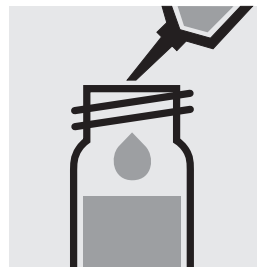
Add to one cell 0.50 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 0.50 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Heat both cells in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.



Add to each cell 1.0 ml of **OA-2K** with pipette.



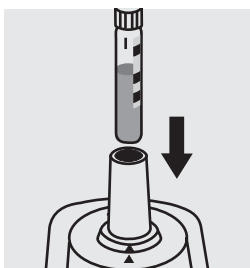
Add to each cell 1.0 ml of **OA-3K** with pipette, close with the screw cap, and mix.



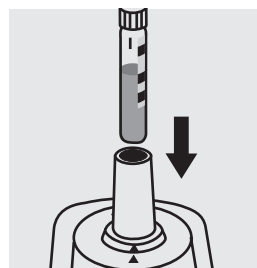
Add to each cell 1.0 ml of **OA-4K** with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press **Start** to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous, Cat.No. 106268 (see section "Standard solutions").

# Volatile Organic Acids

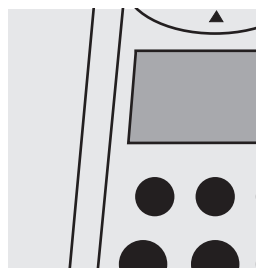
101809

Test

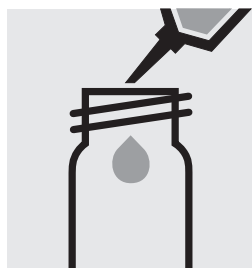
<b>Measuring range:</b> 50 – 3000 mg/l volatile organic acid	(calculated as acetic acid)	16-mm cell
71 – 4401 mg/l volatile organic acid	(calculated as butyric acid)	16-mm cell



Check the pH of the sample, specified range: pH 2 – 12.



Select method (5)(3)(1).



Pipette 0.75 ml each of **OA-1** into two round cells.



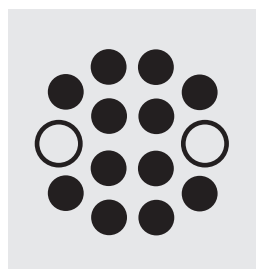
Add to each cell 0.50 ml of **OA-2** with pipette.



Add to one cell 0.50 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 0.50 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Heat both cells in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.



Add to each cell 1.0 ml of **OA-3** with pipette.



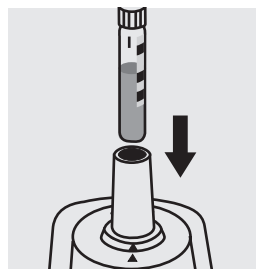
Add to each cell 1.0 ml of **OA-4** with pipette, close with the screw cap, and mix.



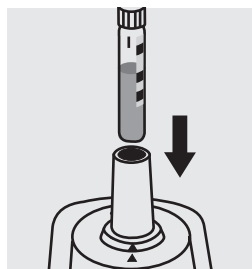
Add to each cell 1.0 ml of **OA-5** with pipette, close with the screw cap, and mix.



Reaction time: 1 minute  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous, Cat.No. 106268 (see section "Standard solutions").

# Zinc

**100861**

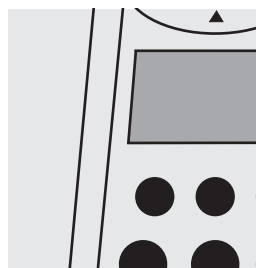
Cell Test

Measuring range: 25 – 1000 µg/l Zn

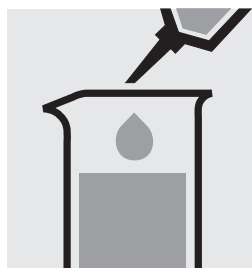
16-mm cell



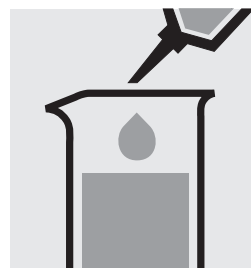
Check the pH of the sample, specified range: pH 1 – 7.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



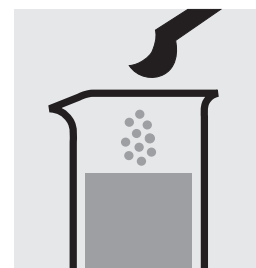
Select method **540**.



Pipette 10 ml of the sample into a glass vessel.



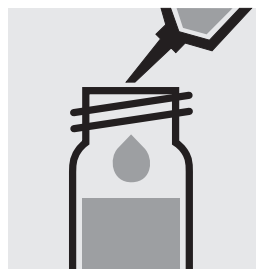
Pipette 10 ml of distilled water into a second glass vessel.



Add to each glass vessel 1 level green microscoop of **Zn-1K** and dissolve the solid substance: **pretreated sample / blank**.



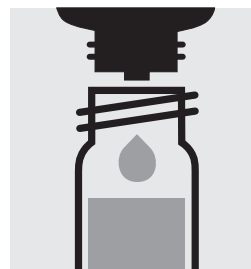
Pipette 0.50 ml each of **Zn-2K** into two reaction cells, close with the screw cap, and mix.



Add to one cell 2.0 ml of **pretreated sample** with pipette, close the cell with the screw cap, and mix.



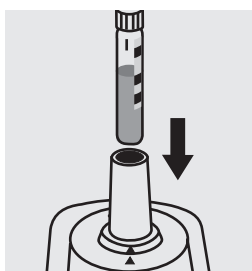
Add to the second cell 2.0 ml of **pretreated blank** with pipette, close the cell with the screw cap, and mix. (Blank cell)



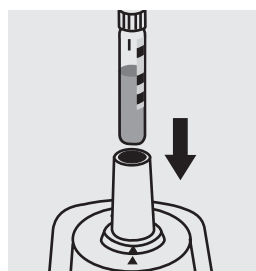
Add to each cells 5 drops of **Zn-3K**, close the cell with the screw cap, and mix.



Reaction time: 15 minutes  
Press **←** to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **Zero**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

**Important:**

For the determination of **total zinc** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687, and thermoreactor is necessary.

**Quality assurance:**

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100, Cat.No. 118701.

Ready-to-use zinc standard solution Certipur®, Cat.No. 119806, concentration 1000 mg/l Zn, can also be used after diluting accordingly.

The measurement results are expressed in µg/l.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.



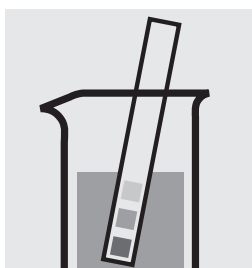
# Zinc

**114566**

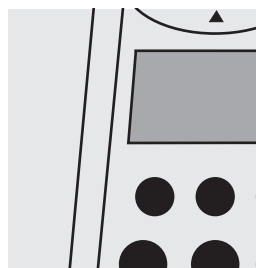
Cell Test

Measuring range: 0.20 – 5.00 mg/l Zn

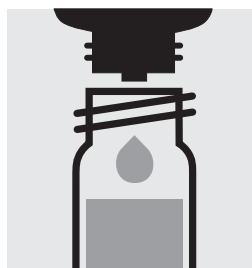
16-mm cell



Check the pH of the sample, specified range: pH 3 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (5)(4)(1).



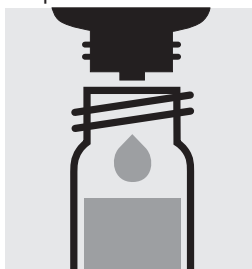
Add 5 drops each of **Zn-1K** into two reaction cells, close with the screw cap, and mix.



Add to one cell 0.50 ml of the sample with pipette, close with the screw cap, and mix.



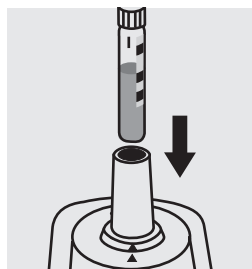
Add to the second cell 0.50 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



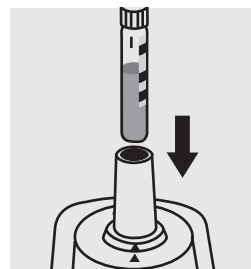
Add to each cell 5 drops of **Zn-2K**, close with the screw cap, and mix.



Reaction time: 15 minutes  
Press (←) to start the countdown.



Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press (Zero).



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

## Important:

For the determination of **total zinc** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687, and thermoreactor is necessary.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 40, Cat.No. 114692.

Ready-to-use zinc standard solution Certipur®, Cat.No. 119806, concentration 1000 mg/l Zn, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

## 5.2 Standard solutions

### 5.2.1 Use of Spectroquant® CombiCheck and ready-to-use standard solutions

#### CombiCheck standard solutions

CombiCheck	Cat. No.	Parameter	Can be used for Cat No.
10	114676	Ammonium	114558
		Chloride	114730
		COD	114540
		Nitrate	114773, 114556
		Phosphate	114543, 114848, 110474
		Sulfate	114548, 100617
20	114675	Ammonium	-
		Chloride	114730
		COD	114541
		Nitrate	114542
		Phosphate	114729, 100475
		Sulfate	114564
30	114677	Cadmium	114834
		Iron	114549, 100796
		Copper	114553, 114767
		Manganese	100816, 114770
40	114692	Aluminium	-
		Lead	114833, 109717
		Nickel	114554, 114785
		Zinc	114566
50	114695	Ammonium	114739, 114752
		COD	101796
		Nitrogen	114537
60	114696	Chloride	114897
		COD	114895, 114690
70	114689	Ammonium	114559, 100683
		COD	114555
		Nitrogen	-
80	114738	COD	114691
		Nitrate	-
		Phosphate	114729, 100475
90	118700	Cadmium	114834, 101745
		Iron	114549, 114761, 100796
		Copper	114553, 114767
		Manganese	100816, 114770, 101846
100	118701	Aluminium	114825, 100594
		Lead	114833, 109717
		Nickel	114554, 114785
		Zinc	100861

# Standard solutions

Test / Method	Cat. No. Test	Evaluation as	CombiCheck, Confidence interval			Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Cat. No.	Spec. value for the standard	max. working tolerance	Cat. No.	concentration	expanded measurement uncertainty	
Acid Capacity	101758	OH	-	5.00 mmol/l*	± 0.50 mmol/l	-	-	-	see 5.2.2
Aluminium	114825	Al	100, 118701	R-1: 400 µg/l	± 50 µg/l	132225	200 µg/l	± 6 µg/l	119770**
				R-2: 240 µg/l	± 40 µg/l	132226	50 µg/l	± 2 µg/l	
Aluminium	100594	Al	100, 118701	R-1: 0.40 mg/l	± 0.05 mg/l	132225	0.200 mg/l	± 0.006 mg/l	119770**
Ammonium	114739	NH <sub>4</sub> -N	50, 114695	R-1: 1000 µg/l	± 100 µg/l	125022	400 µg/l	± 12 µg/l	119812**
				R-2: 1000 µg/l	± 100 µg/l	125023	1000 µg/l	± 40 µg/l	
132227	250 µg/l	± 11 µg/l							
Ammonium	114558	NH <sub>4</sub> -N	10, 114676	R-1: 4.00 mg/l	± 0.30 mg/l	125022	0.400 mg/l	± 0.012 mg/l	119812**
				R-2: 3.00 mg/l	± 0.25 mg/l	125023	1.00 mg/l	± 0.04 mg/l	
						125024	2.00 mg/l	± 0.07 mg/l	
						125025	6.00 mg/l	± 0.13 mg/l	
Ammonium	114559	NH <sub>4</sub> -N	70, 114689	R-1: 50.0 mg/l	± 5.0 mg/l	125025	6.00 mg/l	± 0.13 mg/l	119812**
				R-2: 20.0 mg/l	± 2.0 mg/l	125026	12.0 mg/l	± 0.4 mg/l	
						125027	50.0 mg/l	± 1.2 mg/l	
Ammonium	114752	NH <sub>4</sub> -N	50, 114695	R-1: 1.00 mg/l	± 0.10 mg/l	125022	0.400 mg/l	± 0.012 mg/l	119812**
				R-2: 1.00 mg/l	± 0.10 mg/l	125023	1.00 mg/l	± 0.04 mg/l	
						132227	0.250 mg/l	± 0.011 mg/l	
Ammonium	100683	NH <sub>4</sub> -N	70, 114689	R-1: 50.0 mg/l	± 5.0 mg/l	125025	6.00 mg/l	± 0.13 mg/l	119812**
				R-2: 20.0 mg/l	± 2.0 mg/l	125026	12.0 mg/l	± 0.4 mg/l	
AOX	100675	AOX	-	1.00 mg/l*	± 0.10 mg/l	-	-	-	100680
Arsenic	101747	As	-	50 µg/l*	± 5 µg/l	133002	1000 µg/l	± 50 µg/l	119773**
BOD	100687	O <sub>2</sub>	-	210 mg/l	± 20 mg/l	-	-	-	100718
Boron	100826	B	-	1.00 mg/l*	± 0.15 mg/l	133005	1.00 mg/l	± 0.06 mg/l	119500**
Bromine	100605	Br <sub>2</sub>	-	2.50 mg/l*	± 0.25 mg/l	-	-	-	see 5.2.2
Cadmium	114834	Cd	30, 114677	R-1: 500 µg/l	± 60 µg/l	132228	100 µg/l	± 3 µg/l	119777**
				R-2: 300 µg/l	± 45 µg/l				
			90, 118700	R-1: 250 µg/l	± 30 µg/l				
				R-2: 200 µg/l	± 30 µg/l				
Cadmium	101745	Cd	90, 118700	R-1: 250 µg/l	± 30 µg/l	132228	100 µg/l	± 3 µg/l	119777**
				R-2: 100 µg/l	± 15 µg/l				
Calcium	100858	Ca	-	75 mg/l*	± 7 mg/l	-	-	-	see 5.2.2
Calcium	114815	Ca	-	80 mg/l*	± 8 mg/l	-	-	-	119778**
Chloride	114730	Cl	10, 114676	R-1: 25 mg/l	± 6 mg/l	132229	10.0 mg/l	± 0.5 mg/l	119897**
				R-2: 25 mg/l	± 6 mg/l	132230	50 mg/l	± 3 mg/l	
			20, 114675	R-1: 60 mg/l	± 10 mg/l				
				R-2: 40 mg/l	± 7 mg/l				
Chloride	114897	Cl	60, 114696	R-1: 125 mg/l	± 13 mg/l	132229	10.0 mg/l	± 0.5 mg/l	119897**
				R-2: 50 mg/l	± 7 mg/l	132230	50 mg/l	± 3 mg/l	
Chloride	101804	Cl	-	7.5 mg/l*	± 0.8 mg/l	-	-	-	119897**
Chloride	101807	Cl	-	2.50 mg/l*	± 0.25 mg/l	-	-	-	119897**
Chlorine	100595	Cl <sub>2</sub>	-	2.50 mg/l*	± 0.25 mg/l	-	-	-	see 5.2.2
Chlorine	100597	Cl <sub>2</sub>	-	2.50 mg/l*	± 0.25 mg/l	-	-	-	see 5.2.2
Chlorine	100598	Cl <sub>2</sub>	-	1.50 mg/l*	± 0.15 mg/l	-	-	-	see 5.2.2
Chlorine	100602	Cl <sub>2</sub>	-	1.50 mg/l*	± 0.15 mg/l	-	-	-	see 5.2.2
Chlorine	100599	Cl <sub>2</sub>	-	1.50 mg/l*	± 0.15 mg/l	-	-	-	see 5.2.2
Chlorine	100086 / 100087 / 100088	Cl <sub>2</sub>		1.50 mg/l*	± 0.15 mg/l	-	-	-	see 5.2.2
				2.50 mg/l*	± 0.25 mg/l	-	-		
Chlorine dioxide	100608	ClO <sub>2</sub>	-	2.50 mg/l*	± 0.25 mg/l	-	-	-	see 5.2.2
Chromate	114552	Cr	-	1.00 mg/l*	± 0.10 mg/l	-	-	-	119780**
Chromate	114758	Cr	-	1000 µg/l*	± 100 µg/l	-	-	-	119780**
Cobalt	117244	Co	-	1.00 mg/l*	± 0.10 mg/l	-	-	-	119785**
COD	101796	COD	50, 114695	R-1: 20.0 mg/l	± 4.0 mg/l	125028	20.0 mg/l	± 0.7 mg/l	see 5.2.2
				R-2: 15.0 mg/l	± 3.0 mg/l				

\* self prepared, recommended concentration

\*\* 1000 mg/l analyte

Test / Method	Cat. No. Test	Evaluation as	CombiCheck, Confidence interval			Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Cat. No.	Spec. value for the standard	max. working tolerance	Cat. No.	concentration	expanded measurement uncertainty	
COD	114540	COD	10, 114676	R-1: 80 mg/l R-2: 30 mg/l	± 12 mg/l ± 8 mg/l	125029	100 mg/l	± 3 mg/l	see 5.2.2
COD	114895	COD	60, 114696	R-1: 250 mg/l R-2: 75 mg/l	± 25 mg/l ± 10 mg/l	125029 125030	100 mg/l 200 mg/l	± 3 mg/l ± 4 mg/l	see 5.2.2
COD	114690	COD	60, 114696	R-1: 250 mg/l R-2: 75 mg/l	± 25 mg/l ± 15 mg/l	125029 125030 125031	100 mg/l 200 mg/l 400 mg/l	± 3 mg/l ± 4 mg/l ± 5 mg/l	see 5.2.2
COD	114541	COD	20, 114675	R-1: 750 mg/l R-2: 200 mg/l	± 75 mg/l ± 40 mg/l	125029 125030 125031 125032	100 mg/l 200 mg/l 400 mg/l 1000 mg/l	± 3 mg/l ± 4 mg/l ± 5 mg/l ± 11 mg/l	see 5.2.2
COD	114691	COD	80, 114738	R-1: 1500 mg/l R-2: 1000 mg/l	± 150 mg/l ± 100 mg/l	125031 125032 125033	400 mg/l 1000 mg/l 2000 mg/l	± 5 mg/l ± 11 mg/l ± 32 mg/l	see 5.2.2
COD	114555	COD	70, 114689	R-1: 5.00 g/l R-2: 2.00 g/l	± 0.40 g/l ± 0.20 g/l	125032 125033 125034	1.00 g/l 2.00 g/l 8.00 g/l	± 0.01 g/l ± 0.03 g/l ± 0.07 g/l	see 5.2.2
COD	101797	COD	-	50.00 g/l*	± 5.00 g/l	125034 125035	8.00 g/l 50.0 g/l	± 0.07 g/l ± 0.9 g/l	see 5.2.2
COD	109772	COD	-	80 mg/l*	± 12 mg/l	125028 125029	20.0 mg/l 100 mg/l	± 0.7 mg/l ± 3 mg/l	see 5.2.2
COD	109773	COD	-	750 mg/l*	± 75 mg/l	125029 125030 125031 125032	100 mg/l 200 mg/l 400 mg/l 1000 mg/l	± 3 mg/l ± 4 mg/l ± 5 mg/l ± 11 mg/l	see 5.2.2
COD	117058	COD	-	30.0 mg/l COD/20 000 mg/l Cl*	± 150 mg/l	-	-	-	see 5.2.2
COD	117059	COD	-	1500 mg/l COD/20 000 mg/l Cl*	± 3.0 mg/l	-	-	-	see 5.2.2
Color	-	Pt/Co (Hz)	-	500 mg/l	-	-	-	-	100246
Copper	114553	Cu	30, 114677	R-1: 2.00 mg/l R-2: 3.00 mg/l	± 0.20 mg/l ± 0.30 mg/l	-	-	-	119786**
Copper	114767	Cu	30, 114677	R-1: 2.00 mg/l R-2: 3.00 mg/l	± 0.20 mg/l ± 0.30 mg/l	-	-	-	119786**
Cyanide	102531	CN	-	200 µg/l*	± 25 µg/l	-	-	-	119533**
Cyanide	114561	CN	-	200 µg/l*	± 25 µg/l	-	-	-	119533**
Cyanide	109701	CN	-	100 µg/l*	± 15 µg/l	-	-	-	119533**
Cyanuric Acid	119253	CyA	-	80 mg/l*	± 10 mg/l	-	-	-	see 5.2.2
Fluoride	114557	F	-	0.75 mg/l*	± 0.08 mg/l	-	-	-	119814**
Fluoride	100809	F	-	0.75 mg/l*	± 0.08 mg/l	132233 132234 132235 132236	0.50 mg/l 0.200 mg/l 1.00 mg/l 1.50 mg/l	± 0.02 mg/l ± 0.012 mg/l ± 0.03 mg/l ± 0.04 mg/l	119814**
Fluoride	117243	F	-	1.00 mg/l*	± 0.15 mg/l	132233 132234 132235 132236	0.50 mg/l 0.200 mg/l 1.00 mg/l 1.50 mg/l	± 0.02 mg/l ± 0.012 mg/l ± 0.03 mg/l ± 0.04 mg/l	119814**
Fluoride	114598	F	-	1.00 mg/l*	± 0.15 mg/l	132233 132234 132235 132236	0.50 mg/l 0.200 mg/l 1.00 mg/l 1.50 mg/l	± 0.02 mg/l ± 0.012 mg/l ± 0.03 mg/l ± 0.04 mg/l	119814**
Fluoride	100822	F	-	1.00 mg/l*	± 0.15 mg/l	132233 132234 132235 132236	0.50 mg/l 0.200 mg/l 1.00 mg/l 1.50 mg/l	± 0.02 mg/l ± 0.012 mg/l ± 0.03 mg/l ± 0.04 mg/l	119814**
Fluoride	117236	F	-	1.00 mg/l*	± 0.15 mg/l	132233 132234 132235 132236	0.50 mg/l 0.200 mg/l 1.00 mg/l 1.50 mg/l	± 0.02 mg/l ± 0.012 mg/l ± 0.03 mg/l ± 0.04 mg/l	119814**
Hydrazine	109711	N <sub>2</sub> H <sub>4</sub>	-	500 µg/l*	± 50 µg/l	-	-	-	see 5.2.2

\* self prepared, recommended concentration

\*\* 1000 mg/l analyte

Test / Method	Cat. No. Test	Evaluation as	CombiCheck, Confidence interval			Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Cat. No.	Spec. value for the standard	max. working tolerance	Cat. No.	concentration	expanded measurement uncertainty	
Hydrogen-peroxide	118789	H <sub>2</sub> O <sub>2</sub>	-	2.00 mg/l*	± 0.20 mg/l	-	-	-	see 5.2.2
Iodine	100606	I <sub>2</sub>	-	2.50 mg/l*	± 0.25 mg/l	-	-	-	see 5.2.2
Iron	114549	Fe	30, 114677	R-1: 1.00 mg/l	± 0.15 mg/l	133018	0.1000 mg/l	± 0.0030 mg/l	119781**
				R-2: 3.00 mg/l	± 0.30 mg/l	133019	0.300 mg/l	± 0.009 mg/l	
	90, 118700	R-1: 1.00 mg/l	± 0.15 mg/l	133020	1.00 mg/l	± 0.04 mg/l			
		R-2: 3.00 mg/l	± 0.30 mg/l						
Iron	114761	Fe	90, 118700	R-1: 1.00 mg/l	± 0.15 mg/l	133014	0.0500 mg/l	± 0.0015 mg/l	119781**
				R-2: 3.00 mg/l	± 0.30 mg/l	133018	0.1000 mg/l	± 0.0030 mg/l	
						133019	0.300 mg/l	± 0.009 mg/l	
						133020	1.00 mg/l	± 0.04 mg/l	
Iron	100796	Fe	30, 114677	R-1: 1.00 mg/l	± 0.15 mg/l	133018	0.1000 mg/l	± 0.0030 mg/l	119781**
				R-2: 1.88 mg/l	± 0.20 mg/l	133019	0.300 mg/l	± 0.009 mg/l	
			90, 118700	R-1: 1.00 mg/l	± 0.15 mg/l	133020	1.00 mg/l	± 0.04 mg/l	
				R-2: 1.88 mg/l	± 0.20 mg/l				
Lead	114833	Pb	40, 114692	R-1: 2.00 mg/l	± 0.20 mg/l	-	-	-	119776**
				R-2: 1.00 mg/l	± 0.15 mg/l				
			100, 118701	R-1: 2.00 mg/l	± 0.20 mg/l				
				R-2: 1.00 mg/l	± 0.15 mg/l				
Lead	109717	Pb	40, 114692	R-1: 2.00 mg/l	± 0.20 mg/l	133004	0,100 mg/l	± 0,005 mg/l	119776**
				R-2: 0.63 mg/l	± 0.10 mg/l				
			100, 118701	R-1: 2.00 mg/l	± 0.20 mg/l				
				R-2: 0.63 mg/l	± 0.10 mg/l				
Magnesium	100815	Mg	-	40.0 mg/l*	± 4.0 mg/l	-	-	see 5.2.2	
Manganese	100816	Mn	30, 114677	R-1: 1.00 mg/l	± 0.15 mg/l	132238	0.200 mg/l	± 0.005 mg/l	119789**
				R-2: 1,43 mg/l	± 0,15 mg/l	132239	1.00 mg/l	± 0.03 mg/l	
			90, 118700	R-1: 1.00 mg/l	± 0.15 mg/l				
				R-2: 1.43 mg/l	± 0.15 mg/l				
Manganese	101739	Mn	-	1.00 mg/l*	± 0.10 mg/l	-	-	119789**	
Manganese	114770	Mn	30, 114677	R-1: 1.00 mg/l	± 0.15 mg/l	132238	0.200 mg/l	± 0.005 mg/l	119789**
				R-2: 1.00 mg/l	± 0.15 mg/l	132239	1.00 mg/l	± 0.03 mg/l	
			90, 118700	R-1: 1.00 mg/l	± 0.15 mg/l				
				R-2: 1.00 mg/l	± 0.15 mg/l				
Manganese	101846	Mn	90, 118700	R-1: 1.00 mg/l	± 0.15 mg/l	132238	0.200 mg/l	± 0.005 mg/l	119789**
		R-2: 1.25 mg/l	± 0.15 mg/l	132239	1.00 mg/l	± 0.03 mg/l			
Molybdenum	100860	Mo	-	0.50 mg/l*	± 0.05 mg/l	-	-	170227**	
Molybdenum	119252	Mo	-	25.0 mg/l*	± 2.5 mg/l	-	-	170227**	
Monochlor-amine	101632	Cl <sub>2</sub>	-	2.50 mg/l*	± 0.25 mg/l	-	-	see 5.2.2	
Nickel	114554	Ni	40, 114692	R-1: 2.00 mg/l	± 0.20 mg/l	-	-	-	109989**
				R-2: 2.00 mg/l	± 0.20 mg/l				
			100, 118701	R-1: 2.00 mg/l	± 0.20 mg/l				
				R-2: 2.00 mg/l	± 0.20 mg/l				
Nickel	114785	Ni	40, 114692	R-1: 2.00 mg/l	± 0.20 mg/l	-	-	-	109989**
				R-2: 2.00 mg/l	± 0.20 mg/l				
			100, 118701	R-1: 2.00 mg/l	± 0.20 mg/l				
				R-2: 2.00 mg/l	± 0.20 mg/l				
Nitrate	114542	NO <sub>3</sub> -N NO <sub>3</sub>	20, 114675	R-1: 9.0 mg/l	± 0.9 mg/l	125037	2.50 mg/l	± 0.06 mg/l	119811**
				R-2: 5.0 mg/l	± 0.6 mg/l				
						132241	10.0 mg/l	± 0.3 mg/l	
						132242	50.0 mg/l	± 2.0 mg/l	
Nitrate	114773	NO <sub>3</sub> -N NO <sub>3</sub>	10, 114676	R-1: 2.50 mg/l	± 0.25 mg/l	125036	0.500 mg/l	± 0.05 mg/l	119811**
				R-2: 2.00 mg/l	± 0.40 mg/l	125037	2.50 mg/l	± 0.06 mg/l	
			20, 114675	R-1: 9.0 mg/l	± 0.9 mg/l				
				R-2: 5.0 mg/l	± 0.6 mg/l				
					132241	10.0 mg/l	± 0.3 mg/l		
					132242	50.0 mg/l	± 2.0 mg/l		
Nitrate	114556	NO <sub>3</sub> -N NO <sub>3</sub>	10, 114676	R-1: 2.50 mg/l	± 0.25 mg/l	125036	0.500 mg/l	± 0.05 mg/l	119811**
				R-2: 1.50 mg/l	± 0.20 mg/l	125037	2.50 mg/l	± 0.06 mg/l	
						132240	1.0 mg/l	± 0.03 mg/l	
						132241	10.0 mg/l	± 0.3 mg/l	

\* self prepared, recommended concentration

\*\* 1000 mg/l analyte

Test / Method	Cat. No. Test	Evaluation as	CombiCheck, Confidence interval			Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Cat. No.	Spec. value for the standard	max. working tolerance	Cat. No.	concentration	expanded measurement uncertainty	
Nitrate	101842	NO <sub>3</sub> -N	-	10.0 mg/l*	± 1.5 mg/l	-			119811**
Nitrite	114547	NO <sub>2</sub> -N	-	300 µg/l*	± 30 µg/l	125041	200 µg/l	± 9 µg/l	119899**
Nitrite	114776	NO <sub>2</sub> -N	-	200 µg/l*	± 20 µg/l	125041	200 µg/l	± 9 µg/l	119899**
Nitrit	100609	NO <sub>2</sub> -N	-	50 mg/l*	± 5 mg/l	125042	40.0 mg/l	± 1.3 mg/l	119899**
Nitrogen	114537	N	50, 114695	R-1: 5.0 mg/l	± 0.7 mg/l	125043	2.50 mg/l	± 0.06 mg/l	see 5.2.2
				R-2: 3.0 mg/l	± 0.5 mg/l	125044	12.0 mg/l	± 0.3 mg/l	
Oxygen scavengers	119251	DEHA	-	250 µg/l*	± 30 µg/l	-			see 5.2.2
Ozone	100607	O <sub>3</sub>	-	1.00 mg/l*	± 0.10 mg/l	-			see 5.2.2
pH	101744	pH	-	7.0	± 0.2	-			109407
Phenol	114551	C <sub>6</sub> H <sub>5</sub> OH	-	1.25 mg/l*	± 0.13 mg/l	-			see 5.2.2
Phenol	100856	C <sub>6</sub> H <sub>5</sub> OH	-	2.50 mg/l*	± 0.25 mg/l	-			see 5.2.2
Phosphate	100474	PO <sub>4</sub> -P	10, 114676	R-1: 0.80 mg/l	± 0.08 mg/l	-			119898**
				R-2: 0.60 mg/l	± 0.07 mg/l				
Phosphate	114543	PO <sub>4</sub> -P	10, 114676	R-1: 0.80 mg/l	± 0.08 mg/l	125046	0.400 mg/l P	± 0.016 mg/l	119898**
				R-2: 0.60 mg/l	± 0.07 mg/l				
Phosphate	100475	PO <sub>4</sub> -P	20, 114675	R-1: 8.0 mg/l	± 0.7 mg/l	-			119898**
				R-2: 5.0 mg/l	± 0.5 mg/l				
Phosphate	114729	PO <sub>4</sub> -P	80, 114738	R-1: 15.0 mg/l	± 1.0 mg/l	125047	4.00 mg/l P	± 0.08 mg/l	119898**
				R-2: 5.0 mg/l	± 0.5 mg/l				
Phosphate	100616	PO <sub>4</sub> -P	-	R-1: 8.0 mg/l	± 0.7 mg/l	125048	15.0 mg/l P	± 0.4 mg/l	119898**
				R-2: 5.0 mg/l	± 0.5 mg/l				
Phosphate	100673	PO <sub>4</sub> -P	-	R-1: 50.0 mg/l*	± 5.0 mg/l	125049	75.0 mg/l P	± 1.6 mg/l	119898**
				R-2: 50.0 mg/l*	± 5.0 mg/l				
Phosphate	114848	PO <sub>4</sub> -P	10, 114676	R-1: 0.80 mg/l	± 0.08 mg/l	-			119898**
				R-2: 0.30 mg/l	± 0.05 mg/l				
Phosphate	100798	PO <sub>4</sub> -P	-	30.0 mg/l*	± 3.0 mg/l	-			119898**
Phosphate	114546	PO <sub>4</sub> -P	-	15.0 mg/l*	± 1.0 mg/l	-			119898**
Phosphate	114842	PO <sub>4</sub> -P	-	15.0 mg/l*	± 1.0 mg/l	-			119898**
Potassium	114562	K	-	25.0 mg/l	± 4.0 mg/l	-			170230**
Potassium	100615	K	-	150 mg/l	± 15 mg/l	-			170230**
Residual hardness	114683	Ca	-	2.50 mg/l*	± 0.30 mg/l	-			119778**
Silicate	114794	SiO <sub>2</sub>	-	5.00 mg/l*	± 0.50 mg/l	132243	0.500 mg/l	± 0.025 mg/l	170236**
						132245	1.000 mg/l	± 0.030 mg/l	
Silicate	100857	SiO <sub>2</sub>	-	50.0 mg/l*	± 5.0 mg/l	-			170236**
Silicate	101813	SiO <sub>2</sub>	-	0.100 mg/l*	± 0.010 mg/l	132244	0.1000 mg/l	± 0.0040 mg/l	170236**
Sodium	100885	Na	-	100 mg/l*	± 10 mg/l	-			see 5.2.2
Sulfate	102532	SO <sub>4</sub>	-	25.0 mg/l	± 3.0 mg/l	-			119813**
Sulfate	114548	SO <sub>4</sub>	10, 114676	R-1: 100 mg/l	± 15 mg/l	125050	40 mg/l	± 6 mg/l	119813**
				R-2: 40 mg/l	± 5 mg/l	125051	125 mg/l	± 6 mg/l	
Sulfate	100617	SO <sub>4</sub>	10, 114676	R-1: 100 mg/l	± 15 mg/l	125051	125 mg/l	± 6 mg/l	119813**
				R-2: 100 mg/l	± 15 mg/l	125052	400 mg/l	± 20 mg/l	
Sulfate	114564	SO <sub>4</sub>	20, 114675	R-1: 500 mg/l	± 75 mg/l	125051	125 mg/l	± 6 mg/l	119813**
				R-2: 150 mg/l	± 30 mg/l	125052	400 mg/l	± 20 mg/l	
						125053	800 mg/l	± 27 mg/l	
Sulfate	101812	SO <sub>4</sub>	-	5.0 mg/l	± 0.5 mg/l	-			119813**
Sulfate	102537	SO <sub>4</sub>	10, 114676	R-1: 100 mg/l	± 15 mg/l	125050	40 mg/l	± 6 mg/l	119813**
				R-2: 40 mg/l	± 5 mg/l	125051	125 mg/l	± 6 mg/l	
Sulfide	114779	S	-	0.75 mg/l*	± 0.08 mg/l	-			see 5.2.2
Sulfite	114394	SO <sub>3</sub>	-	10.0 mg/l*	± 1.5 mg/l	-			see 5.2.2
Sulfite	101746	SO <sub>3</sub>	-	30.0 mg/l*	± 1.0 mg/l	-			see 5.2.2

\* self prepared, recommended concentration

\*\* 1000 mg/l analyte

Test / Method	Cat. No. Test	Evaluation as	CombiCheck, Confidence interval			Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Cat. No.	Spec. value for the standard	max. working tolerance	Cat. No.	concentration	expanded measurement uncertainty	
Surfactants (anionic)	102552	SDSA	-	1.00 mg/l*	± 0.20 mg/l	-	-	-	see 5.2.2
Surfactants (cationic)	101764		-	1.00 mg/l*	± 0.10 mg/l	-	-	-	see 5.2.2
Surfactants (nonionic)	101787		-	4.00 mg/l*	± 0.40 mg/l	133022	1.00 mg/l	± 0.16 mg/l	see 5.2.2
						133023	5.00 mg/l	± 0.30 mg/l	
Tin	114622	Sn	-	1.25 mg/l*	± 0.13 mg/l	-	-	-	170242**
Total hardness	100961	Ca	-	75 mg/l*	± 7 mg/l	-	-	-	see 5.2.2
Volatile org. acids	101749	HOAc	-	1500 mg/l*	± 80 mg/l	-	-	-	see 5.2.2
Volatile org. acids	101809	HOAc	-	1500 mg/l*	± 80 mg/l	-	-	-	see 5.2.2
Zinc	100861	Zn	-	500 µg/l*	± 50 µg/l	-	-	-	119806**
Zinc	114566	Zn	40, 114692	R-1: 2.00 mg/l	± 0.40 mg/l	-	-	-	119806**
				R-2: 2.00 mg/l	± 0.40 mg/l				
			100, 118701	R-1: 0.750 mg/l	± 0.150 mg/l				
				R-2: 0.250 mg/l	± 0.050 mg/l				

\* self prepared, recommended concentration

\*\* 1000 mg/l analyte

## 5.2.2 Preparation of standard solutions

### Standard solution of acid capacity

#### Preparation of a standard solution:

A sodium hydroxide solution of 0.1 mol/l (corresponds to 100 mmol/l) is used.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

#### Stability:

When stored in a cool place (refrigerator), the diluted investigational solutions remain stable for one week.

#### Reagents required:

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1.09141.1000  
Sodium hydroxide solution  
0.1 mol/l Titripur®

1.16754.9010  
Water for analysis  
EMSURE®

### Standard solution of bromine analogous to DIN EN ISO 7393

#### Preparation of a $\text{KIO}_3$ stock solution:

Dissolve 1.006 g of  $\text{KIO}_3$  in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

#### Preparation of a $\text{KIO}_3/\text{KI}$ standard solution:

Transfer 11,12 ml of the  $\text{KIO}_3$  stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water. 1 ml of this solution is equivalent to 0.025 mg of bromine.

#### Preparation of the bromine standard solution:

Pipette 10.0 ml (full pipette)  $\text{KIO}_3/\text{KI}$  standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of  $\text{H}_2\text{SO}_4$  0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 2.50 mg/l bromine.

#### Stability:

The  $\text{KIO}_3$  stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The  $\text{KIO}_3/\text{KI}$  standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted bromine standard solution is not stable and must be used immediately.

#### Reagents required:

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1.02404.0100  
Potassium iodate,  
volumetric standard

1.05043.0250  
Potassium iodide for  
analysis EMSURE®

1.09072.1000  
Sulfuric acid 0.5 mol/l  
Titripur®

1.09136.1000  
Sodium hydroxide solution  
2 mol/l Titripur®

1.16754.9010  
Water for analysis  
EMSURE®



## Standard solution of calcium

### Preparation of a standard solution:

Dissolve 2.946 g of calcium nitrate tetrahydrate with distilled water in a calibrated or conformity-checked 500-ml volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1000 mg/l calcium.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

The standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

### Reagents required:

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1.02121.0500  
Calcium nitrate tetrahydrate for analysis  
EMSURE®

1.16754.9010  
Water for analysis  
EMSURE®

## Standard solutions of free chlorine

All standard solutions described here for free chlorine yield equivalent results and are identically suited for the determination of chlorine.

## Standard solution of free chlorine

### Preparation of a standard solution:

Dissolve 1.85 g of dichloroisocyanuric acid sodium salt dihydrate GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1000 mg/l free chlorine.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

### Reagents required:

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1.10888.0250  
Dichloroisocyanuric acid sodium salt dihydrate GR for analysis

1.16754.9010  
Water for analysis  
EMSURE®

### Note

This is a standard solution that can be prepared particularly rapidly and easily.

# Standard solution of free chlorine analogous to DIN EN ISO 7393

## Preparation of a $\text{KIO}_3$ stock solution:

Dissolve 1.006 g of  $\text{KIO}_3$  in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

## Preparation of a $\text{KIO}_3/\text{KI}$ standard solution:

Transfer 7.50 ml (12.50 ml) of the  $\text{KIO}_3$  stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.

1 ml of this solution is equivalent to 0.0075 mg (0.0125 mg) of free chlorine.

## Preparation of the chlorine standard solution:

Pipette 20.0 ml (full pipette)  $\text{KIO}_3/\text{KI}$  standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of  $\text{H}_2\text{SO}_4$  0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 1.50 mg/l (2.50 mg/l) free chlorine.

## Stability:

The  $\text{KIO}_3$  stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The  $\text{KIO}_3/\text{KI}$  standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted chlorine standard solution is not stable and must be used immediately.

## Reagents required:

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- 1.02404.0100  
Potassium iodate,  
volumetric standard
- 1.05043.0250  
Potassium iodide for  
analysis EMSURE®
- 1.09072.1000  
Sulfuric acid 0.5 mol/l  
Titripur®
- 1.09136.1000  
Sodium hydroxide solution  
2 mol/l Titripur®
- 1.16754.9010  
Water for analysis  
EMSURE®

## Note

This procedure involves the preparation according to a standardized method.

## Standard solution of free chlorine

### Preparation of a stock solution:

First prepare a 1:10 dilution using a sodium hypochlorite solution containing approximately 13 % of active chlorine. For this pipette 10 ml of sodium hypochlorite solution into a calibrated or conformity-checked 100-ml volumetric flask and then make up to the mark with distilled water.

### Precise assay of the stock solution:

Pipette 10.0 ml of the stock solution into a 250-ml ground-glass-stoppered conical flask containing 60 ml of distilled water. Subsequently add to this solution 5 ml of hydrochloric acid 25 % and 3 g of potassium iodide. Close the conical flask with the ground-glass stopper, mix thoroughly, and leave to stand for 1 min.

Titrate the eliminated iodine with sodium thiosulfate solution 0.1 mol/l until a weakly yellow color emerges. Add 2 ml of zinc iodide-starch solution and titrate from blue to colorless.

### Calculation and preparation of the standard solution:

*Consumption of sodium thiosulfate solution 0.1 mol/l (ml)  $\times$  355 = content of free chlorine, in mg/l*

Further investigational concentrations may be prepared from the stock solution prepared according to the procedure described above by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), a standard solution of 1000 mg/l remains stable for approximately one week. The diluted standard solutions (investigational concentrations) are stable for approximately 2 hours.

### Reagents required:

---

- 1.00316.1000  
Hydrochloric acid 25 %  
for analysis EMSURE®
- 1.05614.2500  
Sodium hypochlorite  
solution techn. approx.  
13 % active chlorine
- 1.09147.1000  
Sodium thiosulfate  
solution 0.1 mol/l  
Titripur®
- 1.05043.0250  
Potassium iodide GR  
for analysis
- 1.05445.0500  
Zinc iodide-starch  
solution GR for analysis
- 1.16754.9010  
Water for analysis  
EMSURE®

### Note

This is a standard solution that is absolutely necessary for the preparation of the monochloramine standard.

## Standard solution of total chlorine

### Preparation of a standard solution:

Dissolve 4.00 g of chloramine T GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l total chlorine.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

### Reagents required:

---

1.02426.0250  
Chloramine T trihydrate  
GR for analysis

1.16754.9010  
Water for analysis  
EMSURE®

## Standard solution of chlorine dioxide analogous to DIN EN ISO 7393

### Preparation of a $\text{KIO}_3$ stock solution:

Dissolve 1.006 g of  $\text{KIO}_3$  in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

### Preparation of a $\text{KIO}_3/\text{KI}$ standard solution:

Transfer 13.12 ml of the  $\text{KIO}_3$  stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water. 1 ml of this solution is equivalent to 0.025 mg of chlorine dioxide.

### Preparation of the chlorine dioxide standard solution:

Pipette 10.0 ml (full pipette)  $\text{KIO}_3/\text{KI}$  standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of  $\text{H}_2\text{SO}_4$  0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 2.50 mg/l chlorine dioxide.

### Stability:

The  $\text{KIO}_3$  stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The  $\text{KIO}_3/\text{KI}$  standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted chlorine dioxide standard solution is not stable and must be used immediately.

### Reagents required:

---

- 1.02404.0100  
Potassium iodate,  
volumetric standard
- 1.05043.0250  
Potassium iodide for  
analysis EMSURE®
- 1.09072.1000  
Sulfuric acid 0.5 mol/l  
Titripur®
- 1.09136.1000  
Sodium hydroxide solution  
2 mol/l Titripur®
- 1.16754.9010  
Water for analysis  
EMSURE®

## Standard solution of COD

### Preparation of a standard solution:

Dissolve 0.850 g of potassium hydrogen phthalate GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l COD.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one month. When stored under appropriate cool conditions (refrigerator), the diluted standard solutions (investigational concentrations) remain stable - depending on the respective concentration - for approximately one week to one month.

### Reagents required:

1.02400.0080

Potassium hydrogen phthalate GR for analysis, volumetric standard

1.16754.9010

Water for analysis  
EMSURE®

## Standard solution of COD/ chloride

### Preparation of a chloride dilution solution:

Dissolve 32.9 g of sodium chloride (free from organic material, e. g. Suprapur®) with distilled water (free from organic material, e. g. LiChrosolv®) in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water. The dilution solution prepared according to this procedure has a concentration of 20 g/l Cl<sup>-</sup>.

### Preparation of a COD/Cl<sup>-</sup> standard solution:

Dissolve 0.850 g of potassium hydrogen phthalate GR with **dilution solution** in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with **dilution solution**.

The standard solution prepared according to this procedure has a concentration of 10 000 mg/l COD and 20 g/l Cl<sup>-</sup>.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with **dilution solution**.

### Stability:

When stored in a cool place (refrigerator), the dilution solution of 20 g/l Cl<sup>-</sup> and the standard solution of 10 000 mg/l COD / 20 g/l Cl<sup>-</sup> remain stable for one month. When stored under appropriate cool conditions (refrigerator), the diluted standard solutions (investigational concentrations) remain stable - depending on the respective concentration - for approximately one week to one month.

### Reagents required:

---

- 1.02400.0080  
Potassium hydrogen phthalate GR for analysis, volumetric standard
- 1.06406.0050  
Sodium chloride 99.99 Suprapur®
- 1.15333.9010  
Water for chromatography LiChrosolv®

## Standard solution of cyanuric acid

### Preparation of a standard solution:

Dissolve 1.00 g of cyanuric acid with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water. The substance is slightly soluble and the dissolution process may take several hours.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l cyanuric acid.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

### Reagents required:

---

8.20358.0005

Cyanuric acid for synthesis

1.16754.9010

Water for analysis  
EMSURE®

## Standard solution of hydrazine

### Preparation of a standard solution:

Dissolve 4.07 g of hydrazinium sulfate with oxygen-low (boil previously) distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with oxygen-low distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l hydrazine.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with oxygen-low distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

### Reagents required:

---

1.04603.0100

Hydrazinium sulfate  
GR for analysis

1.16754.9010

Water for analysis  
EMSURE®



## Standard solution of hydrogen-peroxide

### Preparation of a stock solution:

Place 10.0 ml of Perhydrol® 30% H<sub>2</sub>O<sub>2</sub> in a calibrated or con-formity-checked 100-ml volumetric flask and make up to the mark with distilled water. Transfer 30.0 ml (full pipette) of this solution to a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water. The stock solution prepared according to this procedure has a concentration of approx. 1000 mg/l hydrogenperoxide.

### Precise assay of the stock solution:

Pipette 50.0 ml (full pipette) of the hydrogen-peroxide stock solution into a 500-ml conical flask, dilute with 200 ml of distilled water, and add 30 ml of sulfuric acid 25 %. Titrate with a 0.02 mol/l potassium permanganate solution until the color changes to pink.

### Calculation and preparation of the standard solution:

*Consumption of potassium permanganate solution 0.02 mol/l (ml) x 34.02 = content of hydrogen peroxide, in mg/l*

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

### Reagents required:

---

- 1.09122.1000  
Potassium permanganate solution 0.02 mol/l Titripur®
- 1.07209.0250  
Perhydrol® 30 % for analysis EMSURE®
- 1.00716.1000  
Sulfuric acid 25 % for analysis EMSURE®
- 1.16754.9010  
Water for analysis EMSURE®

## Standard solution of iodine analogous to DIN EN ISO 7393

### Preparation of a $\text{KIO}_3$ stock solution:

Dissolve 1.006 g of  $\text{KIO}_3$  in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

### Preparation of a $\text{KIO}_3/\text{KI}$ standard solution:

Transfer 7.00 ml of the  $\text{KIO}_3$  stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water. 1 ml of this solution is equivalent to 0.025 mg of iodine.

### Preparation of the iodine standard solution:

Pipette 10.0 ml (full pipette)  $\text{KIO}_3/\text{KI}$  standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of  $\text{H}_2\text{SO}_4$  0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 2.50 mg/l iodine.

### Stability:

The  $\text{KIO}_3$  stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The  $\text{KIO}_3/\text{KI}$  standard solution can be used for 5 hours when stored in a cool place (refrigerator). The dilute chlorine dioxide standard solution is not stable and must be used immediately.

### Reagents required:

---

- 1.02404.0100  
Potassium iodate,  
volumetric standard
- 1.05043.0250  
Potassium iodide for  
analysis EMSURE®
- 1.09072.1000  
Sulfuric acid 0.5 mol/l  
Titripur®
- 1.09136.1000  
Sodium hydroxide solution  
2 mol/l Titripur®
- 1.16754.9010  
Water for analysis  
EMSURE®

## Standard solution of magnesium

### Preparation of a standard solution:

Dissolve 1.055 g of magnesium nitrate hexahydrate with distilled water in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1000 mg/l magnesium.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

The standard solution of 1000 mg/l remains stable for one week. The dilute standard solutions (investigational concentrations) remain stable for one day.

### Reagents required:

---

1.05853.0500  
Magnesium nitrate hexahydrate for analysis EMSURE®

1.16754.9010  
Water for analysis EMSURE®

## Standard solution of monochloramine

### Preparation of a standard solution:

Place 5.0 ml of chlorine standard solution 100 mg/l Cl<sub>2</sub> and 10.0 ml ammonium standard solution 10 mg/l NH<sub>4</sub>-N in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 5.00 mg/l Cl<sub>2</sub> or 3.63 mg/l NH<sub>2</sub>Cl.

### Stability:

The standard solution is not stable and must be used immediately.

### Reagents required:

---

Chlorine standard solution 100 mg/l Cl<sub>2</sub>  
Preparation see "Standard solution of free chlorine" with hypochlorite solution (standard solution that is absolutely necessary for the preparation of the monochloramine standard)

Ammonium standard solution 10 mg/l NH<sub>4</sub>-N  
Preparation with Ammonium standard solution Certipur®, Cat. No. 1.19812.0500, 1000 mg/l NH<sub>4</sub> = 777 mg/l NH<sub>4</sub>-N

1.16754.9010  
Water for analysis EMSURE®

## Standard solution of nitrogen (total)

### Preparation of a standard solution:

Dissolve 5.36 g of glycine GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l total nitrogen.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

### Reagents required:

---

1.04201.0100

Glycine GR for analysis

1.16754.9010

Water for analysis  
EMSURE®

## Standard solution of oxygen scavengers

### Preparation of a standard solution:

Dissolve 1.00 g of N,N-diethylhydroxylamine with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l N,N-diethylhydroxylamine (DEHA).

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

### Reagents required:

---

8.18473.0050

N,N-Diethylhydroxylamine for synthesis

1.16754.9010

Water for analysis  
EMSURE®

## Standard solution of ozone analogous to DIN EN ISO 7393

### Preparation of a $\text{KIO}_3$ stock solution:

Dissolve 1.006 g of  $\text{KIO}_3$  in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

### Preparation of a $\text{KIO}_3/\text{KI}$ standard solution:

Transfer 14.80 ml of the  $\text{KIO}_3$  stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water. 1 ml of this solution is equivalent to 0.010 mg of ozone.

### Preparation of the ozone standard solution:

Pipette 10.0 ml (full pipette)  $\text{KIO}_3/\text{KI}$  standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of  $\text{H}_2\text{SO}_4$  0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water. The concentration of the solution is 1.00 mg/l ozone.

### Stability:

The  $\text{KIO}_3$  stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The  $\text{KIO}_3/\text{KI}$  standard solution can be used for 5 hours when stored in a cool place (refrigerator). The dilute chlorine dioxide standard solution is not stable and must be used immediately.

## Standard solution of phenol

### Preparation of a standard solution:

Dissolve 1.00 g of phenol GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l phenol.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

### Reagents required:

---

- 1.02404.0100  
Potassium iodate,  
volumetric standard
- 1.05043.0250  
Potassium iodide for  
analysis EMSURE®
- 1.09072.1000  
Sulfuric acid 0.5 mol/l  
Titripur®
- 1.09136.1000  
Sodium hydroxide solution  
2 mol/l Titripur®
- 1.16754.9010  
Water for analysis  
EMSURE®

### Reagents required:

---

- 1.00206.0250  
Phenol GR for analysis
- 1.16754.9010  
Water for analysis  
EMSURE®

## Standard solution of silicate

### Preparation of a standard solution:

A silicon standard solution of 1000 mg/l is used.

1000 mg/l Si corresponds to 2139 mg/l SiO<sub>2</sub>.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Example:

Mix 4.675 ml of silicon standard solution (1000 mg/l Si) with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 10.00 mg/l SiO<sub>2</sub>.

After its preparation, the solution must be immediately transferred to a clean polyethylene vessel for further storage.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

After its preparation, the solution with the desired working concentration must be immediately transferred to a clean polyethylene vessel for further storage.

### Stability:

The diluted standard solutions (investigational concentrations) remain stable - depending on the respective concentration - for one day to approximately six months.

### Reagents required:

1.70236.0100  
Silicone standard solution  
Certipur®

1.16754.9010  
Water for analysis  
EMSURE®

## Standard solution of sodium

### Preparation of a standard solution:

A chloride standard solution of 1000 mg/l is used.

1000 mg/l chloride corresponds to 649 mg/l sodium.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the diluted standard solutions (investigational concentrations) remains stable for one month.

### Reagents required:

1.19897.0500  
Chloride standard solution  
Certipur®

1.16754.9010  
Water for analysis  
EMSURE®

## Standard solution of sulfide

### Preparation of a stock solution:

Dissolve 7.5 g of glass-clear, if necessary washed\* crystals of Sodium sulfide nonahydrate with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled. The stock solution prepared according to this procedure has a concentration of approx. 1000 mg/l sulfide.

### Precise assay of the stock solution:

Place 100 ml of distilled water and 5.0 ml (full pipette) of sulfuric acid 25 % in a 500-ml ground-glass-stoppered conical flask. To this solution add 25.0 ml (full pipette) of the sulfide stock solution and 25.0 ml (full pipette) of iodine solution 0.05 mol/l. Shake the contents of the flask thoroughly for about 1 min, subsequently titrate with sodium thiosulfate solution 0.1 mol/l until the yellow iodine color has disappeared, add 1 ml of zinc iodide-starch solution, and continue to titrate until a milky, pure white color emerges.

### Calculation and preparation of the standard solution:

$C1 = \text{consumption of sodium thiosulfate solution } 0.1 \text{ mol/l}$

$C2 = \text{quantity of iodine solution } 0.05 \text{ mol/l}$   
(25.0 ml)

$\text{mg/l sulfide} = (C2 - C1) \times 64.13$

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l remains stable for at most one day. The diluted standard solutions (investigational concentrations) must be used immediately.

### Reagents required:

431648 (ALDRICH)

Sodium sulfide nonahydrate  $\geq 99.99\%$

1.09099.1000

Iodine solution 0.05 mol/l Titripur®

1.09147.1000

Sodium thiosulfate solution 0.1 mol/l Titripur®

1.00716.1000

Sulfuric acid 25 % for analysis EMSURE®

1.05445.0500

Zinc iodide-starch solution GR for analysis

1.16754.9010

Water for analysis EMSURE®

### \*Washing the sodium sulfide nonahydrate crystals:

During storage, the surfaces of the sodium sulfide nonahydrate crystals can turn yellow to brown in color.

If this discoloration is present, it can simply be rinsed off using a little distilled water.

Subsequently allow the crystals to dry briefly (due to the following titration procedure for the assay, it is not necessary to dry the substance completely).

If the sodium sulfide nonahydrate crystals are colorless or white, they do not have to be washed.

### Tip:

If the sodium sulfide nonahydrate material is kept in the refrigerator, it discolors only at a very slow rate.

## Standard solution of sulfite

### Preparation of a stock solution:

Dissolve 1.57 g of sodium sulfite and 0.4 g of Titriplex® III GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of approx. 1000 mg/l sulfite.

### Precise assay of the stock solution:

Place 50.0 ml (full pipette) of the sulfite stock solution and 5.0 ml (full pipette) of hydrochloric acid 25 % in a 300-ml conical flask.

To this solution add 25.0 ml (full pipette) of iodine solution 0.05 mol/l and process immediately. After mixing the contents of the flask, subsequently titrate with sodium thiosulfate solution 0.1 mol/l until the yellow iodine color has disappeared, add 1 ml of zinc iodide-starch solution, and continue to titrate from blue to colorless.

### Calculation and preparation of the standard solution:

$C1 = \text{consumption of sodium thiosulfate solution } 0.1 \text{ mol/l}$

$C2 = \text{quantity of iodine solution } 0.05 \text{ mol/l (25.0 ml)}$

$$\text{mg/l sulfite} = (C2 - C1) \times 80.06$$

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water and buffer solution pH 9.00.

This is done in the following manner:

Withdraw the desired aliquot from the stock solution, place in a calibrated or conformity-approved 1000-ml volumetric flask, add 20 ml of buffer solution pH 9.00, make up to the mark with distilled water, and mix.

### Stability:

When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l remains stable for at most one day. The diluted standard solutions (investigational concentrations) must be used immediately.

### Reagents required:

---

- 1.06657.0500  
Sodium sulfite anhydrous for analysis EMSURE®
- 1.08418.0100  
Titriplex® III GR for analysis
- 1.09099.1000  
Iodine solution 0.05 mol/l Titripur®
- 1.09147.1000  
Sodium thiosulfate solution 0.1 mol/l Titripur®
- 1.00316.1000  
Hydrochloric acid 25 % for analysis EMSURE®
- 1.05445.0500  
Zinc iodide-starch solution GR for analysis
- 1.09461.1000  
Buffer solution pH 9.00 Certipur®
- 1.16754.9010  
Water for analysis EMSURE®



## Standard solution of surfactants (anionic)

### Preparation of a standard solution:

Dissolve 1.00 g of Dodecane-1-sulfonic acid sodium salt with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l anionic surfactant.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one month. The diluted standard solutions (investigational concentrations) must be used immediately.

### Reagents required:

---

1.12146.0005  
Dodecane-1-sulfonic acid sodium salt

1.16754.9010  
Water for analysis  
EMSURE®

## Standard solution of surfactants (cationic)

### Preparation of a standard solution:

Dissolve 1.00 g of Cetyltrimethylammonium Bromide, Molecular Biology Grade with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l cationic surfactant.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

### Reagents required:

---

219374  
Cetyltrimethylammonium Bromide, Molecular Biology Grade  
Calbiochem® (CTAB)

1.16754.9010  
Water for analysis  
EMSURE®

## Standard solution of surfactants (nonionic)

### Preparation of a standard solution:

Dissolve 1.00 g of Triton® X-100 GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l nonionic surfactant.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

### Reagents required:

---

1.12298.0101

Triton® X-100

1.16754.9010

Water for analysis  
EMSURE®

## Standard solution of tin

### Preparation of a standard solution:

A tin standard solution of 1000 mg/l is used. Transfer 30 ml of HCl 1 mol/l to a calibrated or conformity-checked 100-ml volumetric flask, add 10.0 ml (full pipette) of the tin standard solution, and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 100 mg/l tin.

Further investigational concentrations may be prepared from the standard solution by diluting accordingly with distilled water and HCl 1 mol/l.

This is done in the following manner:

Transfer 1 ml of HCl 1 mol/l to a calibrated or conformity-checked 100-ml volumetric flask. Withdraw the desired aliquot from the tin standard solution 100 mg/l, add, make up to the mark with distilled water, and mix.

### Stability:

The tin standard solution 100 mg/l remains stable for 30 minutes. The diluted standard solutions (investigational concentrations) must be used immediately.

### Reagents required:

---

1.70242.0100

Tin standard solution  
Certipur®

1.09057.1000

Hydrochloric acid 1 mol/l  
Titripur®

1.16754.9010

Water for analysis  
EMSURE®

## Standard solution of total hardness

### Preparation of a standard solution:

Dissolve 2.946 g of calcium nitrate tetrahydrate with distilled water in a calibrated or conformity-checked 500-ml volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1000 mg/l calcium (corresponds to 175 °e).

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

### Stability:

The standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

### Reagents required:

---

1.02121.0500  
Calcium nitrate tetrahydrate for analysis EMSURE®

1.16754.9010  
Water for analysis EMSURE®

## Standard solution of volatile organic acids

### Preparation of a standard solution:

Dissolve 2.05 g of sodium acetate anhydrous with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1500 mg/l acetic acid.

### Stability:

When stored in a cool place (refrigerator), the standard solution remains stable for one week.

### Reagents required:

---

1.06268.0250  
Sodium acetate anhydrous for analysis EMSURE®

1.16754.9010  
Water for analysis EMSURE®

## 5.3 Printing measurement results

Besides the Spectroquant® Data Transfer infrared module (optional), a printer with HPPCL up to version 5 is required to print out the data via the USB interface of the module; an ASCII printer is needed to print out the data via the module's RS232 interface.

### 5.3.1 Setting the print parameters

The Spectroquant® Move 100 colorimeter can print out data on a printer via the infrared interface to the Data Transfer module without having to save them first.

The standard settings of the printer type used should be checked before printing out data. The usual settings are as follows:

Data bits: 8  
Parity: none  
Baud rate: dependent on the printer type  
e.g. LQ 300 matrix printer: 4800  
DP 1012 ticket printer: 19200

The printing parameters of the Spectroquant® Move 100 Colorimeter must be aligned to match these settings accordingly. This is done in the following manner:

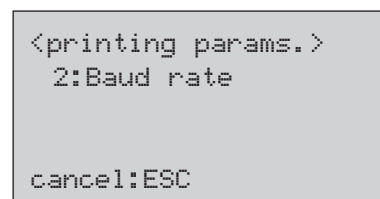
Press the keys **[Mode]**, **[Shift]** + **[2]** **[9]**.



Confirm your selection by pressing **[ ↵ ]**.



The display shows:



Press the keys **[Shift] + [2]** to set the baud rate.



The display shows:

```
< Baud rate>
is:19200
select: [▲] [▼]
save: ←
cancel:ESC
```

Press the **[▲]** or **[▼]** arrow keys to select the desired baud rate (1200, 2400, 4800, 9600, 14400, 19200).



Confirm your selection by pressing **[ ← ]**.



Press **[Esc]** to exit this mode.



One press of the **[Esc]** key takes you back to the mode menu,



two presses of the **[Esc]** key to the method-selection list.



To transfer data, connect the colorimeter to the Data Transfer infrared module and the module to a printer. The cable included with the module can be used for this purpose.

When the Data Transfer module is switched on (see section 5.4) and connected to the printer, the measurement result can be printed out without having to save it first:

Press the **[F3]** key.



The entire data set is printed out, stating the date, time, method, and result.

Specimen printout

**163 COD 14541**  
**25-1500mg/l**  
**Profi-Mode: no**  
**2018-06-01 14:53:09**  
**Test No.: 1**  
**Code-No.: 007**  
**151 mg/l**

**The serial number is an internal number that is automatically assigned when a measurement result is saved. This number appears only on the printout.**

## 5.3.2 Printing all measurement results

In this mode all saved measurement results are printed out.

Press the keys **[Mode]**, **[Shift]** + **[2]** **[0]**.



Confirm your selection by pressing **[↵]**.



The display shows:

```
<Print>
print all data

Start:      ↵
cancel:ESC
```

Pressing the **[↵]** key prints out all saved measurement results.



It is possible to cancel the entry by **[Esc]**.

The display shows e.g.:

```
<Print>
Test No.:
```

After the printout operation the colorimeter returns to the mode menu.

### **Note:**

See also section 5.4 "Data transmission via the Spectroquant® Data Transfer infrared module (optional)".

## 5.3.3 Printing measurement results from a defined date range

In this mode all measurement results from a defined period of time are printed out.

If you wish to print out only one day's test results, enter the same date for both the start and end dates.

Press the keys **[Mode]**, **[Shift] + [2]** **[1]**.



Confirm your selection by pressing **[↵]**.



The display shows:

```
<Print>
sorted:date
from yy-mm-dd
  _-_-_-
```

Enter the start date in the sequence year, month, day

e.g. June 14, 2018 = **[Shift] + [1][8] [0][6] [1][4]**.



Confirm by pressing the **[↵]** key.



The display shows:

```
<Print>
sorted:date
to yy-mm-dd
  _-_-_-
```

Enter the end date in the sequence year, month, day

e.g. June 19, 2018 = **[Shift] + [1][8] [0][6] [1][9]**.



Confirm by pressing the **[↵]** key.



The display shows:

```
<Print>
sorted:date
from 2018-16-14
to 2018-16-19
Start: ↵
Ende:ESC
```

Pressing the [ ↵ ] key prints out the saved test results from the defined period of time.



It is possible to cancel the entry by [Esc].

After the printout operation the colorimeter returns to the mode menu.

**Note:**

See also section 5.4 "Data transmission via the Spectroquant® Data Transfer infrared module (optional)".

### 5.3.4 Printing measurement results from a defined code-No. range

In this mode all measurement results from a defined code-No. range are printed out.

If you wish to print out only test results with the same code No., enter the same code for both the start and end codes.

To print out all test results without the code No. or with the code No. 0, enter zero [Shift] + [0] for both the start and end code Nos.

Press the keys [Mode], [Shift] + [2] [2].



Confirm your selection by pressing [ ↵ ].





The display shows:

```
<Print>
sorted: Code-No.
from _____
```

Enter the start code number (max. 6 digits), e.g. **[Shift] + [1] [0] [0]**.



Confirm by pressing the **[ ↵ ]** key.



The display shows:

```
<Print>
sorted: Code-No.
from 100____
to _____
```

Enter the end code number (max. 6 digits), e.g. **[Shift] + [1] [3] [0]**.



Confirm by pressing the **[ ↵ ]** key.



The display shows:

```
<Print>
sorted: Code-No.
from 000100
to 000130
Start: ↵
cancel:ESC
```

Pressing the **[ ↵ ]** key prints out the saved test results from the defined code-No. range.



It is possible to cancel the entry by **[Esc]**.

After the printout operation the colorimeter returns to the mode menu.

**Note:**

See also section 5.4 "Data transmission via the Spectroquant® Data Transfer infrared module (optional)".

## 5.3.5 Printing measurement results from a defined method

In this mode all measurement results from a specific method are printed out.

Press the keys **[Mode]**, **[Shift]** + **[2]** **[3]**.



Confirm your selection by pressing **[ ↵ ]**.



The display shows:

```
<Print>
>> 10 Acid cap. 01758
    20 Aluminium 14825
    21 Aluminium 00594
    ...
```

Select the method from the list or else enter the method number directly.

Confirm by pressing the **[ ↵ ]** key.



(In the case of differentiating methods repeat this procedure as necessary and confirm by pressing **[ ↵ ]**.)



The display shows:

```
<Print>
method
21 Aluminium 00594
Start: ↵
Ende:ESC
```

Pressing the **[ ↵ ]** key prints out the saved test results from the defined method.



It is possible to cancel the entry by **[Esc]**.

After the printout operation the colorimeter returns to the mode menu.

### **Note:**

See also section 5.4 "Data transmission via the Spectroquant® Data Transfer infrared module (optional)".

## **5.4 Data transmission via the Spectroquant® Data Transfer infrared module (optional)**

The Spectroquant® Data Transfer module (optional) is required to print out saved or current data or to transmit them to a PC.

### **5.4.1 Printing data**

Besides the Spectroquant® Data Transfer infrared module (optional), a printer with HPPCL up to version 5 is required to print out the data via the USB interface of the module; an ASCII printer is needed to print out the data via the module's RS232 interface.

### **5.4.2 Transferring data to a PC**

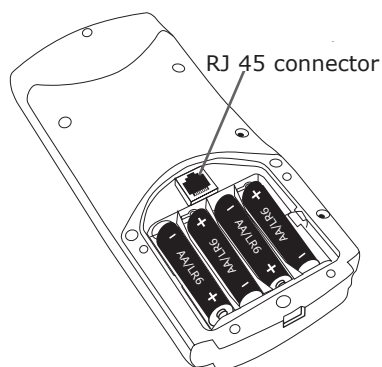
Besides the Spectroquant® Data Transfer module, a data-transfer program (included with the module) is required to transfer measurement results to a PC. Please refer to the instructions for use for the Data Transfer module for exact details.

## 5.5 Software update via the internet

The connector cable with an integrated electronics package (optional) is required to carry out the update. The device is connected via the serial interface of the computer.

New software versions can be updated via the internet.

See section 1.2 for instructions on how to open and close the battery compartment!



### Before running the update

Save your stored measurement results by printing them out or by transferring them to your computer.

When running the update these data as well as the existing software will be entirely deleted!

If the update procedure is interrupted (e. g. interruption of connection, LoBat., etc.) the instrument isn't able to work (no display). The instrument will only work again after completing the data transfer.

Set the baud rate of the colorimeter to 19200 (mode menu, keys **[Mode]**, **[Shift] + [2]** **[9]**,



press **[↵]**,



then the keys **[Shift] + [2]**,



and then use the **[▲]** or **[▼]** arrow keys to select the baud rate).



Required for the update procedure:

- a PC with a Windows operating system;
- the cable for the software update;
- the supplied screwdriver
- these files:
  - the programme **HexLoad.exe**, which is executed on the PC and transfers the update software to the photometer; (see CD or else go to **[www.analytical-test-kits.com/method-update](http://www.analytical-test-kits.com/method-update)** on the internet)
  - the software update for the Spectroquant® Move 100 Colorimeter (= \*.hex file, see at **[www.analytical-test-kits.com/method-update](http://www.analytical-test-kits.com/method-update)** on the internet).

Download the files as necessary and save them together in a new folder that you have specially created for the update of the colorimeter. You do not need to install the **HexLoad.exe** programme, a simple copy is sufficient.

Please read the update instructions thoroughly before you start to run the update.

Follow the instructions given in the update file while performing the update.

**Note**

In the case of the Spectroquant® Move 100 Colorimeter an update always involves a method and/or programme update.

**Important:**

Please check whether programmes are running on your computer that use or monitor the **COM ports**. These include e. g. programmes that log the online time, the MSN Messenger programme, chat programmes, and similar. These programmes must be completely deactivated during the update process, since otherwise the **HexLoad** programme may report "**Communication timed out...**" and the update cannot be executed.

# Executing the update

Connect the colorimeter to the free serial port (**COMx**) of the PC using the cable for the software update.

Do not switch the unit on again for the time being.

Double-click on the **HexLoad** symbol in the folder to start the **HexLoad** programme (see figure).

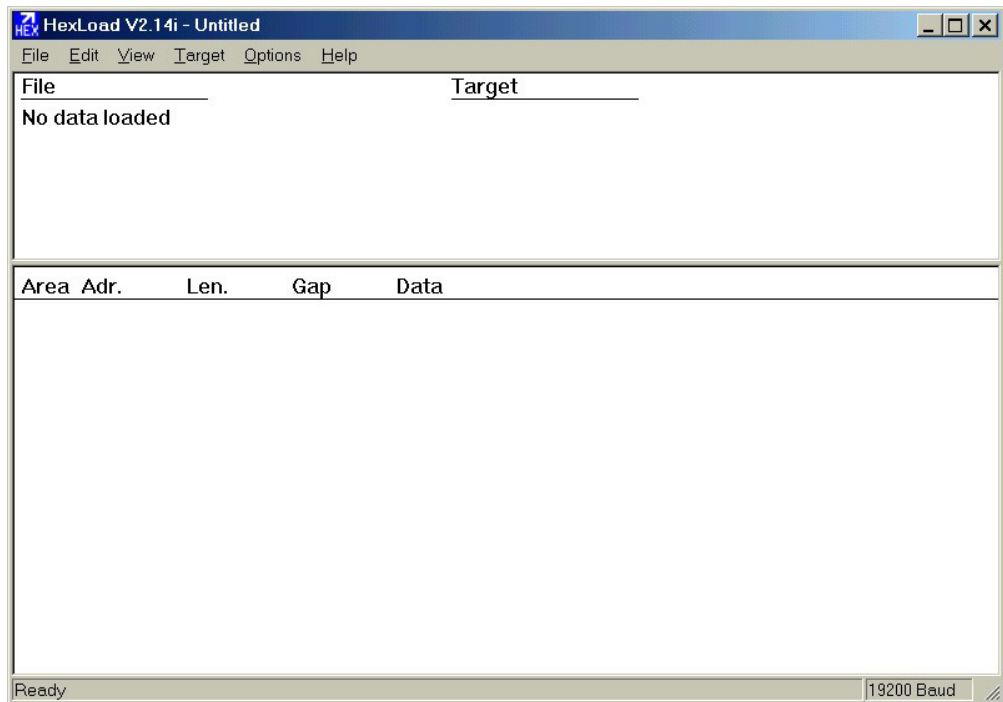


Fig. 1

Go to "**Options > Communication parameters**" and set the **baud rate** to **19200** and **ComPort** to "**AUTO**" (or the number of the connected **COM port**, e. g. Com-Port 1). Then click on "**OK**".

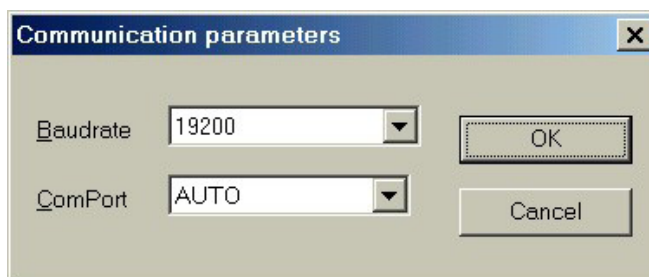
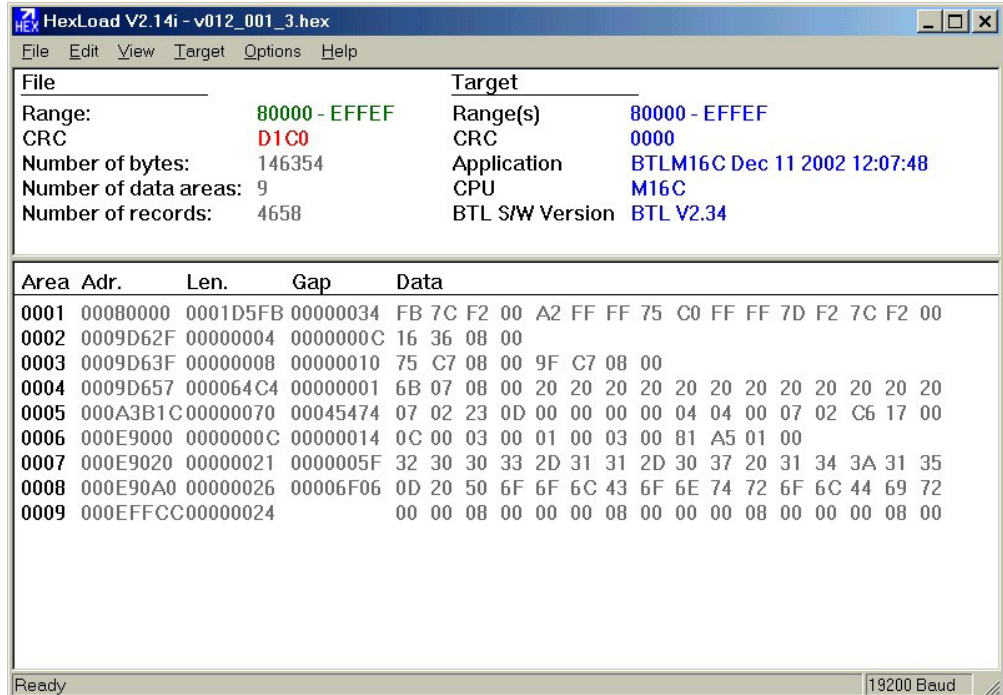


Fig. 2

After this go to the menu item **"File > Open.."** for **HexLoad** to load the software update (\*.hex file). Now switch the colorimeter on. When a connection to **HexLoad** has been established, the **display** of the **Spectroquant® Move 100 Colorimeters** remains **blank**. **HexLoad** should now look similar to the example below, although the figures actually shown may vary:



**Fig. 3**

**It is essential that:**

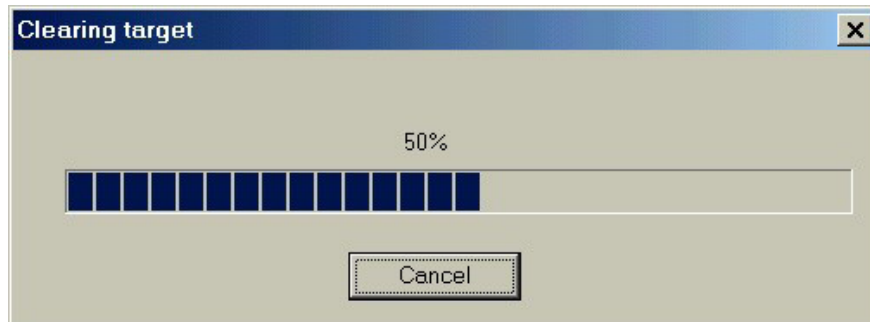
- under **"File"** in the top lefthand corner the message **"No data loaded"** has changed and been replaced by values similar to those shown above; and
- under **"Target"** in the top righthand corner values (in blue type) are now shown.

In the event that no values are shown under **"Target"**, this indicates that it has not been possible to establish a connection between the colorimeter and the PC. In this case please check the cable connection and the communication settings.



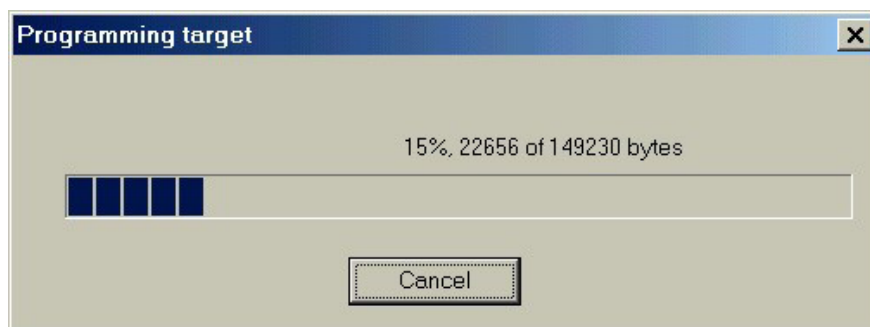
Now press the **F9** key on your PC to prompt **HexLoad** to start the update sequence. The following stati are now displaced:

The previous software is deleted:



**Fig. 4**

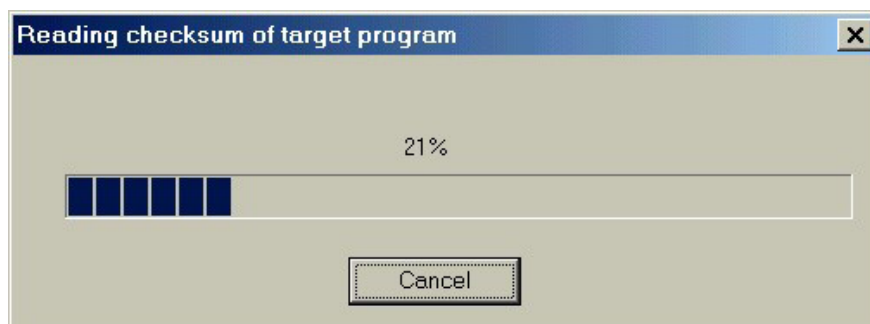
... and the new software is saved:



**Fig. 5**

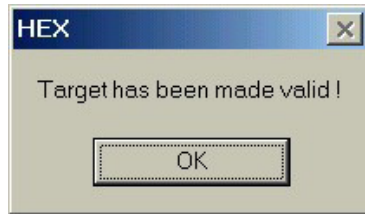
In the event that the error message "**Communication time out**" appears at this stage, this indicates that other programmes are still running in the background that are interfering with the software-update routine. Close these programmes and repeat the software-update procedure.

The new software is now checked.



**Fig. 6**

The check was successful and the new software is now active:

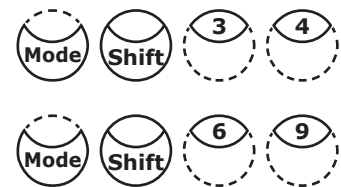


**Fig. 7**

Click on **"OK"** to exit and close **HexLoad**.

Disconnect the cable for the software update from the unit and close the compartment. The instrument is now ready for use again with the new software.

Press the keys **[Mode], [Shift] + [3] [4]** to **delete any data** and thus to initialize the memory system (see section 1.7) and run a **initializing of the user-method system** by pressing the keys **[Mode], [Shift] + [6] [9]** (see section 5.6.5).



## 5.6 User methods

The software provides two possibilities for saving user-specific methods in the instrument. For the user-concentration method (section 5.6.1), prepared standards are measured and the instrument defines the programming. The programme "User polynomials" (section 5.6.2) enables the user to specify polynomials and thus also, on the one hand, to correctly enter polynomials of higher orders and, on the other, to better control the course of the curves and to maintain the quality of the prepared standards.

### 5.6.1 User-concentration method

Up to ten specific user-concentration methods can be entered and stored. This requires two to 14 standards of known concentrations and a zero factor (distilled water or a reagent blind). The accuracy of the method rises in direct proportion to the number of standard solutions measured. It is thus advisable to use five to ten standard concentrations spread equidistantly over the measuring range. The standards should be measured in the rising sequence of the concentrations, from the lightest to the darkest color. The limits for "Underrange" and "Overrange" are set at -2600 mAbs\* and 2600 mAbs\*.

After a user-concentration method is called up, the concentrations of the lowest and highest standards measured are shown on the display as the measuring-range limits.

In actual fact the lower limit of the measuring range is given either by the nonlinearity of the calibration function or by the limit of determination. The limit of determination is the lowest concentration of an analyte that can be quantitatively determined with a defined probability (e.g. 99 %). The upper limit of the measuring range is defined as the point at which there is no longer any linear correlation between the concentration and the absorbance. (The exact determination of the actual limits of the measuring range can be taken from the corresponding literature references.)

The sample should, where necessary, be diluted to ideally lie in the middle of the working range (measurement with the lowest error).

\*1000 mAbs = 1 Abs = 1 E

## Entering a concentration method

Press the keys **[Mode]**, **[Shift]** + **[6]** **[4]**.



Confirm your selection by pressing **[↵]**.



The display now shows:

```
<User concentr.>
choose no.: _____
(850-859)
```

Press the number keys to select a method number in the range 850 to 859, e.g.: **[Shift]** + **[8]** **[5]** **[0]**



Confirm your selection by pressing **[↵]**.

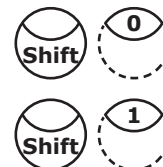


### Note

In the event that the entered number is already being used as a storage slot for a concentration method, the following message appears on the display:

```
<User concentr.>
overwrite conc.meth.?
YES: 1,      NO: 0
```

- Press the keys **[Shift]** + **[0]** or the key **[Esc]** to return to method-No. prompt.
- Press the keys **[Shift]** + **[1]** to continue the entry.



The display shows:

```
<User concentr.>
wavelength:
1: 530 nm   4: 430 nm
2: 560 nm   5: 580 nm
3: 610 nm   6: 660 nm
```

Press the number keys to select the desired wavelength, e.g.: **[Shift]** + **[2]** for 560 nm.



The display shows:

```
<User concentr.>
choose unit:
>> mg/l
    g/l
    mmol/l
    mAbs
    µg/l
    E
    A
    %
```

Press the arrow key [▲] or [▼] to select the desired unit.



Confirm your selection by pressing [↵].



The display shows:

```
<User concentr.>
choose resolution:
1: 1
2: 0.1
3: 0.01
4: 0.001
```

Press the number keys to select the desired resolution,  
e.g.: [Shift] + [3] for 0.01.



### Note

Please adjust the desired resolution according to the following criteria:

Range	max. Resolution
0.000 ...9,999	0.001
10.00 ...99,99	0.01
100.0 ...999,9	0.1
1000 ...9999	1

## Measurement mode with standards of known concentrations

The display shows:

```
<User concentr.>
Prepare Zero
Press ZERO
```

Prepare zero and press **[Zero]**.



### Note

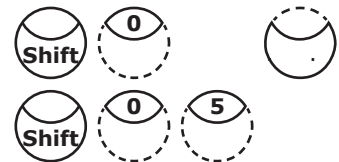
Use distilled water or a reagent blank.

The display shows:

```
<User concentr.>
Zero accepted
S1: +_____
← | ESC | F1
```

Enter the concentration of the first standard;  
e.g.: **[Shift] + [0], [.]**, **[Shift]+ [0] [5]** for 0.05.

- Back with the key **[Esc]**.
- Backout the entry with the key **[F1]**.



Confirm your selection by pressing **[ ← ]**.



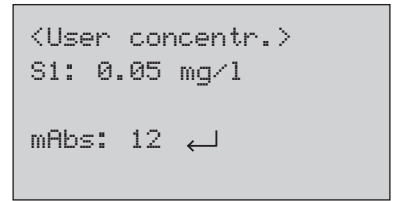
The display shows:

```
<User concentr.>
S1: 0.05 mg/l
Prepare
Press TEST
```

Prepare the first standard and press **[Test]**.



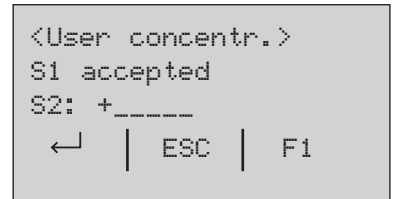
The display shows the entered value and the measured absorbance value:



Confirm your selection by pressing **[↵]**.

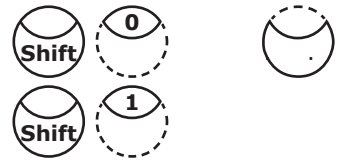


The display shows:



Enter the concentration of the second standard; e.g.: **[Shift] + [0]**, **[.]**, **[Shift] + [1]** for 0.1.

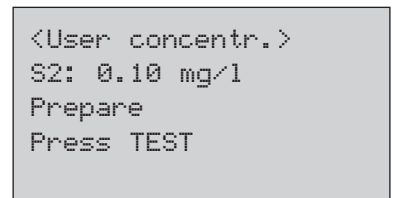
- Back with the key **[Esc]**.
- Backout the entry with the key **[F1]**.



Confirm your selection by pressing **[↵]**.



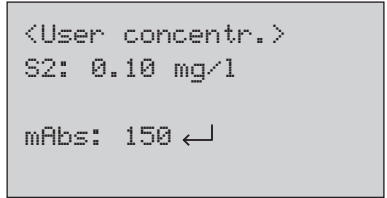
The display shows:



Prepare the second standard and press **[Test]**.



The display shows the entered value and the measured absorbance value:



Confirm your selection by pressing [ ← ].



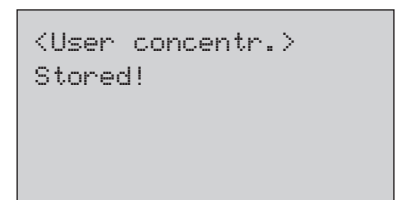
**Note**

- To measure further standards, follow the above procedure.
- At least two standards must be measured.
- A maximum of 14 standards (S1 to S14) can be measured.

When the desired number of standards or the maximum number of 14 standards have been measured, press the key **[Store]**.



The display now shows:



The colorimeter automatically returns to the mode menu.  
The concentration method is now stored in the instrument, and the method can be directly selected either by entering the method number or else via the method-selection list.

**Tip**

Save all data relating to a specific user concentration in written form, since in the event of a loss of power (e.g. when changing the battery) all concentration data are lost and must be entered anew.

Data can also be transferred to a PC via "mode 67" (Spectroquant® Data Transfer infrared module required – see section 5.4.4).



## 5.6.2 User polynomials

Up to 25 user polynomials can be entered and stored. The programme enables the user to use polynomials up to the fifth degree:

$$y = A + Bx + Cx^2 + Dx^3 + Ex^4 + Fx^5$$

If a polynomial of a lower degree is required, the remaining coefficients are set at zero (0); e.g. for a polynomial of the second degree D, E, F are set at 0.

The values for the coefficients A, B, C, D, E, F must be entered in accordance with scientific conventions with at most six decimal places; e.g.  $121.35673 = 1.213567E+02$ .

### Entering a user polynomial

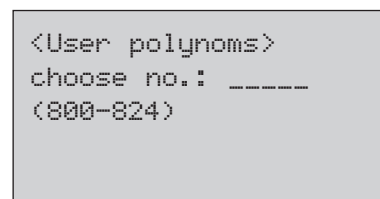
Press the keys **[Mode]**, **[Shift]** + **[6]** **[5]**.



Confirm your selection by pressing **[↵]**.



The display shows:



Press the number keys to select a method number in the range 800 to 824, e.g.: **[Shift]** + **[8]** **[0]** **[0]**



Confirm your selection by pressing **[↵]**.

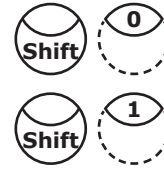


**Note**

In the event that the entered number is already being used as a storage slot for a polynomial, the following message appears on the display:

```
<User polynoms>
overwrite polynom?
YES: 1,    NO: 0
```

- Press the keys **[Shift] + [0]** or the key **[Esc]** to return to method-No. prompt.
- Press the keys **[Shift] + [1]** to continue the entry.



The display shows:

```
<User polynoms>
wavelength:
1: 530 nm    4: 430 nm
2: 560 nm    5: 580 nm
3: 610 nm    6: 660 nm
```

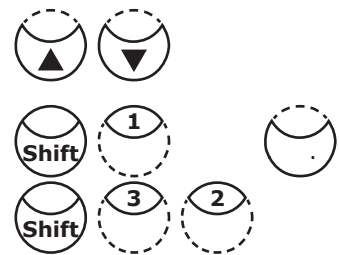
Press the number keys to select the desired wavelength,  
e.g.: **[Shift] + [2]** for 560 nm.



The display shows:

```
<User polynoms>
y = A+Bx+Cx2+Dx3+
      Ex4+Fx5
A: +_____
```

- Press the arrow key **[▲]** or **[▼]** to select between the plus and minus signs.
- Enter the data of coefficient A including the decimal point,  
e.g.: **[Shift] + [1], [.]**, **[Shift] + [3] [2]** for 1.32.



Confirm your selection by pressing **[↵]**.



The display shows:

```
<User polynoms>
y = A+Bx+Cx2+Dx3+
      Ex4+Fx5
A: 1.32___ E+_____
```

- Press the arrow key [**▲**] or [**▼**] to select between the plus and minus signs.
- Enter the exponent of coefficient A, e.g.: [**Shift**] + [**3**] for 3.



Confirm your selection by pressing [ **↵** ].



The display shows:

```
<User polynoms>
y = A+Bx+Cx2+Dx3+
      Ex4+Fx5
B: +_____
```

The data for the other coefficients are prompted in sequence (B, C, D, E and F).

**Note**

Entering zero [**Shift**] + [**0**] for the value of a given coefficient automatically negates any entry of the exponent.

Confirm each selection by pressing [ **↵** ].



The display shows:

```
<User polynoms>
measurement range
Min mAbs: +_____
```

Enter the measurement-range limits in the range between -2600 and +2600 mAbs.

- Press the arrow key [**▲**] or [**▼**] to select between the plus and minus signs.



- Enter the lower limit (Min) in the unit absorbance (mAbs), e.g.: [**Shift**] + [**2**] [**0**] for 20 mAbs.



Confirm each selection by pressing [**↵**].



The display shows:

```
<User polynoms>
measurement range
Min mAbs: +20__
Max mAbs: +____
```

- Enter the upper limit (Max) in the unit absorbance (mAbs), e.g.: [**Shift**] + [**2**] [**1**] [**0**] [**0**] for 2100 mAbs.



Confirm each selection by pressing [**↵**].



The display shows:

```
<User polynoms>
choose unit:
>> mg/l
    g/l
    mmol/l
    mAbs
    µg/l
    E
    A
    %
```

Press the arrow key [**▲**] or [**▼**] to select the desired unit.



Confirm your selection by pressing [**↵**].



The display shows:

```
<User polynoms>
choose resolution:
1: 1
2: 0.1
3: 0.01
4: 0.001
```

Press the number keys to select the desired resolution,  
e.g.: **[Shift] + [2]** for 0.1.



**Note**

Please adjust the desired resolution according to the following criteria:

Range	max. Resolution
0.000 ...9.999	0.001
10.00 ...99.99	0.01
100.0 ...999.9	0.1
1000 ...9999	1

The display shows:

```
<User polynoms>
Stored!
```

The colorimeter automatically returns to the mode menu.  
The polynomial is now stored in the instrument and the method can be directly selected either by entering the method number or else via the method-selection list.

**Tip**

Save all data relating to a specific user concentration in written form, since in the event of a loss of power (e.g. when changing the battery) all polynomial data are lost and must be entered anew.  
Data can also be transferred to a PC via "mode 67" (Spectroquant® Data Transfer infra-red module required – see section 5.4.4).

## 5.6.3 Deleting a user method (concentration or polynomial)

As a rule every user method can be overwritten. An existing user method (concentration or polynomial) can, however, also be completely deleted and subsequently no longer appears in the method-selection list.

Press the keys **[Mode]**, **[Shift]** + **[6]** **[6]**.



Confirm your selection by pressing **[↵]**.



The display shows:

```
<User m. clear>
choose no.: _____
(800-824), (850-859)
```

Press the number keys to select the user method to be deleted (in the range between 800 and 824 or, respectively, 850 and 859), e.g.: **[Shift]** + **[8]** **[0]** **[0]**



Confirm your selection by pressing **[↵]**.



The display shows the prompt message:

```
<User m. clear>
M800
delete?
YES: 1,      NO: 0
```

- Press the keys **[Shift]** + **[1]** to delete the selected user method.
- Press the keys **[Shift]** + **[0]** to reject the deletion of the method.



The colorimeter automatically returns to the mode menu.

## 5.6.4 Printing / transferring data of a user method (concentration or polynomial)

This mode function enables all entered data for stored user-concentration methods and user polynomials to be printed out or, respectively, to be transferred to a PC via Hyperterminal.

Press the keys **[Mode]**, **[Shift]** + **[6]** **[7]**.



Confirm your selection by pressing **[↵]**.



The display now shows:

```
<User m. print>
Start: ↵
```

Press key **[↵]** to print out all concentration and polynomial data (e.g. wavelength, unit, ...) or to transfer them to a PC.



The display shows e.g.:

```
<User m. print>
M800
M803
...
```

After printing out the data the colorimeter automatically returns to the mode menu.

## 5.6.5 Initializing the user-method system (concentration or polynomial)

A loss of power results in incoherent data for stored user methods. The user-method system must then be initialized with this mode function to return it to a default standard.

Press the keys **[Mode]**, **[Shift]** + **[6]** **[9]**.



Confirm your selection by pressing **[↵]**.



The display shows:

```
<User m. init.>
Start: ↵
```

Confirm your selection by pressing **[↵]**.



The display now shows the prompt message:

```
<User m. init.>
initialising?
YES: 1,    NO: 0
```

- Press the keys **[Shift]** + **[1]** to start the initializing procedure.



### **Attention:**

All stored concentration methods and polynomials are deleted by the initializing procedure!

- Press the keys **[Shift]** + **[0]** to abort the initializing procedure.



The colorimeter automatically returns to the mode menu.



## 5.7 User-specific calibration

In principle it is possible for the user to make his/her own calibration. It is, however, advisable to retain the factory calibration, since this was performed using a 10-item calibration procedure.

A user-specific calibration is made using a standard with a known concentration. This concentration should be equivalent to that of the water sample. Here it is possible to use e. g. Spectroquant® CombiCheck standards or ready-to-use standard solutions (see chapter 5.2).

In the case of differentiated methods, only the simple form is calibrated, i. e. with the chlorine methods only free chlorine is calibrated, and the calibration then automatically applies for the other two variants (total and differentiated).

The following methods cannot be user-specifically calibrated:

<b>Method No.:</b>	<b>Parameter</b>
10	Acid cap. 01758
20	Aluminium 14825
21	Aluminium 00594
70	BOD 00687
90	Bromine 00605
110	Calcium 00858
122	Chloride 01804
123	Chloride 01807
132	Cl2 LR 0.10-6.00
133	Cl2 LR 0.02-4.50
140	ClO2 0.05-8.50
141	ClO2 0.20-10.00
170	Color
222	Fluoride 00809
223	Fluoride 00822
224	Fluoride 17243
560	HydroPerox 18789
240	Iodine 00606
270	Magnesium 00815
290	Molybdenum 00860
300	Monochloramine
323	Nitrate 01842
322	Nitrate 14556
550	Oxygen 14694
555	Oxyg.scavengers
350	Ozone 0.02-3.00
351	Ozone 0.10-4.00
360	pH 01744
400	Potassium 14562
401	Potassium 00615
410	Residual hardness 14683
440	Sulfate 14548
441	Sulfate 00617
442	Sulfate 14564
443	Sulfate 01812
450	Sulfide 14779
480	Suspended solids
490	Tin 14622
510	Total hardness 00961
520	Turbidity

<b>Method No.:</b>	<b>Parameter</b>
600	A 430 nm
610	A 530 nm
620	A 560 nm
630	A 580 nm
640	A 610 nm
650	A 660 nm

User-calibrated methods are indicated in the selection list by inversely shown method names (light type against a dark background).

After the user-specific calibration is deleted, the original factory calibration becomes reactivated.

## 5.7.1 Saving the user-specific calibration

Perform the measurement using a standard of known concentration following the procedure described for the method in question.

When the test result appears on the display press the keys **[Mode]**, **[Shift]** + **[4]** **[5]**.

Confirm by pressing **[↵]**.

The display shows:

Pressing the **[▲]** key raises the displayed value; pressing the **[▼]** key reduces the displayed value. Press the buttons until the displayed value matches the specified value for the standard used.

Confirm the set value by pressing **[↵]**.

(Pressing the **[Esc]** key aborts the calibration procedure without saving a new factor.)

After the set value has been confirmed, the display shows:

Subsequently the test result calculated on the basis of the new calibration appears and the method name is shown in inverse form:

```
380 Phosphate 14543
0.05 - 4.00 mg/l P04-P
3.53 mg/l P04-P
```



```
<user calibration>
380 Phosphate 14543
0.05-4.00 mg/l P04-P
3.53 mg/l P04-P
up: ↓,    down: ↑
save:     ↵
```



```
<user calibration>
380 Phosphate 14543
0.05-4.00 mg/l P04-P

JUS factor
  saved
```

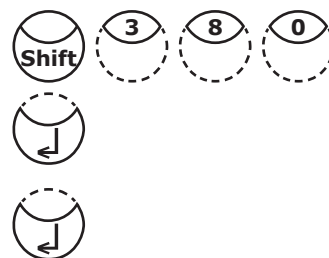
```
380 Phosphate 14543
0.05-4.00 mg/l P04-P
3.50 mg/l P04-P
```

## 5.7.2 Deleting the user-specific calibration

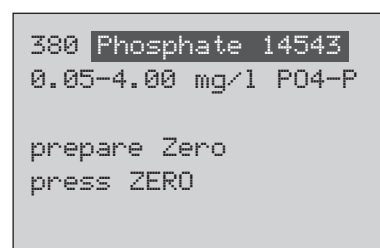
The user-specific calibration can be deleted only for those methods with which this can be used.

Call up the method in question, e. g. **[Shift] + [3] [8] [0]**, **[↵]**.

In the case of methods with a countdown function, skip this function by pressing the **[↵]** key twice.



The display shows:



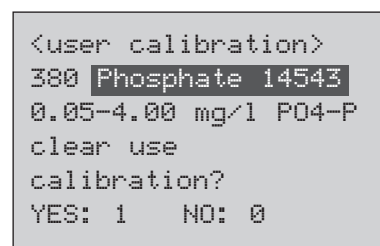
If a prompt for zero calibration appears, press the keys **[Mode]**, **[Shift] + [4] [6]**.



Confirm by pressing **[↵]**.



The display shows:



- Pressing the keys **[Shift] + [1]** deletes the user-specific calibration. The original factory calibration is reactivated.
- Pressing the keys **[Shift] + [0]** key retains the user-specific calibration for further use.



The instrument then returns to the countdown mode or, respectively, in the case of methods without a countdown function, to the zero-calibration prompt.

## 5.8 Calculating the Langelier saturation index

The Langelier saturation index (LSI) is a measure of the corrosivity of water.

When the LSI is below  $-0.5$ , the water is corrosive, and the pH and/or alkalinity should be raised.

When the LSI is over  $0.5$ , the water is very hard and there is a risk of calcification. Here the pH and/or alkalinity should be reduced.

When the LSI is zero, the water is ideally conditioned.

The following parameters exert an influence on the corrosive behavior or, respectively, the water hardness:

- pH
- Temperature
- Calcium hardness
- Acid capacity up to pH 4.3 = total alkalinity = alkalinity-m = m value
- TDS = Total dissolved solids (sum of dissolved salts (mg/l))

After determining these parameters, make a note of the measurement results and enter them into the programme for calculating the Langelier saturation index as described below.

# Setting the temperature unit

The temperature can be entered in degrees Celsius or degrees Fahrenheit. For this the following presetting procedure must be carried out (once only):

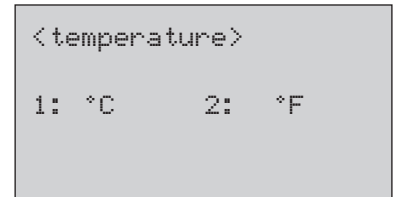
Press the keys **[Mode]**, **[Shift]** + **[7]** **[1]**.



Confirm your selection by pressing **[↵]**.



The display shows:



- Pressing the keys **[Shift]** + **[1]** key selects the °Celsius unit.
- Pressing the keys **[Shift]** + **[2]** key selects the °Fahrenheit unit.



The instrument then returns to the mode menu.

# Program for calculating the Langelier saturation index

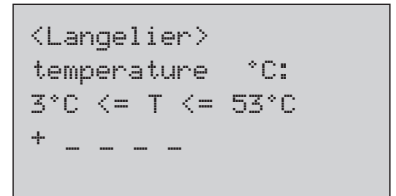
Press the keys [**Mode**], [**Shift**] + [**7**] [**0**].



Confirm your selection by pressing [↵].



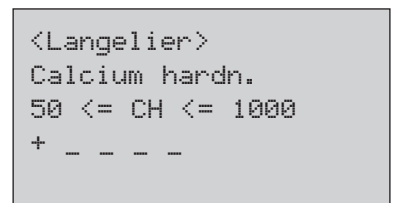
The display shows:



Enter the value for the temperature (T) within the range 3 °C to 53 °C and confirm by pressing [↵]. If you have selected the °Fahrenheit unit, a value within the range 37 °F to 128 °F must be entered.



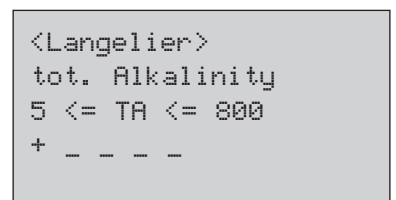
The display shows:



Enter the value for the calcium hardness (CH) within the range 50 to 1000 mg/l CaCO<sub>3</sub> and confirm by pressing [↵].



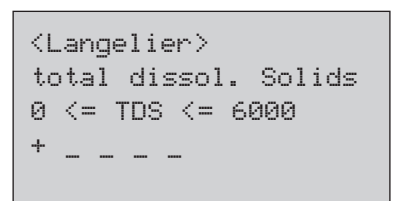
The display shows:



Enter the value for the total alkalinity (TA) within the range 5 and 800 mg/l CaCO<sub>3</sub> and confirm by pressing [↵].



The display shows:



Enter the value for **TDS** (total dissolved solids) within the range 0 and 6000 mg/l and confirm by pressing [↵].





The display shows:

```
<Langelier>
pH value
0 <= pH <= 12
+ _ _ _ _
```

Enter the pH within the range 0 and 12 and confirm by pressing [ ↵ ].



The display shows the Langelier saturation index:

```
<Langelier>
Langelier
saturation index:
-0.25
ESC ↵
```

- Pressing the [ ↵ ] key starts the entry mode anew (entry of the temperature result etc.).
- Pressing the [Esc] key takes the instrument back to the mode menu.



**Note:**

If a result is entered that is beyond the defined range of entries, an additional message appears in the display, e.g.

Value too high.

```
<Langelier>
Calcium hardn.
50<=CH<=1000
CH<=1000 mg/l CaCO3 !
```

Value too low.

```
<Langelier>
Calcium hardn.
50<=CH<=1000
CH>=50 mg/l CaCO3 !
```

Acknowledge this message by pressing [ ↵ ] and enter a value that is within the defined range.



# 5.9 Technical specifications

## Display

---

Backlit graphic display

## Serial interface

---

Infrared interface for data transfer  
RJ45 connector for internet updates

## Optics

---

LEDs, interference filters (IF) and photo sensor in transparent sample chamber

**Wavelength ranges:**

430 nm IF  $\Delta \lambda$  (nm) = 5

530 nm IF  $\Delta \lambda$  (nm) = 5

560 nm IF  $\Delta \lambda$  (nm) = 5

580 nm IF  $\Delta \lambda$  (nm) = 5

610 nm IF  $\Delta \lambda$  (nm) = 6

660 nm IF  $\Delta \lambda$  (nm) = 5

IF = interference filter

## Wavelength accuracy

---

$\pm 1$  nm

## Photometric accuracy

---

1.000 Abs  $\pm 0.020$  Abs

2.600 Abs  $\pm 0.052$  Abs ( $\cong 2\%$  FS)

(measured with standard solutions -

T = 20 - 25 °C)

FS = full scale

## Photometric resolution

---

0.005 A

## Operation

---

Acid and solvent resistant tactile film keyboard with acoustic feedback via integrated beeper

## Power supply

---

4 batteries (Type AA/LR 6);  
lifetime: approx. 26 hours continuous use or  
3500 tests

## Auto off

---

20 minutes after last function,  
30 seconds acoustical signal before switch off

## Dimensions

---

approx. 210 x 95 x 45 mm (instrument)  
approx. 395 x 295 x 106 mm (case)

## Weight (instrument)

---

approx. 450 g

## Operating conditions

---

5 - 40°C at max. 30 - 90 % rel. humidity  
(free from condensation)

## Language options

---

German, English, French, Spanish, Italian,  
Portuguese, Polish, Indonesian

## Storage capacity

---

approx. 1,000 data sets

## IP classification

---

Dust and waterproof acc. to IP 68

### **Subject to technical modification!**

#### **Note:**

To ensure maximum accuracy of test results,  
always use the reagent systems supplied by  
the instrument manufacturer.



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