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Operating manual



Spectroquant® **Move 100**

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1

Getting started

1.1 Package contents

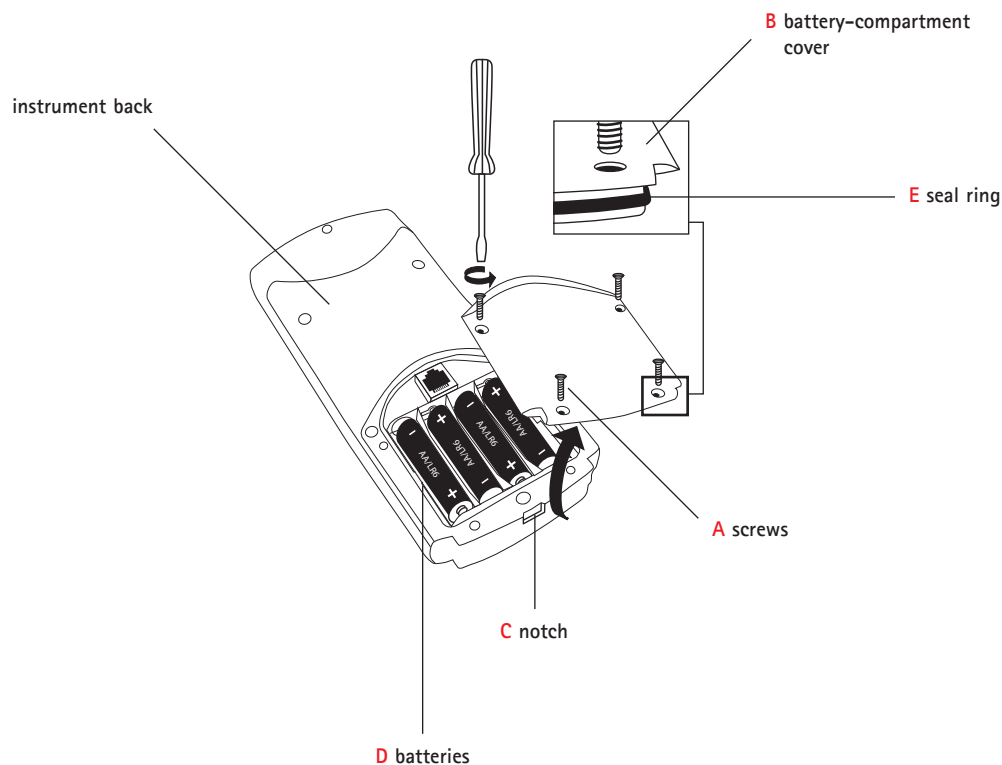
The standard contents of the Spectroquant® Move 100 Colorimeter package comprise the following items:

- 1 Colorimeter in a plastic carrying case
- 4 Batteries (type AA/LR6) **(a)**
- 1 Adapter for 16-mm ø round cells **(b)**
- 3 Round cells with cap, ø 16 mm **(c)**
- 3 Round cells with cap, ø 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.

Dispose of used batteries in accordance with the local regulations.

1.2.1 Replacement of batteries

Refer to page 8 for how to replace used batteries.

Recommendation

Do not use rechargeable batteries!

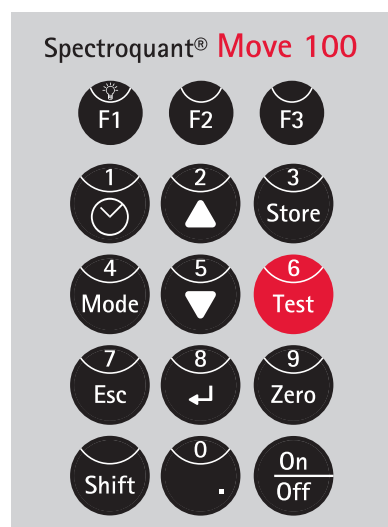
1.2.2 Saving data – Important notes

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



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 SQ Move 100, e.g. current unit configuration | 3.6 |

The individual mode functions are selected in the following manner:

Press the **[Mode]** key.

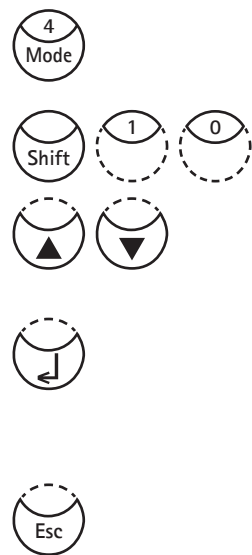
Enter the digits for the desired function, e.g.: **[Shift] + [1] [0]** for setting the language, or

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]**.

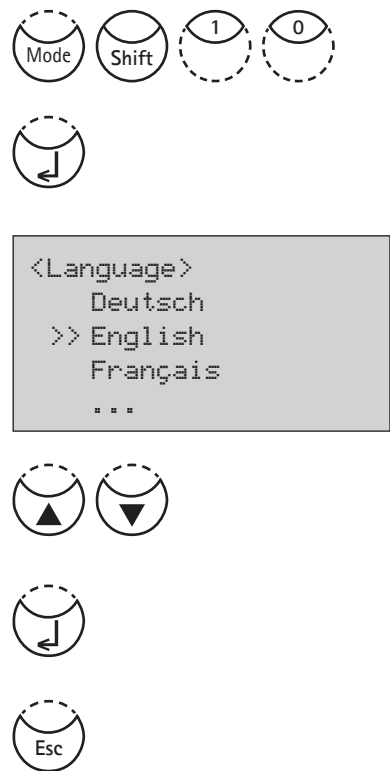
Confirm your selection by pressing **[↵]**.

The display shows:

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

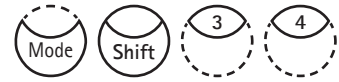
Confirm your selection by pressing **[↵]**.

(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.: July 14, 2012 =

[Shift] + [1] [2] [0] [7] [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].



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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.



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:

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

There are two ways to select the desired method:

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

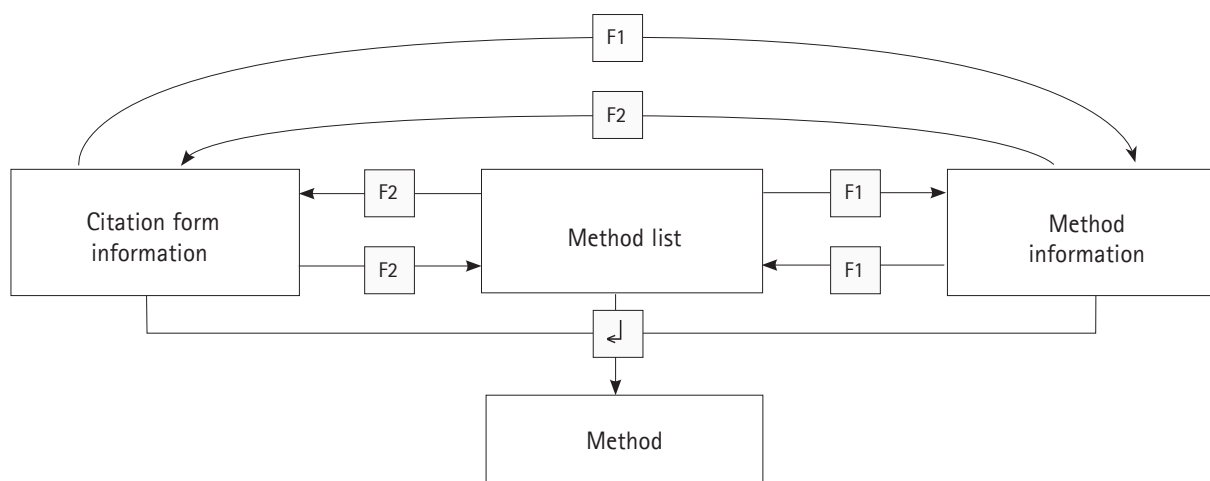
Line 2: Range with citation form 1

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
```

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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.

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).



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

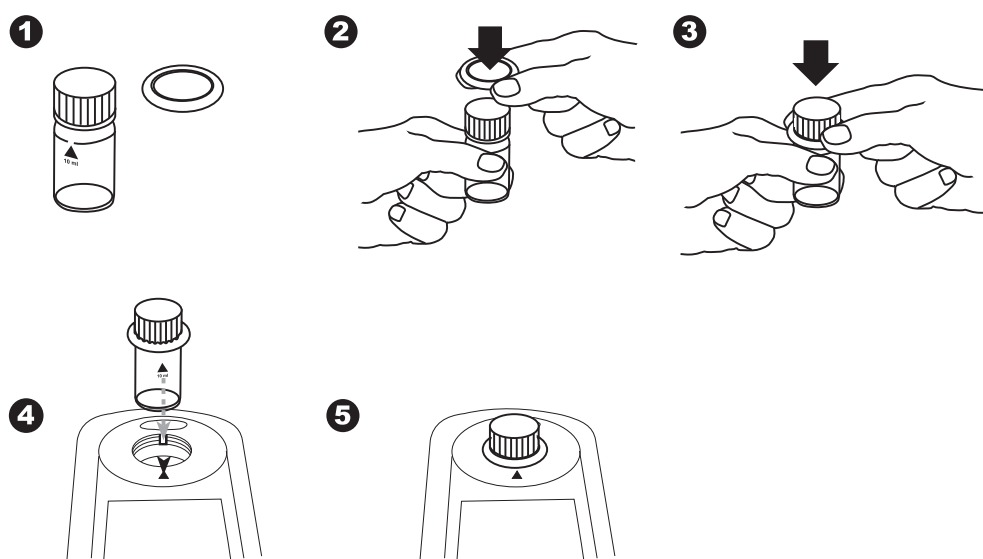
After the countdown has expired the display shows:

```
90 Bromine 00605  
0.10-5.00 mg/l Br2  
prepare Zero  
press ZERO
```

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

en

Positioning the cell (ø 24 mm)

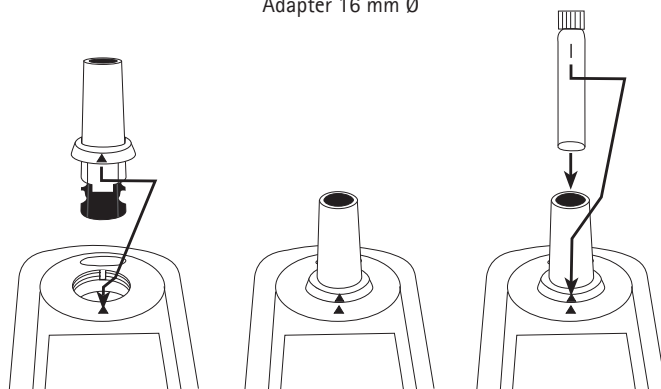


Align the triangular mark on the cell with that on the Spectroquant® Move 100.

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.

- 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
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
```



```
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;

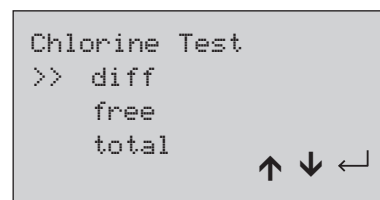
you can also enter a new method number directly,
e.g.: [Shift] + [1] [6] [3] for COD 14541.

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).



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

Confirm your selection by pressing [↵].

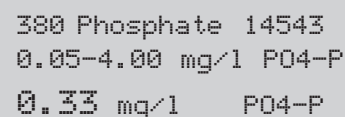


2.4 Altering the citation form

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:

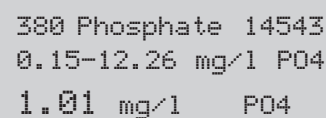
Result shown on display using Method 380 (Phosphate 14543) as an example:



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

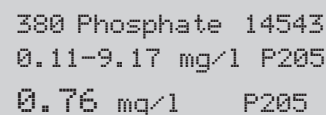
Pressing the [▼] arrow key gives you the option to select a citation form.

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

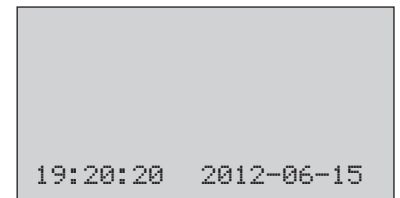
Reaction times for your own measurements in the absorbance mode can be more easily observed by using the user-countdown function (see the following section 2.6, "User countdown").

2.6 User countdown (timer function)

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

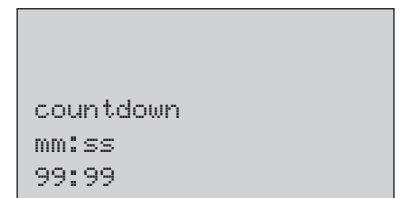
Press the ["Clock"] key.

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.

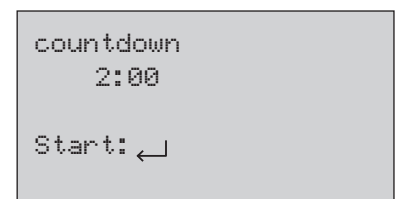
Enter the time in double digits, in the sequence minutes and seconds,
e. g.: 2 minutes, 0 seconds= [Shift] + [0][2][0][0].



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)

```
31 Ammonium 14558
0.20-8.00mg/l NH4-N

Code-No.:
- - - - -
```

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
```

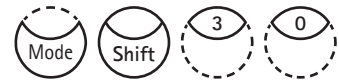
It is advisable to delete the data memory as soon as possible when no longer required (see section 2.9, "Deleting saved measurement results").

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.



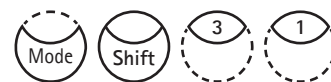
If there are no data saved in the memory, the display shows:

```
<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.: May 14, 2012 = [Shift] + [1] [2] [0] [5] [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.: May 19, 2012 = [Shift] + [1] [2] [0] [5] [1] [9].



Confirm by pressing [↵].



The display shows:

```
<Storage>
sorted: date
from 2012-05-14
to   2012-05-19
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

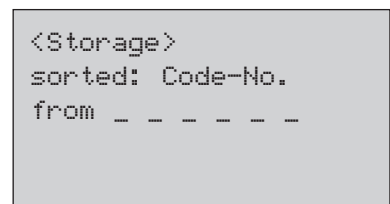
Press the keys [Mode], [Shift] + [3] [2].



Confirm your selection by pressing [↵].



The display shows:



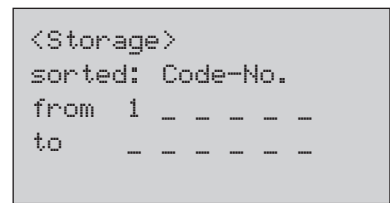
Enter the start code No. (max. 6 digits), e.g.: [Shift] + [1].



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.

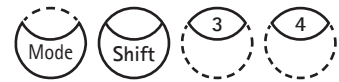


Exit by pressing the [Esc] key.



2.9 Deleting saved measurement results

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



Confirm your selection by pressing [↵].

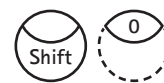


The display shows:

```
<Delete data>
Delete all Data?

YES:1,      NO:0
```

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



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



```
<Delete data>
Delete data  ↵
Do not delete: ESC
```

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.



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

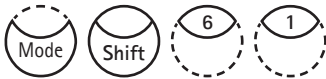
In the event that you wish for only a few methods to be shown in the method-selection list, it is advisable to first execute mode 62 "Mlist all off" (deactivate all methods) and then to process the method-selection list using mode 60 "Method list". All you then need do is select the methods that you 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.

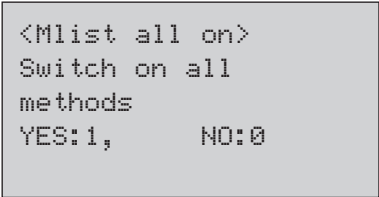
Press the keys [Mode], [Shift] + [6] [1].



Confirm your selection by pressing [↵].



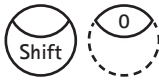
The display shows:



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.

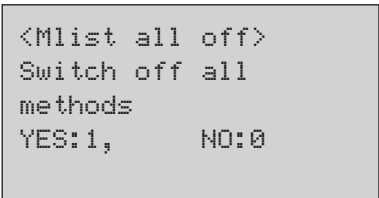
Press the keys [Mode], [Shift] + [6] [2].



Confirm your selection by pressing [↵].



The display shows:



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 user guidance. Items d, e, and f are omitted.

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



Confirm your selection by pressing [↵].



The display shows:

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

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:



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.

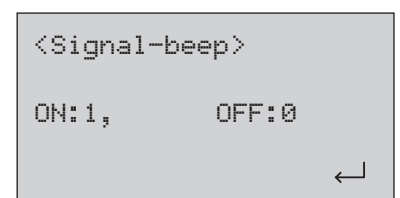
3.3.2 Activating/deactivating the signal beep

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.



Press the [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:

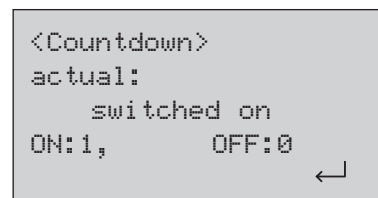
Press the keys [Mode], [Shift] + [1] [3].



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.



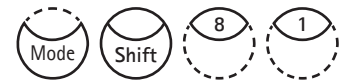
Confirm by pressing [↵].



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] key 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:
  V012.010.3.003.050

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.






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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 Overrange/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 Overrange 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 |
| 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 |

| Display message | Possible causes | Measures |
|---|--|--|
| 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. |
| <div> <div>...</div> <div>???</div> <div>...</div> </div> <p>Example 1</p> <div> 130 Chlorine CT 0.05-5.00 mg/l Cl2 0,60 mg/l free Cl ??? comb. Cl 0,59 mg/l total Cl </div> <p>Example 2</p> <div> 130 Chlorine CT 0.05-5.00 mg/l Cl2 Underrange free Cl ??? comb. Cl 0,59 mg/l total Cl </div> <p>Example 3</p> <div> 130 Chlorine CT 0.05-5.00 mg/l Cl2 0,60 mg/l free Cl ??? comb. Cl Ovrrange total Cl </div> | <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> <p>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.</p> |

4.2 Avoiding errors in photometric measurements

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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 19 or 20).
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.

Declaration of CE-Conformity

Declaration of EC-Conformity according to
DIRECTIVE 2004/108/EG OF THE EUROPEAN PARLIAMENT
AND OF THE COUNCIL of 2004, December the 15th

en

Name of manufacturer:

Merck KGaA

64271 Darmstadt
Germany

declares that this product

Product name:

Spectroquant® Move 100

meets the requirements of the following product family standard:

DIN EN 61326-1:2006

Immunity test requirements for equipment intended for use in industrial locations (Table 2)

Emission according to the requirements for class B equipment

Darmstadt, 10th January 2013

Merck KGaA

i.V.



B. Grau
Director MM WFA

i.A.



C. Klein
Product Manager Photometry



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 ₄ -N | RB | Cell test | 16 mm |
| 31 | Ammonium 14558 | 1.14558.0001 | 0.20 - 8.00 mg/l | NH ₄ -N | RB | Cell test | 16 mm |
| 32 | Ammonium 14559 | 1.14559.0001 | 4.0 - 80.0 mg/l | NH ₄ -N | RB | Cell test | 16 mm |
| 33 | Ammonium 14752 | 1.14752.0001* | 0.02 - 1.30 mg/l | NH ₄ -N | RB | Test | 24 mm |
| 34 | Ammonium 00683 | 1.00683.0001 | 1.0 - 50.0 mg/l | NH ₄ -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 ₂ 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 ₂ | H ₂ 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 |
| 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 | Chlorine Cell Test | 1.00595.0001 (free) 1.00597.0001 (free + total) | 0.05 - 5.00 mg/l | Cl ₂ | H ₂ O | Cell test | 16 mm |
| 131 | Chlorine Test | 1.00598.0002 (free) 1.00598.0001 (free) 1.00602.0001 (total) 1.00602.0002 (total) 1.00599.0001 (free + total) | 0.02 - 3.00 mg/l | Cl ₂ | H ₂ O | Test | 24 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 |
|-----------|-------------------|--|--|------------------|--------------|--------------|
| 132 | Chlorine LR, CT | 1.00086.0001 + 1.00087.0001 (free) 1.00086.0001 + 1.00087.0001 + 1.00088.0001 (total) | 0.05 - 5.00 mg/l Cl ₂ | H ₂ O | Cell test | 16 mm |
| 133 | Chlorine LR, test | 1.00086.0001 + 1.00087.0001 (free) 1.00086.0001 + 1.00087.0001 + 1.00088.0001 (total) | 0.02 - 3.00 mg/l Cl ₂ | H ₂ O | Test | 24 mm |
| 140 | Chlorine dioxide | 1.00608.0001 | 0.10 - 5.00 mg/l ClO ₂ | H ₂ O | Test | 24 mm |
| 150 | Chromate 14552 | 1.14552.0001 | 0.05 - 2.00 mg/l Cr | H ₂ O | Cell test | 16 mm |
| 151 | Chromate 14758 | 1.14758.0001* | 10 - 1400 µg/l Cr | H ₂ O | Test | 24 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 ₂ O | Method | 24 mm |
| 180 | Copper 14553 | 1.14553.0001 | 0.05 - 8.00 mg/l Cu | H ₂ O | Cell test | 16 mm |
| 181 | Copper 14767 | 1.14767.0001 | 0.10 - 6.00 mg/l Cu | H ₂ O | Test | 16 mm |
| 190 | Cyanide 14561 | 1.14561.0001 | 10 - 350 µg/l CN | H ₂ O | Cell test | 16 mm |
| 191 | Cyanide 09701 | 1.09701.0001* | 5 - 200 µg/l CN | H ₂ 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 |
| 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 |
| 230 | Hydrazine 09711 | 1.09711.0001* | 10 - 1200 µg/l N ₂ H ₄ | RB | Test | 24 mm |
| 240 | Iodine 00606 | 1.00606.0001 | 0.10 - 5.00 mg/l I ₂ | H ₂ O | Test | 24 mm |
| 250 | Iron 14549 | 1.14549.0001 | 0.05 - 4.00 mg/l Fe | H ₂ O | Cell test | 16 mm |
| 251 | Iron 14761 | 1.14761.0001* 1.14761.0002* | 0.01 - 2.00 mg/l Fe | H ₂ O | Test | 24 mm |
| 252 | Iron 00796 | 1.00796.0001 | 0.10 - 5.00 mg/l Fe | H ₂ O | Test | 16 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 ₂ 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 ₂ O | Test | 24 mm |
| 283 | Manganese 01846 | 1.01846.0001 | 0.05 - 1.80 mg/l Mn | RB | Test | 24 mm |
| 291 | Molybdenum 19252 | 1.19252.0001 | 0.5 - 45.0 mg/l Mo | H ₂ O | Test | 24 mm |
| 300 | Monochloramine | 1.01632.0001 | 0.10 - 5.00 mg/l Cl ₂ | H ₂ O | Test | 24 mm |
| 310 | Nickel 14554 | 1.14554.0001 | 0.10 - 6.00 mg/l Ni | H ₂ 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 ₃ -N | RB | Cell test | 16 mm |
| 321 | Nitrate 14773 | 1.14773.0001 | 0.5 - 15.0 mg/l NO ₃ -N | RB | Test | 16 mm |
| 323 | Nitrate 01842 | 1.01842.0001 | 0.3 - 30.0 mg/l NO ₃ -N | RB | Test | 24 mm |
| 330 | Nitrite 14547 | 1.14547.0001 | 10 - 700 µg/l NO ₂ -N | H ₂ O | Cell test | 16 mm |
| 331 | Nitrite 14776 | 1.14776.0001* 1.14776.0002* | 5 - 400 µg/l NO ₂ -N | H ₂ O | Test | 24 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 ₂ | H ₂ O | Cell test | 16 mm |
| 350 | Ozone 00607 | 1.00607.0001 1.00607.0002 | 0.02 - 2.00 mg/l O ₃ | H ₂ O | Test | 24 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

| Meth. No. | Parameter | Cat. No. | Measuring range | | Blank | Type of test | Type of cell |
|-----------|-------------------------|---------------|--------------------|----------------------------------|------------------|--------------|--------------|
| 360 | pH 01744 | 1.01744.0001 | 6.4 - 8.8 | | H ₂ O | Cell test | 16 mm |
| 370 | Phenol 14551 | 1.14551.0001 | 0.10 - 2.50 mg/l | C ₆ H ₅ OH | RB | Cell test | 16 mm |
| 371 | Phenol 00856 | 1.00856.0001 | 0.10 - 5.00 mg/l | C ₆ H ₅ OH | RB | Test | 24 mm |
| 387 | Phosphate 00474 | 1.00474.0001 | 0.05 - 4.00 mg/l | PO ₄ -P | H ₂ O | Cell test | 16 mm |
| 380 | Phosphate 14543 | 1.14543.0001 | 0.05 - 4.00 mg/l | PO ₄ -P | H ₂ O | Cell test | 16 mm |
| 388 | Phosphate 00475 | 1.00475.0001 | 0.5 - 20.0 mg/l | PO ₄ -P | H ₂ O | Cell test | 16 mm |
| 381 | Phosphate 14729 | 1.14729.0001 | 0.5 - 20.0 mg/l | PO ₄ -P | H ₂ O | Cell test | 16 mm |
| 382 | Phosphate 00616 | 1.00616.0001 | 3.0 - 100.0 mg/l | PO ₄ -P | H ₂ O | Cell test | 16 mm |
| 389 | Phosphate 00673 | 1.00673.0001 | 3.0 - 100.0 mg/l | PO ₄ -P | H ₂ O | Cell test | 16 mm |
| 383 | Phosphate 14848 | 1.14848.0001* | 0.01 - 2.50 mg/l | PO ₄ -P | H ₂ O | Test | 24 mm |
| 384 | Phosphate 00798 | 1.00798.0001 | 1.0 - 60.0 mg/l | PO ₄ -P | H ₂ O | Test | 16 mm |
| 385 | Phosphate 14842 | 1.14842.0001 | 0.5 - 30.0 mg/l | PO ₄ -P | RB | Test | 16 mm |
| 386 | Phosphate 14546 | 1.14546.0001 | 0.5 - 25.0 mg/l | PO ₄ -P | RB | Cell test | 16 mm |
| 400 | Potassium 14562 | 1.14562.0001 | 5.0 - 50.0 mg/l | K | H ₂ O | Cell test | 16 mm |
| 401 | Potassium 00615 | 1.00615.0001 | 30 - 300 mg/l | K | H ₂ 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 ₂ | H ₂ O | Test | 24 mm |
| 421 | Silicate 00857 | 1.00857.0001 | 11 - 1070 mg/l | SiO ₂ | H ₂ O | Test | 16 mm |
| 422 | Silicate 01813 | 1.01813.0001 | 0.004 - 0.500 mg/l | SiO ₂ | RB | Test | 24 mm |
| 430 | Sodium 00885 | 1.00885.0001 | 10 - 300 mg/l | Na | RB | Cell test | 16 mm |
| 440 | Sulfate 14548 | 1.14548.0001 | 5 - 250 mg/l | SO ₄ | H ₂ O | Cell test | 16 mm |
| 442 | Sulfate 14564 | 1.14564.0001 | 100 - 1000 mg/l | SO ₄ | H ₂ O | Cell test | 16 mm |
| 443 | Sulfate 01812 | 1.01812.0001 | 1.0 - 25.0 mg/l | SO ₄ | RB | Test | 24 mm |
| 450 | Sulfide 14779 | 1.14779.0001 | 0.10 - 1.50 mg/l | S | H ₂ O | Test | 16 mm |
| 460 | Sulfite 14394 | 1.14394.0001 | 1.0 - 20.0 mg/l | SO ₃ | RB | Cell test | 16 mm |
| 461 | Sulfite 01746 | 1.01746.0001 | 1.0 - 60.0 mg/l | SO ₃ | RB | Test | 16 mm |
| 470 | Surfact-a 14697 | 1.14697.0001 | 0.05 - 2.00 mg/l | MBAS | 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 ₂ O | Method | 24 mm |
| 510 | Total hardness 00961 | 1.00961.0001 | 5 - 215 mg/l | Ca | RB | Cell test | 16 mm |
| 520 | Turbidity | - | 1 - 100 FAU | | H ₂ 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

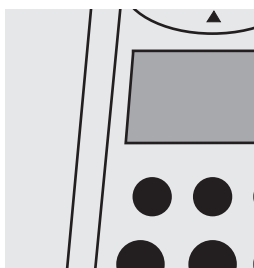
RB = own reagent blank value

Acid capacity to pH 4.3 (total alkalinity)

101758

Cell Test

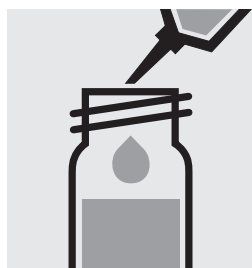
Measuring range: 0.40 – 8.00 mmol/l OH 16-mm cell
20 – 400 mg/l CaCO₃ 16-mm cell



Select method **10**.



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



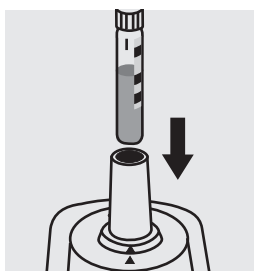
Add to one cell 1.0 ml of the sample with pipette, close with the screw cap, and mix.



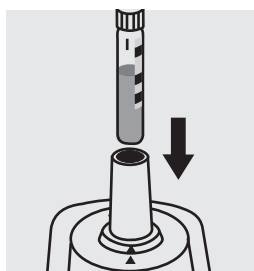
Add to the second cell 1.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



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

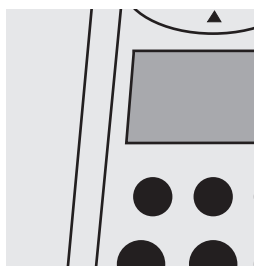
Measuring range: 20 – 700 µg/l Al

24-mm cell

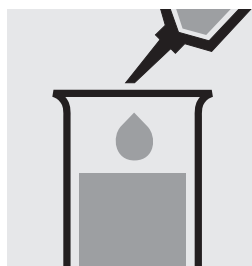
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



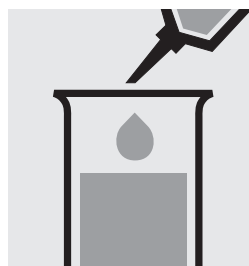
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



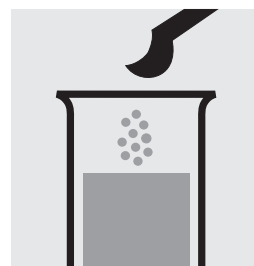
Select method \odot \odot \odot .



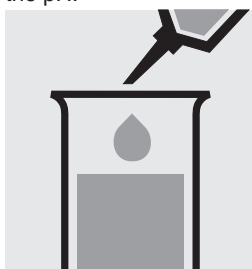
Pipette 10 ml of the sample into a test tube.



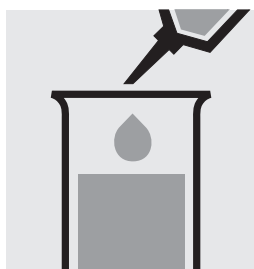
Pipette 10 ml of distilled water into a second test tube.
(Blank)



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



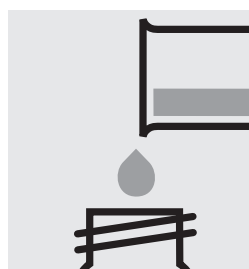
Add to each test tube 2.4 ml of **Al-2** with pipette and mix.



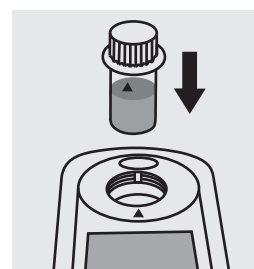
Add to each test tube 0.5 ml of **Al-3** with pipette and mix.



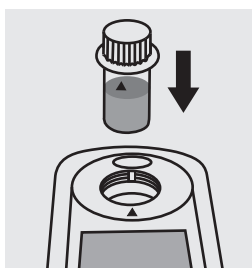
Reaction time: 2 minutes
Press \leftarrow to start the countdown.



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 \odot .



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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use aluminium standard solution CertiPUR®, Cat.No. 119770, concentration 1000 mg/l Al can be used after diluting accordingly.

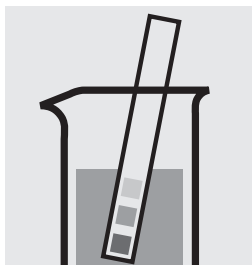
Aluminium

100594

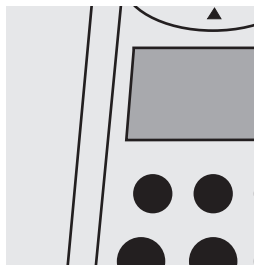
Cell Test

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.



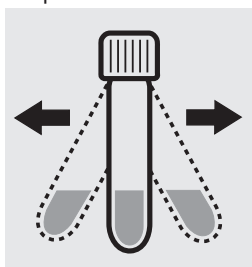
Pipette 6.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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.



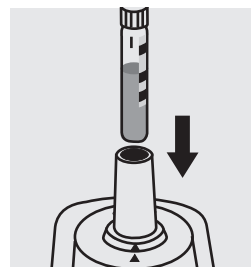
Shake both cells vigorously to dissolve the solid substance.



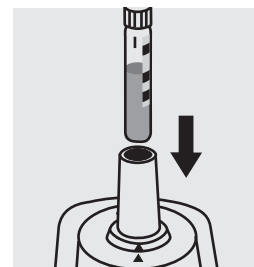
Add to each test tube 0.25 ml of **Al-2K** with pipette, close with the screw cap, and mix.



Reaction time: 5 minutes
Press 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:

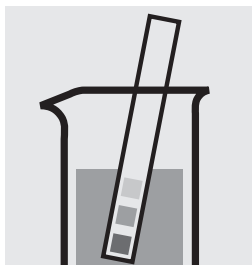
To check the measurement system (test reagents, measurement device, and handling) ready-for-use aluminium standard solution CertiPUR®, Cat.No. 119770, concentration 1000 mg/l Al can be used after diluting accordingly.

Ammonium

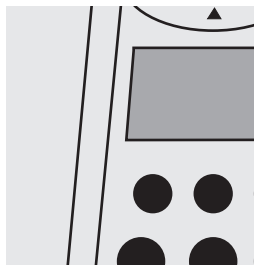
114739

Cell Test

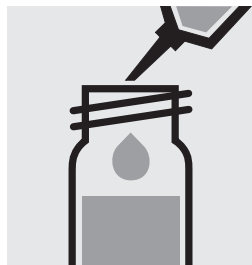
| | |
|--|------------|
| Measuring range: 10 – 2000 µg/l NH ₄ -N | 16-mm cell |
| 13 – 2576 µg/l NH ₄ | 16-mm cell |



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.



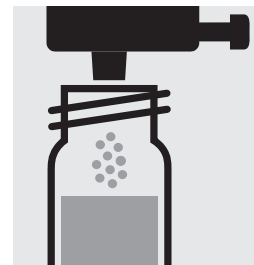
Select method **3.0**.



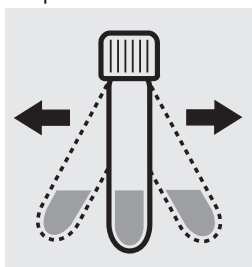
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



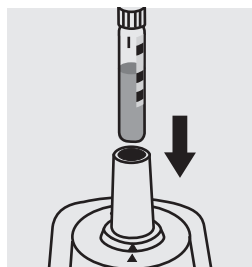
Add to each cell 1 dose of **NH₄-1K** using the blue dose-metering cap, close with the screw cap.



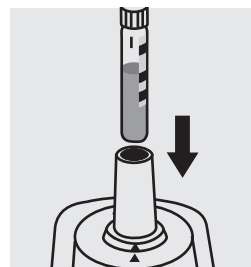
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 15 minutes
Press **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:

Very high ammonium concentrations in the sample produce turquoise-coloured 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 solution for photometric applications, CRM, Cat.No. 125022 and 125023.
The measurement results are expressed in µg/l NH₄-N.

Ready-for-use ammonium standard solution CertiPUR®, Cat.No. 119812, concentration 1000 mg/l NH₄⁺, can also be used after diluting accordingly.

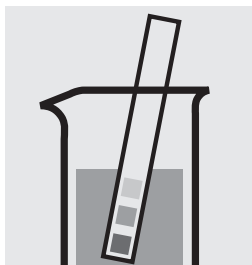
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Ammonium

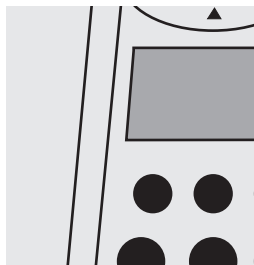
114558

Cell Test

| | |
|---|------------|
| Measuring range: 0.20 – 8.00 mg/l $\text{NH}_4\text{-N}$ | 16-mm-cell |
| 0.26 – 10.30 mg/l NH_4 | 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.



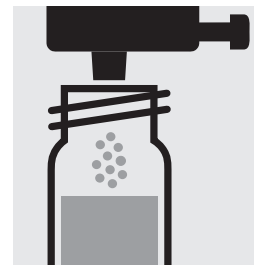
Select method **31**.



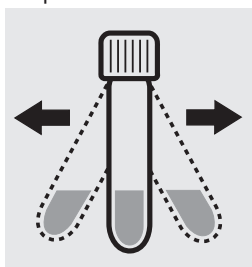
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



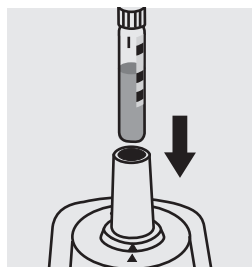
Add to each cell 1 dose of **NH₄-1K** using the blue dose-metering cap, close with the screw cap.



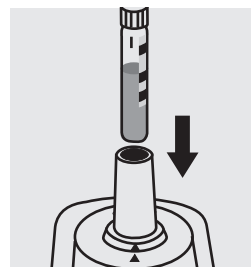
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 15 minutes
Press **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:

Very high ammonium concentrations in the sample produce turquoise-coloured 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 solution for photometric applications, CRM, Cat. No. 125022, 125023, 125024, and 125025.

Ready-for-use ammonium standard solution CertiPUR®, Cat.No. 119812, concentration 1000 mg/l NH_4^+ , can also be used after diluting accordingly.

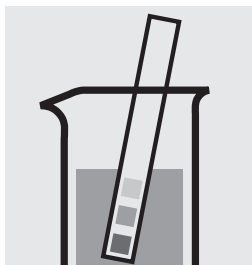
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Ammonium

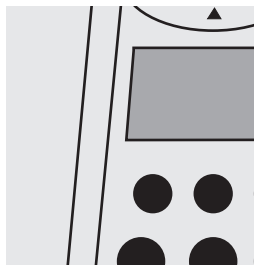
114559

Cell Test

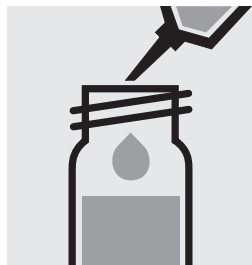
| | | |
|------------------|--|------------|
| Measuring range: | 4.0 – 80.0 mg/l $\text{NH}_4\text{-N}$ | 16-mm-cell |
| | 5.2 – 103.0 mg/l NH_4 | 16-mm-cell |



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.



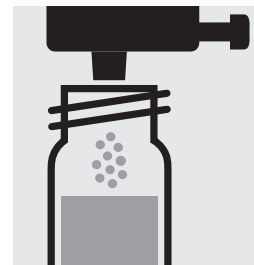
Select method 032.



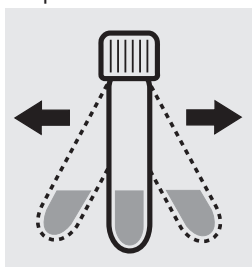
Pipette 0.10 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



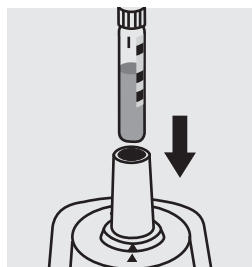
Add to each cell 1 dose of $\text{NH}_4\text{-1K}$ using the blue dose-metering cap, close with the screw cap.



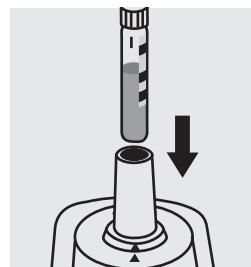
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 15 minutes
Press (15 min) 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-coloured 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 solution for photometric applications, CRM, Cat. No. 125025, 125026, and 125027.

Ready-for-use ammonium standard solution CertiPUR®, Cat.No. 119812, concentration 1000 mg/l 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.

Ammonium

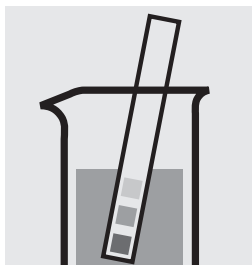
114752

Test

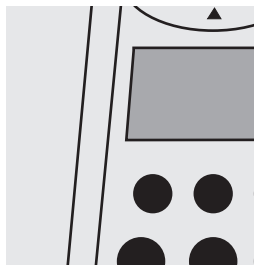
Measuring range: 0.02 – 1.30 mg/l $\text{NH}_4\text{-N}$ 24-mm cell

0.03 – 1.67 mg/l NH_4 24-mm cell

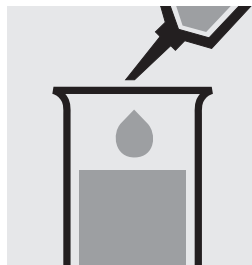
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



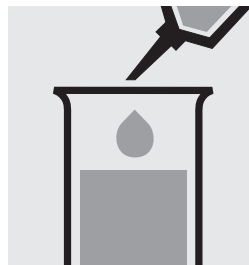
Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



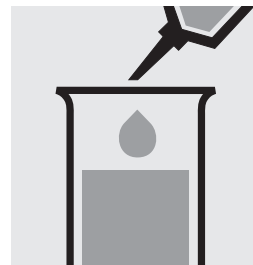
Select method \bigcirc 3 \bigcirc 3.



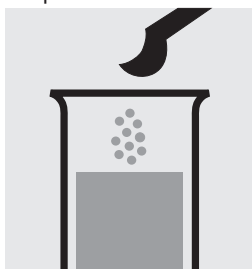
Pipette 10 ml of the sample into a test tube.



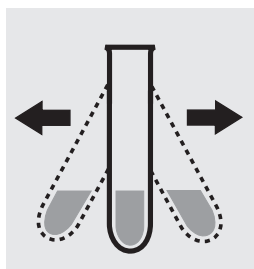
Pipette 10 ml of distilled water into a second test tube. (Blank)



Add to each test tube 1.2 ml of $\text{NH}_4\text{-1}$ with pipette and mix.



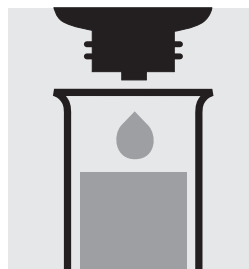
Add to each test tube 2 level blue microspoons of $\text{NH}_4\text{-2}$.



Shake both test tubes vigorously to dissolve the solid substance.



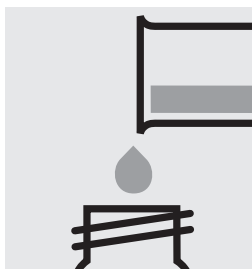
Reaction time: 5 minutes
Press \leftarrow to start the countdown.



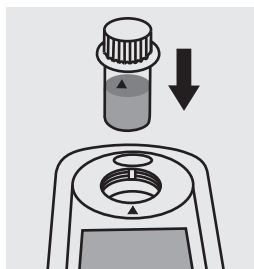
Add to each test tube 8 drops of $\text{NH}_4\text{-3}$ and mix.



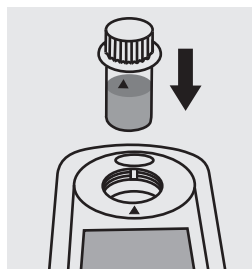
Reaction time: 5 minutes
Press \leftarrow to start the countdown.



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-coloured 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 solution for photometric applications, CRM, Cat.No. 125022 and 125023. Use 10 ml R-1 instead of the sample.

Ready-for-use ammonium standard solution CertiPUR®, Cat.No. 119812, concentration 1000 mg/l NH_4^+ , 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

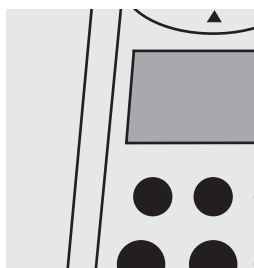
100683

Test

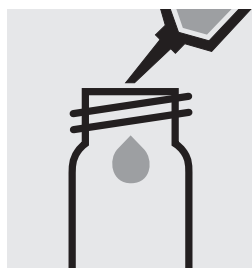
| | |
|---|------------|
| Measuring range: 1.0 – 50.0 mg/l $\text{NH}_4\text{-N}$ | 16-mm cell |
| 1.3 – 64.4 mg/l NH_4 | 16-mm cell |



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.



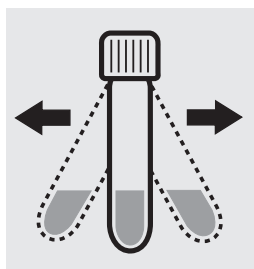
Add to one cell 0.20 ml of the sample with pipette, close with the screw cap, and mix.



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



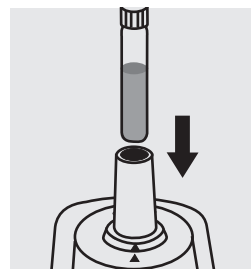
Add to each cell 1 level blue microspoon of $\text{NH}_4\text{-2}$, close with the screw cap.



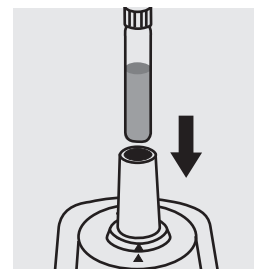
Shake both cells vigorously to dissolve the solid substance.



Reaction time: 15 minutes
Press to start the countdown.



Insert the blank cell into the cell compartment. Press .



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

Important:

Very high ammonium concentrations in the sample produce turquoise-coloured 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 solution for photometric applications, CRM, Cat. No. 125025 and 125026.

Ready-for-use ammonium standard solution CertiPUR®, Cat.No. 119812, concentration 1000 mg/l 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)

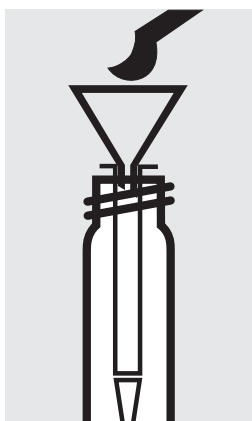
100675

Cell Test

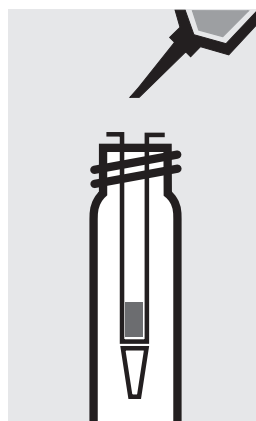
Measuring range: 0.05 – 2.50 mg/l AOX

16-mm cell

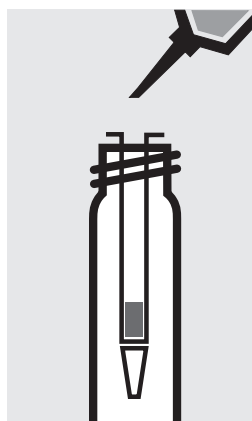
Preparation of the adsorption column:



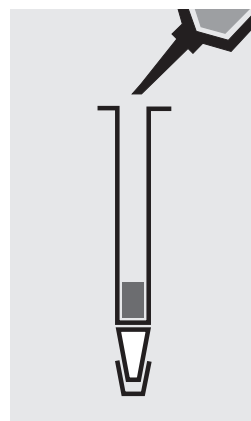
Place the column in an empty cell. Fill 1 level blue microspoon of **AOX-1** into the column using the glass funnel.



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.

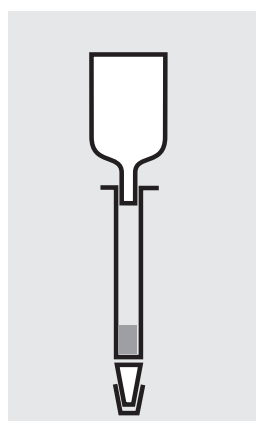


Close the bottom end of the column with the stopper. Apply to the column 1 ml of **AOX-3**. Close the top end of the column with the stopper and swirl to eliminate air bubbles. Remove the stopper on the top end and fill the column to the brim with **AOX-3**.

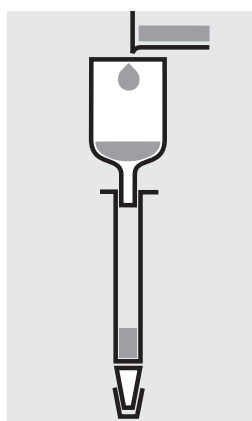
Sample enrichment:



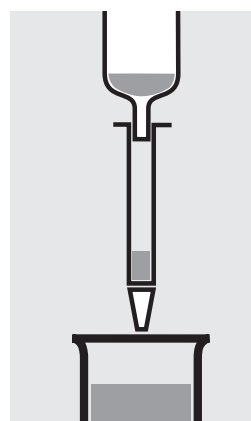
Check the pH of the sample, specified range: pH 6 – 7. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



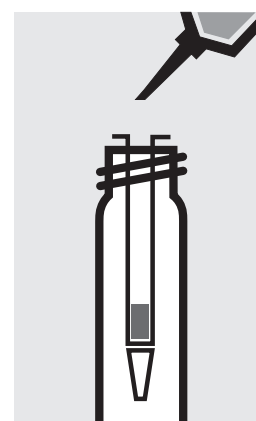
Attach the glass reservoir to the prepared column (closed at the bottom end).



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.

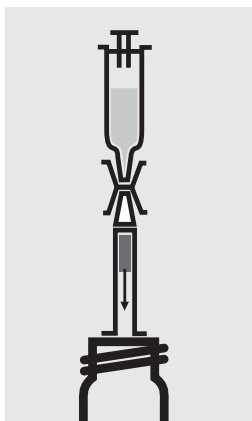
AOX

Adsorbable organic halogens (x)

100675

Cell Test

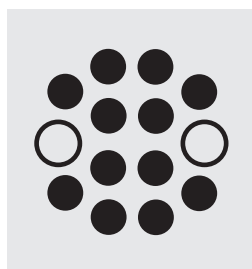
Digestion:



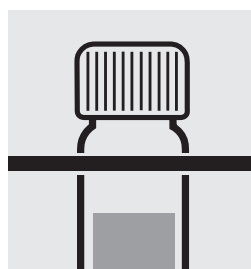
Fill the 10-ml syringe with 10 ml of reagent **AOX-5** and attach the syringe with the column outlet using the connector. Place the top end of the column on an empty cell and rinse the charcoal filling of the column into an empty 16-mm cell.



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.

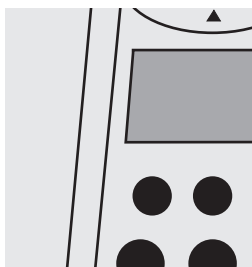


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

Determination:



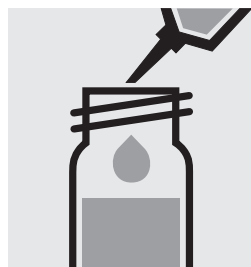
Select method **040**.



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



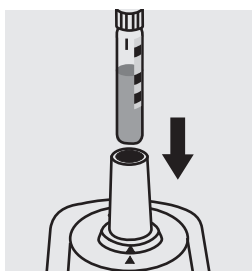
Add to one cell 7.0 ml of **pretreated sample** (without charcoal) with glass pipette, close with the screw cap, and mix.



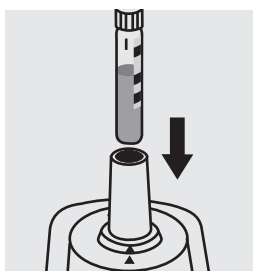
Add to the second cell 7.0 ml distilled water with pipette, close with the screw cap, and mix. (Blank cell)



Reaction time: 15 minutes
Press **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) Spectroquant® AOX Standard, Cat.No. 100680, concentration 0.2 – 2.0 mg/l can be used.

Arsenic

101747

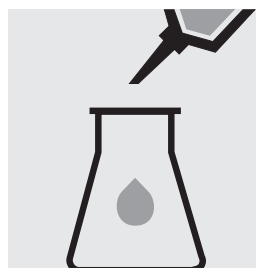
Test

Measuring range: 5 – 100 µg/l As

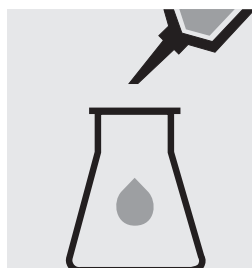
16-mm cell



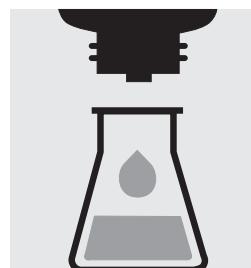
Check the pH of the sample, specified range: pH 0 – 13.



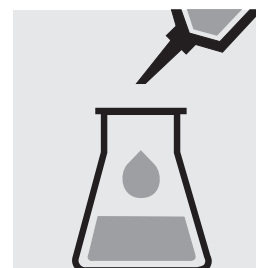
Place 350 ml of the sample into an Erlenmeyer flask with ground joint.



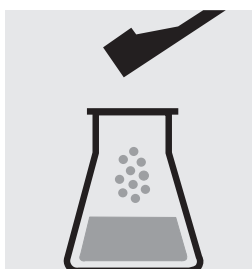
Place 350 ml of distilled water into a second Erlenmeyer flask with ground joint. (Blank)



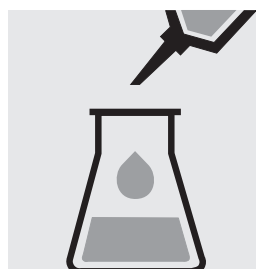
Add to each Erlenmeyer flask 5 drops of **As-1** and mix.



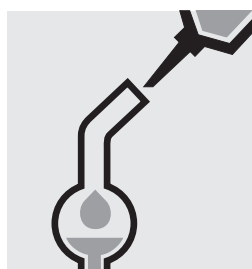
Add to each Erlenmeyer flask 20 ml of **As-2** with pipette and mix.



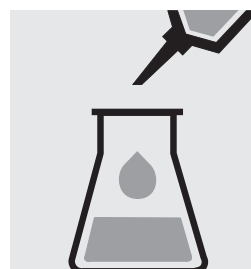
Add to each Erlenmeyer flask 1 level green dosing spoon of **As-3** and dissolve.



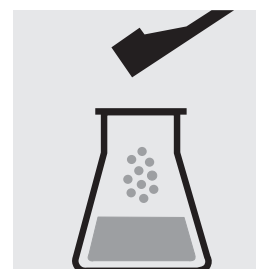
Add to each Erlenmeyer flask 1.0 ml of **As-4** with pipette and mix.



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



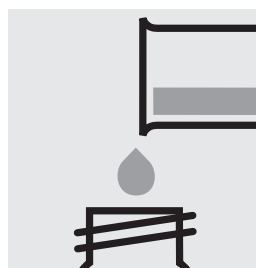
Add to each Erlenmeyer flask 1.0 ml of **As-6** with pipette to the solution in the Erlenmeyer flask and mix.



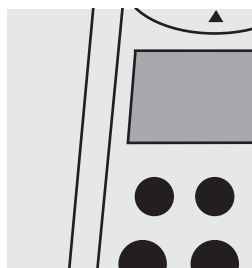
Add to each Erlenmeyer flask 3 level red dosing spoons of **As-7**. **Immediately** attach the absorption tubes to the Erlenmeyer flasks.



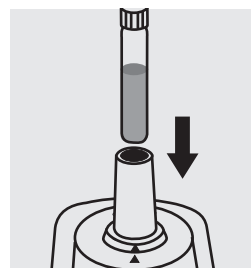
Leave to stand for 2 hours. During this time carefully swirl the flask several times or stir slowly with a magnetic stirrer.



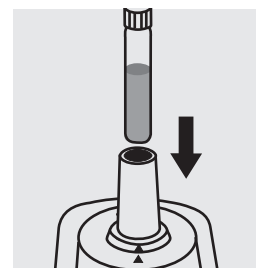
Transfer the solutions from the absorption tubes into two separate 16-mm cell, close with the screw cap.



Select method **50**.



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-for-use arsenic standard solution CertiPUR®, Cat.No. 119773, concentration 1000 mg/l As can be used after diluting accordingly.

BOD

Biochemical oxygen demand

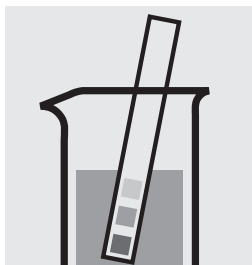
100687

Cell Test

Measuring range: 0.5 – 3000¹⁾ mg/l O₂ 16-mm cell

¹⁾ 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)



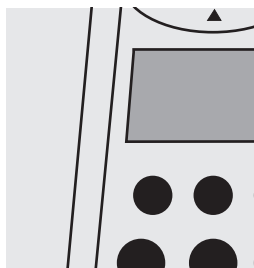
Incubate one bottle of **pretreated sample** and one of **inoculated nutrient-salt solution** closed in a thermostatic incubation cabinet at 20 ± 1°C for 5 days.

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 **70**.



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



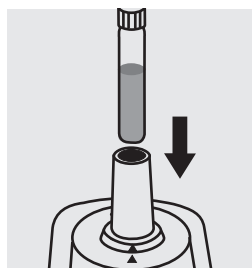
Add to each oxygen reaction bottle 10 drops of **BOD-3K**, reclose, and mix.



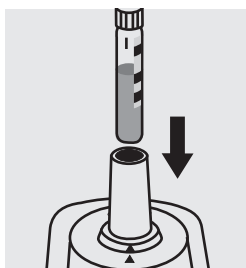
Transfer each solution into a separate 16-mm cell, close with the screw caps.



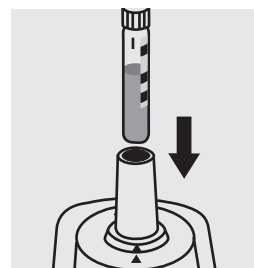
Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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 • dilution factor – B

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.

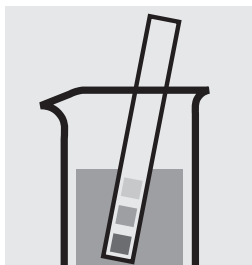
Boron

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.



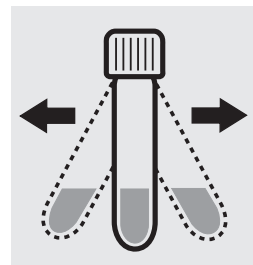
Pipette 1.0 ml each of **B-1K** into two reaction cells, close with the screw cap, and mix.



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



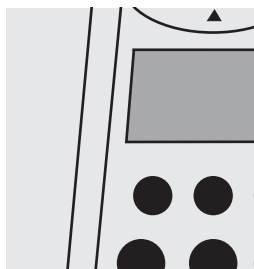
Add to the second cell 4.0 ml of distilled water with pipette, close with the screw cap. (Blank cell)



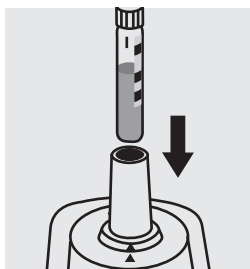
Shake both cells vigorously to dissolve the solid substance.



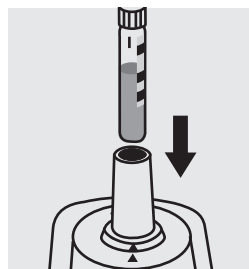
Reaction time:
60 minutes



Select method 080.



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-for-use boron standard solution CertiPUR®, Cat.No. 119500, concentration 1000 mg/l B can also be used after diluting accordingly.

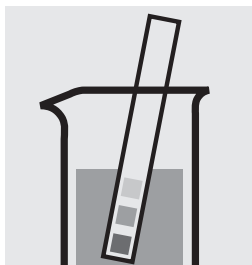
Bromine

100605

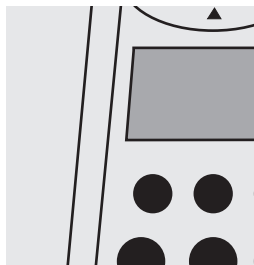
Test

Measuring range: 0.10 – 5.00 mg/l Br₂

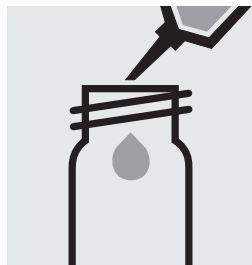
24-mm cell



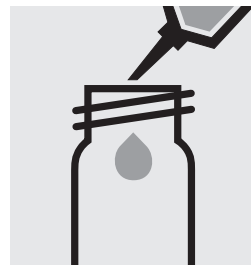
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **0.90**.



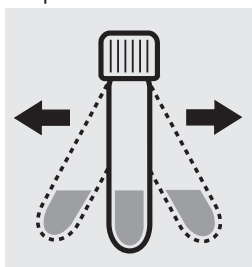
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



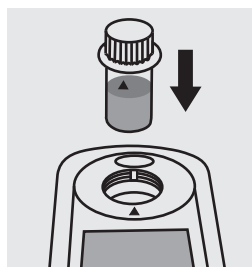
Add 1 level blue micro-spoon of **Br₂-1**, close with the screw cap.



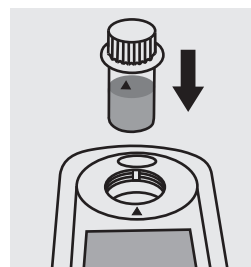
Shake the cell vigorously to dissolve the solid substance.



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-coloured 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”).

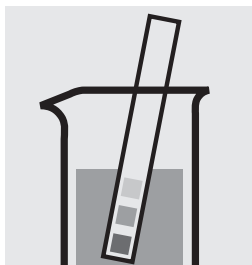
Cadmium

114834

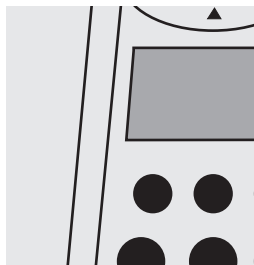
Cell Test

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.



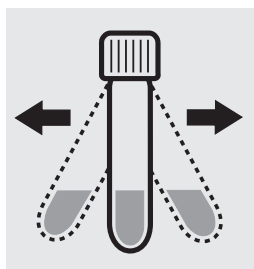
Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



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



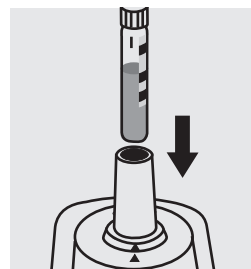
Add to each cell 1 level green microspoon of **Cd-2K**, close with the screw cap.



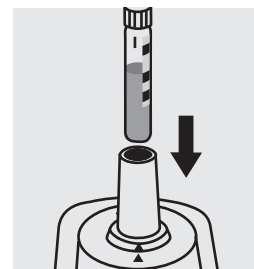
Shake both cells vigorously to dissolve the solid substance.



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, Cat.No. 114677. The measurement results are expressed in µg/l Cd.

Ready-for-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 30) is highly recommended.

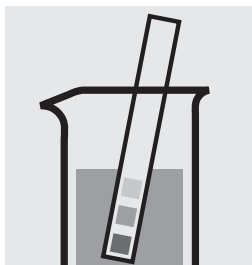
Cadmium

101745

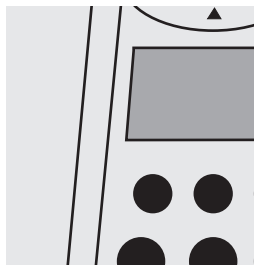
Test

Measuring range: 5–500 µg/l Cd

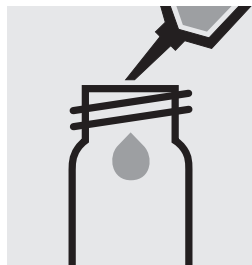
24-mm cell



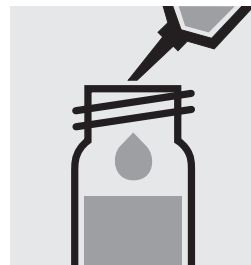
Check the pH of the sample, specified range: pH 3 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ①①①.



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.



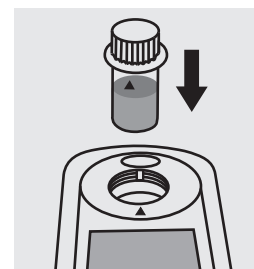
Add to each cell 1 level green microspoon of **Cd-3**, close with the screw cap, and dissolve the solid substance.



Reaction time: 2 minutes
Press 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:

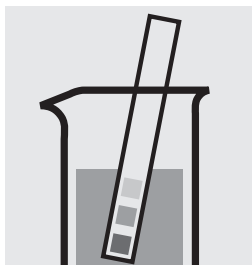
To check the measurement system (test reagents, measurement device, and handling) ready-for-use cadmium standard solution CertiPUR®, Cat.No. 119777, concentration 1000 mg/l Cd, can be used after diluting accordingly.

Calcium

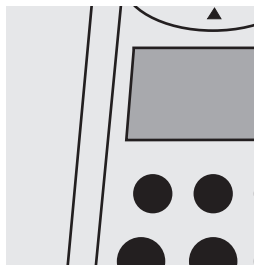
114815

Test

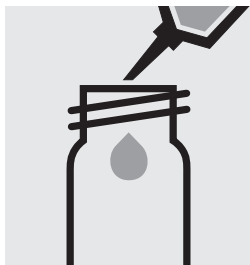
| | |
|---|------------|
| Measuring range: 5 – 160 mg/l Ca | 16-mm cell |
| 7 – 224 mg/l CaO | 16-mm cell |
| 13 – 400 mg/l CaCO ₃ | 16-mm cell |



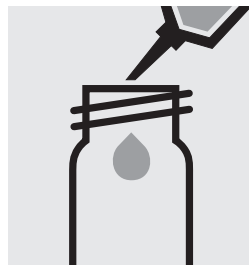
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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



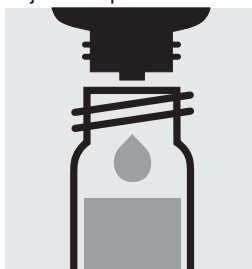
Pipette 0.10 ml of the sample into a 16-mm cell.



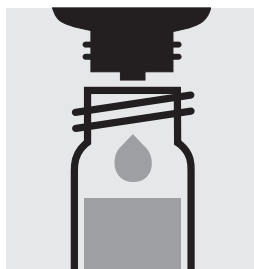
Pipette 0.10 ml of distilled water into a second 16-mm cell. (Blank cell)



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



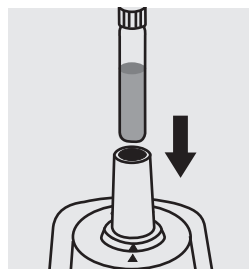
Add to each cell 4 drops of **Ca-2**, close with the screw cap, and mix.



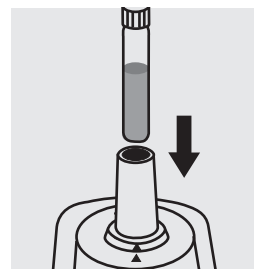
Add to each cell 4 drops of **Ca-3**, close with the screw cap, and mix.



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-for-use calcium standard solution CertiPUR®, Cat.No. 119778, concentration 1000 mg/l Ca, can be used after diluting accordingly.

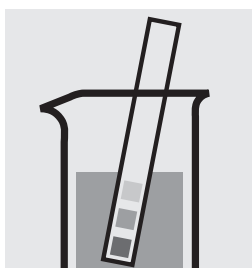
Chloride

114730

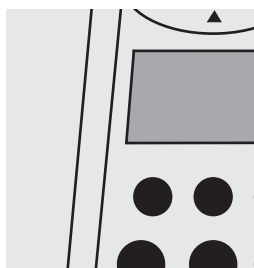
Cell Test

Measuring range: 5 – 125 mg/l Cl

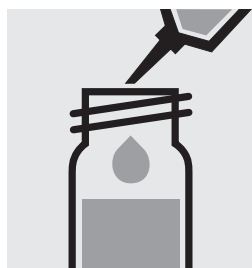
16-mm cell



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**.



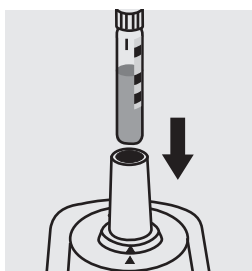
Pipette 0.50 ml each of **Cl-1K** into two reaction cells, close with the screw cap, and mix.



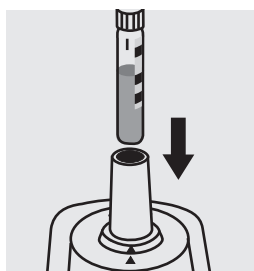
Add to one cell 1.0 ml of the sample with pipette, close with the screw cap, and mix.



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.No. 114676 and 114675.

Ready-for-use chloride standard solution CertiPUR®, Cat.No. 119897, concentration 1000 mg/l Cl⁻, 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

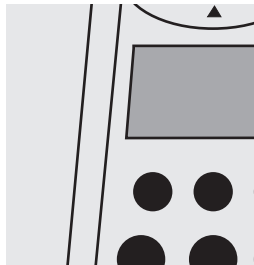
Test

Measuring range: 10–250 mg/l Cl

16-mm cell



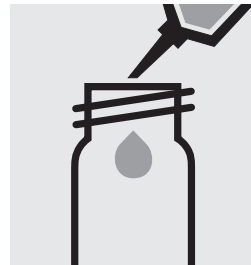
Check the pH of the sample, specified range: pH 1 – 12. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



Select method ①②①.



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)



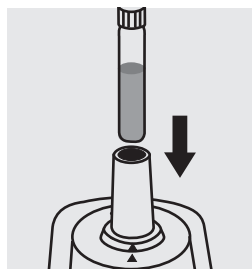
Add to each cell 2.5 ml of **CI-1** with pipette, close with the screw cap, and mix.



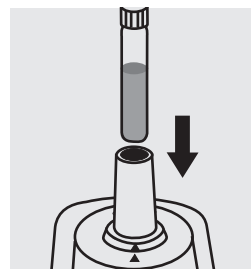
Add to each cell 0.50 ml of **CI-2** with pipette, close with the screw cap, and mix.



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.

Ready-for-use chloride standard solution CertiPUR®, Cat.No. 119897, concentration 1000 mg/l Cl⁻, 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.

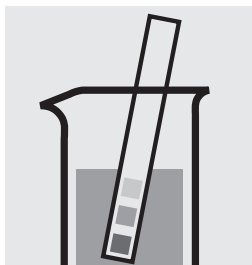
Chloride

101804

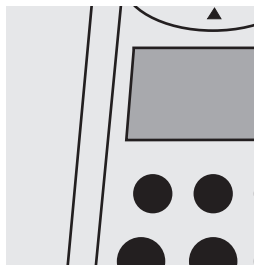
Cell Test

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 ①②②.



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




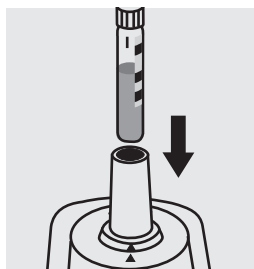
Pipette 10 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



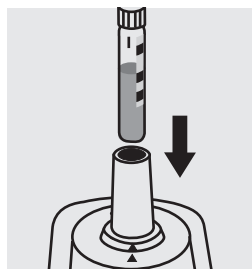
Add 0.25 ml each of **Cl-1K** with pipette, close with the screw cap, and mix.



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-for-use chloride standard solution CertiPUR®, Cat.No. 119897, concentration 1000 mg/l Cl⁻, can be used after diluting accordingly.

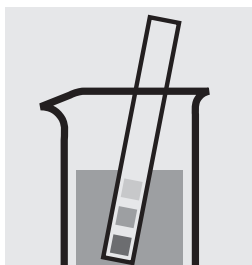
Chloride

101807

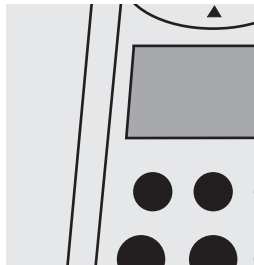
Test

Measuring range: 0.50 – 5.00 mg/l Cl

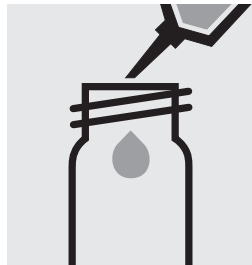
24-mm cell



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 process analysis, Cat.No. 101051, is recommended) with pipette, close with the screw cap, and mix. (Blank cell)



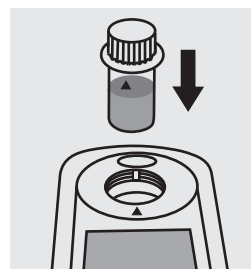
Add to each cell 0.20 ml of **CI-2** with pipette, close with the screw cap, and mix.



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-for-use chloride standard solution CertiPUR®, Cat.No. 119897, concentration 1000 mg/l Cl⁻, can be used after diluting accordingly.

Chlorine

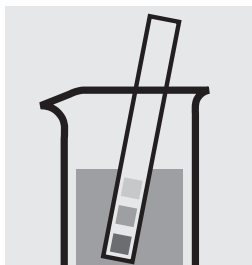
Determination of free chlorine

100595

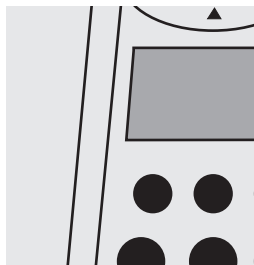
Cell Test

Measuring range: 0.05 – 5.00 mg/l Cl_2

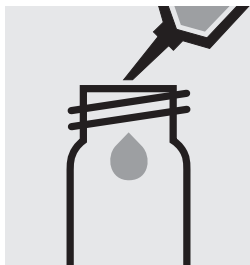
16-mm cell



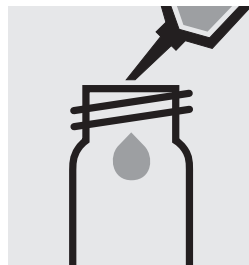
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



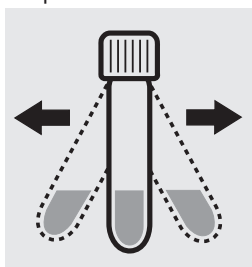
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a round cell.



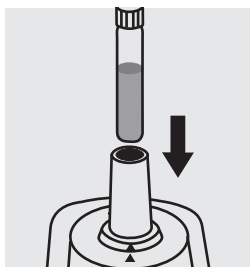
Add 1 level blue micro-spoon of **Cl₂-1**, close with the screw cap.



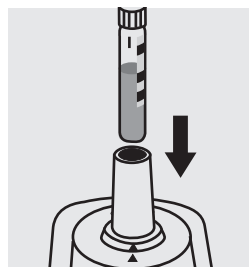
Shake the cell vigorously to dissolve the solid substance.



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-coloured 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

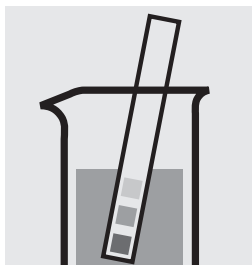
Determination of free chlorine

100597

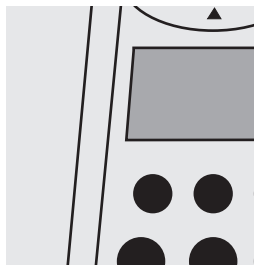
Cell Test

Measuring range: 0.05 – 5.00 mg/l Cl_2

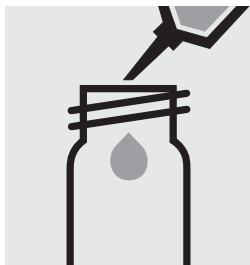
16-mm cell



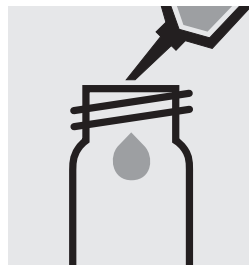
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method 130, select subitem >>free.



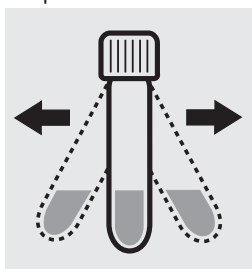
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a round cell.



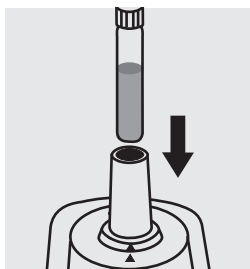
Add 1 level blue micro-spoon of $\text{Cl}_2\text{-1}$, close with the screw cap.



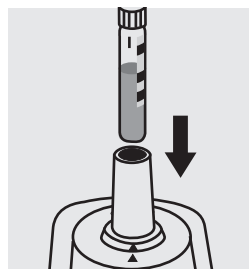
Shake the cell vigorously to dissolve the solid substance.



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-coloured 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

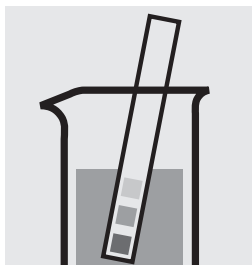
Determination of total chlorine

100597

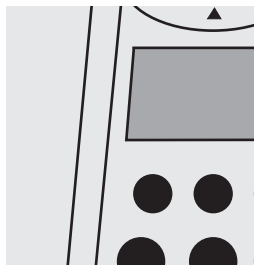
Cell Test

Measuring range: 0.05 – 5.00 mg/l Cl_2

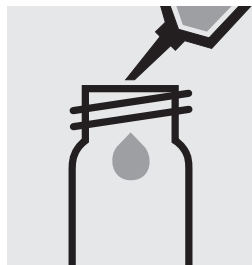
16-mm cell



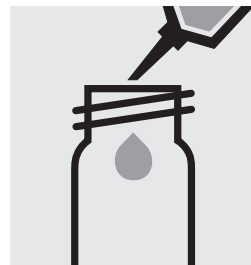
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



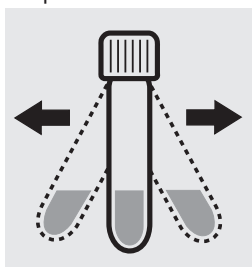
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



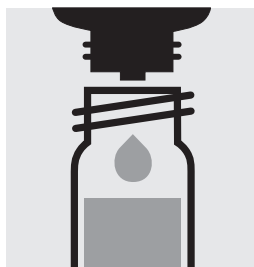
Pipette 5.0 ml of the sample into a round cell.



Add 1 level blue micro-spoon of **Cl₂-1**, close with the screw cap.



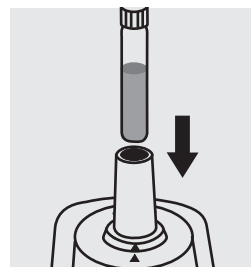
Shake the cell vigorously to dissolve the solid substance.



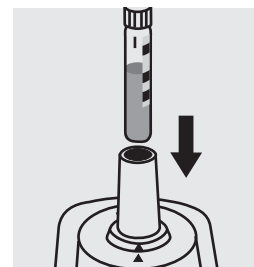
Add 2 drops of **Cl₂-2**, close with the screw cap, and mix.



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-coloured 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

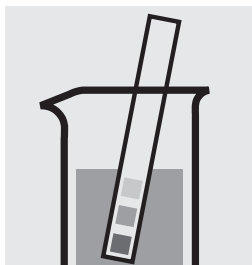
Determination of free chlorine, total chlorine,
and combined chlorine

100597

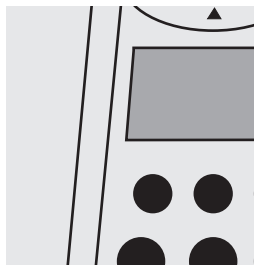
Cell Test

Measuring range: 0.05 – 5.00 mg/l Cl_2

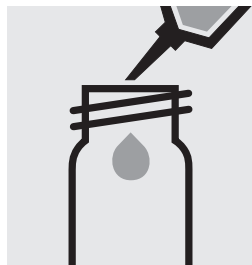
16-mm cell



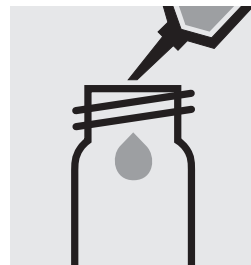
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



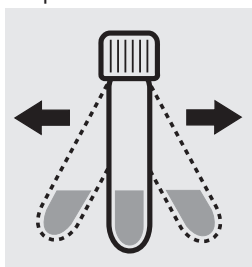
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap.
(Blank cell)



Pipette 5.0 ml of the sample into a round cell.



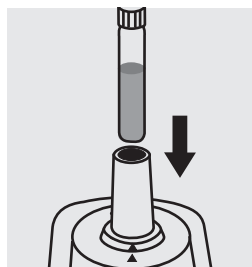
Add 1 level blue micro-spoon of **Cl₂-1**, close with the screw cap.



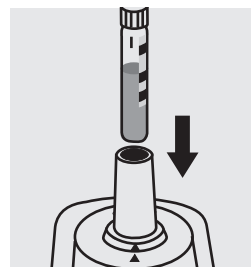
Shake the cell vigorously to dissolve the solid substance.



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



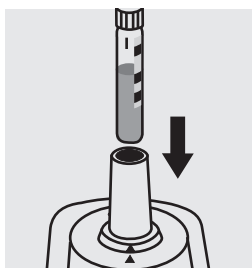
Insert the blank cell into the cell compartment.
Press **Zero**.



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 **Cl₂-2**, 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-coloured 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 **Cl₂-2**. 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

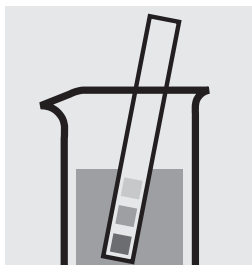
100598

Determination of free chlorine

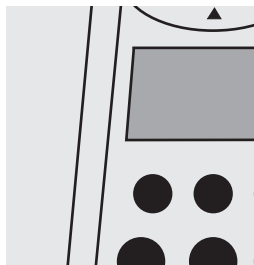
Test

Measuring range: 0.02 – 3.00 mg/l Cl_2

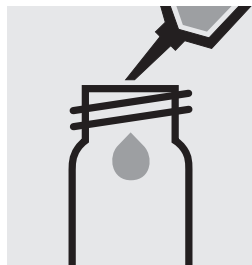
24-mm cell



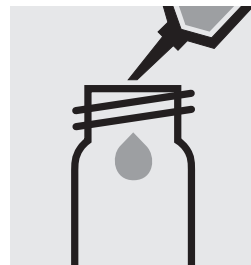
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



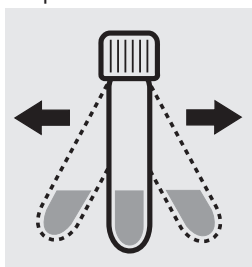
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



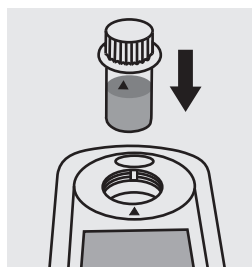
Add 1 level blue micro-spoon of **Cl₂-1**, close with the screw cap.



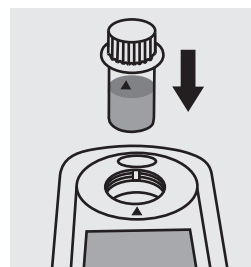
Shake the cell vigorously to dissolve the solid substance.



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-coloured 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

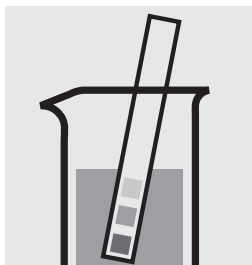
100602

Determination of total chlorine

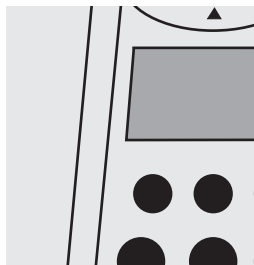
Test

Measuring range: 0.02 – 3.00 mg/l Cl_2

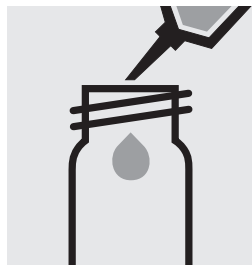
24-mm cell



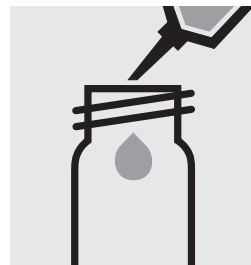
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ①③①, select subitem >>total.



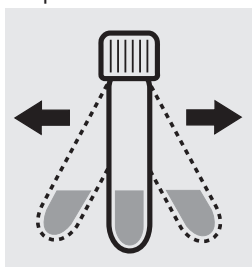
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



Add 1 level blue micro-spoon of Cl_2 -1, close with the screw cap.



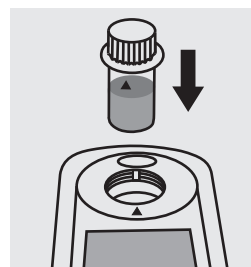
Shake the cell vigorously to dissolve the solid substance.



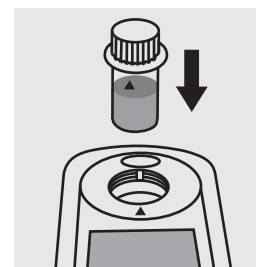
Add 2 drops of Cl_2 -2, close with the screw cap, and mix.



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-coloured 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

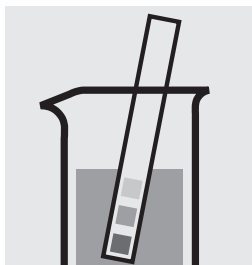
100599

Determination of free chlorine

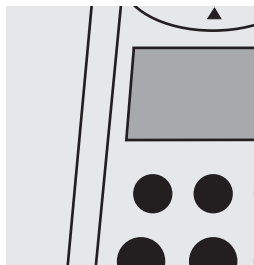
Test

Measuring range: 0.02 – 3.00 mg/l Cl_2

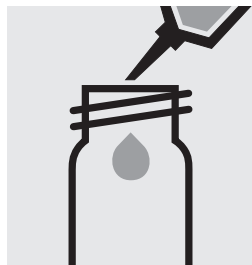
24-mm cell



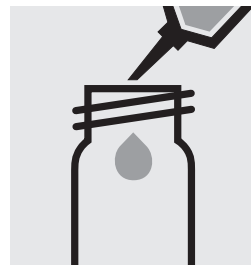
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



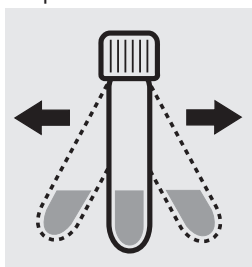
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap.
(Blank cell)



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



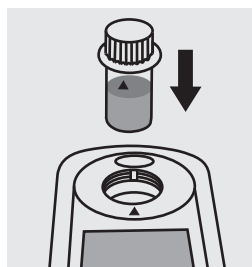
Add 1 level blue micro-spoon of **Cl₂-1**, close with the screw cap.



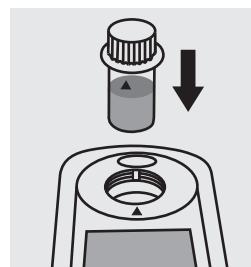
Shake the cell vigorously to dissolve the solid substance.



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-coloured 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

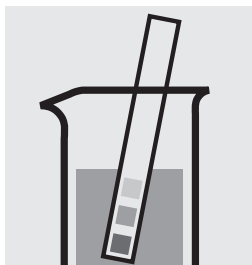
100599

Determination of total chlorine

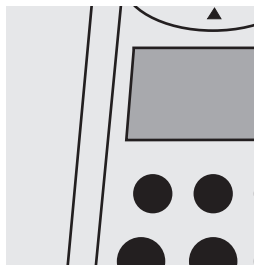
Test

Measuring range: 0.02 – 3.00 mg/l Cl_2

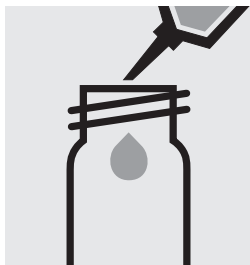
24-mm cell



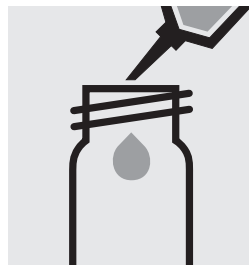
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ①③①, select subitem >>total.



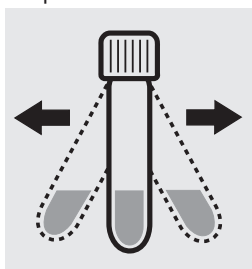
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap.
(Blank cell)



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



Add 1 level blue micro-spoon of **Cl₂-1**, close with the screw cap.



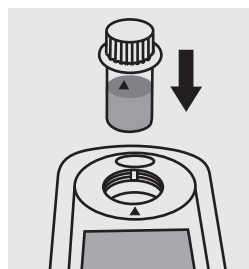
Shake the cell vigorously to dissolve the solid substance.



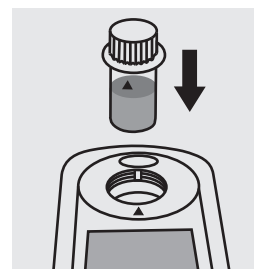
Add 2 drops of **Cl₂-2**, close with the screw cap, and mix.



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-coloured 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

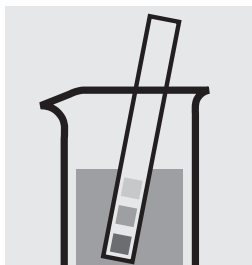
Determination of free chlorine, total chlorine,
and combined chlorine

100599

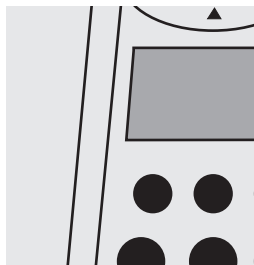
Test

Measuring range: 0.02 – 3.00 mg/l Cl_2

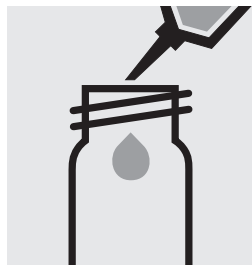
24-mm cell



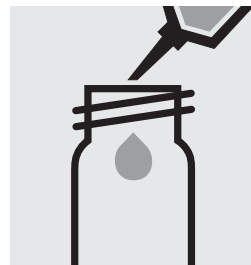
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ①③①, select subitem >>diff.



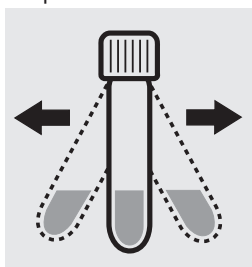
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



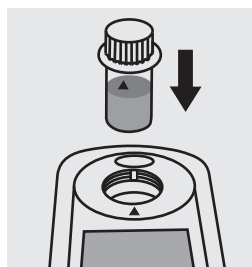
Add 1 level blue micro-spoon of **Cl₂-1**, close with the screw cap.



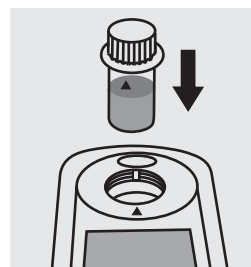
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 1 minute
Press to start the countdown.



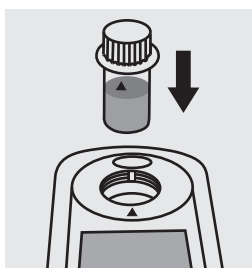
Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



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 **Cl₂-2**, 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-coloured 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 **Cl₂-2**. 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)

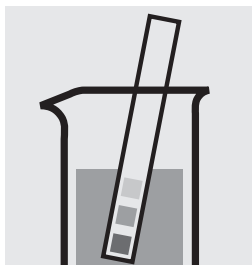
100086/100087

Determination of free chlorine

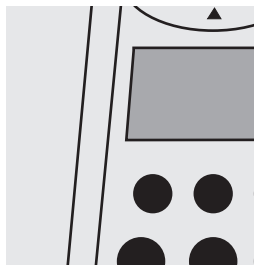
Cell Test

Measuring range: 0.05–5.00 mg/l Cl_2

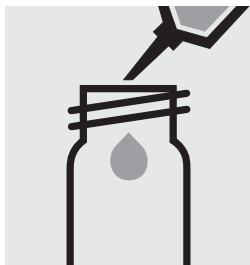
16-mm cell



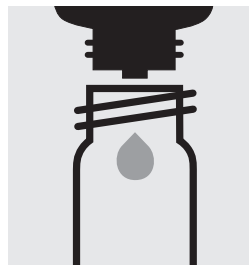
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



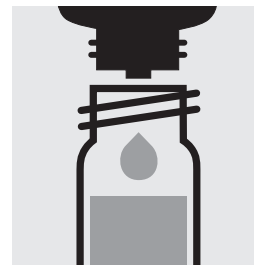
Select method ①③②, select subitem >>free.



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_2 -1 into a round cell.



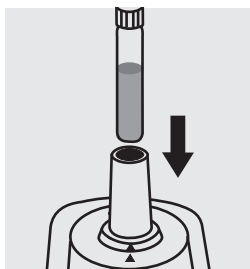
Add 3 drops of Cl_2 -2, close with the screw cap, and mix.



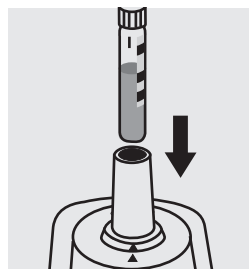
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



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-coloured 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)

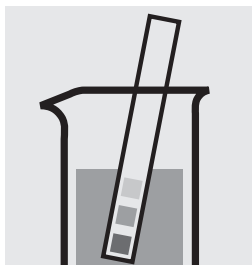
100086/100087

Determination of free chlorine

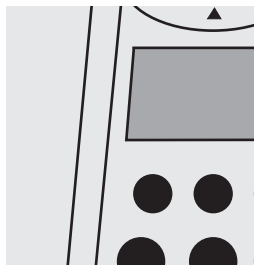
Test

Measuring range: 0.02–3.00 mg/l Cl_2

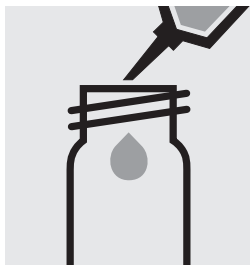
24-mm cell



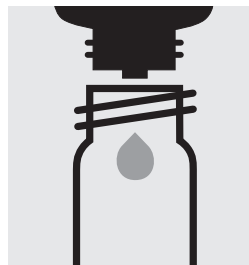
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



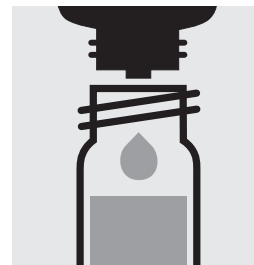
Select method ①③③, select subitem >>free.



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_2 -1 into a 24-mm cell.



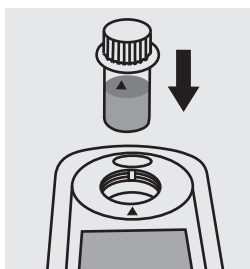
Add 3 drops of Cl_2 -2, close with the screw cap, and mix.



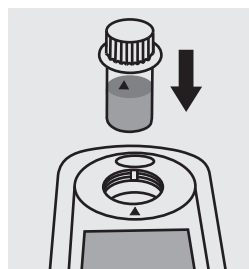
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



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 .



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-coloured 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)

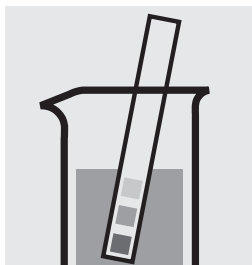
100086/100087/
100088

Determination of total chlorine

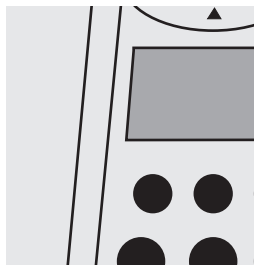
Cell Test

Measuring range: 0.05–5.00 mg/l Cl_2

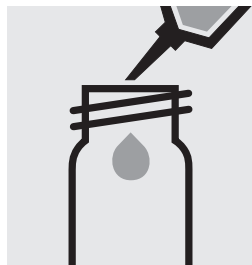
16-mm cell



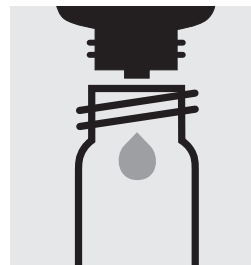
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



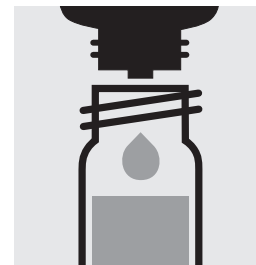
Select method ①③②, select subitem >>total.



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 $\text{Cl}_2\text{-1}$ into a round cell.



Add 3 drops of $\text{Cl}_2\text{-2}$, close with the screw cap, and mix.



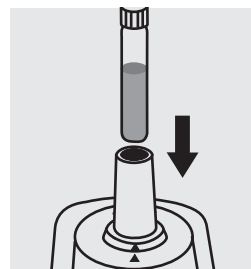
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



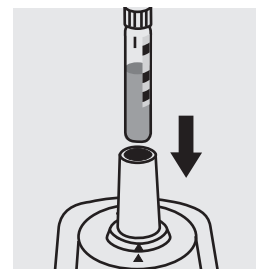
Add 2 drops of $\text{Cl}_2\text{-3}$, close with the screw cap, and mix.



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-coloured 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)

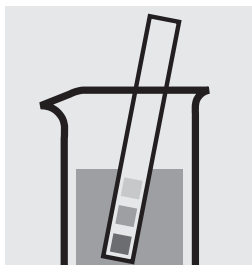
100086/100087/
100088

Determination of total chlorine

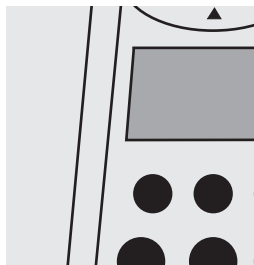
Test

Measuring range: 0.02–3.00 mg/l Cl_2

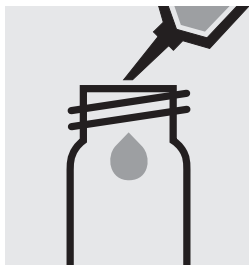
24-mm cell



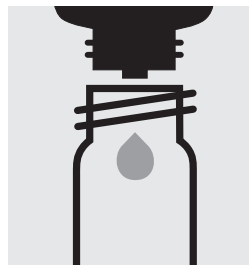
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method 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_2 -1 into a 24-mm cell.



Add 3 drops of Cl_2 -2, close with the screw cap, and mix.



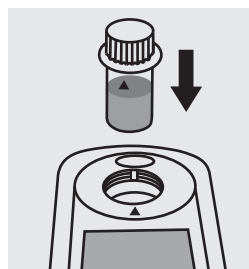
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



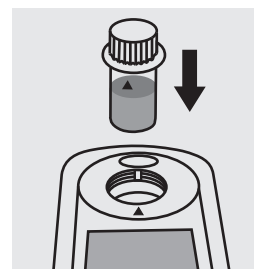
Add 2 drops of Cl_2 -3, close with the screw cap, and mix.



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-coloured 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)

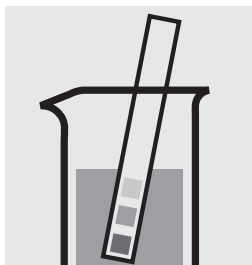
Determination of free chlorine,
total chlorine, and combined chlorine

100086/100087/
100088

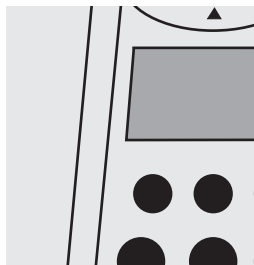
Cell Test

Measuring range: 0.05–5.00 mg/l Cl_2

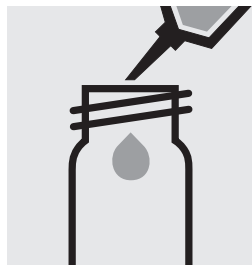
16-mm cell



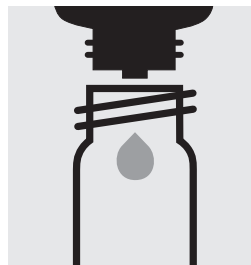
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



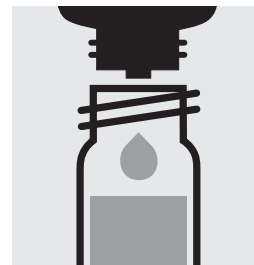
Select method ①③②, select subitem >>diff.



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_2 -1 into a round cell.



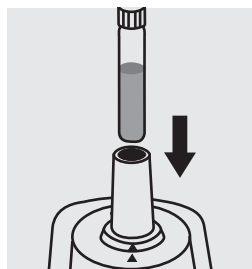
Add 3 drops of Cl_2 -2, close with the screw cap, and mix.



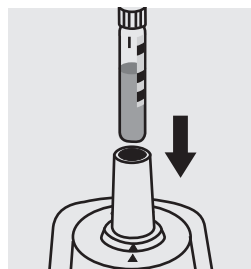
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



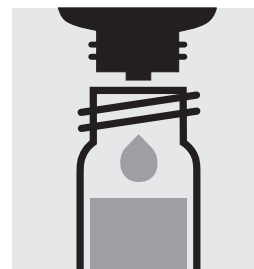
Reaction time: 1 minute
Press to start the countdown.



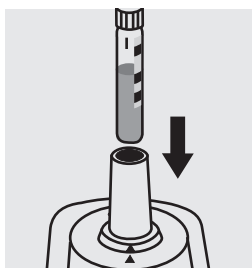
Insert the blank cell into the cell compartment. Press (Zero).



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_2 -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-coloured 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_2 -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)

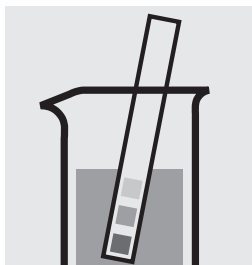
Determination of free chlorine,
total chlorine, and combined chlorine

100086/100087/
100088

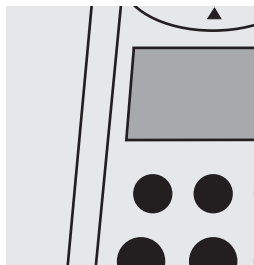
Test

Measuring range: 0.02–3.00 mg/l Cl_2

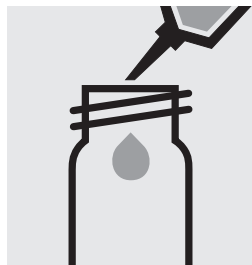
24-mm cell



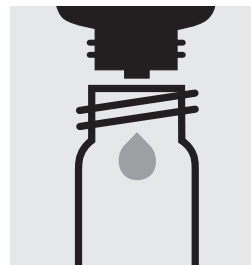
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ①③③, 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 $\text{Cl}_2\text{-1}$ into a 24-mm cell.



Add 3 drops of $\text{Cl}_2\text{-2}$, close with the screw cap, and mix.



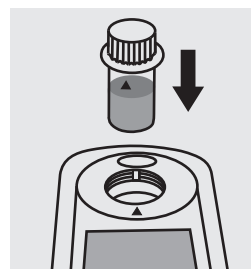
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



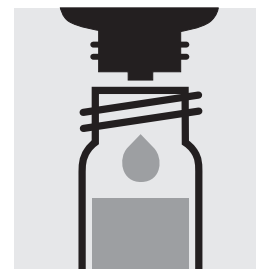
Reaction time: 1 minute
Press to start the countdown.



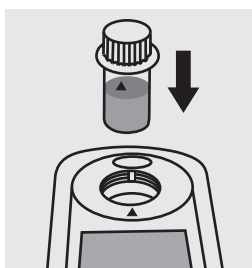
Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer. Press **(Zero)**.



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 $\text{Cl}_2\text{-3}$, 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-coloured 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 $\text{Cl}_2\text{-3}$. Use this second cell **only** for the determination of **total chlorine!**

Quality assurance:

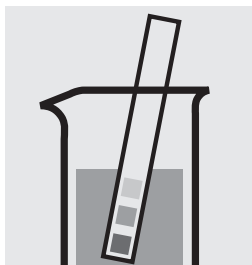
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

Chlorine dioxide

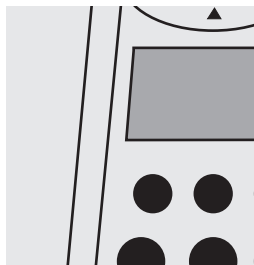
100608

Test

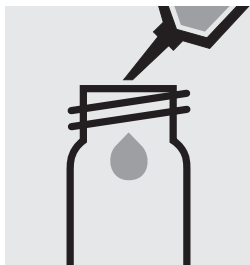
Measuring range: 0.10–5.00 mg/l ClO_2 24-mm cell



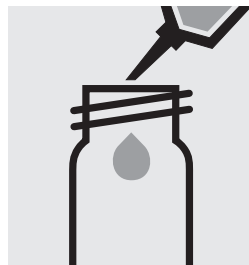
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



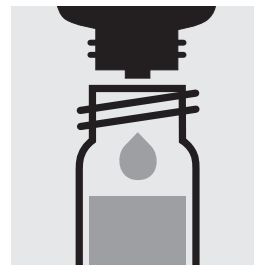
Select method ①④①.



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.



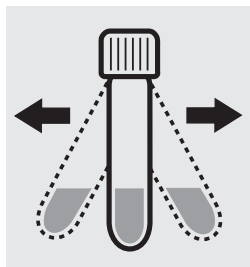
Add 2 drops of $\text{ClO}_2\text{-1}$, close with the screw cap, and mix.



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



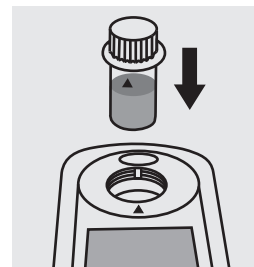
Add 1 level blue micro-spoon of $\text{ClO}_2\text{-2}$, close with the screw cap.



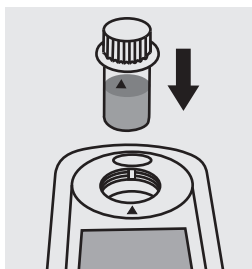
Shake the cell vigorously to dissolve the solid substance.



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-coloured 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”).

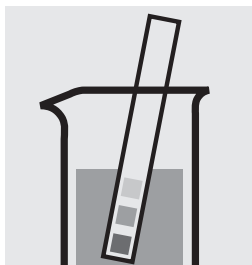
Chromate

114552

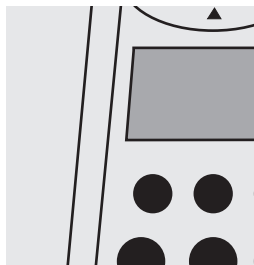
Determination of chromium(VI)

Cell Test

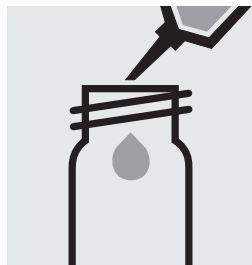
| | |
|--------------------------------------|------------|
| Measuring range: 0.05 – 2.00 mg/l Cr | 16-mm cell |
| 0.11 – 4.46 mg/l CrO_4 | 16-mm cell |



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.



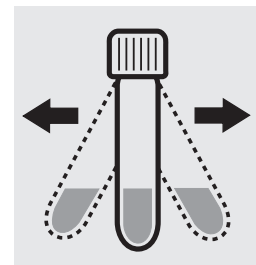
Select method 150.



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.



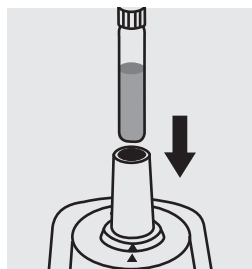
Shake the cell vigorously to dissolve the solid substance and leave to stand for **1 minute**.



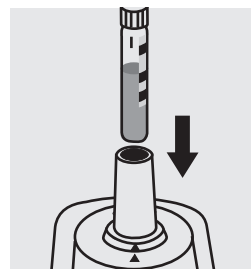
Add 5.0 ml of the sample with pipette, close with the screw cap, and mix.



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-for-use chromate standard solution CertiPUR®, Cat.No. 119780, concentration 1000 mg/l CrO_4^{2-} , can be used after diluting accordingly.

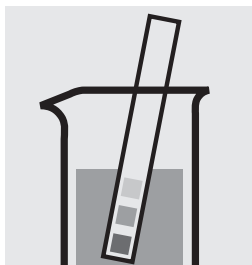
Chromate

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_4 | 16-mm cell |



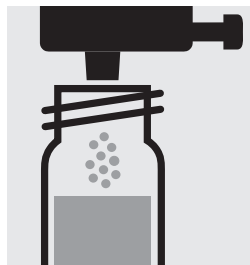
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



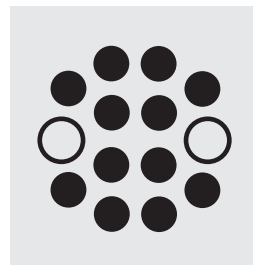
Pipette 10 ml of the sample into an empty 16-mm cell.



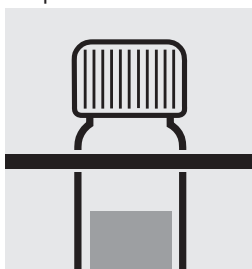
Add 1 drop of **Cr-1K**, close with the screw cap, and mix.



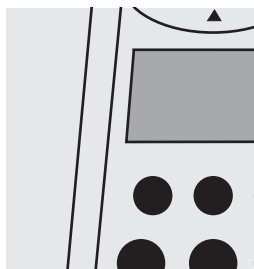
Add 1 dose of **Cr-2K** using the blue dose-metering cap, close the reaction cell with the screw cap.



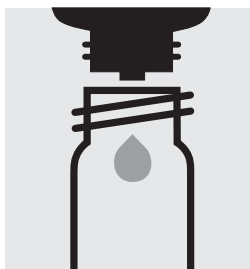
Heat the cell in the thermoreactor at 120 °C (100 °C) for 1 hour.



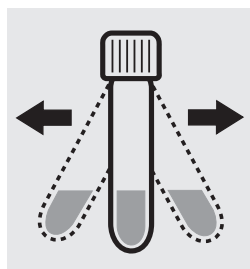
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.



Select method ①⑤①.



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**.



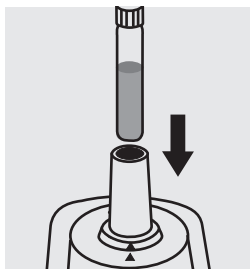
Add 5.0 ml of the **pre-treated sample** with pipette, close with the screw cap, and mix.



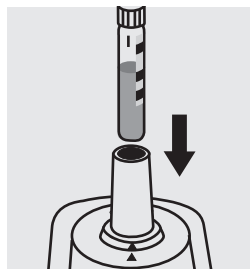
Reaction time: 1 minute
Press to start the countdown.



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-for-use chromate standard solution CertiPUR®, Cat.No. 119780, concentration 1000 mg/l CrO_4^{2-} , can be used after diluting accordingly.

Chromate

114758

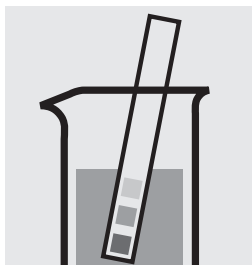
Determination of chromium(VI)

Test

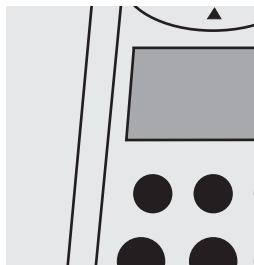
Measuring range: 10 – 1400 µg/l Cr 24-mm cell

22 – 3123 µg/l CrO₄ 24-mm cell

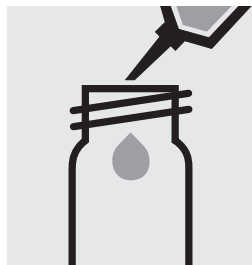
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



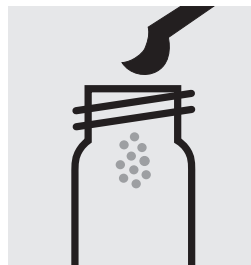
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



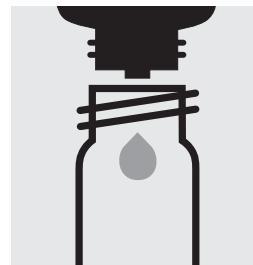
Select method ①⑤①.



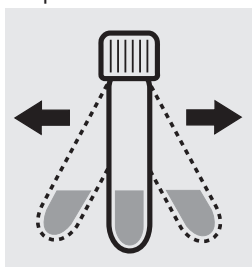
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Place 2 level grey microspoons of **Cr-1** into a dry 24-mm cell.



Add 12 drops of **Cr-2**, close with the screw cap.



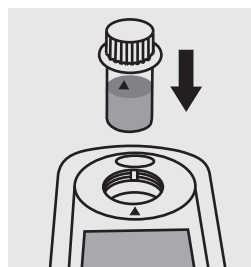
Shake the cell vigorously to dissolve the solid substance.



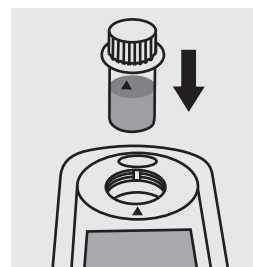
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



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-for-use chromate standard solution CertiPUR®, Cat.No. 119780, concentration 1000 mg/l CrO₄²⁻, can be used after diluting accordingly.

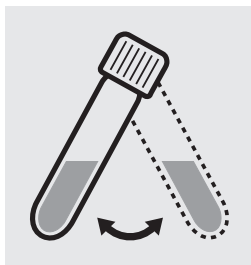
COD

Chemical oxygen demand

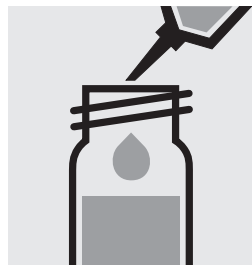
101796

Cell Test

Measuring range: 5.0–80.0 mg/l COD or O₂ 16-mm cell



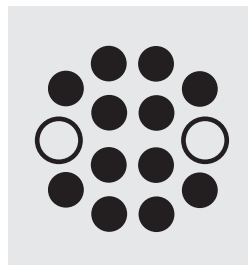
Suspend the bottom sediment in two cells by swirling.



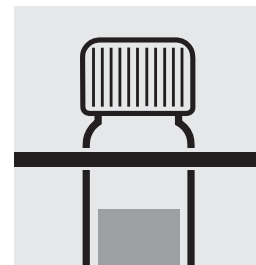
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



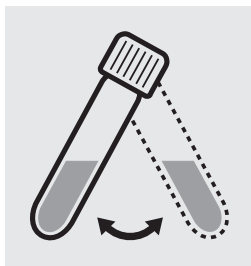
Carefully pipette 2.0 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



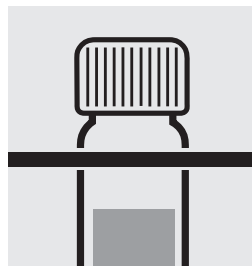
Heat both cells in the thermoreactor at 148 °C for 2 hours.



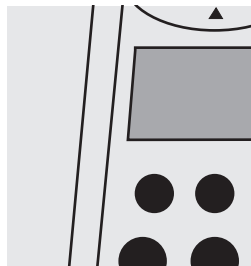
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



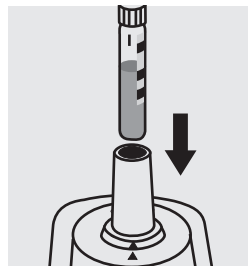
Swirl both cells after 10 minutes.



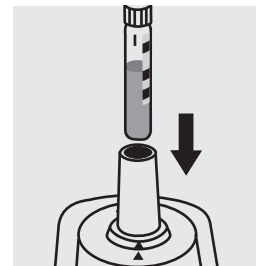
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



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.

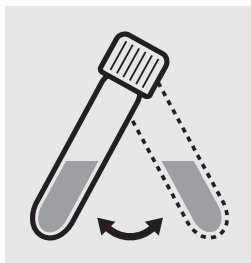
COD

Chemical oxygen demand

114540

Cell Test

Measuring range: 10–150 mg/l COD or O₂ 16-mm cell



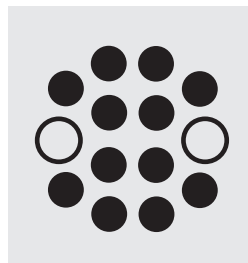
Suspend the bottom sediment in two cells by swirling.



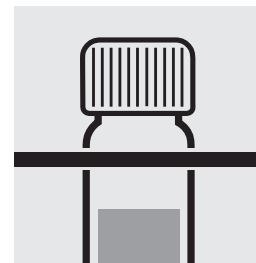
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



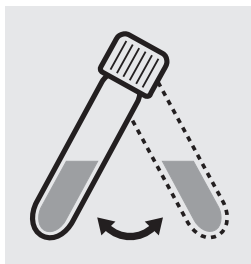
Carefully pipette 3.0 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



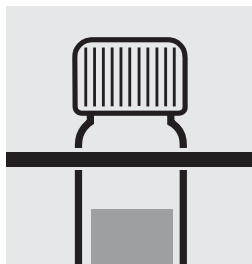
Heat both cells in the thermoreactor at 148 °C for 2 hours.



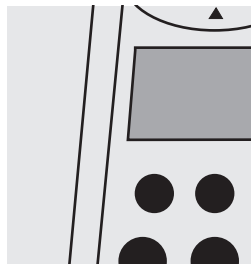
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



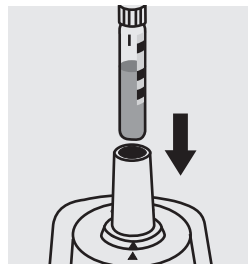
Swirl both cells after 10 minutes.



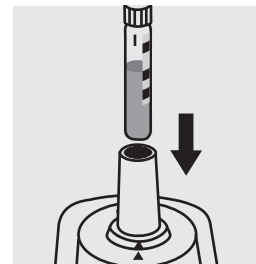
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



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.

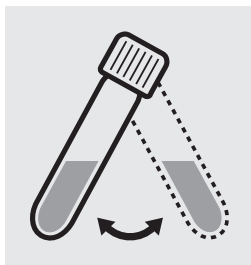
COD

Chemical oxygen demand

114895

Cell Test

Measuring range: 15–300 mg/l COD or O₂ 16-mm cell



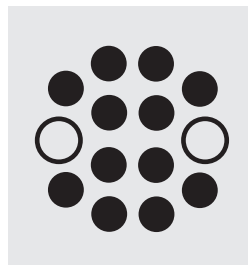
Suspend the bottom sediment in two cells by swirling.



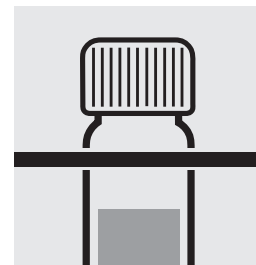
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



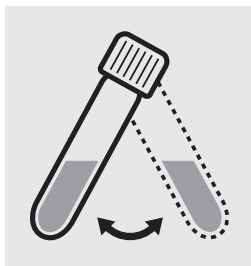
Carefully pipette 2.0 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



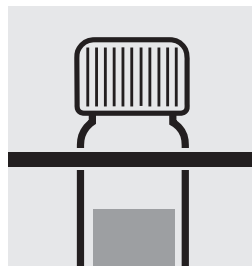
Heat both cells in the thermoreactor at 148 °C for 2 hours.



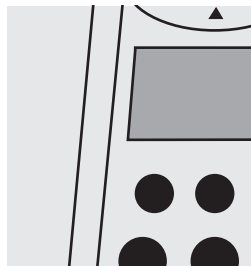
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



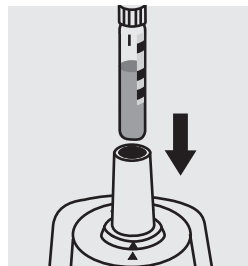
Swirl both cells after 10 minutes.



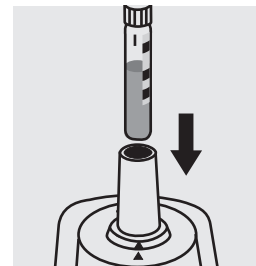
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



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 solution for photometric applications, CRM, Cat.No. 125029 and 125030.

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

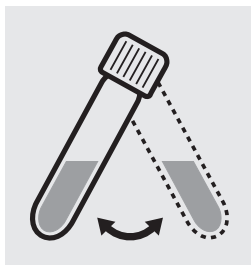
COD

Chemical oxygen demand

114690

Cell Test

Measuring range: 50–500 mg/l COD or O₂ 16-mm cell



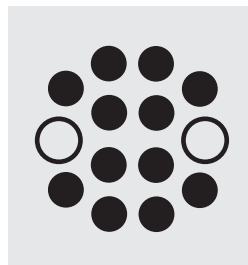
Suspend the bottom sediment in two cells by swirling.



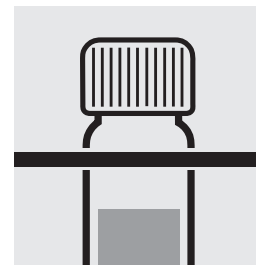
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



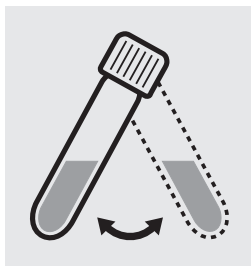
Carefully pipette 2.0 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



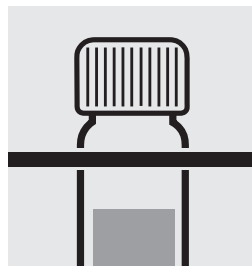
Heat both cells in the thermoreactor at 148 °C for 2 hours.



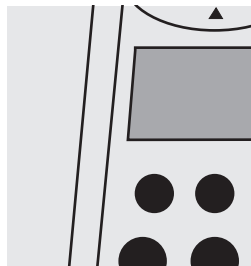
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



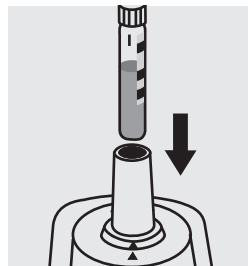
Swirl both cells after 10 minutes.



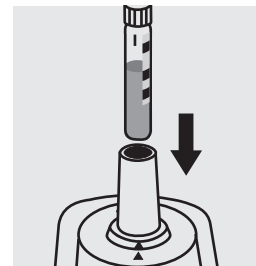
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



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 solution for photometric applications, CRM, Cat.No. 125029, 125030, and 125031.

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

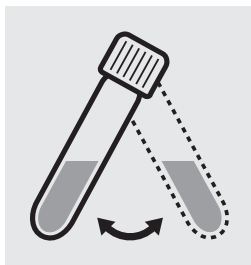
COD

Chemical oxygen demand

114541

Cell Test

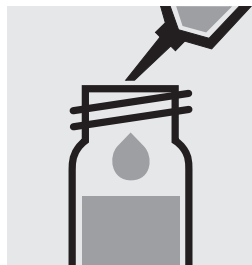
Measuring range: 25–1500 mg/l COD or O₂ 16-mm cell



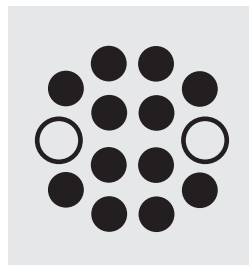
Suspend the bottom sediment in two cells by swirling.



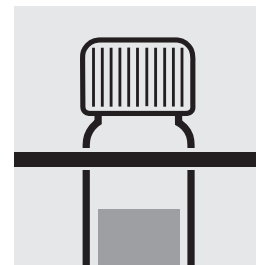
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



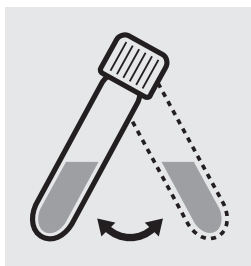
Carefully pipette 3.0 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**
(Blank cell)



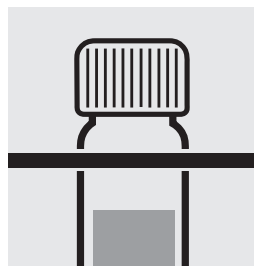
Heat both cells in the thermoreactor at 148 °C for 2 hours.



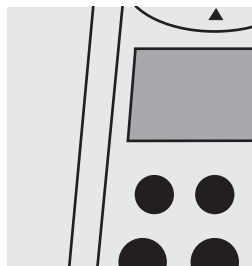
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



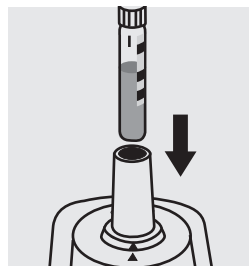
Swirl both cells after 10 minutes.



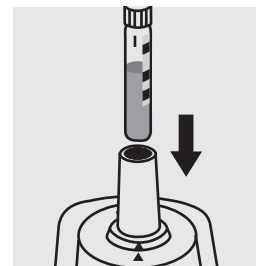
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



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 solution for photometric applications, CRM, Cat.No. 125029, 125030, 125031, and 125032.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

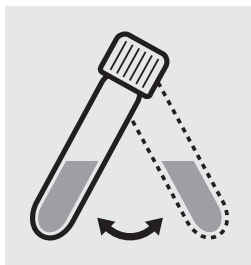
COD

Chemical oxygen demand

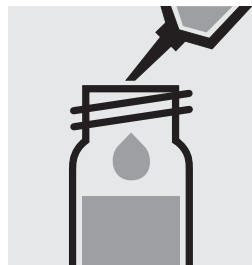
114691

Cell Test

Measuring range: 300–3500 mg/l COD or O₂ 16-mm cell



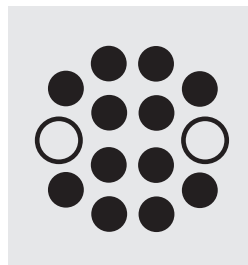
Suspend the bottom sediment in two cells by swirling.



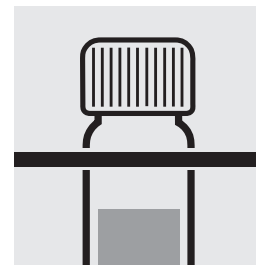
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



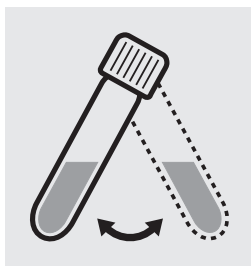
Carefully pipette 2.0 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**
(Blank cell)



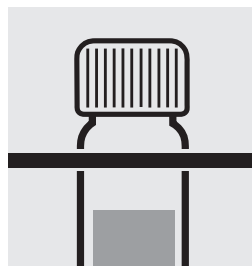
Heat both cells in the thermoreactor at 148 °C for 2 hours.



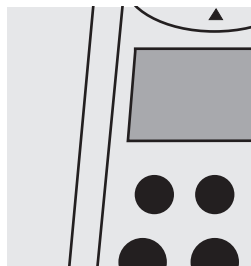
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



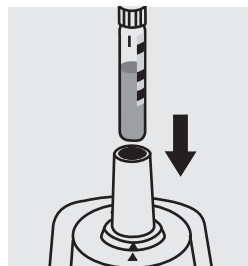
Swirl both cells after 10 minutes.



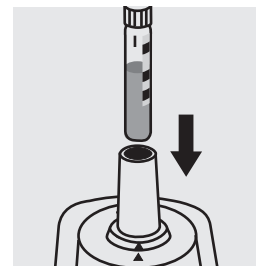
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



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 solution for photometric applications, CRM, Cat.No. 125031, 125032, and 125033.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 80) is highly recommended.

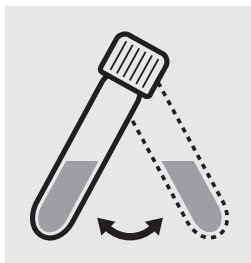
COD

Chemical oxygen demand

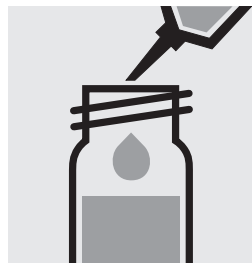
114555

Cell Test

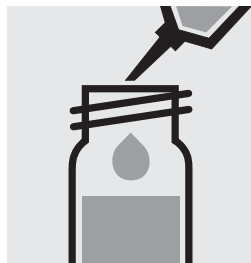
Measuring range: 0.50–10.00 g/l COD or O₂ 16-mm cell



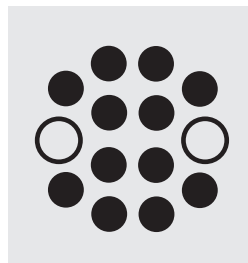
Suspend the bottom sediment in two cells by swirling.



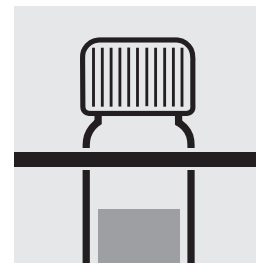
Carefully pipette 1.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



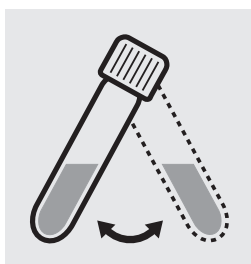
Carefully pipette 1.0 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**
(Blank cell)



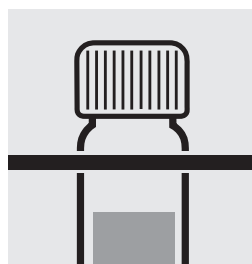
Heat both cells in the thermoreactor at 148 °C for 2 hours.



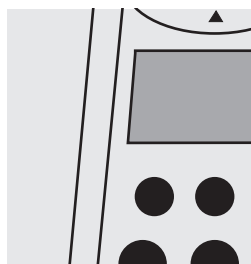
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



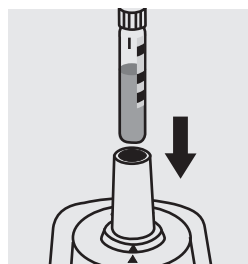
Swirl both cells after 10 minutes.



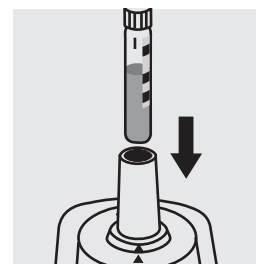
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method ①⑥⑤.



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 solution for photometric applications, CRM, Cat.No. 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.

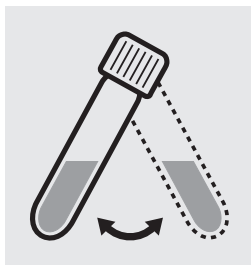
COD

Chemical oxygen demand

101797

Cell Test

Measuring range: 5.00–90.00 g/l COD or O₂ 16-mm cell



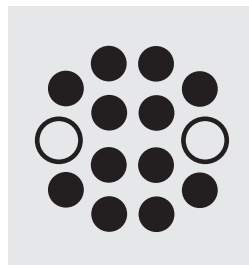
Suspend the bottom sediment in two cells by swirling.



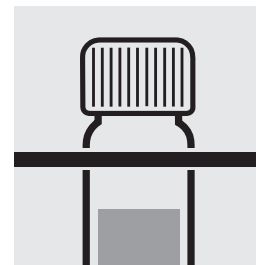
Carefully pipette 0.10 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



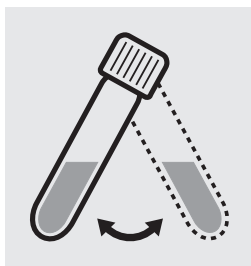
Carefully pipette 0.10 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**
(Blank cell)



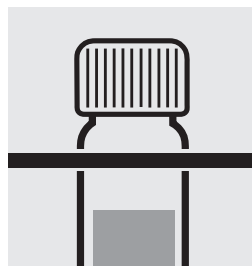
Heat both cells in the thermoreactor at 148 °C for 2 hours.



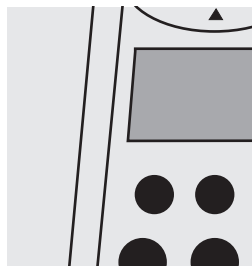
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



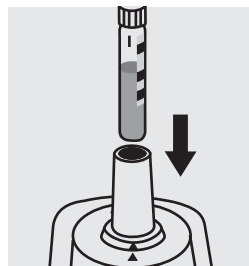
Swirl both cells after 10 minutes.



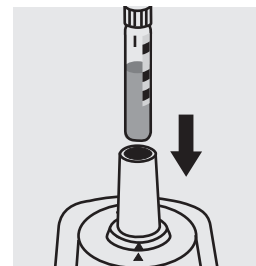
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



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 solution for photometric applications, CRM, Cat.No. 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

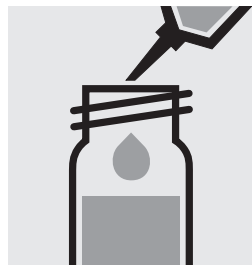
109772

Cell Test

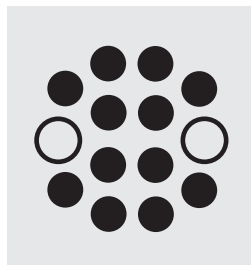
Measuring range: 10–150 mg/l COD or O₂ 16-mm cell



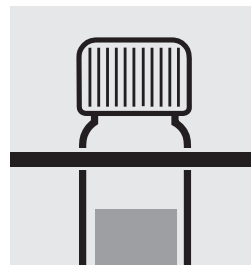
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



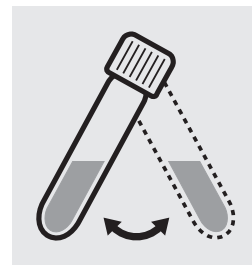
Carefully pipette 2.0 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



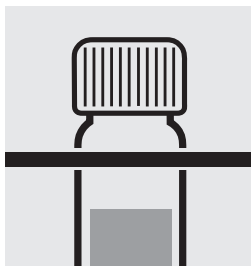
Heat both cells in the thermoreactor at 148 °C for 2 hours.



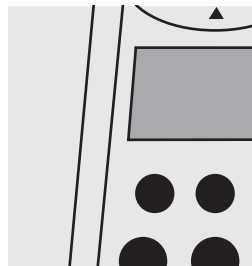
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



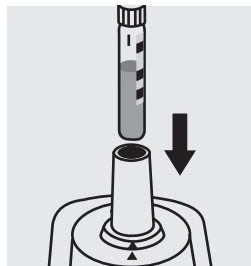
Swirl both cells after 10 minutes.



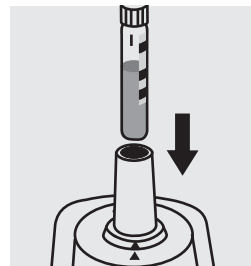
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



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 solution for photometric applications, CRM, Cat.No. 125028 and 125029.

To check for sample-dependent effects the use of addition solutions is highly recommended.

COD (Hg-free)

Chemical oxygen demand

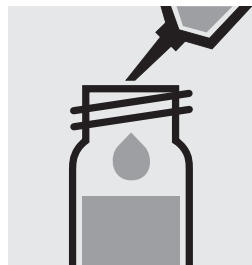
109773

Cell Test

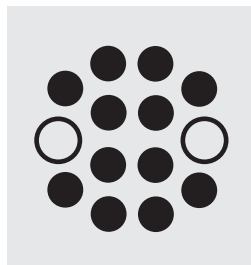
Measuring range: 100–1500 mg/l COD or O₂ 16-mm cell



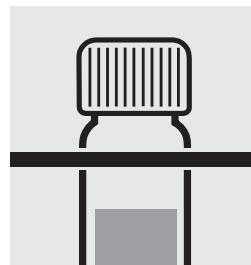
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!**



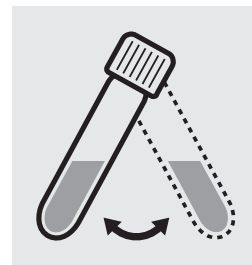
Carefully pipette 2.0 ml of distilled water into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes very hot!** (Blank cell)



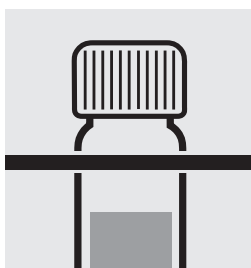
Heat both cells in the thermoreactor at 148 °C for 2 hours.



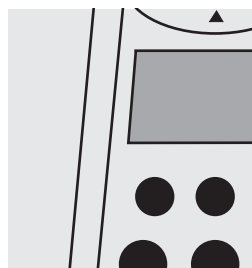
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



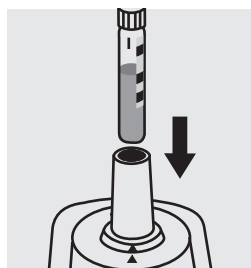
Swirl both cells after 10 minutes.



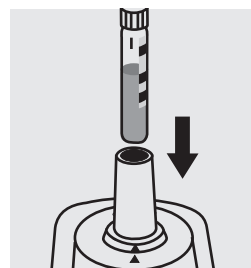
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method (1)(6)(6).



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 solution for photometric applications, CRM, Cat.No. 125029, 125030, 125031, and 125032.

To check for sample-dependent effects the use of addition solutions is highly recommended.

COD

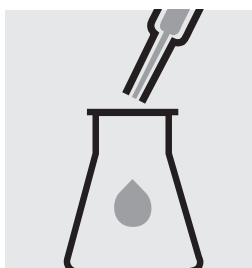
Chemical oxygen demand
for seawater / high chloride contents

117058

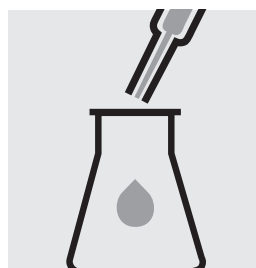
Cell Test

Measuring range: 5.0–60.0 mg/l COD or O₂ 16-mm cell

Chloride depletion:



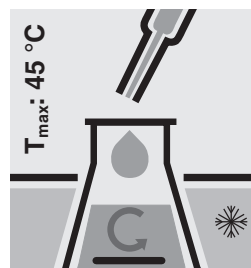
Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



Pipette with glass pipette 20 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.



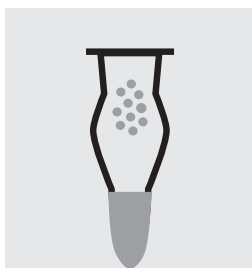
Add to each a magnetic stirring rod, and cool in the ice bath.



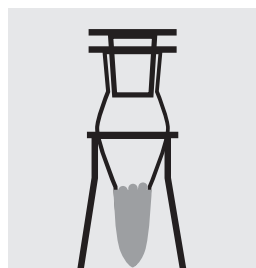
Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.



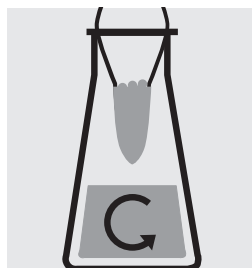
Cool both Erlenmeyer flasks to room temperature in the ice bath.



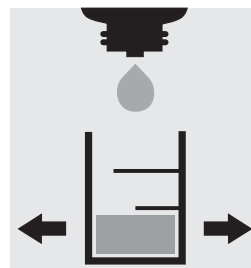
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



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 Aquamerck® Chloride Test, Cat. No. 111132, according to the application (see the web-site):
Specified value
<2000 mg/l Cl⁻.

Chloride determination (acc. to application - brief version):

Fill 5.0 ml of sodium hydroxide solution 2 mol/l, Cat. No. 109136, into the test vessel of the Aquamerck® Chloride Tests. Carefully allow to run from the pipette 0.5 ml of depleted sample down the inside of the tilted test vessel into the sodium hydroxide solution and mix (**Wear eye protection! The test vessel 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

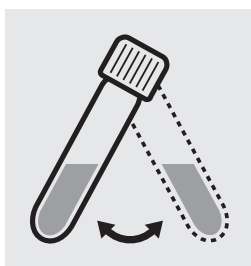
COD

Chemical oxygen demand
for seawater / high chloride contents

117058

Cell Test

Determination:



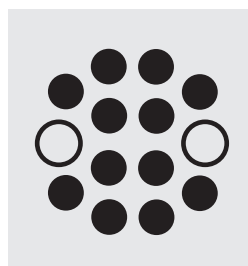
Suspend the bottom sediment in two cells by swirling.



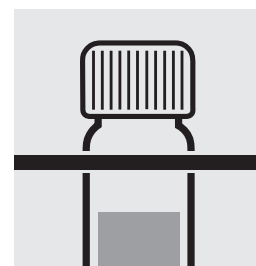
Carefully pipette 5.0 ml of the **depleted sample** into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



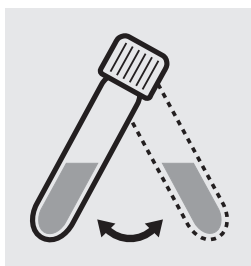
Carefully pipette 5.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**
(Blank cell)



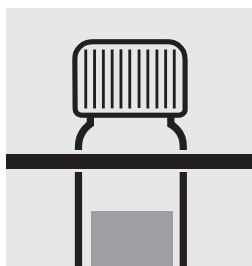
Heat both cells in the thermoreactor at 148 °C for 2 hours.



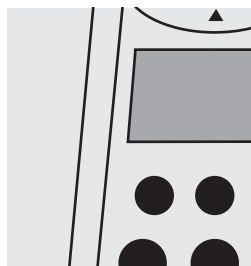
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



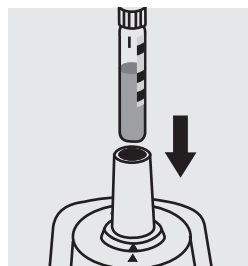
Swirl both cells after 10 minutes.



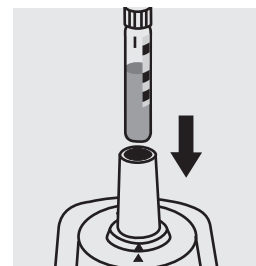
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **570**.



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. 106404 (see section "Standard solutions").

COD

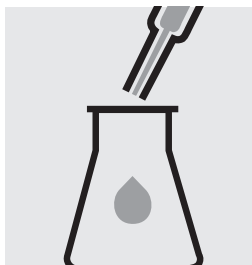
Chemical oxygen demand
for seawater / high chloride contents

117059

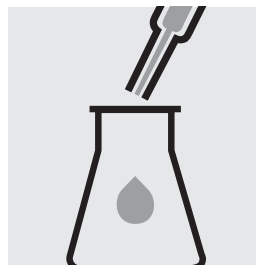
Cell Test

Measuring range: 50–3000 mg/l COD or O₂ 16-mm cell

Chloride depletion:



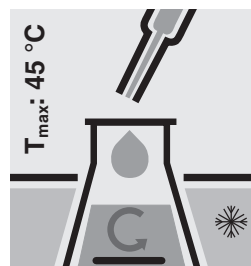
Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



Pipette with glass pipette 20 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.



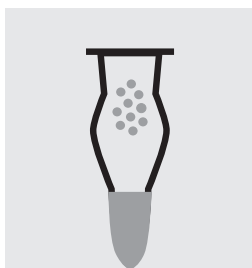
Add to each a magnetic stirring rod, and cool in the ice bath.



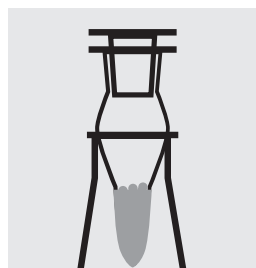
Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.



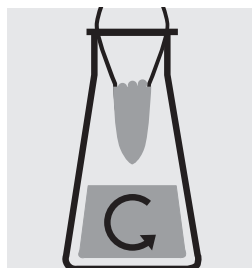
Cool both Erlenmeyer flasks to room temperature in the ice bath.



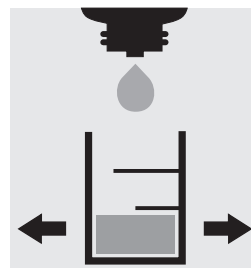
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



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 Aquamerck® Chloride Test, Cat. No. 111132, as per the application instructions (see the website): specified value <250 mg/l Cl⁻.

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 Aquamerck® Chloride Tests. 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 wird nicht benötigt.) 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

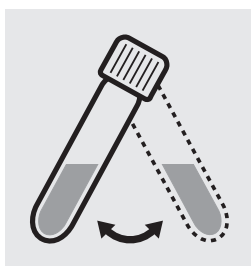
COD

Chemical oxygen demand
for seawater / high chloride contents

117059

Cell Test

Determination:



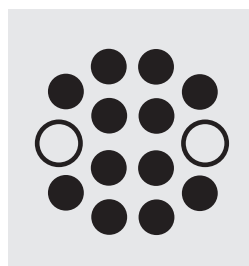
Suspend the bottom sediment in two cells by swirling.



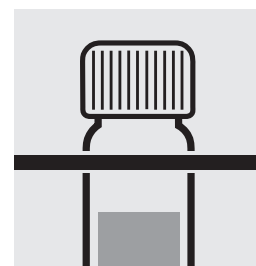
Carefully pipette 3.0 ml of the **depleted sample** into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



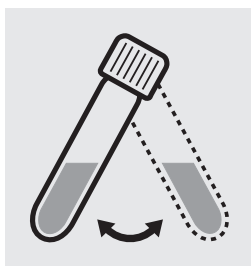
Carefully pipette 3.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**
(Blank cell)



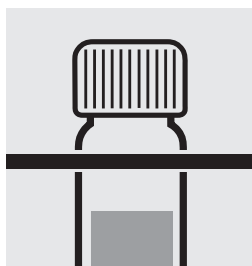
Heat both cells in the thermoreactor at 148 °C for 2 hours.



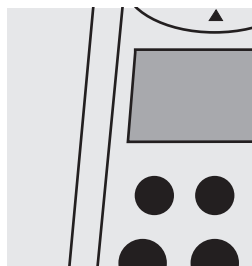
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



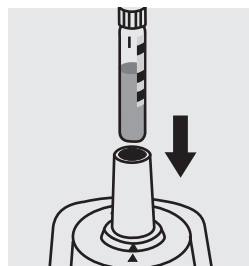
Swirl both cells after 10 minutes.



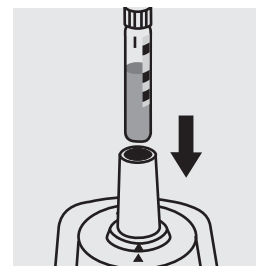
Replace both cells in the rack for complete cooling to room temperature. **(Very important!)**



Select method **571**.



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. 106404 (see section "Standard solutions").

Color

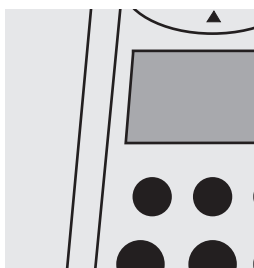
(Platinum-Cobalt Standard Method)

analogous to APHA 2120B, DIN EN ISO 6271-2, Water Research Vol. 30, No. 11, 2771-2775, 1996

Measuring range: 25 – 1000 mg/l Pt/Co (Hazen)

430 nm

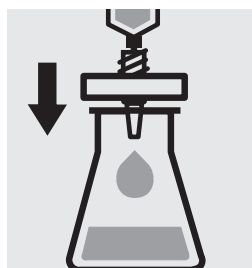
24-mm cell



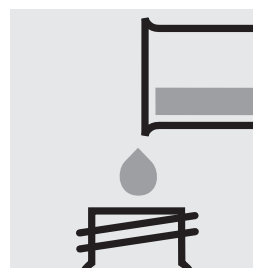
Select method **170**.



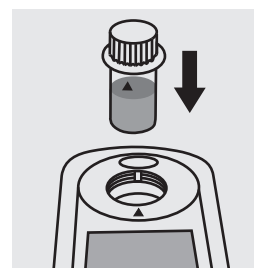
Fill approx. 10 ml of distilled water into a 24-mm cell, close with the screw cap. (Blank cell)



Filter sample solution through a membrane filter with 0.45 µm pore size.



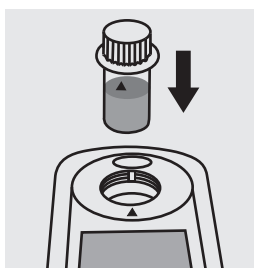
Transfer the solution into a 24-mm cell, close with the screw cap.



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-for-use Platinum Cobalt Color Reference Solution (Hazen 500) CertiPUR®, Cat.No. 100246, concentration 500 mg/l Pt, can be used.

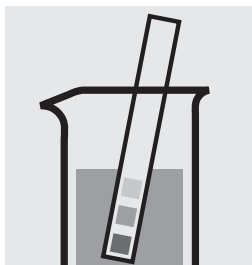
Copper

114553

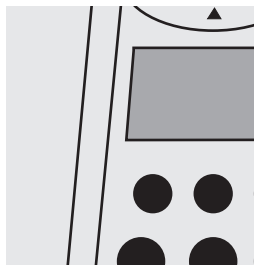
Cell Test

Measuring range: 0.05–8.00 mg/l Cu

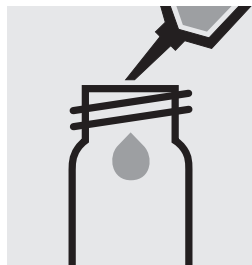
16-mm cell



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.



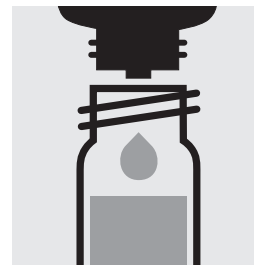
Select method **180**.



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)



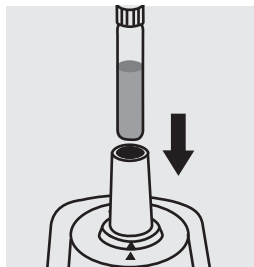
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



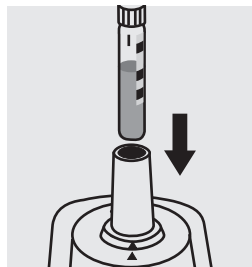
Add 5 drops of **Cu-1K**, close with the screw cap, and mix.



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-coloured 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, Cat.No. 114677.

Ready-for-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 30) is highly recommended.

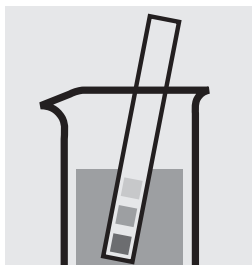
Copper

114767

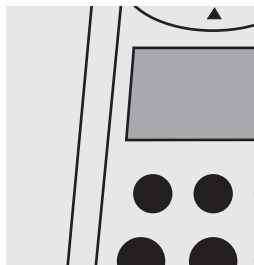
Test

Measuring range: 0.10 – 6.00 mg/l Cu

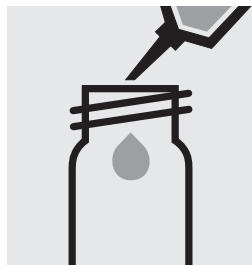
16-mm cell



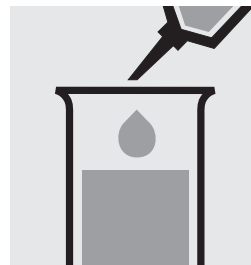
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



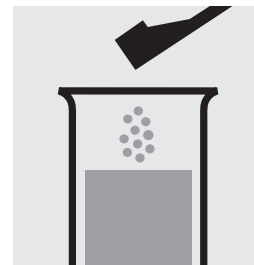
Select method **181**.



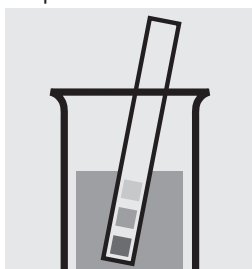
Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of the sample into a test tube.



Add 1 green dosing spoon of **Cu-1** and dissolve the solid substance.



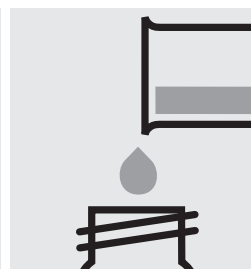
Check the pH of the sample, specified range: pH 7.0 – 9.5.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



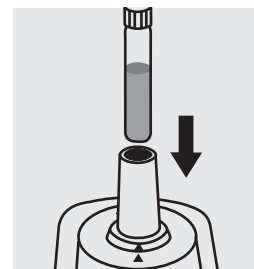
Add 5 drops of **Cu-2** and mix.



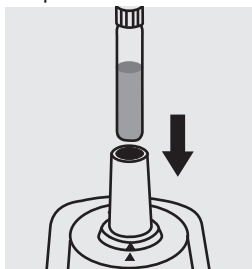
Reaction time: 5 minutes
Press to start the countdown.



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-coloured 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, Cat.No. 114677.

Ready-for-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 30) is highly recommended.

Cyanide

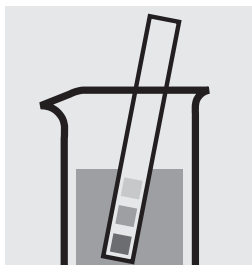
114561

Determination of free cyanide

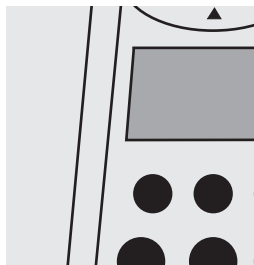
Cell Test

Measuring range: 10–350 µg/l CN

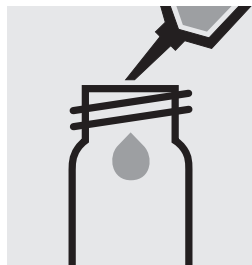
16-mm cell



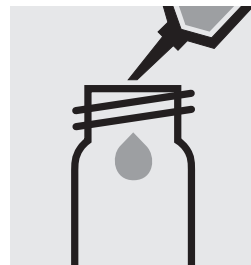
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (1)(9)(0).



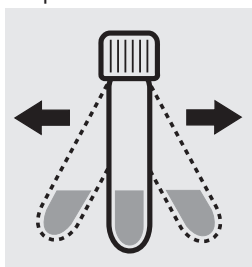
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



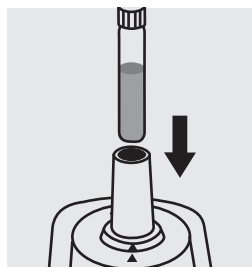
Add 1 level blue micro-spoon of **CN-3K**, close with the screw cap.



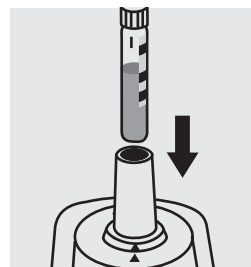
Shake the cell vigorously to dissolve the solid substance.



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-for-use cyanide standard solution, Cat.No. 119533, concentration 1000 mg/l CN⁻, can be used after diluting accordingly.

Cyanide

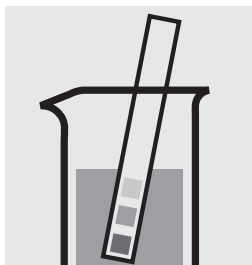
114561

Determination of readily liberated cyanide

Cell Test

Measuring range: 10–350 µg/l CN

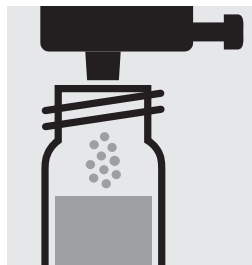
16-mm cell



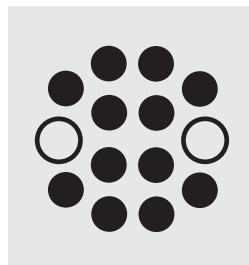
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



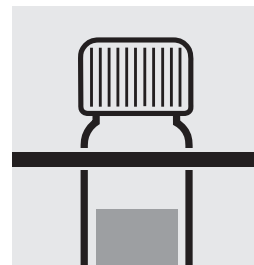
Pipette 10 ml of the sample into an empty 16-mm cell.



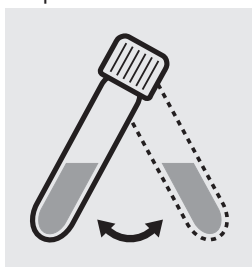
Add 1 dose of **CN-1K** using the green dose-metering cap, close with the screw cap.



Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



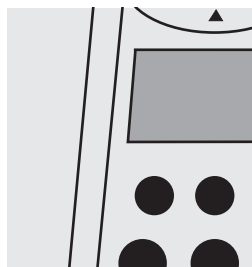
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



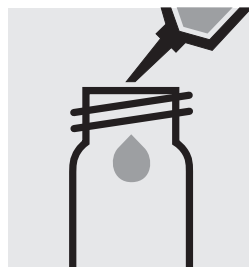
Swirl the cell before opening.



Add 3 drops of **CN-2K**, close with the screw cap, and mix: **pretreated sample**.



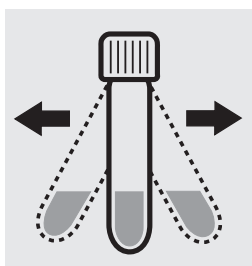
Select method ①⑨①.



Pipette 5.0 ml of the **pretreated sample** into a reaction cell, close with the screw cap, and dissolve the solid substance.



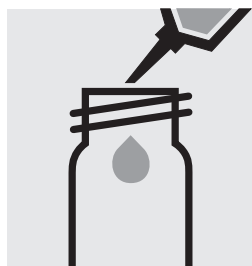
Add 1 level blue micro-spoon of **CN-3K**, close with the screw cap.



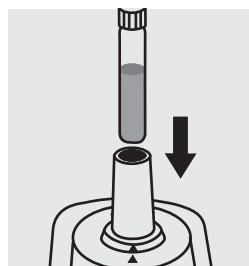
Shake the cell vigorously to dissolve the solid substance.



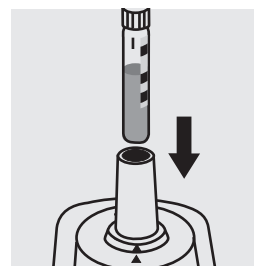
Reaction time: 10 minutes
Press (←) to start the countdown.



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-for-use cyanide standard solution, Cat.No. 119533, concentration 1000 mg/l CN⁻, can be used after diluting accordingly.

Cyanide

109701

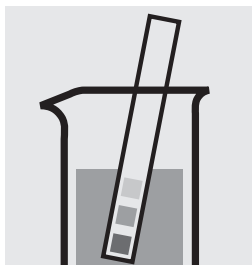
Determination of free cyanide

Test

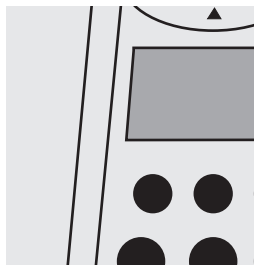
Measuring range: 5 – 200 µg/l CN

24-mm cell

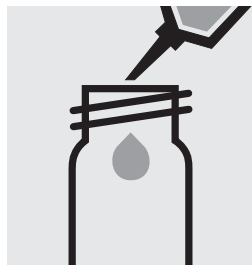
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



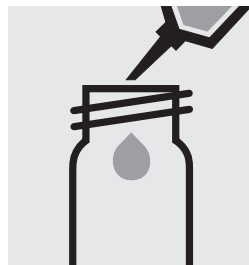
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **191**.



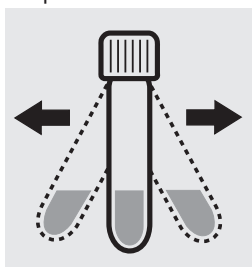
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



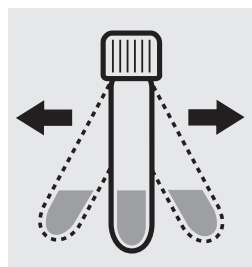
Add 2 level green microspoons of **CN-3**, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



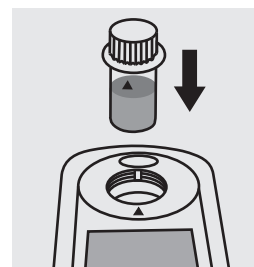
Add 2 level blue microspoons of **CN-4**, close with the screw cap.



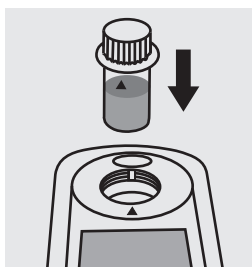
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 10 minutes
Press **10** 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-for-use cyanide standard solution, Cat.No. 119533, concentration 1000 mg/l CN⁻, can be used after diluting accordingly.

Cyanide

109701

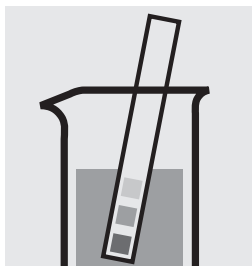
Determination of readily liberated cyanide

Test

Measuring range: 5 – 200 µg/l CN

24-mm cell

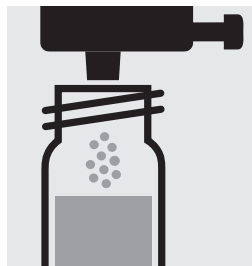
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



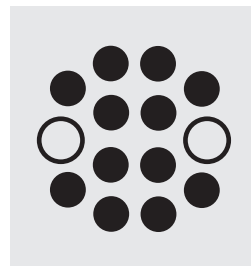
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



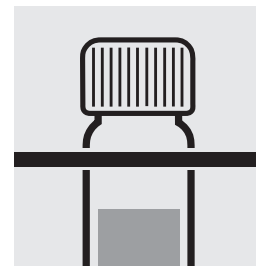
Pipette 10 ml of the sample into a 16-mm cell.



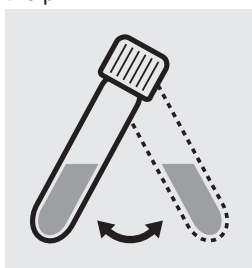
Add 1 dose of **CN-1** using the green dose-metering cap, close with the screw cap.



Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



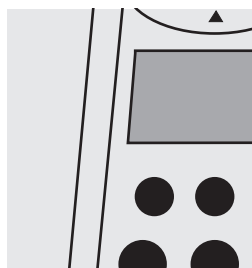
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



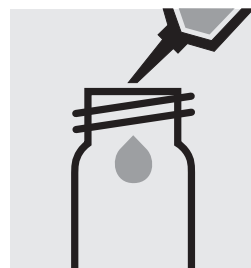
Swirl the cell before opening.



Add 3 drops of **CN-2K**, close with the screw cap, and mix: **pretreated sample**.



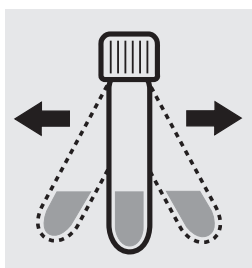
Select method ①⑨①.



Transfer the **pretreated sample** into a 24-mm cell.



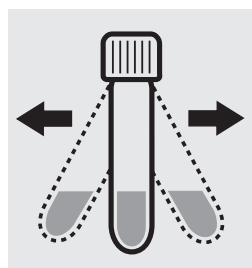
Add 2 level green microspoons of **CN-3**, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



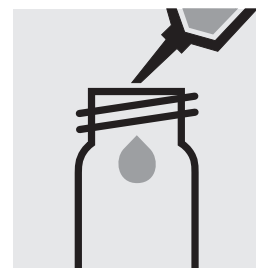
Add 2 level blue microspoons of **CN-4**, close with the screw cap.



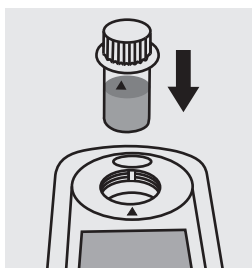
Shake the cell vigorously to dissolve the solid substance.



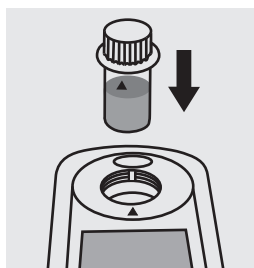
Reaction time: 10 minutes. Press (←) to start the countdown.



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:

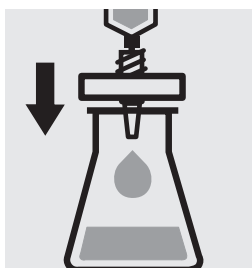
To check the measurement system (test reagents, measurement device, and handling) ready-for-use cyanide standard solution, Cat.No. 119533, concentration 1000 mg/l CN⁻, can be used after diluting accordingly.

Cyanuric acid

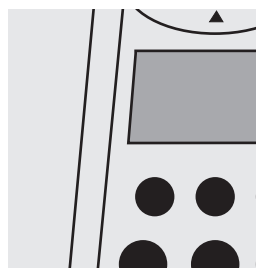
119253

Test

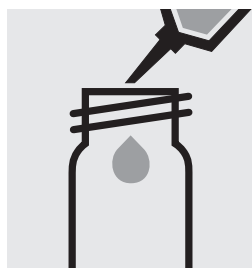
Measuring range: 2 – 160 mg/l cyanuric acid 24-mm cell



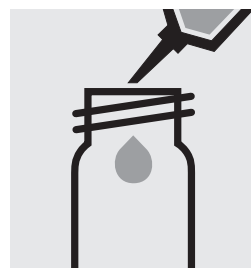
Filter turbid samples.



Select method **201**.



Pipette **5.0 ml of distilled water** (Water for process analysis, Cat.No. 101051, 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)



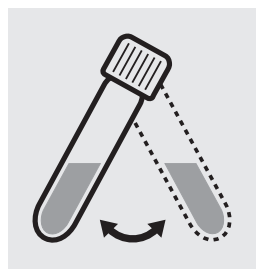
Pipette 5.0 ml of the sample into a 24-mm cell.



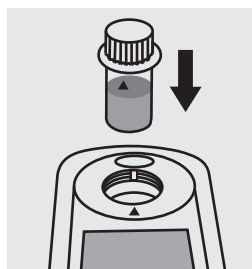
Add **5.0 ml of distilled water** (Water for process analysis, Cat.No. 101051, is recommended) with pipette, close with the screw cap, and mix.



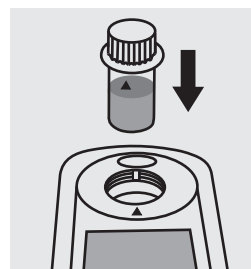
Add 1 **reagent tablet**, crush with stirring rod, and close with the screw cap.



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").

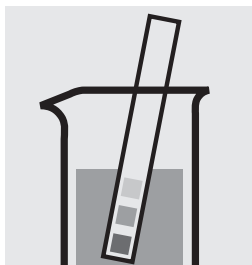
Fluoride

114557

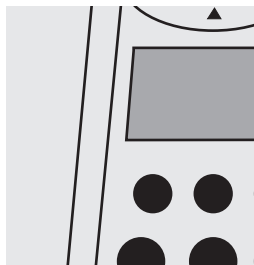
Cell Test

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.



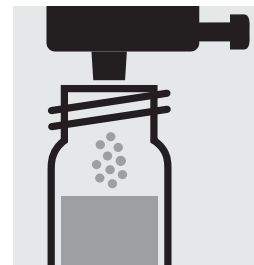
Select method 220.



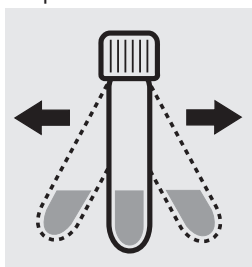
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



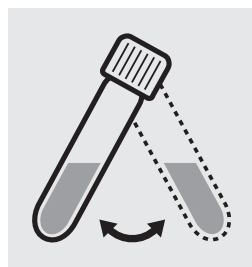
Add to each cell 1 dose of **F-1K** using the blue dose-metering cap, close with the screw cap.



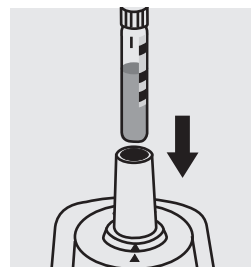
Shake both cells vigorously to dissolve the solid substance.



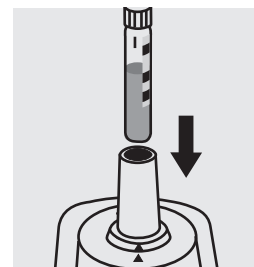
Reaction time: 5 minutes.
Press to start the countdown.



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-coloured 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-for-use fluoride standard solution CertiPUR®, Cat.No. 119814, concentration 1000 mg/l F⁻, can be used after diluting accordingly.

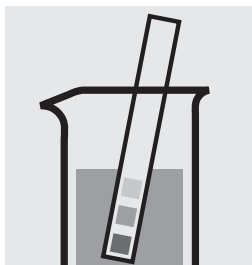
Fluoride

100809

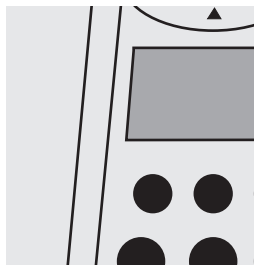
Cell Test

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).



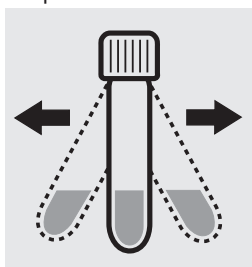
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



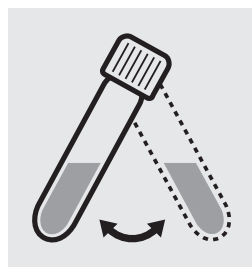
Add to each cell 1 level blue microspoon of **F-1K**, close with the screw cap.



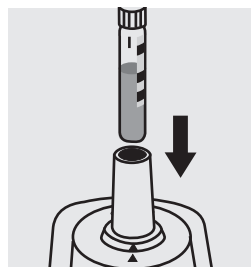
Shake both cells vigorously to dissolve the solid substance.



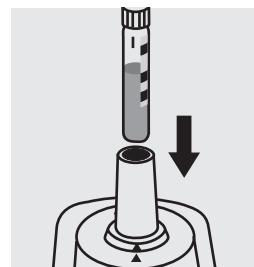
Reaction time: 15 minutes
Press (←) to start the countdown.



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-coloured 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-for-use fluoride standard solution CertiPUR®, Cat.No. 119814, concentration 1000 mg/l F⁻, can be used after diluting accordingly.

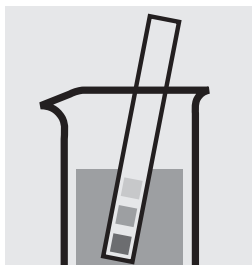
Fluoride

114598

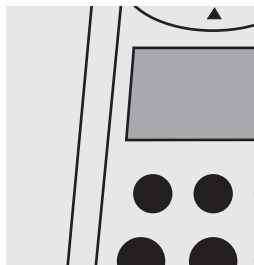
Test

Measuring range: 0.10 – 2.00 mg/l F

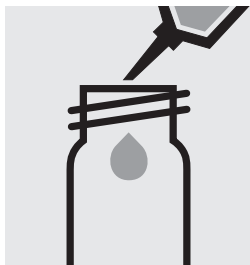
16-mm cell



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.



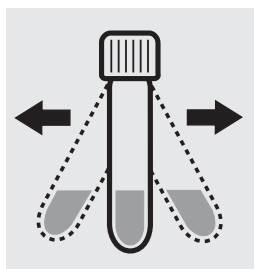
Add to one cell 5.0 ml of the sample with pipette, close with the screw cap, and mix.



Add to the second cell 5.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



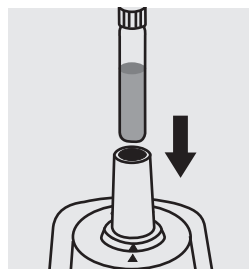
Add to each cell 1 level blue microspoon of F-2, close with the screw cap.



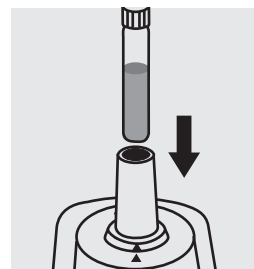
Shake both cells vigorously to dissolve the solid substance.



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-coloured 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-for-use fluoride standard solution CertiPUR®, Cat.No. 119814, concentration 1000 mg/l F⁻, can be used after diluting accordingly.

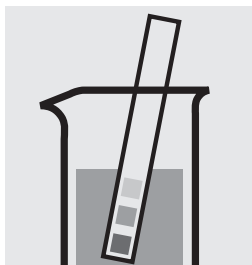
Fluoride

100822

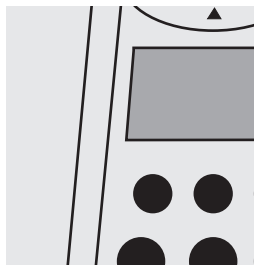
Test

Measuring range: 0.08 – 2.00 mg/l F

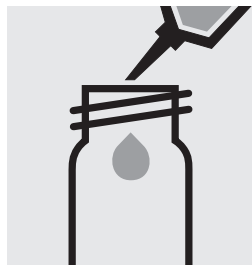
24-mm cell



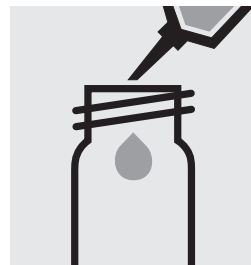
Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



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



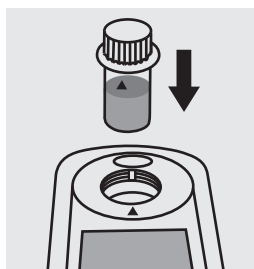
Pipette 10 ml of distilled water into a second 24-mm cell. (Blank cell)



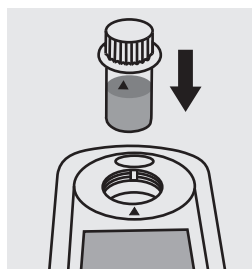
Add to each cell 2.0 ml of **F-1** with pipette, close with the screw cap, and mix.



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-for-use fluoride standard solution CertiPUR®, Cat.No. 119814, concentration 1000 mg/l F⁻, can be used after diluting accordingly.

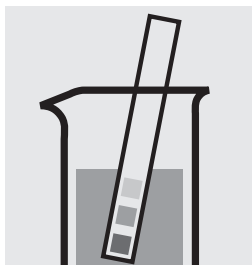
Hydrazine

109711

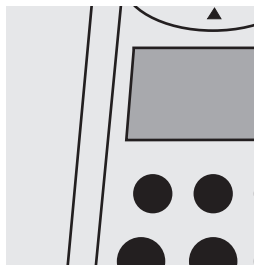
Test

Measuring range: 10– 1200 $\mu\text{g/l}$ N_2H_4 24-mm cell

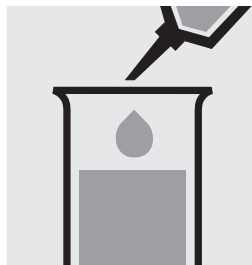
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



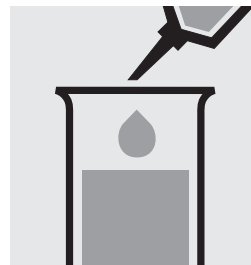
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



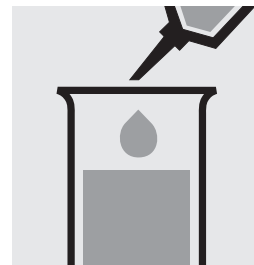
Select method (2)(3)(0).



Pipette 10 ml of the sample into a test tube.



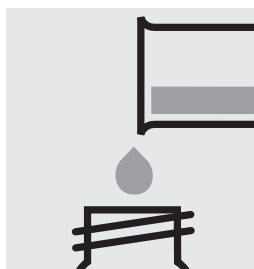
Pipette 10 ml of distilled water into a second test tube. (Blank)



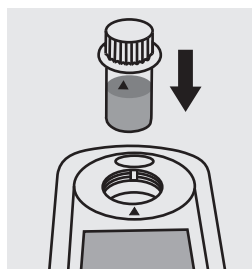
Add to each test tube 4.0 ml of **Hy-1** with pipette and mix.



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”).

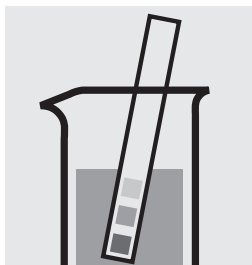
Iodine

100606

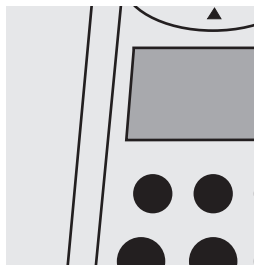
Test

Measuring range: 0.10–5.00 mg/I₂

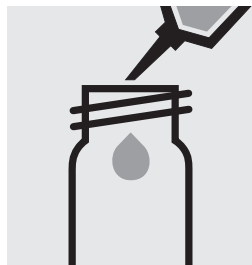
24-mm cell



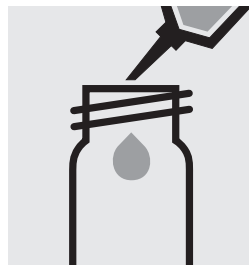
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (2)(4)(0).



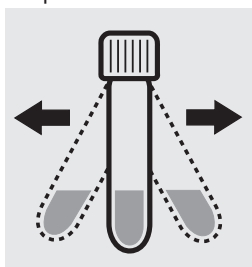
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



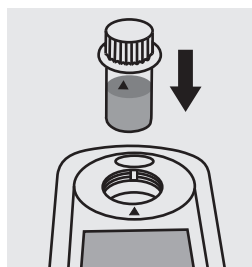
Add 1 level blue micro-spoon of I₂-2, close with the screw cap.



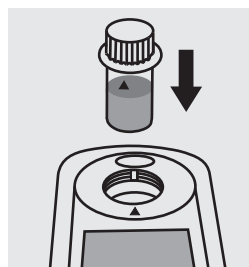
Shake the cell vigorously to dissolve the solid substance.



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-coloured 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”).

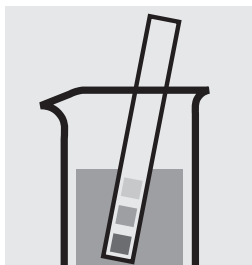
Iron

114549

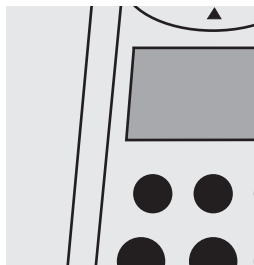
Cell Test

Measuring range: 0.05 – 4.00 mg/l Fe

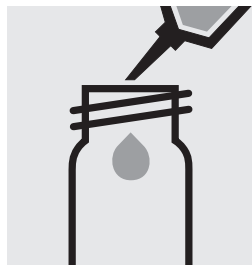
16-mm cell



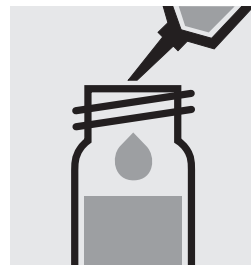
Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method **250**.



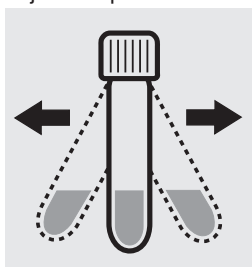
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



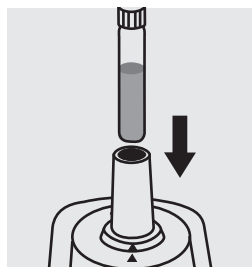
Add 1 level blue micro-spoon of **Fe-1K**, close with the screw cap.



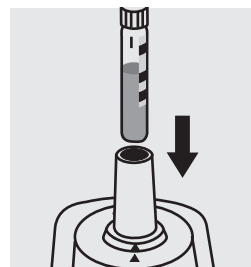
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 3 minutes. Press **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 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, Cat.No. 114677.

Ready-for-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 30) is highly recommended.

Iron

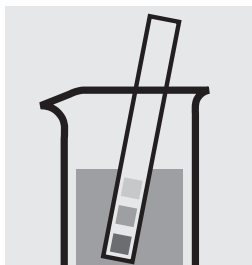
114761

Test

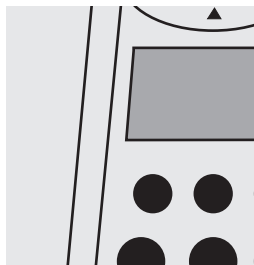
Measuring range: 0.01–2.00 mg/l Fe

24-mm cell

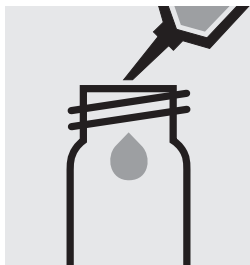
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



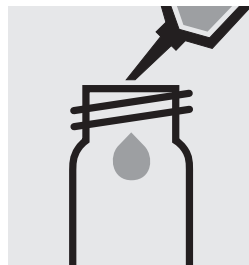
Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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)



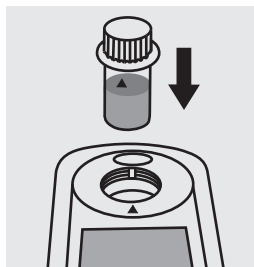
Pipette 10 ml of the sample into a 24-mm cell.



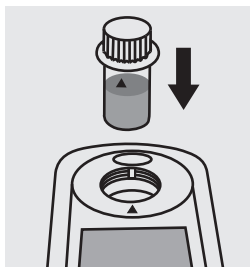
Add 6 drops of **Fe-1**, close with the screw cap, and mix.



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) ready-for-use iron standard solution, Cat.No. 119781, concentration 1000 mg/l Fe, can be used after diluting accordingly.

Iron

100796

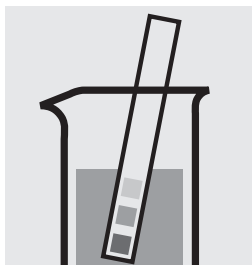
Determination of iron(II) and iron(III)

Test

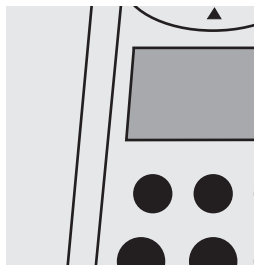
Measuring range: 0.10–5.00 mg/l Fe

16-mm cell

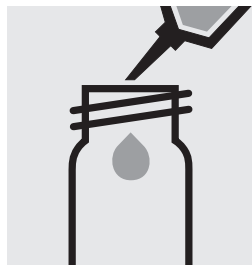
Determination of iron(II)



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 252.



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.



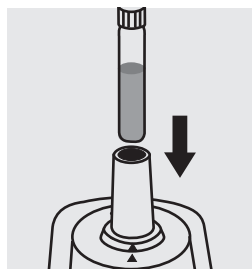
Add 1 drop of **Fe-1**, close with the screw cap, and mix.



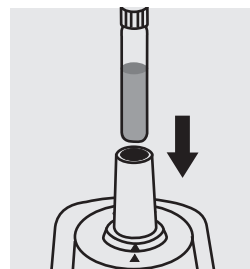
Add 0.50 ml of **Fe-2** with pipette, close with the screw cap, and mix.



Reaction time: 5 minutes.
Press to start the countdown.



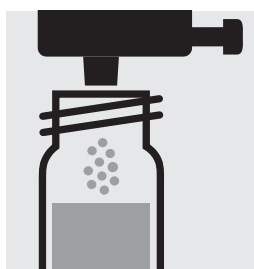
Insert the blank cell into the cell compartment. Press **Zero**.



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, Cat.No. 114677.

Ready-for-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 30) is highly recommended.

Lead

114833

Cell Test

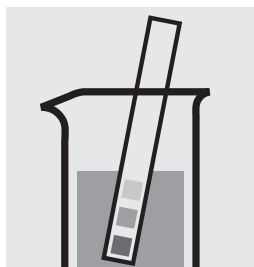
Measuring range: 0.10–5.00 mg/l Pb

16-mm cell

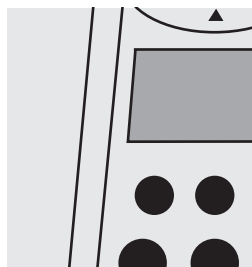
Samples of total hardness 0–10°d



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).



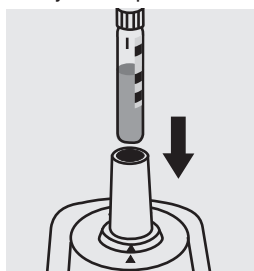
Add 5 drops each of **Pb-1K** into two reaction cells, close with the screw cap, and mix.



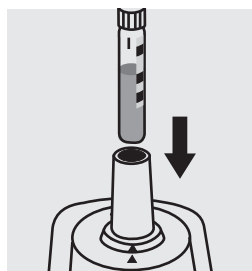
Add to one cell 5.0 ml of the sample with pipette, close with the screw cap, and mix.



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).



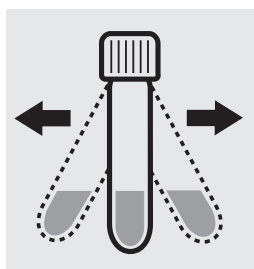
Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press (Test).

= Result A

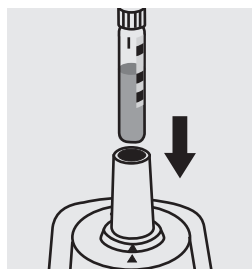
Samples of total hardness > 10°d



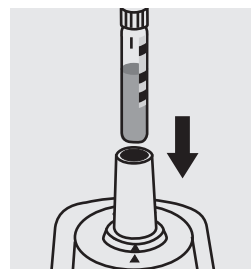
Add 1 level grey microspoon each of **Pb-2K** to the already measured cells, close with the screw cap.



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, Cat.No. 114692.

Ready-for-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 40) is highly recommended.

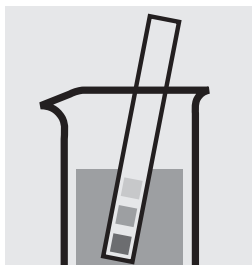
Lead

109717

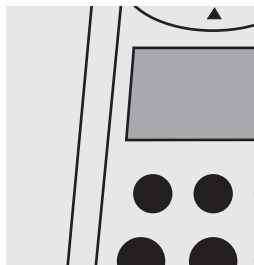
Test

Measuring range: 0.05 – 5.00 mg/l Pb

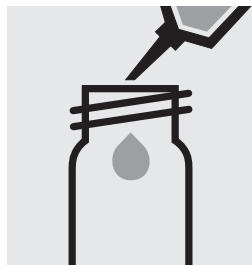
24-mm cell



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 ②⑥①.



Pipette 0.50 ml each of **Pb-1** into two 24-mm cells.



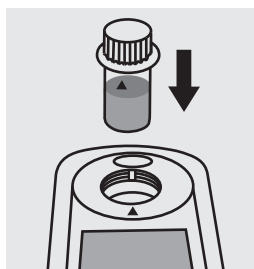
Add to each cell 0.50 ml **Pb-2** with pipette, close with the screw cap, and mix.



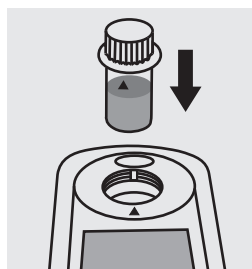
Add to one cell 8.0 ml of the sample with pipette, close with the screw cap, and mix.



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, Cat.No. 114692.

Ready-for-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 40) is highly recommended.

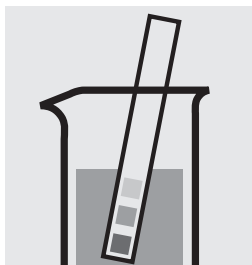
Magnesium

100815

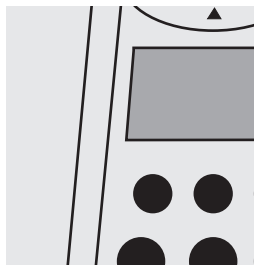
Cell Test

Measuring range: 5.0 – 75.0 mg/l Mg

16-mm cell



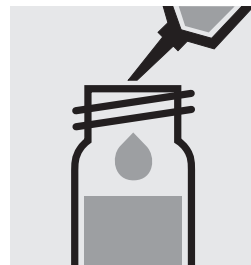
Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Select method (2)(7)(0).



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



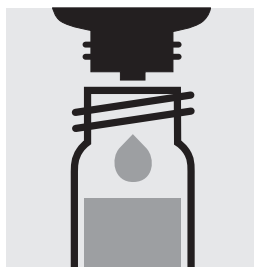
Pipette 1.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



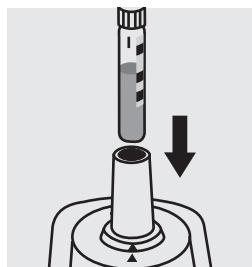
Add to each cell 1.0 ml of **Mg-1K** with pipette, close with the screw cap, and mix.



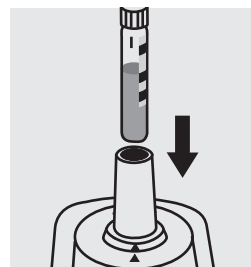
Reaction time:
exactly 3 minutes
Press (←) to start the countdown.



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”).

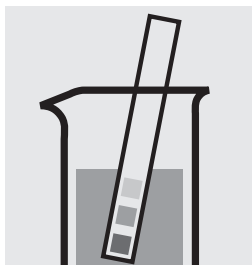
Manganese

100816

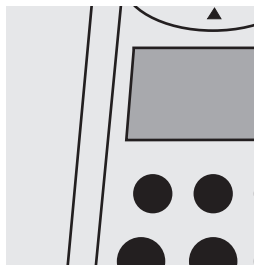
Cell Test

Measuring range: 0.10–5.00 mg/l Mn

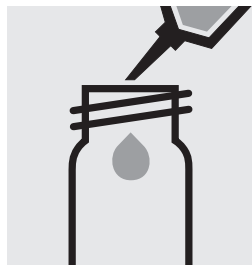
16-mm cell



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.



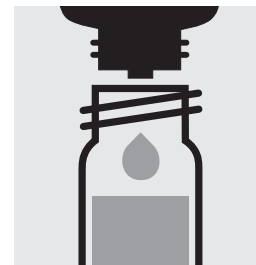
Select method 280.



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)



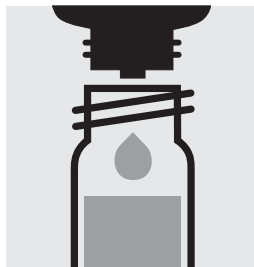
Pipette 7.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 2 drops of **Mn-1K**, close with the screw cap, and mix.



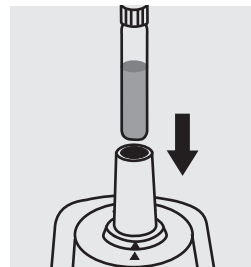
Reaction time: 2 minutes
Press to start the countdown.



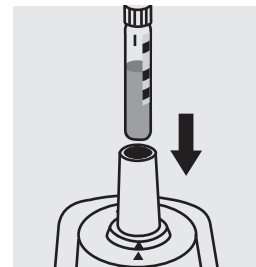
Add 3 drops of **Mn-2K**, close with the screw cap, and mix.



Reaction time: 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**.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30, Cat.No. 114677.

Ready-for-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 30) is highly recommended.

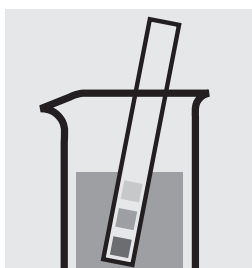
Manganese

101739

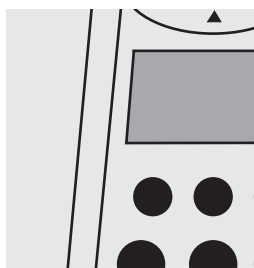
Test

Measuring range: 0.05–1.80 mg/l Mn

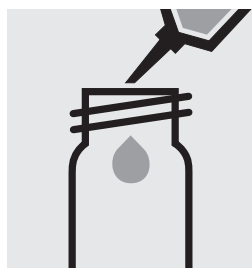
24-mm cell



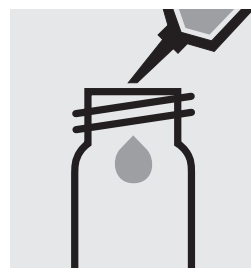
Check the pH of the sample, specified range: pH 3 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ②⑧①.



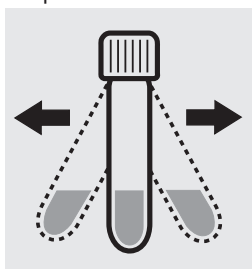
Pipette 8.0 ml of the sample into a 24-mm cell.



Pipette 8.0 ml of distilled water into a second 24-mm cell. (Blank cell)



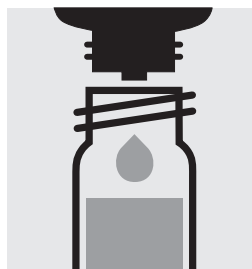
Add to each cell 1 level grey microspoon of **Mn-1**, close with the screw cap.



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.



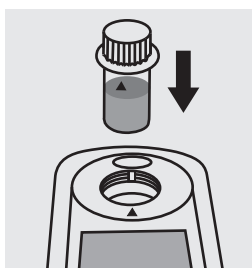
Add to each cell 3 drops of **Mn-3**, close with the screw cap, and mix.



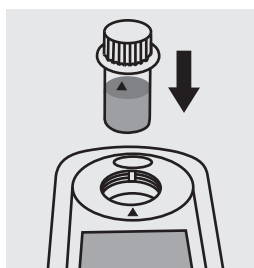
Add **swiftly** to each cell 0.25 ml of **Mn-4** with pipette, close with the screw cap, and mix **immediately**.



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-for-use manganese standard solution CertiPUR®, Cat.No. 119789, concentration 1000 mg/l Mn, can be used after diluting accordingly.

Manganese

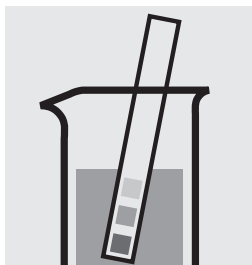
114770

Test

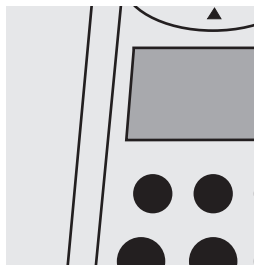
Measuring range: 0.05–6.00 mg/l Mn

24-mm cell

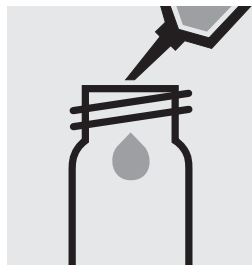
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



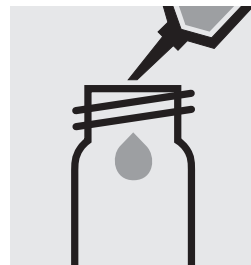
Check the pH of the sample, specified range: pH 2–7.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



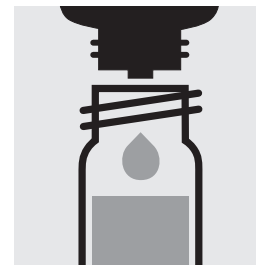
Select method 282.



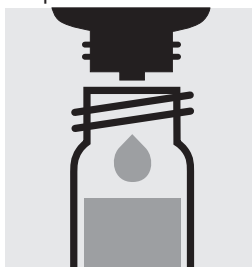
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



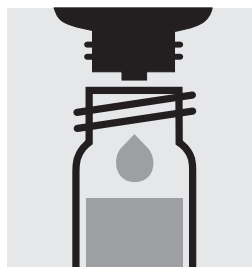
Add 8 drops of **Mn-1**, close with the screw cap, and mix. Check the pH, specified pH: approx. 11.5.



Add 4 drops of **Mn-2**, close with the screw cap, and mix. Check the pH, specified pH: approx. 11.5.



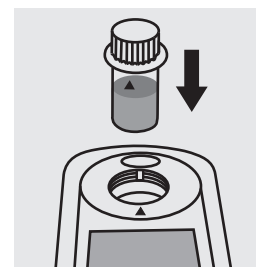
Reaction time: 2 minutes.
Press to start the countdown.



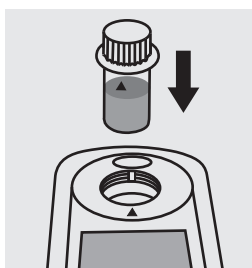
Add 4 drops of **Mn-3**, close with the screw cap, and mix.



Reaction time: 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 .



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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30, Cat.No. 114677. Use 10 ml R-1 instead of the sample.

Ready-for-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 30) is highly recommended. Use 10 ml sample + 0.1 ml R-2.

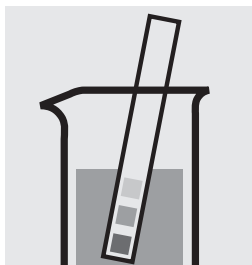
Manganese

101846

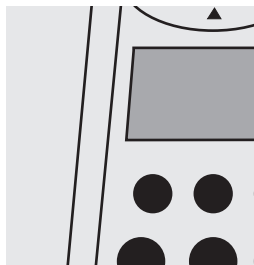
Test

Measuring range: 0.05–1.80 mg/l Mn

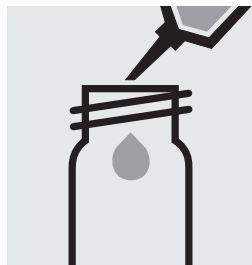
24-mm cell



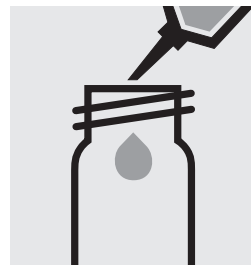
Check the pH of the sample, specified range: pH 3 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ②⑧③.



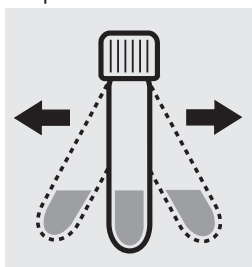
Pipette 8.0 ml of the sample into a 24-mm cell.



Pipette 8.0 ml of distilled water into a second 24-mm cell. (Blank cell)



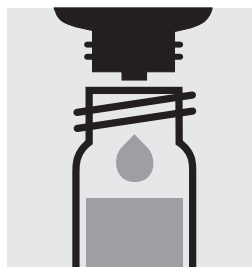
Add to each cell 1 level grey microspoon of **Mn-1**, close with the screw cap.



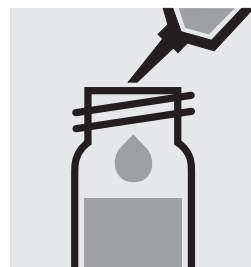
Shake both cells vigorously to dissolve the solid substance.



Add to each cell 2.0 ml of **Mn-2** with pipette, close with the screw cap, and mix.



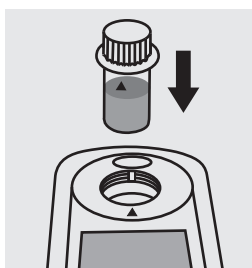
Add **carefully** to each cell 3 drops of **Mn-3**, close with the screw cap, and mix.



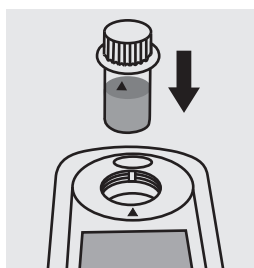
Add to each cell 0.25 ml of **Mn-4** with pipette, close with the screw cap, and mix **carefully** (Foams! Wear eye protection!).



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:

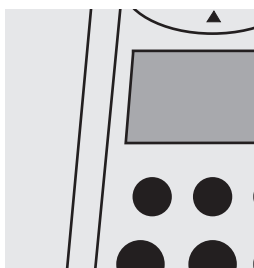
To check the measurement system (test reagents, measurement device, and handling) ready-for-use manganese standard solution CertiPUR®, Cat.No. 119789, concentration 1000 mg/l Mn, can be used after diluting accordingly.

Molybdenum

119252

Test

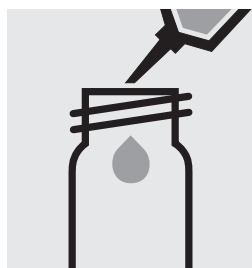
| | |
|--|------------|
| Measuring range: 0.5 – 45.0 mg/l Mo | 24-mm cell |
| 0.8 – 75.0 mg/l MoO ₄ | 24-mm cell |
| 1.1 – 96.6 mg/l Na ₂ MoO ₄ | 24-mm cell |



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.



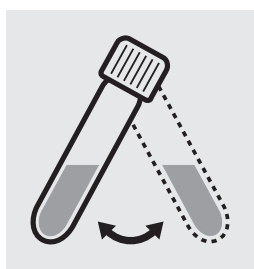
Add 1 powder pack of **Molybdenum HR1**, close with the screw cap, and dissolve the solid substance.



Add 1 powder pack of **Molybdenum HR2**, close with the screw cap, and dissolve the solid substance.



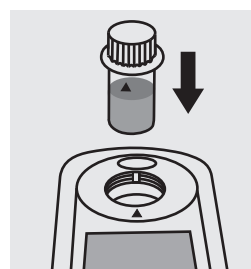
Add 1 powder pack of **Molybdenum HR3** and close with the screw cap.



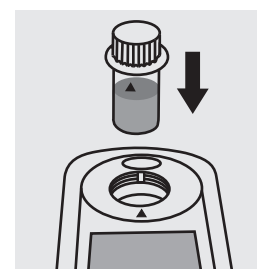
Swirl the cell to dissolve the solid substance.



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:

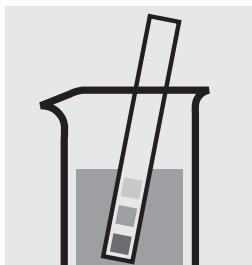
To check the measurement system (test reagents, measurement device, and handling) a ready-for-use molybdenum standard solution CertiPUR®, Cat.No. 170227, concentration 1000 mg/l Mo, can be used after diluting accordingly.

Monochloramine

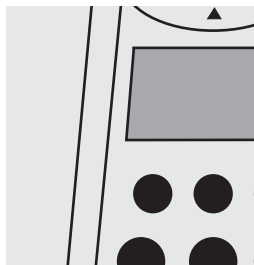
101632

Test

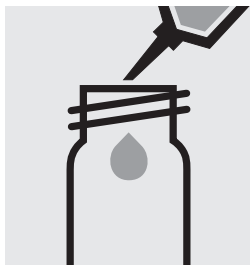
| | |
|---|------------|
| Measuring range: 0.10–5.00 mg/l Cl_2 | 24-mm cell |
| 0.07–3.63 mg/l NH_2Cl | 24-mm cell |
| 0.02–0.99 mg/l $\text{NH}_2\text{Cl-N}$ | 24-mm cell |



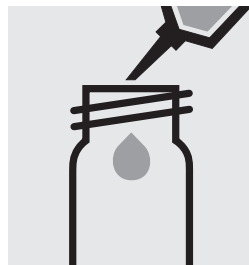
Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method 300.



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



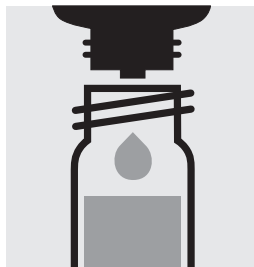
Pipette 10 ml of the sample into a 24-mm cell.



Add 0.60 ml of **MCA-1** with pipette, close with the screw cap, and mix.



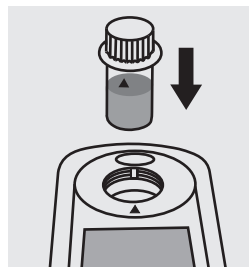
Reaction time:
5 minutes
Press **Enter** to start the countdown.



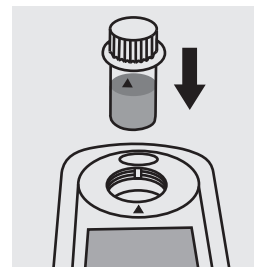
Add 4 drops of **MCA-2**, close with the screw cap, and mix.



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-coloured 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”).

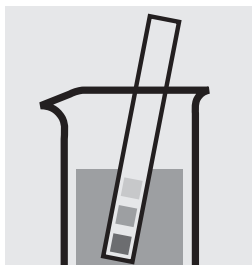
Nickel

114554

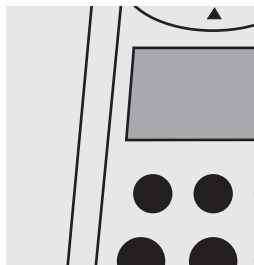
Cell Test

Measuring range: 0.10–6.00 mg/l Ni

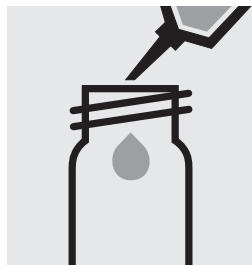
16-mm cell



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 ③①①.



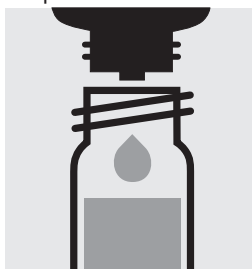
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



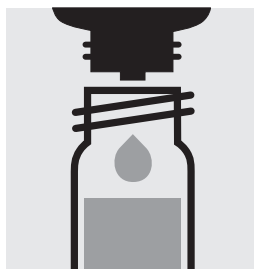
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



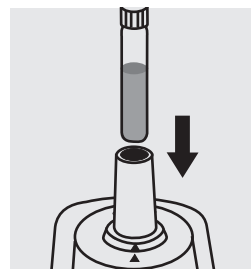
Add 2 drops of **Ni-1K**, close with the screw cap, and mix. Check the pH of the solution, specified range: pH 10 – 12



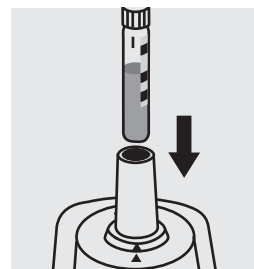
Add 2 drops of **Ni-2K**, close with the screw cap, and mix.



Reaction time: 2 minutes.
Press 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, Cat.No. 114692.

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 40) is highly recommended.

Nickel

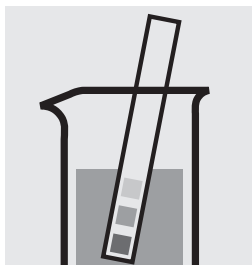
114785

Test

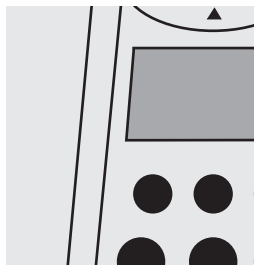
Measuring range: 0.05 – 5.00 mg/l Ni

24-mm cell

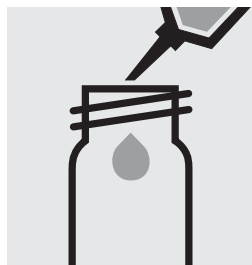
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



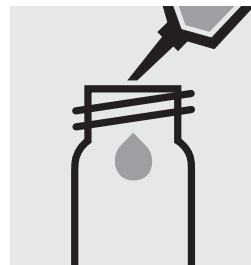
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



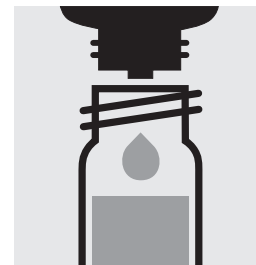
Select method ③①①.



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 colour disappears, continue adding drop by drop until a slight yellow colouration persists.



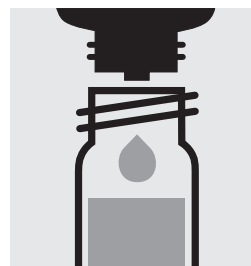
Reaction time:
1 minute
Press to start the countdown.



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



Check the pH, specified range: pH 10 – 12



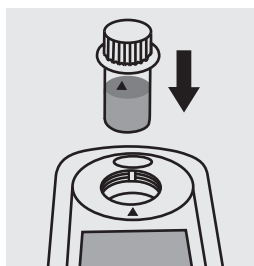
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



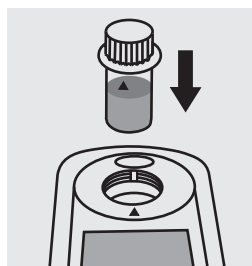
Add to each cell 4 drops of **Ni-3**, close with the screw cap, and mix.



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 .



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

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, Cat.No. 114692. Use 10 ml R-1 instead of the sample.

A nickel standard solution Titrisol®, Cat.No. 109989, can also be used after diluting accordingly.

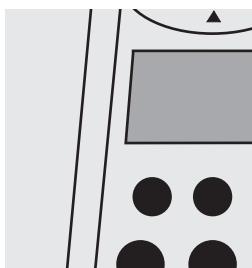
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended. Use 10 ml sample + 0.2 ml R-2.

Nitrate

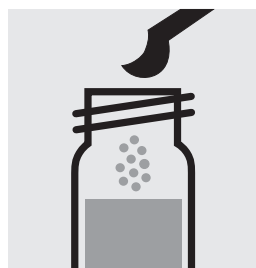
114542

Cell Test

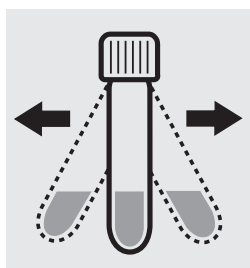
| | |
|---|------------|
| Measuring range: 0.5 – 15.0 mg/l NO ₃ -N | 16-mm cell |
| 2.2 – 66.4 mg/l NO ₃ | 16-mm cell |



Select method (3)(2)(0).



Add 1 level yellow micro-spoon each of **NO₃-1K** into two reaction cells, close with the screw cap.



Shake both cells **vigorously for 1 minute** to dissolve the solid substance.



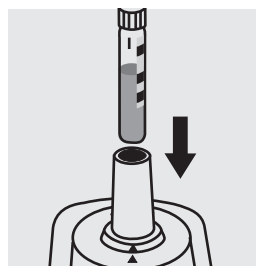
Add to one cell very slowly 1.5 ml of the sample with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!**



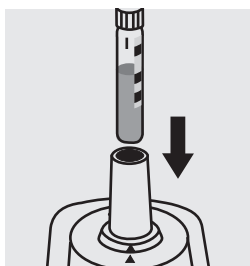
Add to the second cell very slowly 1.5 ml of distilled water with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!**
(Blank cell)



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 solution for photometric applications, CRM, Cat. No. 125037.

Ready-for-use nitrate standard solution CertiPUR®, Cat.No. 119811, concentration 1000 mg/l NO₃⁻, can also be used after diluting accordingly.

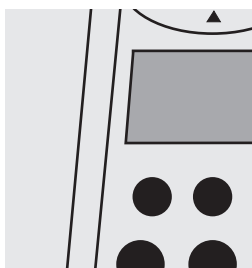
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Nitrate

114773

Test

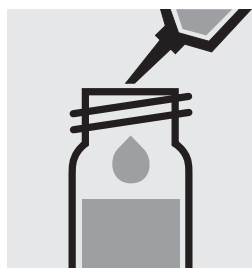
| | |
|---|------------|
| Measuring range: 0.5 – 15.0 mg/l $\text{NO}_3\text{-N}$ | 16-mm cell |
| 2.2 – 66.4 mg/l NO_3 | 16-mm cell |



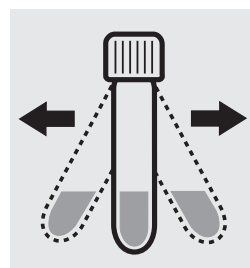
Select method (3)(2)(1).



Place 1 level blue microspoon each of $\text{NO}_3\text{-1}$ into two dry 16-mm cells.



Add to each cell 5.0 ml of $\text{NO}_3\text{-2}$ with pipette, close with the screw cap.



Shake both cells **vigorously for 1 minute** to dissolve the solid substance.



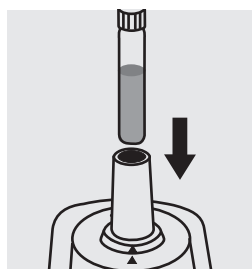
Add to one cell very slowly 1.5 ml of the sample with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!**



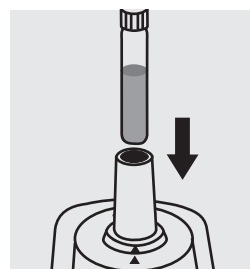
Add to the second cell very slowly 1.5 ml of distilled water with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!**
(Blank cell)



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 solution for photometric applications, CRM, Cat.No. 125036 and 125037.

Ready-for-use nitrate standard solution CertiPUR®, Cat.No. 119811, concentration 1000 mg/l NO_3^- , can also be used after diluting accordingly.

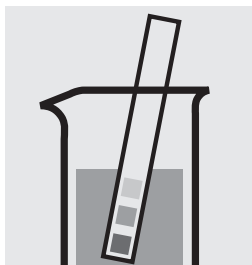
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

Nitrate

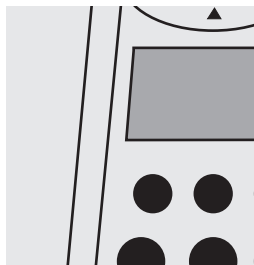
101842

Test

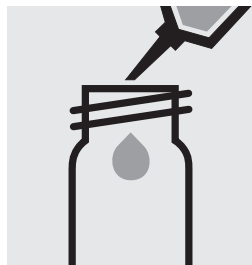
| | |
|---|------------|
| Measuring range: 0.3–30.0 mg/l NO ₃ -N | 24-mm cell |
| 1.3–132.8 mg/l NO ₃ | 24-mm cell |



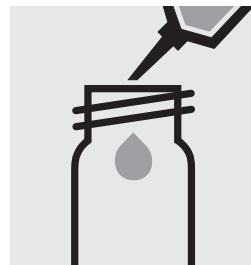
Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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



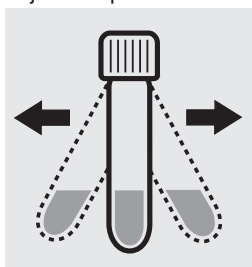
Pipette 10 ml of the sample into a 24-mm cell.



Pipette 10 ml of distilled water into a second 24-mm cell.
(Blank cell)



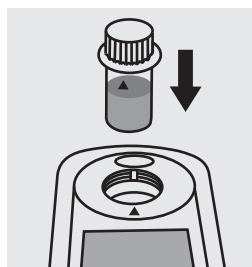
Add to each cell 1 level blue microspoon of **NO₃-1**, **immediately** close tightly with the screw cap.



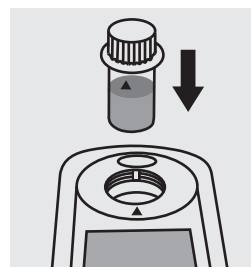
Shake both cells **vigorously for 1 minute** to dissolve the solid substance.



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:

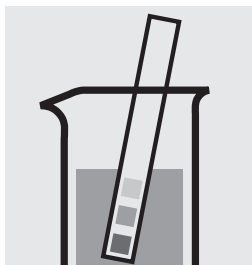
To check the measurement system (test reagents, measurement device, and handling) a ready-for-use nitrate standard solution CertiPUR®, Cat.No. 119811, concentration 1000 mg/l NO₃⁻, can be used after diluting accordingly.

Nitrite

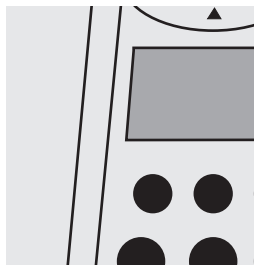
114547

Cell Test

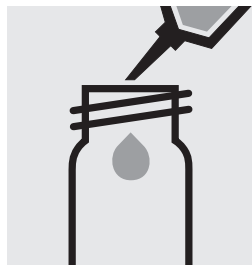
| | |
|---|------------|
| Measuring range: 10 – 700 µg/l NO ₂ -N | 16-mm cell |
| 33 – 2299 µg/l NO ₂ | 16-mm cell |



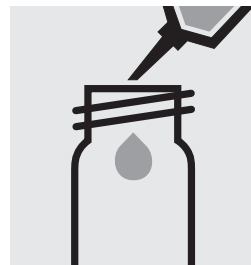
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



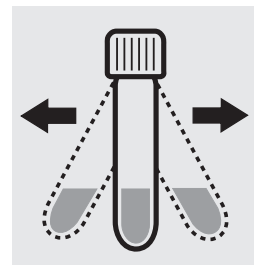
Select method **330**.



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)



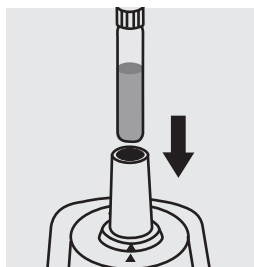
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap.



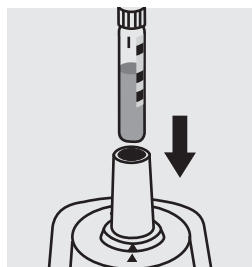
Shake the cell vigorously to dissolve the solid substance.



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-for-use nitrite standard solution CertiPUR®, Cat.No. 119899, concentration 1000 mg/l NO₂⁻, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125041.

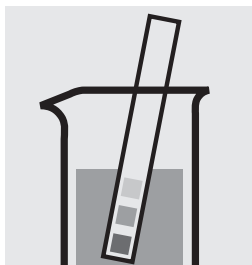
Nitrite

114776

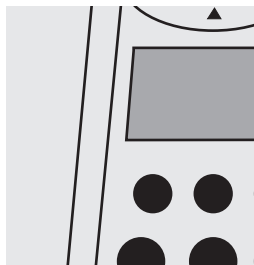
Test

| | |
|---|------------|
| Measuring range: 5 – 400 µg/l NO ₂ -N | 24-mm cell |
| 16 – 1313 µg/l NO ₂ | 24-mm cell |

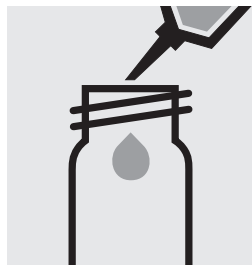
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



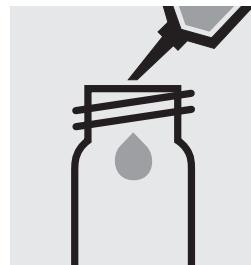
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method ③③①.



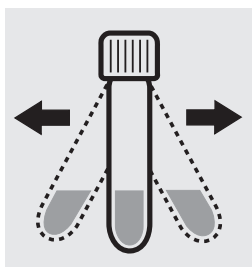
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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



Add 2 level blue micro-spoons of **NO₂-1**, close with the screw cap.



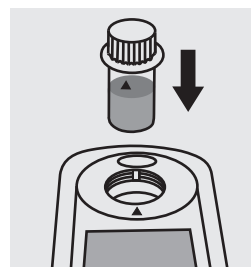
Shake the cell vigorously to dissolve the solid substance.



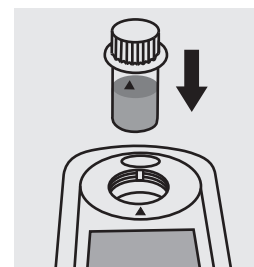
Check the pH, specified range: pH 2.0 – 2.5. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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-for-use nitrite standard solution CertiPUR®, Cat.No. 119899, concentration 1000 mg/l NO₂⁻, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125041.

Nitrogen (total)

114537

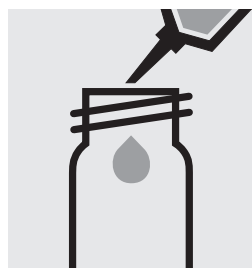
Cell Test

Measuring range: 0.5 – 15.0 mg/l N

16-mm cell



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



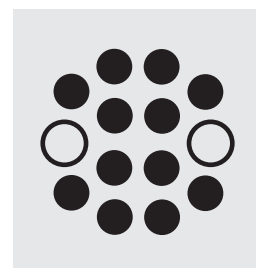
Pipette 10 ml of distilled water into a second empty 16-mm cell. (Blank)



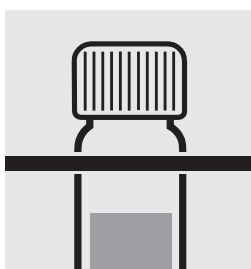
Add to each cell 1 level blue microspoon of **N-1K**.



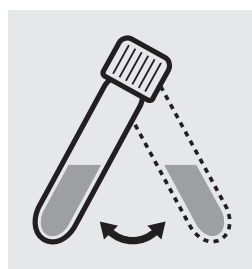
Add to each cell 6 drops of **N-2K**, close with the screw cap, and mix



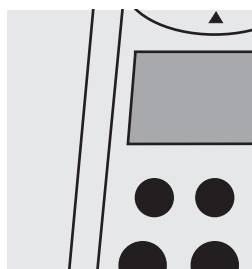
Heat both cells in the thermoreactor at 120 °C (100 °C) for 1 hour.



Remove both cells from the thermoreactor and place in a test-tube rack to cool to room temperature:
pretreated sample / blank.



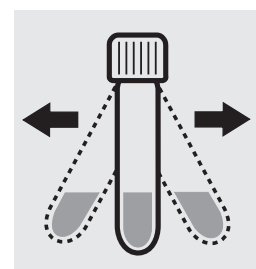
Swirl both cells after 10 minutes.



Select method **③④①**.



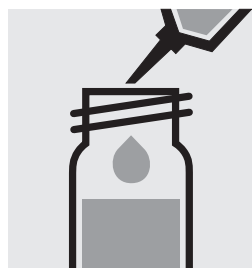
Add 1 level yellow microspoon each of **N-3K** into two reaction cells, close with the screw cap.



Shake both cells **vigorously for 1 minute** to dissolve the solid substance.



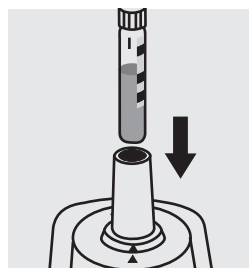
Add to one cell very slowly 1.5 ml of the **pretreated sample** with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!**



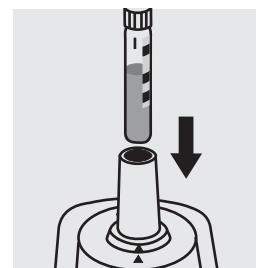
Add to the second cell very slowly 1.5 ml of the **pretreated blank** with pipette, close with the screw cap, and mix **briefly**. **Caution, cell becomes very hot!** (Blank cell)



Reaction time: 10 minutes
Press **⏮** 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 solution for photometric applications, CRM, Cat.No. 125043 and 125044.

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

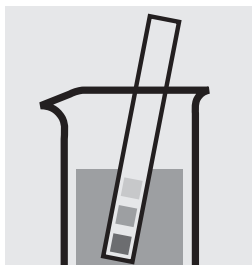
Oxygen

114694

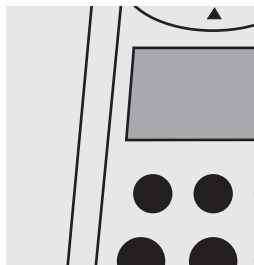
Cell Test

Measuring range: 0.5– 12.0 mg/l O₂

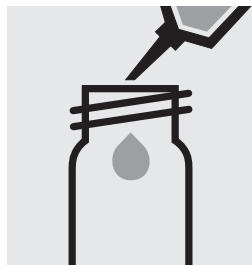
16-mm cell



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 **550**.



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 **O₂-1K**.



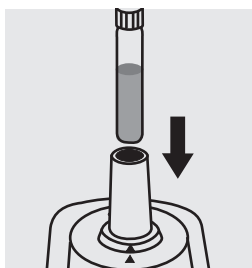
Add 5 drops of **O₂-2K**, close the cell with the screw cap, and shake for 10 seconds.



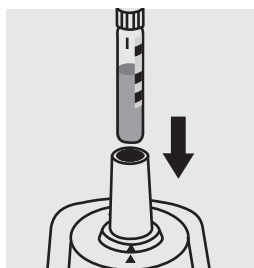
Reaction time: 1 minute
Press **←** to start the countdown.



Add 10 drops of **O₂-3K**, 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).

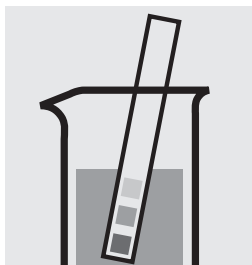
Ozone

100607

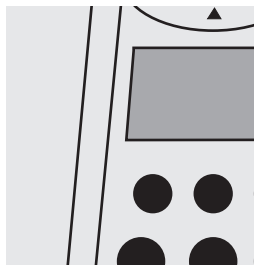
Test

Measuring range: 0.02–2.00 mg/l O₃

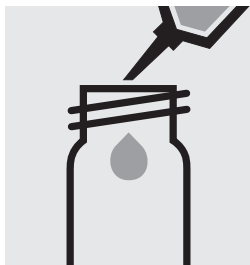
24-mm cell



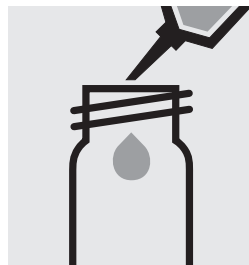
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



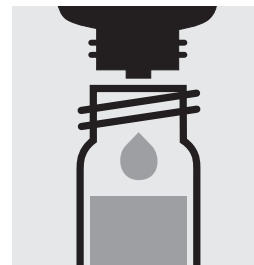
Select method ③⑤①.



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



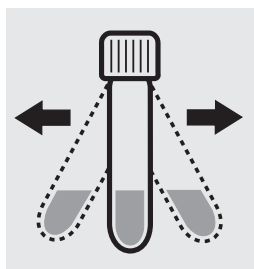
Pipette 10 ml of the sample into a 24-mm cell.



Add 2 drops of O₃-1, close with the screw cap, and mix.



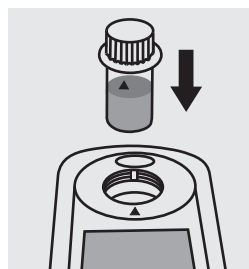
Add 1 level blue micro-spoon of O₃-2, close with the screw cap.



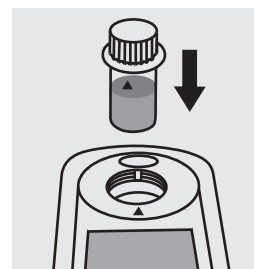
Shake the cell vigorously to dissolve the solid substance.



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:

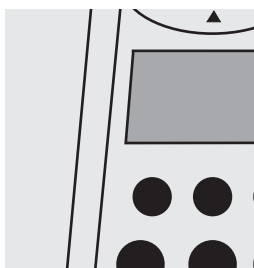
Very high ozone concentrations in the sample produce yellow-coloured solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

Quality assurance:

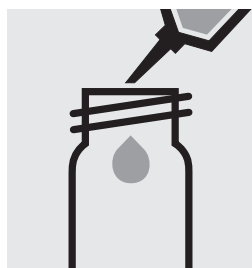
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

Measuring range: pH 6.4 – 8.8

16-mm cell

Select method **360**.

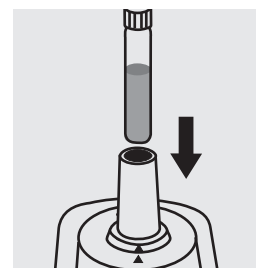
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



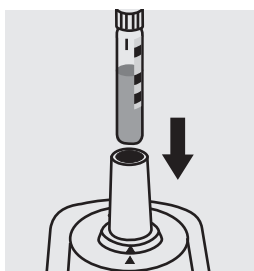
Pipette 10 ml of the sample into a round cell.



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:

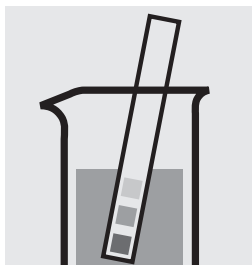
To check the measurement system (test reagents, measurement device, and handling) buffer solution pH 7.00 CertiPUR®, Cat.No. 109407, can be used.

Phenol

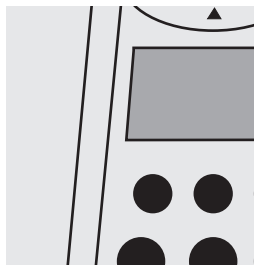
114551

Cell Test

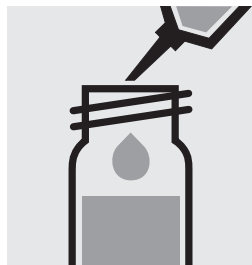
Measuring range: 0.10 – 2.50 mg/l C_6H_5OH 16-mm cell



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).



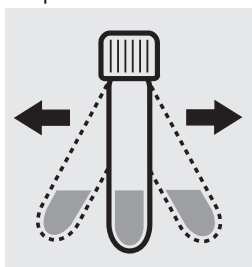
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



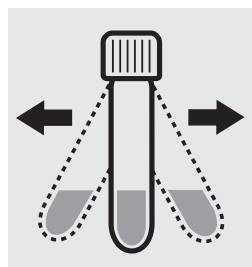
Add to each cell 1 level grey microspoon of **Ph-1K**, close with the screw cap.



Shake both cells vigorously to dissolve the solid substance.



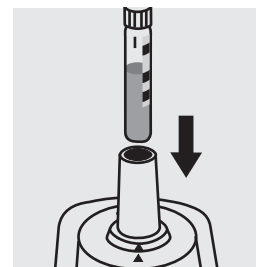
Add to each cell 1 level green microspoon of **Ph-2K**, close with the screw cap.



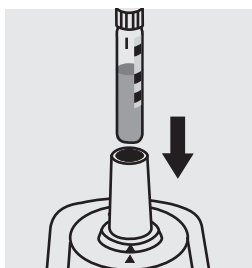
Shake both cells vigorously to dissolve the solid substance.



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 colour and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

Quality assurance:

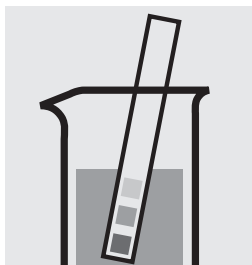
To check the measurement system (test reagents, measurement device, and handling) a phenol standard solution must be prepared from Phenol GR, Cat.No. 100206 (see section "Standard solutions").

Phenol

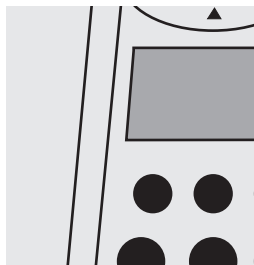
100856

Test

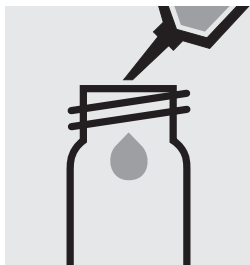
Measuring range: 0,10 – 5,00 mg/l C_6H_5OH 24-mm cell



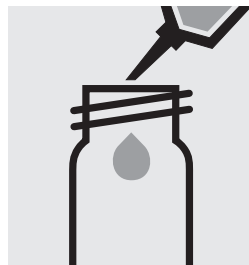
Check the pH of the sample, specified range: pH 2 – 11. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method ③⑦①.



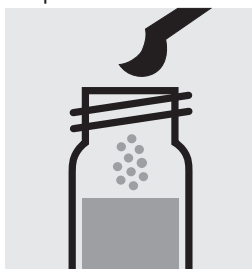
Pipette 10 ml of the sample into a 24-mm cell.



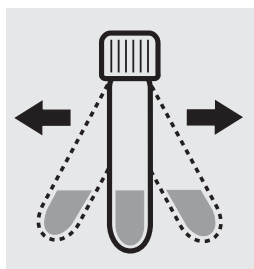
Pipette 10 ml of distilled water into a second 24-mm cell. (Blank cell)



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



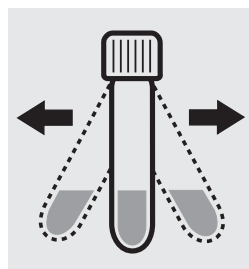
Add to each cell 1 level grey microspoon of **Ph-2**, close with the screw cap, and mix.



Shake both cells vigorously to dissolve the solid substance.



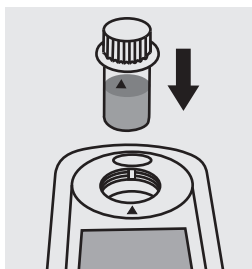
Add to each cell 1 level grey microspoon of **Ph-3**, close with the screw cap, and mix.



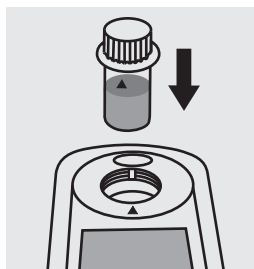
Shake both cells vigorously to dissolve the solid substance.



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").

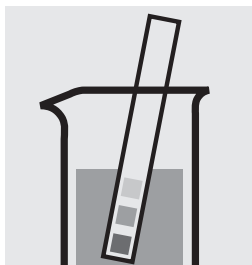
Phosphate

100474

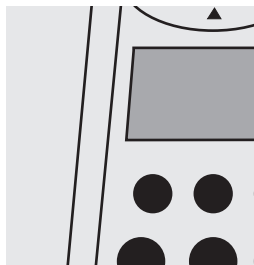
Determination of orthophosphate

Cell Test

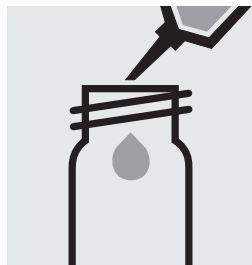
| | |
|--|------------|
| Measuring range: 0.05 – 4.00 mg/l PO ₄ -P | 16-mm cell |
| 0.15 – 12.26 mg/l PO ₄ | 16-mm cell |
| 0.11 – 9.17 mg/l P ₂ O ₅ | 16-mm cell |



Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



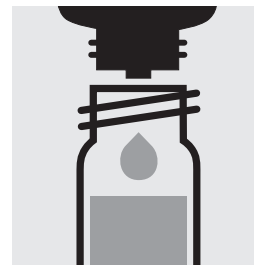
Select method 387.



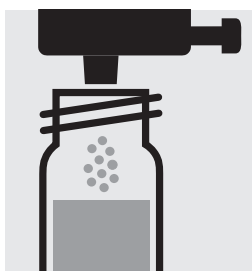
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



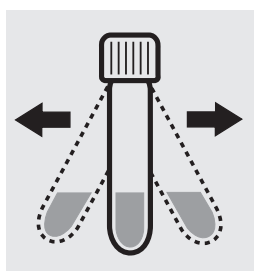
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-1K**, close with the screw cap, and mix.



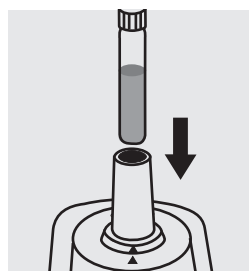
Add 1 dose of **P-2K** using the blue dose-metering cap, close with the screw cap.



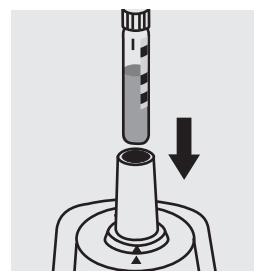
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes
Press 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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO₄³⁻, 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.

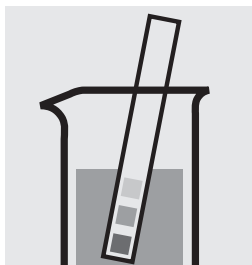
Phosphate

114543

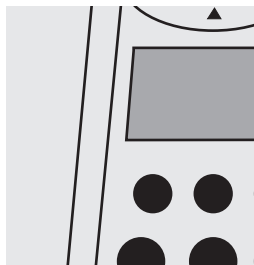
Determination of orthophosphate

Cell Test

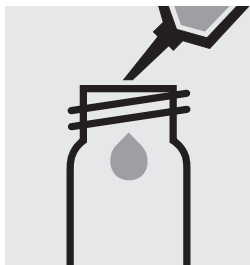
| | |
|--|------------|
| Measuring range: 0.05 – 4.00 mg/l PO ₄ -P | 16-mm cell |
| 0.15 – 12.26 mg/l PO ₄ | 16-mm cell |
| 0.11 – 9.17 mg/l P ₂ O ₅ | 16-mm cell |



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 380.



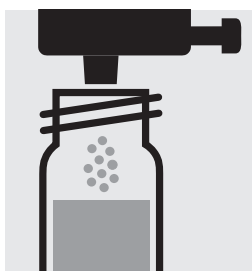
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



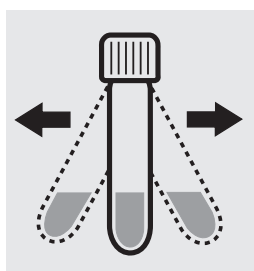
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-2K**, close with the screw cap, and mix.



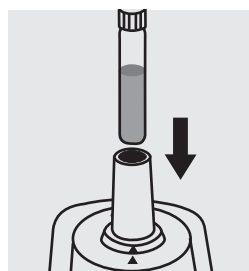
Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



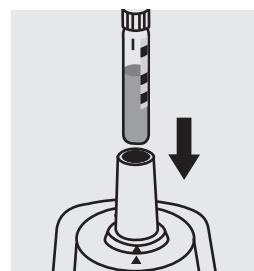
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press 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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO₄³⁻, 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

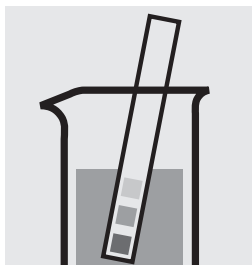
114543

Determination of total phosphorus

= sum of orthophosphate, polyphosphate, and organophosphate

Cell Test

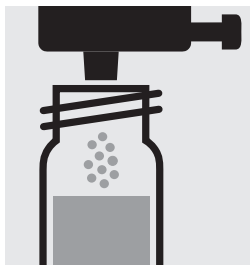
| | |
|--|------------|
| Measuring range: 0.05 – 4.00 mg/l PO ₄ -P | 16-mm cell |
| 0.15 – 12.26 mg/l PO ₄ | 16-mm cell |
| 0.11 – 9.17 mg/l P ₂ O ₅ | 16-mm cell |



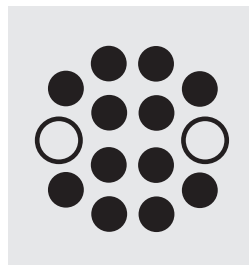
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



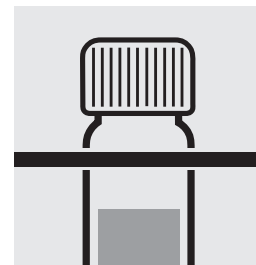
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



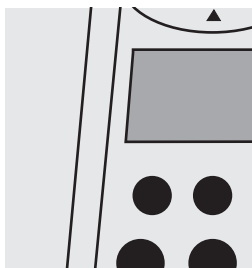
Add 1 dose of **P-1K** using the green dose-metering cap, close with the screw cap.



Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



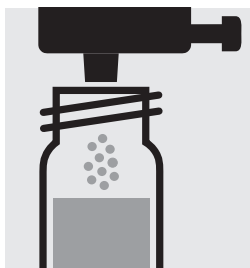
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



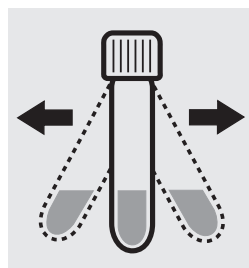
Select method **380**.



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.



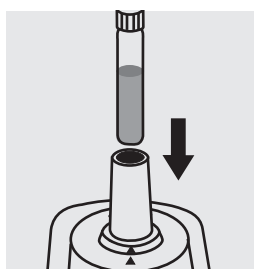
Shake the cell vigorously to dissolve the solid substance.



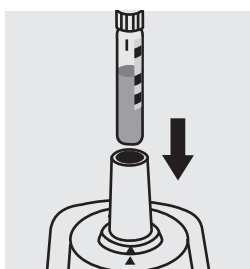
Reaction time: 5 minutes. Press **←** to start the countdown.



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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO₄³⁻, 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.

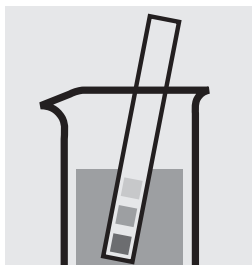
Phosphate

100475

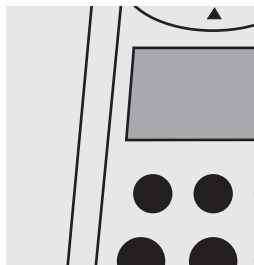
Determination of orthophosphate

Cell Test

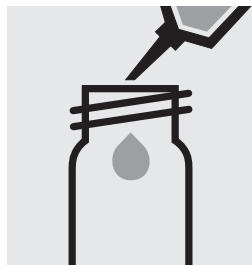
| | |
|---|------------|
| Measuring range: 0.5–20.0 mg/l $\text{PO}_4\text{-P}$ | 16-mm cell |
| 1.5–61.3 mg/l PO_4 | 16-mm cell |
| 1.1–45.8 mg/l P_2O_5 | 16-mm cell |



Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



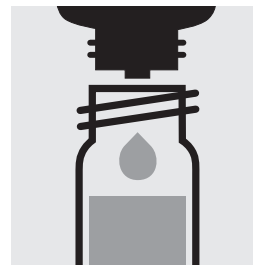
Select method 388.



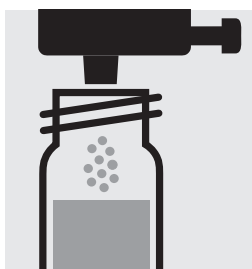
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



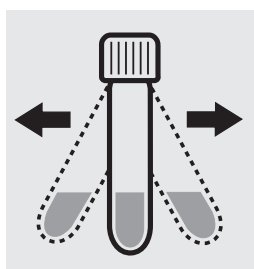
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-1K**, close with the screw cap, and mix.



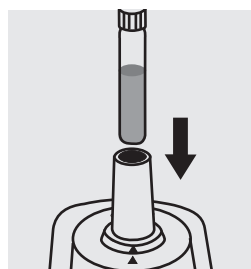
Add 1 dose of **P-2K** using the blue dose-metering cap, close with the screw cap.



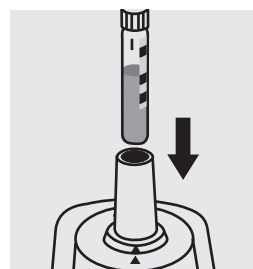
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press 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.No. 114675 and 114738.

Ready-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO_4^{3-} , 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.

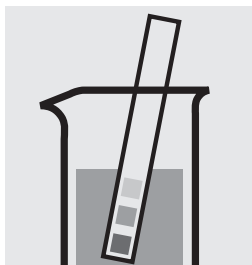
Phosphate

Determination of orthophosphate

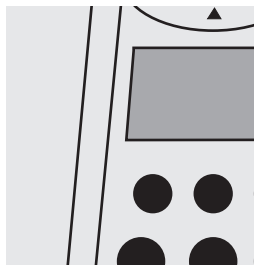
114729

Cell Test

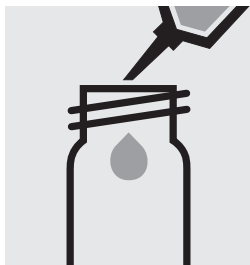
| | |
|---|------------|
| Measuring range: 0.5–20.0 mg/l $\text{PO}_4\text{-P}$ | 16-mm cell |
| 1.5–61.3 mg/l PO_4 | 16-mm cell |
| 1.1–45.8 mg/l P_2O_5 | 16-mm cell |



Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



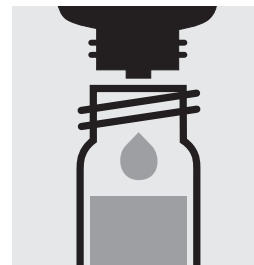
Select method ③⑧①.



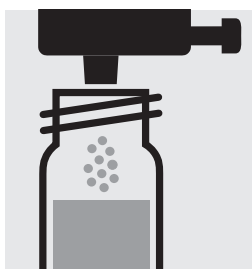
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



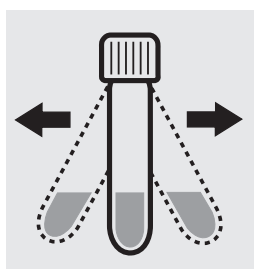
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-2K**, close with the screw cap, and mix.



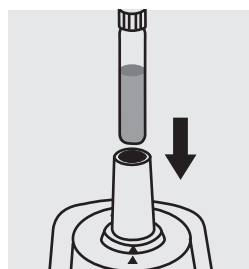
Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



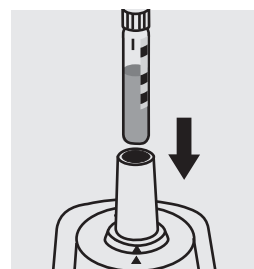
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes
Press 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.No. 114675 and 114738.

Ready-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO_4^{3-} , 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

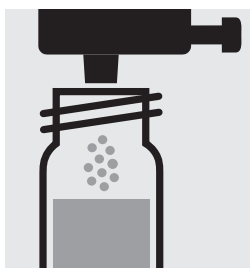
| | |
|---|------------|
| Measuring range: 0.5–20.0 mg/l PO ₄ -P | 16-mm cell |
| 1.5–61.3 mg/l PO ₄ | 16-mm cell |
| 1.1–45.8 mg/l P ₂ O ₅ | 16-mm cell |



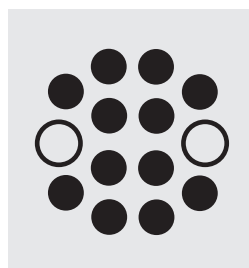
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



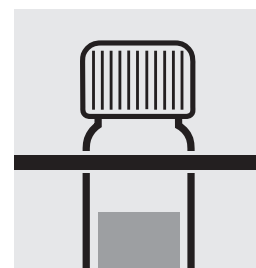
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



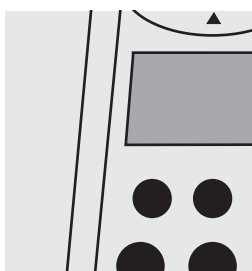
Add 1 dose of **P-1K** using the green dose-metering cap, close with the screw cap.



Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



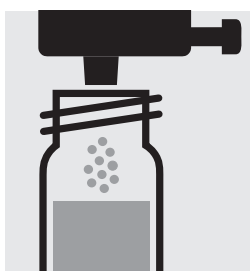
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



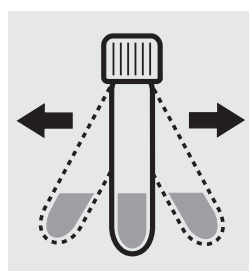
Select method (3)(8)(1).



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.



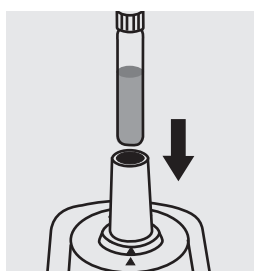
Shake the cell vigorously to dissolve the solid substance.



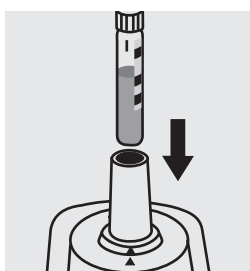
Reaction time: 5 minutes. Press (←) to start the countdown.



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.No. 114675 and 114738, or as well as the Standard solution for photometric applications, CRM, Cat.No. 125047 and 125048.

Ready-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO₄³⁻, 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.

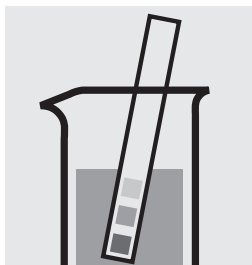
Phosphate

100616

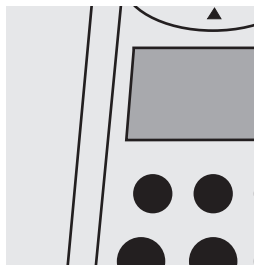
Determination of orthophosphate

Cell Test

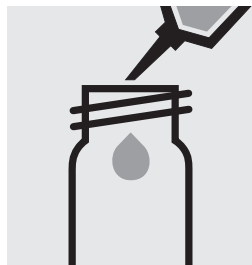
| | |
|---|------------|
| Measuring range: 3.0 – 100.0 mg/l PO ₄ -P | 16-mm cell |
| 9 – 307 mg/l PO ₄ | 16-mm cell |
| 7 – 229 mg/l P ₂ O ₅ | 16-mm cell |



Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



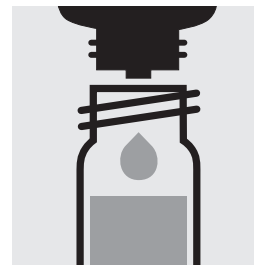
Select method ③⑧②.



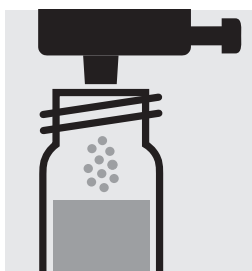
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



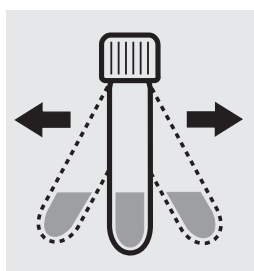
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **PO₄-1K**, close with the screw cap, and mix.



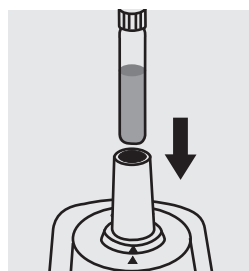
Add 1 dose of **PO₄-2K** using the blue dose-metering cap, close with the screw cap.



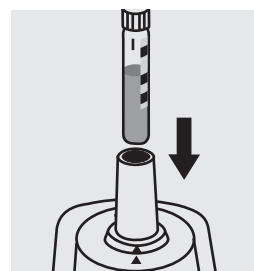
Shake the cell vigorously to dissolve the solid substance.



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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO₄³⁻, can be used after diluting accordingly.

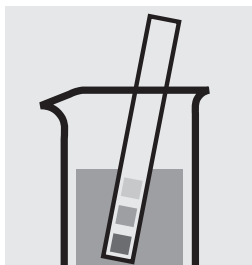
Phosphate

100673

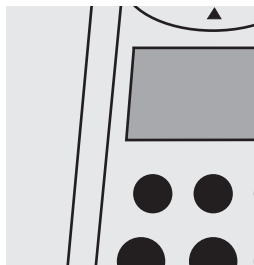
Determination of orthophosphate

Cell Test

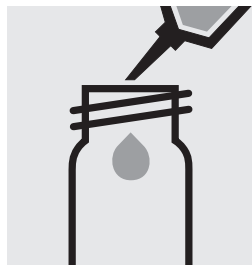
| | |
|---|------------|
| Measuring range: 3.0 – 100.0 mg/l PO ₄ -P | 16-mm cell |
| 9 – 307 mg/l PO ₄ | 16-mm cell |
| 7 – 229 mg/l P ₂ O ₅ | 16-mm cell |



Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



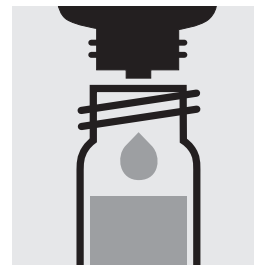
Select method ③⑧⑨.



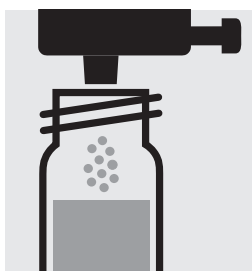
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



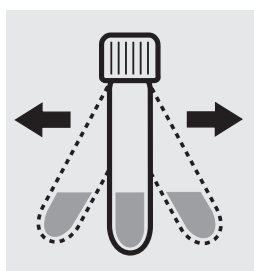
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **P-2K**, close with the screw cap, and mix.



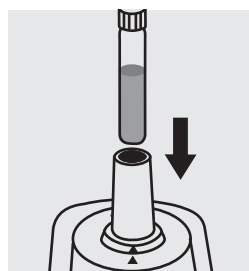
Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



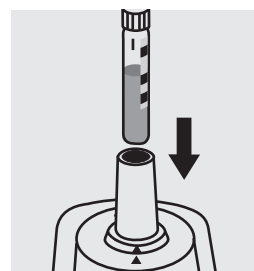
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes. Press 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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO₄³⁻, can be used after diluting accordingly.

Phosphate

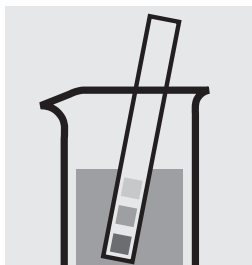
Determination of total phosphorus

= sum of orthophosphate, polyphosphate, and organophosphate

100673

Cell Test

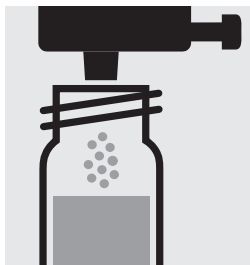
| | |
|---|------------|
| Measuring range: 3.0 – 100.0 mg/l PO ₄ -P | 16-mm cell |
| 9 – 307 mg/l PO ₄ | 16-mm cell |
| 7 – 229 mg/l P ₂ O ₅ | 16-mm cell |



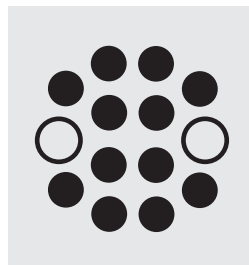
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



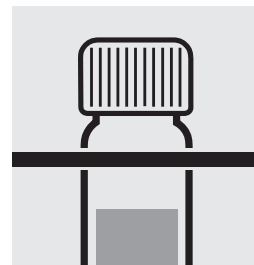
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



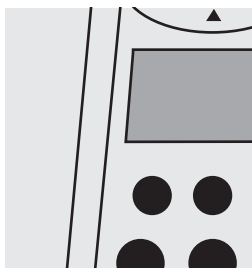
Add 1 dose of **P-1K** using the green dose-metering cap, close with the screw cap.



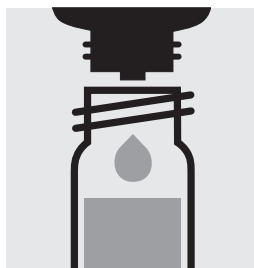
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



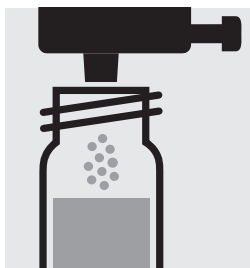
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



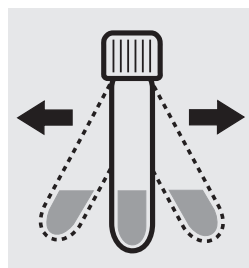
Select method (3)(8)(9).



Add 5 drops of **P-2K**, close with the screw cap, and mix.



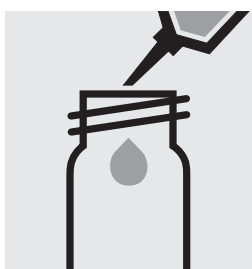
Add 1 dose of **P-3K** using the blue dose-metering cap, close with the screw cap.



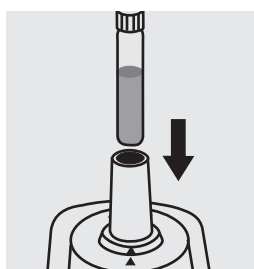
Shake the cell vigorously to dissolve the solid substance.



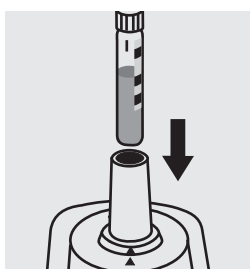
Reaction time: 5 minutes. Press (←) to start the countdown.



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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO₄³⁻, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125047, 125048, and 125049.

Phosphate

114848

Determination of orthophosphate

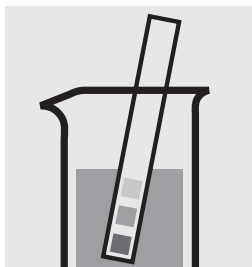
Test

Measuring range: 0.01 – 2.50 mg/l $\text{PO}_4\text{-P}$ 24-mm cell

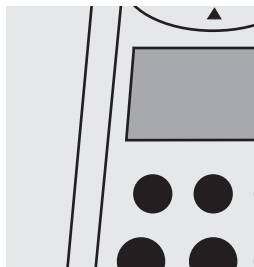
0.03 – 7.66 mg/l PO_4 24-mm cell

0.02 – 5.73 mg/l P_2O_5 24-mm cell

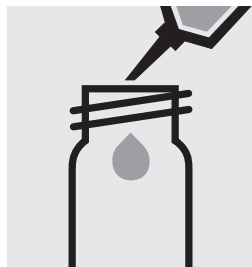
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



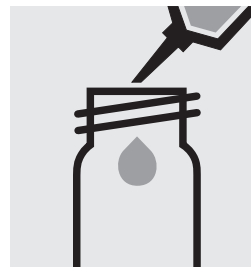
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method **383**.



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



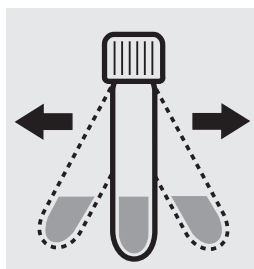
Pipette 10 ml of the sample into a 24-mm cell.



Add 10 drops of **$\text{PO}_4\text{-1}$** , close with the screw cap, and mix.



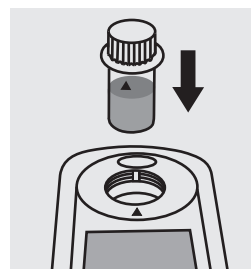
Add 2 level blue microspoons of **$\text{PO}_4\text{-2}$** , close with the screw cap.



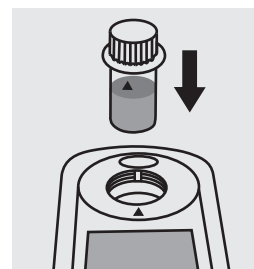
Shake the cell vigorously to dissolve the solid substance.



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



Insert the blank cell into the cell compartment. 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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO_4^{3-} , 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.

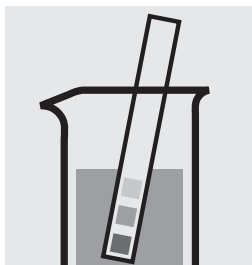
Phosphate

100798

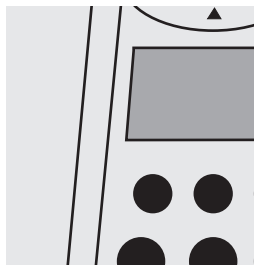
Determination of orthophosphate

Test

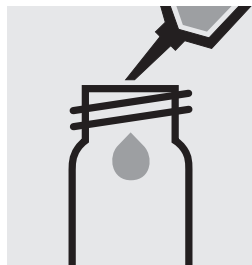
| | |
|---|------------|
| Measuring range: 1.0 – 60.0 mg/l PO ₄ -P | 16-mm cell |
| 3.1 – 184.0 mg/l PO ₄ | 16-mm cell |
| 2.3 – 137.5 mg/l P ₂ O ₅ | 16-mm cell |



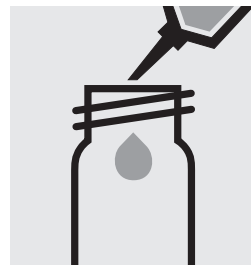
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method 384.



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



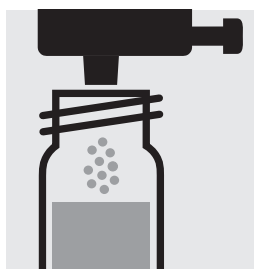
Pipette 8.0 ml of distilled water (Water for process analysis, Cat.No. 01051, is recommended) into a 16-mm cell.



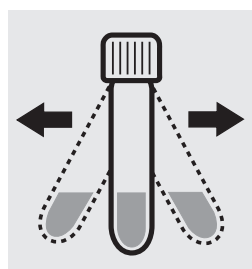
Add 0.50 ml of the sample with pipette, close with the screw cap, and mix.



Add 0.50 ml of **PO₄-1** with pipette, close with the screw cap, and mix.



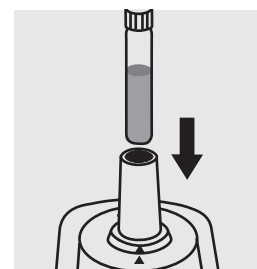
Add 1 dose of **PO₄-2** using the blue dose-metering cap, close with the screw cap.



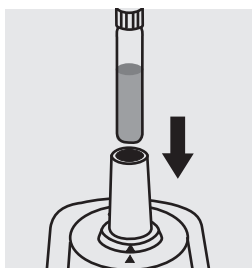
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes
Press to start the countdown.



Insert the blank cell into the cell compartment. Press .



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

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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO₄³⁻, can be used after diluting accordingly.

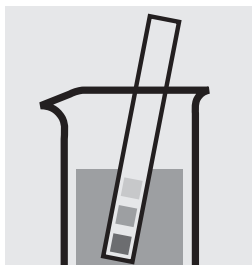
Phosphate

114842

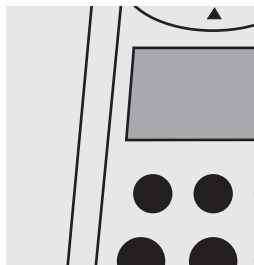
Determination of orthophosphate

Test

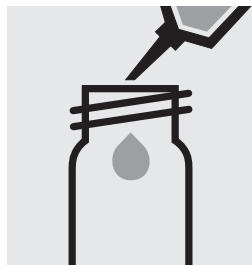
| | |
|---|------------|
| Measuring range: 0.5 – 30.0 mg/l $\text{PO}_4\text{-P}$ | 16-mm cell |
| 1.5 – 92.0 mg/l PO_4 | 16-mm cell |
| 1.1 – 68.7 mg/l P_2O_5 | 16-mm cell |



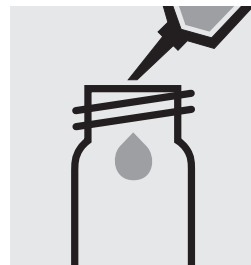
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



Select method 385.



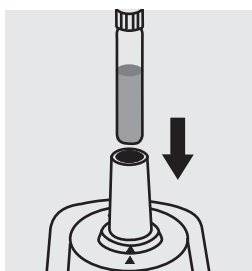
Pipette 5.0 ml of the sample into a 16-mm cell.



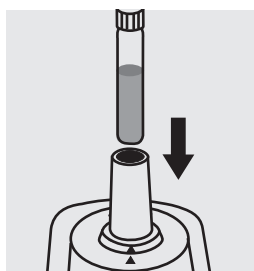
Pipette 5.0 ml of distilled water into a second 16-mm cell.
(Blank cell)



Add to each cell 1.2 ml of $\text{PO}_4\text{-1}$ 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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO_4^{3-} , can be used after diluting accordingly.

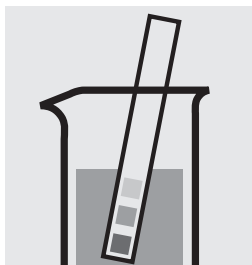
Phosphate

Determination of orthophosphate

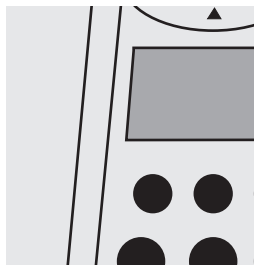
114546

Cell Test

| | |
|---|------------|
| Measuring range: 0.5–25.0 mg/l $\text{PO}_4\text{-P}$ | 16-mm cell |
| 1.5–76.7 mg/l PO_4 | 16-mm cell |
| 1.1–57.3 mg/l P_2O_5 | 16-mm cell |



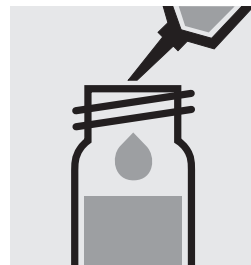
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



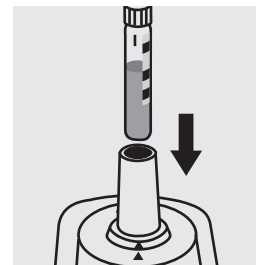
Select method ③⑧⑥.



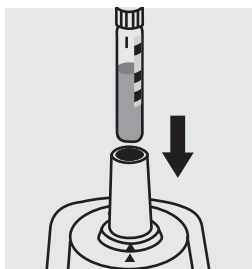
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO_4^{3-} , can be used after diluting accordingly.

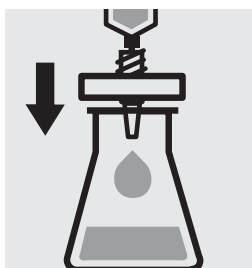
Potassium

114562

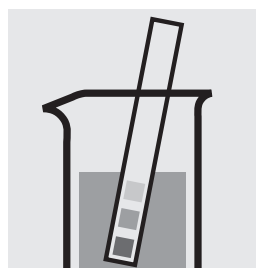
Cell Test

Measuring range: 5.0–50.0 mg/l K

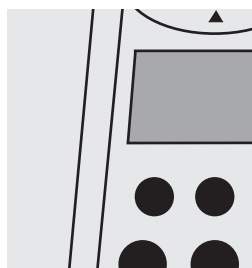
16-mm cell



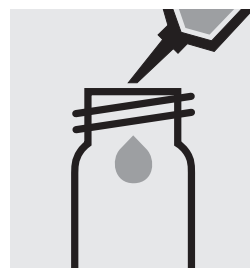
Filter turbid samples.



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 400.



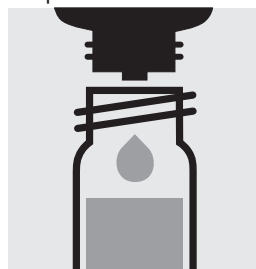
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap.
(Blank cell)



Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



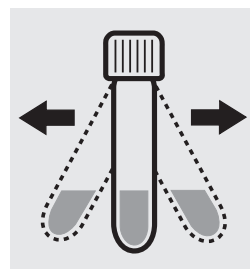
Check the pH, specified range: pH 10.0 – 11.5.



Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.



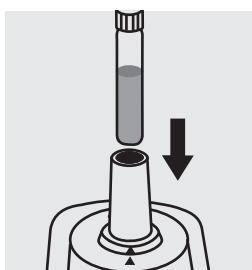
Add 1 level blue micro-spoon of **K-2K**, close the cell with the screw cap.



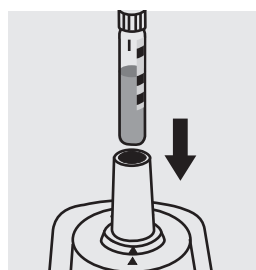
Shake the cell vigorously to dissolve the solid substance.



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 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-for-use potassium standard solution CertiPUR®, Cat.No. 170230, concentration 1000 mg/l K, can be used after diluting accordingly.

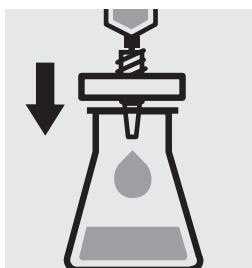
Potassium

100615

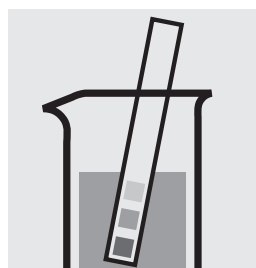
Cell Test

Measuring range: 30–300 mg/l K

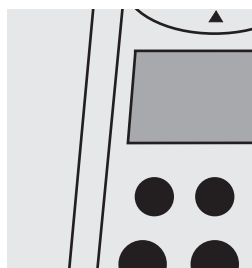
16-mm cell



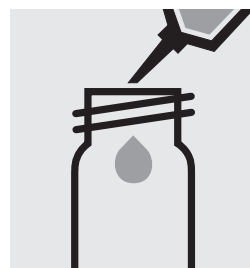
Filter turbid samples.



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 401.



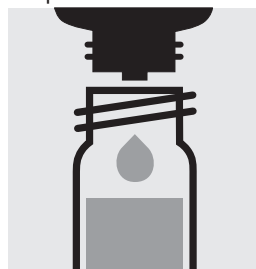
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap.
(Blank cell)



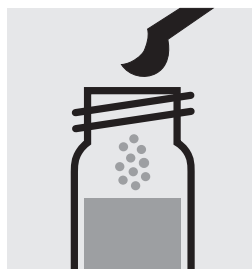
Pipette 0.50 ml of the sample into a reaction cell, close with the screw cap, and mix.



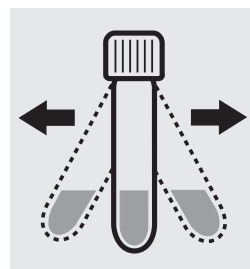
Check the pH, specified range: pH 10.0 – 11.5.



Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.



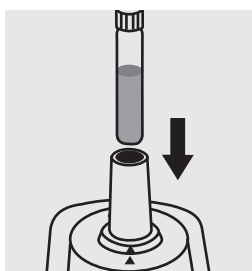
Add 1 level blue micro-spoon of **K-2K**, close the cell with the screw cap.



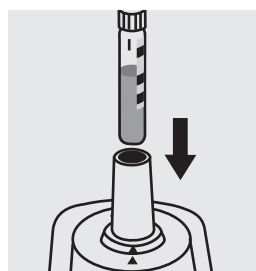
Shake the cell vigorously to dissolve the solid substance.



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

Quality assurance:

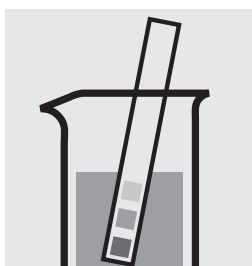
To check the measurement system (test reagents, measurement device, and handling) ready-for-use potassium standard solution CertiPUR®, Cat.No. 170230, concentration 1000 mg/l K, can be used after diluting accordingly.

Residual Hardness

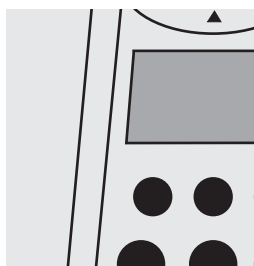
114683

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 ₃ | 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.



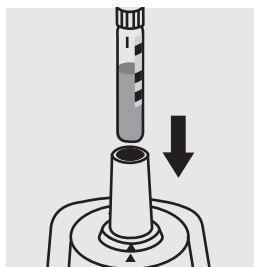
Pipette 4.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



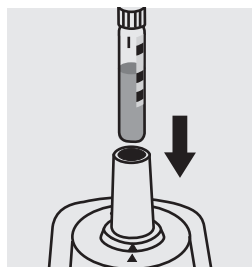
Add to each cell 0.20 ml of **RH-1K** with pipette, close with the screw cap, and mix.



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-for-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)

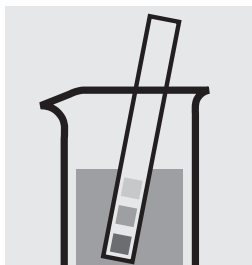
114794

Test

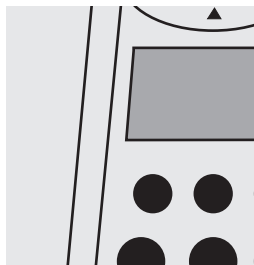
Measuring range: 0.11 – 8.56 mg/l SiO_2 24-mm cell

0.05 – 4.00 mg/l Si 24-mm cell

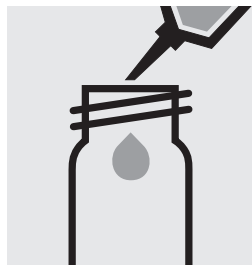
Attention: In contrast to the instructions given in the package insert the sample volume as well as the reagent volume must be doubled.



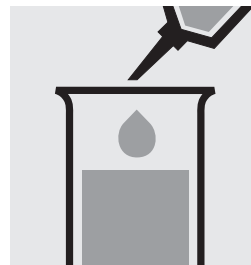
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



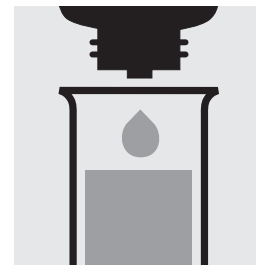
Select method 420.



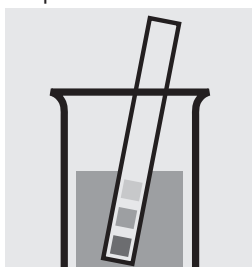
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 10 ml of the sample into a test tube.



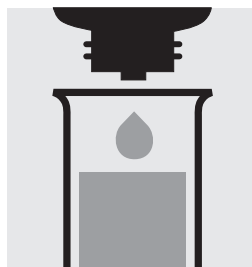
Add 6 drops of **Si-1** and mix.



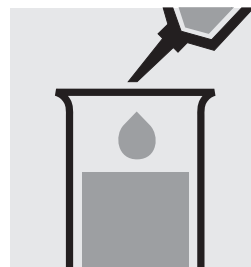
Check the pH, specified range: pH 1.2 – 1.6.



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



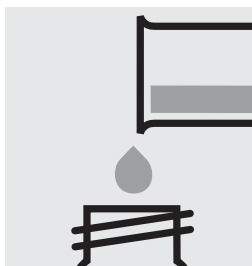
Add 6 drops of **Si-2** and mix.



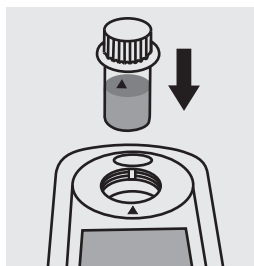
Add 1.0 ml of **Si-3** with pipette and mix.



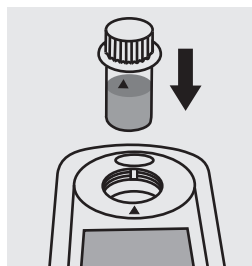
Reaction time: 10 minutes
Press **(←)** to start the countdown.



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:

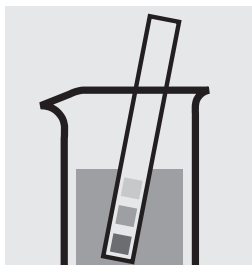
To check the measurement system (test reagents, measurement device, and handling) ready-for-use silicon standard solution CertiPUR®, Cat.No. 170236, concentration 1000 mg/l Si, can be used after diluting accordingly (Attention! Do **not** store standard solutions in glass vessels - see section "Standard solutions").

Silicate (silicic acid)

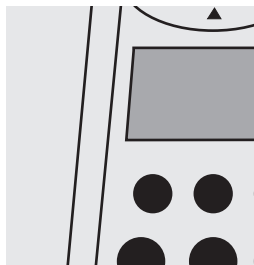
100857

Test

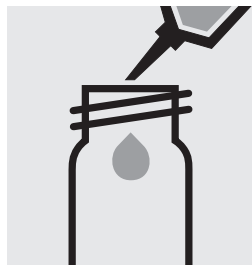
| | |
|--|------------|
| Measuring range: 11 – 1070 mg/l SiO_2 | 16-mm cell |
| 5 – 500 mg/l Si | 16-mm cell |



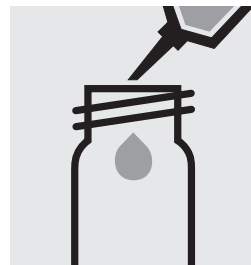
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method 421.



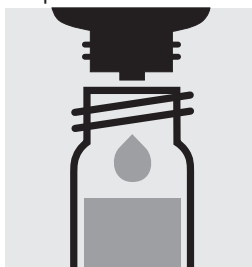
Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



Pipette 5.0 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a 16-mm cell.



Add 0.50 ml of the sample with pipette, close with the screw cap, and mix.



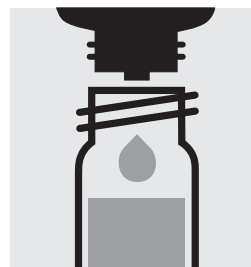
Add 4 drops of **Si-1**, close with the screw cap, and mix.



Add 2.0 ml of **Si-2** with pipette, close with the screw cap, and mix.



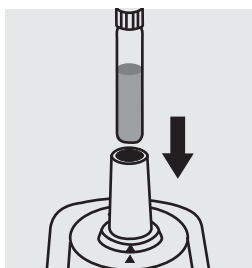
Reaction time: 2 minutes
Press to start the countdown.



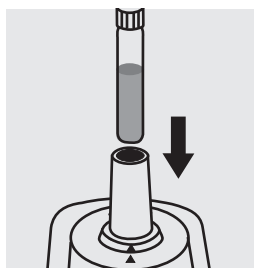
Add 4 drops of **Si-3**, close with the screw cap, and mix.



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-for-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)

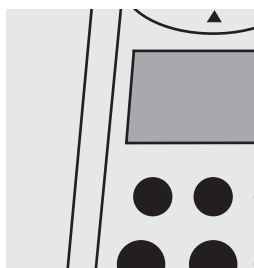
101813

Test

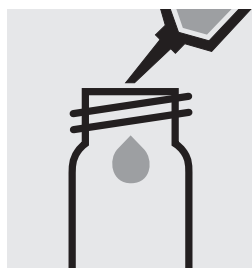
| | |
|--|------------|
| Measuring range: 0.004–0.500 mg/l SiO ₂ | 24-mm cell |
| 0.002–0.234 mg/l Si | 24-mm cell |



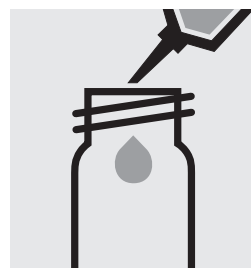
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



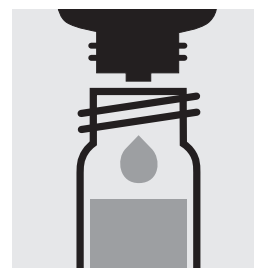
Select method ④②②.



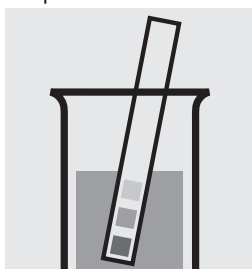
Pipette 10 ml of the sample into a plastic vessel (Flat-bottomed tubes, Cat.No. 117988).



Pipette 10 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second plastic vessel (Flat-bottomed tubes, Cat.No. 117988). (Blank)



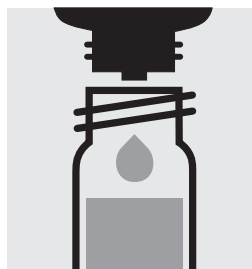
Add to each vessel 3 drops of Si-1, close with the screw cap, and mix.



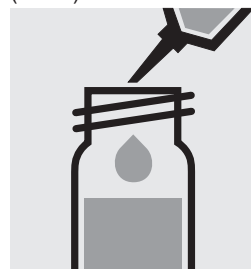
Check the pH, specified range: pH 1.2 – 1.6.



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



Add to each vessel 3 drops of Si-2, close with the screw cap, and mix.



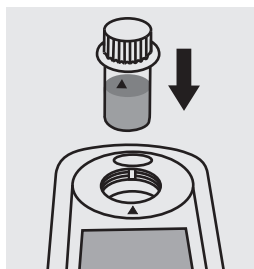
Add to each vessel 0.50 ml of Si-3 with pipette, close with the screw cap, and mix.



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



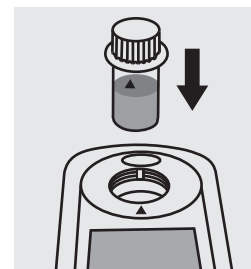
Transfer the blank into a 24-mm cell, close with the screw cap and measure **immediately**.



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 measurement (e.g. pipettes etc.)!

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-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").

Sodium

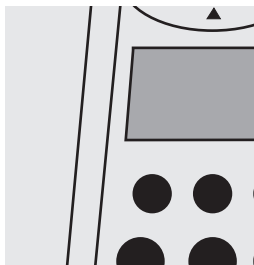
in nutrient solutions

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.



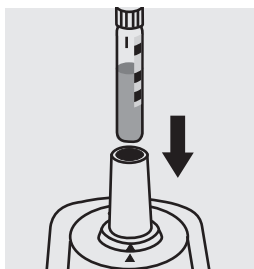
Add to one cell 0.50 ml of the sample with pipette, close with the screw cap, and mix.



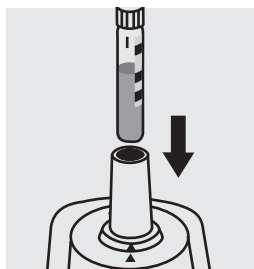
Add to the second cell 0.50 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



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-for-use chloride standard solution CertiPUR®, Cat.No. 119897, concentration 1000 mg/l Cl⁻ (corresponds to 649 mg/l Na), can be used after diluting accordingly (see section “Standard solutions”).

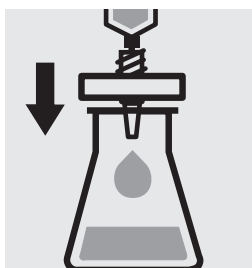
Sulfate

114548

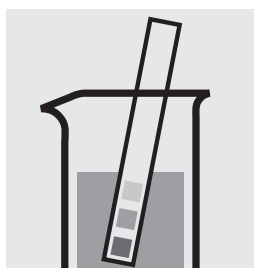
Cell Test

Measuring range: 5 – 250 mg/l SO_4

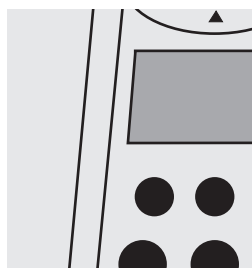
16-mm cell



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 440.



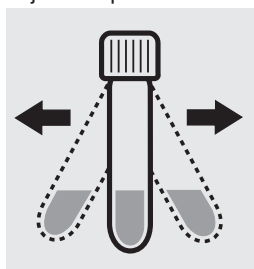
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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




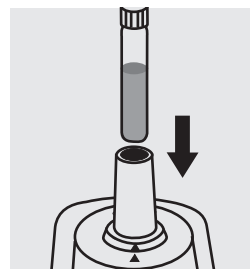
Add 1 level green micro-spoon of $\text{SO}_4\text{-1K}$, close the cell with the screw cap.




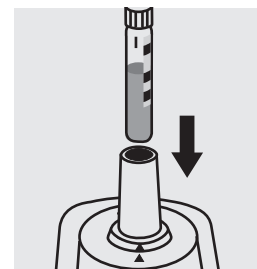
Shake the cell vigorously to dissolve the solid substance.




Reaction time: 2 minutes, **measure immediately**. Press  to start the countdown.



Insert the blank cell into the cell compartment. Press .



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

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. 125050 and 125051.

Ready-for-use sulfate standard solution CertiPUR®, Cat.No. 119813, concentration 1000 mg/l SO_4^{2-} , 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.

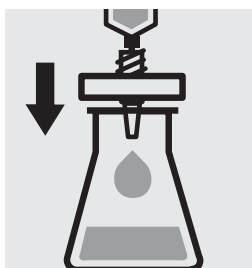
Sulfate

114564

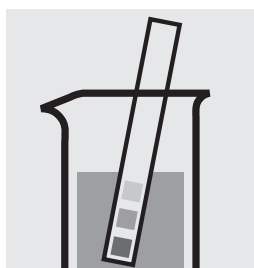
Cell Test

Measuring range: 100 – 1000 mg/l SO_4

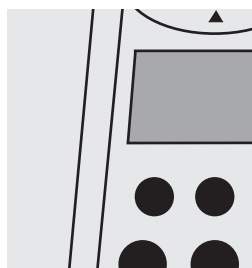
16-mm cell



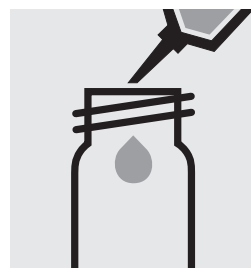
Filter turbid samples.



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 ④④②.



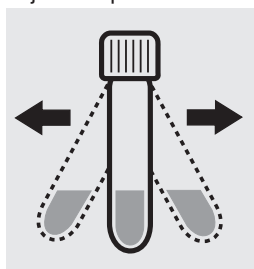
Fill approx. 10 ml of distilled water into an empty 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



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




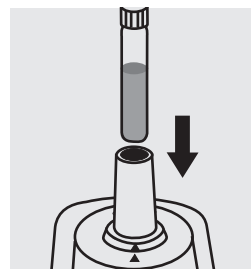
Add 1 level green microspoon of $\text{SO}_4\text{-1K}$, close the cell with the screw cap.




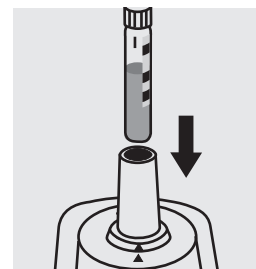
Shake the cell vigorously to dissolve the solid substance.




Reaction time: 2 minutes, **measure immediately**. Press  to start the countdown.



Insert the blank cell into the cell compartment. Press .



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

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 solution for photometric applications, CRM, Cat. No. 125051, 125052 and 125053.

Ready-for-use sulfate standard solution CertiPUR®, Cat.No. 119813, concentration 1000 mg/l SO_4^{2-} , 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.

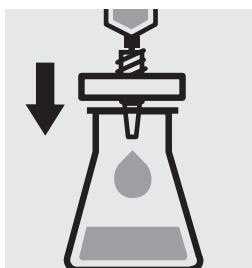
Sulfate

101812

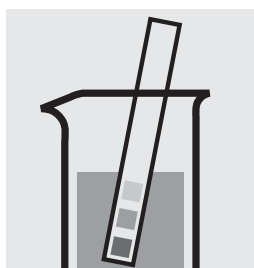
Test

Measuring range: 1.0–25.0 mg/l SO_4

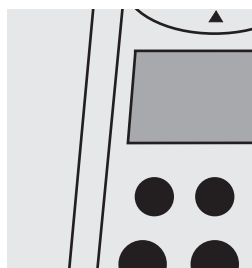
24-mm cell



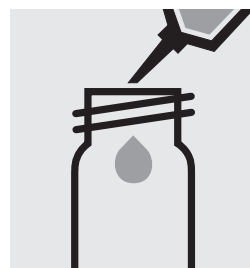
Filter turbid samples.



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 ④④③.



Pipette 0.50 ml each of **SO₄-1** into two 24-mm cells.



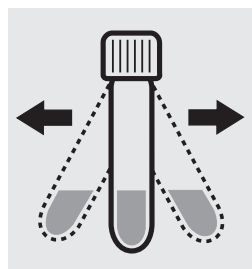
Add to one cell 10 ml of the sample with pipette, close with the screw cap, and mix.



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



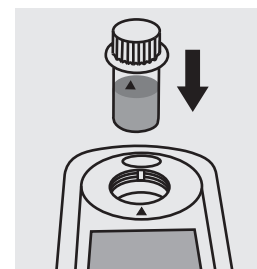
Add to each cell 1 level green microspoon of **SO₄-2**, close the cell with the screw cap.



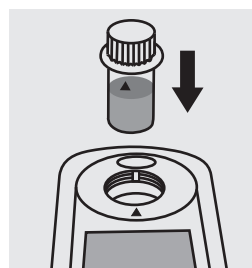
Shake the cell vigorously to dissolve the solid substance.



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-for-use sulfate standard solution CertiPUR®, Cat.No. 119813, concentration 1000 mg/l SO_4^{2-} , can be used after diluting accordingly.

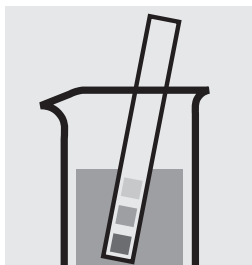
Sulfide

114779

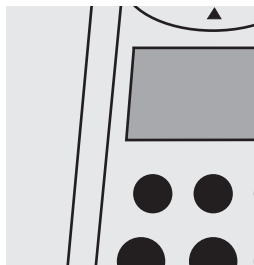
Test

Measuring range: 0.10 – 1.50 mg/l S

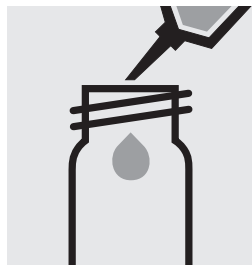
16-mm cell



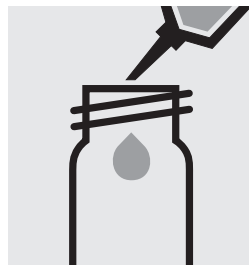
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



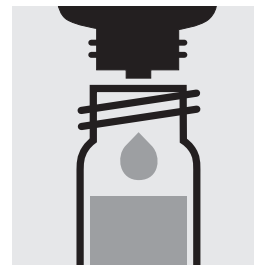
Select method **450**.



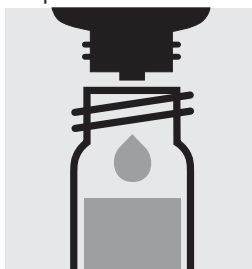
Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



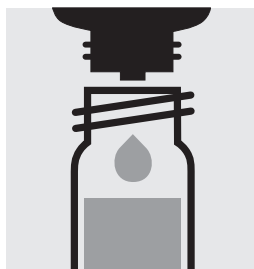
Pipette 5.0 ml of the sample into a 16-mm cell.



Add 1 drop of **S-1**, close with the screw cap, and mix.



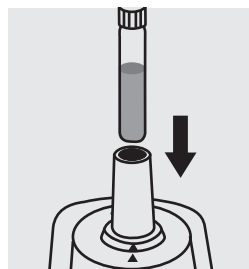
Add 5 drops of **S-2**, close with the screw cap, and mix.



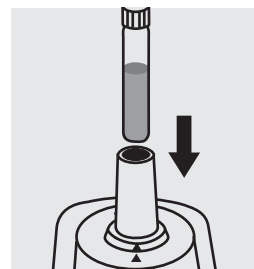
Add 5 drops of **S-3**, close with the screw cap, and mix.



Reaction time: 1 minute. Press **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**.

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").

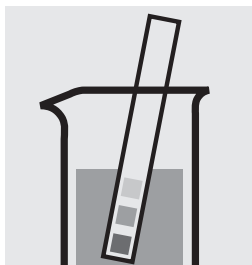
Sulfite

114394

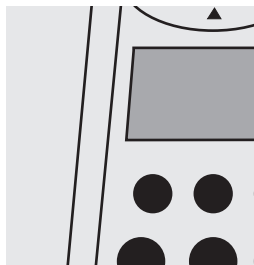
Cell Test

Measuring range: 1.0 – 20.0 mg/l SO_3

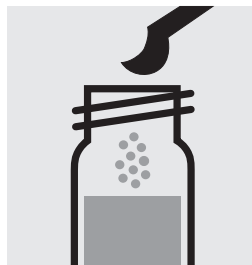
16-mm cell



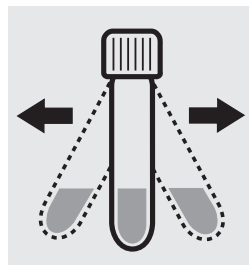
Check the pH of the sample, specified range: pH 4 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (4)(6)(0).



Add 1 level grey micro-spoon each of $\text{SO}_3\text{-1K}$ into two reaction cells, close with the screw cap.



Shake both cells vigorously to dissolve the solid substance.



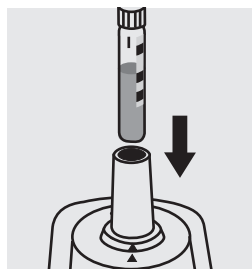
Add to one cell 3.0 ml of the sample with pipette, close with the screw cap, and mix.



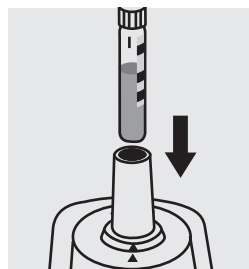
Add to the second cell 3.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



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").

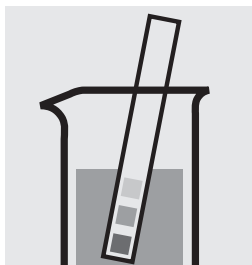
Sulfite

101746

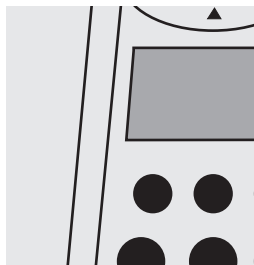
Test

Measuring range: 1.0 – 60.0 mg/l SO_3

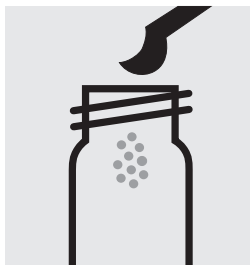
16-mm cell



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.



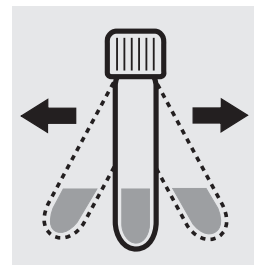
Select method 461.



Place 1 level grey microspoon each of $\text{SO}_3\text{-1}$ into two dry 16-mm cells.



Add to each cell 3.0 ml of $\text{SO}_3\text{-2}$ 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.



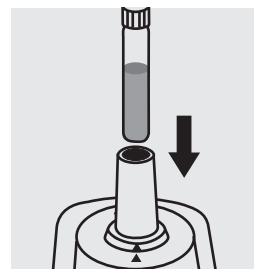
Add to one cell 2.0 ml of the sample with pipette, close with the screw cap, and mix.



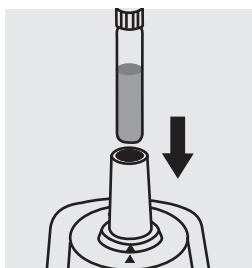
Add to the second cell 2.0 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



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”).

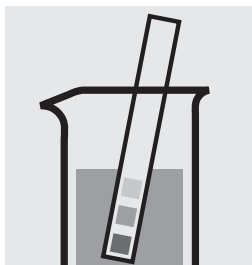
Surfactants (anionic)

114697

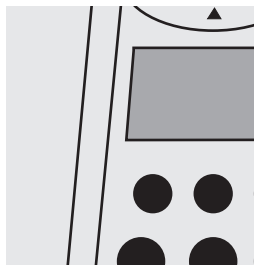
Cell Test

Measuring range: 0.05 – 2.00 mg/l MBAS* 16-mm cell

* Methylene-blue-active substances



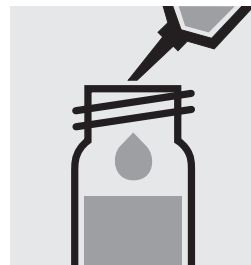
Check the pH of the sample, specified range: pH 5 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



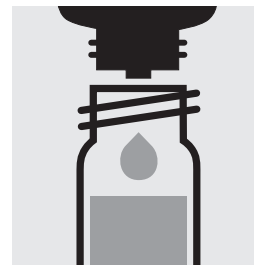
Select method 470.



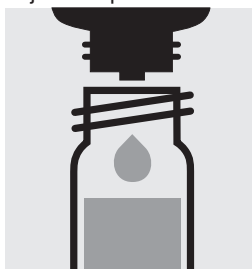
Pipette 5.0 ml of the sample into a reaction cell, **do not mix!**



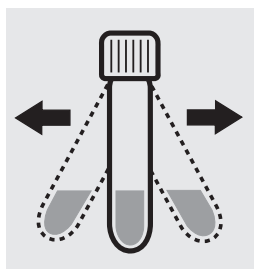
Pipette 5.0 ml of distilled water into a second reaction cell, close with the screw cap, **do not mix!** (Blank cell)



Add to each cell 3 drops of T-1K, **do not mix!**



Add to each cell 2 drops of T-2K, close with the screw cap.



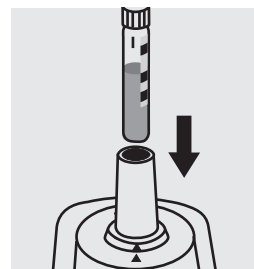
Shake both cells vigorously for 30 seconds.



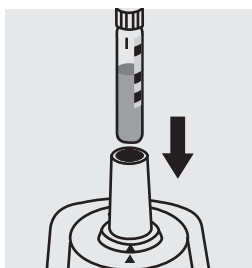
Reaction time: 10 minutes
Press to start the countdown.



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 .



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

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”).

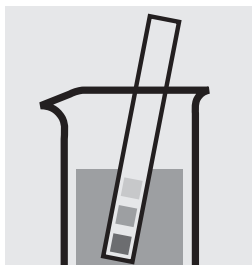
Surfactants (nonionic)

101787

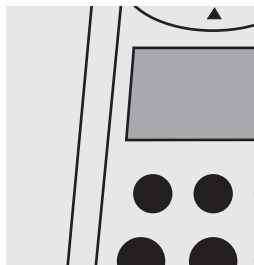
Cell Test

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.



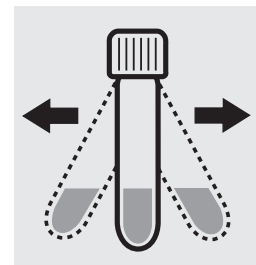
Select method 471.



Pipette 4.0 ml of the sample into a reaction cell, close with the screw cap.



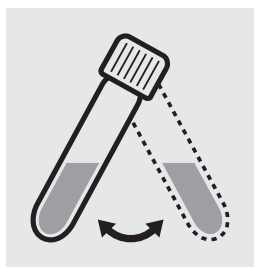
Pipette 4.0 ml of distilled water into a second reaction cell, close with the screw cap. (Blank cell)



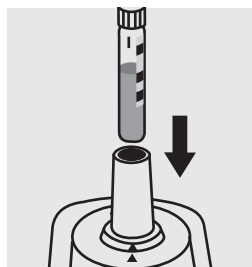
Shake both cells **vigorously for 1 minute**.



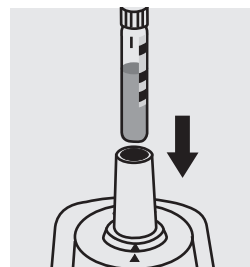
Reaction time:
2 minutes
Press to start the countdown.



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**.

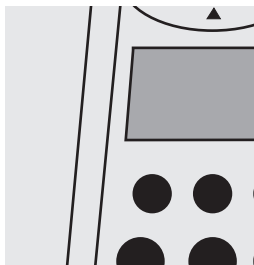
Quality assurance:

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”).

Suspended Solids

Measuring range: 50 – 750 mg/l of suspended solid

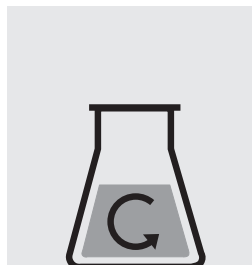
24-mm cell



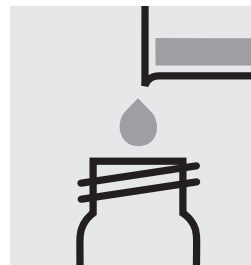
Select method 480.



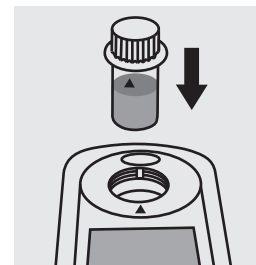
Fill approx. 10 ml of distilled water into a 24-mm cell, close with the screw cap. (Blank cell)



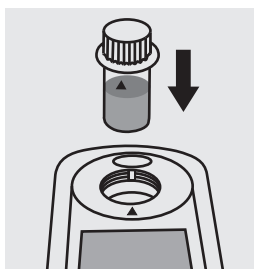
Homogenize 500 ml of sample for 2 minutes in a mixer running at high speed.



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**.



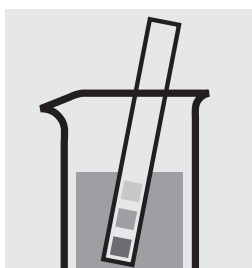
Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

Total Hardness

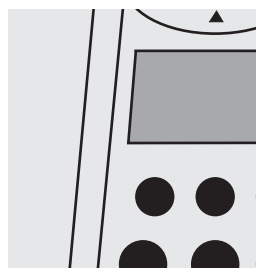
100961

Cell Test

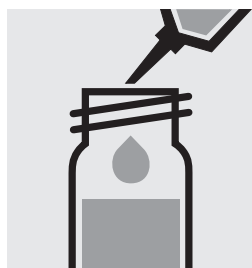
| | | | |
|---|------------|---------------------------------------|------------|
| Measuring range: 5 – 215 mg/l Ca | 16-mm cell | Measuring range: 0.7 – 30.1 °d | 16-mm cell |
| 7 – 301 mg/l CaO | 16-mm cell | 1.2 – 53.7 °f | 16-mm cell |
| 12 – 537 mg/l CaCO ₃ | 16-mm cell | 0.9 – 37.6 °e | 16-mm 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.



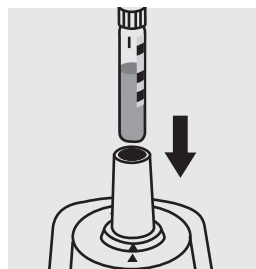
Pipette 1.0 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank cell)



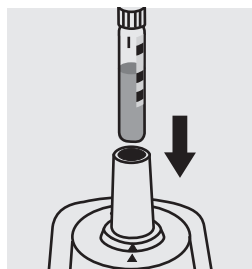
Add to each cell 1.0 ml of **H-1K** with pipette, close with the screw cap, and mix.



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:

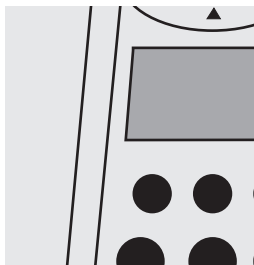
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

Turbidity

analogous to EN ISO 7027

Measuring range: 1 – 100 FAU

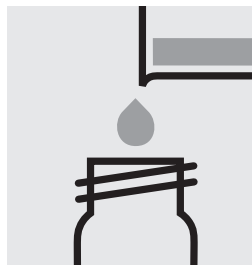
24-mm cell



Select method **520**.



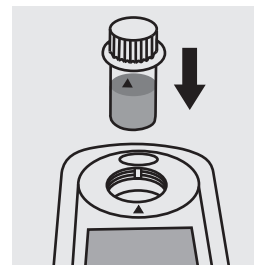
Fill approx. 10 ml of distilled water into a 24-mm cell, close with the screw cap. (Blank cell)



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**.



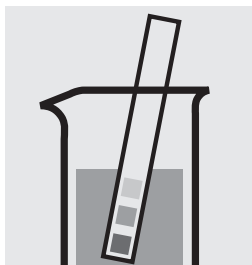
Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **Test**.

Volatile Organic Acids

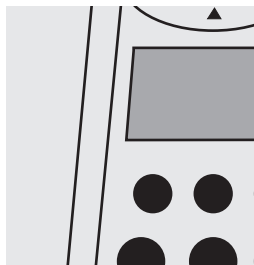
101749

Cell Test

| | | |
|--|------------------------------|------------|
| Measuring range: 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**.



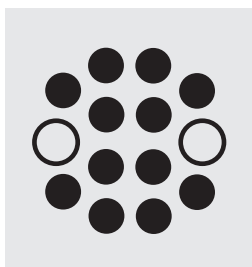
Pipette 0.50 ml each of **OA-1K** into two reaction cells.



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.



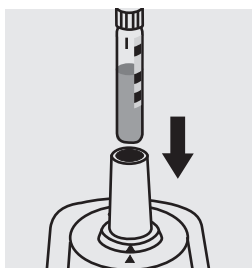
Add to each cell 1.0 ml of **OA-3K** with pipette, close with the screw cap, and mix.



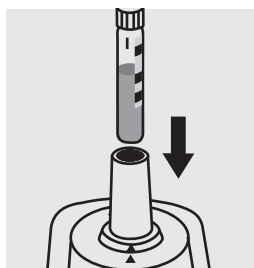
Add to each cell 1.0 ml of **OA-4K** with pipette, close with the screw cap, and mix.



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:

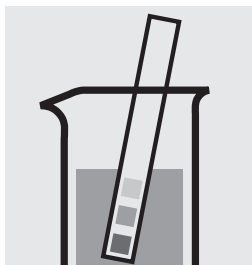
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous, Cat.No. 106268 (see section "Standard solutions").

Volatile Organic Acids

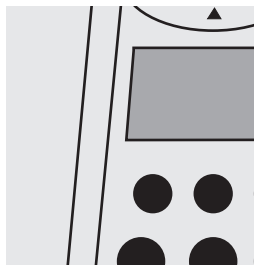
101809

Test

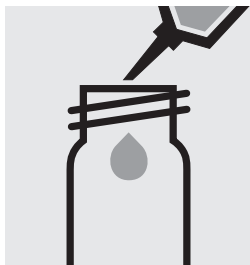
| | | |
|--|------------------------------|------------|
| Measuring range: 50 – 3000 mg/l volatile organic acid | (calculated as acetic acid) | 16-mm cell |
| 71 – 4401 mg/l volatile organic acid | (calculated as butyric acid) | 16-mm cell |



Check the pH of the sample, specified range: pH 2 – 12.



Select method **531**.



Pipette 0.75 ml each of **OA-1** into two round cells.



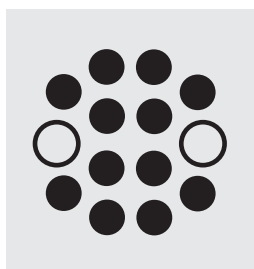
Add to each cell 0.50 ml of **OA-2** with pipette.



Add to one cell 0.50 ml of the sample with pipette, close with the screw cap, and mix.



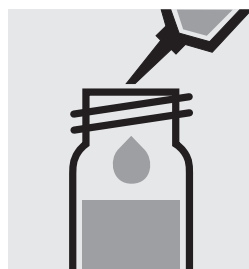
Add to the second cell 0.50 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



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.



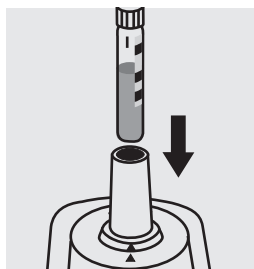
Add to each cell 1.0 ml of **OA-4** with pipette, close with the screw cap, and mix.



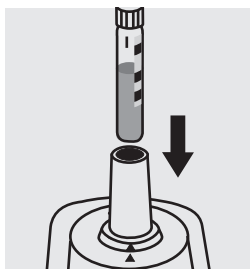
Add to each cell 1.0 ml of **OA-5** with pipette, close with the screw cap, and mix.



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").

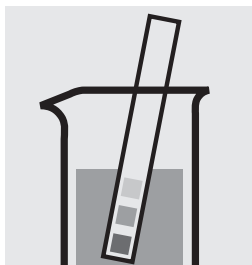
Zinc

100861

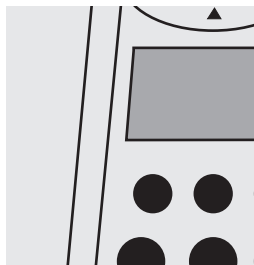
Cell Test

Measuring range: 25 – 1000 µg/l Zn

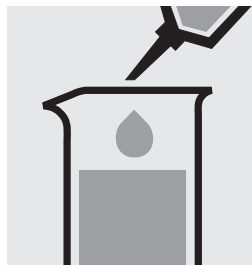
16-mm cell



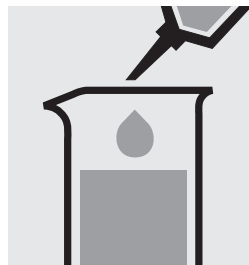
Check the pH of the sample, specified range: pH 1 – 7.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



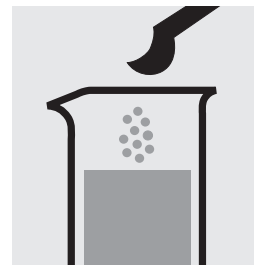
Select method **540**.



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 microspoon of **Zn-1K** and dissolve the solid substance: **pretreated sample / blank**.



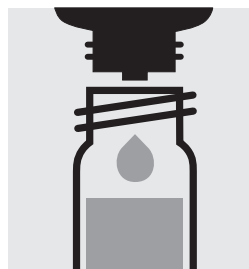
Pipette 0.50 ml each of **Zn-2K** into two reaction cells, close with the screw cap, and mix.



Add to one cell 2.0 ml of **pretreated sample** with pipette, close the cell with the screw cap, and mix.



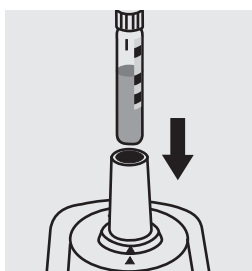
Add to the second cell 2.0 ml of **pretreated blank** with pipette, close the cell with the screw cap, and mix.
(Blank cell)



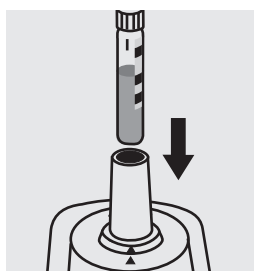
Add to each cells 5 drops of **Zn-3K**, close the cell with the screw cap, and mix.



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) ready-for-use zinc standard solution CertiPUR®, Cat.No. 119806, concentration 1000 mg/l Zn, can be used after diluting accordingly.

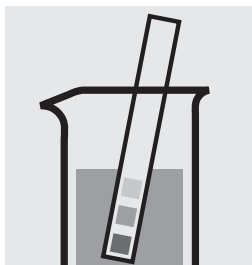
Zinc

114566

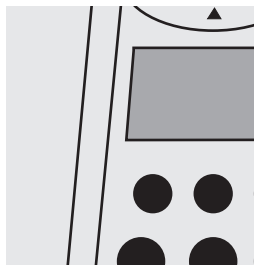
Cell Test

Measuring range: 0.20 – 5.00 mg/l Zn

16-mm cell



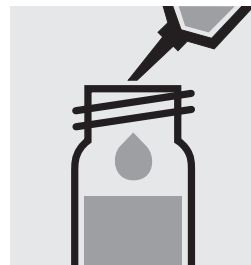
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method (5)(4)(1).



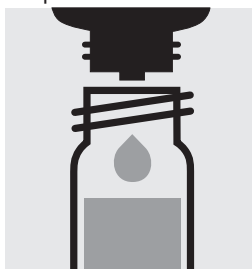
Add 5 drops each of **Zn-1K** into two reaction cells, close with the screw cap, and mix.



Add to one cell 0.50 ml of the sample with pipette, close with the screw cap, and mix.



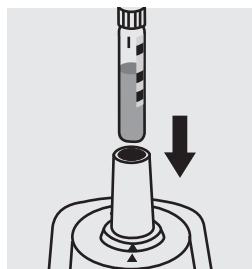
Add to the second cell 0.50 ml of distilled water with pipette, close with the screw cap, and mix. (Blank cell)



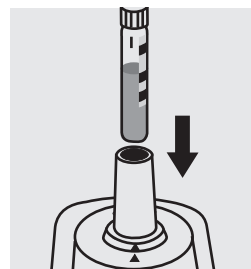
Add to each cell 5 drops of **Zn-2K**, close with the screw cap, and mix.



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-for-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 |

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 | - | 350 µg/l* | ± 40 µg/l | - | - | - | 119770** |
| Aluminium | 100594 | Al | - | 0.25 mg/l* | ± 0.03 mg/l | - | - | - | 119770** |
| Ammonium | 114739 | NH ₄ -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 | |
| Ammonium | 114558 | NH ₄ -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 ₄ -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 ₄ -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 | |
| Ammonium | 100683 | NH ₄ -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 | - | - | - | 119773** |
| BOD | 100687 | O ₂ | - | 210 mg/l | ± 20 mg/l | - | - | - | 100718 |
| Boron | 100826 | B | - | 1.00 mg/l* | ± 0.15 mg/l | - | - | - | 119500** |
| Bromine | 100605 | Br ₂ | - | 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 | - | - | - | 119777** |
| | | | | R-2: 300 µg/l | ± 45 µg/l | - | - | - | |
| Cadmium | 101745 | Cd | - | 250 µg/l* | ± 10 µg/l | - | - | - | 119777** |
| Calcium | 114815 | Ca | - | 80 mg/l* | ± 8 mg/l | - | - | - | 119778** |
| Chloride | 114730 | Cl | 10, 114676 | R-1: 25 mg/l | ± 6 mg/l | - | - | - | 119897** |
| | | | | R-2: 25 mg/l | ± 6 mg/l | - | - | - | |
| | | | 20, 114675 | R-1: 60 mg/l | ± 10 mg/l | - | - | - | |
| Chloride | 114897 | Cl | 60, 114696 | R-1: 125 mg/l | ± 13 mg/l | - | - | - | 119897** |
| | | | | R-2: 50 mg/l | ± 7 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 ₂ | - | 2.50 mg/l* | ± 0.25 mg/l | - | - | - | see 5.2.2 |
| Chlorine | 100597 | Cl ₂ | - | 2.50 mg/l* | ± 0.25 mg/l | - | - | - | see 5.2.2 |
| Chlorine | 100598 | Cl ₂ | - | 1.50 mg/l* | ± 0.15 mg/l | - | - | - | see 5.2.2 |
| Chlorine | 100602 | Cl ₂ | - | 1.50 mg/l* | ± 0.15 mg/l | - | - | - | see 5.2.2 |
| Chlorine | 100599 | Cl ₂ | - | 1.50 mg/l* | ± 0.15 mg/l | - | - | - | see 5.2.2 |
| Chlorine | 100086 / | Cl ₂ | - | 1.50 mg/l* | ± 0.15 mg/l | - | - | - | see 5.2.2 |
| | 100087 / | | | 2.50 mg/l* | ± 0.25 mg/l | - | - | - | see 5.2.2 |
| | 100088 | | | | | - | - | - | |
| Chlorine dioxide | 100608 | ClO ₂ | - | 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** |
| 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, Cat. No. | Confidence interval | | Diluted and ready-to-use standard solutions, CRM | | | Ready-to-use standard solution 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/ 20000 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 | 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 | - | - | - | 119814** |
| Fluoride | 114598 | F | - | 1.00 mg/l* | ± 0.15 mg/l | - | - | - | 119814** |
| Fluoride | 100822 | F | - | 1.00 mg/l* | ± 0.15 mg/l | - | - | - | 119814** |
| Hydrazine | 109711 | N ₂ H ₄ | - | 500 µg/l* | ± 50 µg/l | - | - | - | see 5.2.2 |
| Iodine | 100606 | I ₂ | - | 2.50 mg/l* | ± 0.25 mg/l | - | - | - | see 5.2.2 |
| Iron | 114549 | Fe | 30, 114677 | R-1: 1.00 mg/l R-2: 3.00 mg/l | ± 0.15 mg/l ± 0.30 mg/l | - | - | - | 119781** |
| Iron | 114761 | Fe | - | 1.00 mg/l* | ± 0.15 mg/l | - | - | - | 119781** |
| Iron | 100796 | Fe | 30, 114677 | R-1: 1.00 mg/l R-2: 1.88 mg/l | ± 0.15 mg/l ± 0.20 mg/l | - | - | - | 119781** |
| Lead | 114833 | Pb | 40, 114692 | R-1: 2.00 mg/l R-2: 1.00 mg/l | ± 0.20 mg/l ± 0.15 mg/l | - | - | - | 119776** |

* 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 | |
| Lead | 109717 | Pb | 40, 114692 | R-1: 2.00 mg/l R-2: 0.63 mg/l | ± 0.20 mg/l ± 0.10 mg/l | - | | | 119776** |
| 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 R-2: 1.43 mg/l | ± 0.15 mg/l ± 0.15 mg/l | - | | | 119789** |
| Manganese | 101739 | Mn | - | 1.00 mg/l* | ± 0.10 mg/l | - | | | 119789** |
| Manganese | 114770 | Mn | 30, 114677 | R-1: 1.00 mg/l R-2: 1.00 mg/l | ± 0.15 mg/l ± 0.15 mg/l | - | | | 119789** |
| Manganese | 101846 | Mn | - | 1.00 mg/l* | ± 0.10 mg/l | - | | | 119789** |
| Molybdenum | 119252 | Mo | - | 25.0 mg/l* | ± 2.5 mg/l | - | | | 170227** |
| Monochlor- amine | 101632 | Cl ₂ | - | 2.50 mg/l* | ± 0.25 mg/l | - | | | see 5.2.2 |
| Nickel | 114554 | Ni | 40, 114692 | R-1: 2.00 mg/l R-2: 2.00 mg/l | ± 0.20 mg/l ± 0.20 mg/l | - | | | 109989** |
| Nickel | 114785 | Ni | 40, 114692 | R-1: 2.00 mg/l R-2: 2.00 mg/l | ± 0.20 mg/l ± 0.20 mg/l | - | | | 109989** |
| Nitrate | 114542 | NO ₃ -N | 20, 114675 | R-1: 9.0 mg/l R-2: 5.0 mg/l | ± 0.9 mg/l ± 0.6 mg/l | 125037 | 2.50 mg/l | ± 0.06 mg/l | 119811** |
| Nitrate | 114773 | NO ₃ -N | 10, 114676 | R-1: 2.50 mg/l R-2: 2.00 mg/l | ± 0.25 mg/l ± 0.40 mg/l | 125036 | 0.500 mg/l | ± 0.05 mg/l | 119811** |
| | | | 20, 114675 | R-1: 9.0 mg/l R-2: 5.0 mg/l | ± 0.9 mg/l ± 0.6 mg/l | 125037 | 2.50 mg/l | ± 0.06 mg/l | |
| Nitrate | 101842 | NO ₃ -N | - | 10.0 mg/l* | ± 1.5 mg/l | - | | | 119811** |
| Nitrite | 114547 | NO ₂ -N | - | 300 µg/l* | ± 30 µg/l | 125041 | 200 µg/l | ± 9 µg/l | 119899** |
| Nitrite | 114776 | NO ₂ -N | - | 200 µg/l* | ± 20 µg/l | 125041 | 200 µg/l | ± 9 µg/l | 119899** |
| Nitrogen | 114537 | N | 50, 114695 | R-1: 5.0 mg/l R-2: 3.0 mg/l | ± 0.7 mg/l ± 0.5 mg/l | 125043 | 2.50 mg/l | ± 0.06 mg/l | see 5.2.2 |
| | | | | | | 125044 | 12.0 mg/l | ± 0.3 mg/l | |
| Ozone | 100607 | O ₃ | - | 1.00 mg/l* | ± 0.10 mg/l | - | | | see 5.2.2 |
| pH | 101744 | pH | - | 7.0 | ± 0.2 | - | | | 109407 |
| Phenol | 114551 | C ₆ H ₅ OH | - | 1.25 mg/l* | ± 0.13 mg/l | - | | | see 5.2.2 |
| Phenol | 100856 | C ₆ H ₅ OH | - | 2.50 mg/l* | ± 0.25 mg/l | - | | | see 5.2.2 |
| Phosphate | 100474 | PO ₄ -P | 10, 114676 | R-1: 0.80 mg/l R-2: 0.60 mg/l | ± 0.08 mg/l ± 0.07 mg/l | - | | | 119898** |
| Phosphate | 114543 | PO ₄ -P | 10, 114676 | R-1: 0.80 mg/l R-2: 0.60 mg/l | ± 0.08 mg/l ± 0.07 mg/l | 125046 | 0.400 mg/l P | ± 0.016 mg/l | 119898** |
| Phosphate | 100475 | PO ₄ -P | 20, 114675 | R-1: 8.0 mg/l R-2: 5.0 mg/l | ± 0.7 mg/l ± 0.5 mg/l | - | | | 119898** |
| | | | 80, 114738 | R-1: 15.0 mg/l R-2: 5.0 mg/l | ± 1.0 mg/l ± 0.5 mg/l | | | | |
| Phosphate | 114729 | PO ₄ -P | 20, 114675 | R-1: 8.0 mg/l R-2: 5.0 mg/l | ± 0.7 mg/l ± 0.5 mg/l | 125047 | 4.00 mg/l P | ± 0.08 mg/l | 119898** |
| | | | | | | 125048 | 15.0 mg/l P | ± 0.4 mg/l | |
| | | | 80, 114738 | R-1: 15.0 mg/l R-2: 5.0 mg/l | ± 1.0 mg/l ± 0.5 mg/l | | | | |
| Phosphate | 100616 | PO ₄ -P | - | 50.0 mg/l* | ± 5.0 mg/l | - | | | 119898** |
| Phosphate | 100673 | PO ₄ -P | - | 50.0 mg/l* | ± 5.0 mg/l | 125047 | 4.00 mg/l P | ± 0.08 mg/l | 119898** |
| | | | | | | 125048 | 15.0 mg/l P | ± 0.4 mg/l | |
| | | | | | | 125049 | 75.0 mg/l P | ± 1.6 mg/l | |
| Phosphate | 114848 | PO ₄ -P | 10, 114676 | R-1: 0.80 mg/l R-2: 0.30 mg/l | ± 0.08 mg/l ± 0.05 mg/l | - | | | 119898** |
| Phosphate | 100798 | PO ₄ -P | - | 30.0 mg/l* | ± 3.0 mg/l | - | | | 119898** |

* 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 | |
| Phosphate | 114546 | PO ₄ -P | - | 15.0 mg/l* | ± 1.0 mg/l | - | - | 119898** |
| Phosphate | 114842 | PO ₄ -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 ₂ | - | 5.00 mg/l* | ± 0.50 mg/l | - | - | 170236** |
| Silicate | 100857 | SiO ₂ | - | 50.0 mg/l* | ± 5.0 mg/l | - | - | 170236** |
| Silicate | 101813 | SiO ₂ | - | 0.100 mg/l* | ± 0.010 mg/l | - | - | 170236** |
| Sodium | 100885 | Na | - | 100 mg/l* | ± 10 mg/l | - | - | see 5.2.2 |
| Sulfate | 114548 | SO ₄ | 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 | |
| | | | | R-1: 500 mg/l | ± 75 mg/l | 125051 | 125 mg/l ± 6 mg/l | |
| | | | | R-2: 150 mg/l | ± 30 mg/l | 125052 125053 | 400 mg/l ± 20 mg/l 800 mg/l ± 27 mg/l | |
| Sulfate | 101812 | SO ₄ | - | 5.0 mg/l | ± 0.5 mg/l | - | - | 119813** |
| Sulfide | 114779 | S | - | 0.75 mg/l* | ± 0.08 mg/l | - | - | see 5.2.2 |
| Sulfite | 114394 | SO ₃ | - | 10.0 mg/l* | ± 1.5 mg/l | - | - | see 5.2.2 |
| Sulfite | 101746 | SO ₃ | - | 30.0 mg/l* | ± 1.0 mg/l | - | - | see 5.2.2 |
| Surfactants (anionic) | 114697 | MBAS | - | 1.00 mg/l* | ± 0.20 mg/l | - | - | see 5.2.2 |
| (nonionic) | 101787 | | - | 4.00 mg/l* | ± 0.40 mg/l | - | - | see 5.2.2 |
| 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 | | | |

* 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 investigations remain stable for one week.

Reagents required:

- | | |
|--------------|---|
| 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 KIO₃ stock solution:

Dissolve 1.006 g of KIO₃ 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 KIO₃/KI standard solution:

Transfer 11,12 ml of the KIO₃ 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) KIO₃/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H₂SO₄ 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 colour. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 2.50 mg/l bromine.

Stability:

The KIO₃ stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO₃/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:

- | | |
|--------------|---|
| 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:

- | | |
|--------------|---|
| 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:

- | | |
|--------------|--|
| 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 KIO_3 stock solution:

Dissolve 1.006 g of 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 KIO_3/KI standard solution:

Transfer 7.50 ml (12.50 ml) of the 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) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_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 colour. 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 KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/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:

| | |
|--------------|---|
| 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 colour emerges. Add 2 ml of zinc iodide-starch solution and titrate from blue to colourless.

Calculation and preparation of the standard solution:

Consumption of sodium thiosulfate solution 0.1 mol/l (ml) x 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® |
| 1.05614.9025 | 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 KIO_3 stock solution:

Dissolve 1.006 g of 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 KIO_3/KI standard solution:

Transfer 13.12 ml of the 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) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_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 colour. 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 KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/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 GR with distilled water 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⁻.

Preparation of a COD/Cl⁻ 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⁻.

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⁻ and the standard solution of 10 000 mg/l COD / 20 g/l Cl⁻ 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 |
| 1.06404.0500 | Sodium chloride for analysis EMSURE® |
| 1.16754.9010 | Water for analysis EMSURE® |

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 iodine analogous to DIN EN ISO 7393

Preparation of a KIO_3 stock solution:

Dissolve 1.006 g of 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 KIO_3/KI standard solution:

Transfer 7.00 ml of the 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) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_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 colour. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 2.50 mg/l iodine.

Stability:

The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/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 diluted 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_2 and 10.0 ml ammonium standard solution 10 mg/l $\text{NH}_4\text{-N}$ 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_2 or 3.63 mg/l NH_2Cl .

Stability:

The standard solution is not stable and must be used immediately.

Reagents required:

Chlor standard solution

100 mg/l Cl_2

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 $\text{NH}_4\text{-N}$

Preparation with Ammonium standard solution CertiPUR®, Cat. No. 1.19812.0500, 1000 mg/l $\text{NH}_4 = 777$ mg/l $\text{NH}_4\text{-N}$

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 ozone analogous to DIN EN ISO 7393

Preparation of a KIO_3 stock solution:

Dissolve 1.006 g of 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 KIO_3/KI standard solution:

Transfer 14.80 ml of the 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) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_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 colour. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 1.00 mg/l ozone.

Stability:

The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/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 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:

| | |
|--------------|----------------------------|
| 1.00206.0250 | 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 SiO₂.

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 SiO₂.

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

Reagents required:

Preparation of a stock solution:

Dissolve 5.0 g of glass-clear, if necessary washed crystals of sodium sulfide hydrate GR 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 colour has disappeared, add 1 ml of zinc iodide-starch solution, and continue to titrate until a milky, pure white colour emerges.

Calculation and preparation of the standard solution:

$C1 = \text{consumption of sodium thiosulfate solution } 0.1 \text{ mol/l}$

$C2 = \text{quantity of iodine solution } 0.05 \text{ mol/l (25.0 ml)}$

$\text{mg/l sulfide} = (C2 - C1) \times 64.1026$

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.

| | |
|--------------|---|
| | Sodium sulfide hydrate approx. 60 % GR for analysis |
| 1.09099.1000 | Iodine solution 0.05 mol/l TitriPUR® |
| 1.09147.1000 | Sodium thiosulfate solution 0.1 mol/l TitriPUR® |
| 1.00716.1000 | Sulfuric acid 25 % for analysis EMSURE® |
| 1.05445.0500 | Zinc iodide-starch solution GR for analysis |
| 1.16754.9010 | Water for analysis EMSURE® |

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 colour has disappeared, add 1 ml of zinc iodide-starch solution, and continue to titrate from blue to colourless.

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 sodium 1-dodecanesulfonate 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 surfactants.

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 Sodium 1-dodecane-sulfonate
- 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 surfactants.

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 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

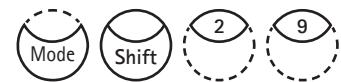
The Spectroquant® Move 100 colorimeter can print out data on a printer via the infrared interface to the Data Transfer module without having to save them first.

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:

```
<printing params.>
2:Baud rate

cancel:ESC
```

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

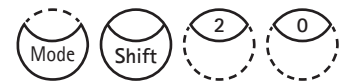
163 COD 14541
25-1500mg/l
Profi-Mode: no
2012-07-01 14:53:09
Test No.: 1
Code-No.: 007
151 mg/l

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. July 14, 2012 =
[Shift] + [1][2] [0][7] [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. July 19, 2012 =
[Shift] + [1][2] [0][7] [1][9].



Confirm by pressing the [↵] key.



The display shows:

```
<Print>
sorted:date
from 2012-07-14
to 2012-07-19
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:

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

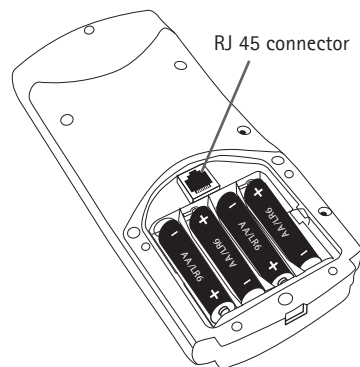
Besides the Spectroquant® Data Transfer infrared module (optional),
a printer with HPPCL up to version 5 is required to print out the data via the USB interface of the module;
an ASCII printer is needed to print out the data via the module's RS232 interface.

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!

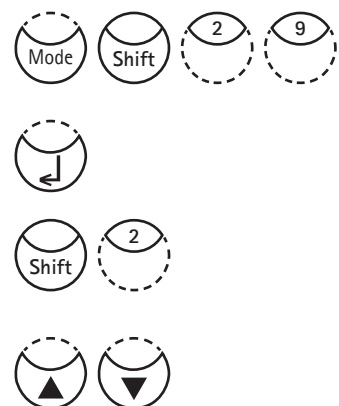
If the update procedure is interrupted (e.g. interruption of connection, LoBat., etc.) the instrument isn't able to work (no display). The instrument will only work again after completing the data transfer.

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 on the internet)
 - the software update for the Spectroquant® Move 100 Colorimeter (= *.hex file, see at 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).

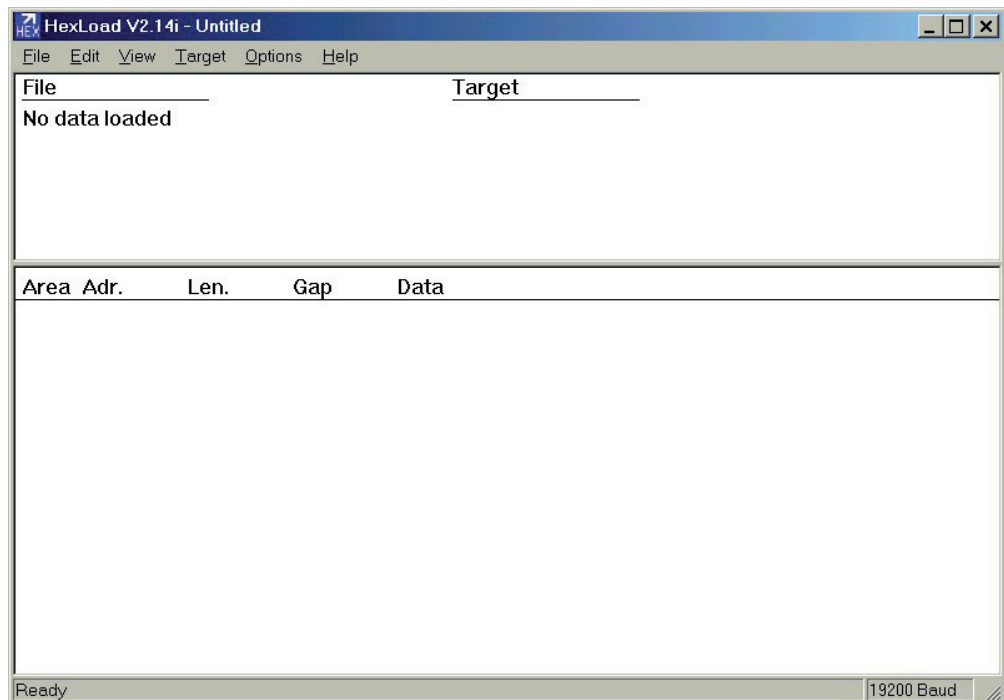


Fig. 1

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".

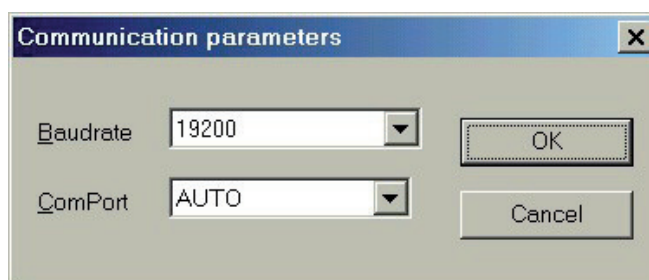


Fig. 2

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:

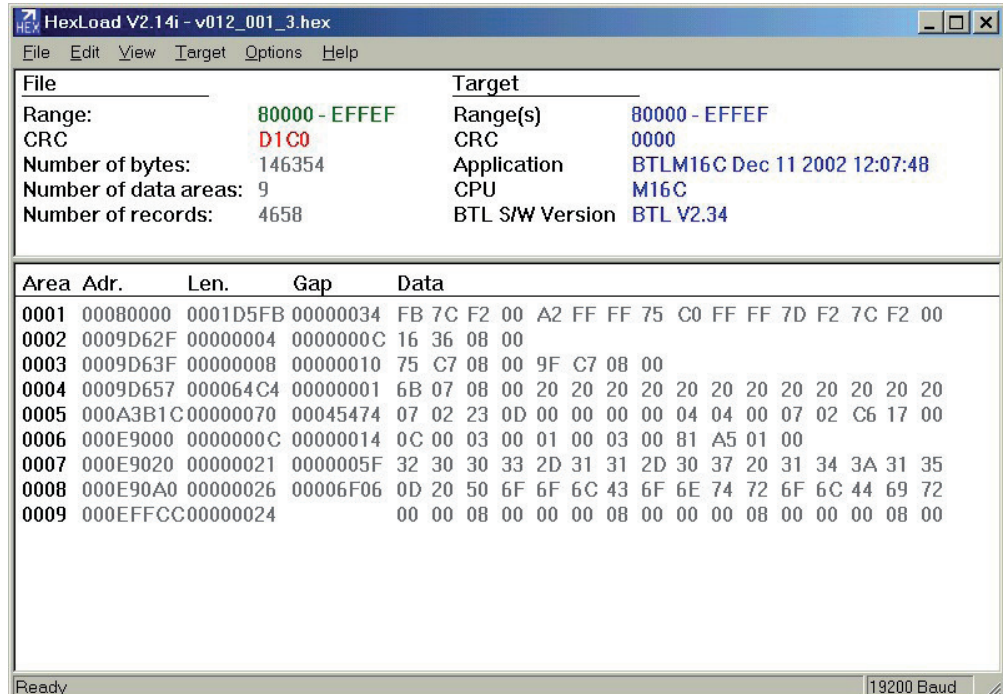


Fig. 3

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:

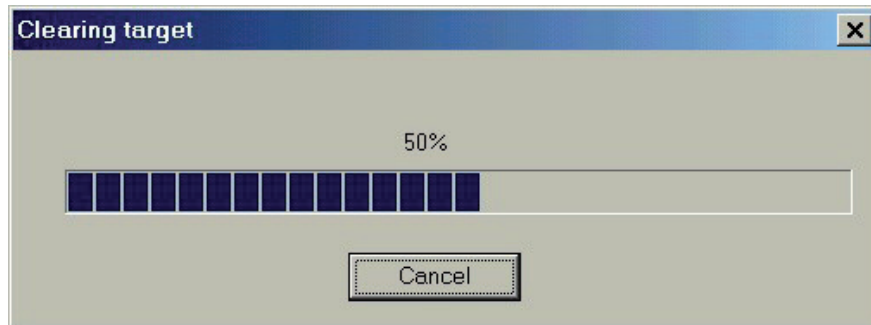


Fig. 4

... and the new software is saved:

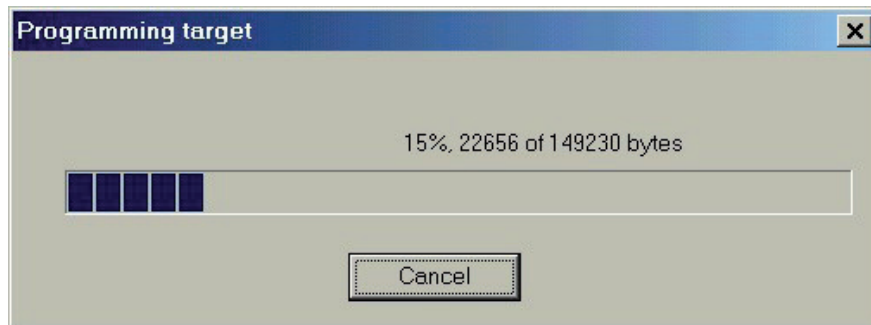


Fig. 5

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.

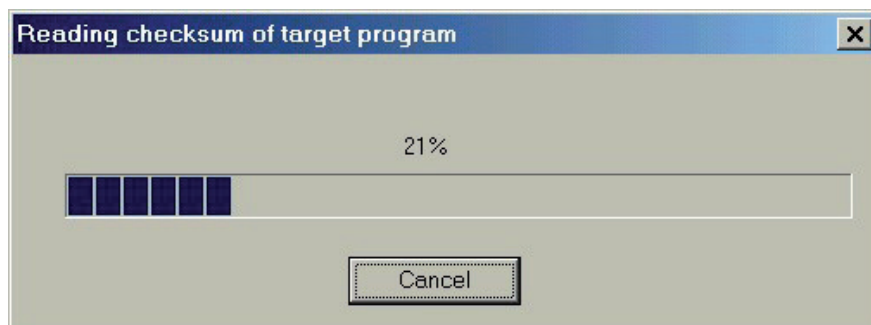


Fig. 6

The check was successful and the new software is now active:



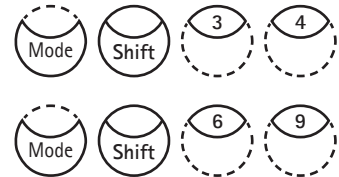
Fig. 7

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 colour. The limits for "Underrange" and "Over-range" 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.

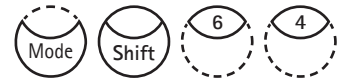
In actual fact the lower limit of the measuring range is given either by the nonlinearity of the calibration function or by the limit of determination. The limit of determination is the lowest concentration of an analyte that can be quantitatively determined with a defined probability (e.g. 99 %). The 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 [↵].

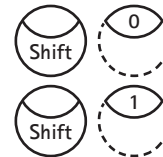


Note

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

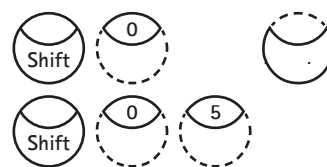
Use distilled water or a reagent blank.

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:

```
<User concentr.>
S1: 0.05 mg/l
mAbs: 12 ←
```

Confirm your selection by pressing [←].

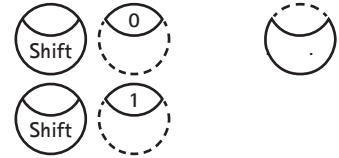


The display shows:

```
<User concentr.>
S1 accepted
S2: +_____
← | ESC | F1
```

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:

```
<User concentr.>
S2: 0.10 mg/l
Prepare
Press TEST
```

Prepare the second standard and press [Test].



The display shows the entered value and the measured
absorbance value:

```
<User concentr.>
S2: 0.10 mg/l

mAbs: 150 ←
```

Confirm your selection by pressing [←].



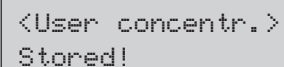
Note

- 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:



```
<User concentr.>  
Stored!
```

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:

```
<User polynoms>
choose no.: _____
(800-824)
```

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 [↵].

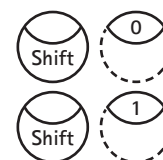


Note

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
```

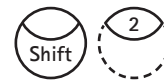
- Press the keys [Shift] + [0] or the key [Esc] to return to method-No. prompt.
- Press the keys [Shift] + [1] to continue the entry.



The display shows:

```
<User polynoms>
wavelength:
1: 530 nm   4: 430 nm
2: 560 nm   5: 580 nm
3: 610 nm   6: 660 nm
```

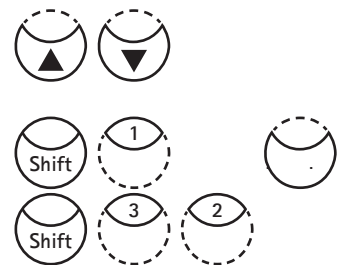
Press the number keys to select the desired wavelength,
e.g.: [Shift] + [2] for 560 nm.



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.



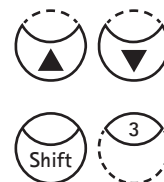
Confirm your selection by pressing [↵].



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.

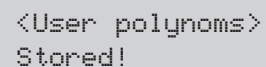


Note

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 infrared 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 and 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.:

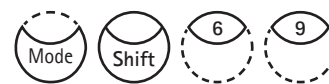
```
<User m. print>
M800
M803
...
```

After printing out the data the colorimeter automatically returns to the mode menu.

5.6.5 Initializing the user-method system (concentration and 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: ↵
```

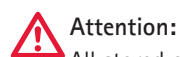
Confirm your selection by pressing [↵].



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:

| Method No.: | Parameter |
|-------------|-------------------------|
| 10 | Acid cap. 01758 |
| 20 | Aluminium 14825 |
| 21 | Aluminium 00594 |
| 70 | BOD 00687 |
| 90 | Bromine 00605 |
| 122 | Chloride 01804 |
| 123 | Chloride 01807 |
| 140 | Chlorine dioxide |
| 170 | Color |
| 240 | Iodine 00606 |
| 270 | Magnesium 00815 |
| 300 | Monochloramine |
| 323 | Nitrate 01842 |
| 550 | Oxygen 14694 |
| 350 | Ozone 00607 |
| 360 | pH 01744 |
| 400 | Potassium 14562 |
| 401 | Potassium 00615 |
| 410 | Residual hardness 14683 |
| 440 | Sulfate 14548 |
| 442 | Sulfate 14564 |
| 443 | Sulfate 01812 |
| 450 | Sulfide 14779 |
| 480 | Suspended solids |
| 510 | Total hardness 00961 |
| 520 | Turbidity |

| Method No.: | Parameter |
|-------------|-----------|
| 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.

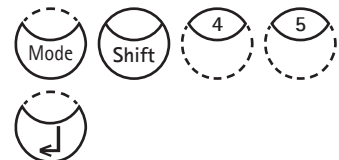
When the test result appears on the display

press the keys [Mode], [Shift] + [4] [5].

Confirm by pressing [↵].

The display shows:

```
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:      ↵
```

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:

```
<user calibration>
380 Phosphate 14543
0.05-4.00 mg/l P04-P

JUS factor
      saved
```

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
3.50 mg/l P04-P
```

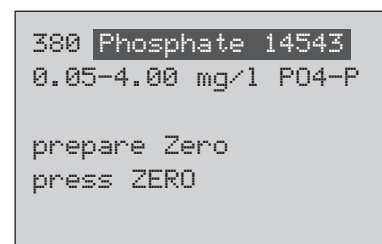
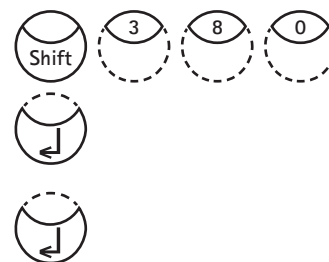
5.7.2 Deleting the user-specific calibration

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.

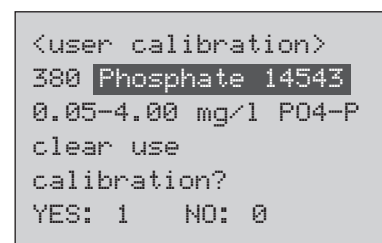
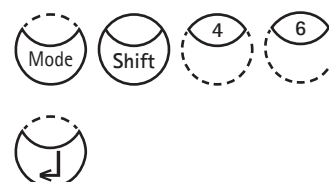
The display shows:



If a prompt for zero calibration appears, press the keys
[Mode], [Shift] + [4] [6].

Confirm by pressing [↵].

The display shows:

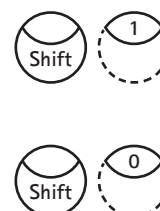


- Pressing the keys [Shift] + [1] deletes the user-specific calibration.

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.

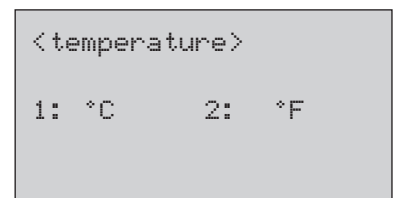
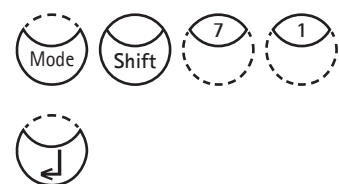
Setting the temperature unit

The temperature can be entered in degrees Celsius or degrees Fahrenheit. For this the following presetting procedure must be carried out (once only):

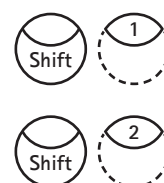
Press the keys [Mode], [Shift] + [7] [1].

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:

```
<Langelier>
temperature °C:
3°C <= T <= 53°C
+ - - - -
```

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:

```
<Langelier>
Calcium hardn.
50 <= CH <= 1000
+ - - - -
```

Enter the value for the calcium hardness (CH) within the range 50 to 1000 mg/l CaCO_3 and confirm by pressing [↵].



The display shows:

```
<Langelier>
tot. Alkalinity
5 <= TA <= 800
+ - - - -
```

Enter the value for the total alkalinity (TA) within the range 5 and 800 mg/l CaCO_3 and confirm by pressing [↵].



The display shows:

```
<Langelier>
total dissol. Solids
0 <= TDS <= 6000
+ - - - -
```

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

± 1 nm

Photometric accuracy

1.000 Abs ± 0.020 Abs

2.600 Abs ± 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.



