photoLab S6

Operating Instructions

Part 3: Analysis specifications for the available test kits

Appendices

07/2013

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Contents

Available photometric test kits

The following methods 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). The method number listed in column 1 is for manual selection. The total range relates to the cited test in column 2.

Method No.	Determination		Total Range	Method
003	Ammonium Cell Test	A6/25	0.20 – 8.00 mg/l NH_4-N	Indophenol blue
104	Ammonium Cell Test	114739	0.010 – 2.000 mg/l NH_4-N	Indophenol blue
052	Ammonium Cell Test	114544	0.5 – 16.0 mg/l NH_4-N	Indophenol blue
053	Ammonium Cell Test	114559	4.0 – 80.0 mg/l NH_4-N	Indophenol blue
039	Chromate Cell Test*	114552	0.05 – 2.00 mg/l Cr	Diphenylcarbazide
039	Chromate Cell Test* (total chromium)	114552	0.05 – 2.00 mg/l Cr	Peroxodisulfate oxidation, diphenylcarbazide
001	COD Cell Test*	C3/25	10 – 150 mg/l COD	Chromosulfuric acid oxidation, chromate determination
031	COD Cell Test*	114560	4.0 – 40.0 mg/l COD	Chromosulfuric acid oxidation, chromate determination
105	COD Cell Test*	114895	15 – 300 mg/l COD	Chromosulfuric acid oxidation, chromate determination
093	COD Cell Test*	114690	50 – 500 mg/l COD	Chromosulfuric acid oxidation, chromate determination
002	COD Cell Test*	C4/25	25 – 1500 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination
094	COD Cell Test*	114691	300 – 3500 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination
024	COD Cell Test*	114555	500 – 10000 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination
026	Copper Cell Test*	114553	0.05 – 8.00 mg/l Cu	Cuprizone
037	Iron Cell Test	114549	0.05 – 4.00 mg/l Fe	Triazine
017	Nickel Cell Test*	114554	0.10 – 6.00 mg/l Ni	Dimethylglyoxime
004	Nitrate Cell Test*	N2/25	0.5 – 25.0 mg/l NO_3-N	2,6-Dimethylphenol
059	Nitrate Cell Test*	114542	0.5 – 18.0 mg/l NO_3-N	Nitrospectral
107	Nitrate Cell Test*	114764	1.0 – 50.0 mg/l NO_3-N	2,6-Dimethylphenol
072	Nitrate Cell Test in seawater*	114556	0.10 – 3.00 mg/l NO_3-N	Resorcine
005	Nitrite Cell Test*	N5/25	0.010 – 0.700 mg/l NO_2-N	Griess reaction
068	Nitrogen (total) Cell Test	114537	0.5 – 15.0 mg/l N	Peroxodisulfate oxidation, nitrospectral
153	Nitrogen (total) Cell Test*	100613	0.5 – 15.0 mg/l N	Peroxodisulfate oxidation, 2,6-dimethylphenol
108	Nitrogen (total) Cell Test	114763	10 – 150 mg/l N	Peroxodisulfate oxidation, 2,6-dimethylphenol
006	Phosphate Cell Test	P6/25	0.05 – 5.00 mg/l PO_4-P	Phosphomolybdenum blue
006	Phosphate Cell Test (total phosphorus)	P6/25	0.05 – 5.00 mg/l P	Peroxodisulfate oxidation, Phosphomolybdenum blue
007	Phosphate Cell Test	P7/25	0.5 – 25.0 mg/l PO_4-P	Phosphomolybdenum blue
007	Phosphate Cell Test (total phosphorus)	P7/25	0.5 – 25.0 mg/l P	Peroxodisulfate oxidation, Phosphomolybdenum blue
064	Sulfate Cell Test	114548	5 – 250 mg/l SO_4	Bariumsulfate, turbidimetric
082	Sulfate Cell Test	114564	100 – 1000 mg/l SO_4	Bariumsulfate, turbidimetric
074	Zinc Cell Test	114566	0.20 – 5.00 mg/l Zn	PAR
208	Acid Capacity Cell Test to pH 4.3 (total alkalinity)	101758	0.40 – 8.00 mmol/l	Indicator reaction
196	Aluminium Cell Test*	100594	0.02 – 0.50 mg/l Al	Chromazurole S
104	Ammonium Cell Test	114739	0.010 – 2.000 mg/l NH_4-N	Indophenol blue
051	Ammonium Cell Test	114558	0.20 – 8.00 mg/l NH_4-N	Indophenol blue
052	Ammonium Cell Test	114544	0.5 – 16.0 mg/l NH_4-N	Indophenol blue
053	Ammonium Cell Test	114559	4.0 – 80.0 mg/l NH_4-N	Indophenol blue
156	AOX Cell Test*	100675	0.05 – 2.50 mg/l AOX	Oxidation to chloride
157	BOD Cell Test*	100687	0.5 – 3000 mg/l O_2	Modification of Winkler method
067	Cadmium Cell Test	114834	0.025 – 1.000 mg/l Cd	Cadion derivative
165	Calcium Cell Test*	100858	10 – 250 mg/l Ca	Phthalein purple
095	Chloride Cell Test*	114730	5 – 125 mg/l Cl	Iron(III)-thiocyanat
218	Chloride Cell Test*	101804	0.5 – 15.0 mg/l Cl	Iron(III)-thiocyanat
141	Chlorine Cell Test* (free chlorine)	100595	0.03 – 6.00 mg/l Cl_2	S-DPD
142	Chlorine Cell Test* (free and total chlorine)	100597	0.03 – 6.00 mg/l Cl_2	S-DPD
194	Chlorine Cell Test* (free and total chlorine)	100086/100087/ 100088	0.03 – 6.00 mg/l Cl_2	DPD
039	Chromate Cell Test*	114552	0.05 – 2.00 mg/l Cr	Diphenylcarbazide

* turbidity correction possible

Available photometric test kits

Method No.	Determination		Total Range	Method
039	Chromate Cell Test* (total chromium)	114552	0.05 – 2.00 mg/l Cr	Peroxodisulfate oxidation, Diphenylcarbazide
020	Chromium Baths		20 – 400 g/l CrO_3	Inherent color
031	COD Cell Test*	114560	4.0 – 40.0 mg/l COD	Chromosulfuric acid oxidation, chromate determination
211	COD Cell Test*	101796	5.0 – 80.0 mg/l COD	Chromosulfuric acid oxidation, chromate determination
014	COD Cell Test*	114540	10 – 150 mg/l COD	Chromosulfuric acid oxidation, chromate determination
105	COD Cell Test*	114895	15 – 300 mg/l COD	Chromosulfuric acid oxidation, chromate determination
093	COD Cell Test*	114690	50 – 500 mg/l COD	Chromosulfuric acid oxidation, chromate determination
023	COD Cell Test*	114541	25 – 1500 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination
094	COD Cell Test*	114691	300 – 3500 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination
024	COD Cell Test*	114555	500 – 10000 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination
209	COD Cell Test*	101797	5000 – 90000 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination
137	COD Cell Test (Hg free)*	109772	10 – 150 mg/l COD	Chromosulfuric acid oxidation, chromate determination
138	COD Cell Test (Hg free)*	109773	100 – 1500 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination
220	COD Cell Test for seawater*	117058	5.0 – 60.0 mg/l COD	Chloride depletion, chromosulfuric acid oxidation, chromate determination
221	COD Cell Test for seawater*	117059	50 – 3000 mg/l COD	Chloride depletion, chromosulfuric acid oxidation, chromium(III) chromate determination
026	Copper Cell Test*	114553	0.05 – 8.00 mg/l Cu	Cuprizone
083	Copper Baths		10.0 – 50.0 g/l Cu	Inherent color
075	Cyanide Cell Test* (free cyanide)	114561	0.010 – 0.500 mg/l CN	Barbituric acid and pyridinecarboxylic acid
075	Cyanide Cell Test* (readily liberated cyanide)	114561	0.010 – 0.500 mg/l CN	Citronic acid, barbituric acid, and pyridinecarboxylic acid
028	Formaldehyde Cell Test*	114500	0.10 – 8.00 mg/l HCHO	Chromotropic acid
	Hardness, see Total or Residual Hardness			
037	Iron Cell Test	114549	0.05 – 4.00 mg/l Fe	Triazine
106	Iron Cell Test*	114896	1.0 – 50.0 mg/l Fe (Fe(II) and Fe(III))	2,2'-Dipyridyl
066	Lead Cell Test*	114833	0.10 – 5.00 mg/l Pb	PAR
158	Magnesium Cell Test*	100815	5.0 – 75.0 mg/l Mg	Phthalein purple
159	Manganese Cell Test*	100816	0.10 – 5.00 mg/l Mn	Formaldoxime
017	Nickel Cell Test*	114554	0.10 – 6.00 mg/l Ni	Dimethylglyoxime
057	Nickel Baths		10 – 120 g/l Ni	Inherent color
059	Nitrate Cell Test*	114542	0.5 – 18.0 mg/l NO_3-N	Nitrospectral
030	Nitrate Cell Test*	114563	0.5 – 25.0 mg/l NO_3-N	2,6-Dimethylphenol
107	Nitrate Cell Test*	114764	1.0 – 50.0 mg/l NO_3-N	2,6-Dimethylphenol
151	Nitrate Cell Test*	100614	23 – 225 mg/l NO_3-N	2,6-Dimethylphenol
035	Nitrite Cell Test*	114547	0.010 – 0.700 mg/l NO_2-N	Griess reaction
197	Nitrite Cell Test*	100609	1.0 – 90.0 mg/l NO_2-N	Iron(II) ethylenediammonium sulfate
068	Nitrogen (total) Cell Test	114537	0.5 – 15.0 mg/l N	Peroxodisulfate oxidation, nitrospectral
153	Nitrogen (total) Cell Test*	100613	0.5 – 15.0 mg/l N	Peroxodisulfate oxidation, 2,6-Dimethylphenol
108	Nitrogen (total) Cell Test	114763	10 – 150 mg/l N	Peroxodisulfate oxidation, 2,6-Dimethylphenol
092	Oxygen Cell Test*	114694	0.5 – 12.0 mg/l O_2	Modification of Winkler method
186	pH Cell Test	101744	6.4 – 8.8	Phenol red
212	Phosphate Cell Test	100474	0.05 – 5.00 mg/l PO_4-P	Phosphomolybdenum blue
055	Phosphate Cell Test	114543	0.05 – 5.00 mg/l PO_4-P	Phosphomolybdenum blue
055	Phosphate Cell Test (total phosphorus)	114543	0.05 – 5.00 mg/l P	Peroxodisulfate oxidation, phosphomolybdenum blue
213	Phosphate Cell Test	100475	0.5 – 25.0 mg/l PO_4-P	Phosphomolybdenum blue
086	Phosphate Cell Test	114729	0.5 – 25.0 mg/l PO_4-P	Phosphomolybdenum blue
086	Phosphate Cell Test (total phosphorus)	114729	0.5 – 25.0 mg/l P	Peroxodisulfate oxidation, phosphomolybdenum blue
152	Phosphate Cell Test	100616	3.0 – 100.0 mg/l PO_4-P	Phosphomolybdenum blue
214	Phosphate Cell Test	100673	3.0 – 100.0 mg/l PO_4-P	Phosphomolybdenum blue
214	Phosphate Cell Test (total phosphorus)	100673	3.0 – 100.0 mg/l P	Peroxodisulfate oxidation, phosphomolybdenum blue

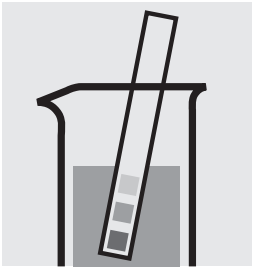
* turbidity correction possible

Available photometric test kits

Method No.	Determination		Total Range	Method
069	Phosphate Cell Test*	114546	0.5 – 25.0 mg/l PO_4-P	Vanadatomolybdate
103	Potassium Cell Test	114562	5.0 – 50.0 mg/l K	Kalignost, turbidimetric
150	Potassium Cell Test	100615	30 – 300 mg/l K	Kalignost, turbidimetric
098	Residual Hardness Cell Test*	114683	0.50 – 5.00 mg/l Ca	Phthalein purple
168	Sodium Cell Test in nutrient solutions*	100885	10 – 300 mg/l Na	indirectly as chloride
064	Sulfate Cell Test	114548	5 – 250 mg/l SO_4	Bariumsulfate, turbidimetric
154	Sulfate Cell Test	100617	50 – 500 mg/l SO_4	Bariumsulfate, turbidimetric
082	Sulfate Cell Test	114564	100 – 1000 mg/l SO_4	Bariumsulfate, turbidimetric
193	Surfactants (nonionic) Cell Test*	101787	0.10 – 7.50 mg/l n-Ten	TBPE
182	Suspended Solids		50 – 750 mg/l SusS	
172	TOC Cell Test	114878	5.0 – 80.0 mg/l TOC	Peroxodisulfate oxidation, indicator
173	TOC Cell Test	114879	50 – 800 mg/l TOC	Peroxodisulfate oxidation, indicator
178	Total Hardness Cell Test*	100961	5 – 215 mg/l Ca	Phthalein purple
	Water hardness, see Total or Residual Hardness			
191	Volatile Organic Acids Cell Test*	101763	50 – 3000 mg/l HOAc	Esterification
222	Volatile Organic Acids Cell Test*	101749	50 – 3000 mg/l CH_3COOH	Esterification
223	Volatile Organic Acids Test*	101809	50 – 3000 mg/l CH_3COOH	Esterification
174	Zinc Cell Test	100861	0.025 – 1.000 mg/l Zn	PAR
074	Zinc Cell Test	114566	0.20 – 5.00 mg/l Zn	PAR

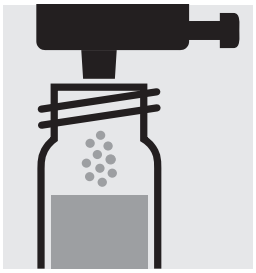
* turbidity correction possible

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

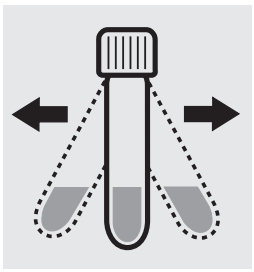


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

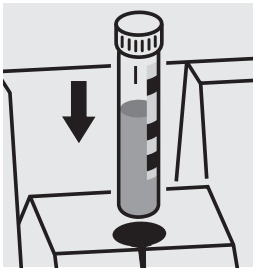


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

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).

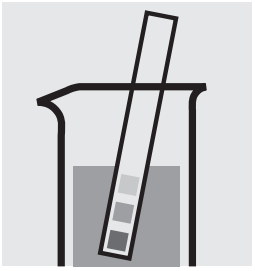
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat. No. 250482.

Ready-for-use ammonium standard solution, Cat.No. 250461, concentration 1000 mg/l NH_4^+, can also be used after diluting accordingly.

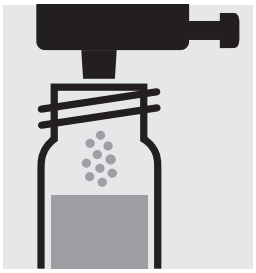
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Measuring	0.010 – 2.000 mg/l NH_4-N
range:	0.01 – 2.58 mg/l NH_4
	Expression of results also possible in mmol/l.

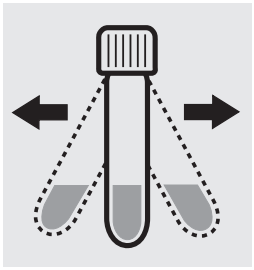


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

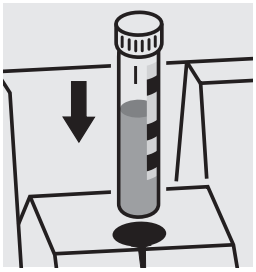


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

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).

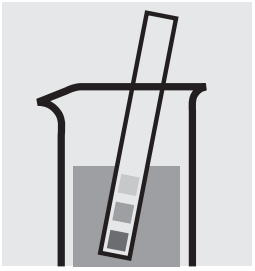
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 50, Cat.No. 250486.

Ready-for-use ammonium standard solution, Cat.No. 250461, concentration 1000 mg/l NH_4^+, can also be used after diluting accordingly.

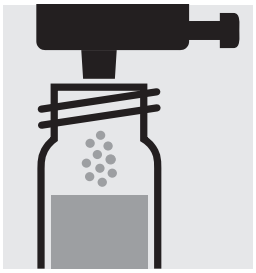
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

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

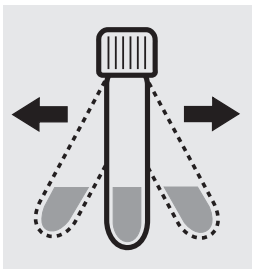


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

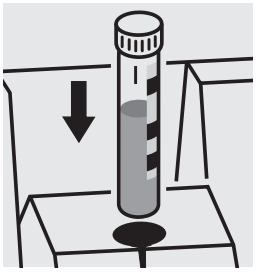


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

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).

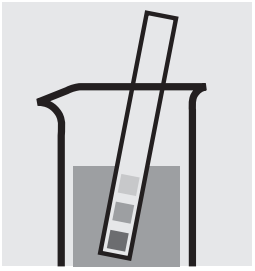
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20, Cat.No. 250483.

Ready-for-use ammonium standard solution, Cat.No. 250461, concentration 1000 mg/l NH_4^+, can also be used after diluting accordingly.

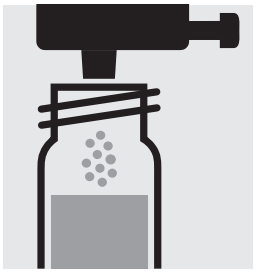
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

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

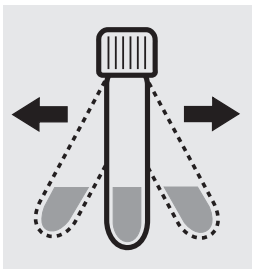


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

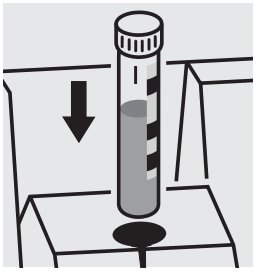


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

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 CombiCheck 70, Cat.No. 250488.

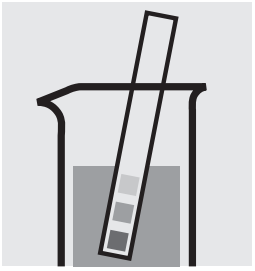
Ready-for-use ammonium standard solution, Cat.No. 250461, concentration 1000 mg/l NH_4^+, can also be used after diluting accordingly.

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

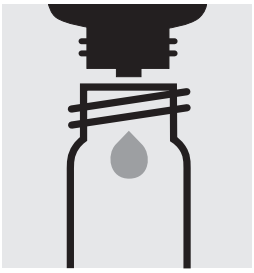
14552 · Chromate

Determination of chromium(VI)

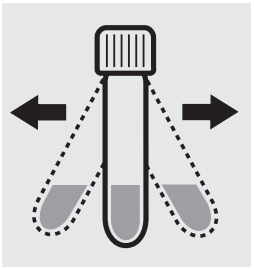
Measuring	0.05 – 2.00 mg/l Cr
range:	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l.



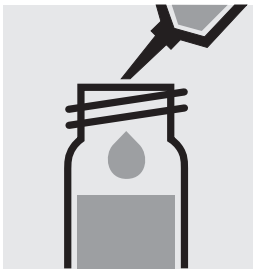
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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

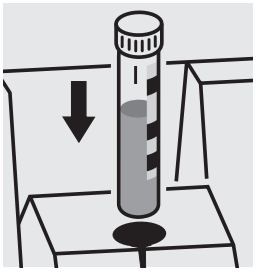


Shake the cell vigorously to dissolve the solid substance and leave to stand for **1 minute**.



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 cell compartment. Align the mark on the cell with that on the photometer.

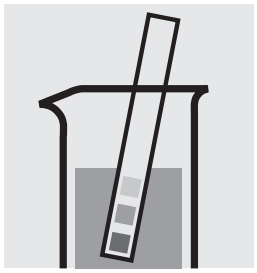
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use chromate standard solution, Cat.No. 250468, concentration 1000 mg/l CrO_4^{2-}, can be used after diluting accordingly.

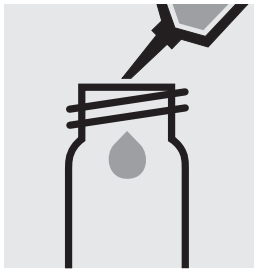
14552 · Chromate

Determination of total chromium (sum of chromium(VI) and chromium(III))

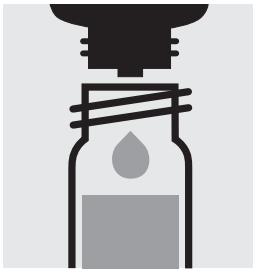
Measuring	0.05 – 2.00 mg/l Cr
range:	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l and also in Cr total (Σ Cr), Cr(III), and Cr(VI).



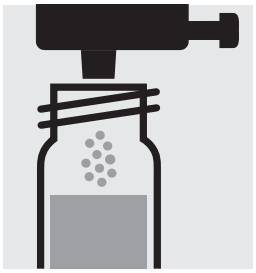
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



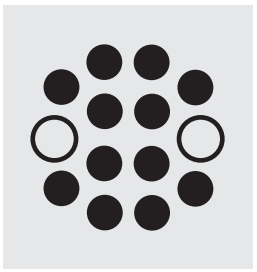
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).



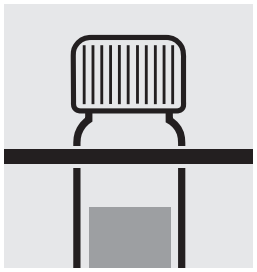
Add 1 drop of **Cr-1K**, close with the screw cap, and mix.



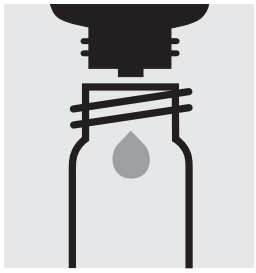
Add 1 dose of **Cr-2K** using the blue dose-metering cap, close the reaction cell with the screw cap.



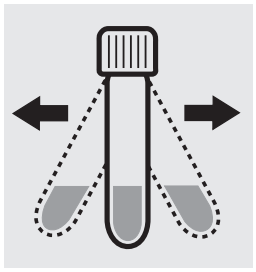
Heat the cell in the thermoreactor at 120 °C (100 °C) for 1 hour.



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



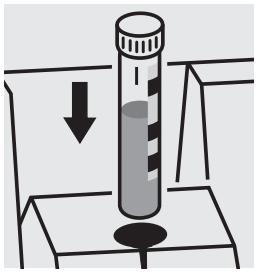
Add 6 drops of **Cr-3K** into a reaction cell, close the cell with the screw cap.



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



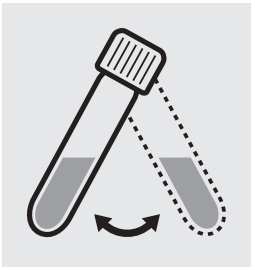
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

A differentiation between chromium(VI) and chromium(III) can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the total chromium, press enter and measure the chromium(VI) (see analytical procedure for chromium(VI)). After pressing enter, the individual measuring values for Cr VI and Cr III are shown on the display.

Quality assurance:

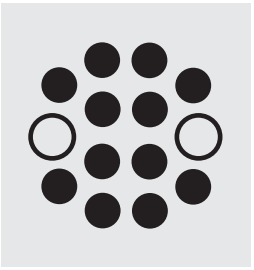
To check the measurement system (test reagents, measurement device, and handling) ready-for-use chromate standard solution, Cat.No. 250468, concentration 1000 mg/l CrO_4^{2-}, can be used after diluting accordingly.

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

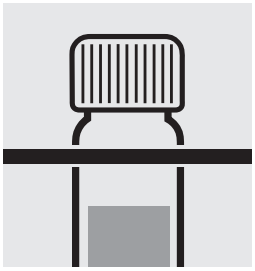


Suspend the bottom sediment in the cell by swirling.

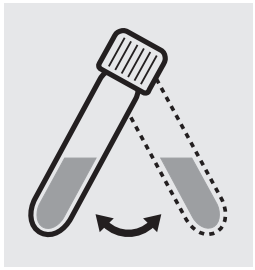
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



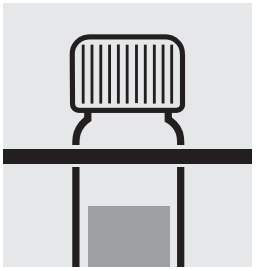
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



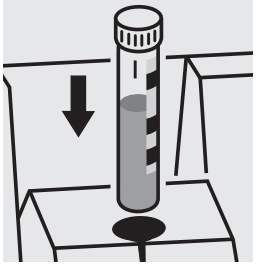
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



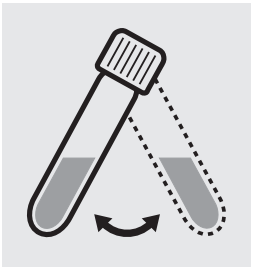
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat.No. 250482.

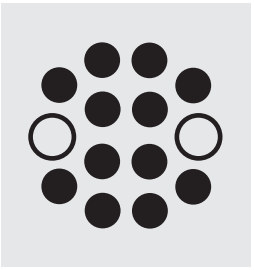
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

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

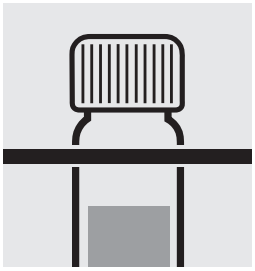


Suspend the bottom sediment in the cell by swirling.

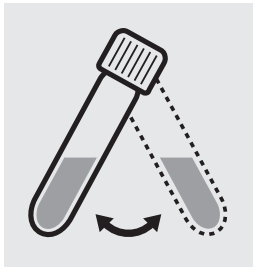
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



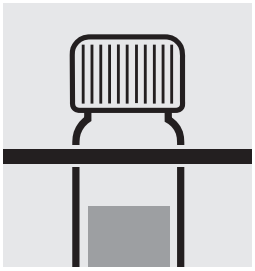
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



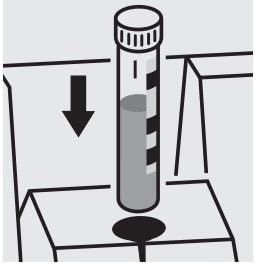
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 cell compartment. Align the mark on the cell with that on the photometer.

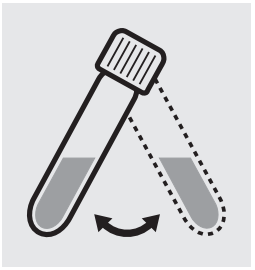
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 50, Cat.No. 250486.

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

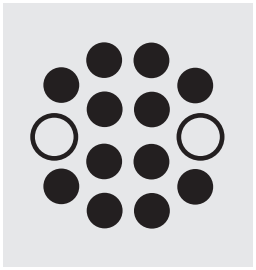
14895 · Chemical Oxygen Demand

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

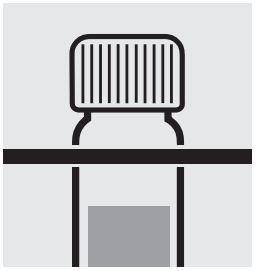


Suspend the bottom sediment in the cell by swirling.

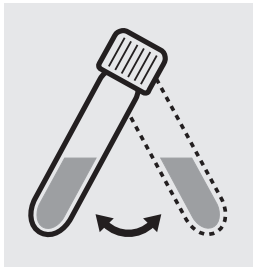
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



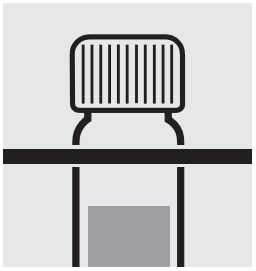
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



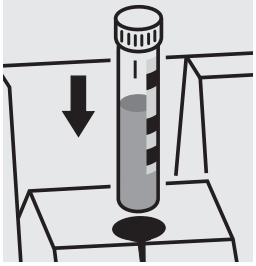
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



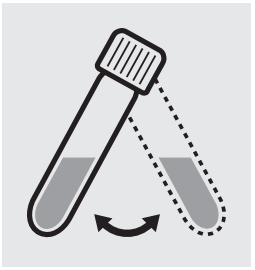
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 60, Cat.No. 250487.

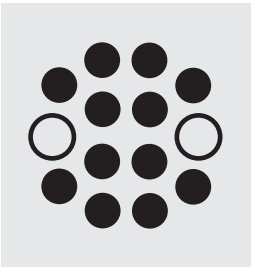
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 60) is highly recommended.

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

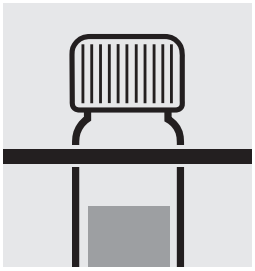


Suspend the bottom sediment in the cell by swirling.

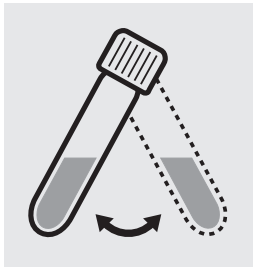
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



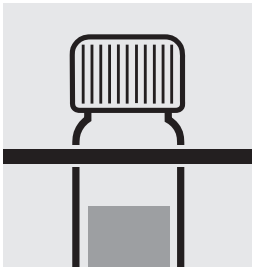
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



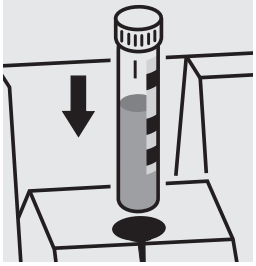
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 cell compartment. Align the mark on the cell with that on the photometer.

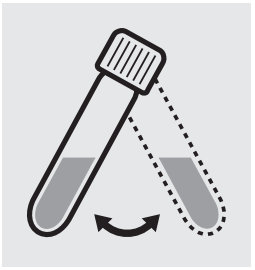
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 60, Cat.No. 250487.

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

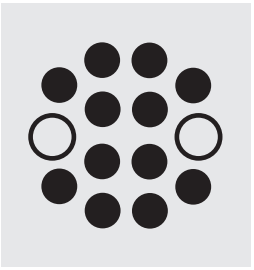
C4/25 · Chemical Oxygen Demand

Measuring range:	25–1500 mg/l COD or O_2 Expression of results also possible in mmol/l.

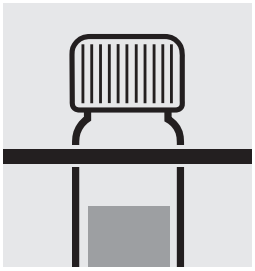


Suspend the bottom sediment in the cell by swirling.

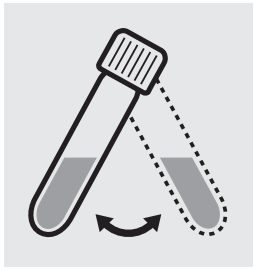
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



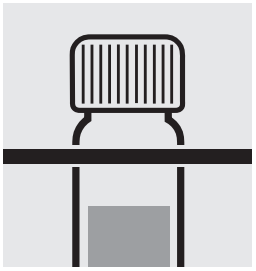
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



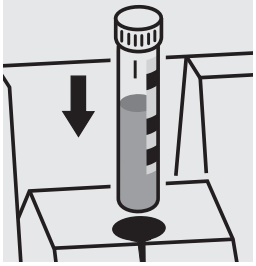
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



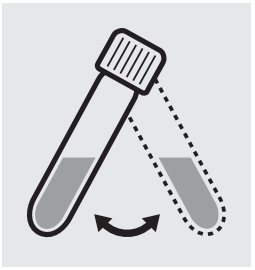
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20, Cat.No. 250483.

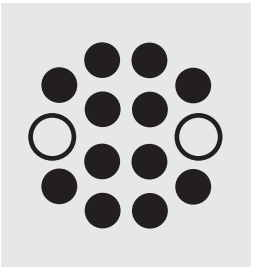
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Measuring range:	300–3500 mg/l COD or O_2 Expression of results also possible in mmol/l.

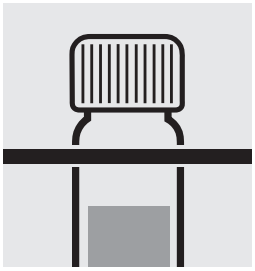


Suspend the bottom sediment in the cell by swirling.

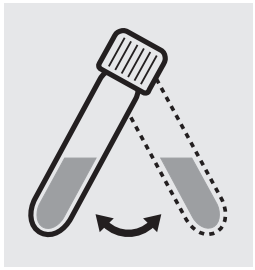
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



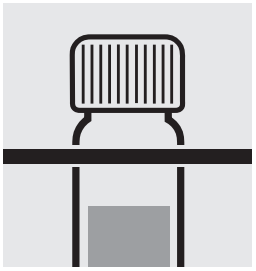
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



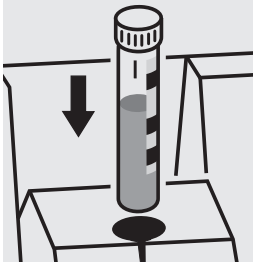
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



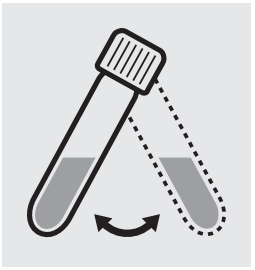
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 80, Cat.No. 250489.

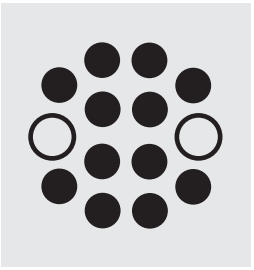
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 80) is highly recommended.

Measuring range:	500 – 10000 mg/l COD or O_2 Expression of results also possible in mmol/l.

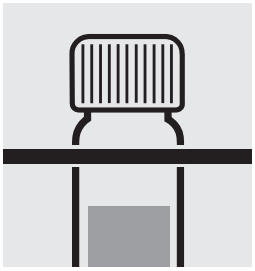


Suspend the bottom sediment in the cell by swirling.

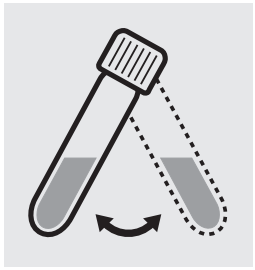
Carefully pipette 1.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



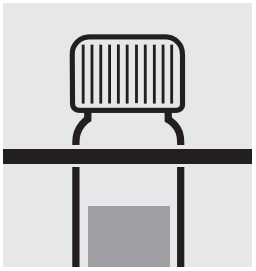
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



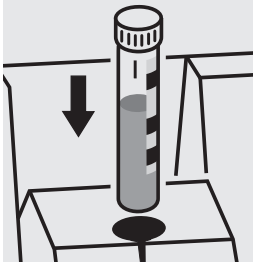
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



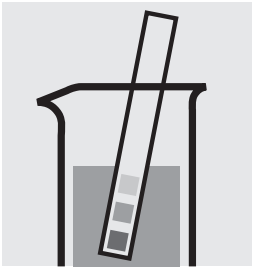
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 70, Cat.No. 250488.

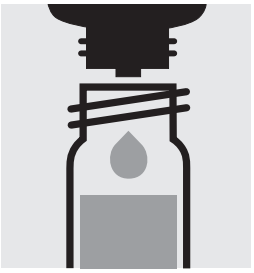
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

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



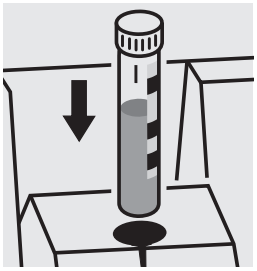
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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 cell compartment. Align the mark on the cell with that on the photometer.

Important:

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

For the determination of **total copper** a pretreatment with Crack Set 10C, Cat.No. 252033, or Crack Set 10, Cat.No. 250496 and thermoreactor is necessary.

Result can be expressed as sum of copper (Σ Cu).

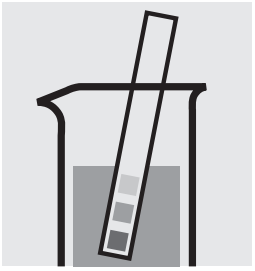
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 30, Cat.No. 250484.

Ready-for-use copper standard solution, Cat.No. 250473, concentration 1000 mg/l Cu, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

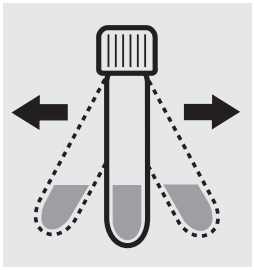
Measuring range:	0.05 – 4.00 mg/l Fe Expression of results also possible in mmol/l.



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.

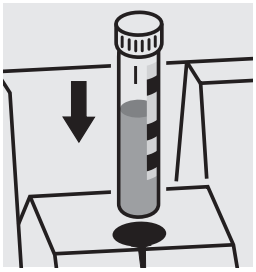
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level blue microspoon 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 cell compartment. Align the mark on the cell with that on the photometer.

Important:

For the determination of **total iron** a pretreatment with Crack Set 10C, Cat.No. 252033, or Crack Set 10, Cat.No. 250496 and thermoreactor is necessary.

Result can be expressed as sum of iron (Σ Fe).

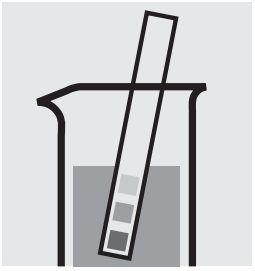
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 30, Cat.No. 250484.

Ready-for-use iron standard solution, Cat.No. 250469, concentration 1000 mg/l Fe, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

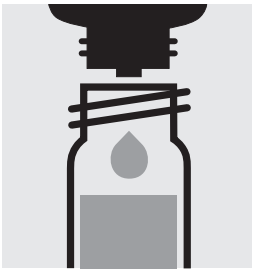
Measuring range:	0.10 – 6.00 mg/l Ni Expression of results also possible in mmol/l.



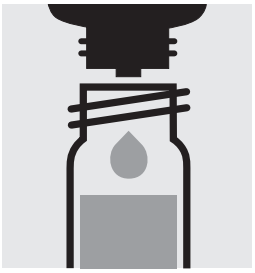
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

Reaction time:
1 minute

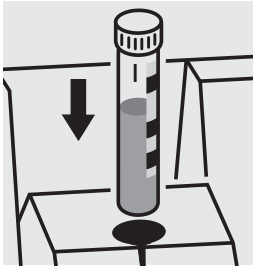


Add 2 drops of **Ni-1K**, close with the screw cap, and mix.



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

Reaction time:
2 minutes



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

Important:

For the determination of **total nickel** a pretreatment with Crack Set 10C, Cat.No. 252033, or Crack Set 10, Cat.No. 250496 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 CombiCheck 40, Cat.No. 250485.

Ready-for-use nickel standard solution, Cat.No. 250475, concentration 1000 mg/l Ni, can also be used after di-l uting accordingly.

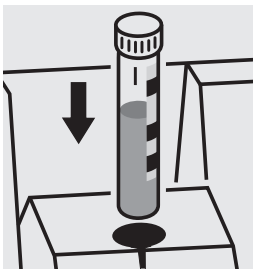
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Measuring	0.5 – 25.0 mg/l NO_3-N
range:	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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

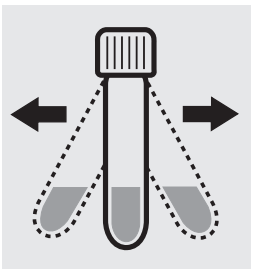
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20, Cat. No. 250483.

Ready-for-use nitrate standard solution, Cat.No. 250476, concentration 1000 mg/l NO_3^-, can also be used after diluting accordingly.

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

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.

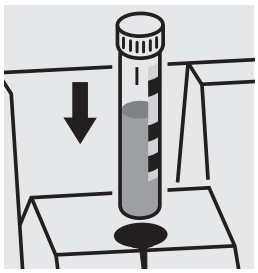
Add 1 level yellow microspoon of **NO_3-1K** into a reaction cell and close with the screw cap.



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

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

Reaction time:
10 minutes



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) we recommended to use CombiCheck 20, Cat.No. 114675.

Ready-for-use nitrate standard solution, Cat.No. 250483, concentration 1000 mg/l NO_3^-, can also be used after diluting accordingly.

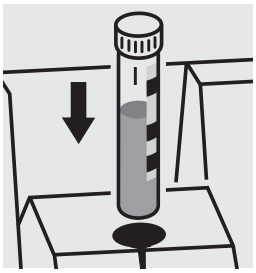
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

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 cell compartment. Align the mark on the cell with that on the photometer.

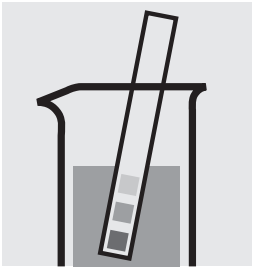
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 80, Cat.No. 250489.

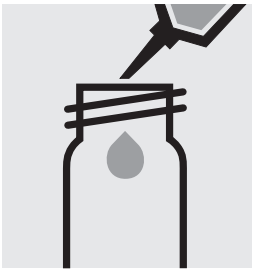
Ready-for-use nitrate standard solution, Cat.No. 250476, concentration 1000 mg/l NO_3^-, can also be used after diluting accordingly.

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

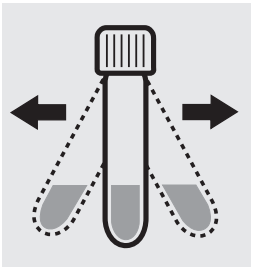
Measuring range:	0,010 – 0,700 mg/l NO_2-N 0,03 – 2,30 mg/l NO_2 Expression of results also possible in mmol/l.



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

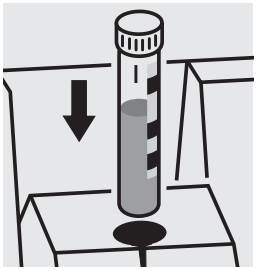


Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 10 minutes

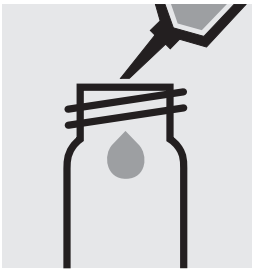


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

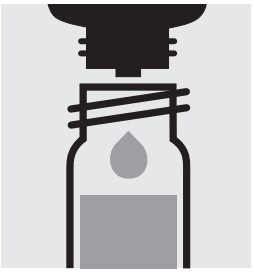
To check the measurement system (test reagents, measurement device, and handling) ready-for-use nitrite standard solution, Cat.No. 250477, concentration 1000 mg/l NO_2^-, can be used after diluting accordingly.

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

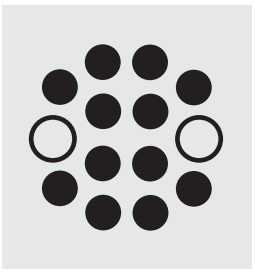


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

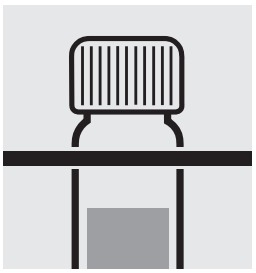
Add 1 level blue microspoon of **N-1K.**



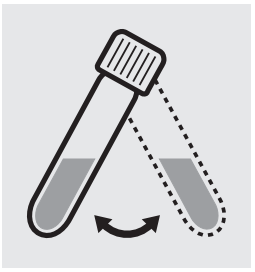
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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

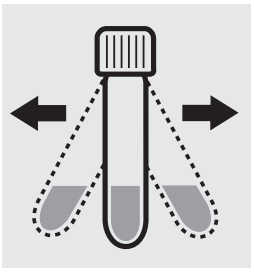


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.



Swirl the cell after 10 minutes.

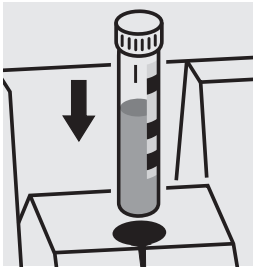
Add 1 level yellow microspoon of **N-3K into a reaction cell**, close the cell with the screw cap.



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



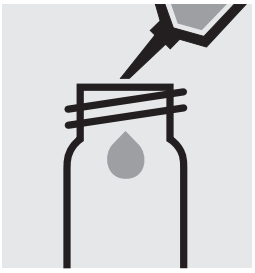
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 50, Cat.No. 250486.

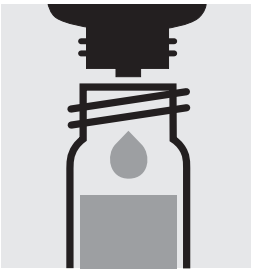
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

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

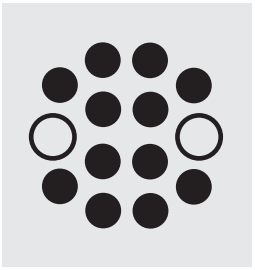


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

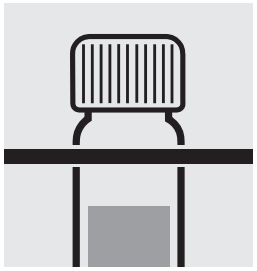
Add 1 level blue micro-spoon of **N-1K.**



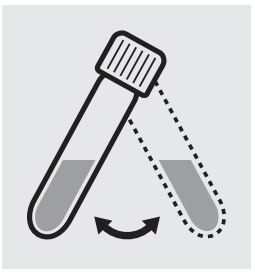
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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



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

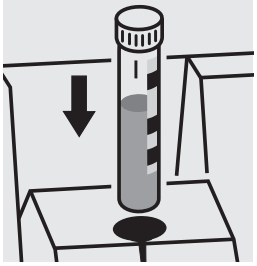


Swirl the cell after 10 minutes.

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



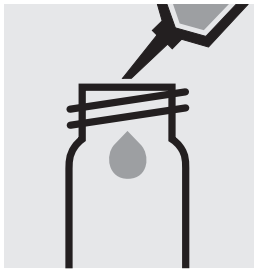
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

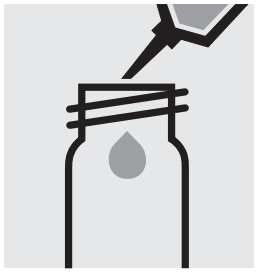
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 50, Cat.No. 250486.

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

Measuring range:	10 – 150 mg/l N Expression of results also possible in mmol/l.

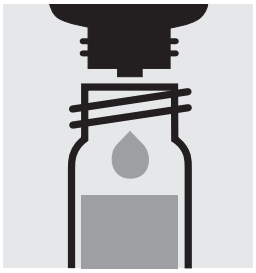


Pipette 1.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

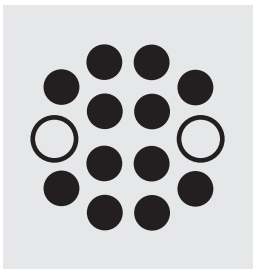


Add 9.0 ml of distilled water with pipette.

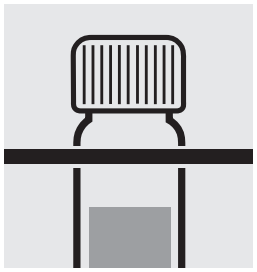
Add 1 level blue micro-spoon of **N-1K.**



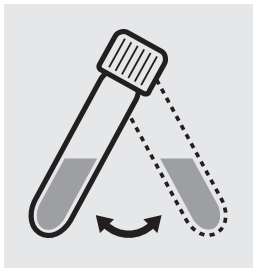
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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



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

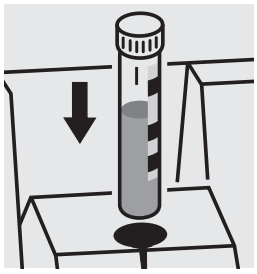


Swirl the cell after 10 minutes.

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 cell compartment. Align the mark on the cell with that on the photometer.

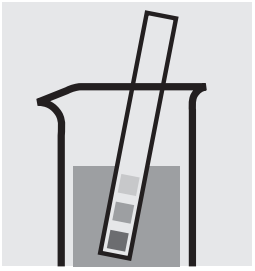
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 70, Cat.No. 250488.

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

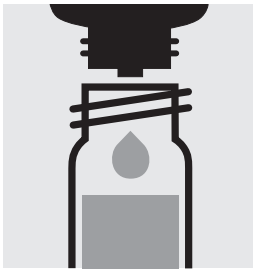
Determination of orthophosphate

Measuring	0.05 – 5.00 mg/l PO_4 -P
range:	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.

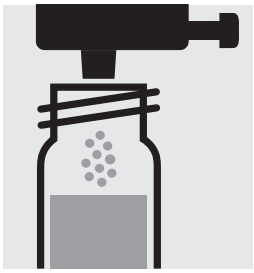


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

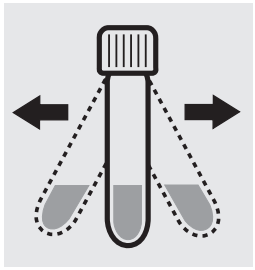
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

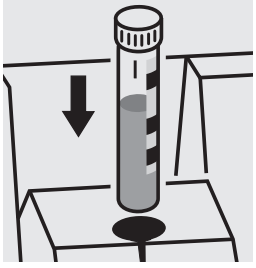


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

Quality assurance:

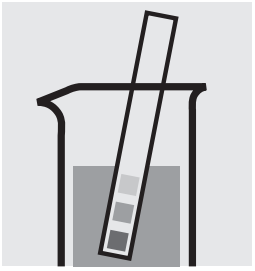
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat. No. 250482.

Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

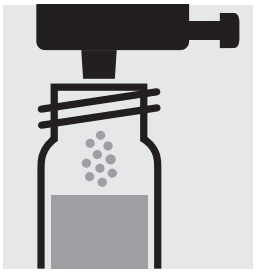
Determination of total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate

Measuring	0.05 – 5.00 mg/l P
range:	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 and also in P total (Σ P), and P org* [P(o)].

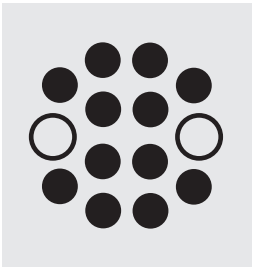


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

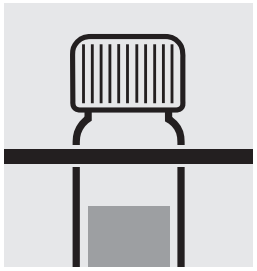
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



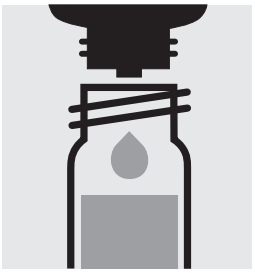
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



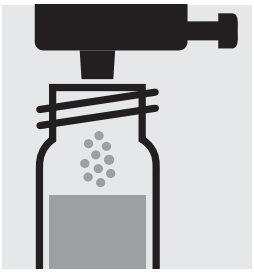
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



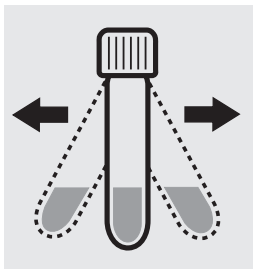
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

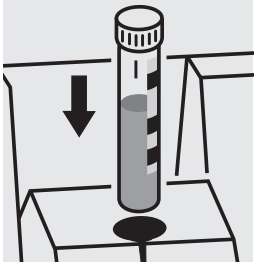


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 5 minutes



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

A differentiation between orthophosphate (PO_4-P) and P org* (P(o)) can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the P total, press enter and measure the ortho-phosphate (see analytical procedure for ortho-phosphate). After pressing enter, the individual measuring values for PO_4-P and P(o) are shown on the display.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat. No. 250482.

Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

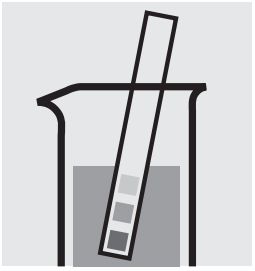
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

* P org is the sum of polyphosphate and organophosphate.

P7/25 · Phosphate

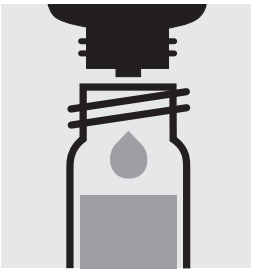
Determination of orthophosphate

Measuring	0.5 – 25.0 mg/l PO_4 -P
range:	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.

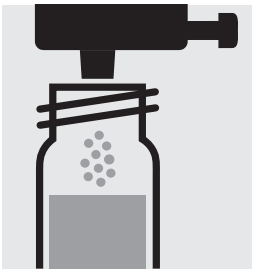


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

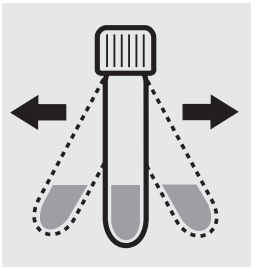
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

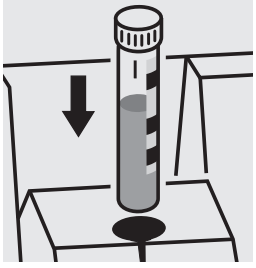


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the 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) we recommended to use CombiCheck 20 and 80, Cat. Nos. 250483 and 250489.

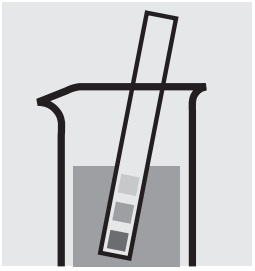
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

P7/25 · Phosphate

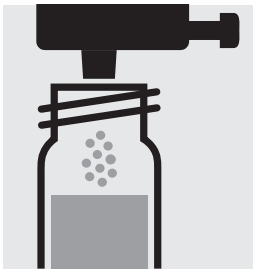
Determination of total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate

Measuring	0.5 – 25.0 mg/l P
range:	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 and also in P total (Σ P), and P org* [P(o)].

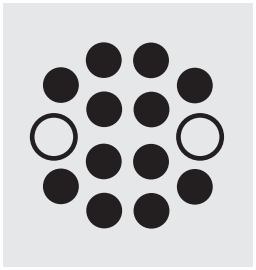


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

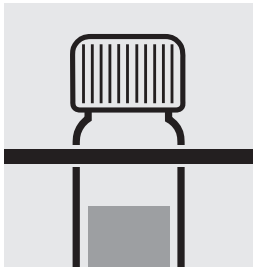
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



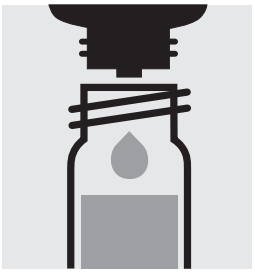
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



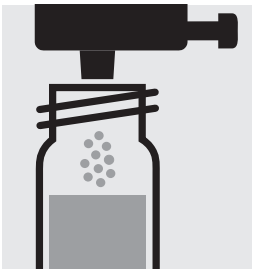
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



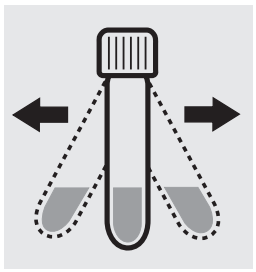
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

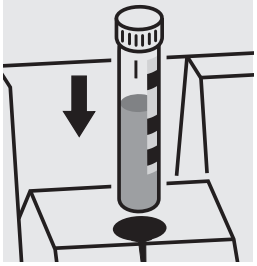


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

A differentiation between orthophosphate (PO_4-P) and P org* (P(o)) can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the P total, press enter and measure the ortho-phosphate (see analytical procedure for ortho-phosphate). After pressing enter, the individual measuring values for PO_4-P and P(o) are shown on the display.

* P org is the sum of polyphosphate and organophosphate.

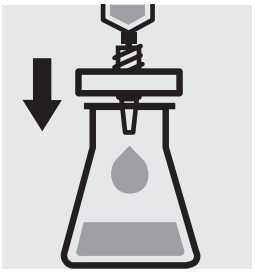
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20 and 80, Cat. Nos. 250483 and 250489.

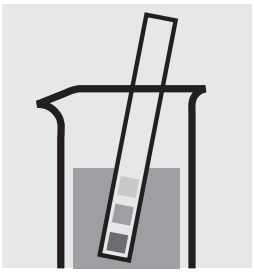
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

Measuring range:	5 – 250 mg/l SO_4 Expression of results also possible in mmol/l.



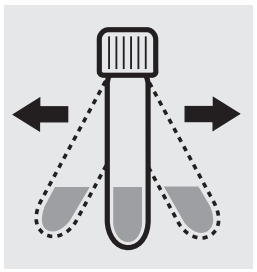
Filter turbid samples.



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.

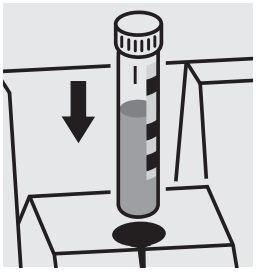
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green microspoon 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 cell compartment. Align the mark on the cell with that on the photometer.

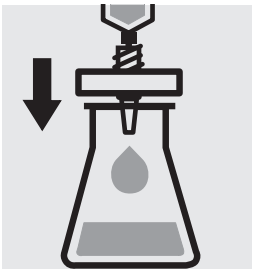
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat.No. 250482.

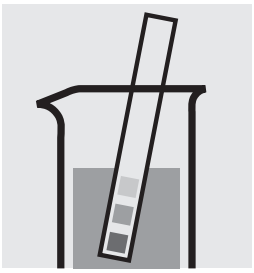
Ready-for-use sulfate standard solution, Cat.No. 250480, concentration 1000 mg/l SO_4^{2-}, can also be used after diluting accordingly.

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

Measuring range:	100– 1000 mg/l SO_4 Expression of results also possible in mmol/l.



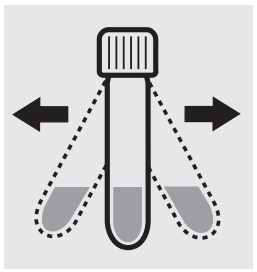
Filter turbid samples.



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.

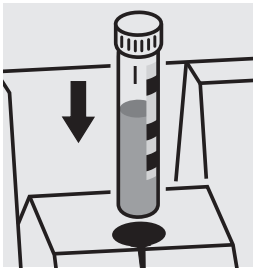
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green microspoon 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 cell compartment. Align the mark on the cell with that on the photometer.

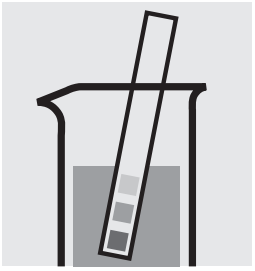
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20, Cat.No. 250483.

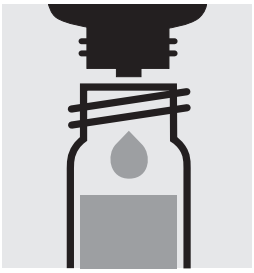
Ready-for-use sulfate standard solution, Cat.No. 250480, concentration 1000 mg/l SO_4^{2-}, can also be used after diluting accordingly.

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

Measuring range:	0.20 – 5.00 mg/l Zn Expression of results also possible in mmol/l.

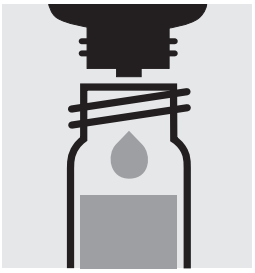


Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



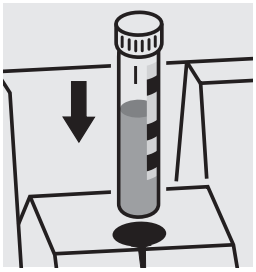
Add 5 drops of **Zn-1K** into a reaction cell, close with the screw cap, and mix.

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.

Reaction time: 15 minutes



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

Important:

For the determination of **total zinc** a pretreatment with Crack Set 10C, Cat.No. 252033, or Crack Set 10, Cat.No. 250496, 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 CombiCheck 40, Cat.No. 250485.

Ready-for-use zinc standard solution, Cat.No. 250481, concentration 1000 mg/l Zn, can also be used after diluting accordingly.

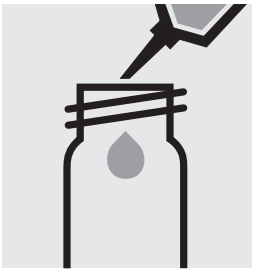
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Acid Capacity to pH 4.3 (Total Alkalinity)

101758

Cell Test

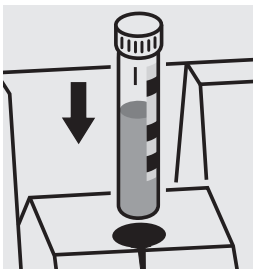
Measuring range:	0.40 –	8.00	mmol/l
	20 –	400	mg/l $CaCO_3$



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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

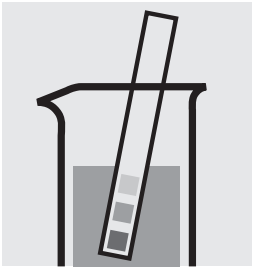
To check the measurement system (test reagents, measurement device, and handling) a sodium hydroxide solution 0.1 mol/l, Cat.No. 109141, can be used after diluting accordingly (see section “Standard solutions”).

Aluminium

100594

Cell Test

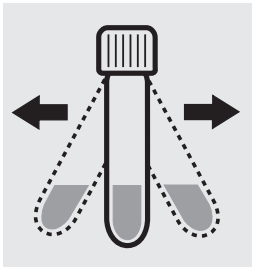
Measuring range:	0.02 – 0.50 mg/l Al Expression of results also possible in mmol/l.



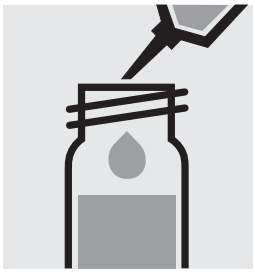
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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.

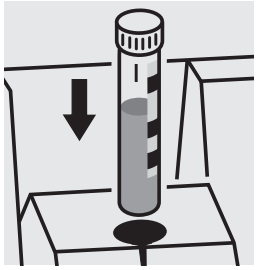


Shake the cell vigorously to dissolve the solid substance.



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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

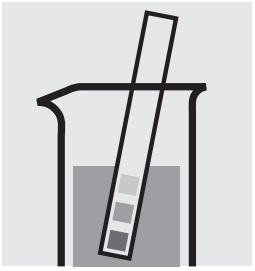
To check the measurement system (test reagents, measurement device, and handling) ready-for-use aluminium standard solution CertiPUR®, Cat.No. 119770, concentration 1000 mg/l Al can be used after diluting accordingly.

Ammonium

114739

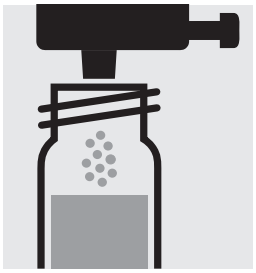
Cell Test

Measuring range:	0.010 – 2.000 mg/l NH_4-N
	0.01 – 2.58 mg/l NH_4
	Expression of results also possible in mmol/l.

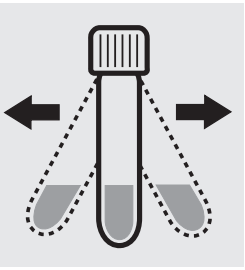


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

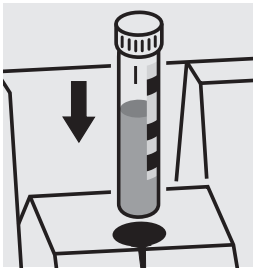


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50, Cat.No. 114695, or the Standard solution for photometric applications, CRM, Cat.No. 125022 and 125023.

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

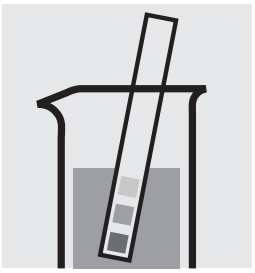
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Ammonium

114558

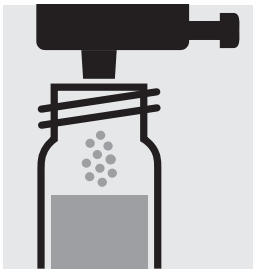
Cell Test

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

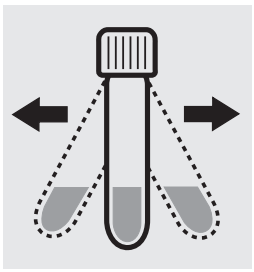


Check the pH of the sample, specified range: pH 4 – 13
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

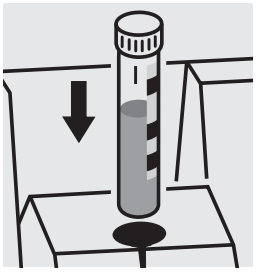


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

Important:

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

Quality assurance:

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

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

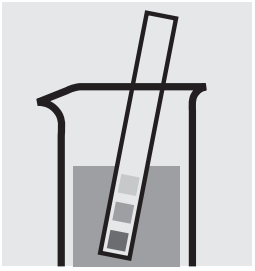
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Ammonium

114544

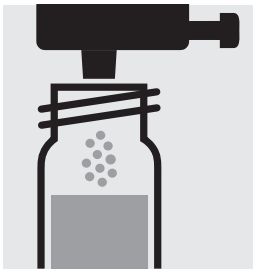
Cell Test

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

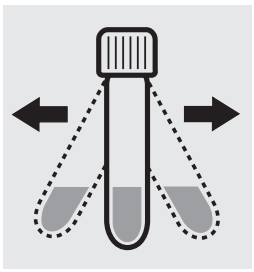


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

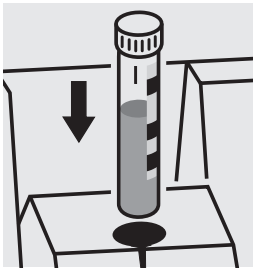


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

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, Cat.No. 114675, or the Standard solution for photometric applications, CRM, Cat.No. 125023, 125024, 125025, and 125026.

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

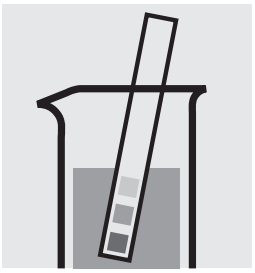
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Ammonium

114559

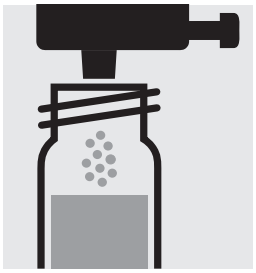
Cell Test

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

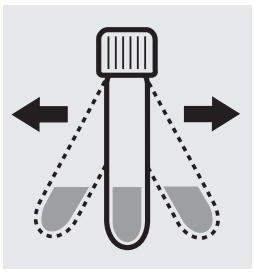


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

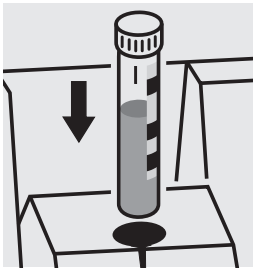


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

Important:

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

Quality assurance:

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

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

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

AOX

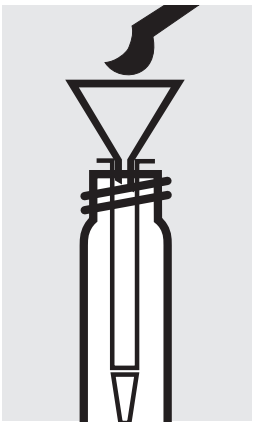
Adsorbable Organic Halogens (x)

100675

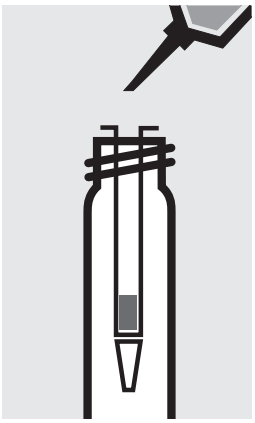
Cell Test

Measuring range: 0.05 – 2.50 mg/l AOX

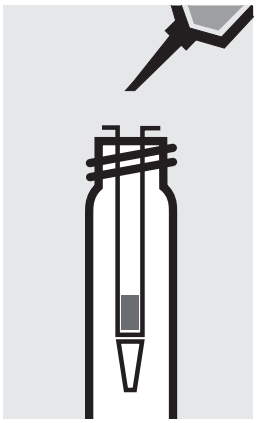
Preparation of the adsorption column:



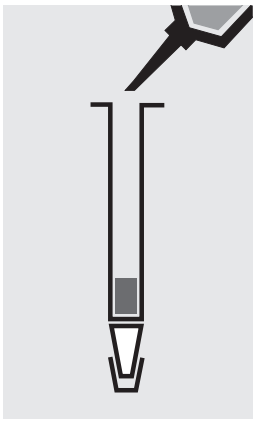
Place the column in an empty cell. Fill 1 level blue microspoon of **AOX-1** into the column using the glass funnel.



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

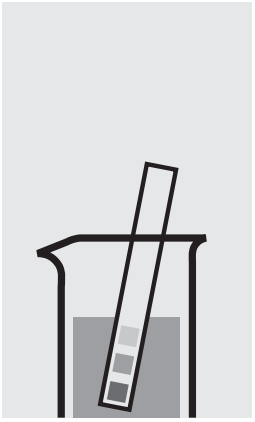


Run 3 separate 1-ml portions of **AOX-3** through the column. Discard the wash solution.

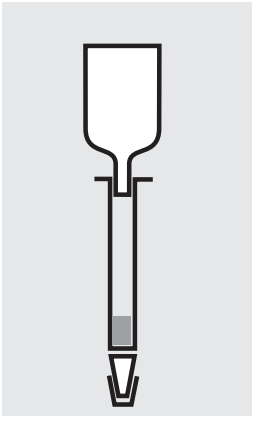


Close the bottom end of the column with the stopper. Apply to the column 1 ml of **AOX-3**. Close the top end of the column with the stopper and swirl to eliminate air bubbles. Remove the stopper on the top end and fill the column to the brim with **AOX-3**.

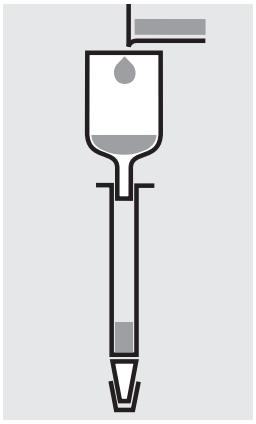
Sample enrichment:



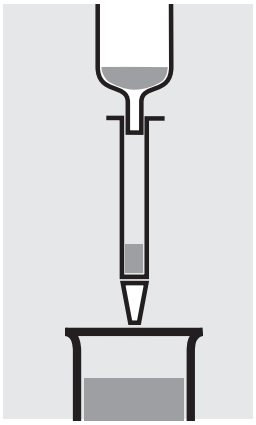
Check the pH of the sample, specified range: pH 6 – 7.
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



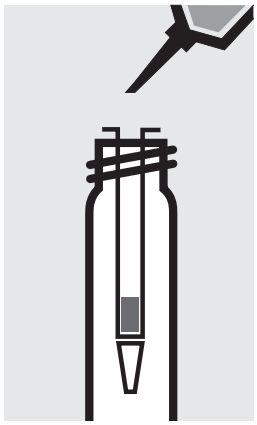
Attach the glass reservoir to the prepared column (closed at the bottom end).



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.

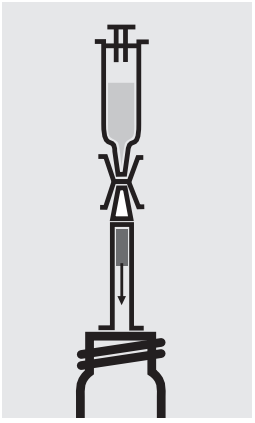
AOX

Adsorbable Organic Halogens (x)

100675

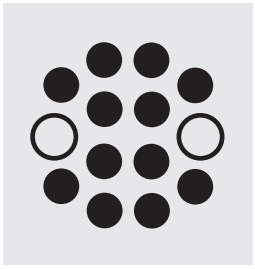
Cell Test

Digestion:

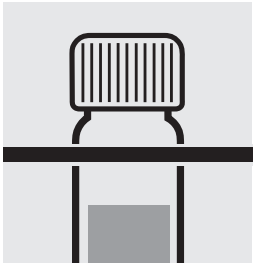


Fill the 10-ml syringe with 10 ml of reagent **AOX-5** and attach the syringe with the column outlet using the connector. Place the top end of the column on an empty cell and rinse the charcoal filling of the column into an empty 16-mm cell.

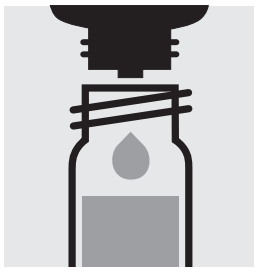
Add 2 level green microspoons of **AOX-6**, close the cell with the screw cap, and mix.



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.



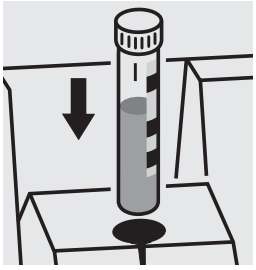
Add 5 drops of **AOX-4**, close the cell and mix; clear supernatant: **pretreated sample**.

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 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) Spectroquant® AOX Standard, Cat.No. 100680, concentration 0.2 – 2.0 mg/l can be used.

BOD

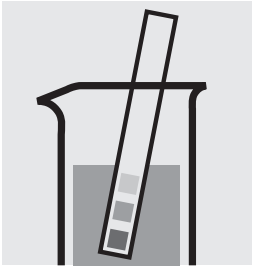
Biochemical Oxygen Demand

100687

Cell Test

Measuring range:	0.5 – 3000 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)

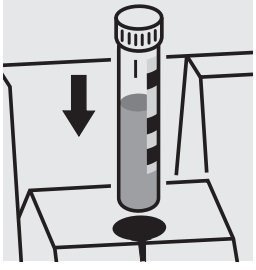
After incubation, use one bottle of **pretreated sample** and one of **inoculated nutrient-salt solution** for the measurement of the final oxygen concentration.

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

Reaction time:
1 minute

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

Fill the solution into a round cell.



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

Calculation:

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

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

BOD of original sample in mg/l = A • dilution factor – B

Quality assurance:

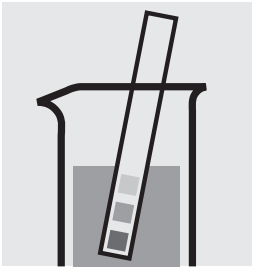
To check the measurement system (test reagents, measurement device, and handling) Spectroquant BOD Standard (acc. to EN 1899), Cat.No. 100718, can be used.

Cadmium

114834

Cell Test

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

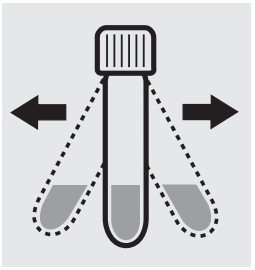


Check the pH of the sample, specified range: pH 3 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

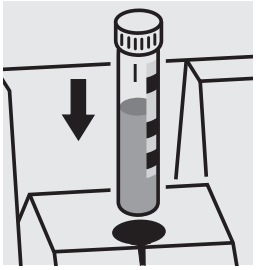
Add 0.20 ml of **Cd-1K** with pipette, close the cell with the screw cap, and mix.

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 cell compartment. Align the mark on the cell with that on the photometer.

Important:

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

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 30, Cat.No. 114677.

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

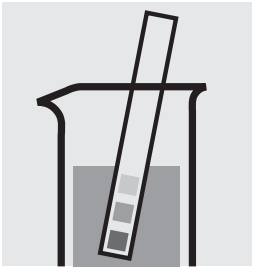
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

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.



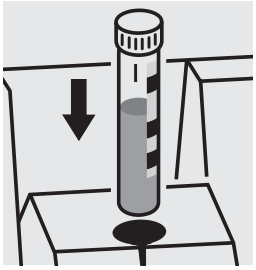
Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

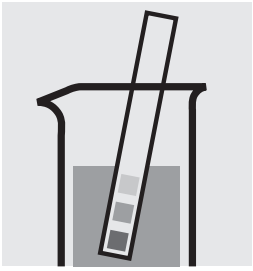
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

Chloride

114730

Cell Test

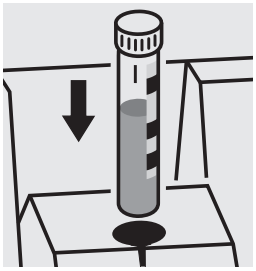
Measuring range:	5 – 125 mg/l Cl Expression of results also possible in mmol/l.



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 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) we recommended to use Spectroquant® CombiCheck 10 and 20, Cat.Nos. 114676 and 114675.

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

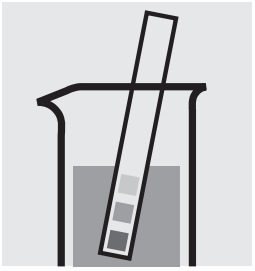
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

Chloride

101804

Cell Test

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

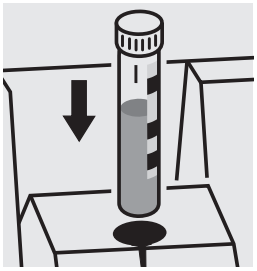


Check the pH of the sample, specified range: pH 3 – 11.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.

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

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

Reaction time: 10 minutes



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

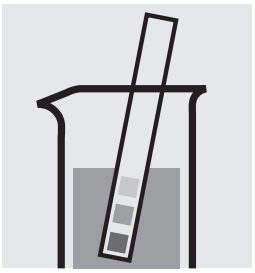
Chlorine

Determination of free chlorine

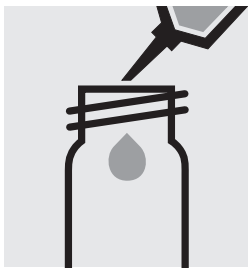
100595

Cell Test

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

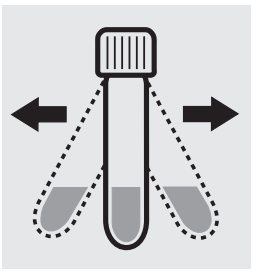


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



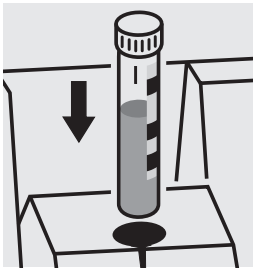
Pipette 5.0 ml of the sample into a round cell.

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 cell compartment. Align the mark on the cell with that on the photometer.

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

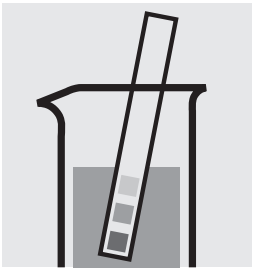
Determination of free chlorine and total chlorine

100597

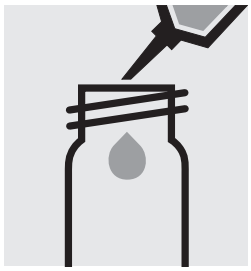
Cell Test

Measuring range:	0.03– 6.00 mg/l Cl_2 Expression of results also possible in mmol/l and also in free Cl_2 [Cl_2(f)], combined Cl_2 [Cl_2(b)], and total Cl_2 [Cl_2(t)].

Determination of free chlorine

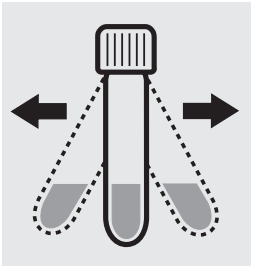


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



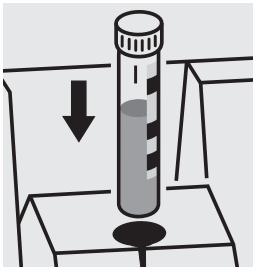
Pipette 5.0 ml of the sample into a round cell.

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 cell compartment. Align the mark on the cell with that on the photometer.

Determination of total chlorine

Same preparation as described above, add 2 drops of **Cl_2-2**, close the cell with the screw cap, and mix after dissolving solid.

A differentiation between free and combined chlorine [Cl_2(f) and Cl_2(b)] can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the free chlorine, press enter, remove the cell, add 2 drops of Cl_2-2, close with the screw cap, mix, and measure the total chlorine. After pressing enter, the individual measuring values for free and combined chlorine are shown on the display.

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)

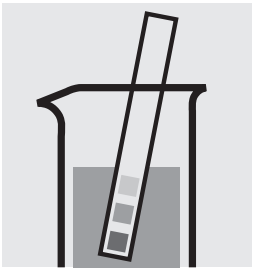
Determination of free chlorine and total chlorine

100086/100087/ 100088

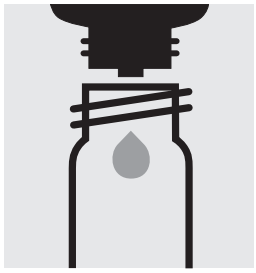
Cell Test

Measuring range:	0.03– 6.00 mg/l Cl_2 Expression of results also possible in mmol/l and also in free Cl_2 [Cl_2(f)], combined Cl_2 [Cl_2(b)], and total Cl_2 [Cl_2(t)].

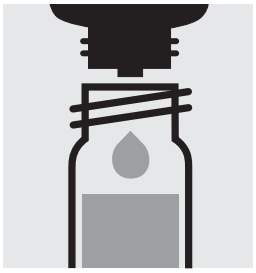
Determination of free chlorine



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.



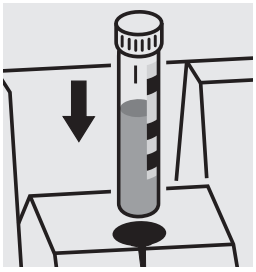
Place 6 drops of **Cl_2-1** into a round cell.



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 cell compartment. Align the mark on the cell with that on the photometer.

Determination of total chlorine

Same preparation as described above, add 2 drops of **Cl_2-3**, close with the screw cap, and mix after the end of the reaction time.

A differentiation between free and combined chlorine [Cl_2(f) and Cl_2(b)] can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the free chlorine, press enter, remove the cell, add 2 drops of Cl_2-3, close with the screw cap, mix, and measure the total chlorine. After pressing enter, the individual measuring values for free and combined chlorine are shown on the display.

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”).

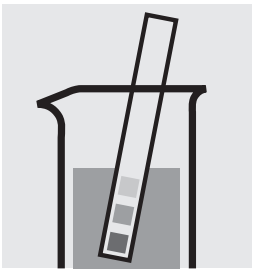
Chromate

Determination of chromium(VI)

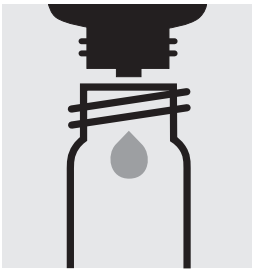
114552

Cell Test

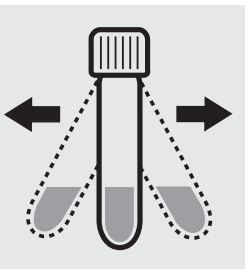
Measuring range:	0.05 – 2.00 mg/l Cr
	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l.



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.



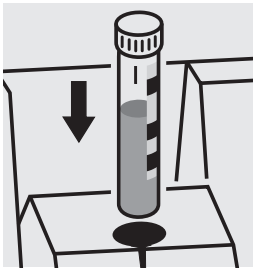
Add 6 drops of **Cr-3K** into a reaction cell, close with the screw cap.



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

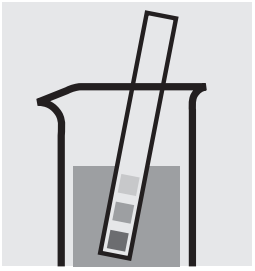
Chromate

Determination of total chromium
= sum of chromium(VI) and chromium(III)

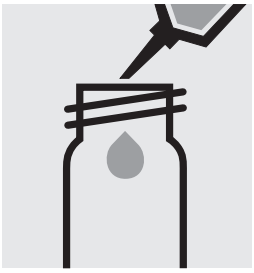
114552

Cell Test

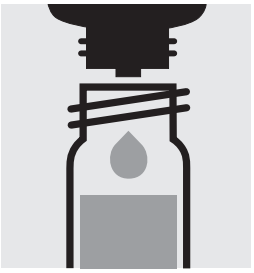
Measuring range:	0.05 – 2.00 mg/l Cr
	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l and also in Cr total (Σ Cr), Cr(III), and Cr(VI).



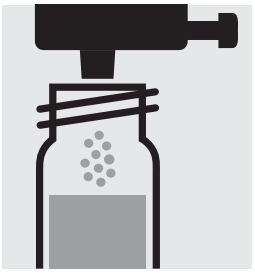
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



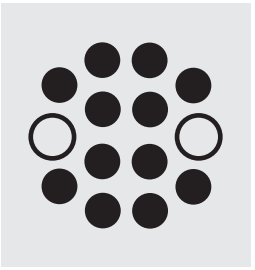
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



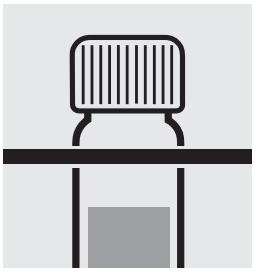
Add 1 drop of **Cr-1K**, close with the screw cap, and mix.



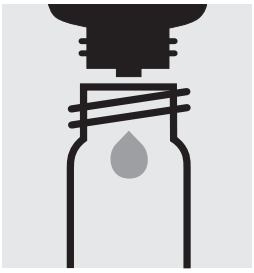
Add 1 dose of **Cr-2K** using the blue dose-metering cap, close the reaction cell with the screw cap.



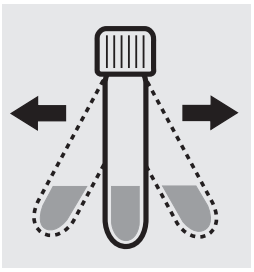
Heat the cell in the thermoreactor at 120 °C (100 °C) for 1 hour.



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



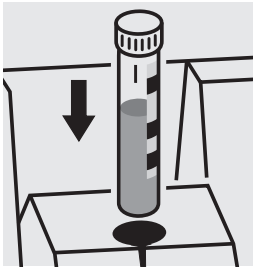
Add 6 drops of **Cr-3K** into a reaction cell, close the cell with the screw cap.



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 cell compartment. Align the mark on the cell with that on the photometer.

A differentiation between chromium(VI) and chromium(III) can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the total chromium, press enter and measure the chromium(VI) (see analytical procedure for chromium(VI)). After pressing enter, the individual measuring values for Cr VI and Cr III are shown on the display.

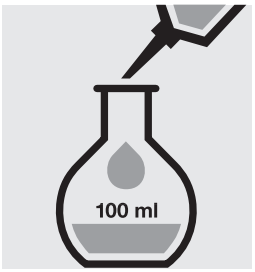
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use chromate standard solution CertiPUR®, Cat.No. 119780, concentration 1000 mg/l CrO_4^{2-}, can be used after diluting accordingly.

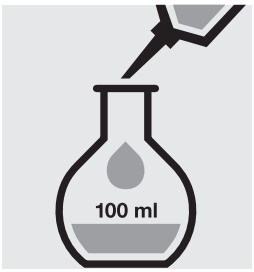
Chromium in electroplating baths

Inherent color

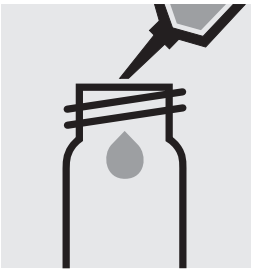
Measuring range: 20 – 400 g/l CrO_3



Pipette 5.0 ml of the sample into a 100-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.

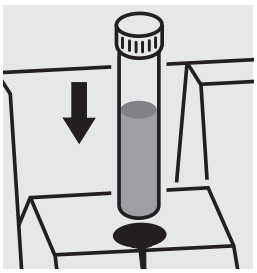


Pipette 4.0 ml of the dilute sample into a 100-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.



Pipette 5.0 ml of the 1:500 dilute sample into an empty round cell (Empty cells, Cat. No. 114724).

Add 5.0 ml of **sulfuric acid 40%**, close the cell with the screw cap, and mix.



Place the cell into the cell compartment. Select method no. **20**.

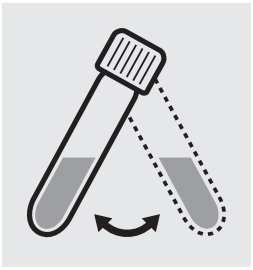
COD

Chemical Oxygen Demand

114560

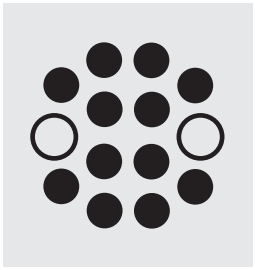
Cell Test

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

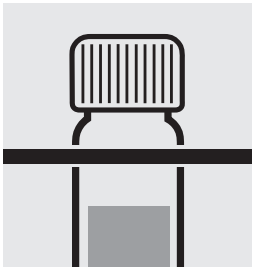


Suspend the bottom sediment in the cell by swirling.

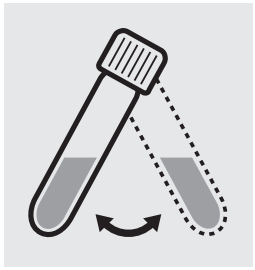
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



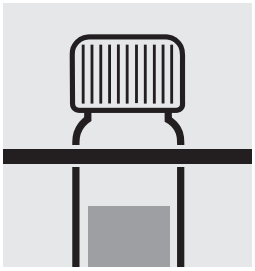
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



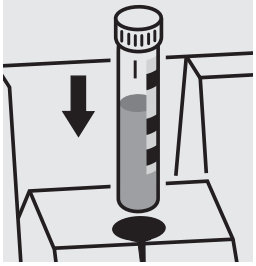
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use Spectroquant® CombiCheck 50, Cat.No. 114695, or the Standard solution for photometric applications, CRM, Cat.No. 125028.

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

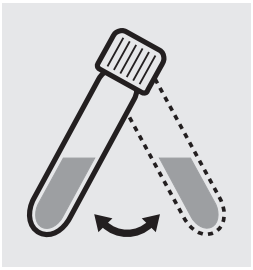
COD

Chemical Oxygen Demand

101796

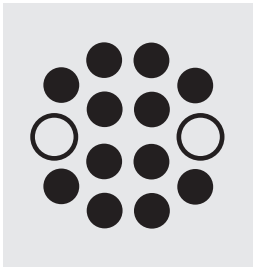
Cell Test

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

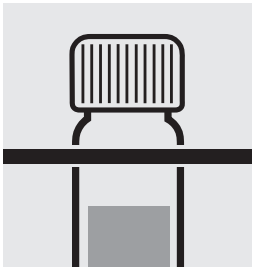


Suspend the bottom sediment in the cell by swirling.

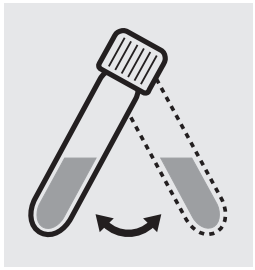
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



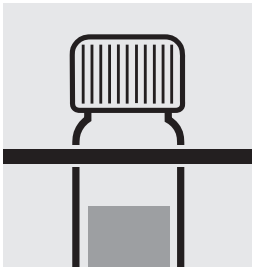
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



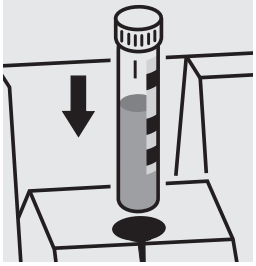
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use Spectroquant® CombiCheck 50, Cat.No. 114695, or the Standard solution for photometric applications, CRM, Cat.No. 125028.

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

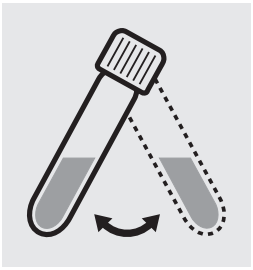
COD

Chemical Oxygen Demand

114540

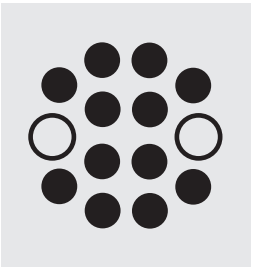
Cell Test

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

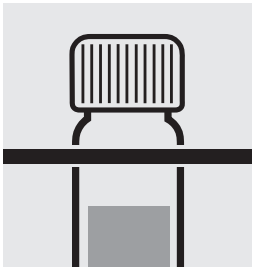


Suspend the bottom sediment in the cell by swirling.

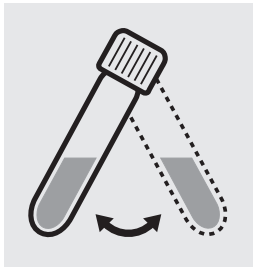
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



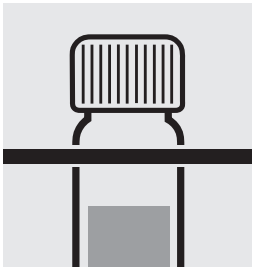
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



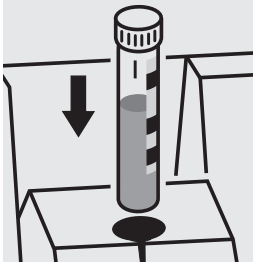
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solution for photometric applications, CRM, Cat.No. 125029.

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

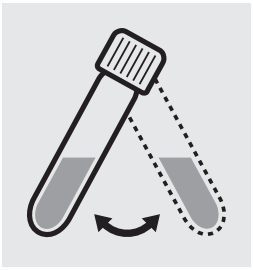
COD

Chemical Oxygen Demand

114895

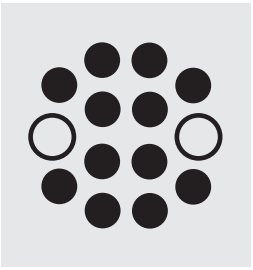
Cell Test

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

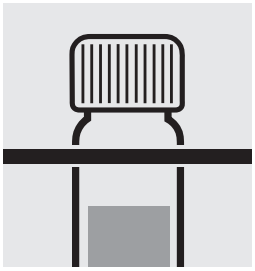


Suspend the bottom sediment in the cell by swirling.

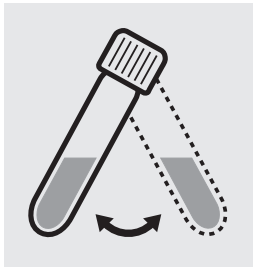
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



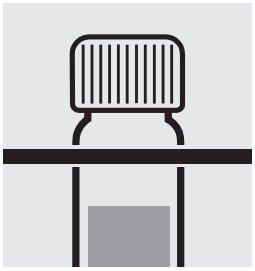
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



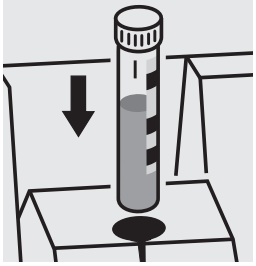
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use Spectroquant® CombiCheck 60, Cat.No. 114696, or the Standard solution for photometric applications, CRM, Cat.No. 125029 and 125030.

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

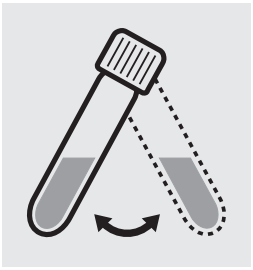
COD

Chemical Oxygen Demand

114690

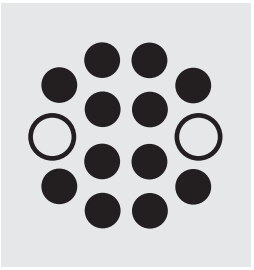
Cell Test

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

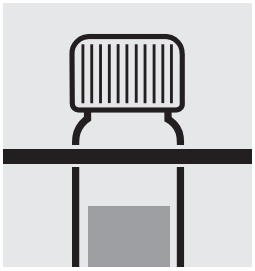


Suspend the bottom sediment in the cell by swirling.

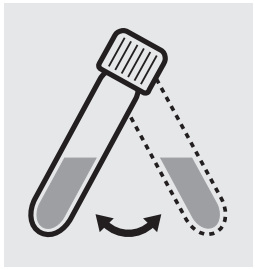
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



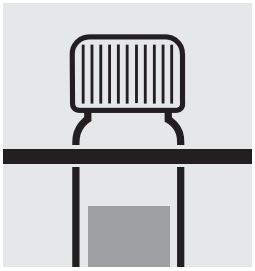
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



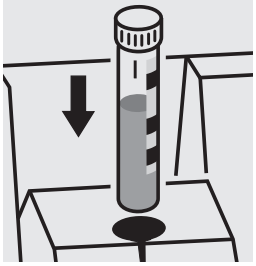
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use Spectroquant® CombiCheck 60, Cat.No. 114696, or the Standard solution for photometric applications, CRM, Cat.No. 125029, 125030, and 125031.

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

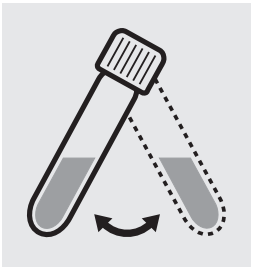
COD

Chemical Oxygen Demand

114541

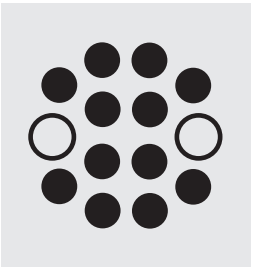
Cell Test

Measuring range:	25 – 1500 mg/l COD or O_2 Expression of results also possible in mmol/l.

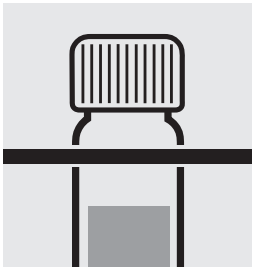


Suspend the bottom sediment in the cell by swirling.

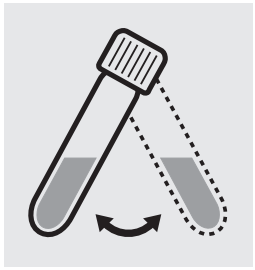
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



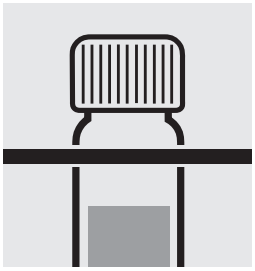
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



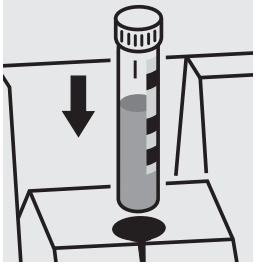
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use Spectroquant® CombiCheck 20, Cat.No. 114675, or the Standard solution for photometric applications, CRM, Cat.No. 125029, 125030, 125031, and 125032.

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

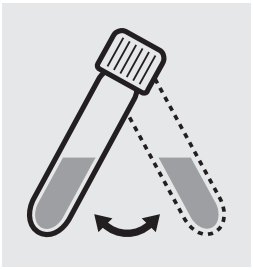
COD

Chemical Oxygen Demand

114691

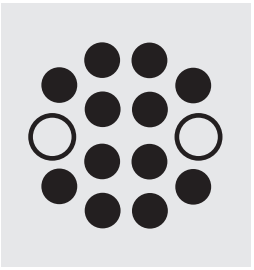
Cell Test

Measuring range:	300 – 3500 mg/l COD or O_2 Expression of results also possible in mmol/l.

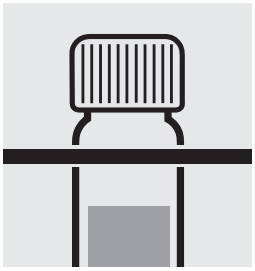


Suspend the bottom sediment in the cell by swirling.

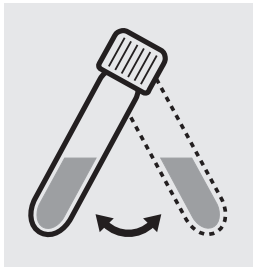
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



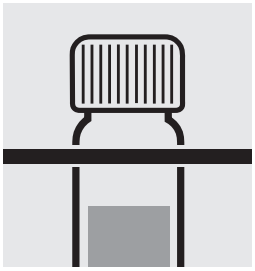
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



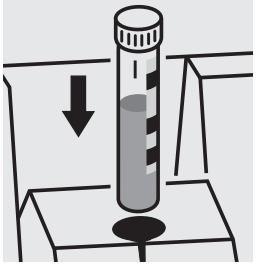
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use Spectroquant® CombiCheck 80, Cat.No. 114738, or the Standard solution for photometric applications, CRM, Cat.No. 125031, 125032, and 125033.

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

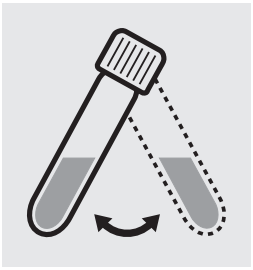
COD

Chemical Oxygen Demand

114555

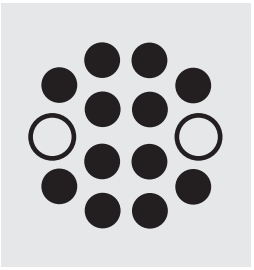
Cell Test

Measuring range:	500 – 10000 mg/l COD or O_2 Expression of results also possible in mmol/l.

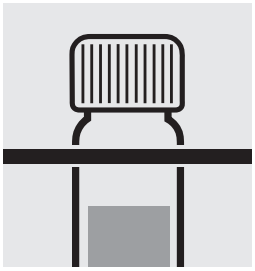


Suspend the bottom sediment in the cell by swirling.

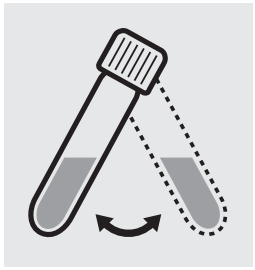
Carefully pipette 1.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



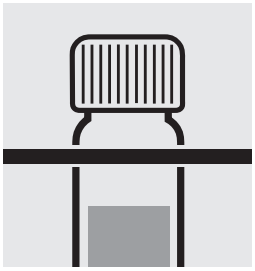
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



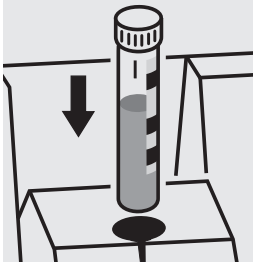
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use Spectroquant® CombiCheck 70, Cat.No. 114689, or the Standard solution for photometric applications, CRM, Cat.No. 125032, 125033, and 125034.

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

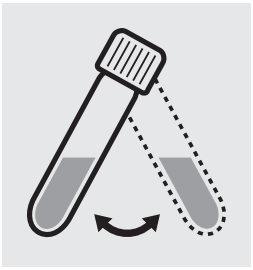
COD

Chemical Oxygen Demand

101797

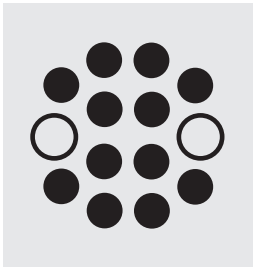
Cell Test

Measuring range:	5000–90000 mg/l COD or O_2 Expression of results also possible in mmol/l.

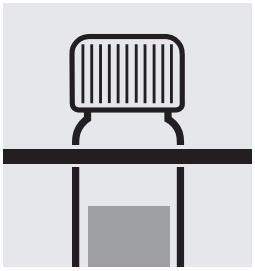


Suspend the bottom sediment in the cell by swirling.

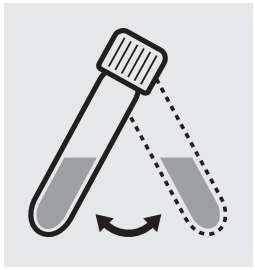
Carefully pipette 0.10 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



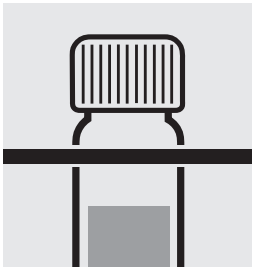
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



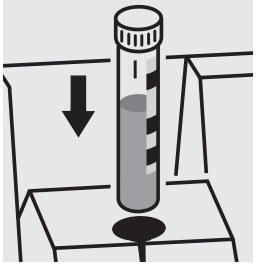
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use the Standard solution for photometric applications, CRM, Cat.No. 125034 and 125035.

COD (Hg-free)

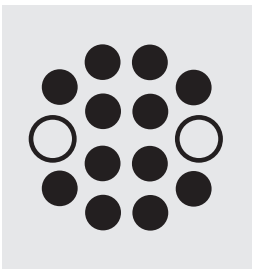
Chemical Oxygen Demand

109772

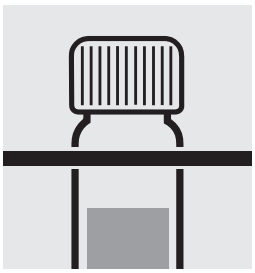
Cell Test

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

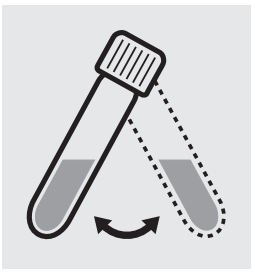
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



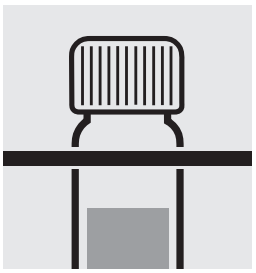
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



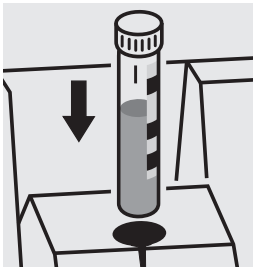
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use the Standard solution for photometric applications, CRM, Cat.No. 125028 and 125029.

COD (Hg-free)

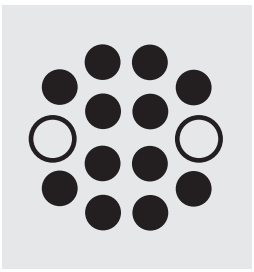
Chemical Oxygen Demand

109773

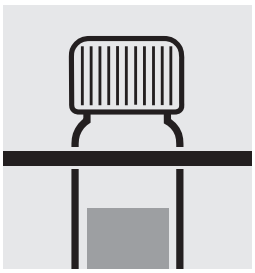
Cell Test

Measuring range:	100 – 1500 mg/l COD or O_2 Expression of results also possible in mmol/l.

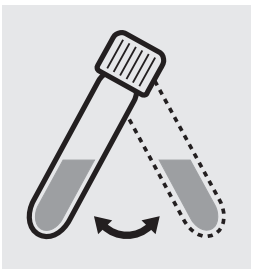
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



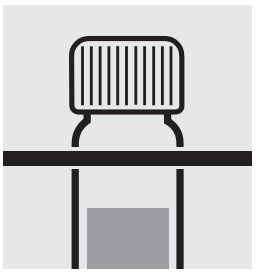
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



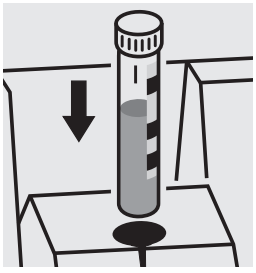
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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 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) we recommended to use the Standard solution for photometric applications, CRM, Cat.No. 125029, 125030, 125031, and 125032.

COD

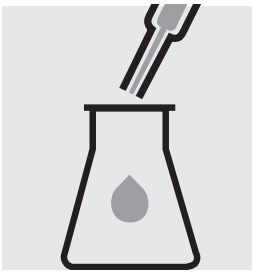
Chemical Oxygen Demand
for seawater / high chloride contents

117058

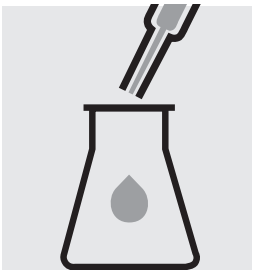
Cell Test

Measuring range: 5.0–60.0 mg/l COD or O_2 16-mm cell

Chloride depletion:

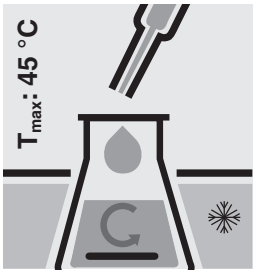


Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



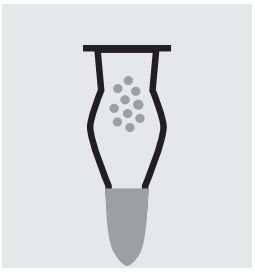
Pipette with glass pipette 20 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.

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

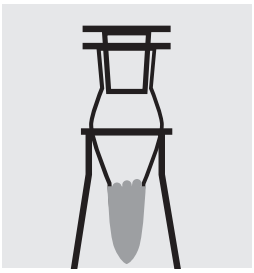


Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.

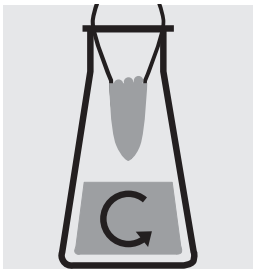
Cool both Erlenmeyer flasks to room temperature in the ice bath.



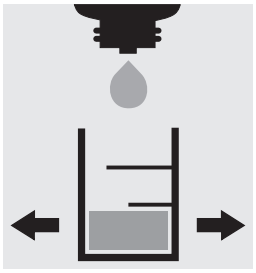
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



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



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



Check the chloride content of the depleted sample using Aquamerck® Chloride Test, Cat. No. 111132, according to the application (see the website):
Specified value
<2000 mg/l Cl^-.

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

Fill 5.0 ml of sodium hydroxide solution 2 mol/l, Cat. No. 109136, into the test vessel of the Aquamerck® Chloride Tests. Carefully allow to run from the pipette 0.5 ml of depleted sample down the inside of the tilted test vessel into the sodium hydroxide solution and mix (**Wear eye protection! The test vessel becomes hot!**).
Add 2 drops of reagent Cl-1 and swirl. The sample directly turns yellow in color. (Reagent Cl-2 is not required.)
Holding the reagent bottle vertically, slowly add reagent Cl-3 dropwise to the sample while swirling until its color changes from yellow to blue-violet. Shortly before the color changes, wait a few seconds after adding each drop.

Result in mg/l chloride = number of drops x 250

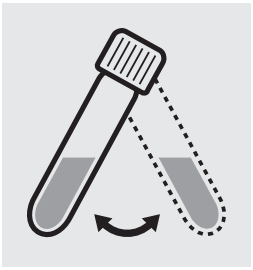
COD

Chemical Oxygen Demand
for seawater / high chloride contents

117058

Cell Test

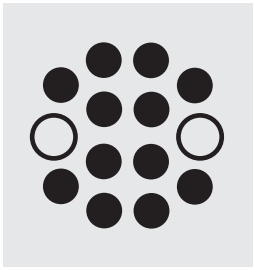
Determination:



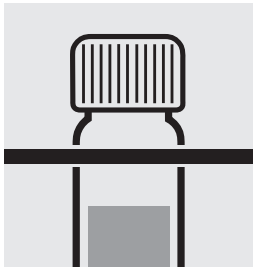
Suspend the bottom sediment in two cells by swirling.

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

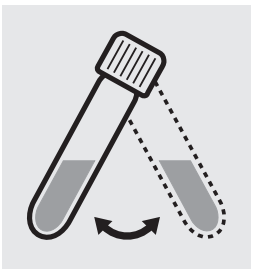
Carefully pipette 5.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!
(Blank cell)



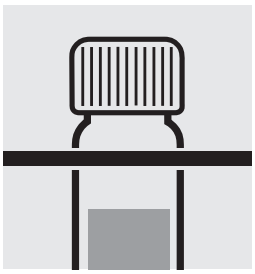
Heat both cells in the thermoreactor at 148 °C for 2 hours.



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

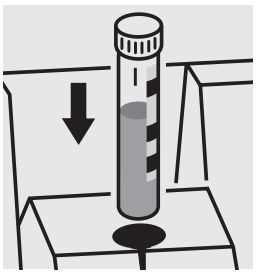


Swirl both cells after 10 minutes.

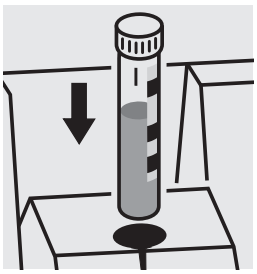


Replace both cells in the rack for complete cooling to room temperature. (**Very important!**)

Configure the photometer for blank-measurement.



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



Place the cell containing the sample 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 COD/chloride standard solution must be prepared from Potassium hydrogen phthalate, Cat.No. 102400 and Sodium chloride, Cat.No. 106404 (see section “Standard solutions”).

COD

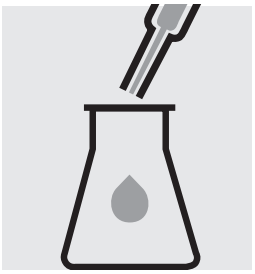
Chemical Oxygen Demand
for seawater / high chloride contents

117059

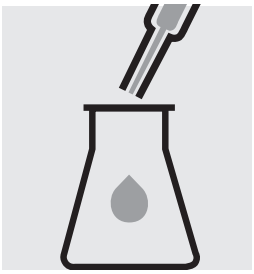
Cell Test

Measuring range: 50–3000 mg/l COD or O_2 16-mm cell

Chloride depletion:

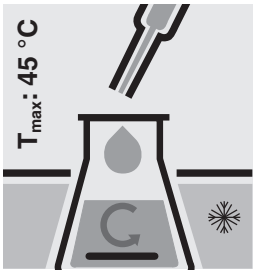


Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



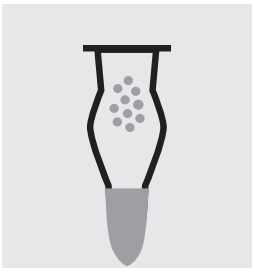
Pipette with glass pipette 20 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.

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

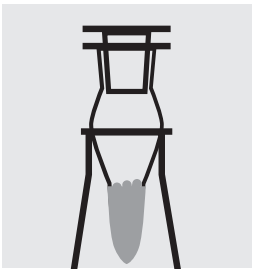


Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.

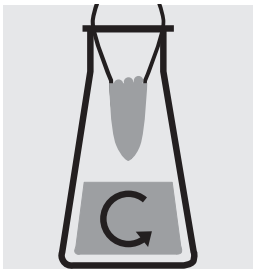
Cool both Erlenmeyer flasks to room temperature in the ice bath.



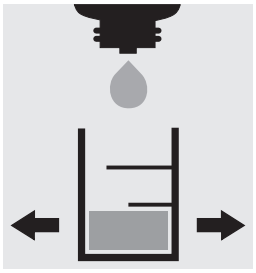
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



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



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



Check the chloride content of the depleted sample using the Aquamerck® Chloride Test, Cat. No. 111132, as per the application instructions (see the website):
specified value <250 mg/l Cl^-.

Chloride determination (acc. the application instructions - abridged version):

Fill 5.0 ml of sodium hydroxide solution 2 mol/l, Cat. No. 109136, into the test vessel of the Aquamerck® Chloride Tests. Carefully allow to run from the pipette 0.5 ml of depleted sample down the inside of the tilted test vessel onto the sodium hydroxide solution and mix (**Wear eye protection! The cell becomes hot!**).
Add 2 drops of reagent Cl-1 and swirl. The sample directly turns yellow in color. (Reagenz Cl-2 wird nicht benötigt.)
Holding the reagent bottle vertically, slowly add reagent Cl-3 dropwise to the sample while swirling until its color changes from yellow to blue-violet. Shortly before the color changes, wait a few seconds after adding each drop.

Result in mg/l chloride = number of drops x 250

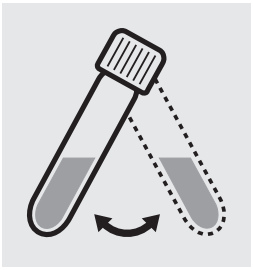
COD

Chemical Oxygen Demand
for seawater / high chloride contents

117059

Cell Test

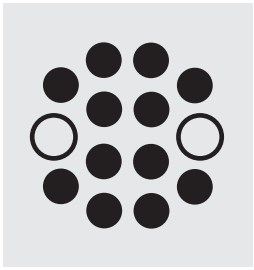
Determination:



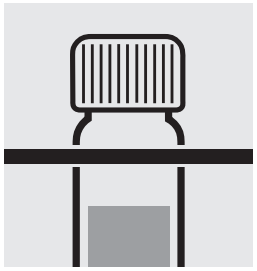
Suspend the bottom sediment in two cells by swirling.

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

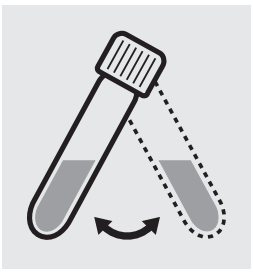
Carefully pipette 3.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!
(Blank cell)



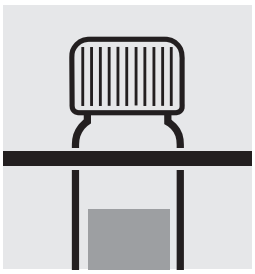
Heat both cells in the thermoreactor at 148 °C for 2 hours.



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

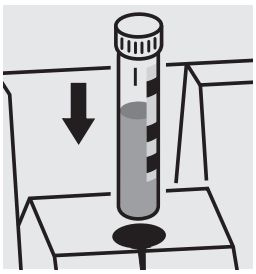


Swirl both cells after 10 minutes.

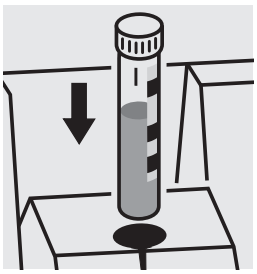


Replace both cells in the rack for complete cooling to room temperature. (**Very important!**)

Configure the photometer for blank-measurement.



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



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

Quality assurance:

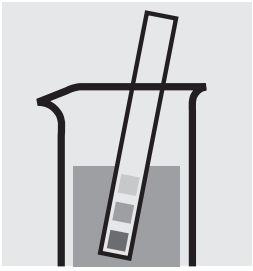
To check the measurement system (test reagents, measurement device, and handling) a COD/chloride standard solution must be prepared from Potassium hydrogen phthalate, Cat.No. 102400 and Sodium chloride, Cat.No. 106404 (see section “Standard solutions”).

Copper

114553

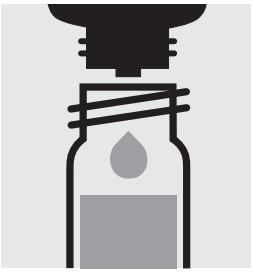
Cell Test

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



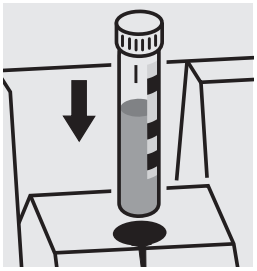
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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 cell compartment. Align the mark on the cell with that on the photometer.

Important:

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

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

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 30, Cat.No. 114677.

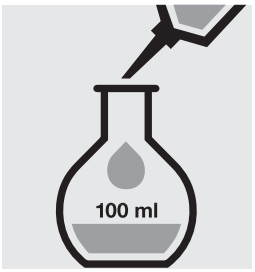
Ready-for-use copper standard solution CertiPUR®, Cat.No. 119786, concentration 1000 mg/l Cu, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

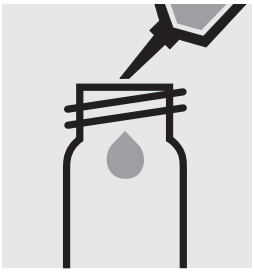
Copper in electroplating baths

Inherent color

Measuring range: 10.0 – 50.0 g/l Cu

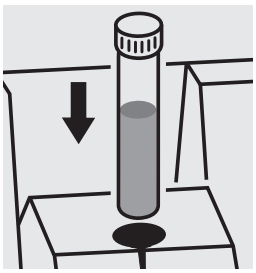


Pipette 25 ml of the sample into a 100-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.



Pipette 5.0 ml of the 1:4 dilute sample into an empty round cell (Empty cells, Cat.No. 114724).

Add 5.0 ml of **sulfuric acid 40%**, close the cell with the screw cap, and mix.



Place the cell into the cell compartment. Select method no. **83**.

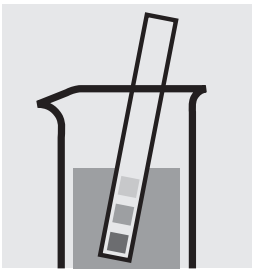
Cyanide

Determination of free cyanide

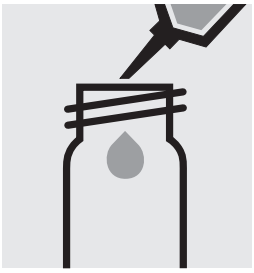
114561

Cell Test

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

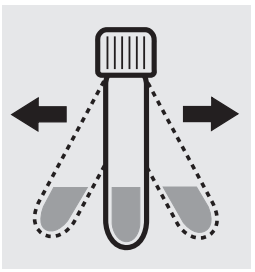


Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



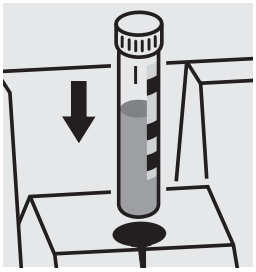
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and dissolve the solid substance.

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 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) ready-for-use cyanide standard solution CertiPUR®, Cat.No. 119533, concentration 1000 mg/l CN^-, can be used after diluting accordingly.

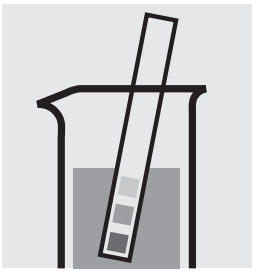
Cyanide

Determination of readily liberated cyanide

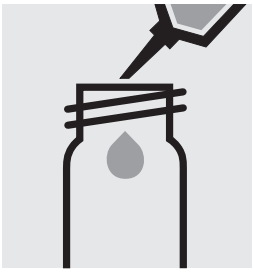
114561

Cell Test

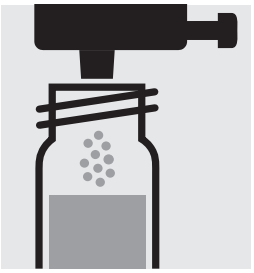
Measuring range:	0.010 – 0.500 mg/l CN Expression of results also possible in mmol/l and cyanide readily liberated [CN(v)].



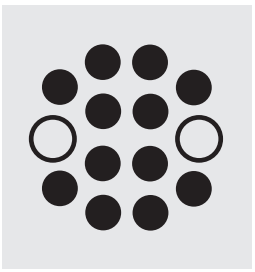
Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



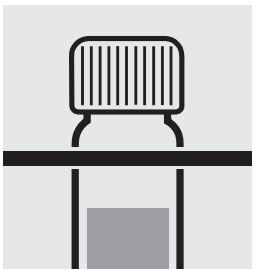
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



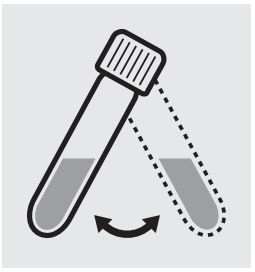
Add 1 dose of **CN-1K** using the green dose-metering cap, close the cell with the screw cap.



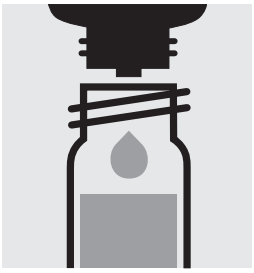
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



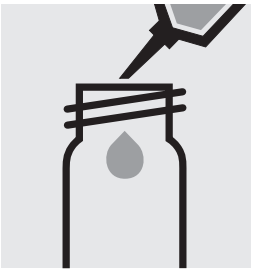
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



Swirl the cell before opening.

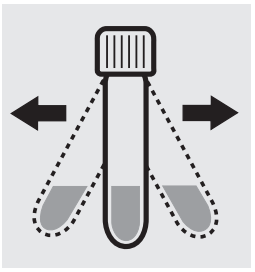


Add 3 drops of **CN-2K**, close with the screw cap, and mix: **pretreated sample**.



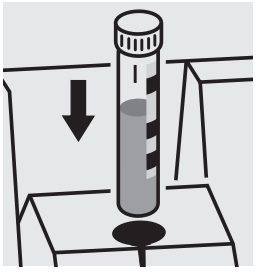
Pipette 5.0 ml of the **pretreated sample** into a reaction cell, close with the screw cap, and dissolve the solid substance.

Add 1 level blue microspoon 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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

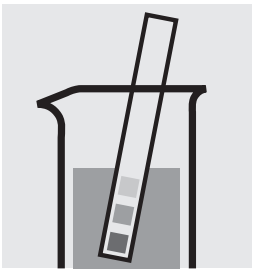
To check the measurement system (test reagents, measurement device, and handling) ready-for-use cyanide standard solution CertiPUR®, Cat.No. 119533, concentration 1000 mg/l CN^-, can be used after diluting accordingly.

Formaldehyde

114500

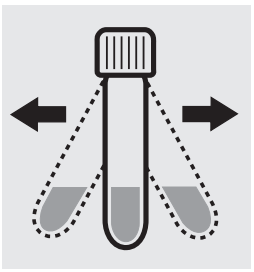
Cell Test

Measuring range:	0.10 – 8.00 mg/l HCHO Expression of results also possible in mmol/l.

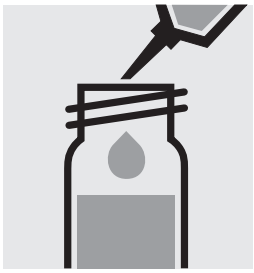


Check the pH of the sample, specified range: pH 0 – 13.

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

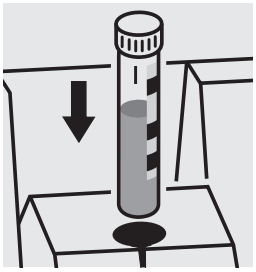


Shake the cell vigorously to dissolve the solid substance.



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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

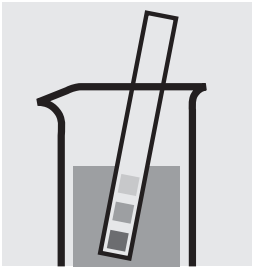
To check the measurement system (test reagents, measurement device, and handling) a formaldehyde standard solution must be prepared from Formaldehyde solution 37%, Cat.No. 104003 (see section “Standard solutions”).

Iron

114549

Cell Test

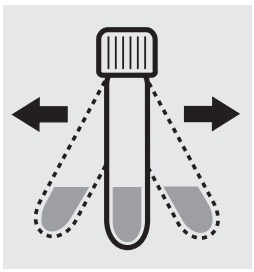
Measuring range:	0.05 – 4.00 mg/l Fe Expression of results also possible in mmol/l.



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.

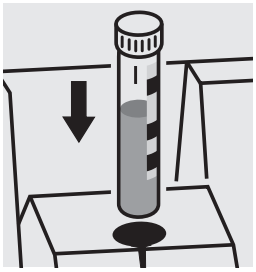
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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 cell compartment. Align the mark on the cell with that on the photometer.

Important:

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

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 30, Cat.No. 114677.

Ready-for-use iron standard solution CertiPUR®, Cat.No. 119781, concentration 1000 mg/l Fe, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

Iron

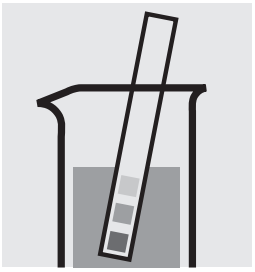
Determination of iron(II) and iron(III)

114896

Cell Test

Measuring range:	1.0 – 50.0 mg/l Fe Expression of results also possible in mmol/l and also in Fe(II), Fe(III).

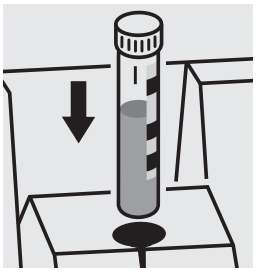
Determination of iron (II)



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.

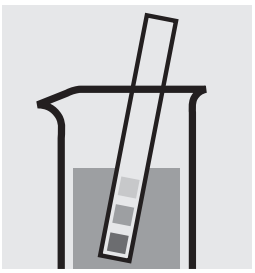
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Reaction time: 5 minutes



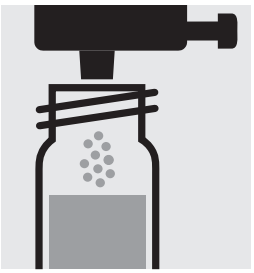
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Determination of iron (II + III)

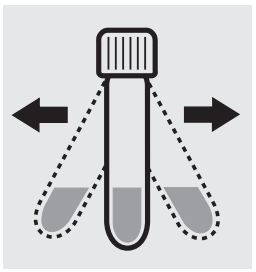


Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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

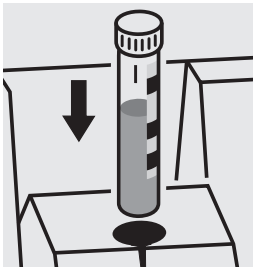


Add 1 dose of **Fe-1K** using the blue dose-metering cap, close the reaction cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 5 minutes



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

A differentiation between iron(II) and iron(III) can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form.
Then measure the iron(II + III), press enter and measure the iron(II). After pressing enter, the individual measuring values for Fe II and Fe III are shown on the display.

Important:

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

Result can be expressed as sum of iron (Σ Fe).

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use iron standard solution CertiPUR®, Cat.No. 119687, concentration 1000 mg/l Fe(III), can be used after diluting accordingly.

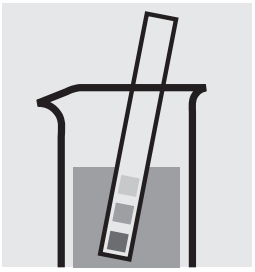
Lead

114833

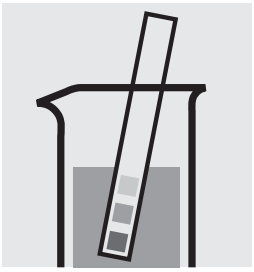
Cell Test

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

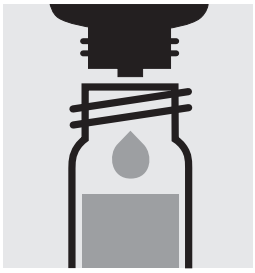
Samples of total hardness 0 – 10 °d



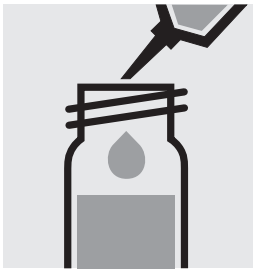
Check the total hardness of the sample.



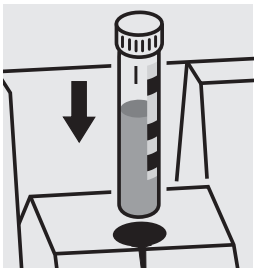
Check the pH of the sample, specified range: pH 3 – 6.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



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



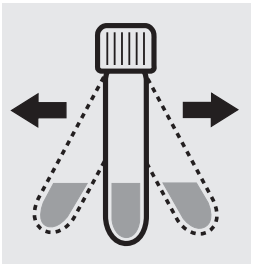
Add 5.0 ml of the sample with pipette, close the cell with the screw cap, and mix.



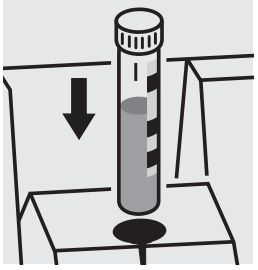
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer
= Result A

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 cell 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, Cat.No. 114688, or Crack Set 10, Cat.No. 114687, 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 40, Cat.No. 114692.

Ready-for-use lead standard solution CertiPUR®, Cat.No. 119776, concentration 1000 mg/l Pb, can also be used after diluting accordingly.

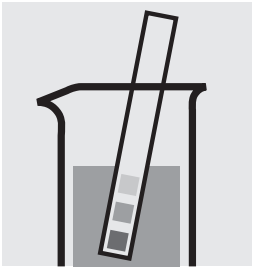
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Magnesium

100815

Cell Test

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

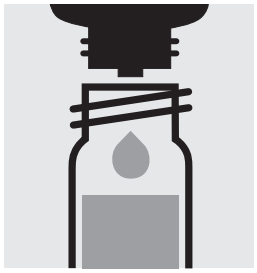


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

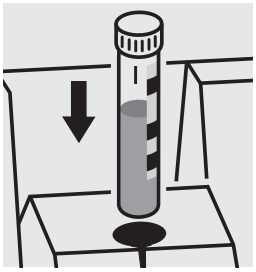
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

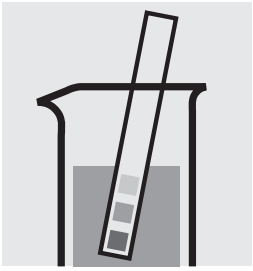
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

Manganese

100816

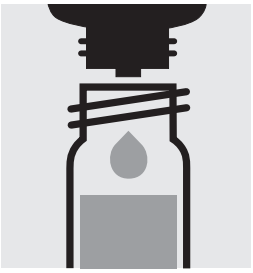
Cell Test

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



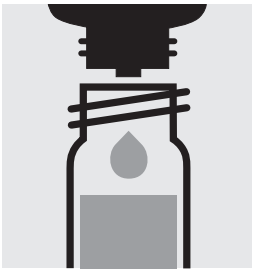
Check the pH of the sample, specified range: pH 2 – 7.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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



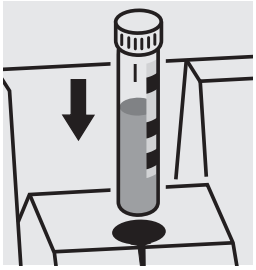
Add 2 drops of **Mn-1K**, close the cell with the screw cap, and mix.

Reaction time:
2 minutes



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

Reaction time:
5 minutes



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) we recommended to use Spectroquant® CombiCheck 30, Cat.No. 114677.

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

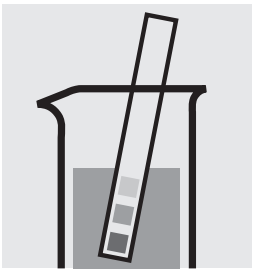
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

Nickel

114554

Cell Test

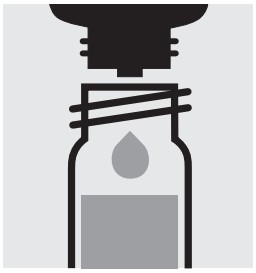
Measuring range:	0.10 – 6.00 mg/l Ni Expression of results also possible in mmol/l.



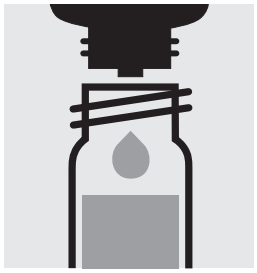
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

Reaction time:
1 minute

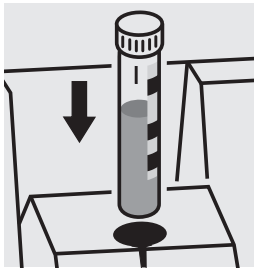


Add 2 drops of **Ni-1K**, close with the screw cap, and mix.



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

Reaction time:
2 minutes



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

Important:

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

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 40, Cat.No. 114692.

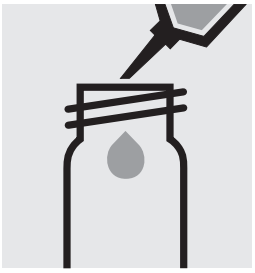
A nickel standard solution Titrisol®, Cat.No. 109989, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Nickel in electroplating baths

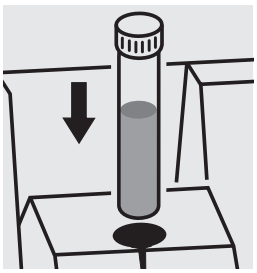
Inherent color

Measuring range: 10 – 120 g/l Ni



Pipette 5.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

Add 5.0 ml of **sulfuric acid 40 %**, close the cell with the screw cap, and mix.



Place the cell into the cell compartment. Select method no. **57**.

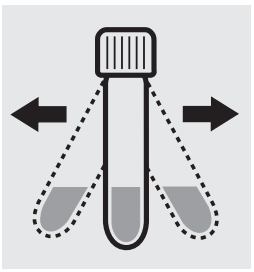
Nitrate

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.

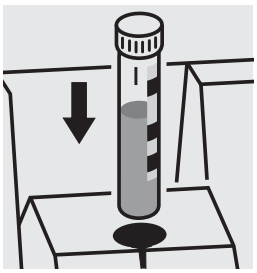
Add 1 level yellow microspoon of **NO_3-1K** into a reaction cell and close with the screw cap.



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

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

Reaction time:
10 minutes



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) we recommended to use Spectroquant® CombiCheck 20, Cat.No. 114675, or the Standard solution for photometric applications, CRM, Cat. No. 125037 and 125038.

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

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

Nitrate

114563

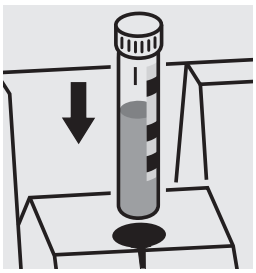
Cell Test

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 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) we recommended to use Spectroquant® CombiCheck 20, Cat.No. 114675, or the Standard solution for photometric applications, CRM, Cat. No. 125037 and 125038.

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

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

Nitrate

114764

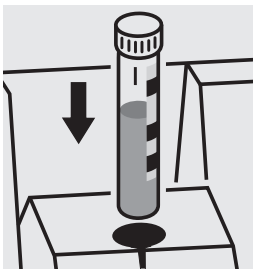
Cell Test

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 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) we recommended to use Spectroquant® CombiCheck 80, Cat.No. 114738, or the Standard solution for photometric applications, CRM, Cat. No. 125037, 125038, and 125039.

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

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

Nitrate

100614

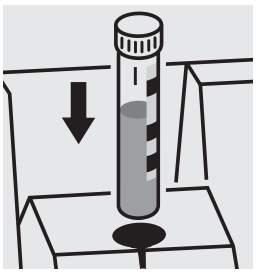
Cell Test

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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

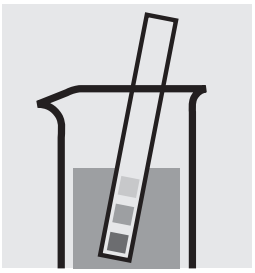
To check the measurement system (test reagents, measurement device, and handling) ready-for-use nitrate standard solution CertiPUR®, Cat.No. 119811, concentration 1000 mg/l NO_3^-, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125039 and 125040.

Nitrite

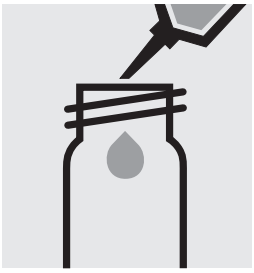
114547

Cell Test

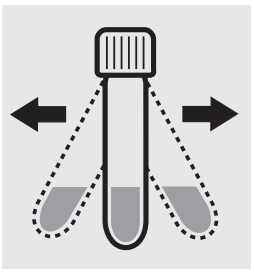
Measuring range:	0.010 – 0.700 mg/l NO_2-N
	0.03 – 2.30 mg/l NO_2
	Expression of results also possible in mmol/l.



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

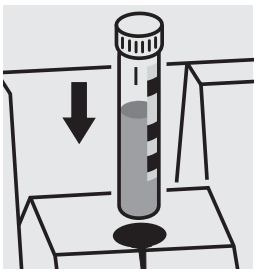


Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 10 minutes



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

Quality assurance:

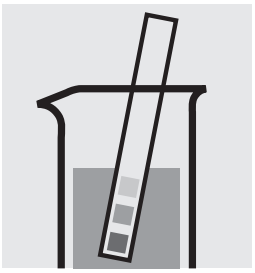
To check the measurement system (test reagents, measurement device, and handling) ready-for-use nitrite standard solution CertiPUR®, Cat.No. 119899, concentration 1000 mg/l NO_2^-, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125041.

Nitrite

100609

Cell Test

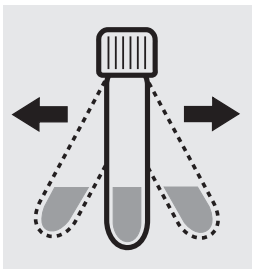
Measuring range:	1.0 – 90.0 mg/l NO_2-N
	3 – 296 mg/l NO_2
	Expression of results also possible in mmol/l.



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

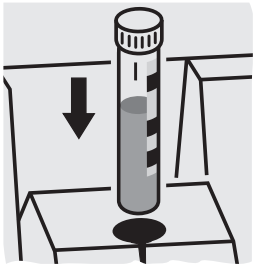
Add 2 level blue micro-spoons of **NO_2-1K** into a reaction cell.

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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

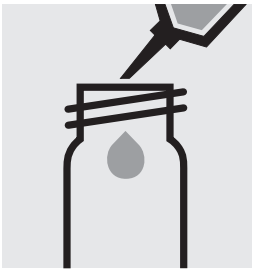
To check the measurement system (test reagents, measurement device, and handling) ready-for-use nitrite standard solution CertiPUR®, Cat.No. 119899, concentration 1000 mg/l NO_2^-, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125042.

Nitrogen (total)

114537

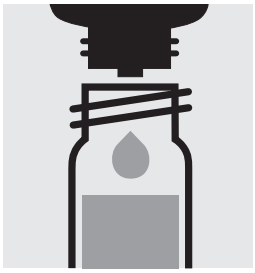
Cell Test

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

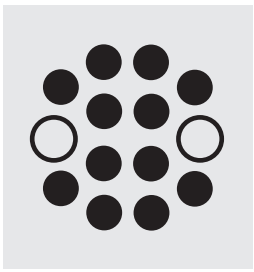


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

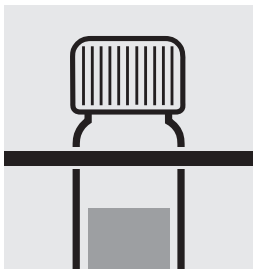
Add 1 level blue microspoon of **N-1K.**



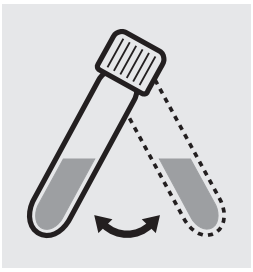
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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

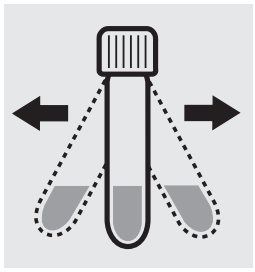


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.

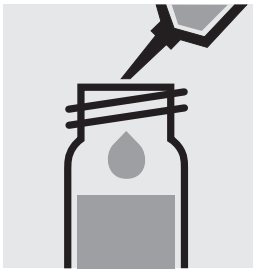


Swirl the cell after 10 minutes.

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

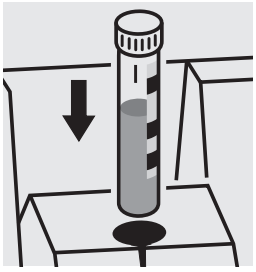


Shake the cell **vigorously for 1 minute** to dissolve the solid substance.



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 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) we recommended to use Spectroquant® CombiCheck 50, Cat.No. 114695, or the Standard solution for photometric applications, CRM, Cat.No. 125043 and 125044.

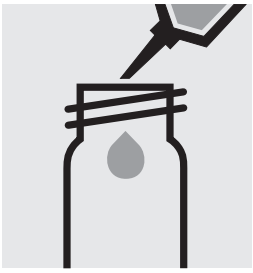
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Nitrogen (total)

100613

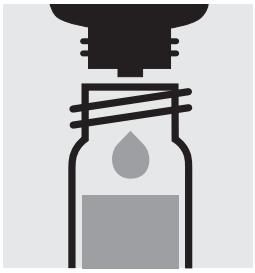
Cell Test

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

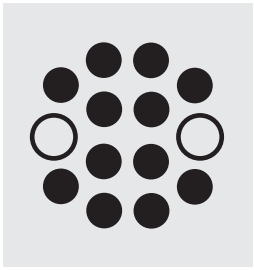


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

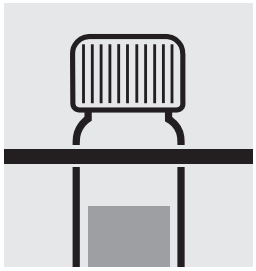
Add 1 level blue micro-spoon of **N-1K.**



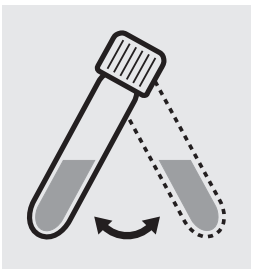
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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



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

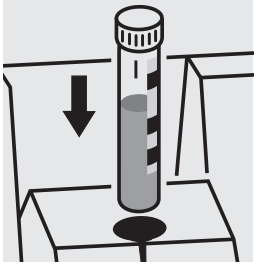


Swirl the cell after 10 minutes.

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 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) we recommended to use Spectroquant® CombiCheck 50, Cat.No. 114695, or the Standard solution for photometric applications, CRM, Cat.No. 125043 and 125044.

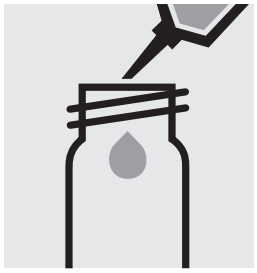
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Nitrogen (total)

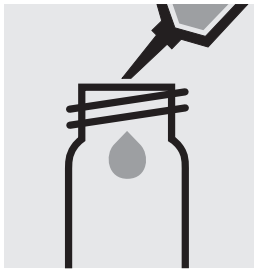
114763

Cell Test

Measuring range:	10 – 150 mg/l N Expression of results also possible in mmol/l.

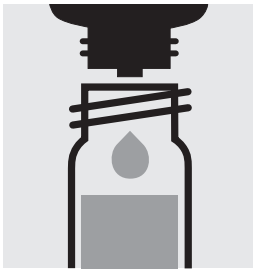


Pipette 1.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

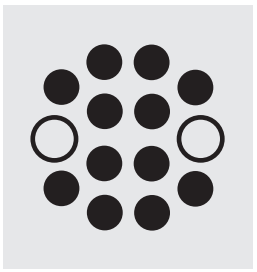


Add 9.0 ml of distilled water (Water for process analysis, Cat.No. 101051, is recommended) with pipette.

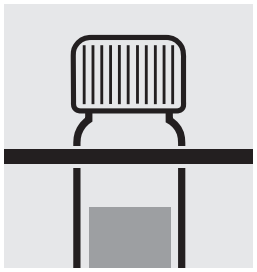
Add 1 level blue microspoon of **N-1K.**



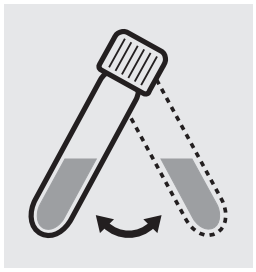
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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



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

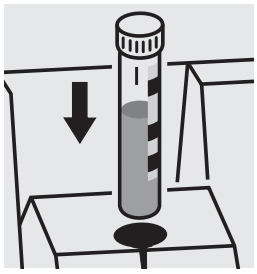


Swirl the cell after 10 minutes.

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 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) we recommended to use Spectroquant® CombiCheck 70, Cat.No. 114689, or the Standard solution for photometric applications, CRM, Cat.No. 125044 and 125045.

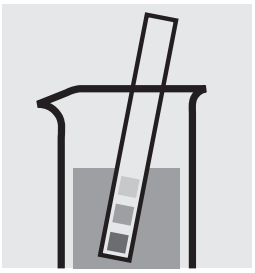
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

Oxygen

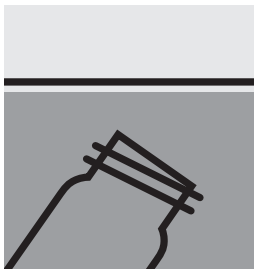
114694

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 over-flowing and make sure, that no air bubbles are present.

Place the filled cell in a test-tube rack.

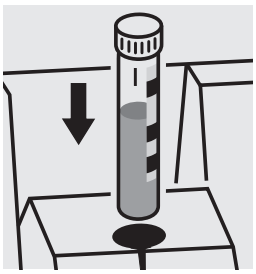
Add with microspoon 1 glass bead.

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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

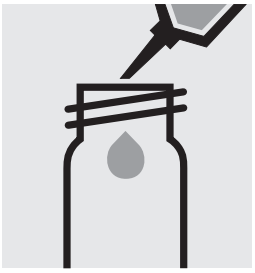
To check the measurement system (test reagents, measurement device, and handling) a oxygen standard solution must be prepared (application see the website).

pH

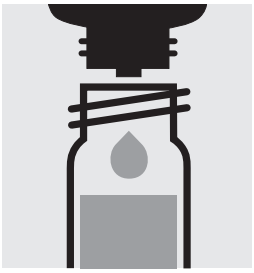
101744

Cell Test

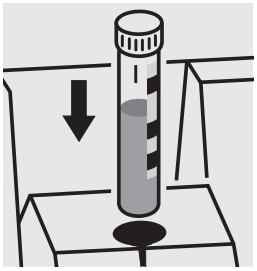
Measuring range: pH 6.4 – 8.8



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 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) buffer solution pH 7.00 CertiPUR®, Cat.No. 109407, can be used.

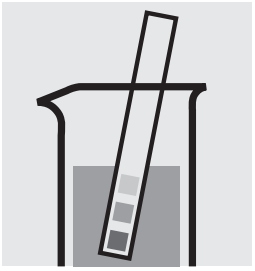
Phosphate

Determination of orthophosphate

100474

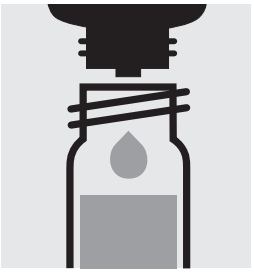
Cell Test

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.

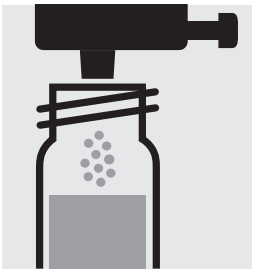


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

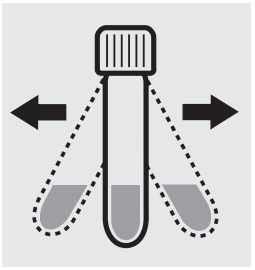
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

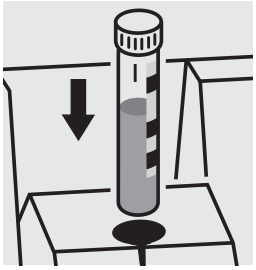


Add 1 dose of **P-2K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676.

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

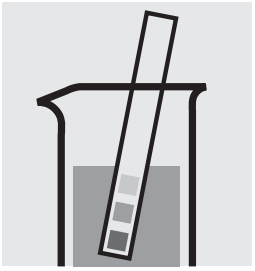
Phosphate

114543

Determination of orthophosphate

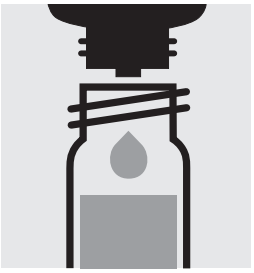
Cell Test

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.

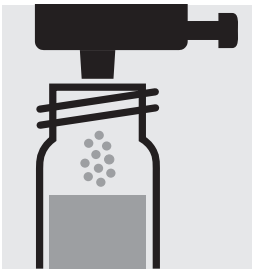


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

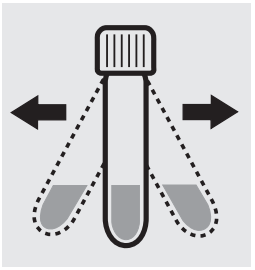
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

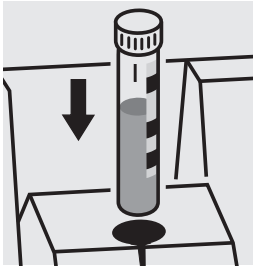


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the 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) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676.

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

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

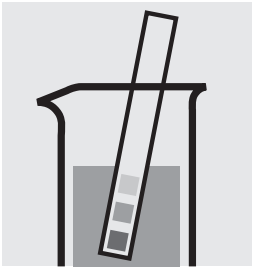
Phosphate

Determination of total phosphorus
= sum of orthophosphate, polyphosphate, and organophosphate

114543

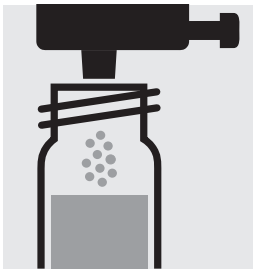
Cell Test

Measuring range:	0.05 – 5.00 mg/l 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 and also in P total (Σ P), and P org* [P(o)].

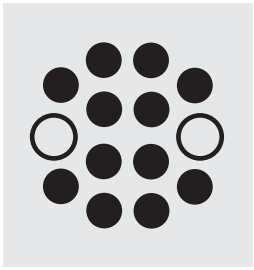


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

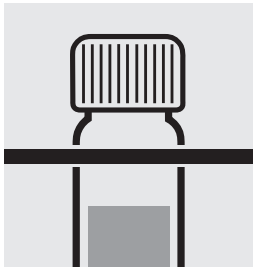
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



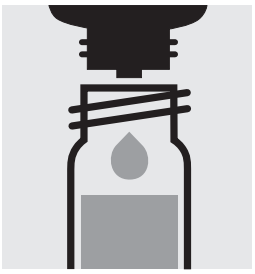
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



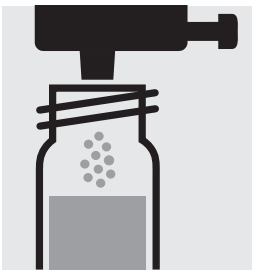
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



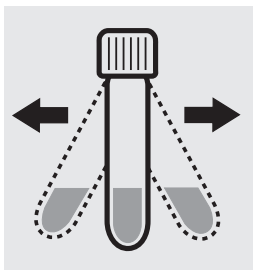
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

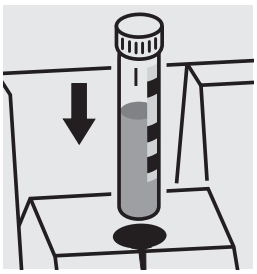


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

A differentiation between orthophosphate (PO_4-P) and P org* (P(o)) can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the P total, press enter and measure the ortho-phosphate (see analytical procedure for ortho-phosphate). After pressing enter, the individual measuring values for PO_4-P and P(o) are shown on the display.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solution for photometric applications, CRM, Cat. No. 125046 and 125047.

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

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

*P org is the sum of polyphosphate and organophosphate.

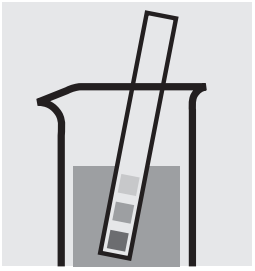
Phosphate

Determination of orthophosphate

100475

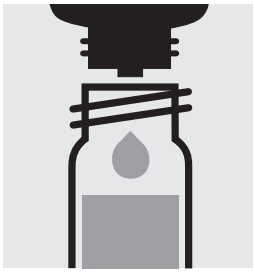
Cell Test

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.

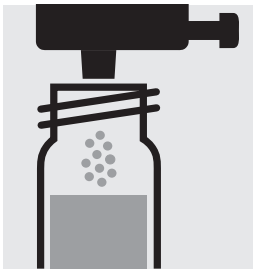


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

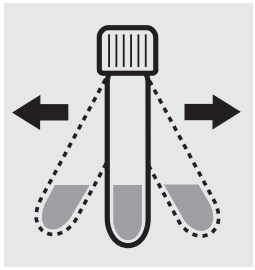
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

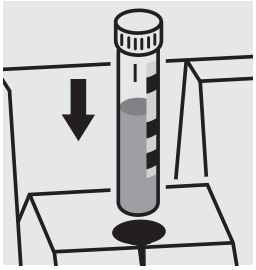


Add 1 dose of **P-2K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 and 80, Cat.Nos. 114675 and 114738.

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

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

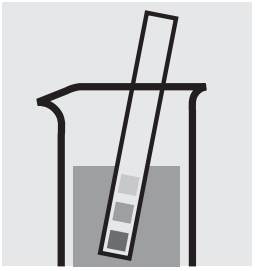
Phosphate

114729

Determination of orthophosphate

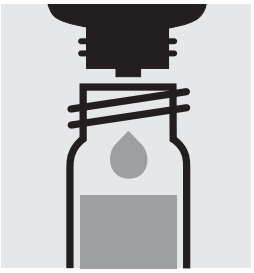
Cell Test

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.

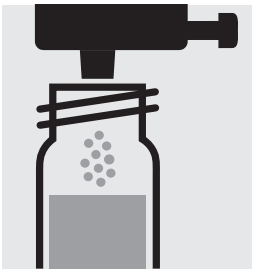


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

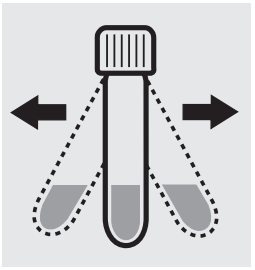
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

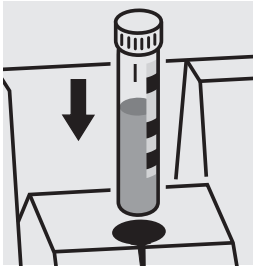


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the 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) we recommended to use Spectroquant® CombiCheck 20 and 80, Cat.Nos. 114675 and 114738.

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

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

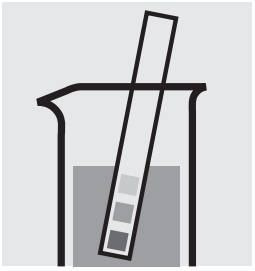
Phosphate

Determination of total phosphorus
= sum of orthophosphate, polyphosphate, and organophosphate

114729

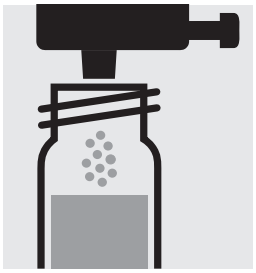
Cell Test

Measuring range:	0.5 – 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 and also in P total (Σ P), and P org* [P(o)].

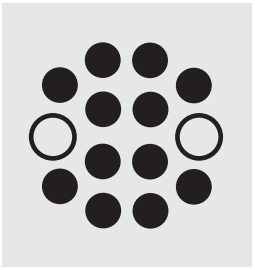


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

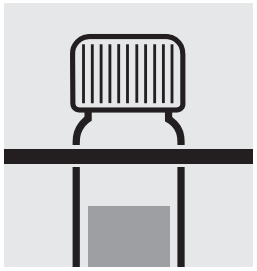
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



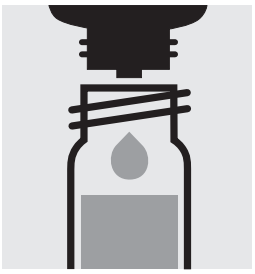
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



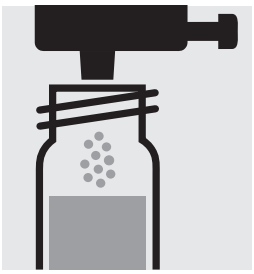
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



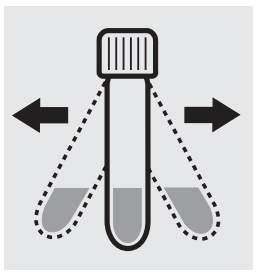
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

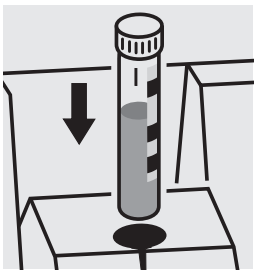


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

A differentiation between orthophosphate (PO_4-P) and P org* (P(o)) can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the P total, press enter and measure the orthophosphate (see analytical procedure for orthophosphate). After pressing enter, the individual measuring values for PO_4-P and P(o) are shown on the display.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20 and 80, Cat.No. 114675 and 114738, or as well as the Standard solution for photometric applications, CRM, Cat.No. 125047 and 125048.

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

* P org is the sum of polyphosphate and organophosphate.

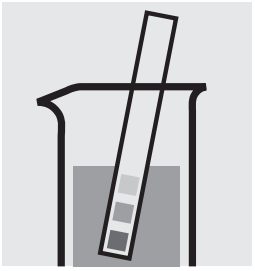
Phosphate

Determination of orthophosphate

100616

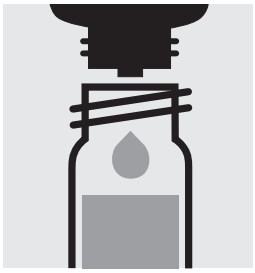
Cell Test

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.

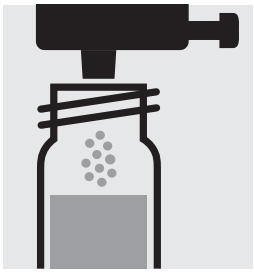


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

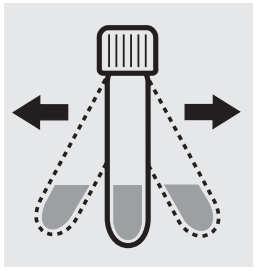
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



Add 5 drops of **PO_4-1K**, close the cell with the screw cap, and mix.

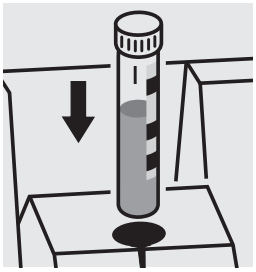


Add 1 dose of **PO_4-2K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO_4^{3-}, can be used after diluting accordingly.

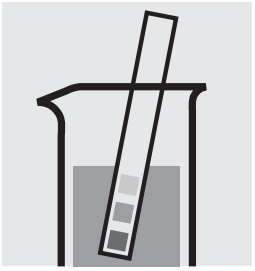
Phosphate

Determination of orthophosphate

100673

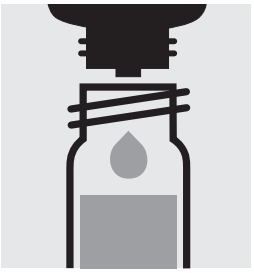
Cell Test

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.

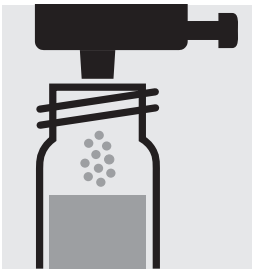


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

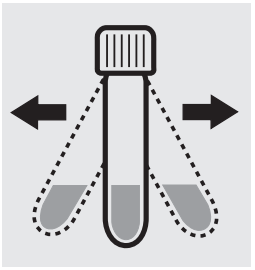
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

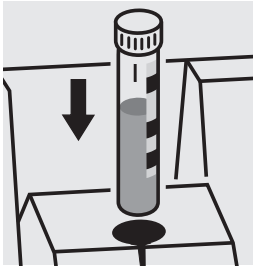


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

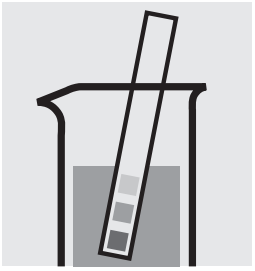
Phosphate

Determination of total phosphorus
= sum of orthophosphate, polyphosphate, and organophosphate

100673

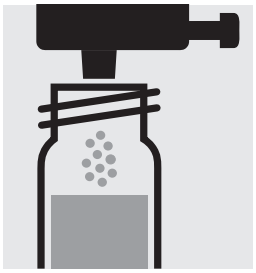
Cell Test

Measuring	3.0 – 100.0 mg/l PO_4 -P
range:	9 – 307 mg/l PO_4
	7 – 229 mg/l P_2O_5
	Expression of results also possible in mmol/l and also in P total (Σ P), and P org* [P(o)].

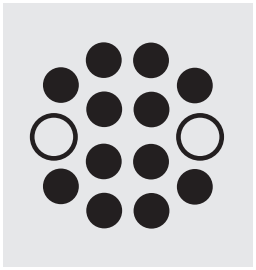


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

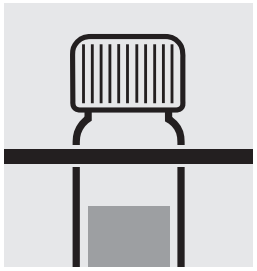
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



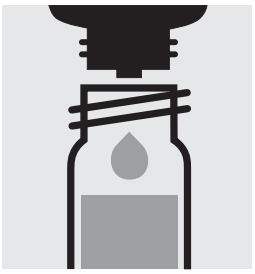
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



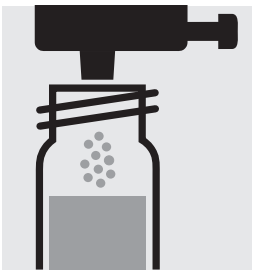
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



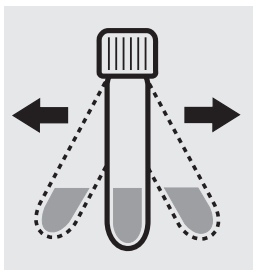
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

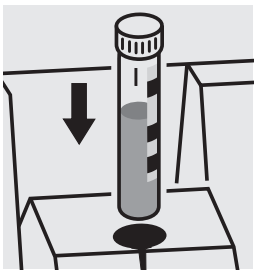


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

A differentiation between orthophosphate (PO_4-P) and P org* (P(o)) can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the P total, press enter and measure the orthophosphate (see analytical procedure for orthophosphate). After pressing enter, the individual measuring values for PO_4-P and P(o) are shown on the display.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO_4^{3-}, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125047, 125048, and 125049.

* P org is the sum of polyphosphate and organophosphate.

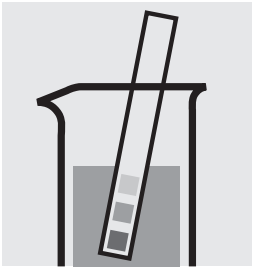
Phosphate

Determination of orthophosphate

114546

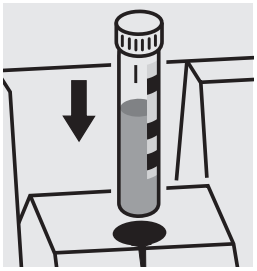
Cell Test

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 cell compartment. Align the mark on the cell with that on the photometer.

Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate and organophosphate** either Phosphate Cell Test, Cat. No. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. No. 114687 resp. 114688 can be used.

Quality assurance:

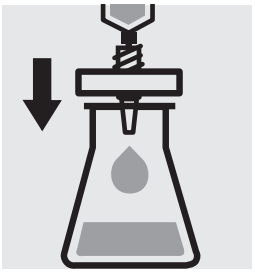
To check the measurement system (test reagents, measurement device, and handling) ready-for-use phosphate standard solution CertiPUR®, Cat.No. 119898, concentration 1000 mg/l PO_4^{3-}, can be used after diluting accordingly.

Potassium

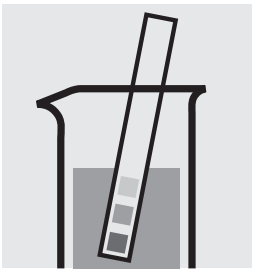
114562

Cell Test

Measuring range:	5.0 – 50.0 mg/l K Expression of results also possible in mmol/l.



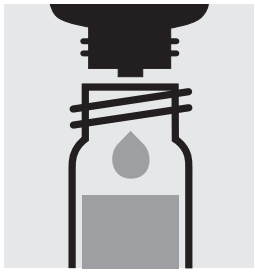
Filter turbid samples.



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.

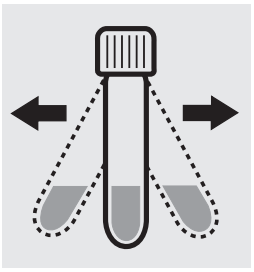
Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



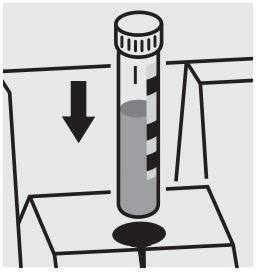
Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.

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 into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

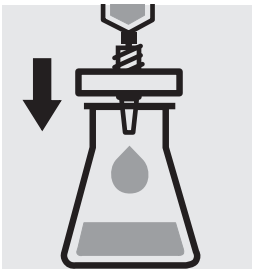
To check the measurement system (test reagents, measurement device, and handling) ready-for-use potassium standard solution CertiPUR®, Cat.No. 170230, concentration 1000 mg/l K, can be used after diluting accordingly.

Potassium

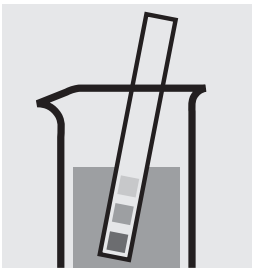
100615

Cell Test

Measuring range:	30 – 300 mg/l K Expression of results also possible in mmol/l.



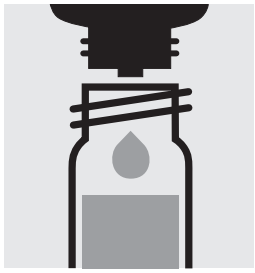
Filter turbid samples.



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.

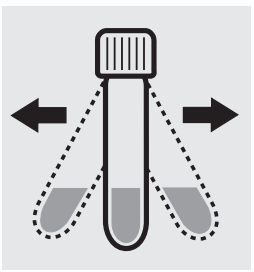
Pipette 0.50 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



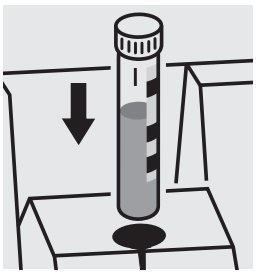
Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.

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

Residual Hardness

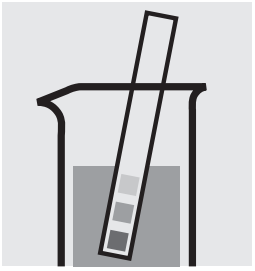
114683

Cell Test

Measuring range:	0.50 – 5.00 mg/l Ca 0.070 – 0.700 °d 0.087 – 0.874 °e 0.12 – 1.25 °f

Measuring range:	0.70 – 7.00 mg/l CaO 1.2 – 12.5 mg/l $CaCO_3$

Expression of results also possible in mmol/l.

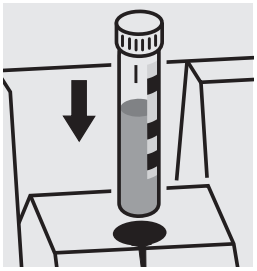


Check the pH of the sample, specified range: pH 5– 8.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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 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) ready-for-use calcium standard solution CertiPUR®, Cat.No. 119778, concentration 1000 mg/l Ca, can be used after diluting accordingly. (Pay attention to pH value!)

Sodium

in nutrient solutions

100885

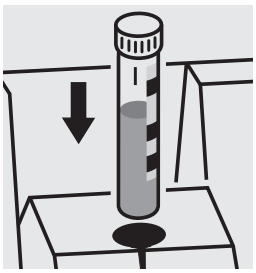
Cell Test

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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

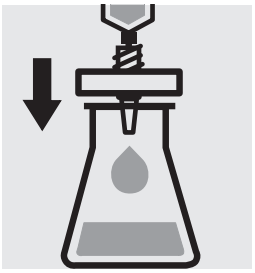
To check the measurement system (test reagents, measurement device, and handling) ready-for-use chloride standard solution CertiPUR®, Cat.No. 119897, concentration 1000 mg/l Cl^- (corresponds to 649 mg/l Na), can be used after diluting accordingly (see section “Standard solutions”).

Sulfate

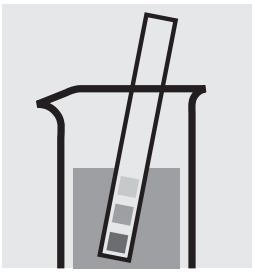
114548

Cell Test

Measuring range:	5 – 250 mg/l SO_4 Expression of results also possible in mmol/l.



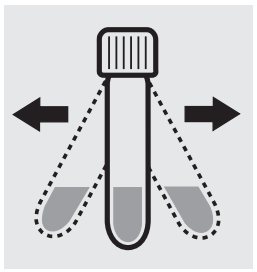
Filter turbid samples.



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.

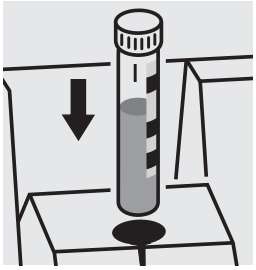
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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 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) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solution for photometric applications, CRM, Cat. No. 125050 and 125051.

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

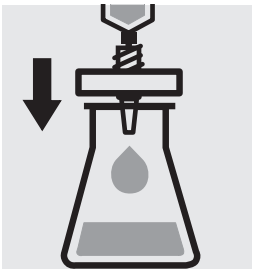
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Sulfate

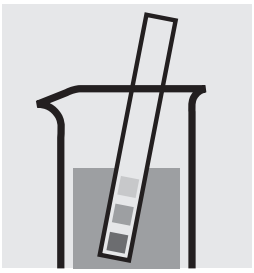
100617

Cell Test

Measuring range:	50 – 500 mg/l SO_4 Expression of results also possible in mmol/l.



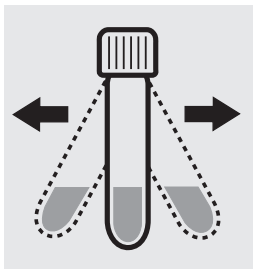
Filter turbid samples.



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.

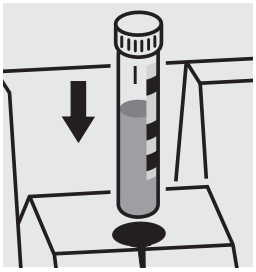
Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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 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) we recommended to use Spectroquant® CombiCheck 10, Cat.No. 114676, or the Standard solution for photometric applications, CRM, Cat. No. 125051 and 125052.

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

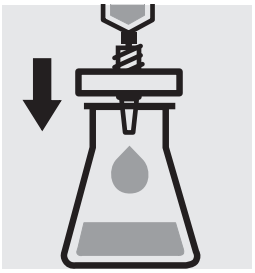
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Sulfate

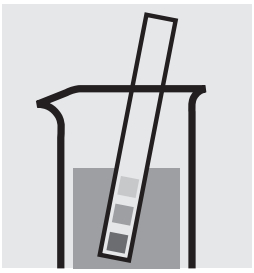
114564

Cell Test

Measuring range:	100 – 1000 mg/l SO_4 Expression of results also possible in mmol/l.



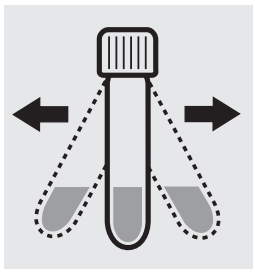
Filter turbid samples.



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.

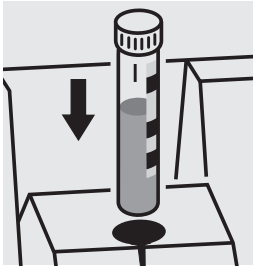
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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 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) we recommended to use Spectroquant® CombiCheck 20, Cat.No. 114675, or the Standard solution for photometric applications, CRM, Cat. No. 125051, 125052 and 125053.

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

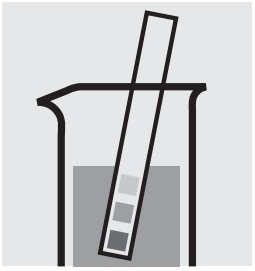
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Surfactants (nonionic)

101787

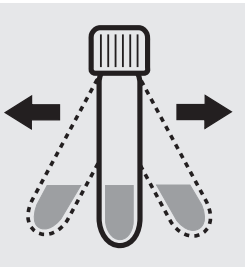
Cell Test

Measuring range:	0.010 – 7.50 mg/l surfactants (nonionic) (calculated as Triton® X-100)



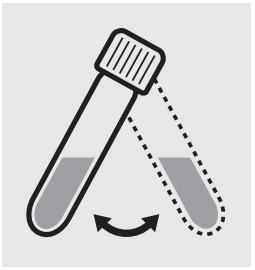
Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

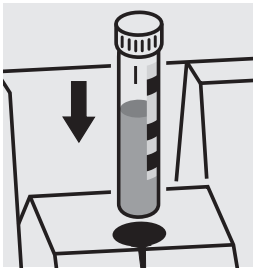


Shake the cell **for 1 minute vigorously**.

Reaction time: 2 minutes



Swirl the cell before measurement.



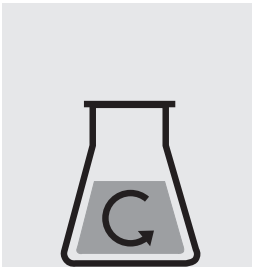
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

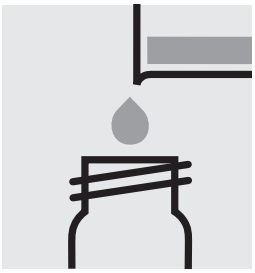
To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from Triton® X-100, Cat.No. 112298 (see section “Standard solutions”).

Suspended Solids

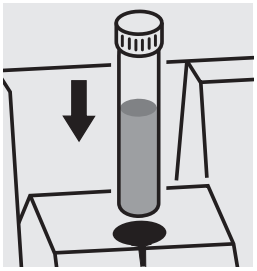
Measuring range: 50 – 750 mg/l of suspended solid



Homogenize 500 ml of sample for 2 minutes in a mixer running at high speed.



Transfer the solution into a cell.



Place the cell into the cell compartment, select method no. **182**.

TOC

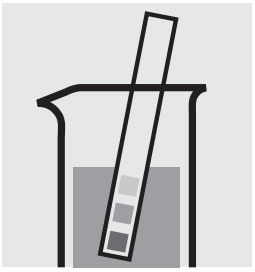
Total Organic Carbon

114878

Cell Test

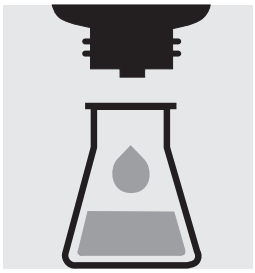
Measuring range: 5.0 – 80.0 mg/l TOC

Removal of inorganic bound carbon (TIC):

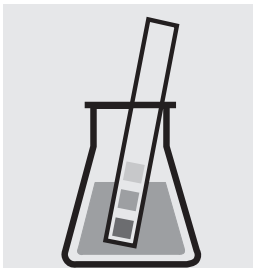


Check the pH of the sample, specified range: pH 2– 12.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

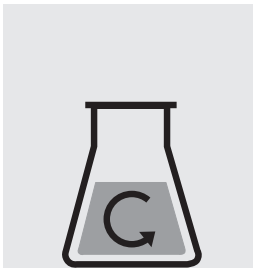
Place 25 ml of the sample into a suitable glass vessel.



Add 3 drops of **TOC-1K** and mix.



Check the pH, specified range pH < 2.5.

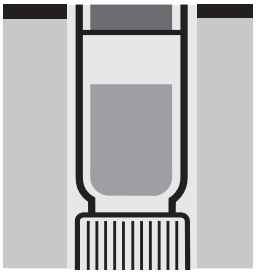


Stir for 10 minutes.

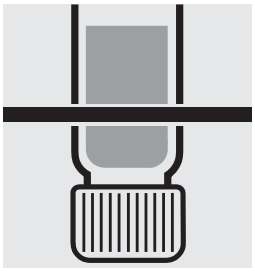
Preparation of measurement sample:

Pipette 3.0 ml of stirred sample into a reaction cell.

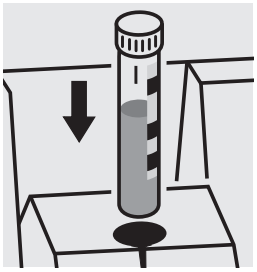
Add 1 level grey micro-spoon of **TOC-2K**. **Immediately** close the cell tightly with an **aluminium cap** (Cat.No. 173500).



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 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 TOC standard solution CertiPUR®, Cat.No. 109017, concentration 1000 mg/l TOC, can be used after diluting accordingly.

TOC

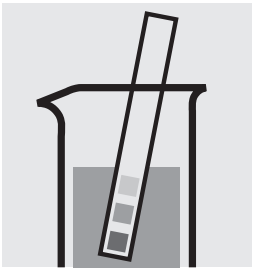
Total Organic Carbon

114879

Cell Test

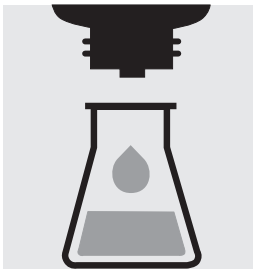
Measuring range: 50 – 800 mg/l TOC

Removal of inorganic bound carbon (TIC):

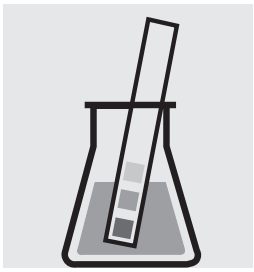


Check the pH of the sample, specified range: pH 2– 12.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

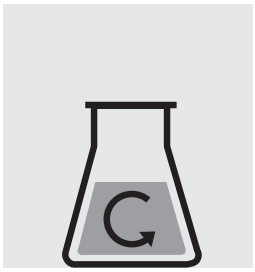
Pipette 1.0 ml of the sample and 9.0 ml of distilled water (Water for process analysis, Cat. No. 101051, is recommended) into a suitable glass vessel.



Add 2 drops of **TOC-1K** and mix.



Check the pH, specified range pH < 2.5

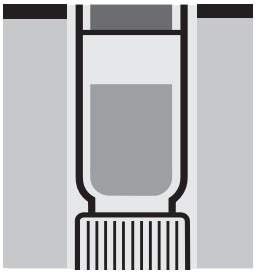


Stir for 10 minutes.

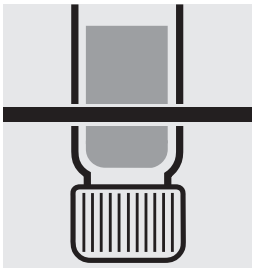
Preparation of measurement sample:

Pipette 3.0 ml of stirred sample into a reaction cell.

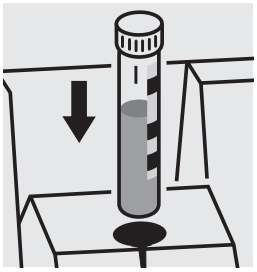
Add 1 level grey micro-spoon of **TOC-2K**. **Immediately** close the cell tightly with an **aluminium cap** (Cat.No. 173500).



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 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 TOC standard solution CertiPUR®, Cat.No. 109017, concentration 1000 mg/l TOC, can be used after diluting accordingly.

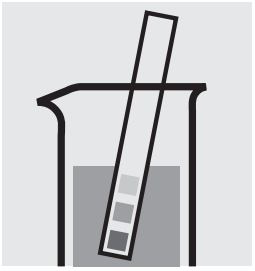
Total Hardness

100961

Determination of total hardness

Cell Test

Measuring range:	5 – 215 mg/l Ca 0.7 – 30.1 °d 0.9 – 37.6 °e 1.2 – 53.7 °f	**Measuring range:**	7 – 301 mg/l CaO 12 – 537 mg/l $CaCO_3$ Expression of results also possible in mmol/l and also in mg/l Mg .

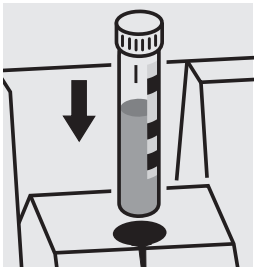


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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 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 freshly prepared standard solution can be used (see section “Standard solutions”).

Total Hardness

Differentiation between Ca- and Mg-hardness

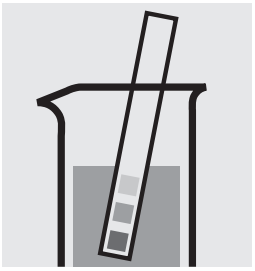
100961

Cell Test

Measuring	0.12 – 5.36	mmol/l
range:	0.7 – 30.1	°d
	0.9 – 37.6	°e
	1.2 – 53.7	°f

Differentiation possible only in mmol/l.

A differentiation between calcium- and magnesium-hardness can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form.

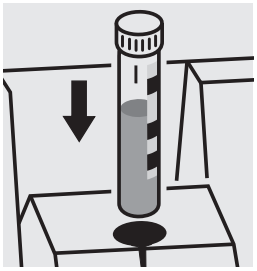


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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

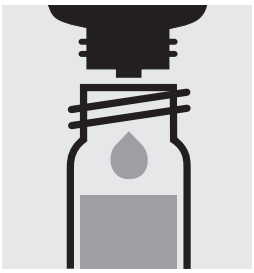
Add 1.0 ml of **H-1K** with pipette, close the cell with the screw cap, and mix.

Reaction time:
3 minutes

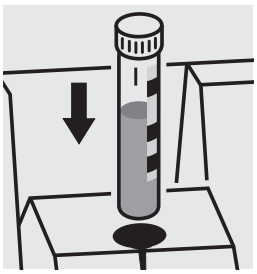


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer
= Result total hardness

Press enter, remove the cell.



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 cell compartment. Align the mark on the cell with that on the photometer
= Result magnesium

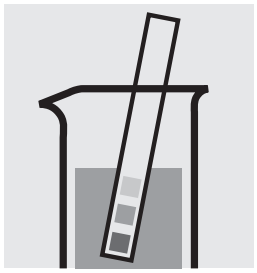
After pressing enter, the individual measuring values for Ca- and Mg-hardness are shown on the display.

Volatile Organic Acids

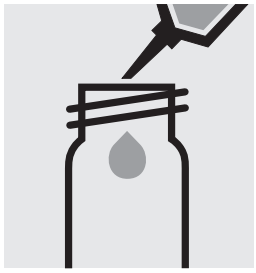
101763

Cell Test

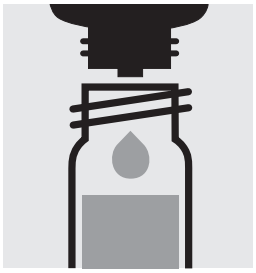
Measuring range:	50 – 3000 mg/l volatile organic acid (calculated as acetic acid)



Check the pH of the sample, specified range: pH 2– 12.

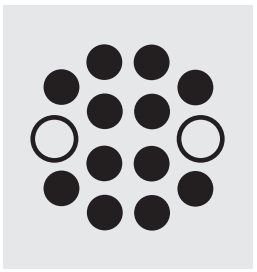


Pipette 0.75 ml of **OA-1** into a round cell.

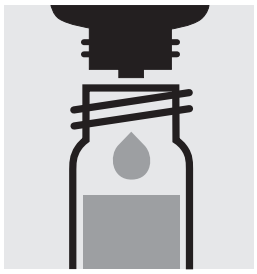


Add 2 drops of **OA-2**.

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 10 minutes. Then cool to room temperature under running water.



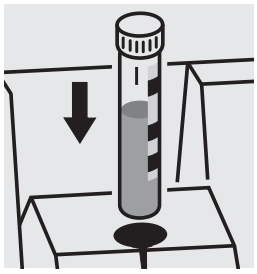
Add 5 drops of **OA-3**.

Add 0.50 ml of **OA-4** with pipette, close the cell with the screw cap, and mix.

Reaction time: 3 minutes

Add 5.0 ml of **OA-5** with pipette, close the cell with the screw cap, and shake vigorously.

Reaction time: 10 minutes



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

Quality assurance:

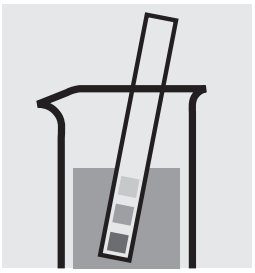
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous, Cat.No. 106268 (see section “Standard solutions”).

Volatile Organic Acids

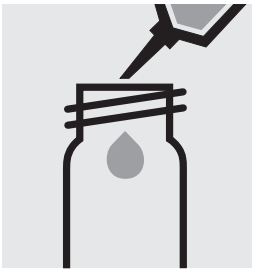
101749

Cell Test

Measuring	50 – 3000 mg/l volatile organic acid	(calculated as acetic acid)
range:	71 – 4401 mg/l volatile organic acid	(calculated as butyric acid)

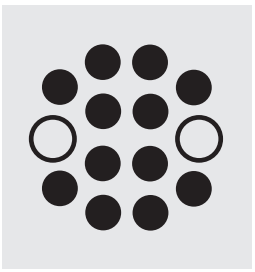


Check the pH of the sample, specified range: pH 2– 12.



Pipette 0.50 ml of **OA-1** into a round cell.

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



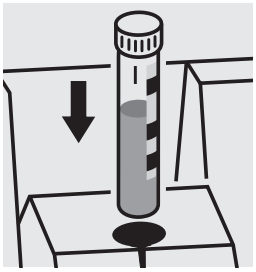
Heat the cell in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.

Add 1.0 ml of **OA-2** with pipette.

Add 1.0 ml of **OA-3** with pipette, close the cell with the screw cap, and mix.

Add 1.0 ml of **OA-4** with pipette, close the cell with the screw cap, and shake vigorously.

Reaction time:
1 minute



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

Quality assurance:

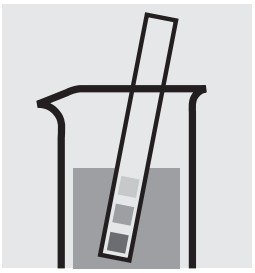
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous, Cat.No. 106268 (see section “Standard solutions”).

Volatile Organic Acids

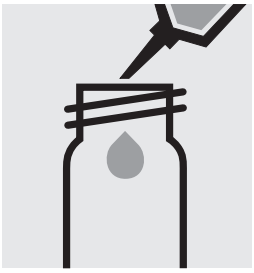
101809

Test

Measuring	50 – 3000 mg/l volatile organic acid	(calculated as acetic acid)
range:	71 – 4401 mg/l volatile organic acid	(calculated as butyric acid)



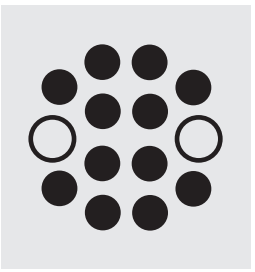
Check the pH of the sample, specified range: pH 2– 12.



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.



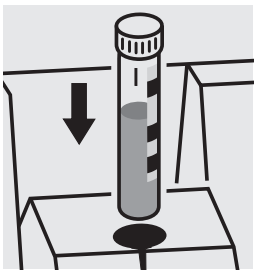
Heat the cell in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.

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 cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

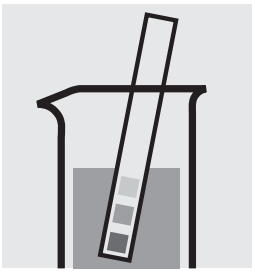
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous, Cat.No. 106268 (see section “Standard solutions”).

Zinc

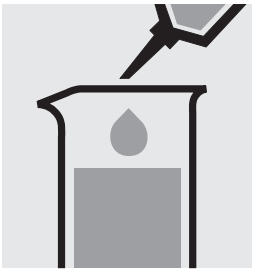
100861

Cell Test

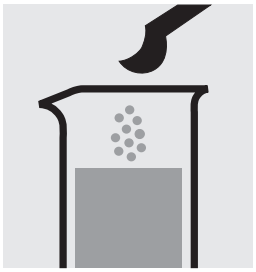
Measuring range:	0.025 – 1.000 mg/l Zn Expression of results also possible in mmol/l.



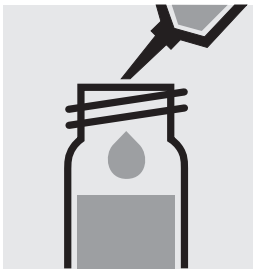
Check the pH of the sample, specified range: pH 1– 7.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



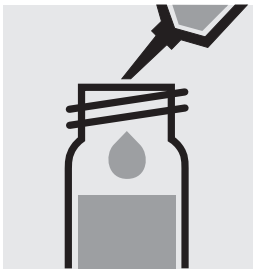
Pipette 10 ml of sample into a glass vessel.



Add 1 level green microspoon of **Zn-1K** and
shake to dissolve the solid substance: **sample-reagent mixture**.



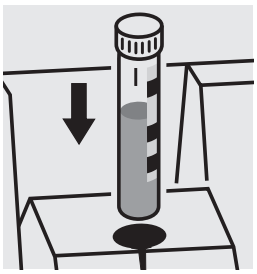
Pipette 0.50 ml of **Zn-2K** into a reaction cell, close with the screw cap, and mix.



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 cell compartment. Align the mark on the cell with that on the photometer.

Important:

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

Result can be expressed as sum of zinc (Σ Zn).

Quality assurance:

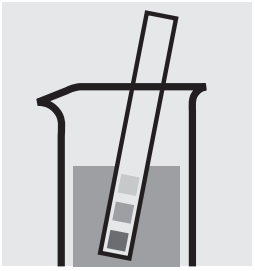
To check the measurement system (test reagents, measurement device, and handling) ready-for-use zinc standard solution CertiPUR®, Cat.No. 119806, concentration 1000 mg/l Zn, can be used after diluting accordingly.

Zinc

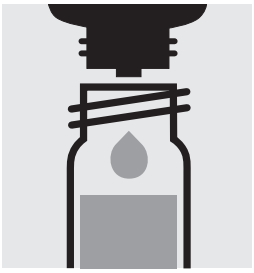
114566

Cell Test

Measuring range:	0.20 – 5.00 mg/l Zn Expression of results also possible in mmol/l.

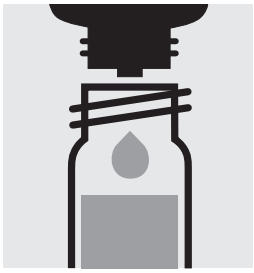


Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



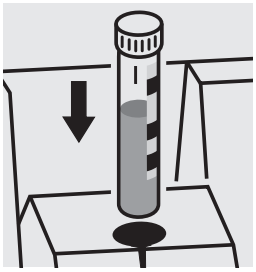
Add 5 drops of **Zn-1K** into a reaction cell, close with the screw cap, and mix.

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.

Reaction time: 15 minutes



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

Important:

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

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 40, Cat.No. 114692.

Ready-for-use zinc standard solution CertiPUR®, Cat.No. 119806, concentration 1000 mg/l Zn, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Suitability of Test Kits for Testing Seawater and Tolerance Limits of Neutral Salts

Test kit	Cat. No.	Seawater	Limit of tolerance, salts in %		
			NaCl	$NaNO_3$	Na_2SO_4
Acid Capacity Cell Test	101758	no	–	–	–
Aluminium Cell Test	100594	yes	20	20	20
Ammonium Cell Test	A6/25	yes	20	10	15
Ammonium Cell Test	114739	no	5	5	5
Ammonium Cell Test	114558	yes	20	10	15
Ammonium Cell Test	114544	yes	20	15	20
Ammonium Cell Test	114559	yes	20	20	20
AOX Cell Test	100675	no	0.4	20	20
BOD Cell Test	100687	yes	20	20	20
Cadmium Cell Test	114834	no	1	10	1
Calcium Cell Test	100858	no	2	2	1
Chloride Cell Test	114730	yes	–	20	1
Chloride Cell Test	101804	no	–	0.5	0.05
Chlorine Cell Test	100595	no	10	10	10
Chlorine Cell Test	100597	no	10	10	10
Chlorine reagents (liquid) (free and total)	100086/100087/ 100088	no	10	10	10
Chromate Cell Test (chromium(VI))	114552	yes	10	10	10
Chromate Cell Test (chromium total)	114552	no	1	10	10
COD Cell Test	C3/25	no	0.4	10	10
COD Cell Test	C4/25	no	0.4	10	10
COD Cell Test	114560	no	0.4	10	10
COD Cell Test	101796	no	0.4	10	10
COD Cell Test	114540	no	0.4	10	10
COD Cell Test	114895	no	0.4	10	10
COD Cell Test	114690	no	0.4	20	20
COD Cell Test	114541	no	0.4	10	10
COD Cell Test	114691	no	0.4	20	20
COD Cell Test	114555	no	1.0	10	10
COD Cell Test	101797	no	10	20	20
COD Cell Test (Hg free)	109772	no	0	10	10
COD Cell Test (Hg free)	109773	no	0	10	10
COD Cell Test (seawater)	117058	yes	35	10	10
COD Cell Test (seawater)	117059	yes	35	10	10
Copper Cell Test	114553	yes	15	15	15
Cyanide Cell Test	114561	no	10	10	10
Formaldehyde Cell Test	114500	no	5	0	10
Hardness, see Total Hardness Cell Test					
Iron Cell Test	114549	yes	20	20	20
Iron Cell Test	114896	no	5	5	5
Lead Cell Test	114833	no	20	20	1
Magnesium Cell Test	100815	yes	2	2	1
Manganese Cell Test	100816	no	20	20	20
Nickel Cell Test	114554	no	20	20	20
Nitrate Cell Test	N2/25	no	0.2	–	20
Nitrate Cell Test	114542	no	0.4	–	20
Nitrate Cell Test	114563	no	0.2	–	20
Nitrate Cell Test	114764	no	0.5	–	20
Nitrate Cell Test	100614	no	2	–	20
Nitrite Cell Test	N5/25	yes	20	20	15
Nitrite Cell Test	114547	yes	20	20	15
Nitrite Cell Test	100609	yes	20	20	15
Nitrogen (total) Cell Test	114537	no	0.5	–	10
Nitrogen (total) Cell Test	100613	no	0.2	–	10
Nitrogen (total) Cell Test	114763	no	2	–	20
Oxygen Cell Test	114694	no	10	5	1
pH Cell Test	101744	yes	–	–	–
Phosphate Cell Test (orthophosphates)	P6/25	yes	5	10	10
Phosphate Cell Test (phosphorus total)	P6/25	no	1	10	10
Phosphate Cell Test (orthophosphates)	P7/25	yes	20	20	20
Phosphate Cell Test (phosphorus total)	P7/25	yes	5	20	20
Phosphate Cell Test	100474	yes	5	10	10
Phosphate Cell Test (orthophosphates)	114543	yes	5	10	10
Phosphate Cell Test (phosphorus total)	114543	no	1	10	10
Phosphate Cell Test	100475	yes	20	20	20

Suitability of Test Kits for Testing Seawater and Tolerance Limits of Neutral Salts

Test kit	Cat. No.	Seawater	Limit of tolerance, salts in %		
			NaCl	$NaNO_3$	Na_2SO_4
Phosphate Cell Test (orthophosphates)	114729	yes	20	20	20
Phosphate Cell Test (phosphorus total)	114729	yes	5	20	20
Phosphate Cell Test	100616	yes	20	20	20
Phosphate Cell Test (orthophosphates)	100673	yes	20	20	20
Phosphate Cell Test (phosphorus total)	100673	yes	20	20	20
Phosphate Cell Test	114546	yes	20	20	20
Potassium Cell Test	114562	yes	20	20	20
Potassium Cell Test	100615	yes	20	20	20
Residual Hardness Cell Test	114683	no	0.01	0.01	0.01
Sodium Cell Test	100885	no	–	10	1
Sulfate Cell Test	114548	yes	10	0.1	–
Sulfate Cell Test	100617	yes	10	0.1	–
Sulfate Cell Test	114564	yes	10	0.5	–
Surfactants (nonionic) Cell Test	101787	no	2	5	2
TOC Cell Test	114878	no	0,5	10	10
TOC Cell Test	114879	no	5	20	20
Total Hardness Cell Test	100961	no	2	2	1
Volatile Organic Acids Cell Test	101763	no	20	20	10
Volatile Organic Acids Cell Test	101749	no	20	20	10
Volatile Organic Acids Test	101809	no	20	20	10
Zinc Cell Test	100861	no	20	20	1
Zinc Cell Test	114566	no	10	10	10

Spectroquant® CombiCheck and Standard Solutions

Test kit, Cat. No. or method	Evaluation as	CombiCheck, Cat. No.	Confidence interval: Spec. value for the standard	Confidence interval: max. working tolerance	Diluted and ready-to-use standard solutions, CRM: Cat. No.	concentration	expanded measurement uncertainty	Ready-to-use standard solution, Cat. No.
Acid Capacity Cell Test, 101758	OH	–	5.00 mmol/l*	± 0.50 mmol/l	–			see prep. instr.
Aluminium Cell Test, 100594	Al	–	0.25 mg/l*	± 0.03 mg/l	–			119770
Ammonium Cell Test, A6/25	NH_4-N	CombiCheck 10, 114676	4.00 mg/l	± 0.30 mg/l	–			119812
Ammonium Cell Test, 114739	NH_4-N	CombiCheck 50, 114695	1.00 mg/l	± 0.10 mg/l	125022	0.400 mg/l	± 0.012 mg/l	
					125023	1.00 mg/l	± 0.04 mg/l	119812
Ammonium Cell Test, 114558	NH_4-N	CombiCheck 10, 114676	4.00 mg/l	± 0.30 mg/l	125022	0.400 mg/l	± 0.012 mg/l	
					125023	1.00 mg/l	± 0.04 mg/l	
					125024	2.00 mg/l	± 0.07 mg/l	
					125025	6.00 mg/l	± 0.13 mg/l	119812
Ammonium Cell Test, 114544	NH_4-N	CombiCheck 20, 114675	12.0 mg/l	± 1.0 mg/l	125023	1.00 mg/l	± 0.04 mg/l	
					125024	2.00 mg/l	± 0.07 mg/l	
					125025	6.00 mg/l	± 0.13 mg/l	
					125026	12.0 mg/l	± 0.4 mg/l	119812
Ammonium Cell Test, 114559	NH_4-N	CombiCheck 70, 114689	50.0 mg/l	± 5.0 mg/l	125025	6.00 mg/l	± 0.13 mg/l	
					125026	12.0 mg/l	± 0.4 mg/l	
					125027	50.0 mg/l	± 1.2 mg/l	119812
AOX Cell Test, 100675	AOX	–	1.00 mg/l*	± 0.10 mg/l	–			100680
BOD Cell Test, 100687	O_2	–	210 mg/l	± 20 mg/l	–			100718
Cadmium Cell Test, 114834	Cd	CombiCheck 30, 114677	0.500 mg/l	± 0.060 mg/l	–			119777
Calcium Cell Test, 100858	Ca	–	75 mg/l*	± 7 mg/l	–			see prep. instr.
Chloride Cell Test, 114730	Cl	CombiCheck 20, 114675	60 mg/l	± 10 mg/l				
		CombiCheck 10, 114676	25 mg/l	± 6 mg/l	–			119897
Chloride Cell Test, 101804	Cl	–	7.5 mg/l*	± 0.8 mg/l	–			119897
Chlorine Cell Test, 100595	Cl_2	–	3.00 mg/l*	± 0.30 mg/l	–			see prep. instr.
Chlorine Cell Test, 100597	Cl_2	–	3.00 mg/l*	± 0.30 mg/l	–			see prep. instr.
Chlorine Cell Test (liquid reagent), 100086/100087	Cl_2	–	3.00 mg/l*	± 0.30 mg/l	–			see prep. instr.
Chlorine Cell Test (liquid reagent), 100086/100087/100088	Cl_2	–	3.00 mg/l*	± 0.30 mg/l	–			see prep. instr.
Chromate Cell Test, 114552	Cr	–	1.00 mg/l*	± 0.10 mg/l	–			119780
COD Cell Test, C3/25	COD	CombiCheck 10, 114676	80 mg/l	± 12 mg/l	–			see prep. instr.
COD Cell Test, C4/25	COD	CombiCheck 20, 114675	750 mg/l	± 75 mg/l	–			see prep. instr.
COD Cell Test, 114560	COD	CombiCheck 50, 114695	20.0 mg/l	± 4.0 mg/l	125028	20.0 mg/l	± 0.7 mg/l	see prep. instr.
COD Cell Test, 101796	COD	CombiCheck 50, 114695	20.0 mg/l	± 2.0 mg/l	125028	20.0 mg/l	± 0.7 mg/l	see prep. instr.
COD Cell Test, 114540	COD	CombiCheck 10, 114676	80 mg/l	± 12 mg/l	125029	100 mg/l	± 3 mg/l	see prep. instr.
COD Cell Test, 114895	COD	CombiCheck 60, 114696	250 mg/l	± 20 mg/l	125029	100 mg/l	± 3 mg/l	
					125030	200 mg/l	± 4 mg/l	see prep. instr.
COD Cell Test, 114690	COD	CombiCheck 60, 114696	250 mg/l	± 25 mg/l	125029	100 mg/l	± 3 mg/l	
					125030	200 mg/l	± 4 mg/l	
					125031	400 mg/l	± 5 mg/l	see prep. instr.
COD Cell Test, 114541	COD	CombiCheck 20, 114675	750 mg/l	± 75 mg/l	125029	100 mg/l	± 3 mg/l	
					125030	200 mg/l	± 4 mg/l	
					125031	400 mg/l	± 5 mg/l	
					125032	1000 mg/l	± 11 mg/l	see prep. instr.
COD Cell Test, 114691	COD	CombiCheck 80, 114738	1500 mg/l	± 150 mg/l	125031	400 mg/l	± 5 mg/l	
					125032	1000 mg/l	± 11 mg/l	
					125033	2000 mg/l	± 32 mg/l	see prep. instr.
COD Cell Test, 114555	COD	CombiCheck 70, 114689	5000 mg/l	± 400 mg/l	125032	1000 mg/l	± 11 mg/l	
					125033	2000 mg/l	± 32 mg/l	
					125034	8000 mg/l	± 68 mg/l	see prep. instr.
COD Cell Test, 101797	COD	–	50000 mg/l*	± 5000 mg/l	125034	8000 mg/l	± 68 mg/l	
					125035	50000 mg/l	± 894 mg/l	see prep. instr.
COD Cell Test, 109772	COD	–	80 mg/l*	± 12 mg/l	125028	20.0 mg/l	± 0.7 mg/l	
					125029	100 mg/l	± 3 mg/l	see prep. instr.
COD Cell Test, 109773	COD	–	750 mg/l*	± 75 mg/l	125029	100 mg/l	± 3 mg/l	
					125030	200 mg/l	± 4 mg/l	
					125031	400 mg/l	± 5 mg/l	
					125032	1000 mg/l	± 11 mg/l	see prep. instr.
COD Cell Test, 117058	COD	–	30.0 mg/l*	± 3.0 mg/l	–			see prep. instr.
COD Cell Test, 117059	COD	–	1500 mg/l*	± 150 mg/l	–			see prep. instr.
Copper Cell Test, 114553	Cu	CombiCheck 30, 114677	2.00 mg/l	± 0.20 mg/l	–			119786
Cyanide Cell Test, 114561	CN	–	0.250 mg/l*	± 0.030 mg/l	–			119533
Formaldehyde Cell Test, 114500	HCHO	–	5.00 mg/l*	± 0.50 mg/l	–			see prep. instr.
Hardness, see Total Hardness Cell Test								
Iron Cell Test, 114549	Fe	CombiCheck 30, 114677	1.00 mg/l	± 0.15 mg/l	–			119781
Iron Cell Test, 114896	Fe	–	25.0 mg/l*	± 2.5 mg/l	–			119781
Lead Cell Test, 114833	Pb	CombiCheck 40, 114692	2.00 mg/l	± 0.20 mg/l	–			119776
Magnesium Cell Test, 100815	Mg	–	40.0 mg/l*	± 4.0 mg/l	–			see prep. instr.
Manganese Cell Test, 100816	Mn	CombiCheck 30, 114677	1.00 mg/l	± 0.15 mg/l	–			119789

* Self prepared, recommended concentration

Spectroquant® CombiCheck and Standard Solutions

Test kit, Cat. No. or method	Evaluation as	CombiCheck, Cat. No.	Confidence interval: Spec. value for the standard	Confidence interval: max. working tolerance	Diluted and ready-to-use standard solutions, CRM: Cat. No.	concentration	expanded measurement uncertainty	Ready-to-use standard solution, Cat. No.
Nickel Cell Test, 114554	Ni	CombiCheck 40, 114692	2.00 mg/l	± 0.20 mg/l	–			109989
Nitrate Cell Test, N2/25	NO_3-N	CombiCheck 20, 114675	9.0 mg/l	± 0.9 mg/l	–			119811
Nitrate Cell Test, 114542	NO_3-N	CombiCheck 20, 114675	9.0 mg/l	± 0.9 mg/l	125037	2.50 mg/l	± 0.06 mg/l	
					125038	15.0 mg/l	± 0.4 mg/l	119811
Nitrate Cell Test, 114563	NO_3-N	CombiCheck 20, 114675	9.0 mg/l	± 0.9 mg/l	125037	2.50 mg/l	± 0.06 mg/l	
					125038	15.0 mg/l	± 0.4 mg/l	119811
Nitrate Cell Test, 114764	NO_3-N	CombiCheck 80, 114738	25.0 mg/l	± 2.5 mg/l	125037	2.50 mg/l	± 0.06 mg/l	
					125038	15.0 mg/l	± 0.4 mg/l	
					125039	40.0 mg/l	± 1.0 mg/l	119811
Nitrat Cell Test, 100614	NO_3-N	–	100 mg/l*	± 10 mg/l	125039	40.0 mg/l	± 1.0 mg/l	
					125040	200 mg/l	± 5 mg/l	119811
Nitrite Cell Test, N5/25	NO_2-N	–	0.300 mg/l*	± 0.030 mg/l	–			119899
Nitrite Cell Test, 114547	NO_2-N	–	0.300 mg/l*	± 0.030 mg/l	125041	0.200 mg/l	± 0.009 mg/l	119899
Nitrite Cell Test, 100609	NO_2-N	–	45.0 mg/l*	± 5 mg/l	125042	40.0 mg/l	± 1.3 mg/l	119899
Nitrogen (total) Cell Test, 114537	N	CombiCheck 50, 114695	5.0 mg/l	± 0.7 mg/l	125043	2.50 mg/l	± 0.06 mg/l	
					125044	12.0 mg/l	± 0.3 mg/l	see prep. instr.
Nitrogen (total) Cell Test, 100613	N	CombiCheck 50, 114695	5.0 mg/l	± 0.7 mg/l	125043	2.50 mg/l	± 0.06 mg/l	
					125044	12.0 mg/l	± 0.3 mg/l	see prep. instr.
Nitrogen (total) Cell Test, 114763	N	CombiCheck 70, 114689	50 mg/l	± 7 mg/l	125044	12.0 mg/l	± 0.3 mg/l	
					125045	100 mg/l	± 3 mg/l	see prep. instr.
Oxygen Cell Test, 114694	O_2	–	–	± 0.6 mg/l	–			see the website
pH Cell Test, 101744	pH	–	7.0	± 0.2	–			109407
Phosphate Cell Test, P6/25	PO_4-P	CombiCheck 10, 114676	0.80 mg/l	± 0.08 mg/l	–			119898
Phosphate Cell Test, P7/25	PO_4-P	CombiCheck 80, 114738	15.0 mg/l	± 1.0 mg/l	–			119898
		CombiCheck 20, 114675	8.0 mg/l	± 0.7 mg/l	–			119898
Phosphate Cell Test, 100474	PO_4-P	CombiCheck 10, 114676	0.80 mg/l	± 0.08 mg/l	–			119898
Phosphate Cell Test, 114543	PO_4-P	CombiCheck 10, 114676	0.80 mg/l	± 0.08 mg/l	125046	0.400 mg/l P	± 0.016 mg/l	
					125047	4.00 mg/l P	± 0.08 mg/l	119898
Phosphate Cell Test, 100475	PO_4-P	CombiCheck 80, 114738	15.0 mg/l	± 1.0 mg/l				
		CombiCheck 20, 114675	8.0 mg/l	± 0.7 mg/l	–			119898
Phosphate Cell Test, 114729	PO_4-P	CombiCheck 80, 114738	15.0 mg/l	± 1.0 mg/l	125047	4.00 mg/l P	± 0.08 mg/l	
		CombiCheck 20, 114675	8.0 mg/l	± 0.7 mg/l	125048	15.0 mg/l P	± 0.4 mg/l	119898
Phosphat Cell Test, 100616	PO_4-P	–	50.0 mg/l*	± 5.0 mg/l	–			119898
Phosphat Cell Test, 100673	PO_4-P	–	50.0 mg/l*	± 5.0 mg/l	125047	4.00 mg/l P	± 0.08 mg/l	
					125048	15.0 mg/l P	± 0.4 mg/l	
					125049	75.0 mg/l P	± 1.6 mg/l	119898
Phosphate Cell Test, 114546	PO_4-P	–	15.0 mg/l*	± 1.0 mg/l	–			119898
Potassium Cell Test, 114562	K	–	25.0 mg/l*	± 4.0 mg/l	–			170230
Potassium Cell Test, 100615	K	–	150 mg/l*	± 15 mg/l	–			170230
Residual Hardness Cell Test, 114683	Ca	–	2.50 mg/l*	± 0.30 mg/l	–			119778
Sodium Cell Test, 100885	Na	–	100 mg/l*	± 10 mg/l	–			see prep. instr.
Sulfate Cell Test, 114548	SO_4	CombiCheck 10, 114676	100 mg/l	± 15 mg/l	125050	40 mg/l	± 6 mg/l	
					125051	125 mg/l	± 6 mg/l	119813
Sulfat Cell Test, 100617	SO_4	CombiCheck 10, 114676	100 mg/l	± 15 mg/l	125051	125 mg/l	± 6 mg/l	
					125052	400 mg/l	± 20 mg/l	119813
Sulfate Cell Test, 114564	SO_4	CombiCheck 20, 114675	500 mg/l	± 75 mg/l	125051	125 mg/l	± 6 mg/l	
					125052	400 mg/l	± 20 mg/l	
					125053	800 mg/l	± 27 mg/l	119813
Sulfate Test, 114791	SO_4	CombiCheck 10, 114676	100 mg/l	± 15 mg/l	125050	40 mg/l	± 6 mg/l	
					125051	125 mg/l	± 6 mg/l	119813
Surfactants (nonionic) Cell Test, 101787	n-Ten	–	4.00 mg/l*	± 0.40 mg/l	–			see prep. instr.
TOC Cell Test, 114878	TOC	–	40.0 mg/l*	± 3.0 mg/l	–			109017
TOC Cell Test, 114879	TOC	–	400 mg/l*	± 30 mg/l	–			109017
Total Hardness Cell Test, 100961	Ca	–	75 mg/l*	± 7 mg/l	–			see prep. instr.
Volatile Organic Acids Cell Test, 101763	HOAc	–	1500 mg/l*	± 80 mg/l	–			see prep. instr.
Volatile Organic Acids Cell Test, 101749	C_3H_7COOH	–	1500 mg/l*	± 80 mg/l	–			see prep. instr.
Volatile Organic Acids Test, 101809	C_3H_7COOH	–	1500 mg/l*	± 80 mg/l	–			see prep. instr.
Zinc Cell Test, 100861	Zn	–	0.500 mg/l*	± 0.050 mg/l	–			119806
Zinc Cell Test, 114566	Zn	CombiCheck 40, 114692	2.00 mg/l	± 0.40 mg/l	–			119806

* Self prepared, recommended concentration

Instructions for the Preparation of Standard Solutions

Standard solution of acid capacity

Reagents required:

1.09141.1000	Sodium hydroxide solution 0.1 mol/l TitriPUR®
1.16754.9010	Water for analysis EMSURE®

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.

Standard solution of calcium

Reagents required:

1.02121.0500	Calcium nitrate tetrahydrate for analysis EMSURE®
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 2.946 g of calcium nitrate tetrahydrate with distilled water in a calibrated or conformity-checked 500-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l calcium.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
The standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

Instructions for the Preparation of Standard Solutions

Standard solutions of free chlorine

All standard solutions described here for free chlorine yield equivalent results and are identically suited for the determination of chlorine.

Standard solution of free chlorine

Reagents required:

1.10888.0250	Dichloroisocyanuric acid sodium salt dihydrate GR for analysis
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 1.85 g of dichloroisocyanuric acid sodium salt dihydrate GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l free chlorine.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

Note:
This is a standard solution that can be prepared particularly rapidly and easily.

Instructions for the Preparation of Standard Solutions

Standard solution of free chlorine analogous to DIN EN ISO 7393

Preparation of a KIO_3 stock solution:
Dissolve 1.006 g of KIO_3 in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:
Transfer 15.00 ml (5.00 ml) of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.
1 ml of this solution is equivalent to 0.015 mg (0.005 mg) of free chlorine.

Preparation of the 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 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.
The concentration of the solution is 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®

Instructions for the Preparation of Standard Solutions

Standard solution of free chlorine

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®

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 1min.

Titrate the eliminated iodine with sodium thiosulfate solution 0.1 mol/l until a weakly yellow color emerges. Add 2 ml of zinc iodide-starch solution and titrate from blue to colorless.

Calculation and preparation of a standard solution:

Consumption of sodium thiosulfate solution 0.1 mol/l (ml) x 355 =
= content of free chlorine, in mg/l

Further investigational concentrations may be prepared from the stock solution prepared according to the procedure described above by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), a standard solution 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.

Standard solution of total chlorine

Reagents required:

1.02426.0250	Chloramine T trihydrate GR for analysis
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 4.00 g of chloramine T GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l total chlorine.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

Instructions for the Preparation of Standard Solutions

Standard solution of COD

Reagents required:

1.02400.0080	Potassium hydrogen phthalate GR for analysis, volum. standard
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 0.850 g of potassium hydrogen phthalate GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l COD.

Further investigational concentrations may be prepared from this stock solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution remains stable for one month. When stored under appropriate cool conditions (refrigerator), the diluted standard solutions (investigational concentrations) remain stable – depending on the respective concentration – for approx. one week to one month.

Standard solution of COD/chloride

Reagents required:

1.02400.0080	Potassium hydrogen phthalate GR for analysis, volum. standard
1.06404.0500	Sodium chloride for analysis EMSURE®
1.16754.9010	Water for analysis EMSURE®

Preparation of a chloride dilution solution:
Dissolve 32.9 g of sodium chloride GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The dilution solution prepared according to this procedure has a concentration of 20 g/l Cl^-.

Preparation of a COD/Cl^- standard solution:
Dissolve 0.850 g of potassium hydrogen phthalate GR with **dilution solution** in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with **dilution solution**.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l 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.

Instructions for the Preparation of Standard Solutions

Standard solution of formaldehyde

Preparation of a stock solution:
In a calibrated or conformity-checked 1000-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. 1000 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) x 37.525

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l remains stable for 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®

Instructions for the Preparation of Standard Solutions

Standard solution of magnesium

Reagents required:

1.05853.0500	Magnesium nitrate hexahydrate for analysis EMSURE®
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 1.055 g of magnesium nitrate hexahydrate with distilled water in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l magnesium.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
The standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solution of nitrogen (total)

Reagents required:

1.04201.0100	Glycine GR for analysis
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 5.36 g of glycine GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l total nitrogen.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

Standard solution of sodium

Reagents required:

1.19897.0500	Chloride standard solution CertiPur®
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
A chloride standard solution of 1000 mg/l is used.
1000 mg/l chloride corresponds to 649 mg/l sodium.

Further investigational concentrations may be prepared 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.

Instructions for the Preparation of Standard Solutions

Standard solution of surfactants (nonionic)

Reagents required:

1.12298.0101	Triton® X-100
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 1.00 g of Triton® X-100 with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l non-ionic surfactants.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

Standard solution of total hardness

Reagents required:

1.02121.0500	Calcium nitrate tetrahydrate for analysis EMSURE®
1.16754.9010	Water GR for analysis

Preparation of a standard solution:
Dissolve 2.946 g of calcium nitrate tetrahydrate with distilled water in a calibrated or conformity-checked 500-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l calcium (corresponds to 175 °e).

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
The standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solution of volatile organic acids

Reagents required:

1.06268.0250	Sodium acetate anhydrous for analysis EMSURE®
1.16754.9010	Water GR for analysis

Preparation of a standard solution:
Dissolve 2,05 g of sodium acetate anhydrous with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1500 mg/l acetic acid.

Stability:
When stored in a cool place (refrigerator), the standard solution remains stable for one week.

What can Xylem do for you?

We're a global team unified in a common purpose: creating innovative solutions to meet our world's water needs. Developing new technologies that will improve the way water is used, conserved, and re-used in the future is central to our work. We move, treat, analyze, and return water to the environment, and we help people use water efficiently, in their homes, buildings, factories and farms. In more than 150 countries, we have strong, long-standing relationships with customers who know us for our powerful combination of leading product brands and applications expertise, backed by a legacy of innovation.

For more information on how Xylem can help you, go to xyleminc.com.

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