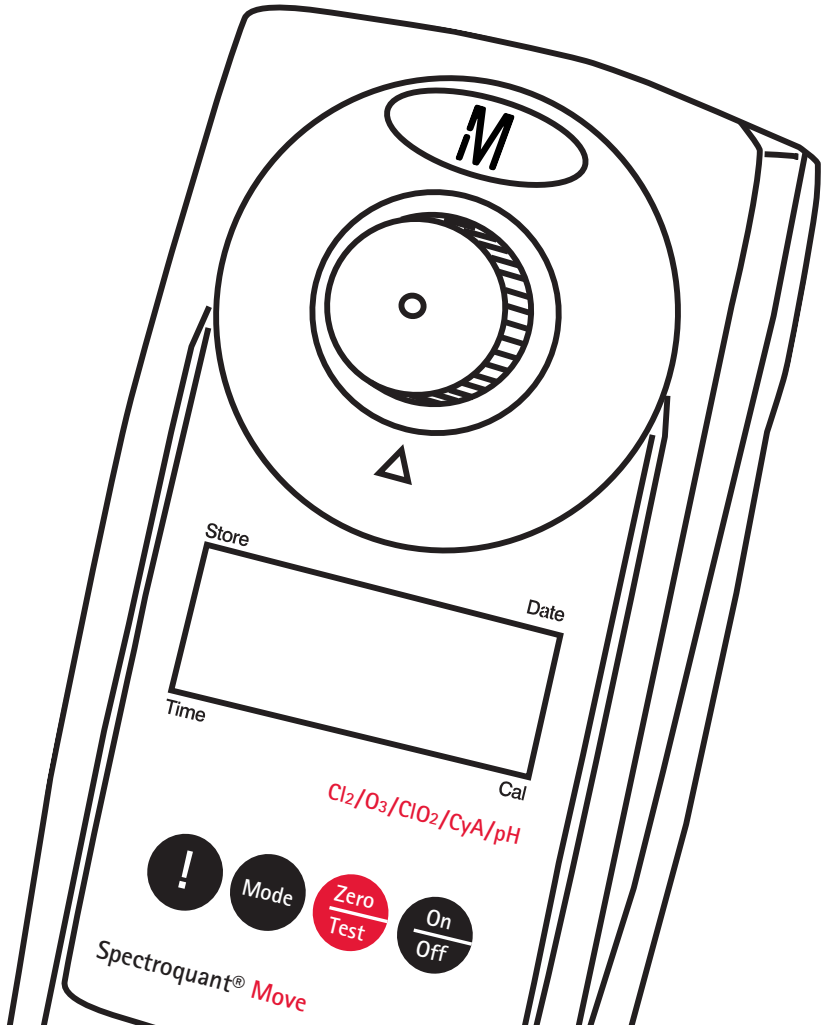
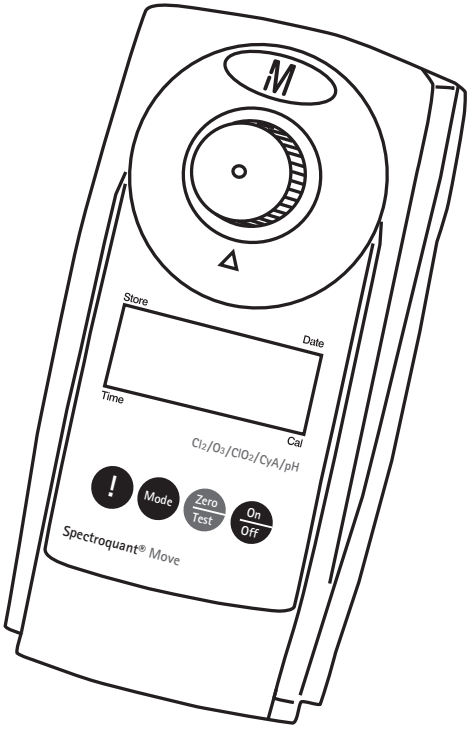
Spectroquant®

Move Cl_2 / O_3 / ClO_2 / CyA / pH



en

Operating manual



Spectroquant®

Move Cl_2 / O_3 / ClO_2 / CyA / pH

Table of contents

en

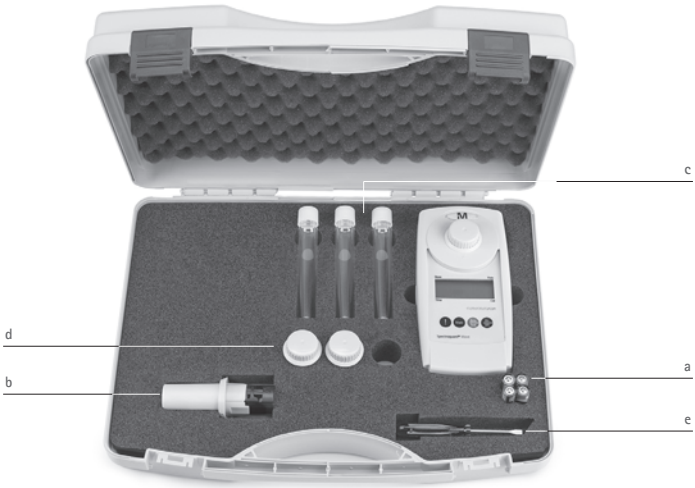
en

1 Getting started

1.1 Package contents

The standard contents of the Spectroquant® Move Cl_2 / O_3 / ClO_2 / CyA / pH Colorimeter package comprise the following items:

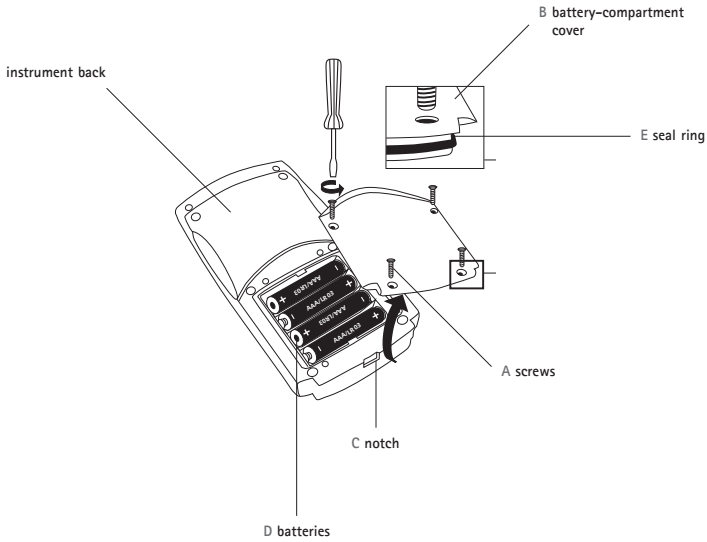
1 Colorimeter in a plastic carrying case
4 Microbatteries (AAA/LR03) (a)
1 Adapter for 16-mm ø round cells (b)
3 Round cells with cap, ø 16 mm (c)
3 Round cells with cap, ø 24 mm (d)
1 Screwdriver (e)
1 Operating-instructions manual
1 Certificate of compliance



1.2 Inserting the batteries

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

en



1. Ensure that the Spectroquant® Move 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-compart ment 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 6 for how to replace used batteries.

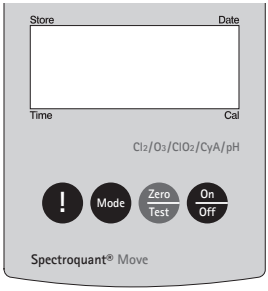
Recommendation
Do not use rechargeable batteries!

1.2.2 Saving data - Important notes

The batteries save data (stored results and photometer setting). During battery change the data in the Spectroquant® Move is saved for approx. 1 minute. If the change time exceeds 1 minute all stored data and settings are lost.
If the batteries are removed for more than one minute the date and time menu starts automatically when the photometer is switched on the next time

Recommendation
For replacement a screwdriver and new batteries must be available.

1.3 Overview of the key functions



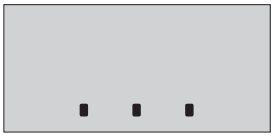
On / Off	Switching the unit on and off
Zero / Test	Zero-calibration function / run a measurement
Mode	Menu for settings and other functions
!	Function key: Function explained at the corresponding place in the text

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 instrument runs an electronic self-check test.

3 decimal points appear in the display,



the display shows e.g.:

Select the required method using the **[Mode]** key.

Scroll Memory (SM)
To avoid unnecessary scrolling for the required test method, the instrument memorizes the last method used before being switched off. When the instrument is switched on again, the scroll list comes up with the last used test method first.

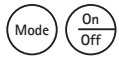
The date and time must be set (see section 1.6, **"Setting the date and time"**).

1.5 Overview of the mode menu

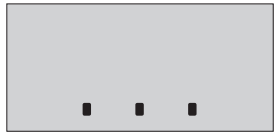
en

The individual mode functions are selected in the following manner:

Press the **[Mode]** key and **hold depressed**.
Switch on the colorimeter by pressing the **[On/Off]** key.



3 decimal points appear in the display,
release the **[Mode]** key.



Select the desired mode function using the **[!]** key.
The selected menu is indicated by an arrow in the display.

Mode function	Brief desciption	Chapter
↑ ↓ ↑ ↓	Setting date and time	1.6
↑ ↓ diS ↑ ↓	Retrieving saved measurement results	2.4
↑ ↓ Prt ↑ ↓	Data transmission (to printer or PC)	2.5
↑ Cal ↓ ↑ ↓	Adjustment mode	3

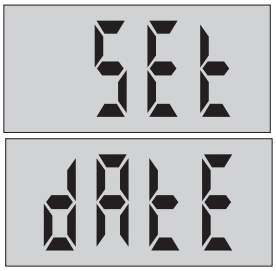
1.6 Setting the date and time

Press the **[Mode]** key and **hold depressed**,
switch on the colorimeter by pressing the **[On/Off]** key.
3 decimal points appear in the display,
release the **[Mode]** key,
select the desired mode function using the **[!]** key
(see section 1.5, "Overview of the mode menu").

The display shows:

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

The display shows first:



then the value to be edited will been shown for 2 sec.

The setting starts with the year (YYYY) followed by the actual value to be edited. The same applies for month (MM), day (dd), hour (hh), and minutes (mm). Set the minutes in steps of 10, press the **[!]** key to continue setting the minutes in steps of 1.

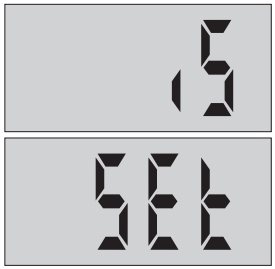
Increase the value by pressing the **[Mode]** key.

Decrease the value by pressing the **[Zero/Test]** key.

Proceed to the next value to be edited by pressing the **[!]** key.

After setting the minutes and pressing the **[!]** key

the display shows



and the instrument automatically returns to the measurement mode.

Caution:
If the battery is removed for more than one minute the data and time menu starts automatically when the instrument is switched on the next time insertion of new battery.

1.7 Countdown / Reaction time

If a reaction time is included in a method a countdown function can be used.

After selecting the method of your choice and zeroing the instrument, press the **[!]** key and **hold depressed**.
Press the **[Zero/Test]** key.
Release the **[!]** key; the countdown starts.
After the countdown is finished the measurement starts automatically.

It is possible to interrupt the countdown by pressing the **[Zero/Test]** key. Measurement starts immediately.

Caution:
An incomplete reaction time can lead to incorrect test results.

1.8 Automatic switch-off

The Spectroquant® Move switches off automatically 10 minutes after the last time a key was pressed.
The automatic switch-off function is inactive while the unit is performing operations (running countdown, printing). After the operation in question has ended, the 10-minute waiting time before the automatic switch-off function starts running anew.

1.9 Display backlight

Press the key **[!]** to turn the display backlight on or off.
The backlight is switched off automatically during the measurement.

2 Operating mode

2.1 Selecting the method

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

The instrument runs an electronic self-check test.
3 decimal points appear in the display.

The display shows e.g.:

Select the required method using the **[Mode]** key.

Scroll Memory (SM)
To avoid unnecessary scrolling for the required test method, the instrument memorizes the last method used before being switched off. When the instrument is switched on again, the scroll list comes up with the last used test method first.

2.2 Measuring with test kits

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

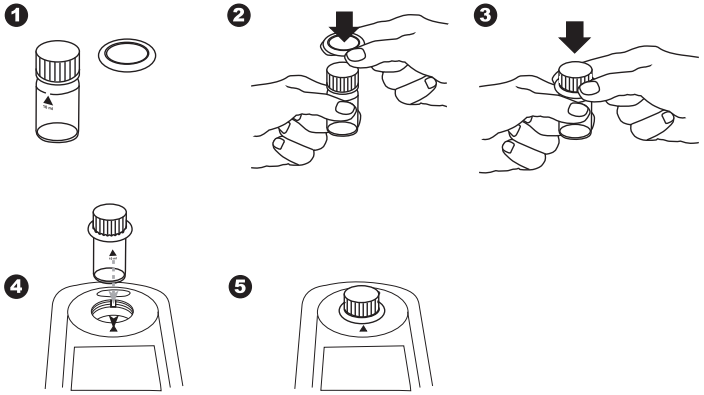
After selecting the method, prepare the blank and sample for measurement.

If a reaction time is included in a method a countdown function can be used (see section 1.7, "Countdown / Reaction time").

After the method has been selected the display shows: example Chlorine Test 100598 (24-mm cell)

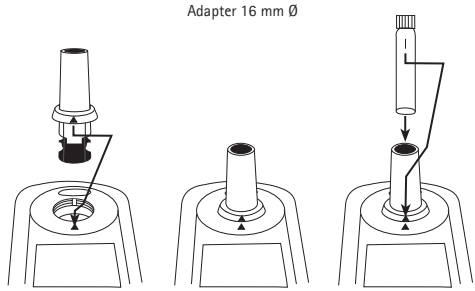
Place the prepared blank in the measurement compartment with the mark on the cell pointing towards the mark on the unit case.

Positioning the cell (ø 24 mm)



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

Insertion of the adapter and positioning the cell (ø 16 mm)



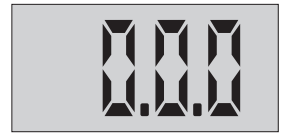
Align the triangular mark on the adapter with that on the Spectroquant® Move.

Align the line mark above the item number of the cell (where available) with the triangular mark on the Spectroquant® Move.

Press the **[Zero/Test]** key.

Method symbol blinks for approx. 8 seconds:
example Chlorine Test 100598 (24-mm cell)

The display shows:



After the end of the zeroing step, remove the cell from the measurement compartment.

OTZ (One Time Zero)
The zero setting is held in memory until the instrument is switched off. It is not necessary to perform a new zero each time, if the water samples under test are from the same body of water and the conditions of testing are the same. The zero setting can be repeated each time if necessary.

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

Press the **[Zero/Test]** key, where applicable, start the countdown (see section 1.7, "Countdown / Reaction time")

Method symbol blinks for approx. 8 seconds.

The result appears in the display, e. g.:

The result is stored automatically.

After the result has been displayed,

- it can be printed out (see section 2.5)
- 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 **[Zero/Test]** key anew.

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

    Press the **[Zero/Test]** key for 2 seconds to reset to zero.

2.5 Measuring absorbances

en

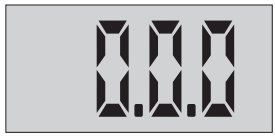
Besides measuring concentrations using a selected method,
the unit is also capable of measuring absorbances.
For this you call up the method "Abs1".

Measuring range: -100 mAbs to +2500 mAbs
at 530 nm

The display shows:

Always zero the photometer using a filled cell
(e.g. with DI water).
Press the **[Zero/Test]** key.
Method symbol blinks for approx. 5 seconds.

The display shows:



Then measure the sample.
Press the **[Zero/Test]** key anew.
Method symbol blinks for approx. 3 seconds.

The display shows e.g.:

The result is stored automatically.

2.4 Retrieving saved measurement results

Press the **[Mode]** key and **hold depressed**,
switch on the instrument by pressing the **[On/Off]** key.
3 decimal points appear in the display,
release the [**Mode**] key,
select the desired mode function using the **[!]** key
(see section 1.5, "Overview of the mode menu").

The display shows:

Confirm by pressing **[Mode]**.

The instrument shows the last 16 data sets in the following format
(automatically proceeds every 3 seconds until result is displayed):

Number	n xx (xx: 16...1)
Year	YYYY (e. g. 2014)
Date	MM.dd (monthmonth.dayday)
Time	hh:mm (hourhour:minuteminute)
Method	Method symbol (U.1, U.2, ..., Abs1)
Result	x.xx

The **[Zero/Test]** key repeats the current data set.

The **[Mode]** key scrolls through all stored data sets.

Quit the menu by pressing the **[!]** key.

If the instrument is switched on, press the **[!]** key for more than 4 seconds to access the recall menu.
Press the **[!]** key again to return to the menu for selecting the method.

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

2.5 Data transmission (to printer or PC) via the Spectroquant® Data Transfer infrared module (optional)

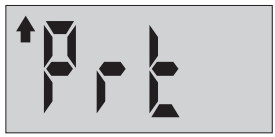
To print data, or to transmit to a PC, the optional Spectroquant® Data Transfer module is required.

The Spectroquant® Data Transfer module and the connected printer/PC must be ready.

Press the **[Mode]** key and **hold depressed**,
switch on the instrument by pressing the **[On/Off]** key.
3 decimal points appear in the display,
release the [**Mode**] key,
select the desired mode function using the **[!]** key
(see section 1.5, "Overview of the mode menu").

The display shows:

Store Date



Time Cal

Press the **[Mode]** key to start the transmitting;

the instrument displays "PrtG" (Printing) for approx. 1 second

followed by the number of the first data set and its transmission.
All data sets will be transmitted one after the other.
After finishing the instrument switches to test mode.

The print job can be cancelled by pressing the **[On/Off]** key. The instrument switches off.

If the instrument is not able to communicate with the Spectroquant® Data Transfer module, a timeout occurs after approx. 2 minutes. The error E162 is displayed for approx. 4 seconds. Subsequently, the instrument switches to test mode (see also the operating manual for the Spectroquant® Data Transfer module).

2.5.1 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.

2.5.2 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.

en

3 Special function adjustment mode

The Spectroquant® Colorimeter Move Cl_2 / O_3 / ClO_2 / CyA / pH features an option that enables user-specific adjustment. This option is required only in exceptional cases.
The Spectroquant® rapid tests are subject to stringent checks that ensure a consistently high quality and a high batch reproducibility. Furthermore, the Move colorimeters are programmed by means of calibration at several points.
In the event the user chooses to adjust the instrument, this takes place at only two points of the measuring range (zero point and measurement result). In this case it is advisable to check the adjustment using various concentrations of a standard solution.

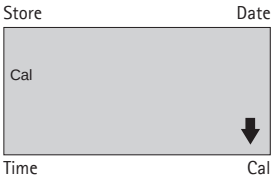
User-specific adjustments can be made for the following methods:

U.1	Chlorine Test	100598 100602 100599
U.2	Chlorine Test	100598 100602 100599
U.3	Chlorine Test	100086/100087/100088
U.4	Chlorine Test	100086/100087/100088
U.9	Cyanuric acid Test	119253
U.10	pH Cell Test	101744

3.1 User calibration

Press the **[Mode]** key and **hold depressed**,
switch on the instrument by pressing the **[On/Off]** key.
3 decimal points appear in the display,
release the **[Mode]** key,
select the desired mode function using the **[↕]** key
(see section 1.5, "Overview of the mode menu").

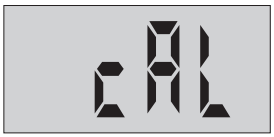
The display shows:



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

Note:

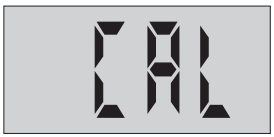
- User adjustment is active:



- Factory adjustment is active:

The display shows in alternating mode e.g.:
for Chlorine Test 100598 (24-mm cell)

or, if a user adjustment is already active, "cAL".

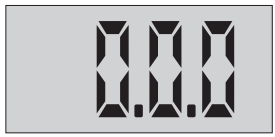


Scroll through methods using the **[Mode]** key.

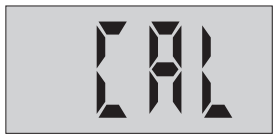
Conduct zero setting as described (see section 2.1.1).
Press the **[Zero/Test]** key.

Method symbol blinks for approx. 8 seconds.

The display shows in alternating mode:



or, if a user adjustment is already active, "cAL".



Perform the measurement with a standard of known concentration (e. g. 2.50 mg/l) as described for the selected method.

Insert the prepared measurement sample into the measurement compartment with the cell mark aligned with the mark on the unit case.
Press the **[Zero/Test]** key.

Method symbol blinks for approx. 3 seconds.

The display shows the result in alternating mode with CAL or, if a user adjustment is already active, "cAL".

If - in consideration of the tolerance - the result matches the value of the standard, exit the adjustment mode by presing the **[On/Off]** key. The instrument switches itself off automatically. The adjustment is not saved, since it does not differ from the factory calibration.

Pressing the **[Mode]** key once raises the result by 1 digit,

pressing the **[Zero/Test]** key once reduces the result by 1 digit.

Repeatedly press keys until the displayed result matches the value of the standard.

Press the **[On/Off]** key to calculate the new correction factor and to save it at the user adjustment level.

The display shows (confirmation of adjustment):

The instrument switches off.

Recommended adjustment settings:
for all methods, the middle of the measuring range

3.2 Factory calibration reset

en

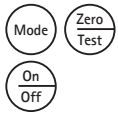
Resetting the user adjustment to the original factory adjustment will reset all methods and ranges.

A user-adjusted method is indicated by an arrow while the test result is displayed at the position "Cal".

The display shows e. g.:

The instrument can be reset to the delivery status (factory adjustment setting) in the following way:

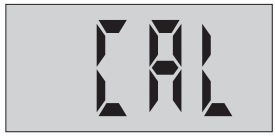
After the instrument has been switched off, **hold** the **[Mode]** and **[Zero/Test]** keys **depressed**.



Switch on the instrument by pressing the **[On/Off]** key.
3 decimal points appear in the display,
release the **[Mode]** and **[Zero/Test]** keys.

The display shows in alternating mode:

the instrument is in delivery status
("SEL" stand for "select")



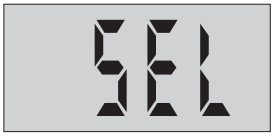
or

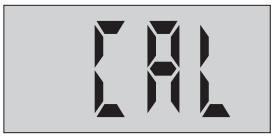
the instrument is operating with a user-specified adjustment.

If this is to be retained, switch the instrument off with the **[On/Off]** key.

Adjustment is reset to the factory setting for all methods at the same time by pressing the **[Mode]** key.

The display shows in alternating mode:





Switch the instrument off with the **[ON/OFF]** key.

en

4 Trouble-shooting

4.1 User messages on the display / Error messages

4.1.1 User messages

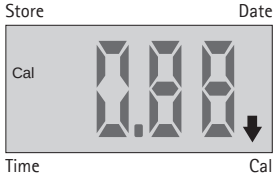
Measuring range exceeded or excessive turbidity

Result below the lowest limit of the measuring range

Replace batteries, no further tests possible

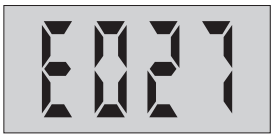
Battery capacity is too low for the display backlight, measurement is still possible

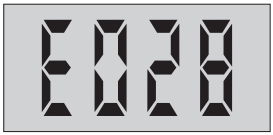
A user-adjusted method is indicated by an arrow while the test result is displayed at the position "Cal" (see section 3.2, "Factory calibration reset").



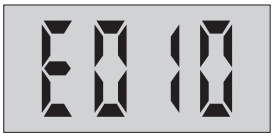
4.1.2 Error messages

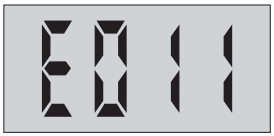
Light absorption too great
Reason e.g.: optical sytem dirty or blank sample too strongly colored
Check blank sample / measurement compartment.





Adjustment factor "out of range"



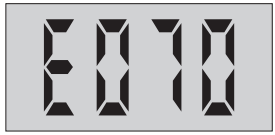


Too much light reaching the detector

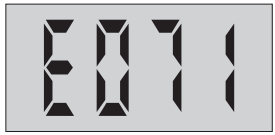
Battery capacity was too low during measurement; change batteries.

No data stored in the memory.

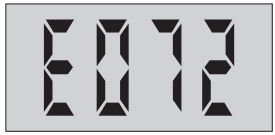
Factory adjustment for U.1 incorrect / erase



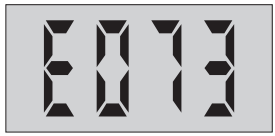
User adjustment for U.1 incorrect / erase



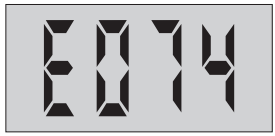
Factory adjustment for U.2 incorrect / erase



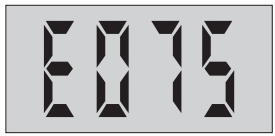
User adjustment for U.2 incorrect / erase



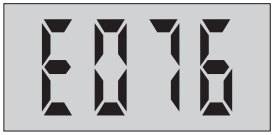
Factory adjustment for U.3 incorrect / erase



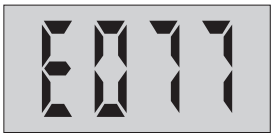
User adjustment for U.3 incorrect / erase



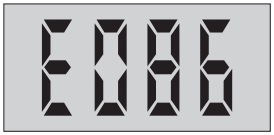
Factory adjustment for U.4 incorrect / erase



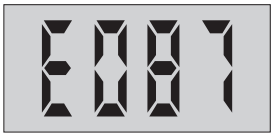
User adjustment for U.4 incorrect / erase



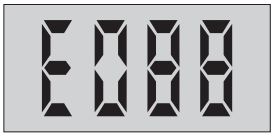
Factory adjustment for U.9 incorrect / erase



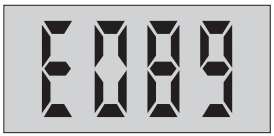
User adjustment for U.9 incorrect / erase



Factory adjustment for U.10 incorrect / erase



User adjustment for U.10 incorrect / erase



4.2 Avoiding errors in photometric measurements

1. The cells, caps, and stirring rod 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 15 or 16).

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.

10. Always add the reagent tablets to the sample straight from the foil without touching them with the fingers.

4.3 Notes

1. Observe the applications, analysis procedures, and matrix effects of the methods.

2. Ensure proper disposal of reagent solutions.

3. Material Safety Data Sheets are available on request (www.analytical-test-kits.com).

Technical specifications

en

Instrument

Direct reading colorimeter,
one wavelength

Display

LCD display with backlight (on keypress)

Serial interface

Infrared interface for data transfer

Optics

LEDs, interference filters (IF) and photo sensor
in transparent sample chamber

Wavelength ranges:
530 nm IF $\Delta \lambda$ (nm) = 5
IF = interference filter

Wavelength accuracy

$\pm$ 1 nm

Photometric accuracy

1.000 Abs $\pm$ 0.030 Abs
2.600 Abs $\pm$ 0.078 Abs ($\widehat{=}$ 3 % FS)
(measured with standard solutions - T = 20 - 25 °C)
FS = full scale

Photometric resolution

1 mAbs

Operation

Acid and solvent resistant tactile film keyboard

Power supply

4 microbatteries (Type AAA/LR03);
lifetime: 17h operating time or 5000 test measurements in
continuous mode when display backlight is off

Automatic switch-off

10 minutes after last function,
30 seconds acoustical signal before switch off

Dimensions

approx. 155 x 75 x 35 mm (instrument)
approx. 340 x 275 x 83 mm (case)

Weight (instrument)

approx. 260 g

Operating conditions

5 - 40°C at max. 30 - 90 % rel. humidity
(free from condensation)

Time

Real time clock und date

Calibration

User and factory calibration;
resetting to factory calibration possible

Storage capacity

Internal ring memory for 16 data sets

IP classification

Floating (1 hour at 0.1 meter), 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.

Important Information

en

⚠ CAUTION ⚠

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

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

Important disposal instructions for batteries and accumulators

EC Guideline 2006/66/EC requires users to return all used and worn-out batteries and accumulators. They must not be disposed of in normal domestic waste. Because our products include batteries and accumulators in the delivery package our advice is as follows:

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

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

Important Information

To Preserve, Protect and Improve the Quality of the Environment

Disposal of Electrical Equipment in the European Union

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

For more information please visit the following website:

www.millipore.com/company/flx4/eu_regulatory_compliance

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 Cl_2 / O_3 / ClO_2 / CyA / pH

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 1)

Emission according to the requirements for class B equipment

Darmstadt, 20th September 2014

Merck KGaA

i.V.
B. Grau
Director MM WFA

i.A.
C. Klein
Product Manager Photometry

en

5 Preprogrammed methods and standard solutions

5.1 Overview of preprogrammed methods and analytical procedures

Method	Parameter	Cat. No.	Measuring range		Blank	Type of test	Type of cell
U.1	Chlorine	1.00598.0002 (free)	0.02 - 4.50 mg/l	Cl_2	H_2O	Test	24 mm
		1.00598.0001 (free)					
		1.00602.0001 (total)					
		1.00602.0002 (total)					
		1.00599.0001 (free + total)					
U.2	Chlorine	1.00598.0002 (free)	0.10 - 6.00 mg/l	Cl_2	H_2O	Test	16 mm
		1.00598.0001 (free)					
		1.00602.0001 (total)					
		1.00602.0002 (total)					
		1.00599.0001 (free + total)					
U.3	Chlorine	1.00086.0001 + 1.00087.0001 (free)					
		1.00086.0001 + 1.00087.0001 + 1.00088.0001 (total)					
			0.02 - 4.50 mg/l	Cl_2	H_2O	Test	24 mm
U.4	Chlorine	1.00086.0001 + 1.00087.0001 (free)					
		1.00086.0001 + 1.00087.0001 + 1.00088.0001 (total)					
			0.10 - 6.00 mg/l	Cl_2	H_2O	Cell test	16 mm
U.7	Chlorine dioxide	1.00608.0001	0.05 - 8.50 mg/l	ClO_2	H_2O	Test	24 mm
U.8	Chlorine dioxide	1.00608.0001	0.20 - 10.00mg/l	ClO_2	H_2O	Test	16 mm
U.9	Cyanuric acid	1.19253.0001	2 - 160 mg/l	CyA	SB	Test	24 mm
U.5	Ozone	1.00607.0001	0.02 - 3.00 mg/l	O_3	H_2O	Test	24 mm
		1.00607.0002					
U.6	Ozone	1.00607.0001	0.10 - 4.00 mg/l	O_3	H_2O	Test	16 mm
		1.00607.0002					
U.10	pH	1.01744.0001	6.4 - 8.8		H_2O	Cell test	16 mm
Abs1	Absorbance	-	-100 - 2500 mAbs	-	H_2O	-	16/24 mm

SB = sample blank value

Chlorine

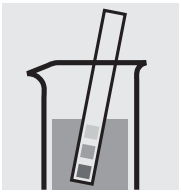
Determination of free chlorine

100598

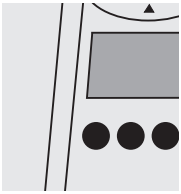
Test

Measuring range: 0.02 – 4.50 mg/l Cl_2 24-mm cell

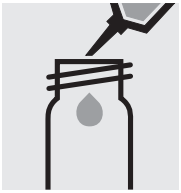
en



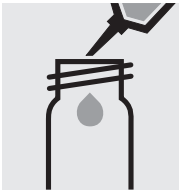
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **U.1**.

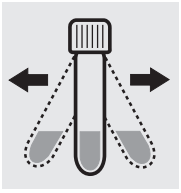


Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



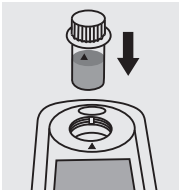
Pipette 10 ml of the sample into a 24-mm cell.

Add 1 level blue microspoon of **Cl_2-1**, close with the screw cap.

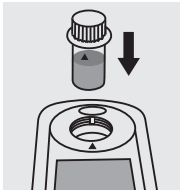


Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



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



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

Chlorine

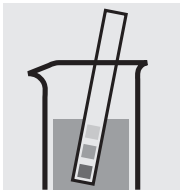
Determination of total chlorine

100602

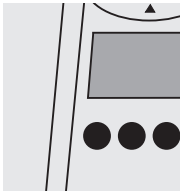
Test

Measuring range: 0.02 – 4.50 mg/l Cl_2 24-mm cell

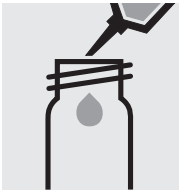
en



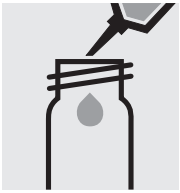
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **U.1**.

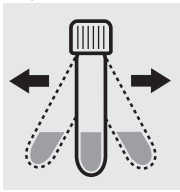


Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)

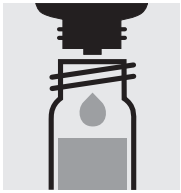


Pipette 10 ml of the sample into a 24-mm cell.

Add 1 level blue microspoon of **Cl_2-1**, close with the screw cap.

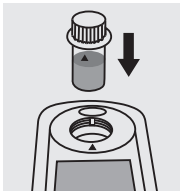


Shake the cell vigorously to dissolve the solid substance.

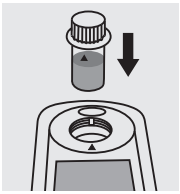


Add 2 drops of **Cl_2-2**, close with the screw cap, and mix.

Reaction time:
1 minute



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



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section 5.2 “Standard solutions”).

Chlorine

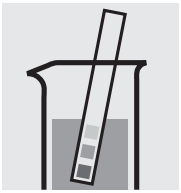
Determination of free chlorine

100599

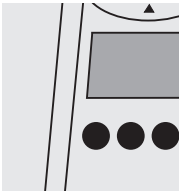
Test

Measuring range: 0.02 – 4.50 mg/l Cl_2 24-mm cell

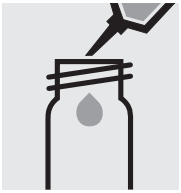
en



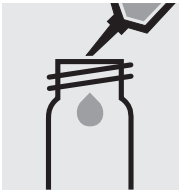
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **U.1**.

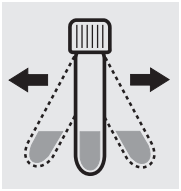


Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



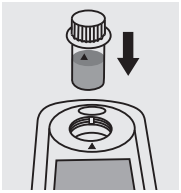
Pipette 10 ml of the sample into a 24-mm cell.

Add 1 level blue microspoon of **Cl_2-1**, close with the screw cap.

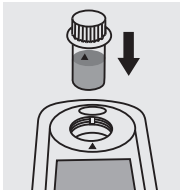


Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



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



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

Chlorine

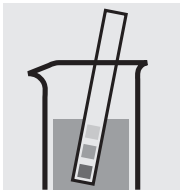
Determination of total chlorine

100599

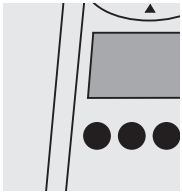
Test

Measuring range: 0.02 – 4.50 mg/l Cl_2 24-mm cell

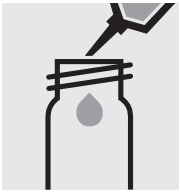
en



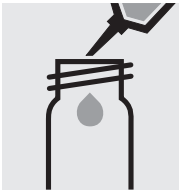
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **U.1**.

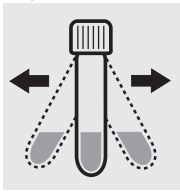


Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)

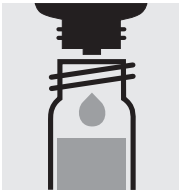


Pipette 10 ml of the sample into a 24-mm cell.

Add 1 level blue microspoon of **Cl_2-1**, close with the screw cap.

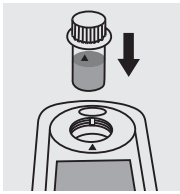


Shake the cell vigorously to dissolve the solid substance.

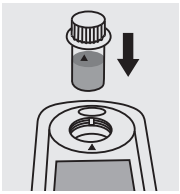


Add 2 drops of **Cl_2-2**, close with the screw cap, and mix.

Reaction time:
1 minute



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



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section 5.2 “Standard solutions”).

Chlorine

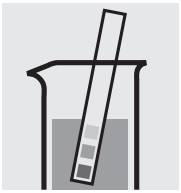
Determination of free chlorine, total chlorine, and combined chlorine

100599

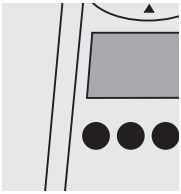
Test

Measuring range: 0.02 – 4.50 mg/l Cl_2 24-mm cell

en

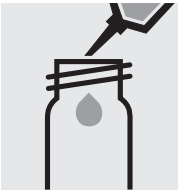


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



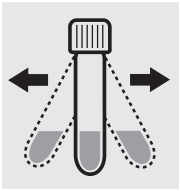
Select method **U.1**.

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



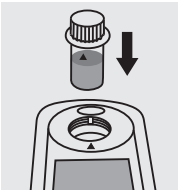
Pipette 10 ml of the sample into a 24-mm cell.

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

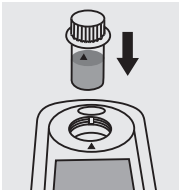


Shake the cell vigorously to dissolve the solid substance.

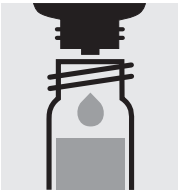
Reaction time:
1 minute



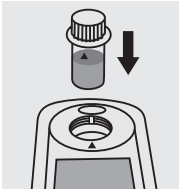
Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]**.



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



Remove the sample cell from the photometer, open, add 2 drops of **Cl_2-2**, 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 **[Zero/Test]** anew.
(= T2)

comb. Cl_2 = T2 - T1

Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded.
In such cases the sample must be diluted (plausibility check).
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.
For on-the-spot determinations where there are no suitable facilities for rinsing, the cell contents can be transferred to a new 24-mm cell before the addition of reagent Cl_2-2. Use this second cell **only** for the determination of **total chlorine**!

Quality assurance:

To check the measurement system (test reagents, meas-urement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

Chlorine

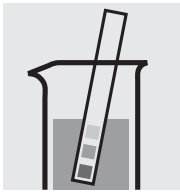
Determination of free chlorine

100598

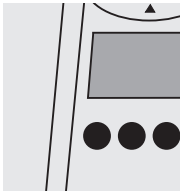
Test

Measuring range: 0.10 – 6.00 mg/l Cl_2 16-mm cell

en



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.

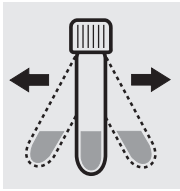


Select method **U.2**.

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

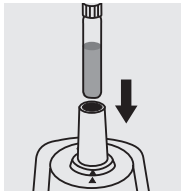
Pipette 10 ml of the sample into a 16-mm cell.

Add 1 level blue microspoon of **Cl_2-1**, close with the screw cap.

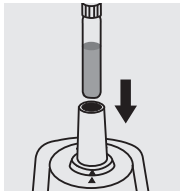


Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



Insert the cell containing the sample into the cell compartment. Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

Chlorine

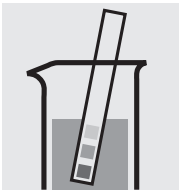
Determination of total chlorine

100602

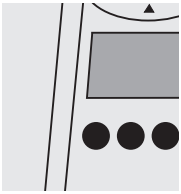
Test

Measuring range: 0.10 – 6.00 mg/l Cl_2 16-mm cell

en

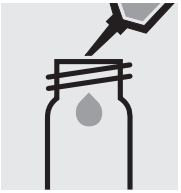


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



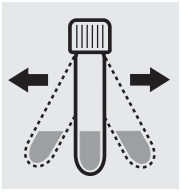
Select method **U.2**.

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

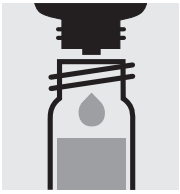


Pipette 10 ml of the sample into a 16-mm cell.

Add 1 level blue microspoon of **Cl_2-1**, close with the screw cap.

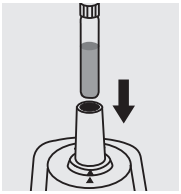


Shake the cell vigorously to dissolve the solid substance.

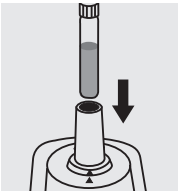


Add 2 drops of **Cl_2-2**, close with the screw cap, and mix.

Reaction time:
1 minute



Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



Insert the cell containing the sample into the cell compartment. Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section 5.2 “Standard solutions”).

Chlorine

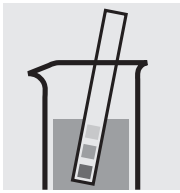
Determination of free chlorine

100599

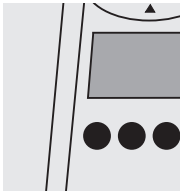
Test

Measuring range: 0.10 – 6.00 mg/l Cl_2 16-mm cell

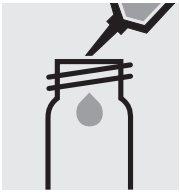
en



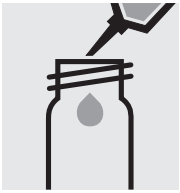
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **U.2**.

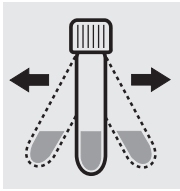


Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)



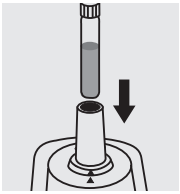
Pipette 10 ml of the sample into a 16-mm cell.

Add 1 level blue microspoon of **Cl_2-1**, close with the screw cap.

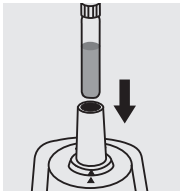


Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



Insert the cell containing the sample into the cell compartment. Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

Chlorine

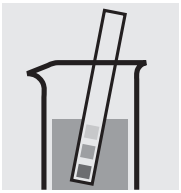
Determination of total chlorine

100599

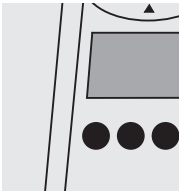
Test

Measuring range: 0.10 – 6.00 mg/l Cl_2 16-mm cell

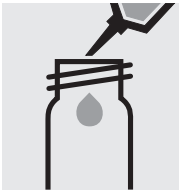
en



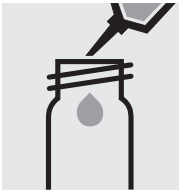
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **U.2**.

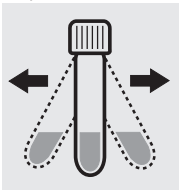


Fill approx. 10 ml of distilled water into a 16-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)

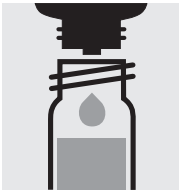


Pipette 10 ml of the sample into a 16-mm cell.

Add 1 level blue microspoon of **Cl_2-1**, close with the screw cap.

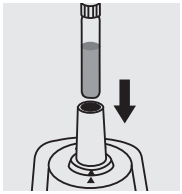


Shake the cell vigorously to dissolve the solid substance.

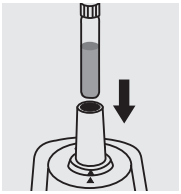


Add 2 drops of **Cl_2-2**, close with the screw cap, and mix.

Reaction time:
1 minute



Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



Insert the cell containing the sample into the cell compartment. Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section 5.2 “Standard solutions”).

Chlorine

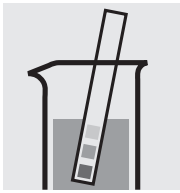
Determination of free chlorine, total chlorine, and combined chlorine

100599

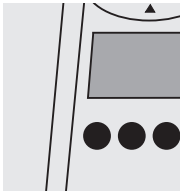
Test

Measuring range: 0.10 – 6.00 mg/l Cl_2 16-mm cell

en



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.

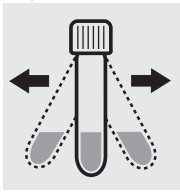


Select method **U.2**.

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

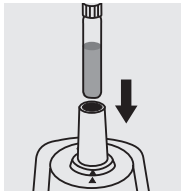
Pipette 10 ml of the sample into a 16-mm cell.

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

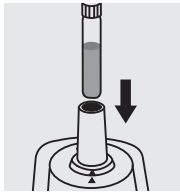


Shake the cell vigor-ously to dissolve the solid substance.

Reaction time:
1 minute

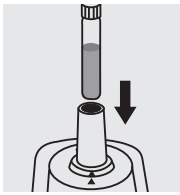


Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



Insert the cell containing the sample into the cell compartment. Press **[Zero/Test]** anew. **(= T1)**

Remove the sample cell from the photometer, open, add 2 drops of **Cl_2-2**, close with the screw cap, and mix.



Insert anew the cell con-taining the sample into the cell compartment. Press **[Zero/Test]** anew. **(= T2)**

comb. Cl_2 = T2 - T1

Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded.
In such cases the sample must be diluted (plausibility check).
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.
For on-the-spot determinations where there are no suitable facilities for rinsing, the cell contents can be transferred to a new 16-mm cell before the addition of reagent Cl_2-2. Use this second cell **only** for the determination of **total chlorine**!

Quality assurance:

To check the measurement system (test reagents, meas-urement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

Chlorine (with liquid reagents)

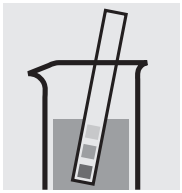
Detemination of free chlorine

100086/100087

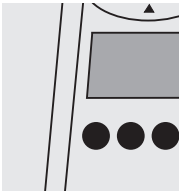
Test

Measuring range: 0.02 – 4.50 mg/l Cl_2 24-mm cell

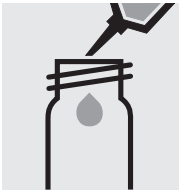
en



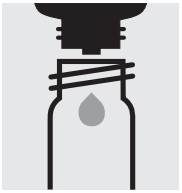
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



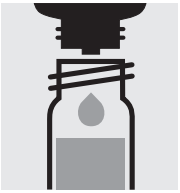
Select method **U.3**.



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



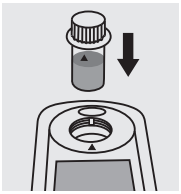
Place 6 drops of **Cl_2-1** into a 24-mm cell.



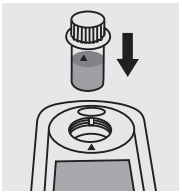
Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

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

Reaction time:
1 minute



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



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

Chlorine (with liquid reagents)

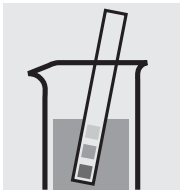
Detemination of total chlorine

100086/100087/ 100088

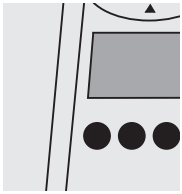
Test

Measuring range: 0.02 – 4.50 mg/l Cl_2 24-mm cell

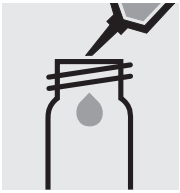
en



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.

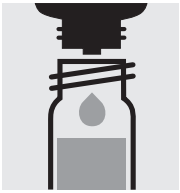


Select method **U.3**.



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

Place 6 drops of **Cl_2-1** into a 24-mm cell.

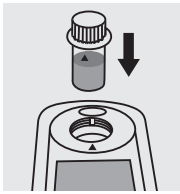


Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

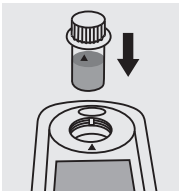
Add 10 ml of the sample with pipette, close with the screw cap, and mix.

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

Reaction time:
1 minute



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



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section 5.2 “Standard solutions”).

Chlorine (with liquid reagents)

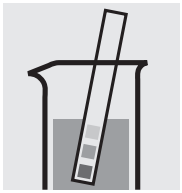
Determination of free chlorine, total chlorine, and combined chlorine

100086/100087/ 100088

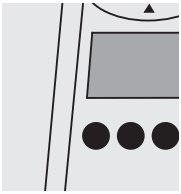
Test

Measuring range: 0.02 – 4.50 mg/l Cl_2 24-mm cell

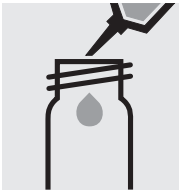
en



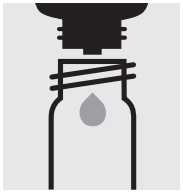
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



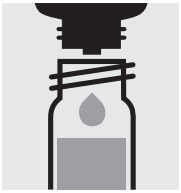
Select method **U.3**.



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



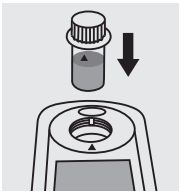
Place 6 drops of **Cl_2-1** into a 24-mm cell.



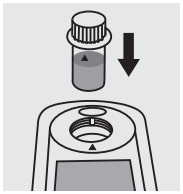
Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

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

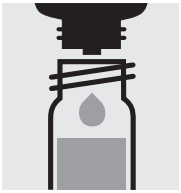
Reaction time: 1 minute



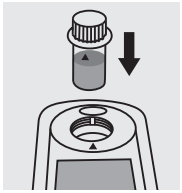
Insert the blank cell into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]**.



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

comb. Cl_2 = T2 - T1

Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.
For on-the-spot determinations where there are no suitable facilities for rinsing, the cell contents can be transferred to a new 24-mm cell before the addition of reagent Cl_2-3. Use this second cell **only** for the determination of **total chlorine**!

Quality assurance:

To check the measurement system (test reagents, meas-urement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

Chlorine (with liquid reagents)

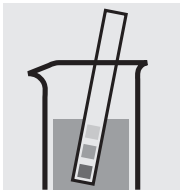
Detemination of free chlorine

100086/100087

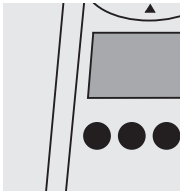
Test

en

Measuring range: 0.10 – 6.00 mg/l Cl_2 16-mm cell

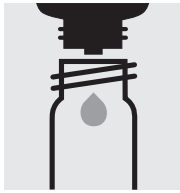


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

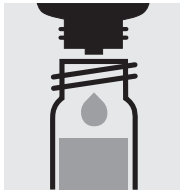


Select method **U.4**.

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



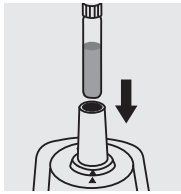
Place 6 drops of **Cl_2-1** into a 16-mm cell.



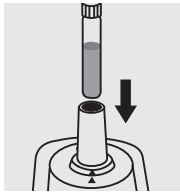
Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

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

Reaction time:
1 minute



Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



Insert the cell containing the sample into the cell compartment. Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

Chlorine (with liquid reagents)

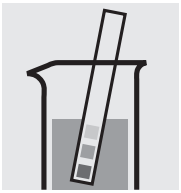
Detemination of total chlorine

100086/100087/ 100088

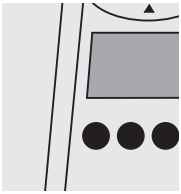
Test

Measuring range: 0.10 – 6.00 mg/l Cl_2 16-mm cell

en

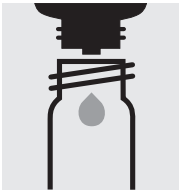


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

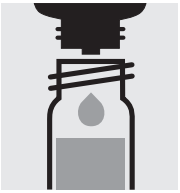


Select method **U.4**.

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

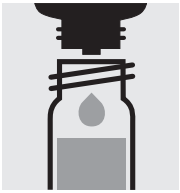


Place 6 drops of **Cl_2-1** into a 16-mm cell.



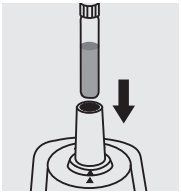
Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

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

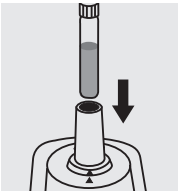


Add 2 drops of **Cl_2-3**, close with the screw cap, and mix.

Reaction time:
1 minute



Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



Insert the cell containing the sample into the cell compartment. Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard from Chloramine T GR, Cat.No. 102426, can be used (see section 5.2 “Standard solutions”).

Chlorine (with liquid reagents)

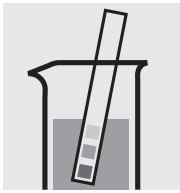
Determination of free chlorine, total chlorine, and combined chlorine

100086/100087/ 100088

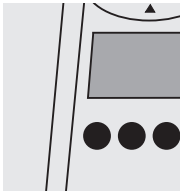
Test

Measuring range: 0.10 – 6.00 mg/l Cl_2 16-mm cell

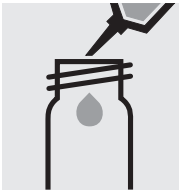
en



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.

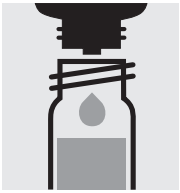


Select method **U.4**.



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

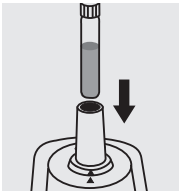
Place 6 drops of **Cl_2-1** into a 16-mm cell.



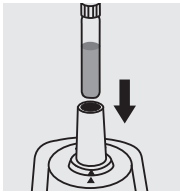
Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

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

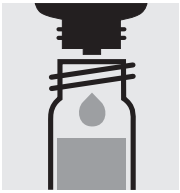
Reaction time:
1 minute



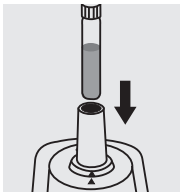
Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



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

comb. Cl_2 = T2 - T1

Important:

Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and subsequently several times with distilled water.
For on-the-spot determinations where there are no suitable facilities for rinsing, the cell contents can be transferred to a new 16-mm cell before the addition of reagent Cl_2-3. Use this second cell **only** for the determination of **total chlorine**!

Quality assurance:

To check the measurement system (test reagents, meas-urement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

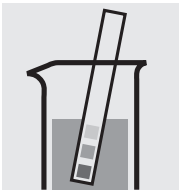
Chlorine Dioxide

100608

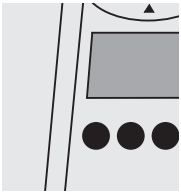
Test

Measuring range: 0.05 – 8.50 mg/l ClO_2 24-mm cell

en

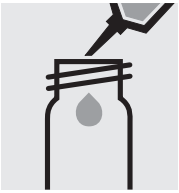


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

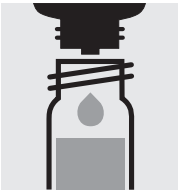


Select method **U.7**.

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



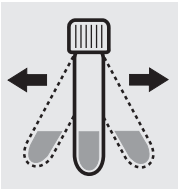
Pipette 10 ml of the sample into a 24-mm cell.



Add 2 drops of **ClO_2-1**, close with the screw cap, and mix.

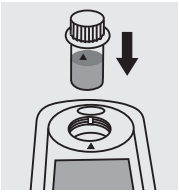
Reaction time:
2 minutes

Add 1 level blue microspoon of **ClO_2-2**, close with the screw cap.

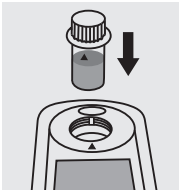


Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



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



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

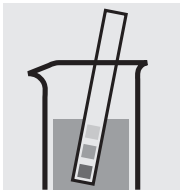
Chlorine Dioxide

100608

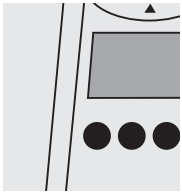
Test

Measuring range: 0.20 – 10.00 mg/l ClO_2 16-mm cell

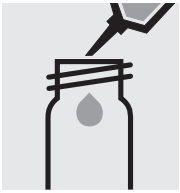
en



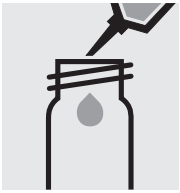
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



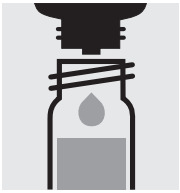
Select method **U.8**.



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



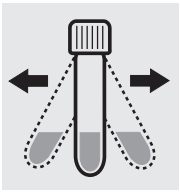
Pipette 10 ml of the sample into a 16-mm cell.



Add 2 drops of **ClO_2–1**, close with the screw cap, and mix.

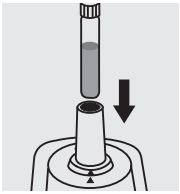
Reaction time:
2 minutes

Add 1 level blue microspoon of **ClO_2-2**, close with the screw cap.

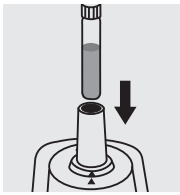


Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



Insert the cell containing the sample into the cell compartment. Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

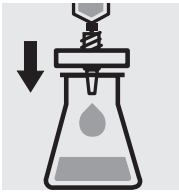
Cyanuric Acid

119253

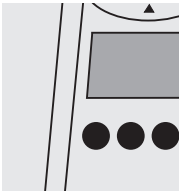
Test

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

en

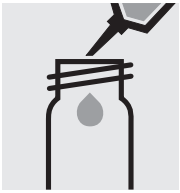


Filter turbid samples.



Select method **U.9**.

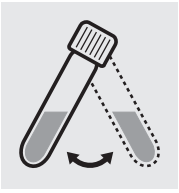
Pipette **5.0 ml of distilled water** (Water for analysis EMSURE®, Cat.No. 116754, is recommended) **+ 5.0 ml of the sample** *into a 24-mm cell* (**do not add any reagents!**), close with the screw cap, and mix.
(Blank cell)



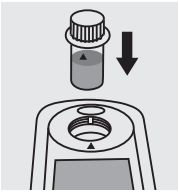
Pipette 5.0 ml of the sample into a 24-mm cell.

Add **5.0 ml of distilled water** (Water for analysis EMSURE®, Cat.No. 116754, is recommended) with pipette, close with the screw cap, and mix.

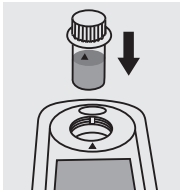
Add 1 reagent tablet **Cyanuric Acid**, crush with stirring rod, and close with the screw cap.



Swirl the cell to dissolve the solid substance.



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



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]** anew.

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 5.2 “Standard solutions”).

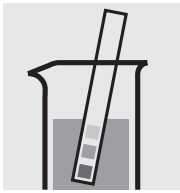
Ozone

100607

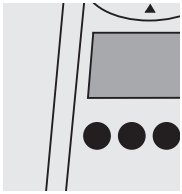
Test

Measuring range: 0.02 – 3.00 mg/l O_3 24-mm cell

en



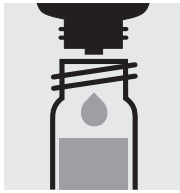
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method **U.5**.

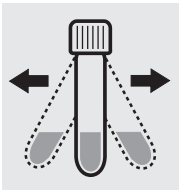
Fill approx. 10 ml of distilled water into a 24-mm cell (**do not add any reagents!**), close with the screw cap. (Blank cell)

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



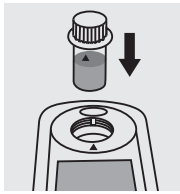
Add 2 drops of **O_3-1**, close with the screw cap, and mix.

Add 1 level blue microspoon of **O_3-2**, close with the screw cap.

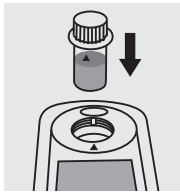


Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



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



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer.
Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

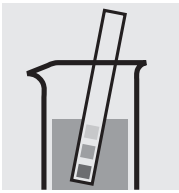
Ozone

100607

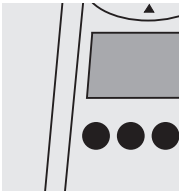
Test

Measuring range: 0.10 – 4.00 mg/l O_3 16-mm cell

en

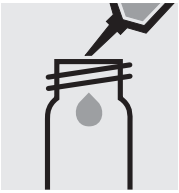


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

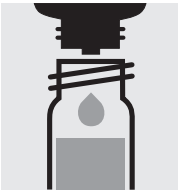


Select method **U.6**.

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

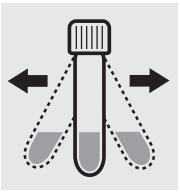


Pipette 10 ml of the sample into a 16-mm cell.



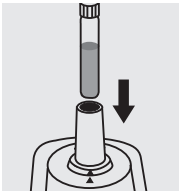
Add 2 drops of **O_3-1**, close with the screw cap, and mix.

Add 1 level blue micro-spoon of **O_3-2**, close with the screw cap.

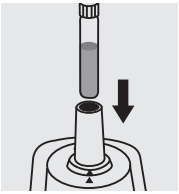


Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



Insert the blank cell into the cell compartment. Press **[Zero/Test]**.



Insert the cell containing the sample into the cell compartment. Press **[Zero/Test]** anew.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section 5.2 “Standard solutions”).

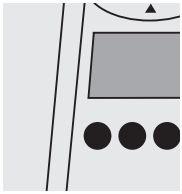
pH

101744

Cell Test

Measuring range: pH 6.4 – 8.8 16-mm cell

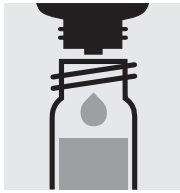
en



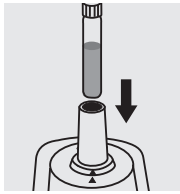
Select method **U.10**.

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

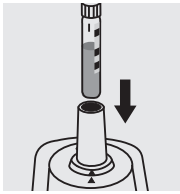
Pipette 10 ml of the sample into a round cell.



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/Test]**.



Insert the cell containing the sample into the cell compartment. Align the mark on the cell with that on the photometer. Press **[Zero/Test]** anew.

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.

5.2 Preparation of standard solutions

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 color. Subsequently make up the solution to the mark with distilled water.
The concentration of the solution is 1.50 mg/l (2.50 mg/l) free chlorine.

Stability:
The 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 color emerges. Add 2 ml of zinc iodide-starch solution and titrate from blue to colorless.

Caculation 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®
1.05614.2500	Sodium hypochlorite solution techn. approx. 13 % active chlorine
1.09147.1000	Sodium thiosulfate solution 0.1 mol/l Titripur®
1.05043.0250	Potassium iodide GR for analysis
1.05445.0500	Zinc iodide-starch solution GR for analysis
1.16754.9010	Water for analysis EMSURE®

Note
This is a standard solution that is absolutely necessary for the preparation of the monochloramine standard.

Standard solution of total chlorine

Reagents required:

1.02426.0250 Chloramine T trihydrate GR for analysis

1.16754.9010 Water for analysis EMSURE®

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.

Standard solution of chlorine dioxide analogous to DIN EN ISO 7393

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®

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 color. Subsequently make up the solution to the mark with distilled water.
The concentration of the solution is 2.50 mg/l chlorine dioxide.

Stability:
The 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.

Standard solution of cyanuric acid

Reagents required:

8.20358.0005 Cyanuric acid for synthesis

1.16754.9010 Water for analysis EMSURE®

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.

Standard solution of ozone analogous to DIN EN ISO 7393

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®

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 color. Subsequently make up the solution to the mark with distilled water.
The concentration of the solution is 1.00 mg/l ozone.

Stability:
The 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.

Merck KGaA, 64271 Darmstadt, Germany,
Tel. +49(0)6151 72-2440
www.analytical-test-kits.com

EMD Millipore Corporation, 290 Concord Road,
Billerica, MA 01821, USA, Tel. +1-978-715-4321

10/2014