OPERATING MANUAL

ba75433e09 06/2014

photoLab® S12

ANALYSIS SPECIFICATIONS FOR THE AVAILABLE TEST KITS

WTW

a xylem brand

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 and, in the reagent tests, covers all possible path length (cells from 10 to 50 mm).

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
095	Chloride Cell Test*	114730	5 – 125 mg/l Cl	Iron(III)-thiocyanat
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
103	Potassium Cell Test	114562	5.0 – 50.0 mg/l K	Kalignost, turbidimetric
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
043	Aluminium Test*	114825	0.020 – 1.20 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
054	Ammonium Test	114752	0.010 – 3.00 mg/l NH_4-N	Indophenol blue
155	Ammonium Test	100683	2.0 – 75.0 mg/l NH_4-N	Indophenol blue
163	Ammonium Test	100683	5 – 150 mg/l NH_4-N	Indophenol blue
130	Antimony in water and wastewater	Application	0.10 – 8.00 mg/l Sb	Brilliant green
156	AOX Cell Test*	100675	0.05 – 2.50 mg/l AOX	Oxidation to chloride
132	Arsenic Test*	101747	0.001 – 0.100 mg/l As	Ag-DDTC

* turbidity correction possible
** individual calibration necessary

Available photometric test kits

Method No.	Determination		Total Range	Method
157	BOD Cell Test*	100687	0.5 – 3000 mg/l O_2	Modification of Winkler method
164	Boron Cell Test*	100826	0.05 – 2.00 mg/l B	Azomethine H
046	Boron Test*	114839	0.050 – 0.800 mg/l B	Rosocyanine
195	Bromate in water and drinking water	Application	0.003 – 0.120 mg/l BrO_3	3,3'-Dimethylnaphtidine
146	Bromine Test*	100605	0.020 – 10.00 mg/l Br_2	S-DPD
067	Cadmium Cell Test	114834	0.025 – 1.000 mg/l Cd	Cadion derivative
183	Cadmium Test	101745	0.0020 – 0.500 mg/l Cd	Cadion derivative
165	Calcium Cell Test*	100858	10 – 250 mg/l Ca	Phthalein purple
042	Calcium Test*	114815	5 – 160 mg/l Ca	Glyoxal-bis-hydroxyanil
125	Calcium Test sensitive*	114815	1.0 – 15.0 mg/l Ca	Glyoxal-bis-hydroxyanil
095	Chloride Cell Test*	114730	5 – 125 mg/l Cl	Iron(III)-thiocyanat
110	Chloride Test*	114897	2.5 – 25.0 mg/l Cl	Iron(III)-thiocyanat
063	Chloride Test*	114897	10 – 250 mg/l Cl	Iron(III)-thiocyanat
218	Chloride Cell Test*	101804	0.5 – 15.0 mg/l Cl	Iron(III)-thiocyanat
219	Chloride Test*	101807	0.10 – 5.00 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
143	Chlorine Test* (free chlorine)	100598	0.010 – 6.00 mg/l Cl_2	S-DPD
145	Chlorine Test* (total chlorine)	100602	0.010 – 6.00 mg/l Cl_2	S-DPD
144	Chlorine Test* (free and total chlorine)	100599	0.010 – 6.00 mg/l Cl_2	S-DPD
194	Chlorine Cell Test*, Test* (free and total chlorine)	100086/100087/ 100088	0.010 – 6.00 mg/l Cl_2	DPD
149	Chlorine dioxide Test*	100608	0.020 – 10.00 mg/l ClO_2	S-DPD
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
040	Chromate Test*	114758	0.010 – 3.00 mg/l Cr	Diphenylcarbazide
020	Chromium Baths		4.0 – 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
015	Color α(445) (spectral absorption coefficient)	CO445	0.1 – 50.0 m^{-1}	Measurement at 445 nm
061	Color α(525) (spectral absorption coefficient)	CO525	0.1 – 50.0 m^{-1}	Measurement at 525 nm
078	Color α(620) (spectral absorption coefficient)	CO620	0.1 – 250 m^{-1}	Measurement at 620 nm
032	Color Hazen*	CU340	0.2 – 500 mg/l Pt/Co (Hazen)	Platinum-cobalt-Standard Method, measurement at 340 nm
179	Color Hazen*	CU445	1 – 1000 mg/l Pt/Co (Hazen)	Platinum-cobalt-Standard Method, measurement at 445 nm
026	Copper Cell Test*	114553	0.05 – 8.00 mg/l Cu	Cuprizone
027	Copper Test*	114767	0.02 – 6.00 mg/l Cu	Cuprizone

* turbidity correction possible
** individual calibration necessary

Available photometric test kits

Method No.	Determination		Total Range	Method
083	Copper Baths		2.0 – 80.0 g/l Cu	Inherent color
228	Cyanide Cell Test* (free cyanide)	102531	0.010 – 0.500 mg/l CN	Barbituric acid and pyridinecarboxylic acid
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
109	Cyanide Test* (free cyanide)	109701	0.0020 – 0.500 mg/l CN	Barbituric acid and pyridinecarboxylic acid
109	Cyanide Test* (readily liberated cyanide)	109701	0.0020 – 0.500 mg/l CN	Citronic acid, barbituric acid, and pyridinecarboxylic acid
210	Cyanuric Acid Test	119253	2 – 160 mg/l CYA	Triazine derivative
076	Fluoride Cell Test*	114557	0.10 – 1.50 mg/l F	Alizarin complexone
124	Fluorid Cell Test sensitive	114557	0.025 – 0.500 mg/l F	Alizarin complexone
215	Fluoride Cell Test*	100809	0.10 – 1.80 mg/l F	Alizarin complexone
216	Fluorid Cell Test sensitive	100809	0.025 – 0.500 mg/l F	Alizarin complexone
166	Fluorid Test*	114598	0.10 – 2.00 mg/l F	Alizarin complexone
167	Fluorid Test*	114598	1.0 – 20.0 mg/l F	Alizarin complexone
217	Fluorid Test	100822	0.02 – 2.00 mg/l F	SPADNS
028	Formaldehyde Cell Test*	114500	0.10 – 8.00 mg/l HCHO	Chromotropic acid
091	Formaldehyde Test*	114678	0.02 – 8.00 mg/l HCHO	Chromotropic acid
045	Gold Test	114821	0.5 – 12.0 mg/l Au	Rhodamine B
	Hardness see Total Hardness or Residual Hardness			
	Hazen see Color Hazen			
044	Hydrazine Test*	109711	0.005 – 2.00 mg/l N_2H_4	4-Dimethylaminobenzaldehyde
099	Hydrogenperoxide Cell Test*	114731	2.0 – 20.0 mg/l H_2O_2	Titanyl sulfate
128	Hydrogenperoxide Cell Test sens.*	114731	0.25 – 5.00 mg/l H_2O_2	Titanyl sulfate
198	Hydrogenperoxide Test	118789	0.015 – 6.00 mg/l H_2O_2	Phenanthroline derivative
147	Iodine Test*	100606	0.050 – 10.00 mg/l I_2	S-DPD
033	Iodine color number		0.010 – 3.00	Measurement at 340 nm
021	Iodine color number		0.2 – 50.0	Measurement at 445 nm
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
038	Iron Test	114761	0.005 – 5.00 mg/l Fe	Triazine
161	Iron Test*	100796	0.010 – 5.00 mg/l Fe (Fe(II) and Fe(III))	1,10-Phenanthroline
066	Lead Cell Test*	114833	0.10 – 5.00 mg/l Pb	PAR
160	Lead Test*	109717	0.010 – 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
184	Manganese Test*	101739	0.005 – 2.00 mg/l Mn	PAN
019	Manganese Test*	114770	0.010 – 10.00 mg/l Mn	Formaldoxime
226	Manganese Test*	101846	0.005 – 2.00 mg/l Mn	PAN
135	Mercury in water and wastewater	Application	0.025 – 1.000 mg/l Hg	Michler's ketone
175	Molybdenum Cell Test	100860	0.02 – 1.00 mg/l Mo	Bromopyrogallol red
206	Molybdenum Test	119252	0.5 – 45.0 mg/l Mo	Mercaptoacetic acid
185	Monochloramine Test	101632	0.050 – 10.00 mg/l Cl_2	Indophenol blue
017	Nickel Cell Test*	114554	0.10 – 6.00 mg/l Ni	Dimethylglyoxime
018	Nickel Test*	114785	0.02 – 5.00 mg/l Ni	Dimethylglyoxime
057	Nickel Baths		2.0 – 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
060	Nitrate Test*	114773	0.2 – 20.0 mg/l NO_3-N	Nitrospectral
139	Nitrate Test*	109713	0.10 – 25.0 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
140	Nitrate Test in seawater*	114942	0.2 – 17.0 mg/l NO_3-N	Resorcine
227	Nitrate Test	101842	0.3 – 30.0 mg/l NO_3-N	Benzoic acid derivative
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
036	Nitrite Test*	114776	0.002 – 1.00 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
092	Oxygen Cell Test*	114694	0.5 – 12.0 mg/l O_2	Modification of Winkler method

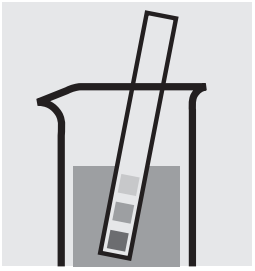
* turbidity correction possible
** individual calibration necessary

Available photometric test kits

Method No.	Determination		Total Range	Method
207	Oxygen Scavengers Test	119251	0.020 – 0.500 mg/l DEHA	FerroZine®
148	Ozone Test*	100607	0.010 – 4.00 mg/l O_3	S-DPD
133	Palladium in water and wastewater	Application	0.05 – 1.25 mg/l Pd	Thio-Michler's ketone
186	pH Cell Test	101744	6.4 – 8.8	Phenol red
073	Phenol Cell Test*	114551	0.10 – 2.50 mg/l Phenole	MBTH
176	Phenol Test*	100856	0.025 – 5.00 mg/l C_6H_5OH	Aminoantipyrine
177	Phenol Test*	100856	0.002 – 0.200 mg/l C_6H_5OH	Aminoantipyrine, by extraction
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
056	Phosphate Test	114848	0.010 – 5.00 mg/l PO_4-P	Phosphomolybdenum blue
162	Phosphate Test	100798	1.0 – 100.0 mg/l PO_4-P	Phosphomolybdenum blue
069	Phosphate Cell Test*	114546	0.5 – 25.0 mg/l PO_4-P	Vanadatomolybdate
070	Phosphate Test*	114842	0.5 – 30.0 mg/l PO_4-P	Vanadatomolybdate
134	Platinium in water and wastewater	Application	0.10 – 1.25 mg/l Pt	o-Phenylendiamine
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
079	Silicate (Silicic acid) Test	114794	0.11 – 10.70 mg/l SiO_2	Silicomolybdenum blue
081	Silicate (Silicic acid) Test	114794	0.011 – 1.600 mg/l SiO_2	Silicomolybdenum blue
169	Silicate (Silicic acid) Test*	100857	1.1 – 107.0 mg/l SiO_2	Molybdatosilicate
171	Silicate (Silicic acid) Test*	100857	11 – 1070 mg/l SiO_2	Molybdatosilicate
225	Silicate (Silicic acid) Test	101813	0.0005 – 0.5000 mg/l SiO_2	Silicomolybdenum blue
047	Silver Test*	114831	0.25 – 3.00 mg/l Ag	Eosine / 1,10-phenanthroline
168	Sodium Cell Test in nutrient solutions*	100885	10 – 300 mg/l Na	indirectly as chloride
229	Sulfate Cell Test	102532	1.0 – 50.0 mg/l SO_4	Bariumsulfate, turbidimetric
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
065	Sulfate Test*	114791	25 – 300 mg/l SO_4	Tannin
224	Sulfate Test	101812	0.50 – 50.0 mg/l SO_4	Bariumsulfate, turbidimetric
230	Sulfate Test	102537	5 – 300 mg/l SO_4	Bariumsulfate, turbidimetric
080	Sulfide Test*	114779	0.020 – 1.50 mg/l S	Dimethyl-p-phenylendiamine
071	Sulfite Cell Test*	114394	1.0 – 20.0 mg/l SO_3	Ellman's reagent
127	Sulfite Cell Test sensitive*	114394	0.05 – 3.00 mg/l SO_3	Ellman's reagent
187	Sulfite Test*	101746	1.0 – 60.0 mg/l SO_3	Ellman's reagent
087	Surfactants (anionic) Cell Test	114697	0.05 – 2.00 mg/l MBAS (methylene blue active substances)	Methylene blue
231	Surfactants (anionic) Cell Test	102552	0.05 – 2.00 mg/l MBAS (methylene blue active substances)	Methylene blue
192	Surfactants (cationic) Cell Test*	101764	0.05 – 1.50 mg/l k-Ten	Disulfine blue
193	Surfactants (nonionic) Cell Test*	101787	0.10 – 7.50 mg/l n-Ten	TBPE
182	Suspended Solids		25 – 750 mg/l SusS	
100	Tin Cell Test*	114622	0.10 – 2.50 mg/l Sn	Pyrocatechol violet
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 Hardness or Residual Hardness			
077	Turbidity		1 – 100 FAU	Measurement at 550 nm
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
041	Zinc Test*	114832	0.05 – 2.50 mg/l Zn	Cl-PAN

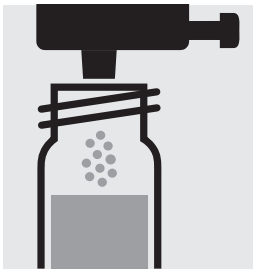
* turbidity correction possible
** individual calibration necessary

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

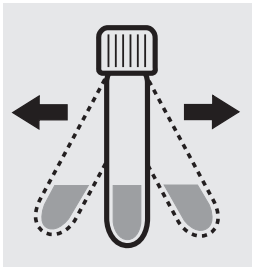


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

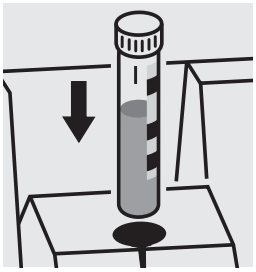


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the 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).

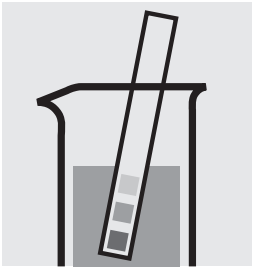
Quality assurance:

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.

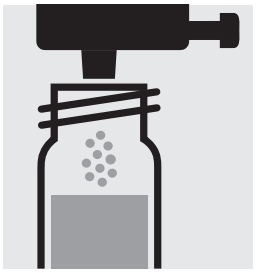
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Measuring	0.010 – 2.000 mg/l NH_4-N
range:	0.01 – 2.58 mg/l NH_4
	0.010 – 2.000 mg/l NH_3-N
	0.01 – 2.43 mg/l NH_3
	Expression of results also possible in mmol/l.

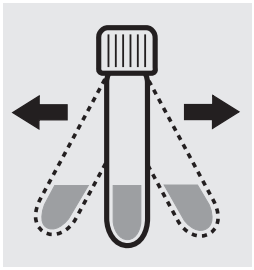


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

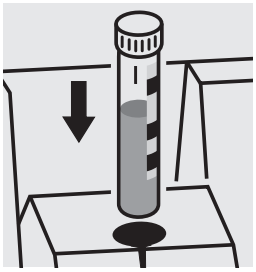


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the 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).

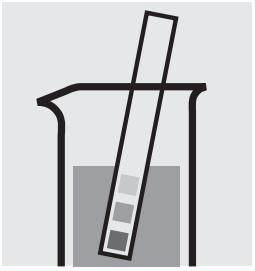
Quality assurance:

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.

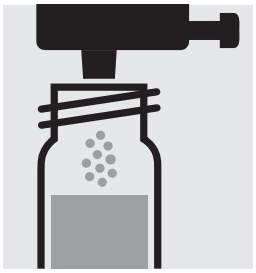
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

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

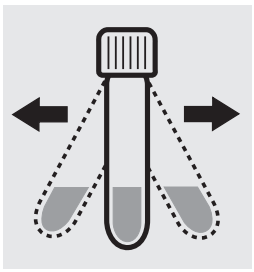


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

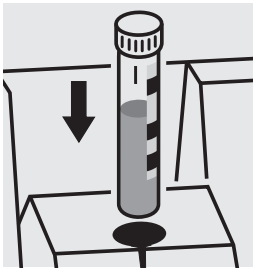


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the 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).

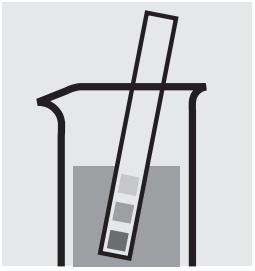
Quality assurance:

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.

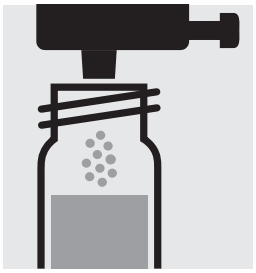
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

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

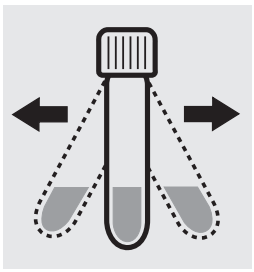


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

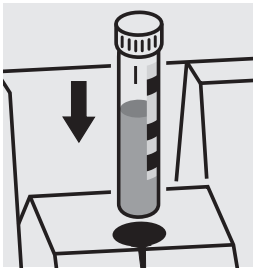


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the 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).

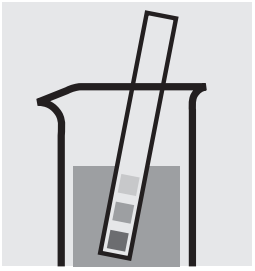
Quality assurance:

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.

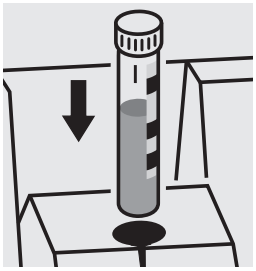
Measuring range:	5 – 125 mg/l Cl Expression of results also possible in mmol/l.



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 CombiCheck 10 and 20, Cat.Nos. 250482 and 250483.

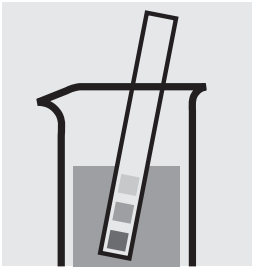
Ready-for-use chloride standard solution, Cat.No. 250466, concentration 1000 mg/l Cl^-, can also be used after diluting accordingly.

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

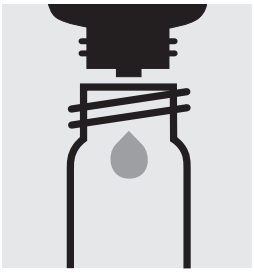
14552 · Chromate

Determination of chromium(VI)

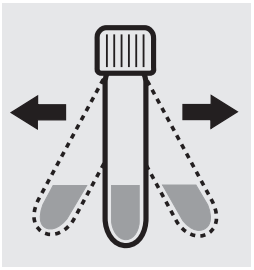
Measuring	0.05 – 2.00 mg/l Cr
range:	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l.



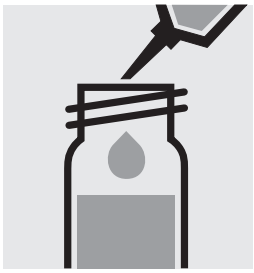
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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

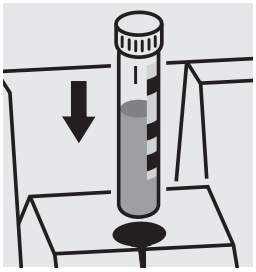


Shake the cell vigorously to dissolve the solid substance and leave to stand for **1 minute**.



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.

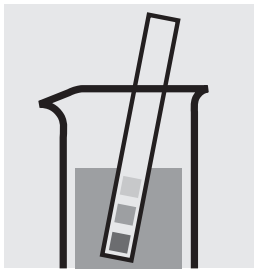
Quality assurance:

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.

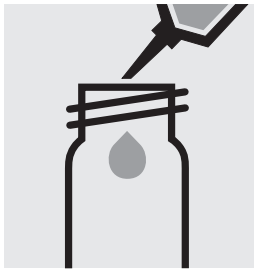
14552 · Chromate

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

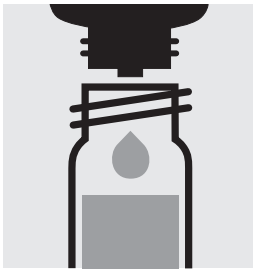
Measuring	0.05 – 2.00 mg/l Cr
range:	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l and also in Cr total (Σ Cr), Cr(III), and Cr(VI).



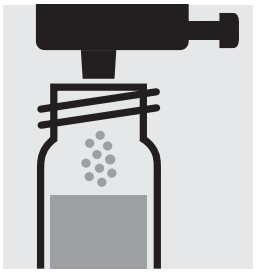
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



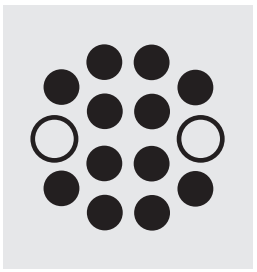
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).



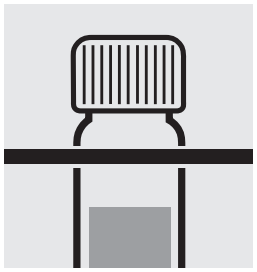
Add 1 drop of **Cr-1K**, close with the screw cap, and mix.



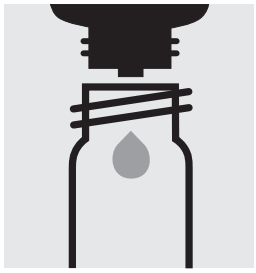
Add 1 dose of **Cr-2K** using the blue dose-metering cap, close the reaction cell with the screw cap.



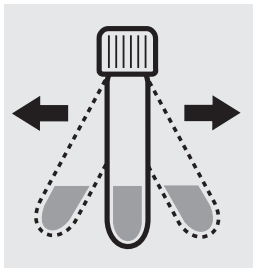
Heat the cell in the thermoreactor at 120 °C (100 °C) for 1 hour.



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



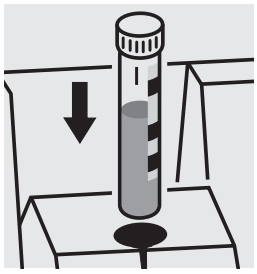
Add 6 drops of **Cr-3K** into a reaction cell, close the cell with the screw cap.



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.

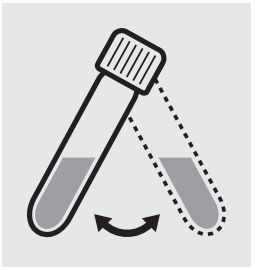
A differentiation between chromium(VI) and chromium(III) can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the total chromium, press enter and measure the chromium(VI) (see analytical procedure for chromium(VI)).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

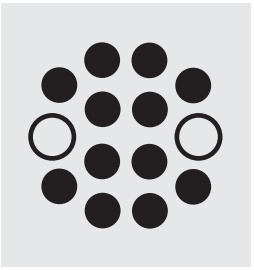
C3/25 · Chemical Oxygen Demand

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

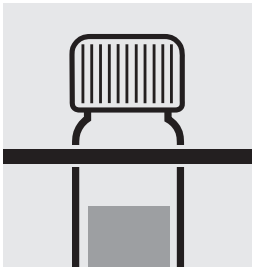


Suspend the bottom sediment in the cell by swirling.

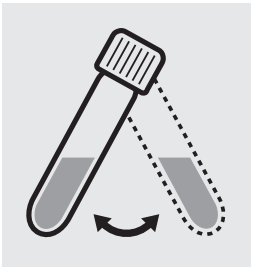
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



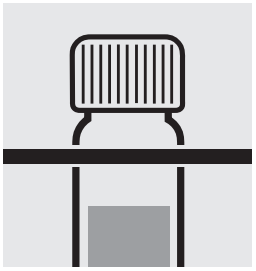
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



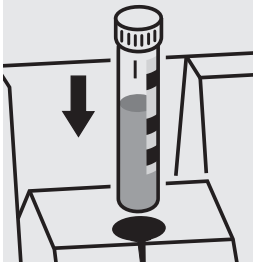
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

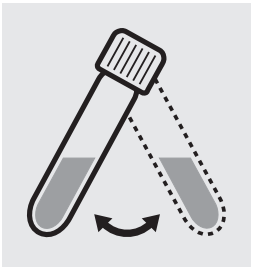
Quality assurance:

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.

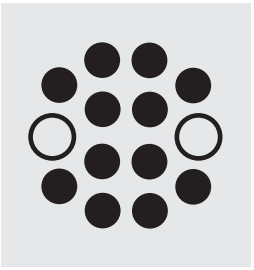
14560 · Chemical Oxygen Demand

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

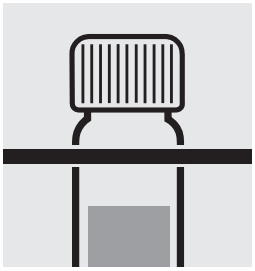


Suspend the bottom sediment in the cell by swirling.

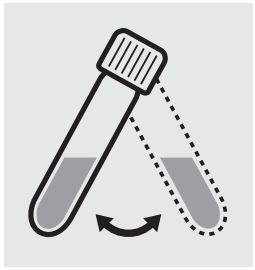
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



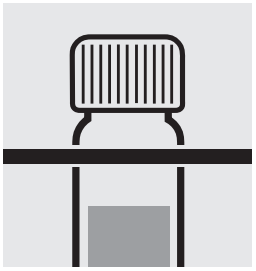
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



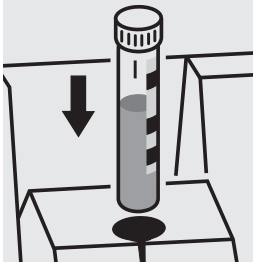
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



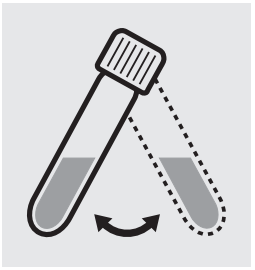
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

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

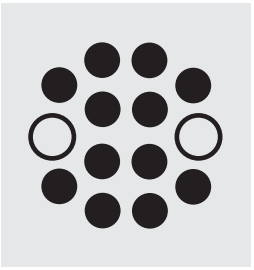
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

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

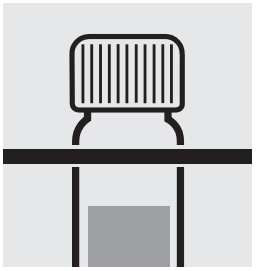


Suspend the bottom sediment in the cell by swirling.

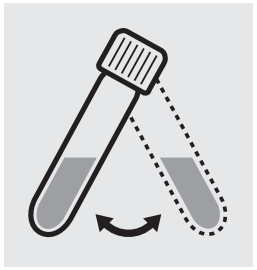
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



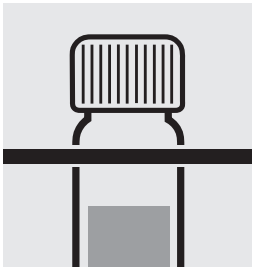
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



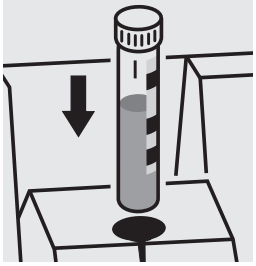
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

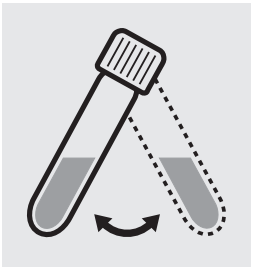
Quality assurance:

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.

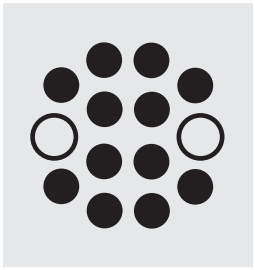
14690 · Chemical Oxygen Demand

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

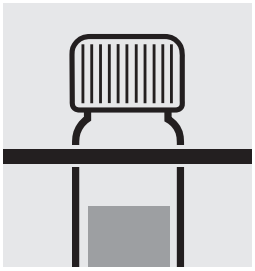


Suspend the bottom sediment in the cell by swirling.

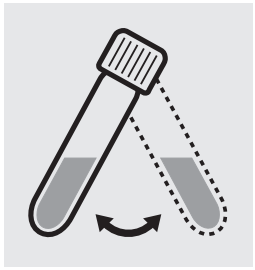
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



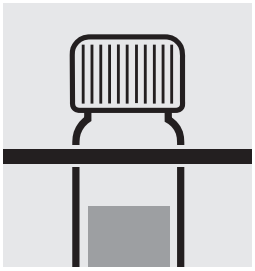
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



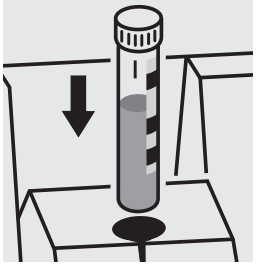
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

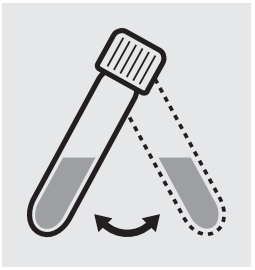
Quality assurance:

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.

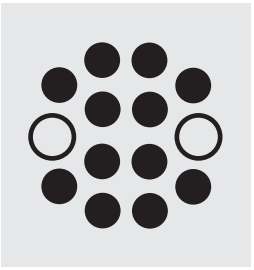
C4/25 · Chemical Oxygen Demand

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

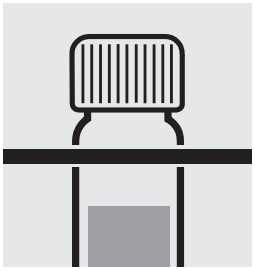


Suspend the bottom sediment in the cell by swirling.

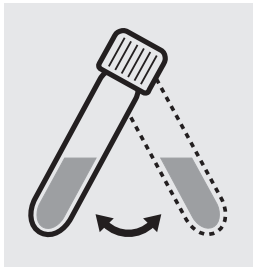
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



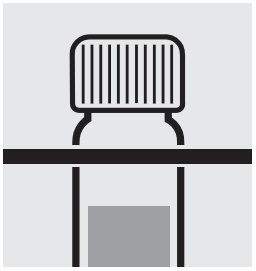
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



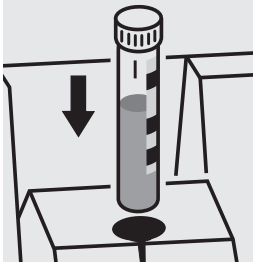
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



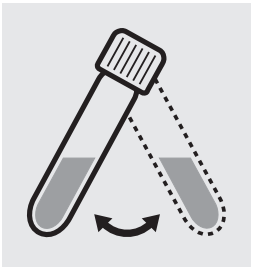
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

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

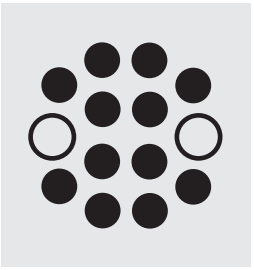
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

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

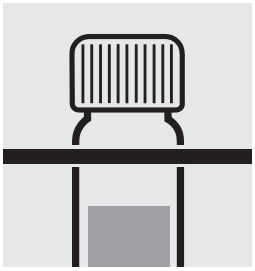


Suspend the bottom sediment in the cell by swirling.

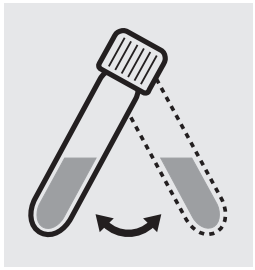
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



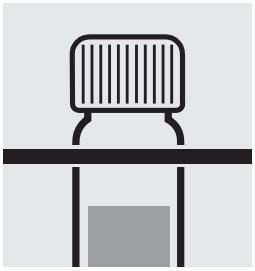
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



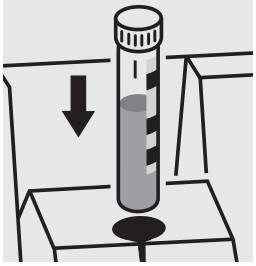
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

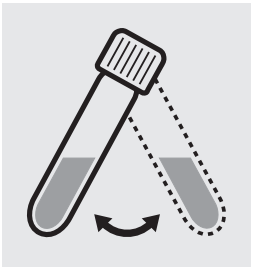
Quality assurance:

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.

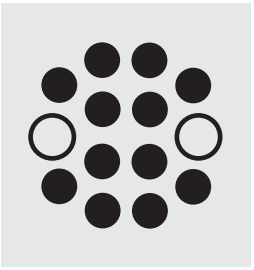
14555 · Chemical Oxygen Demand

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

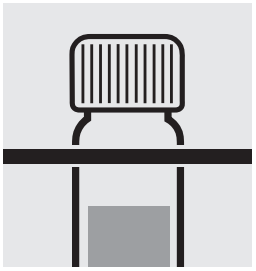


Suspend the bottom sediment in the cell by swirling.

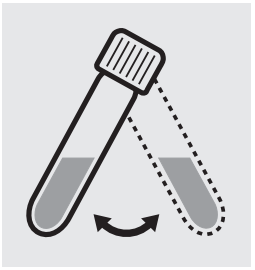
Carefully pipette 1.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



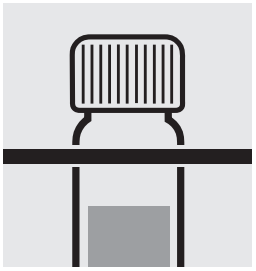
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



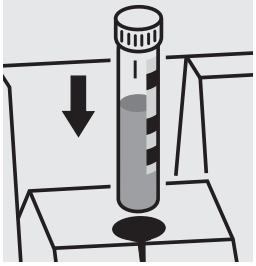
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



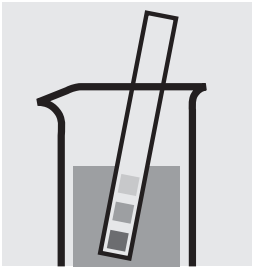
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

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

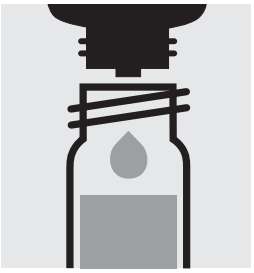
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

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



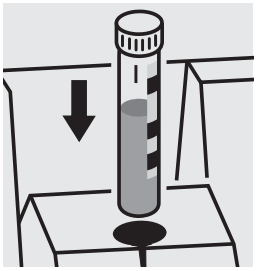
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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).

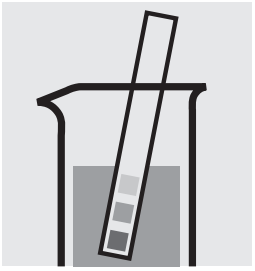
Quality assurance:

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.

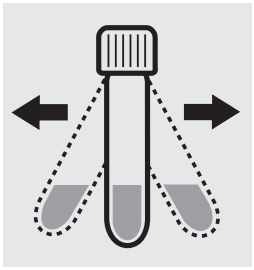
Measuring range:	0.05 – 4.00 mg/l Fe Expression of results also possible in mmol/l.



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.

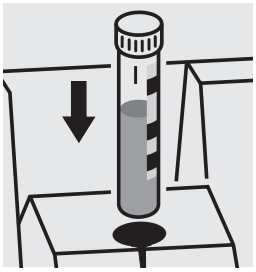
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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).

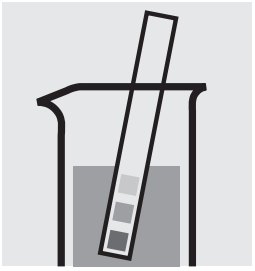
Quality assurance:

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.

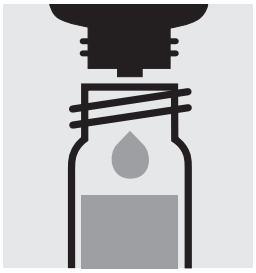
Measuring range:	0.10 – 6.00 mg/l Ni Expression of results also possible in mmol/l.



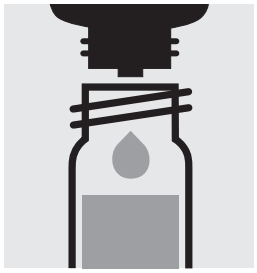
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

Reaction time:
1 minute

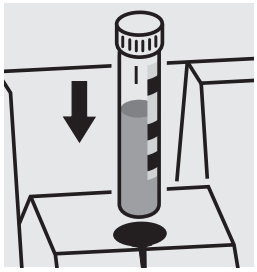


Add 2 drops of **Ni-1K**, close with the screw cap, and mix.



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 diluting accordingly.

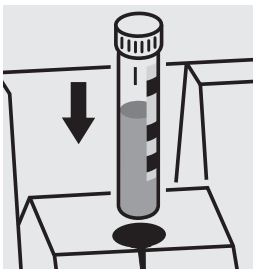
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

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:

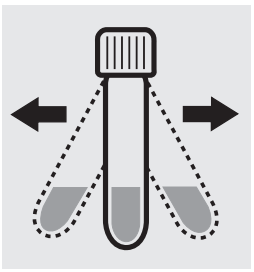
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20, Cat.No. 250483.

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	0.5 – 18.0 mg/l NO_3-N
range:	2.2 – 79.7 mg/l NO_3
	Expression of results also possible in mmol/l.

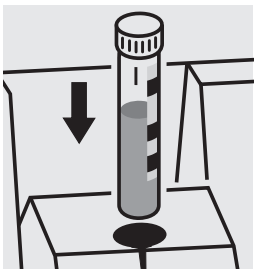
Add 1 level yellow microspoon of **NO_3-1K** into a reaction cell and close with the screw cap.



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.

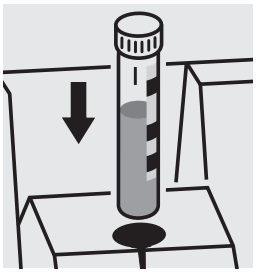
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

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.

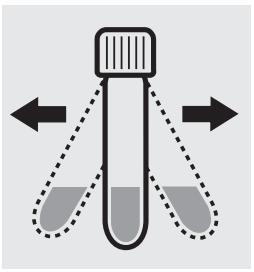
Ready-for-use nitrate standard solution, Cat.No. 250476, concentration 1000 mg/l NO_3^-, can also be used after diluting accordingly.

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

Measuring	0.10 – 3.00 mg/l NO_3-N
range:	0.4 – 13.3 mg/l NO_3
	Expression of results also possible in mmol/l.

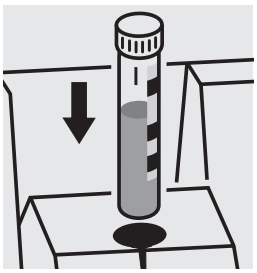
Pipette 2.0 ml of the sample into a reaction cell, **do not mix**.

Add 1 level blue microspoon of **NO_3-1K**, **immediately** close the cell tightly with the screw cap. **Caution, foams strongly (eye protection, protective gloves)!**



Shake the cell **vigorously for 5 seconds** to dissolve the solid substance.

Reaction time: 30 minutes



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

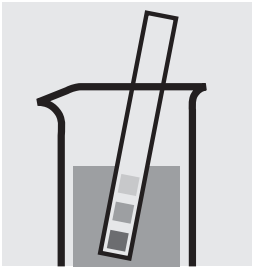
Quality assurance:

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

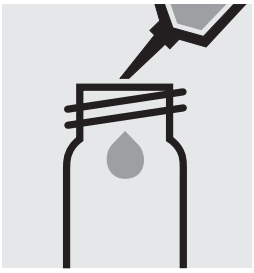
Ready-for-use nitrate standard solution, Cat.No. 250476, concentration 1000 mg/l NO_3^-, can also be used after diluting accordingly.

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

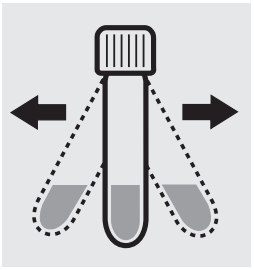
Measuring	0,010 – 0,700 mg/l NO_2-N
range:	0,03 – 2,30 mg/l NO_2
	Expression of results also possible in mmol/l.



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

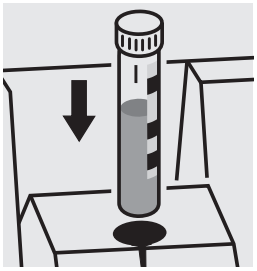


Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 10 minutes

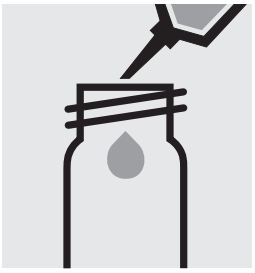


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

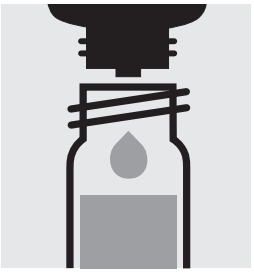
To check the measurement system (test reagents, measurement device, and handling) ready-for-use nitrite standard solution, Cat.No. 250477, concentration 1000 mg/l NO_2^-, can be used after diluting accordingly.

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

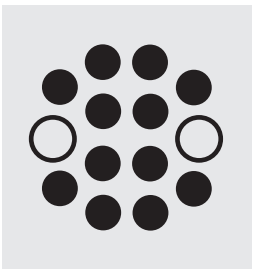


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

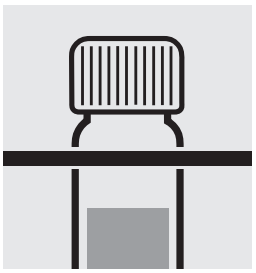
Add 1 level blue microspoon of **N-1K.**



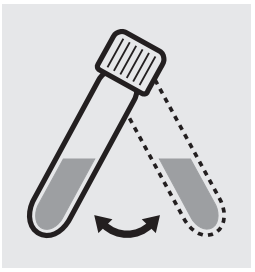
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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

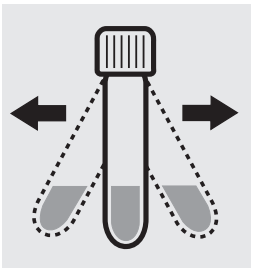


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.



Swirl the cell after 10 minutes.

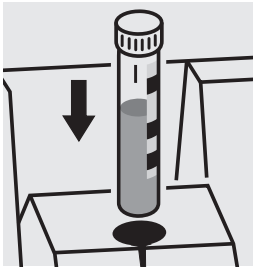
Add 1 level yellow microspoon of **N-3K into a reaction cell**, close the cell with the screw cap.



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



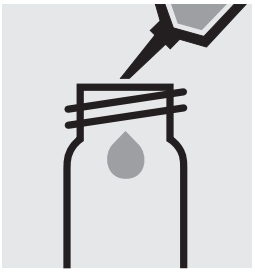
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

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

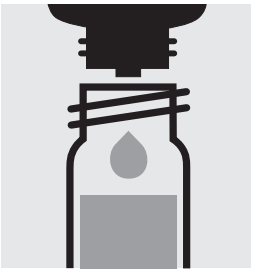
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

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

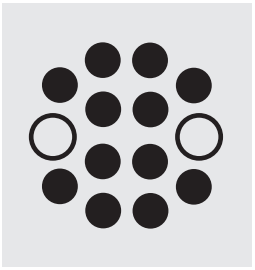


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

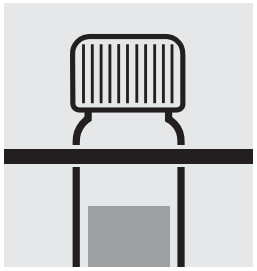
Add 1 level blue micro-spoon of **N-1K.**



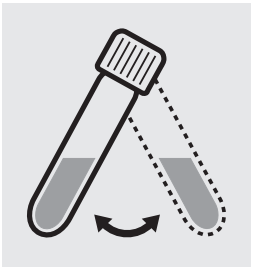
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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**.

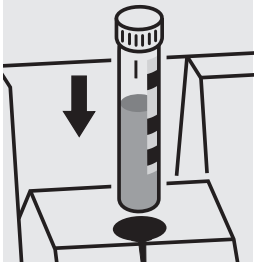


Swirl the cell after 10 minutes.

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



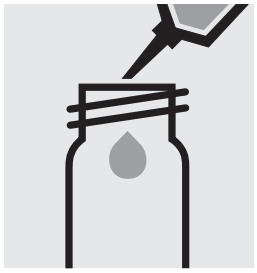
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

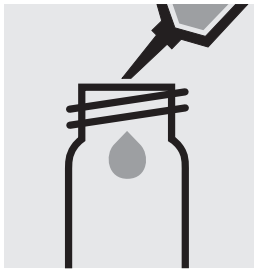
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 50, Cat.No. 250486.

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.

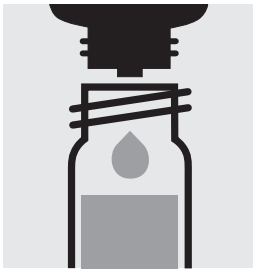


Pipette 1.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

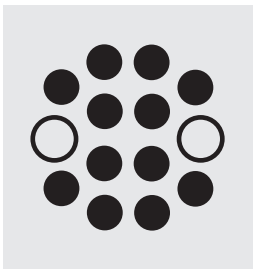


Add 9.0 ml of distilled water (Water for analysis EMSURE®, Merck-Cat. No. 116754, is recommended) with pipette.

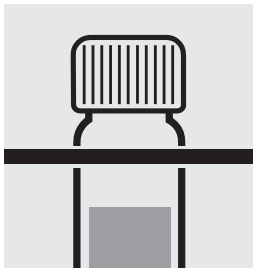
Add 1 level blue microspoon of **N-1K.**



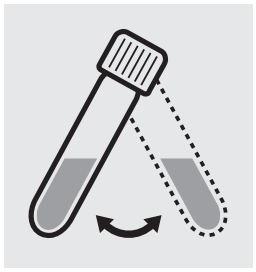
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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**.

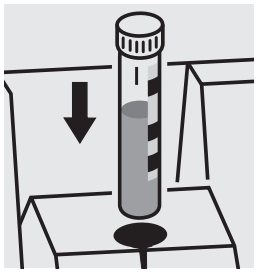


Swirl the cell after 10 minutes.

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:

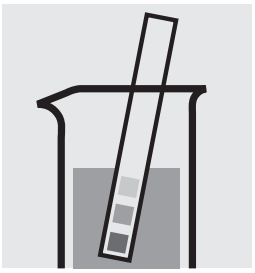
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 70, Cat.No. 250488.

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

P6/25 · Phosphate

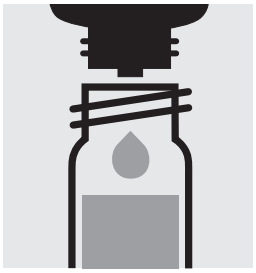
Determination of orthophosphate

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.

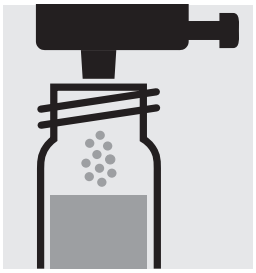


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

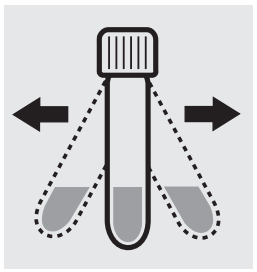
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

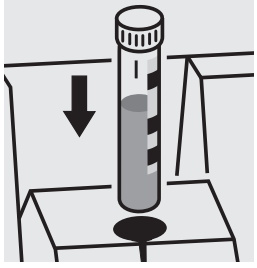


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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.

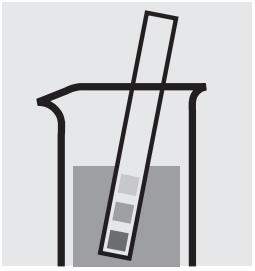
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

P6/25 · Phosphate

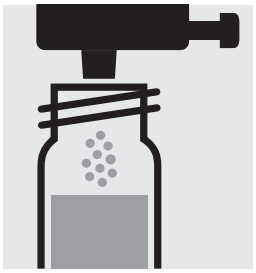
Determination of total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate

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)].



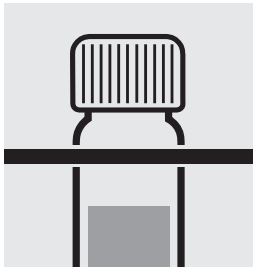
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

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

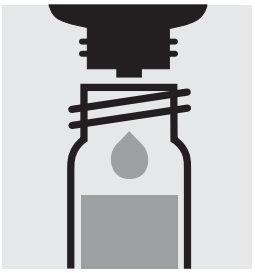


Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.

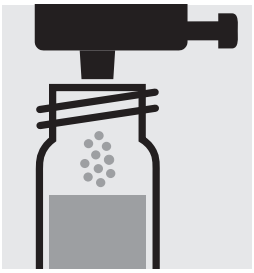
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



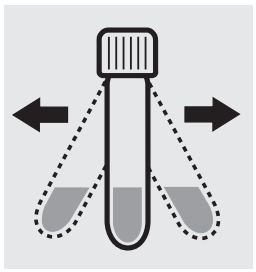
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

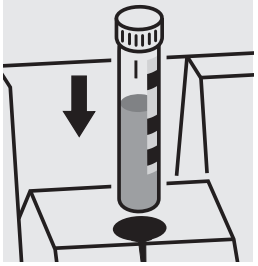


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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.

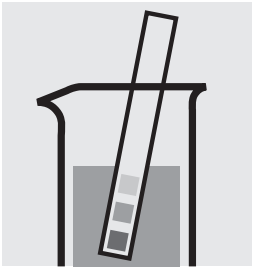
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

* P org is the sum of polyphosphate and organophosphate.

P7/25 · Phosphate

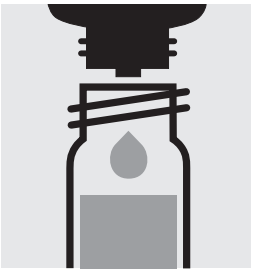
Determination of orthophosphate

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.

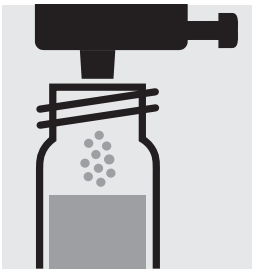


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

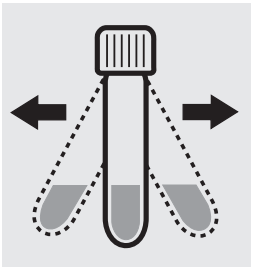
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

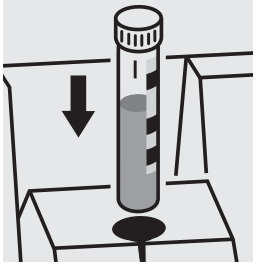


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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.

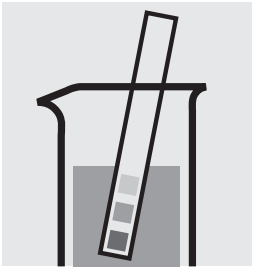
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

P7/25 · Phosphate

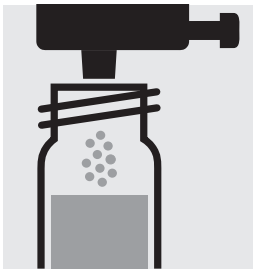
Determination of total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate

Measuring 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)].

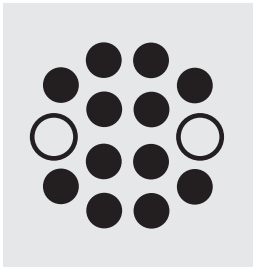


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

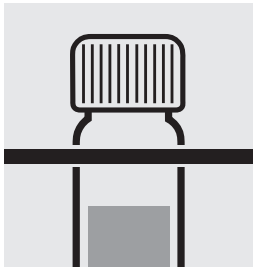
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



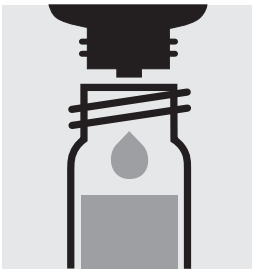
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



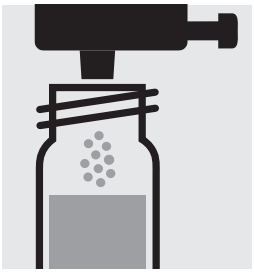
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



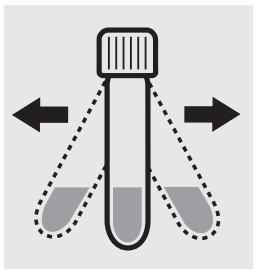
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

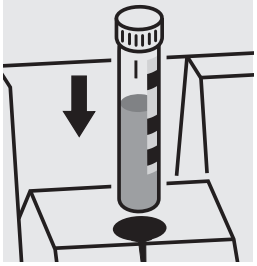


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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 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.

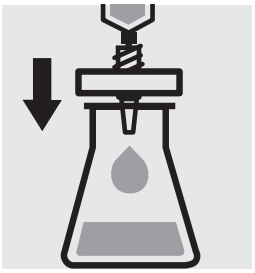
Quality assurance:

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

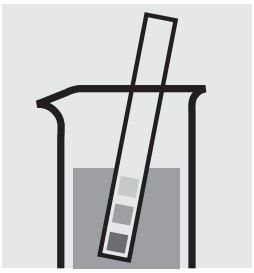
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

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



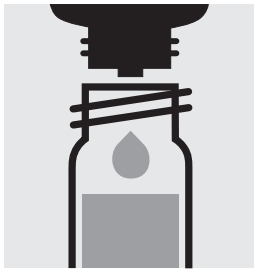
Filter turbid samples.



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.

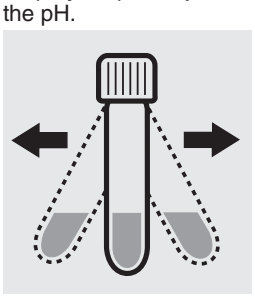
Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



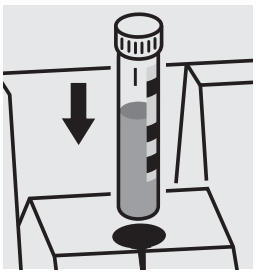
Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes

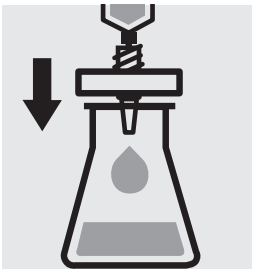


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

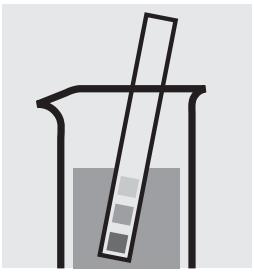
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use potassium standard solution, Cat.No. 252471, concentration 1000 mg/l K, can be used after diluting accordingly.

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



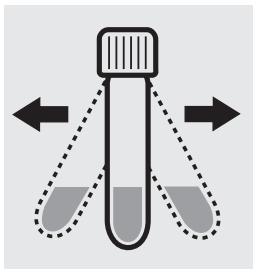
Filter turbid samples.



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.

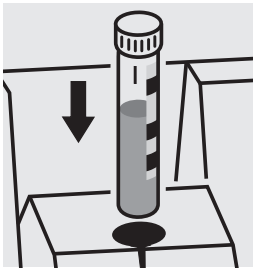
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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.

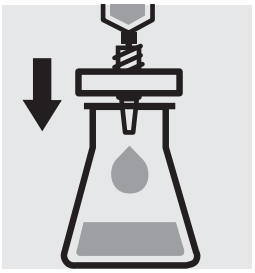
Quality assurance:

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

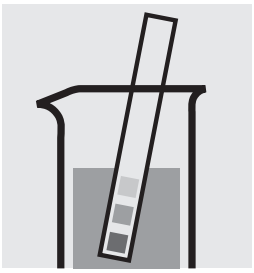
Ready-for-use sulfate standard solution, Cat.No. 250480, concentration 1000 mg/l SO_4^{2-}, can also be used after diluting accordingly.

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.



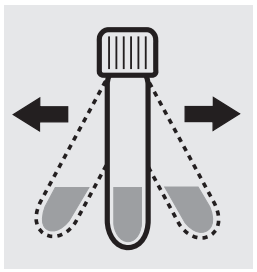
Filter turbid samples.



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.

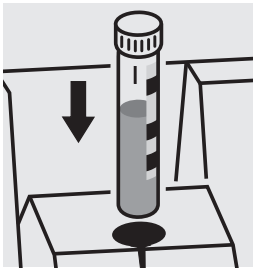
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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.

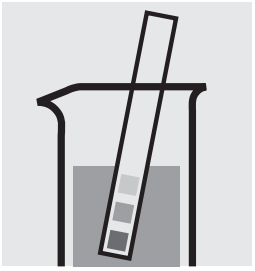
Quality assurance:

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

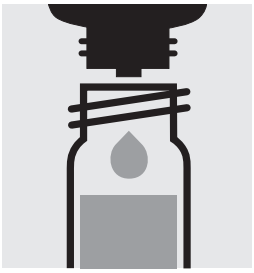
Ready-for-use sulfate standard solution, Cat.No. 250480, concentration 1000 mg/l SO_4^{2-}, can also be used after diluting accordingly.

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.

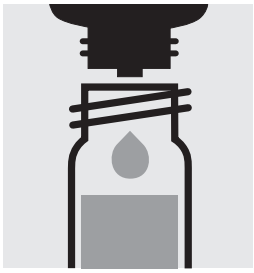


Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



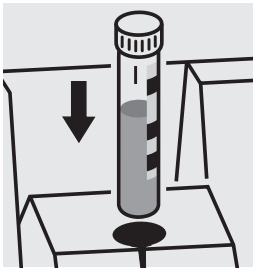
Add 5 drops of **Zn-1K** into a reaction cell, close with the screw cap, and mix.

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.

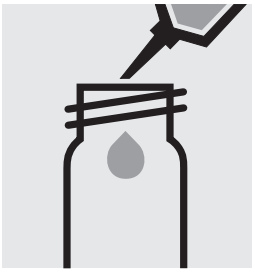
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Acid Capacity to pH 4.3 (Total Alkalinity)

101758

Cell Test

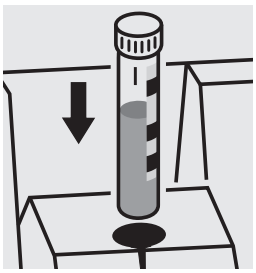
Measuring range:	0.40 –	8.00	mmol/l
	20 –	400	mg/l $CaCO_3$



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:

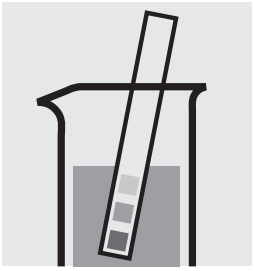
To check the measurement system (test reagents, measurement device, and handling) a sodium hydroxide solution 0.1 mol/l, Cat.No. 109141, can be used after diluting accordingly (see section “Standard solutions”).

Aluminium

100594

Cell Test

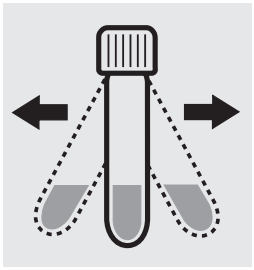
Measuring range:	0.02 – 0.50 mg/l Al Expression of results also possible in mmol/l.



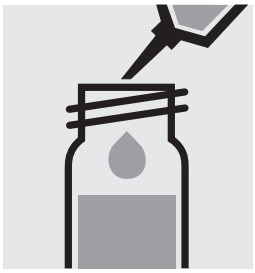
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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.

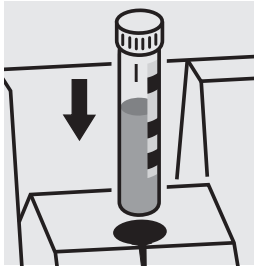


Shake the cell vigorously to dissolve the solid substance.



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:

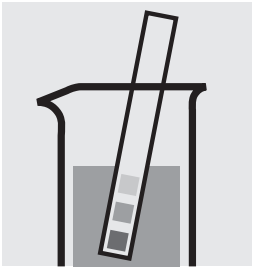
To check the measurement system (test reagents, measurement device, and handling) ready-for-use aluminium standard solution Certipur®, Cat.No. 119770, concentration 1000 mg/l Al can be used after diluting accordingly.

Aluminium

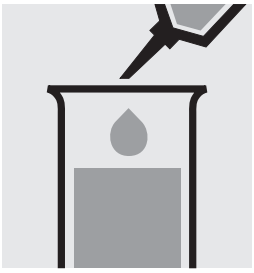
114825

Test

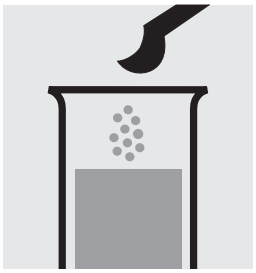
Measuring	0.10 – 1.20 mg/l Al	10-mm cell
range:	0.05 – 0.60 mg/l Al	20-mm cell
	0.020 – 0.200 mg/l Al	50-mm cell
	Expression of results also possible in mmol/l.	



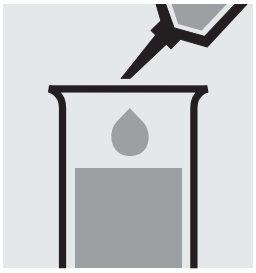
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



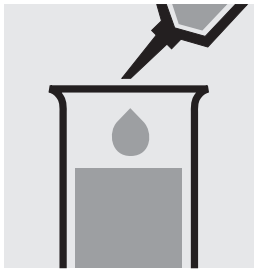
Pipette 5.0 ml of the sample into a test tube.



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

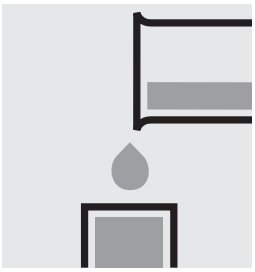


Add 1.2 ml of **Al-2** with pipette and mix.

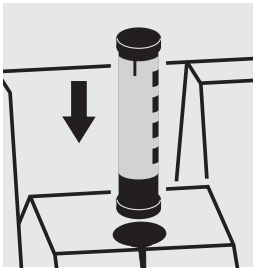


Add 0.25 ml of **Al-3** with pipette and mix.

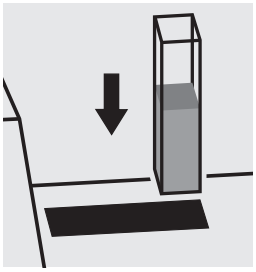
Reaction time:
2 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

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 aluminium standard solution Certipur®, Cat.No. 119770, concentration 1000 mg/l Al, can also be used after diluting accordingly.

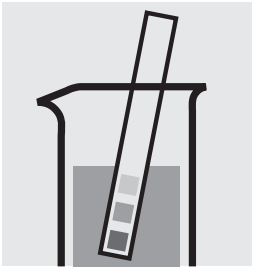
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Ammonium

114739

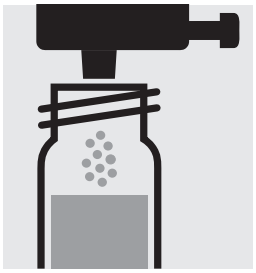
Cell Test

Measuring	0.010 – 2.000 mg/l NH_4-N
range:	0.01 – 2.58 mg/l NH_4
	0.010 – 2.000 mg/l NH_3-N
	0.01 – 2.43 mg/l NH_3
	Expression of results also possible in mmol/l.

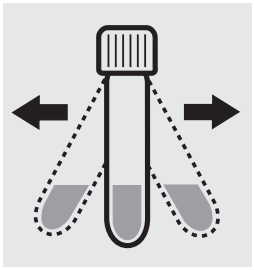


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

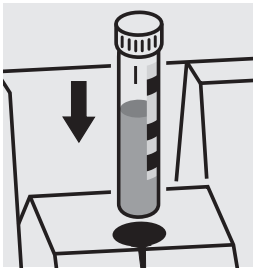


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the 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.

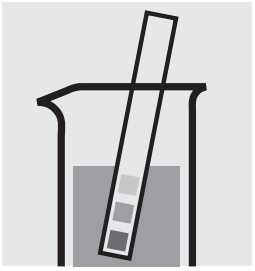
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Ammonium

114558

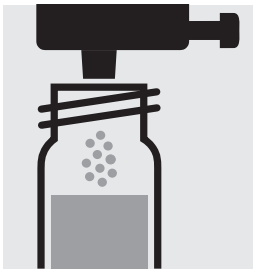
Cell Test

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

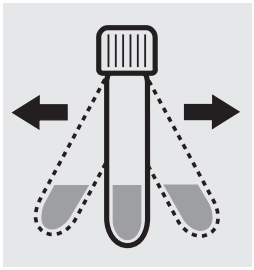


Check the pH of the sample, specified range: pH 4 – 13
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

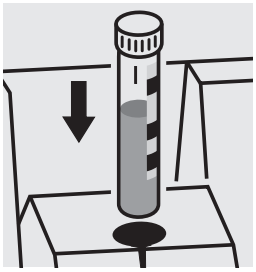


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the 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.

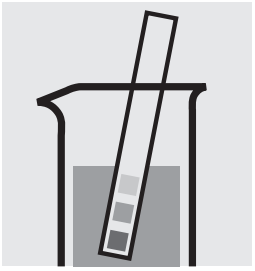
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Ammonium

114544

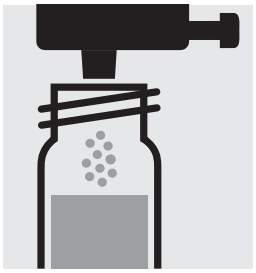
Cell Test

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

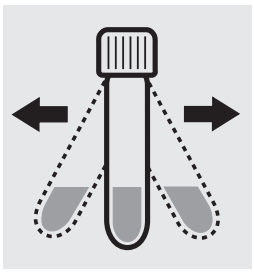


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

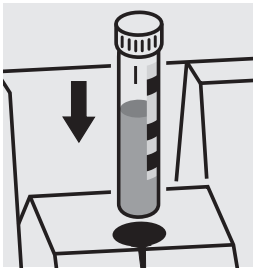


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the 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.

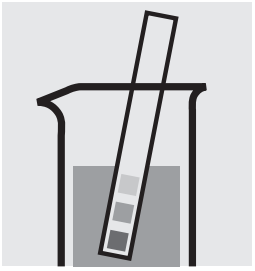
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Ammonium

114559

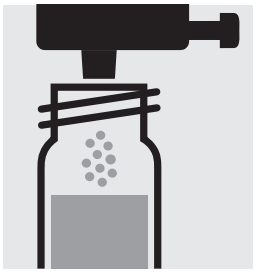
Cell Test

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

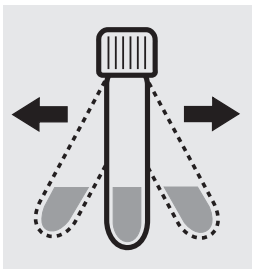


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

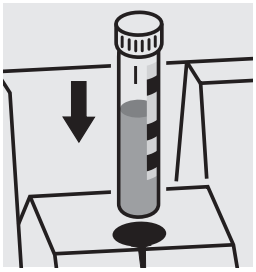


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Place the cell into the 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.

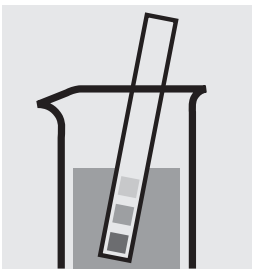
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

Ammonium

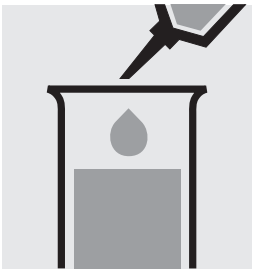
114752

Test

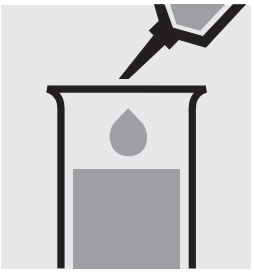
Measuring	0.05 – 3.00 mg/l NH_4-N	0.06 – 3.86 mg/l NH_4	10-mm cell
range:	0.05 – 3.00 mg/l NH_3-N	0.06 – 3.65 mg/l NH_3	10-mm cell
	0.03 – 1.50 mg/l NH_4-N	0.04 – 1.93 mg/l NH_4	20-mm cell
	0.03 – 1.50 mg/l NH_3-N	0.04 – 1.82 mg/l NH_3	20-mm cell
	0.010 – 0.500 mg/l NH_4-N	0.013 – 0.644 mg/l NH_4	50-mm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



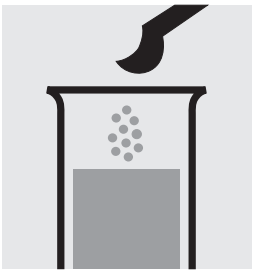
Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



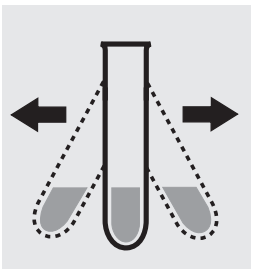
Pipette 5.0 ml of the sample into a test tube.



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

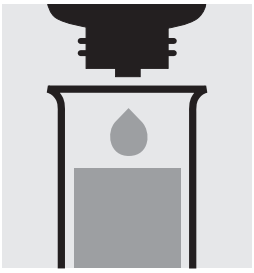


Add 1 level blue microspoon of **NH_4-2**.



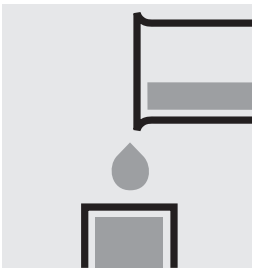
Shake vigorously to dissolve the solid substance.

Reaction time:
5 minutes

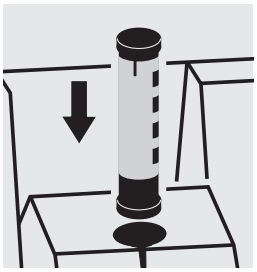


Add 4 drops of **NH_4-3** and mix.

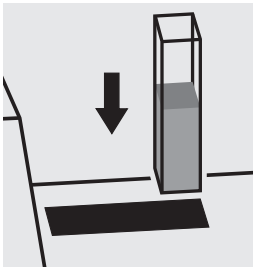
Reaction time:
5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

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, 125023, and 125024.

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.

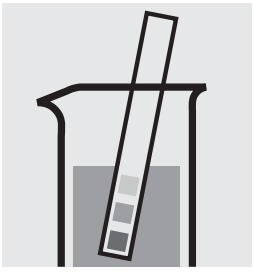
Ammonium

100683

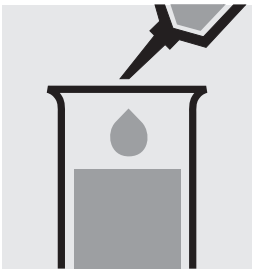
Test

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

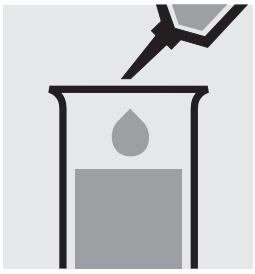
Measuring range: 2.0 – 75.0 mg/l NH_4-N



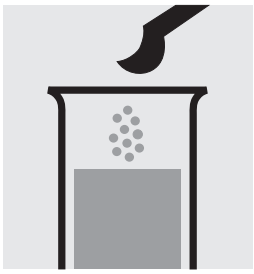
Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



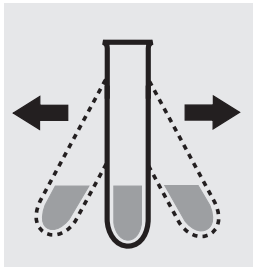
Pipette 5.0 ml of **NH_4-1** into a test tube.



Add 0.20 ml of the sample with pipette.

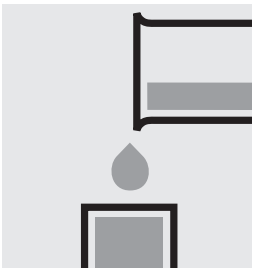


Add 1 level blue micro-spoon of **NH_4-2**.

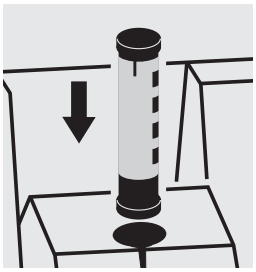


Shake vigorously to dissolve the solid substance.

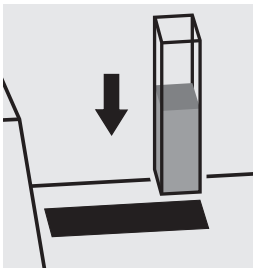
Reaction time:
15 minutes



Transfer the solution into a cell.

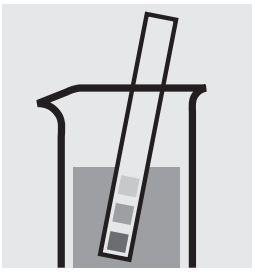


Select method with AutoSelector measuring range 2.0 – 75.0 mg/l NH_4-N.

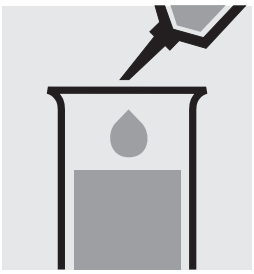


Place the cell into the cell compartment.

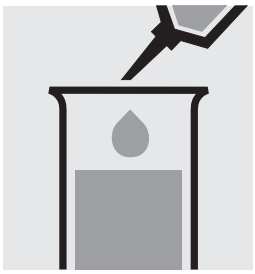
Measuring range: 5 – 150 mg/l NH_4-N



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



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



Add 0.10 ml of the sample with pipette.

Continue as mentioned above; starting from the addition of **NH_4-2** (Fig. 4). Select method with AutoSelector measuring range 5 – 150 mg/l NH_4-N.

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.

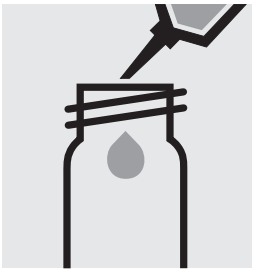
Ready-for-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH_4^+, can also be used after diluting accordingly.

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

Antimony in water and wastewater

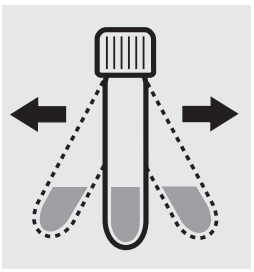
Application

Measuring range: 0.10 – 8.00 mg/l Sb 10-mm cell



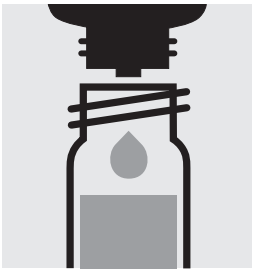
Pipette 4.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

Add approx. 1.5 g of **aluminium chloride hexahydrate extra pure** (Cat.No. 101084), close the cell with the screw cap.



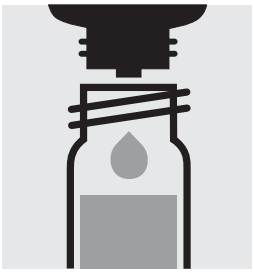
Shake the cell vigorously to dissolve the solid substance.

Add 1.0 ml **phosphoric acid 85 % GR** (Cat.No. 100573) with pipette, close the cell with the screw cap, and mix.



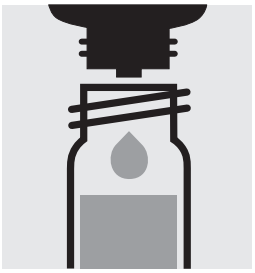
Add 2 drops of **reagent 1**, close the cell with the screw cap, and mix.

Reaction time:
3 minutes



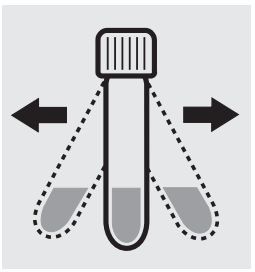
Add 2 drops of **reagent 2**, close the cell with the screw cap, and mix.

Reaction time:
2 minutes

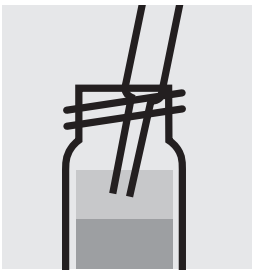


Add 2 drops of **reagent 3**, close the cell with the screw cap, and mix.

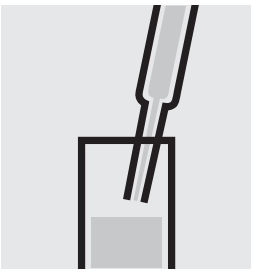
Add 5.0 ml **toluene GR** (Cat.No. 108325) with pipette, close the cell with the screw cap.



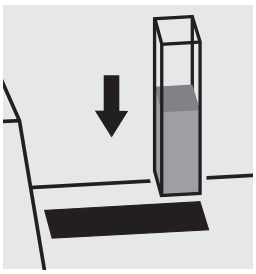
Shake the cell vigorously for 30 seconds. Leave to stand to allow phases to separate.



Aspirate the clear upper phase from the tube with pipette.



Transfer the solution into a rectangular cell.



Place the cell into the cell compartment. Select method no. **130**.

Note:

Empty cells with screw caps, Cat.No. 114724 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Important:

The exact composition and preparation of the reagents 1, 2, and 3 used are given in the corresponding application, which also includes further information on the method employed. This application can be downloaded directly at www.analytical-test-kits.com.

AOX

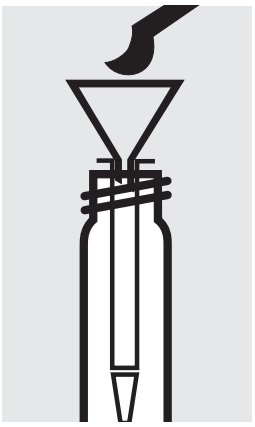
Adsorbable Organic Halogens (x)

100675

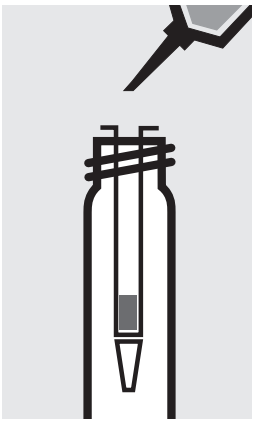
Cell Test

Measuring range: 0.05 – 2.50 mg/l AOX

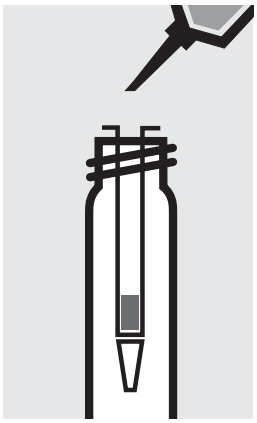
Preparation of the adsorption column:



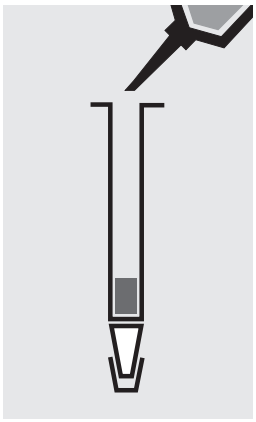
Place the column in an empty cell. Fill 1 level blue microspoon of **AOX-1** into the column using the glass funnel.



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

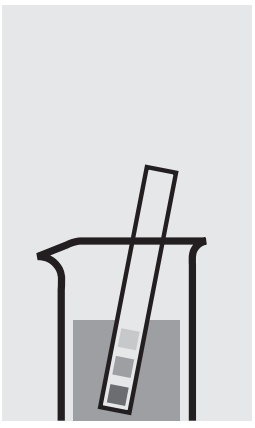


Run 3 separate 1-ml portions of **AOX-3** through the column. Discard the wash solution.

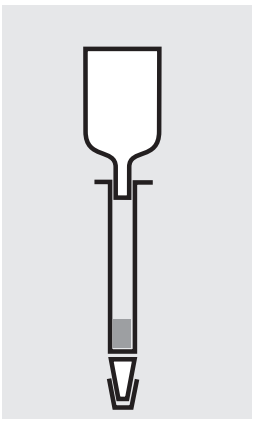


Close the bottom end of the column with the stopper. Apply to the column 1 ml of **AOX-3**. Close the top end of the column with the stopper and swirl to eliminate air bubbles. Remove the stopper on the top end and fill the column to the brim with **AOX-3**.

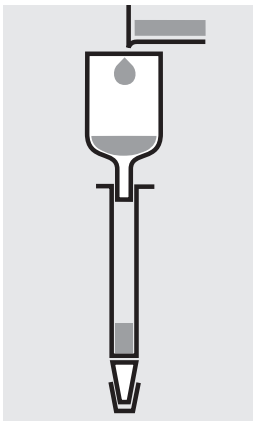
Sample enrichment:



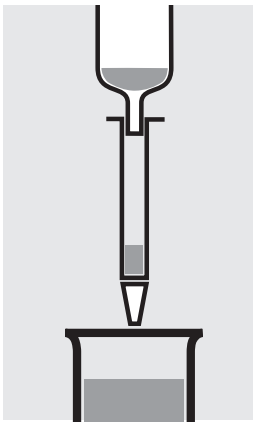
Check the pH of the sample, specified range: pH 6 – 7.
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



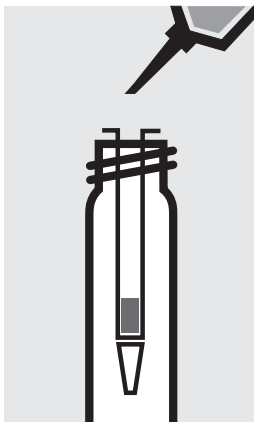
Attach the glass reservoir to the prepared column (closed at the bottom end).



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.

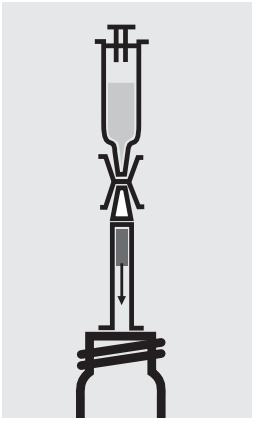
AOX

Adsorbable Organic Halogens (x)

100675

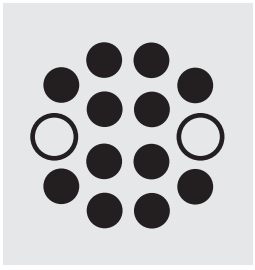
Cell Test

Digestion:

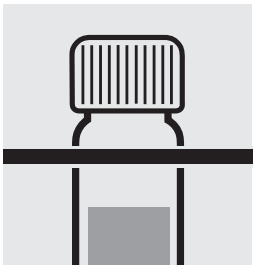


Fill the 10-ml syringe with 10 ml of reagent **AOX-5** and attach the syringe with the column outlet using the connector. Place the top end of the column on an empty cell and rinse the charcoal filling of the column into an empty 16-mm cell.

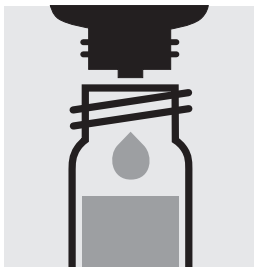
Add 2 level green microspoons of **AOX-6**, close the cell with the screw cap, and mix.



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.



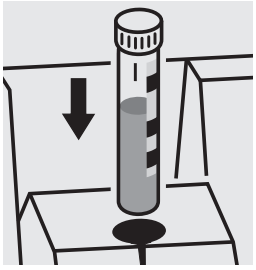
Add 5 drops of **AOX-4**, close the cell and mix; clear supernatant: **pretreated sample**.

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:

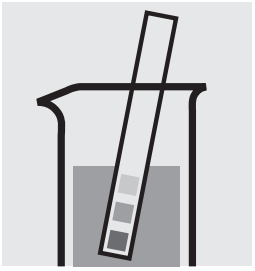
To check the measurement system (test reagents, measurement device, and handling) Spectroquant® AOX Standard, Cat.No. 100680, concentration 0.2 – 2.0 mg/l can be used.

Arsenic

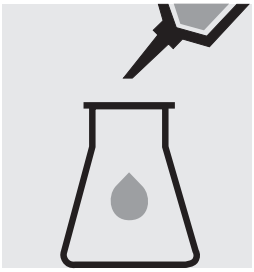
101747

Test

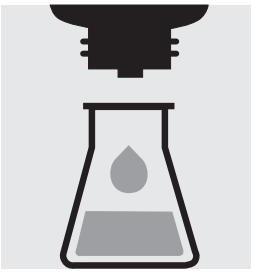
Measuring	0.005 – 0.100 mg/l As	10-mm cell
range:	0.001 – 0.020 mg/l As	20-mm cell
	Expression of results also possible in mmol/l.	



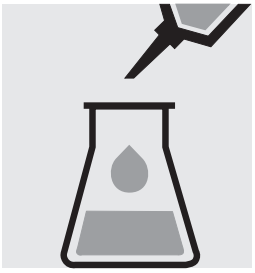
Check the pH of the sample, specified range: pH 0 – 13.



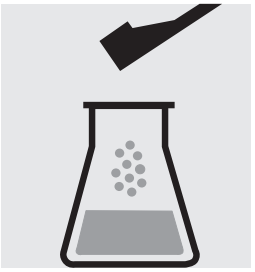
Place 350 ml of the sample into an Erlenmeyer flask with ground joint.



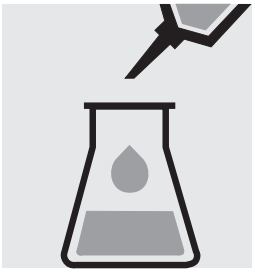
Add 5 drops of **As-1** and mix.



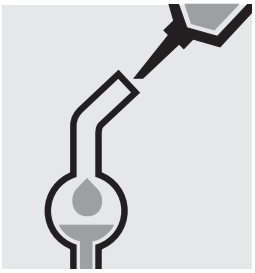
Add 20 ml of **As-2** with pipette and mix.



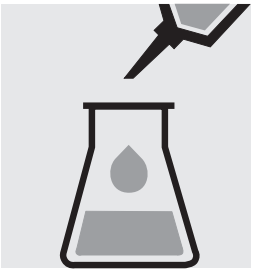
Add 1 level green dosing spoon of **As-3** and dissolve.



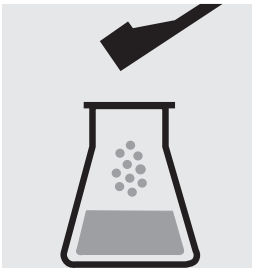
Add 1.0 ml of **As-4** with pipette and mix.



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

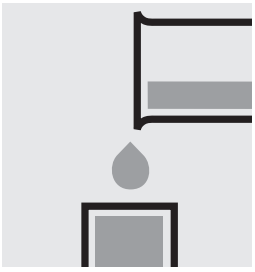


Add 1.0 ml of **As-6** with pipette to the solution in the Erlenmeyer flask and mix.

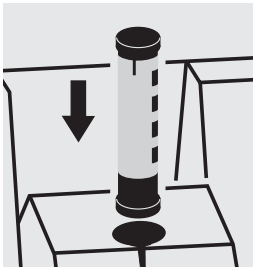


Add 3 level red dosing spoons of **As-7**. **Immediately** attach the absorption tube to the Erlenmeyer flask.

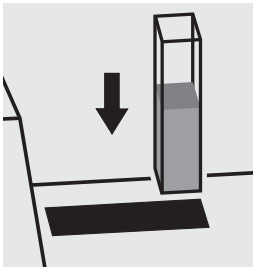
Leave to stand for 2 hours. During this time carefully swirl the flask several times or stir slowly with a magnetic stirrer.



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



Select method with AutoSelector.



Place the cell into the cell compartment.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use arsenic standard solution Certipur®, Cat.No. 119773, concentration 1000 mg/l As can be used after diluting accordingly.

BOD

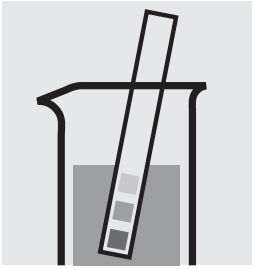
Biochemical Oxygen Demand

100687

Cell Test

Measuring range:	0.5 – 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)

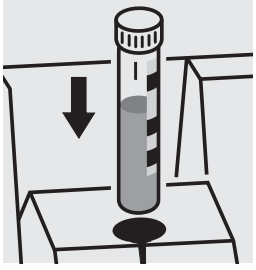
After incubation, use one bottle of **pretreated sample** and one of **inoculated nutrient-salt solution** for the measurement of the final oxygen concentration.

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:

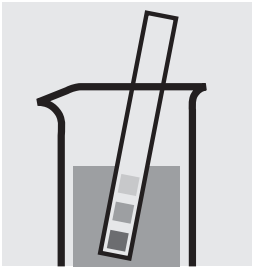
To check the measurement system (test reagents, measurement device, and handling) Spectroquant BOD Standard (acc. to EN 1899), Cat.No. 100718, can be used.

Boron

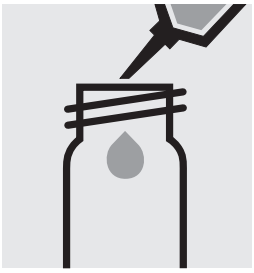
100826

Cell Test

Measuring range:	0,05 – 2,00 mg/l B Expression of results also possible in mmol/l.

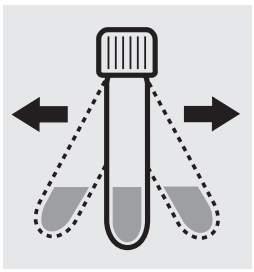


Check the pH of the sample, specified range: pH 2 – 12.
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



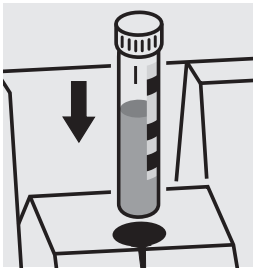
Pipette 1.0 ml of **B-1K** into a reaction cell, close with the screw cap, and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 60 minutes



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

Quality assurance:

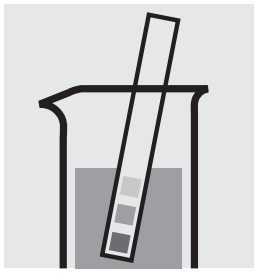
To check the measurement system (test reagents, measurement device, and handling) ready-for-use boron standard solution Certipur®, Cat.No. 119500, concentration 1000 mg/l B can also be used after diluting accordingly.

Boron

114839

Test

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

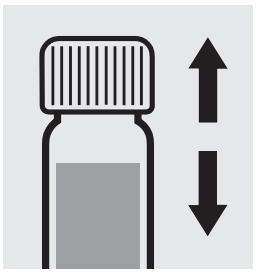


Check the pH of the sample, specified range: pH 1 – 13.

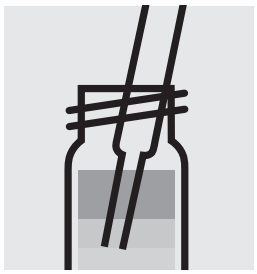
Pipette 5.0 ml of the sample into a test tube with screw cap. **(Important: Do not use test tubes made of glass containing boron!)**

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

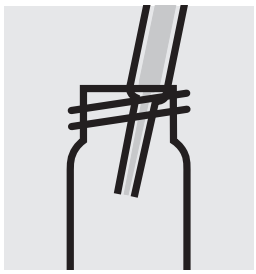
Add 1.5 ml of **B-2** with pipette and close with the screw cap.



Shake the tube vigorously for 1 minute.

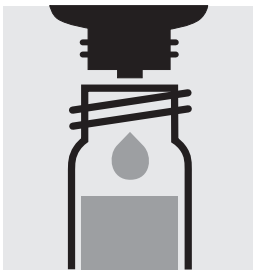


Aspirate 0.5 ml of the clear lower phase from the tube with pipette.

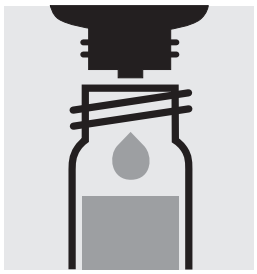


Transfer the extract to a separate fresh tube.

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



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

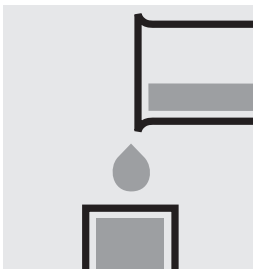


Add 15 drops of **B-5**, close with the screw cap, and mix.

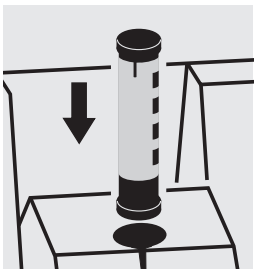
Reaction time: 12 minutes

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

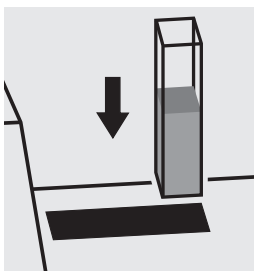
Reaction time: 2 minutes



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

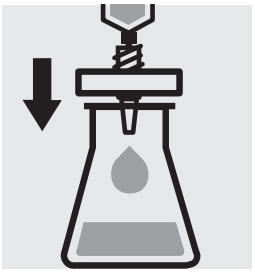
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use boron standard solution Certipur®, Cat.No. 119500, concentration 1000 mg/l B can also be used after diluting accordingly.

Bromate in water and drinking water

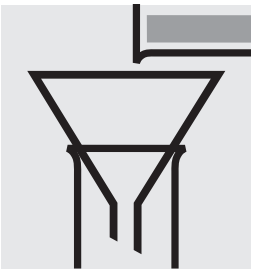
Application

Measuring range:	0.003 – 0.120 mg/l BrO_3 50-mm cell
Attention!	The measurement is carried out at 550 nm in a 50-mm rectangular cell against a blank, prepared from distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) and the reagents in an analogous manner.

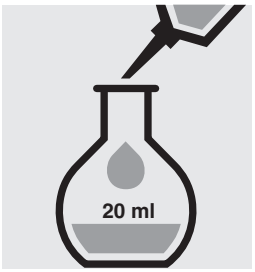


Filter turbid samples.

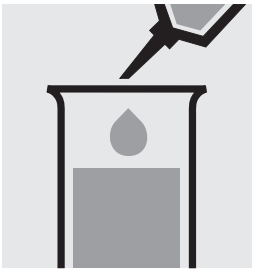
Evaporate 200 ml of sample solution in a glass beaker almost to dryness on the hob.



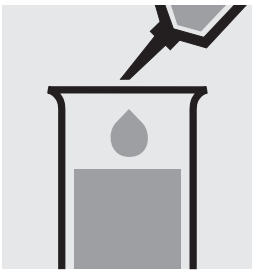
Transfer the residue to a 20-ml volumetric glass using a little distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended).



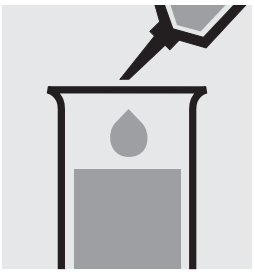
Make up the contents of the volumetric flask to the mark with distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) and mix thoroughly: **pretreated sample**.



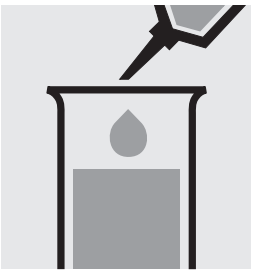
Pipette 10 ml of the pretreated sample into a test tube.



Add 0.10 ml of **reagent 1** with pipette and mix.

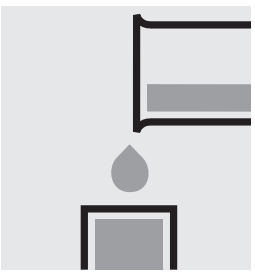


Add 0.20 ml of **reagent 2** with pipette and mix.

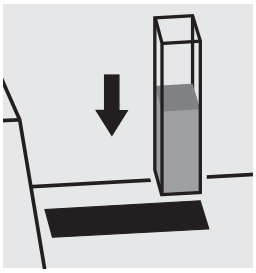


Add 0.20 ml **perchloric acid 70 - 72 % GR** (Cat. No. 100519) with pipette and mix.

Reaction time: 30 minutes



Transfer the solution into a cell.



Place the cell into the cell compartment.
Select method No. **1195**.

Important:

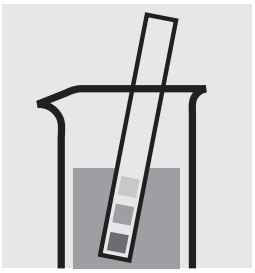
The exact composition and preparation of the reagents 1 and 2 used are given in the corresponding application, which also includes further information on the method employed. This application can be downloaded directly at www.analytical-test-kits.com.

Bromine

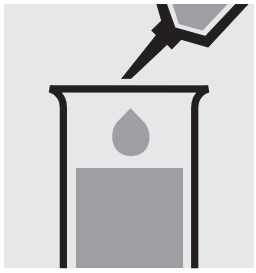
100605

Test

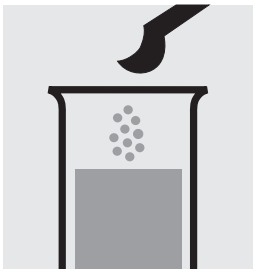
Measuring	0.10 – 10.00 mg/l Br_2	10-mm cell
range:	0.05 – 5.00 mg/l Br_2	20-mm cell
	0.020 – 2.000 mg/l Br_2	50-mm cell
	Expression of results also possible in mmol/l.	



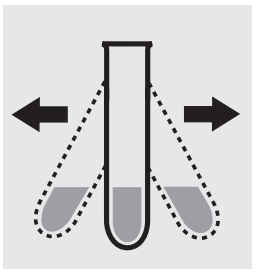
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.

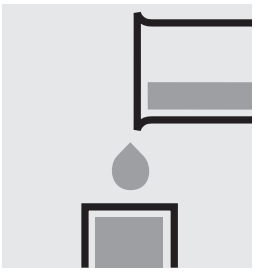


Add 1 level blue microspoon of **Br_2-1.**

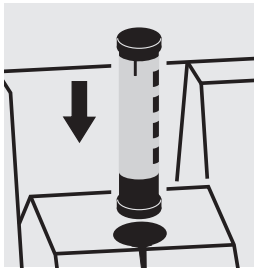


Shake vigorously to dissolve the solid substance.

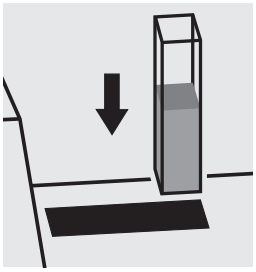
Reaction time: 1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

Quality assurance:

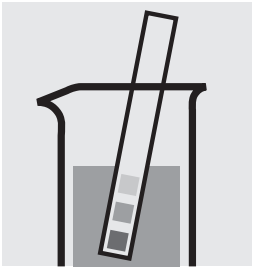
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

Cadmium

114834

Cell Test

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

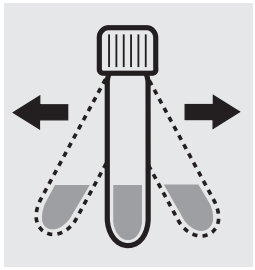


Check the pH of the sample, specified range: pH 3 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

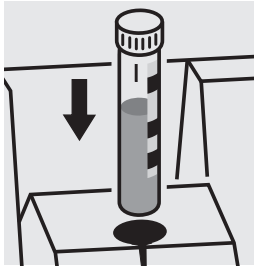
Add 0.20 ml of **Cd-1K** with pipette, close the cell with the screw cap, and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes



Place the cell into the 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.

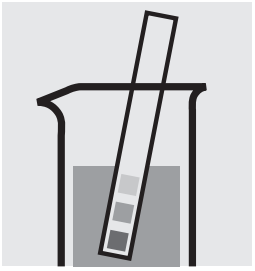
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

Cadmium

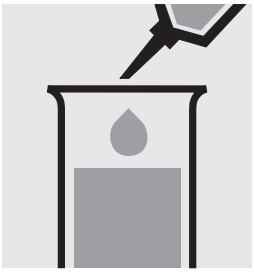
101745

Test

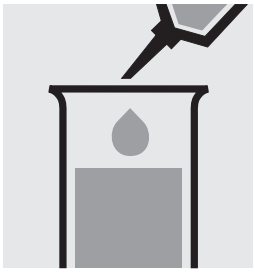
Measuring	0.010 – 0.500 mg/l Cd	10-mm cell
range:	0.005 – 0.250 mg/l Cd	20-mm cell
	0.0020 – 0.1000 mg/l Cd	50-mm cell
	Expression of results also possible in mmol/l.	



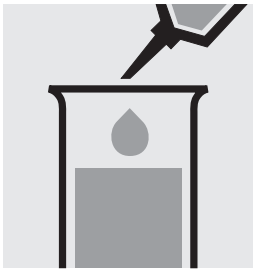
Check the pH of the sample, specified range: pH 3 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



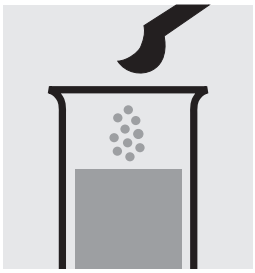
Pipette 1.0 ml of **Cd-1** into a test tube.



Add 10 ml of the sample with pipette and mix.

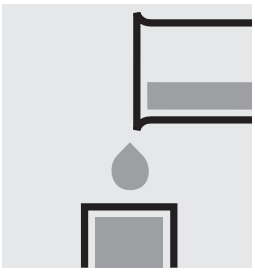


Add 0.20 ml of **Cd-2** with pipette and mix.

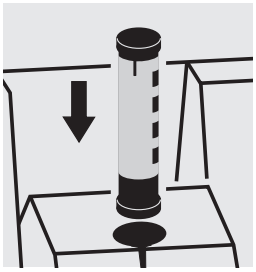


Add 1 level green microspoon of **Cd-3** and dissolve the solid substance.

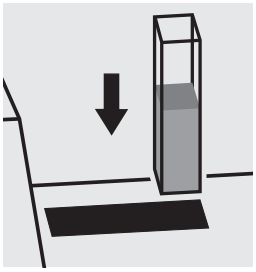
Reaction time:
2 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

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:

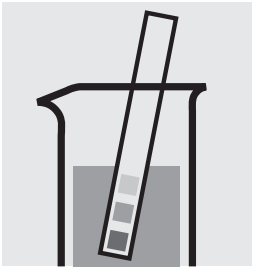
To check the measurement system (test reagents, measurement device, and handling) ready-for-use cadmium standard solution Certipur®, Cat.No. 119777, concentration 1000 mg/l Cd, can be used after diluting accordingly.

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.



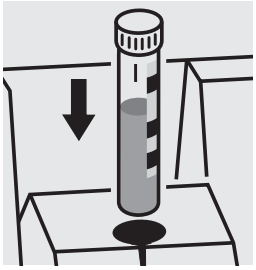
Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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”).

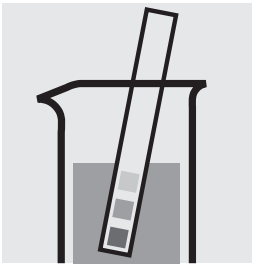
Calcium

114815

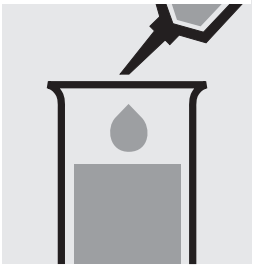
Test

Measuring	10	– 160	mg/l Ca	14	– 224	mg/l CaO	25	– 400	mg/l $CaCO_3$	10-mm cell
range:	5	– 80	mg/l Ca	7	– 112	mg/l CaO	12	– 200	mg/l $CaCO_3$	20-mm cell
	1.0	– 15.0	mg/l Ca	1.4	– 21.0	mg/l CaO	2.5	– 37.5	mg/l $CaCO_3$	10-mm cell
	Expression of results also possible in mmol/l.									

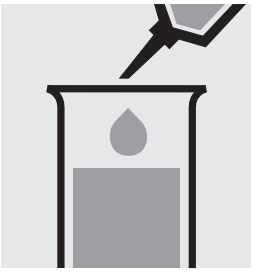
Measuring range: 5 – 160 mg/l Ca



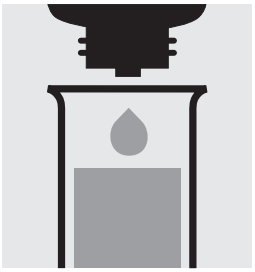
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



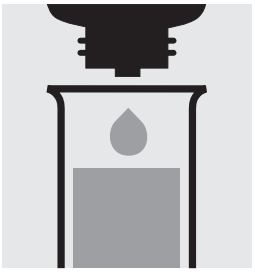
Pipette 0.10 ml of the sample into a test tube.



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

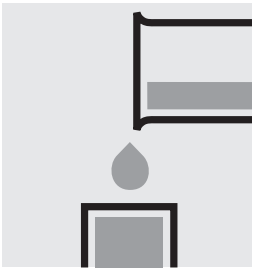


Add 4 drops of **Ca-2** and mix.

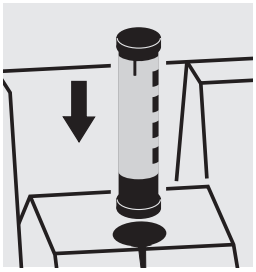


Add 4 drops of **Ca-3** and mix.

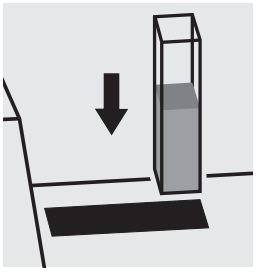
Reaction time:
8 minutes, **measure immediately**.



Transfer the solution into a corresponding cell

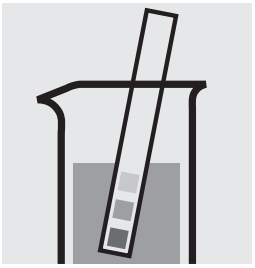


Select method with AutoSelector measuring range 5 - 160 mg/l Ca.

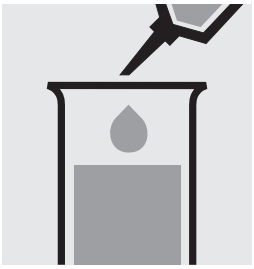


Place the cell into the cell compartment.

Measuring range: 1.0 – 15.0 mg/l Ca



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



Pipette 0.50 ml of the sample into a test tube.

Continue as mentioned above;
starting from the addition of **Ca-1** (Fig. 3). Measure in a 10-mm cell and select method with AutoSelector measuring range 1.0 – 15.0 mg/l Ca.

Quality assurance:

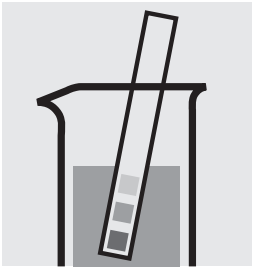
To check the measurement system (test reagents, measurement device, and handling) ready-for-use calcium standard solution Certipur®, Cat.No. 119778, concentration 1000 mg/l Ca, can be used after diluting accordingly.

Chloride

114730

Cell Test

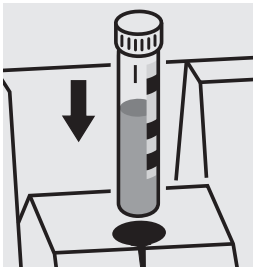
Measuring range:	5 – 125 mg/l Cl Expression of results also possible in mmol/l.



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.

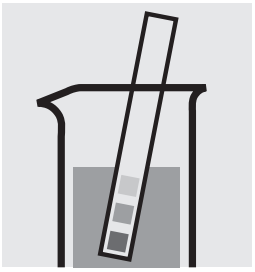
Chloride

114897

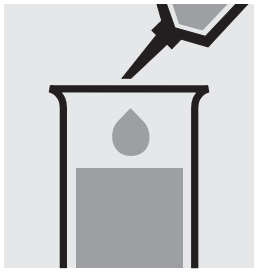
Test

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

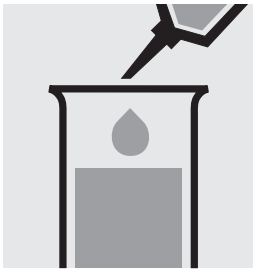
Measuring range: 10 – 250 mg/l Cl



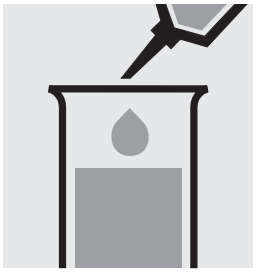
Check the pH of the sample, specified range: pH 1 – 12.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



Pipette 1.0 ml of the sample into a test tube.

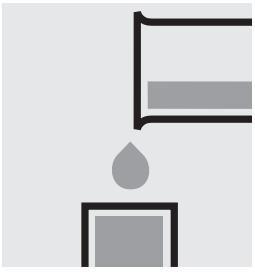


Add 2.5 ml of **Cl-1** with pipette and mix.

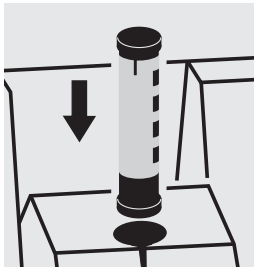


Add 0.50 ml of **Cl-2** with pipette and mix.

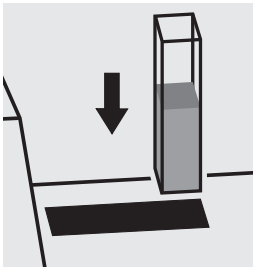
Reaction time: 1 minute



Transfer the solution into a cell.

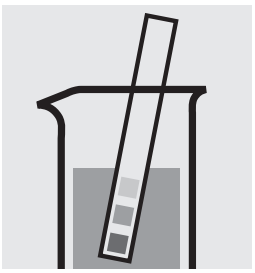


Select method with AutoSelector measuring range 10 – 250 mg/l Cl.

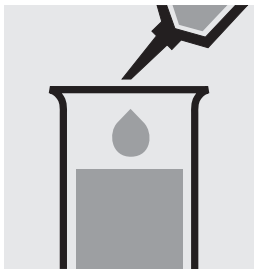


Place the cell into the cell compartment.

Measuring range: 2.5 – 25.0 mg/l Cl



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



Pipette 5.0 ml of the sample into a test tube.

Continue as mentioned above; starting from the addition of **Cl-1** (Fig. 3). Select method with AutoSelector measuring range 2.5 – 25.0 mg/l Cl.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 60, Cat.No. 114696.

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

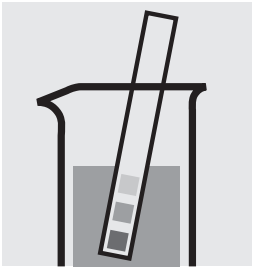
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 60) is highly recommended.

Chloride

101804

Cell Test

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

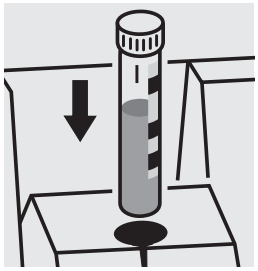


Check the pH of the sample, specified range: pH 3 – 11.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.

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

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

Reaction time: 10 minutes



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

Quality assurance:

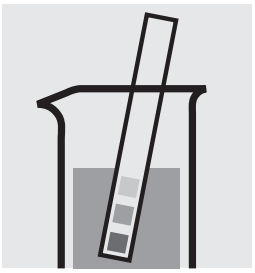
To check the measurement system (test reagents, measurement device, and handling) ready-for-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl^-, can be used after diluting accordingly.

Chloride

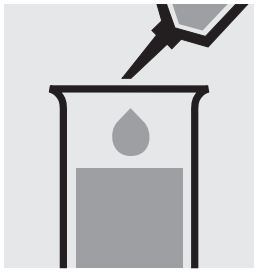
101807

Test

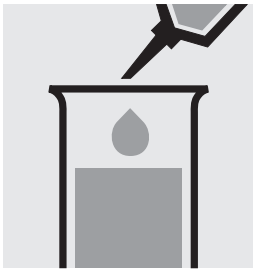
Measuring range:	0.10 – 5.00 mg/l Cl Expression of results also possible in mmol/l.	50-mm cell



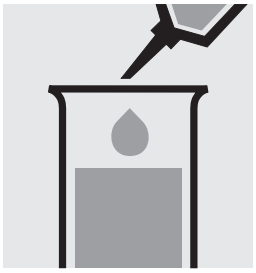
Check the pH of the sample, specified range: pH 3 – 11.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



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

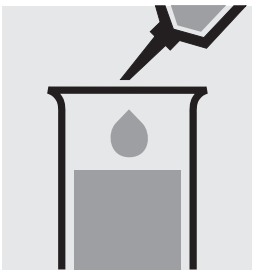


Add to one tube 10 ml of the sample with pipette and mix.

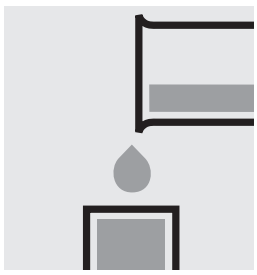


Add to the second tube 10 ml of of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) with pipette and mix.
(Blank cell)

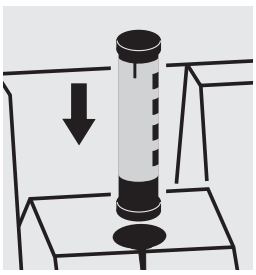
Reaction time: 10 minutes



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

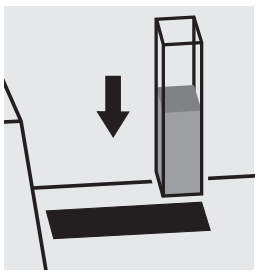


Transfer both solutions into two separate 50-mm-cells.

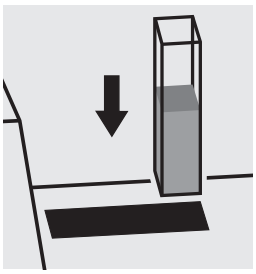


Select method with AutoSelector.

Configure the photometer for blank-measurement.



Place the blank cell into the cell compartment.



Place the cell containing the sample into the cell compartment.

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.

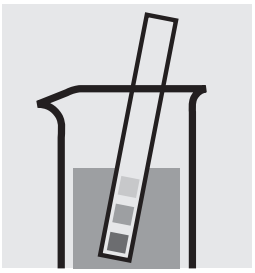
Chlorine

Determination of free chlorine

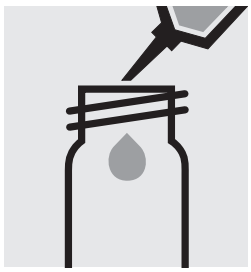
100595

Cell Test

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

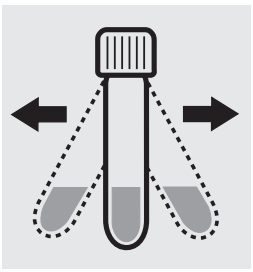


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



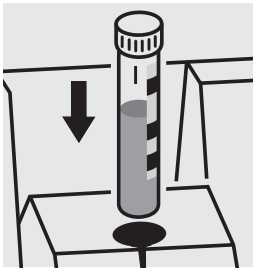
Pipette 5.0 ml of the sample into a round cell.

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

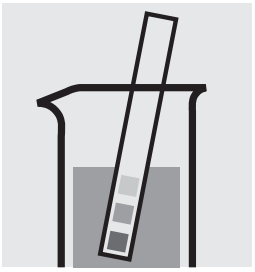
Determination of free chlorine and total chlorine

100597

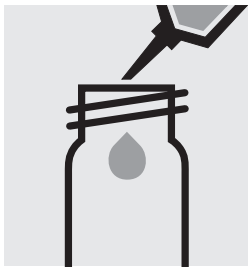
Cell Test

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

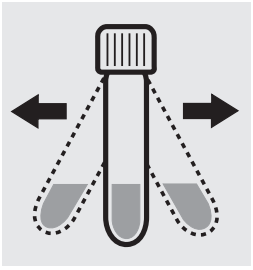


Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



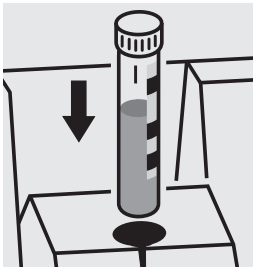
Pipette 5.0 ml of the sample into a round cell.

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”).

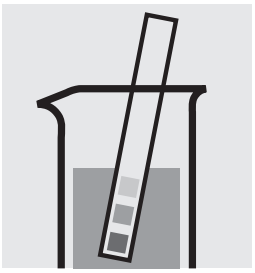
Chlorine

Determination of free chlorine

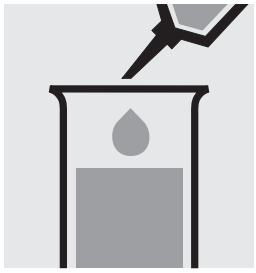
100598

Test

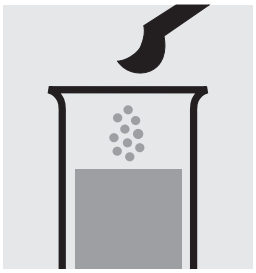
Measuring	0.05 – 6.00	mg/l Cl_2	10-mm cell
range:	0.02 – 3.00	mg/l Cl_2	20-mm cell
	0.010 – 1.000	mg/l Cl_2	50-mm cell
	Expression of results also possible in mmol/l.		



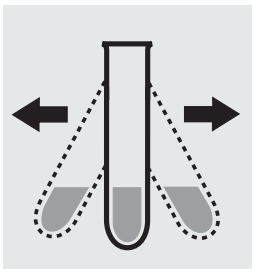
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.

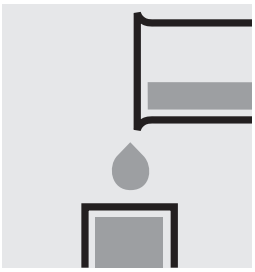


Add 1 level blue micro-spoon of **Cl_2-1**.

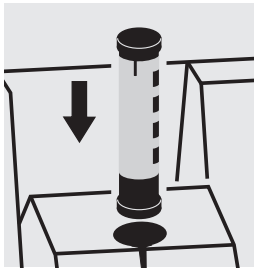


Shake vigorously to dissolve the solid substance.

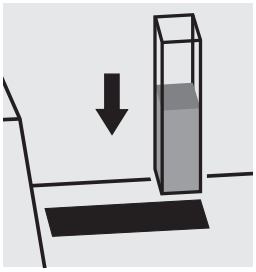
Reaction time: 1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

Quality assurance:

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

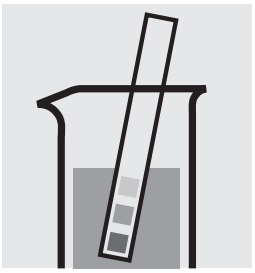
Chlorine

Determination of total chlorine

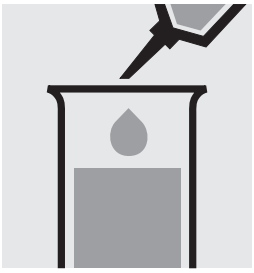
100602

Test

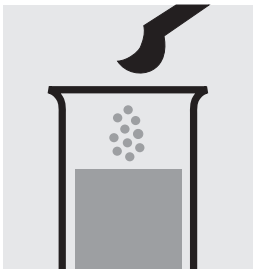
Measuring	0.05 – 6.00	mg/l Cl_2	10-mm cell
range:	0.02 – 3.00	mg/l Cl_2	20-mm cell
	0.010 – 1.000	mg/l Cl_2	50-mm cell
	Expression of results also possible in mmol/l.		



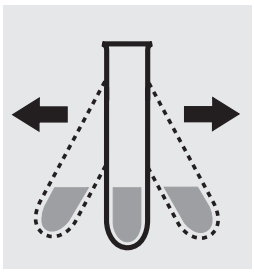
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



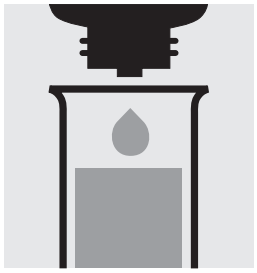
Pipette 10 ml of the sample into a test tube.



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

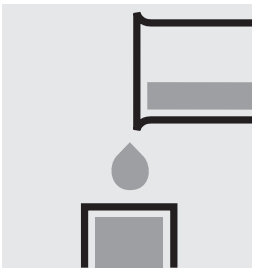


Shake vigorously to dissolve the solid substance.

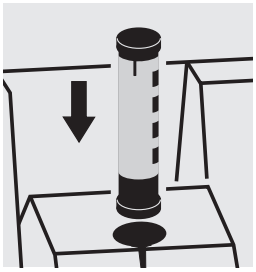


Add 2 drops of **Cl_2-2** and mix.

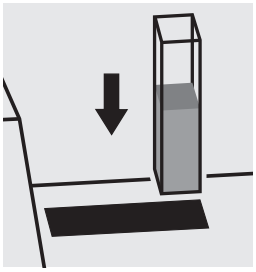
Reaction time:
1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

Quality assurance:

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

Chlorine

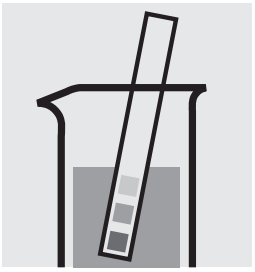
Determination of free chlorine and total chlorine

100599

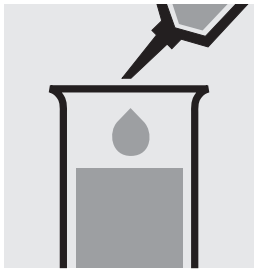
Test

Measuring	0.05 – 6.00	mg/l Cl_2	10-mm cell
range:	0.02 – 3.00	mg/l Cl_2	20-mm cell
	0.010 – 1.000	mg/l Cl_2	50-mm cell
	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)].		

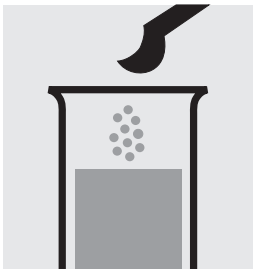
Determination of free chlorine



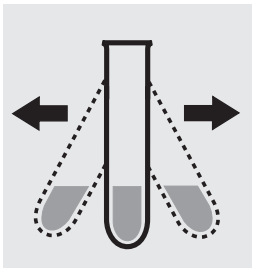
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.

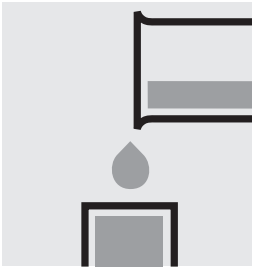


Add 1 level blue micro-spoon of **Cl_2-1**.

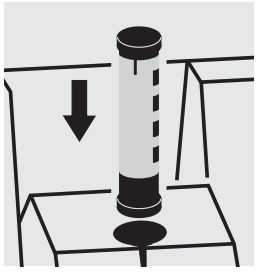


Shake vigorously to dissolve the solid substance.

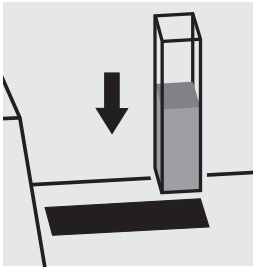
Reaction time: 1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Determination of total chlorine

Same preparation as described above, add 2 drops of **Cl_2-2** 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 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)

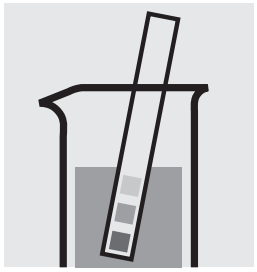
Determination of free chlorine and total chlorine

100086/100087/ 100088

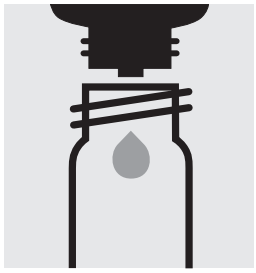
Cell Test

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)].

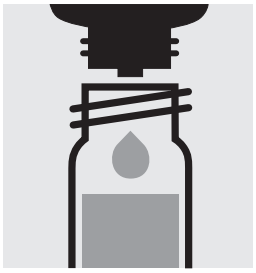
Determination of free chlorine



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.



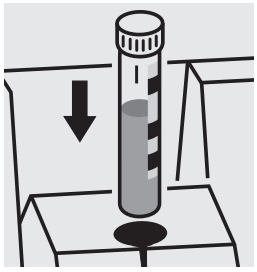
Place 6 drops of **Cl_2-1** into a round cell.



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”).

Chlorine (with liquid reagents)

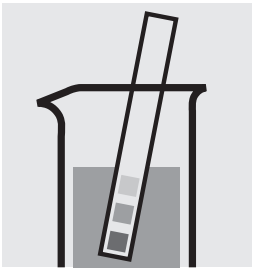
Detemination of free chlorine and total chlorine

100086/100087/ 100088

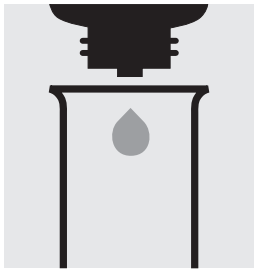
Test

Measuring range:	0.010– 1.000 mg/l Cl_2 50-mm cell 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)].

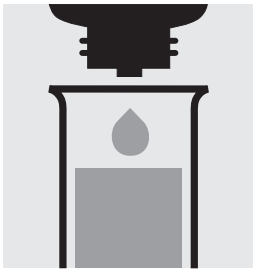
Determination of free chlorine



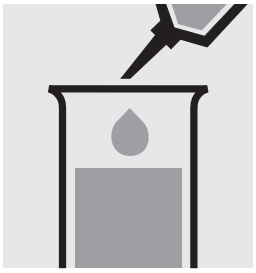
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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

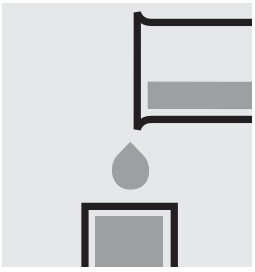


Add 3 drops of **Cl_2-2**, close with the screw cap, and mix.

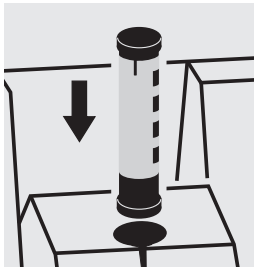


Add 10 ml of the sample with pipette, close with the screw cap, and mix.

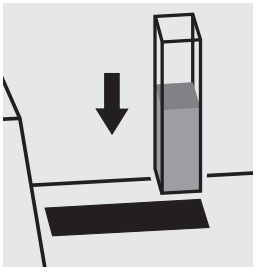
Reaction time: 1 minute



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Determination of total chlorine

Same preparation as described above, add 2 drops of **Cl_2-3** 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, mix using the microspatula, 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:

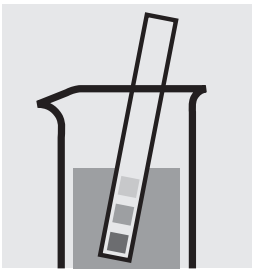
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

Chlorine Dioxide

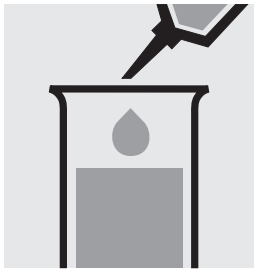
100608

Test

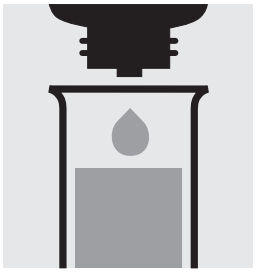
Measuring	0.10 – 10.00 mg/l ClO_2	10-mm cell
range:	0.05 – 5.00 mg/l ClO_2	20-mm cell
	0.020 – 2.000 mg/l ClO_2	50-mm cell
	Expression of results also possible in mmol/l.	



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

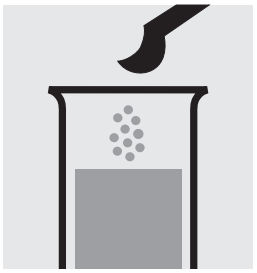


Pipette 10 ml of the sample into a test tube.

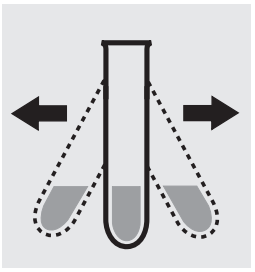


Add 2 drops of **ClO_2-1** and mix.

Reaction time:
2 minutes

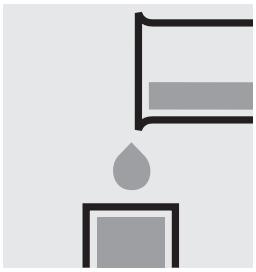


Add 1 level blue micro-spoon of **ClO_2-2.**

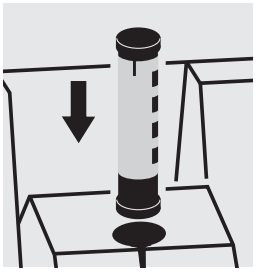


Shake vigorously to dissolve the solid substance.

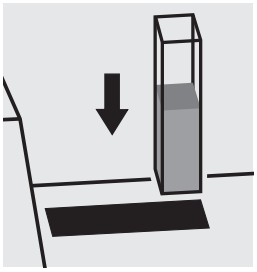
Reaction time:
1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

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”).

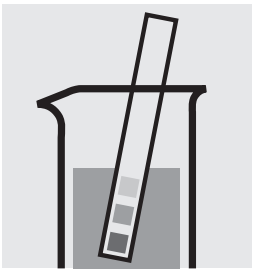
Chromate

Determination of chromium(VI)

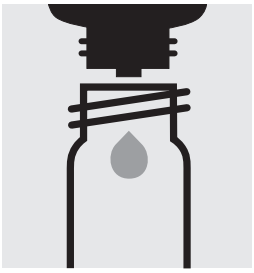
114552

Cell Test

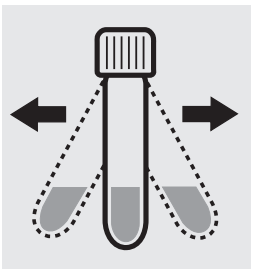
Measuring range:	0.05 – 2.00 mg/l Cr
	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l.



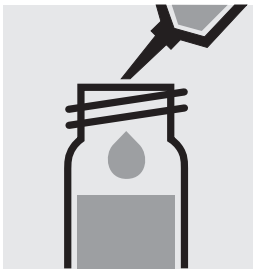
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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

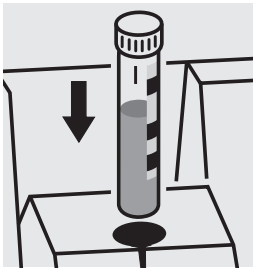


Shake the cell vigorously to dissolve the solid substance and leave to stand for **1 minute**.



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.

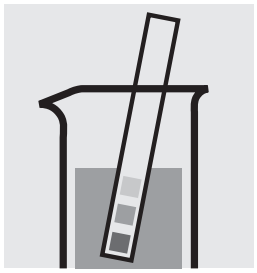
Chromate

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

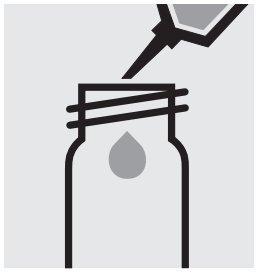
114552

Cell Test

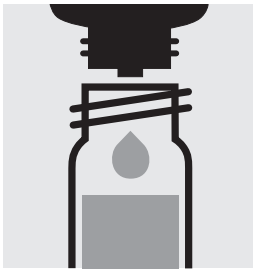
Measuring range:	0.05 – 2.00 mg/l Cr
	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l and also in Cr total (Σ Cr), Cr(III), and Cr(VI).



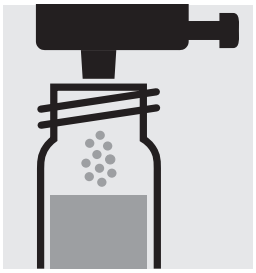
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



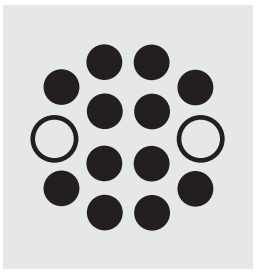
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



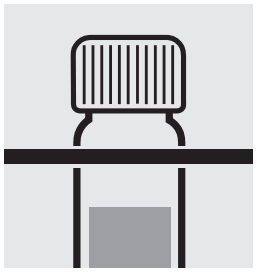
Add 1 drop of **Cr-1K**, close with the screw cap, and mix.



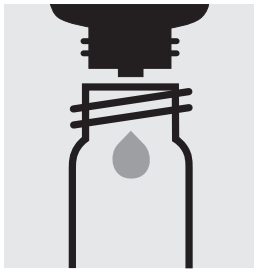
Add 1 dose of **Cr-2K** using the blue dose-metering cap, close the reaction cell with the screw cap.



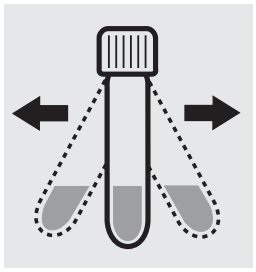
Heat the cell in the thermoreactor at 120 °C (100 °C) for 1 hour.



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



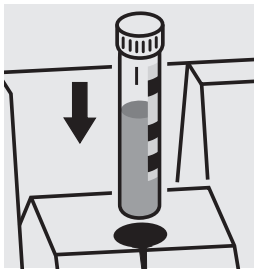
Add 6 drops of **Cr-3K** into a reaction cell, close the cell with the screw cap.



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.

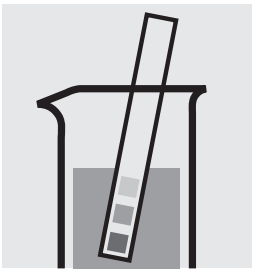
Chromate

Determination of chromium(VI)

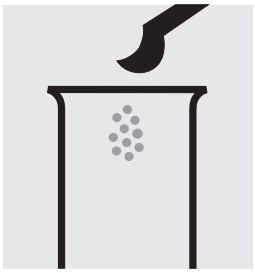
114758

Test

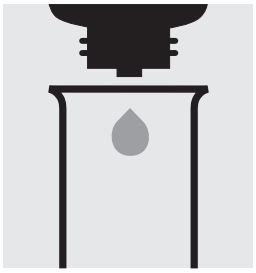
Measuring	0.05 – 3.00 mg/l Cr	0.11 – 6.69 mg/l CrO_4	10-mm cell
range:	0.03 – 1.50 mg/l Cr	0.07 – 3.35 mg/l CrO_4	20-mm cell
	0.010 – 0.600 mg/l Cr	0.02 – 1.34 mg/l CrO_4	50-mm cell
	Expression of results also possible in mmol/l.		



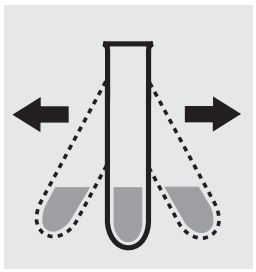
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



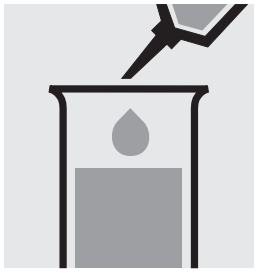
Place 1 level grey micro-spoon of **Cr-1** into a dry test tube.



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

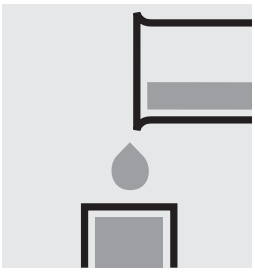


Shake the test tube vigorously to dissolve the solid substance.

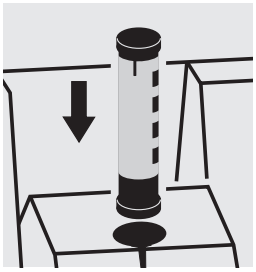


Add 5.0 ml of the sample with pipette and mix.

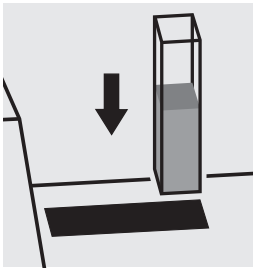
Reaction time:
1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

For the determination of **total chromium = sum of chromium(VI) and chromium(III)** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

Result can be expressed as sum of chromium (Σ Cr).

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

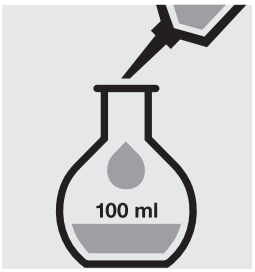
Quality assurance:

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.

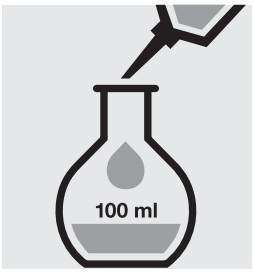
Chromium in electroplating baths

Inherent color

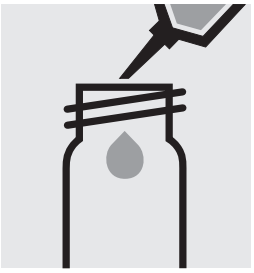
Measuring	20 – 400	g/l CrO_3	10-mm cell
range:	10 – 200	g/l CrO_3	20-mm cell
	4.0 – 80.0	g/l CrO_3	50-mm cell



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

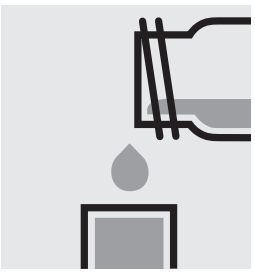


Pipette 4.0 ml of the dilute sample into a 100-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.

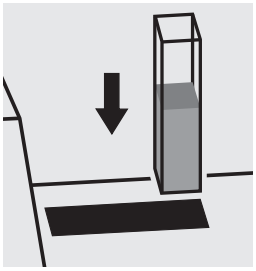


Pipette 5.0 ml of the 1:500 dilute sample into an empty round cell (Empty cells, Cat. No. 114724).

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



Transfer the solution into a corresponding rectangular cell.



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

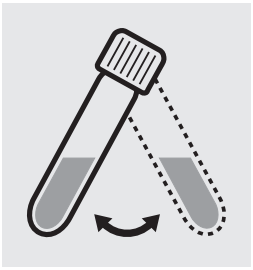
COD

Chemical Oxygen Demand

114560

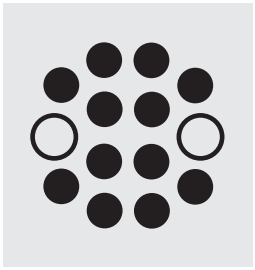
Cell Test

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

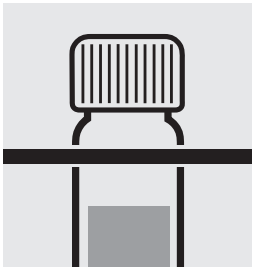


Suspend the bottom sediment in the cell by swirling.

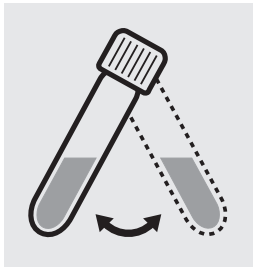
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



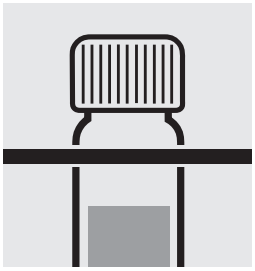
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



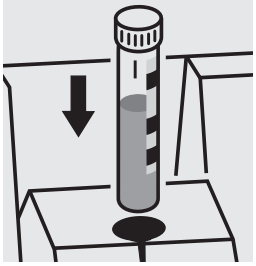
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

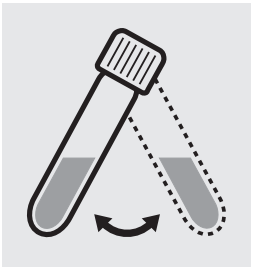
COD

Chemical Oxygen Demand

101796

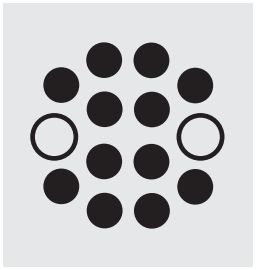
Cell Test

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

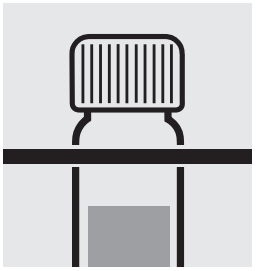


Suspend the bottom sediment in the cell by swirling.

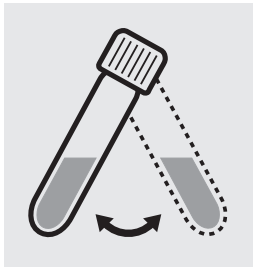
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



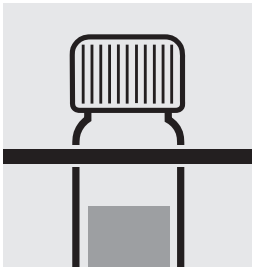
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



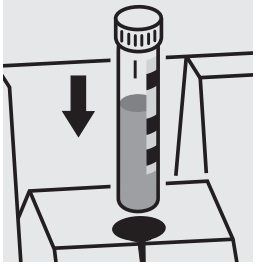
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

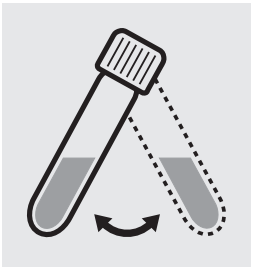
COD

Chemical Oxygen Demand

114540

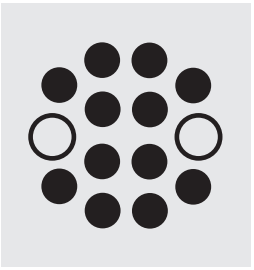
Cell Test

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

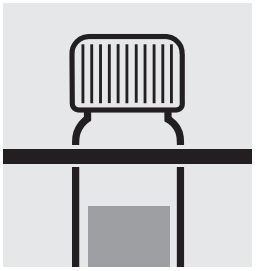


Suspend the bottom sediment in the cell by swirling.

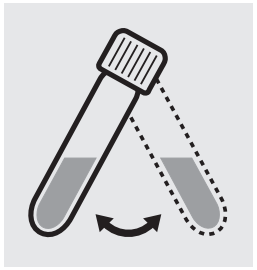
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



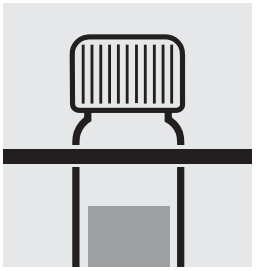
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



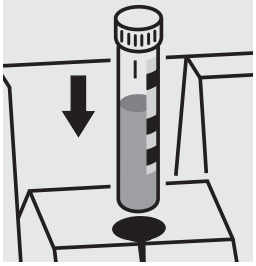
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

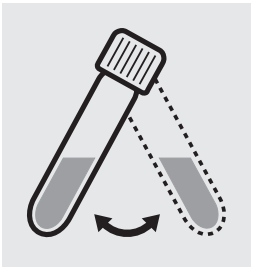
COD

Chemical Oxygen Demand

114895

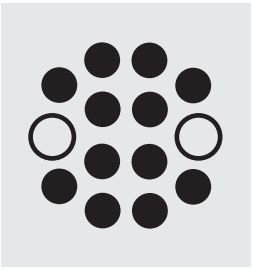
Cell Test

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

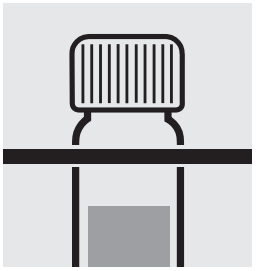


Suspend the bottom sediment in the cell by swirling.

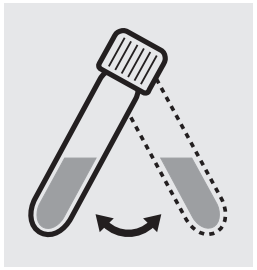
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



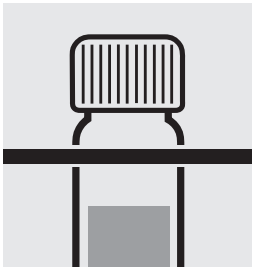
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



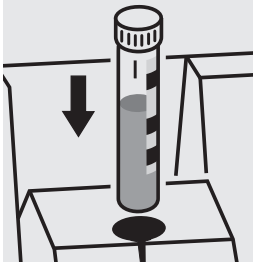
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

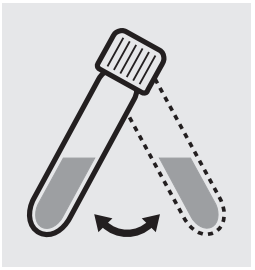
COD

Chemical Oxygen Demand

114690

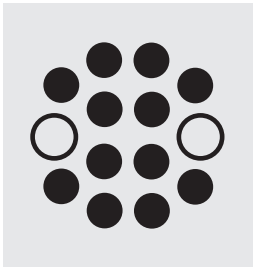
Cell Test

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

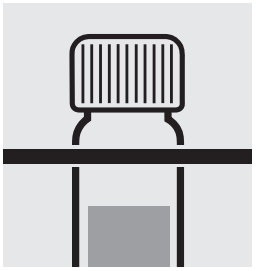


Suspend the bottom sediment in the cell by swirling.

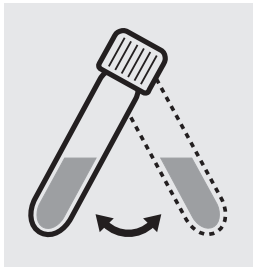
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



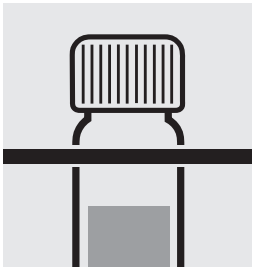
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



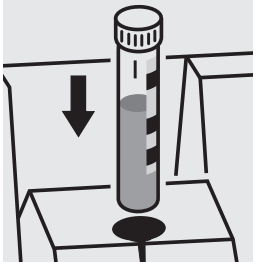
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

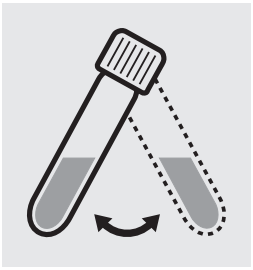
COD

Chemical Oxygen Demand

114541

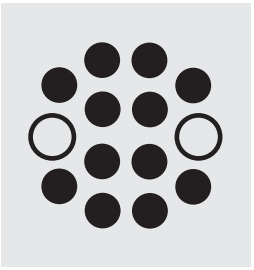
Cell Test

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

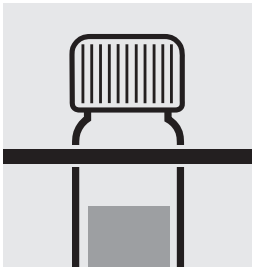


Suspend the bottom sediment in the cell by swirling.

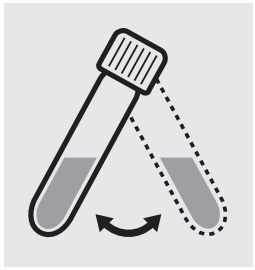
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



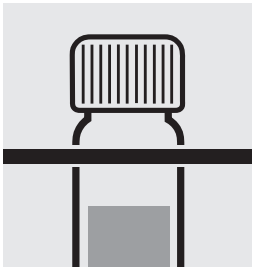
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



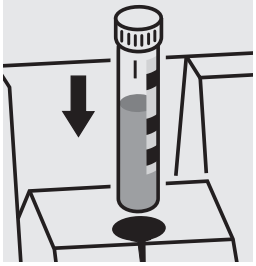
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

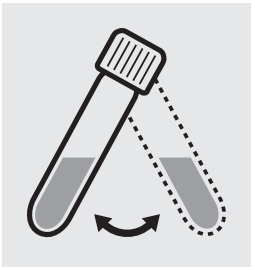
COD

Chemical Oxygen Demand

114691

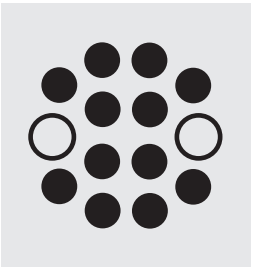
Cell Test

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

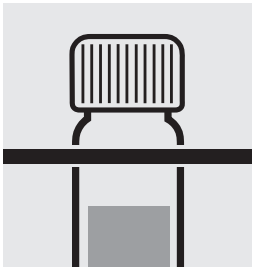


Suspend the bottom sediment in the cell by swirling.

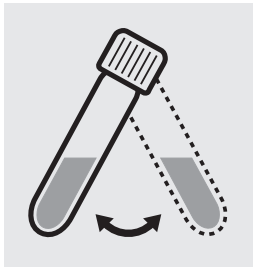
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



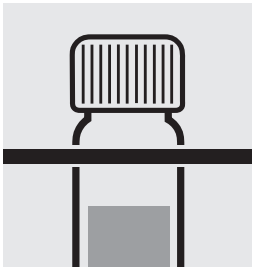
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



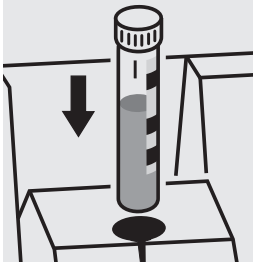
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

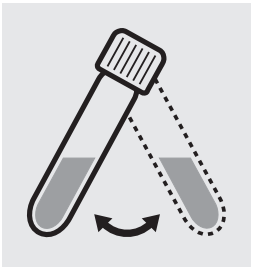
COD

Chemical Oxygen Demand

114555

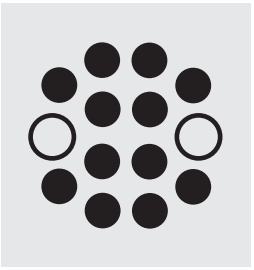
Cell Test

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

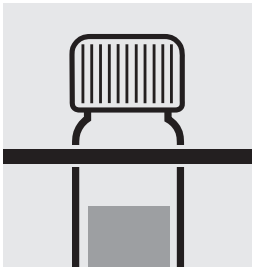


Suspend the bottom sediment in the cell by swirling.

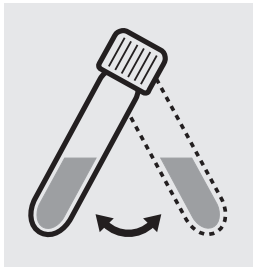
Carefully pipette 1.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



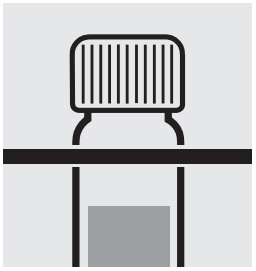
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



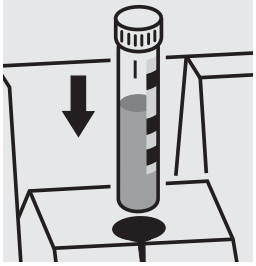
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

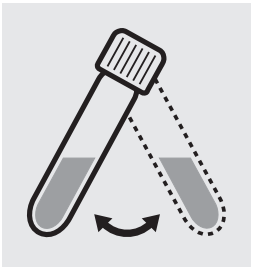
COD

Chemical Oxygen Demand

101797

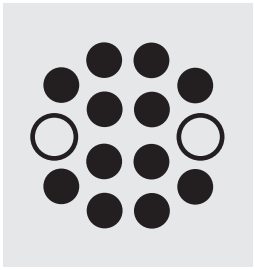
Cell Test

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

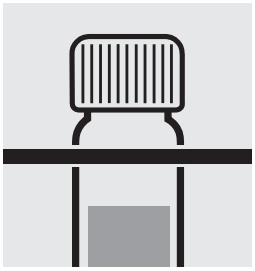


Suspend the bottom sediment in the cell by swirling.

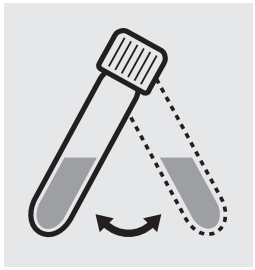
Carefully pipette 0.10 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



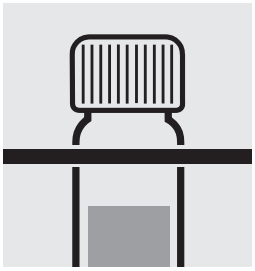
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



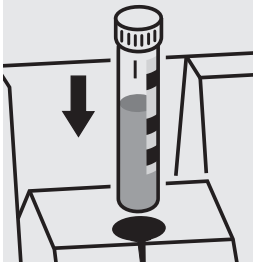
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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)

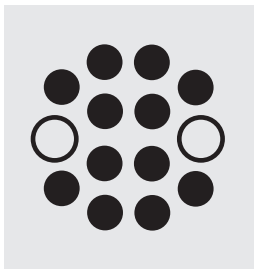
Chemical Oxygen Demand

109772

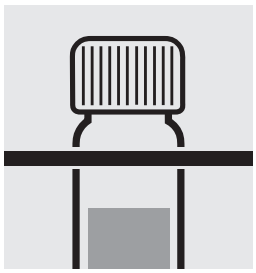
Cell Test

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

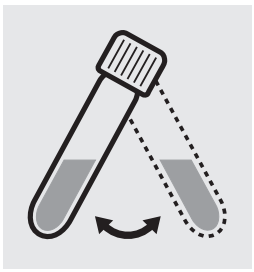
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



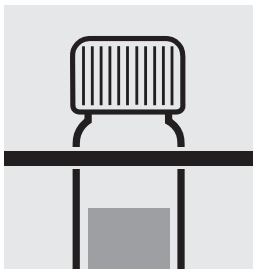
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



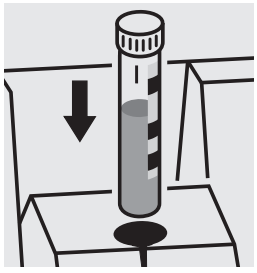
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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)

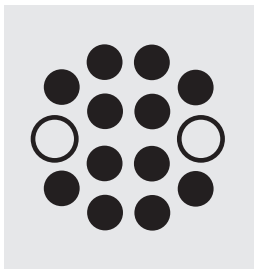
Chemical Oxygen Demand

109773

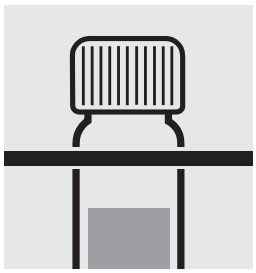
Cell Test

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

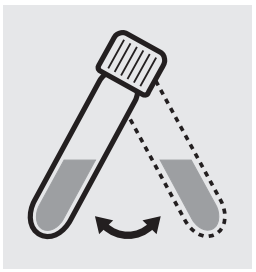
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



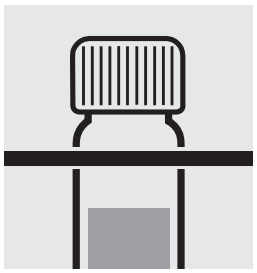
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



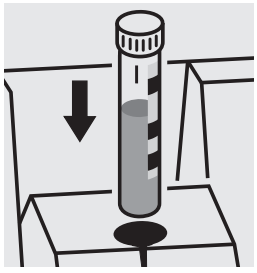
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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

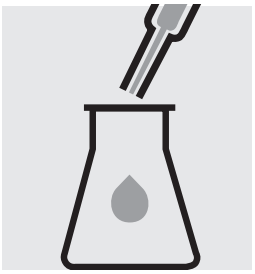
Chemical Oxygen Demand
for seawater / high chloride contents

117058

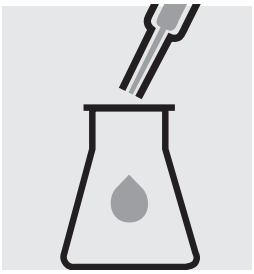
Cell Test

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

Chloride depletion:

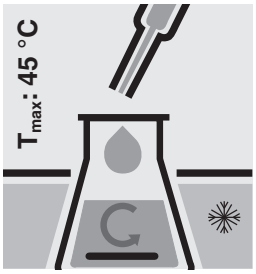


Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



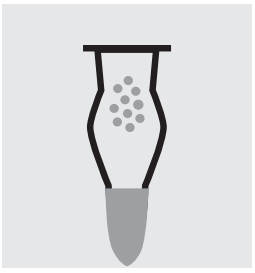
Pipette with glass pipette 20 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.

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

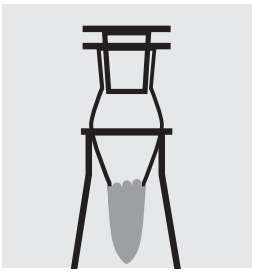


Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.

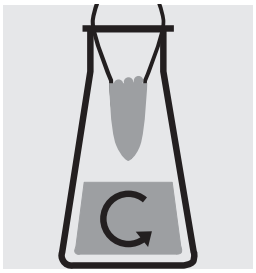
Cool both Erlenmeyer flasks to room temperature in the ice bath.



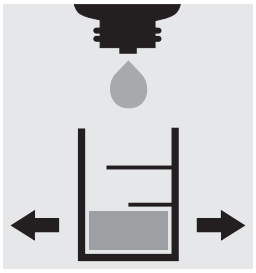
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



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



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



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

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 MColortest™ Chloride Test, Cat. No. 111132.
Carefully allow to run from the pipette 0.5 ml of depleted sample down the inside of the tilted test vessel 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

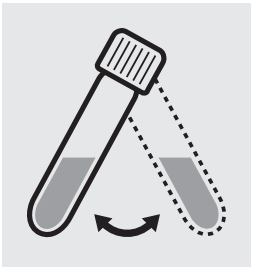
COD

Chemical Oxygen Demand
for seawater / high chloride contents

117058

Cell Test

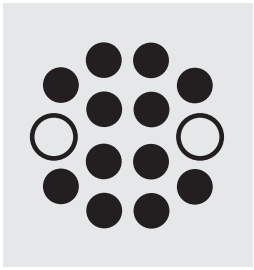
Determination:



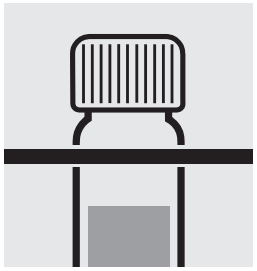
Suspend the bottom sediment in two cells by swirling.

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!

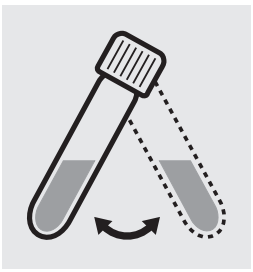
Carefully pipette 5.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!
(Blank cell)



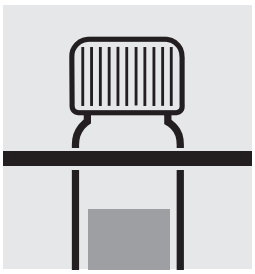
Heat both cells in the thermoreactor at 148 °C for 2 hours.



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

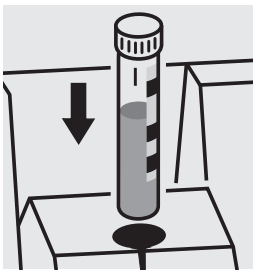


Swirl both cells after 10 minutes.

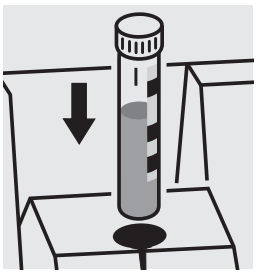


Replace both cells in the rack for complete cooling to room temperature. (**Very important!**)

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

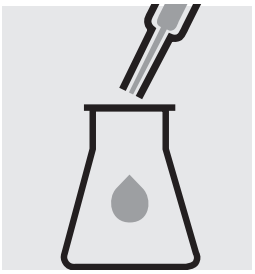
Chemical Oxygen Demand
for seawater / high chloride contents

117059

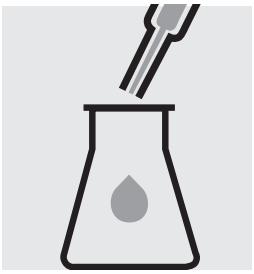
Cell Test

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

Chloride depletion:

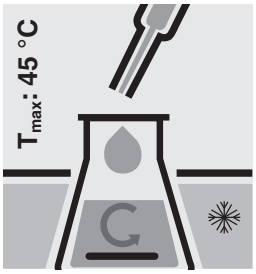


Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



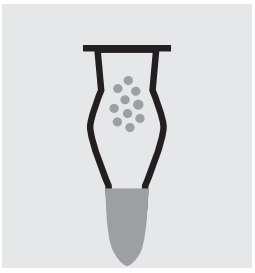
Pipette with glass pipette 20 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.

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

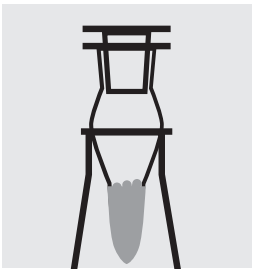


Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.

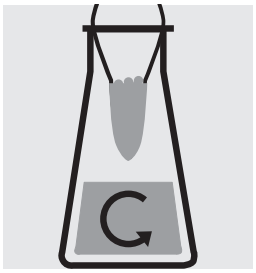
Cool both Erlenmeyer flasks to room temperature in the ice bath.



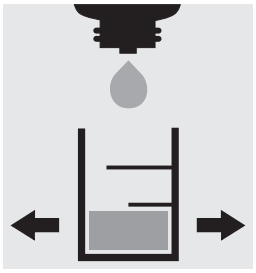
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



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



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



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

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

Fill 5.0 ml of sodium hydroxide solution 2 mol/l, Cat. No. 109136, into the test vessel of the MColortest™ Chloride Test, Cat. No. 111132.
Carefully allow to run from the pipette 0.5 ml of depleted sample down the inside of the tilted test vessel onto the sodium hydroxide solution and mix (**Wear eye protection! The cell becomes hot!**).
Add 2 drops of reagent Cl-1 and swirl. The sample directly turns yellow in color. (Reagent Cl-2 is not required.)
Holding the reagent bottle vertically, slowly add reagent Cl-3 dropwise to the sample while swirling until its color changes from yellow to blue-violet. Shortly before the color changes, wait a few seconds after adding each drop.

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

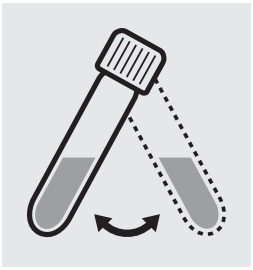
COD

Chemical Oxygen Demand
for seawater / high chloride contents

117059

Cell Test

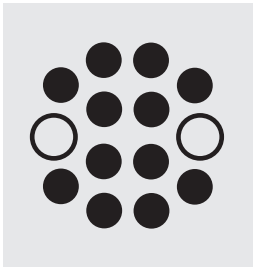
Determination:



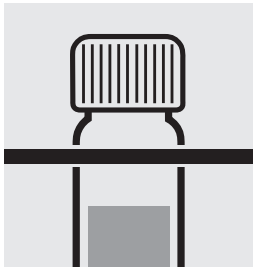
Suspend the bottom sediment in two cells by swirling.

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

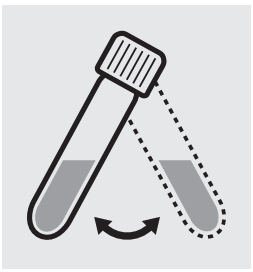
Carefully pipette 3.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously.
Caution, the cell becomes hot!
(Blank cell)



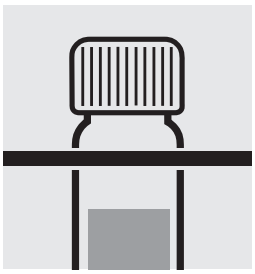
Heat both cells in the thermoreactor at 148 °C for 2 hours.



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

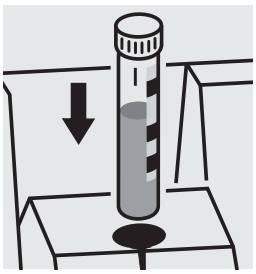


Swirl both cells after 10 minutes.

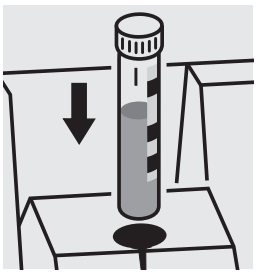


Replace both cells in the rack for complete cooling to room temperature. (**Very important!**)

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.

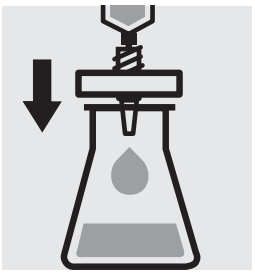
Quality assurance:

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”).

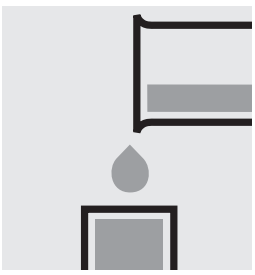
Color
(Spectral Absorption Coefficient)

analogous to **EN ISO 7887**

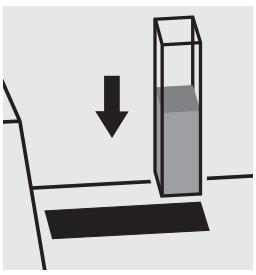
Measuring	0.1 – 50.0 m^{-1}	445 nm	50-mm cell	Method No. 015 α(445)
range:	0.1 – 50.0 m^{-1}	525 nm	50-mm cell	Method No. 061 α(525)
	1 – 250 m^{-1}	620 nm	10-mm cell	Method No. 078 α(620)
	0.3 – 125.0 m^{-1}	620 nm	20-mm cell	Method No. 078 α(620)
	0.1 – 50.0 m^{-1}	620 nm	50-mm cell	Method No. 078 α(620)



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



Transfer the solution into a corresponding cell.



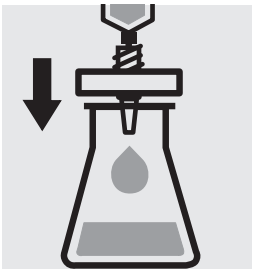
Place the cell into the cell compartment, select method no. **15**, **61**, or **78**.

Notes:
Filtered sample = true color.
Unfiltered sample = apparent color.

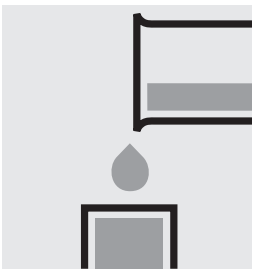
Color Hazen
(Platinum-Cobalt Standard Method)

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

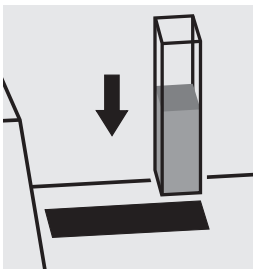
Measuring	1 - 500	mg/l Pt/Co	1 - 500	mg/l Pt	1 - 500	Hazen	1 - 500	CU	340 nm	10-mm cell
range:	1 - 250	mg/l Pt/Co	1 - 250	mg/l Pt	1 - 250	Hazen	1 - 250	CU	340 nm	20-mm cell
	0.2- 100.0	mg/l Pt/Co	0.2- 100.0	mg/l Pt	0.2- 100.0	Hazen	0.2- 100.0	CU	340 nm	50-mm cell



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



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment, select method no. **32**.

Notes:
Filtered sample = true color.
Unfiltered sample = apparent color.

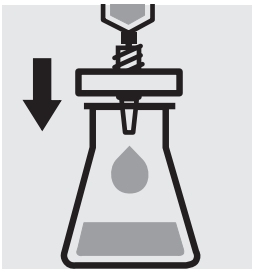
Quality assurance:

To check the measurement system (measurement device, handling) ready-for-use Platinum Cobalt Color Reference Solution (Hazen 500) Certipur®, Cat.No. 100246, concentration 500 mg/l Pt, can be used after diluting accordingly.

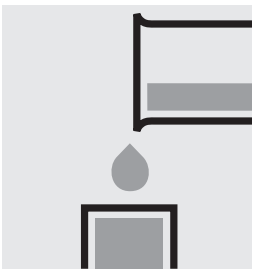
Color Hazen
(Platinum-Cobalt Standard Method)

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

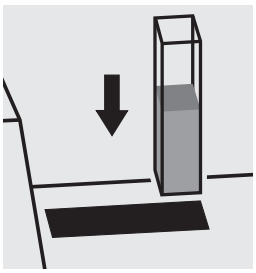
Measuring range:	1 - 1000 mg/l Pt/Co	1 - 1000 mg/l Pt	1 - 1000 Hazen	1 - 1000 CU	445 nm	50-mm cell



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



Transfer the solution into a cell.



Place the cell into the cell compartment, select method no. **179**.

Notes:
Filtered sample = true color.
Unfiltered sample = apparent color.

Quality assurance:

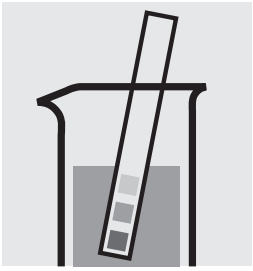
To check the measurement system (measurement device, handling) ready-for-use Platinum Cobalt Color Reference Solution (Hazen 500) Certipur®, Cat.No. 100246, concentration 500 mg/l Pt, can be used.

Copper

114553

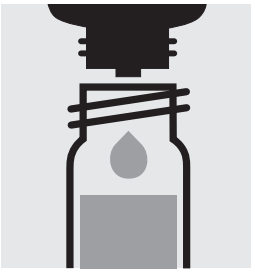
Cell Test

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



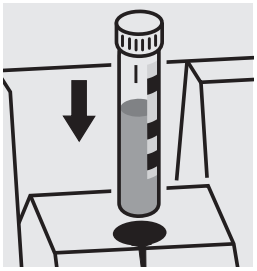
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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.

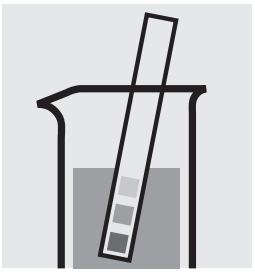
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

Copper

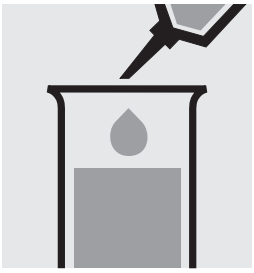
114767

Test

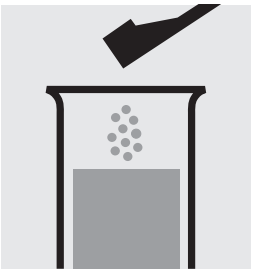
Measuring	0.10 – 6.00 mg/l Cu	10-mm cell
range:	0.05 – 3.00 mg/l Cu	20-mm cell
	0.02 – 1.20 mg/l Cu	50-mm cell
	Expression of results also possible in mmol/l.	



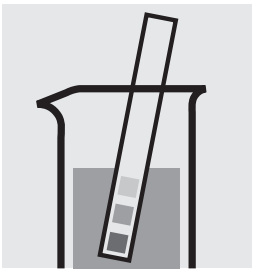
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



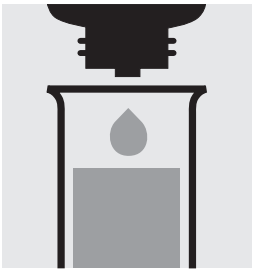
Pipette 5.0 ml of the sample into a test tube.



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

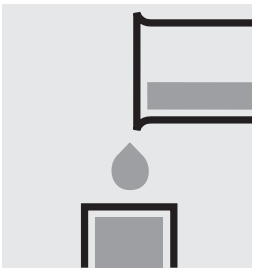


Check the pH, specified range: pH 7.0 – 9.5.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

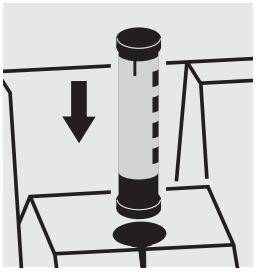


Add 5 drops of **Cu-2** and mix.

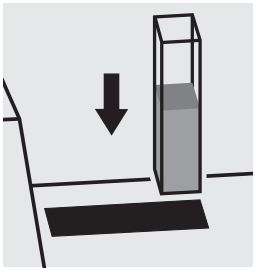
Reaction time:
5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

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

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

To measure in the 50-mm cell, only the sample volume has to be doubled.
Alternatively, the semi-microcell, Cat.No. 173502, can be used.

Quality assurance:

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

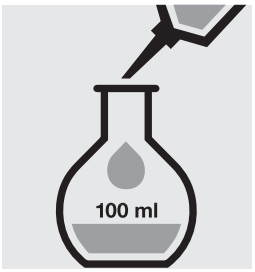
Ready-for-use copper standard solution Certipur®, Cat.No. 119786, concentration 1000 mg/l Cu, can also be used after diluting accordingly.

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

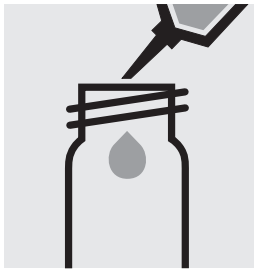
Copper in electroplating baths

Inherent color

Measuring	10.0 – 80.0 g/l Cu	10-mm cell
range:	5.0 – 40.0 g/l Cu	20-mm cell
	2.0 – 16.0 g/l Cu	50-mm cell

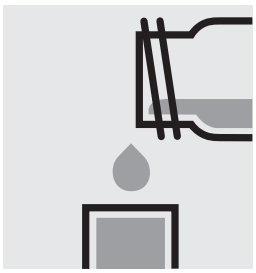


Pipette 25 ml of the sample into a 100-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.

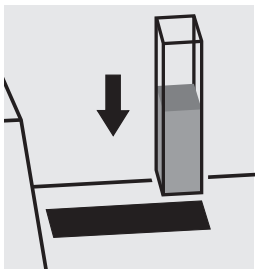


Pipette 5.0 ml of the 1:4 dilute sample into an empty round cell (Empty cells, Cat.No. 114724).

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



Transfer the solution into a corresponding rectangular cell.



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

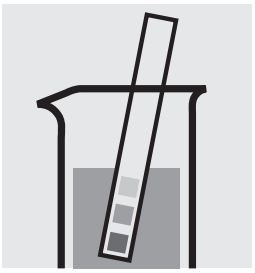
Cyanide

Determination of free cyanide

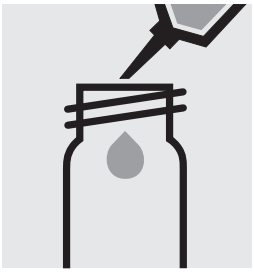
102531

Cell Test

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

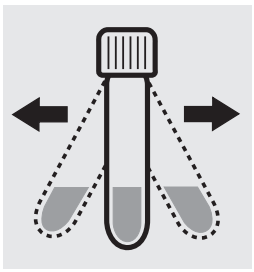


Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



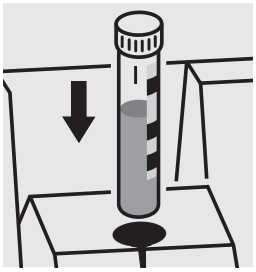
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and dissolve the solid substance.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 10 minutes



Place the cell into the 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.

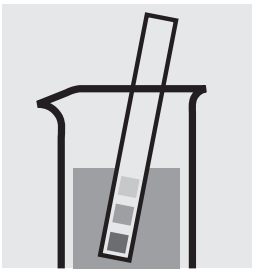
Cyanide

Determination of free cyanide

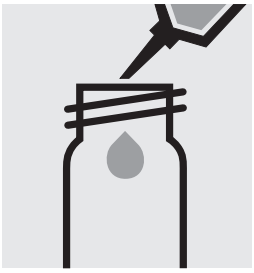
114561

Cell Test

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

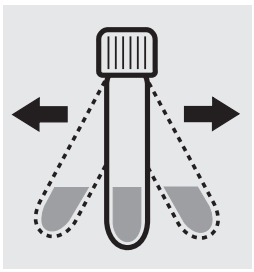


Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



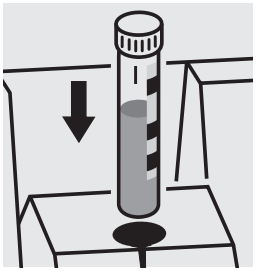
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and dissolve the solid substance.

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.

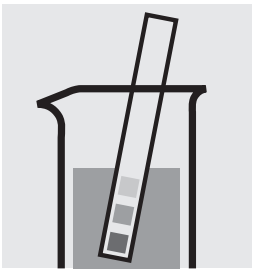
Cyanide

Determination of readily liberated cyanide

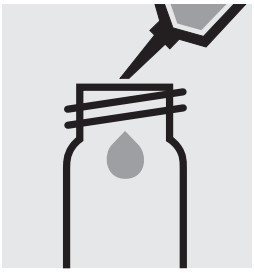
114561

Cell Test

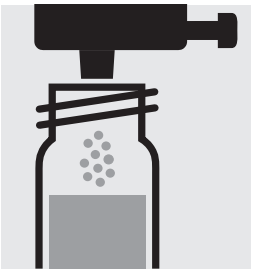
Measuring range:	0.010 – 0.500 mg/l CN Expression of results also possible in mmol/l and cyanide readily liberated [CN(v)].



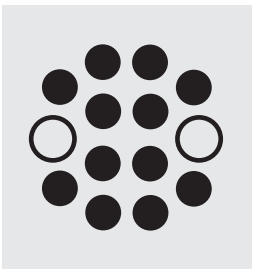
Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



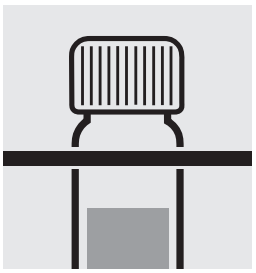
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



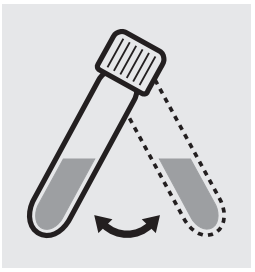
Add 1 dose of **CN-1K** using the green dose-metering cap, close the cell with the screw cap.



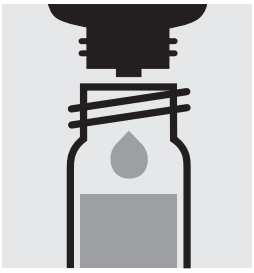
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



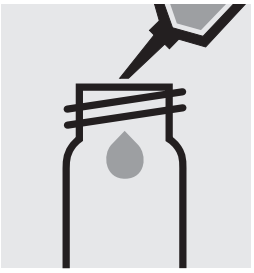
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



Swirl the cell before opening.

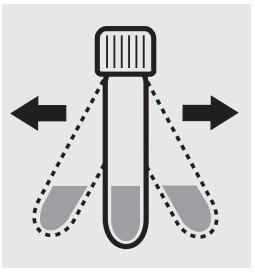


Add 3 drops of **CN-2K**, close with the screw cap, and mix: **pretreated sample**.



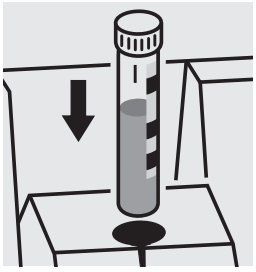
Pipette 5.0 ml of the **pretreated sample** into a reaction cell, close with the screw cap, and dissolve the solid substance.

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.

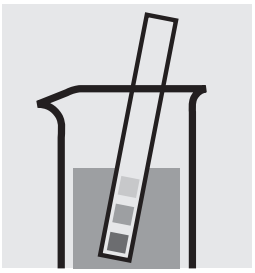
Cyanide

Determination of free cyanide

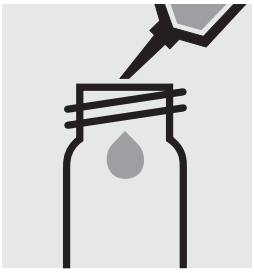
109701

Test

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

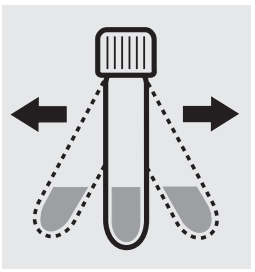


Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



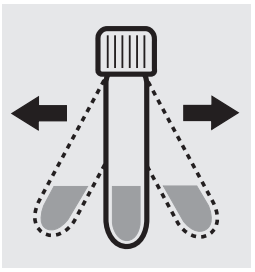
Pipette 5.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

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



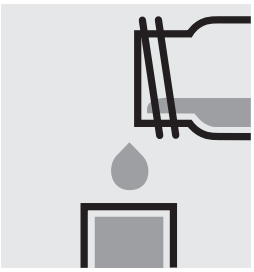
Shake the cell vigorously to dissolve the solid substance.

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

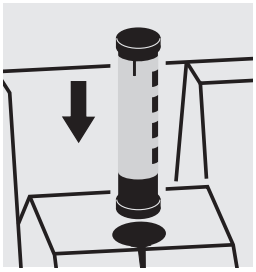


Shake the cell vigorously to dissolve the solid substance.

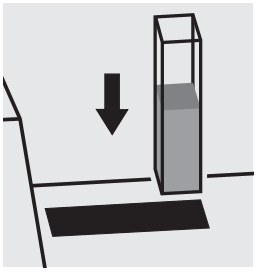
Reaction time:
10 minutes



Transfer the solution into a corresponding rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Note:

Empty cells with screw caps, Cat.No. 114724 are recommended for the preparation. These cells can be sealed with the screw caps, thus preventing any gas losses.

Important:

To measure in the 50-mm cell, the sample volume and the volume of the reagents CN-3 and CN-4 have to be doubled for each.
Alternatively, the semi-microcell, Cat.No. 173502, can be used.

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.

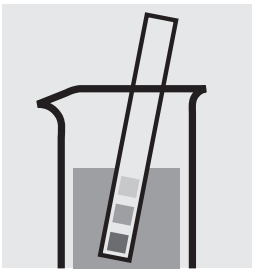
Cyanide

Determination of readily liberated cyanide

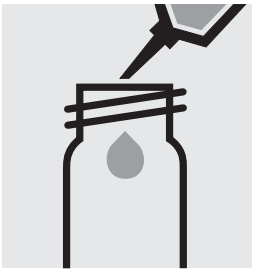
109701

Test

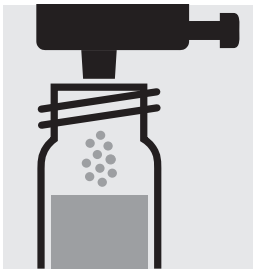
Measuring	0.010 – 0.500	mg/l CN	10-mm cell
range:	0.005 – 0.250	mg/l CN	20-mm cell
	0.0020 – 0.1000	mg/l CN	50-mm cell
	Expression of results also possible in mmol/l and cyanide readily liberated [CN(v)].		



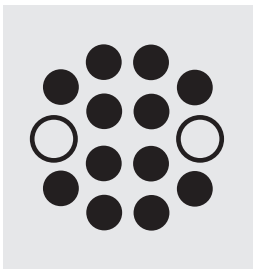
Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



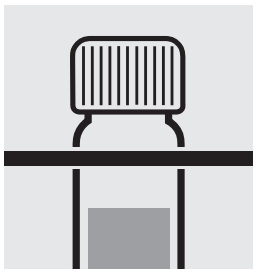
Add 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



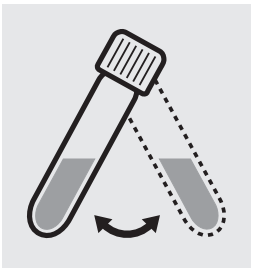
Add 1 dose of **CN-1** using the green dose-metering cap, close the cell with the screw cap.



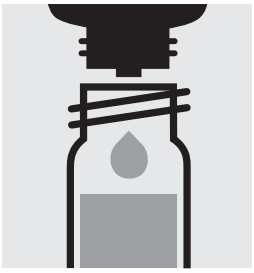
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



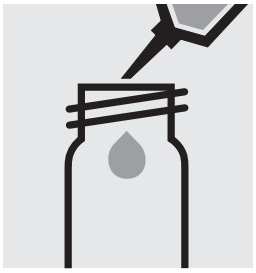
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



Swirl the cell before opening.

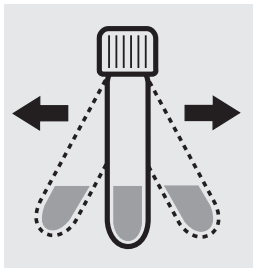


Add 3 drops of **CN-2**, close with the scew cap, and mix: **pretreated sample**.



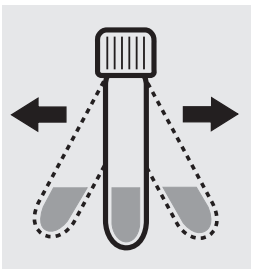
Pipette 5.0 ml of the **pretreated sample** into an empty round cell (Empty cells, Cat.No. 114724).

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



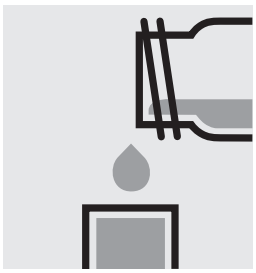
Shake the cell vigorously to dissolve the solid substance.

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

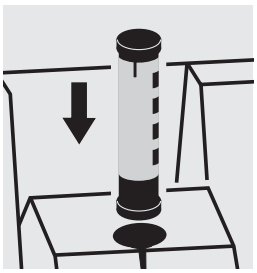


Shake the cell vigorously to dissolve the solid substance.

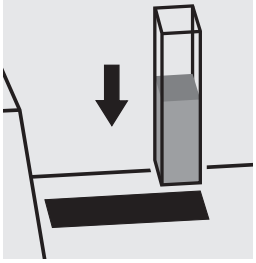
Reaction time: 10 minutes



Transfer the solution into a corresponding rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Note:

Empty cells with screw caps, Cat.No. 114724 are recommended for the preparation. These cells can be sealed with the screw caps, thus preventing any gas losses.

Important:

To measure in the 50-mm cell, the sample volume for the determination – not for the previous decomposition – and the volume of the reagents CN-3 and CN-4 have to be doubled for each.
Alternatively, the semi-microcell, Cat.No. 173502, can be used.

Quality assurance:

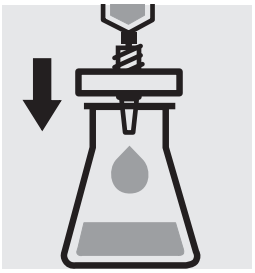
To check the measurement system (test reagents, measurement device, and handling) ready-for-use cyanide standard solution Certipur®, Cat.No. 119533, concentration 1000 mg/l CN^-, can be used after diluting accordingly.

Cyanuric Acid

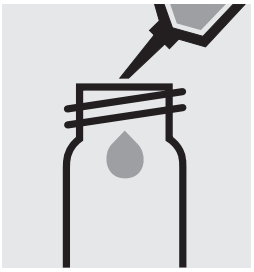
119253

Test

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



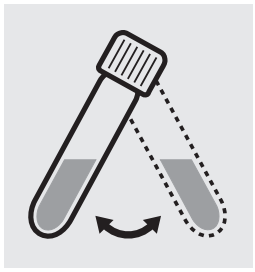
Filter turbid samples.



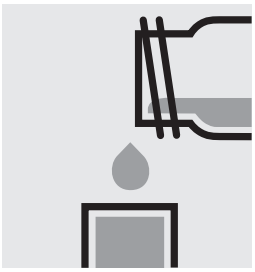
Pipette 5.0 ml of the sample into into an empty test tube (e. g. flat-bottomed tubes cells, Cat.No. 114902).

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

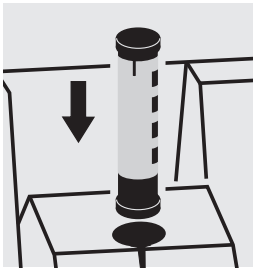
Add 1 reagent tablet **Cyanuric Acid**, crush with stirring rod, and close with the screw cap.



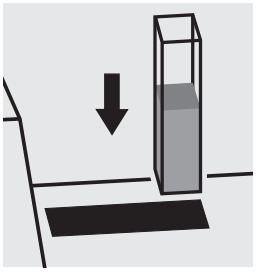
Swirl the cell to dissolve the solid substance.



Transfer the solution into a rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Quality assurance:

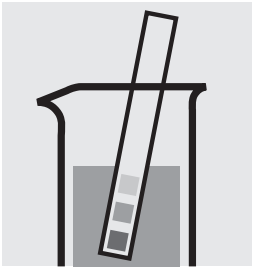
To check the measurement system (test reagents, measurement device, and handling) a cyanuric acid standard solution must be prepared from Cyanuric acid, Cat.No. 820358 (see section “Standard solutions”).

Fluoride

114557

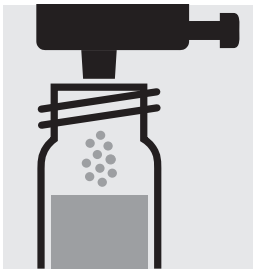
Cell Test

Measuring	0.10 – 1.50 mg/l F	Round cell
range:	0.025 – 0.500 mg/l F	50-mm cell (see “sensitive” preparation procedure)
	Expression of results also possible in mmol/l.	

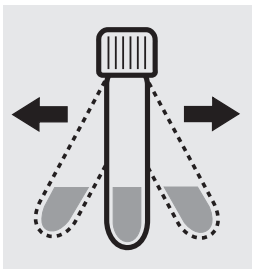


Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

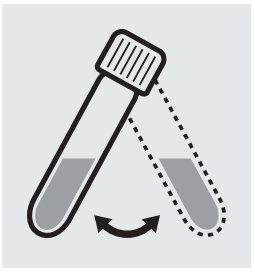


Add 1 dose of **F-1K** using the blue dose-metering cap, close the cell with the screw cap.

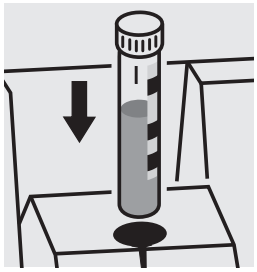


Shake the cell vigorously to dissolve the solid substance.

Reaction time: 5 minutes



Swirl the cell before measurement.



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

Fluoride sensitive

Use the same preparation procedure as above, but add 10 ml of sample instead of 5.0 ml. Prepare an own blank by using 10 ml of distilled water and all reagents. For measurement transfer the solution into a 50-mm cell. Configure the photometer prior for blank-measurement. Select method **F sens** in the menu (method no. 124).

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F^-, can be used after diluting accordingly.

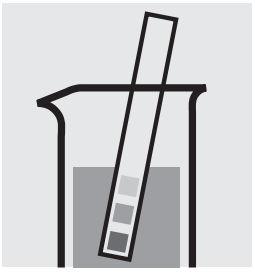
Fluoride

100809

Cell Test

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

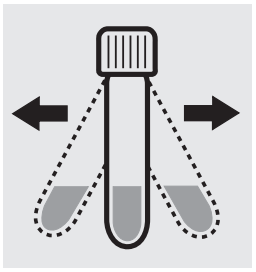
Measuring range: 0.10 – 1.80 mg/l F



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

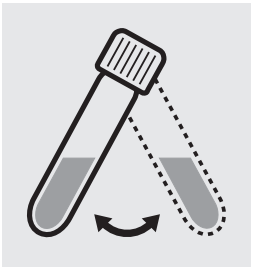
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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

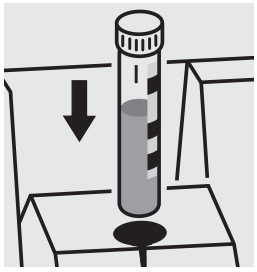


Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Swirl the cell before measurement.



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

Important:

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

Quality assurance:

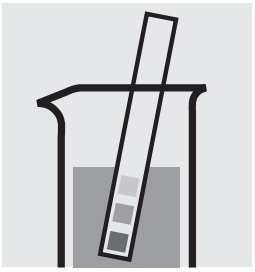
To check the measurement system (test reagents, measurement device, and handling) ready-for-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F^-, can be used after diluting accordingly.

Fluoride

100809

Cell Test

Measuring range: 0.025 – 0.500 mg/l F



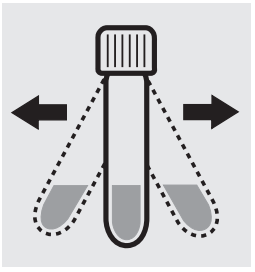
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Configure the photometer for blank-measurement. Select method **F sens** in the menu (method no. 216).

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

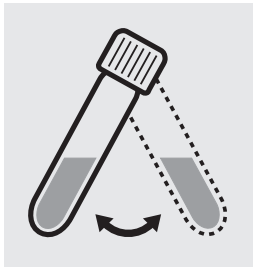
Pipette 10 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank)

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

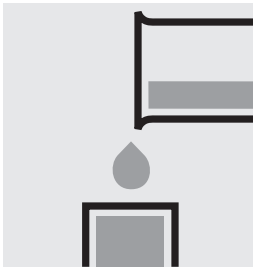


Shake both cells vigorously to dissolve the solid substance.

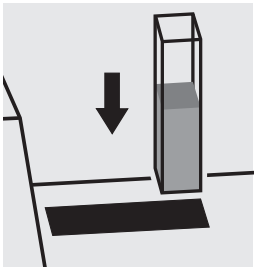
Reaction time:
15 minutes



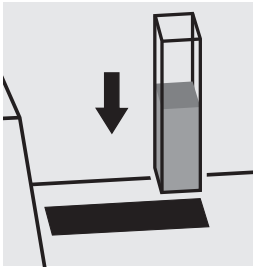
Swirl the cells.



Transfer both solutions into two separate 50-mm-cells.



Place the blank cell into the cell compartment.



Place the cell containing the sample into the cell compartment.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F^-, can be used after diluting accordingly.

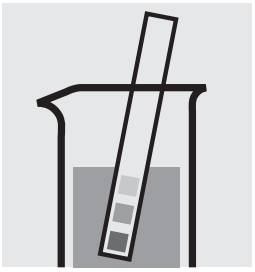
Fluoride

114598

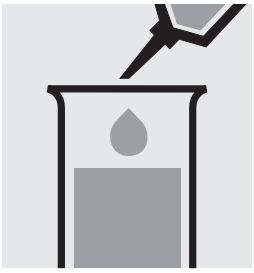
Test

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

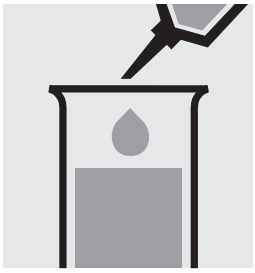
Measuring range: 0.10 – 2.00 mg/l F



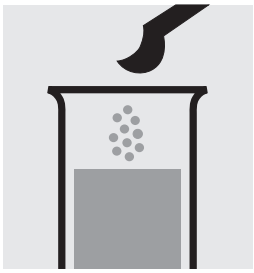
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



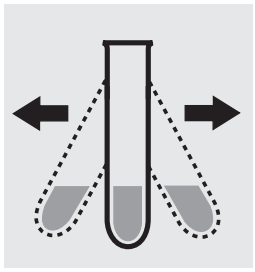
Pipette 2.0 ml of **F-1** into a test tube.



Add 5.0 ml of the sample with pipette and mix.

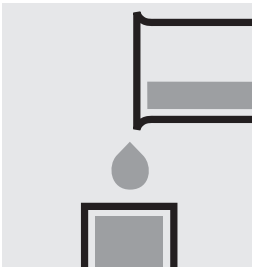


Add 1 level blue micro-spoon of **F-2** and mix.

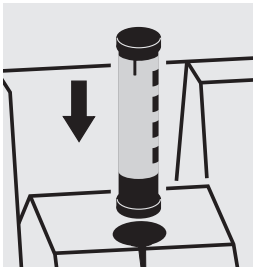


Shake the test tube vigorously to dissolve the solid substance.

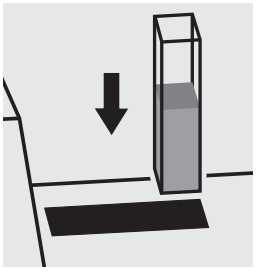
Reaction time:
5 minutes



Transfer the solution into a cell.

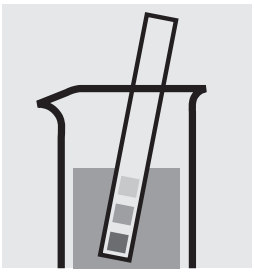


Select method with AutoSelector measuring range 0.10 – 2.00 mg/l F.

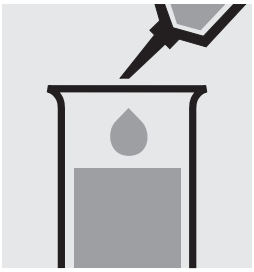


Place the cell into the cell compartment.

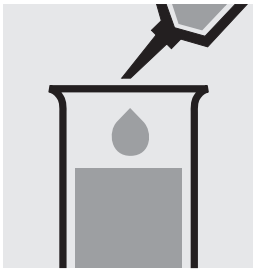
Measuring range: 1.0 – 20.0 mg/l F



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



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



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

Continue as mentioned above; starting from the addition of **F-2** (Fig. 4). Select method with AutoSelector measuring range 1.0 – 20.0 mg/l F.

Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F^-, can be used after diluting accordingly.

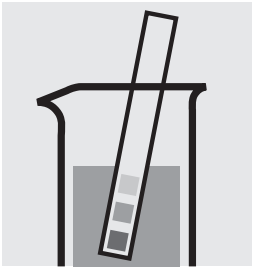
Fluoride

100822

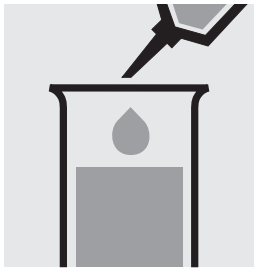
Test

Measuring range: 0.02 – 2.00 mg/l F 50-mm semi-microcell, Cat. No. 173502

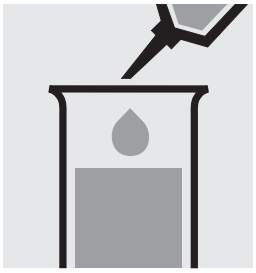
Expression of results also possible in mmol/l.



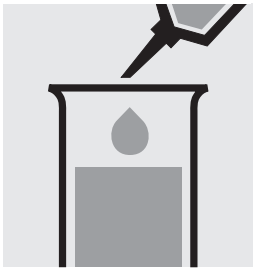
Check the pH of the sample, specified range: pH 1 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.

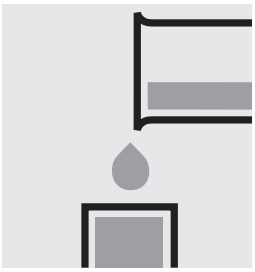


Pipette 5.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a second test tube.
(Blank)

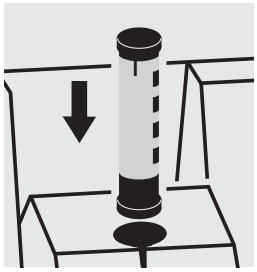


Add to each tube 1.0 ml of **F-1** with pipette and mix.

Reaction time:
1 minute

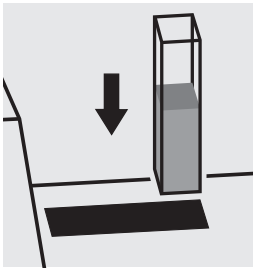


Transfer both solutions into a separate **semi-microcell**.

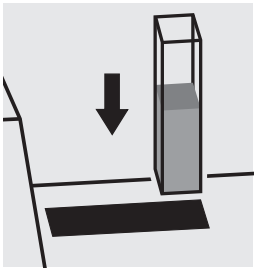


Select method with AutoSelector.

Configure the photometer for blank-measurement.



Place the blank cell into the cell compartment.



Place the cell containing the sample into the cell compartment.

Important:

For measurement in the 50-mm **rectangular cell** the sample volume and the volume of the reagent must be doubled for each.

Quality assurance:

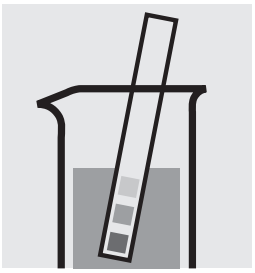
To check the measurement system (test reagents, measurement device, and handling) ready-for-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F^-, can be used after diluting accordingly.

Formaldehyde

114500

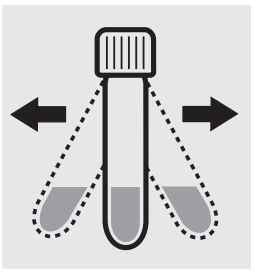
Cell Test

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

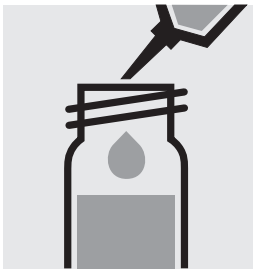


Check the pH of the sample, specified range: pH 0 – 13.

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

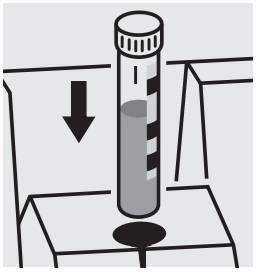


Shake the cell vigorously to dissolve the solid substance.



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

Reaction time: 5 minutes



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

Quality assurance:

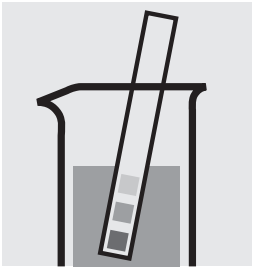
To check the measurement system (test reagents, measurement device, and handling) a formaldehyde standard solution must be prepared from Formaldehyde solution 37%, Cat.No. 104003 (see section “Standard solutions”).

Formaldehyde

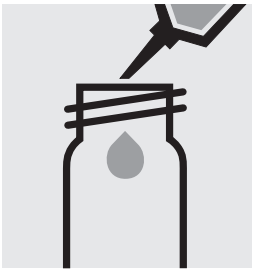
114678

Test

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

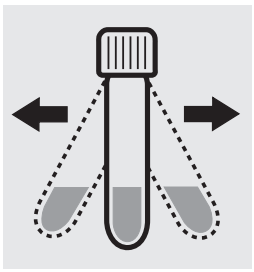


Check the pH of the sample, specified range: pH 0 – 13.

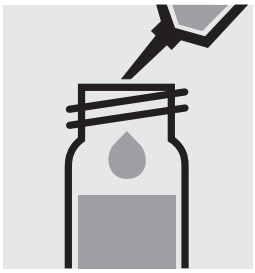


Pipette 4.5 ml of **HCHO-1** into an empty round cell (Empty cells, Cat.No. 114724).

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

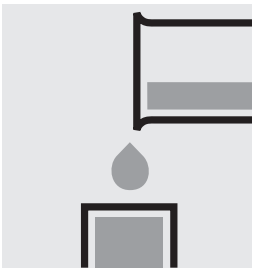


Shake the cell vigorously to dissolve the solid substance.

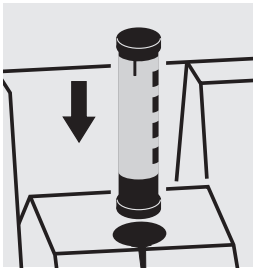


Add 3.0 ml of the sample with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

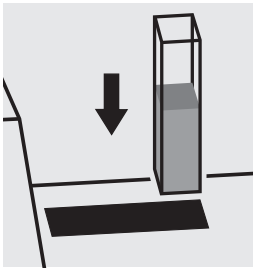
Reaction time: 5 minutes



Transfer the solution into a corresponding rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Note:

Empty cells with screw caps, Cat.No. 114724 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Quality assurance:

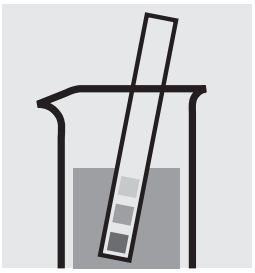
To check the measurement system (test reagents, measurement device, and handling) a formaldehyde standard solution must be prepared from Formaldehyde solution 37%, Cat.No. 104003 (see section “Standard solutions”).

Gold

114821

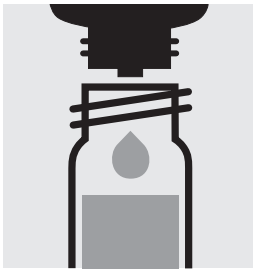
Test

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

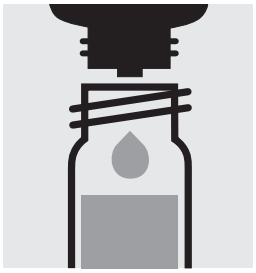


Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute hydrochloric acid drop by drop to adjust the pH.

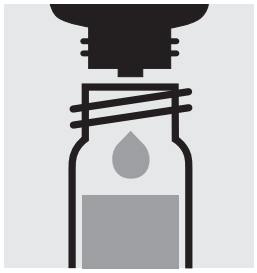
Pipette 2.0 ml of the sample into a test tube with screw cap.



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

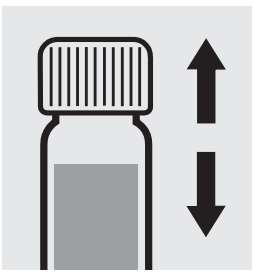


Add 4 drops of **Au-2** and mix.

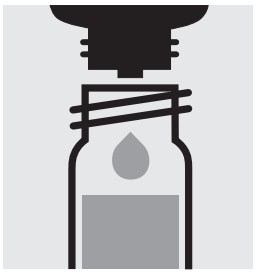


Add 6 drops of **Au-3** and mix.

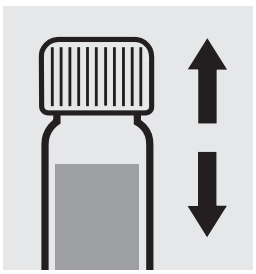
Add 6.0 ml of **Au-4** with pipette, close with the screw cap.



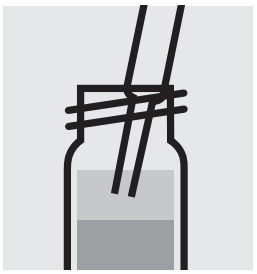
Shake the tube vigorously for 1 minute.



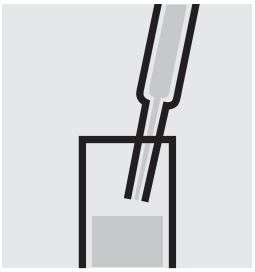
Add 6 drops of **Au-5**, close with the screw cap.



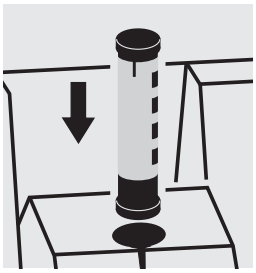
Shake the tube vigorously for 1 minute.



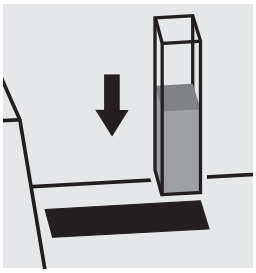
Aspirate the clear upper phase from the tube with pipette.



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Quality assurance:

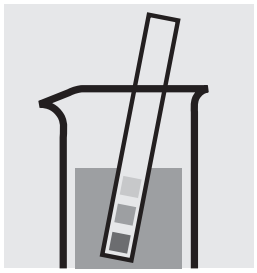
To check the measurement system (test reagents, measurement device, and handling) ready-for-use gold standard solution Certipur®, Cat.No. 170216, concentration 1000 mg/l Au, can be used after diluting accordingly.

Hydrazine

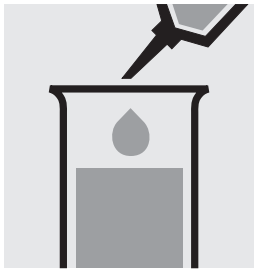
109711

Test

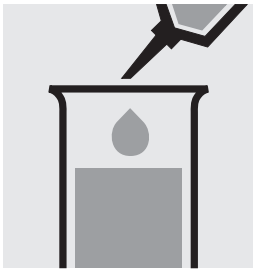
Measuring	0.02 – 2.00 mg/l N_2H_4	10-mm cell
range:	0.01 – 1.00 mg/l N_2H_4	20-mm cell
	0.005 – 0.400 mg/l N_2H_4	50-mm cell
	Expression of results also possible in mmol/l.	



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

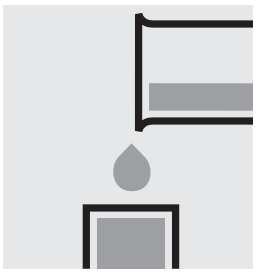


Pipette 5.0 ml of the sample into a test tube.

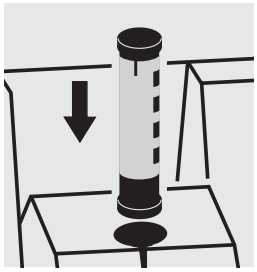


Add 2.0 ml of **Hy-1** with pipette and mix.

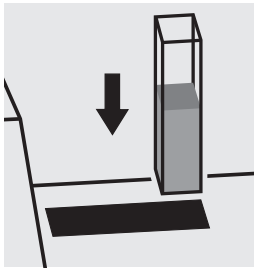
Reaction time:
5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a hydrazine standard solution must be prepared from Hydrazinium sulfate GR, Cat.No. 104603 (see section “Standard solutions”).

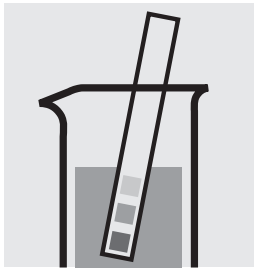
Hydrogen Peroxide

114731

Cell Test

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

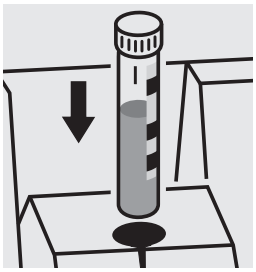
Measuring range: 2.0 – 20.0 mg/l H_2O_2



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

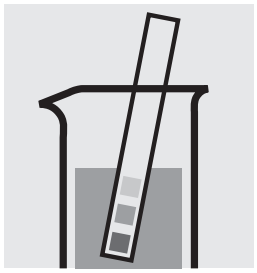
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.

Reaction time:
2 minutes



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

Measuring range: 0.25 – 5.00 mg/l H_2O_2

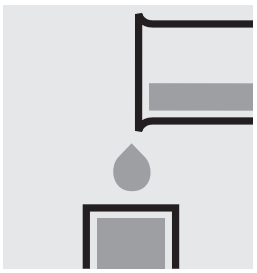


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

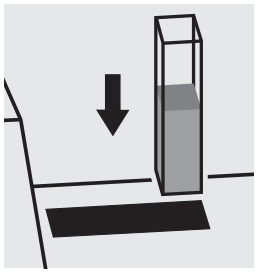
Select method **H_2O_2 sens** in the menu (method no. 128).

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

Reaction time:
2 minutes



Transfer the solution into a 50-mm cell.



Place the cell into the cell compartment.

Important:

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

Quality assurance:

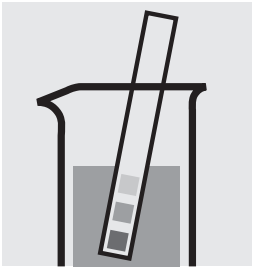
To check the measurement system (test reagents, measurement device, and handling) a hydrogenperoxide standard solution must be prepared from Perhydrol® 30% H_2O_2 GR, Cat.No. 107209 (see section “Standard solutions”).

Hydrogen Peroxide

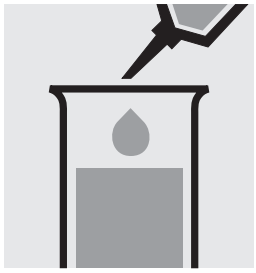
118789

Test

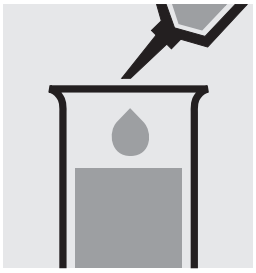
Measuring	0.03 – 6.00 mg/l H_2O_2	10-mm cell
range:	0.015 – 3.000 mg/l H_2O_2	20-mm cell
	Expression of results also possible in mmol/l.	



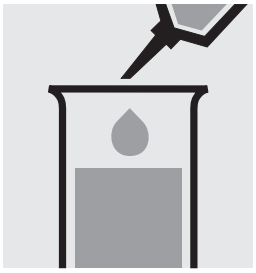
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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

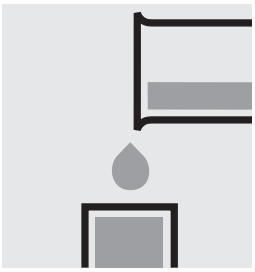


Add 8.0 ml of the sample with pipette and mix.

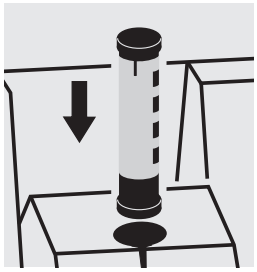


Add 0.50 ml of **H_2O_2-2** with pipette and mix.

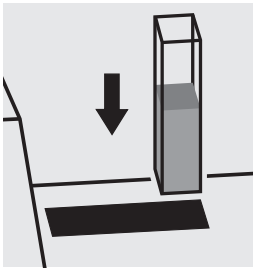
Reaction time: 10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Quality assurance:

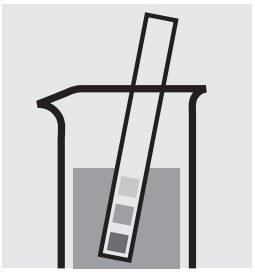
To check the measurement system (test reagents, measurement device, and handling) a hydrogenperoxide standard solution must be prepared from Perhydrol® 30% H_2O_2 GR, Cat.No. 107209 (see section “Standard solutions”).

Iodine

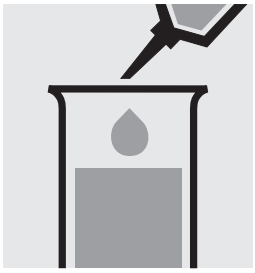
100606

Test

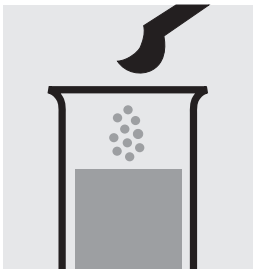
Measuring	0.20 – 10.00	mg/l I_2	10-mm cell
range:	0.10 – 5.00	mg/l I_2	20-mm cell
	0.050– 2.000	mg/l I_2	50-mm cell
	Expression of results also possible in mmol/l.		



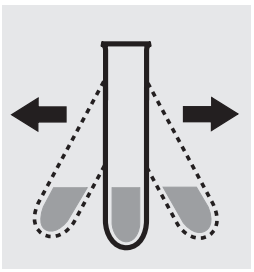
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.

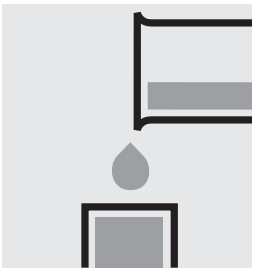


Add 1 level blue micro-spoon of **I_2-1**.

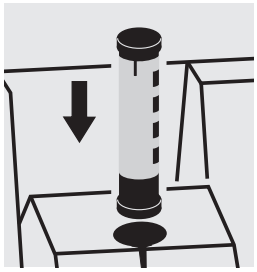


Shake vigorously to dissolve the solid substance.

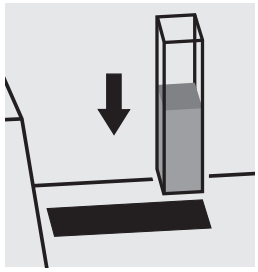
Reaction time: 1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

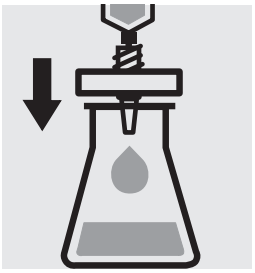
Quality assurance:

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

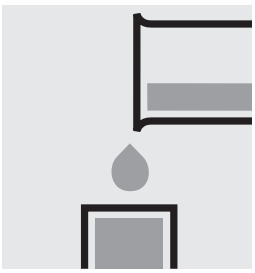
Iodine Color Number

analogous to **DIN 6162A**

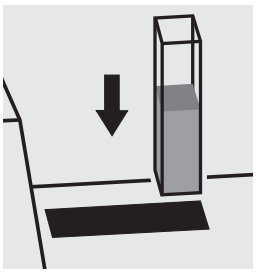
Measuring	0.05 – 3.00	340 nm	10-mm cell
range:	0.03 – 1.50	340 nm	20-mm cell
	0.010 – 0.600	340 nm	50-mm cell



Filter turbid samples.



Transfer the solution into a corresponding cell.

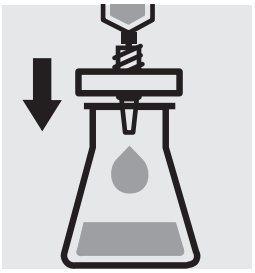


Place the cell into the cell compartment, select method no. **33**.

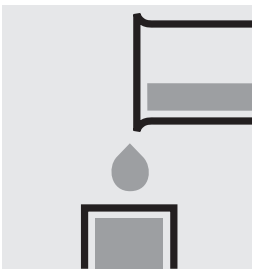
Iodine Color Number

analogous to **DIN 6162A**

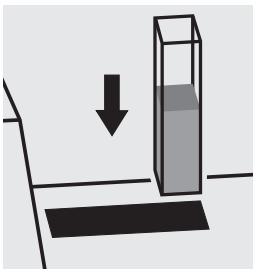
Measuring	1.0 – 50.0	445 nm	10-mm cell
range:	0.5 – 25.0	445 nm	20-mm cell
	0.2 – 10.0	445 nm	50-mm cell



Filter turbid samples.



Transfer the solution into a corresponding cell.



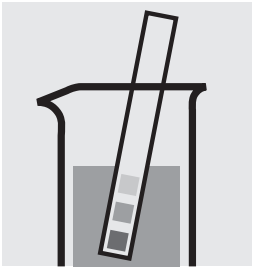
Place the cell into the cell compartment, select method no. **21**.

Iron

114549

Cell Test

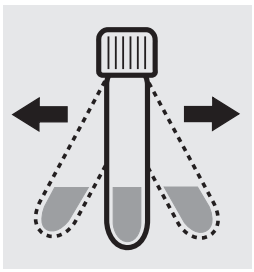
Measuring range:	0.05 – 4.00 mg/l Fe Expression of results also possible in mmol/l.



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.

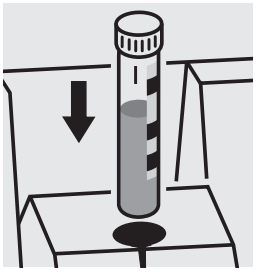
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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

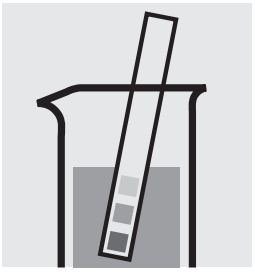
Determination of iron(II) and iron(III)

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).

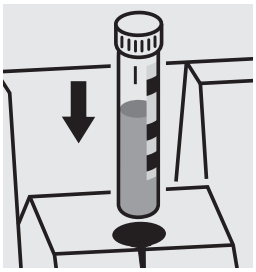
Determination of iron (II)



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.

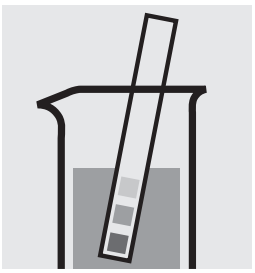
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Reaction time:
5 minutes



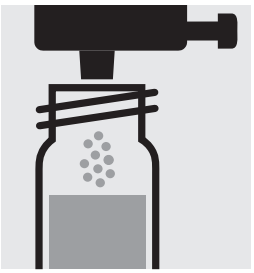
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Determination of iron (II + III)

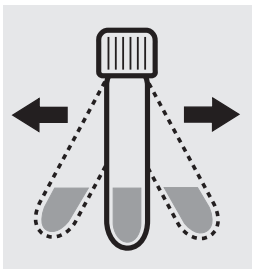


Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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

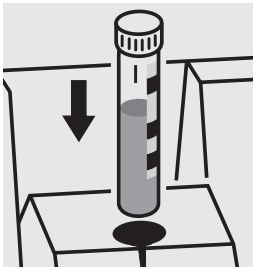


Add 1 dose of **Fe-1K** using the blue dose-metering cap, close the reaction cell with the screw cap.



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:

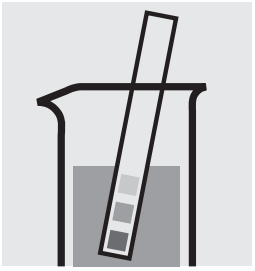
To check the measurement system (test reagents, measurement device, and handling) ready-for-use iron standard solution Certipur®, Cat.No. 119687, concentration 1000 mg/l Fe(III), can be used after diluting accordingly.

Iron

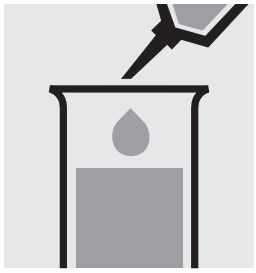
114761

Test

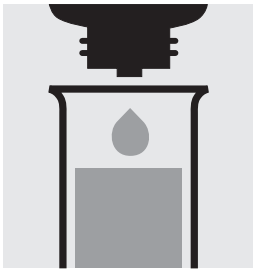
Measuring	0.05 – 5.00 mg/l Fe	10-mm cell
range:	0.03 – 2.50 mg/l Fe	20-mm cell
	0.005 – 1.000 mg/l Fe	50-mm cell
	Expression of results also possible in mmol/l.	



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.

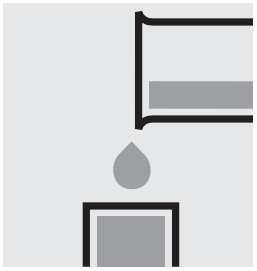


Pipette 5.0 ml of the sample into a test tube.

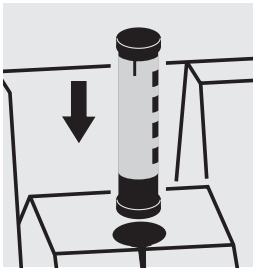


Add 3 drops of **Fe-1** and mix.

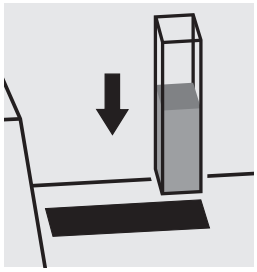
Reaction time:
3 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

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).

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 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

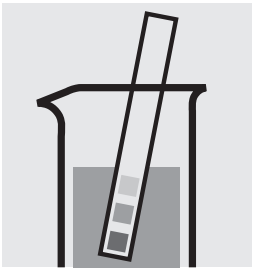
Determination of iron(II) and iron(III)

100796

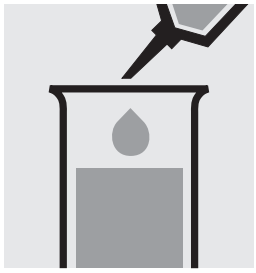
Test

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

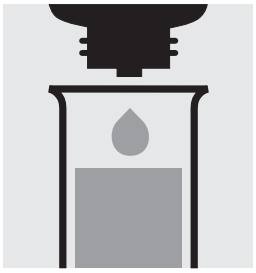
Determination of iron(II)



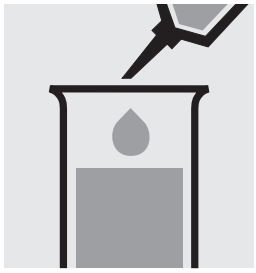
Check the pH of the sample, specified range: pH 2 – 8.
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



Pipette 8.0 ml of the sample into a test tube.

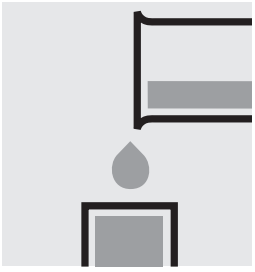


Add 1 drop of **Fe-1** and mix.

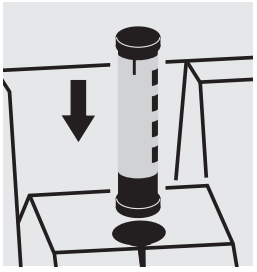


Add 0.50 ml of **Fe-2** with pipette and mix.

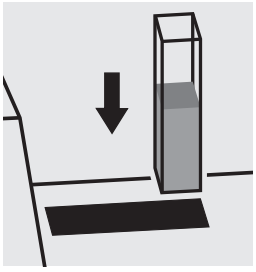
Reaction time: 5 minutes



Transfer the solution into a corresponding cell.



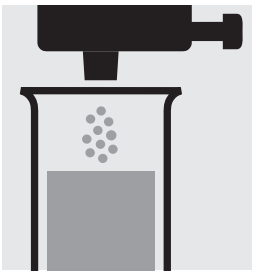
Select method with AutoSelector.



Place the cell into the cell compartment.

Determination of iron(II + III)

Same preparation as discribed above. After adding of **Fe-2** continue with **Fe-3**.



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

Reaction time: 10 minutes, then measure.

Calculation of iron(III)

Result B (Fe II+III)
– Result A (Fe II)
= mg/l Fe(III)

Important:

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

Quality assurance:

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

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

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

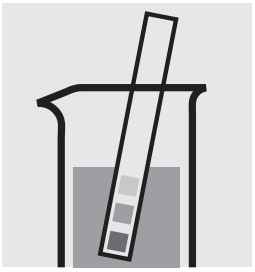
Lead

114833

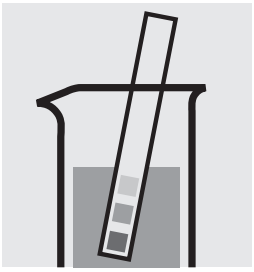
Cell Test

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

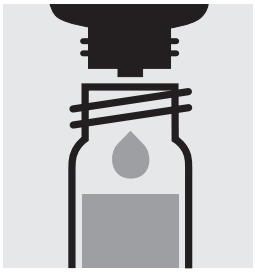
Samples of total hardness 0 – 10 °d



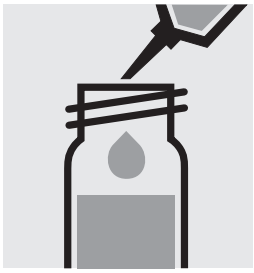
Check the total hardness of the sample.



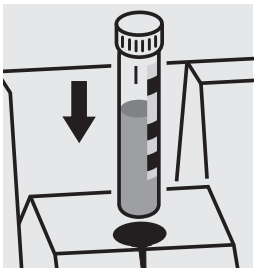
Check the pH of the sample, specified range: pH 3 – 6.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



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



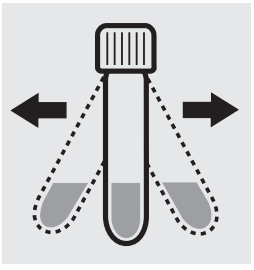
Add 5.0 ml of the sample with pipette, close the cell with the screw cap, and mix.



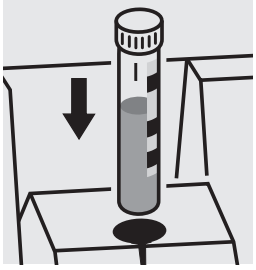
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer
= Result A

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.

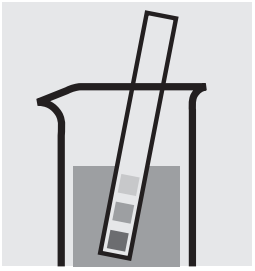
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Lead

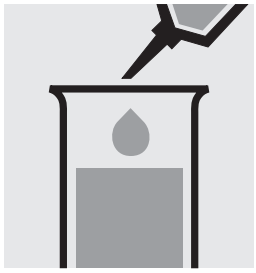
109717

Test

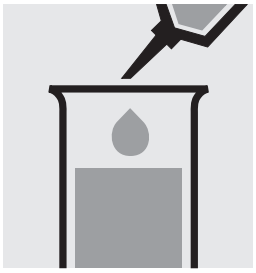
Measuring	0.10 – 5.00 mg/l Pb	10-mm cell
range:	0.05 – 2.50 mg/l Pb	20-mm cell
	0.010 – 1.000 mg/l Pb	50-mm cell
	Expression of results also possible in mmol/l.	



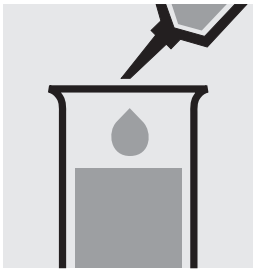
Check the pH of the sample, specified range: pH 3 – 6.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



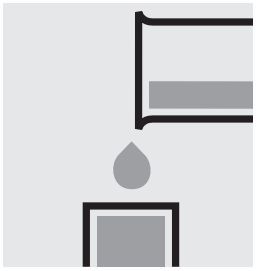
Pipette 0.50 ml of **Pb-1** into a test tube.



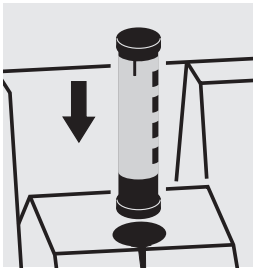
Add 0.50 ml of **Pb-2** with pipette and mix.



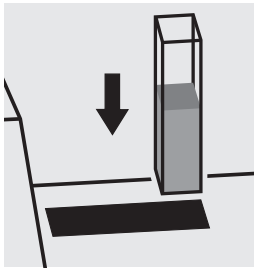
Add 8.0 ml of the sample with pipette and mix.



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

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.

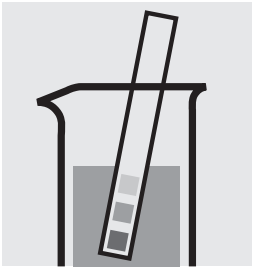
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Magnesium

100815

Cell Test

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

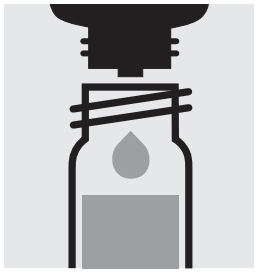


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

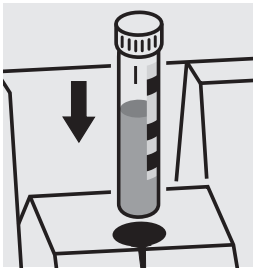
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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:

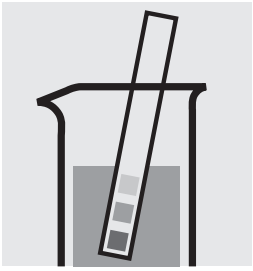
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

Manganese

100816

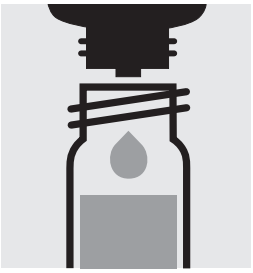
Cell Test

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



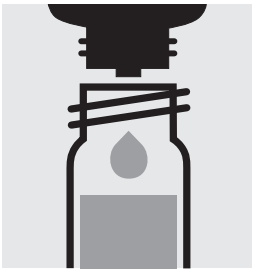
Check the pH of the sample, specified range: pH 2 – 7.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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



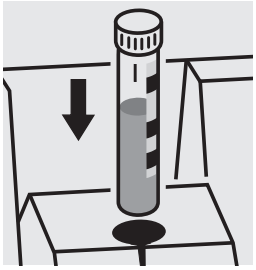
Add 2 drops of **Mn-1K**, close the cell with the screw cap, and mix.

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.

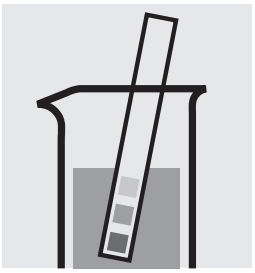
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

Manganese

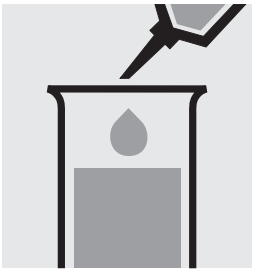
101739

Test

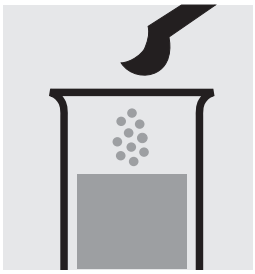
Measuring	0.05 – 2.00	mg/l Mn	10-mm cell
range:	0.03 – 1.00	mg/l Mn	20-mm cell
	0.005 – 0.400	mg/l Mn	50-mm cell
	Expression of results also possible in mmol/l.		



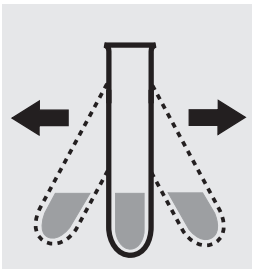
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



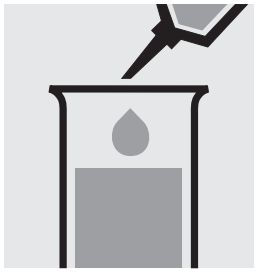
Pipette 8.0 ml of the sample into a test tube.



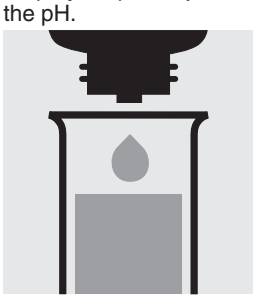
Add 1 level grey microspoon of **Mn-1**.



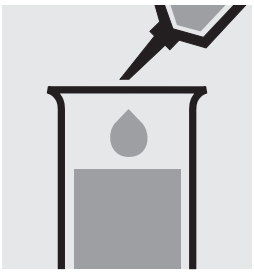
Shake the tube vigorously to dissolve the solid substance.



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

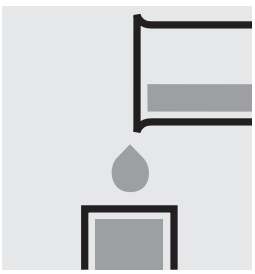


Add 3 drops of **Mn-3** and mix.

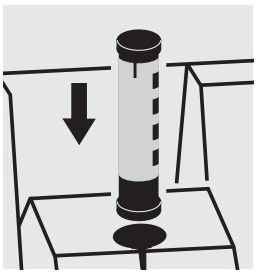


Add **swiftly** 0.25 ml of **Mn-4** with pipette and mix **immediately**.

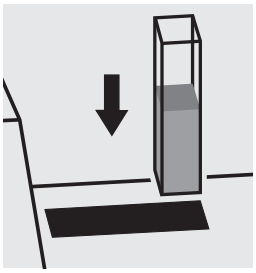
Reaction time:
10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

Quality assurance:

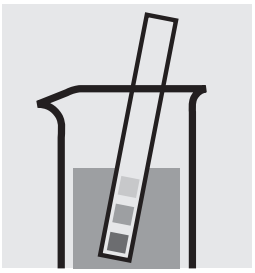
To check the measurement system (test reagents, measurement device, and handling) ready-for-use manganese standard solution Certipur®, Cat.No. 119789, concentration 1000 mg/l Mn, can be used after diluting accordingly.

Manganese

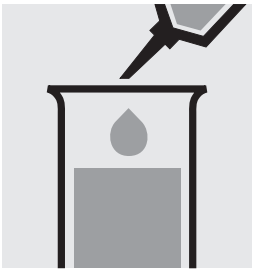
114770

Test

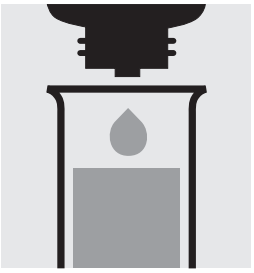
Measuring	0.50 – 10.00 mg/l Mn	10-mm cell
range:	0.25 – 5.00 mg/l Mn	20-mm cell
	0.010 – 2.000 mg/l Mn	50-mm cell
	Expression of results also possible in mmol/l.	



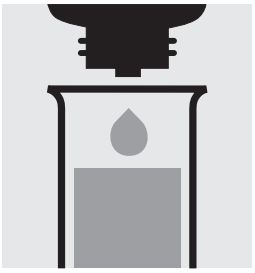
Check the pH of the sample, specified range: pH 2 – 7.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.

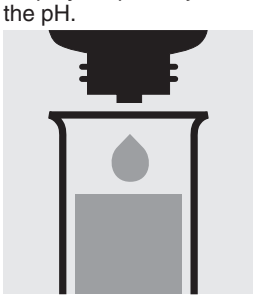


Add 4 drops of **Mn-1** and mix.
Check the pH, specified pH: approx. 11.5.



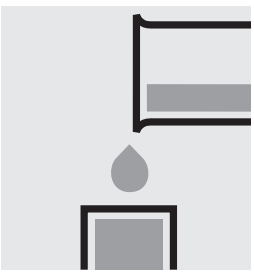
Add 2 drops of **Mn-2** and mix.

Reaction time: 2 minutes

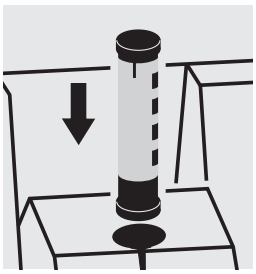


Add 2 drops of **Mn-3** and mix.

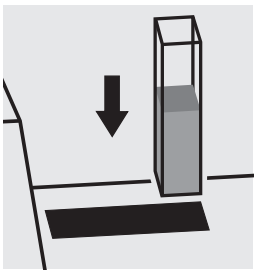
Reaction time: 2 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

Quality assurance:

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

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

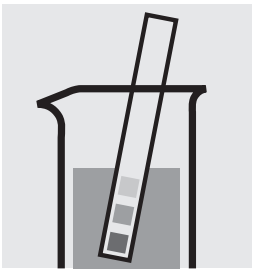
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 30) is highly recommended.

Manganese

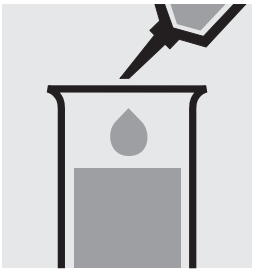
101846

Test

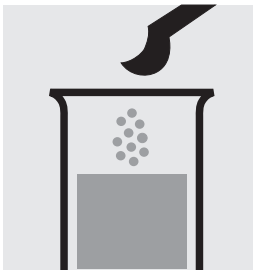
Measuring	0.05 – 2.00	mg/l Mn	10-mm cell
range:	0.03 – 1.00	mg/l Mn	20-mm cell
	0.005 – 0.400	mg/l Mn	50-mm cell
	Expression of results also possible in mmol/l.		



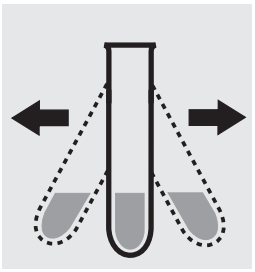
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



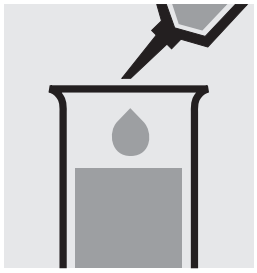
Pipette 8.0 ml of the sample into a test tube.



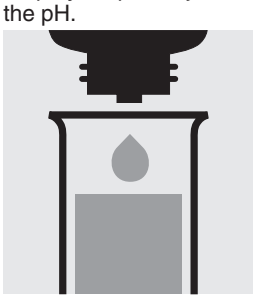
Add 1 level grey microspoon of **Mn-1**.



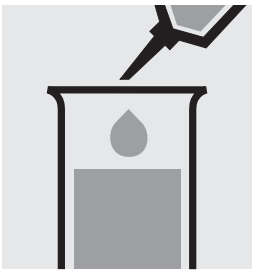
Shake the tube vigorously to dissolve the solid substance.



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

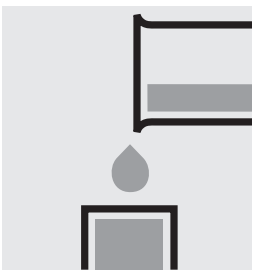


Add **carefully** 3 drops of **Mn-3** and mix.

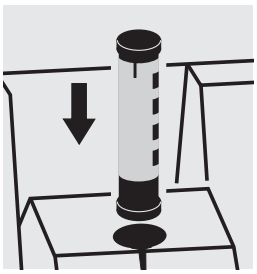


Add **carefully** 0.25 ml of **Mn-4** with pipette and mix **carefully** (**Foams! Wear eye protection!**).

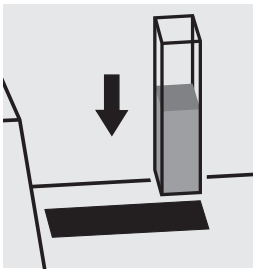
Reaction time:
10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

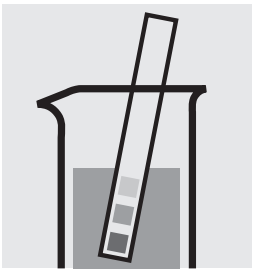
Quality assurance:

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

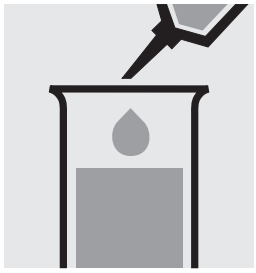
Mercury in water and wastewater

Application

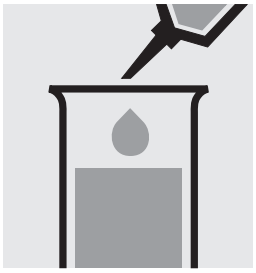
Measuring range: 0.025 – 1.000 mg/l Hg 50-mm cell



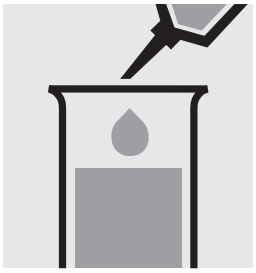
Check the pH of the sample, specified range: pH 3 – 7.
If required, add dilute sodium hydroxide solution or acetic acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.

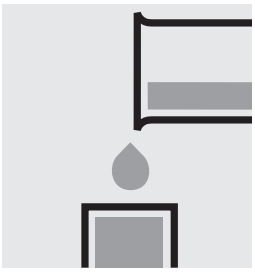


Add 1.0 ml of **reagent 1** with pipette and mix.

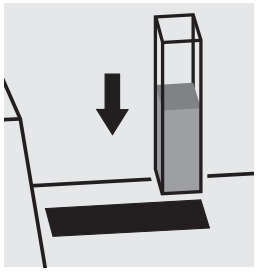


Add 1.5 ml of **reagent 2** with pipette and mix.

Reaction time: 5 minutes



Transfer the solution into a cell.



Place the cell into the cell compartment.
Select method no. **135**.

Important:

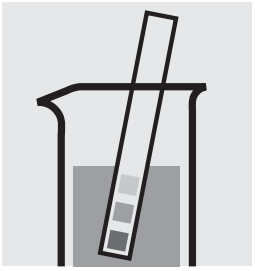
The exact composition and preparation of the reagents 1 and 2 used are given in the corresponding application, which also includes further information on the method employed. This application can be downloaded directly at www.analytical-test-kits.com.

Molybdenum

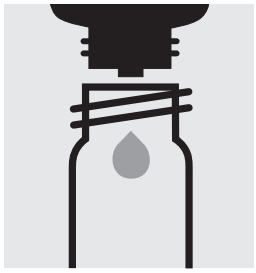
100860

Cell Test

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

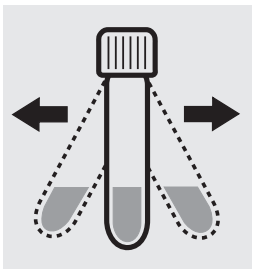


Check the pH of the sample, specified range: pH 1 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



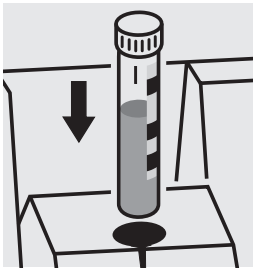
Place 2 drops of **Mo-1K** into a reaction cell and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 2 minutes



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

Quality assurance:

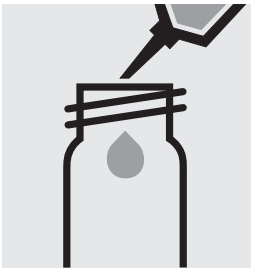
To check the measurement system (test reagents, measurement device, and handling) a ready-for-use molybdenum standard solution Certipur®, Cat.No. 170227, concentration 1000 mg/l Mo, can be used after diluting accordingly.

Molybdenum

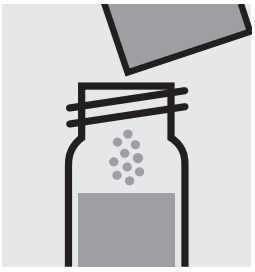
119252

Test

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

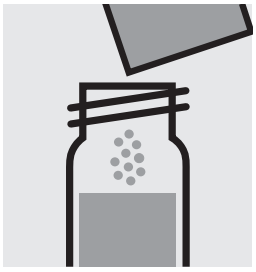


Pipette 10 ml of the sample into into a empty round cell (Empty cells, Cat.No. 114724).

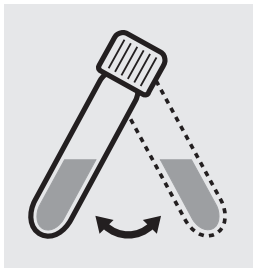


Add 1 powder pack of **Molybdenum HR1**, close with the screw cap, and dissolve the solid substance.

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

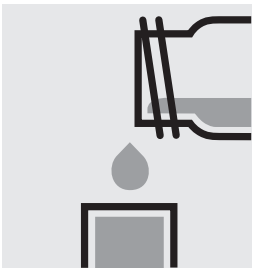


Add 1 powder pack of **Molybdenum HR3** and close with the screw cap.

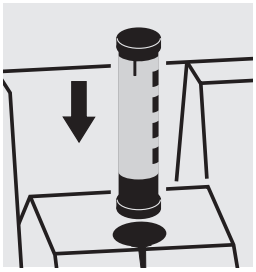


Swirl the cell to dissolve the solid substance.

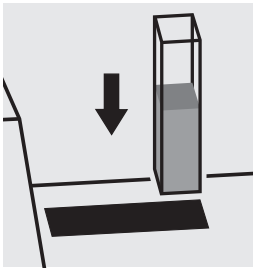
Reaction time:
5 minutes, **measure immediately**.



Transfer the solution into a rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Quality assurance:

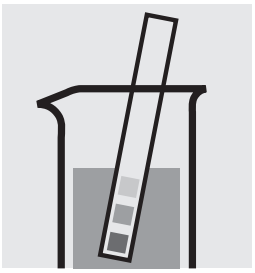
To check the measurement system (test reagents, measurement device, and handling) a ready-for-use molybdenum standard solution Certipur®, Cat.No. 170227, concentration 1000 mg/l Mo, can be used after diluting accordingly.

Monochloramine

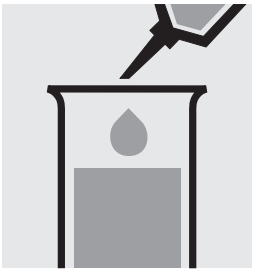
101632

Test

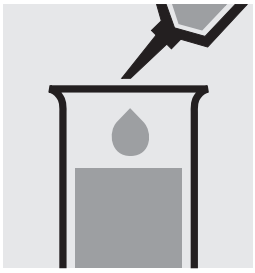
Measuring	0.25 – 10.00 mg/l Cl_2	0.18 – 7.26 mg/l NH_2Cl	0.05 – 1.98 mg/l NH_2Cl-N 10-mm cell
range:	0.13 – 5.00 mg/l Cl_2	0.09 – 3.63 mg/l NH_2Cl	0.026 – 0.988 mg/l NH_2Cl-N 20-mm cell
	0.050 – 2.000 mg/l Cl_2	0.04 – 1.45 mg/l NH_2Cl	0.010 – 0.395 mg/l NH_2Cl-N 50-mm cell
	Expression of results also possible in mmol/l.		



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

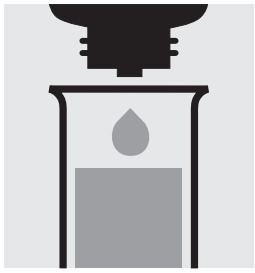


Pipette 10 ml of the sample into a test tube.



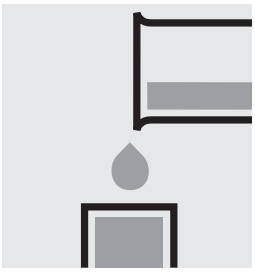
Add 0.60 ml of **MCA-1** with pipette and mix.

Reaction time:
5 minutes

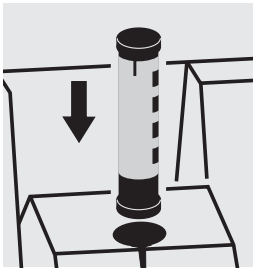


Add 4 drops of **MCA-2** and mix.

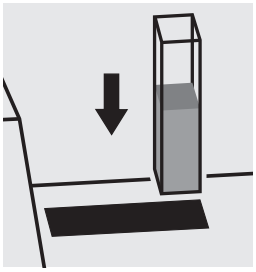
Reaction time:
10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

Quality assurance:

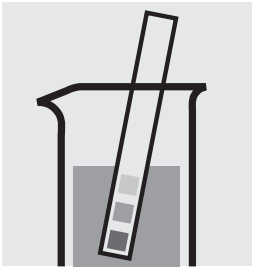
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared (see section “Standard solutions”).

Nickel

114554

Cell Test

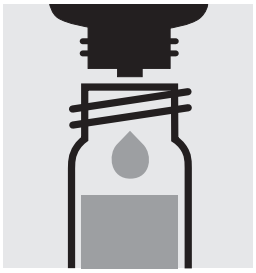
Measuring range:	0.10 – 6.00 mg/l Ni Expression of results also possible in mmol/l.



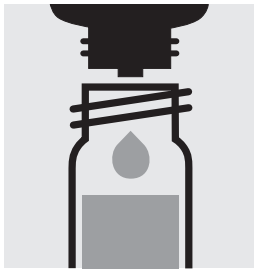
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

Reaction time:
1 minute

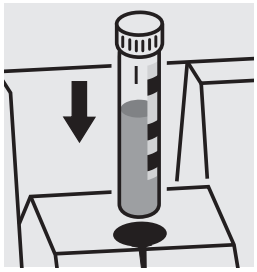


Add 2 drops of **Ni-1K**, close with the screw cap, and mix.



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

Reaction time:
2 minutes



Place the cell into the 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.

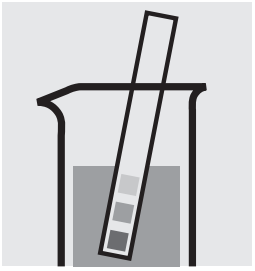
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Nickel

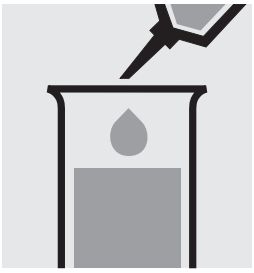
114785

Test

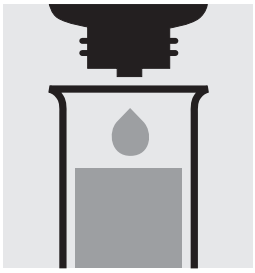
Measuring	0.10 – 5.00 mg/l Ni	10-mm cell
range:	0.05 – 2.50 mg/l Ni	20-mm cell
	0.02 – 1.00 mg/l Ni	50-mm cell
	Expression of results also possible in mmol/l.	



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

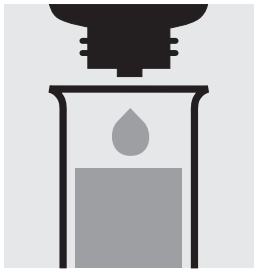


Pipette 5.0 ml of the sample into a test tube.

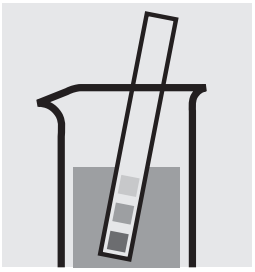


Add 1 drop of **Ni-1** and mix. If the color disappears, continue adding drop by drop until a slight yellow coloration persists.

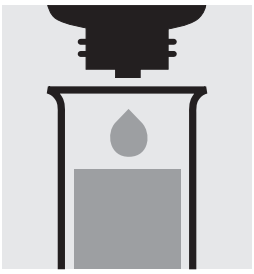
Reaction time:
1 minute



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

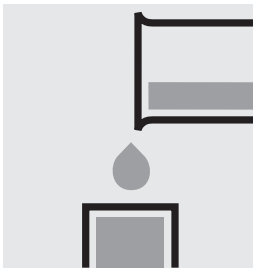


Check the pH, specified range: pH 10 – 12.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

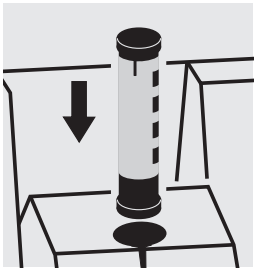


Add 2 drops of **Ni-3** and mix.

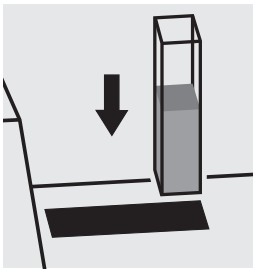
Reaction time:
2 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

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).

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 40, Cat.No. 114692.

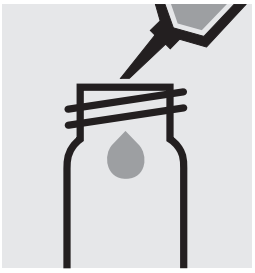
A nickel standard solution Titrisol®, Cat.No. 109989, can also be used after diluting accordingly.

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

Nickel in electroplating baths

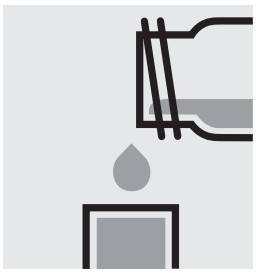
Inherent color

Measuring range:	10 – 120 g/l Ni	10-mm cell
	5.0 – 60.0 g/l Ni	20-mm cell
	2.0 – 24.0 g/l Ni	50-mm cell

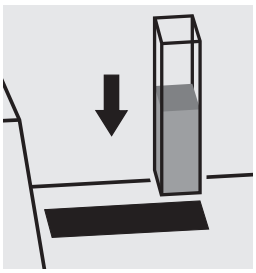


Pipette 5.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

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



Transfer the solution into a corresponding rectangular cell.



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

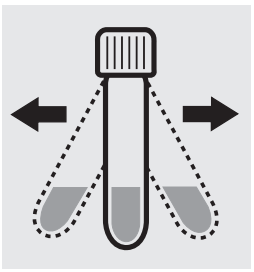
Nitrate

114542

Cell Test

Measuring	0.5 – 18.0 mg/l NO_3-N
range:	2.2 – 79.7 mg/l NO_3
	Expression of results also possible in mmol/l.

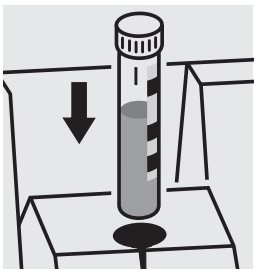
Add 1 level yellow microspoon of **NO_3-1K** into a reaction cell and close with the screw cap.



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

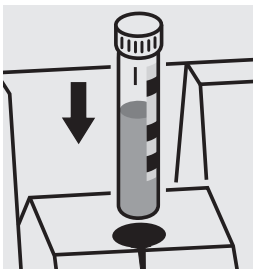
Cell Test

Measuring	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 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

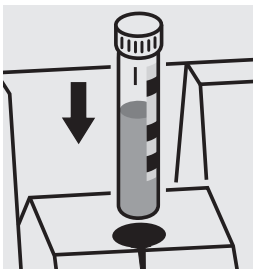
Cell Test

Measuring	1.0 – 50.0 mg/l NO_3-N
range:	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

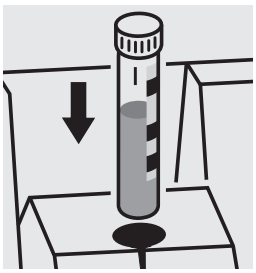
Cell Test

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.

Nitrate

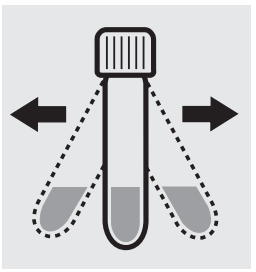
114773

Test

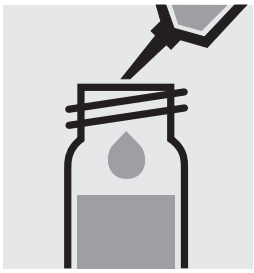
Measuring	0.5 – 20.0 mg/l NO_3-N	2.2 – 88.5 mg/l NO_3 10-mm cell
range:	0.2 – 10.0 mg/l NO_3-N	0.9 – 44.3 mg/l NO_3 20-mm cell
	Expression of results also possible in mmol/l.	

Place 1 blue microspoon of **NO_3-1** into a dry empty round cell (Empty cells, Cat.No. 114724).

Add 5.0 ml of **NO_3-2** with pipette into the cell. Close the cell with the screw cap.

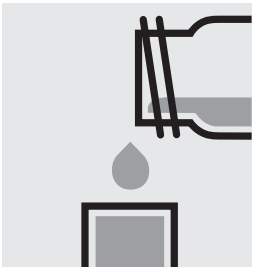


Shake vigorously for 1 minute to dissolve the solid substance.

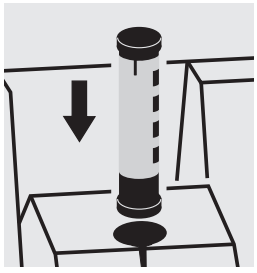


Add very slowly 1.5 ml of the sample with pipette, close the cell with the screw cap, and mix **briefly**.
Caution, cell becomes hot!

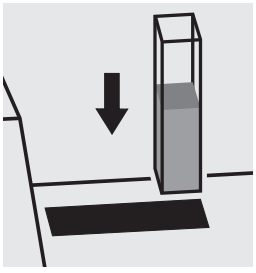
Reaction time: 10 minutes



Transfer the solution into a corresponding rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Note:

Empty cells with screw caps, Cat.No. 114724 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 and 20, Cat.No. 114676 and 114675, or the Standard solution for photometric applications, CRM, Cat.No. 125036, 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.

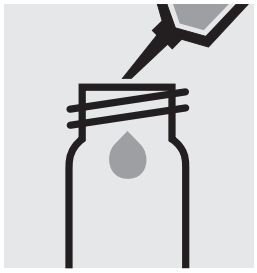
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

Nitrate

109713

Test

Measuring	1.0 – 25.0 mg/l NO_3-N	4.4 – 110.7 mg/l NO_3	10-mm cell
range:	0.5 – 12.5 mg/l NO_3-N	2.2 – 55.3 mg/l NO_3	20-mm cell
	0.10 – 5.00 mg/l NO_3-N	0.4 – 22.1 mg/l NO_3	50-mm cell
	Expression of results also possible in mmol/l.		

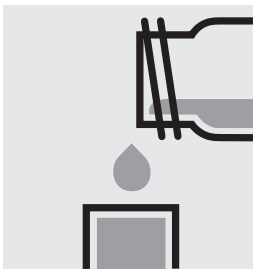


Pipette 4.0 ml of **NO_3-1** into a dry empty round cell (Empty cells, Cat. No. 114724).

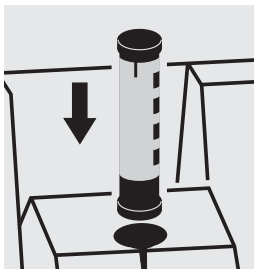
Add 0.50 ml of the sample with pipette, **do not mix.**

Add 0.50 ml of **NO_3-2** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

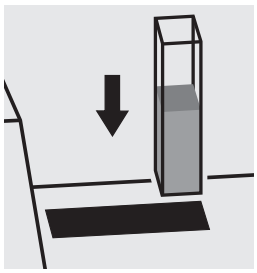
Reaction time: 10 minutes



Transfer the solution into a corresponding rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

Note:

Empty cells with screw caps, Cat.No. 114724 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10 and 20, Cat.No. 114676 and 114675, or the Standard solution for photometric applications, CRM, Cat.No. 125036, 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) is highly recommended.

Nitrate

in seawater

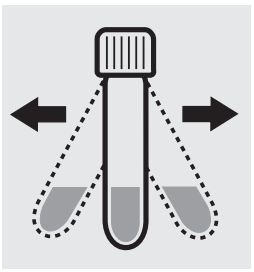
114556

Cell Test

Measuring range:	0.10 – 3.00 mg/l NO_3-N
	0.4 – 13.3 mg/l NO_3
	Expression of results also possible in mmol/l.

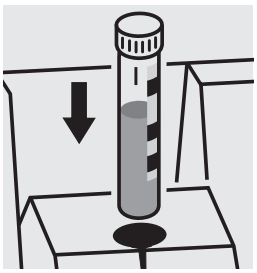
Pipette 2.0 ml of the sample into a reaction cell, **do not mix**.

Add 1 level blue micro-spoon of **NO_3-1K**, **immediately** close the cell tightly with the screw cap. **Caution, foams strongly (eye protection, protective gloves)!**



Shake the cell **vigorously for 5 seconds** to dissolve the solid substance.

Reaction time: 30 minutes



Place the cell into the 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. 125036 and 125037.

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

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

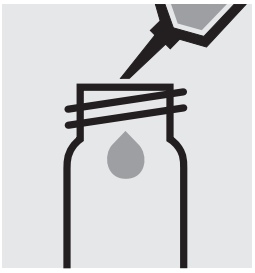
Nitrate

in seawater

114942

Test

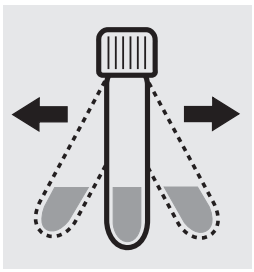
Measuring range:	0.2 – 17.0 mg/l NO_3-N	0.9 – 75.3 mg/l NO_3	10-mm cell
	Expression of results also possible in mmol/l.		



Pipette 5.0 ml of **NO_3-1** into a dry empty round cell (Empty cells, Cat. No. 114724).

Add 1.0 ml of the sample with pipette. **Caution, cell becomes hot!**

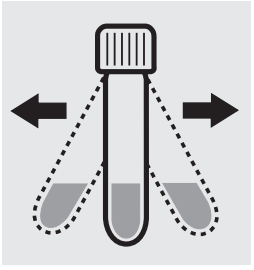
Immediately add 1.5 ml of **NO_3-2** with pipette.



Close cell tightly and shake **vigorously**.

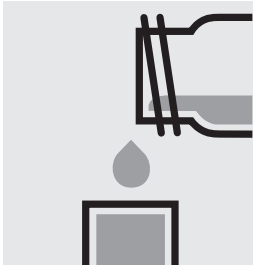
Reaction time: 15 minutes

Add 2 level grey micro-spoons of **NO_3-3**.

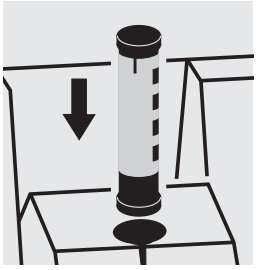


Close cell tightly and shake **vigorously** until the reagent is completely dissolved.

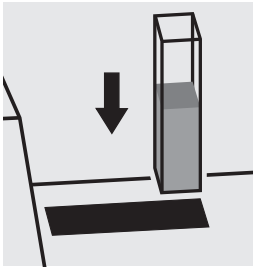
Reaction time: 60 minutes



Transfer the solution into a rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

Empty cells with screw caps, Cat.No. 114724 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 20, Cat.No. 114675, or the Standard solution for photometric applications, CRM, Cat.No. 125036, 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.

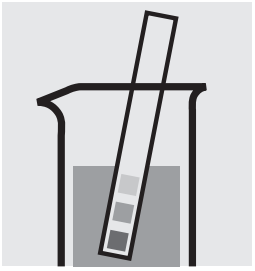
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Nitrate

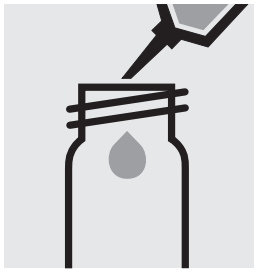
101842

Test

Measuring range:	0.3 – 30.0 mg/l NO_3-N	1.3 – 132.8 mg/l NO_3	50-mm cell
	Expression of results also possible in mmol/l.		

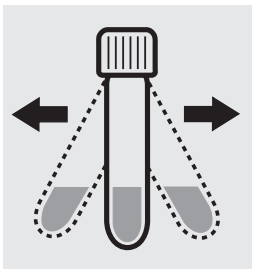


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



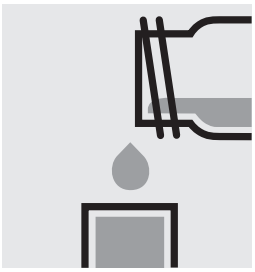
Pipette 10 ml of the sample into a test tube (Flat-bottomed tubes, Cat.No. 114902).

Add 1 level blue micro-spoon of **NO_3-1**, **immediately** close tightly with the screw cap.

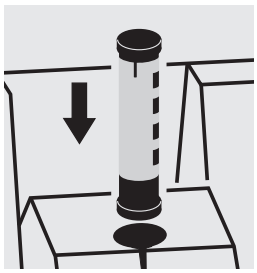


Shake the tube **vigorously for 1 minute** to dissolve the solid substance.

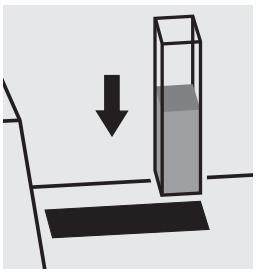
Reaction time:
5 minutes, **measure immediately**.



Transfer the solution (when possible without sediment) into a corresponding rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Quality assurance:

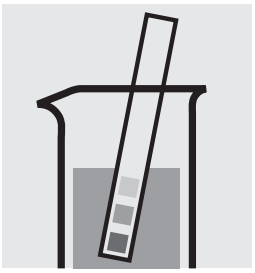
To check the measurement system (test reagents, measurement device, and handling) a ready-for-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO_3^-, can be used after diluting accordingly.

Nitrite

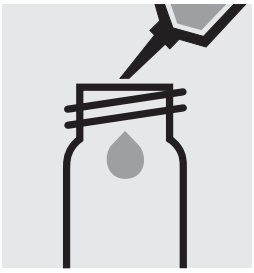
114547

Cell Test

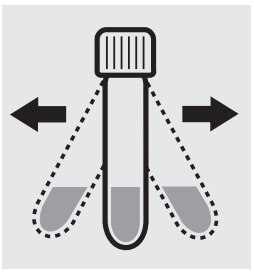
Measuring range:	0.010 – 0.700 mg/l NO_2-N
	0.03 – 2.30 mg/l NO_2
	Expression of results also possible in mmol/l.



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

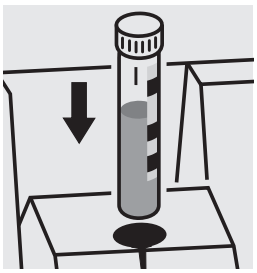


Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap.



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:

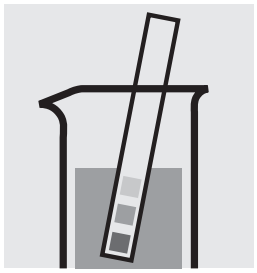
To check the measurement system (test reagents, measurement device, and handling) ready-for-use nitrite standard solution Certipur®, Cat.No. 119899, concentration 1000 mg/l NO_2^-, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125041.

Nitrite

100609

Cell Test

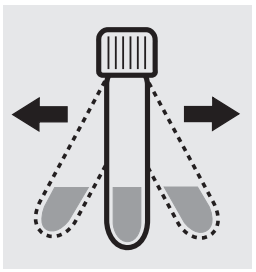
Measuring range:	1.0 – 90.0 mg/l NO_2-N
	3 – 296 mg/l NO_2
	Expression of results also possible in mmol/l.



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

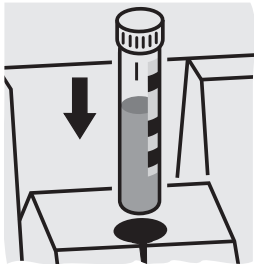
Add 2 level blue micro-spoons of **NO_2-1K** into a reaction cell.

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:

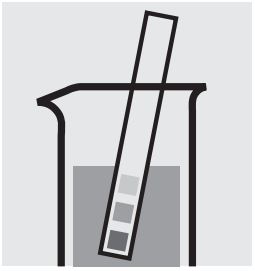
To check the measurement system (test reagents, measurement device, and handling) ready-for-use nitrite standard solution Certipur®, Cat.No. 119899, concentration 1000 mg/l NO_2^-, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125042.

Nitrite

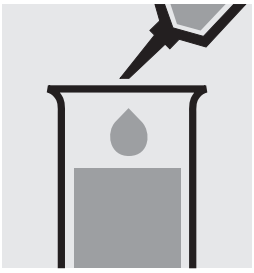
114776

Test

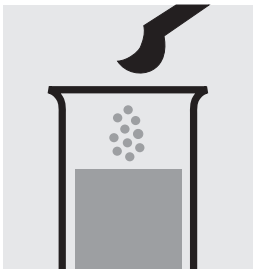
Measuring	0.02 – 1.00 mg/l NO_2-N	0.07 – 3.28 mg/l NO_2	10-mm cell
range:	0.010 – 0.500 mg/l NO_2-N	0.03 – 1.64 mg/l NO_2	20-mm cell
	0.002 – 0.200 mg/l NO_2-N	0.007 – 0.657 mg/l NO_2	50-mm cell
	Expression of results also possible in mmol/l.		



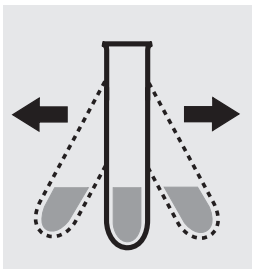
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



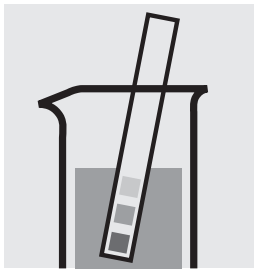
Pipette 5.0 ml of the sample into a test tube.



Add 1 level blue microspoon of **NO_2-1**.

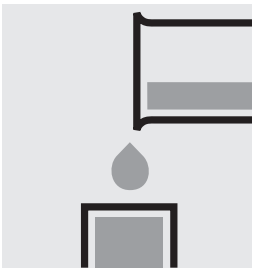


Shake vigorously to dissolve the solid substance.

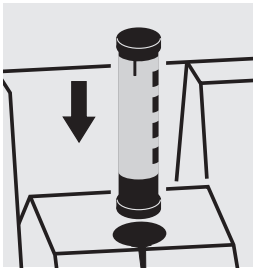


Check the pH, specified range: pH 2.0 – 2.5.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

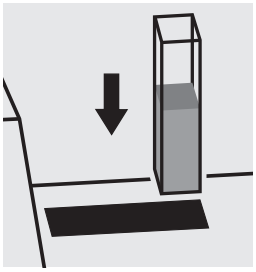
Reaction time:
10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

Quality assurance:

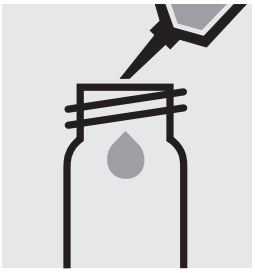
To check the measurement system (test reagents, measurement device, and handling) ready-for-use nitrite standard solution Certipur®, Cat.No. 119899, concentration 1000 mg/l NO_2^-, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125041.

Nitrogen (total)

114537

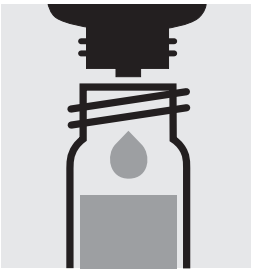
Cell Test

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

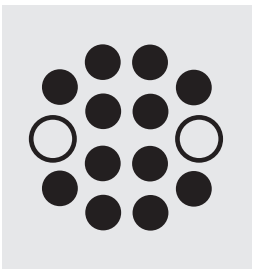


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

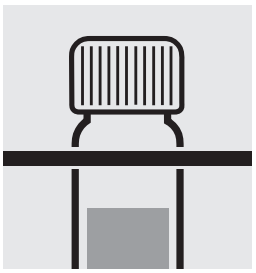
Add 1 level blue microspoon of **N-1K.**



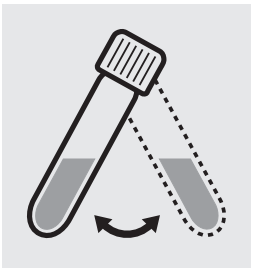
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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

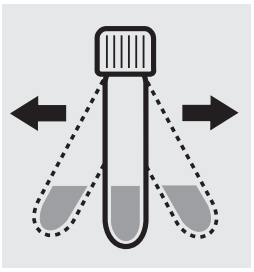


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.



Swirl the cell after 10 minutes.

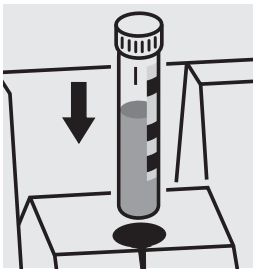
Add 1 level yellow microspoon of **N-3K into a reaction cell**, close the cell with the screw cap.



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.

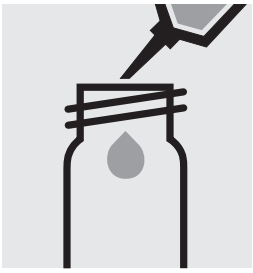
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Nitrogen (total)

100613

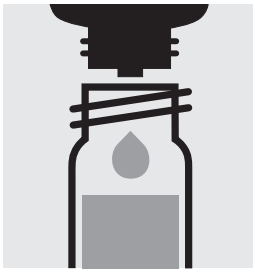
Cell Test

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

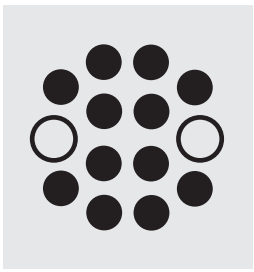


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

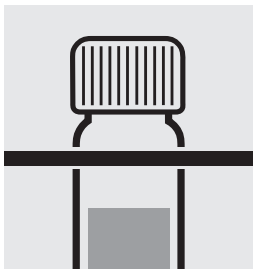
Add 1 level blue micro-spoon of **N-1K.**



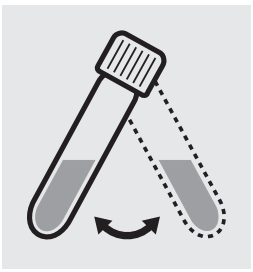
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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**.

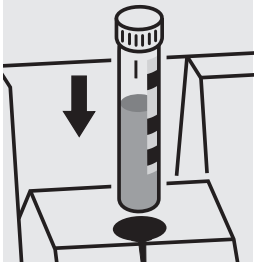


Swirl the cell after 10 minutes.

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.

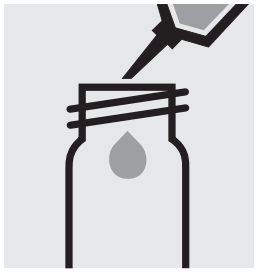
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

Nitrogen (total)

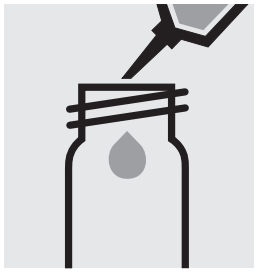
114763

Cell Test

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

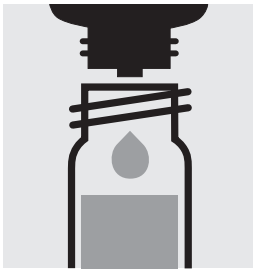


Pipette 1.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

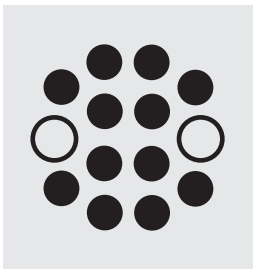


Add 9.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) with pipette.

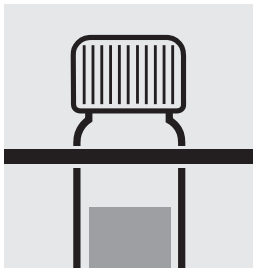
Add 1 level blue microspoon of **N-1K.**



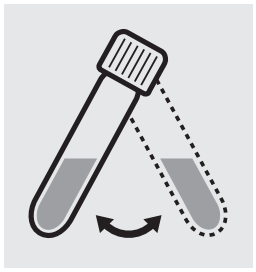
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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**.

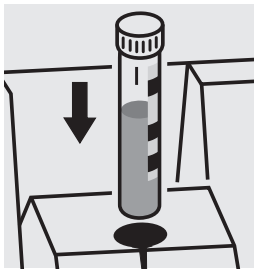


Swirl the cell after 10 minutes.

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.

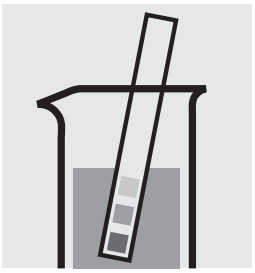
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

Oxygen

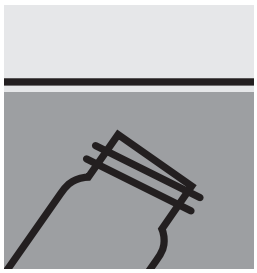
114694

Cell Test

Measuring range: 0.5 – 12.0 mg/l O_2



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.

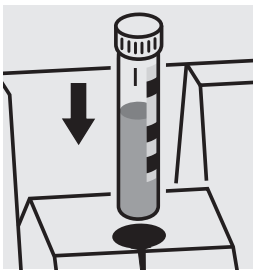
Add with microspoon 1 glass bead.

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:

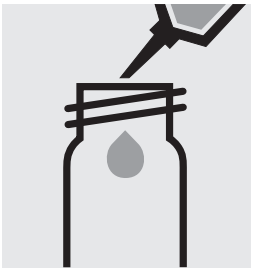
To check the measurement system (test reagents, measurement device, and handling) a oxygen standard solution must be prepared (application see the website).

Oxygen Scavengers

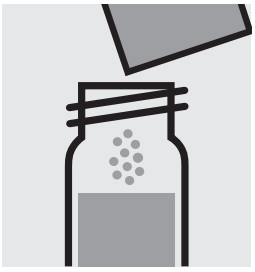
119251

Test

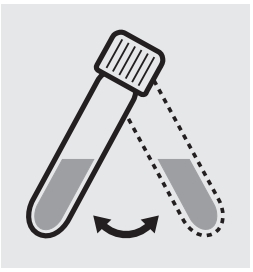
Measuring range:	0.020 – 0.500 mg/l DEHA*	20-mm cell
	* N,N-diethylenhydroxylamine	
	0.027 – 0.666 mg/l Carbohy*	20-mm cell
	* carbohydrazide	
	0.05 – 1.31 mg/l Hydro*	20-mm cell
	* hydroquinone	
	0.08 – 1.95 mg/l ISA*	20-mm cell
	* isoascorbic acid	
	0.09 – 2.17 mg/l MEKO*	20-mm cell
	* methylethylketoxime	



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



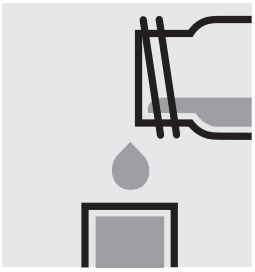
Add 1 powder pack of **Oxyscav 1** and close with the screw cap.



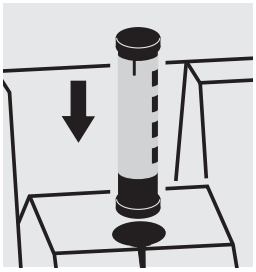
Swirl the cell to dissolve the solid substance.

Add 0.20 ml of **Oxyscav 2** with pipette, close with the screw cap, and mix.

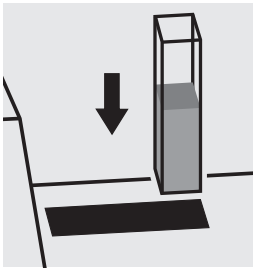
Reaction time: 10 minutes, **protect from light in the process**, **measure immediately**.



Transfer the solution into a rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Quality assurance:

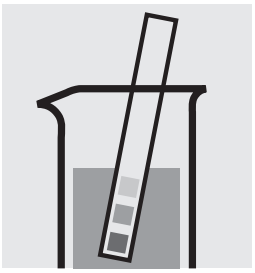
To check the measurement system (test reagents, measurement device, and handling) a oxygen scavengers standard solution must be prepared from N,N-diethylhydroxylamine, Cat.No. 818473 (see section “Standard solutions”).

Ozone

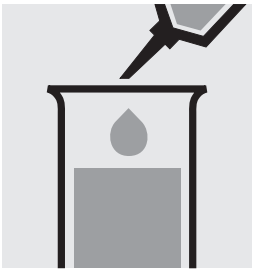
100607

Test

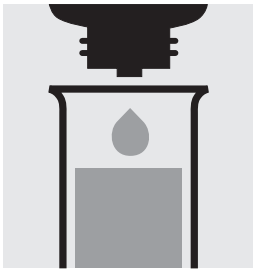
Measuring	0.05 – 4.00	mg/l O_3	10-mm cell
range:	0.02 – 2.00	mg/l O_3	20-mm cell
	0.010 – 0.800	mg/l O_3	50-mm cell
	Expression of results also possible in mmol/l.		



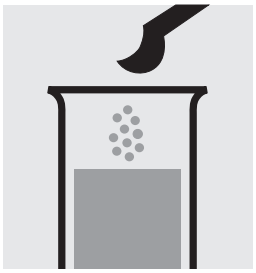
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



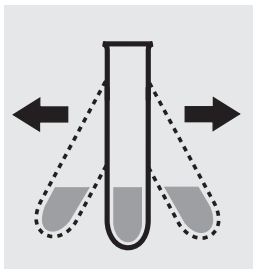
Pipette 10 ml of the sample into a test tube.



Add 2 drops of **O_3-1** and mix.

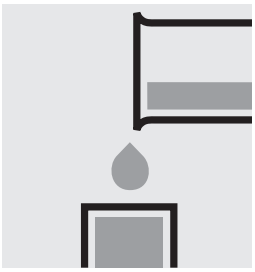


Add 1 level blue micro-spoon of **O_3-2.**

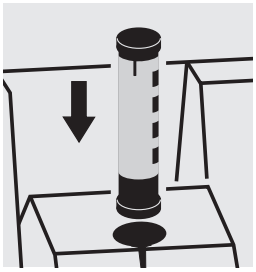


Shake vigorously to dissolve the solid substance.

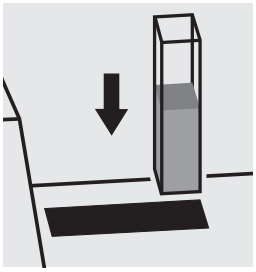
Reaction time:
1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

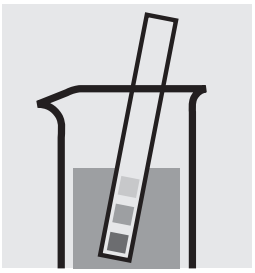
Quality assurance:

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

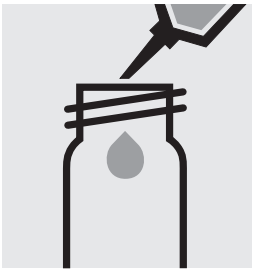
Palladium in water and wastewater

Application

Measuring range: 0.05 – 1.25 mg/l Pd 10-mm cell



Check the pH of the sample, specified range: pH 2 – 5.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



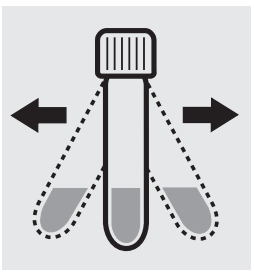
Pipette 5.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

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

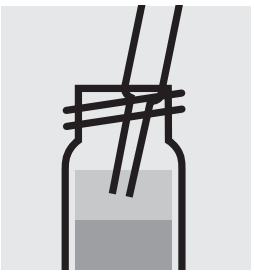
Check the pH of the sample, specified value: pH 3.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Add 0.20 ml of **reagent 2** with pipette, close the cell with the screw cap, and mix.

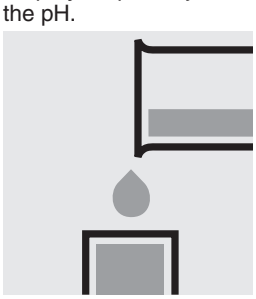
Add 5.0 ml **isoamyl alcohol GR** (Cat.No. 100979) with pipette, close the cell with the screw cap.



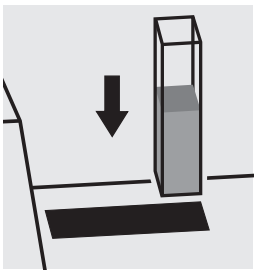
Shake the cell vigorously for 1 minute.
Leave to stand to allow phases to separate.



Aspirate the organic-clear upper phase from the tube with pipette and dry over **sodium sulfate anhydrous** (Cat.No. 106649).



Transfer the dried solution into a rectangular cell.



Place the cell into the cell compartment.
Select method no. **133**.

Note:

Empty cells with screw caps, Cat.No. 114724 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Important:

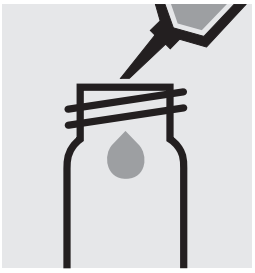
The exact composition and preparation of the reagents 1 and 2 used are given in the corresponding application, which also includes further information on the method employed. This application can be downloaded directly at www.analytical-test-kits.com.

pH

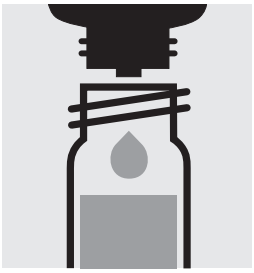
101744

Cell Test

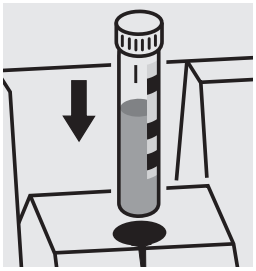
Measuring range: pH 6.4 – 8.8



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:

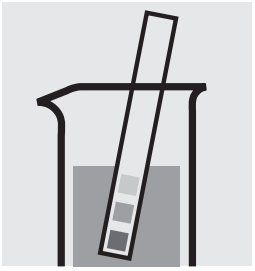
To check the measurement system (test reagents, measurement device, and handling) buffer solution pH 7.00 Certipur®, Cat.No. 109407, can be used.

Phenol

114551

Cell Test

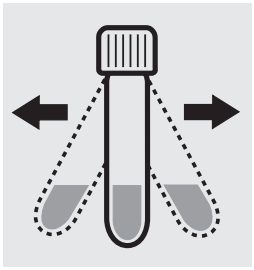
Measuring range:	0.10 – 2.50 mg/l phenol Expression of results also possible in mmol/l.



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

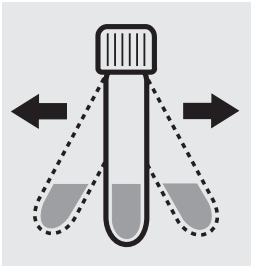
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



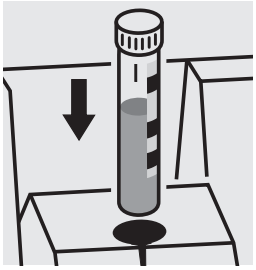
Shake the cell vigorously to dissolve the solid substance.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



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

Important:

Very high phenol concentrationsin the sample result in a weakening of the color and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

Quality assurance:

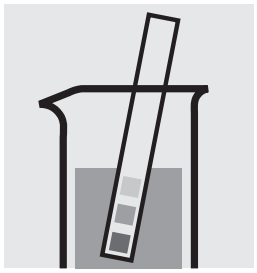
To check the measurement system (test reagents, measurement device, and handling) a phenol standard solution must be prepared from Phenol GR, Cat.No. 100206 (see section “Standard solutions”).

Phenol

100856

Test

Measuring	0.002 – 0.100 mg/l C_6H_5OH	20-mm cell
range:	Expression of results also possible in mmol/l.	
Attention!	The measurement is carried out in a 20-mm rectangular cell against a blank, prepared from distilled water	
	(Water for analysis EMSURE®, Cat.No. 116754, is recommended) and the reagents in an analogous manner.	



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

Pipette 200 ml of sample into a separation funnel.

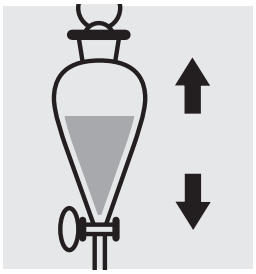
Add 5.0 ml of **Ph-1** with pipette and mix.

Add 1 level green microspoon of **Ph-2** and shake to dissolve the solid substance.

Add 1 level green microspoon of **Ph-3** and shake to dissolve the solid substance.

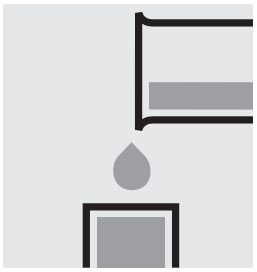
Reaction time:
30 minutes
(protected from light)

Add 10 ml of chloroform with pipette, close separation funnel.

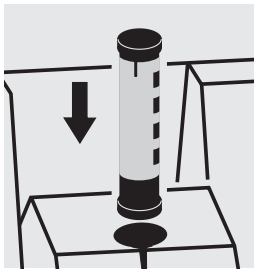


Shake vigorously for 1 minute.

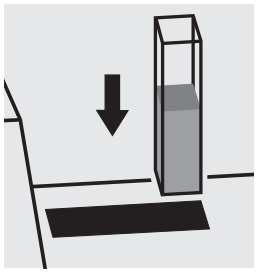
Leave to stand for 5 – 10 minutes to allow the phases to separate.



Transfer the clear **lower** phase into a cell.



Select method with AutoSelector measuring range 0.002 – 0.100 mg/l.



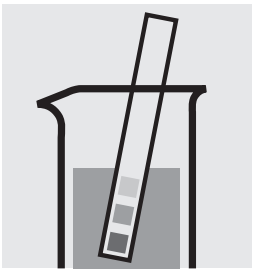
Place the cell into the cell compartment.

Phenol

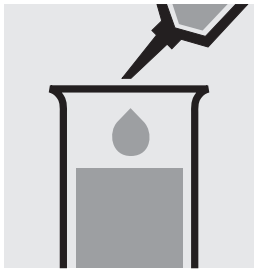
100856

Test

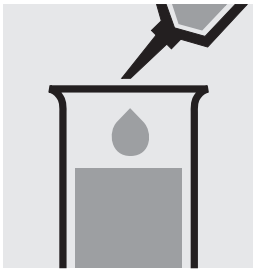
Measuring	0.10 – 5.00 mg/l C_6H_5OH	10-mm cell
range:	0.05 – 2.50 mg/l C_6H_5OH	20-mm cell
	0.025 – 1.000 mg/l C_6H_5OH	50-mm cell
	Expression of results also possible in mmol/l.	



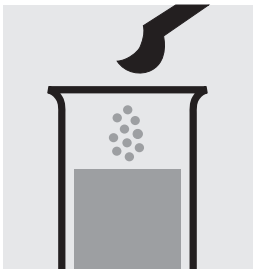
Check the pH of the sample, specified range: pH 2 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



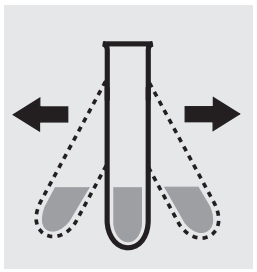
Pipette 10 ml of the sample into a test tube.



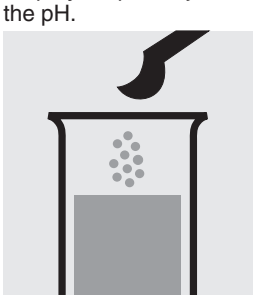
Add 1.0 ml of **Ph-1** with pipette and mix.



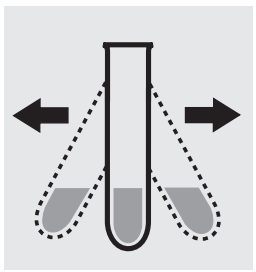
Add 1 level grey micro-spoon of **Ph-2**.



Shake vigorously to dissolve the solid substance.

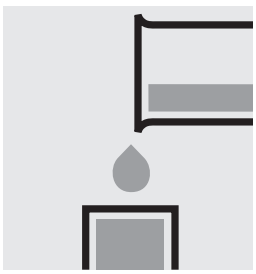


Add 1 level grey micro-spoon of **Ph-3**.

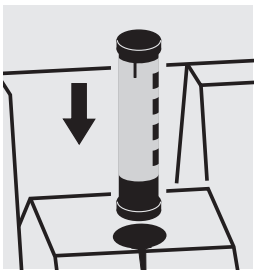


Shake vigorously to dissolve the solid substance.

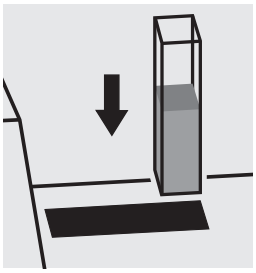
Reaction time: 10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector measuring range 0.025 – 5.00 mg/l.



Place the cell into the cell compartment.

Quality assurance:

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

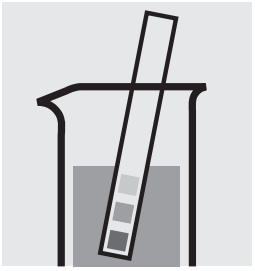
Phosphate

Determination of orthophosphate

100474

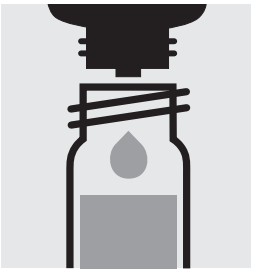
Cell Test

Measuring range:	0.05 – 5.00 mg/l PO_4 -P
	0.2 – 15.3 mg/l PO_4
	0.11 – 11.46 mg/l P_2O_5
	Expression of results also possible in mmol/l.

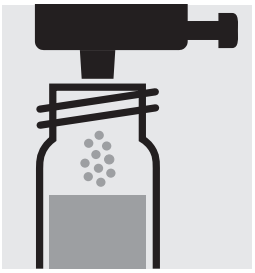


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

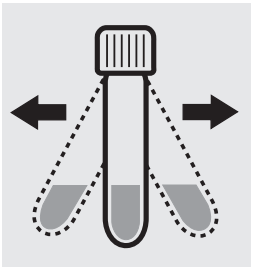
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

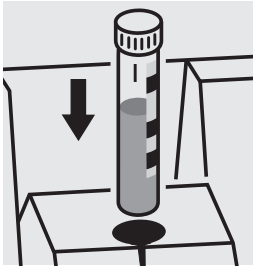


Add 1 dose of **P-2K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the 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.

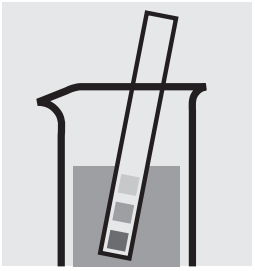
Phosphate

Determination of orthophosphate

114543

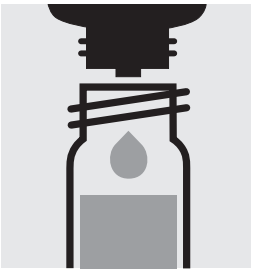
Cell Test

Measuring range:	0.05 – 5.00 mg/l PO_4 -P
	0.2 – 15.3 mg/l PO_4
	0.11 – 11.46 mg/l P_2O_5
	Expression of results also possible in mmol/l.

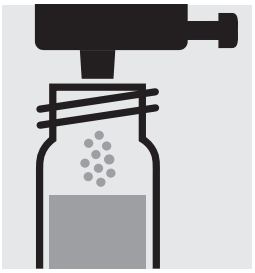


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

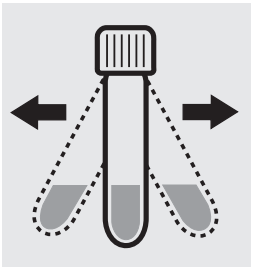
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

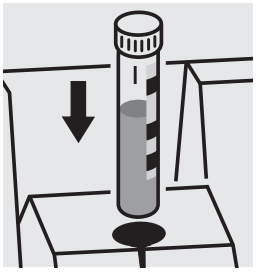


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the 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.

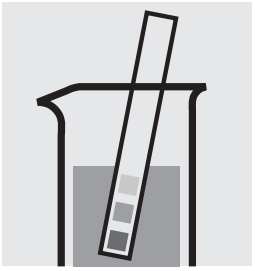
Phosphate

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

114543

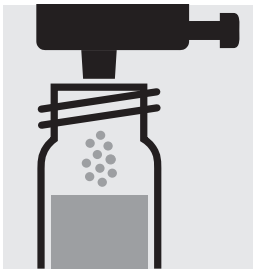
Cell Test

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)].

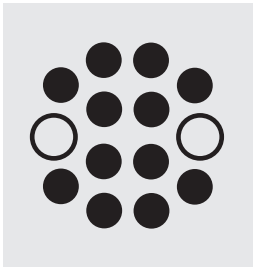


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

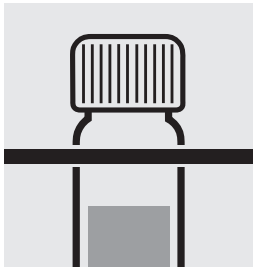
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



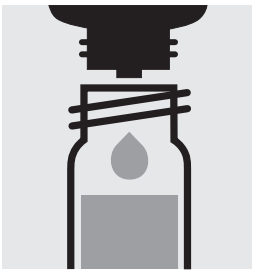
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



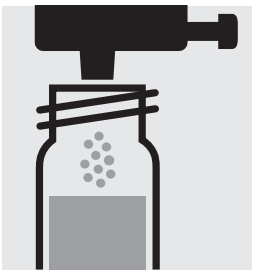
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



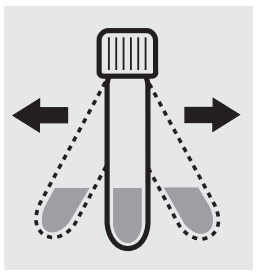
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

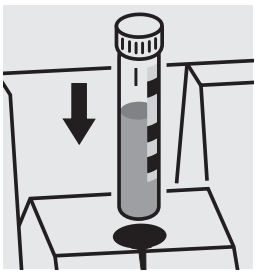


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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.

* 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 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.

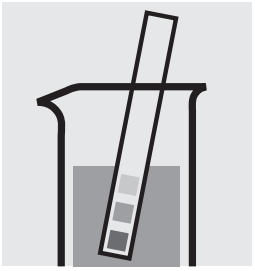
Phosphate

Determination of orthophosphate

100475

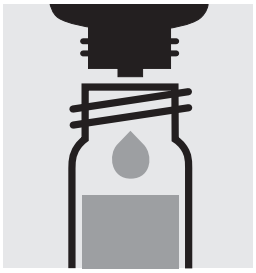
Cell Test

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.

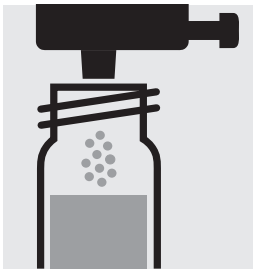


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

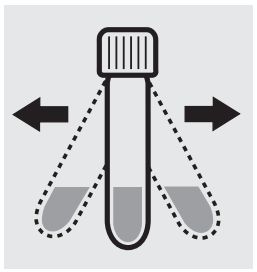
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

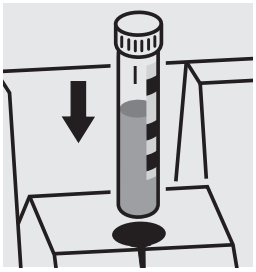


Add 1 dose of **P-2K** using the blue dose-metering cap, close the cell with the screw cap.



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.

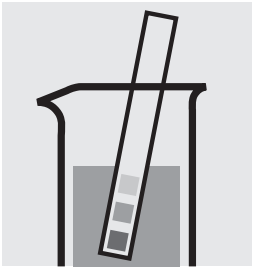
Phosphate

Determination of orthophosphate

114729

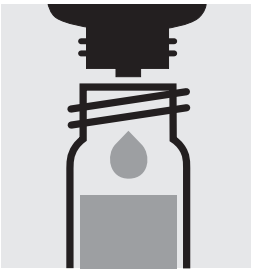
Cell Test

Measuring range:	0.5 – 25.0 mg/l PO_4 -P
	1.5 – 76.7 mg/l PO_4
	1.1 – 57.3 mg/l P_2O_5
	Expression of results also possible in mmol/l.

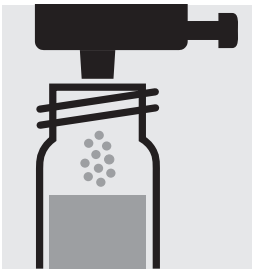


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

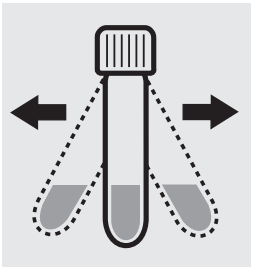
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

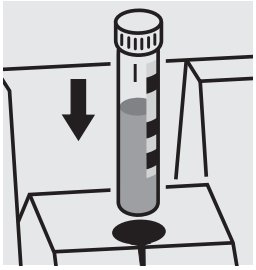


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



Place the cell into the 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.

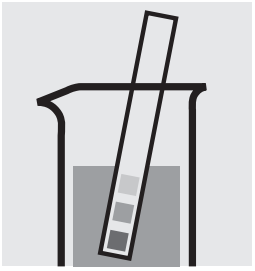
Phosphate

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

114729

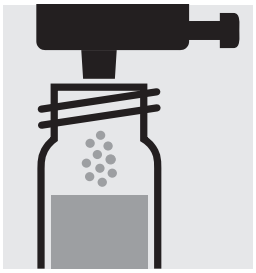
Cell Test

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)].

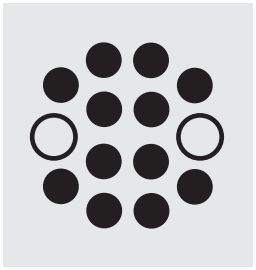


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

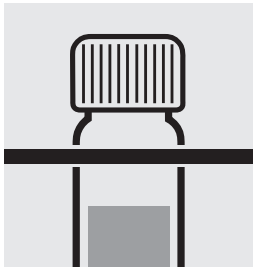
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



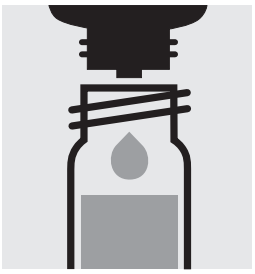
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



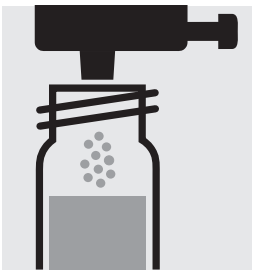
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



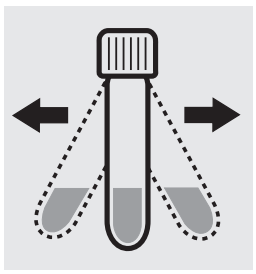
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

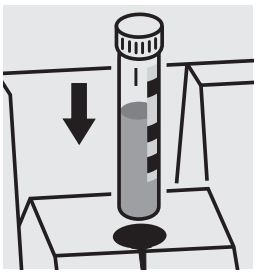


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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 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 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.

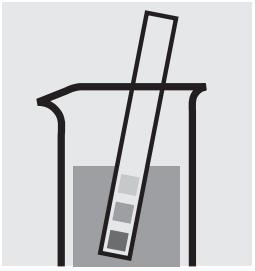
Phosphate

Determination of orthophosphate

100616

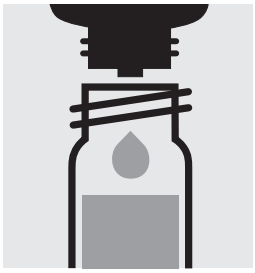
Cell Test

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.

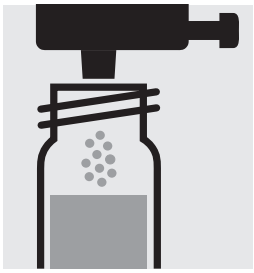


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

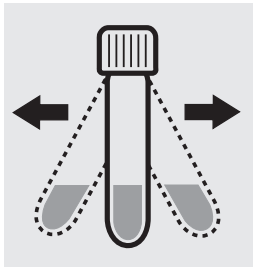
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

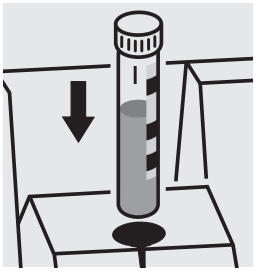


Add 1 dose of **PO_4-2K** using the blue dose-metering cap, close the cell with the screw cap.



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.

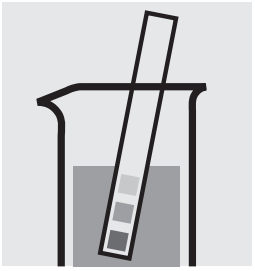
Phosphate

Determination of orthophosphate

100673

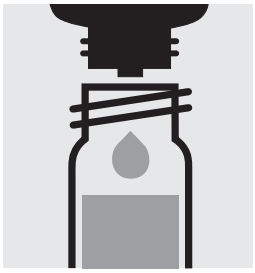
Cell Test

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.

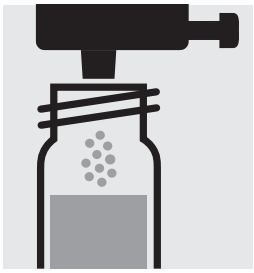


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

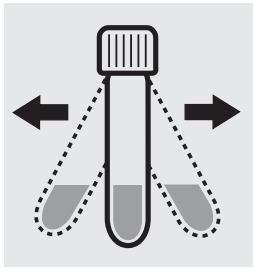
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

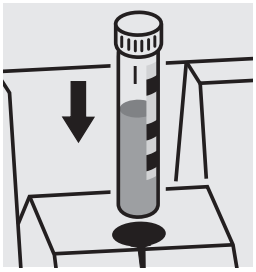


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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.

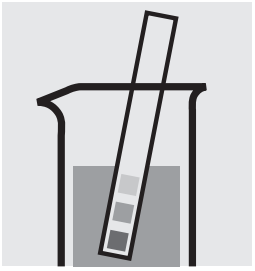
Phosphate

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

100673

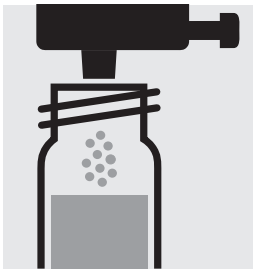
Cell Test

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)].

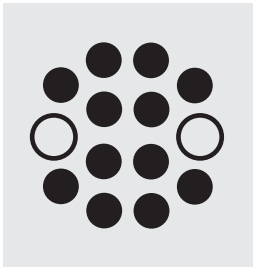


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

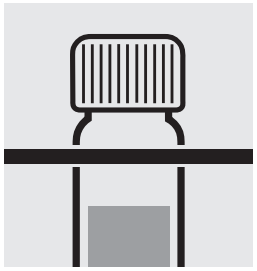
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



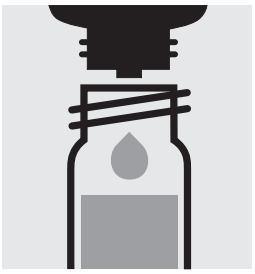
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



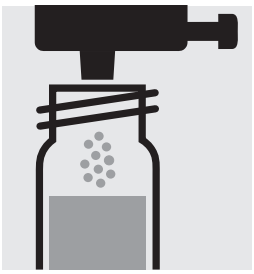
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



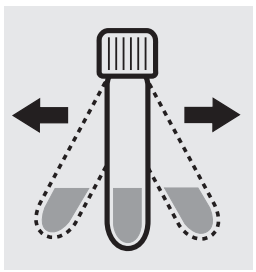
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

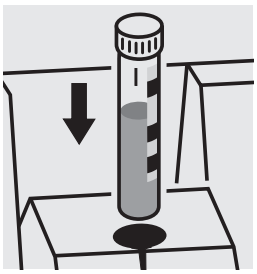


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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 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) 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.

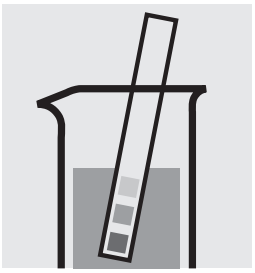
Phosphate

Determination of orthophosphate

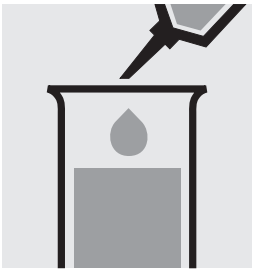
114848

Test

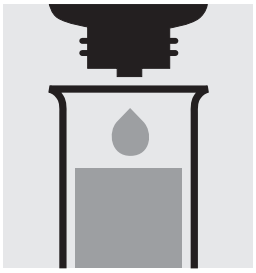
Measuring	0.05 – 5.00 mg/l PO_4-P	0.2 – 15.3 mg/l PO_4	0.11 – 11.46 mg/l P_2O_5	10-mm cell
range:	0.03 – 2.50 mg/l PO_4-P	0.09 – 7.67 mg/l PO_4	0.07 – 5.73 mg/l P_2O_5	20-mm cell
	0.010 – 1.000 mg/l PO_4-P	0.03 – 3.07 mg/l PO_4	0.02 – 2.29 mg/l P_2O_5	50-mm cell
	Expression of results also possible in mmol/l.			



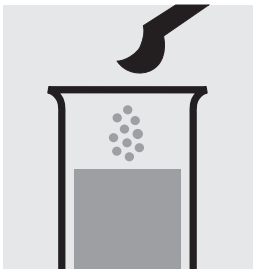
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



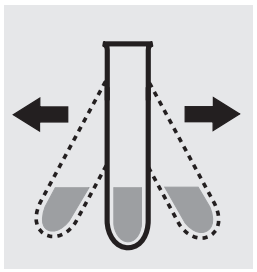
Pipette 5.0 ml of the sample into a test tube.



Add 5 drops of **PO_4-1** and mix.

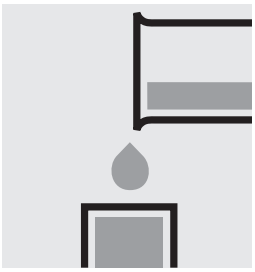


Add 1 level blue micro-spoon of **PO_4-2**.

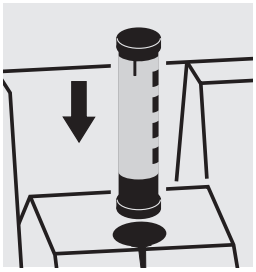


Shake vigorously to dissolve the solid substance.

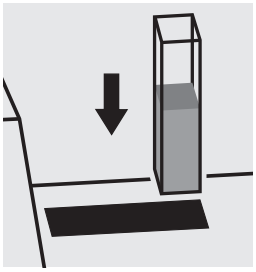
Reaction time:
5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

For measurement in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each.
Alternatively, the semi-microcell, Cat.No. 173502, can be used.

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate** a pretreatment with Crack Set 10C, Cat.No. 114688, or Crack Set 10, Cat.No. 114687, and thermoreactor is necessary.

Result can be expressed as sum of phosphorus (Σ P).

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, 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.

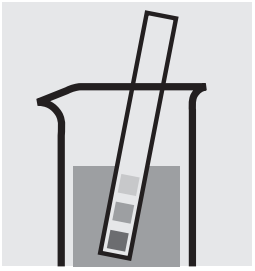
Phosphate

Determination of orthophosphate

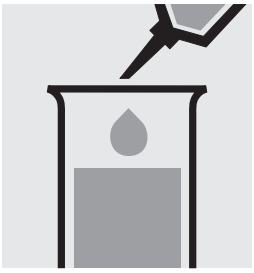
100798

Test

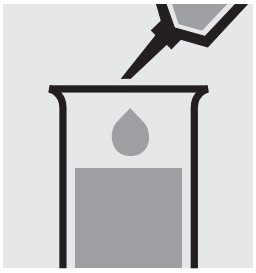
Measuring range:	1.0 – 100.0 mg/l PO_4-P	3 – 307	mg/l PO_4	2 – 229	mg/l P_2O_5	10-mm cell
	Expression of results also possible in mmol/l.					



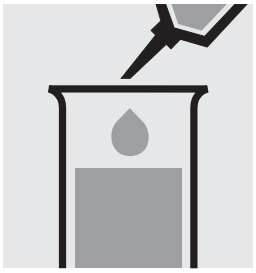
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



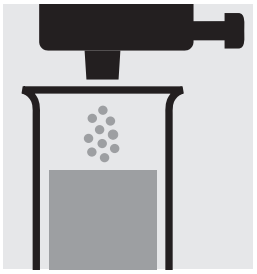
Pipette 8.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a test tube.



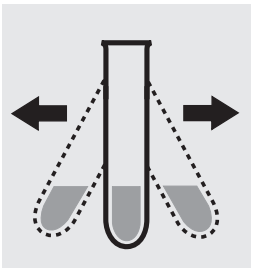
Add 0.50 ml of the sample with pipette and mix.



Add 0.50 ml of **PO_4-1** with pipette and mix.

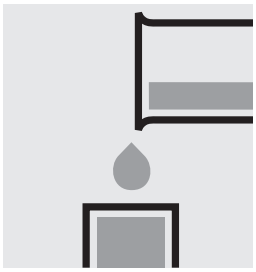


Add 1 dose of **PO_4-2** using the blue dose-metering cap.

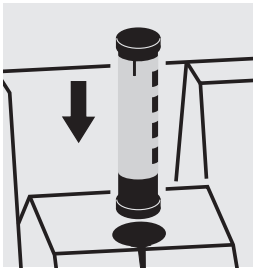


Shake vigorously to dissolve the solid substance.

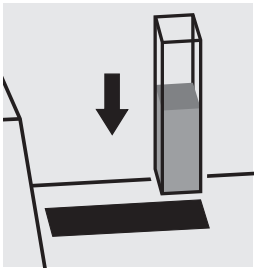
Reaction time:
5 minutes



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

Quality assurance:

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

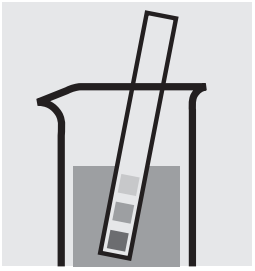
Phosphate

Determination of orthophosphate

114546

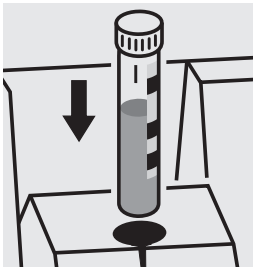
Cell Test

Measuring range:	0.5 – 25.0 mg/l 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.

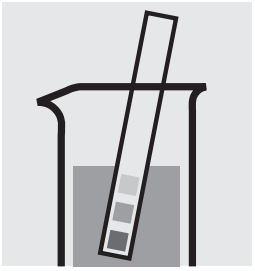
Phosphate

Determination of orthophosphate

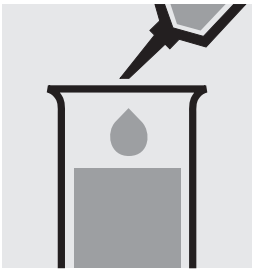
114842

Test

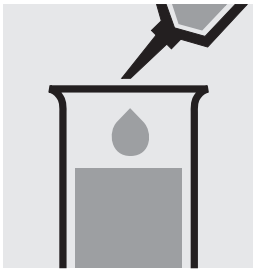
Measuring	1.0 – 30.0 mg/l PO_4-P	3.1 – 92.0 mg/l PO_4	2.3 – 68.7 mg/l P_2O_5	10-mm cell
range:	0.5 – 15.0 mg/l PO_4-P	1.5 – 46.0 mg/l PO_4	1.1 – 34.4 mg/l P_2O_5	20-mm cell
	Expression of results also possible in mmol/l.			



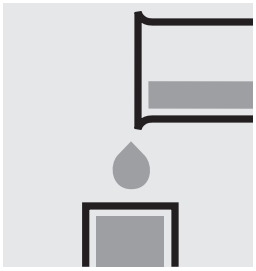
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



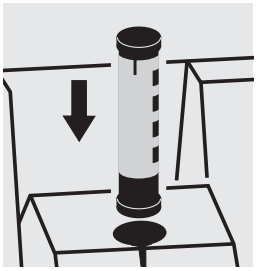
Pipette 5.0 ml of the sample into a test tube.



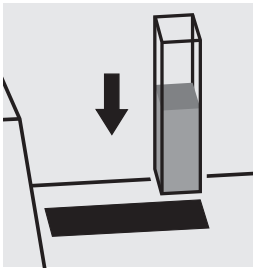
Add 1.2 ml of **PO_4-1** with piette and mix.



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

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.

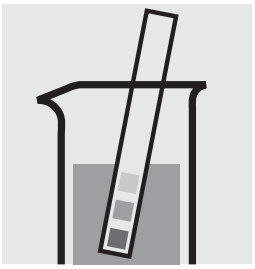
Quality assurance:

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.

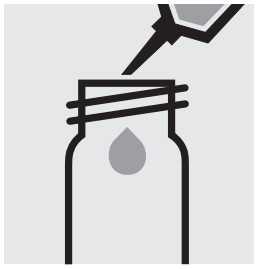
Platinum in water and wastewater

Application

Measuring range:	0.10 – 1.25 mg/l Pt 10-mm cell
Attention!	The measurement is carried out at 690 nm in a 10-mm rectangular cell against a blank, prepared from distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) and the reagents in an analogous manner.



Check the pH of the sample, specified range: pH 2 – 5.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

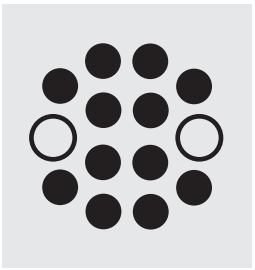


Pipette 5.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

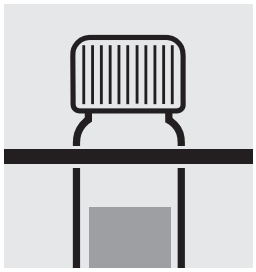
Add 1.0 ml of **reagent 1** with pipette, close the cell with the screw cap, and mix.

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

Check the pH of the sample, specified value: pH 6.5.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

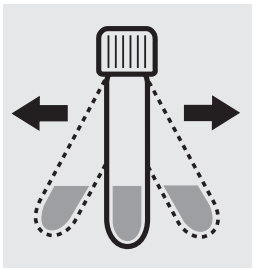


Heat the cell in the thermoreactor at 100 °C for 5 minutes.

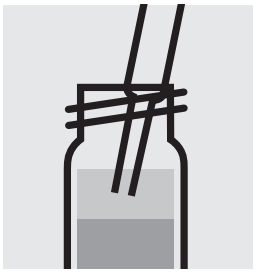


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.

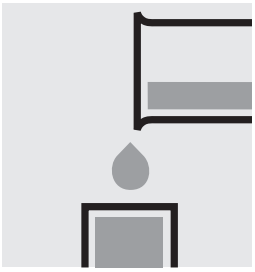
Add 5.0 ml **Isobutyl-methylketone GR** (Cat.No. 106146) with pipette, close the cell with the screw cap.



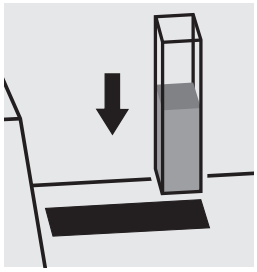
Shake the cell vigorously for 1 minute.
Leave to stand to allow phases to separate.



Aspirate the organic-clear upper phase from the tube with pipette and dry over **sodium sulfate anhydrous** (Cat.No. 106649).



Transfer the dried solution into a rectangular cell.



Place the cell into the cell compartment.
Select method no. **134**.

Note:

Empty cells with screw caps, Cat.No. 114724 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Important:

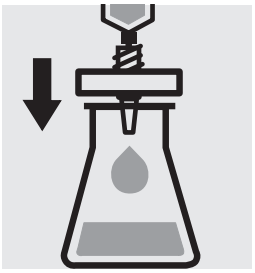
The exact composition and preparation of the reagents 1 and 2 used are given in the corresponding application, which also includes further information on the method employed. This application can be downloaded directly at www.analytical-test-kits.com.

Potassium

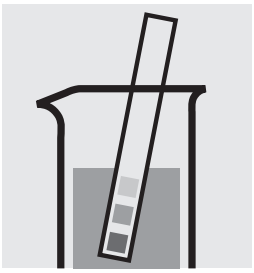
114562

Cell Test

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



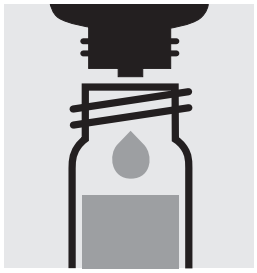
Filter turbid samples.



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.

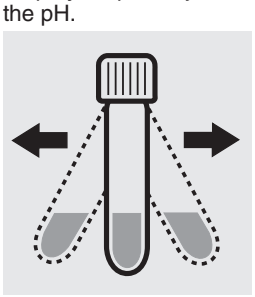
Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



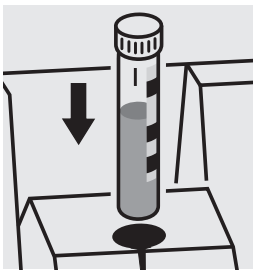
Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.

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:

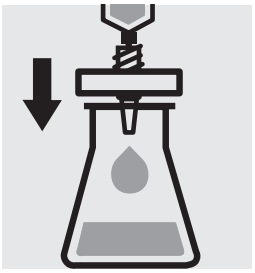
To check the measurement system (test reagents, measurement device, and handling) ready-for-use potassium standard solution Certipur®, Cat.No. 170230, concentration 1000 mg/l K, can be used after diluting accordingly.

Potassium

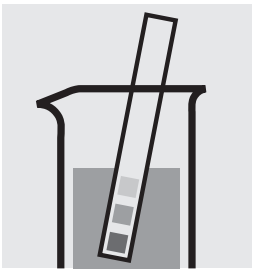
100615

Cell Test

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



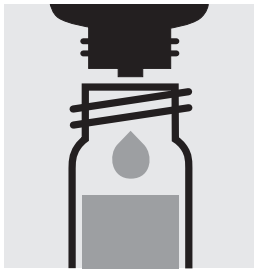
Filter turbid samples.



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.

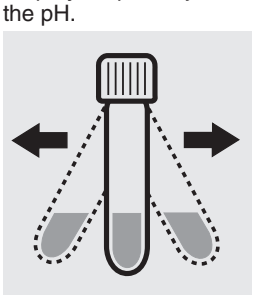
Pipette 0.50 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



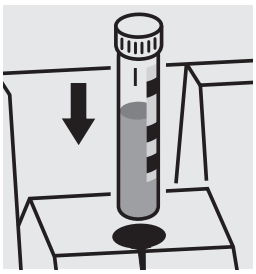
Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.

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

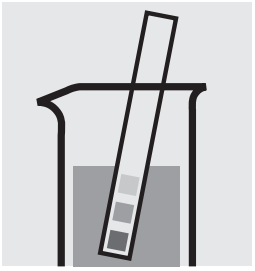
114683

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.

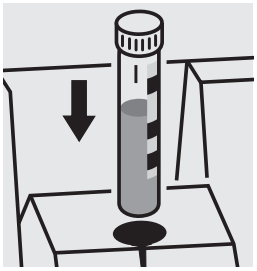


Check the pH of the sample, specified range: pH 5–8.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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:

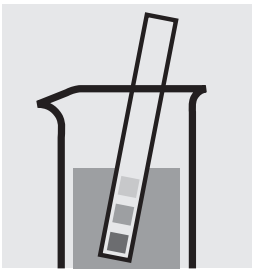
To check the measurement system (test reagents, measurement device, and handling) ready-for-use calcium standard solution Certipur®, Cat.No. 119778, concentration 1000 mg/l Ca, can be used after diluting accordingly. (Pay attention to pH value!)

Silicate (Silicic Acid)

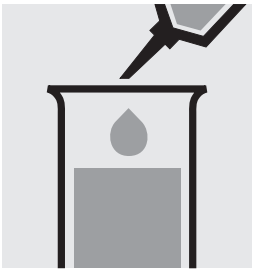
114794

Test

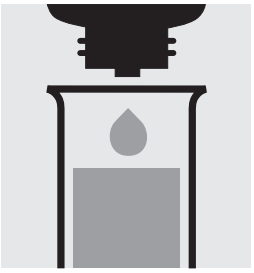
Measuring	0.21 – 10.70 mg/l SiO_2	0.1 – 5.00 mg/l Si	10-mm cell
range:	0.11 – 5.35 mg/l SiO_2	0.05 – 2.50 mg/l Si	20-mm cell
	0.011 – 1.600 mg/l SiO_2	0.005 – 0.750 mg/l Si	50-mm cell
	Expression of results also possible in mmol/l.		



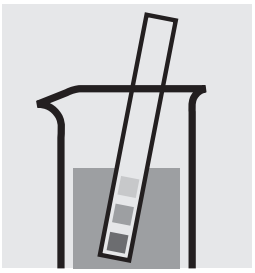
Check the pH of the sample, specified range: pH 2– 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.

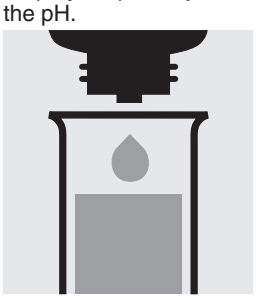


Add 3 drops of **Si-1** and mix.

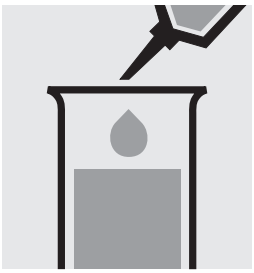


Check the pH, specified range: pH 1.2 – 1.6.

Reaction time: 3 minutes

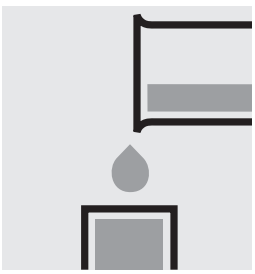


Add 3 drops of **Si-2** and mix.

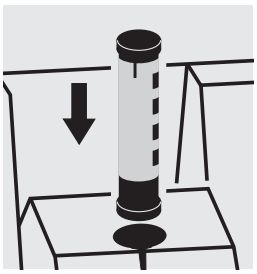


Add 0.50 ml of **Si-3** with pipette and mix.

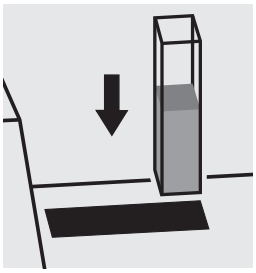
Reaction time: 10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

Quality assurance:

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

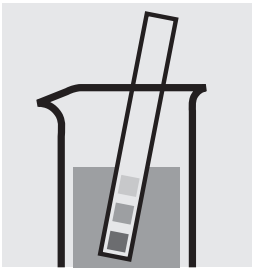
Silicate (Silicic Acid)

100857

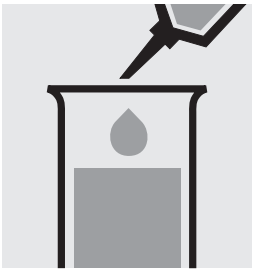
Test

Measuring	1.1 – 107.0 mg/l SiO_2	0.5 – 50.0 mg/l Si	10-mm cell
range:	11 – 1070 mg/l SiO_2	5 – 500 mg/l Si	10-mm cell
	Expression of results also possible in mmol/l.		

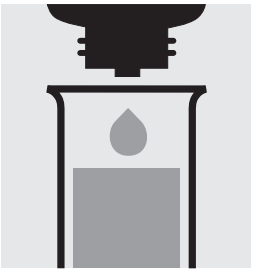
Measuring range: 1.1 – 107.0 mg/l SiO_2



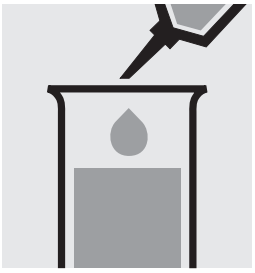
Check the pH of the sample, specified range: pH 2– 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 4.0 ml of the sample into a test tube.

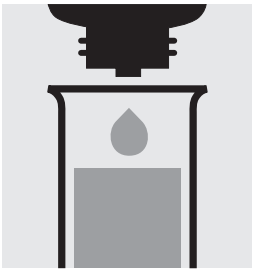


Add 4 drops of **Si-1** and mix.



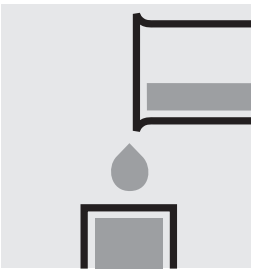
Add 2.0 ml of **Si-2** with pipette and mix.

Reaction time: 2 minutes

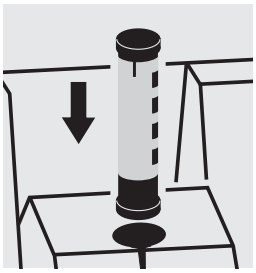


Add 4 drops of **Si-3** and mix.

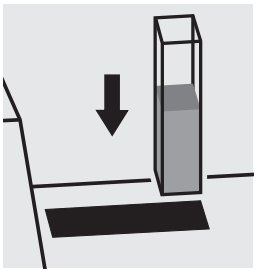
Reaction time: 2 minutes



Transfer the solution into a cell.

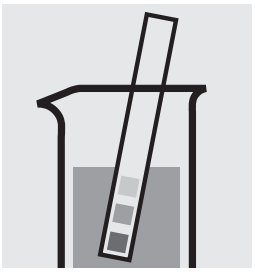


Select method with AutoSelector measuring range 0.5 – 50.0 mg/l Si.

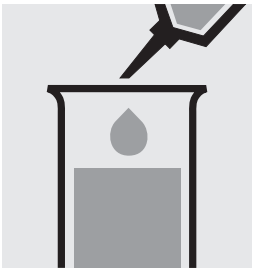


Place the cell into the cell compartment.

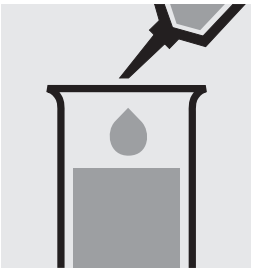
Measuring range: 11 – 1070 mg/l SiO_2



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



Pipette 5.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a test tube.



Add 0.50 ml of the sample with pipette and mix.

Continue as mentioned above; starting from the addition of **Si-1** (Fig. 3). Select method with AutoSelector measuring range 5 – 500 mg/l Si.

Quality assurance:

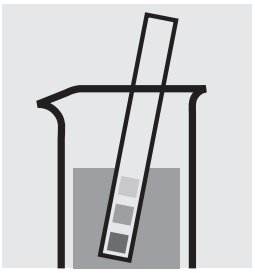
To check the measurement system (test reagents, measurement device, and handling) ready-for-use silicon standard solution Certipur®, Cat.No. 170236, concentration 1000 mg/l Si, can be used after diluting accordingly (Attention! Do **not** store standard solutions in glass vessels - see section "Standard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

Silicate (Silicic Acid)

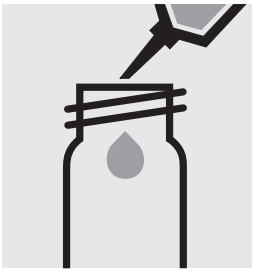
101813

Test

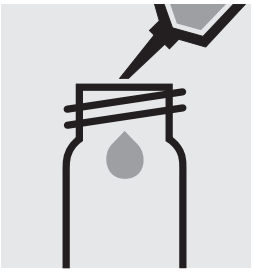
Measuring range:	0.0005 – 0.5000 mg/l SiO_2	0.0002 – 0.2337 mg/l Si	50-mm cell
	Expression of results also possible in mmol/l.		



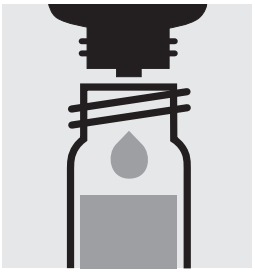
Check the pH of the sample, specified range: pH 2– 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



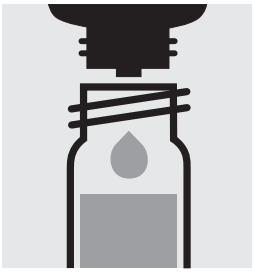
Pipette 10 ml of distilled water (Water Ultrapur, Cat.No. 101262, is recommended) into a second plastic vessel (**Flat-bottomed tubes, Cat.No. 117988**).
(Blank)



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

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

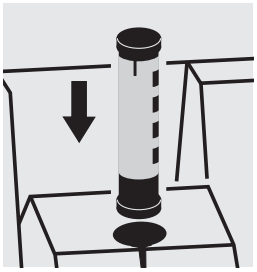
Reaction time:
5 minutes



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

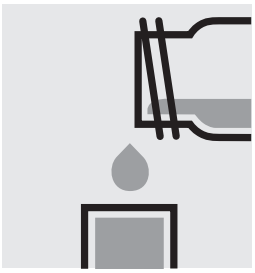
Add to each vessel 0.50 ml of **Si-3** with pipette, close with the screw cap, and mix.

Reaction time:
5 minutes

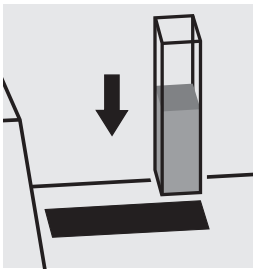


Select method with AutoSelector.

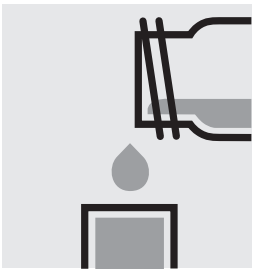
Configure the photometer for blank-measurement.



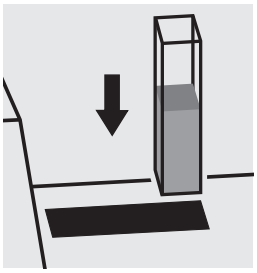
Transfer the blank into a rectangular cell and measure **immediately**.



Insert the blank cell into the cell compartment.



Transfer the measurement sample into a rectangular cell and measure **immediately**.



Insert the cell containing the sample into the cell compartment.

Important:

No glass equipment may be used in the course of the determination (e.g. pipettes etc.)!

Quality assurance:

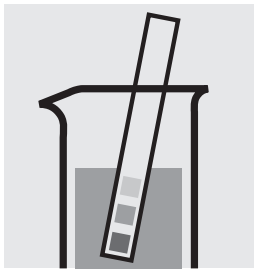
To check the measurement system (test reagents, measurement device, and handling) ready-for-use silicon standard solution Certipur®, Cat.No. 170236, concentration 1000 mg/l Si, can be used after diluting accordingly (Attention! Do **not** store standard solutions in glass vessels - see section "Standard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

Silver

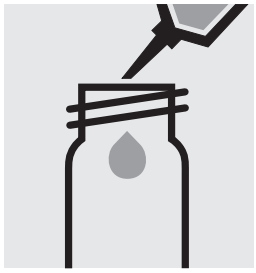
114831

Test

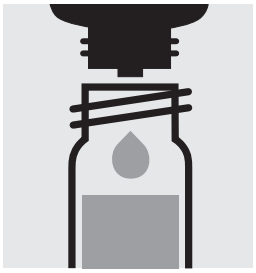
Measuring	0.50 – 3.00 mg/l Ag	10-mm cell
range:	0.25 – 1.50 mg/l Ag	20-mm cell
	Expression of results also possible in mmol/l.	



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

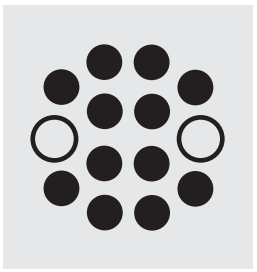


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).

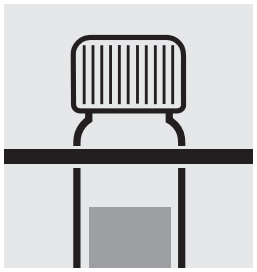


Add 2 drops of **Ag-1.**

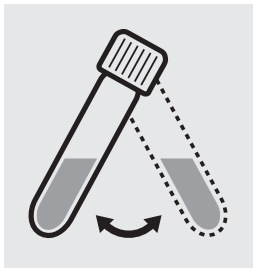
Add 1 level green microspoon of **Ag-2**, close the cell with the screw cap.



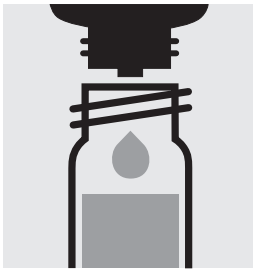
Heat the cell in the thermoreactor at 120 °C (100 °C) for 1 hours.



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

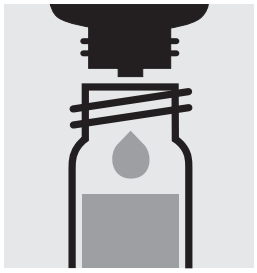


Swirl the cell before opening.

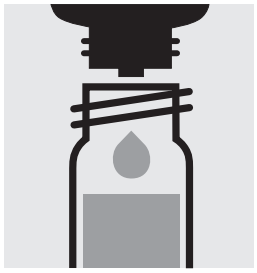


Add 3 drops of **Ag-3**, close with the screw cap, and mix.

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



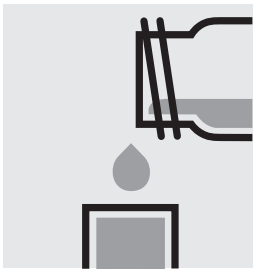
Add 1 drop of **Ag-4**, close with the screw cap, and mix.



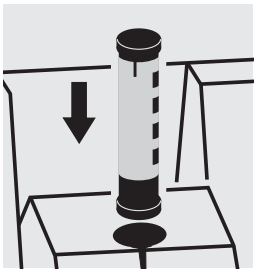
Add 5 drops of **Ag-5**, close with the screw cap, and mix.

Add 1.0 ml of **Ag-6**, close with the screw cap, and mix.

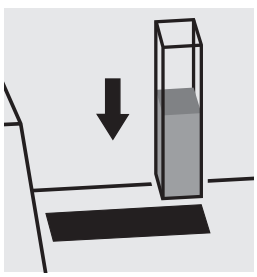
Reaction time: 5 minutes



Transfer the solution into a corresponding rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

Very high silver concentrations in the sample produce turbid solutions (measurement solution should be clear). In such cases the sample must be diluted (plausibility check).

Quality assurance:

To check the measurement system (test reagents,measurement device, and handling) ready-for-use silver standard solution Certipur®, Cat.No. 119797, concentration 1000 mg/l Ag, can be used after diluting accordingly.

Sodium

in nutrient solutions

100885

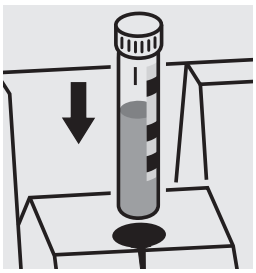
Cell Test

Measuring range:	10 – 300 mg/l Na Expression of results also possible in mmol/l.

Pipette 0.50 ml of **Na-1K** into a reaction cell and mix.

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

Reaction time: 1 minute



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

Quality assurance:

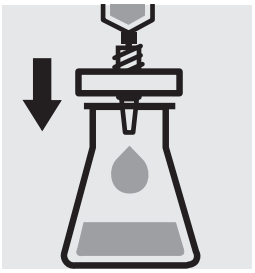
To check the measurement system (test reagents, measurement device, and handling) ready-for-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl^- (corresponds to 649 mg/l Na), can be used after diluting accordingly (see section “Standard solutions”).

Sulfate

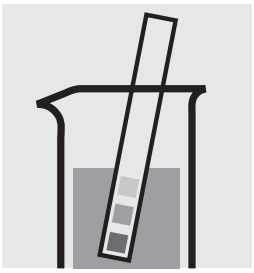
102532

Cell Test

Measuring range:	1.0 – 50.0 mg/l SO_4 Expression of results also possible in mmol/l.



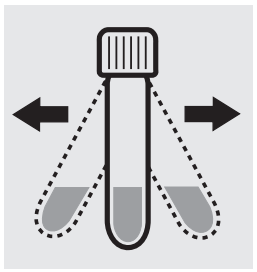
Filter turbid samples.



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

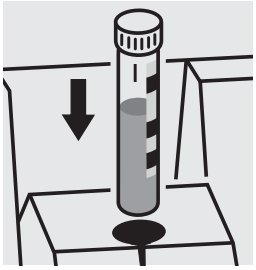
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green micro-spoon of **SO_4-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance**.**

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



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

Quality assurance:

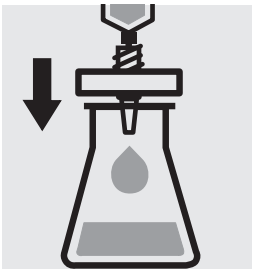
To check the measurement system (test reagents, measurement device, and handling) ready-for-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO_4^{2-}, can be used after diluting accordingly.

Sulfate

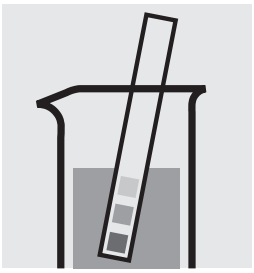
114548

Cell Test

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



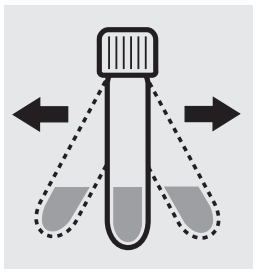
Filter turbid samples.



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

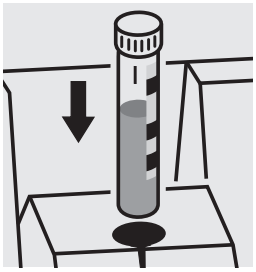
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green micro-spoon of **SO_4-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance**.**

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



Place the cell into the 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.

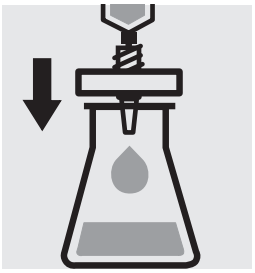
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Sulfate

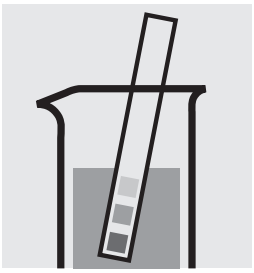
100617

Cell Test

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



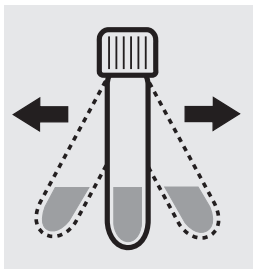
Filter turbid samples.



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.

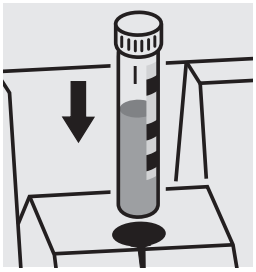
Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green 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 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.

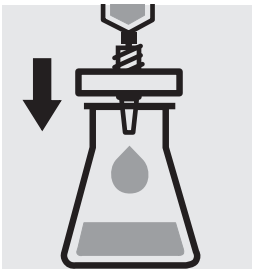
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Sulfate

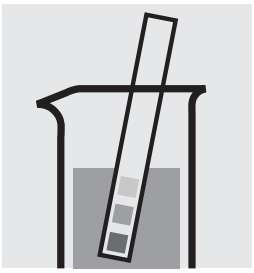
114564

Cell Test

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



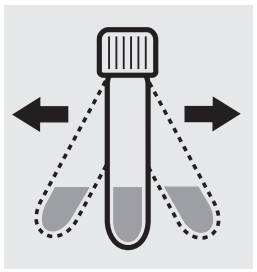
Filter turbid samples.



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.

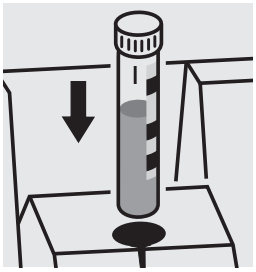
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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.

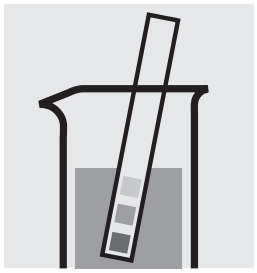
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

Sulfate

114791

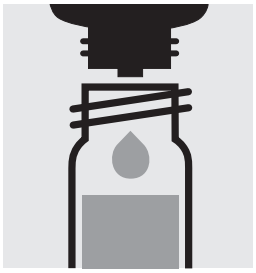
Test

Measuring range:	25 – 300 mg/l SO_4 Expression of results also possible in mmol/l.	10-mm cell



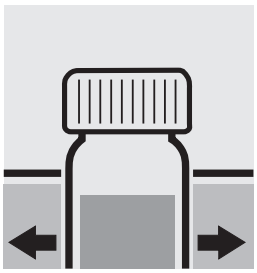
Check the pH of the sample, specified range: pH 2– 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 2.5 ml of the sample into a test tube with screw cap.

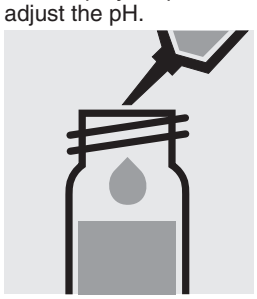


Add 2 drops of **SO_4-1** and mix.

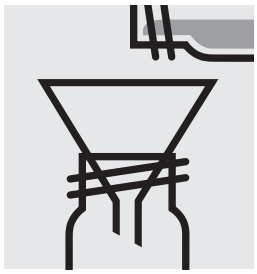
Add 1 level green microspoon of **SO_4-2**, close the test tube with the screw cap, and mix.



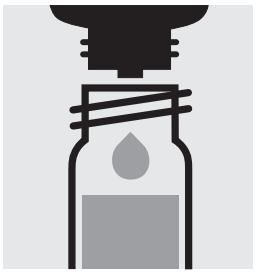
Temper the test tube in a water bath at 40 °C for 5 minutes.



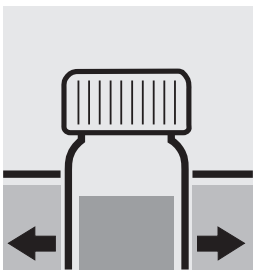
Add 2.5 ml of **SO_4-3** with pipette and mix.



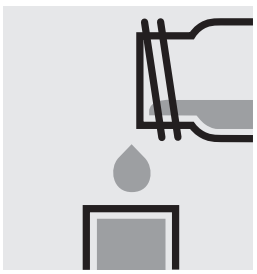
Filter the content of the test tube with a round filter into another test tube with screw cap.



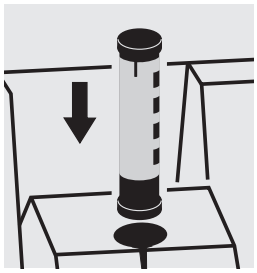
Add 4 drops of **SO_4-4** to the filtrate, close the test tube with the screw cap, and mix.



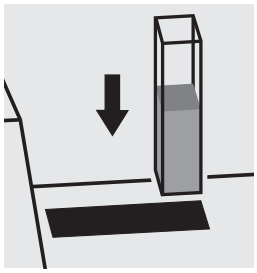
Temper the test tube again in the water bath for 7 minutes.



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

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.

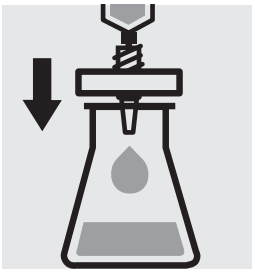
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Sulfate

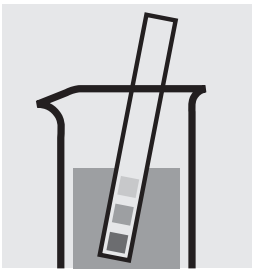
101812

Test

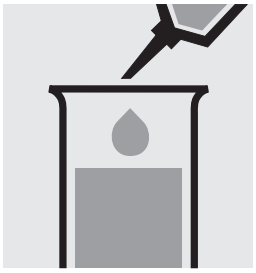
Measuring	2.5 – 50.0	mg/l SO_4	10-mm cell
range:	1.3 – 25.0	mg/l SO_4	20-mm cell
	0.50 – 10.00	mg/l SO_4	50-mm cell
	Expression of results also possible in mmol/l.		



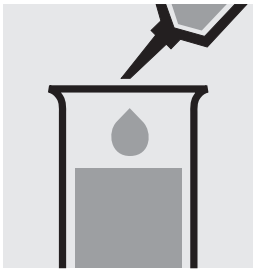
Filter turbid samples.



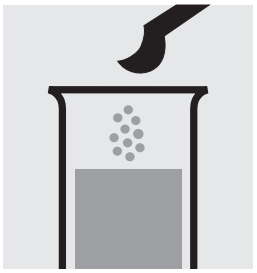
Check the pH of the sample, specified range: pH 2– 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



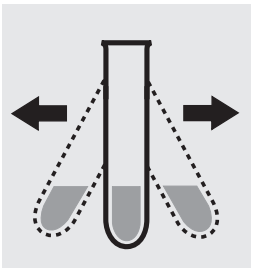
Pipette 0.50 ml of **SO_4-1** into a test tube.



Add 10 ml of the sample with pipette and mix.

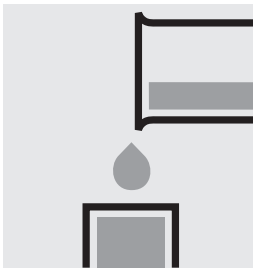


Add 1 level green microspoon of **SO_4-2**.

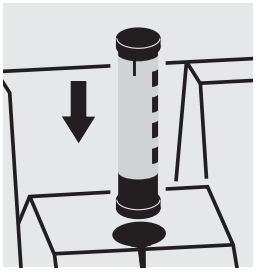


Shake the test tube vigorously to dissolve the solid substance.

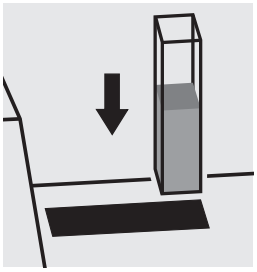
Reaction time:
2 minutes, **measure immediately**.



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Quality assurance:

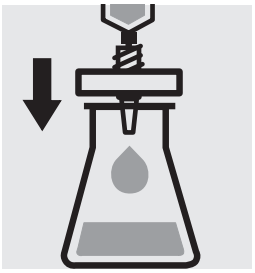
To check the measurement system (test reagents, measurement device, and handling) ready-for-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO_4^{2-}, can be used after diluting accordingly.

Sulfate

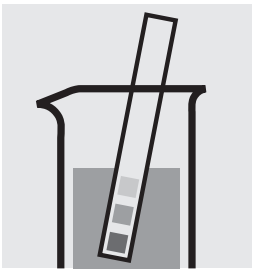
102537

Test

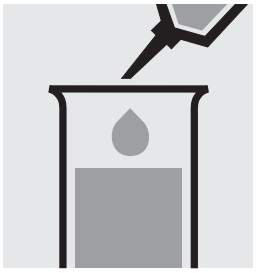
Measuring range:	5 – 300 mg/l SO_4	10-mm cell
	Expression of results also possible in mmol/l.	



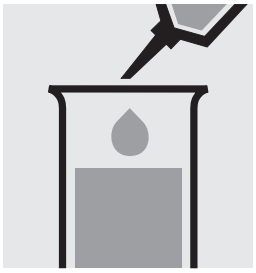
Filter turbid samples.



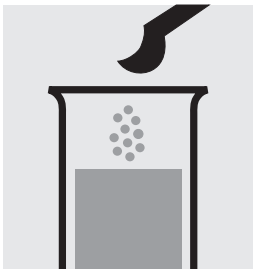
Check the pH of the sample, specified range: pH 2– 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



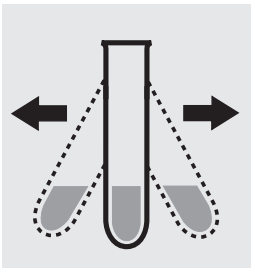
Pipette 0.50 ml of **SO_4-1** into a test tube.



Add 5.0 ml of the sample with pipette and mix.

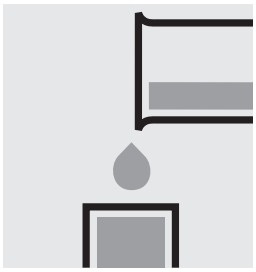


Add 1 level blue microspoon of **SO_4-2**.

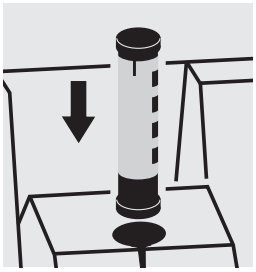


Shake the test tube vigorously to dissolve the solid substance.

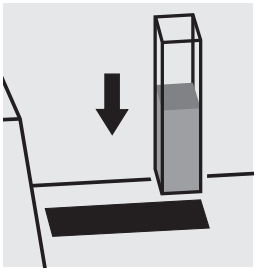
Reaction time:
2 minutes, **measure immediately**.



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

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.

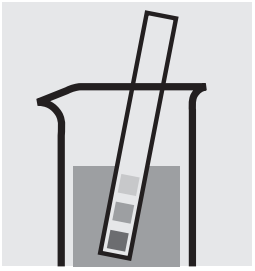
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

Sulfide

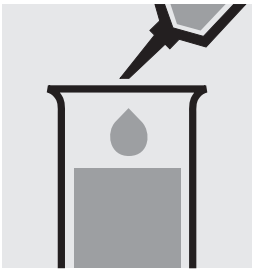
114779

Test

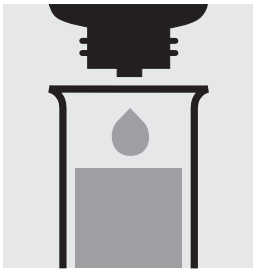
Measuring	0.10 – 1.50 mg/l S	0.10 – 1.55 mg/l HS	10-mm cell
range:	0.050 – 0.750 mg/l S	0.052 – 0.774 mg/l HS	20-mm cell
	0.020 – 0.500 mg/l S	0.021 – 0.516 mg/l HS	50-mm cell
	Expression of results also possible in mmol/l.		



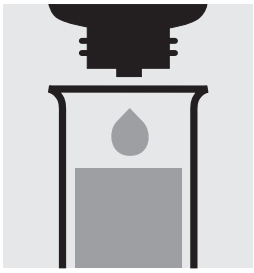
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



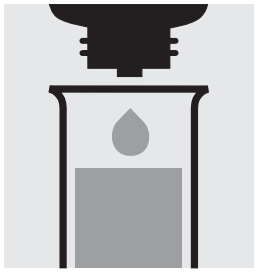
Pipette 5.0 ml of the sample into a test tube.



Add 1 drop of **S-1** and mix.

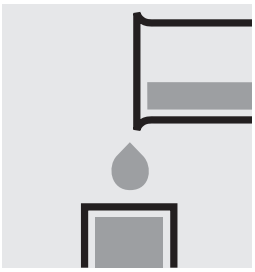


Add 5 drops of **S-2** and mix.

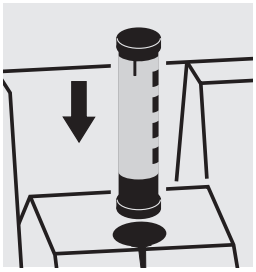


Add 5 drops of **S-3** and mix.

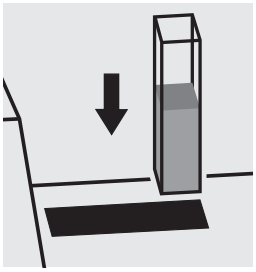
Reaction time:
1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell, Cat.No. 173502, can be used.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a sulfide standard solution must be prepared from sodium sulfide GR (see section “Standard solutions”).

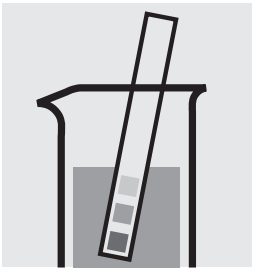
Sulfite

114394

Cell Test

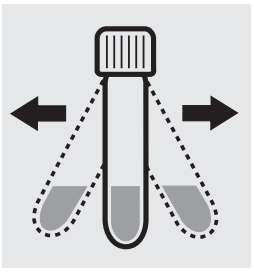
Measuring	1.0 – 20.0 mg/l SO_3	0.8 – 16.0 mg/l SO_2	Round cell
range:	0.05 – 3.00 mg/l SO_3	0.04 – 2.40 mg/l SO_2	50-mm cell
	Expression of results also possible in mmol/l.		

Measuring range: 1.0 – 20.0 mg/l SO_3



Check the pH of the sample, specified range: pH 4–9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

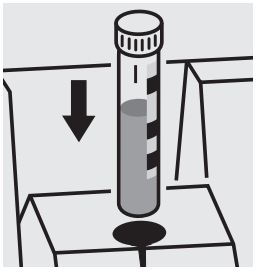
Add 1 level grey micro-spoon of **SO_3-1K** into a reaction cell, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Add 3.0 ml of the sample with pipette, close the cell with the screw cap, and mix.

Reaction time: 2 minutes



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

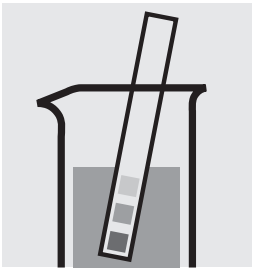
To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR, Cat.No. 106657 (see section “Standard solutions”).

Sulfite

114394

Cell Test

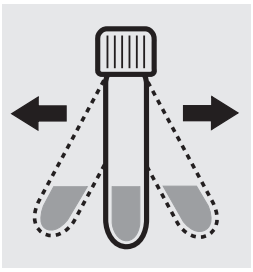
Measuring range: 0.05 – 3.00 mg/l SO_3



Check the pH of the sample, specified range: pH 4– 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Configure the photometer for blank-measurement. Select method **SO_3 sens** in the menu (method no. 127).

Add 1 level grey microspoon each of **SO_3-1K** into two reaction cells, close with the screw cap.

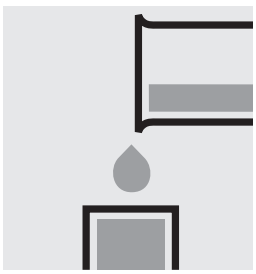


Shake both cells vigorously to dissolve the solid substance.

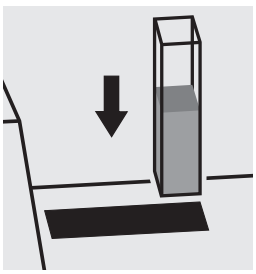
Add 7.0 ml of the sample with pipette to one reaction cell, close with the screw cap, and mix.

Add 7.0 ml of distilled water with pipette to the second reaction cell, close with the screw cap, and mix.
(Blank)

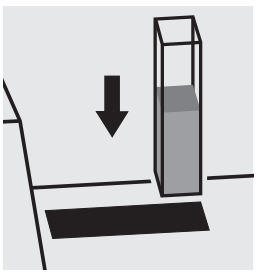
Reaction time:
2 minutes



Transfer both solutions into two separate 50-mm cells.



Place the blank cell into the cell compartment.



Place the cell containing the sample into the cell compartment.

Quality assurance:

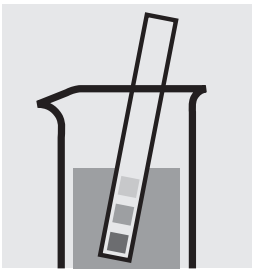
To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR, Cat.No. 106657 (see section “Standard solutions”).

Sulfite

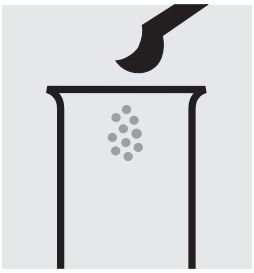
101746

Test

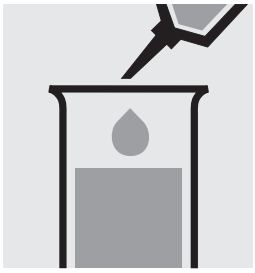
Measuring	1.0 – 60.0 mg/l SO_3	10-mm cell
range:	0.8 – 48.0 mg/l SO_2	10-mm cell
	Expression of results also possible in mmol/l.	



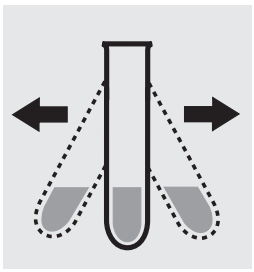
Check the pH of the sample, specified range: pH 4–9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



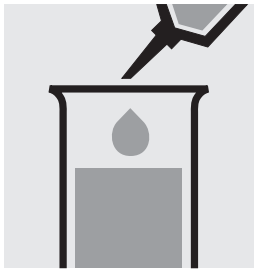
Place 1 level grey microspoon of **SO_3-1** into a dry test tube.



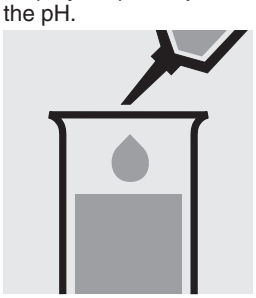
Add 3.0 ml of **SO_3-2** with pipette.



Shake vigorously to dissolve the solid substance.

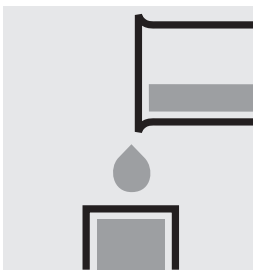


Add 5.0 ml of distilled water with pipette and mix.

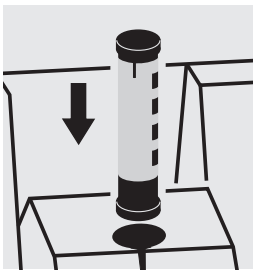


Add 2.0 ml of the sample with pipette and mix.

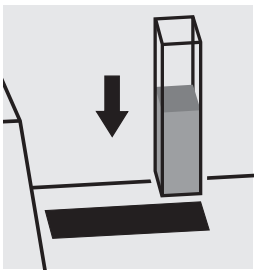
Reaction time:
2 minutes



Transfer the solution into a cell.



Select method with Auto-Selector.



Place the cell into the cell compartment.

Quality assurance:

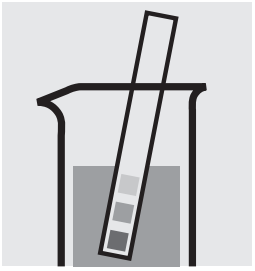
To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR, Cat.No. 106657 (see section “Standard solutions”).

Surfactants (anionic)

114697

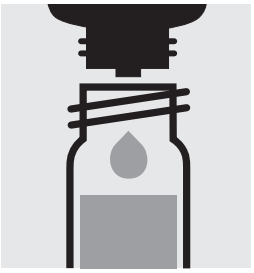
Cell Test

Measuring range:	0.05 – 2.00 mg/l MBAS*
	* **M**ethylene-**b**lue-**a**ctive **s**ubstances
	Expression of results also possible in mmol/l.

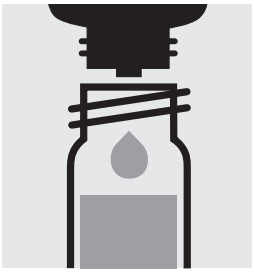


Check the pH of the sample, specified range: pH 5 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

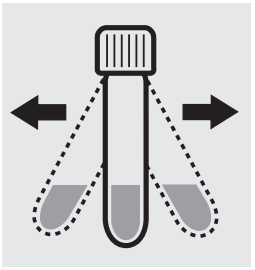
Pipette 5.0 ml of the sample into a reaction cell, **do not mix**!



Add 3 drops of **T-1K, do not mix**!

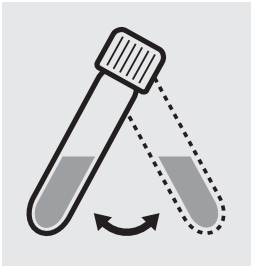


Add 2 drops of **T-2K**, close the cell with the screw cap.

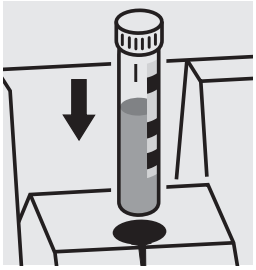


Shake the cell for 30 seconds.

Reaction time:
10 minutes



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:

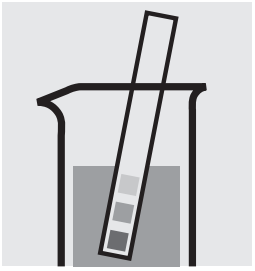
To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from dodecane-1-sulfonic acid sodium salt GR, Cat.No. 112146 (see section “Standard solutions”).

Surfactants (anionic)

102552

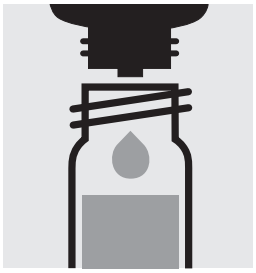
Cell Test

Measuring range:	0.05 – 2.00 mg/l MBAS*
	* **M**ethylene-**b**lue-**a**ctive **s**ubstances
	Expression of results also possible in mmol/l.

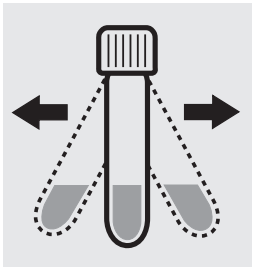


Check the pH of the sample, specified range: pH 5 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 5.0 ml of the sample into a reaction cell, **do not mix**!

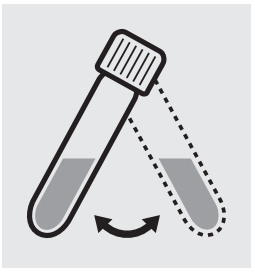


Add 2 drops of **T-1K**, close the cell with the screw cap.

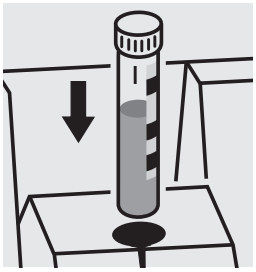


Shake the cell **vigorously for 30 seconds**.

Reaction time: 10 minutes



Swirl the cell before the measurement.



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

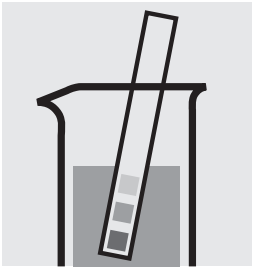
To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from dodecane-1-sulfonic acid sodium salt GR, Cat.No. 112146 (see section “Standard solutions”).

Surfactants (cationic)

101764

Cell Test

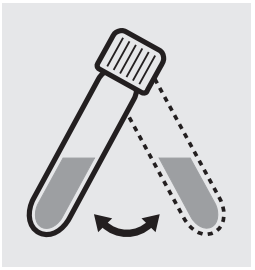
Measuring range:	0.05 – 1.50 mg/l surfactants (cationic) (calculated as N-cetyl-N,N,N-trimethylammonium bromide)



Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

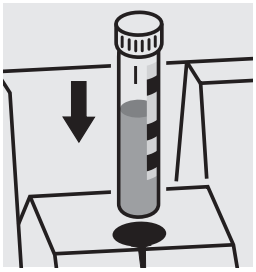
Pipette 5.0 ml of the sample into a reaction cell, **do not mix**!

Add 0.50 ml of **T-1K** with pipette and close with the screw cap.



Swirl the cell for 30 seconds.

Reaction time: 5 minutes



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

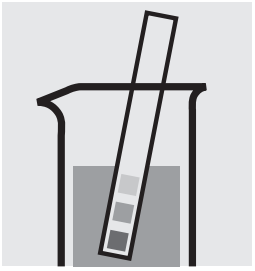
To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from N-cetyl-N,N,N-trimethylammonium bromide, Cat.No. 102342 (see section “Standard solutions”).

Surfactants (nonionic)

101787

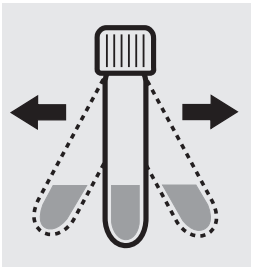
Cell Test

Measuring range:	0.010 – 7.50 mg/l surfactants (nonionic) (calculated as Triton® X-100)



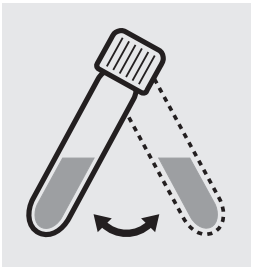
Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 4.0 ml of the sample into a reaction cell. Close with the screw cap.

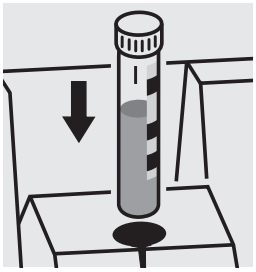


Shake the cell **for 1 minute vigorously**.

Reaction time: 2 minutes



Swirl the cell before measurement.



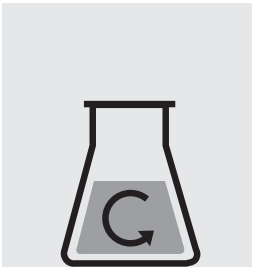
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

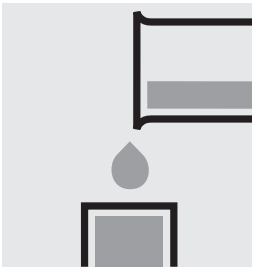
To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from Triton® X-100, Cat.No. 112298 (see section “Standard solutions”).

Suspended Solids

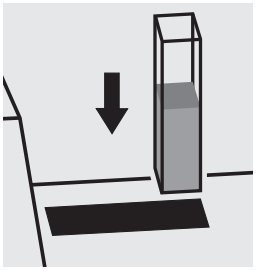
Measuring range: 25 – 750 mg/l of suspended solid 20-mm cell



Homogenize 500 ml of sample for 2 minutes in a mixer running at high speed.



Transfer the solution into a cell.



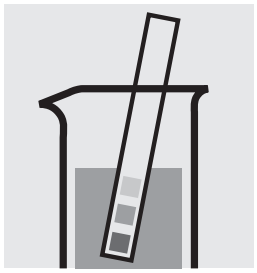
Place the cell into the cell compartment, select method no. **182**.

Tin

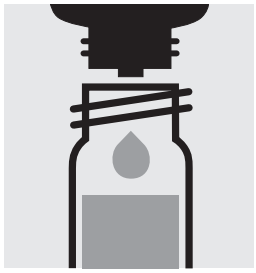
114622

Cell Test

Measuring range:	0.10 – 2.50 mg/l Sn Expression of results also possible in mmol/l.



Check the pH of the sample, specified range: pH < 3.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

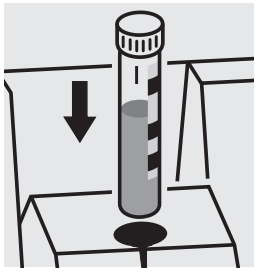


Add 6 drops of **Sn-1K** into a reaction cell, close with the screw cap, and mix.

Add 5.0 ml of the sample with pipette, close the cell with the screw cap, and mix.

Check the pH, specified range: pH 1.5 – 3.5.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

Reaction time: 15 minutes



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a tin standard solution must be prepared from ready-for-use tin standard solution Certipur®, Cat.No. 170242, concentration 1000 mg/l Sn (see section “Standard solutions”).

TOC

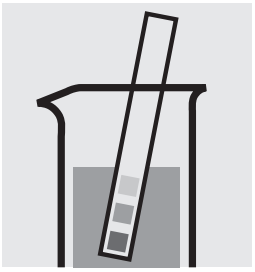
Total Organic Carbon

114878

Cell Test

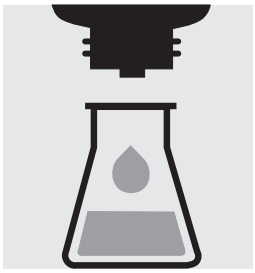
Measuring range: 5.0 – 80.0 mg/l TOC

Removal of inorganic bound carbon (TIC):

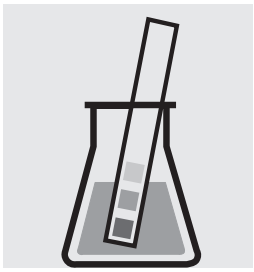


Check the pH of the sample, specified range: pH 2– 12.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

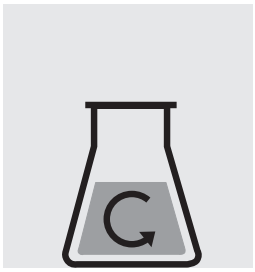
Place 25 ml of the sample into a suitable glass vessel.



Add 3 drops of **TOC-1K** and mix.



Check the pH, specified range pH < 2.5.

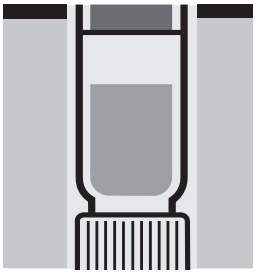


Stir for 10 minutes.

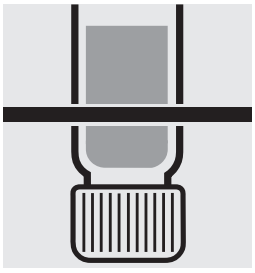
Preparation of measurement sample:

Pipette 3.0 ml of stirred sample into a reaction cell.

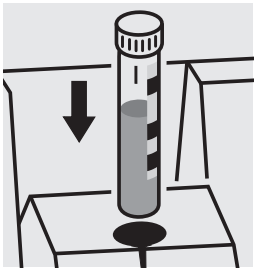
Add 1 level grey micro-spoon of **TOC-2K**. **Immediately** close the cell tightly with an **aluminium cap** (Cat.No. 173500).



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

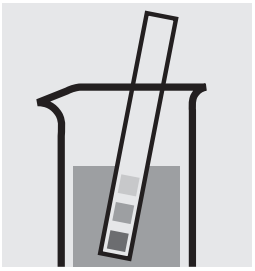
Total Organic Carbon

114879

Cell Test

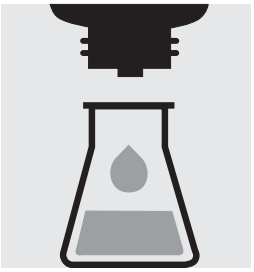
Measuring range: 50 – 800 mg/l TOC

Removal of inorganic bound carbon (TIC):

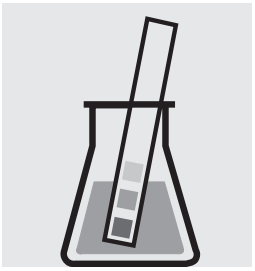


Check the pH of the sample, specified range: pH 2– 12.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

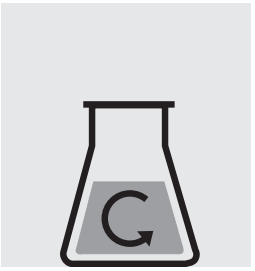
Pipette 1.0 ml of the sample and 9.0 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a suitable glass vessel.



Add 2 drops of **TOC-1K** and mix.



Check the pH, specified range pH < 2.5

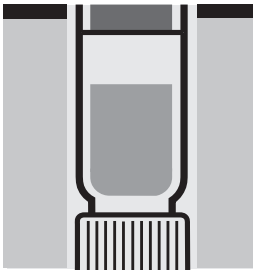


Stir for 10 minutes.

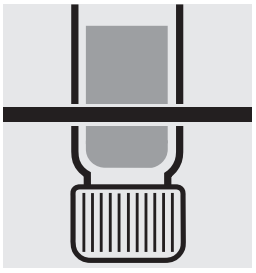
Preparation of measurement sample:

Pipette 3.0 ml of stirred sample into a reaction cell.

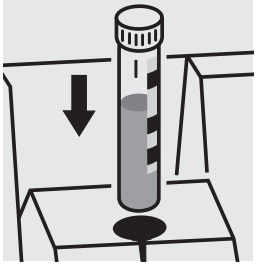
Add 1 level grey microspoon of **TOC-2K**. **Immediately** close the cell tightly with an **aluminium cap** (Cat.No. 173500).



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.

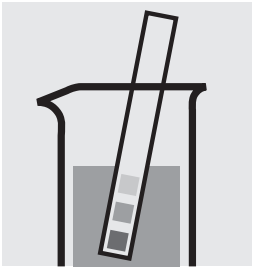
Total Hardness

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 .

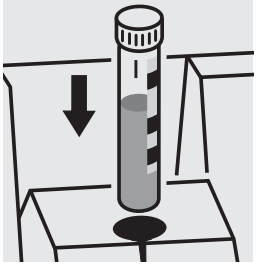


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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

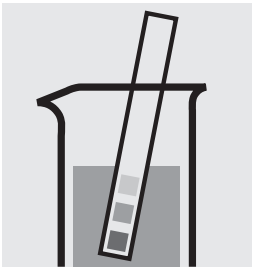
100961

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.

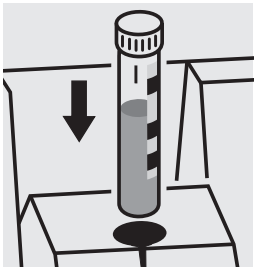


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

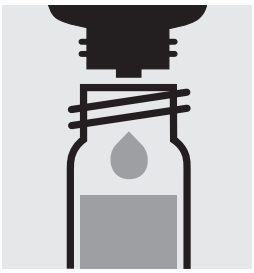
Add 1.0 ml of **H-1K** with pipette, close the cell with the screw cap, and mix.

Reaction time:
3 minutes

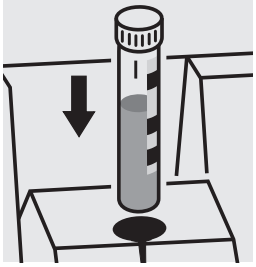


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer
= Result total hardness

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.



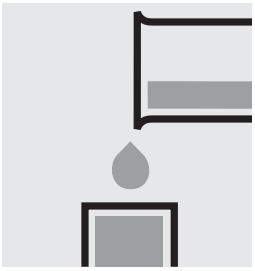
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer
= Result magnesium

After pressing enter, the individual measuring values for Ca- and Mg-hardness are shown on the display.

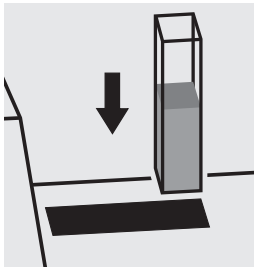
Turbidity

analogous to **EN ISO 7027**

Measuring range:	1 – 100 FAU	550 nm	50-mm cell



Transfer the sample into a cell.



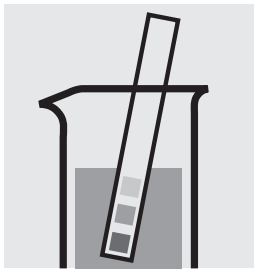
Place the cell into the cell compartment, select method No. **177**.

Volatile Organic Acids

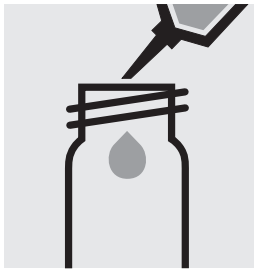
101763

Cell Test

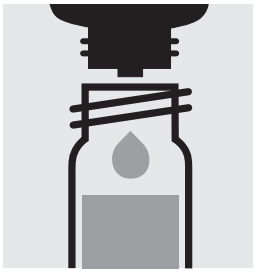
Measuring range:	50 – 3000 mg/l volatile organic acid (calculated as acetic acid)



Check the pH of the sample, specified range: pH 2– 12.

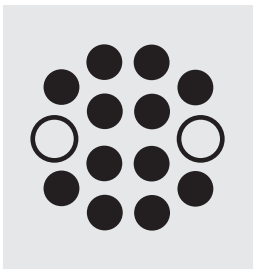


Pipette 0.75 ml of **OA-1** into a round cell.

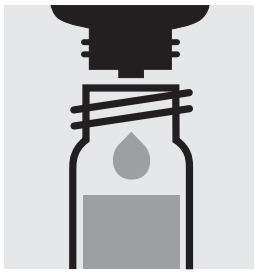


Add 2 drops of **OA-2**.

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.



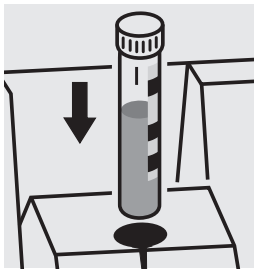
Add 5 drops of **OA-3**.

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:

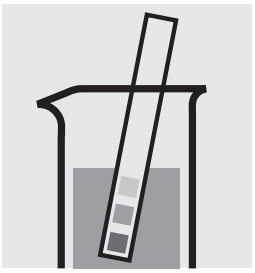
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous, Cat.No. 106268 (see section “Standard solutions”).

Volatile Organic Acids

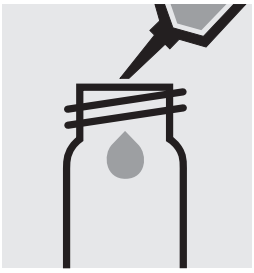
101749

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)

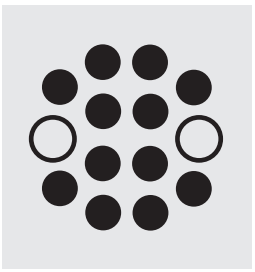


Check the pH of the sample, specified range: pH 2– 12.



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.



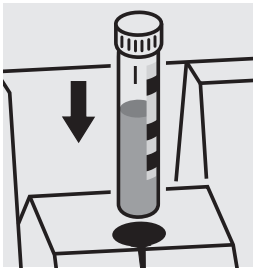
Heat the cell in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.

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:

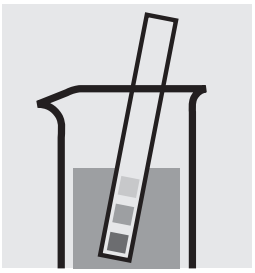
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous, Cat.No. 106268 (see section “Standard solutions”).

Volatile Organic Acids

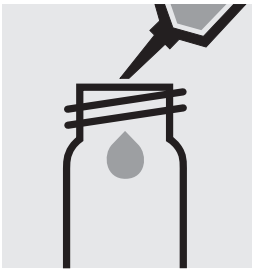
101809

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)



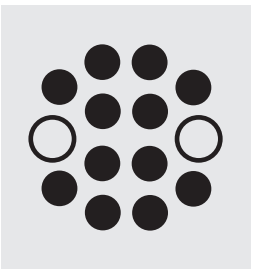
Check the pH of the sample, specified range: pH 2– 12.



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.



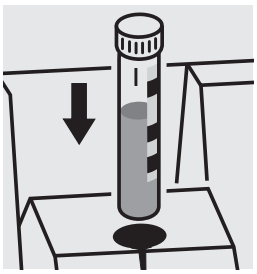
Heat the cell in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.

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:

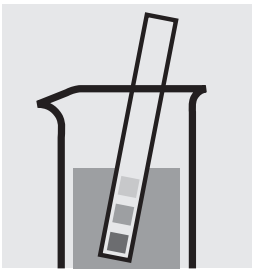
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous, Cat.No. 106268 (see section “Standard solutions”).

Zinc

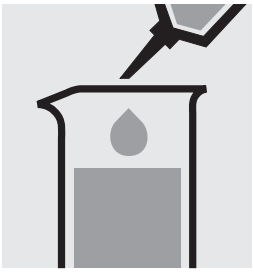
100861

Cell Test

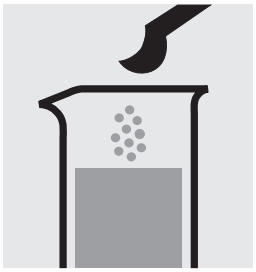
Measuring range:	0.025 – 1.000 mg/l Zn Expression of results also possible in mmol/l.



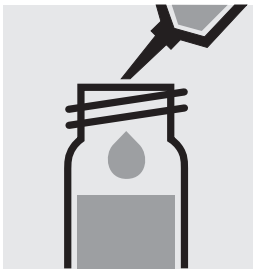
Check the pH of the sample, specified range: pH 1– 7.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



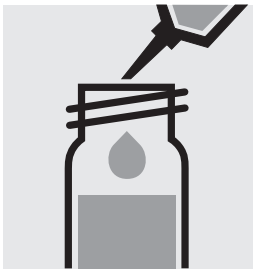
Pipette 10 ml of sample into a glass vessel.



Add 1 level green microspoon of **Zn-1K** and
shake to dissolve the solid substance: **sample-reagent mixture**.



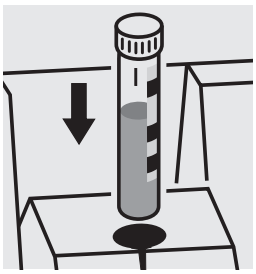
Pipette 0.50 ml of **Zn-2K** into a reaction cell, close with the screw cap, and mix.



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:

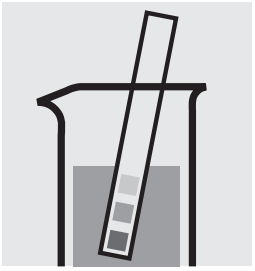
To check the measurement system (test reagents, measurement device, and handling) ready-for-use zinc standard solution Certipur®, Cat.No. 119806, concentration 1000 mg/l Zn, can be used after diluting accordingly.

Zinc

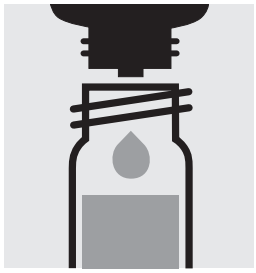
114566

Cell Test

Measuring range:	0.20 – 5.00 mg/l Zn Expression of results also possible in mmol/l.

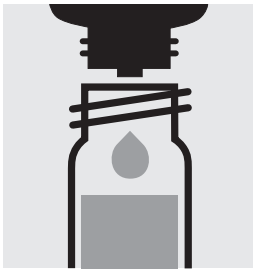


Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



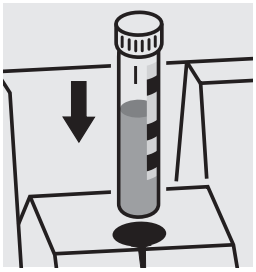
Add 5 drops of **Zn-1K** into a reaction cell, close with the screw cap, and mix.

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.

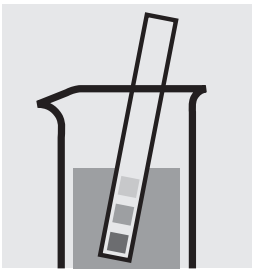
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 40) is highly recommended.

Zinc

114832

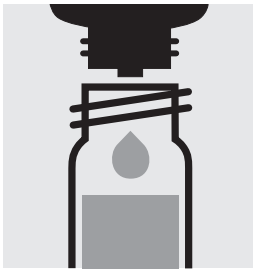
Test

Measuring range:	0.05 – 2.50 mg/l Zn Expression of results also possible in mmol/l.	10-mm cell



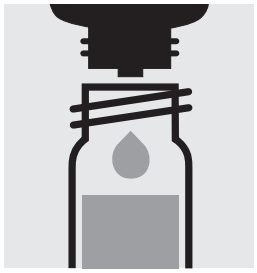
Check the pH of the sample, specified range: pH 4– 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 5.0 ml of the sample into a test tube with screw cap.



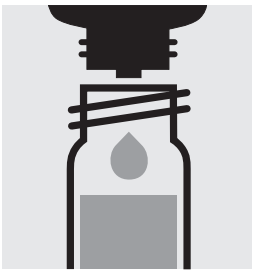
Add 5 drops of **Zn-1**, close the test tube with the screw cap, and mix.

Check the pH, specified range:
pH 12 – 13.
If required, add dilute sodium hydroxide solution drop by drop to adjust the pH.



Add 2 drops of **Zn-2**, close the test tube with the screw cap, and mix.

Add 5 drops of **Zn-3**, close the test tube with the screw cap, and mix.

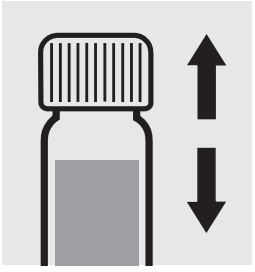


Add 3 drops of **Zn-4**, close the test tube with the screw cap, and mix.

Reaction time:
3 minutes

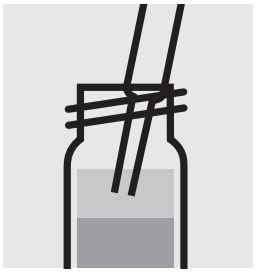
Add 1 level grey microspoon of **Zn-5**, close the test tube with the screw cap, and dissolve the solid substance.

Add 5.0 ml of **Zn-6** (Cat. No. 106146, Isobutyl-methylketone) with pipette and close the test tube with the screw cap.

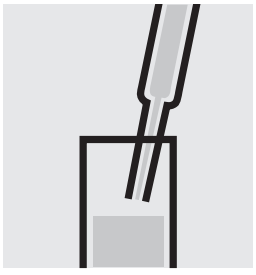


Shake the tube vigorously for 30 seconds.

Leave to stand for 2 minutes.

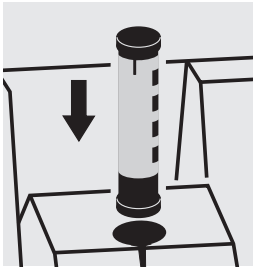


Aspirate the clear upper phase from the tube with pipette.

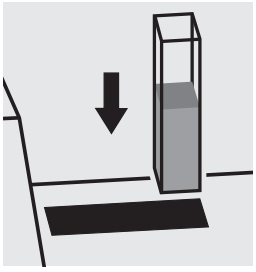


Transfer the solution into a cell.

Leave to stand for 3 minutes.



Select method with AutoSelector.



Place the cell into the cell compartment.

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.

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
Aluminium Test	114825	yes	10	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
Ammonium Test	114752	no [1]	10	10	20
Ammonium Test	100683	yes	20	20	20
AOX Cell Test	100675	no	0.4	20	20
Arsenic Test	101747	no	10	10	10
BOD Cell Test	100687	yes	20	20	20
Boron Cell Test	100826	yes	10	20	20
Boron Test	114839	no	20	5	20
Bromine Test	100605	no	10	10	10
Cadmium Cell Test	114834	no	1	10	1
Cadmium Test	101745	no	1	10	1
Calcium Cell Test	100858	no	2	2	1
Calcium Test	114815	yes	20	20	10
Chloride Cell Test	114730	yes	–	20	1
Chloride Test	114897	yes	–	10	0.1
Chloride Cell Test	101804	no	–	0.5	0.05
Chloride Test	101807	no	–	0.5	0.05
Chlorine Cell Test	100595	no	10	10	10
Chlorine Cell Test	100597	no	10	10	10
Chlorine Test	100598	no	10	10	10
Chlorine Test	100602	no	10	10	10
Chlorine Test	100599	no	10	10	10
Chlorine reagents (liquid) (free and total)	100086/100087/ 100088	no	10	10	10
Chlorine dioxide Test	100608	no	10	10	10
Chromate Cell Test (chromium(VI))	114552	yes	10	10	10
Chromate Cell Test (chromium total)	114552	no	1	10	10
Chromate Test	114758	yes	10	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
Copper Test	114767	yes	15	15	15
Cyanide Cell Test	102531	no	10	10	10
Cyanide Cell Test	114561	no	10	10	10
Cyanide Test	109701	no	10	10	10
Cyanuric Acid Test	119253	no	–	–	–
Fluoride Cell Test	114557	no	10	10	10
Fluoride Cell Test	100809	no	10	10	10
Fluoride Test	114598	yes	20	20	20
Fluoride Test	100822	yes [2]	0.05	0.05	0.001
Formaldehyde Cell Test	114500	no	5	0	10
Formaldehyde Test	114678	no	5	0	10
Gold Test	114821	yes	10	20	5
Hardness, see Total Hardness Cell Test					
Hydrazine Test	109711	no	20	5	2
Hydrogenperoxide Cell Test	114731	yes	20	20	20
Hydrogenperoxide Test	118789	no	0.1	1	5
Iodine Test	100606	no	10	10	10

[1] This test kit is also suitable for testing seawater after the addition of sodium hydroxide solution (see package insert).
[2] distill beforehand analogous APHA 4500-F^- B

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
Iron Cell Test	114549	yes	20	20	20
Iron Cell Test	114896	no	5	5	5
Iron Test	114761	yes	20	20	20
Iron Test	100796	yes	20	20	20
Lead Cell Test	114833	no	20	20	1
Lead Cell Test	109717	no	20	5	15
Magnesium Cell Test	100815	yes	2	2	1
Manganese Cell Test	100816	no	20	20	20
Manganese Test	101739	no	20	25	5
Manganese Test	114770	yes	20	20	20
Manganese Test	101846	no	20	25	5
Molybdenum Cell Test	100860	no	20	20	5
Molybdenum Test	119252	no	–	–	–
Monochloramine Test	101632	no	10	10	20
Nickel Cell Test	114554	no	20	20	20
Nickel Test	114785	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
Nitrate Test	114773	no	0.4	–	20
Nitrate Test	109713	no	0.2	–	20
Nitrate Cell Test (seawater)	114556	yes	20	–	20
Nitrate Test (seawater)	114942	yes	20	–	20
Nitrate Test	101842	no	0.001	–	0.001
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
Nitrite Test	114776	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
Oxygen Scavengers Test	119251	no	–	–	–
Ozone Test	100607	no	10	10	10
pH Cell Test	101744	yes	–	–	–
Phenol Cell Test	114551	yes	20	20	15
Phenol Test	100856	yes	20	20	20
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
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 Test	114848	yes	5	10	10
Phosphate Test	100798	yes	15	20	10
Phosphate Cell Test	114546	yes	20	20	20
Phosphate Test	114842	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
Silicate (Silicic Acid) Test	114794	yes	5	10	5
Silicate (Silicic Acid) Test	100857	no	5	10	2.5
Silicate (Silicic Acid) Test	101813	no	0.5	1	0.2
Silver Test	114831	no	0	1	5

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
Sodium Cell Test	100885	no	–	10	1
Sulfate Cell Test	102532	no	2	0.007	–
Sulfate Cell Test	114548	yes	10	0.1	–
Sulfate Cell Test	100617	yes	10	0.1	–
Sulfate Cell Test	114564	yes	10	0.5	–
Sulfate Test	114791	no	0.2	0.2	–
Sulfide Test	114779	no	0.5	1	1
Sulfate Test	101812	no	2	0.007	–
Sulfate Test	102537	yes	10	0.015	–
Sulfite Cell Test	114394	no	20	20	20
Sulfite Test	101746	no	20	20	20
Surfactants (anionic) Cell Test	114697	no	0.1	0.01	10
Surfactants (anionic) Cell Test	102552	no	0.1	0.01	10
Surfactants (cationic) Cell Test	101764	no	0.1	0.1	20
Surfactants (nonionic) Cell Test	101787	no	2	5	2
Tin Cell Test	114622	yes	20	20	20
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
Zinc Test	114832	no	5	15	15

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
Aluminium Test, 114825	Al	CombiCheck 40, 114692	0.75 mg/l	± 0.08 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
Ammonium Test, 114752	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	
					125024	2.00 mg/l	± 0.07 mg/l	119812
Ammonium Test, 100683	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
Arsenic Test, 101747	As	–	0.050 mg/l*	± 0.005 mg/l	–			119773
BOD Cell Test, 100687	O_2	–	210 mg/l	± 20 mg/l	–			100718
Boron Cell Test, 100826	B	–	1.00 mg/l*	± 0.15 mg/l	–			119500
Boron Test, 114839	B	–	0.400 mg/l*	± 0.040 mg/l	–			119500
Bromine Test, 100605	Br_2	–	5,00 mg/l*	± 0,50 mg/l	–			see prep. instr.
Cadmium Cell Test, 114834	Cd	CombiCheck 30, 114677	0.500 mg/l	± 0.060 mg/l	–			119777
Cadmium Test, 101745	Cd	–	0.250 mg/l	± 0.010 mg/l	–			119777
Calcium Cell Test, 100858	Ca	–	75 mg/l*	± 7 mg/l	–			see prep. instr.
Calcium Test, 114815	Ca	–	80 mg/l*	± 8 mg/l	–			119778
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 Test, 114897	Cl	CombiCheck 60, 114696	125 mg/l	± 13 mg/l				
		–	12.5 mg/l*	± 0.13 mg/l	–			119897
Chloride Cell Test, 101804	Cl	–	7.5 mg/l*	± 0.8 mg/l	–			119897
Chloride Test, 101807	Cl	–	2.50 mg/l*	± 0.25 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 Test, 100598	Cl_2	–	3.00 mg/l*	± 0.30 mg/l	–			see prep. instr.
Chlorine Test, 100602	Cl_2	–	3.00 mg/l*	± 0.30 mg/l	–			see prep. instr.
Chlorine Test, 100599	Cl_2	–	3.00 mg/l*	± 0.30 mg/l	–			see prep. instr.
Chlorine Cell Test (liquid reagent), 00086/00087	Cl_2	–	3.00 mg/l*	± 0.30 mg/l	–			see prep. instr.
Chlorine Test (liquid reagent), 100086/100087	Cl_2	–	0.500 mg/l*	± 0.050 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.
Chlorine Test (liquid reagent), 100086/100087/100088	Cl_2	–	0.500 mg/l*	± 0.050 mg/l	–			see prep. instr.
Chlorine Dioxide Test, 100608	ClO_2	–	5.00 mg/l*	± 0.50 mg/l	–			see prep. instr.
Chromate Cell Test, 114552	Cr	–	1.00 mg/l*	± 0.10 mg/l	–			119780
Chromate Test, 114758	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.

* 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.
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	50 000 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.
Color Hazen	Pt/Co (Hazen)	–	250 mg/l*		–			100246
Color Hazen	Pt/Co (Hazen)	–	500 mg/l		–			100246
Copper Cell Test, 114553	Cu	CombiCheck 30, 114677	2.00 mg/l	± 0.20 mg/l	–			119786
Copper Test, 114767	Cu	CombiCheck 30, 114677	2.00 mg/l	± 0.20 mg/l	–			119786
Cyanide Cell Test, 102531	CN	–	0.250 mg/l*	± 0.030 mg/l	–			119533
Cyanide Cell Test, 114561	CN	–	0.250 mg/l*	± 0.030 mg/l	–			119533
Cyanide Test, 109701	CN	–	0.250 mg/l*	± 0.030 mg/l	–			119533
Cyanuric Acid Test, 119253	Cyan Acid	–	80 mg/l*	± 10 mg/l	–			see prep. instr.
Fluoride Cell Test, 114557	F	–	0.75 mg/l*	± 0.08 mg/l	–			119814
Fluoride Cell Test, 100809	F	–	0.75 mg/l*	± 0.08 mg/l	–			119814
Fluoride Test, 114598	F	–	1.00 mg/l*	± 0.15 mg/l				
			10.0 mg/l*	± 1.2 mg/l	–			119814
Fluoride Test, 100822	F	–	1.00 mg/l*	± 0.15 mg/l	–			119814
Formaldehyde Cell Test, 114500	HCHO	–	5.00 mg/l*	± 0.50 mg/l	–			see prep. instr.
Formaldehyde Test, 114678	HCHO	–	4.50 mg/l*	± 0.50 mg/l	–			see prep. instr.
Gold Test, 114821	Au	–	6.0 mg/l*	± 0.6 mg/l	–			170216
Hardness, see Total Hardness Cell Test								
Hydrazine Test, 109711	N_2H_4	–	1.00 mg/l*	± 0.10 mg/l	–			see prep. instr.
Hydrogenperoxide Cell Test, 114731	H_2O_2	–	10.0 mg/l*	± 1.0 mg/l	–			see prep. instr.
Hydrogenperoxide Test, 118789	H_2O_2	–	2.00 mg/l*	± 0.20 mg/l	–			see prep. instr.
Iodine Test, 100606	I_2	–	5.00 mg/l*	± 0.50 mg/l	–			see prep. instr.
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
Iron Test, 114761	Fe	CombiCheck 30, 114677	1.00 mg/l	± 0.15 mg/l	–			119781
Iron Test, 100796	Fe	CombiCheck 30, 114677	1.00 mg/l	± 0.15 mg/l	–			119781
Lead Cell Test, 114833	Pb	CombiCheck 40, 114692	2.00 mg/l	± 0.20 mg/l	–			119776
Lead Test, 109717	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
Manganese Test, 101739	Mn	–	1.00 mg/l*	± 0.10 mg/l	–			119789
Manganese Test, 114770	Mn	CombiCheck 30, 114677	1.00 mg/l	± 0.15 mg/l	–			119789
Manganese Test, 101846	Mn	–	1.00 mg/l*	± 0.10 mg/l	–			119789
Molybdenum Cell Test, 100860	Mo	–	0.50 mg/l*	± 0.05 mg/l	–			170227
Molybdenum Test, 119252	Mo	–	25.0 mg/l*	± 2.5 mg/l	–			170227
Monochloramine Test, 101632	Cl_2	–	5.00 mg/l*	± 0.50 mg/l	–			see prep. instr.
Nickel Cell Test, 114554	Ni	CombiCheck 40, 114692	2.00 mg/l	± 0.20 mg/l	–			109989
Nickel Test, 114785	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
Nitrate Test, 114773	NO_3-N	CombiCheck 20, 114675	9.0 mg/l	± 0.9 mg/l	125036	0.500 mg/l	± 0.05 mg/l	
					125037	2.50 mg/l	± 0.06 mg/l	
					125038	15.0 mg/l	± 0.4 mg/l	119811

* 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	max. working tolerance	Diluted and ready-to-use standard solutions, CRM Cat. No.	concentration	expanded measurement uncertainty	Ready-to-use standard solution, Cat. No.
Nitrate Test, 109713	NO_3-N	CombiCheck 20, 114675	9.0 mg/l	± 0.9 mg/l	125036	0.500 mg/l	± 0.05 mg/l	
					125037	2.50 mg/l	± 0.06 mg/l	
					125038	15.0 mg/l	± 0.4 mg/l	119811
Nitrate Cell Test, 114556	NO_3-N	CombiCheck 10, 114676	2.50 mg/l	± 0.25 mg/l	125036	0.500 mg/l	± 0.05 mg/l	
					125037	2.50 mg/l	± 0.06 mg/l	119811
Nitrate Test, 114942	NO_3-N	CombiCheck 20, 114675	9.0 mg/l	± 0.9 mg/l	125036	0.500 mg/l	± 0.05 mg/l	
					125037	2.50 mg/l	± 0.06 mg/l	
					125038	15.0 mg/l	± 0.4 mg/l	119811
Nitrate Test, 101842	NO_3-N	–	10.0 mg/l*	± 1.5 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
Nitrite Test, 114776	NO_2-N	–	0.50 mg/l*	± 0.05 mg/l	125041	0.200 mg/l	± 0.009 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
Oxygen Scavengers Test, 119251	DEHA	–	0.250 mg/l*	± 0.030 mg/l	–			see prep. instr.
Ozone Test, 100607	O_3	–	2.00 mg/l*	± 0.20 mg/l	–			see prep. instr.
pH Cell Test, 101744	pH	–	7.0	± 0.2	–			109407
Phenol Cell Test, 114551	C_6H_5OH	–	1.25 mg/l*	± 0.13 mg/l	–			see prep. instr.
Phenol Test, 100856	C_6H_5OH	–	2.50 mg/l*	± 0.25 mg/l	–			see prep. instr.
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 Test, 114848	PO_4-P	CombiCheck 10, 114676	0.80 mg/l	± 0.08 mg/l	–			119898
Phosphate Test, 100798	PO_4-P	–	50.0 mg/l*	± 5.0 mg/l	–			119898
Phosphate Cell Test, 114546	PO_4-P	–	15.0 mg/l*	± 1.0 mg/l	–			119898
Phosphate Test, 114842	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
Silicate Test, 100857	SiO_2	–	50.0 mg/l*	± 5.0 mg/l	–			170236
Silicate Test, 101813	SiO_2	–	0.1000 mg/l*	± 0.0100 mg/l	–			170236
Silver Test, 114831	Ag	–	1.50 mg/l*	± 0.20 mg/l	–			119797
Sodium Cell Test, 100885	Na	–	100 mg/l*	± 10 mg/l	–			see prep. instr.
Sulfate Cell Test, 102532	SO_4	–	25.0 mg/l*	± 3.0 mg/l	–			119813
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
Sulfate Test, 101812	SO_4	–	5.00 mg/l*	± 0.50 mg/l	–			119813
Sulfate Test, 102537	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
Sulfide Test, 114779	S	–	0.75 mg/l*	± 0.08 mg/l	–			see prep. instr.
Sulfite Cell Test, 114394	SO_3	–	12.5 mg/l*	± 1.5 mg/l	–			see prep. instr.

* 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	max. working tolerance	Diluted and ready-to-use standard solutions, CRM Cat. No.	concentration	expanded measurement uncertainty	Ready-to-use standard solution, Cat. No.
Sulfite Test, 101746	SO_3	–	30.0 mg/l*	± 1.0 mg/l	–			see prep. instr.
Surfactants (anionic) Cell Test, 114697	MBAS	–	1.00 mg/l*	± 0.20 mg/l	–			see prep. instr.
Surfactants (anionic) Cell Test, 102552	MBAS	–	1.00 mg/l*	± 0.20 mg/l	–			see prep. instr.
Surfactants (cationic) Cell Test, 101764	k-Ten	–	1.00 mg/l*	± 0.10 mg/l	–			see prep. instr.
Surfactants (nonionic) Cell Test, 101787	n-Ten	–	4.00 mg/l*	± 0.40 mg/l	–			see prep. instr.
Tin Cell Test, 114622	Sn	–	1.25 mg/l*	± 0.13 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
Zinc Test, 114832	Zn	–	1.25 mg/l*	± 0.20 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 bromine analogous to DIN EN ISO 7393

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®

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 11.13 ml of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.
1 ml of this solution is equivalent to 0.025 mg of bromine.

Preparation of the bromine standard solution:
Pipette 20.0 ml (full pipette) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_4 0.5 mol/l, leave to stand for 1 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 5.00 mg/l bromine.

Stability:
The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted bromine standard solution is not stable and must be used immediately.

Instructions for the Preparation of Standard Solutions

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.

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 chlorine dioxide analogous to DIN EN ISO 7393

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®

Preparation of a KIO_3 stock solution:
Dissolve 1.006 g of KIO_3 in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:
Transfer 13.12 ml of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.
1 ml of this solution is equivalent to 0.025 mg of chlorine dioxide.

Preparation of the chlorine dioxide standard solution:
Pipette 20.0 ml (full pipette) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_4 0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.
The concentration of the solution is 5.00 mg/l chlorine dioxide.

Stability:
The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted chlorine dioxide standard solution is not stable and must be used immediately.

Standard solution of 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.

Instructions for the Preparation of Standard Solutions

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.

Standard solution of cyanuric acid

Reagents required:

8.20358.0005	Cyanuric acid for synthesis
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 1.00 g of cyanuric acid with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water. The substance is slightly soluble and the dissolution process may take several hours.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l cyanuric acid.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

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 hydrazine

Reagents required:

1.04603.0100	Hydrazinium sulfate GR for analysis
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 4.07 g of hydrazinium sulfate GR with oxygen-low (boil previously) distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with oxygen-low distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l hydrazine.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with oxygen-low distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solution of hydrogen peroxide

Reagents required:

1.09122.1000	Potassium permanganate solution 0.02 mol/l Titripur®
1.07209.0250	Perhydrol® 30 % for analysis EMSURE®
1.00716.1000	Sulfuric acid 25 % for analysis EMSURE®
1.16754.9010	Water for analysis EMSURE®

Preparation of a stock solution:
Place 10.0 ml of Perhydrol® 30 % H_2O_2 in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water. Transfer 30.0 ml (full pipette) of this solution to a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The stock solution prepared according to this procedure has a concentration of approx. 1000 mg/l hydrogen peroxide.

Precise assay of the stock solution:
Pipette 50.0 ml (full pipette) of the hydrogen peroxide stock solution into a 500-ml conical flask, dilute with 200 ml of distilled water, and add 30 ml of sulfuric acid 25 %.
Titrate with a 0.02 mol/l potassium permanganate solution until the color changes to pink.

Calculation and preparation of a standard solution:

Consumption of potassium permanganate solution 0.02 mol/l (ml) x 34.02 = content of hydrogen peroxide, in mg/l

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

Instructions for the Preparation of Standard Solutions

Standard solution of iodine analogous to DIN EN ISO 7393

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®

Preparation of a KIO_3 stock solution:
Dissolve 1.006 g of KIO_3 in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:
Transfer 7.00 ml of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.
1 ml of this solution is equivalent to 0.025 mg of iodine.

Preparation of the iodine standard solution:
Pipette 20.0 ml (full pipette) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_4 0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.
The concentration of the solution is 5.00 mg/l iodine.

Stability:
The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted iodine standard solution is not stable and must be used immediately.

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.

Instructions for the Preparation of Standard Solutions

Standard solution of monochloramine

Preparation of a standard solution:
Place 5.0 ml of chlorine standard solution 100 mg/l Cl_2 and 10.0 ml ammonium standard solution 10 mg/l NH_4-N in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 5.00 mg/l Cl_2 or 3.63 mg/l NH_2Cl.

Stability:
The standard solution is not stable and must be used immediately.

Reagents required:

	Chlorine standard solution 100 mg/l Cl_2 Preparation see "Standard solution of free chlorine" with hypochlorite solution (standard solution that is absolutely necessary for the preparation of the monochloramine standard)
	Ammonium standard solution 10 mg/l NH_4-N Preparation with Ammonium standard solution Certipur®, Cat.No. 1.19812.0500, 1000 mg/l NH_4 = = 777 mg/l NH_4-N
1.16754.9010	Water for analysis EMSURE®

Standard solution of nitrogen (total)

Preparation of a standard solution:
Dissolve 5.36 g of glycine GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l total nitrogen.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:

1.04201.0100	Glycine GR for analysis
1.16754.9010	Water for analysis EMSURE®

Standard solution of oxygen scavengers

Preparation of a standard solution:
Dissolve 1.00 g of N,N-diethylhydroxylamine with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l N,N-diethylhydroxylamine (DEHA).

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

Reagents required:

8.18473.0050	N,N-Diethylhydroxylamine for synthesis
1.16754.9010	Water for analysis EMSURE®

Instructions for the Preparation of Standard Solutions

Standard solution of ozone analogous to DIN EN ISO 7393

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®

Preparation of a KIO_3 stock solution:
Dissolve 1.006 g of KIO_3 in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:
Transfer 14.80 ml of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.
1 ml of this solution is equivalent to 0.010 mg of ozone.

Preparation of the ozone standard solution:
Pipette 20.0 ml (full pipette) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_4 0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.
The concentration of the solution is 2.00 mg/l ozone.

Stability:
The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted ozone standard solution is not stable and must be used immediately.

Standard solution of phenol

Reagents required:

1.00206.0250	Phenol GR for analysis
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 1.00 g of phenol GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l phenol.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

Instructions for the Preparation of Standard Solutions

Standard solution of silicate

Reagents required:

1.70236.0100	Silicone standard solution Certipur®
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
A silicon standard solution of 1000 mg/l Si is used.
1000 mg/l Si corresponds to 2139 mg/l SiO_2.

Further investigational concentrations may be prepared by diluting accordingly with distilled water.

Example:
Mix 4.675 ml of silicon standard solution (1000 mg/l Si) with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 10.00 mg/l SiO_2.
After its preparation, the solution must be immediately transferred to a clean polyethylene vessel for further storage.
Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.
After its preparation, the solution with the desired working concentration must be immediately transferred to a clean polyethylene vessel for further storage.

Stability:
The diluted standard solutions (investigational concentrations) remain stable - depending on the respective concentration - for one day to approximately six months.

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 sulfide

Preparation of a stock solution:
Dissolve 5.0 g of glass-clear, if necessary washed crystals of sodium sulfide hydrate GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The stock solution prepared according to this procedure has a concentration of approx. 1000 mg/l sulfide.

Precise assay of the stock solution:
Place 100 ml of distilled water and 5.0 ml (full pipette) of sulfuric acid 25% in a 500-ml ground-glass-stoppered conical flask. To this solution add 25.0 ml (full pipette) of the sulfide stock solution and 25.0 ml (full pipette) of iodine solution 0.05 mol/l. Shake the contents of the flask thoroughly for about 1 minute, subsequently titrate with sodium thiosulfate solution 0.1 mol/l until the yellow iodine color has disappeared, add 1 ml of zinc iodide-starch solution, and continue to titrate until a milky, pure white color emerges.

Calculation and preparation of the standard solution:

C1 = consumption of sodium thiosulfate 0.1 mol/l (ml)
C2 = quantity of iodine solution 0.05 mol/l (25.0 ml)

mg/l sulfide = (C2 – C1) x 64.13

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l remains stable for at most one day. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:

	Sodium sulfide hydrate approx. 60 % GR for analysis
1.09099.1000	Iodine solution 0.05 mol/l Titripur®
1.09147.1000	Sodium thiosulfate solution 0.1 mol/l Titripur®
1.00716.1000	Sulfuric acid 25% for analysis EMSURE®
1.05445.0500	Zinc iodide-starch solution GR for analysis
1.16754.9010	Water for analysis EMSURE®

Instructions for the Preparation of Standard Solutions

Standard solution of sulfite

Preparation of a stock solution:
Dissolve 1.57 g of sodium sulfite and 0.4 g of Titriplex® III GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of approx. 1000 mg/l sulfite.

Precise assay of the stock solution:
Place 50.0 ml (full pipette) of the sulfite stock solution and 5.0 ml (full pipette) of hydrochloric acid 25 % in a 300-ml conical flask.
To this solution add 25.0 ml (full pipette) of iodine solution 0.05 mol/l and process immediately. After mixing the contents of the flask, subsequently titrate with sodium thiosulfate solution 0.1 mol/l until the yellow iodine color has disappeared, add 1 ml of zinc iodide-starch solution, and continue to titrate from blue to colorless.

Calculation and preparation of the standard solution:

C1 = consumption of sodium thiosulfate 0.1 mol/l (ml)
C2 = quantity of iodine solution 0.05 mol/l (25.0 ml)

$$mg/l\ sulfite = (C2 - C1) \times 80.06$$

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water and buffer solution pH 9.00. This is done in the following manner:
Withdraw the desired aliquot from the stock solution, place in a calibrated or conformity-approved 1000-ml volumetric flask, add 20 ml of buffer solution pH 9.00, make up to the mark with distilled water, and mix.

Stability:
When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l remains stable for at most one day. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:

1.06657.0500	Sodium sulfite anhydrous for analysis EMSURE®
1.08418.0100	Titriplex® III GR for analysis
1.09099.1000	Iodine solution 0.05 mol/l Titripur®
1.09147.1000	Sodium thiosulfate solution 0.1 mol/l Titripur®
1.00316.1000	Hydrochloric acid 25 % GR for analysis EMSURE®
1.05445.0500	Zinc iodide-starch solution GR for analysis
1.09461.1000	Buffer solution pH 9.00 Certipur®
1.16754.9010	Water for analysis EMSURE®

Instructions for the Preparation of Standard Solutions

Standard solution of surfactants (anionic)

Reagents required:

1.12146.0005	Sodium 1-dodecanesulfonate
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 1.00 g of sodium 1-dodecanesulfonate with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 1000 mg/l anionic surfactants.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one month. The diluted standard solutions (investigational concentrations) must be used immediately.

Standard solution of surfactants (cationic)

Reagents required:

1.02342.0100	N-cetyl-N,N,N-trimethylammonium bromide GR for analysis
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
Dissolve 1.00 g of N-cetyl-N,N,N-trimethyl-ammonium bromide 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 cat-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 month. The diluted standard solutions (investigational concentrations) must be used immediately.

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.

Instructions for the Preparation of Standard Solutions

Standard solution of tin

Reagents required:

1.70242.0100	Tin standard solution Certipur®
1.09057.1000	Hydrochloric acid 1 mol/l Titripur®
1.16754.9010	Water for analysis EMSURE®

Preparation of a standard solution:
A tin standard solution of 1000 mg/l is used.
Transfer 30 ml of HCl 1 mol/l to a calibrated or conformity-checked 100-ml volumetric flask, add 10.0 ml (full pipette) of the tin standard solution, and make up to the mark with distilled water.
The standard solution prepared according to this procedure has a concentration of 100 mg/l tin.

Further investigational concentrations may be prepared from the standard solution by diluting accordingly with distilled water and HCl 1 mol/l. This is done in the following manner:
Transfer 1 ml of HCl 1 mol/l to a calibrated or conformity-checked 100-ml volumetric flask. Withdraw the desired aliquot from the tin standard solution 100 mg/l, add, make up to the mark with distilled water, and mix.

Stability:
The tin standard solution 100 mg/l remains stable for 30 minutes. The diluted standard solutions (investigational concentrations) must be used immediately.

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.

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