UV/Vis Spectroscopy

Water Analysis
Instrument Introduction
Simplified Workflow

Water Testing Procedures
Methods
Tips and Hints

Easy Water Testing

With EasyPlus UV/VIS and Spectroquant®

METTLER TOLEDO

Editorial

The scarcity of available drinking water increases the demand for water protection. Water that is tapped from the circuit or refed is subject to strict testing requirements.

The monitoring of the drinking water circuit is carried out worldwide based on the World Health Organization's (WHO) Guidelines for drinking-water quality (GDWQ).

According to this guideline, potential health risks are evaluated and clear monitoring plans for drinking and wastewater are established—regardless of whether the water is drawn from the tap, a water tank, or is discharged into the wastewater. While large sample series are automatically processed and documented in large testing labs, the same measurements must also be feasible and affordable for on-site sampling. EasyPlus UV/VIS spectrophotometers can play an important role in this context, as they offer a secure measurement workflow—even for untrained users. By using ready-to-use water test kits, the measurement parameters can be easily analyzed and documented with available calibration curves, which guarantees safe and accurate water analyses at any time and any place.

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1. Introduction

1.1. Overview of Water Testing

The term "water testing" is used to describe diverse procedures to analyze water quality and safety. In order to meet the criteria under which water is judged fit for consumption or industrial processes—outlined under regulatory requirements set out by local authorities—a large amount of water testing work is performed on a daily basis in laboratories around the world.

A range of technologies and instruments can be employed to implement a water testing workflow [1]. Among them, UV/Vis spectrophotometry has been proven to be reliable, fast and easy-to-perform, requiring minimal bench space and able to measure down to low detection limits with sophisticated yet affordable instruments. By this method, a sample of analyte in water can react with given reagents through mixing; after the reaction, the quantity of certain parameters in the mixture can be determined photometrically with a UV/Vis spectrophotometer.

1.2. EasyPlus UV/VIS with Spectroquant® Test Kits

The EasyPlus UV/VIS spectrophotometer installs more than 150 methods, which have been validate with the Spectroquant® test kits (under the brand of Supelco). The methods covers the applications in analyzing the water quality in different sectors (Figure 1). The Spectroquant® test kits are ready-to-use, eliminating the time-consuming and costly preparation for chemistries and chemical reagents, while METTLER TOLEDO's UV/Vis Spectrophotometers deliver accurate and reliable measurement results with the predefined and validated methods.

This solution dramatically facilitates workflows for waste, drinking and process water testing in the corresponding industrial segments (Figure 1).

Figure 1: Water testing applications.

1.3. Overview of Water Testing Procedures

A water testing workflow usually starts with the selection of a test kit that provides a suitable analyte concentration range. From the sample preparation point of view, there are certain steps that must be carefully completed before a measurement. In general, water samples are prepared by mixing with the reagents from the kits, with additional procedures such as heating when necessary. The preparation procedure varies with the specific analyte and the test kit. To prepare samples correctly, therefore, it is always recommended to refer to and strictly follow the instruction sheet (Figure 2) given by the manufacturer together with the test kits. Sample preparation procedures for the assessment of over 48 parameters, are illustrated step by step in this guide.

After sample preparation, the sample is ready for measurement. The analyte in the water sample reacts with the reagents from the test kit during the sample preparation. As a result, the concentration of the photometrically measureable substance can be determined via UV/Vis spectrophotometry.

The measuring principle of water testing via UV/Vis spectrophotometry is very similar to an ordinary quantification by optical spectroscopy [2]. In principle, a calibration curve establishes a correlation between absorbance and the concentration of the analyte, which must be determined [2]. The methods can be simply started by scanning the 2D-Barcodes on the cells or the AutoSelector.


Supelco.

1.14729.0001

Spectroquant®

Ammonium Cell Test NH_4^+

1. Method

2. Measuring range and number of determinations

Measuring range	Number of determinations
0.010 – 2.000 mg/l NH_4-N	25
0.01 – 2.58 mg/l NH_4^+	

3. Applications

4. Influence of foreign substances

5. Reagents and auxiliaries

6. Preparation

7. Procedure

8. Analytical quality assurance

9. Notes

Figure 2: An example of an inserted instruction sheet provided with Spectroquant® Cell Test Kits. It is strongly recommended to refer to the specific inserted instruction sheet of the parameter/analyte.

2. EasyPlus UV/VIS

2.1. Overview of the Spectrophotometer

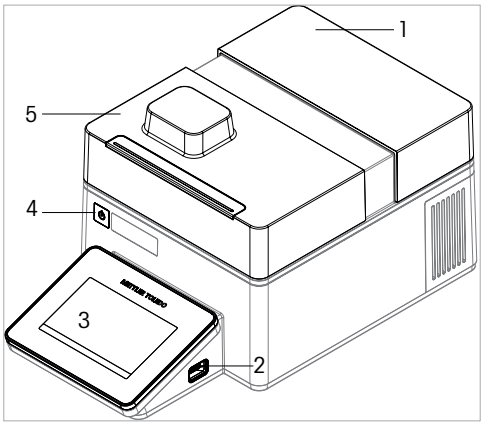


Figure 3: Top view.

No.	Name	Function
1	Back cover	Protects storage compartment for the following accessories: • Allen wrench • Two cuvette carousels
2	Front USB socket	USB-A socket to connect USB devices, for example USB flash drives, printers or barcode readers
3	Touch screen	Displays information and is used to enter information
4	Power button	Starts up and shuts down the spectrophotometer
5	Lid	SmartLid™ protects the analysis compartment

2.1.1. Analysis Compartment

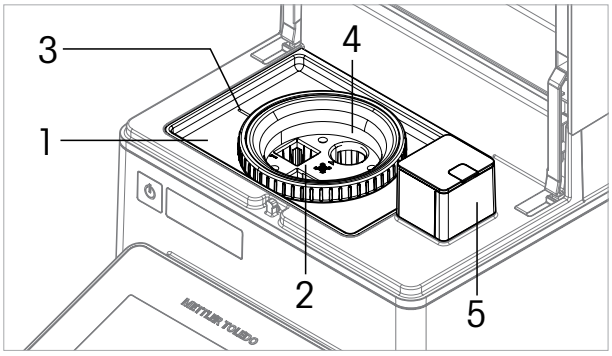
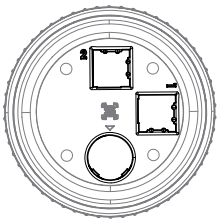


Figure 4: Components inside the analysis compartment.

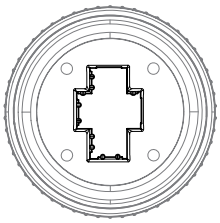
No.	Name	Function
1	Drip tray	Protects internal components from spillage
2	Measurement position	Position for cuvette during measurement
3	Mark	Mark for aligning cuvette carousel dot with the measurement position
4	Cuvette carousel	Cuvette carousel with cuvette holders for specific cuvette types
5	Internal barcode reader (optional accessory)	Reads 2D barcodes of Spectroquant® test kits

2.1.2. Cuvette Carousel Types



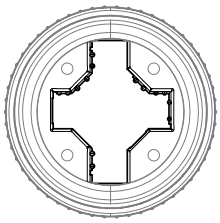
Cuvette carousel 10/16

No.	Name
1	10 mm cuvette holder
2	10 mm cuvette holder
3	∅16 mm cuvette holder



Cuvette carousel 20/30

No.	Name
1	30 mm cuvette holder
2	20 mm cuvette holder



Cuvette carousel 40/50/1

No.	Name
1	50 mm cuvette holder
2	40 mm cuvette holder
3	1 inch cuvette holder

2.1.3. Home Screen and Menu Structure

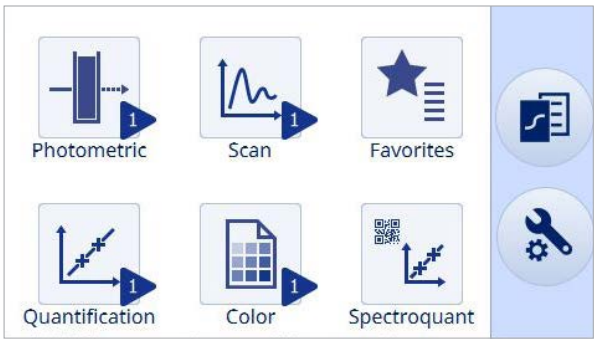
Upon startup, the home screen will be displayed:

Figure 5: Overview of home screen and functions.

Icon	Name	Description
	Spectroquant (with SQKitReader only)	Start Spectroquant® methods for water test kits. Absorbance is measured at specific wavelengths. These raw results are converted to the concentration of the analyte of the sample. The conversion is based on a mathematical formula, which is defined by the Spectroquant® test kit.
	Results	Access and manage the results of the last 100 analyses.
	Setup & Tools	Access the following functions: • Settings: change instrument settings. • Language: change the language of the user interface. • Diagnostics: run diagnostics. • Toolbox: update the firmware, restore factory settings, access tutorial and service information. • Adjustment: run adjustment methods to restore spectrophotometer performance: – Dark current correction of the two photosensors for accurate optical measurements (Easy VIS only). – System baseline correction for accurate optical measurements. • Spectroquant® (with SQKitReader only): change settings that apply to all Spectroquant® methods.

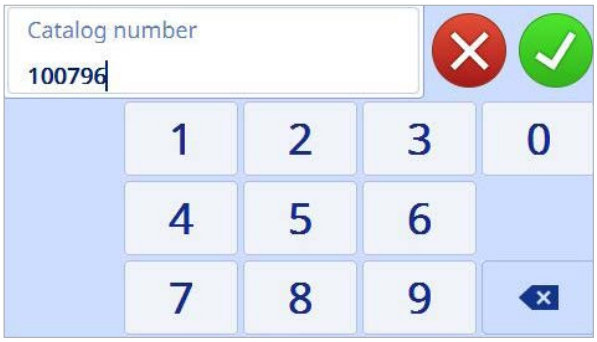
2.2. Water Testing Workflow

A water testing workflow can be launched immediately from the shortcut on the home screen.



1) Press "Spectroquant" on the home screen to enter the Spectroquant menu.

2a) After opening the lid, the barcode on the tubes or the AutoSelector can be scanned with automatically activated SQKitReader™. The corresponding method will start immediately.



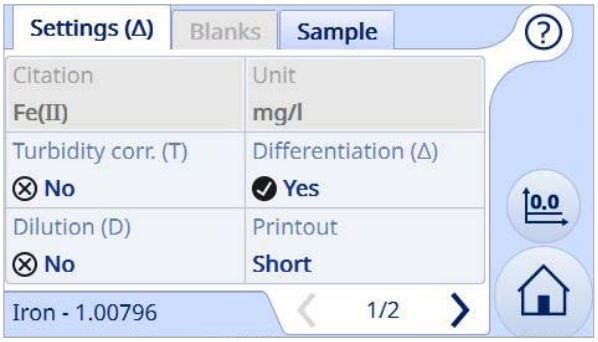
2b) If no barcode is available, the article number of the test kit can be entered manually.

3) If a testkit is expired, a popup is informing. By confirming this popup, the testkit can still be used. This information is tracked with the future results.

4) After the automatic method start, the instrument will search for stored zero adjustment. If no zero adjustment is available, the customer is asked to measure it.

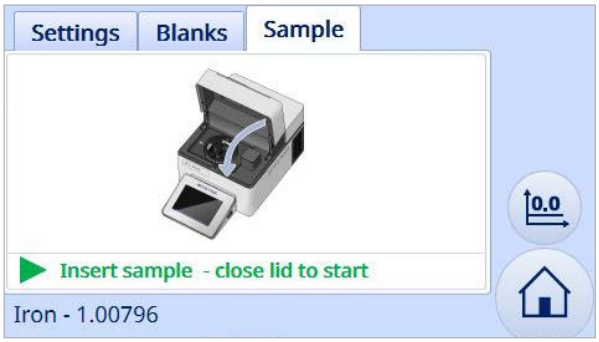
5) After inserting the zero cell, the measurement will be initiated by closing the lid.

6) After the determination of zero adjustment, the screen will show the instruction to insert the sample.

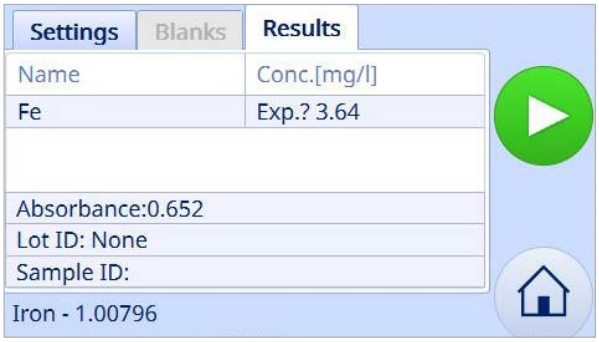


7) In the "Settings" tab, several parameters can be changed. The offered parameters are depended from the testkit. Activated Turbidity correction (T), Dilution (D) or Differentiation (Δ) will be illustrated in the tabs name.

8) In the "Blanks" tab, reagent or sample blank can be determined. The indicator "R" (for reagent blank) or "S" (for sample blank) will be shown in the tabs name after activation.

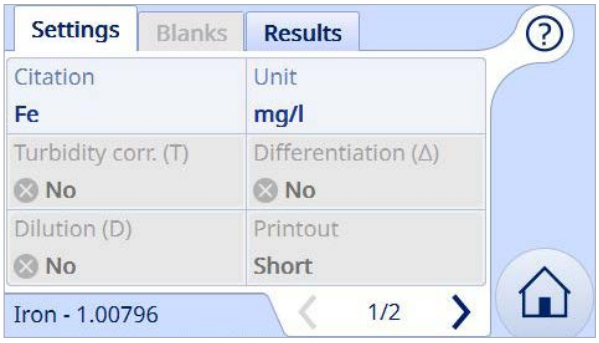


9) By returning to the "Sample" tab, the instruction will change by opening the lid. As soon as the lid will be closed, the measurement will start automatically.



Exp. = the used test kit has expired. The result is related to an expired test kit.
Exp.? = the expiration date of the used test kit is unknown, because the number was typed in manually.

10) The result screen is showing the result of the selected citation with the selected unit. Additionally the measured absorbance, lot ID and optional sample ID can be found as well.
The sample ID can be activated under
Setup & Tools → Spectroquant → Sample ID.



11) Citation and Unit can be changed by selecting them in the "Settings" tab. After return to the "Results" tab, the result table is automatically updated.

12) By clicking the play button, the next sample of the same testkit can be measured. Or the barcode of a different testkit will be scanned and the corresponding method will start.

3. Photometric Test Kits

3.1. Overview of Spectroquant® Testing Procedures

The test kit number listed in column 2 is for manual selection.

The total range relates to the cited test in column 1 and, in the reagent tests, covers all possible path length (cuvettes from 10 to 50 mm).

Parameter	Test Kit No.	Total range	Method
Acid Capacity Cell Test to pH 4.3 (total alkalinity)	101758	0.40–8.00 mmol/L	Indicator reaction
Aluminium Cell Test[1]	100594	0.02–0.50 mg/L Al	Chromazurole S
Aluminium Test[1]	114825	0.020–1.20 mg/L Al	Chromazurole S
Ammonium Cell Test	114739	0.010–2.000 mg/L NH_4-N	Indophenol blue
Ammonium Cell Test	114558	0.20–8.00 mg/L NH_4-N	Indophenol blue
Ammonium Cell Test	114544	0.5–16.0 mg/L NH_4-N	Indophenol blue
Ammonium Cell Test	114559	4.0–80.0 mg/L NH_4-N	Indophenol blue
Ammonium Test	114752	0.010–3.00 mg/L NH_4-N	Indophenol blue
Ammonium Test	100683	2.0–75.0 mg/L NH_4-N	Indophenol blue
Ammonium Test	100683	5–150 mg/L NH_4-N	Indophenol blue
AOX Cell Test[1]	100675	0.05–2.50 mg/L AOX	Oxidation to chloride
Arsenic Test[1]	101747	0.001–0.100 mg/L As	Ag-DDTC
BOD Cell Test[1]	100687	0.5–3,000 mg/L BOD	Modification of Winkler method
Boron Cell Test[1]	100826	0.05–2.00 mg/L B	Azomethine H
Boron Test[1]	114839	0.050–0.800 mg/L B	Rosocyanine
Bromine Test[1]	100605	0.020–10.00 mg/L Br_2	S-DPD
Cadmium Cell Test	114834	0.025–1.000 mg/L Cd	Cadion derivate
Cadmium Test	101745	0.0020–0.500 mg/L Cd	Cadion derivate
Calcium Cell Test[1]	100858	10–250 mg/L Ca	Phthalein purple
Calcium Test[1]	114815	5–160 mg/L Ca	Glyoxal-bis-hydroxyanil
Calcium Test sensitive[1]	114815	1.0–15.0 mg/L Ca	Glyoxal-bis-hydroxyanil
Calcium Test	100049	0.20–4.00 mg/L Ca	Phthalein derivate
Chloride Cell Test[1]	114730	5–125 mg/L Cl	Iron (III)-thiocyanat
Chloride Test[1]	114897	2.5–25.0 mg/L Cl	Iron (III)-thiocyanat
Chloride Test[1]	114897	10–250 mg/L Cl	Iron (III)-thiocyanat
Chloride Cell Test[1]	101804	0.5–15.0 mg/L Cl	Iron (III)-thiocyanat
Chloride Test[1]	101807	0.10–5.00 mg/L Cl	Iron (III)-thiocyanat
Chlorine Cell Test[1] (free chlorine)	100595	0.03–6.00 mg/L Cl_2	S-DPD
Chlorine Cell Test[1] (free chlorine + total chlorine)	100597	0.03–6.00 mg/L Cl_2	S-DPD
Chlorine Test[1] (free chlorine)	100598	0.010–6.00 mg/L Cl_2	S-DPD
Chlorine Test[1] (total chlorine)	100602	0.010–6.00 mg/L Cl_2	S-DPD
Chlorine Test[1] (free chlorine + total chlorine)	100599	0.010–6.00 mg/L Cl_2	S-DPD
Chlorine Cell Test[1] (free chlorine + total chlorine)	100086/100087/ 100088/100089	0.03–6.00 mg/L Cl_2	DPD
Chlorine Test[1] (free chlorine + total chlorine)	100086/100087/ 100088	0.010–1.000 mg/L Cl_2	DPD
Chlorine Dioxide Test[1]	100608	0.020–10.00 mg/L ClO_2	S-DPD
Chromate Cell Test[1]	114552	0.05–2.00 mg/L Cr	Diphenylcarbazide

Parameter	Test Kit No.	Total range	Method
Chromate Cell Test[1] (total chromium)	114552	0.05–2.00 mg/L Cr	Peroxodisulfate oxidation/Diphenylcarbazide
Chromate Test[1]	114758	0.010–3.00 mg/L Cr	Diphenylcarbazide
Cobalt Cell Test[1]	117244	0.05–2.00 mg/L Co	Nitroso-R salt
COD Cell Test[1]	114560	4.0–40.0 mg/L COD	Chromosulfuric acid oxidation/chromate determination
COD Cell Test[1]	101796	5.0–80.0 mg/L COD	Chromosulfuric acid oxidation/chromate determination
COD Cell Test[1]	114540	10–150 mg/L COD	Chromosulfuric acid oxidation/chromate determination
COD Cell Test[1]	114895	15–300 mg/L COD	Chromosulfuric acid oxidation/chromate determination
COD Cell Test[1]	114690	50–500 mg/L COD	Chromosulfuric acid oxidation/chromate determination
COD Cell Test[1]	114541	25–1,500 mg/L COD	Chromosulfuric acid oxidation/chromium (III) determination
COD Cell Test[1]	114691	300–3,500 mg/L COD	Chromosulfuric acid oxidation/chromium (III) determination
COD Cell Test[1]	114555	500–10,000 mg/L COD	Chromosulfuric acid oxidation/chromium (III) determination
COD Cell Test[1]	101797	5,000–90,000 mg/L COD	Chromosulfuric acid oxidation/chromium (III) determination
COD Cell Test (Hg free)[1]	109772	10–150 mg/L COD	Chromosulfuric acid oxidation/chromate determination
COD Cell Test (Hg free)[1]	109773	100–1,500 mg/L COD	Chromosulfuric acid oxidation/chromium (III) determination
COD Cell Test for seawater[1]	117058	5.0–60.0 mg/L COD	Chloride depletion/chromosulfuric acid oxidation/ chromate determination
COD Cell Test for seawater[1]	117059	50–3,000 mg/L COD	Chloride depletion/chromosulfuric acid oxidation/ chromium (III) determination
Copper Cell Test[1]	114553	0.05–8.00 mg/L Cu	Cuprizone
Copper Test[1]	114767	0.02–6.00 mg/L Cu	Cuprizone
Cyanide Cell Test[1] (free cyanide)	102531	0.010–0.500 mg/L CN	Barbituric acid + pyridinecarboxylic acid
Cyanide Cell Test[1] (free cyanide)	114561	0.010–0.500 mg/L CN	Barbituric acid + pyridinecarboxylic acid
Cyanide Cell Test[1] (readily liberated cyanide)	114561	0.010–0.500 mg/L CN	Citric acid/barbituric acid + pyridinecarboxylic acid
Cyanide Test[1] (free cyanide)	109701	0.0020–0.500 mg/L CN	Barbituric acid + pyridinecarboxylic acid
Cyanide Test[1] (readily liberated cyanide)	109701	0.0020–0.500 mg/L CN	Citric acid/barbituric acid + pyridinecarboxylic acid
Cyanuric Acid Test	119253	2–160 mg/L Cyan Acid	Triazine derivative
Fluoride Cell Test[1]	100809	0.10–1.80 mg/L F	Alizarin complexone
Fluoride Cell Test sensitive	100809	0.025–0.500 mg/L F	Alizarin complexone
Fluoride Cell Test	117243	0.10–2.50 mg/L F	SPADNS (As free)
Fluoride Test[1]	114598	0.10–2.00 mg/L F	Alizarin complexone
Fluoride Test[1]	114598	1.0–20.0 mg/L F	Alizarin complexone
Fluoride Test	100822	0.02–2.00 mg/L F	SPADNS
Fluoride Test	117236	0.02–2.00 mg/L F	SPADNS (As free)
Formaldehyde Cell Test[1]	114500	0.10–8.00 mg/L HCHO	Chromotropic acid
Formaldehyde Test[1]	114678	0.02–8.00 mg/L HCHO	Chromotropic acid
Gold Test	114821	0.5–12.0 mg/L Au	Rhodamine B
Hydrazine Test[1]	109711	0.005–2.00 mg/L N_2H_4	4-Dimethylaminobenzaldehyde
Hydrogen Peroxide Cell Test[1]	114731	2.0–20.0 mg/L H_2O_2	Titanyl sulfate
Hydrogen Peroxide Cell Test sensitive[1]	114731	0.25–5.00 mg/L H_2O_2	Titanyl sulfate
Hydrogen Peroxide Test	118789	0.015–6.00 mg/L H_2O_2	Phenanthroline derivative
Iodine Test[1]	100606	0.050–10.00 mg/L I_2	S-DPD
Iron Cell Test	114549	0.05–4.00 mg/L Fe	Triazine

Parameter	Test Kit No.	Total range	Method
Iron Cell Test[1]	114896	1.0–50.0 mg/L Fe (Fe (II) and Fe (III))	2,2′-Bipyridine
Iron Test	114761	0.005–5.00 mg/L Fe	Triazine
Iron Test[1]	100796	0.010–5.00 mg/L Fe (Fe (II) and Fe (III))	1,10-Phenanthroline
Lead Cell Test[1]	114833	0.10–5.00 mg/L Pb	PAR
Lead Test[1]	109717	0.010–5.00 mg/L Pb	PAR
Magnesium Cell Test[1]	100815	5.0–75.0 mg/L Mg	Phthalein purple
Manganese Cell Test[1]	100816	0.10–5.00 mg/L Mn	Formaldoxime
Manganese Test[1]	114770	0.010–10.00 mg/L Mn	Formaldoxime
Manganese Test[1]	101846	0.005–2.00 mg/L Mn	PAN
Molybdenum Cell Test	100860	0.02–1.00 mg/L Mo	Brompyrogallol red
Molybdenum Test	119252	0.5–45.00 mg/L Mo	Mercaptoacetic acid
Monochloramine Test	101632	0.050–10.00 mg/L Cl_2	Indophenol blue
Nickel Cell Test[1]	114554	0.10–6.00 mg/L Ni	Dimethylglyoxime
Nickel Test[1]	114785	0.02–5.00 mg/L Ni	Dimethylglyoxime
Nitrate Cell Test[1]	114542	0.5–18.0 mg/L NO_3-N	Nitrospectral
Nitrate Cell Test[1]	114563	0.5–25.0 mg/L NO_3-N	2,6-Dimethylphenol
Nitrate Cell Test[1]	114764	1.0–50.0 mg/L NO_3-N	2,6-Dimethylphenol
Nitrate Cell Test[1]	100614	23–225 mg/L NO_3-N	2,6-Dimethylphenol
Nitrate Test[1]	114773	0.20–20.0 mg/L NO_3-N	Nitrospectral
Nitrate Test[1]	109713	0.10–25.0 mg/L NO_3-N	2,6-Dimethylphenol
Nitrate Cell Test in seawater[1]	114556	0.10–3.00 mg/L NO_3-N	Resorcine
Nitrate Test in seawater[1]	114942	0.2–17.0 mg/L NO_3-N	Resorcine
Nitrate Test	101842	0.3–30.0 mg/L NO_3-N	Reduction/Benzoic acid derivative
Nitrite Cell Test[1]	114547	0.010–0.700 mg/L NO_2-N	Griess reaction
Nitrite Cell Test[1]	100609	1.0–90.0 mg/L NO_2-N	Iron (II)-ethylenediammonium sulfate
Nitrite Test[1]	114776	0.002–1.00 mg/L NO_2-N	Griess reaction
Nitrogen (total) Cell Test	114537	0.5–15.0 mg/L N	Peroxodisulfate oxidation/Nitrospectral
Nitrogen (total) Cell Test	100613	0.5–15.0 mg/L N	Peroxodisulfate oxidation/2,6-Dimethylphenol
Nitrogen (total) Cell Test	114763	10–150 mg/L N	Peroxodisulfate oxidation/2,6-Dimethylphenol
Oxygen Cell Test[1]	114694	0.5–12.0 mg/L O_2	Modification of Winkler method
Oxygen Scavengers Test	119251	0.020–0.500 mg/L DEHA	FerroZine®
Ozone Test[1]	100607	0.010–4.00 mg/L O_3	S-DPD
pH Cell Test	101744	6.4–8.8	Phenol red
Phenol Cell Test[1]	114551	0.10–2.50 mg/L C_6H_5OH	MBTH
Phenol Test[1]	100856	0.025–5.00 mg/L C_6H_5OH	Aminoantipyrine
Phenol Test[1]	100856	0.002–0.100 mg/L C_6H_5OH	Aminoantipyrine by extraction
Phosphate Cell Test	100474	0.05–5.00 mg/L PO_4-P	Phosphormolybdenum blue
Phosphate Cell Test	114543	0.05–5.00 mg/L PO_4-P	Phosphormolybdenum blue
Phosphate Cell Test (total phosphorus)	114543	0.05–5.00 mg/L P	Peroxodisulfate oxidation/phosphormolybdenum blue
Phosphate Cell Test	100475	0.5–25.0 mg/L PO_4-P	Phosphormolybdenum blue
Phosphate Cell Test	114729	0.5–25.0 mg/L PO_4-P	Phosphormolybdenum blue
Phosphate Cell Test (total phosphorus)	114729	0.5–25.0 mg/L P	Peroxodisulfate oxidation/phosphormolybdenum blue
Phosphate Cell Test	100616	3.0–100.0 mg/L PO_4-P	Phosphormolybdenum blue
Phosphate Cell Test	100673	3.0–100.0 mg/L PO_4-P	Phosphormolybdenum blue
Phosphate Cell Test (total phosphorus)	100673	3.0–100.0 mg/L P	Peroxodisulfate oxidation/phosphormolybdenum blue
Phosphate Test	114848	0.005–5.00 mg/L PO_4-P	Phosphormolybdenum blue

Parameter	Test Kit No.	Total range	Method
Phosphate Test	100798	1.0–100.0 mg/L PO_4-P	Phosphormolybdenum blue
Phosphate Cell Test[1]	114546	0.5–25.0 mg/L PO_4-P	Vanadatomolybdate
Phosphate Test[1]	114842	0.5–30.0 mg/L PO_4-P	Vanadatomolybdate
Potassium Cell Test	114562	5.0–50.0 mg/L K	Kalignost®, turbidimetric
Potassium Cell Test	100615	30–300 mg/L K	Kalignost®, turbidimetric
Residual Hardness Cell Test[1]	114683	0.50–5.00 mg/L Ca	Phthalein purple
Silicate (Silicic acid) Test	114794	0.11–10.70 mg/L SiO_2	Silicomolybdenum blue
Silicate (Silicic acid) Test	114794	0.011–1.600 mg/L SiO_2	Silicomolybdenum blue
Silicate (Silicic acid) Test[1]	100857	1.1–107.0 mg/L SiO_2	Molybdatosilicate
Silicate (Silicic acid) Test[1]	100857	11–1,070 mg/L SiO_2	Molybdatosilicate
Silver Test[1]	114831	0.25–3.00 mg/L Ag	Eosine/1,10-Phenanthroline
Sodium Cell Test in nutrient solutions[1]	100885	10–300 mg/L Na	Indirectly as chloride
Sulfate Cell Test	102532	1.0–50.0 mg/L SO_4	Bariumsulfate, turbidimetric
Sulfate Cell Test	114548	5–250 mg/L SO_4	Bariumsulfate, turbidimetric
Sulfate Cell Test	100617	50–500 mg/L SO_4	Bariumsulfate, turbidimetric
Sulfate Cell Test	114564	100–1,000 mg/L SO_4	Bariumsulfate, turbidimetric
Sulfate Test[1]	114791	25–300 mg/L SO_4	Tannin
Sulfate Test	101812	0.50–50.0 mg/L SO_4	Bariumsulfate, turbidimetric
Sulfate Test	102537	5–300 mg/L SO_4	Bariumsulfate, turbidimetric
Sulfide Test[1]	114779	0.020–1.50 mg/L S	Dimethyl-p-phenylendiamin
Sulfite Cell Test[1]	114394	1.0–20.0 mg/L SO_3	Ellman's reagent
Sulfite Cell Test sensitive[1]	114394	0.05–3.00 mg/L SO_3	Ellman's reagent
Sulfite Test[1]	101746	1.0–60.0 mg/L SO_3	Ellman's reagent
Surfactants (anionic) Cell Test	102552	0.05–2.00 mg/L SDAS	Methylene blue
Surfactants (cationic) Cell Test[1]	101764	0.05–1.50 mg/L k-Ten	Disulfine blue
Surfactants (nonionic) Cell Test[1]	101787	0.10–7.50 mg/L n-Ten	TBPE
Tin Cell Test[1]	114622	0.10–2.50 mg/L Sn	Pyrocatechol violet
TOC Cell Test	114878	5.0–80.0 mg/L TOC	Peroxodisulfate oxidation/Indicator
TOC Cell Test	114879	50–800 mg/L TOC	Peroxodisulfate oxidation/Indicator
Total Hardness Cell Test[1]	100961	5–215 mg/L Ca	Phthalein purple
Volatile Organic Acids Cell Test[1]	101749	50–3,000 mg/L CH_3COOH	Esterification
Volatile Organic Acids Test[1]	101809	50–3,000 mg/L CH_3COOH	Esterification
Zinc Cell Test	100861	0.025–1.000 mg/L Zn	PAR
Zinc Cell Test	114566	0.20–5.00 mg/L Zn	PAR
Zinc Test[1]	114832	0.05–2.50 mg/L Zn	Cl-PAN

3.2. Analytical Test Procedures

The following methods with the corresponding catalog numbers are programmed into the photometer and measurements can be made without any further adjustments. Method selection is achieved through a barcode on the cell (for cell tests) or through a barcode on the AutoSelector (for reagent tests).

To gain more information about the predefined methods, the flyer provided together with the Spectroquant® Test Kit shall be referred to.

[1] Turbidity correction possible

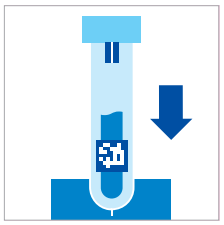
Acid Capacity to pH 4.3 (Total Alkalinity)	**101758**	Cell Test

Measuring range: 0.40–8.00 mmol/L
20–400 mg/L $CaCO_3$

Pipette 4.0 mL of **AC-1** into a round cell.

Add 1.0 mL of the sample with pipette, close the cell with the screw cap, and mix.

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



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a sodium hydroxide solution 0.1 mol/L can be used after diluting accordingly (see section "Standard solutions").

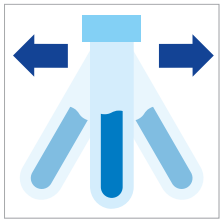
Aluminium	100594	Cell Test

Measuring range: 0.02–0.50 mg/L Al
Expression of results also possible in mmol/L.

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

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

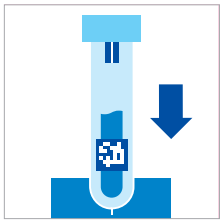
Add 1 level blue microspoon of **Al-1K**, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Add 0.25 mL of **Al-2K** with pipette, close with the screw cap, and mix.

Reaction time:
5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

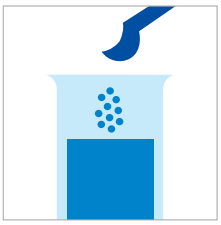
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100 or the Standard solutions for photometric applications.
Ready-to-use aluminium standard solution Certipur® concentration 1,000 mg/L Al, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

Aluminium	**114825**	Test

Measuring range: 0.10–1.20 mg/L Al 10-mm cuvette
0.05–0.60 mg/L Al 20-mm cuvette
0.020–0.200 mg/L Al 50-mm cuvette
Expression of results also possible in mmol/L.

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

Pipette 5.0 mL of the sample into a test tube.

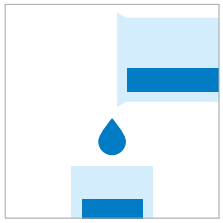


Add 1 level blue microspoon of **Al-1** to the test tube and dissolve the solid substance.

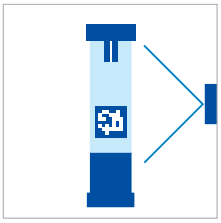
Add 1.2 mL of **Al-2** with pipette and mix.

Add 0.25 mL of **Al-3** with pipette and mix.

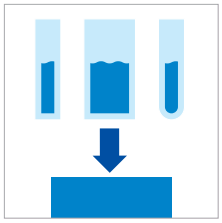
Reaction time:
2 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

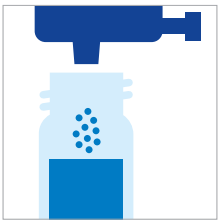
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100 or the Standard solutions for photometric applications.
Ready-to-use aluminium standard solution Certipur®, concentration 1,000 mg/L Al, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

Ammonium	**114739**	Cell Test

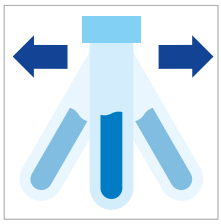
Measuring range: 0.010–2.000 mg/L NH_4-N
0.013–2.571 mg/L NH_4
0.010–2.000 mg/L NH_3-N
0.012–2.432 mg/L NH_3
Expression of results also possible in mmol/L.

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

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

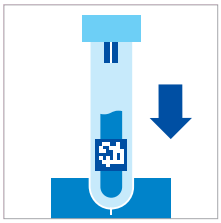


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

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

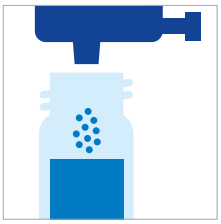
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50 or the Standard solutions for photometric applications.
Ready-to-use ammonium standard solution Certipur® concentration 1,000 mg/L NH_4^+, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Ammonium	114558	Cell Test

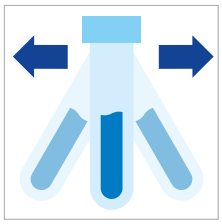
Measuring range: 0.20–8.00 mg/L NH_4-N
0.26–10.30 mg/L NH_4
0.20–8.00 mg/L NH_3-N
0.24–9.73 mg/L NH_3
Expression of results also possible in mmol/L.

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

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

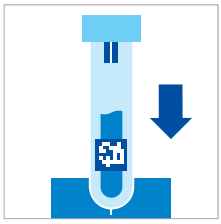


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

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

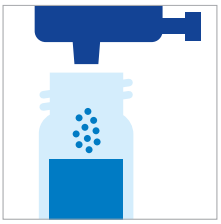
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 or the Standard solutions for photometric.
Ready-to-use ammonium standard solution Certipur® concentration 1,000 mg/L NH_4^+, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Ammonium	**114544**	Cell Test

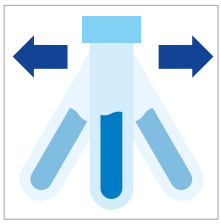
Measuring range: 0.5–16.0 mg/L NH_4-N
0.6–20.6 mg/L NH_4
0.5–16.0 mg/L NH_3-N
0.6–19.5 mg/L NH_3
Expression of results also possible in mmol/L.

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

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

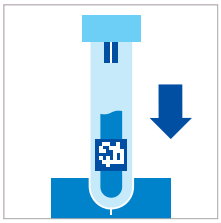


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

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

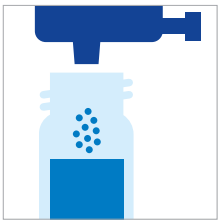
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 or the Standard solutions for photometric applications.
Ready-to-use ammonium standard solution Certipur® concentration 1,000 mg/L NH_4^+, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Ammonium	114559	Cell Test

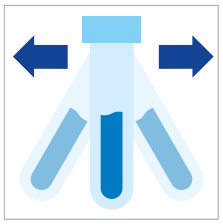
Measuring range: 4.0–80.0 mg/L NH_4-N
5.2–103.0 mg/L NH_4
4.0–80.0 mg/L NH_3-N
4.9–97.3 mg/L NH_3
Expression of results also possible in mmol/L.

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

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

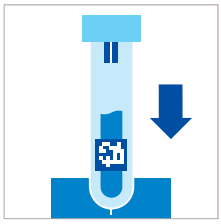


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

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

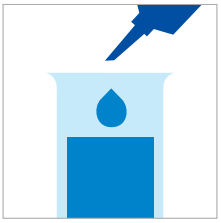
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 70 or the Standard solutions for photometric applications.
Ready-to-use ammonium standard solution Certipur® concentration 1,000 mg/L NH_4^+, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

Ammonium	**114752**	Cell Test

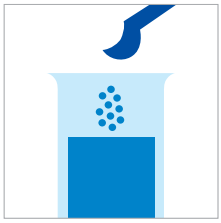
Measuring range:	0.05–3.00 mg/L NH_4-N	0.06–3.86 mg/L NH_4	10-mm cuvette
	0.03–1.50 mg/L NH_4-N	0.04–1.93 mg/L NH_4	20-mm cuvette
	0.010–0.500 mg/L NH_4-N	0.013–0.644 mg/L NH_4	50-mm cuvette
	0.05–3.00 mg/L NH_3-N	0.06–3.65 mg/L NH_3	10-mm cuvette
	0.03–1.50 mg/L NH_3-N	0.04–1.82 mg/L NH_3	20-mm cuvette
	0.010–0.500 mg/L NH_3-N	0.016–0.608 mg/L NH_3	50-mm cuvette
	Expression of results also possible in mmol/L.		

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

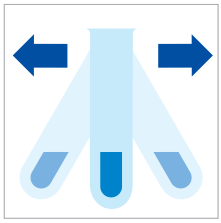
Pipette 5.0 mL of the sample into a test tube.



Add 0.60 mL of **NH_4-1** with pipette and mix.

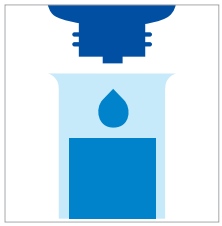


Add 1 level blue microspoon of **NH_4-2**.



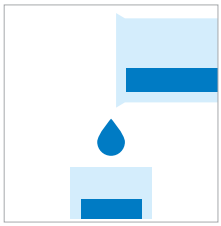
Shake vigorously to dissolve the solid substance.

Reaction time: 5 minutes

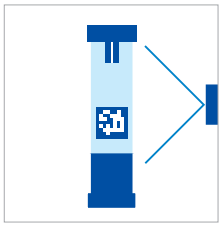


Add 4 drops of **NH_4-3** and mix.

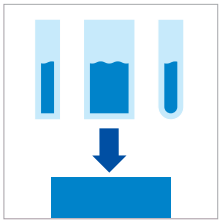
Reaction time: 5 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
Very high ammonium concentrations in the sample produce turquoise-colored solutions (measurement solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50 or the Standard solutions for photometric applications.
Ready-to-use ammonium standard solution Certipur® concentration 1,000 mg/L NH_4^+, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Ammonium	**100683**	Test

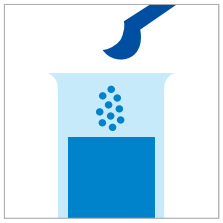
Measuring range:	2.0–75.0 mg/L NH_4-N	2.6–96.6 mg/L NH_4	10-mm cuvette
	5–150 mg/L NH_4-N	6–193 mg/L NH_4	10-mm cuvette
	2.0–75.0 mg/L NH_3-N	2.4–91.2 mg/L NH_3	10-mm cuvette
	5–150 mg/L NH_3-N	6–182 mg/L NH_3	10-mm cuvette
	Expression of results also possible in mmol/L.		

Measuring range: 2.0–75.0 mg/L NH_4-N

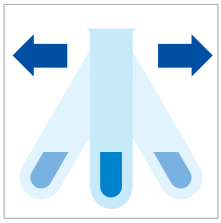
Check the pH of the sample, specified range: pH 4–13. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 5.0 mL of **NH_4-1** into a test tube.

Add 0.20 mL of the sample with pipette.

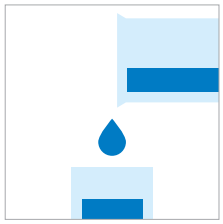


Add 1 level blue micro-spoon of **NH_4-2**.

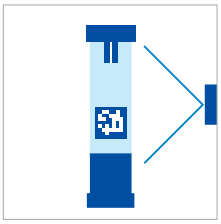


Shake vigorously to dissolve the solid substance.

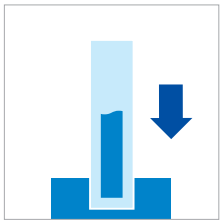
Reaction time: 15 minutes



Transfer the solution into a cuvette.



Select method with AutoSelector measuring range 2.0–75.0 mg/L **NH_4-N**.



Place the cuvette into the analysis compartment.

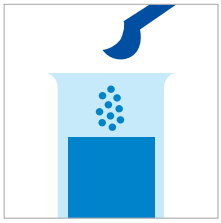
Ammonium	100683	Cell Test

Measuring range: 5–150 mg/L NH_4-N

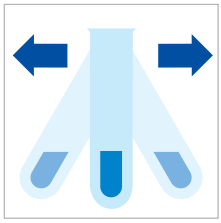
Check the pH of the sample, specified range: pH 4–13. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 5.0 mL of **NH_4-1** into a test tube.

Add 0.10 mL of the sample with pipette.

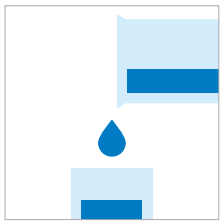


Add 1 level blue micro-spoon of **NH_4-2**.

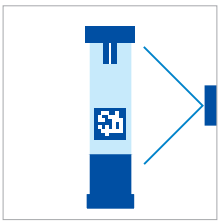


Shake vigorously to dissolve the solid substance.

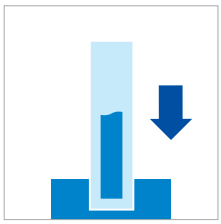
Reaction time: 15 minutes



Transfer the solution into a cuvette.



Select method with AutoSelector measuring range 5–150 mg/L **NH_4-N**.



Place the cuvette into the analysis compartment.

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

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 70 or the Standard solutions for photometric applications.
Ready-to-use ammonium standard solution Certipur® concentration 1,000 mg/L NH_4^+, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

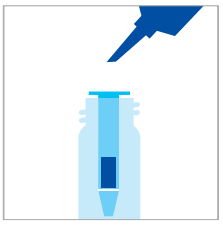
AOX Adsorbable Organic Halogens (x)	**100675**	Cell Test

Measuring range: 0.05–2.50 mg/L AOX

Preparation of the adsorption column:

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

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



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

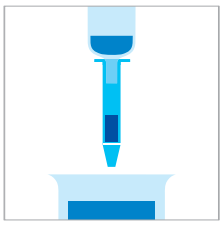
Close the bottom end of the column with the stopper. Apply to the column 1 mL of **AOX-3**. Close the top end of the column with the stopper and swirl to eliminate air bubbles. Remove the stopper on the top end and fill the column to the brim with **AOX-3**.

Sample enrichment:

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

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

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

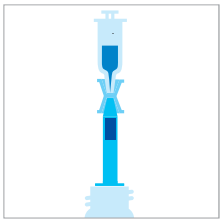


Remove the stopper from the column outlet and run the sample through completely.

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

AOX Adsorbable Organic Halogens (x)	**100675**	Cell Test

Digestion:

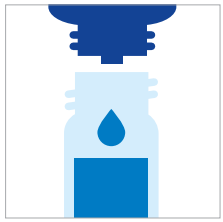


Fill the 10 mL syringe with 10 mL of reagent **AOX-5** and attach the syringe with the column outlet using the connector. Place the top end of the column on an empty cell and rinse the charcoal filling of the column into an empty 16-mm cell.

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

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

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



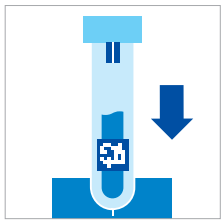
Add 5 drops of **AOX-4**, close the cell and mix; clear supernatant: **pretreated sample**.

Determination:

Pipette 0.20 mL of **AOX-1K** into a reaction cell, and mix.

Add 7.0 mL of **pretreated sample** with glass pipette, close the cell with the screw cap, and mix.

Reaction time:
15 minutes



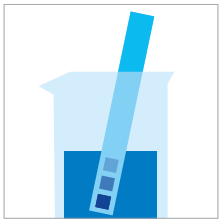
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + distilled water).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) Spectroquant® AOX Standard concentration 0.2–2.0 mg/L can be used.

Arsenic | 101747 | Test

Measuring range: 0.005–0.100 mg/L As 10-mm cuvette
0.001–0.020 mg/L As 20-mm cuvette
Expression of results also possible in mmol/L.

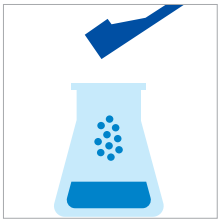


Check the pH of the sample, specified range: pH 0–13.

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

Add 5 drops of **As-1** and mix.

Add 20 mL of **As-2** with pipette and mix.

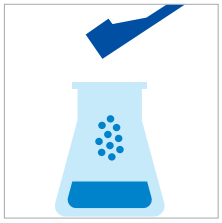


Add 1 level green dosing spoon of **As-3** and dissolve.

Add 1.0 mL of **As-4** with pipette and mix.

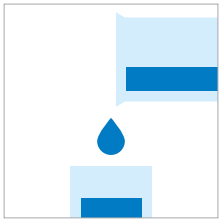
Pipette 5.0 mL of **As-5** into the absorption tube.

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

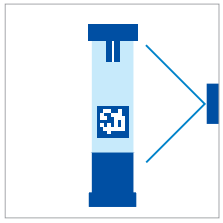


Add 3 level red dosing spoons of **As-7**. Immediately attach the absorption tube to the Erlenmeyer flask.

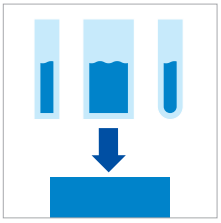
Leave to stand for 2 hours. During this time carefully swirl the flask several times or stir slowly with a magnetic stirrer.



Transfer the solution from the absorption tube into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use arsenic standard solution Certipur® concentration 1,000 mg/L As or the Standard solution for photometric applications can be used after diluting accordingly.

BOD Biochemical Oxygen Demand	**100687**	Cell Test

Measuring range: 0.5–3.000 mg/L BOD
0.5–3.000 mg/L O_2
Expression of results also possible in mmol/L.

Preparation and incubation:

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

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

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

Measurement of inital oxygen concentration = Result 1 (measurement sample) = Result 1 (blank)

Use one bottle of **pretreated sample** and one of **inoculated nutrient-salt solution** for the measurement of the initial oxygen concentration.

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

Determination:

Measurement of final oxygen concentration = Result 2 (measurement sample) = Result 2 (blank)

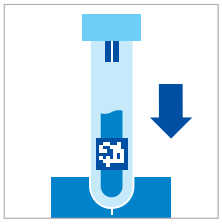
After incubation, use one bottle of **pretreated sample** and one of **inoculated nutrient-salt solution** for the measurement of the final oxygen concentration.

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

Reaction time: 15 minutes

Add 10 drops of **BOD-3K**, reclose, and mix.

Fill the solution into a round cell.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Calculation:
BOD of measurement sample:
Result 1 – Result 2 (measurement sample) = A in mg/L
BOD of blank:
Result 1 – Result 2 (blank) = B in mg/L
BOD of original sample in mg/L = (A – B) × dilution factor

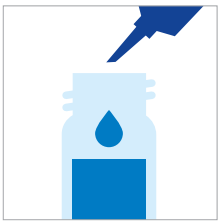
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) Spectroquant BOD Standard (acc. to EN 1899) can be used.

Boron	**100826**	Cell Test

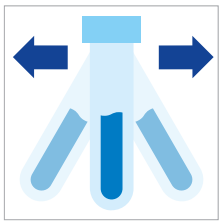
Measuring range: 0.05–2.00 mg/L B
Expression of results also possible in mmol/L.

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

Pipette 1.0 mL of **B-1K** into a reaction cell, close with the screw cap, and mix.

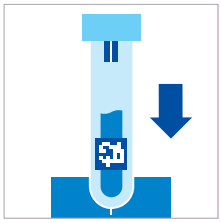


Add 4.0 mL of the sample with pipette into a reaction cell, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 60 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

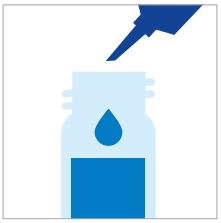
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use boron standard solution Certipur® concentration 1,000 mg/L. B can also be used after diluting accordingly as well as the Standard solution for photometric applications, CRM.

Boron	114839	Test

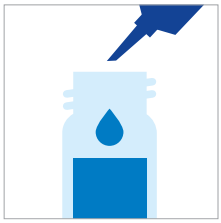
Measuring range: 0.050–0.800 mg/L B 10-mm cuvette
Expression of results also possible in mmol/L.

Check the pH of the sample, specified range: pH 1–13.

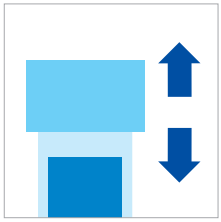
Pipette 5.0 mL of the sample into a test tube with screw cap. **(Important: Do not use test tubes made of glass containing boron!)**



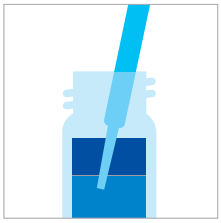
Add 1.0 mL of **B-1** with pipette, close with the screw cap, and mix.



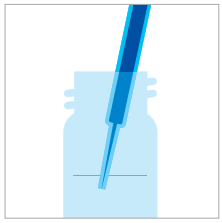
Add 1.5 mL of **B-2** with pipette and close with the screw cap.



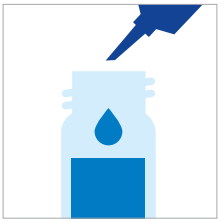
Shake the tube vigorously for 1 minute.



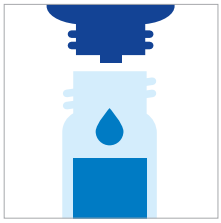
Aspirate 0.5 mL of the clear lower phase from the tube with pipette.



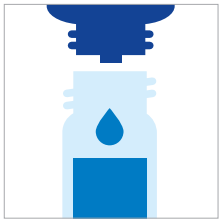
Transfer the extract to a separate fresh tube.



Add 0.80 mL of **B-3** with pipette, close with the screw cap, and mix.



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

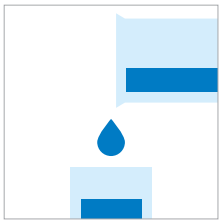


Add 18 drops of **B-5**, close with the screw cap, and mix.

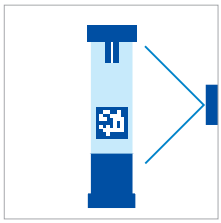
Reaction time: 12 minutes

Add 6.0 mL of **B-6** with pipette, close with the screw cap, and mix.

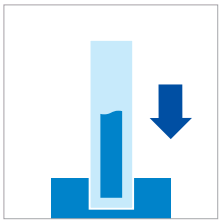
Reaction time: 2 minutes



Transfer the solution into a cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

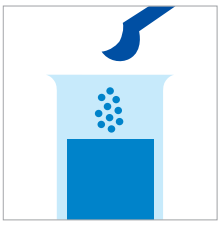
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use boron standard solution Certipur® concentration 1,000 mg/L B can also be used after diluting accordingly.

Bromine	**100605**	Test

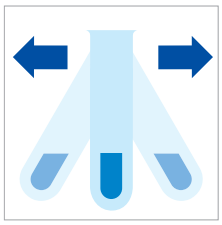
Measuring range: 0.10–10.00 mg/L Br_2 10-mm cuvette
0.05–5.00 mg/L Br_2 20-mm cuvette
0.020–2.000mg/L Br_2 50-mm cuvette
Expression of results also possible in mmol/L.

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.

Pipette 10 mL of the sample into a test tube.

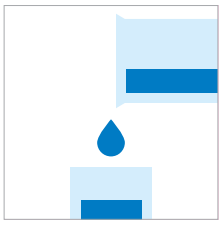


Add 1 level blue microspoon of **Br_2-1**.

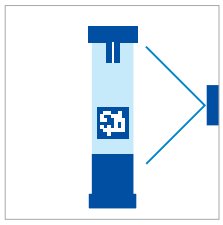


Shake vigorously to dissolve the solid substance.

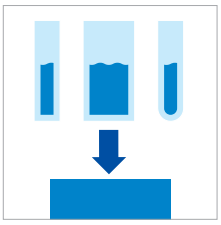
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

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

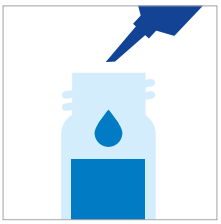
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

Cadmium	114834	Cell Test

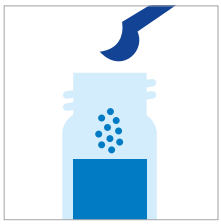
Measuring range: 0.025–1.000 mg/L Cd
Expression of results also possible in mmol/L.

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

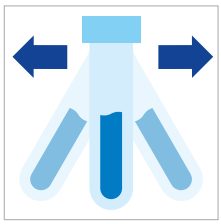
Pipette 5.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



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

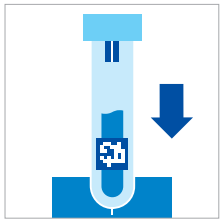


Add 1 level green microspoon of **Cd-2K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Important:
For the determination of total cadmium a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of cadmium (Σ Cd).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90 or the Standard solution for photometric applications.
Ready-to-use cadmium standard solution Certipur® concentration 1,000 mg/L Cd, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

Cadmium	101745	Test

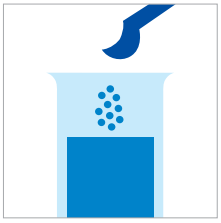
Measuring range: 0.01–0.500 mg/L Cd 10-mm cuvette
0.005–0.250 mg/L Cd 20-mm cuvette
0.0020–0.1000 mg/L Cd 50-mm cuvette
Expression of results also possible in mmol/L.

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

Pipette 1.0 mL of **Cd-1** into a test tube.

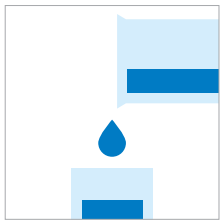
Add 10 mL of the sample with pipette and mix.

Add 0.20 mL of **Cd-2** with pipette and mix.

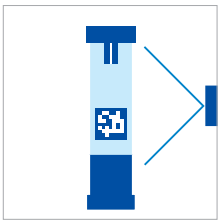


Add 1 level green microspoon of **Cd-3** and dissolve the solid substance.

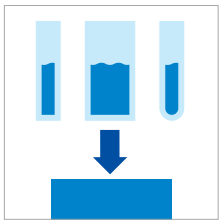
Reaction time: 2 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
For the determination of **total cadmium** a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of cadmium (Σ Cd).

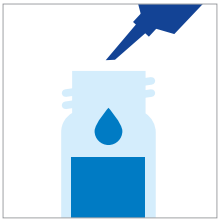
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90 or the Standard solutions for photometric applications.
Ready-to-use cadmium standard solution Certipur® concentration 1,000 mg/L Cd, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

Calcium	**100858**	Cell Test

Measuring range: 10–250 mg/L Ca
14–350 mg/L CaO
25–624 mg/L $CaCO_3$
Expression of results also possible in mmol/L.

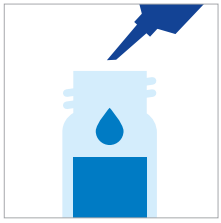
Check the pH of the sample, specified range: pH 3–9. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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

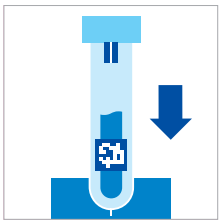


Add 1.0 mL of **Ca-1K** with pipette, close the cell with the screw cap, and mix.

Reaction time: **exactly** 3 minutes



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



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

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

Calcium	114815	Test

Measuring range:

10–160 mg/L Ca	14–224 mg/L CaO	25–400 mg/L $CaCO_3$	10-mm cuvette
5–80 mg/L Ca	7–112 mg/L CaO	12–200 mg/L $CaCO_3$	20-mm cuvette
1.0–15.0 mg/L Ca	1.4–21.0 mg/L CaO	2.5–37.5 mg/L $CaCO_3$	10-mm cuvette

Expression of results also possible in mmol/L.

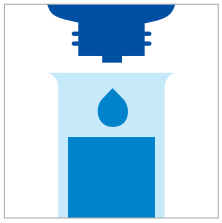
Measuring range: 5–160 mg/L Ca

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

Pipette 0.10 mL of the sample into a test tube.

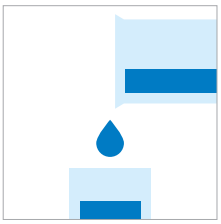
Add 5.0 mL of **Ca-1** with pipette and mix.

Add 4 drops of **Ca-2** and mix.

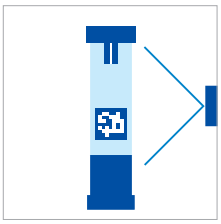


Add 4 drops of **Ca-3** and mix.

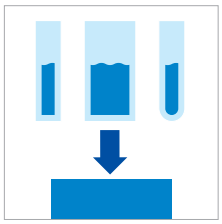
Reaction time: 8 minutes, **measure immediately**.



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector measuring range 5–160 mg/L Ca.



Place the cuvette into the analysis compartment.

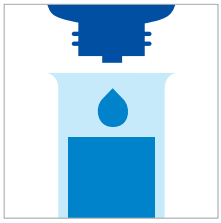
Calcium	114815	Test

Measuring range: 1.0–15.0 mg/L Ca

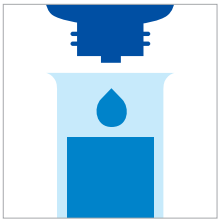
Check the pH of the sample, specified range: pH 4–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 0.50 mL of the sample into a test tube.

Add 5.0 mL of **Ca-1** with pipette and mix.

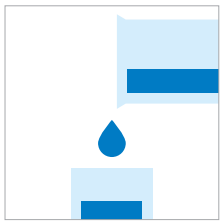


Add 4 drops of **Ca-2** and mix.

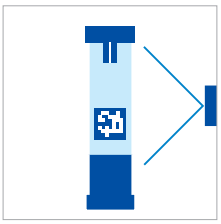


Add 4 drops of **Ca-3** and mix.

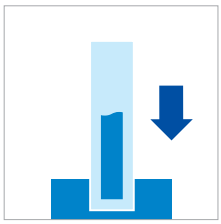
Reaction time: 8 minutes, **measure immediately**.



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector measuring range 1.0–15.0 mg/L Ca.



Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use calcium standard solution Certipur® concentration 1,000 mg/L Ca, can be used after diluting accordingly.

Calcium	**100049**	Test

Measuring range: 0.20–4.00 mg/L Ca 10-mm cuvette
Expression of results also possible in mmol/L.

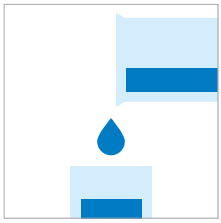
Check the pH of the sample, specified range: pH 3–9. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 5.0 mL of the sample into a test tube.

Add 0.50 mL of **Ca-1** with pipette and mix.

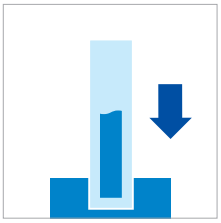
Add 0.50 mL of **Ca-2** with pipette and mix.

Reaction time: 5 minutes



Transfer the solution into a corresponding cuvette.

Select article no. **100049**.



Place the cuvette into the analysis compartment.

Important:
A separate calibration must be made for each batch.
It is recommended to perform a calibration with a blank and 5 standard solutions over the entire measuring range. The calibration should be checked regularly using standard solutions.

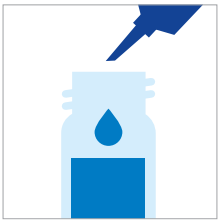
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use calcium standard solution Certipur® concentration 1,000 mg/L Ca, can be used after diluting accordingly.

Chloride	114730	Cell Test

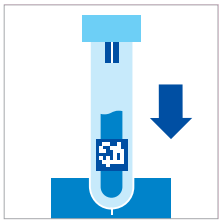
Measuring range: 5–125 mg/L Cl
Expression of results also possible in mmol/L.

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

Pipette 0.50 mL of **Cl-1K** into a reaction cell, close with the screw cap, and mix.



Add 1.0 mL of the sample with pipette, close with the screw cap, and mix.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 and 20 or the Standard solutions for photometric applications.
Ready-to-use chloride standard solution Certipur® concentration 1,000 mg/L Cl^-, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

Chloride	114897	Test

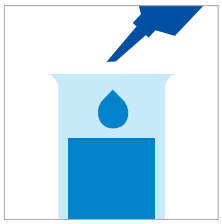
Measuring range: 10–250 mg/L Cl 10-mm cuvette
2.5–25.0 mg/L Cl 10-mm cuvette
Expression of results also possible in mmol/L.

Measuring range: 10–250 mg/L Cl

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

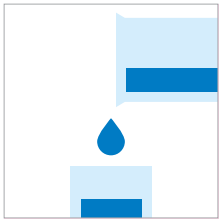
Pipette 1.0 mL of the sample into a test tube.

Add 2.5 mL of **Cl-1** with pipette and mix.

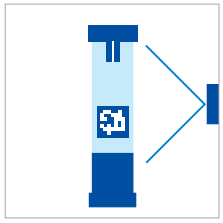


Add 0.50 mL of **Cl-2** with pipette and mix.

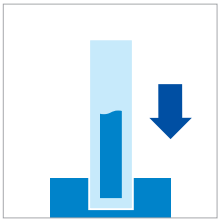
Reaction time: 1 minute



Transfer the solution into a cuvette.



Select method with AutoSelector measuring range 10–250 mg/L Cl.



Place the cuvette into the analysis compartment.

Chloride	114897	Test

Measuring range: 2.5–25.0 mg/L Cl

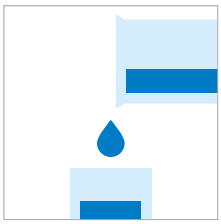
Check the pH of the sample, specified range: pH 1–12. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.

Pipette 5.0 mL of the sample into a test tube.

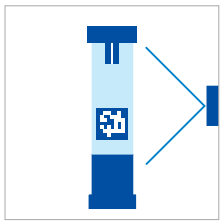
Add 2.5 mL of **CI-1** with pipette and mix.

Add 0.50 mL of **CI-2** with pipette and mix.

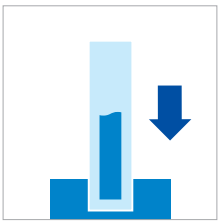
Reaction time: 1 minute



Transfer the solution into a cuvette.



Select method with AutoSelector measuring range 2.5–25.0 mg/L Cl.



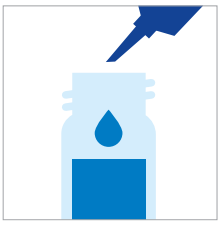
Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 60 or the Standard solutions for photometric applications.
Ready-to-use chloride standard solution Certipur® concentration 1,000 mg/L Cl^-, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 60) is highly recommended.

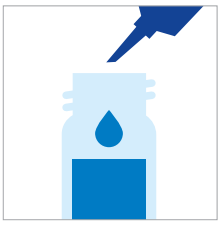
Chloride	101804	Cell Test

Measuring range: 0.5–15.0 mg/L Cl
Expression of results also possible in mmol/L.

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

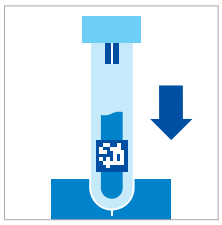


Pipette 10 mL of the sample into a reaction cell, close with the screw cap, and mix.



Add 0.25 mL of **CI-1K** with pipette, close with the screw cap, and mix.

Reaction time:
10 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use chloride standard solution Certipur® concentration 1,000 mg/L Cl^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

Chloride	101807	Test

Measuring range: 0.10–5.00 mg/L Cl 50-mm cuvette
Expression of results also possible in mmol/L.

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

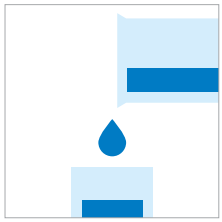
Pipette 0.20 mL each of **Cl-1** into two test tubes.

Add to one tube 10 mL of the sample with pipette and mix.

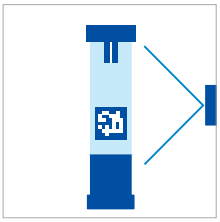
Add to the second tube 10 mL of distilled water (Water for analysis EMSURE® is recommended) with pipette and mix. (Blank)

Reaction time: 10 minutes

Add to each tube 0.20 mL of **Cl-2** with pipette and mix.

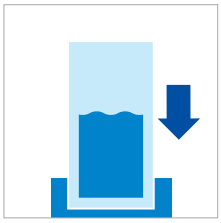


Transfer both solutions into two separate 50-mm cuvettes.



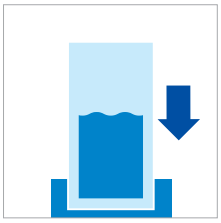
Select method with AutoSelector.

Tap the <Blanks> tab. Activate "Reagent blank" and confirm with "OK"



Place the zero cell into the analysis compartment.

Switch back to <Sample> tab.



Place the cuvette containing the sample into the analysis compartment.

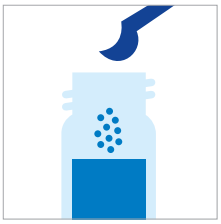
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use chloride standard solution Certipur® concentration 1,000 mg/L Cl^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

Chlorine Determination of Free Chlorine	**100595**	Cell Test

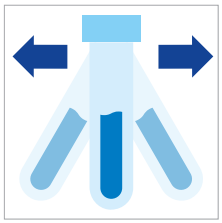
Measuring range: 0.03–6.00 mg/L Cl_2
Expression of results also possible in mmol/L.

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.

Pipette 5.0 mL of the sample into a round cell.

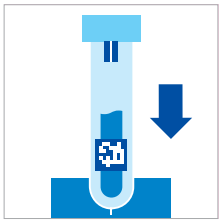


Add 1 level blue micro-spoon of **Cl_2-1**, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 1 minute



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

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

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

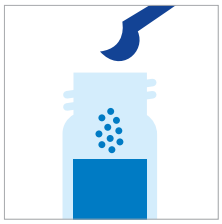
Chlorine Determination of Free Chlorine and Total Chlorine	**100597**	Cell Test

Measuring range: 0.03–6.00 mg/L Cl_2
Expression of results also possible in mmol/L.

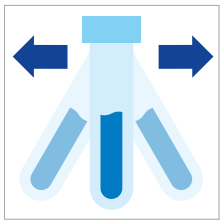
Determination of free chlorine

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.

Pipette 5.0 mL of the sample into a round cell.

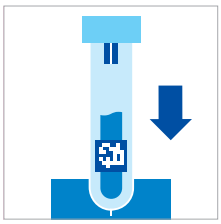


Add 1 level blue micro-spoon of **Cl_2-1**, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 1 minute



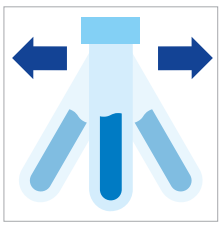
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Determination of total chlorine

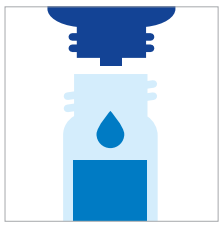
Check the pH of the sample, specified range: pH 4–8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 5.0 mL of the sample into a round cell.

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

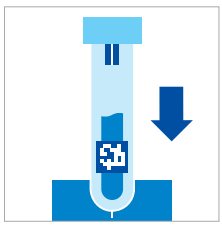


Shake the cell vigorously to dissolve the solid substance.



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

Reaction time: 1 minute



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

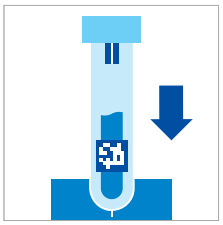
Important:
Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check). After each determination of total chlorine rinse the cell with sulfuric acid 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 solution can be used (see section "Standard solutions").

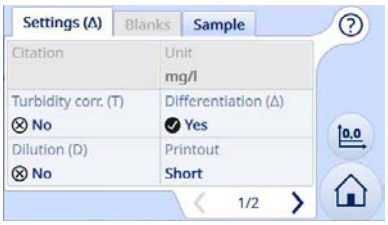
Chlorine Differentiation between Free Chlorine and Total Chlorine	**100597**	Cell Test

Measuring range: 0.03–6.00 mg/L Cl_2

After starting the method it is possible to set the method-specific "Differentiation" mode.
Note: If the aim is to measure **only** free chlorine or total chlorine, the "Differentiation" mode must be deactivated again.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

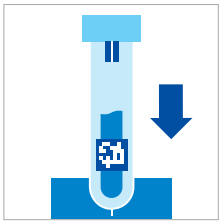


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **free chlorine** (see analytical procedure "Determination of free chlorine" with 100597) = c**ell A**

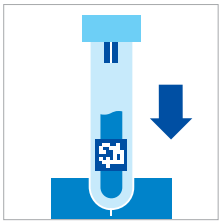
After the reaction time has expired:



Place the **cell A** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Perform determination of **total chlorine** (see analytical procedure "Determination of total chlorine" with 100597) = c**ell B**

After the reaction time has expired:



Place the **cell B** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

The results A (Cl_2 (f)), B (Cl_2 (t)), and C (Cl_2 (b)) are shown in the display in mg/L.

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 solution can be used (see section "Standard solutions").

Chlorine Determination of Free Chlorine	**100598**	Test

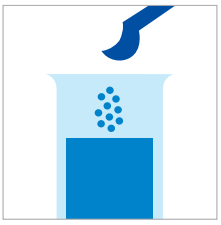
Measuring range:

0.05–6.00 mg/L Cl_2	50-mm cuvette
0.02–3.00 mg/L Cl_2	20-mm cuvette
0.010–1.000 mg/L Cl_2	50-mm cuvette

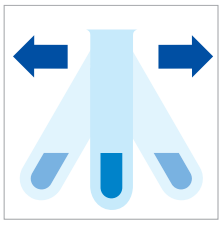
Expression of results also possible in mmol/L.

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.

Pipette 10 mL of the sample into a test tube.

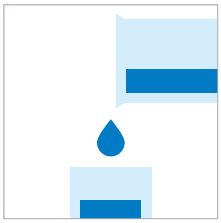


Add 1 level blue micro-spoon of **Cl_2-1**.

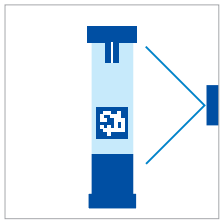


Shake vigorously to dissolve the solid substance.

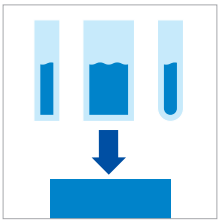
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

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

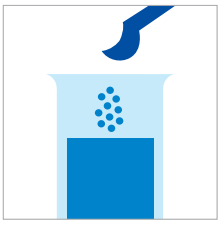
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

Chlorine Determination of Total Chlorine	**100602**	Test

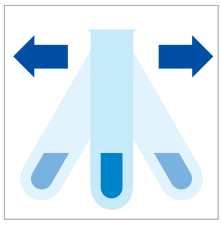
Measuring range: 0.05–6.00 mg/L Cl_2 10-mm cuvette
0.02–3.00 mg/L Cl_2 20-mm cuvette
0.010–1.000 mg/L Cl_2 50-mm cuvette
Expression of results also possible in mmol/L.

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.

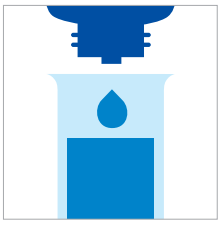
Pipette 10 mL of the sample into a test tube.



Add 1 level blue micro-spoon of **Cl_2-1**.

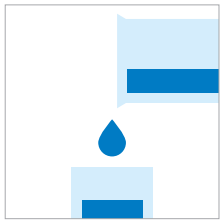


Shake vigorously to dissolve the solid substance.

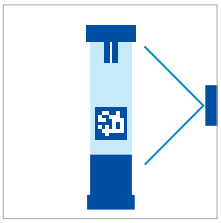


Add 2 drops of **Cl_2-2** and mix.

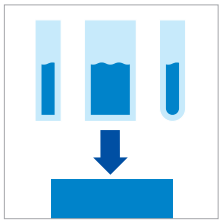
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

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 cuvette 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 can be used (see section "Standard solutions").

Chlorine Determination of Free Chlorine and Total Chlorine	**100599**	Test

Measuring range:

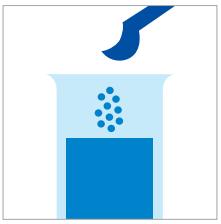
0.05–6.00 mg/L Cl_2	10-mm cuvette
0.02–3.00 mg/L Cl_2	20-mm cuvette
0.010–1.000 mg/L Cl_2	50-mm cuvette

Expression of results also possible in mmol/L.

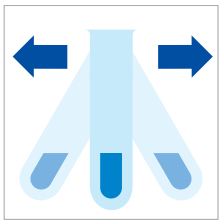
Determination of free chlorine

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.

Pipette 10 mL of the sample into a test tube.

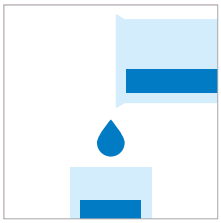


Add 1 level blue micro-spoon of **Cl_2-1**.

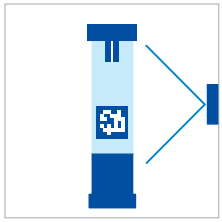


Shake vigorously to dissolve the solid substance.

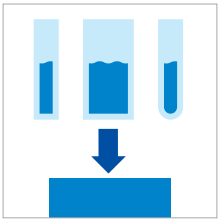
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



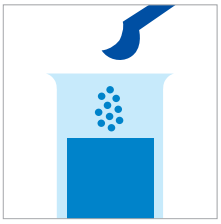
Place the cuvette into the analysis compartment.

Chlorine Determination of Free Chlorine and Total Chlorine	**100599**	Test

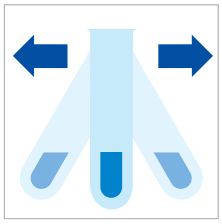
Determination of total chlorine

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.

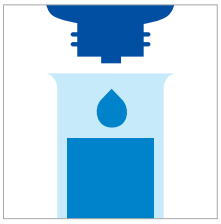
Pipette 10 mL of the sample into a test tube.



Add 1 level blue micro-spoon of **Cl_2-1**.

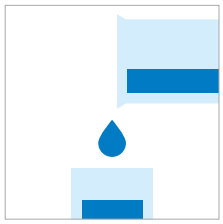


Shake vigorously to dissolve the solid substance.

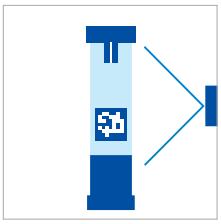


Add 2 drops of **Cl_2-2** and mix.

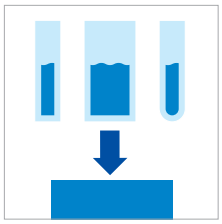
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

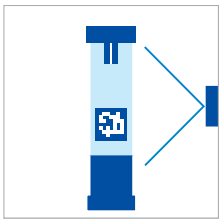
Important:
Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).
After each determination of total chlorine rinse the cuvette with sulfuric 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 solution can be used (see section "Standard solutions").

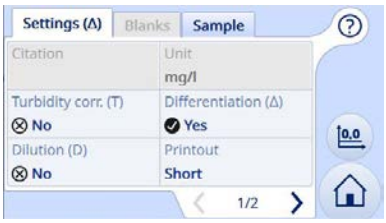
Chlorine Differentiation between Free Chlorine and Total Chlorine	**100599**	Test

Measuring range: 0.05–6.00 mg/L Cl_2 10-mm cuvette
0.02–3.00 mg/L Cl_2 20-mm cuvette
0.010–1.000 mg/L Cl_2 50-mm cuvette

After starting the method it is possible to set the method-specific "Differentiation" mode.
Note: If the aim is to measure **only** free chlorine or total chlorine, the "Differentiation" mode must be deactivated again.



Select method with AutoSelector.

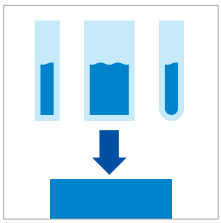


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **free chlorine** (see analytical procedure "Determination of free chlorine" with 100599). = **cuvette A**

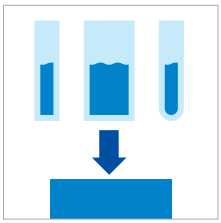
After the reaction time has expired:



Place the cuvette A into the analysis compartment.

Perform determination of **total chlorine** (see analytical procedure "Determination of total chlorine" with 100599). = **cuvette B**

After the reaction time has expired:



Place the cuvette B into the analysis compartment.

The results A (Cl_2 (f)), B (Cl_2 (t)), and C (Cl_2 (b)) are shown in the display in mg/L.

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 cuvette 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 solution can be used (see section "Standard solutions").

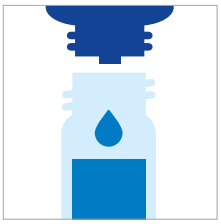
Chlorine (With Liquid Reagents) Determination of Free Chlorine and Total Chlorine	**100086/100087/ 100088/100089**	Cell Test

Measuring range: 0.03–6.00 mg/L Cl_2
Expression of results also possible in mmol/L.

Determination of free chlorine

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.

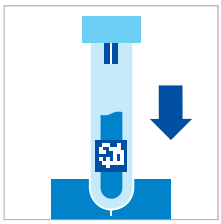
Place 6 drops of **Cl_2-1** into a round cell.



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

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

Reaction time: 1 minute



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Chlorine (With Liquid Reagents)

Determination of Free Chlorine and Total Chlorine

100086/100087/ 100088/100089

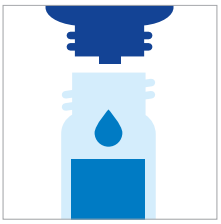
Cell Test

Measuring range: 0.03–6.00 mg/L Cl_2
Expression of results also possible in mmol/L.

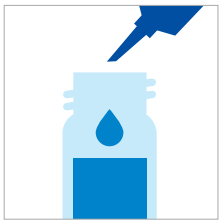
Determination of total chlorine

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.

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

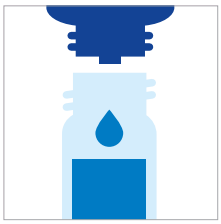


Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

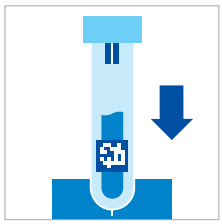


Add 10 mL of the sample with pipette, close with the screw cap, and mix.

Reaction time: 1 minute



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



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

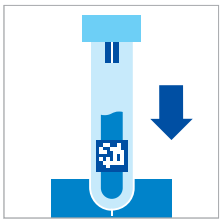
Important:
Very high chlorine concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).
After each determination of total chlorine rinse the cell with sulfuric acid 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 solution can be used (see section "Standard solutions").

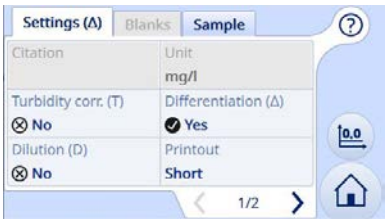
Chlorine (With Liquid Reagents) Differentiation between Free Chlorine and Total Chlorine	**100086/100087/ 100088/100089**	Cell Test

Measuring range: 0.03–6.00 mg/L Cl_2

After starting the method it is possible to set the method-specific "Differentiation" mode.
Note: If the aim is to measure **only** free chlorine or total chlorine, the "Differentiation" mode must be deactivated again.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

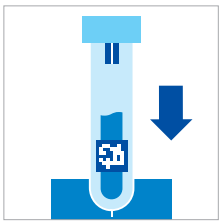


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **free chlorine** (see analytical procedure "Determination of free chlorine" with 100086/ 100087/100088/ 100089) = c**ell A**

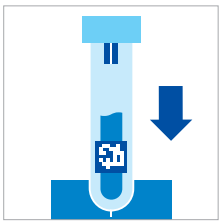
After the reaction time has expired:



Place the **cell A** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Perform determination of **total chlorine** (see analytical procedure "Determination of free chlorine" with 100086/ 100087/100088/ 100089) = c**ell B**

After the reaction time has expired:



Place the **cell B** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

The results A (Cl_2 (f)), B (Cl_2 (t)), and C (Cl_2 (b)) are shown in the display in mg/L.

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.

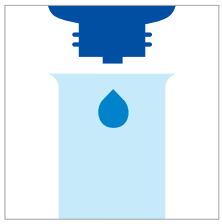
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

Chlorine (With Liquid Reagents) Determination of Free Chlorine and Total Chlorine	**100086/100087/ 100088**	Test

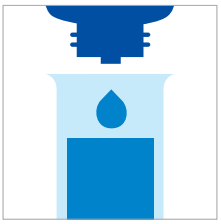
Measuring range: 0.10–1.00 mg/L Cl_2 50-mm cuvette
Expression of results also possible in mmol/L.

Determination of free chlorine

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.



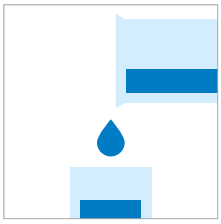
Place 6 drops of **Cl_2-1** into a test tube.



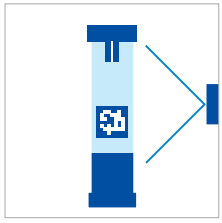
Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

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

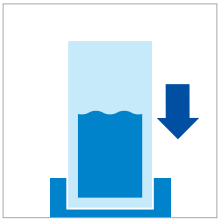
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.

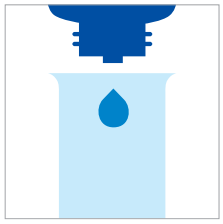


Place the cuvette into the analysis compartment.

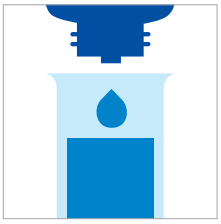
Chlorine (with Liquid Reagents) Detemination of Free Chlorine and Total Chlorine	**100086/100087/ 100088**	Test

Determination of total chlorine

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.



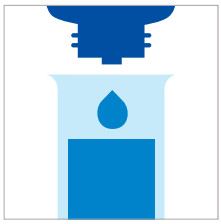
Place 6 drops of **Cl_2-1** into a test tube.



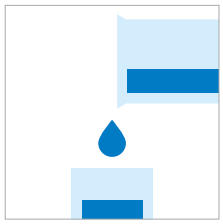
Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

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

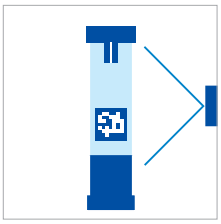
Reaction time: 1 minute



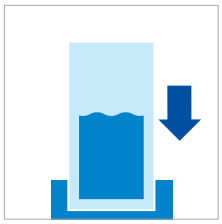
Add 2 drops of **Cl_2-3**, close with the screw cap, and mix.



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

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 cuvette 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 solution can be used (see section "Standard solutions").

Chlorine (With Liquid Reagents)

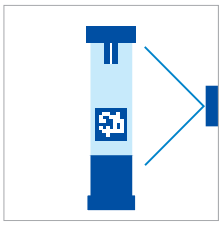
Differentiation between Free Chlorine and Total Chlorine

100086/100087/ 100088/100089

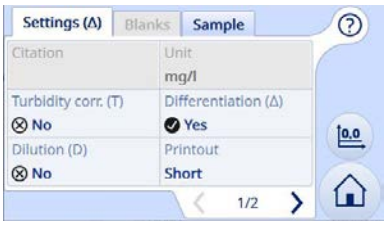
Test

Measuring range: 0.10–1.00 mg/L Cl_2 50-mm cuvette

After starting the method it is possible to set the method-specific "Differentiation" mode.
Note: If the aim is to measure **only** free chlorine or total chlorine, the "Differentiation" mode must be deactivated again.



Select method with AutoSelector.

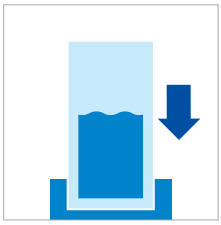


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **free chlorine** (see analytical procedure "Determination of free chlorine" with 100086/100087/100088). = **cuvette A**

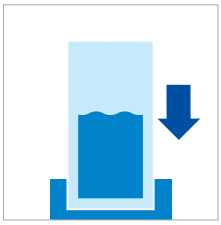
After the reaction time has expired:



Place the **cuvette A** into the analysis compartment.

Perform determination of **total chlorine** (see analytical procedure "Determination of total chlorine" with 100086/100087/100088). = **cuvette B**

After the reaction time has expired:



Place the **cuvette B** into the analysis compartment.

The results A (Cl_2 (f)), B (Cl_2 (t)), and C (Cl_2 (b)) are shown in the display in mg/L.

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 cuvette 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 solution can be used (see section "Standard solutions").

Chlorine Dioxide | 100608 | Test

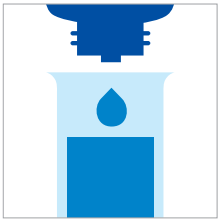
Measuring range:

0.10–10.00 mg/L ClO_2	10-mm cuvette
0.05–5.00 mg/L ClO_2	20-mm cuvette
0.020–2.000 mg/L ClO_2	50-mm cuvette

Expression of results also possible in mmol/L.

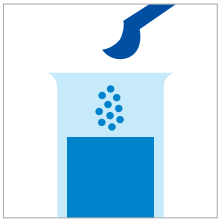
Check the pH of the sample, specified range: pH 4–8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 10 mL of the sample into a test tube.

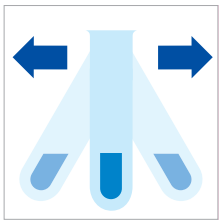


Add 2 drops of **ClO_2-1** and mix.

Reaction time: 2 minutes

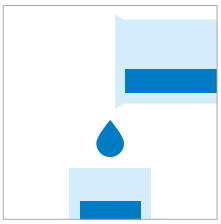


Add 1 level blue microspoon of **ClO_2-2**.

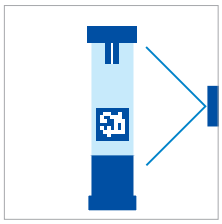


Shake vigorously to dissolve the solid substance.

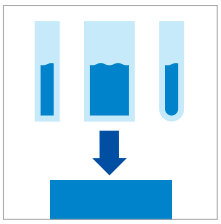
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

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

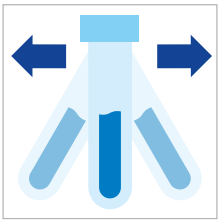
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

Chromate Determination of Chromium (VI)	**114552**	Cell Test

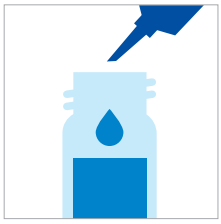
Measuring range: 0.05–2.00 mg/L Cr
0.11–4.46 mg/L CrO_4
Expression of results also possible in mmol/L.

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

Add 6 drops of **Cr-3K** into a reaction cell, close with the screw cap.

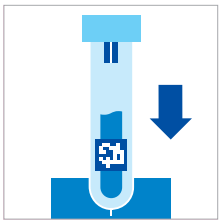


Shake the cell vigorously to dissolve the solid substance and leave to stand for **1 minute**.



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

Reaction time: 1 minute



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

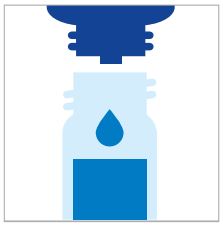
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use chromate standard solution Certipur® concentration 1,000 mg/L CrO_4^{2-}, can be used after diluting accordingly as well as the Standard solution for photometric applications.

Chromate Determination of Total Chromium = Sum of Chromium (VI) and Chromium (III)	**114552**	Cell Test

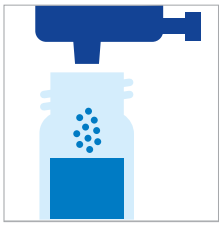
Measuring range: 0.05–2.00 mg/L Cr
0.11–4.46 mg/L CrO_4
Expression of results also possible in mmol/L.

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

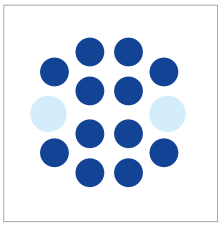
Pipette 10 mL of the sample into an empty round cell.



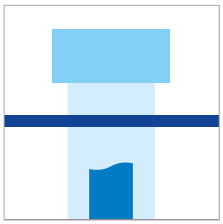
Add 1 drop of **Cr-1K**, close with the screw cap, and mix.



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

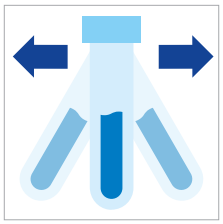


Heat the cell in the thermoreactor at 120 °C for 1 hour.



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

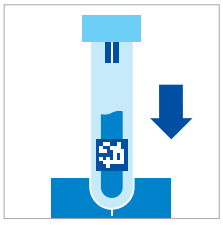
Add 6 drops of **Cr-3K** into a reaction cell, close the cell with the screw cap.



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

Add 5.0 mL of the **pretreated sample** with pipette, close with the screw cap, and mix.

Reaction time: 1 minute



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

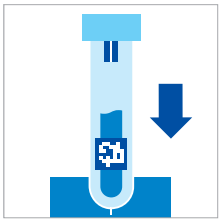
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use chromate standard solution Certipur® concentration 1,000 mg/L CrO_4^{2-}, can be used after diluting accordingly as well as the Standard solution for photometric applications.

Chromate Differentiation between Chromium (VI) and Chromium (III)	**114552**	Cell Test

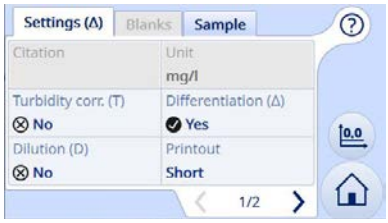
Measuring range: 0.05–2.00 mg/L Cr
0.11–4.46 mg/L CrO_4

If the aim is to differentiate between chromium (VI) and chromium (III), after starting the method it is possible to set the method-specific "Differentiation" mode.

Note: If no differentiation is to be measured, the "Differentiation" mode must be deactivated again.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

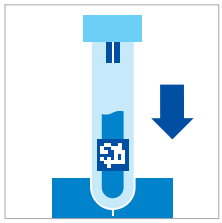


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **total chromium** (see analytical procedure "Determination of total chromium" with 114552) = c**ell A**

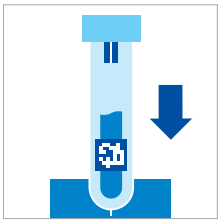
After the reaction time has expired:



Place the **cell A** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Perform determination of **chromium (VI)** (see analytical procedure "Determination of chromium (VI)" with 114552) = c**ell B**

After the reaction time has expired:



Place the **cell B** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

The results A (Σ Cr), B (Cr (VI)), and C (Cr (III)) are shown in the display in mg/L.

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

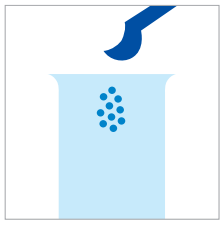
Chromate Determination of Chromium (VI)	**114758**	Test

Measuring range:

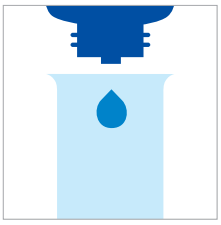
0.05–3.00 mg/L Cr	0.11–6.69 mg/L CrO_4	10-mm cuvette
0.03–1.50 mg/L Cr	0.07–3.35 mg/L CrO_4	20-mm cuvette
0.010–0.600 mg/L Cr	0.02–1.34 mg/L CrO_4	50-mm cuvette

Expression of results also possible in mmol/L.

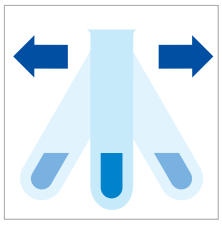
Check the pH of the sample, specified range: pH 1–9. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Place 1 level grey micro-spoon of **Cr-1** into a dry test tube.



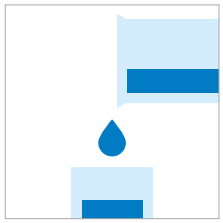
Add 6 drops of **Cr-2**.



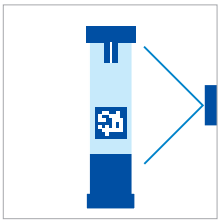
Shake the test tube vigorously to dissolve the solid substance.

Add 5.0 mL of the sample with pipette and mix.

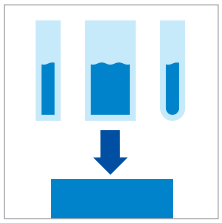
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
For the determination of **total chromium = sum of chromium (VI) and chromium (III)** a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of chromium (Σ Cr).
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

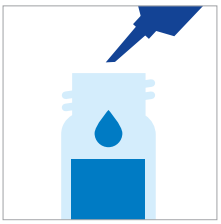
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use chromate standard solution Certipur® concentration 1,000 mg/L CrO_4^{2-}, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

Cobalt	117244	Cell Test

Measuring range: 0.05–2.00 mg/L Co
Expression of results also possible in mmol/L.

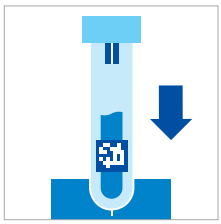
Check the pH of the sample, specified range: pH 2.5–7.5. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.

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



Add 0.5 mL of **Co-1K** with pipette, close with the screw cap, and mix.

Reaction time:
10 minutes

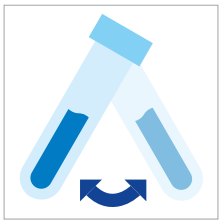


Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

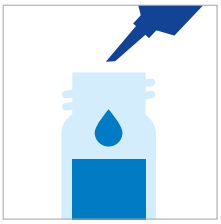
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use cobalt standard solution Certipur®, concentration 1,000 mg/L Co, can be used after diluting accordingly.

COD Chemical Oxygen Demand	**114560**	Cell Test

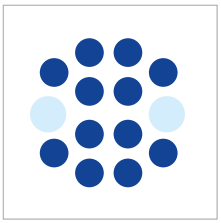
Measuring range: 4.0–40.0 mg/L COD or O_2
Expression of results also possible in mmol/L.



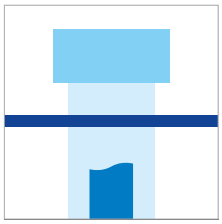
Suspend the bottom sediment in the cell by swirling.



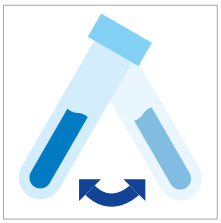
Carefully pipette 3.0 mL of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!



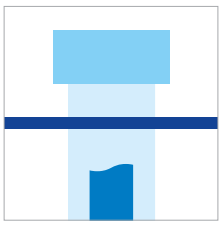
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



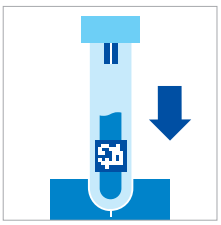
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



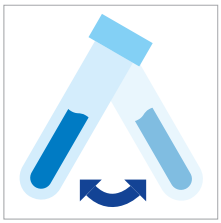
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50 or the Standard solution for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

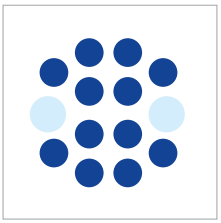
COD Chemical Oxygen Demand	**101796**	Cell Test

Measuring range: 5.0–80.0 mg/L COD or O_2
Expression of results also possible in mmol/L.



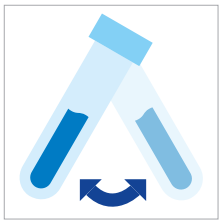
Suspend the bottom sediment in the cell by swirling.

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

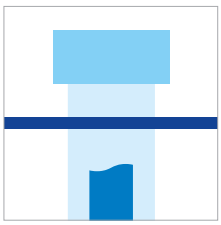


Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.

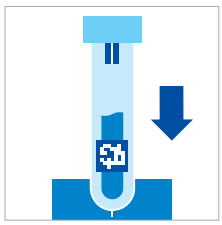
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



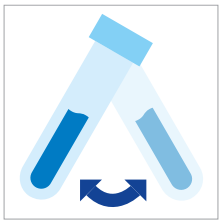
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

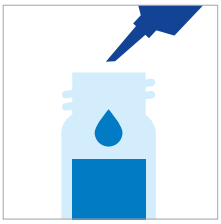
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50 or the Standard solution for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

COD Chemical Oxygen Demand	**114540**	Cell Test

Measuring range: 10–150 mg/L COD or O_2
Expression of results also possible in mmol/L.



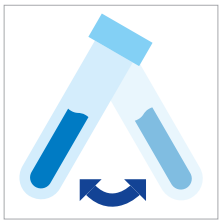
Suspend the bottom sediment in the cell by swirling.



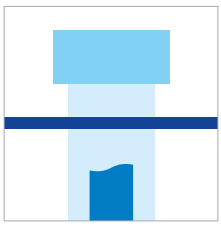
Carefully pipette 3.0 mL of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!

Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.

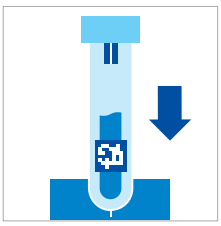
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



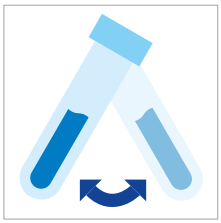
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 or the Standard solution for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

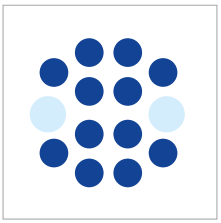
COD Chemical Oxygen Demand	**114895**	Cell Test

Measuring range: 15–300 mg/L COD or O_2
Expression of results also possible in mmol/L.



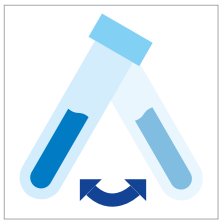
Suspend the bottom sediment in the cell by swirling.

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

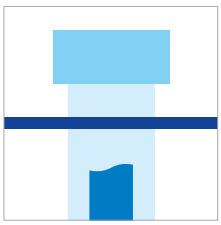


Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.

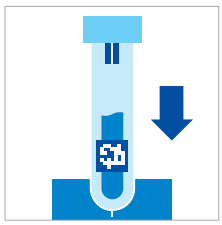
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



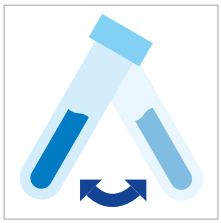
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

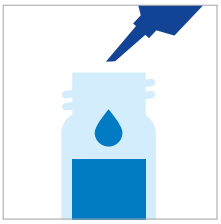
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 60 or the Standard solutions for photometric applications .
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 60) is highly recommended.

COD Chemical Oxygen Demand	**114690**	Cell Test

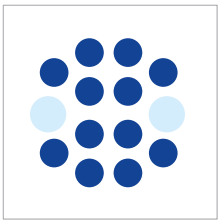
Measuring range: 50–500 mg/L COD or O_2
Expression of results also possible in mmol/L.



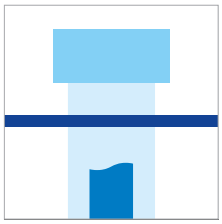
Suspend the bottom sediment in the cell by swirling.



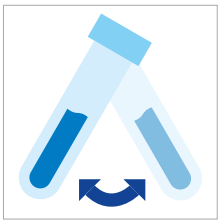
Carefully pipette 2.0 mL of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!



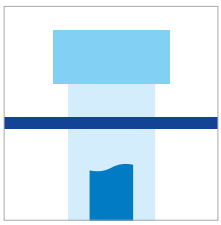
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



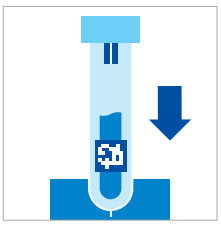
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



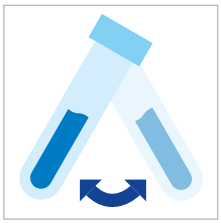
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 60 or the Standard solutions for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 60) is highly recommended.

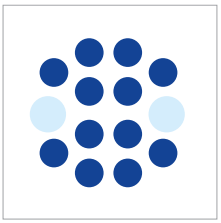
COD Chemical Oxygen Demand	**114541**	Cell Test

Measuring range: 25–1,500 mg/L COD or O_2
Expression of results also possible in mmol/L.



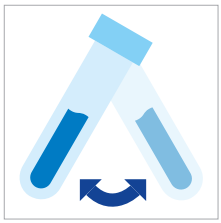
Suspend the bottom sediment in the cell by swirling.

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

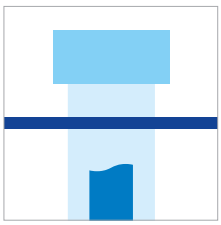


Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.

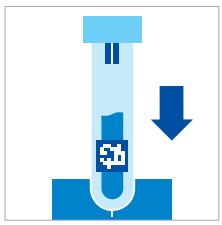
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



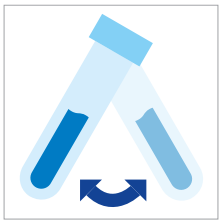
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

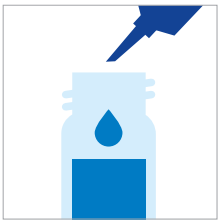
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 or the Standard solutions for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

COD Chemical Oxygen Demand	**114691**	Cell Test

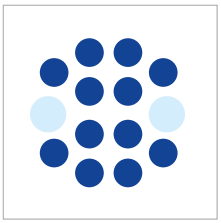
Measuring range: 300–3,500 mg/L COD or O_2
Expression of results also possible in mmol/L.



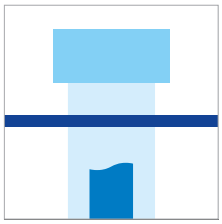
Suspend the bottom sediment in the cell by swirling.



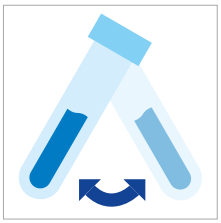
Carefully pipette 2.0 mL of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!



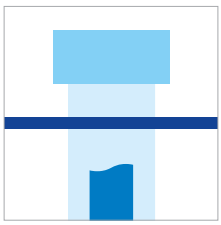
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



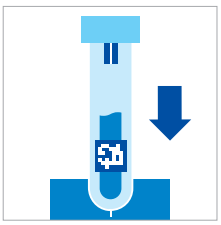
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



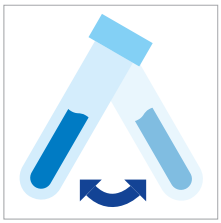
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 80 or the Standard solutions for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 80) is highly recommended.

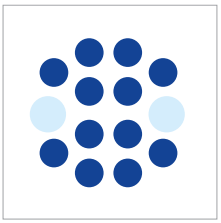
COD Chemical Oxygen Demand	**114555**	Cell Test

Measuring range: 500–10,000 mg/L COD or O_2
Expression of results also possible in mmol/L.



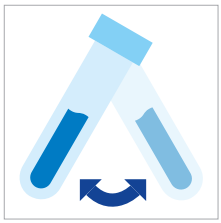
Suspend the bottom sediment in the cell by swirling.

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

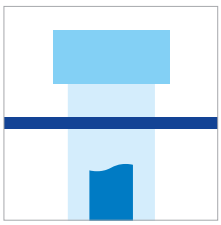


Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.

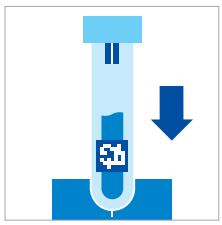
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



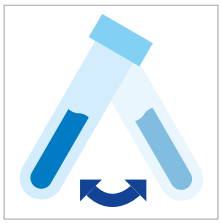
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

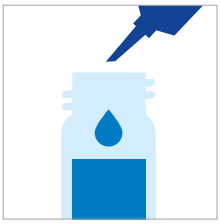
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 70 or the Standard solutions for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

COD Chemical Oxygen Demand	**101797**	Cell Test

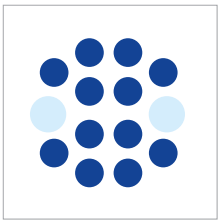
Measuring range: 5,000–90,000 mg/L COD or O_2
Expression of results also possible in mmol/L.



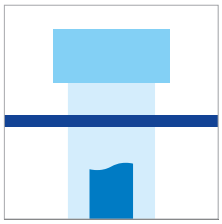
Suspend the bottom sediment in the cell by swirling.



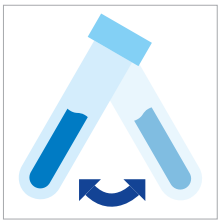
Carefully pipette 0.10 mL of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!



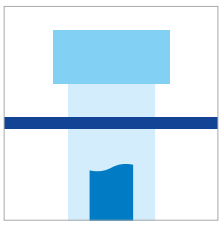
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



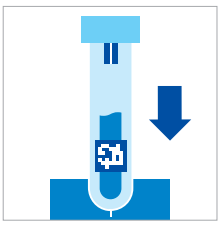
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



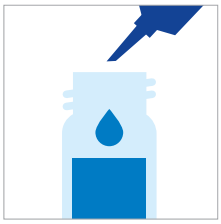
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use the Standard solutions for photometric applications.

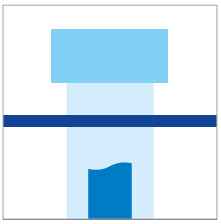
COD (Hg-Free) Chemical Oxygen Demand	**109772**	Cell Test

Measuring range: 10–150 mg/L COD or O_2
Expression of results also possible in mmol/L.

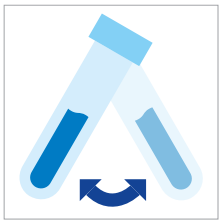


Carefully pipette 2.0 mL of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!

Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.

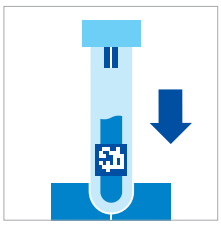


Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.

Replace the cell in the rack for complete cooling to room temperature.
Very important!



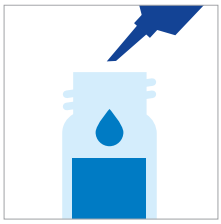
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

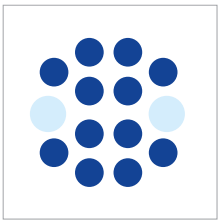
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use the Standard solutions for photometric applications.

COD (Hg-Free) Chemical Oxygen Demand	**109773**	Cell Test

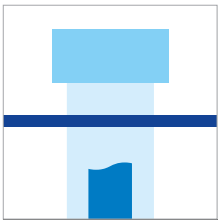
Measuring range: 100–1,500 mg/L COD or O_2
Expression of results also possible in mmol/L.



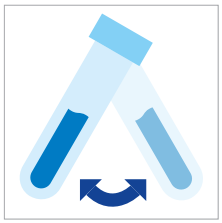
Carefully pipette 2.0 mL of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!



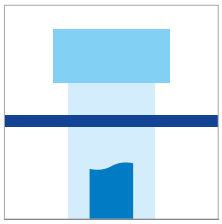
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



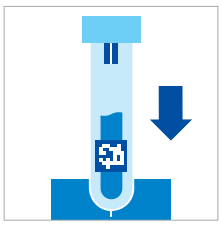
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



Replace the cell in the rack for complete cooling to room temperature.
Very important!



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

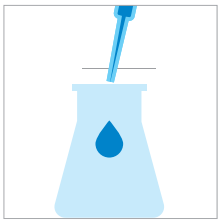
Note:
To increase the accuracy is recommended to measure against an own prepared blank sample (reaction cell + COD-free water).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use the Standard solutions for photometric applications.

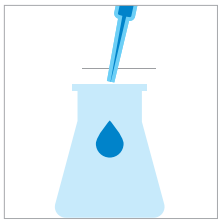
COD Chemical Oxygen Demand for Seawater/High Chloride Contents	**117058**	Cell Test

Measuring range: 5.0–60.0 mg/L COD or O_2
Expression of results also possible in mmol/L.

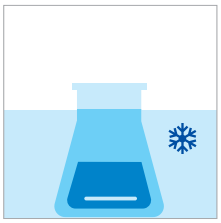
Chloride depletion:



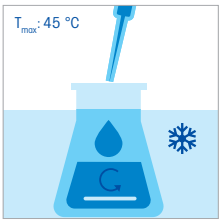
Pipette with glass pipette 20 mL of the sample into a 300-mL Erlenmeyer flask with NS 29/32.



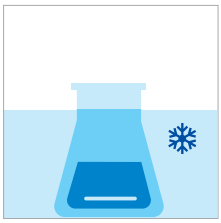
Pipette with glass pipette 20 mL of distilled water (Water for chromatography LiChrosolv® is recommended) into a second 300-mL Erlenmeyer flask with NS 29/32.



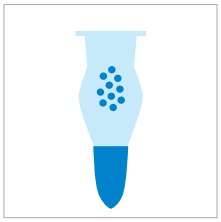
Add to each a magnetic stirring rod, and cool in the ice bath.



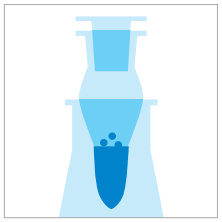
Add **slowly** to each Erlenmeyer flask 25 mL of **Sulfuric acid for the determination of COD** with glass pipette **under cooling and stirring**.



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

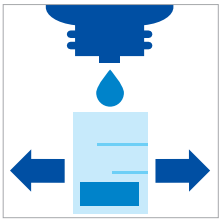


Fill 6–7 g each of **Sodalime with indicator** into two absorption tubes.



Close the absorption tubes with the glass stoppers, and attach to the top of the Erlenmeyer flasks.

Stir at 250 rpm for 2 h at room temperature: depleted sample/ depleted blank

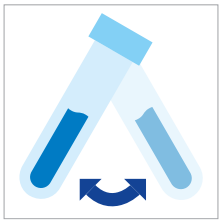


Check the chloride content of the depleted sample using MQuant® Chloride Test according to the application: Specified value <2,000 mg/L Cl^-.

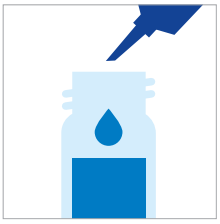
Chloride determination (acc. the application instructions—abridged version):
Fill 5.0 mL of sodium hydroxide solution 2 mol/L into the test vessel of the MQuant® Chloride Test.
Carefully allow to run from the pipette 0.5 mL of depleted sample down the inside of the tilted test vessel onto the sodium hydroxide solution and mix (**Wear eye protection! The cell becomes hot!**).
Add 2 drops of reagent Cl-1 and swirl. The sample directly turns yellow in color. (Reagent Cl-2 is not required.)
Holding the reagent bottle vertically, slowly add reagent Cl-3 dropwise to the sample while swirling until its color changes from yellow to blue-violet. Shortly before the color changes, wait a few seconds after adding each drop.
Result in mg/L chloride = number of drops × 250

COD Chemical Oxygen Demand for Seawater/High Chloride Contents	**117058**	Cell Test

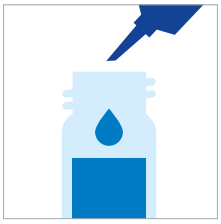
Determination:



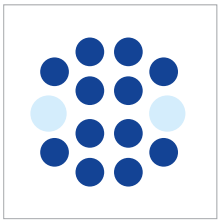
Suspend the bottom sediment in two cells by swirling.



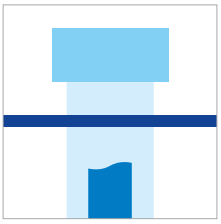
Carefully pipette 5.0 mL of the **depleted sample** into a reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!



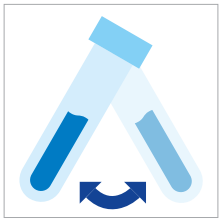
Carefully pipette 5.0 mL of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!
(Blank cell)



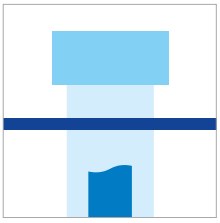
Heat both cells in the thermoreactor at 148 °C for 2 hours.



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

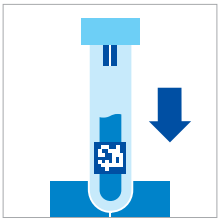


Swirl both cells after 10 minutes.



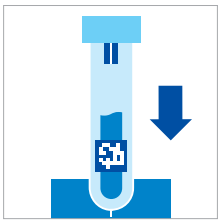
Replace both cells in the rack for complete cooling to room temperature. **Very important!**

Tap the <Blanks> tab. Activate "Reagent blank" and confirm with "OK".



Place the zero cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Switch back to <Sample> tab.



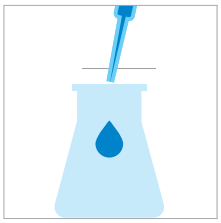
Place the cell containing the sample into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a COD/chloride standard solution must be prepared from Potassium hydrogen phthalate, and Sodium chloride (see section "Standard solutions").

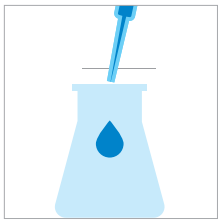
COD Chemical Oxygen Demand for Seawater/High Chloride Contents	**117059**	Cell Test

Measuring range: 50–3,000 mg/L COD or O_2
Expression of results also possible in mmol/L.

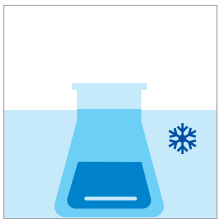
Chloride depletion:



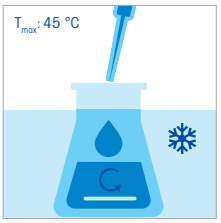
Pipette with glass pipette 20 mL of the sample into a 300-mL Erlenmeyer flask with NS 29/32.



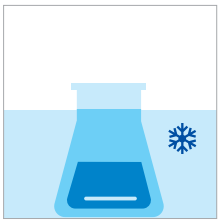
Pipette with glass pipette 20 mL of distilled water (Water for chromatography LiChrosolv® is recommended) into a second 300-mL Erlenmeyer flask with NS 29/32.



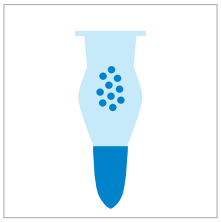
Add to each a magnetic stirring rod, and cool in the ice bath.



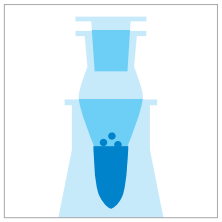
Add **slowly** to each Erlenmeyer flask 25 mL of **Sulfuric acid for the determination of COD** with glass pipette **under cooling and stirring**.



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

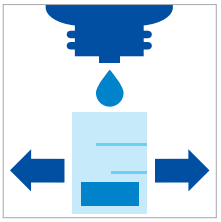


Fill 6–7 g each of **Sodalime with indicator** into two absorption tubes.



Close the absorption tubes with the glass stoppers, and attach to the top of the Erlenmeyer flasks.

Stir at 250 rpm for 2 h at room temperature: depleted sample/ depleted blank

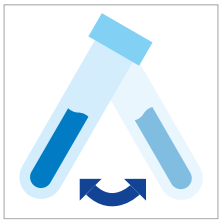


Check the chloride content of the depleted sample using MQuant® Chloride Test according to the application (see the website): specified value < 250 mg/L Cl^-.

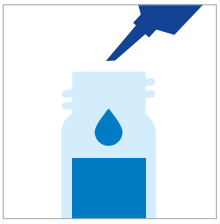
Chloride determination (acc. the application instructions—abridged version):
Fill 5.0 mL of sodium hydroxide solution 2 mol/L into the test vessel of the MQuant® Chloride Test.
Carefully allow to run from the pipette 0.5 mL of depleted sample down the inside of the tilted test vessel onto the sodium hydroxide solution and mix (**Wear eye protection! The cell becomes hot!**).
Add 2 drops of reagent Cl-1 and swirl. The sample directly turns yellow in color. (Reagent Cl-2 is not required.)
Holding the reagent bottle vertically, slowly add reagent Cl-3 dropwise to the sample while swirling until its color changes from yellow to blue-violet. Shortly before the color changes, wait a few seconds after adding each drop.
Result in mg/L chloride = number of drops × 250

COD Chemical Oxygen Demand for Seawater/High Chloride Contents	**117059**	Cell Test

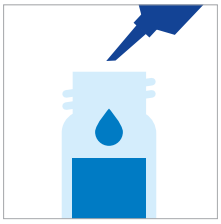
Determination:



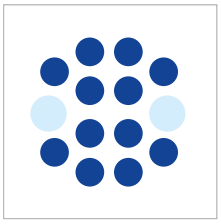
Suspend the bottom sediment in two cells by swirling.



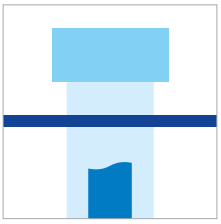
Carefully pipette 3.0 mL of the **depleted sample** into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



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



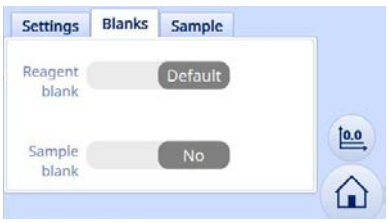
Heat both cells in the thermoreactor at 148 °C for 2 hours.



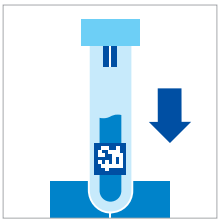
Remove both cells from the thermoreactor and place in a test-tube rack to cool.

Swirl both cells after 10 minutes.

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

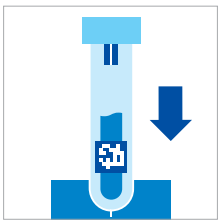


Tap the <Blanks> tab. Activate "Reagent blank" and confirm with "OK".



Place the zero cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Switch back to <Sample> tab.



Place the cell containing the sample into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

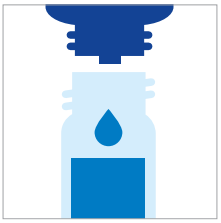
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a COD/chloride standard solution must be prepared from Potassium hydrogen phthalate, and Sodium chloride (see section "Standard solutions").

Copper	114553	Cell Test

Measuring range: 0.05–8.00 mg/L Cu
Expression of results also possible in mmol/L.

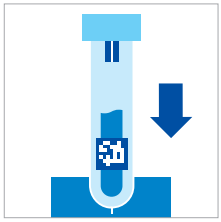
Check the pH of the sample, specified range: pH 4–10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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



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

Reaction time:
5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Important:
Very high copper concentrations in the sample produce turquoise-colored solutions (measurement solution should be blue) and false-low readings are yielded.
In such cases the sample must be diluted (plausibility check).
For the determination of **total copper** a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of copper (Σ Cu).

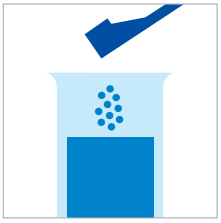
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90.
Ready-to-use copper standard solution Certipur® concentration 1,000 mg/L Cu, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

Copper	114767	Test

Measuring range: 0.10–6.00 mg/L Cu 10-mm cuvette
0.05–3.00 mg/L Cu 20-mm cuvette
0.02–1.20 mg/L Cu 50-mm cuvette
Expression of results also possible in mmol/L.

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

Pipette 5.0 mL of the sample into a test tube.

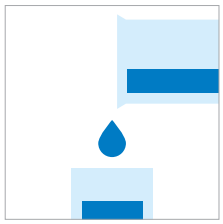


Add 1 green dosing spoon of **Cu-1** and dissolve the solid substance.

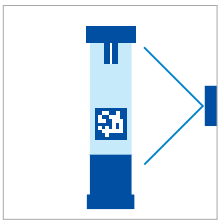
Check the pH, specified range: pH 7.0–9.5. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

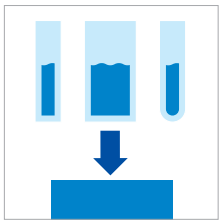
Reaction time:
5 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
Very high copper concentrations in the sample produce turquoise-colored solutions (measurement solution should be blue) and false-low readings are yielded.
In such cases the sample must be diluted (plausibility check).
For the determination of **total copper** a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of copper (Σ Cu).
To measure in the 50-mm cuvette, only the sample volume has to be doubled.

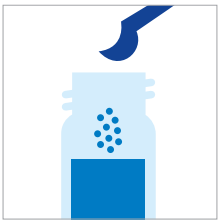
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90.
Ready-to-use copper standard solution Certipur® concentration 1,000 mg/L Cu, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

Cyanide Determination of Free Cyanide	**102531**	Cell Test

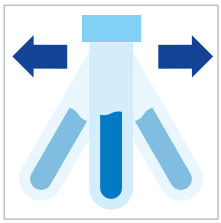
Measuring range: 0.010–0.500 mg/L CN
Expression of results also possible in mmol/L and cyanide free [CN (f)].

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

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

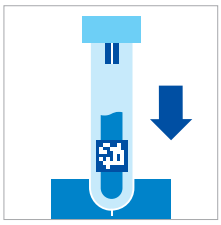


Add 1 level blue micro-spoon of **CN-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 10 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

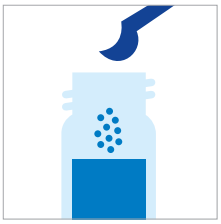
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur® concentration 1,000 mg/L CN^-, can be used after diluting accordingly.

Cyanide Determination of Free Cyanide	**114561**	Cell Test

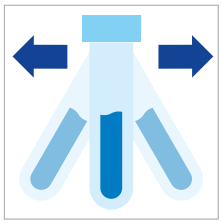
Measuring range: 0.010–0.500 mg/L CN
Expression of results also possible in mmol/L and cyanide free [CN (f)].

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

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

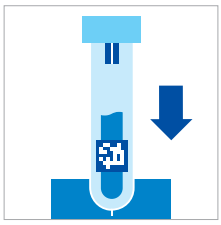


Add 1 level blue micro-spoon of **CN-3K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 10 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

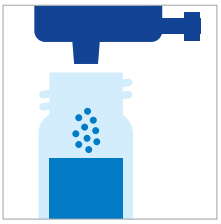
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur® concentration 1,000 mg/L CN^-, can be used after diluting accordingly.

Cyanide Determination of Readily Liberated Cyanide	**114561**	Cell Test

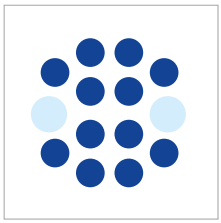
Measuring range: 0.010–0.500 mg/L CN
Expression of results also possible in mmol/L and cyanide readily liberated [CN (v)].

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

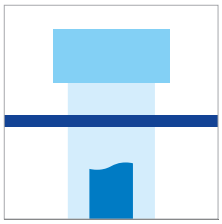
Pipette 10 mL of the sample into an empty round cell.



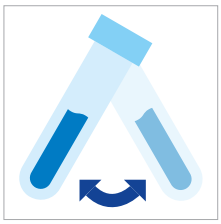
Add 1 dose of **CN-1K** using the green dose-metering cap, close the cell with the screw cap.



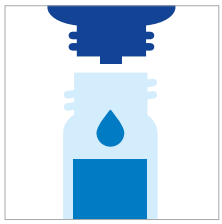
Heat the cell in the thermoreactor at 120 °C for 30 minutes.



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

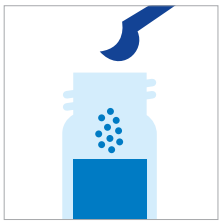


Swirl the cell before opening.

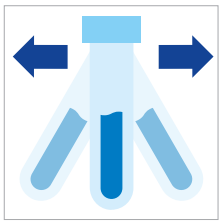


Add 3 drops of **CN-2K**, close with the screw cap, and mix: pretreated sample.

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

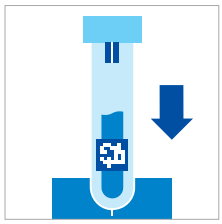


Add 1 level blue micro-spoon of **CN-3K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
10 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

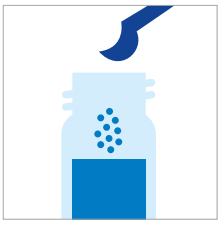
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur® concentration 1,000 mg/L CN^-, can be used after diluting accordingly.

Cyanide Determination of Free Cyanide	**109701**	Test

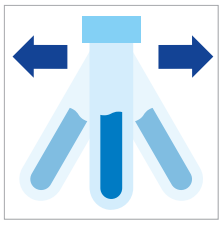
Measuring range: 0.010–0.500 mg/L CN 10-mm cuvette
0.005–0.250 mg/L CN 20-mm cuvette
0.0020–0.1000 mg/L CN 50-mm cuvette
Expression of results also possible in mmol/L and cyanide free [CN (f)].

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

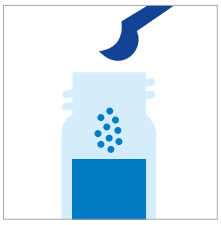
Pipette 5.0 mL of the sample into an empty round cell.



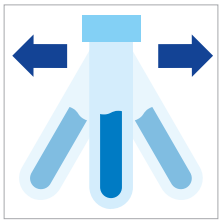
Add 1 level green microspoon of **CN-3**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

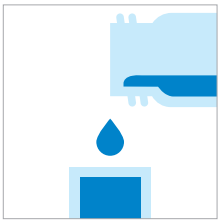


Add 1 level blue microspoon of **CN-4**, close the cell with the screw cap.

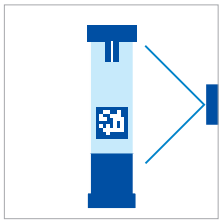


Shake the cell vigorously to dissolve the solid substance.

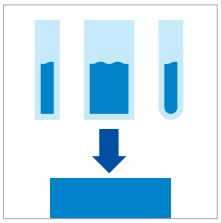
Reaction time:
10 minutes



Transfer the solution into a corresponding rectangular cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Note:
Empty cells with screw caps are recommended for the preparation. These cells can be sealed with the screw caps, thus preventing any gas losses.

Important:
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents CN-3 and CN-4 have to be doubled for each.

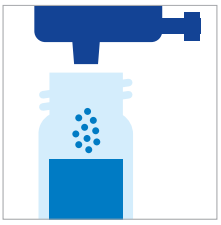
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur® concentration 1,000 mg/L CN^-, can be used after diluting accordingly.

Cyanide Determination of Readily Liberated Cyanide	**109701**	Test

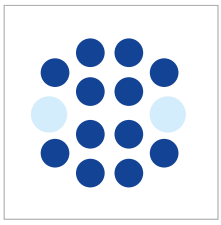
Measuring range: 0.010–0.500 mg/L CN 10-mm cuvette
0.005–0.250 mg/L CN 20-mm cuvette
0.0020–0.1000 mg/L CN 50-mm cuvette
Expression of results also possible in mmol/L and cyanide readily liberated [CN (v)].

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

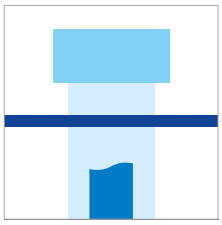
Add 10 mL of the sample into an empty round cell (Empty cells, Cat. No. 114724).



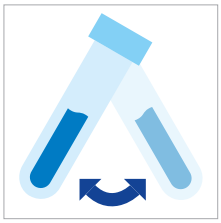
Add 1 dose of **CN-1** using the green dose-metering cap, close the cell with the screw cap.



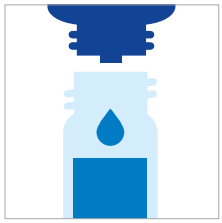
Heat the cell in the thermoreactor at 120 °C for 30 minutes.



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

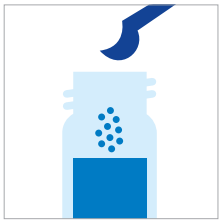


Swirl the cell before opening.

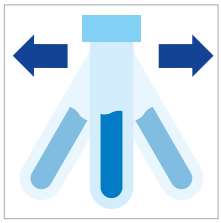


Add 3 drops of **CN-2**, close with the scew cap, and mix: **pretreated sample**.

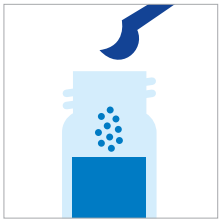
Pipette 5.0 mL of the **pretreated sample** into an empty round cell.



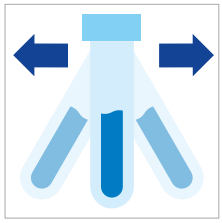
Add 1 level green microspoon of **CN-3**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

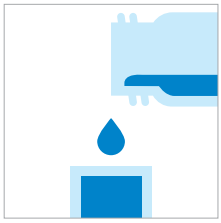


Add 1 level blue micro-spoon of **CN-4**, close the cell with the screw cap.

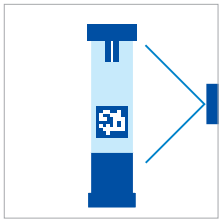


Shake the cell vigorously to dissolve the solid substance.

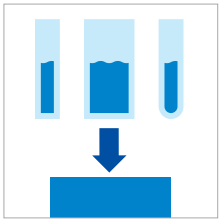
Reaction time:
10 minutes



Transfer the solution into a corresponding rectangular cuvette.



Select method with AutoSelector.



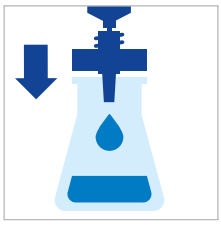
Place the cuvette into the analysis compartment.

Important:
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents CN-3 and CN-4 have to be doubled for each.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use cyanide standard solution Certipur® concentration 1,000 mg/L CN^-, can be used after diluting accordingly.

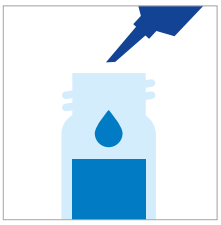
Cyanuric Acid	119253	Test

Measuring range: 2–160 mg/L cyanuric acid 20-mm cuvette
Expression of results also possible in mmol/L.



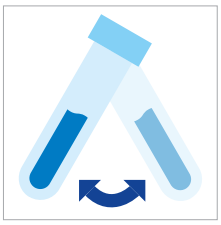
Filter turbid samples.

Pipette 5.0 mL of the sample into an empty test tube (e.g. flat-bottomed tubes).

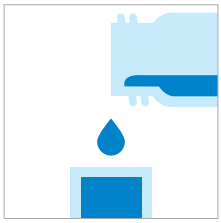


Add **5.0 mL of distilled water** (Water for analysis EMSURE® is recommended) with pipette, close with the screw cap, and mix.

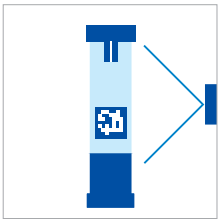
Add 1 **reagent tablet Cyanuric Acid**, crush with stirring rod, and close with the screw cap.



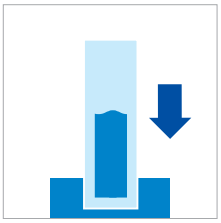
Swirl the cell to dissolve the solid substance.



Transfer the solution into a rectangular cuvette.



Select method with AutoSelector.



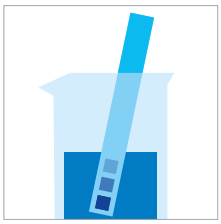
Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a cyanuric acid standard solution must be prepared from Cyanuric acid (see section "Standard solutions").

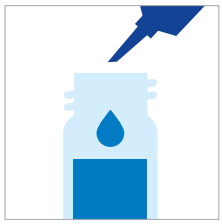
Fluoride	100809	Cell Test

Measuring range: 0.10–1.80 mg/L F Round cell
0.025–0.500 mg/L F 50-mm cuvette
Expression of results also possible in mmol/L.

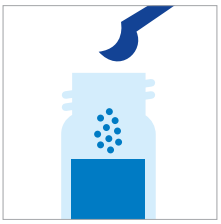
Measuring range: 0.10–1.80 mg/L F



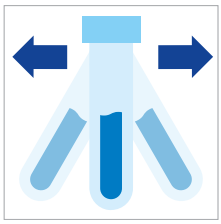
Check the pH of the sample, specified range: pH 3–8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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

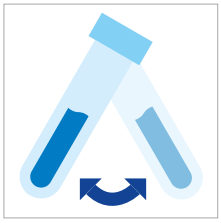


Add 1 level blue microspoon of **F-1K**, close the cell with the screw cap.

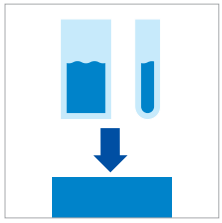


Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Swirl the cell before measurement.



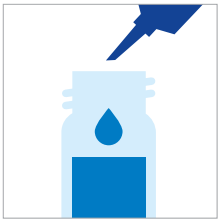
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Fluoride	100809	Cell Test

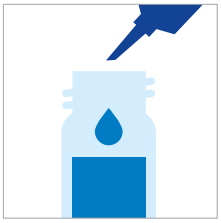
Measuring range: 0.025–0.500 mg/L F

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

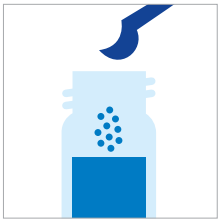
Select article no. **100809**.



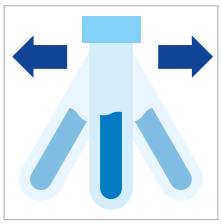
Pipette 10 mL of the sample into a reaction cell, close with the screw cap, and mix.



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

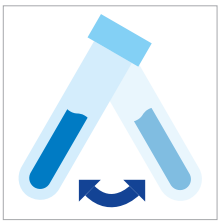


Add 1 level blue microspoon of **F-1K** to each cell, close with the screw cap.

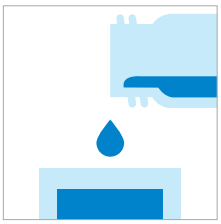


Shake both cells vigorously to dissolve the solid substance.

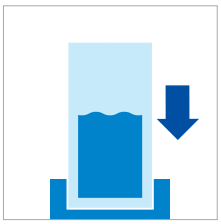
Reaction time: 15 minutes



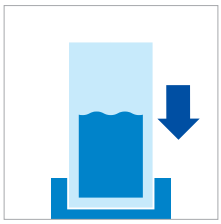
Swirl the cells.



Transfer both solutions into two separate 50-mm cuvettes.



Place the blank zero into the analysis compartment.



Place the cuvettes containing the sample into the analysis compartment.

Important:
Very high fluoride concentrations in the sample produce brown-colored solutions (measurement solution should be violet) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

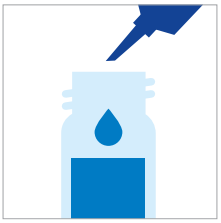
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur® concentration 1,000 mg/L F^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

Fluoride	117243	Cell Test

Measuring range: 0.10–2.50 mg/L F
Expression of results also possible in mmol/L.

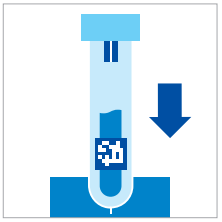
Check the pH of the sample, specified range: pH 2–12. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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

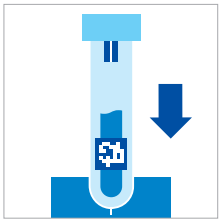


Pipette 5.0 mL of distilled water (Water for analysis EMSURE® is recommended) into a second reaction cell, close with the screw cap, and mix. (Blank)

Reaction time: 1 minute



Place the blank cell into the analysis compartment. Align the mark on the cell with that on the photometer.



Place the cell containing the sample into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur® concentration 1,000 mg/L F^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

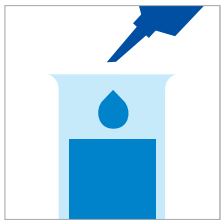
Fluoride	114598	Test

Measuring range: 0.10–2.00 mg/L F 10-mm cuvette
1.0–20.0 mg/L F 10-mm cuvette
Expression of results also possible in mmol/L.

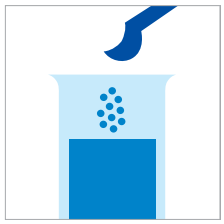
Measuring range: 0.10–2.00 mg/L F

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

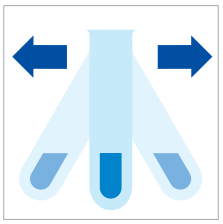
Pipette 2.0 mL of **F-1** into a test tube.



Add 5.0 mL of the sample with pipette and mix.

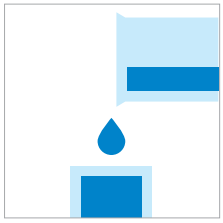


Add 1 level microspoon of **F-2** and mix.

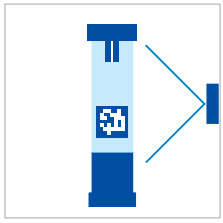


Shake the test tube vigorously to dissolve the solid substance.

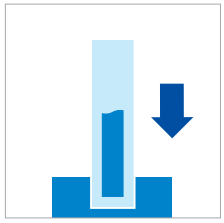
Reaction time:
5 minutes



Transfer the solution into a cuvette.



Select method with AutoSelector measuring range 0.10–2.00 mg/L F.



Place the cuvette into the analysis compartment.

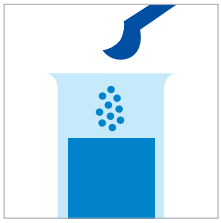
Fluoride	114598	Test

Measuring range: 1.0–20.0 mg/L F

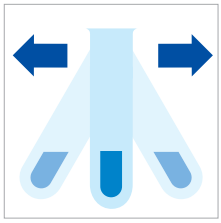
Check the pH of the sample, specified range: pH 3–8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 2.0 mL of **F-1** into a test tube.

Add 5.0 mL of water and 0.5 mL of the sample with pipette and mix.

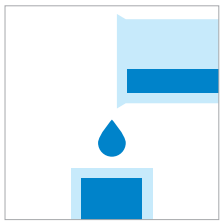


Add 1 level microspoon of **F-2** and mix.

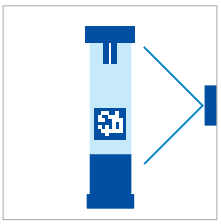


Shake the test tube vigorously to dissolve the solid substance.

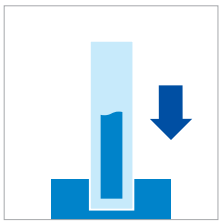
Reaction time:
5 minutes



Transfer the solution into a cuvette.



Select method with AutoSelector measuring range 1.0–20.0 mg/L F.



Place the cuvette into the analysis compartment.

Important:
Very high fluoride concentrations in the sample produce brown-colored solutions (measurement solution should be violet) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur® concentration 1,000 mg/L F^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

Fluoride	**100822**	Test

Measuring range: 0.02–2.00 mg/L F 50-mm cuvette
Expression of results also possible in mmol/L.

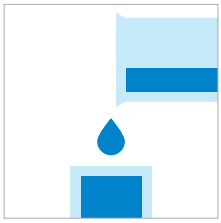
Check the pH of the sample, specified range: pH 1–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 10.0 mL of the sample into a test tube.

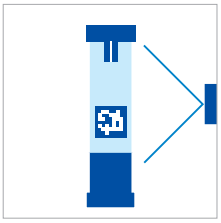
Pipette 10.0 mL of distilled water (Water for analysis EMSURE® is recommended) into a second test tube. (Blank)

Add to each tube 2.0 mL of **F-1** with pipette and mix.

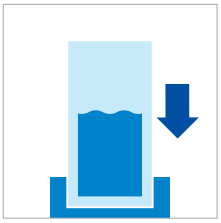
Reaction time: 1 minute



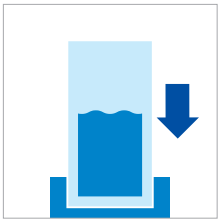
Transfer both solutions into a separate cuvette.



Select method with AutoSelector.



Place the blank cuvette into the analysis compartment.



Place the cuvette containing the sample into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur® concentration 1,000 mg/L F^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

Fluoride	117236	Test

Measuring range: 0.02–2.00 mg/L F 50-mm cuvette
Expression of results also possible in mmol/L.

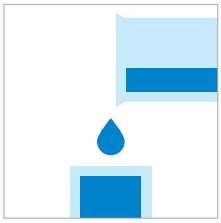
Check the pH of the sample, specified range: pH 2–12. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 10.0 mL of the sample into a test tube.

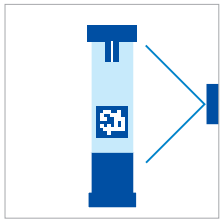
Pipette 10.0 mL of distilled water (Water for analysis EMSURE® is recommended) into a second test tube. (Blank)

Add to each tube 2.0 mL of **F-1** with pipette and mix.

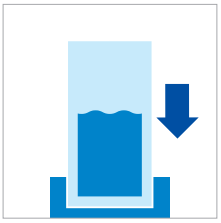
Reaction time: 1 minute



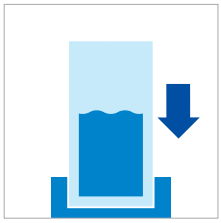
Transfer both solutions into a separate cuvette.



Select method with AutoSelector.



Place the blank cuvette into the analysis compartment.



Place the cuvette containing the sample into the analysis compartment.

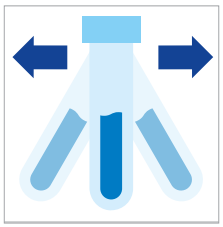
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use fluoride standard solution Certipur® concentration 1,000 mg/L F^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

Formaldehyde	**114500**	Cell Test

Measuring range: 0.10–8.00 mg/L HCHO
Expression of results also possible in mmol/L and cyanide free [CN (f)].

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

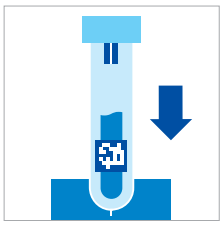
Add 1 level green microspoon of **HCHO-1K** into a reaction cell, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Add 2.0 mL of the sample with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time: 5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

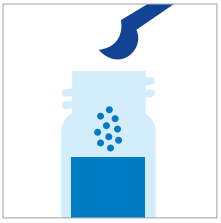
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a formaldehyde standard solution must be prepared from Formaldehyde solution 37% (see section "Standard solutions").

Formaldehyde	114678	Test

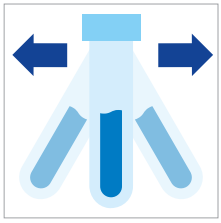
Measuring range: 0.10–8.00 mg/L HCHO 10-mm cuvette
0.05–4.00 mg/L HCHO 20-mm cuvette
0.02–1.50 mg/L HCHO 50-mm cuvette
Expression of results also possible in mmol/L.

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

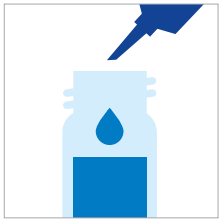
Pipette 4.5 mL of **HCHO-1** into an empty round cell.



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

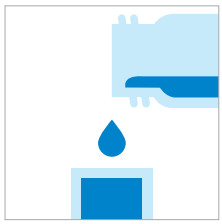


Shake the cell vigorously to dissolve the solid substance.

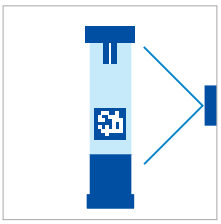


Add 3.0 mL of the sample with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

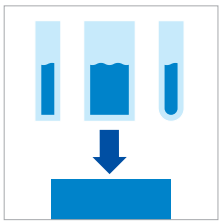
Reaction time: 5 minutes



Transfer the solution into a corresponding rectangular cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

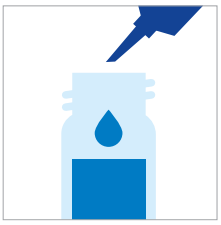
Note:
Empty cells with screw caps are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a formaldehyde standard solution must be prepared from Formaldehyde solution 37% (see section "Standard solutions").

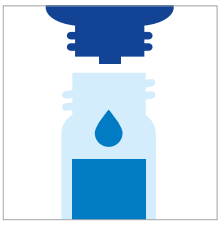
Gold	114821	Test

Measuring range: 0.5–12.0 mg/L Au 10-mm cuvette
Expression of results also possible in mmol/L.

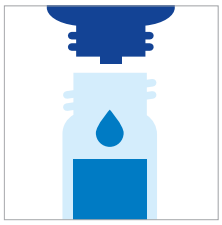
Check the pH of the sample, specified range: pH 1–9. If required, add dilute hydrochloric acid drop by drop to adjust the pH.



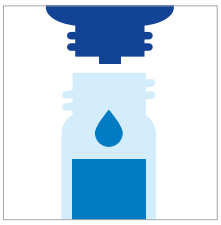
Pipette 2.0 mL of the sample into a test tube with screw cap.



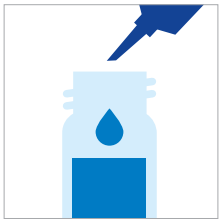
Add 2 drops of **Au-1** and mix.



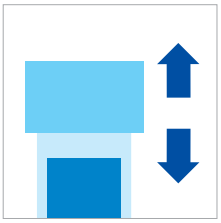
Add 4 drops of **Au-2** and mix.



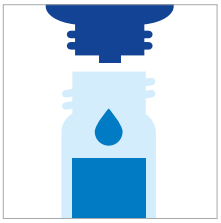
Add 6 drops of **Au-3** and mix.



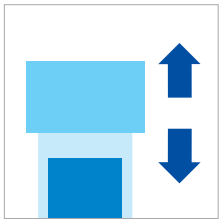
Add 6.0 mL of **Au-4** with pipette, close with the screw cap.



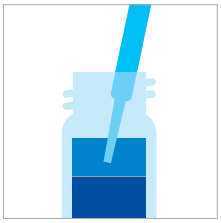
Shake the tube vigorously for 1 minute.



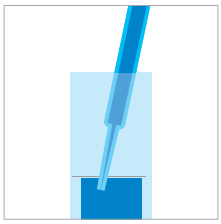
Add 6 drops of **Au-5**, close with the screw cap.



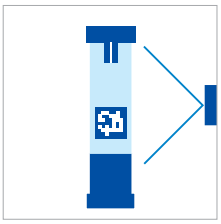
Shake the tube vigorously for 1 minute.



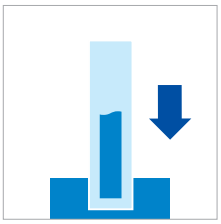
Aspirate the clear upper phase from the tube with pipette.



Transfer the solution into a cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use gold standard solution Certipur® concentration 1,000 mg/L Au, can be used after diluting accordingly.

Hydrazine	109711	Test

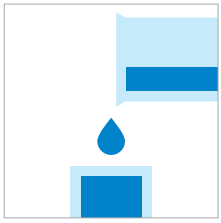
Measuring range: 0.02–2.00 mg/L N_2H_4 10-mm cuvette
0.01–1.00 mg/L N_2H_4 20-mm cuvette
0.005–0.400 mg/L N_2H_4 50-mm cuvette
Expression of results also possible in mmol/L.

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

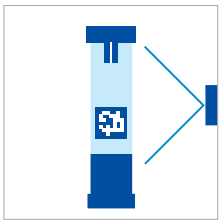
Pipette 5.0 mL of the sample into a test tube.

Add 2.0 mL of **Hy-1** with pipette and mix.

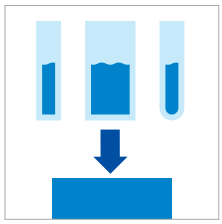
Reaction time: 5 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a hydrazine standard solution must be prepared from Hydrazinium sulfate GR (see section "Standard solutions").

Hydrogen Peroxide	114731	Cell Test

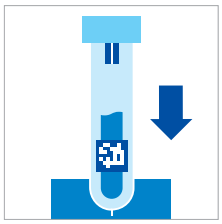
Measuring range: 2.0–20.0 mg/L H_2O_2 Round cell
0.25–5.00 mg/L H_2O_2 50-mm cuvette
Expression of results also possible in mmol/L.

Measuring range: 2.0–20.0 mg/L H_2O_2

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

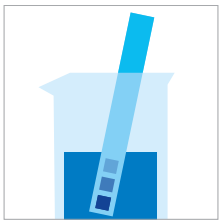
Pipette 10 mL of the sample into a reaction cell, close with the screw cap, and mix.

Reaction time: 2 minutes



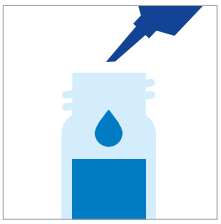
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Measuring range: 0.25–5.00 mg/L H_2O_2



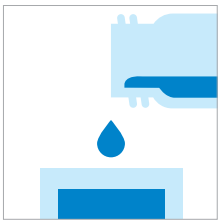
Check the pH of the sample, specified range: pH 0–10. If required, add dilute sulfuric acid drop by drop to adjust the pH.

Select article no. **114731**.

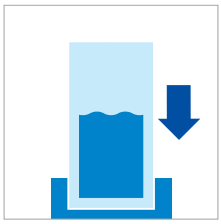


Pipette 10 mL of the sample into a reaction cell, close with the screw cap, and mix.

Reaction time: 2 minutes



Transfer the solution into a 50-mm cuvette.



Place the cuvette into the analysis compartment.

Important:
The contents of the reaction cells may be slightly yellow. However, this does not influence the measurement result.

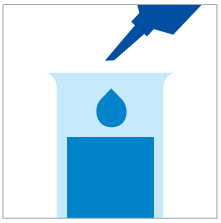
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a hydrogenperoxide standard solution must be prepared from Perhydrol® 30% H_2O_2 GR (see section "Standard solutions").

Hydrogen Peroxide | 118789 | Test

Measuring range: 0.03–6.00 mg/L H_2O_2 10-mm cuvette
0.015–3.000 mg/L H_2O_2 20-mm cuvette
Expression of results also possible in mmol/L.

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

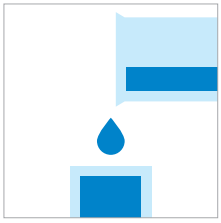
Pipette 0.50 mL of **H_2O_2-1** into a test tube.



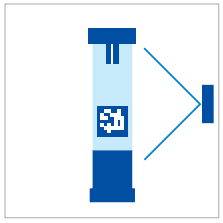
Add 8.0 mL of the sample with pipette and mix.

Add 0.50 mL of **H_2O_2-2** with pipette and mix.

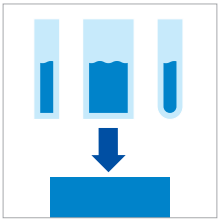
Reaction time: 10 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

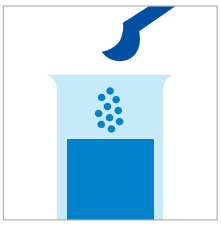
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a hydrogenperoxide standard solution must be prepared from Perhydrol® 30% H_2O_2 GR (see section "Standard solutions").

Iodine	**100606**	Test

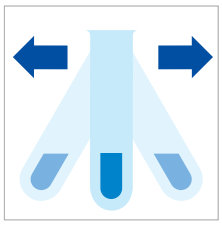
Measuring range: 0.20–10.00 mg/L I_2 10-mm cuvette
0.10–5.00 mg/L I_2 20-mm cuvette
0.050–2.000 mg/L I_2 50-mm cuvette
Expression of results also possible in mmol/L.

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.

Pipette 10 mL of the sample into a test tube.

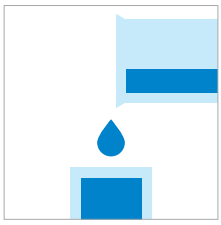


Add 1 level blue micro-spoon of **I_2-1**.

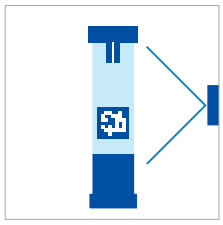


Shake vigorously to dissolve the solid substance.

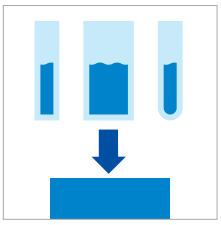
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

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

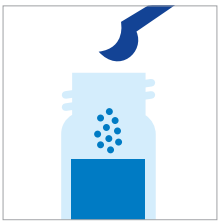
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section "Standard solutions").

Iron	114549	Cell Test

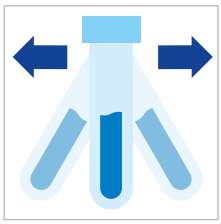
Measuring range: 0.05–4.00 mg/L Fe
Expression of results also possible in mmol/L.

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

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

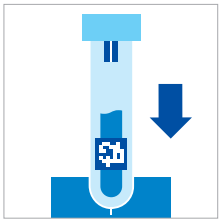


Add 1 level blue micro-spoon of **Fe-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 3 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Important:
For the determination of total iron a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of iron (Σ Fe).

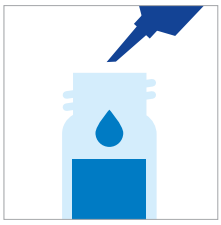
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90 or the Standard solutions for photometric applications.
Ready-to-use iron standard solution Certipur® concentration 1,000 mg/L Fe, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

Iron Determination of Iron (II) and Iron (III)	**114896**	Cell Test

Measuring range: 1.0–50.0 mg/L Fe
Expression of results also possible in mmol/L.

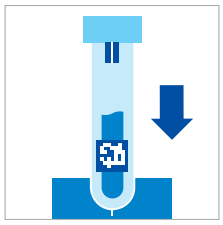
Determination of iron (II)

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



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

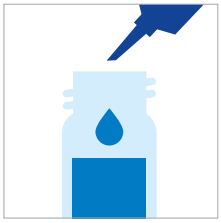
Reaction time:
5 minutes



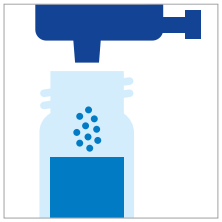
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Determination of iron (II + III)

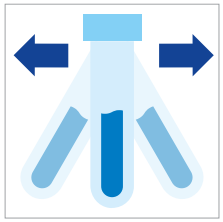
Check the pH of the sample, specified range: pH 3–8. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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

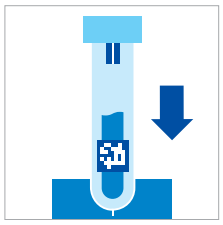


Add 1 dose of **Fe-1K** using the blue dose-metering cap, close the reaction cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Important:
For the determination of total iron a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary. Result can be expressed as sum of iron (Σ Fe).

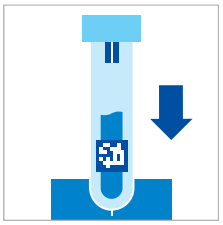
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use iron standard solution Certipur® concentration 1,000 mg/L Fe (III), can be used after diluting accordingly.

Iron Differentiation between Iron (II) and Iron (III)	**114896**	Cell Test

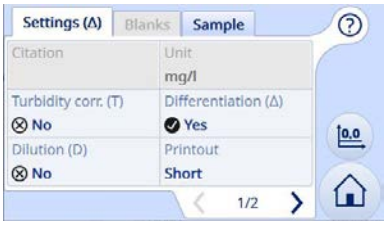
Measuring range: 1.0–50.0 mg/L Fe

If the aim is to differentiate between iron (II) and iron (III), after starting the method it is possible to set the method-specific "Differentiation" mode.

Note: If no differentiation is to be measured, the "Differentiation" mode must be deactivated again.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

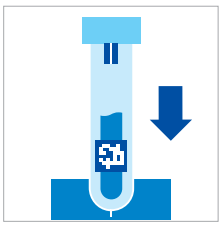


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **iron (II + III)** (see analytical procedure "Determination of iron (II + III)" with 114896).
= **cell A**

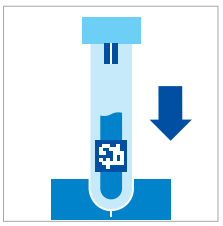
After the reaction time has expired:



Place the **cell A** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Perform determination of **iron (II)** (see analytical procedure "Determination of iron (II)" with 114896).
= **cell B**

After the reaction time has expired:



Place the **cell B** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

The results A (Fe (II + III)), B (Fe (II)), and C (Fe (III)) are shown in the display in mg/L.

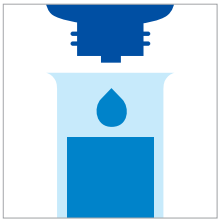
Iron	114761	Test

Measuring range: 0.05–5.00 mg/L Fe 10-mm cuvette
0.03–2.50 mg/L Fe 20-mm cuvette
0.005–1.000 mg/L Fe 50-mm cuvette
Expression of results also possible in mmol/L.

Measuring range: 0.005–5.00 mg/L Fe

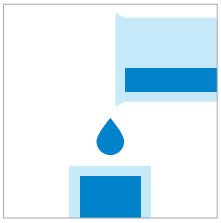
Check the pH of the sample, specified range: pH 1–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 5.0 mL of the sample into a test tube.

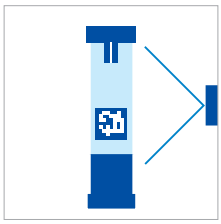


Add 3 drops of **Fe-1** and mix.

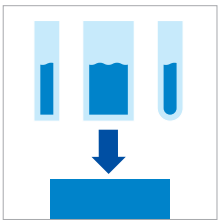
Reaction time: 3 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

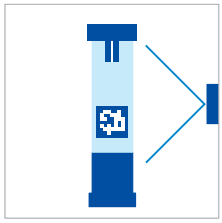
Important:
For the determination of total iron a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of iron (Σ Fe).
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90 or the Standard solutions for photometric applications.
Ready-to-use iron standard solution Certipur® concentration 1,000 mg/L Fe, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

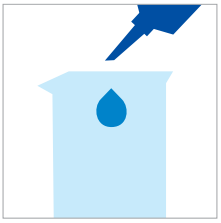
Iron	114761	Test

Measuring range: 0.0025–0.5000 mg/L Fe

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

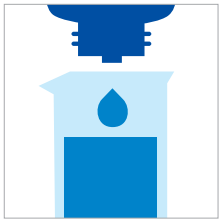


Select method with AutoSelector.



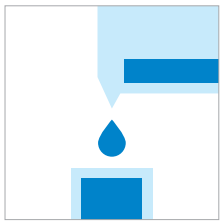
Place 20 mL of sample into a suitable vessel.

Place 20 mL of distilled water (Water for analysis EMSURE® is recommended) into a second suitable vessel. (Blank)

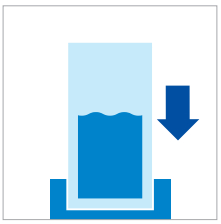


Add to each vessel 12 drops of **Fe-1** and mix.

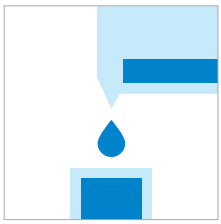
Reaction time:
3 minutes



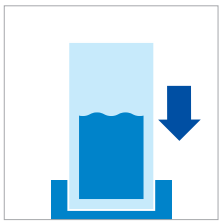
Transfer the blank into the cuvette.



Insert the zero cell into the analysis compartment.



Transfer the measurement sample into the cuvette.



Insert the cuvette containing the sample into the analysis compartment.

Important:
If the sample have been **preserved with nitric acid**, it may be necessary to offset the water used for the blank in the same proportion with nitric acid.
Nitric acid may contain traces of iron and discoloration.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use iron standard solution Certipur® concentration 1,000 mg/L Fe, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

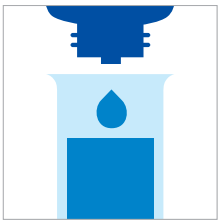
Iron Determination of Iron (II) and Iron (III)	**100796**	Test

Measuring range: 0.10–5.00 mg/L Fe 10-mm cuvette
0.05–2.50 mg/L Fe 20-mm cuvette
0.010–1.000 mg/L Fe 50-mm cuvette
Expression of results also possible in mmol/L.

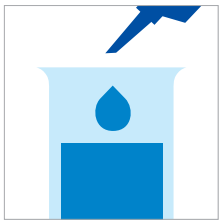
Determination of iron(II)

Check the pH of the sample, specified range: pH 2–8. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.

Pipette 8.0 mL of the sample into a test tube.

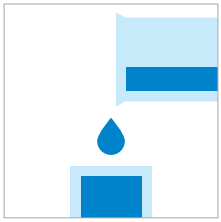


Add 1 drop of **Fe-1** and mix.

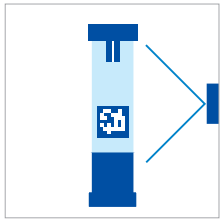


Add 0.50 mL of **Fe-2** with pipette and mix.

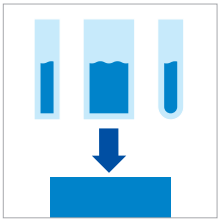
Reaction time: 5 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



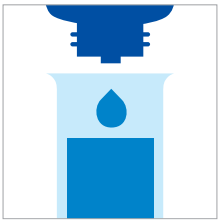
Place the cuvette into the analysis compartment.

Iron Determination of Iron (II) and Iron (III)	**100796**	Test

Determination of iron (II + III)

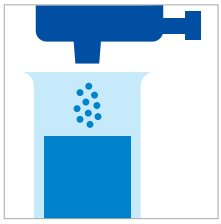
Check the pH of the sample, specified range: pH 2–8. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.

Pipette 8.0 mL of the sample into a test tube.



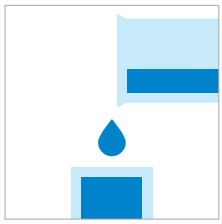
Add 1 drop of **Fe-1** and mix.

Add 0.50 mL of **Fe-2** with pipette and mix.

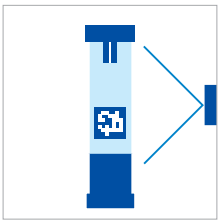


Add 1 dose of **Fe-3** using the blue dose-metering cap and dissolve the solid substance.

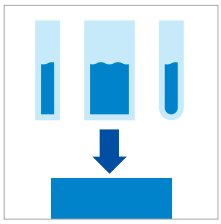
Reaction time:
10 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
For the determination of **total iron** a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.

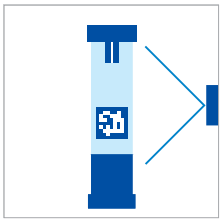
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90 or the Standard solutions for photometric applications.
Ready-to-use iron standard solution Certipur® concentration 1,000 mg/L Fe (III), can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

Iron Differentiation between Iron (II) and Iron (III)	**100796**	Test

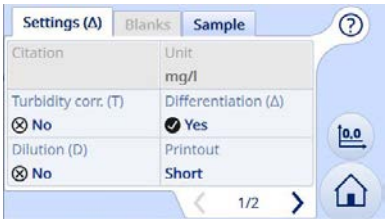
Measuring range: 0.10–5.00 mg/L Fe — 10-mm cuvette
0.05–2.50 mg/L Fe — 20-mm cuvette
0.010–1.000 mg/L Fe — 50-mm cuvette

If the aim is to differentiate between iron (II) and iron (III), after starting the method it is possible to set the method-specific "Differentiation" mode.

Note: If no differentiation is to be measured, the "Differentiation" mode must be deactivated again.



Select method with AutoSelector.

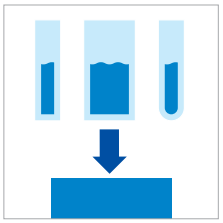


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **iron (II + III)** (see analytical procedure "Determination of iron (II + III)" with 100796).
= **cuvette A**

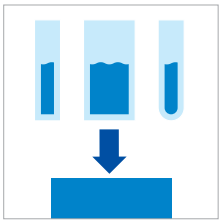
After the reaction time has expired:



Place the **cuvette A** into the analysis compartment.

Perform determination of **iron (II)** (see analytical procedure "Determination of iron (II)" with 100796).
= **cuvette B**

After the reaction time has expired:



Place the **cuvette B** into the analysis compartment.

The results A (Fe (II + III)), B (Fe (II)), and C (Fe (III)) are shown in the display in mg/L.

Lead	114833	Cell Test

Measuring range: 0.10–5.00 mg/L Pb
Expression of results also possible in mmol/L.

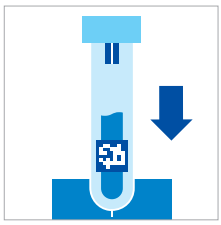
Samples of total hardness 0–10 °d

Check the total hardness of the sample.

Check the pH of the sample, specified range: pH 3–6. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.

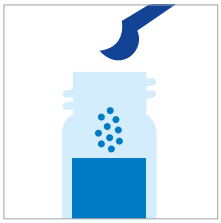
Add 5 drops of **Pb-1K** into a reaction cell and mix.

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

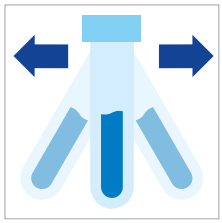


Place the cell into the analysis compartment. Align the mark on the cell with that on the photometer
= **Result A**

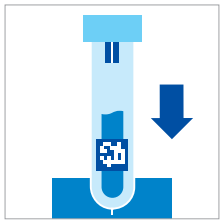
Samples of total hardness >10 °d



Add 1 level grey micro-spoon of **Pb-2K** to the already measured cell, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



Place the cell into the analysis compartment. Align the mark on the cell with that on the photometer
= **Result B**

Result A
–
Result B
=
mg/L Pb

Important:
For the determination of total lead a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of lead (Σ Pb).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100.
Ready-to-use lead standard solution Certipur® concentration 1,000 mg/L Pb, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

Lead	109717	Test

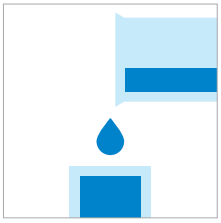
Measuring range: 0.10–5.00 mg/L Pb — 10-mm cuvette
0.05–2.50 mg/L Pb — 20-mm cuvette
0.010–1.000 mg/L Pb — 50-mm cuvette
Expression of results also possible in mmol/L.

Check the pH of the sample, specified range: pH 3–6. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.

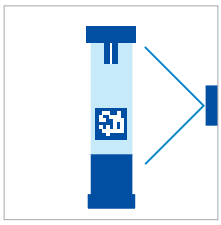
Pipette 0.50 mL of **Pb-1** into a test tube.

Add 0.50 mL of **Pb-2** with pipette and mix.

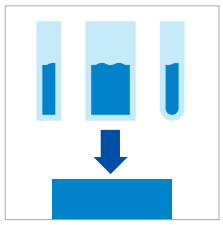
Add 8.0 mL of the sample with pipette and mix.



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
For the determination of total lead a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary. Result can be expressed as sum of lead (Σ Pb).

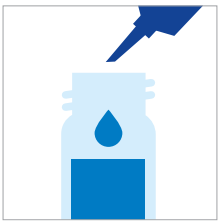
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100 or the Standard solutions for photometric applications.
Ready-to-use lead standard solution Certipur® concentration 1,000 mg/L Pb, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

Magnesium	100815	Cell Test

Measuring range: 5.0–75.0 mg/L Mg
Expression of results also possible in mmol/L.

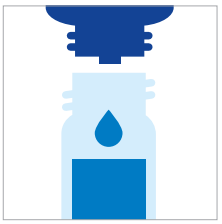
Check the pH of the sample, specified range: pH 3–9. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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

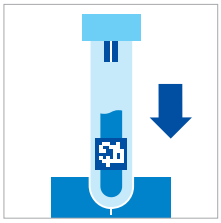


Add 1.0 mL of **Mg-1K** with pipette, close the cell with the screw cap, and mix.

Reaction time: **exactly 3 minutes**



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



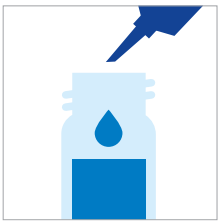
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

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

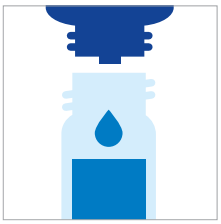
Manganese	100816	Cell Test

Measuring range: 0.10–5.00 mg/L Mn
Expression of results also possible in mmol/L.

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



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

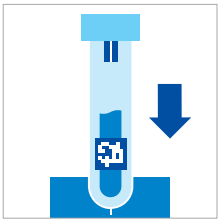


Add 2 drops of **Mn-1K**, close the cell with the screw cap, and mix.

Reaction time:
2 minutes

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

Reaction time:
10 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

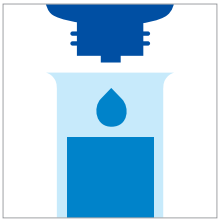
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90 or the Standard solutions for photometric applications.
Ready-to-use manganese standard solution Certipur® concentration 1,000 mg/L Mn, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

Manganese	114770	Test

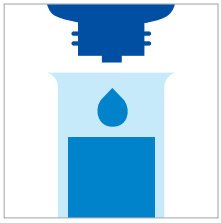
Measuring range: 0.50–10.00 mg/L Mn — 10-mm cuvette
0.25–5.00 mg/L Mn — 20-mm cuvette
0.010–2.000 mg/L Mn — 50-mm cuvette
Expression of results also possible in mmol/L.

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

Pipette 5.0 mL of the sample into a test tube.

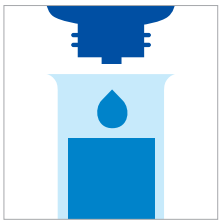


Add 4 drops of **Mn-1** and mix. Check the pH, specified pH: approx. 11.5.



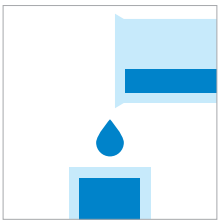
Add 2 drops of **Mn-2** and mix.

Reaction time: 2 minutes

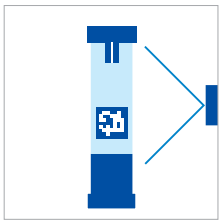


Add 2 drops of **Mn-3** and mix.

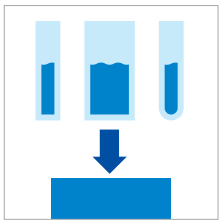
Reaction time: 10 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

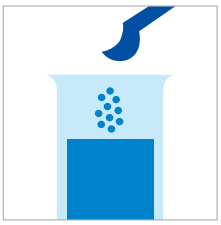
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90 or the Standard solutions for photometric applications.
Ready-to-use manganese standard solution Certipur® concentration 1,000 mg/L Mn, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

Manganese | 101846 | Test

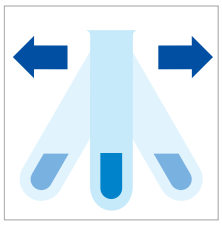
Measuring range: 0.05–2.00 mg/L Mn — 10-mm cuvette
0.03–1.00 mg/L Mn — 20-mm cuvette
0.005–0.400 mg/L Mn — 50-mm cuvette
Expression of results also possible in mmol/L.

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

Pipette 8.0 mL of the sample into a test tube.

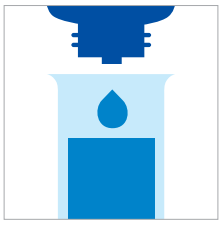


Add 1 level grey microspoon of **Mn-1**.



Shake the tube vigorously to dissolve the solid substance.

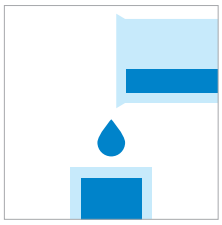
Add 2.0 mL of **Mn-2** with pipette and mix.



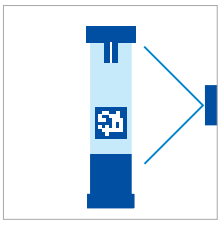
Add carefully 3 drops of **Mn-3** and mix.

Add carefully 0.25 mL of **Mn-4** with pipette and mix **carefully (Foams! Wear eye protection!)**.

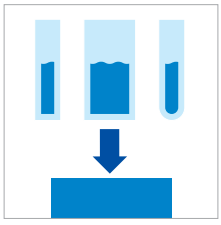
Reaction time: 10 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
When using the 50-mm cuvette, perform the measurement against a separately prepared blank (preparation as per measurement sample, but with distilled water instead of sample).

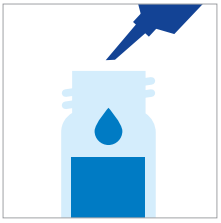
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90 or the Standard solutions for photometric applications.
Ready-to-use manganese standard solution Certipur® concentration 1,000 mg/L Mn, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

Molybdenum	**100860**	Cell Test

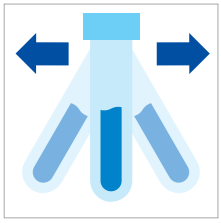
Measuring range: 0.02–1.00 mg/L Mo
0.03–1.67 mg/L MoO_4
0.04–2.15 mg/L Na_2MoO_4
Expression of results also possible in mmol/L.

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

Place 2 drops of **Mo-1K** into a reaction cell and mix.

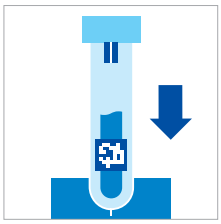


Add 10 mL of the sample with pipette, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 2 minutes



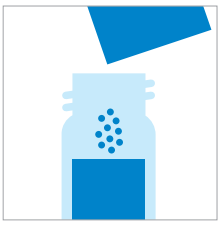
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a ready-to-use molybdenum standard solution Certipur® concentration 1,000 mg/L Mo, can be used after diluting accordingly.

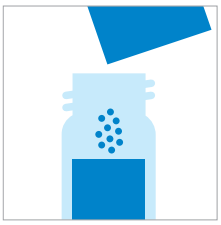
Molybdenum	119252	Test

Measuring range: 0.5–45.0 mg/L Mo 20-mm cuvette
0.8–75.0 mg/L MoO_4 20-mm cuvette
1.1–96.6 mg/L Na_2MoO_4 20-mm cuvette
Expression of results also possible in mmol/L.

Pipette 10 mL of the sample into an empty round cell.

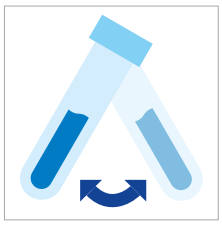


Add 1 powder pack of **Molybdenum HR1**, close with the screw cap, and dissolve the solid substance.



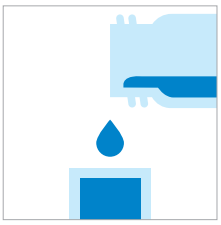
Add 1 powder pack of **Molybdenum HR2**, close with the screw cap, and dissolve the solid substance.

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

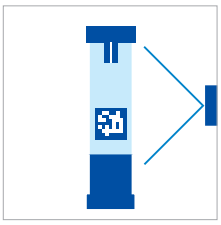


Swirl the cell to dissolve the solid substance.

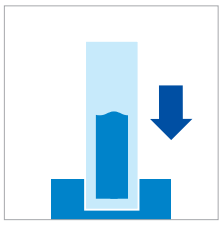
Reaction time: 5 minutes, **measure immediately**.



Transfer the solution into a rectangular cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a ready-to-use molybdenum standard solution Certipur® concentration 1,000 mg/L Mo, can be used after diluting accordingly.

Monochloramine | 101632 | Test

Measuring range:	0.25–10.00 mg/L Cl_2	0.18–7.26 mg/L NH_2Cl	0.05–1.98 mg/L NH_2Cl-N	10-mm cuvette
	0.13–5.00 mg/L Cl_2	0.09–3.63 mg/L NH_2Cl	0.026–0.988 mg/L NH_2Cl-N	20-mm cuvette
	0.050–2.000 mg/L Cl_2	0.04–1.45 mg/L NH_2Cl	0.010–0.395 mg/L NH_2Cl-N	50-mm cuvette

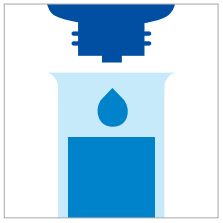
Expression of results also possible in mmol/L.

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

Pipette 10 mL of the sample into a test tube.

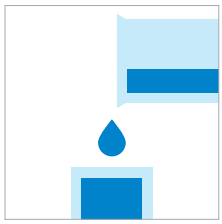
Add 0.60 mL of **MCA-1** with pipette and mix.

Reaction time: 5 minutes

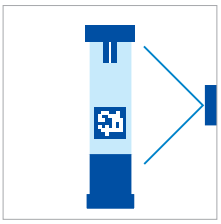


Add 4 drops of **MCA-2** and mix.

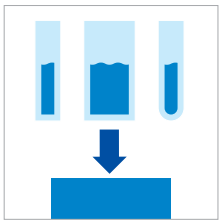
Reaction time: 10 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

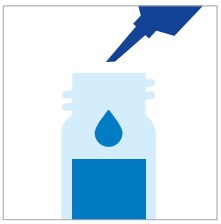
Important:
Very high monochloramine concentrations in the sample produce turquoise-colored solutions (measurement solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared (see section "Standard solutions").

Nickel	114554	Cell Test

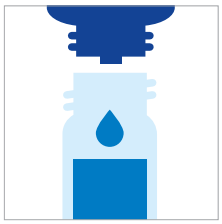
Measuring range: 0.10–6.00 mg/L Ni
Expression of results also possible in mmol/L.

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

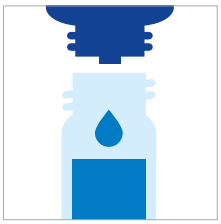


Pipette 5.0 mL of the sample into a reaction cell, close with the screw cap, and mix.

Reaction time: 1 minute

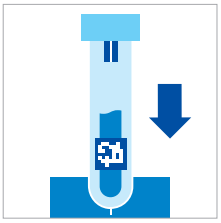


Add 2 drops of **Ni-1K**, close with the screw cap, and mix.



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

Reaction time:
2 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Important:
For the determination of **total nickel** a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of nickel (Σ Ni).

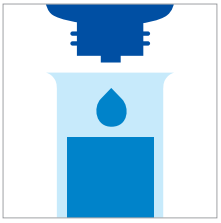
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100.
Solution Titrisol® can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

Nickel	114785	Test

Measuring range: 0.10–5.00 mg/L Ni 10-mm cuvette
0.05–2.50 mg/L Ni 20-mm cuvette
0.02–1.00 mg/L Ni 50-mm cuvette
Expression of results also possible in mmol/L.

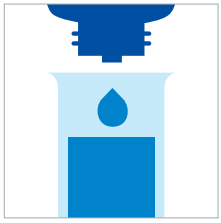
Check the pH of the sample, specified range: pH 3–8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 5.0 mL of the sample into a test tube.



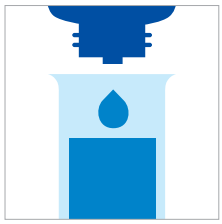
Add 1 drop of **Ni-1** and mix. If the color disappears, continue adding drop by drop until a slight yellow coloration persists.

Reaction time: 1 minute



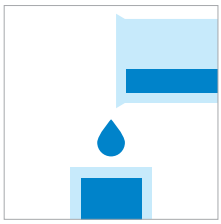
Add 2 drops of **Ni-2** and mix.

Check the pH, specified range: pH 10–12. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

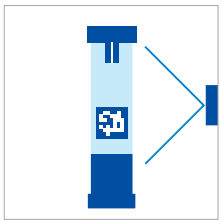


Add 2 drops of **Ni-3** and mix.

Reaction time: 2 minutes



Transfer the solution into a corresponding cuvette.



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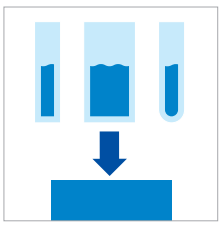


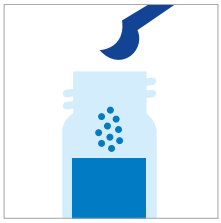
Place the cuvette into the analysis compartment.

Important:
For the determination of total nickel a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of nickel (Σ Ni).
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

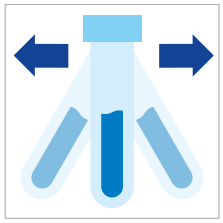
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100.
A nickel standard solution Titrisol® can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

Nitrate	114542	Cell Test

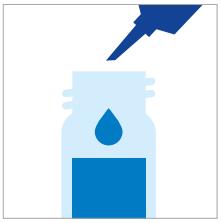
Measuring range: 0.5–18.0 mg/L NO_3-N
2.2–79.7 mg/L NO_3
Expression of results also possible in mmol/L.



Add 1 level microspoon of **NO_3-1K** into a reaction cell and close with the screw cap.

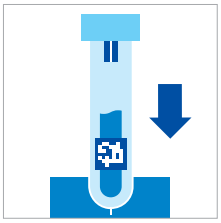


Shake the cell **vigorously for 1 minute** to dissolve the solid substance.



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

Reaction time:
10 minutes

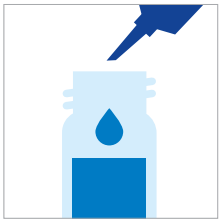


Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

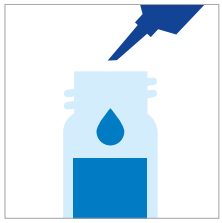
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 or the Standard solutions for photometric applications.
Ready-to-use nitrate standard solution Certipur® concentration 1,000 mg/L NO_3^-, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Nitrate	114563	Cell Test

Measuring range: 0.5–25.0 mg/L NO_3-N
2.2–110.7 mg/L NO_3
Expression of results also possible in mmol/L.

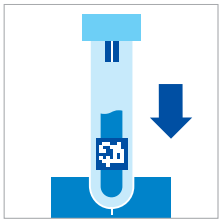


Pipette 1.0 mL of the sample into a reaction cell, **do not mix**.



Add 1.0 mL of **NO_3-1K** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time:
10 minutes

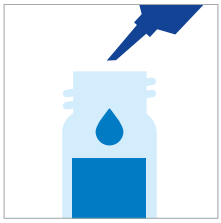


Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 or the Standard solutions for photometric applications.
Ready-to-use nitrate standard solution Certipur® concentration 1,000 mg/L NO_3^-, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Nitrate	114764	Cell Test

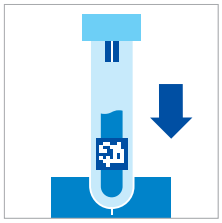
Measuring range: 1.0–50.0 mg/L NO_3-N
4–221 mg/L NO_3
Expression of results also possible in mmol/L.



Pipette 0.50 mL of the sample into a reaction cell, **do not mix**.

Add 1.0 mL of **NO_3-1K** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time:
10 minutes

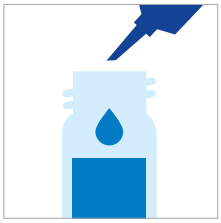


Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 80 or the Standard solutions for photometric applications.
Ready-to-use nitrate standard solution Certipur® concentration 1,000 mg/L NO_3^-, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 80) is highly recommended.

Nitrate	100614	Cell Test

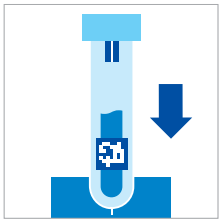
Measuring range: 23–225 mg/L NO_3-N
102–996 mg/L NO_3
Expression of results also possible in mmol/L.



Pipette 1.0 mL of **NO_3-1K** into a reaction cell, **do not mix**.

Add 0.10 mL of the sample with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time:
5 minutes, **measure immediately**.

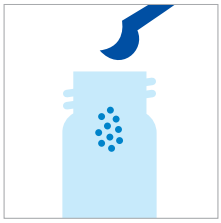


Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrate standard solution Certipur® concentration 1,000 mg/L NO_3^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

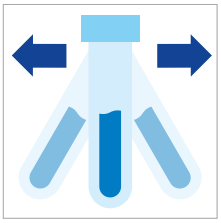
Nitrate	114773	Test

Measuring range: 0.5–20.0 mg/L NO_3-N | 2.2–88.5 mg/L NO_3 | 10-mm cuvette
0.20–10.00 mg/L NO_3-N | 0.89–44.27 mg/L NO_3 | 20-mm cuvette
Expression of results also possible in mmol/L.



Place 1 microspoon of **NO_3-1** into a dry empty round cell.

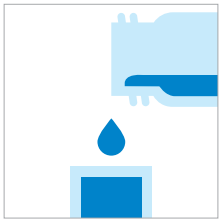
Add 5.0 mL of **NO_3-2** with pipette into the cell. Close the cell with the screw cap.



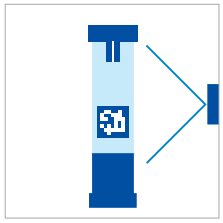
Shake vigorously for 1 minute to dissolve the solid substance.

Add very slowly 1.5 mL of the sample with pi-pette, close the cell with the screw cap, and mix **briefly. Caution, cell becomes hot!**

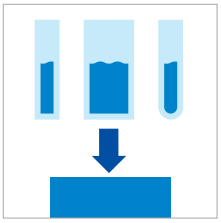
Reaction time: 10 minutes



Transfer the solution into a corresponding rectangular cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Note:
Empty cells with screw caps, are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 and 20 or the Standard solutions for photometric applications.
Ready-to-use nitrate standard solution Certipur® concentration 1,000 mg/L NO_3^-, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

Nitrate	109713	Test

Measuring range:

1.0–25.0 mg/L NO_3-N	4.4–110.7 mg/L NO_3	10-mm cuvette
0.5–12.5 mg/L NO_3	2.2–55.3 mg/L NO_3	20-mm cuvette
0.10–5.00 mg/L NO_3-N	0.4–22.1 mg/L NO_3	50-mm cuvette

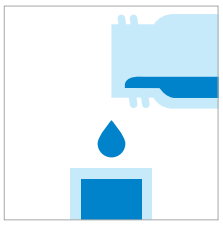
Expression of results also possible in mmol/L.

Pipette 4.0 mL of **NO_3-1** into a dry empty round cell.

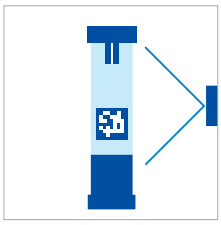
Add 0.50 mL of the sample with pipette, **do not mix**.

Add 0.50 mL of **NO_3-2** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

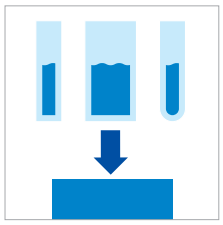
Reaction time: 10 minutes



Transfer the solution into a corresponding rectangular cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

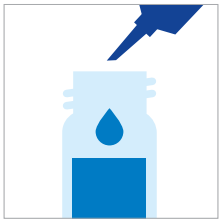
Important:
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

Note:
Empty cells with screw caps are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

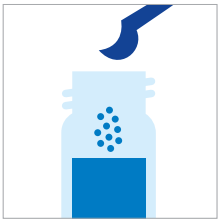
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 and 20 or the Standard solutions for photometric applications.
Ready-to-use nitrate standard solution Certipur® concentration 1,000 mg/L NO_3^-, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

Nitrate in Seawater	114556	Cell Test

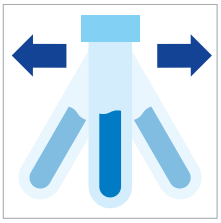
Measuring range: 0.10–3.00 mg/L NO_3-N
0.4–13.3 mg/L NO_3
Expression of results also possible in mmol/L.



Pipette 2.0 mL of the sample into a reaction cell, **do not mix**.

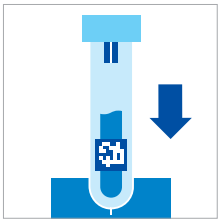


Add 1 level blue micro-spoon of **NO_3-1K**, **immediately** close the cell tightly with the screw cap. **Caution, foams strongly (eye protection, protective gloves)!**



Shake the cell **vigorously for 5 seconds** to dissolve the solid substance.

Reaction time:
30 minutes



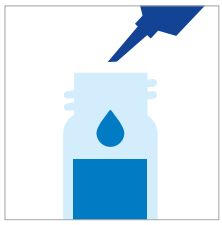
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 or the Standard solutions for photometric applications.
Ready-to-use nitrate standard solution Certipur® concentration 1,000 mg/L NO_3^-, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

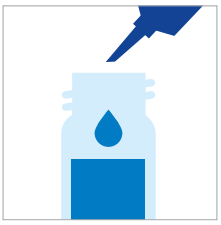
Nitrate in Seawater | 114942 | Test

Measuring range: 0.2–17.0 mg/L NO_3-N 0.9–75.3 mg/L NO_3 10-mm cuvette
Expression of results also possible in mmol/L.

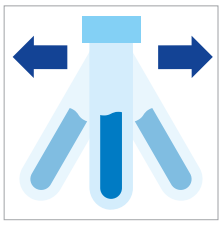
Pipette 5.0 mL of **NO_3-1** into a dry empty round cell.



Add 1.0 mL of the sample with pipette. **Caution, cell becomes hot!**

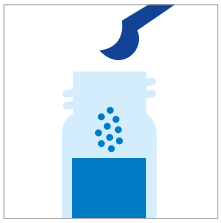


Immediately add 1.5 mL of **NO_3-2** with pipette.

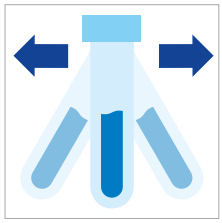


Close cell tightly and shake **vigorously**.

Reaction time: 15 minutes

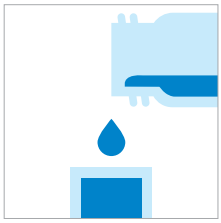


Add 2 level grey micro-spoons of **NO_3-3**.

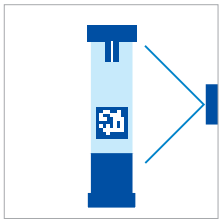


Close cell tightly and shake **vigorously** until the reagent is completely dissolved.

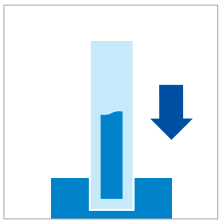
Reaction time: 60 minutes



Transfer the solution into a rectangular cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
Empty cells with screw caps are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

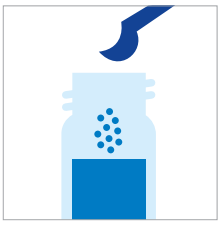
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 or the Standard solutions for photometric applications.
Ready-to-use nitrate standard solution Certipur® concentration 1,000 mg/L NO_3^-, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Nitrate	101842	Test

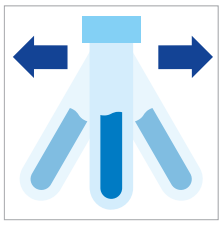
Measuring range: 0.3–30.0 mg/L NO_3-N 1.3–132.8 mg/L NO_3 50-mm cuvette
Expression of results also possible in mmol/L.

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

Pipette 10 mL of the sample into a test tube.

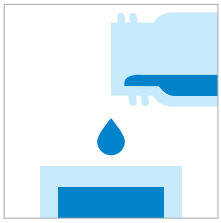


Add 1 level blue micro-spoon of **NO_3-1**, **immediately** close tightly with the screw cap.

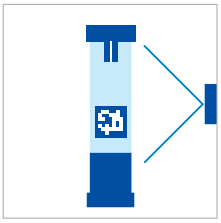


Shake the tube **vigorously for 1 minute** to dissolve the solid substance.

Reaction time: 5 minutes, **measure immediately**.



Transfer the solution (when possible without sediment) into a corresponding cuvette.



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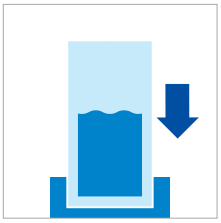


Place the cuvette into the analysis compartment.

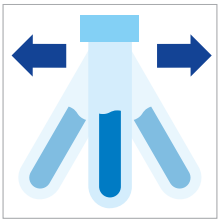
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a ready-to-use nitrate standard solution Certipur® concentration 1,000 mg/L NO_3^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

Nitrite	114547	Cell Test

Measuring range: 0.010–0.700 mg/L NO_2-N
0.03–2.30 mg/L NO_2
Expression of results also possible in mmol/L.

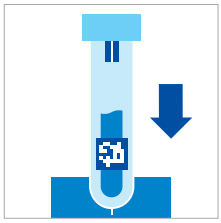
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sulfuric acid drop by drop to adjust the pH.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
10 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

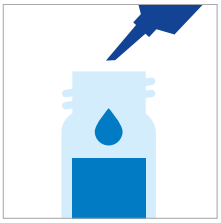
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrite standard solution Certipur® concentration 1,000 mg/L NO_2^-, can be used after diluting accordingly as well as the Standard solution for photometric applications.

Nitrite	100609	Cell Test

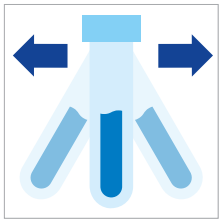
Measuring range: 1.0–90.0 mg/L NO_2-N
3–296 mg/L NO_2
Expression of results also possible in mmol/L.

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

Add 2 level blue micro-spoons of **NO_2-1K** into a reaction cell.

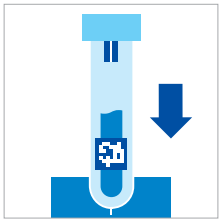


Add 8.0 mL of the sample with pipette and close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 20 minutes, **measure immediately. Do not shake or swirl** the cell before the measurement.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrite standard solution Certipur® concentration 1,000 mg/L NO_2^-, can be used after diluting accordingly as well as the Standard solution for photometric applications.

Nitrite	114776	Test

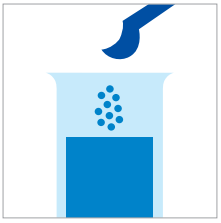
Measuring range:

0.02–1.00 mg/L NO_2-N	0.07–3.28 mg/L NO_2	10-mm cuvette
0.010–0.500 mg/L NO_2-N	0.03–1.64 mg/L NO_2	20-mm cuvette
0.002–0.200 mg/L NO_2-N	0.007–0.657 mg/L NO_2	50-mm cuvette

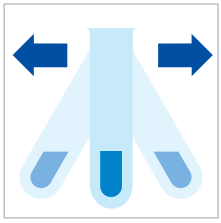
Expression of results also possible in mmol/L.

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

Pipette 5.0 mL of the sample into a test tube.



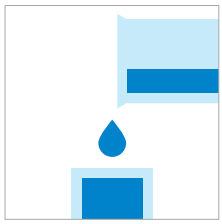
Add 1 level blue micro-spoon of **NO_2-1**.



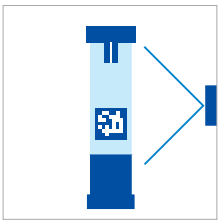
Shake vigorously to dissolve the solid substance.

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

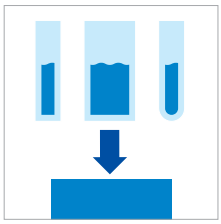
Reaction time: 10 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

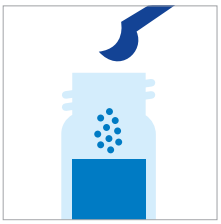
Important:
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrite standard solution Certipur® concentration 1,000 mg/L NO_2^-, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

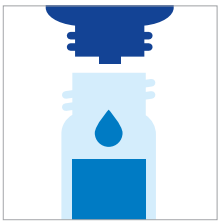
Nitrogen (Total)	114537	Cell Test

Measuring range: 0.5–15.0 mg/L N
Expression of results also possible in mmol/L.

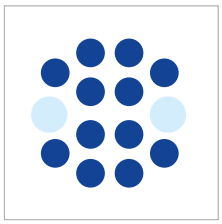
Pipette 10 mL of the sample into an empty round cell.



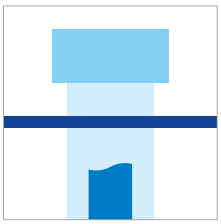
Add 1 level blue microspoon of **N-1K**.



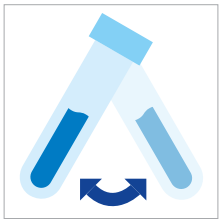
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



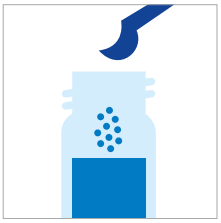
Heat the cell in the thermoreactor at 120 °C for 1 hour.



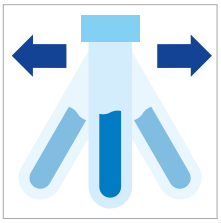
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: pretreated sample.



Swirl the cell after 10 minutes.



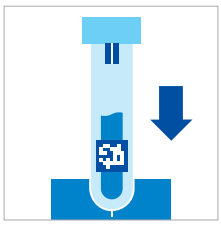
Add 1 level microspoon of **N-3K** **into a reaction cell**, close the cell with the screw cap.



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

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

Reaction time: 10 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

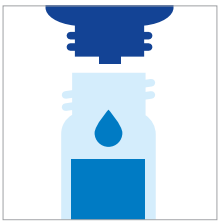
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50 or the Standard solutions for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Nitrogen (Total)	100613	Cell Test

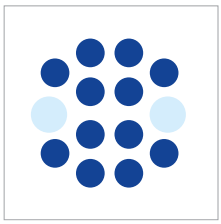
Measuring range: 0.5–15.0 mg/L N
Expression of results also possible in mmol/L.

Pipette 10 mL of the sample into an empty round cell.

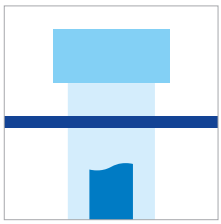
Add 1 level blue micro-spoon of **N-1K**.



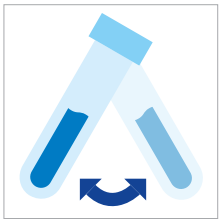
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



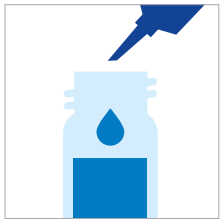
Heat the cell in the thermoreactor at 120 °C for 1 hour.



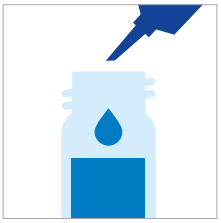
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.



Swirl the cell after 10 minutes.

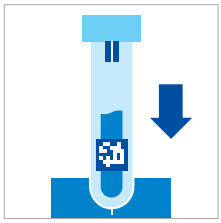


Pipette 1.0 mL of the **pretreated sample** into a reaction cell, **do not mix!**



Add 1.0 mL of **N-3K** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time: 10 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

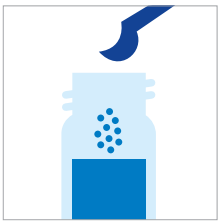
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50 or the Standard solutions for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Nitrogen (Total)	114763	Cell Test

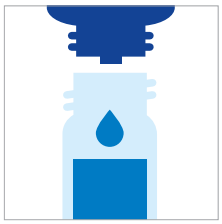
Measuring range: 10–150 mg/L N
Expression of results also possible in mmol/L.

Pipette 1.0 mL of the sample into an empty round cell.

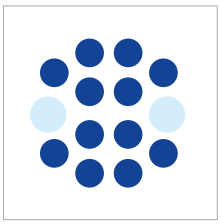
Add 9.0 mL of distilled water (Water for analysis EMSURE® is recommended) with pipette.



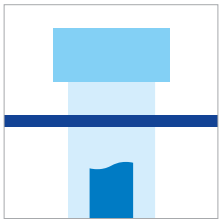
Add 1 level blue micro-spoon of **N-1K**.



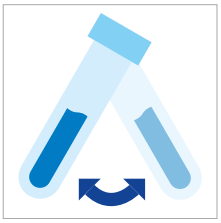
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



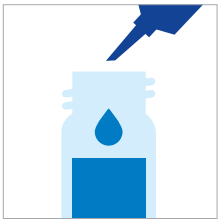
Heat the cell in the thermoreactor at 120 °C for 1 hour.



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



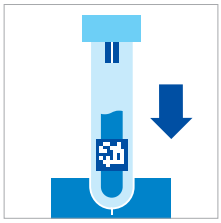
Swirl the cell after 10 minutes.



Pipette 1.0 mL of the **pretreated sample** into a reaction cell, **do not mix!**

Add 1.0 mL of **N-3K** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time: 10 minutes



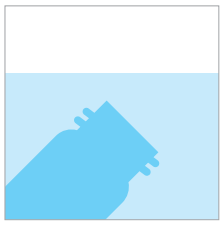
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 70 or the Standard solutions for photometric applications.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

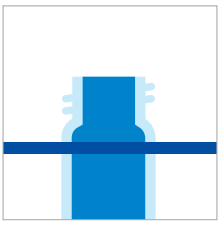
Oxygen	114694	Cell Test

Measuring range: 0.5–12.0 mg/L O_2
Expression of results also possible in mmol/L.

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



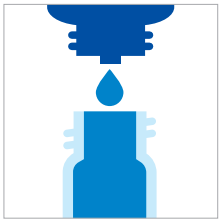
Fill watersample into a reaction cell to overflowing and make sure, that no air bubbles are present.



Place the filled cell in a test-tube rack.

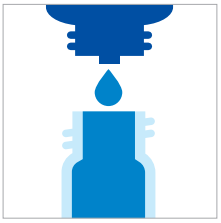
Add with microspoon 1 glass bead.

Add 5 drops of **O_2-1K**.

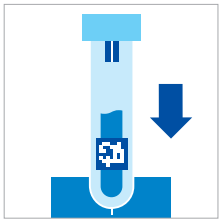


Add 5 drops of **O_2-2K**, close the cell with the screw cap, and shake for 10 seconds.

Reaction time: 1 minute



Add 10 drops of **O_2-3K**, close the cell with the screw cap, mix, and clean from outside.



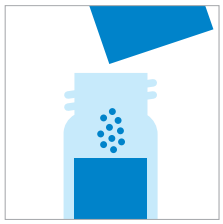
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a oxygen standard solution must be prepared.

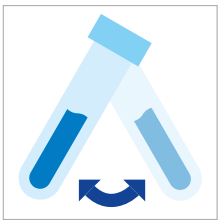
Oxygen Scavengers | 119251 | Test

Measuring range:	0.020–0.500 mg/L DEHA*	20-mm cuvette	*N,N-diethylenhydroxylamine
	0.027–0.666 mg/L Carbohy*	20-mm cuvette	*carbohydrazide
	0.05–1.32 mg/L Hydro*	20-mm cuvette	*hydroquinone
	0.08–1.95 mg/L ISA*	20-mm cuvette	*isoascorbic acid
	0.09–2.17 mg/L MEKO*	20-mm cuvette	*methylethylketoxime

Pipette 10 mL of the sample into an empty round cell.



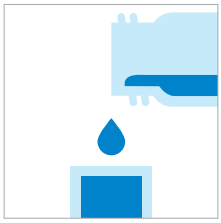
Add 1 powder pack of **Oxyscav 1** and close with the screw cap.



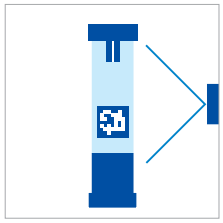
Swirl the cell to dissolve the solid substance.

Add 0.20 mL of **Oxyscav 2** with pipette, close with the screw cap, and mix.

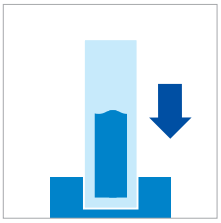
Reaction time: 10 minutes, **protect from light in the process, measure immediately.**



Transfer the solution into a rectangular cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

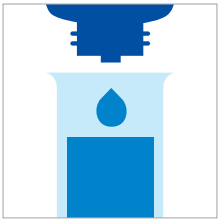
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a oxygen scavengers standard solution must be prepared from N,N-diethylhydroxyl-amine (see section "Standard solutions").

Ozone	100607	Test

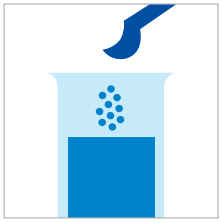
Measuring range: 0.05–4.00 mg/L O_3 10-mm cuvette
0.02–2.00 mg/L O_3 20-mm cuvette
0.010–0.800 mg/L O_3 50-mm cuvette
Expression of results also possible in mmol/L.

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.

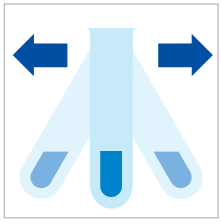
Pipette 10 mL of the sample into a test tube.



Add 2 drops of **O_3-1** and mix.

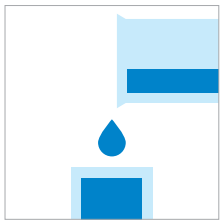


Add 1 level blue micro-spoon of **O_3-2**.

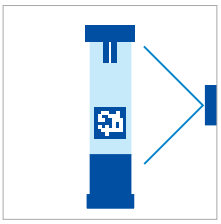


Shake vigorously to dissolve the solid substance.

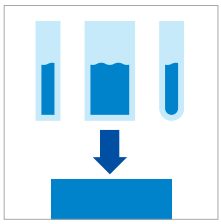
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

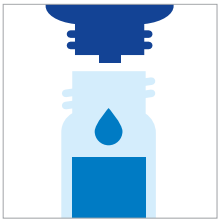
Important:
Very high ozone concentrations in the sample produce yellow-colored solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

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

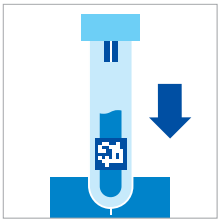
pH	101744	Cell Test

Measuring range: pH 6.4–8.8

Pipette 10 mL of the sample into a round cell.



Add 4 drops of **pH-1**, close the cell with the screw cap, and mix. **Attention!** The reagent bottle must be held **vertically by all means!**



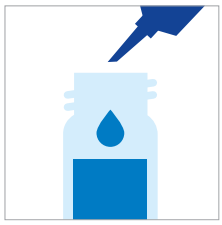
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) buffer solution pH 7.00 Certipur® can be used.

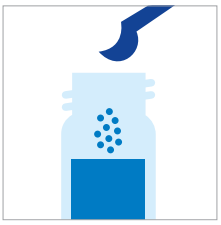
Phenol	114551	Cell Test

Measuring range: 0.10–2.50 mg/L C_6H_5OH
Expression of results also possible in mmol/L.

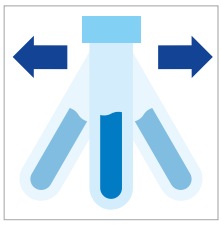
Check the pH of the sample, specified range: pH 2–11. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



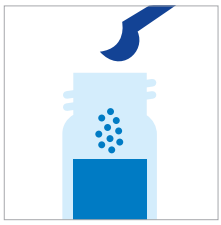
Pipette 10 mL of the sample into a reaction cell, close with the screw cap, and mix.



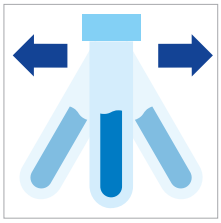
Add 1 level grey microspoon of **Ph-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

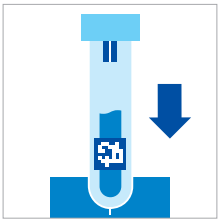


Add 1 level green microspoon of **Ph-2K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 1 minute



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Important:
Very high phenol concentrations in the sample result in a weakening of the color and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a phenol standard solution must be prepared from Phenol GR (see section "Standard solutions").

Phenol	**100856**	Test

Measuring range: 0.002–0.100 mg/L C_6H_5OH 20-mm cuvette
Expression of results also possible in mmol/L.

Attention! The measurement is carried out in a 20-mm cuvette against a blank, prepared from distilled water (water for analysis EMSURE® is recommended) and the reagents in an analogous manner.

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

Pipette 200 mL of sample into a separation funnel.

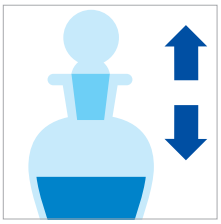
Add 5.0 mL of **Ph-1** with pipette and mix.

Add 1 level green microspoon of **Ph-2** and shake to dissolve the solid substance.

Add 1 level green microspoon of **Ph-3** and shake to dissolve the solid substance.

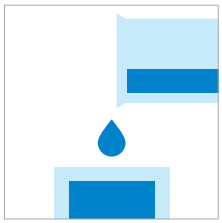
Reaction time: 30 minutes (protected from light)

Add 10 mL of chloroform with pipette, close separation funnel.

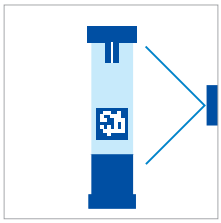


Shake vigorously for 1 minute.

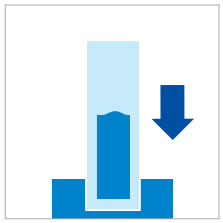
Leave to stand for 5–10 minutes to allow the phases to separate.



Transfer the clear **lower** phase into a cuvette.



Select method with AutoSelector measuring range 0.002–0.100 mg/L.



Place the cuvette into the analysis compartment.

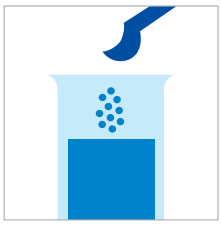
Phenol	100856	Test

Measuring range: 0.10–5.00 mg/L C_6H_5OH 10-mm cuvette
0.05–2.50 mg/L C_6H_5OH 20-mm cuvette
0.025–1.000 mg/L C_6H_5OH 50-mm cuvette
Expression of results also possible in mmol/L.

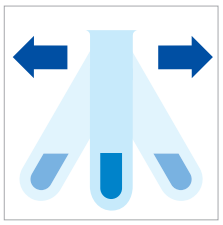
Check the pH of the sample, specified range: pH 2–11. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 10 mL of the sample into a test tube.

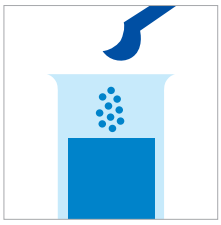
Add 1.0 mL of **Ph-1** with pipette and mix.



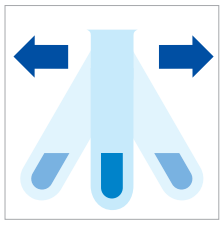
Add 1 level grey micro-spoon of **Ph-2**.



Shake vigorously to dissolve the solid substance.

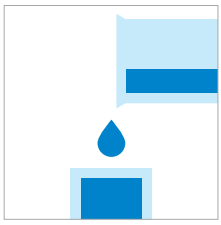


Add 1 level grey micro-spoon of **Ph-3**.

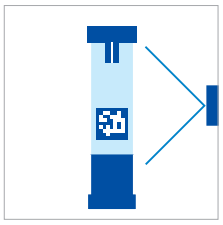


Shake vigorously to dissolve the solid substance.

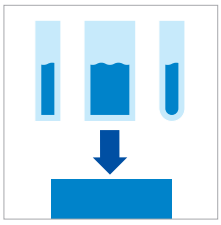
Reaction time:
10 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector measuring range 0.025–5.00 mg/L.



Place the cuvette into the analysis compartment.

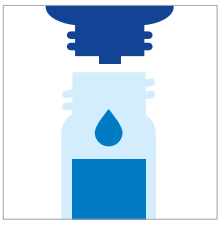
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a phenole standard solution must be prepared from Phenol GR (see section "Standard solutions").

Phosphate Determination of Orthophosphate	**100474**	Cell Test

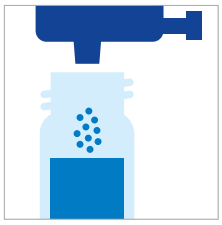
Measuring range: 0.05–5.00 mg/L PO_4-P
0.2–15.3 mg/L PO_4
0.11–11.46 mg/L P_2O_5
Expression of results also possible in mmol/L.

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

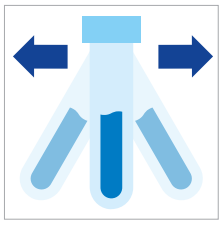
Pipette 5.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



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

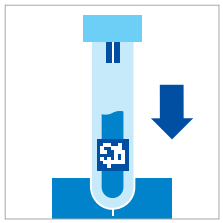


Add 1 dose of **P-2K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

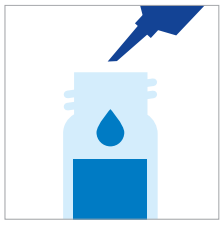
Important:
For the determination of **total phosphorus = sum of ortho-phosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. Nos. 114543, 114729, and 100673 or Phosphate Test, Cat. Nos. 114848 in conjunction with Crack Set 10/10C can be used.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10.
Ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

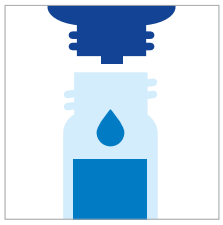
Phosphate Determination of Orthophosphate	**114543**	Cell Test

Measuring range: 0.05–5.00 mg/L PO_4-P
0.2–15.3 mg/L PO_4
0.11–11.46 mg/L P_2O_5
Expression of results also possible in mmol/L.

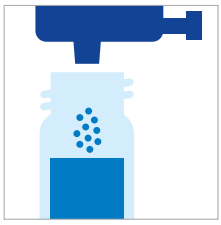
Check the pH of the sample, specified range: pH 0–10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



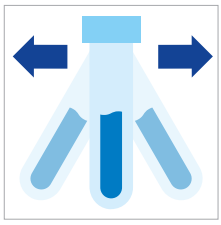
Pipette 5.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



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

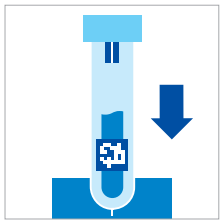


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

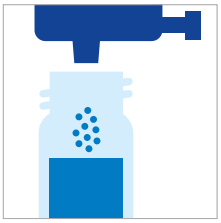
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10.
Ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Phosphate Determination of Total Phosphorus = Sum of Orthophosphate, Polyphosphate, and Organophosphate	**100474**	Cell Test

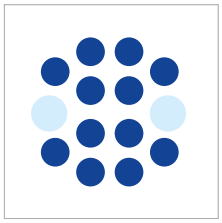
Measuring range: 0.05–5.00 mg/L PO_4-P
0.2–15.3 mg/L PO_4
0.11–11.46 mg/L P_2O_5
Expression of results also possible in mmol/L.

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

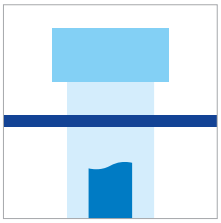
Pipette 5.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



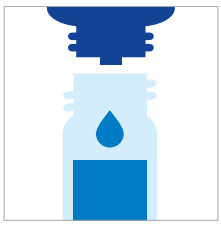
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



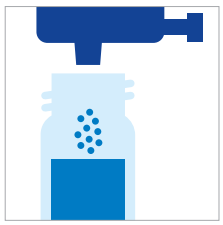
Heat the cell in the thermoreactor at 120 °C for 30 minutes.



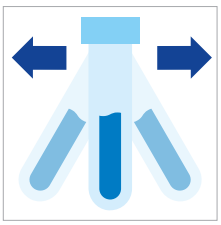
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

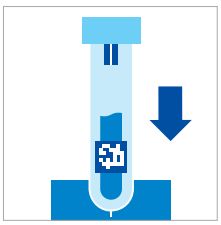


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



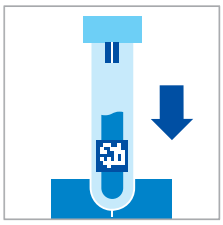
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 or the Standard solutions for photometric applications.
Ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

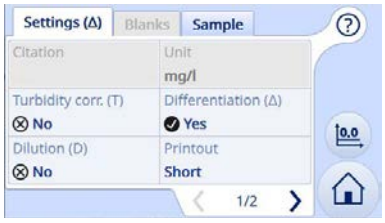
Phosphate Differentiation between Total Phosphorus, Orthophosphate, and Organophosphate	**114543**	Cell Test

Measuring range: 0.05–5.00 mg/L PO_4-P or P
0.2–15.3 mg/L PO_4
0.11–11.46 mg/L P_2O_5
Expression of results also possible in mmol/L.

If the aim is to differentiate between orthophosphate (PO_4-P) and $P_{org.}$*, after starting the method it is possible to set the method-specific "Differentiation" mode.
* $P_{org.}$ is the sum of polyphosphate and organophosphate.
Note: If no differentiation is to be measured, the "Differentiation" mode must be deactivated again.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

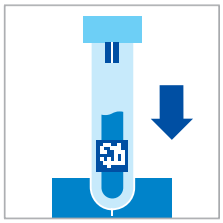


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **total phosphorus** (see analytical procedure "Determination of total phosphorus" with 114543).
= **cell Σ P**

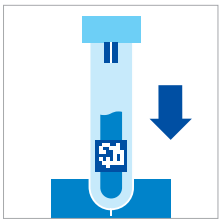
After the reaction time has expired:



Place the cell S P into the analysis compartment. Align the mark on the cell with that on the photometer.

Perform determination of **orthophosphate** (see analytical procedure "Determination of orthophosphate" with 114543).
= **cell PO_4-P**

After the reaction time has expired:



Place the cell **PO_4-P** into the analysis compartment. Align the mark on the cell with that on the photometer.

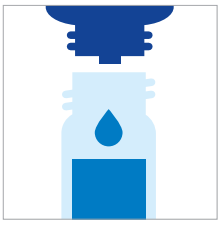
The results A (Σ P), B (PO_4-P), and C ($P_{org.}$) are shown in the display in mg/L.

Phosphate Determination of Orthophosphate	**100475**	Cell Test

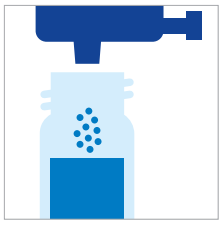
Measuring range: 0.5–25.0 mg/L PO_4-P
1.5–76.7 mg/L PO_4
1.1–57.3 mg/L P_2O_5
Expression of results also possible in mmol/L.

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

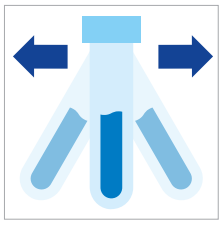
Pipette 1.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



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

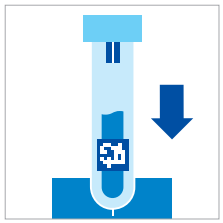


Add 1 dose of **P-2K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

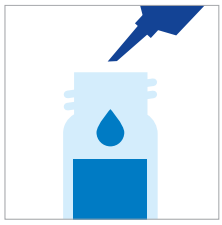
Important:
For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat.Nos. 114543, 114729, and 100673 or Phosphate Test, Cat.No. 114848 in conjunction with Crack Set 10/10C can be used.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 and 80.
Ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

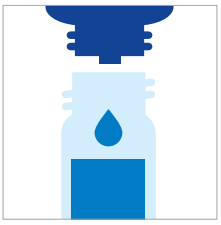
Phosphate Determination of Orthophosphate	**114729**	Cell Test

Measuring range: 0.5–25.0 mg/L PO_4-P
1.5–76.7 mg/L PO_4
1.1–57.3 mg/L P_2O_5
Expression of results also possible in mmol/L.

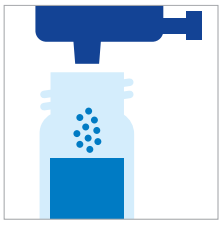
Check the pH of the sample, specified range: pH 0–10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



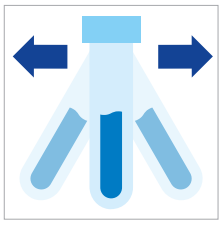
Pipette 1.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



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

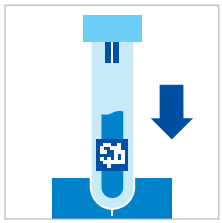


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

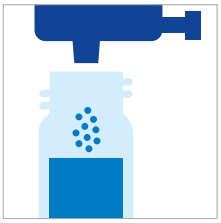
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 and 80.
Ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

Phosphate Determination of Total Phosphorus = Sum of Orthophosphate, Polyphosphate, and Organophosphate	**114729**	Cell Test

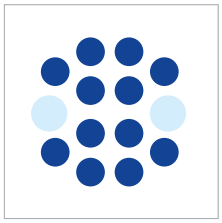
Measuring range: 0.5–25.0 mg/L P
1.5–76.7 mg/L PO_4
1.1–57.3 mg/L P_2O_5
Expression of results also possible in mmol/L.

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

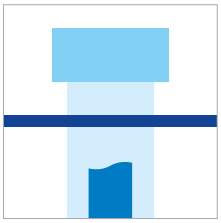
Pipette 1.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



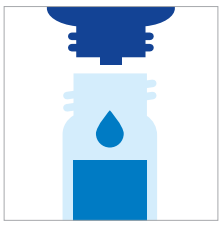
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



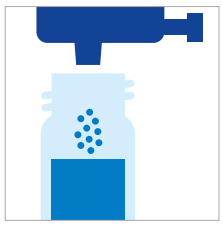
Heat the cell in the thermoreactor at 120 °C for 30 minutes.



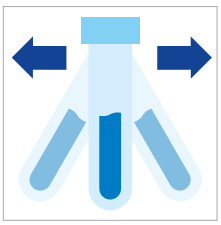
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

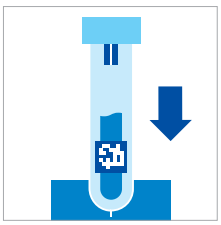


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



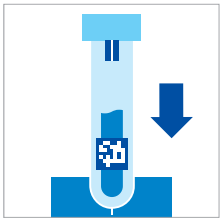
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 and 80 or as well as the Standard solutions for photometric applications.
Ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

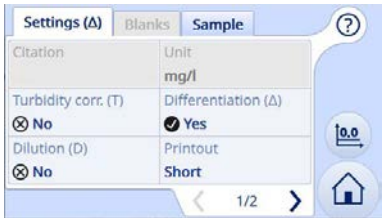
Phosphate Differentiation between Total Phosphorus, Orthophosphate, and Organophosphate	**114729**	Cell Test

Measuring range: 0.5–25.0 mg/L PO_4-P or P
1.5–76.7 mg/L PO_4
1.1–57.3 mg/L P_2O_5

If the aim is to differentiate between orthophosphate (PO_4-P) and $P_{org.}$*, after starting the method it is possible to set the method-specific "Differentiation" mode.
* $P_{org.}$ is the sum of polyphosphate and organophosphate.
Note: If no differentiation is to be measured, the "Differentiation" mode must be deactivated again.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

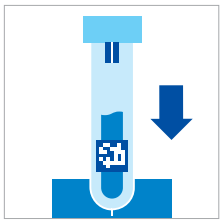


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **total phosphorus** (see analytical procedure "Determination of total phosphorus" with 114729) = c**ell Σ P**

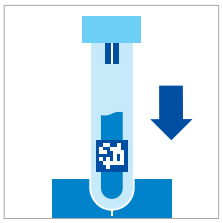
After the reaction time has expired:



Place the **cell Σ P** into the analysis compartment. Align the mark on the cell with that on the photometer.

Perform determination of **orthophosphate** (see analytical procedure "Determination of orthophosphate" with 114729) = c**ell PO_4-P**

After the reaction time has expired:



Place the cell **PO_4-P** into the analysis compartment. Align the mark on the cell with that on the photometer.

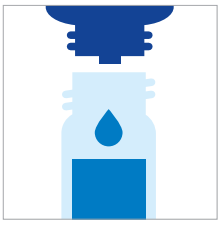
The results A (Σ P), B (PO_4-P), and C ($P_{org.}$) are shown in the display in mg/L.

Phosphate Determination of Orthophosphate	**100616**	Cell Test

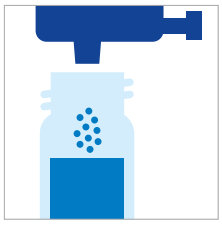
Measuring range: 3.0–100.0 mg/L PO_4-P
9–307 mg/L PO_4
7–229 mg/L P_2O_5
Expression of results also possible in mmol/L.

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

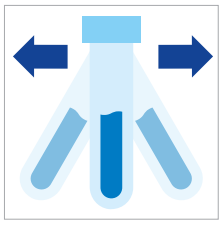
Pipette 0.20 mL of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **PO_4-1K**, close the cell with the screw cap, and mix.

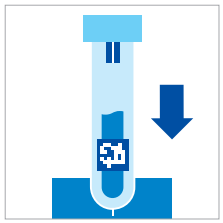


Add 1 dose of **PO_4-2K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

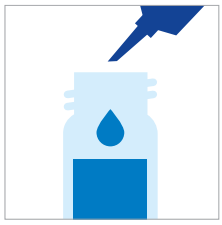
Important:
For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat.Nos. 114543, 114729, and 100673 or Phosphate Test, Cat.No. 114848 in conjunction with Crack Set 10/10C can be used.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can be used after diluting accordingly.

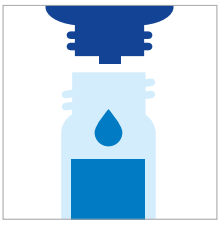
Phosphate Determination of Orthophosphate	**100673**	Cell Test

Measuring range: 3.0–100.0 mg/L PO_4-P
9–307 mg/L PO_4
7–229 mg/L P_2O_5
Expression of results also possible in mmol/L.

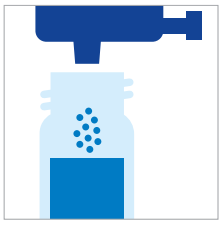
Check the pH of the sample, specified range: pH 0–10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



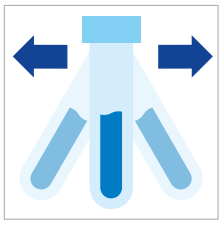
Pipette 0.20 mL of the sample into a reaction cell, close with the screw cap, and mix.



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

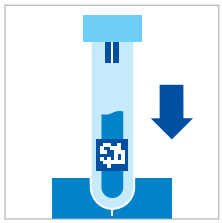


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

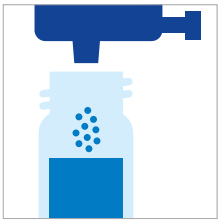
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can be used after diluting accordingly.

Phosphate Determination of Total Phosphorus = Sum of Orthophosphate, Polyphosphate, and Organophosphate	**100673**	Cell Test

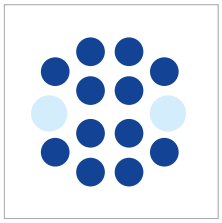
Measuring range: 3.0–100.0 mg/L P
9–307 mg/L PO_4
7–229 mg/L P_2O_5
Expression of results also possible in mmol/L.

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

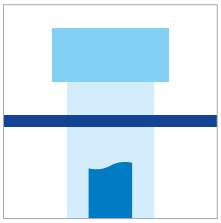
Pipette 0.20 mL of the sample into a reaction cell, close with the screw cap, and mix.



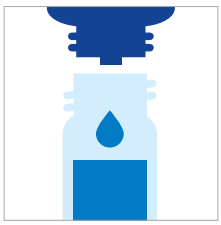
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



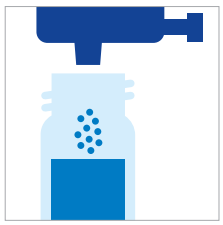
Heat the cell in the thermoreactor at 120 °C for 30 minutes.



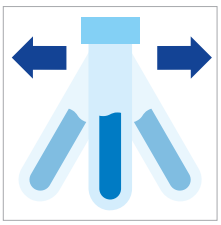
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

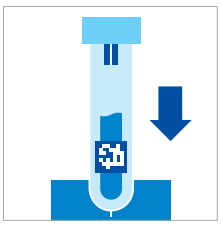


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



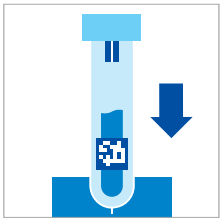
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

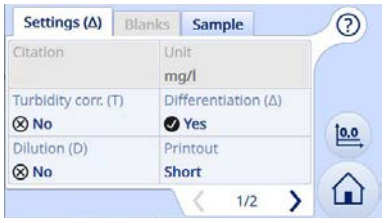
Phosphate Differentiation between Total Phosphorus, Orthophosphate, and Organophosphate	**100673**	Cell Test

Measuring range: 3.0–100.0 mg/L PO_4-P or P
9–307 mg/L PO_4
7–229 mg/L P_2O_5

If the aim is to differentiate between orthophosphate (PO_4-P) and $P_{org.}$*, after starting the method it is possible to set the method-specific "Differentiation" mode.
* $P_{org.}$ is the sum of polyphosphate and organophosphate.
Note: If no differentiation is to be measured, the "Differentiation" mode must be deactivated again.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

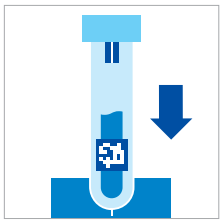


Tap the <Settings> tab. Select "Differentiation" and activate.

Switch back to <Sample> tab.

Perform determination of **total phosphorus** (see analytical procedure "Determination of total phosphorus" with 100673) = c**ell Σ P**

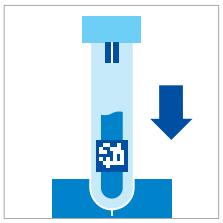
After the reaction time has expired:



Place the cell **PO_4-P** into the analysis compartment. Align the mark on the cell with that on the photometer.

Perform determination of **orthophosphate** (see analytical procedure "Determination of orthophosphate" with 100673) = c**ell PO_4-P**

After the reaction time has expired:



Place the cell **PO_4-P** into the analysis compartment. Align the mark on the cell with that on the photometer.

The results A (Σ P), B (PO_4-P), and C ($P_{org.}$) are shown in the display in mg/L.

Phosphate Determination of Orthophosphate	**114848**	Test

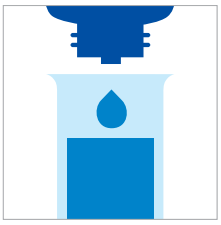
Measuring range:	0.05–5.00 mg/L PO_4-P	0.2–15.3 mg/L PO_4	0.11–11.46 mg/L P_2O_5	10-mm cuvette
	0.03–2.50 mg/L PO_4-P	0.09–7.67 mg/L PO_4	0.07–5.73 mg/L P_2O_5	20-mm cuvette
	0.005–1.000 mg/L PO_4-P	0.015–3.066 mg/L PO_4	0.011–2.291 mg/L P_2O_5	50-mm cuvette

Expression of results also possible in mmol/L.

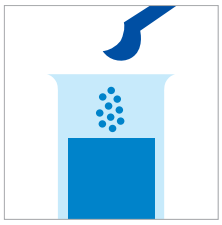
Measuring range: 0.005–5.00 mg/L PO_4-P

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

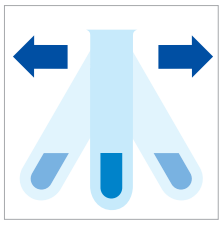
Pipette 5.0 mL of the sample into a test tube.



Add 5 drops of **PO_4-1** and mix.

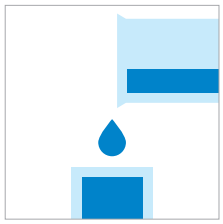


Add 1 level blue micro-spoon of **PO_4-2**.

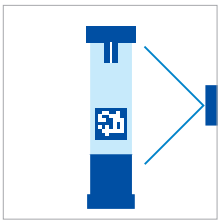


Shake vigorously to dissolve the solid substance.

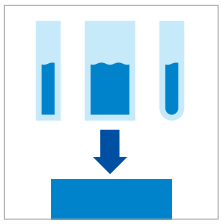
Reaction time:
5 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

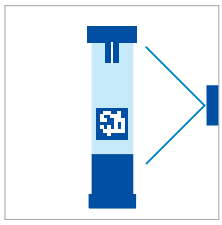
Important:
For measurement in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.
For the determination of **total phosphorus = sum of ortho-phosphate, polyphosphate, and organophosphate** a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of phosphorus (Σ P).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10.
Ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

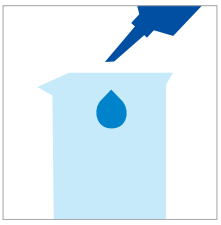
Phosphate Determination of Orthophosphate	**114848**	Test

Measuring range: 0.0025–0.5000 mg/L PO_4-P

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

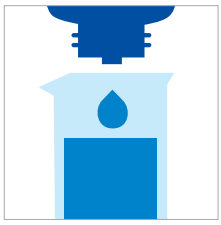


Select method with AutoSelector.

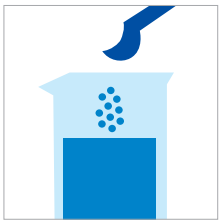


Place 20 mL of sample into a suitable vessel.

Place 20 mL of distilled water (Water for analysis EMSURE® is recommended) into a second suitable vessel. (Blank)



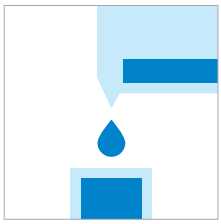
Add to each vessel 20 drops of **PO_4-1** and mix.



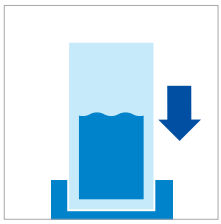
Add to each vessel 4 level blue microspoon of **PO_4-2**.

Shake both vessels vigorously to dissolve the solid substance.

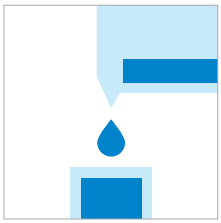
Reaction time:
5 minutes



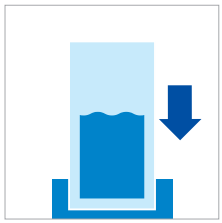
Transfer the blank into the zero.



Insert the zero cell into the analysis compartment.



Transfer the measurement sample into the cuvette.



Insert the cuvette containing the sample into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can be used after diluting accordingly.

Phosphate Determination of Orthophosphate	**100798**	Test

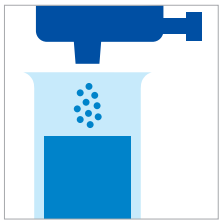
Measuring range: 1.0–100.0 mg/L PO_4-P 3–307 mg/L PO_4 2–229 mg/L P_2O_5 10-mm cuvette
Expression of results also possible in mmol/L.

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

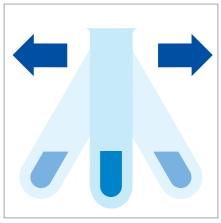
Pipette 8.0 mL of distilled water (Water for analysis EMSURE® is recommended) into a test tube.

Add 0.50 mL of the sample with pipette and mix.

Add 0.50 mL of **PO_4-1** with pipette and mix.

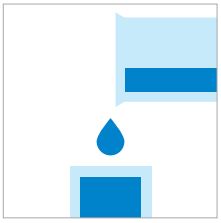


Add 1 dose of **PO_4-2** using the blue dose-metering cap.

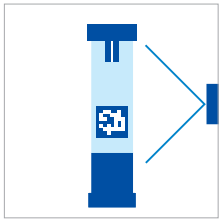


Shake vigorously to dissolve the solid substance.

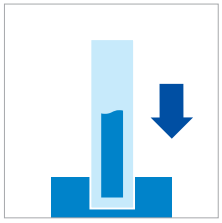
Reaction time:
5 minutes



Transfer the solution into a cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

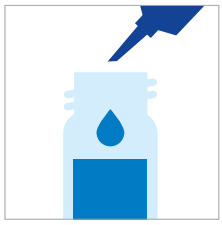
Important:
For the determination of **total phosphorus = sum of ortho-phosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat.Nos. 114543, 114729, and 100673 or Phosphate Test, Cat.No. 114848 in conjunction with Crack Set 10/10C can be used.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can be used after diluting accordingly.

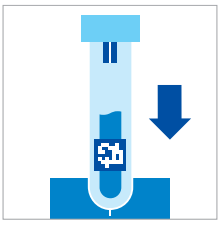
Phosphate Determination of Orthophosphate	**114546**	Cell Test

Measuring range: 0.5–25.0 mg/L PO_4-P
1.5–76.7 mg/L PO_4
1.1–57.3 mg/L P_2O_5
Expression of results also possible in mmol/L.

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



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



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Important:
For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat.Nos. 114543, 114729, and 100673 or Phosphate Test, Cat.No. 114848 in conjunction with Crack Set 10/10C can be used.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can be used after diluting accordingly.

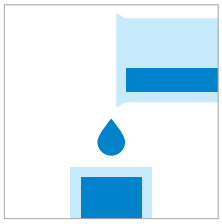
Phosphate Determination of Orthophosphate	**114842**	Test

Measuring range: 1.0–30.0 mg/L PO_4-P | 3.1–92.0 mg/L PO_4 | 2.3–68.7 mg/L P_2O_5 | 10-mm cuvette
0.5–15.0 mg/L PO_4-P | 1.5–46.0 mg/L PO_4 | 1.1–34.4 mg/L P_2O_5 | 20-mm cuvette
Expression of results also possible in mmol/L.

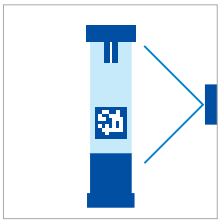
Check the pH of the sample, specified range: pH 0–10. If required, add dilute sulfuric acid drop by drop to adjust the pH.

Pipette 5.0 mL of the sample into a test tube.

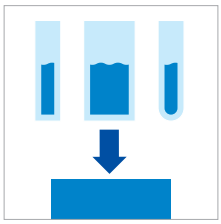
Add 1.2 mL of **PO_4-1** with pipette and mix.



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



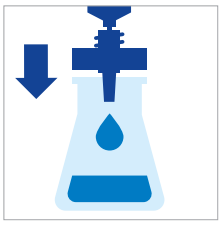
Place the cuvette into the analysis compartment.

Important:
For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat.Nos. 114543, 114729, and 100673 or Phosphate Test, Cat.No. 114848 in conjunction with Crack Set 10/10C can be used.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur® concentration 1,000 mg/L PO_4^{3-}, can be used after diluting accordingly.

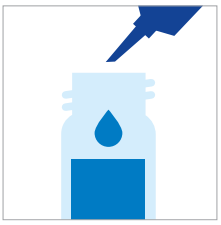
Potassium	114562	Cell Test

Measuring range: 5.0–50.0 mg/L K
Expression of results also possible in mmol/L.

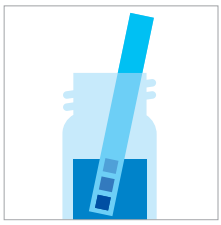


Filter turbid samples.

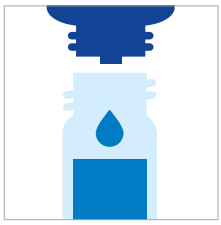
Check the pH of the sample, specified range: pH 3–12. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



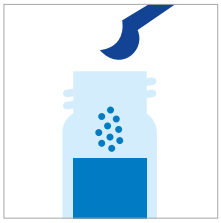
Pipette 2.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



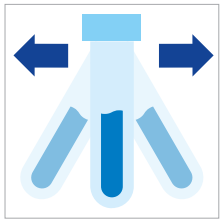
Check the pH, specified range: pH 10.0–11.5.



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

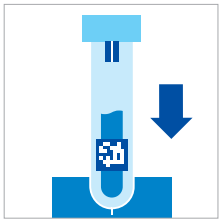


Add 1 level blue micro-spoon of **K-2K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes

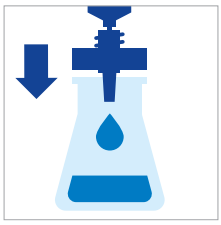


Place the cell **without re-shaking** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use potassium standard solution Certipur® concentration 1,000 mg/L K, can be used after diluting accordingly.

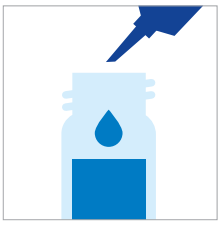
Potassium	**100615**	Cell Test

Measuring range: 30–300 mg/L K
Expression of results also possible in mmol/L.

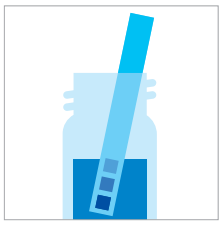


Filter turbid samples.

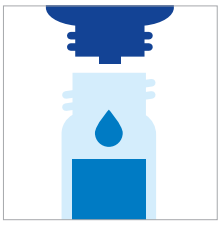
Check the pH of the sample, specified range: pH 3–12. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



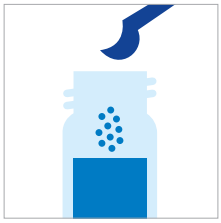
Pipette 0.50 mL of the sample into a reaction cell, close with the screw cap, and mix.



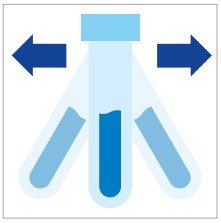
Check the pH, specified range: pH 10.0–11.5.



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

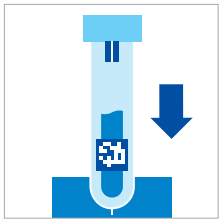


Add 1 level blue micro-spoon of **K-2K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



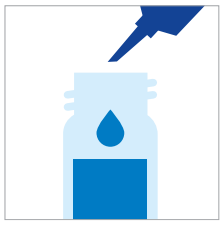
Place the cell **without re-shaking** into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use potassium standard solution Certipur® concentration 1,000 mg/L K, can be used after diluting accordingly.

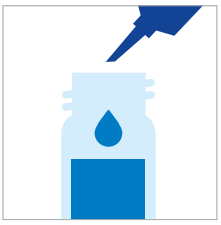
Residual Hardness	114683	Cell Test

Measuring range: 0.50–5.00 mg/L Ca
0.070–0.700 °d
0.087–0.874 °e
0.12–1.25 °f
0.70–7.00 mg/L CaO
1.2–12.5 mg/L $CaCO_3$
Expression of results also possible in mmol/L.

Check the pH of the sample, specified range: pH 5–8. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

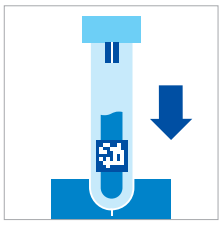


Pipette 4.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



Add 0.20 mL of **RH-1K**, close the cell with the screw cap, and mix.

Reaction time:
10 minutes, **measure immediately**.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use calcium standard solution Certipur® concentration 1,000 mg/L Ca, can be used after diluting accordingly. (Pay attention to pH value!)

Silicate (Silicic Acid) | 114794 | Test

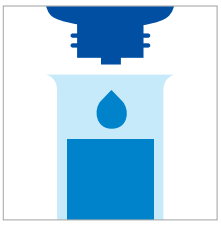
Measuring range:

0.21–10.70 mg/L SiO_2	0.10–5.00 mg/L Si	10-mm cuvette
0.10–5.35 mg/L SiO_2	0.05–2.50 mg/L Si	20-mm cuvette
0.011–1.600 mg/L SiO_2	0.005–0.750 mg/L Si	50-mm cuvette

Expression of results also possible in mmol/L.

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

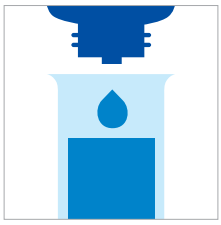
Pipette 5.0 mL of the sample into a test tube.



Add 3 drops of **Si-1** and mix.

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

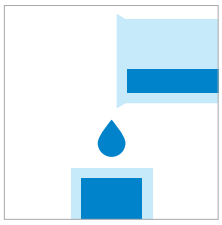
Reaction time: 3 minutes



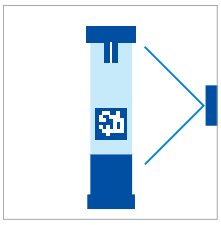
Add 3 drops of **Si-2** and mix.

Add 0.50 mL of **Si-3** with pipette and mix.

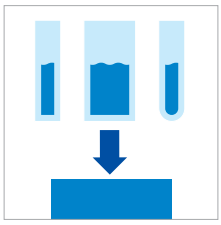
Reaction time: 10 minutes



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use silicon standard solution Certipur® concentration 1,000 mg/L Si, can be used after diluting accordingly as well as the Standard solutions for photometric applications (Attention! Do **not** store standard solutions in glass vessels – see section "Standard solutions"!)

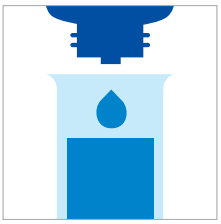
Silicate (Silicic Acid)	100857	Test

Measuring range: 1.1–107.0 mg/L SiO_2 0.5–50.0 mg/L Si 10-mm cuvette
11–1,070 mg/L SiO_2 5–500 mg/L Si 10-mm cuvette
Expression of results also possible in mmol/L.

Measuring range: 1.1–107.0 mg/L SiO_2

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

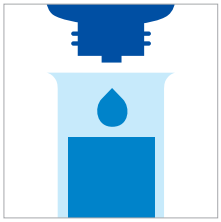
Pipette 4.0 mL of the sample into a test tube.



Add 4 drops of **Si-1** and mix.

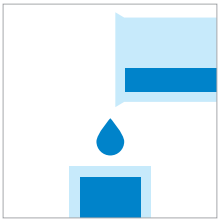
Add 2.0 mL of **Si-2** with pipette and mix.

Reaction time: 2 minutes

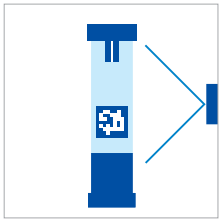


Add 4 drops of **Si-3** and mix.

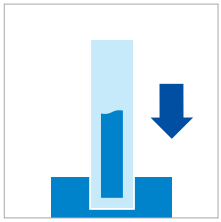
Reaction time: 2 minutes



Transfer the solution into a cuvette.



Select method with AutoSelector measuring range 0.5–50.0 mg/L Si.



Place the cuvette into the analysis compartment.

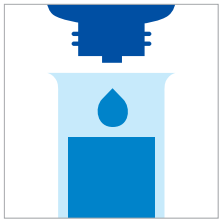
Silicate (Silicic Acid)	100857	Test

Measuring range: 11–1,070 mg/L SiO_2

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

Pipette 5.0 mL of distilled water (Water for analysis EMSURE® is recommended) into a test tube.

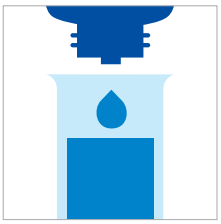
Add 0.50 mL of the sample with pipette and mix.



Add 4 drops of **Si-1** and mix.

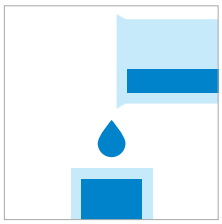
Add 2.0 mL of **Si-2** with pipette and mix.

Reaction time: 2 minutes

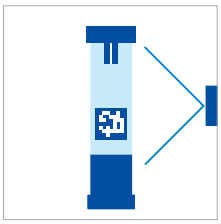


Add 4 drops of **Si-3** and mix.

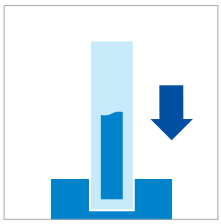
Reaction time: 2 minutes



Transfer the solution into a cuvette.



Select method with AutoSelector measuring range 5–500 mg/L Si.



Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use silicon standard solution Certipur® concentration 1,000 mg/L Si, can be used after diluting accordingly. (Attention! Do **not** store standard solutions in glass vessels – see section "Standard solutions"!)

Silicate (Silicic Acid)	101813	Test

Measuring range: 0.5–500.0 µg/L SiO_2 0.2–233.7 µg/L Si 50-mm cuvette
Expression of results also possible in mmol/L.

Measuring range: 0.5–500.0 µg/L SiO_2

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

Pipette 10 mL of the sample into a plastic vessel.

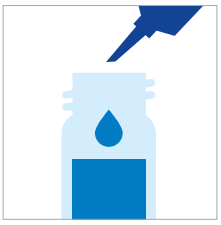
Pipette 10 mL of distilled water (Water Ultrapur is recommended) into a second plastic vessel. (Blank)

Add to each vessel 0.10 mL of **Si-1** with pipette, close with the screw cap, and mix.

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

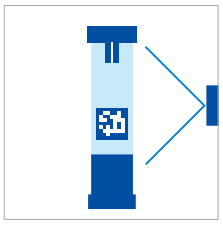
Reaction time: 5 minutes

Add to each vessel 0.10 mL of **Si-2** with pipette, close with the screw cap, and mix.



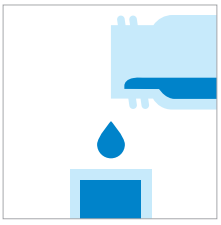
Add to each vessel 0.50 mL of **Si-3** with pipette, close with the screw cap, and mix.

Reaction time: 5 minutes

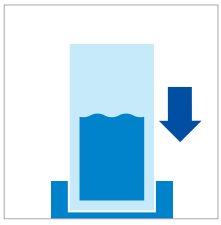


Select method with AutoSelector.

Tap the <Blanks> tab. Activate "Reagent blank" and confirm with "OK".

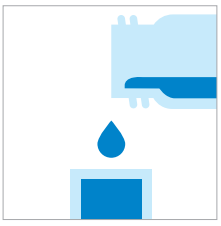


Transfer the blank into the cuvette and measure **immediately**.

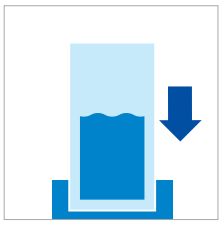


Insert the blank cuvette into the analysis compartment.

Switch back to <Sample> tab.



Transfer the measurement sample into the cuvette and measure **immediately**.

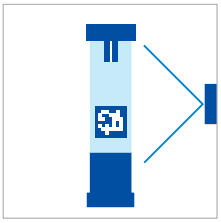


Insert the cuvette containing the sample into the analysis compartment.

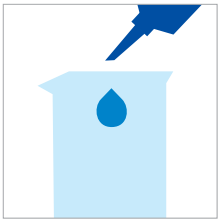
Silicate (Silicic Acid) | 101813 | Test

Measuring range: 0.25–250.00 µg/L SiO_2

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



Select method with AutoSelector.



Place 20 mL of sample into a plastic vessel.

Place 20 mL of distilled water (Water Ultrapur is recommended) into a second plastic vessel. (Blank)

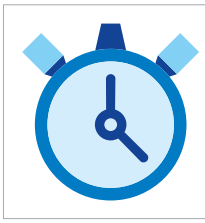
Add to each vessel 0.20 mL of **Si-1** with pipette and mix.

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

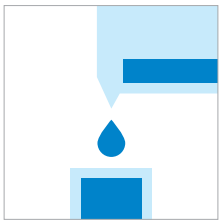
Reaction time: 5 minutes

0.20 mL of **Si-2** with pipette and mix.

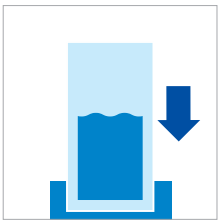
Add to each vessel 1.0 mL of **Si-3** with pipette and mix.



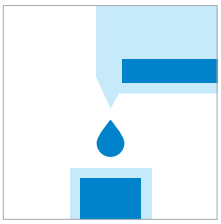
Reaction time: 5 minutes



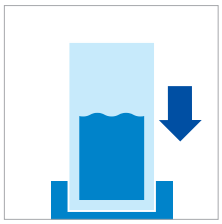
Transfer the blank into the cuvette and measure immediately.



Insert the blank cuvette into the analysis compartment.



Transfer the measurement sample into the cuvette and measure **immediately**.



Insert the cuvette containing the sample into the analysis compartment.

Important:
No glass equipment may be used in the course of the determination (e.g. pipettes etc.)!

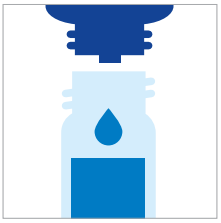
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use silicon standard solution Certipur® concentration 1,000 mg/L Si, can be used after diluting accordingly as well as the Standard solution for photometric applications. (Attention! Do **not** store standard solutions in glass vessels – see section "Standard solutions").

Silver	114831	Test

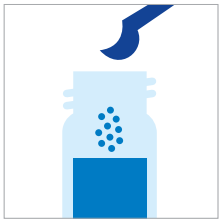
Measuring range: 0.50–3.00 mg/L Ag 10-mm cuvette
0.25–1.50 mg/L Ag 20-mm cuvette
Expression of results also possible in mmol/L.

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

Pipette 10 mL of the sample into an empty round cell.



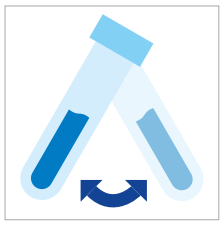
Add 2 drops of **Ag-1**.



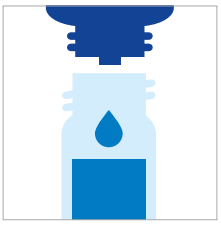
Add 1 level green microspoon of **Ag-2**, close the cell with the screw cap.

Heat the cell in the thermoreactor at 120 °C for 1 hours.

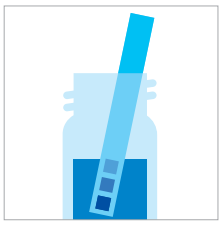
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



Swirl the cell before opening.

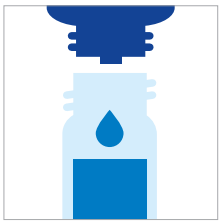


Add 3 drops of **Ag-3**, close with the screw cap, and mix.



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

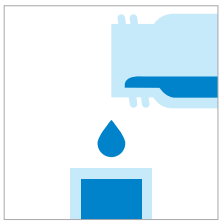
Add 1 drop of **Ag-4**, close with the screw cap, and mix.



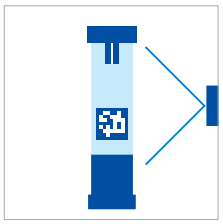
Add 5 drops of **Ag-5**, close with the screw cap, and mix.

Add 1.0 mL of **Ag-6**, close with the screw cap, and mix.

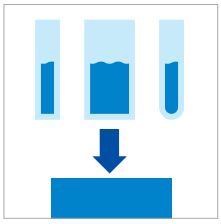
Reaction time: 5 minutes



Transfer the solution into a corresponding rectangular cell.



Select method with AutoSelector.



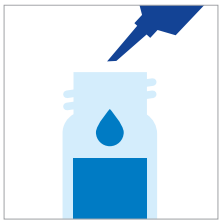
Place the cell into the analysis compartment.

Important:
Very high silver concentrations in the sample produce turbid solutions (measurement solution should be clear). In such cases the sample must be diluted (plausibility check).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use silver standard solution Certipur® concentration 1,000 mg/L Ag, can be used after diluting accordingly.

Sodium In Nutrient Solutions	**100885**	Cell Test

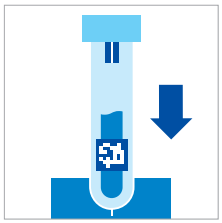
Measuring range: 10–300 mg/L Na
Expression of results also possible in mmol/L.



Pipette 0.50 mL of **Na-1K** into a reaction cell and mix.

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

Reaction time: 1 minute

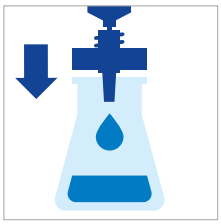


Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use chloride standard solution Certipur® concentration 1,000 mg/L Cl^- (corresponds to 649 mg/L Na), can be used after diluting accordingly (see section "Standard solutions").

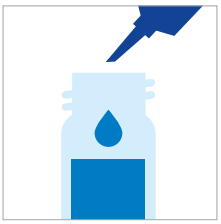
Sulfate	102532	Cell Test

Measuring range: 1.0–50.0 mg/L SO_4
Expression of results also possible in mmol/L.

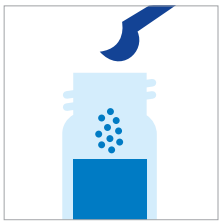


Filter turbid samples.

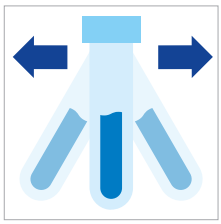
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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

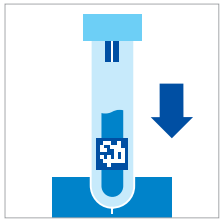


Add 1 level green micro-spoon of **SO_4-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes, **measure immediately**.

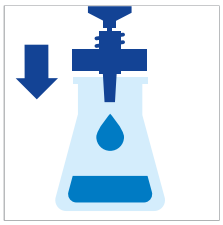


Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use sulfate standard solution Certipur® concentration 1,000 mg/L SO_4^{2-}, can be used after diluting accordingly.

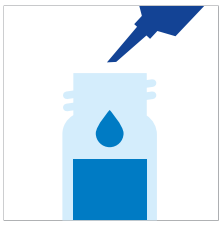
Sulfate	114548	Cell Test

Measuring range: 5–250 mg/L SO_4
Expression of results also possible in mmol/L.



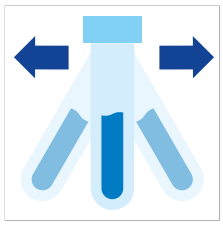
Filter turbid samples.

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



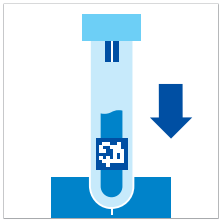
Pipette 5.0 mL of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green micro-spoon of **SO_4-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes, **measure immediately**.

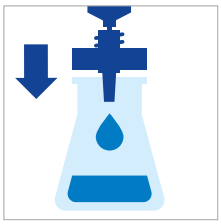


Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 or the Standard solutions for photometric applications.
Ready-to-use sulfate standard solution Certipur® concentration 1,000 mg/L SO_4^{2-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

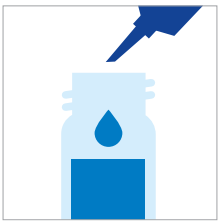
Sulfate	100617	Cell Test

Measuring range: 50–500 mg/L SO_4
Expression of results also possible in mmol/L.

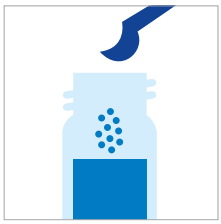


Filter turbid samples.

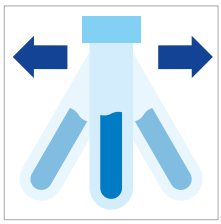
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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

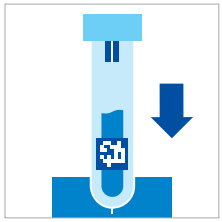


Add 1 level green micro-spoon of **SO_4-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes, **measure immediately**.

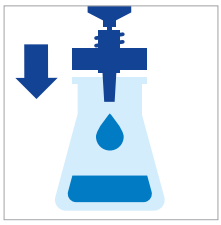


Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 or the Standard solutions for photometric applications.
Ready-to-use sulfate standard solution Certipur® concentration 1,000 mg/L SO_4^{2-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

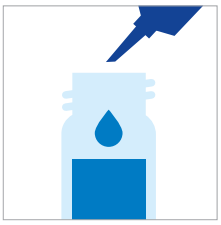
Sulfate	114564	Cell Test

Measuring range: 100–1,000 mg/L SO_4
Expression of results also possible in mmol/L.



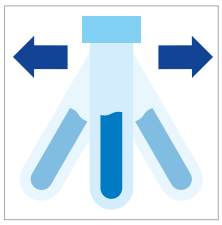
Filter turbid samples.

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



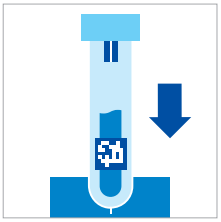
Pipette 1.0 mL of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green micro-spoon of **SO_4-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes, **measure immediately**.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

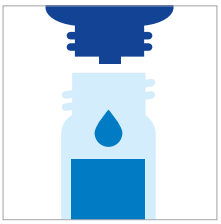
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 or the Standard solutions for photometric applications.
Ready-to-use sulfate standard solution Certipur® concentration 1,000 mg/L SO_4^{2-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Sulfate	114791	Test

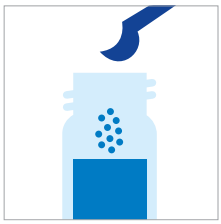
Measuring range: 25–300 mg/L SO_4 10-mm cuvette
Expression of results also possible in mmol/L.

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

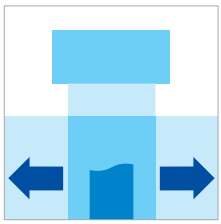
Pipette 2.5 mL of the sample into a test tube with screw cap.



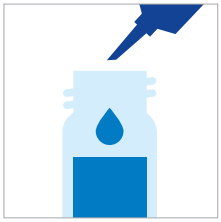
Add 2 drops of **SO_4-1** and mix.



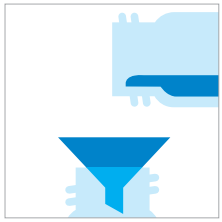
Add 1 level green microspoon of **SO_4-2**, close the test tube with the screw cap, and mix.



Temper the test tube in a water bath at 40 °C for 5 minutes.

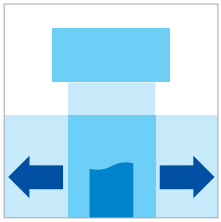


Add 2.5 mL of **SO_4-3** with pipette and mix.

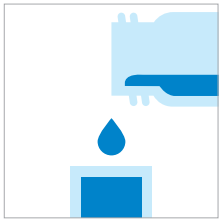


Filter the content of the test tube with a round filter into another test tube with screw cap.

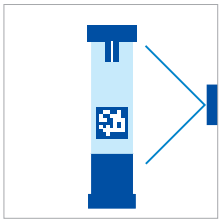
Add 4 drops of **SO_4-4** to the filtrate, close the test tube with the screw cap, and mix.



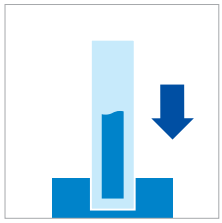
Temper the test tube again in the water bath for 7 minutes.



Transfer the solution into a cuvette.



Select method with AutoSelector.

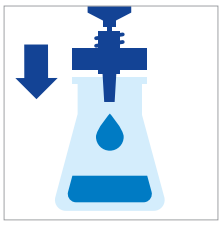


Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 or the Standard solutions for photometric applications.
Ready-to-use sulfate standard solution Certipur® concentration 1,000 mg/L SO_4^{2-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Sulfate	**101812**	Test

Measuring range: 2.5–50.0 mg/L SO_4 10-mm cuvette
1.3–25.0 mg/L SO_4 20-mm cuvette
0.50–10.00 mg/L SO_4 50-mm cuvette
Expression of results also possible in mmol/L.

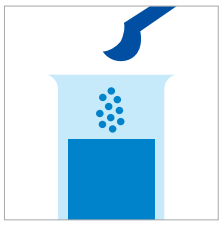


Filter turbid samples.

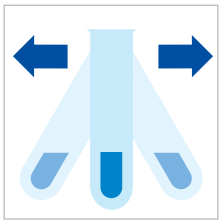
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 0.50 mL of **SO_4-1** into a test tube.

Add 10 mL of the sample with pipette and mix.

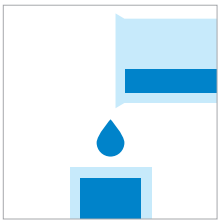


Add 1 level green microspoon of **SO_4-2**.

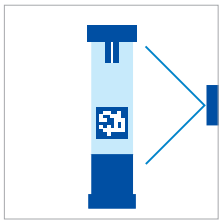


Shake the test tube vigorously to dissolve the solid substance.

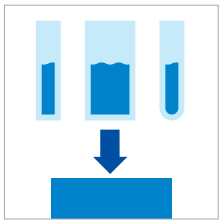
Reaction time: 2 minutes, **measure immediately**.



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.

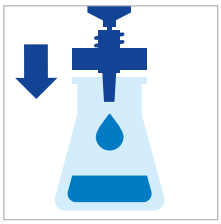


Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use sulfate standard solution Certipur® concentration 1,000 mg/L SO_4^{2-}, can be used after diluting accordingly.

Sulfate	102537	Test

Measuring range: 5–300 mg/L SO_4 10-mm cuvette
Expression of results also possible in mmol/L.

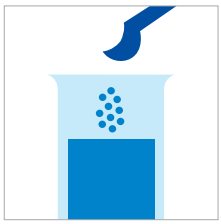


Filter turbid samples.

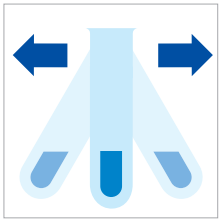
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 0.50 mL of **SO_4-1** into a test tube.

Add 5.0 mL of the sample with pipette and mix.

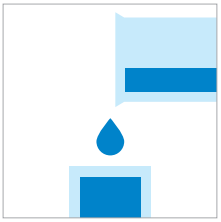


Add 1 level blue micro-spoon of **SO_4-2**.

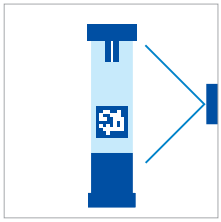


Shake the test tube vigorously to dissolve the solid substance.

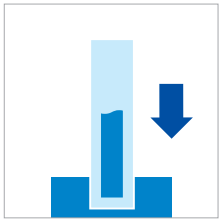
Reaction time:
2 minutes, **measure immediately**.



Transfer the solution into a cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 or the Standard solutions for photometric applications.
Ready-to-use sulfate standard solution Certipur® concentration 1,000 mg/L SO_4^{2-}, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Sulfide	114779	Test

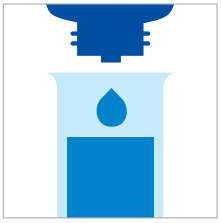
Measuring range:

0.10–1.50 mg/L S	0.10–1.55 mg/L HS	10-mm cuvette
0.050–0.750 mg/L S	0.052–0.774 mg/L HS	20-mm cuvette
0.020–0.500 mg/L S	0.021–0.516 mg/L HS	50-mm cuvette

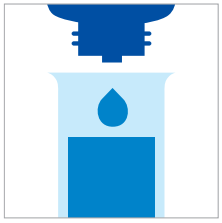
Expression of results also possible in mmol/L.

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

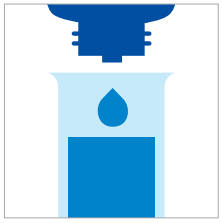
Pipette 5.0 mL of the sample into a test tube.



Add 1 drop of **S-1** and mix.

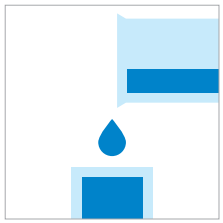


Add 5 drops of **S-2** and mix.

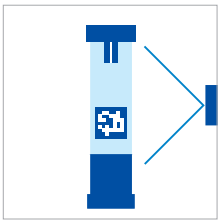


Add 5 drops of **S-3** and mix.

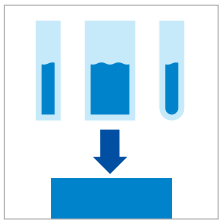
Reaction time: 1 minute



Transfer the solution into a corresponding cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
To measure in the 50-mm cuvette, the sample volume and the volume of the reagents have to be doubled for each.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a sulfide standard solution must be prepared from sodium sulfide GR (see section "Standard solutions").

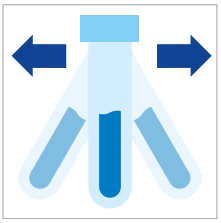
Sulfite	114394	Cell Test

Measuring range: 1.0–20.0 mg/L SO_3 | 0.8–16.0 mg/L SO_2 | Round cell
0.05–3.00 mg/L SO_3 | 0.04–2.40 mg/L SO_2 | 50-mm cuvette
Expression of results also possible in mmol/L.

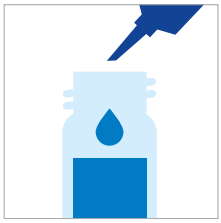
Measuring range: 1.0–20.0 mg/L SO_3

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

Add 1 level grey micro-spoon of **SO_3-1K** into a reaction cell, close with the screw cap.

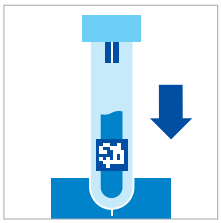


Shake the cell vigorously to dissolve the solid substance.



Add 3.0 mL of the sample with pipette, close the cell with the screw cap, and mix.

Reaction time: 2 minutes



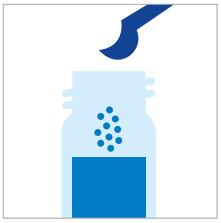
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Sulfite	**114394**	Cell Test

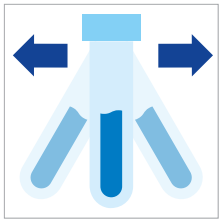
Measuring range: 0.05–3.00 mg/L SO_3

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

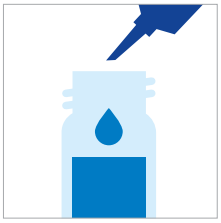
Select article no. **114394**.



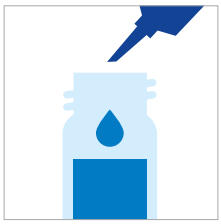
Add 1 level grey micro-spoon each of **SO_3-1K** into two reaction cells, close with the screw cap.



Shake both cells vigorously to dissolve the solid substance.

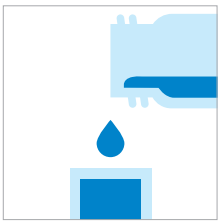


Add 7.0 mL of the sample with pipette to one reaction cell, close with the screw cap, and mix.

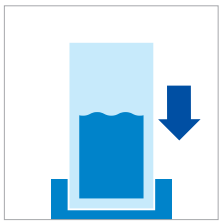


Add 7.0 mL of distilled water with pipette to the second reaction cell, close with the screw cap, and mix. (Blank)

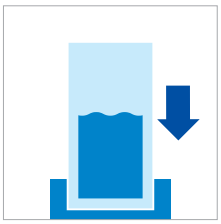
Reaction time: 2 minutes



Transfer both solutions into two separate 50-mm cells.



Place the blank cuvette into the analysis compartment.

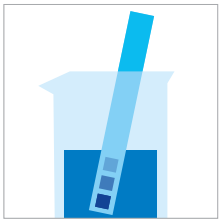


Place the cuvette containing the sample into the analysis compartment.

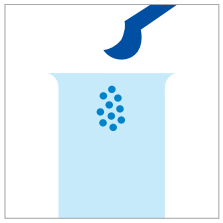
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR (see section "Standard solutions").

Sulfide	101746	Test

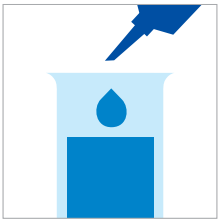
Measuring range: 1.0–60.0 mg/L SO_3 10-mm cuvette
0.8–48.0 mg/L SO_2 10-mm cuvette
Expression of results also possible in mmol/L.



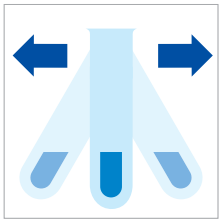
Check the pH of the sample, specified range: pH 4–9. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Place 1 level grey microspoon of **SO_3-1** into a dry test tube.



Add 3.0 mL of **SO_3-2** with pipette.

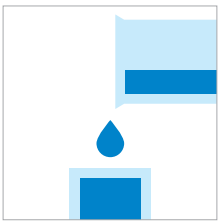


Shake vigorously to dissolve the solid substance.

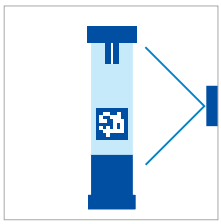
Add 5.0 mL of distilled water with pipette and mix.

Add 2.0 mL of the sample with pipette and mix.

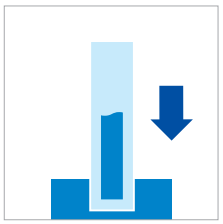
Reaction time:
2 minutes



Transfer the solution into a cuvette.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

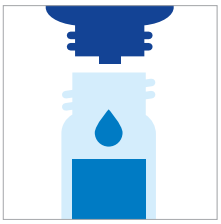
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR (see section "Standard solutions").

Surfactants (Anionic)	102552	Cell Test

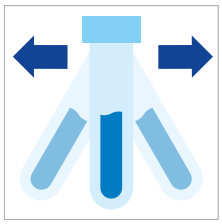
Measuring range: 0.05–2.00 mg/L SDAS* *sodium 1-dodecanesulfonate
0.06–2.56 mg/L SDBS* *sodium dodecylbenzenesulfonate
0.05–2.12 mg/L SDS* *sodium dodecyl sulfate
0.08–3.26 mg/L SDOSSA* *sodium dioctyl sulfosuccinate
Expression of results also possible in mmol/L.

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

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

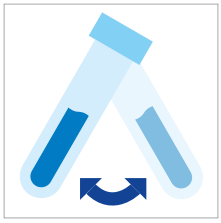


Add 2 drops of **T-1K**, close the cell with the screw cap.

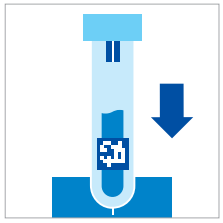


Shake the cell **vigorously for 30 seconds**.

Reaction time: 10 minutes



Swirl the cell before the measurement.



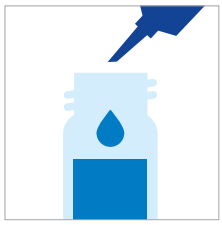
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from dodecane-1-sulfonic acid sodium salt GR (see section "Standard solutions").

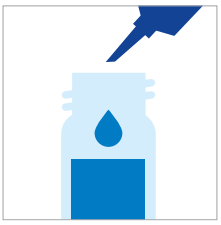
Surfactants (Cationic)	101764	Cell Test

Measuring range: 0.05–1.50 mg/L surfactants (cationic)
(calculated as N-cetyl-N,N,N-trimethylammonium bromide)

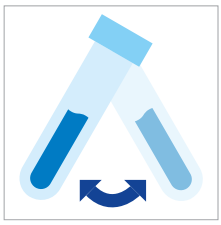
Check the pH of the sample, specified range: pH 3–8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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

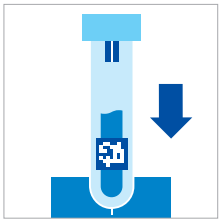


Add 0.50 mL of **T-1K** with pipette and close with the screw cap.



Swirl the cell for 30 seconds.

Reaction time: 5 minutes



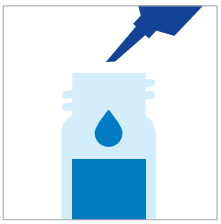
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from Cetyltrimethylammonium Bromide (see section "Standard solutions").

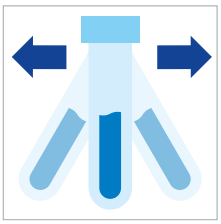
Surfactants (Nonionic)	101787	Cell Test

Measuring range: 0.10–7.50 mg/L surfactants (nonionic) (calculated as Triton® X-100)

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

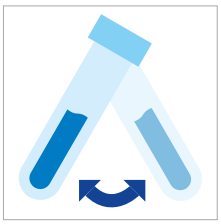


Pipette 4.0 mL of the sample into a reaction cell. Close with the screw cap.

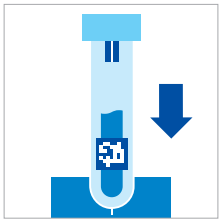


Shake the cell **for 1 minute vigorously**.

Reaction time: 2 minutes



Swirl the cell before measurement.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

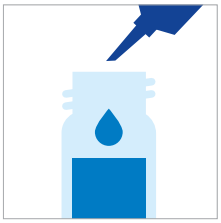
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from Triton® X-100 (see section "Standard solutions").
Standard solutions for photometric applications can also be used.

Tin	117265	Cell Test

Measuring range: 0.10–2.50 mg/L Sn
Expression of results also possible in mmol/L.

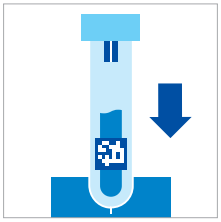
Check the pH of the sample, specified range: pH 1.5–2.2. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 4.0 mL of the sample into a reaction cell, close with the screw cap, and mix.



Add 0.50 mL of **Sn-1K** with pipette, close the cell with the screw cap, and mix.

Reaction time:
15 minutes, **measure immediately**.



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

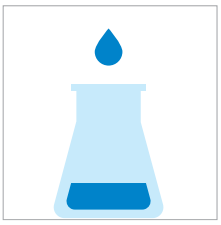
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a tin standard solution must be prepared from ready-to-use tin standard solution Certipur®, concentration 1,000 mg/L Sn (see section "Standard solutions").

TOC Total Organic Carbon	**114878**	Cell Test

Measuring range: 5.0–80.0 mg/L TOC

Removal of inorganic bound carbon (TIC):

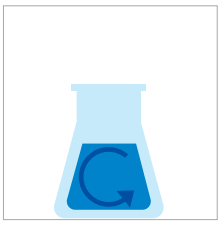
Check the pH of the sample, specified range: pH 2–12. If required, add dilute sulfuric acid drop by drop to adjust the pH.



Place 25 mL of the sample into a suitable glass vessel.

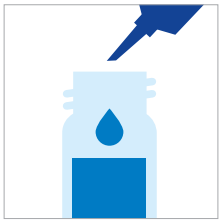
Add 3 drops of **TOC-1K** and mix.

Check the pH, specified range pH <2.5.

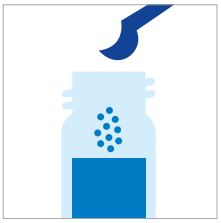


Stir for 10 minutes.

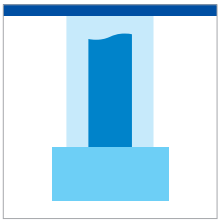
Preparation of measurement sample:



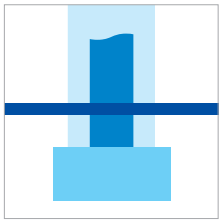
Pipette 3.0 mL of stirred sample into a reaction cell.



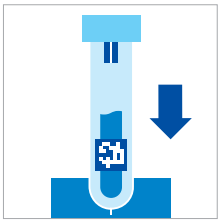
Add 1 level grey micro-spoon of **TOC-2K**. **Immediately** close the cell tightly with an **aluminium cap**.



Heat the cell, standing on its head, at 120 °C in the thermoreactor for 2 hours.



Remove the cell from the thermoreactor and let it, **standing on its head**, to cool for 1 hour.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

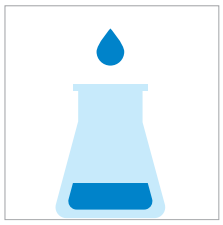
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a TOC standard solution Certipur® concentration 1,000 mg/L TOC, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

TOC Total Organic Carbon	**114879**	Cell Test

Measuring range: 50–800.0 mg/L TOC

Removal of inorganic bound carbon (TIC):

Check the pH of the sample, specified range: pH 2–12. If required, add dilute sulfuric acid drop by drop to adjust the pH.



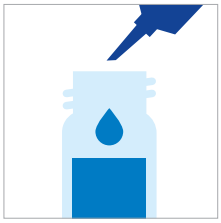
Pipette 1.0 mL of the sample and 9.0 mL of distilled water (Water for chromatography LiChrosolv® is recommended) into a suitable glass vessel.

Add 2 drops of **TOC-1K** and mix.

Check the pH, specified range pH <2.5

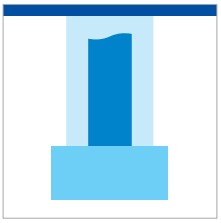
Stir for 10 minutes.

Preparation of measurement sample:

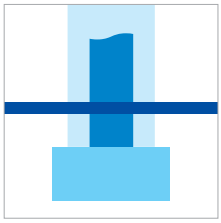


Pipette 3.0 mL of stirred sample into a reaction cell.

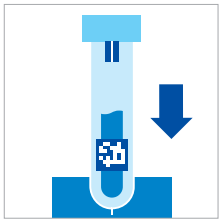
Add 1 level grey micro-spoon of **TOC-2K**. **Immediately** close the cell tightly with an **aluminium cap**.



Heat the cell, standing on its head, at 120 °C in the thermoreactor for 2 hours.



Remove the cell from the thermoreactor and let it, **standing on its head**, to cool for 1 hour.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

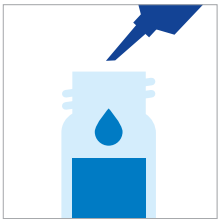
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a TOC standard solution Certipur® concentration 1,000 mg/L TOC, can be used after diluting accordingly as well as the Standard solutions for photometric applications.

Total Hardness Determination of Total Hardness	**100961**	Cell Test

Measuring range: 5–215 mg/L Ca
0.7–30.1 °dH
0.9–37.6 °eH
1.2–53.7 °fH
7–301 mg/L CaO
12–537 mg/L $CaCO_3$
0.12–5.36 mmol/L Ca/Mg
Expression of results also possible in mmol/L.

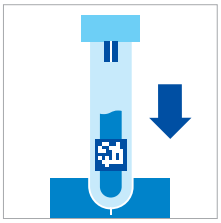
Check the pH of the sample, specified range: pH 3–9. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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



Add 1.0 mL of **H-1K** with pipette, close the cell with the screw cap, and mix.

Reaction time:
3 minutes



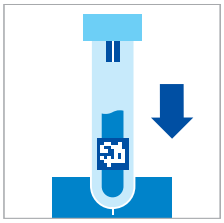
Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

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

Total Hardness Differentiation between Ca- and Mg-Hardness	**100961**	Cell Test

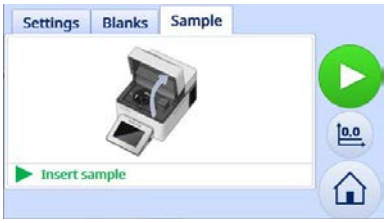
Measuring range: 0.12–5.36 mmol/L
0.7–30.1 °dH
0.9–37.6 °eH
1.2–53.7 °fH

If the aim is to differentiate between Calcium- and Magnesium-hardness, after starting the method it is possible to set the method-specific "Differentiation" mode.
Differentiation possible only in mmol/L.
Note: If no differentiation is to be measured, the "Differentiation" mode must be deactivated again.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Tap the <Settings> tab.
Select "Differentiation" and activate.



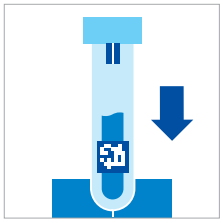
Switch back to <Sample> tab.

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

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

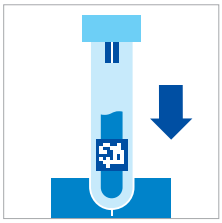
Add 1.0 mL of **H-1K** with pipette, close the cell with the screw cap, and mix.

Reaction time:
3 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™. = **cell A**

Add 3 drops of **H-2K** to the already measured cell, close the cell with the screw cap, and mix.



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™. = **cell B**

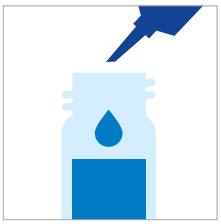
The results A (Σ Ca/Mg), B (Mg), and C (Ca) are shown in the display in mg/L.

Volatile Organic Acids	101749	Cell Test

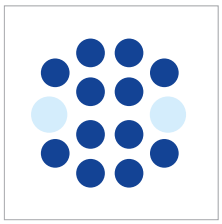
Measuring range: 50–3,000 mg/L volatile organic acid (calculated as acetic acid)
71–4,401 mg/L volatile organic acid (calculated as butyric acid)

Check the pH of the sample, specified range: pH 2–12.

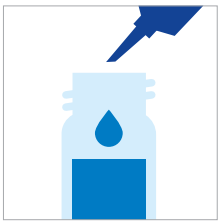
Pipette 0.50 mL of **OA-1K** into a round cell.



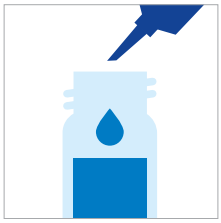
Add 0.50 mL of the sample with pipette, close with the screw cap, and mix.



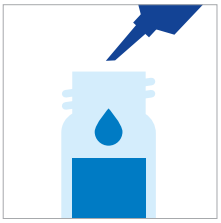
Heat the cell in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.



Add 1.0 mL of **OA-2K** with pipette.

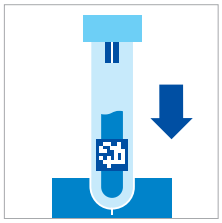


Add 1.0 mL of **OA-3K** with pipette, close the cell with the screw cap, and mix.



Add 1.0 mL of **OA-4K** with pipette, close the cell with the screw cap, and shake vigorously.

Reaction time: 1 minute



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

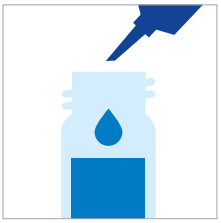
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous (see section "Standard solutions").

Volatile Organic Acids | 101809 | Test

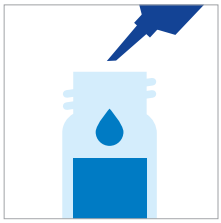
Measuring range: 50–3,000 mg/L volatile organic acid (calculated as acetic acid)
71–4,401 mg/L volatile organic acid (calculated as butyric acid)

Check the pH of the sample, specified range: pH 2–12.

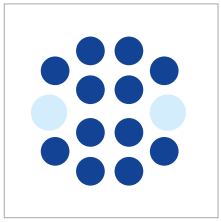
Pipette 0.75 mL of **OA-1** into a round cell.



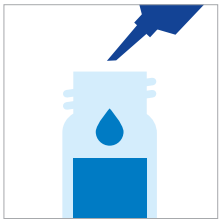
Add 0.50 mL of **OA-2** with pipette.



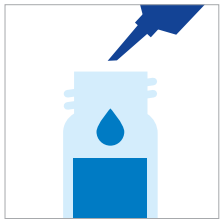
Add 0.50 mL of the sample with pipette, close with the screw cap, and mix.



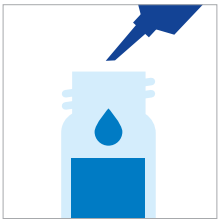
Heat the cell in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.



Add 1.0 mL of **OA-3** with pipette.

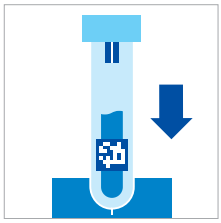


Add 1.0 mL of **OA-4** with pipette, close the cell with the screw cap, and mix.



Add 1.0 mL of **OA-5** with pipette, close the cell with the screw cap, and shake vigorously.

Reaction time: 1 minute



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

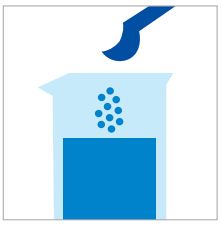
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous (see section "Standard solutions").

Zinc	100861	Cell Test

Measuring range: 0.025–1.000 mg/L Zn
Expression of results also possible in mmol/L.

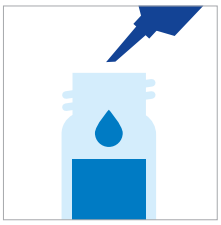
Check the pH of the sample, specified range: pH 1–7. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 10 mL of sample into a glass vessel.

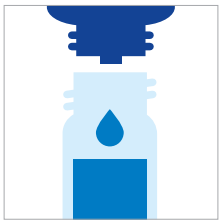


Add 1 level green microspoon of **Zn-1K** and shake to dissolve the solid substance: **sample-reagent mixture**.

Pipette 0.50 mL of **Zn-2K** into a reaction cell, close with the screw cap, and mix.

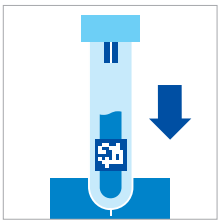


Add 2.0 mL of the **sample-reagent mixture** with pipette, close the cell with the screw cap, and mix.



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

Reaction time:
15 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Important:
For the determination of total zinc a pretreatment with Crack Set 10C and thermoreactor is necessary.
Result can be expressed as sum of zinc (Σ Zn).

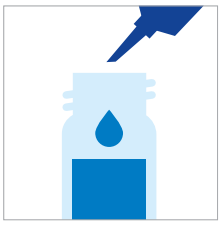
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100.
Ready-to-use zinc standard solution Certipur® concentration 1,000 mg/L Zn, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

Zinc	114566	Cell Test

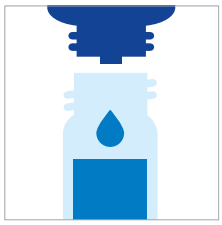
Measuring range: 0.20–5.00 mg/L Zn
Expression of results also possible in mmol/L.

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

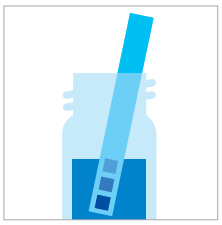
Add 5 drops of **Zn-1K** into a reaction cell, close with the screw cap, and mix.



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

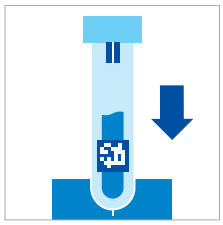


Add 5 drops of **Zn-2K**, close the cell with the screw cap, and mix.



Check the pH, specified range: pH 9.0–10.5.

Reaction time:
15 minutes



Place the cell into the analysis compartment. Align the mark on the cell with orientation mark on the XPathHolder™.

Important:
For the determination of total zinc a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary. Result can be expressed as sum of zinc (Σ Zn).

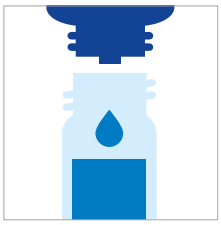
Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) ready-to-use zinc standard solution Certipur® concentration 1,000 mg/L Zn, can be used after diluting accordingly.

Zinc	114832	Test

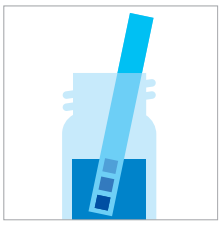
Measuring range: 0.05–2.50 mg/L Zn 10-mm cuvette
Expression of results also possible in mmol/L.

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

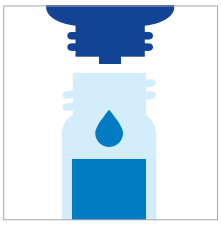
Pipette 5.0 mL of the sample into a test tube with screw cap.



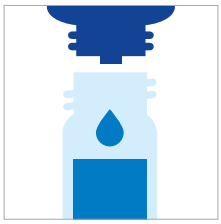
Add 5 drops of **Zn-1**, close the test tube with the screw cap, and mix.



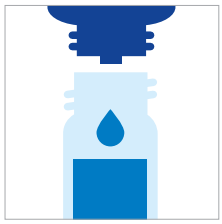
Check the pH, specified range: pH 12–13. If required, add dilute sodium hydroxide solution drop by drop to adjust the pH.



Add 2 drops of **Zn-2**, close the test test tube with the screw cap, and mix.

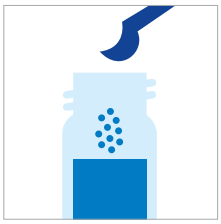


Add 5 drops of **Zn-3**, close the test tube with the screw cap, and mix.

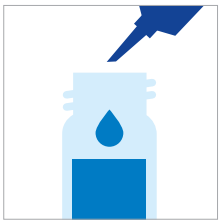


Add 3 drops of **Zn-4**, close the test tube with the screw cap, and mix.

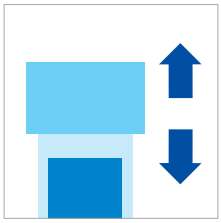
Reaction time: 3 minutes



Add 1 level grey micro-spoon of **Zn-5**, close the test tube with the screw cap, and dissolve the solid substance.



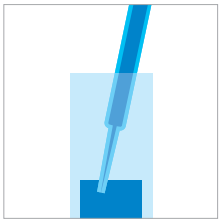
Add 5.0 mL of **Zn-6** (Isobutyl methyl ketone) with pipette and close the test tube with the screw cap.



Shake the tube vigorously for 30 seconds.

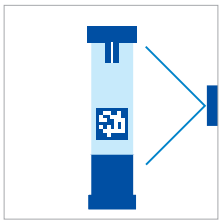
Leave to stand for 2 minutes.

Aspirate the clear upper phase from the tube with pipette.

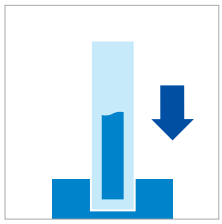


Transfer the solution into a cuvette.

Leave to stand for 3 minutes.



Select method with AutoSelector.



Place the cuvette into the analysis compartment.

Important:
For the determination of total zinc a pretreatment with Crack Set 10C or Crack Set 10 and thermoreactor is necessary.
Result can be expressed as sum of zinc (Σ Zn).

Quality assurance:
To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100.
Ready-to-use zinc standard solution Certipur® concentration 1,000 mg/L Zn, can also be used after diluting accordingly.
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

4. Required Equipment and Consumables

4.1. Instructions for the Preparation of Standard Solutions

4.1.1. Standard Solution of Acid Capacity

Preparation of a standard solution:
A sodium hydroxide solution of 0.1 mol/L (corresponds to 100 mmol/L) is used.
Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the diluted investigational solutions remain stable for one week.

Reagents required:	
1.09141.1000	Sodium hydroxide solution 0.1 mol/L Titripur®
1.16754.9010	Water for analysis EMSURE®

4.1.2. Standard Solution of Bromine 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 1,000-mL volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:
Transfer 11.13 mL of the KIO_3 stock solution to a calibrated or conformity-checked 1,000-mL volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water. 1 mL of this solution is equivalent to 0.025 mg of bromine.

Preparation of a bromine 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 minute, 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 5.00 mg/L bromine.

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 bromine standard solution is not stable and must be used immediately.

Reagents required:	
1.02404.0100	Potassium iodate, volum. 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®

4.1.3. Standard Solution of Calcium

Preparation of a standard solution:
Dissolve 2.946 g of calcium nitrate tetrahydrate with distilled water in a calibrated or conformity-checked 500-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 mg/L calcium. Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
The standard solution of 1,000 mg/L remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

Reagents required:	
1.02121.0500	Calcium nitrate tetrahydrate for analysis EMSURE®
1.16754.9010	Water for analysis EMSURE®

4.1.4. Standard Solution of Free Chlorine

All standard solutions described here for free chlorine yield equivalent results and are identically suited for the determination of 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 1,000-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 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 1,000 mg/L and the diluted standard solutions (investigational concentrations) remain stable for one day.

Note:
This is a standard solution that can be prepared particularly rapidly and easily.

Reagents required:	
1.10888.0250	Dichloroisocyanuric acid sodium salt GR for analysis
1.16754.9010	Water for analysis EMSURE®

4.1.5. 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 1,000-mL volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:
Transfer 15.00 mL (5.00 mL) of the KIO_3 stock solution to a calibrated or conformity-checked 1,000-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 0.015 mg (0.05 mg) of free chlorine.

Preparation of a chlorine standard solution:
Pipette 20.0 mL (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 minute, 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 3.00 mg/L (0.500 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.

Note:
This procedure involves the preparation according to a standardized method.

Reagents required:	
1.02404.0100	Potassium iodate, volum. 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®

4.1.6. Standard Solution of Free Chlorine

Preparation of a stock solution:
First prepare a 1:10 dilution using a sodium hypochlorite solution containing approx. 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 minute. Titrate the eliminated iodine with sodium thiosulfate solution 0.1mol/L until a weakly yellow color emerges. Add 2 mL of zinc iodide-starch solution and titrate from blue to colorless.

Calculation and preparation of a standard solution:
Consumption of sodium thiosulfate solution 0.1 mol/L (mL) · 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 remains stable for approx. one week. The diluted standard solutions (investigational concentrations) are stable for approx. 2 hours.

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

Reagents required:	
1.00316.1000	Hydrochloric acid 25% for analysis EMSURE®
1.05614.9025	Sodium hypochlorite solution techn. approx. 13% active chlorine
1.09147.1000	Sodium thiosulfate solution 0.1 mol/L Titripur®
1.05043.0250	Potassium iodide GR for analysis
1.05445.0500	Zinc iodide-starch solution GR for analysis
1.16754.9010	Water for analysis EMSURE®

4.1.7. Standard Solution of Total Chlorine

Preparation of a standard solution:
Dissolve 4.00 g of chloramine T GR with distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water. The stock solution prepared according to this procedure has a concentration of approx. 1,000 mg/L total chlorine.

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 solu tion 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 minute. Titrate the eliminated iodine with sodium thiosul fate solution 0.1 mol/L until a weakly yellow color emerges. Add 2 mL of zinc iodide-starch solution and titrate from blue to colorless.

Calculation and preparation of a standard solution:
Consumption of sodium thiosulfate solution 0.1 mol/L (mL) · 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), the stock solution of approx. 1,000 mg/L and the diluted standard solutions (investigational concentrations) remain stable for one day.

Reagents required:	
1.00316.1000	Hydrochloric acid 25% for analysis EMSURE®
1.02426.0250	Chloramine T trihydrate GR for analysis
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 solu-tion GR for analysis
1.16754.9010	Water for analysisEMSURE®

4.1.8. Standard Solution COD/Chloride

Preparation of a chloride dilution solution:
Dissolve 32.9 g of sodium chloride (free from organic material, e.g. Suprapur®) with distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water.
The dilution solution prepared according to this procedure has a concentration of 20 g/L Cl^-.

Preparation of a COD/chloride standard solution:
Dissolve 0.851 g of potassium hydrogen phthalate GR with **dilution solution** in a calibrated or conformity-checked 100-mL volumetric flask and make up to the mark with **dilution soution**.
The standard solution prepared according to this procedure has a concentration of 10,000 mg/L COD and 20 g/L Cl^-.

Further investigational concentrations may be prepared from this stock solution by diluting accordingly with **dilution solution**.

Stability:
When stored in a cool place (refrigerator), the dilution solution of 20 g/L Cl and the standard solution of 10,000 mg/L COD/20 g/L Cl^- remain stable for one month. When stored under appropriate cool conditions (refrigerator), the diluted standard solutions (investigational concentrations) remain stable – depending on the respective concentration – for approximately one week to one month.

Reagents required:	
1.02400.0080	Potassium hydrogen phthalate GR for analysis, volum. standard
1.06406.0050	Sodium chloride 99.99 Suprapur®
1.16754.9010	Water for analysis EMSURE®

4.1.9. Standard Solution of Cyanuric Acid

Preparation of a standard solution:
Dissolve 1.00 g of cyanuric acid with distilled water in a calibrated or conformitychecked 1,000-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 1,000 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 1,000 mg/L and the diluted standard solutions (investigational concentrations) remain stable for one day.

Reagents required:	
8.20358.0005	Cyanuric acid for synthesis
1.16754.9010	Water for analysis EMSURE®

4.1.10. Standard Solution of Formaldehyde

Preparation of a stock solution:
In a calibrated or conformity-checked 1,000-mL volumetric flask make up 2.50 mL of formaldehyde solution min. 37% GR to the mark with distilled water. The stock solution prepared according to this procedure has a concentration of approx. 1,000 mg/L formaldehyde.

Precise assay of the stock solution:
Pipette 40.0 mL (full pipette) of the formaldehyde stock solution into a 300-mL ground-glass conical flask and add 50.0 mL (buret) of iodine solution 0.05 mol/L and 20 mL of sodium hydroxide solution 1 mol/L. Leave to stand for 15 minutes and subsequently add 8 mL of sulfuric acid 25%. Subsequently titrate with sodium thiosulfate solution 0.1 mol/L until the yellow iodine color has disappeared, add 1 mL of zinc iodide-starch solution, and continue to titrate until a milky, pure white color emerge.

Calculation and preparation of a standard solution:
C1 = consumption of sodium thiosulfate solution 0.1 mol/L (mL)
C2 = quantity of iodine solution 0.05 mol/L (50.0 mL)
mg/L formaldehyde = (C2 – C1) · 37.525

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), the stock solution of approx. 1,000 mg/L remains stable for one week. After this time, the stock solution must be determined anew. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:	
1.04003.1000	Formaldehyde solution min. 37% GR for analysis
1.09099.1000	Iodine solution 0.05 mol/L Titripur®
1.09147.1000	Sodium thiosulfate solution 0.1 mol/L Titripur®
1.09137.1000	Sodium hydroxide solution 1 mol/L Titripur®
1.00716.1000	Sulfuric acid 25% for analysis EMSURE®
1.05445.0500	Zinc iodide-starch solution GR for analysis
1.16754.9010	Water for analysis EMSURE®

4.1.11. Standard solution of Hydrazine

Preparation of a standard solution:
Dissolve 4.07 g of hydrazinium sulfate GR with oxygen-low (boil previously) distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with oxygen-low distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 mg/L hydrazine. Further investigational concentrations may be prepared from this standard solution by diluting accordingly with oxygen-low distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1,000 mg/L and the diluted standard solutions (investigational concentrations) remain stable for one day.

Reagents required:	
1.04603.0100	Hydrazinium sulfate GR for analysis
1.16754.9010	Water for analysis EMSURE®

4.1.12. Standard Solution of Hydrogenperoxide

Preparation of a stock solution:
Place 10.0 mL of Perhydrol® 30% H_2O_2 in a calibrated or conformity-checked 100-mL volumetric flask and make up to the mark with distilled water. Transfer 30.0 mL (full pipette) of this solution to a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water. The stock solution prepared according to this procedure has a concentration of approx. 1,000 mg/L hydrogenperoxide.

Precise assay of the stock solution:
Pipette 50.0 mL (full pipette) of the hydrogen peroxide stock solution into a 500-mL conical flask, dilute with 200 mL of distilled water, and add 30 mL of sulfuric acid 25%. Titrate with a 0.02 mol/L potassium permanganate solution until the color changes to pink.

Calculation and preparation of a standard solution:
Consumption of potassium permanganate solution 0.02 mol/L (mL) · 34.02 = content of hydrogenperoxide, in mg/L

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the stock solution of approx. 1,000 mg/L and the diluted standard solutions (investigational concentrations) remain stable for one day.

Reagents required:	
1.09122.1000	Potassium permanganate solution 0.02 mol/L Titripur®
1.07209.0250	Perhydrol® 30% for analysis EMSURE®
1.00716.1000	Sulfuric acid 25% for analysis EMSURE®
1.16754.9010	Water for analysis EMSURE®

4.1.13. Standard Solution of Iodine Analogous to DIN EN ISO 7393

Preparation of a KIO_3 stock solution:
Dissolve 1.006 g of KIO_3 in 250 mL of distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:
Transfer 7.00 mL of the KIO_3 stock solution to a calibrated or conformitychecked 1,000-mL volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water. 1 mL of this solution is equivalent to 0.025 mg of iodine.

Preparation of a iodine 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 minute, 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 5.00 mg/L iodine.

Stability:
The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted iodine standard solution is not stable and must be used immediately.

Reagents required:	
1.02404.0100	Potassium iodate, volum. 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®

4.1.14. Standard Solution of Magnesium

Preparation of a standard solution:
Dissolve 1.055 g of magnesium nitrate hexahydrate with distilled water in a calibrated or conformity-checked 100-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 mg/L magnesium. Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
The standard solution of 1,000 mg/L remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

Reagents required:	
1.05853.0500	Magnesium nitrate hexahydrate for analysis EMSURE®
1.16754.9010	Water for analysis EMSURE®

4.1.15. Standard Solution of Monochloramine

Preparation of a standard solution:
Place 5.0 mL of chlorine standard solution 100 mg/L Cl_2 and 10.0 mL ammonium standard solution 10 mg/L NH_4-N in a calibrated or conformity-checked 100-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 5.00 mg/L free chlorine or 3.63 mg/L monochloramine.

Stability:
The standard solution is not stable and must be used immediately.

Reagents required:	
Chlorine standard solution 100 mg/L Cl_2	Preparation see "Standard solution of free chlorine" with hypochlorite solution (standard solution that is absolutely necessary for the preparation of the monochloramine standard)
Ammonium standard solution 10 mg/L NH_4-N	Preparation with Ammonium standard solution Certipur®
1.19812.0500	1000 mg/L NH_4 = 777 mg/L NH_4-N
1.16754.9010	Water for analysis EMSURE®

4.1.16. Standard Solution of Oxygen Scavengers

Preparation of a standard solution:
Dissolve 1.00 g of N,N-diethylhydroxylamine with distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 mg/L N,N-diethylhydroxylamine (DEHA).
Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1,000 mg/L and the diluted standard solutions (investigational concentrations) remain stable for one day.

Reagents required:	
8.18473.0050	N,N-Diethylhydroxylamine for synthesis
1.16754.9010	Water for analysis EMSURE®

4.1.17. Standard Solution of Ozone Analogous to DIN EN ISO 7393

Preparation of a KIO_3 stock solution:
Dissolve 1.006 g of KIO_3 in 250 mL of distilled water in a calibrated or conformity-checked 1,000-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 conformitychecked 1,000-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 a ozone 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 minute, 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 2.00 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 diluted ozone standard solution is not stable and must be used immediately.

Reagents required:	
1.02404.0100	Potassium iodate, volum. 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®

4.1.18. Standard Solution of Phenol

Preparation of a standard solution:
Dissolve 1.00 g of phenol GR with distilled water in a calibrated or conformitychecked 1,000-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 mg/L phenol.
Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1,000 mg/L remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:	
1.00206.0250	Phenol GR for analysis
1.16754.9010	Water for analysis

4.1.19. Standard Solution of Silicate

Preparation of a standard solution:
A silicon standard solution of 1,000 mg/L Si is used. 1,000 mg/L Si corresponds to 2,139 mg/L SiO_2. Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Example:
Mix 4.675 mL of silicon standard solution (1,000 mg/L Si) with distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 10.00 mg/L SiO_2. After its preparation, the solution must be immediately transferred to a clean polyethylene vessel for further storage. Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water. After its preparation, the

solution with the desired working concentration must be immediately transferred to a clean polyethylene vessel for further storage.

Stability:
The diluted standard solutions (investigational concentrations) remain stable – depending on the respective concentration – for one day to approximately six months.

Reagents required:	
1.70236.0100	Silicone standard solution Certipur®
1.16754.9010	Water for analysis EMSURE®

4.1.20. Standard Solution of Sodium

Preparation of a standard solution:
A chloride standard solution of 1,000 mg/L is used. 1,000 mg/L chloride corresponds to 649 mg/L sodium. Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the diluted standard solutions (investigational concentrations) remain stable for one month.

Reagents required:	
1.19897.0500	Chloride standard solution Certipur®
1.16754.9010	Water for analysis EMSURE®

4.1.21. Standard Solution of Sulfide

Preparation of a stock solution:
Dissolve 7.5 g of glass-clear, if necessary washed crystals of sodium sulfide nonahydrate GR with distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water. The stock solution prepared according to this procedure has a concentration of approx. 1,000 mg/L sulfide.

Precise assay of the stock solution:
Place 100 mL of distilled water and 5.0 mL (full pipette) of sulfuric acid 25% in a 500-mL ground-glass-stoppered conical flask. To this solution add 25.0 mL (full pipette) of the sulfide stock solution and 25.0 mL (full pipette) of iodine solution 0.05 mol/L. Shake the contents of the flask thoroughly for about 1 minute, subsequently titrate with sodium thiosulfate solution 0.1 mol/L until the yellow iodine color has disappeared, add 1 mL of zinc iodide-starch solution, and continue to titrate until a milky, pure white color emerges.

Calculation and preparation of a standard solution:
C1 = consumption of sodium thiosulfate 0.1 mol/L (mL)
C2 = quantity of iodine solution 0.05 mol/L (25.0 mL)
mg/L sulfide = (C2 – C1) · 64.13

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), the stock solution of approx. 1,000 mg/L remains stable for at most one day. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:	
	Sodium sulfide nonahydrat GR for analysis
1.09099.1000	Iodine solution 0.05 mol/L Titripur®
1.09147.1000	Sodium thiosulfate solution 0.1 mol/L Titripur®
1.00716.1000	Sulfuric acid 25% for analysis EMSURE®
1.05445.0500	Zinc iodide-starch solution GR for analysis
1.16754.9010	Water for analysis EMSURE®

4.1.22. Standard Solution of Sulfite

Preparation of a stock solution:
Dissolve 1.57 g of sodium sulfite and 0.4 g of Titriplex® III GR with distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of approx. 1,000 mg/L sulfite.

Precise assay of the stock solution:
Place 50.0 mL (full pipette) of the sulfite stock solution and 5.0 mL (full pipette) of hydrochloric acid 25% in a 300-mL conical flask. To this solution add 25.0 mL (full pipette) of iodine solution 0.05 mol/L and process immediately. After mixing the contents of the flask, subsequently titrate with sodium thiosulfate solution 0.1 mol/L until the yellow iodine color has disappeared, add 1 mL of zinc iodide-starch solution, and continue to titrate from blue to colorless.

Calculation and preparation of a standard solution:
C1 = consumption of sodium thiosulfate 0.1 mol/L (mL)
C2 = quantity of iodine solution 0.05 mol/L (25.0 mL)
mg/L sulfite = (C2 – C1) · 80.06

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water and buffer solution pH 9.00.
This is done in the following manner: Withdraw the desired aliquot from the stock solution, place in a calibrated or conformity-approved 1,000-mL volumetric flask, add 20 mL of buffer solution pH 9.00, make up to the mark with distilled water, and mix.

Stability:
When stored in a cool place (refrigerator), the stock solution of approx. 1,000 mg/L remains stable for at most one day. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:	
1.06657.0500	Sodium sulfite anhydrous for analysis EMSURE®
1.08418.0100	Titriplex® III GR for analysis
1.09099.1000	Iodine solution 0.05 mol/L Titripur®
1.09147.1000	Sodium thiosulfate solution 0.1mol/L Titripur®
1.00316.1000	Hydrochloric acid 25% GR for analysis EMSURE®
1.05445.0500	Zinc iodide-starch solution GR for analysis
1.09461.1000	Buffer solution pH 9.00 Certipur®
1.16754.9010	Water for analysis

4.1.23. Standard Solution of Surfactants (Anionic)

Preparation of a standard solution:
Dissolve 1.00 g of dodecane-1-sulfonic acid sodium salt with distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 mg/L anionic surfactant.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1,000 mg/L remains stable for one month. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:	
1.12146.0005	Dodecane-1-sulfonic acid sodium salt
1.16754.9010	Water for analysis

4.1.24. Standard Solution of Surfactants (Cationic)

Preparation of a standard solution:
Dissolve 1.00 g of Cetyltrimethylammonium Bromide, Molecular Biology Grade with distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 mg/L cationic surfactant.
Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1,000 mg/L remains stable for one month. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:	
1.12146.0005	Cetyltrimethylammonium Bromide, Molecular Biology Grade Calbiochem® (**CTAB**)
1.16754.9010	Water for analysis

4.1.25. Standard Solution of Surfactants (Nonionic)

Preparation of a standard solution:
Dissolve 1.00 g of Triton® X-100 with distilled water in a calibrated or conformity-checked 1,000-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 mg/L nonionic surfactant.
Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1,000 mg/L remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:	
1.12298.0101	Triton® X-100
1.16754.9010	Water for analysis

4.1.26. Standard Solution of Tin

Preparation of a standard solution:
A tin standard solution of 1,000 mg/L is used. Transfer 30 mL of HCl 1 mol/L to a calibrated or conformity-checked 100-mL volumetric flask, add 10.0 mL (full pipette) of the tin standard solution, and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 100 mg/L tin. Further investigational concentrations may be prepared from the standard solution by diluting accordingly with distilled water and HCl 1 mol/L. This is done in the following manner: Transfer 1 mL of HCl

1 mol/L to a calibrated or conformity-checked 100-mL volumetric flask. Withdraw the desired aliquot from the tin standard solution 100 mg/L, add, make up to the mark with distilled water, and mix.

Stability:
The tin standard solution 100 mg/L remains stable for 30 minutes. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:	
1.70242.0100	Tin standard solution Certipur®
1.09057.1000	Hydrochloric acid 1 mol/L Titripur®
1.16754.9010	Water for analysis EMSURE®

4.1.27. Standard Solution of Total Hardness

Preparation of a standard solution:
Dissolve 2.946 g of calcium nitrate tetrahydrate with distilled water in a calibrated or conformity-checked 500-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,000 mg/L calcium (corresponds to 175 °e). Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
The standard solution of 1,000 mg/L remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

Reagents required:	
1.02121.0500	Calcium nitrate tetrahydrate for analysis EMSURE®
1.16754.9010	Water for analysis EMSURE®

4.1.28. Standard Solution of Volatile Organic Acids

Preparation of a standard solution:
Dissolve 2,05 g of sodium acetate anhydrous with distilled water in a calibrated or conformity-checked 1000-mL volumetric flask and make up to the mark with distilled water. The standard solution prepared according to this procedure has a concentration of 1,500 mg/L acetic acid.

Stability:
When stored in a cool place (refrigerator), the standard solution remains stable for one week.

Reagents required:	
1.06268.0250	Sodium acetate anhydrous for analysis EMSURE®
1.16754.9010	Water for analysis

4.2. Testing Setups

Depending on testing throughput and the type of test kits employed, different testing setups must be selected. An overview is provided in the below table.

Sample changing mode	Throughput	Max. test volume[1]	Hardware needed	Test kits[2]	Software
Manual	Small	1	Easy UV or Easy VIS + SQKitReader™	T/R	EasyDirect™ UV/VIS (optional)
Manual	Small	1	UV5 + Test Tube Holder	T/R	LabX® (optional)
Manual	Small	1	UV5 + Cuvette (10–50 mm) + Precision Cuvette Holder	R	LabX® (optional)
Semi-automatic	Medium	8	UV5 + CuvetteChanger (10 mm Cuvette)	R	LabX® (optional)
Automatic	High	303	UV5 + InMotion™ + Flow Through Cell/ Immersion Probe	R	LabX®

Table 1: Test setups, hardware and automation possibilities.

For automatic operation mode, an additional PC software, LabX®, is recommended to seamlessly execute predefined work plans without manual intervention, as well as to store and process large quantities of data [3]. Learn more on ▸ **www.mt.com/LabX**

[1] Refers to the maximum volume of tests that can be implemented after one change of sample.
[2] T: tube-based kits; R: kits in the form of reagent bottles.

5. Tips and Hints

Cleaning

- Shut down the spectrophotometer.
- Pull the plug of the power cable out of the power outlet.
- Remove all cuvettes.
- Remove and clean the cuvette carousel.
- Wipe the surface of the analysis compartment with a cloth moistened with the cleaning agent.
- Remove and clean the drip tray.
- Without touching the lenses, wipe the measurement chamber with a soft dry cloth.
- Install the drip tray and the cuvette carousel.
- Close the lid.
- Tilt the spectrophotometer and carefully lower it onto its right side.
- Wipe the drain hole and the bottom of the spectrophotometer with a cloth moistened with the cleaning agent.
- Wipe the work surface with a cloth moistened with the cleaning agent.
- Return the spectrophotometer to its upright position.
- Connect the spectrophotometer to the power supply.

Orientation Mark

It is required to keep a consistent orientation of the test tube within the holder to ensure test repeatability. The orientation mark on the holder must be aligned with the orientation mark on the tube (Figures 6 and 7).

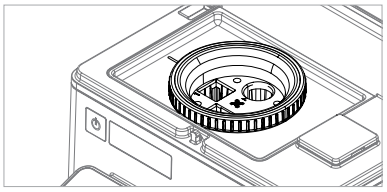


Figure 6: Allign the test tube with the orientation mark (1) on the cuvette carousel.

Data Export

Three different options can be chosen for the export of Spectroquant® measurement results:

- Printout: The result will be printed with METTLER TOLEDO P25 printer.
- Export to USB: After the measurement, a csv file is exported.
- Export to EasyDirect: Automatic export to a PC software. The results in EasyDirect are clearly arranged. Additionally, the data can be transmitted automatically to a LIMS system.

Figure 7: The tube faces the SQKitReader.

Lamp Replacement (Easy VIS)

The lamp lifetime varies and depends on factors such as the switching frequency. The lamp needs to be replaced after a burn time of about 2,000 h. The spectrophotometer monitors the light emitted by the lamp. When changes in the light intensity indicate that the lamp is near the end of its life, users are notified to prepare its replacement.
When you replace the lamp, you need to perform adjustments and reset the lamp usage.

- Perform adjustments: System baseline adjustment and dark current adjustment.
- Reset lamp usage: This is important because blank values that have been measured with the old lamp are no longer valid. When you reset the lamp usage time, the blank values are deleted and users are prompted to measure them again.

Figure 8: The lamp can be easiliy replaced as a whole module and is available as spare part.

Service

Fast intervention is crucial in order to minimize the downtime of your instrument. METTLER TOLEDO will carry out the repair either onsite or at one of our local Service Centers, whichever is most convenient for you.

The performance of any instrument may drift during operation due to various factors that are hard to control. Consequently, it is highly recommended that correct performance is regularly verified to prevent tedious and costly repeat analysis.

Learn more on ▸ **www.mt.com/Service**

6. Update Spectroquant® Methods

The predefined water application methods for Spectroquant test kits are under continuous development. Updates will be provided on a yearly basis on ▸ **www.mt.com/easyplus-uvvis**

To import these new methods into your EasyPlus UV/VIS Spectrophotometer, the following steps are needed:

- Download the methods and store them on a USB flash drive
- Connect the USB stick to the EasyPlus UV/VIS Spectrophotometer (USB-A socket)
- To install the methods in the instrument, follow the next steps

Select the **Setup & Tools** function on the home screen;

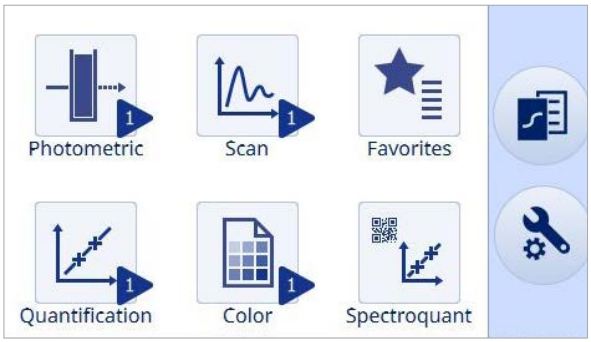


Figure 9. Select Setup & Tools to start the method import process.

Select **Toolbox**;

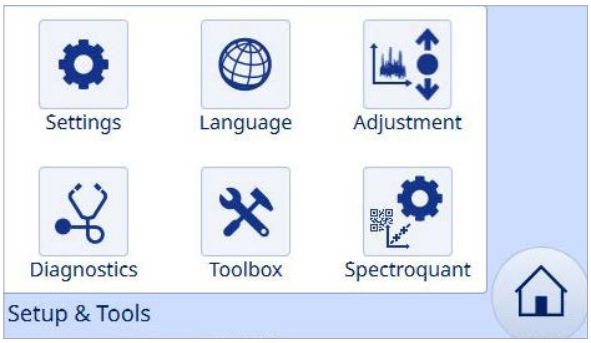


Figure 10. Method import is performed via Toolbox.

Select **update**.

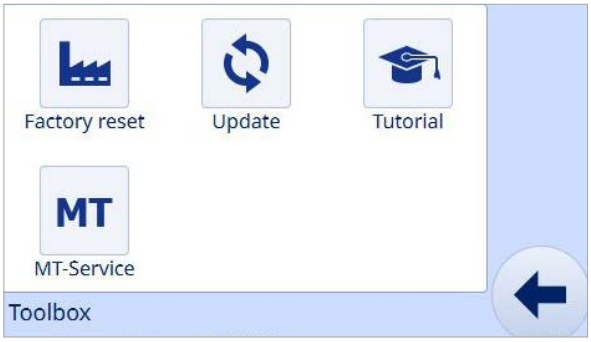


Figure 11. Method update.

Overview "Update". Select **Update**.

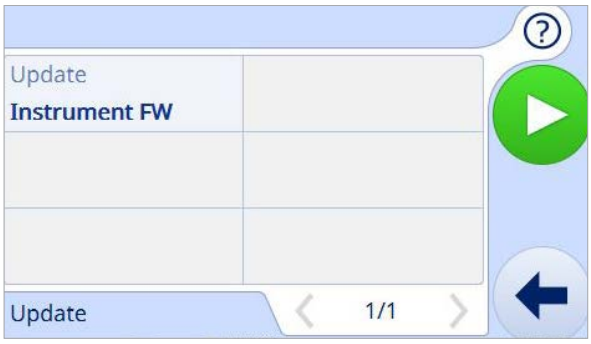


Figure 12. Firmware.

Select **Spectroquant methods**.

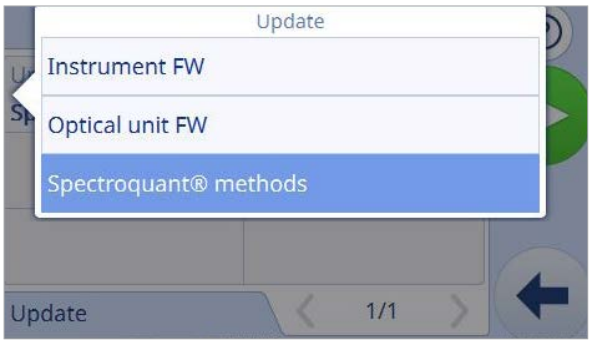


Figure 13. Firmware selection.

Press **Start** to update the method database.

Figure 14. Firmware selection.

7. References

[1] Water Analysis, W. Fresenius, K. E. Quentin, W. Schneider, https://doi.org/10.1007/978-3-642-72610-1

[2] UV/VIS Spectrophotometry, Fundamentals and Applications, Mettler-Toledo GmbH, Analytical, https://www.mt.com/global/en/home/library/guides/laboratory-division/1/uvvis-spectrophotometry-guide-applications-fundamentals.html

[3] LabX® UV/VIS Software, Streamline Your UV/VIS Workflow, Mettler-Toledo GmbH, Analytical, https://www.mt.com/global/en/home/library/product-brochures/lab-analytical-instruments/labx-uvvis.html

[4] EasyPlus UV/VIS User Manual, Mettler-Toledo GmbH, Analytical

GUVP Lifecycle Services
5 Steps to Minimize Risks

GUVP™ (Good UV/Vis Practice) improves measurement quality by helping you to minimize risks throughout your process using a 5-step lifecycle program. Services provided include professional evaluation, selection, installation, training and maintenance to ensure correct operation over the lifetime of your instrument.

The comprehensive, traceable and fully documented GUVP lifecycle program can help you to:

- Minimize process risk
- Obtain measurement accuracy
- Improve product quality
- Ensure compliance
- Protect your investment

Learn more about how GUVP can help you create consistency, reliability and compliance in your UV/Vis measurements at:

www.mt.com/GUVP

www.mt.com/UVVIS-Water-Test

For more information

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