

# Analytical Procedures Appendices

Spectroquant® Prove  
Spectrophotometer 600



# Analytical Procedures and Appendices

## Contents

**I** Table – **Available photometric test kits**

### **Analytical procedures**

**II** Appendix 1 – **Suitability of test kits for testing seawater and tolerance limits of neutral salts**

**III** Appendix 2 – **Spectroquant® CombiCheck and standard solutions**

**IV** Appendix 3 – **Instructions for the preparation of standard solutions**

I

II

III

IV

# Analytical Procedures and Appendices

## I Available photometric test kits and methods

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

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 100 mm).

At the end of this chapter there are the tables for the pre-programmed AQA1 and PipeCheck methods.

Method number	Determination		Total range	Method
208	Acid Capacity Cell Test to pH 4.3 (total alkalinity)	101758	0.40 – 8.00 mmol/l	Indicator reaction
2518	ADMI Color Measurement		2.0 – 100.0	Inherent color
2517	ADMI Color Measurement		10 – 500	Inherent color
2612	$\alpha$ Acids <sup>2)</sup>		0 – 80 mg/l	Inherent color
2637	$\alpha$ Acids (Hop Extracts) <sup>2)</sup>		0.0 - 100.0 %	Inherent color
2636	$\alpha/\beta$ Acids (Hops) <sup>2)</sup>		0.0 - 100.0 %	Inherent color
196	Aluminium Cell Test <sup>1)</sup>	100594	0.02 – 0.50 mg/l Al	Chromazurole S
43	Aluminium Test <sup>1)</sup>	114825	0.020 – 1.20 mg/l Al	Chromazurole S
	Amino nitrogen, free - see Free Amino Nitrogen			
2520	Ammonia, free		0.00 – 3.65 mg/l NH <sub>3</sub>	as ammonium
104	Ammonium Cell Test	114739	0.010 – 2.000 mg/l NH <sub>4</sub> -N	Indophenol blue
51	Ammonium Cell Test	114558	0.20 – 8.00 mg/l NH <sub>4</sub> -N	Indophenol blue
52	Ammonium Cell Test	114544	0.5 – 16.0 mg/l NH <sub>4</sub> -N	Indophenol blue
53	Ammonium Cell Test	114559	4.0 – 80.0 mg/l NH <sub>4</sub> -N	Indophenol blue
54	Ammonium Test	114752	0.010 – 3.00 mg/l NH <sub>4</sub> -N	Indophenol blue
155	Ammonium Test	100683	2.0 – 75.0 mg/l NH <sub>4</sub> -N	Indophenol blue
163	Ammonium Test	100683	5 – 150 mg/l NH <sub>4</sub> -N	Indophenol blue
2601	Anthocyanogenes <sup>2)</sup>		0 – 100 mg/l	Acidic hydrolysis
130	Antimony in water and wastewater		0.10 – 8.00 mg/l Sb	Brilliant green
156	AOX Cell Test <sup>1)</sup>	100675	0.05 – 2.50 mg/l AOX	Oxidation to chloride
132	Arsenic Test <sup>1)</sup>	101747	0.001 – 0.100 mg/l As	Ag-DDTC
2562	ASTM Color Measurement		0.5 - 8.0	Inherent color
2603	Bitterness - beer <sup>2)</sup>		1.0 – 80.0 BU	UV absorption
2604	Bitterness - wort <sup>2)</sup>		1.0 – 120.0 BU	UV absorption

1) turbidity correction possible

2) the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

3) individual calibration necessary

Method number	Determination		Total range	Method
157	BOD Cell Test <sup>1)</sup>	100687	0.5 – 3000 mg/l BOD	Modification of Winkler method
164	Boron Cell Test <sup>1)</sup>	100826	0.05 – 2.00 mg/l B	Azomethine H
46	Boron Test <sup>1)</sup>	114839	0.050 – 0.800 mg/l B	Rosocyanine
307	Bromate in water and drinking water - Ultra Low Range		0.5 – 40.0 µg/l BrO <sub>3</sub>	3,3'-Dimethylnaphthidine
308	Bromate in water and drinking water - Low Range		2.5 – 200.0 µg/l BrO <sub>3</sub>	3,3'-Dimethylnaphthidine
146	Bromine Test <sup>1)</sup>	100605	0.020 – 10.00 mg/l Br <sub>2</sub>	S-DPD
67	Cadmium Cell Test	114834	0.025 – 1.000 mg/l Cd	Cadion derivate
183	Cadmium Test	101745	0.0020 – 0.500 mg/l Cd	Cadion derivate
165	Calcium Cell Test <sup>1)</sup>	100858	10 – 250 mg/l Ca	Phthalein purple
42	Calcium Test <sup>1)</sup>	114815	5 – 160 mg/l Ca	Glyoxal-bis-hydroxyanil
125	Calcium Test sensitive <sup>1)</sup>	114815	1.0 – 15.0 mg/l Ca	Glyoxal-bis-hydroxyanil
304	Calcium Test <sup>3)</sup>	100049	0.20 – 4.00 mg/l Ca	Phthalein derivate
	Carbohydrates, total - see Total Carbohydrates			
2523	Carotene (palm oil)		10 – 7500 mg/kg	Inherent color
95	Chloride Cell Test <sup>1)</sup>	114730	5 – 125 mg/l Cl	Iron(III)-thiocyanat
110	Chloride Test <sup>1)</sup>	114897	2.5 – 25.0 mg/l Cl	Iron(III)-thiocyanat
63	Chloride Test <sup>1)</sup>	114897	10 – 250 mg/l Cl	Iron(III)-thiocyanat
218	Chloride Cell Test <sup>1)</sup>	101804	0.5 – 15.0 mg/l Cl	Iron(III)-thiocyanat
219	Chloride Test <sup>1)</sup>	101807	0.10 – 5.00 mg/l Cl	Iron(III)-thiocyanat
141	Chlorine Cell Test <sup>1)</sup> (free chlorine)	100595	0.03 – 6.00 mg/l Cl <sub>2</sub>	S-DPD
142	Chlorine Cell Test <sup>1)</sup> (free chlorine + total chlorine)	100597	0.03 – 6.00 mg/l Cl <sub>2</sub>	S-DPD
143	Chlorine Test <sup>1)</sup> (free chlorine)	100598	0.010 – 6.00 mg/l Cl <sub>2</sub>	S-DPD
145	Chlorine Test <sup>1)</sup> (total chlorine)	100602	0.010 – 6.00 mg/l Cl <sub>2</sub>	S-DPD
144	Chlorine Test <sup>1)</sup> (free chlorine + total chlorine)	100599	0.010 – 6.00 mg/l Cl <sub>2</sub>	S-DPD
194	Chlorine Cell Test <sup>1)</sup> (free chlorine + total chlorine)	100086/100087/ 100088/100089	0.03 – 6.00 mg/l Cl <sub>2</sub>	DPD
306	Chlorine Test <sup>1)</sup> (free chlorine + total chlorine)	100086/100087/ 100088	0.010 – 1.000 mg/l Cl <sub>2</sub>	DPD

1) turbidity correction possible

2) the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

3) individual calibration necessary

## Analytical Procedures and Appendice – I Available photometric test kits and methods

Method number	Determination		Total range	Method
149	Chlorine Dioxide Test <sup>1)</sup>	100608	0.020 – 10.00 mg/l ClO <sub>2</sub>	S-DPD
2509	Chlorophyll-a (DIN/ISO)		result in µg/l Chl-a or Phaeo	Inherent color
2504	Chlorophyll-a (APHA/ASTM)		result in mg/m <sup>3</sup> Chl-a or Phaeo	Inherent color
2507	Chlorophyll-a, -b, -c (APHA/ASTM)		result in mg/m <sup>3</sup> Chl-a, -b, -c	Inherent color
39	Chromate Cell Test <sup>1)</sup>	114552	0.05 – 2.00 mg/l Cr	Diphenylcarbazide
39	Chromate Cell Test <sup>1)</sup> (total chromium)	114552	0.05 – 2.00 mg/l Cr	Peroxodisulfate oxidation / Diphenylcarbazide
40	Chromate Test <sup>1)</sup>	114758	0.010 – 3.00 mg/l Cr	Diphenylcarbazide
20	Chromium Baths		4.0 – 400 g/l CrO <sub>3</sub>	Inherent color
232	Cobalt Cell Test <sup>1)</sup>	117244	0.05 – 2.00 mg/l Co	Nitroso-R salt
305	Cobalt in water		0.5 – 10.0 mg/l Co	Nitroso-R salt
31	COD Cell Test <sup>1)</sup>	114560	4.0 – 40.0 mg/l COD	Chromosulfuric acid oxidation / chromate determination
211	COD Cell Test <sup>1)</sup>	101796	5.0 – 80.0 mg/l COD	Chromosulfuric acid oxidation / chromate determination
14	COD Cell Test <sup>1)</sup>	114540	10 – 150 mg/l COD	Chromosulfuric acid oxidation / chromate determination
105	COD Cell Test <sup>1)</sup>	114895	15 – 300 mg/l COD	Chromosulfuric acid oxidation / chromate determination
93	COD Cell Test <sup>1)</sup>	114690	50 – 500 mg/l COD	Chromosulfuric acid oxidation / chromate determination
23	COD Cell Test <sup>1)</sup>	114541	25 – 1500 mg/l COD	Chromosulfuric acid oxidation / chromium(III) determination
94	COD Cell Test <sup>1)</sup>	114691	300 – 3500 mg/l COD	Chromosulfuric acid oxidation / chromium(III) determination
24	COD Cell Test <sup>1)</sup>	114555	500 – 10000 mg/l COD	Chromosulfuric acid oxidation / chromium(III) determination

<sup>1)</sup> turbidity correction possible

<sup>2)</sup> the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

<sup>3)</sup> individual calibration necessary

Method number	Determination		Total range	Method
209	COD Cell Test <sup>1)</sup>	101797	5000 – 90000 mg/l COD	Chromosulfuric acid oxidation / chromium(III) determination
137	COD Cell Test (Hg free) <sup>1)</sup>	109772	10 – 150 mg/l COD	Chromosulfuric acid oxidation / chromate determination
138	COD Cell Test (Hg free) <sup>1)</sup>	109773	100 – 1500 mg/l COD	Chromosulfuric acid oxidation / chromium(III) determination
220	COD Cell Test for seawater <sup>1)</sup>	117058	5.0 – 60.0 mg/l COD	Chloride depletion / chromosulfuric acid oxidation / chromate determination
221	COD Cell Test for seawater <sup>1)</sup>	117059	50 – 3000 mg/l COD	Chloride depletion / chromosulfuric acid oxidation / chromium(III) determination
15	Color $\alpha$ (436) (spectral absorptions coefficient)		0.1 – 250 m <sup>-1</sup>	Measurement at 436 nm
61	Color $\alpha$ (525) (spectral absorptions coefficient)		0.1 – 250 m <sup>-1</sup>	Measurement at 525 nm
78	Color $\alpha$ (620) (spectral absorptions coefficient)		0.1 – 250 m <sup>-1</sup>	Measurement at 620 nm
303	Color (410) (EN 7887)		2 – 2500 mg/l Pt	Measurement at 410 nm
2633	Color - ASBC <sup>2)</sup>		0.0 – 50.0 °SRM	Inherent color
2602	Color - EBC <sup>2)</sup>		0.0 – 60.0 EBC Units	Inherent color
32	Color Hazen <sup>1)</sup>		0.2 – 500 mg/l Pt/Co (Hazen)	Platinum-cobalt-Standard Method, measurement at 340 nm
179	Color Hazen <sup>1)</sup>		0 – 1000 mg/l Pt/Co (Hazen)	Platinum-cobalt-Standard Method, measurement at 445 nm
180	Color Hazen <sup>1)</sup>		0 – 1000 mg/l Pt/Co (Hazen)	Platinum-cobalt-Standard Method, measurement at 455 nm
181	Color Hazen <sup>1)</sup>		0 – 1000 mg/l Pt/Co (Hazen)	Platinum-cobalt-Standard Method, measurement at 465 nm
Color of sugar solutions - see ICUMSA Color				

1) turbidity correction possible

2) the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

3) individual calibration necessary

## Analytical Procedures and Appendice – I Available photometric test kits and methods

Method number	Determination		Total range	Method
2613	Copper - EBC <sup>2)</sup>		0.10 – 5.00 mg/l Cu	Cuprethol
26	Copper Cell Test <sup>1)</sup>	114553	0.05 – 8.00 mg/l Cu	Cuprizone
27	Copper Test <sup>1)</sup>	114767	0.02 – 6.00 mg/l Cu	Cuprizone
83	Copper Baths		2.0 – 80.0 g/l Cu	Inherent color
228	Cyanide Cell Test <sup>1)</sup> (free cyanide)	102531	0.010 – 0.500 mg/l CN	Barbituric acid + pyridinecarboxylic acid
75	Cyanide Cell Test <sup>1)</sup> (free cyanide)	114561	0.010 – 0.500 mg/l CN	Barbituric acid + pyridinecarboxylic acid
75	Cyanide Cell Test <sup>1)</sup> (readily liberated cyanide)	114561	0.010 – 0.500 mg/l CN	Citric acid / barbituric acid + pyridinecarboxylic acid
109	Cyanide Test <sup>1)</sup> (free cyanide)	109701	0.0020 – 0.500 mg/l CN	Barbituric acid + pyridinecarboxylic acid
109	Cyanide Test <sup>1)</sup> (readily liberated cyanide)	109701	0.0020 – 0.500 mg/l CN	Citric acid / barbituric acid + pyridinecarboxylic acid
210	Cyanuric Acid Test	119253	2 – 160 mg/l Cyan Acid	Triazine derivative
2528	delta K268 (olive oil)		-0.10 – 1.00	UV absorption
2529	delta K270 (olive oil)		-0.10 – 1.00	UV absorption
2631	Diacetyl (ASBC) <sup>2)</sup>		0.00 – 4.00 mg/l Diacetyl	a-Naphthol
	Diacetyl (EBC)- see Vicinal Diketones			
2524	DOBI (palm oil)		0.00 – 4.00	UV absorption
2626	Flavanoids <sup>2)</sup>		3 – 200 mg/l	4-Dimethylaminocinnamaldehyde
2635	Flocculation (ASBC) <sup>2)</sup>		0.0 - 100.0 %	Turbidity
215	Fluoride Cell Test <sup>1)</sup>	100809	0.10 – 1.80 mg/l F	Alizarin complexone
216	Fluoride Cell Test sensitive	100809	0.025 – 0.500 mg/l F	Alizarin complexone
234	Fluoride Cell Test	117243	0.10 – 2.50 mg/l F	SPADNS (As free)
166	Fluoride Test <sup>1)</sup>	114598	0.10 – 2.00 mg/l F	Alizarin complexone
167	Fluoride Test <sup>1)</sup>	114598	1.0 – 20.0 mg/l F	Alizarin complexone
217	Fluoride Test	100822	0.02 – 2.00 mg/l F	SPADNS
233	Fluoride Test	117236	0.02 – 2.00 mg/l F	SPADNS (As free)
28	Formaldehyde Cell Test <sup>1)</sup>	114500	0.10 – 8.00 mg/l HCHO	Chromotropic acid
91	Formaldehyde Test <sup>1)</sup>	114678	0.02 – 8.00 mg/l HCHO	Chromotropic acid
2606	Free Amino Nitrogen beer / wort <sup>2)</sup>		0 – 400 mg/l	Ninhydrin
2561	Gardner Color Measurement		1.0 - 18.0	Inherent color

1) turbidity correction possible

2) the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

3) individual calibration necessary

Method number	Determination		Total range	Method
45	Gold Test	114821	0.5 – 12.0 mg/l Au	Rhodamine B
	Hardness - see Total Hardness or Residual Hardness			
	Hazen - see Color Hazen			
2634	Hop Storage Index (HSI) <sup>2)</sup>		0.00 – 2.00 HSI	UV absorption
44	Hydrazine Test <sup>1)</sup>	109711	0.005 – 2.00 mg/l N <sub>2</sub> H <sub>4</sub>	4-Dimethylaminobenzaldehyde
99	Hydrogen Peroxide Cell Test <sup>1)</sup>	114731	2.0 – 20.0 mg/l H <sub>2</sub> O <sub>2</sub>	Titanyl sulfate
128	Hydrogen Peroxide Cell Test sensitive <sup>1)</sup>	114731	0.25 – 5.00 mg/l H <sub>2</sub> O <sub>2</sub>	Titanyl sulfate
198	Hydrogen Peroxide Test	118789	0.015 – 6.00 mg/l H <sub>2</sub> O <sub>2</sub>	Phenanthroline derivative
2548	ICUMSA Color GS1/3-7		0 – 50 000 IU <sub>7,0</sub>	Inherent color
2549	ICUMSA Color GS2/3-9		0 – 600 IU <sub>7,0</sub>	Inherent color
2550	ICUMSA Color GS2/3-10		0 – 50 IU <sub>7,0</sub>	Inherent color
2551	ICUMSA Color GS9/1/2/3-8		0 – 20 000 IU <sub>7,0</sub>	Inherent color
147	Iodine Test <sup>1)</sup>	100606	0.050 – 10.00 mg/l I <sub>2</sub>	S-DPD
2615	Iodine Value, photometric <sup>2)</sup>		0.00 – 0.80	Iodine
2616	Iodine Value, photometric <sup>2)</sup>		0.00 – 0.80	Iodine
33	Iodine Color Number		0.010 – 3.00	Measurement at 340 nm
21	Iodine Color Number		0.2 – 50.0	Measurement at 445 nm
2642	Iron - ASBC <sup>2)</sup>		0.00 – 3.00 mg/l Fe	1,10-Phenanthroline
2643	Iron - ASBC <sup>2)</sup>		0.00 – 3.00 mg/l Fe	2,2'-Bipyridine
2644	Iron - ASBC <sup>2)</sup>		0.00 – 0.40 mg/l Fe	Triazine (ferrozine)
2623	Iron - EBC <sup>2)</sup>		0.000 – 1.000 mg/l Fe	Triazine
2624	Iron - EBC <sup>2)</sup>		0.000 – 0.800 mg/l Fe	Triazine
37	Iron Cell Test	114549	0.05 – 4.00 mg/l Fe	Triazine
106	Iron Cell Test <sup>1)</sup>	114896	1.0 – 50.0 mg/l Fe (Fe(II) and Fe(III))	2,2'-Bipyridine
38	Iron Test	114761	0.0025 – 5.00 mg/l Fe	Triazine
161	Iron Test <sup>1)</sup>	100796	0.010 – 5.00 mg/l Fe (Fe(II) and Fe(III))	1,10-Phenanthroline
2611	Iso- $\alpha$ Acids <sup>2)</sup>		0 – 60	UV absorption
2525	K232 (olive oil)		0.00 – 4.00	UV absorption
2526	K268 (olive oil)		0.00 – 4.00	UV absorption
2527	K270 (olive oil)		0.00 – 4.00	UV absorption

1) turbidity correction possible

2) the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

3) individual calibration necessary

## Analytical Procedures and Appendice – I Available photometric test kits and methods

Method number	Determination		Total range	Method
66	Lead Cell Test <sup>1)</sup>	114833	0.10 – 5.00 mg/l Pb	PAR
160	Lead Test <sup>1)</sup>	109717	0.010 – 5.00 mg/l Pb	PAR
158	Magnesium Cell Test <sup>1)</sup>	100815	5.0 – 75.0 mg/l Mg	Phthalein purple
159	Manganese Cell Test <sup>1)</sup>	100816	0.10 – 5.00 mg/l Mn	Formaldehyde
19	Manganese Test <sup>1)</sup>	114770	0.010 – 10.00 mg/l Mn	Formaldehyde
226	Manganese Test <sup>1)</sup>	101846	0.005 – 2.00 mg/l Mn	PAN
135	Mercury in water and wastewater		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 – 45.00 mg/l Mo	Mercaptoacetic acid
185	Monochloramine Test	101632	0.050 – 10.00 mg/l Cl <sub>2</sub>	Indophenol blue
2614	Nickel - EBC <sup>2)</sup>		0.00 – 5.00 mg/l Ni	Dimethylglyoxime
17	Nickel Cell Test <sup>1)</sup>	114554	0.10 – 6.00 mg/l Ni	Dimethylglyoxime
18	Nickel Test <sup>1)</sup>	114785	0.02 – 5.00 mg/l Ni	Dimethylglyoxime
57	Nickel Bath		2.0 – 120 g/l Ni	Inherent color
59	Nitrate Cell Test <sup>1)</sup>	114542	0.5 – 18.0 mg/l NO <sub>3</sub> -N	Nitrospectral
30	Nitrate Cell Test <sup>1)</sup>	114563	0.5 – 25.0 mg/l NO <sub>3</sub> -N	2,6-Dimethylphenol
107	Nitrate Cell Test <sup>1)</sup>	114764	1.0 – 50.0 mg/l NO <sub>3</sub> -N	2,6-Dimethylphenol
151	Nitrate Cell Test <sup>1)</sup>	100614	23 – 225 mg/l NO <sub>3</sub> -N	2,6-Dimethylphenol
60	Nitrate Test <sup>1)</sup>	114773	0.20 – 20.0 mg/l NO <sub>3</sub> -N	Nitrospectral
139	Nitrate Test <sup>1)</sup>	109713	0.10 – 25.0 mg/l NO <sub>3</sub> -N	2,6-Dimethylphenol
72	Nitrate Cell Test in seawater <sup>1)</sup>	114556	0.10 – 3.00 mg/l NO <sub>3</sub> -N	Resorcine
140	Nitrate Test in seawater <sup>1)</sup>	114942	0.2 – 17.0 mg/l NO <sub>3</sub> -N	Resorcine
227	Nitrate Test	101842	0.3 – 30.0 mg/l NO <sub>3</sub> -N	Reduction / Benzoic acid derivative
2503	Nitrate (UV)		0.0 – 7.0 mg/l NO <sub>3</sub> -N	Direct measurement in the UV range
35	Nitrite Cell Test <sup>1)</sup>	114547	0.010 – 0.700 mg/l NO <sub>2</sub> -N	Griess reaction
197	Nitrite Cell Test <sup>1)</sup>	100609	1.0 – 90.0 mg/l NO <sub>2</sub> -N	Iron(II)-ethylenediammonium sulfate
36	Nitrite Test <sup>1)</sup>	114776	0.002 – 1.00 mg/l NO <sub>2</sub> -N	Griess reaction
68	Nitrogen (total) Cell Test	114537	0.5 – 15.0 mg/l N	Peroxodisulfate oxidation / Nitrospectral

1) turbidity correction possible

2) the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

3) individual calibration necessary

Method number	Determination		Total range	Method
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
Oils - see K (olive oil), delta K (olive oil), Carotene (palm oil) or DOBI (palm oil)				
92	Oxygen Cell Test <sup>1)</sup>	114694	0.5 – 12.0 mg/l O <sub>2</sub>	Modification of Winkler method
207	Oxygen Scavengers Test	119251	0.020 – 0.500 mg/l DEHA	FerroZine®
148	Ozone Test <sup>1)</sup>	100607	0.010 – 4.00 mg/l O <sub>3</sub>	S-DPD
133	Palladium in water and wastewater		0.05 – 1.25 mg/l Pd	Thio-Michler's ketone
2,3-Pentandion - see Vicinal Diketones				
186	pH Cell Test	101744	6.4 – 8.8	Phenol red
Phaeophytin (DIN/ISO) / (APHA/ASTM) - see Chlorophyll-a (DIN/ISO) or (APHA/ASTM)				
73	Phenol Cell Test <sup>1)</sup>	114551	0.10 – 2.50 mg/l C <sub>6</sub> H <sub>5</sub> OH	MBTH
176	Phenol Test <sup>1)</sup>	100856	0.025 – 5.00 mg/l C <sub>6</sub> H <sub>5</sub> OH	Aminoantipyrine
177	Phenol Test <sup>1)</sup>	100856	0.002 – 0.100 mg/l C <sub>6</sub> H <sub>5</sub> OH	Aminoantipyrine by extraction
Phenols, steam-volatile - see steam-volatile Phenols				
212	Phosphate Cell Test	100474	0.05 – 5.00 mg/l PO <sub>4</sub> -P	Phosphormolybdenum blue
55	Phosphate Cell Test	114543	0.05 – 5.00 mg/l PO <sub>4</sub> -P	Phosphormolybdenum blue
55	Phosphate Cell Test (total phosphorus)	114543	0.05 – 5.00 mg/l P	Peroxodisulfate oxidation / phosphormolybdenum blue
213	Phosphate Cell Test	100475	0.5 – 25.0 mg/l PO <sub>4</sub> -P	Phosphormolybdenum blue
86	Phosphate Cell Test	114729	0.5 – 25.0 mg/l PO <sub>4</sub> -P	Phosphormolybdenum blue
86	Phosphate Cell Test (total phosphorus)	114729	0.5 – 25.0 mg/l P	Peroxodisulfate oxidation / phosphormolybdenum blue
152	Phosphate Cell Test	100616	3.0 – 100.0 mg/l PO <sub>4</sub> -P	Phosphormolybdenum blue
214	Phosphate Cell Test	100673	3.0 – 100.0 mg/l PO <sub>4</sub> -P	Phosphormolybdenum blue
214	Phosphate Cell Test (total phosphorus)	100673	3.0 – 100.0 mg/l P	Peroxodisulfate oxidation / phosphormolybdenum blue
56	Phosphate Test	114848	0.0025 – 5.00 mg/l PO <sub>4</sub> -P	Phosphormolybdenum blue
162	Phosphate Test	100798	1.0 – 100.0 mg/l PO <sub>4</sub> -P	Phosphormolybdenum blue
69	Phosphate Cell Test <sup>1)</sup>	114546	0.5 – 25.0 mg/l PO <sub>4</sub> -P	Vanadatomolybdate

1) turbidity correction possible

2) the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

3) individual calibration necessary

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Method number	Determination		Total range	Method
70	Phosphate Test <sup>1)</sup>	114842	0.5 – 30.0 mg/l PO <sub>4</sub> -P	Vanadatomolybdate
	Photometric iodine test - see Iodine Test, photometric			
134	Platinum in water and waste-water		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
2640	Protein Beer, dark <sup>2)</sup>		0.00 – 100.00 % (wt/wt)	UV absorption
2639	Protein Beer, stabilized <sup>2)</sup>		0.00 – 100.00 % (wt/wt)	UV absorption
2638	Protein Beer, unstabilized <sup>2)</sup>		0.00 – 100.00 % (wt/wt)	UV absorption
2641	Protein Wort <sup>2)</sup>		0.00 – 100.00 % (malt/db)	UV absorption
2617	Reducing Power <sup>2)</sup>		0 – 100 %	DPI
2632	Reducing Sugars <sup>2)</sup>		0.00 – 1.00 g/l Dextrose	PAHBAH
98	Residual Hardness Cell Test <sup>1)</sup>	114683	0.50 – 5.00 mg/l Ca	Phthalein purple
2563	Saybolt Color Measurement		-15 - 30	Inherent color
2564	Saybolt Color Measurement		-15 - 30	Inherent color
79	Silicate (Silicic acid) Test	114794	0.11 – 10.70 mg/l SiO <sub>2</sub>	Silicomolybdenum blue
81	Silicate (Silicic acid) Test	114794	0.011 – 1.600 mg/l SiO <sub>2</sub>	Silicomolybdenum blue
169	Silicate (Silicic acid) Test <sup>1)</sup>	100857	1.1 – 107.0 mg/l SiO <sub>2</sub>	Molybdatosilicate
171	Silicate (Silicic acid) Test <sup>1)</sup>	100857	11 – 1070 mg/l SiO <sub>2</sub>	Molybdatosilicate
225	Silicate (Silicic acid) Test	101813	0.25 – 500.0 µg/l SiO <sub>2</sub>	Silicomolybdenum blue
47	Silver Test <sup>1)</sup>	114831	0.25 – 3.00 mg/l Ag	Eosine / 1,10-Phenanthroline
168	Sodium Cell Test in nutrient solutions <sup>1)</sup>	100885	10 – 300 mg/l Na	indirectly as chloride
300	Spectral Absorption Coefficient α(254)		0.1 – 250 m <sup>-1</sup>	Measurement at 254 nm
302	Spectral Absorption Coefficient α(436)		0.1 – 250 m <sup>-1</sup>	Measurement at 436 nm
301	Spectral Attenuation Coefficient μ(254)		0.1 – 250 m <sup>-1</sup>	Measurement at 254 nm
2621	Steam-volatile Phenols - malt <sup>2)</sup>		0.00 – 3.00 mg/kg	Aminoantipyrine by extraction
2621	Steam-volatile Phenols - beer <sup>2)</sup>		0.00 – 0.30 mg/kg	Aminoantipyrine by extraction

<sup>1)</sup> turbidity correction possible

<sup>2)</sup> the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

<sup>3)</sup> individual calibration necessary

Method number	Determination		Total range	Method
2622	Steam-volatile Phenols - malt <sup>2)</sup>		0.00 – 3.00 mg/kg	Aminoantipyrine by extraction
2622	Steam-volatile Phenols - beer <sup>2)</sup>		0.00 – 0.30 mg/kg	Aminoantipyrine by extraction
Sugar solutions, Color of - see ICUMSA Color				
229	Sulfate Cell Test	102532	1.0 – 50.0 mg/l SO <sub>4</sub>	Bariumsulfate, turbidimetric
64	Sulfate Cell Test	114548	5 – 250 mg/l SO <sub>4</sub>	Bariumsulfate, turbidimetric
154	Sulfate Cell Test	100617	50 – 500 mg/l SO <sub>4</sub>	Bariumsulfate, turbidimetric
82	Sulfate Cell Test	114564	100 – 1000 mg/l SO <sub>4</sub>	Bariumsulfate, turbidimetric
65	Sulfate Test <sup>1)</sup>	114791	25 – 300 mg/l SO <sub>4</sub>	Tannin
224	Sulfate Test	101812	0.50 – 50.0 mg/l SO <sub>4</sub>	Bariumsulfate, turbidimetric
230	Sulfate Test	102537	5 – 300 mg/l SO <sub>4</sub>	Bariumsulfate, turbidimetric
80	Sulfide Test <sup>1)</sup>	114779	0.020 – 1.50 mg/l S	Dimethyl-p-phenylendiamin
71	Sulfite Cell Test <sup>1)</sup>	114394	1.0 – 20.0 mg/l SO <sub>3</sub>	Ellman's reagent
127	Sulfite Cell Test sensitive <sup>1)</sup>	114394	0.05 – 3.00 mg/l SO <sub>3</sub>	Ellman's reagent
187	Sulfite Test <sup>1)</sup>	101746	1.0 – 60.0 mg/l SO <sub>3</sub>	Ellman's reagent
231	Surfactants (anionic) Cell Test	102552	0.05 – 2.00 mg/l SDAS	Methylene blue
192	Surfactants (cationic) Cell Test <sup>1)</sup>	101764	0.05 – 1.50 mg/l k-Ten	Disulfine blue
193	Surfactants (nonionic) Cell Test <sup>1)</sup>	101787	0.10 – 7.50 mg/l n-Ten	TBPE
182	Suspended Solids		1 – 750 mg/l SusS	
2619	Thiobarbituric Acid Number <sup>2)</sup>		0 – 250	Thiobarbituric acid
100	Tin Cell Test <sup>1)</sup>	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
2625	Total Carbohydrates <sup>2)</sup>		0.000 – 6.000 g/100 ml	Anthrone
178	Total Hardness Cell Test <sup>1)</sup>	100961	5 – 215 mg/l Ca	Phthalein purple
2610	Total Polyphenols <sup>2)</sup>		1 – 800 mg/l	Iron(III)
77	Turbidity		1 – 100 FAU	Measurement at 550 nm

1) turbidity correction possible

2) the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

3) individual calibration necessary

## Analytical Procedures and Appendice – I Available photometric test kits and methods

Method number	Determination		Total range	Method
2620	Vicinal Diketones <sup>2)</sup>		0.000 – 2.000 mg/kg	Phenylendiamin
222	Volatile Organic Acids Cell Test <sup>1)</sup>	101749	50 – 3000 mg/l CH <sub>3</sub> COOH	Esterification
223	Volatile Organic Acids Test <sup>1)</sup>	101809	50 – 3000 mg/l CH <sub>3</sub> COOH	Esterification
Water hardness - see Total Hardness or Residual Hardness				
174	Zinc Cell Test	100861	0.025 – 1.000 mg/l Zn	PAR
74	Zinc Cell Test	114566	0.20 – 5.00 mg/l Zn	PAR
41	Zinc Test <sup>1)</sup>	114832	0.05 – 2.50 mg/l Zn	Cl-PAN

<sup>1)</sup> turbidity correction possible

<sup>2)</sup> the analytical procedure for this method is given in the manual of the "Brewery Methods Prove"

<sup>3)</sup> individual calibration necessary

## Pre-programmed AQA1 and PipeCheck methods

### AQA1

Method number	Name	Cat. No.	Method	Content
9002	Certipur® UV-VIS Standard 1	1081600001	Photometric accuracy	Potassium dichromate solution
9003	Certipur® UV-VIS Standard 1a	1046600001	Photometric accuracy	Potassium dichromate solution
9005	Certipur® UV-VIS Standard 2	1081610001	Stray light	Sodium nitrite solution
9008	Certipur® UV-VIS Standard 3	1081630001	Stray light	Sodium iodide solution
9009	Certipur® UV-VIS Standard 4	1081640001	Stray light	Potassium chloride solution
9007	Certipur® UV-VIS Standard 5	1081650001	Spectral resolution	Toluene solution in n-hexane
9004	Certipur® UV-VIS Standard 6	1081660001	Wavelength accuracy	Holmium oxide solution
9001	Spectroquant® PhotoCheck	1146930001	Photometric accuracy	Color solutions

### PipeCheck

Method number	Name	Cat. No.	Pipette volume	Content
9012	Spectroquant® PipeCheck	1146920001	2.0 ml	Check and reference solution
9013	Spectroquant® PipeCheck	1146920001	3.0 ml	Check and reference solution
9014	Spectroquant® PipeCheck	1146920001	5.0 ml	Check and reference solution
9015	Spectroquant® PipeCheck	1146920001	10.0 ml	Check and reference solution

# Acid Capacity to pH 4.3 (Total Alkalinity)

101758

Cell Test

<b>Measuring</b>	0.40 – 8.00 mmol/l
<b>range:</b>	20 – 400 mg/l CaCO <sub>3</sub>



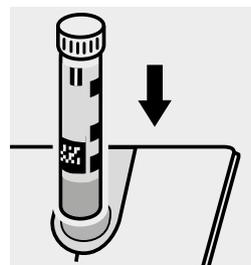
Pipette 4.0 ml of **AC-1** into a round cell.



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”).

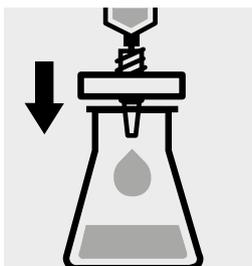
# ADMI Color Measurement

Application

corresponds to **APHA 2120F** (ADMI Weighted-Ordinate Spectrophotometric Method)

<b>Measuring</b>	10 – 500	10-mm cell	Method No. 2517
<b>range:</b>	2.0 – 100.0	50-mm cell	Method No. 2518
<b>Attention!</b>	Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from distilled water (Water for analysis EMSURE®, Cat.No. 116754), is recommended. This zero value remains valid until the method is exited.		

## Preparation:

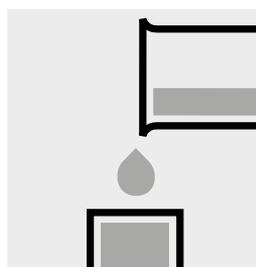


Filter turbid samples.

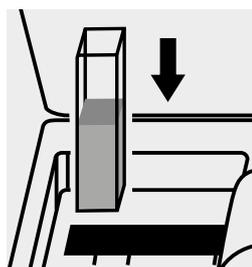
## Determination at the original pH:



Select method no. **2517** or **2518**. Perform the zero adjustment and confirm by pressing the <OK> button.



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The ADMI is shown in the display.



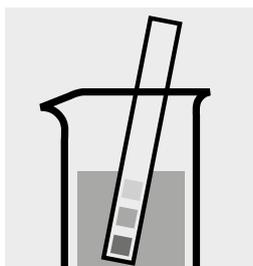
Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

# ADMI Color Measurement

Application

corresponds to **APHA 2120F** (ADMI Weighted-Ordinate Spectrophotometric Method)

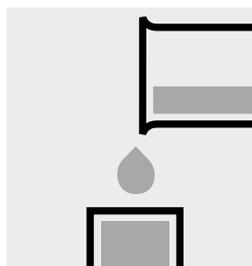
## Determination at pH 7.0:



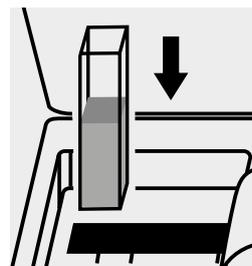
Check the pH of the sample, specified value: pH 7.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method no. **2517** or **2518**. Perform the zero adjustment and confirm by pressing the <OK> button.



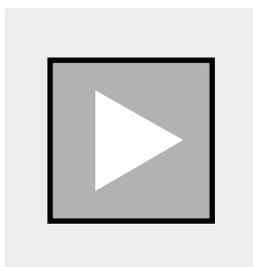
Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The ADMI is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

### Note:

The ADMI factor of 1400 used for calculating the measurement result can be adjusted by the user (see the application for further details).

In the case of **serial measurements** the accuracy of the measurement can be enhanced by making a zero setting prior to **each** individual measurement.

### Important:

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

### Quality assurance:

To check the measurement system (measurement device, and handling) ready-to-use platinum-cobalt color reference solution (Hazen 500) Certipur®, Cat.No. 100246, concentration 500 mg/l Pt can be used after diluting accordingly.

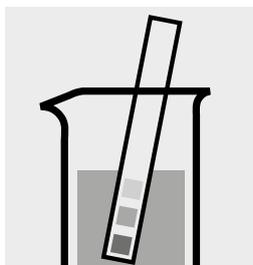
# Aluminium

100594

Cell Test

**Measuring** 0.02 – 0.50 mg/l Al

**range:** Expression of results also possible in mmol/l.



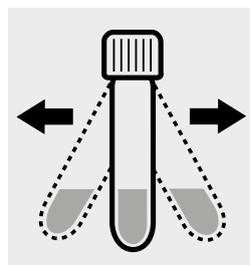
Check the pH of the sample, specified range: pH 3 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



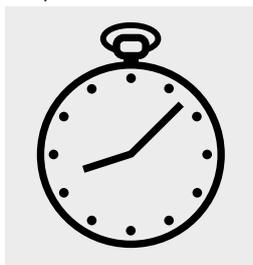
Add 1 level blue microspoon of **Al-1K**, close with the screw cap.



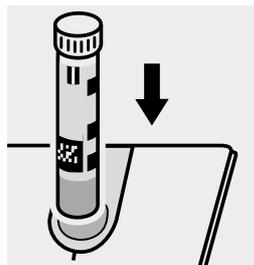
Shake the cell vigorously to dissolve the solid substance.



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) we recommended to use Spectroquant® CombiCheck 100, Cat.No. 118701 or the Standard solutions for photometric applications, CRM, Cat.Nos. 132225 and 132226.

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

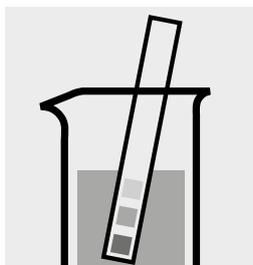
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 100) is highly recommended.

# Aluminium

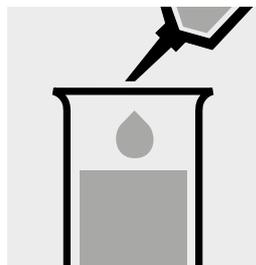
114825

Test

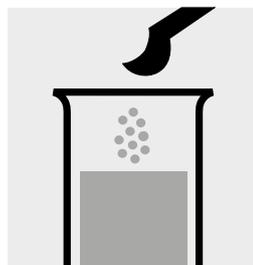
<b>Measuring</b>	0.10 – 1.20 mg/l Al	10-mm cell
<b>range:</b>	0.05 – 0.60 mg/l Al	20-mm cell
	0.020 – 0.200 mg/l Al	50-mm cell
	Expression of results also possible in mmol/l.	



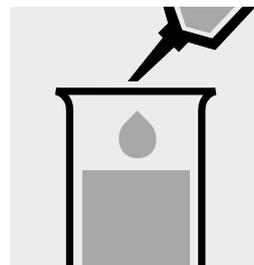
Check the pH of the sample, specified range: pH 3 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



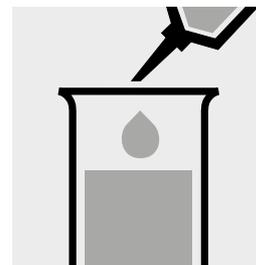
Pipette 5.0 ml of the sample into a test tube.



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



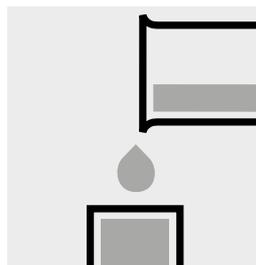
Add 1.2 ml of **Al-2** with pipette and mix.



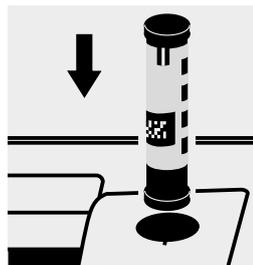
Add 0.25 ml of **Al-3** with pipette and mix.



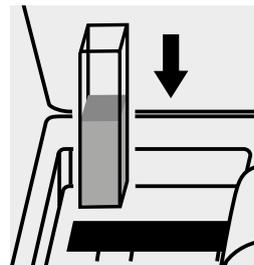
Reaction time:  
2 minutes



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 and 100, Cat.Nos. 114692 and 118701 or the Standard solutions for photometric applications, CRM, Cat.Nos. 132225 and 132226.

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

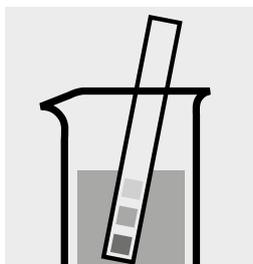
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Ammonia, free

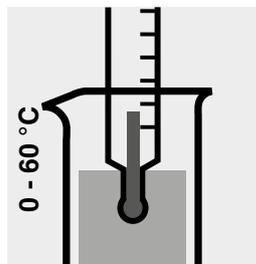
(as ammonium)

Application

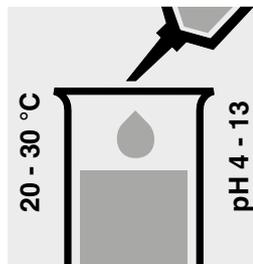
<b>Measuring</b>	0.00 – 3.65 mg/l NH <sub>3</sub>	0.00 – 3.00 mg/l NH <sub>3</sub> -N	10-mm cell
<b>range:</b>	0.00 – 1.83 mg/l NH <sub>3</sub>	0.00 – 1.50 mg/l NH <sub>3</sub> -N	20-mm cell
	0.000 – 0.730 mg/l NH <sub>3</sub>	0.000 – 0.600 mg/l NH <sub>3</sub> -N	50-mm cell



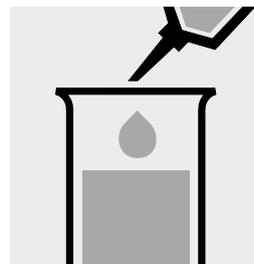
Check the pH of the sample **and note**.



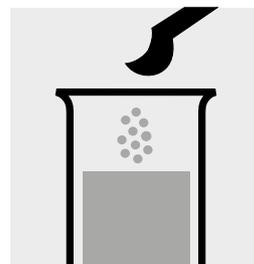
Check the temperature of the solution **and note**.



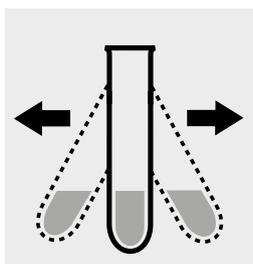
Pipette 5.0 ml of the sample into a test tube. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH and bring the sample to the appropriate temperature.



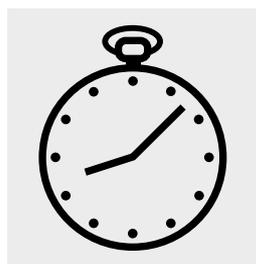
Add 0.60 ml of **NH<sub>4</sub>-1** (from Spectroquant® Ammonium Test, Cat. No. 114752) with pipette and mix.



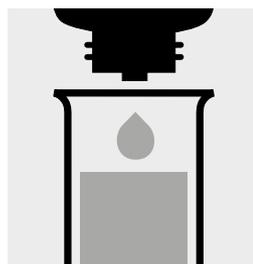
Add 1 level blue microspoon of **NH<sub>4</sub>-2** (from Spectroquant® Ammonium Test, Cat. No. 114752).



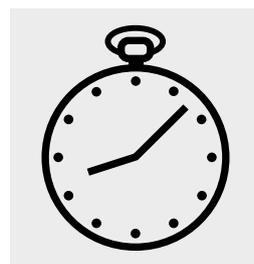
Shake vigorously to dissolve the solid substance.



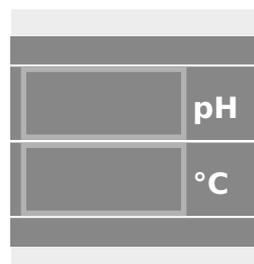
Reaction time: 5 minutes



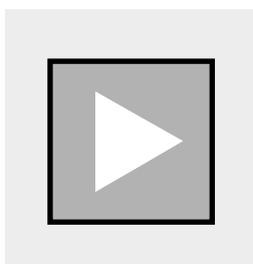
Add 4 drops of **NH<sub>4</sub>-3** (from Spectroquant® Ammonium Test, Cat. No. 114752) and mix.



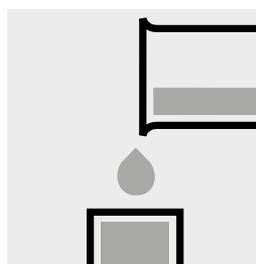
Reaction time: 5 minutes



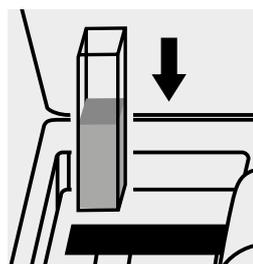
Select method no. **2520**. Enter the pH and the temperature in °C of the original sample.



Tap the <Start> button.



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The NH<sub>3</sub> and NH<sub>3</sub>-N content is shown in the display in mg/l.

## 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.

## Important:

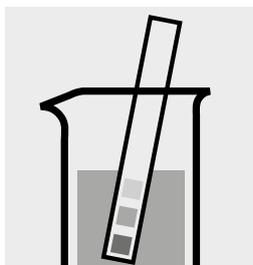
The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# Ammonium

114739

Cell Test

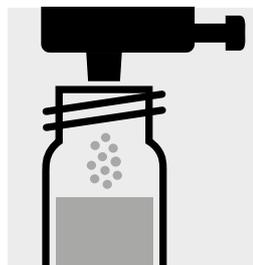
<b>Measuring</b>	0.010 – 2.000 mg/l NH <sub>4</sub> -N
<b>range:</b>	0.013 – 2.571 mg/l NH <sub>4</sub>
	0.010 – 2.000 mg/l NH <sub>3</sub> -N
	0.012 – 2.432 mg/l NH <sub>3</sub>
	Expression of results also possible in mmol/l.



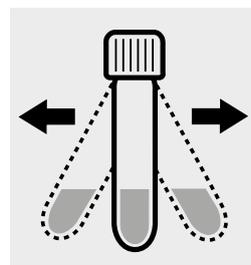
Check the pH of the sample, specified range: pH 4 – 13. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



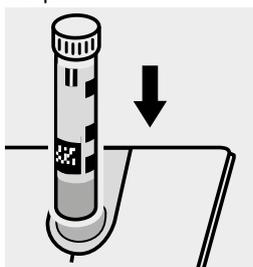
Add 1 dose of **NH<sub>4</sub>-1K** using the blue dose-metering cap, close the cell with the screw cap.



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 solutions for photometric applications, CRM, Cat.Nos. 125022, 125023, and 132227.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH<sub>4</sub><sup>+</sup>, can also be used after diluting accordingly.

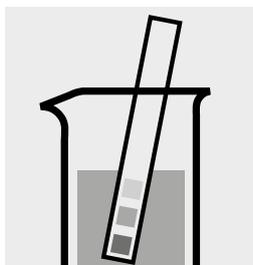
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 50) is highly recommended.

# Ammonium

114558

Cell Test

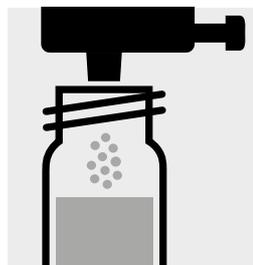
<b>Measuring</b>	0.20 – 8.00 mg/l NH <sub>4</sub> -N
<b>range:</b>	0.26 – 10.30 mg/l NH <sub>4</sub>
	0.20 – 8.00 mg/l NH <sub>3</sub> -N
	0.24 – 9.73 mg/l NH <sub>3</sub>
	Expression of results also possible in mmol/l.



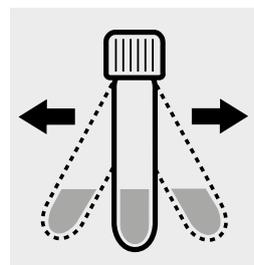
Check the pH of the sample, specified range: pH 4 – 13. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



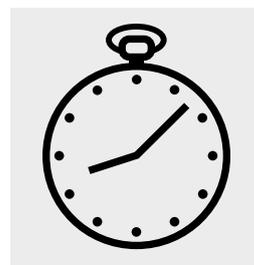
Pipette 1.0 ml of the sample into a reaction cell close with the screw cap, and mix.



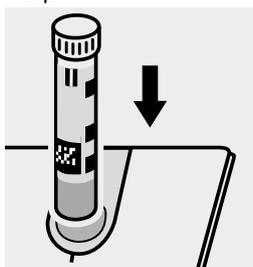
Add 1 dose of **NH<sub>4</sub>-1K** using the blue dose-metering cap, close the cell with the screw cap.



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 solutions for photometric applications, CRM, Cat.Nos. 125022, 125023, 125024, and 125025.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH<sub>4</sub><sup>+</sup>, can also be used after diluting accordingly.

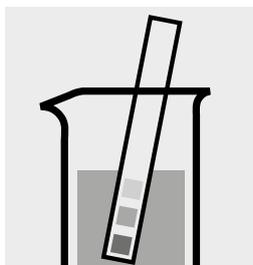
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

# Ammonium

114544

Cell Test

<b>Measuring</b>	0.5 – 16.0 mg/l NH <sub>4</sub> -N
<b>range:</b>	0.6 – 20.6 mg/l NH <sub>4</sub>
	0.5 – 16.0 mg/l NH <sub>3</sub> -N
	0.6 – 19.5 mg/l NH <sub>3</sub>
	Expression of results also possible in mmol/l.



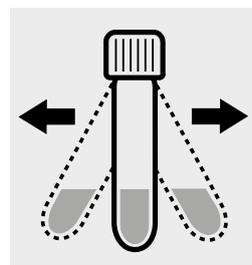
Check the pH of the sample, specified range: pH 4 – 13. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



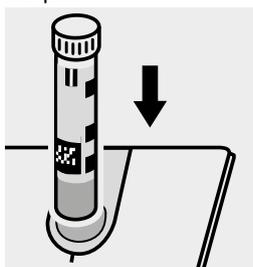
Add 1 dose of **NH<sub>4</sub>-1K** using the blue dose-metering cap, close the cell with the screw cap.



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 solutions for photometric applications, CRM, Cat.Nos. 125023, 125024, 125025, and 125026.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH<sub>4</sub><sup>+</sup>, can also be used after diluting accordingly.

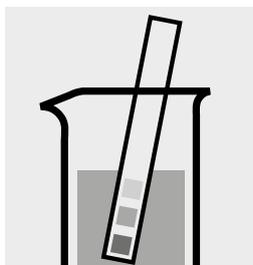
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

# Ammonium

114559

Cell Test

<b>Measuring</b>	4.0 – 80.0 mg/l NH <sub>4</sub> -N
<b>range:</b>	5.2 – 103.0 mg/l NH <sub>4</sub>
	4.0 – 80.0 mg/l NH <sub>3</sub> -N
	4.9 – 97.3 mg/l NH <sub>3</sub>
	Expression of results also possible in mmol/l.



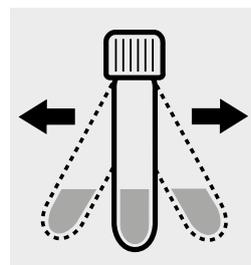
Check the pH of the sample, specified range: pH 4 – 13. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



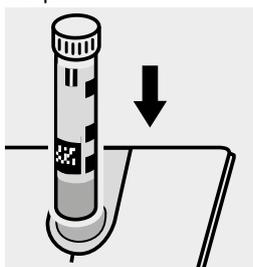
Add 1 dose of **NH<sub>4</sub>-1K** using the blue dose-metering cap, close the cell with the screw cap.



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 solutions for photometric applications, CRM, Cat.Nos. 125025, 125026, and 125027.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH<sub>4</sub><sup>+</sup>, can also be used after diluting accordingly.

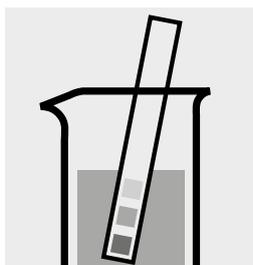
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 70) is highly recommended.

# Ammonium

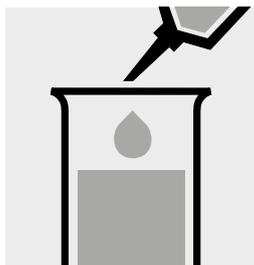
114752

Test

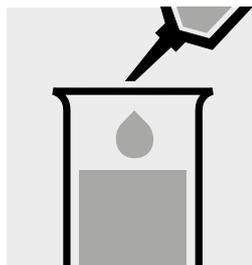
<b>Measuring range:</b>	0.05 – 3.00 mg/l NH <sub>4</sub> -N	0.06 – 3.86 mg/l NH <sub>4</sub>	10-mm cell
	0.03 – 1.50 mg/l NH <sub>4</sub> -N	0.04 – 1.93 mg/l NH <sub>4</sub>	20-mm cell
	0.010 – 0.500 mg/l NH <sub>4</sub> -N	0.013 – 0.644 mg/l NH <sub>4</sub>	50-mm cell
	0.05 – 3.00 mg/l NH <sub>3</sub> -N	0.06 – 3.65 mg/l NH <sub>3</sub>	10-mm cell
	0.03 – 1.50 mg/l NH <sub>3</sub> -N	0.04 – 1.82 mg/l NH <sub>3</sub>	20-mm cell
	0.010 – 0.500 mg/l NH <sub>3</sub> -N	0.016 – 0.608 mg/l NH <sub>3</sub>	50-mm cell
Expression of results also possible in mmol/l.			



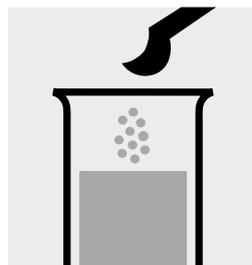
Check the pH of the sample, specified range: pH 4 – 13.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



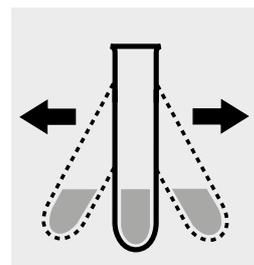
Pipette 5.0 ml of the sample into a test tube.



Add 0.60 ml of NH<sub>4</sub>-1 with pipette and mix.



Add 1 level blue microspoon of NH<sub>4</sub>-2.



Shake vigorously to dissolve the solid substance.



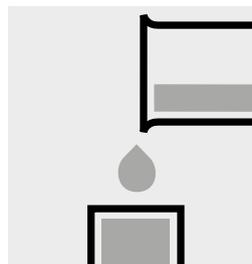
Reaction time:  
5 minutes



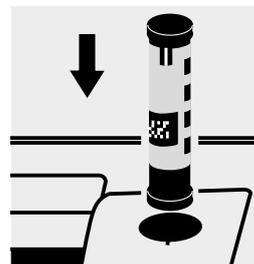
Add 4 drops of NH<sub>4</sub>-3 and mix.



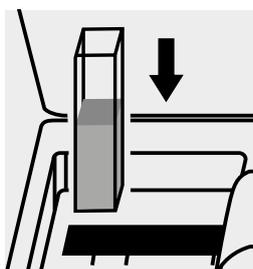
Reaction time:  
5 minutes



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 solutions for photometric applications, CRM, Cat.Nos. 125022, 125023, 125024, and 132227.

Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l NH<sub>4</sub><sup>+</sup>, 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

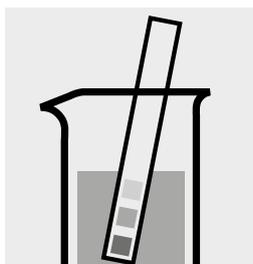
100683

Test

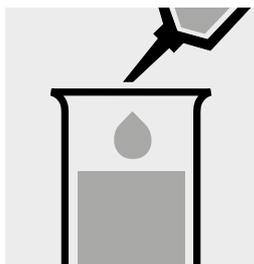
<b>Measuring range:</b> 2.0 – 75.0 mg/l NH <sub>4</sub> -N	2.6 – 96.6 mg/l NH <sub>4</sub>	10-mm cell
5 –150 mg/l NH <sub>4</sub> -N	6 – 193 mg/l NH <sub>4</sub>	10-mm cell
2.0 – 75.0 mg/l NH <sub>3</sub> -N	2.4 – 91.2 mg/l NH <sub>3</sub>	10-mm cell
5 –150 mg/l NH <sub>3</sub> -N	6 – 182 mg/l NH <sub>3</sub>	10-mm cell

Expression of results also possible in mmol/l.

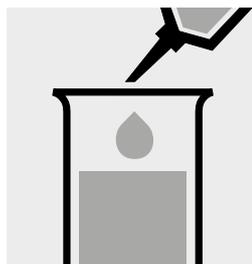
**Measuring range: 2.0 – 75.0 mg/l NH<sub>4</sub>-N**



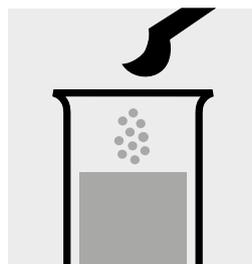
Check the pH of the sample, specified range: pH 4 – 13.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



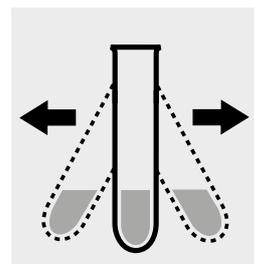
Pipette 5.0 ml of **NH<sub>4</sub>-1** into a test tube.



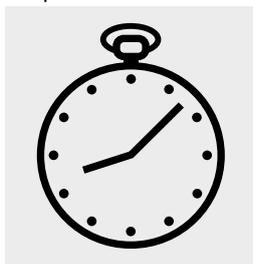
Add 0.20 ml of the sample with pipette.



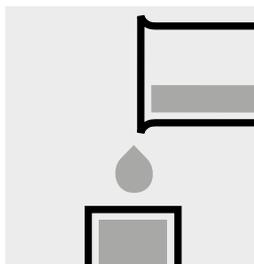
Add 1 level blue micro-spoon of **NH<sub>4</sub>-2**.



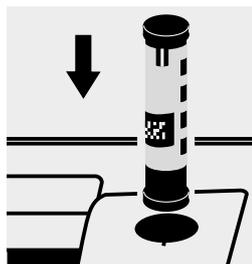
Shake vigorously to dissolve the solid substance.



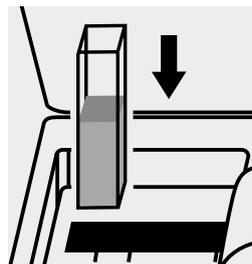
Reaction time:  
15 minutes



Transfer the solution into a cell.

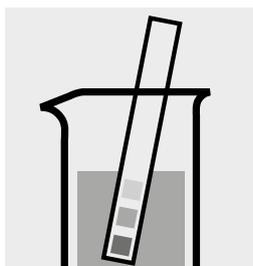


Select method with AutoSelector measuring range 2.0 – 75.0 mg/l NH<sub>4</sub>-N.

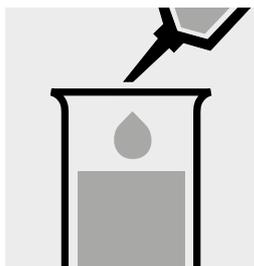


Place the cell into the cell compartment.

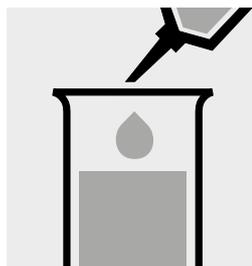
Measuring range: 5 – 150 mg/l  $\text{NH}_4\text{-N}$



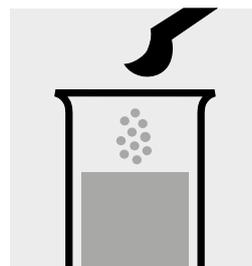
Check the pH of the sample, specified range: pH 4 – 13.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



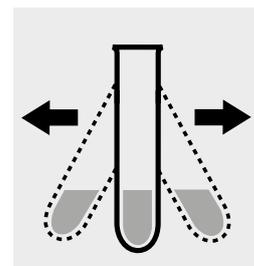
Pipette 5.0 ml of  $\text{NH}_4\text{-1}$  into a test tube.



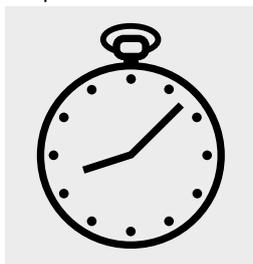
Add 0.10 ml of the sample with pipette.



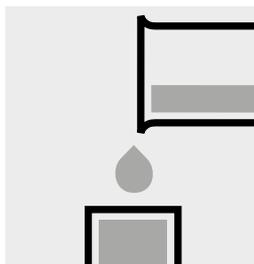
Add 1 level blue micro-spoon of  $\text{NH}_4\text{-2}$ .



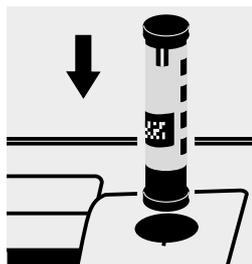
Shake vigorously to dissolve the solid substance.



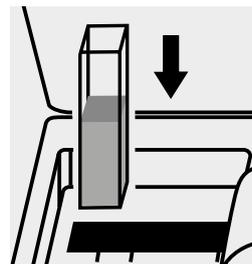
Reaction time:  
15 minutes



Transfer the solution into a cell.



Select method with AutoSelector measuring range 5 – 150 mg/l  $\text{NH}_4\text{-N}$ .



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).

### 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 solutions for photometric applications, CRM, Cat.Nos. 125025, 125026, and 125027.

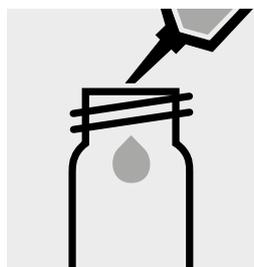
Ready-to-use ammonium standard solution Certipur®, Cat.No. 119812, concentration 1000 mg/l  $\text{NH}_4^+$ , can also be used after diluting accordingly.

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

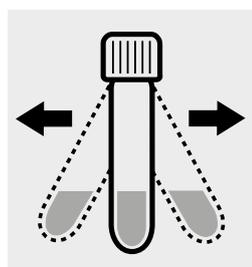
Measuring range: 0.10 – 8.00 mg/l Sb 10-mm cell



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.



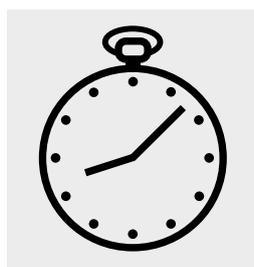
Shake the cell vigorously to dissolve the solid substance.



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.



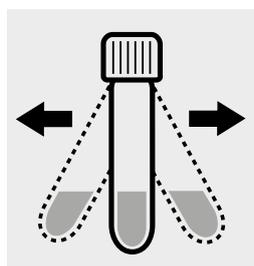
Reaction time:  
2 minutes



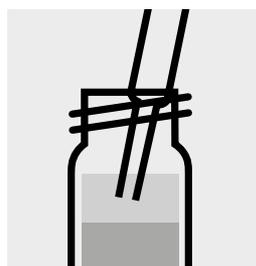
Add 2 drops of **reagent 3**, close the cell with the screw cap, and mix.



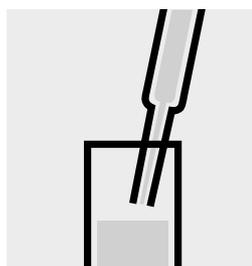
Add 5.0 ml **toluene GR** (Cat.No. 108325) with pipette, close the cell with the screw cap.



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



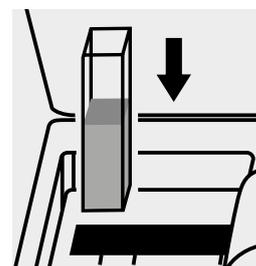
Aspirate the clear upper phase from the tube with pipette.



Transfer the solution into a cell.



Select method no. **130**.



Place the cell into the cell compartment. The measurement is performed automatically.

## 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](http://www.analytical-test-kits.com).

# AOX

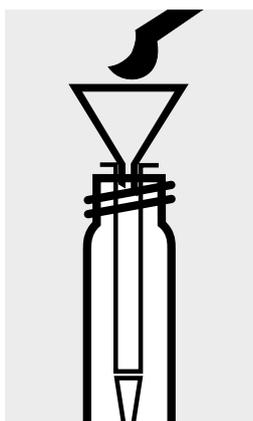
## Adsorbable Organic Halogens (x)

100675

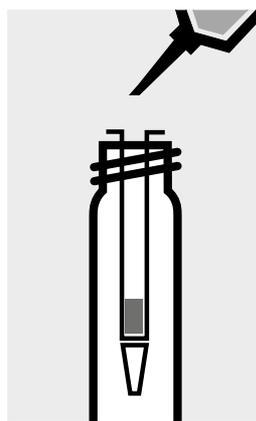
Cell Test

Measuring range: 0.05 – 2.50 mg/l AOX

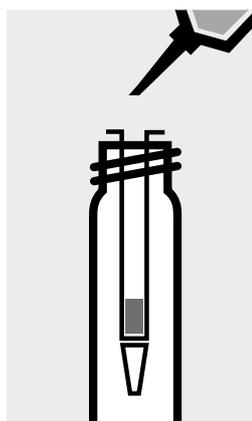
### Preparation of the adsorption column:



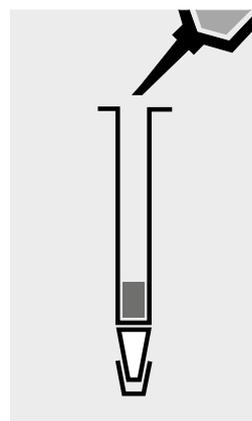
Place the column in an empty cell. Fill 1 level blue microspoon of **AOX-1** into the column using the glass funnel.



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

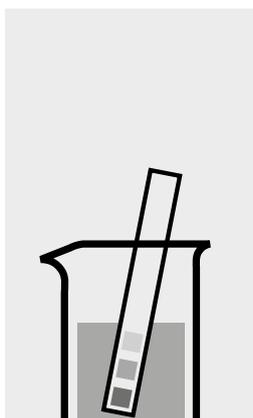


Run 3 separate 1-ml portions of **AOX-3** through the column. Discard the wash solution.

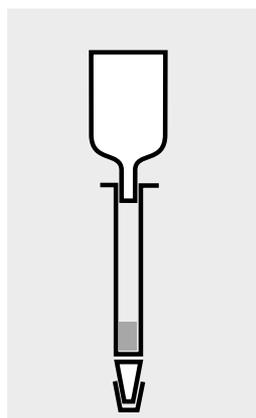


Close the bottom end of the column with the stopper. Apply to the column 1 ml of **AOX-3**. Close the top end of the column with the stopper and swirl to eliminate air bubbles. Remove the stopper on the top end and fill the column to the brim with **AOX-3**.

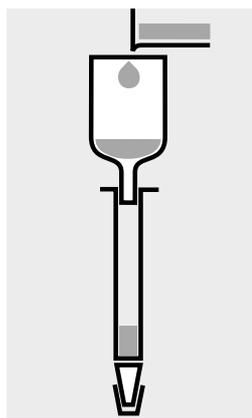
### Sample enrichment:



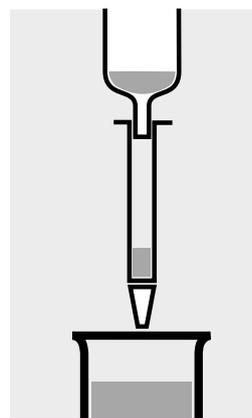
Check the pH of the sample, specified range: pH 6 – 7. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



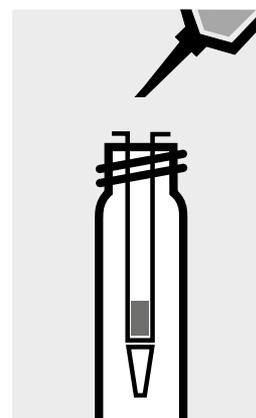
Attach the glass reservoir to the prepared column (closed at the bottom end).



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.

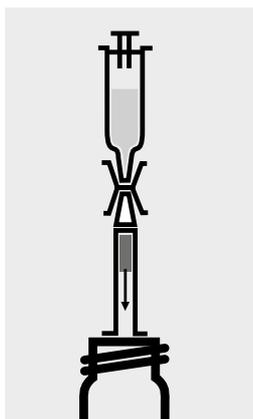
# AOX

## Adsorbable Organic Halogens (x)

100675

Cell Test

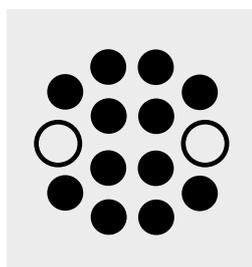
### Digestion:



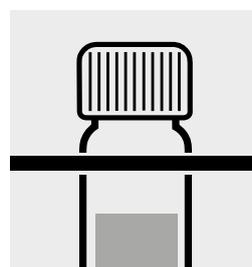
Fill the 10-ml syringe with 10 ml of reagent **AOX-5** and attach the syringe with the column outlet using the connector. Place the top end of the column on an empty cell and rinse the charcoal filling of the column into an empty 16-mm cell.



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.

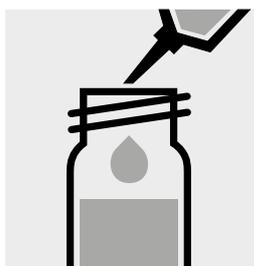


Add 5 drops of **AOX-4**, close the cell and mix; clear supernatant: **pretreated sample**.

### Determination:



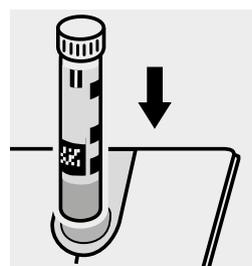
Pipette 0.20 ml of **AOX-1K** into a reaction cell, and mix.



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.

### Note:

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

### Quality assurance:

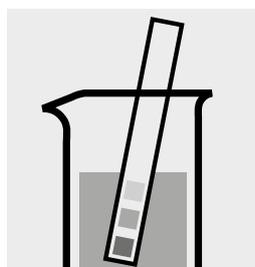
To check the measurement system (test reagents, measurement device, and handling) Spectroquant® AOX Standard, Cat.No. 100680, concentration 0.2 – 2.0 mg/l can be used.

# Arsenic

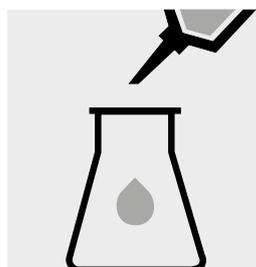
101747

Test

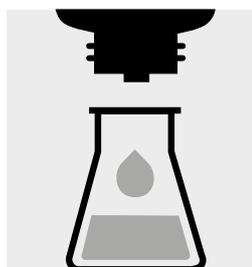
<b>Measuring</b>	0.005 – 0.100 mg/l As	10-mm cell
<b>range:</b>	0.001 – 0.020 mg/l As	20-mm cell
Expression of results also possible in mmol/l.		



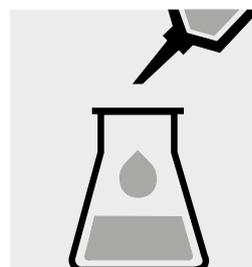
Check the pH of the sample, specified range: pH 0 – 13.



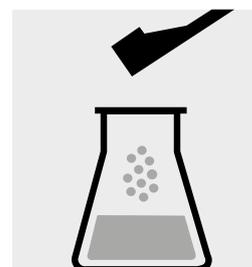
Place 350 ml of the sample into an Erlenmeyer flask with ground joint.



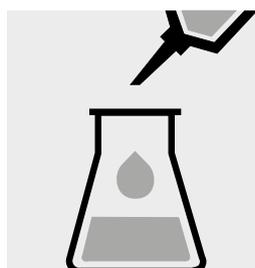
Add 5 drops of **As-1** and mix.



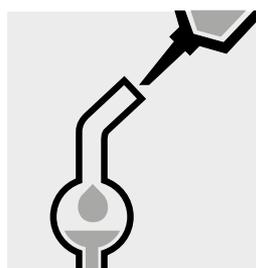
Add 20 ml of **As-2** with pipette and mix.



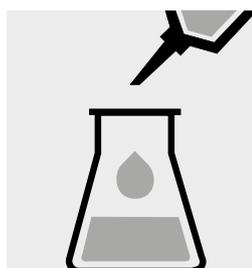
Add 1 level green dosing spoon of **As-3** and dissolve.



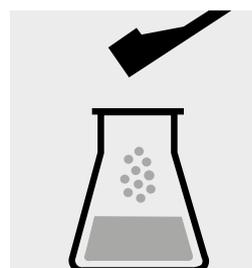
Add 1.0 ml of **As-4** with pipette and mix.



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



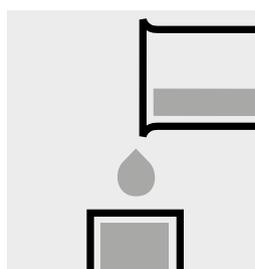
Add 1.0 ml of **As-6** with pipette to the solution in the Erlenmeyer flask and mix.



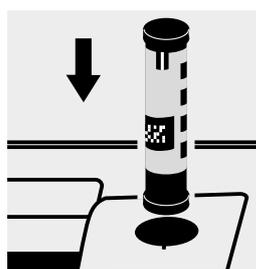
Add 3 level red dosing spoons of **As-7**. **Immediately** attach the absorption tube to the Erlenmeyer flask.



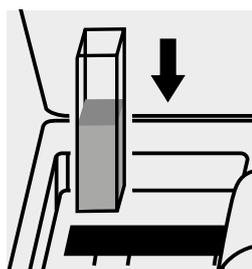
Leave to stand for 2 hours. During this time carefully swirl the flask several times or stir slowly with a magnetic stirrer.



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-to-use arsenic standard solution Certipur<sup>®</sup>, Cat.No. 119773, concentration 1000 mg/l As or the Standard solution for photometric applications, CRM, Cat.No. 133002 can be used after diluting accordingly.

# ASTM Color Measurement

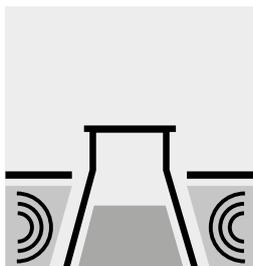
Application

analogous to **ASTM D6045**

**Measuring range:** 0.5 – 8.0 ASTM Color      10-mm cell      Method No. 2562

**Attention!** Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from distilled water (Water for analysis EMSURE<sup>®</sup>, Cat.No. 116754), is recommended. This zero value remains valid until the method is exited.

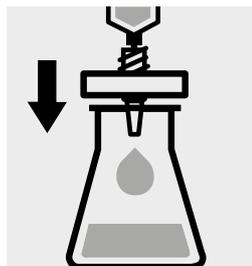
## Preparation:



Contains the sample air or gas bubbles: degassing in ultrasonic bath.



Melt solid samples and homogenize.

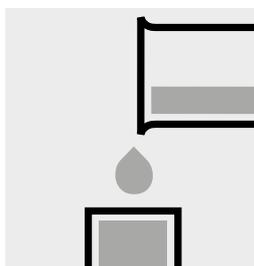


Filter or centrifuge turbid samples.

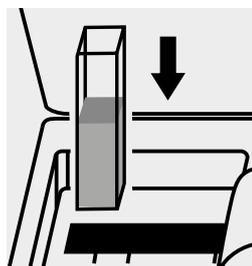
## Determination



Select method no. **2562**. Perform the zero adjustment and confirm by pressing the <OK> button.



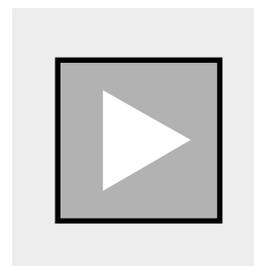
Transfer the solution into the cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. ASTM Color is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

# BOD

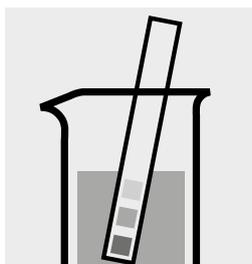
100687

## Biochemical Oxygen Demand

Cell Test

<b>Measuring</b>	0.5 – 3000 mg/l BOD
<b>range:</b>	0.5 – 3000 mg/l O <sub>2</sub>
	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 initial oxygen concentration

= **Result 1**  
(measurement sample)  
= **Result 1**  
(blank)



Incubate one bottle of **pretreated sample** and one of **inoculated nutrient-salt solution** closed in a thermostatic incubation cabinet at  $20 \pm 1^\circ\text{C}$  for 5 days.

### Determination:

#### Measurement of final oxygen concentration

= **Result 2**  
(measurement sample)  
= **Result 2**  
(blank)



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



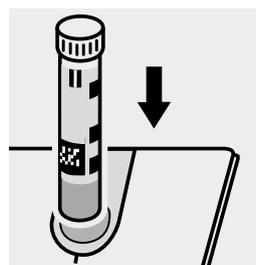
Reaction time:  
1 minute



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 – B) x dilution factor

#### 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.

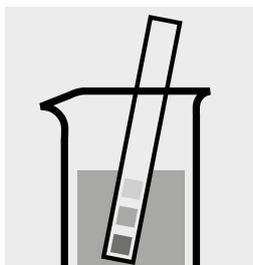
# Boron

100826

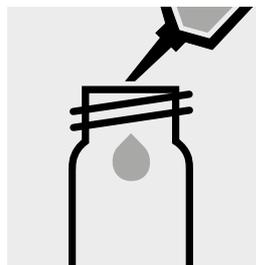
Cell Test

**Measuring** 0,05 – 2,00 mg/l B

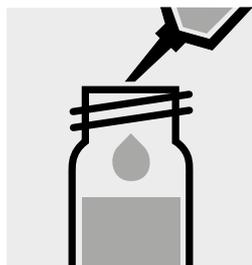
**range:** Expression of results also possible in mmol/l.



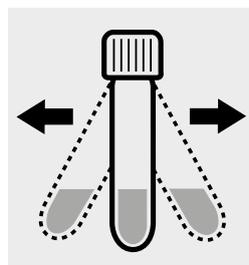
Check the pH of the sample, specified range: pH 2 – 12. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



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



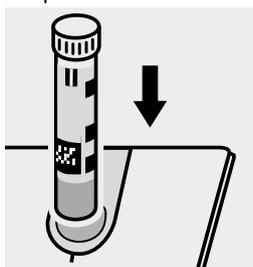
Add 4.0 ml of the sample with pipette into a reaction cell, close the cell with the screw cap.



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:

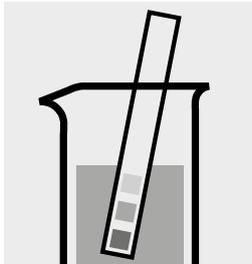
To check the measurement system (test reagents, measurement device, and handling) ready-to-use boron standard solution Certipur®, Cat.No. 119500, concentration 1000 mg/l B can also be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 133005.

# Boron

114839

Test

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



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



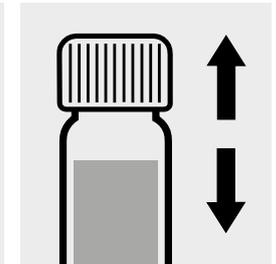
Pipette 5.0 ml of the sample into a test tube with screw cap. **(Important: Do not use test tubes made of glass containing boron!)**



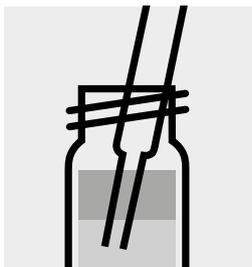
Add 1.0 ml of **B-1** with pipette, close with the screw cap, and mix.



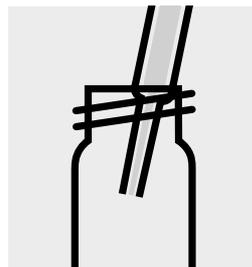
Add 1.5 ml of **B-2** with pipette and close with the screw cap.



Shake the tube vigorously for 1 minute.



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



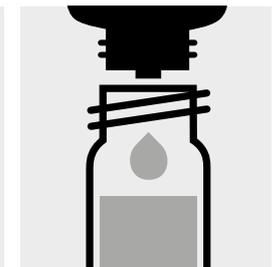
Transfer the extract to a separate fresh tube.



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



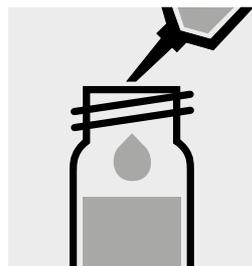
Add 4 drops of **B-4**, close with the screw cap, and mix.



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



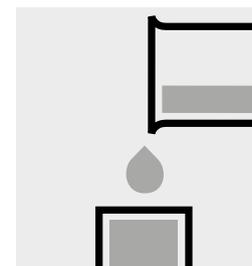
Reaction time: 12 minutes



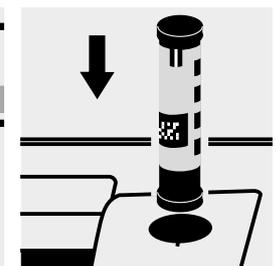
Add 6.0 ml of **B-6** with pipette, close with the screw cap, and mix.



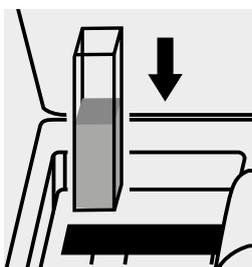
Reaction time: 2 minutes



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

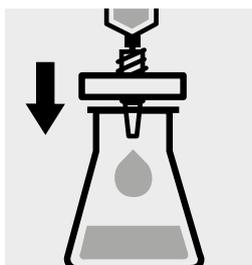
## Quality assurance:

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

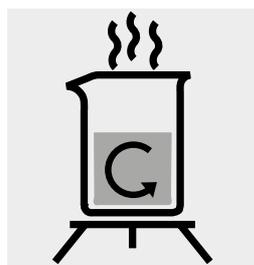
# Bromate in water and drinking water Ultra Low Range

Application

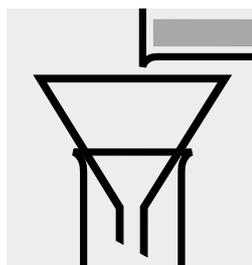
<b>Measuring range:</b> 1.0 – 40.0 µg/l BrO <sub>3</sub>	50-mm cell
0.5 – 20.0 µg/l BrO <sub>3</sub>	100-mm cell
<b>Attention!</b>	For measurement in the <b>100-mm cell</b> both the volume of the prepared sample (fig. 5) as well as the quantities of the reagents must be doubled.
	The measurement is carried out at 550 nm in a corresponding 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.



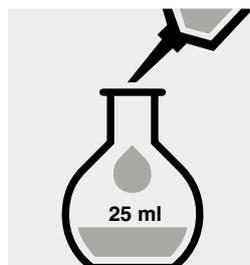
Filter turbid samples.



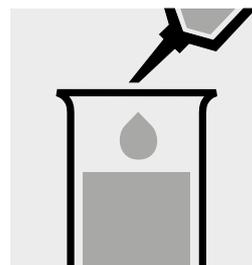
Evaporate 259 ml of sample solution in a glass beaker almost to dryness on the hob.



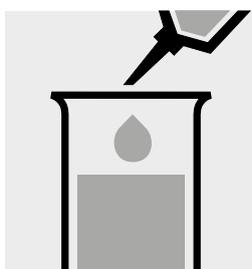
Transfer the residue to a 25-ml volumetric glass using a little distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended).



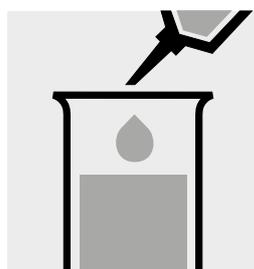
Make up the contents of the volumetric flask to the mark with distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended), mix thoroughly, and filter, if necessary: **pretreated sample**.



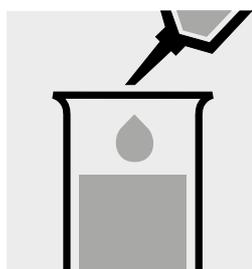
Pipette 10 ml of the pretreated sample into a test tube.



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



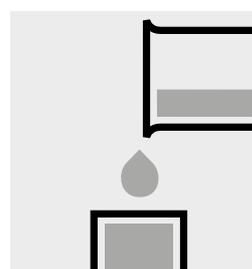
Add 0.20 ml of **reagent 2** with pipette and mix.



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



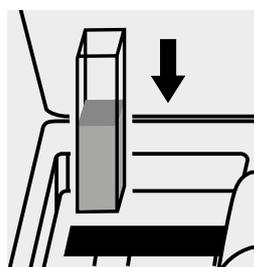
Reaction time: 30 minutes



Filter, if necessary, and transfer the solution into a corresponding cell.



Select method no. **307**.



Place the cell into the cell compartment. The measurement is performed automatically.

### 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](http://www.analytical-test-kits.com).

### Note:

When using the 100-mm rectangular cell, the round-cell holder must be removed before the measurement.

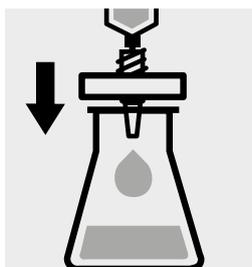
### Quality assurance:

To check the measurement system (reagents, measurement device, and handling) Standard solution for photometric applications, CRM, Cat.No. 133006 can be used.

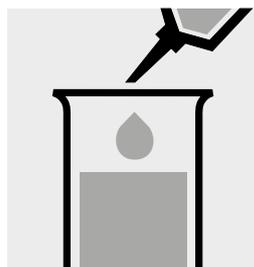
# Bromate in water and drinking water Low Range

Application

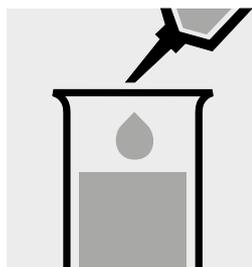
<b>Measuring range:</b> 5.0 – 200.0 µg/l BrO <sub>3</sub>	50-mm cell
2.5 – 100.0 µg/l BrO <sub>3</sub>	100-mm cell
<b>Attention!</b>	For measurement in the <b>100-mm cell</b> both the volume of the prepared sample as well as the quantities of the reagents must be doubled.
	The measurement is carried out at 550 nm in a corresponding 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.



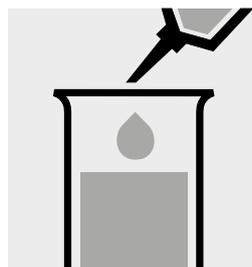
Filter turbid samples.



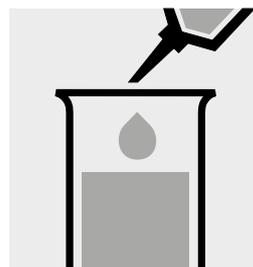
Pipette 10 ml of the pre-treated sample into a test tube.



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



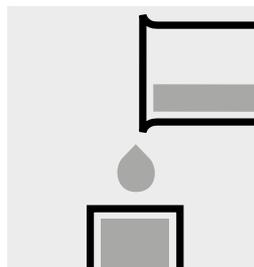
Add 0.20 ml of **reagent 2** with pipette and mix.



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



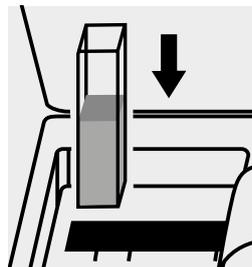
Reaction time:  
30 minutes



Filter, if necessary, and transfer the solution into a corresponding cell.



Select method no. **308**.



Place the cell into the cell compartment. The measurement is performed automatically.

## 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](http://www.analytical-test-kits.com).

## Note:

When using the 100-mm rectangular cell, the round-cell holder must be removed before the measurement.

## Quality assurance:

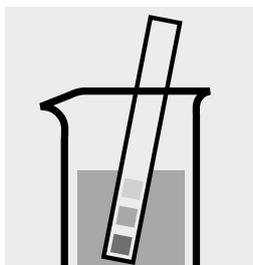
To check the measurement system (reagents, measurement device, and handling) Standard solutions for photometric applications, CRM, Cat.Nos. 133006 and 133007 can be used.

# Bromine

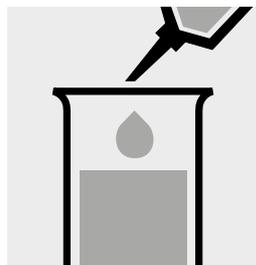
100605

Test

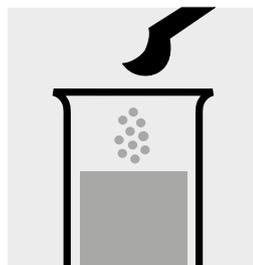
<b>Measuring</b>	0.10 – 10.00 mg/l Br <sub>2</sub>	10-mm cell
<b>range:</b>	0.05 – 5.00 mg/l Br <sub>2</sub>	20-mm cell
	0.020 – 2.000 mg/l Br <sub>2</sub>	50-mm cell
Expression of results also possible in mmol/l.		



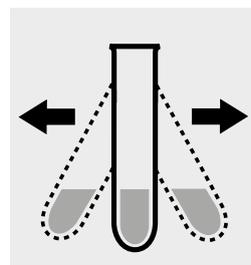
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.



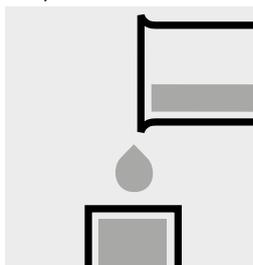
Add 1 level blue micro-spoon of Br<sub>2</sub>-1.



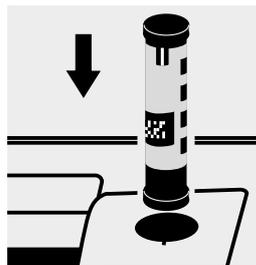
Shake vigorously to dissolve the solid substance.



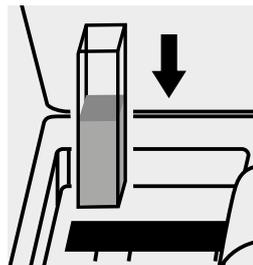
Reaction time: 1 minute



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").

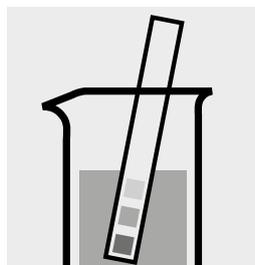
# Cadmium

114834

Cell Test

**Measuring** 0.025 – 1.000 mg/l Cd

**range:** 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.



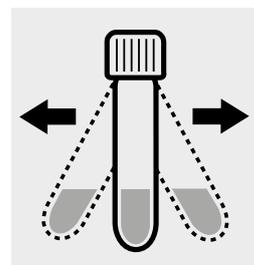
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



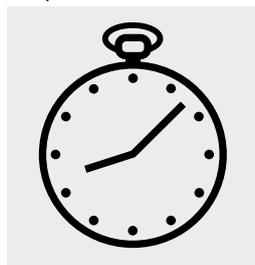
Add 0.20 ml of **Cd-1K** with pipette, close the cell with the screw cap, and mix.



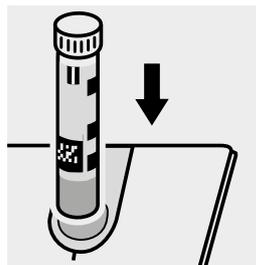
Add 1 level green microspoon of **Cd-2K**, close the cell with the screw cap.



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 ( $\Sigma$  Cd).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700 or the Standard solution for photometric applications, CRM, Cat.No. 132228.

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

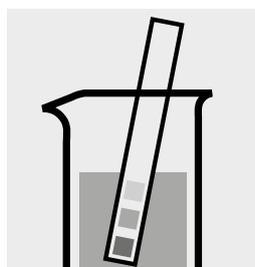
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Cadmium

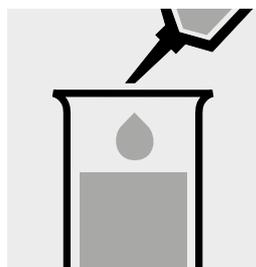
101745

Test

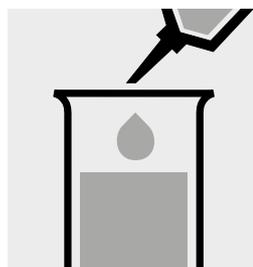
<b>Measuring range:</b>	0.01 – 0.500 mg/l Cd	10-mm cell
	0.005 – 0.250 mg/l Cd	20-mm cell
	0.0020 – 0.1000 mg/l Cd	50-mm cell
	Expression of results also possible in mmol/l.	



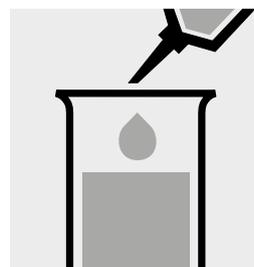
Check the pH of the sample, specified range: pH 3 – 11.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



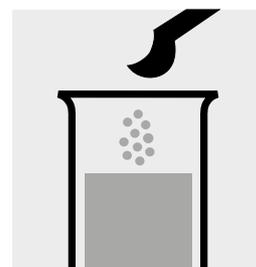
Pipette 1.0 ml of **Cd-1** into a test tube.



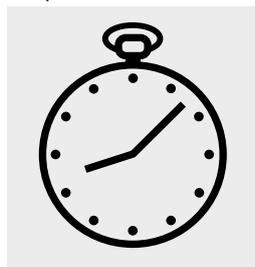
Add 10 ml of the sample with pipette and mix.



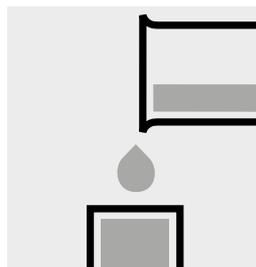
Add 0.20 ml of **Cd-2** with pipette and mix.



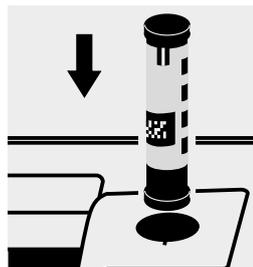
Add 1 level green microspoon of **Cd-3** and dissolve the solid substance.



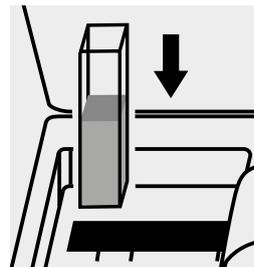
Reaction time:  
2 minutes



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 ( $\Sigma$  Cd).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 90, Cat.No. 118700 or the Standard solutions for photometric applications, CRM, Cat.No. 132228 and 133008.

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

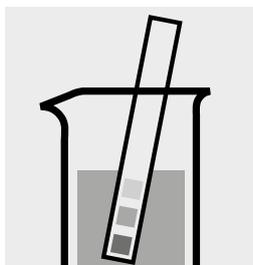
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

# Calcium

100858

Cell Test

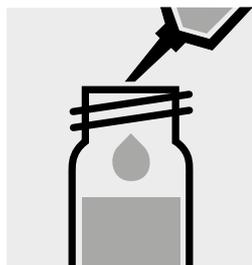
<b>Measuring</b>	10 – 250 mg/l Ca
<b>range:</b>	14 – 350 mg/l CaO
	25 – 624 mg/l CaCO <sub>3</sub>
	Expression of results also possible in mmol/l.



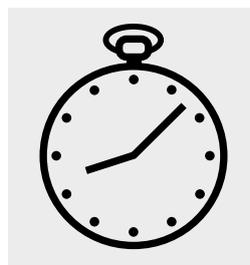
Check the pH of the sample, specified range: pH 3 – 9.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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



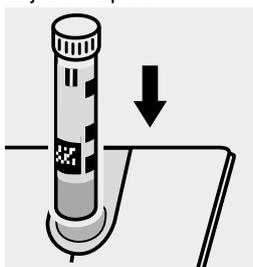
Add 1.0 ml of **Ca-1K** with pipette, close the cell with the screw cap, and mix.



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

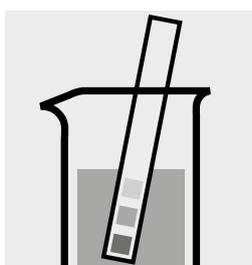
114815

Test

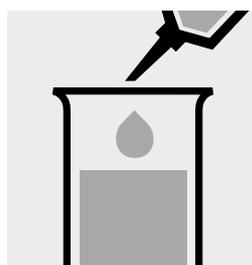
<b>Measuring range:</b>	10 – 160 mg/l Ca	14 – 224 mg/l CaO	25 – 400 mg/l CaCO <sub>3</sub>	10-mm cell
	5 – 80 mg/l Ca	7 – 112 mg/l CaO	12 – 200 mg/l CaCO <sub>3</sub>	20-mm cell
	1.0 – 15.0 mg/l Ca	1.4 – 21.0 mg/l CaO	2.5 – 37.5 mg/l CaCO <sub>3</sub>	10-mm cell

Expression of results also possible in mmol/l.

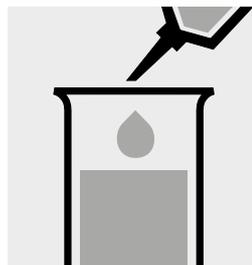
## Measuring range: 5 – 160 mg/l Ca



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.



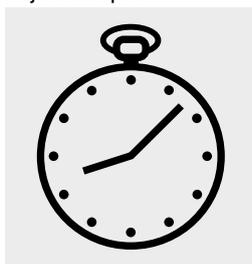
Add 5.0 ml of **Ca-1** with pipette and mix.



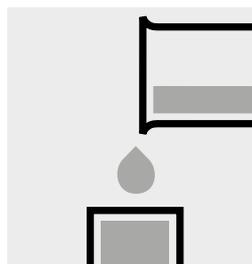
Add 4 drops of **Ca-2** and mix.



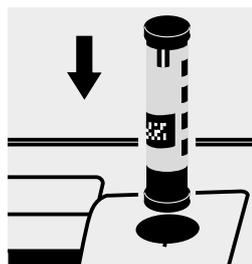
Add 4 drops of **Ca-3** and mix.



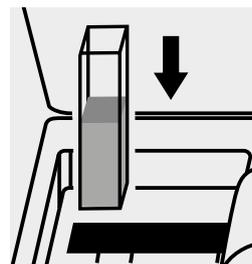
Reaction time: 8 minutes, **measure immediately**.



Transfer the solution into a corresponding cell



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



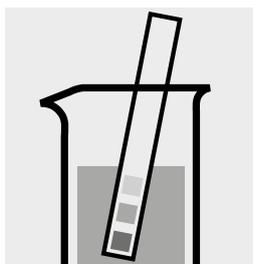
Place the cell into the cell compartment.

# Calcium

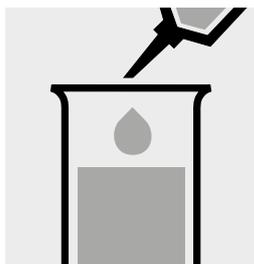
114815

Test

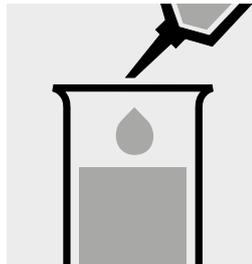
Measuring range: 1.0 – 15.0 mg/l Ca



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



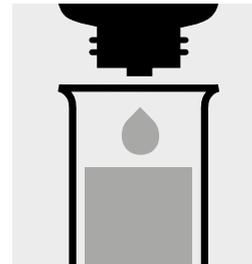
Pipette 0.50 ml of the sample into a test tube.



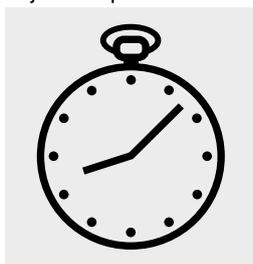
Add 5.0 ml of **Ca-1** with pipette and mix.



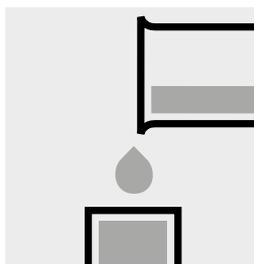
Add 4 drops of **Ca-2** and mix.



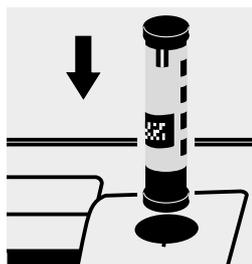
Add 4 drops of **Ca-3** and mix.



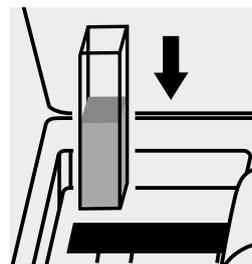
Reaction time: 8 minutes, **measure immediately**.



Transfer the solution into a cell



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



Place the cell into the cell compartment.

## Quality assurance:

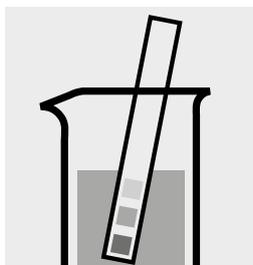
To check the measurement system (test reagents, measurement device, and handling) ready-to-use calcium standard solution Certipur®, Cat.No. 119778, concentration 1000 mg/l Ca, can be used after diluting accordingly.

# Calcium

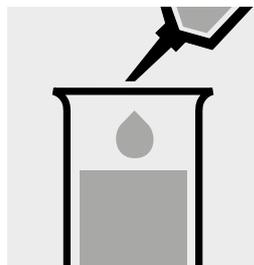
100049

Test

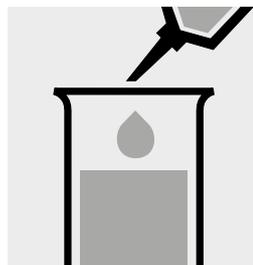
**Measuring** 0.20 – 4.00 mg/l Ca 10-mm cell  
**range:** Expression of results also possible in mmol/l.



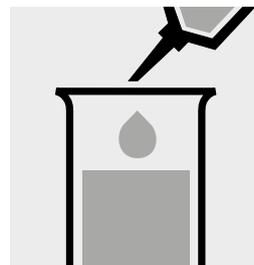
Check the pH of the sample, specified range: pH 3 – 9.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



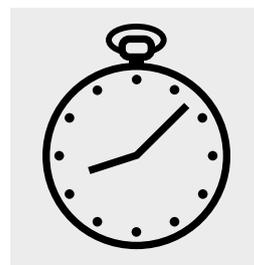
Pipette 5.0 ml of the sample into a test tube.



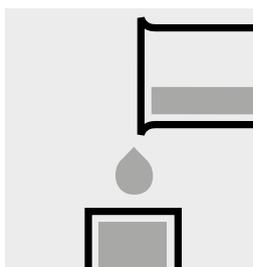
Add 0.50 ml of **Ca-1** with pipette and mix.



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



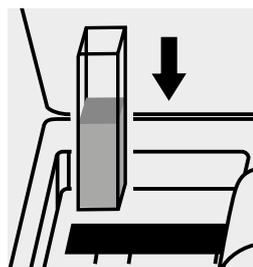
Reaction time: 5 minutes



Transfer the solution into a cell.



Select method no. **304**.



Place the cell into the cell compartment.  
The measurement is performed automatically.

## Important:

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

## Quality assurance:

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

# Carotene in raw palm oil

corresponds to **DIN EN ISO 17923:2011**

**Application**

**Measuring range:** 10 – 7500 mg/kg  $\beta$ -Car

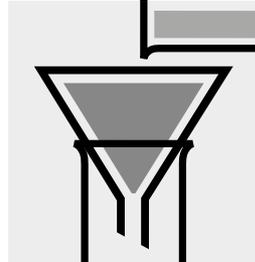
10-mm cell

**Attention!**

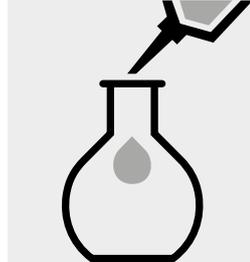
Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from isooctane, is recommended. This zero value remains valid until the method is exited.



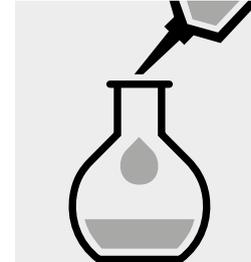
Melt the sample and homogenize.



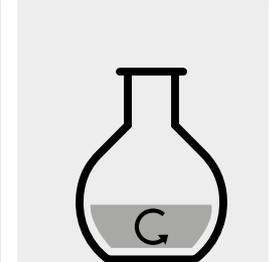
If contaminations are present, filter the sample over a fast filtering paper.



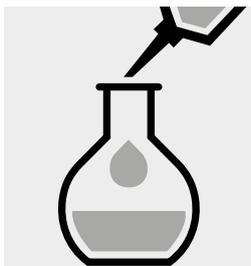
Weigh **between 100.0 mg to 500.0 mg of sample** into a volumetric flask, accurately weighed to 0.1 mg.



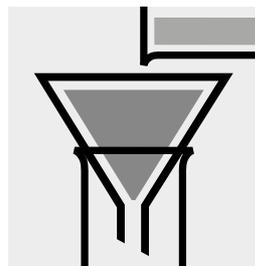
Add a few milliliters of **isooctane for spectroscopy Uvasol®** (Cat. No. 104718).



Dissolve the sample at room temperature.



Make up the contents of the volumetric flask to the mark with **isooctane for spectroscopy Uvasol®** (Cat. No. 104718) and mix.



Filter turbid solutions over a paper filter.



Select method no. **2523**. Perform the zero adjustment and confirm by pressing the **<OK>** button.



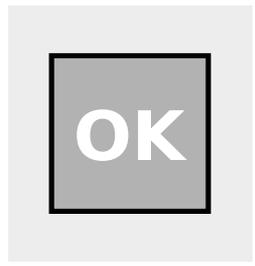
Enter the sample weight in milligrams.



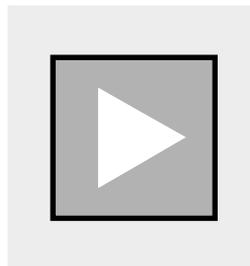
Confirm with **<OK>**.



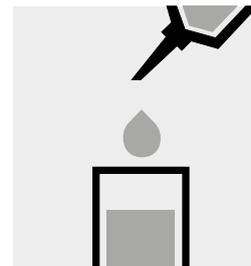
Enter the volume of the sample solution in milliliters.



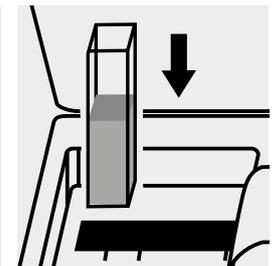
Confirm with **<OK>**.



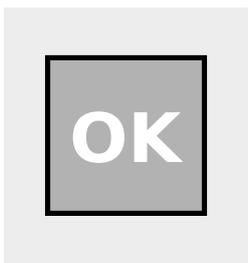
Tap the **<Start>** button.



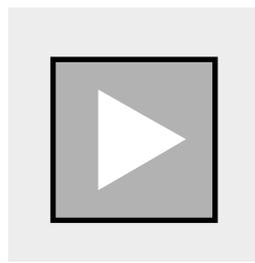
Transfer the solution into a cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with **<OK>**. The  $\beta$ -carotene content is shown in the display in mg/kg.



Tap the **<Start>** button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

**Important:**

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

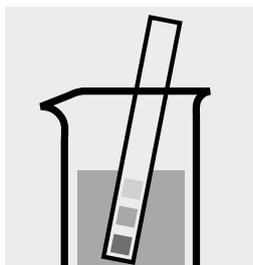
# Chloride

114730

Cell Test

**Measuring** 5 – 125 mg/l Cl

**range:** Expression of results also possible in mmol/l.



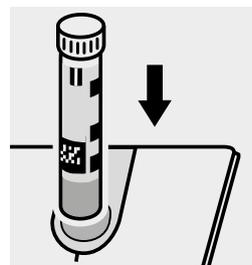
Check the pH of the sample, specified range: pH 1 – 12. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



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 or the Standard solutions for photometric applications, CRM, Cat.Nos. 132229 and 132230.

Ready-to-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup>, 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.

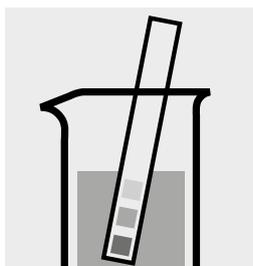
# Chloride

114897

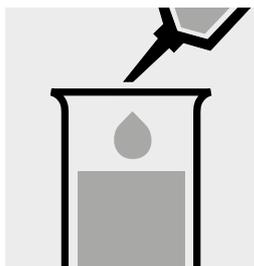
Test

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

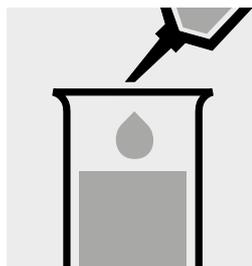
## Measuring range: 10 – 250 mg/l Cl



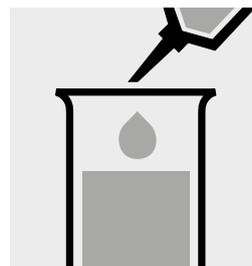
Check the pH of the sample, specified range: pH 1 – 12.  
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



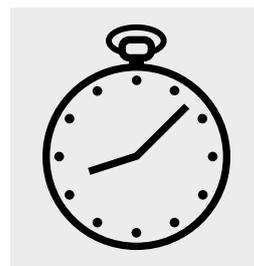
Pipette 1.0 ml of the sample into a test tube.



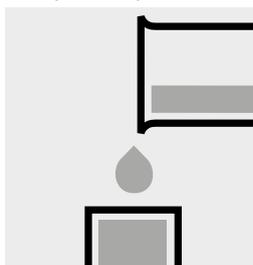
Add 2.5 ml of **Cl-1** with pipette and mix.



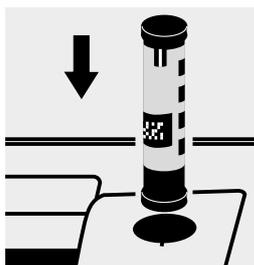
Add 0.50 ml of **Cl-2** with pipette and mix.



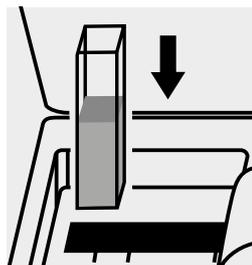
Reaction time: 1 minute



Transfer the solution into a cell.



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



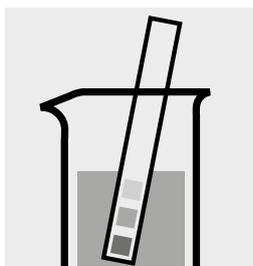
Place the cell into the cell compartment.

# Chloride

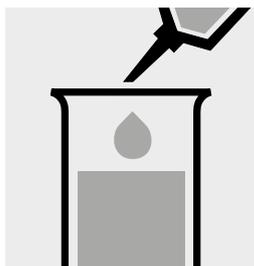
114897

Test

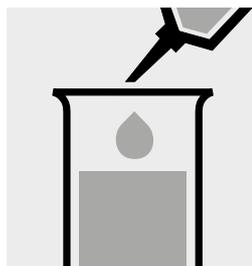
Measuring range: 2.5 – 25.0 mg/l Cl



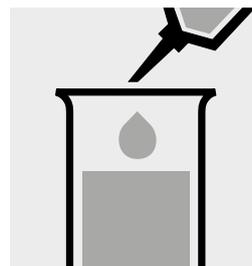
Check the pH of the sample, specified range: pH 1 – 12. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



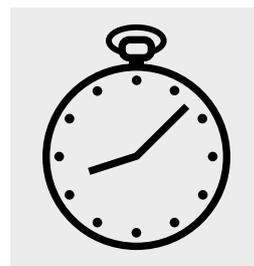
Pipette 5.0 ml of the sample into a test tube.



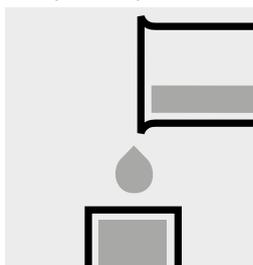
Add 2.5 ml of **CI-1** with pipette and mix.



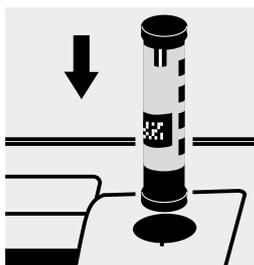
Add 0.50 ml of **CI-2** with pipette and mix.



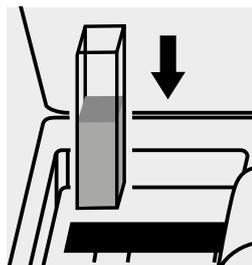
Reaction time: 1 minute



Transfer the solution into a cell.



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



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 60, Cat.No. 114696 or the Standard solutions for photometric applications, CRM, Cat.Nos. 132229 and 132230.

Ready-to-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup>, 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.

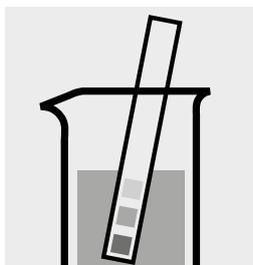
# Chloride

101804

Cell Test

**Measuring** 0.5 – 15.0 mg/l Cl

**range:** Expression of results also possible in mmol/l.



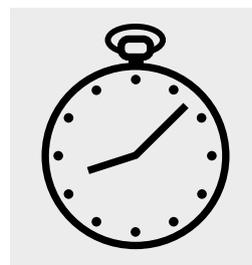
Check the pH of the sample, specified range: pH 3 – 11. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



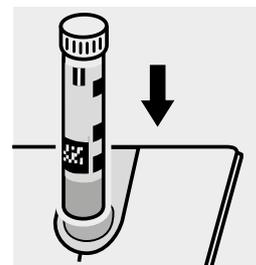
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



Reaction time:  
10 minutes



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

## Quality assurance:

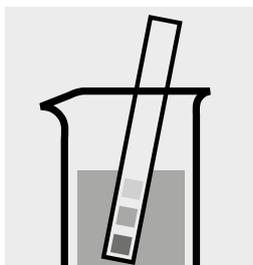
To check the measurement system (test reagents, measurement device, and handling) ready-to-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132229, 133010, and 133011.

# Chloride

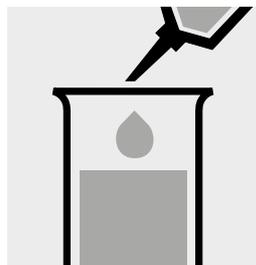
101807

Test

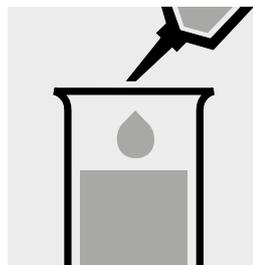
**Measuring** 0.10 – 5.00 mg/l Cl 50-mm cell  
**range:** Expression of results also possible in mmol/l.



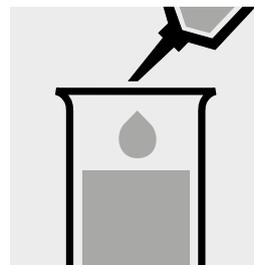
Check the pH of the sample, specified range: pH 3 – 11. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



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



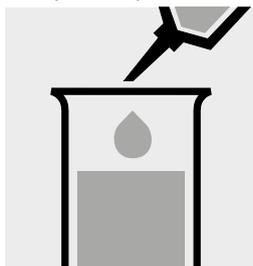
Add to one tube 10 ml of the sample with pipette and mix.



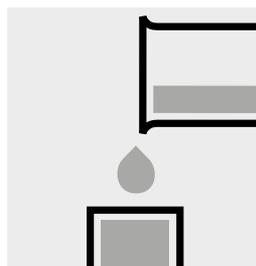
Add to the second tube 10 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) with pipette and mix. (Blank)



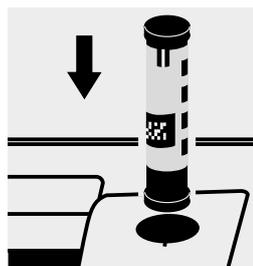
Reaction time: 10 minutes



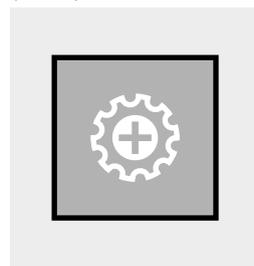
Add to each tube 0.20 ml of **CI-2** with pipette and mix.



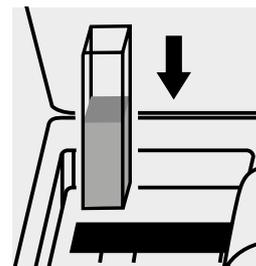
Transfer both solutions into two separate 50-mm-cells.



Select method with AutoSelector.



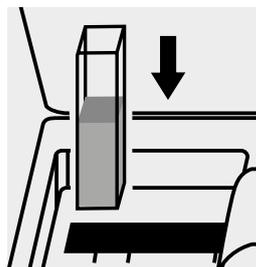
Tap the <Settings> button. Select "Reagent blank".



Place the blank cell into the cell compartment.



Select "User RB". Confirm with <OK>.



Place the cell containing the sample into the cell compartment.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use chloride standard solution Certipur®, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 133010 and 133011.

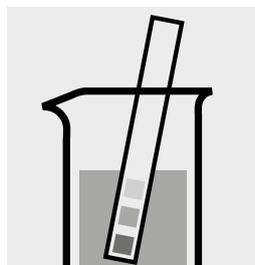
# Chlorine

100595

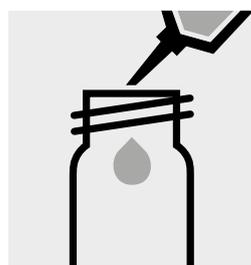
## Determination of free chlorine

Cell Test

<b>Measuring</b>	0.03 – 6.00 mg/l Cl <sub>2</sub>
<b>range:</b>	Expression of results also possible in mmol/l.



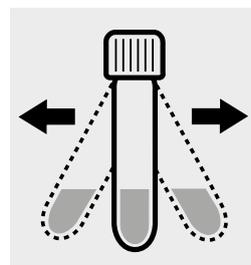
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a round cell.



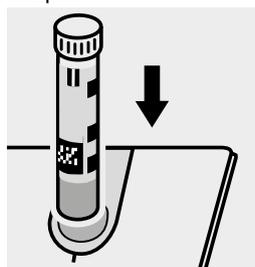
Add 1 level blue micro-spoon of Cl<sub>2</sub>-1, close with the screw cap.



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

100597

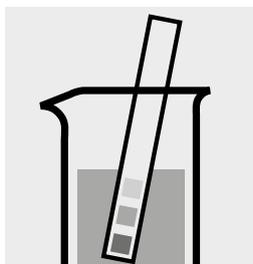
## Determination of free chlorine and total chlorine

Cell Test

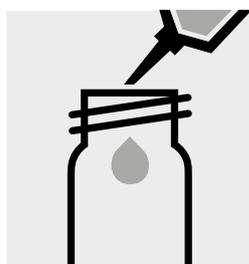
**Measuring** 0.03 – 6.00 mg/l  $\text{Cl}_2$

**range:** Expression of results also possible in mmol/l.

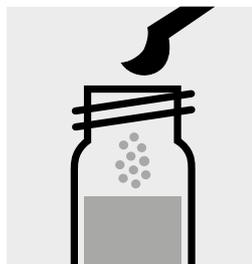
### Determination of free chlorine



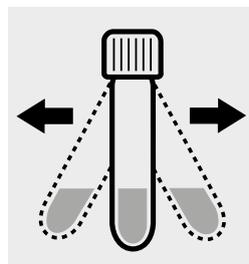
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a round cell.



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

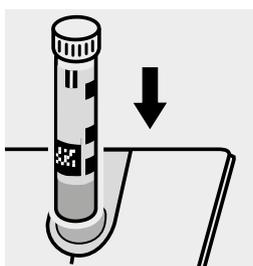


Shake the cell vigorously to dissolve the solid substance.

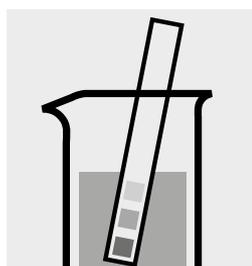


Reaction time: 1 minute

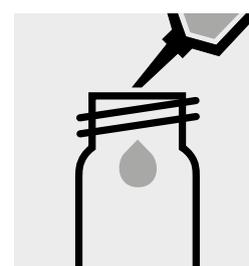
### Determination of total chlorine



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



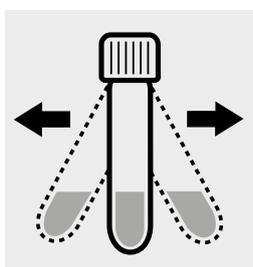
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



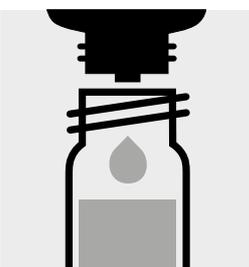
Pipette 5.0 ml of the sample into a round cell.



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



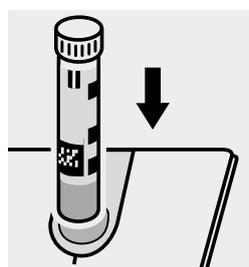
Shake the cell vigorously to dissolve the solid substance.



Add 2 drops of  $\text{Cl}_2-2$ , 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.

#### 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

100597

Differentiation between free chlorine and total chlorine

Cell Test

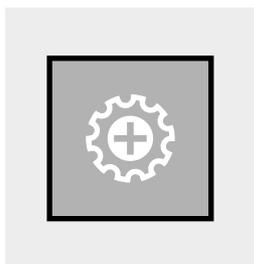
**Measuring range:** 0.03 – 6.00 mg/l Cl<sub>2</sub>

After selecting the method it is possible to set the method-specific “Differentiation” mode.

**Note:** If the aim is to measure **only** free chlorine or total chlorine, the “Differentiation” mode must be deactivated again.



Select method no. **142**.



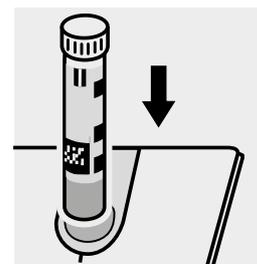
Tap the <Settings> button. Select “Differentiation” and activate.



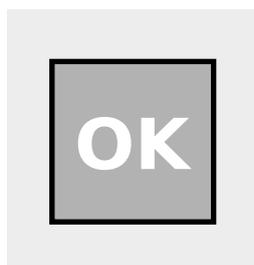
Confirm with <OK>.

Perform determination of **free chlorine** (see analytical procedure “Determination of free chlorine” with 100597). = **cell A**

After the reaction time has expired:



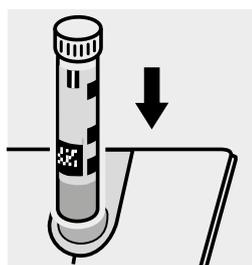
Place the **cell A** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>.

Perform determination of **total chlorine** (see analytical procedure “Determination of total chlorine” with 100597). = **cell B**

After the reaction time has expired:



Place the **cell B** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>. The results A (Cl<sub>2</sub> (f)), B (Cl<sub>2</sub> (t)), and C (Cl<sub>2</sub> (b)) are shown in the display in mg/l.

## Important:

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

## Quality assurance:

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

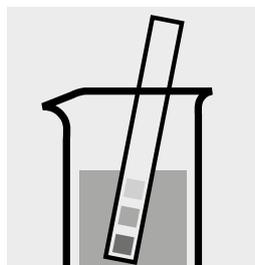
# Chlorine

100598

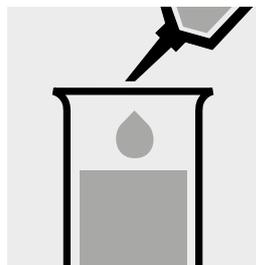
## Determination of free chlorine

Test

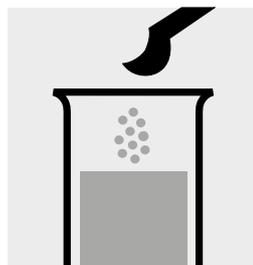
<b>Measuring range:</b>	0.05 – 6.00 mg/l Cl <sub>2</sub>	10-mm cell
	0.02 – 3.00 mg/l Cl <sub>2</sub>	20-mm cell
	0.010 – 1.000 mg/l Cl <sub>2</sub>	50-mm cell
Expression of results also possible in mmol/l.		



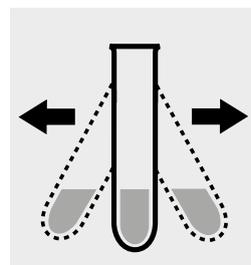
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.



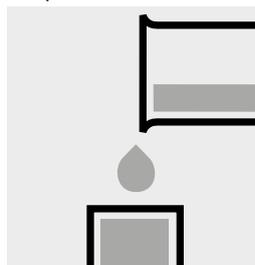
Add 1 level blue micro-spoon of Cl<sub>2</sub>-1.



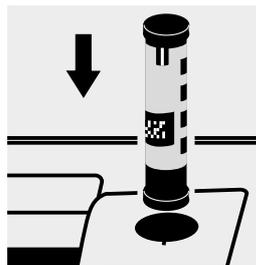
Shake vigorously to dissolve the solid substance.



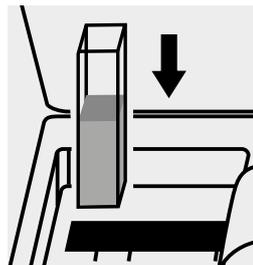
Reaction time: 1 minute



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").

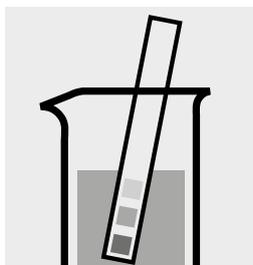
# Chlorine

100602

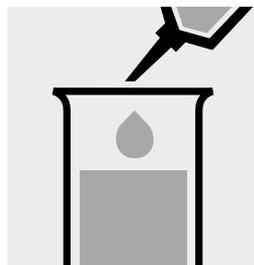
## Determination of total chlorine

Test

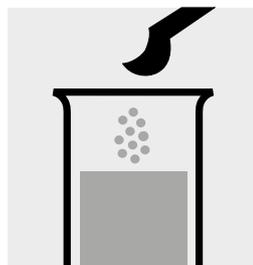
<b>Measuring range:</b>	0.05 – 6.00 mg/l Cl <sub>2</sub>	10-mm cell
	0.02 – 3.00 mg/l Cl <sub>2</sub>	20-mm cell
	0.010 – 1.000 mg/l Cl <sub>2</sub>	50-mm cell
Expression of results also possible in mmol/l.		



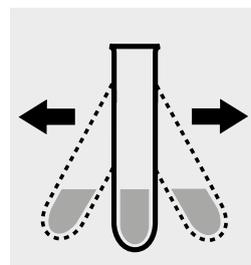
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



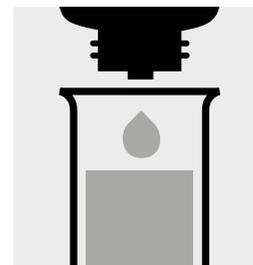
Pipette 10 ml of the sample into a test tube.



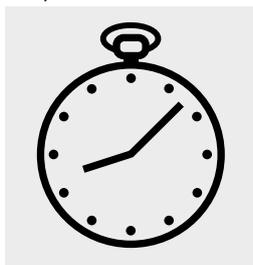
Add 1 level blue micro-spoon of Cl<sub>2</sub>-1.



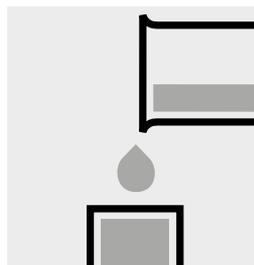
Shake vigorously to dissolve the solid substance.



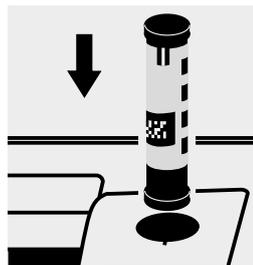
Add 2 drops of Cl<sub>2</sub>-2 and mix.



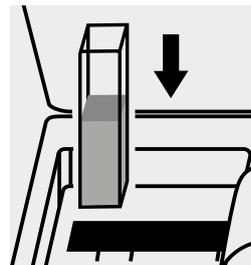
Reaction time:  
1 minute



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

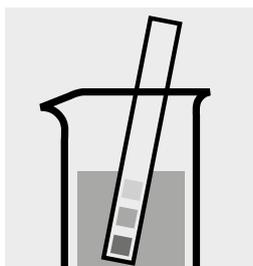
100599

## Determination of free chlorine and total chlorine

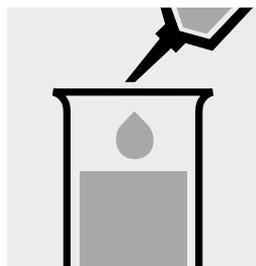
Test

<b>Measuring</b>	0.05 – 6.00 mg/l Cl <sub>2</sub>	10-mm cell
<b>range:</b>	0.02 – 3.00 mg/l Cl <sub>2</sub>	20-mm cell
	0.010 – 1.000 mg/l Cl <sub>2</sub>	50-mm cell
	Expression of results also possible in mmol/l.	

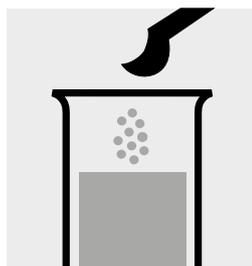
### Determination of free chlorine



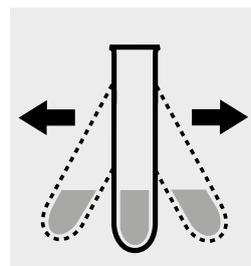
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.



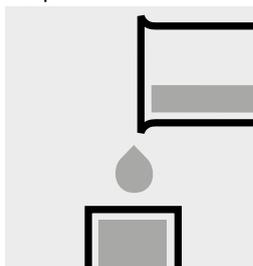
Add 1 level blue micro-spoon of Cl<sub>2</sub>-1.



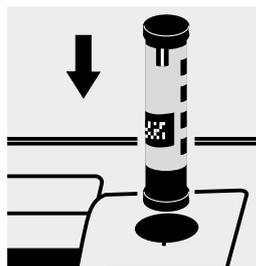
Shake vigorously to dissolve the solid substance.



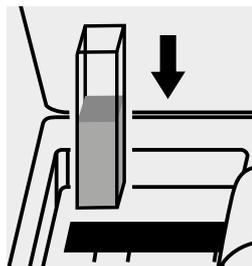
Reaction time: 1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

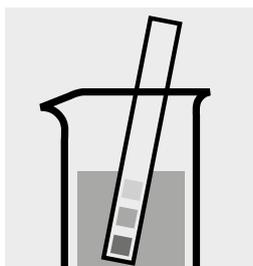
# Chlorine

100599

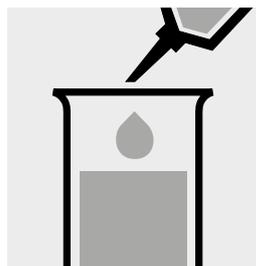
Determination of free chlorine and total chlorine

Test

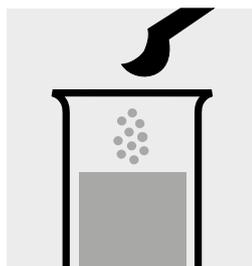
## Determination of total chlorine



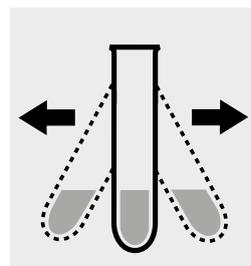
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



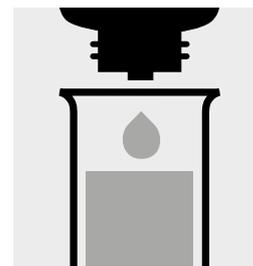
Pipette 10 ml of the sample into a test tube.



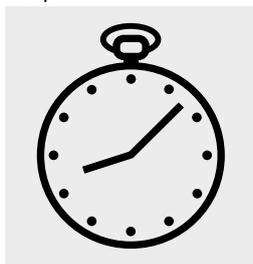
Add 1 level blue micro-spoon of  $\text{Cl}_2\text{-1}$ .



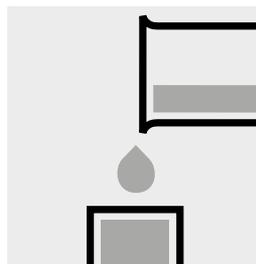
Shake vigorously to dissolve the solid substance.



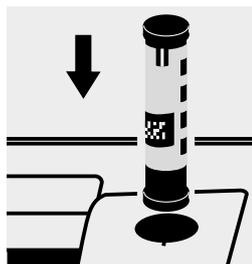
Add 2 drops of  $\text{Cl}_2\text{-2}$  and mix.



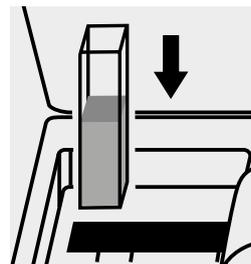
Reaction time:  
1 minute



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

# Chlorine

100599

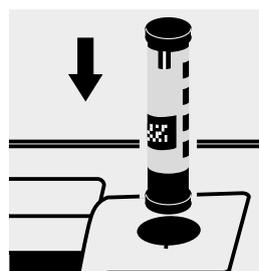
Differentiation between free chlorine and total chlorine

Test

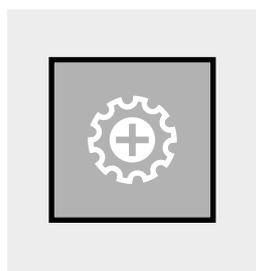
<b>Measuring</b>	0.05 – 6.00 mg/l Cl <sub>2</sub>	10-mm cell
<b>range:</b>	0.02 – 3.00 mg/l Cl <sub>2</sub>	20-mm cell
	0.010 – 1.000 mg/l Cl <sub>2</sub>	50-mm cell

After selecting the method it is possible to set the method-specific “Differentiation” mode.

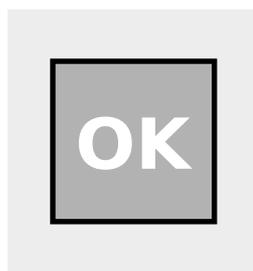
**Note:** If the aim is to measure **only** free chlorine or total chlorine, the “Differentiation” mode must be deactivated again.



Select method with AutoSelector.



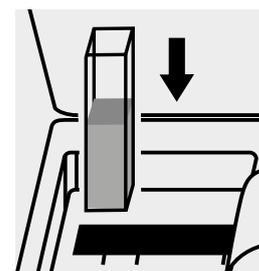
Tap the <Settings> button. Select “Differentiation” and activate.



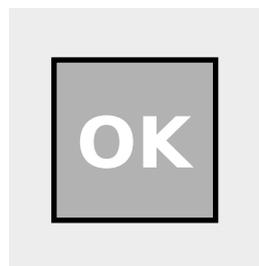
Confirm with <OK>.

Perform determination of **free chlorine** (see analytical procedure “Determination of free chlorine” with 100599). = **cell A**

After the reaction time has expired:



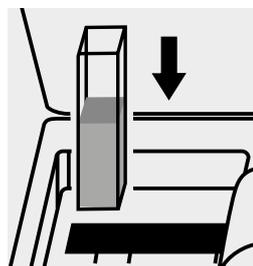
Place the **cell A** into the cell compartment. The measurement is performed automatically.



Confirm with <OK>.

Perform determination of **total chlorine** (see analytical procedure “Determination of total chlorine” with 100599). = **cell B**

After the reaction time has expired:



Place the **cell B** into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The results A (Cl<sub>2</sub> (f)), B (Cl<sub>2</sub> (t)), and C (Cl<sub>2</sub> (b)) are shown in the display in mg/l.

## Important:

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

## Quality assurance:

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

# Chlorine (with liquid reagents)

100086/100087/  
100088/100089

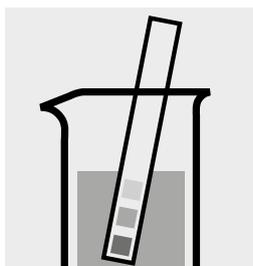
Determination of free chlorine and total chlorine

Cell Test

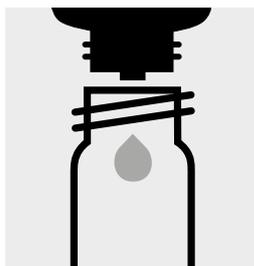
**Measuring** 0.03 – 6.00 mg/l Cl<sub>2</sub>

**range:** Expression of results also possible in mmol/l.

## Determination of free chlorine



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



Place 6 drops of Cl<sub>2</sub>-1 into a round cell.



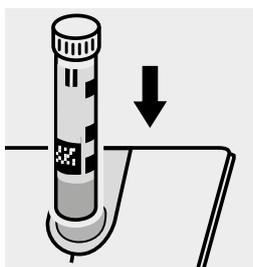
Add 3 drops of Cl<sub>2</sub>-2, close with the screw cap, and mix.



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.

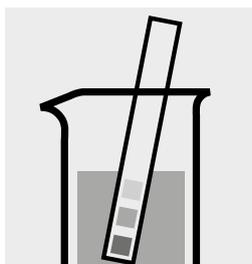
# Chlorine (with liquid reagents)

Determination of free chlorine and total chlorine

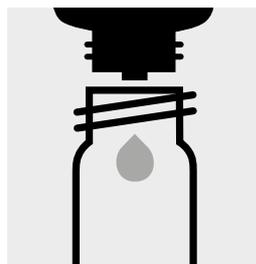
100086/100087/  
100088/100089

Cell Test

## Determination of total chlorine



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



Place 6 drops of **Cl<sub>2</sub>-1** into a round cell.



Add 3 drops of **Cl<sub>2</sub>-2**, close with the screw cap, and mix.



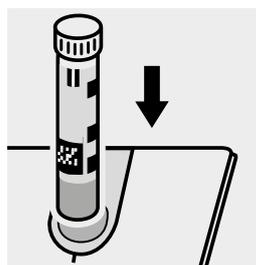
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



Reaction time:  
1 minute



Add 2 drops of **Cl<sub>2</sub>-3**, 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:

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)

100086/100087/  
100088/100089

Differentiation between free chlorine and total chlorine

Cell Test

**Measuring range:** 0.03 – 6.00 mg/l Cl<sub>2</sub>

After selecting the method it is possible to set the method-specific "Differentiation" mode.

**Note:** If the aim is to measure **only** free chlorine or total chlorine, the "Differentiation" mode must be deactivated again.



Select method no. **194**.



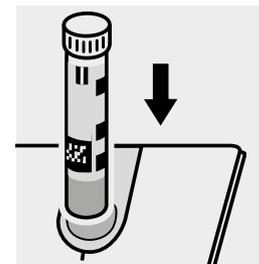
Tap the <Settings> button. Select "Differentiation" and activate.



Confirm with <OK>.

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

After the reaction time has expired:



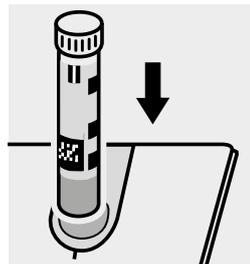
Place the **cell A** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>.

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

After the reaction time has expired:



Place the **cell B** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>. The results A (Cl<sub>2</sub> (f)), B (Cl<sub>2</sub> (t)), and C (Cl<sub>2</sub> (b)) are shown in the display in mg/l.

## Important:

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

## Quality assurance:

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

# Chlorine (with liquid reagents)

100086/100087/  
100088

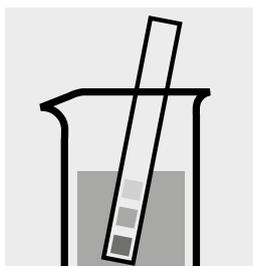
Determination of free chlorine and total chlorine

Test

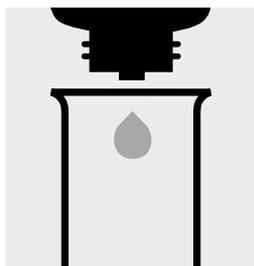
**Measuring** 0.10 – 1.00 mg/l  $\text{Cl}_2$  50-mm cell

**range:** Expression of results also possible in mmol/l.

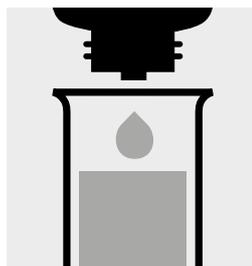
## Determination of free chlorine



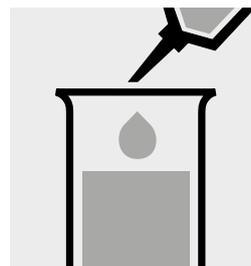
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Place 6 drops of  $\text{Cl}_2$ -1 into a test tube.



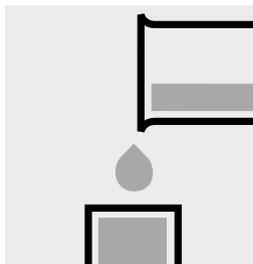
Add 3 drops of  $\text{Cl}_2$ -2, close with the screw cap, and mix.



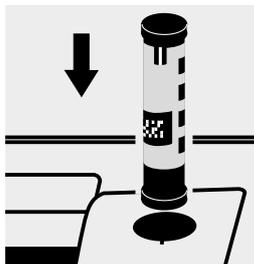
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



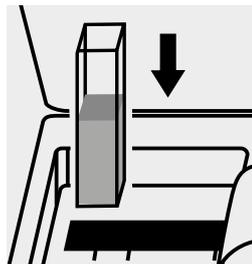
Reaction time: 1 minute



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

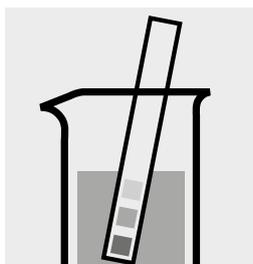
# Chlorine (with liquid reagents)

Determination of free chlorine and total chlorine

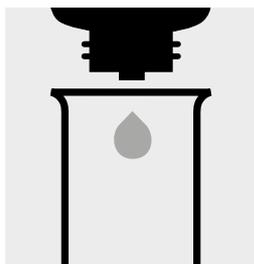
100086/100087/  
100088

Test

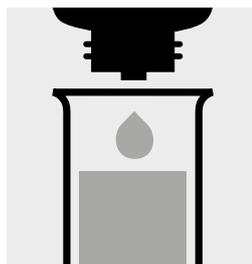
## Determination of total chlorine



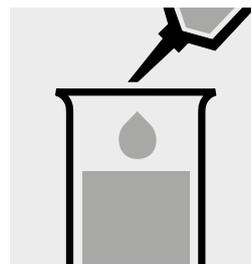
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Place 6 drops of **Cl<sub>2</sub>-1** into a test tube.



Add 3 drops of **Cl<sub>2</sub>-2**, close with the screw cap, and mix.



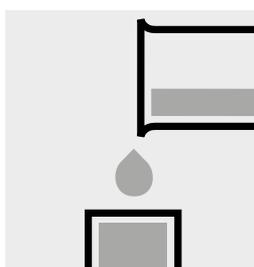
Add 10 ml of the sample with pipette, close with the screw cap, and mix.



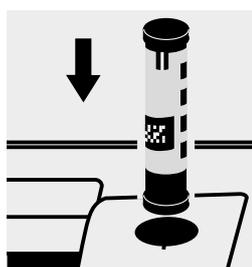
Reaction time:  
1 minute



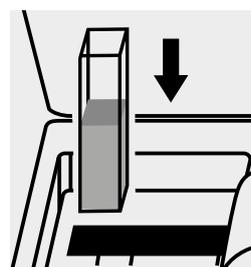
Add 2 drops of **Cl<sub>2</sub>-3**, close with the screw cap, and mix.



Transfer the solution into a 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 solution can be used (see section "Standard solutions").

# Chlorine (with liquid reagents)

100086/100087/  
100088

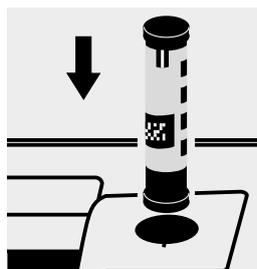
Differentiation between free chlorine and total chlorine

Test

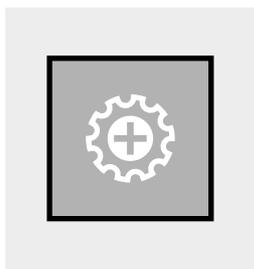
Measuring range: 0.10 – 1.00 mg/l  $\text{Cl}_2$  50-mm cell

After selecting the method it is possible to set the method-specific “Differentiation” mode.

**Note:** If the aim is to measure **only** free chlorine or total chlorine, the “Differentiation” mode must be deactivated again.



Select method with AutoSelector.



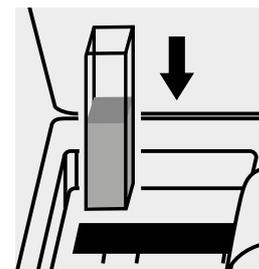
Tap the <Settings> button. Select “Differentiation” and activate.



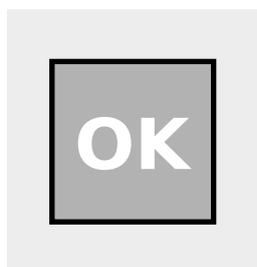
Confirm with <OK>.

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

After the reaction time has expired:



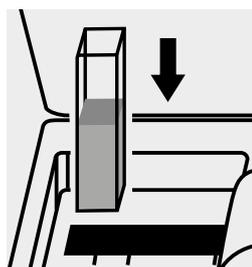
Place the **cell A** into the cell compartment. The measurement is performed automatically.



Confirm with <OK>.

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

After the reaction time has expired:



Place the **cell B** into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The results A ( $\text{Cl}_2$  (f)), B ( $\text{Cl}_2$  (t)), and C ( $\text{Cl}_2$  (b)) are shown in the display in mg/l.

## Important:

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

## Quality assurance:

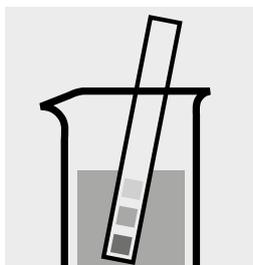
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

# Chlorine Dioxide

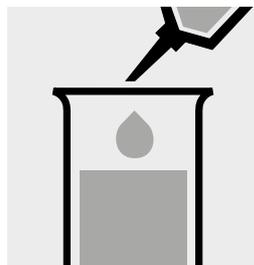
100608

Test

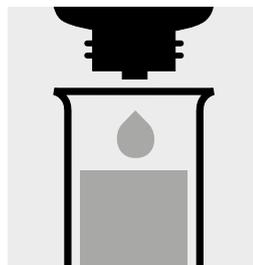
<b>Measuring</b>	0.10 – 10.00 mg/l ClO <sub>2</sub>	10-mm cell
<b>range:</b>	0.05 – 5.00 mg/l ClO <sub>2</sub>	20-mm cell
	0.020 – 2.000 mg/l ClO <sub>2</sub>	50-mm cell
Expression of results also possible in mmol/l.		



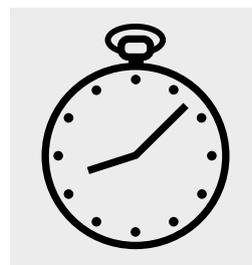
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



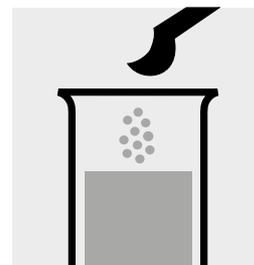
Pipette 10 ml of the sample into a test tube.



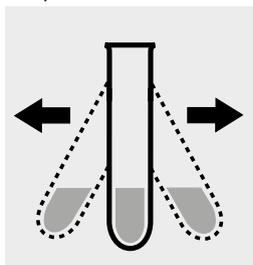
Add 2 drops of ClO<sub>2</sub>-1 and mix.



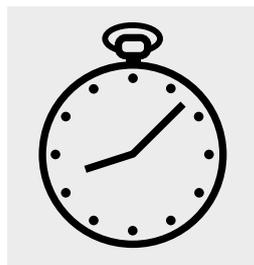
Reaction time:  
2 minutes



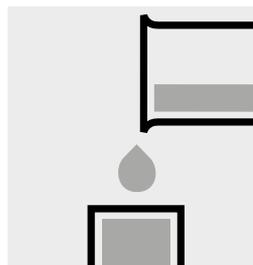
Add 1 level blue micro-spoon of ClO<sub>2</sub>-2.



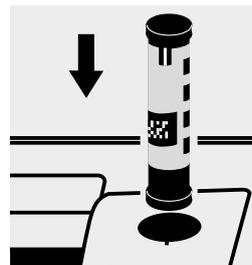
Shake vigorously to dissolve the solid substance.



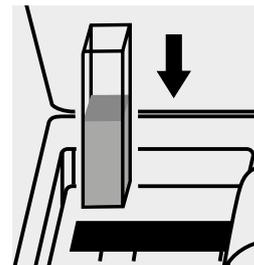
Reaction time:  
1 minute



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

## Important:

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

## Quality assurance:

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

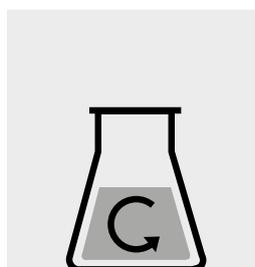
# Chlorophyll

## Determination of chlorophyll-a and phaeophytin

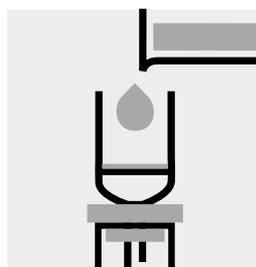
corresponds to **DIN 38412** and **ISO 10260**

### Application

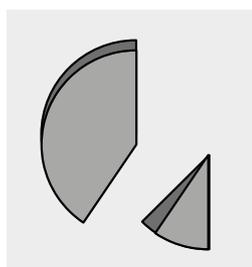
<b>Measuring</b>	depending on the ratio of original sample to extract	10-mm cell
<b>range:</b>	in µg/l Chl-a or Phaeo	20-mm cell
		50-mm cell



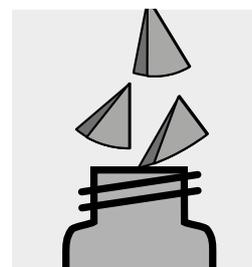
Sufficiently homogenize 0.5 – 2 l of sample. **Note the sample volume.**



Filter the sample through a suitable filter (e.g. glass-fibre filter).



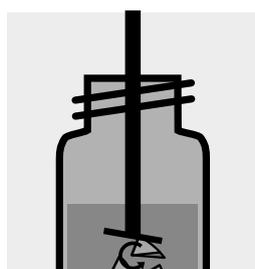
Fold the loaded filter and tear into small pieces.



Place the pieces of the filter in an extraction vessel (e.g. 100-ml amber glass bottle).



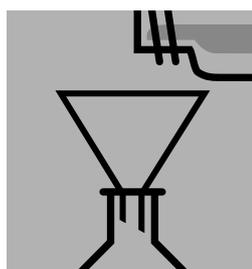
Add approx. 30 ml of boiling **ethanol** (w = 90 %) and allow to cool to room temperature.



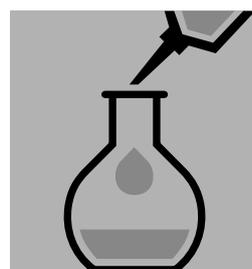
Disintegrate the filter in the homogenizer. Rinse together with a small portion of ethanol.



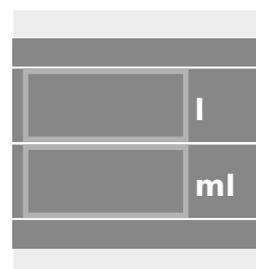
Allow to stand for 6 - 24 hours for the extraction to take place.



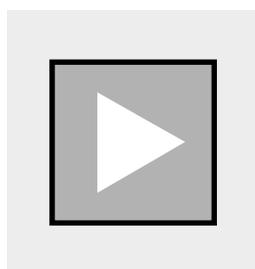
Filter the extract **protected from light** through a paper filter ("Blauband") into a volumetric flask (for DIN 38412: 100 ml). Rinse the filter with a small portion of ethanol.



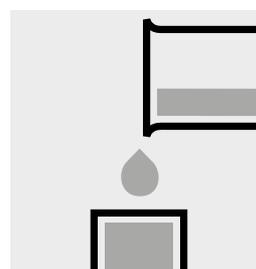
Make the contents of the volumetric flask up to the mark with ethanol, keeping them **protected from light** in the process!



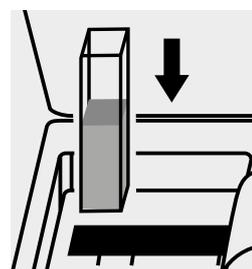
Select method no. **2509**. Enter the volumes of the original sample in liters and extract (volumetric flask) in milliliters.



Tap the <Start> button.



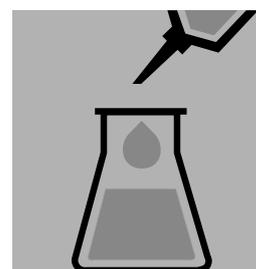
Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>.



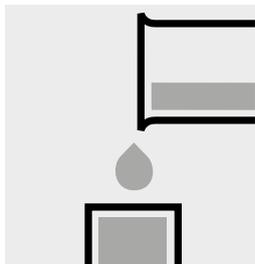
Acidify a portion of the extract with **hydrochloric acid 2 mol/l Titripur®** (Cat. No. 109063) (0.3 ml per 100 ml of extract).

# Chlorophyll

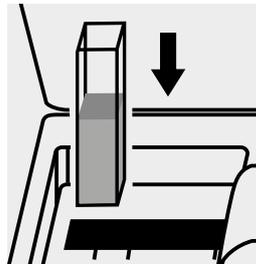
## Determination of chlorophyll-a and phaeophytin

corresponds to **DIN 38412** and **ISO 10260**

Application



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The chlorophyll-a and phaeophytin content is shown in the display in  $\mu\text{g/l}$ .

### Important:

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

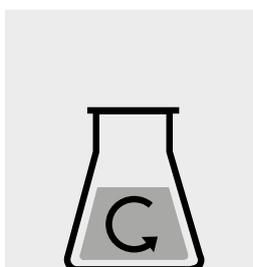
# Chlorophyll

## Determination of chlorophyll-a and phaeophytin

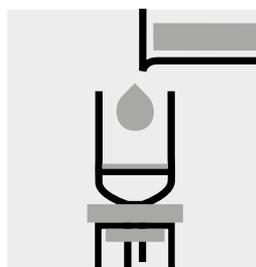
analogous to **APHA 10200-H**

**Application**

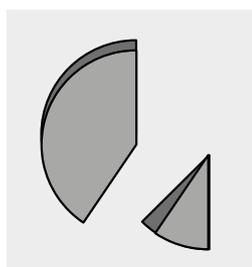
<b>Measuring</b>	depending on the ratio of original sample to extract	10-mm cell
<b>range:</b>	in mg/m <sup>3</sup> Chl-a or Phaeo	20-mm cell
		50-mm cell



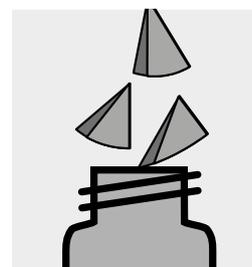
Sufficiently homogenize the sample. **Note the sample volume.**



Filter the sample through a suitable filter (e.g. glass-fibre filter).



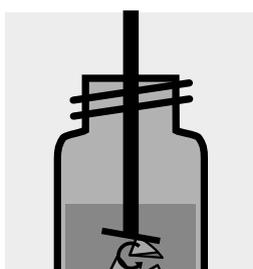
Fold the loaded filter and tear into small pieces.



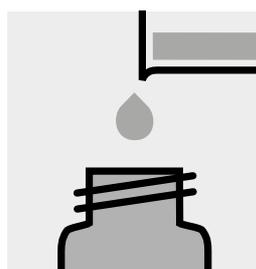
Place the pieces of the filter in an extraction vessel (**protected from light**).



Add 2 - 3 ml of **extracting agent**.



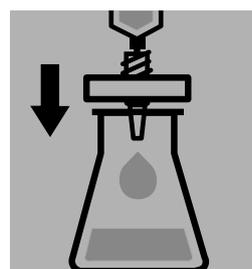
Disintegrate the filter in the homogenizer.



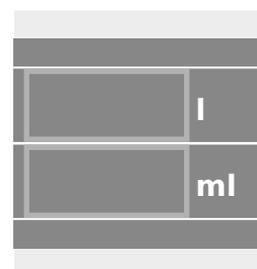
Make up to 10 ml with **extracting agent**.



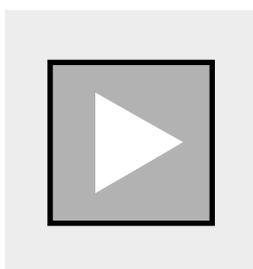
Allow to stand at +4 °C for at least 2 hours for the extraction to take place.



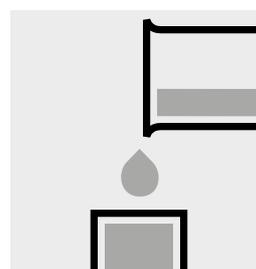
Filter the extract **protected from light** through a suitable filter.



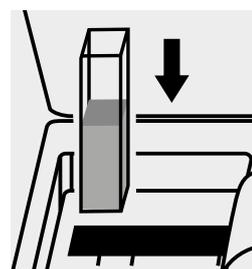
Select method no. **2504**. Enter the volumes of the original sample in liters and extract in milliliters (here: 10 ml).



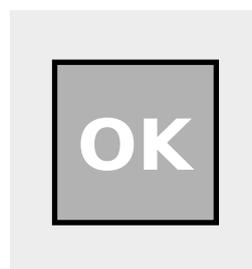
Tap the <Start> button.



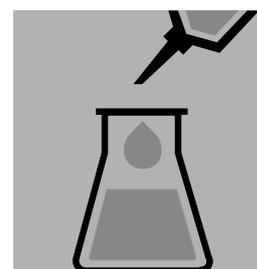
Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>.



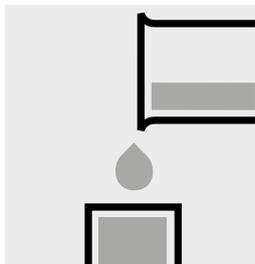
Acidify a portion of the extract with **hydrochloric acid 0.1 mol/l Titripur®** (Cat. No. 109060) (0.15 ml per 5 ml of extract).

# Chlorophyll

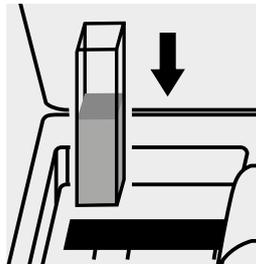
## Determination of chlorophyll-a and phaeophytin

analogous to **APHA 10200-H**

Application



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The chlorophyll-a and phaeophytin content is shown in the display in  $\text{mg/m}^3$ .

### Important:

The exact procedure and the composition and preparation of the extraction agent 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](http://www.analytical-test-kits.com).

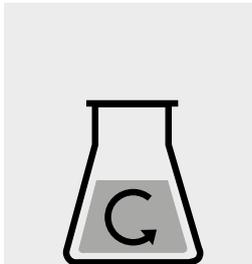
# Chlorophyll

## Determination of chlorophyll-a and phaeophytin

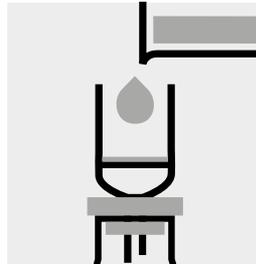
analogous to **ASTM D3731 - 87**

**Application**

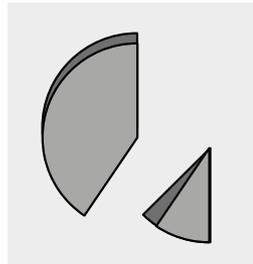
<b>Measuring</b>	depending on the ratio of original sample to extract	10-mm cell
<b>range:</b>	in mg/m <sup>3</sup> Chl-a or Phaeo	20-mm cell
		50-mm cell



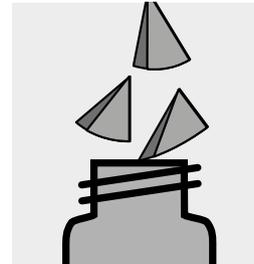
Homogenize the sample, stabilized with magnesium carbonate, to a sufficient degree. **Note the sample volume.**



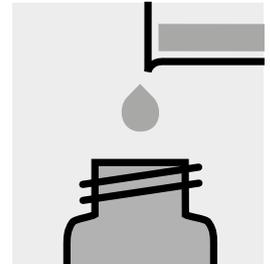
Filter the sample through a suitable filter (e.g. glass-fibre filter).



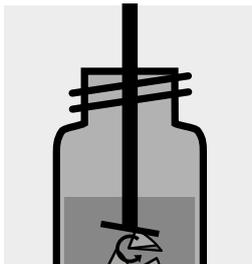
Fold the loaded filter and tear into small pieces.



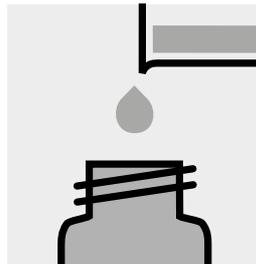
Place the pieces of the filter in an extraction vessel (**protected from light**).



Add 2 - 3 ml of **extracting agent**.



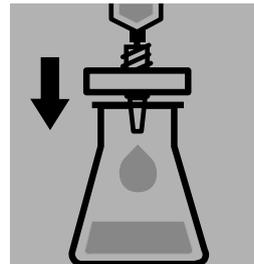
Disintegrate the filter in the homogenizer.



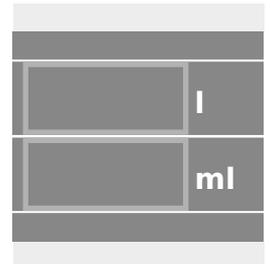
Make up to 10 ml with **extracting agent**.



Allow to stand at +4 °C for 0.25 - 24 hours for the extraction to take place.



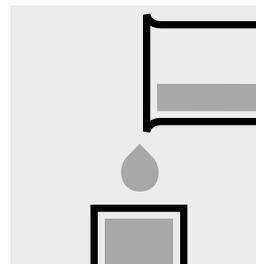
Filter the extract **protected from light** through a suitable filter.



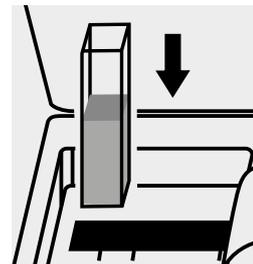
Select method no. **2504**. Enter the volumes of the original sample in liters and extract in milliliters (here: 10 ml).



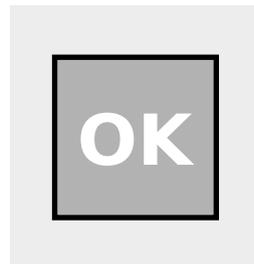
Tap the <Start> button.



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>.



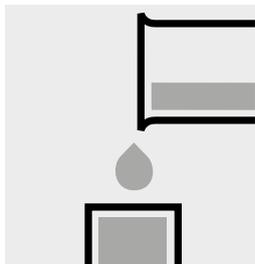
Acidify a portion of the extract with **hydrochloric acid 1 mol/l Titripur®** (Cat. No. 109057) (50 µl per 5 ml of extract).

# Chlorophyll

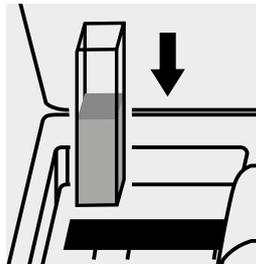
## Determination of chlorophyll-a and phaeophytin

analogous to **ASTM D3731 - 87**

Application



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The chlorophyll-a and phaeophytin content is shown in the display in  $\text{mg/m}^3$ .

### Important:

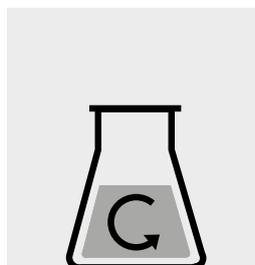
The exact procedure and the composition and preparation of the extraction agent used are given in the corresponding application, which also includes further information on the method employed. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# Chlorophyll-a, -b, -c (Trichromatic Method)

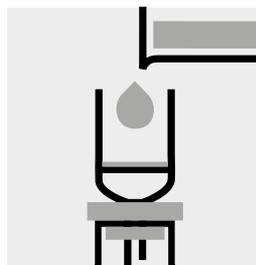
analogous to **APHA 10200-H**

**Application**

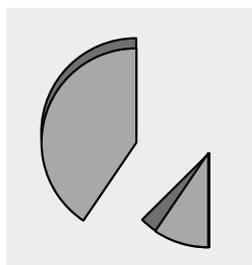
<b>Measuring</b>	depending on the ratio of original sample to extract	10-mm cell
<b>range:</b>	in mg/m <sup>3</sup> Chl-a, -b, -c	50-mm cell



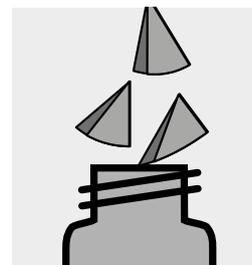
Sufficiently homogenize the sample. **Note the sample volume.**



Filter the sample through a suitable filter (e.g. glass-fibre filter).



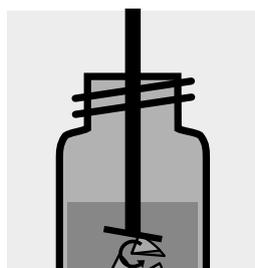
Fold the loaded filter and tear into small pieces.



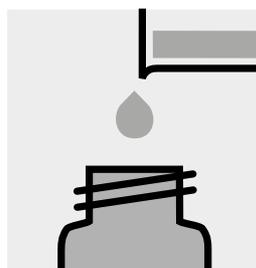
Place the pieces of the filter in an extraction vessel (**protected from light**).



Add 2 - 3 ml of **extracting agent**.



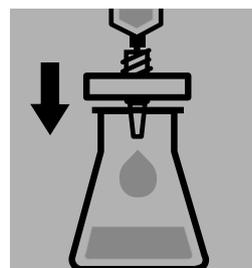
Disintegrate the filter in the homogenizer.



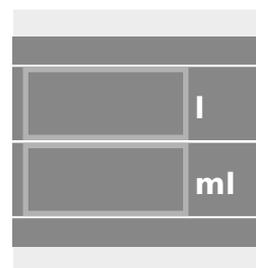
Make up to 10 ml with **extracting agent**.



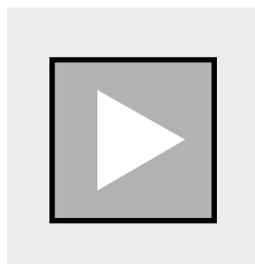
Allow to stand at +4 °C for at least 2 hours for the extraction to take place.



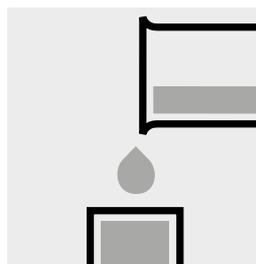
Filter the extract **protected from light** through a suitable filter.



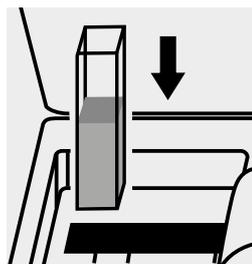
Select method no. **2507**. Enter the volumes of the original sample in liters and extract in milliliters (here: 10 ml).



Tap the <Start> button.



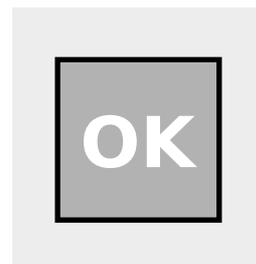
Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Tap the <OK> button.



Confirm with <OK>. The chlorophyll-a, chlorophyll-b, and chlorophyll-c contents are shown in the display in mg/m<sup>3</sup>.

### Important:

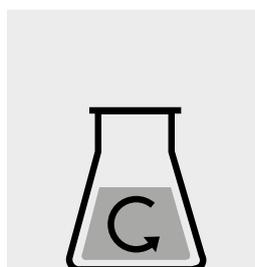
The exact procedure and the composition and preparation of the extraction agent used are given in the corresponding application, which also includes further information on the method employed. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# Chlorophyll-a, -b, -c (Trichromatic Method)

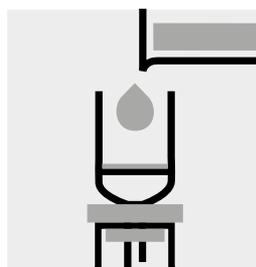
analogous to **ASTM D3731 - 87**

**Application**

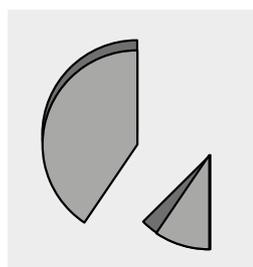
<b>Measuring</b>	depending on the ratio of original sample to extract	10-mm cell
<b>range:</b>	in mg/m <sup>3</sup> Chl-a, -b, -c	50-mm cell



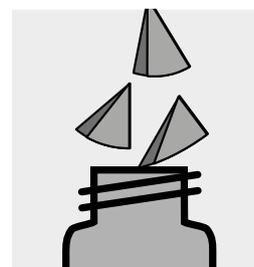
Homogenize the sample, stabilized with magnesium carbonate, to a sufficient degree. **Note the sample volume.**



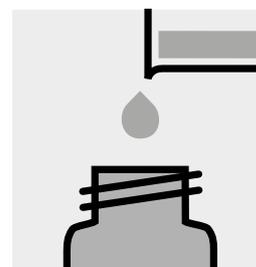
Filter the sample through a suitable filter (e.g. glass-fibre filter).



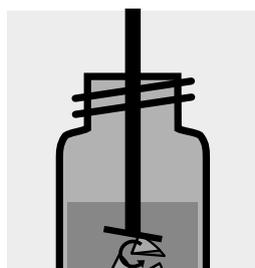
Fold the loaded filter and tear into small pieces.



Place the pieces of the filter in an extraction vessel (**protected from light**).



Add 2 - 3 ml of **extracting agent**.



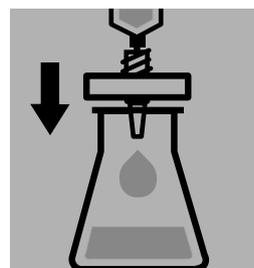
Disintegrate the filter in the homogenizer.



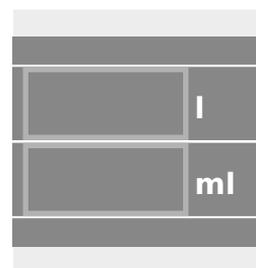
Make up to 10 ml with **extracting agent**.



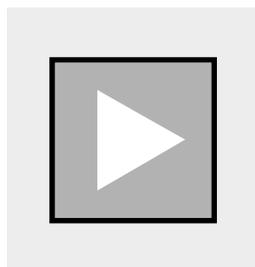
Allow to stand at +4 °C for 0.25 - 24 hours for the extraction to take place.



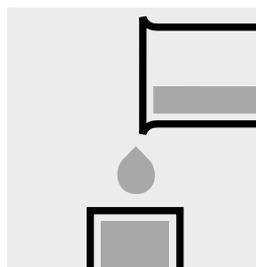
Filter the extract **protected from light** through a suitable filter.



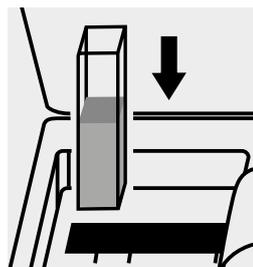
Select method no. **2507**. Enter the volumes of the original sample in liters and extract in milliliters (here: 10 ml).



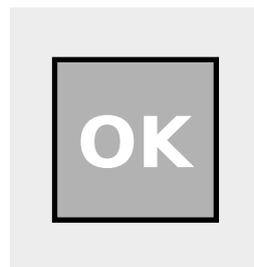
Tap the <Start> button.



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Tap the <OK> button.



Confirm with <OK>. The chlorophyll-a, chlorophyll-b, and chlorophyll-c contents are shown in the display in mg/m<sup>3</sup>.

### Important:

The exact procedure and the composition and preparation of the extraction agent 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](http://www.analytical-test-kits.com).

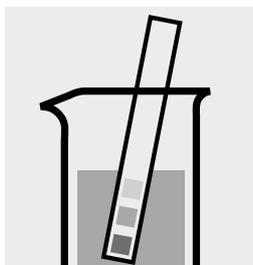
# Chromate

114552

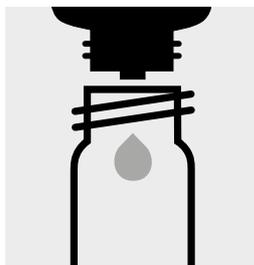
## Determination of chromium(VI)

Cell Test

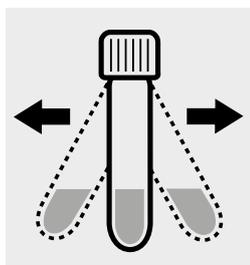
<b>Measuring</b>	0.05 – 2.00 mg/l Cr
<b>range:</b>	0.11 – 4.46 mg/l CrO <sub>4</sub>
	Expression of results also possible in mmol/l.



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.



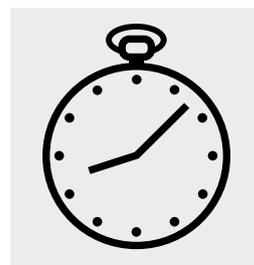
Add 6 drops of **Cr-3K** into a reaction cell, close with the screw cap.



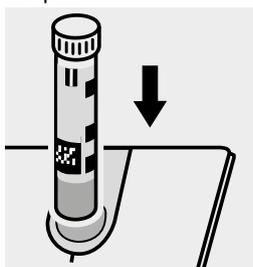
Shake the cell vigorously to dissolve the solid substance and leave to stand for **1 minute**.



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-to-use chromate standard solution Certipur®, Cat.No. 119780, concentration 1000 mg/l CrO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 133013.

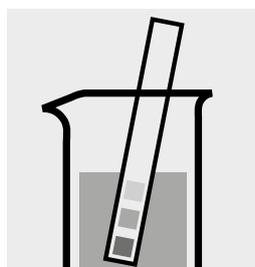
# Chromate

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

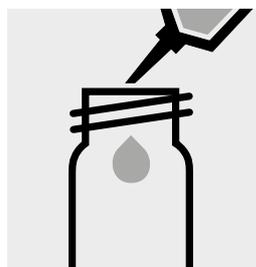
114552

Cell Test

<b>Measuring</b>	0.05 – 2.00 mg/l Cr
<b>range:</b>	0.11 – 4.46 mg/l CrO <sub>4</sub>
	Expression of results also possible in mmol/l.



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



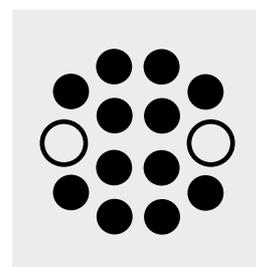
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



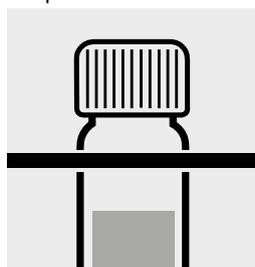
Add 1 drop of **Cr-1K**, close with the screw cap, and mix.



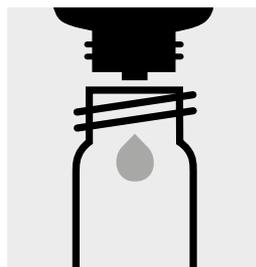
Add 1 dose of **Cr-2K** using the blue dose-metering cap, close the reaction cell with the screw cap.



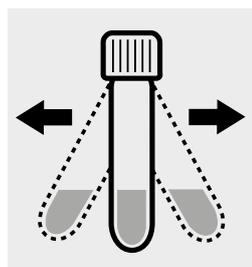
Heat the cell in the thermoreactor at 120 °C for 1 hour.



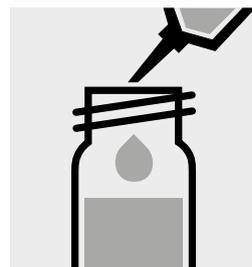
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.



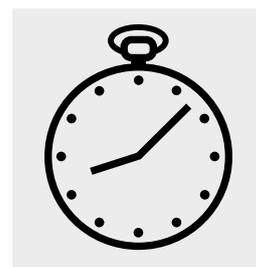
Add 6 drops of **Cr-3K** into a reaction cell, close the cell with the screw cap.



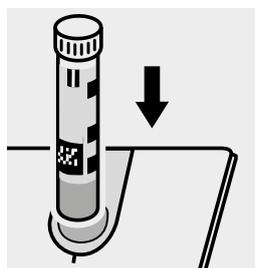
Shake the cell vigorously to dissolve the solid substance and leave to stand for **1 minute**.



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.

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use chromate standard solution Certipur®, Cat.No. 119780, concentration 1000 mg/l CrO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 133013.

# Chromate

114552

Differentiation between chromium(VI) and chromium(III)

Cell Test

**Measuring** 0.05 – 2.00 mg/l Cr

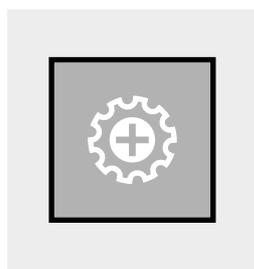
**range:** 0.11 – 4.46 mg/l CrO<sub>4</sub>

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

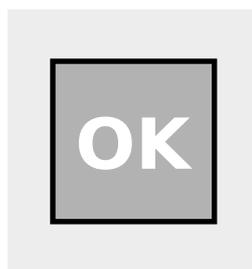
**Note:** If no differentiation is to be measured, the “Differentiation” mode must be deactivated again.



Select method no. **39**.



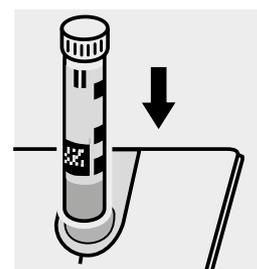
Tap the <Settings> button. Select “Differentiation” and activate.



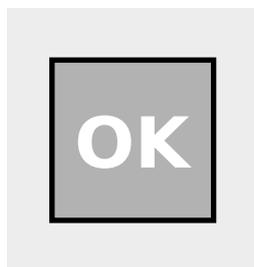
Confirm with <OK>.

Perform determination of **total chromium** (see analytical procedure “Determination of total chromium” with 114552). = **cell A**

After the reaction time has expired:



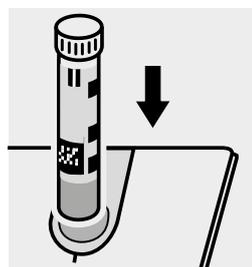
Place the **cell A** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>.

Perform determination of **chromium(VI)** (see analytical procedure “Determination of chromium(VI)” with 114552). = **cell B**

After the reaction time has expired:



Place the **cell B** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>. The results A ( $\Sigma$  Cr), B (Cr(VI)), and C (Cr(III)) are shown in the display in mg/l.

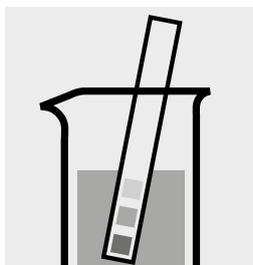
# Chromate

114758

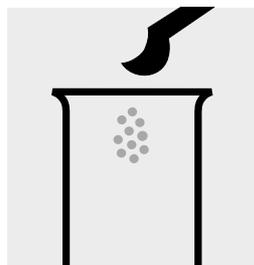
## Determination of chromium(VI)

Test

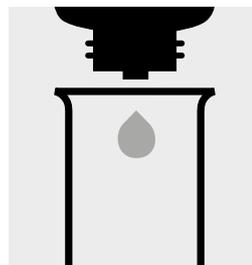
<b>Measuring range:</b>	0.05 – 3.00 mg/l Cr	0.11 – 6.69 mg/l CrO <sub>4</sub>	10-mm cell
	0.03 – 1.50 mg/l Cr	0.07 – 3.35 mg/l CrO <sub>4</sub>	20-mm cell
	0.010 – 0.600 mg/l Cr	0.02 – 1.34 mg/l CrO <sub>4</sub>	50-mm cell
Expression of results also possible in mmol/l.			



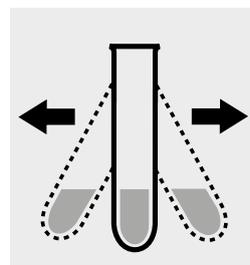
Check the pH of the sample, specified range: pH 1 – 9.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



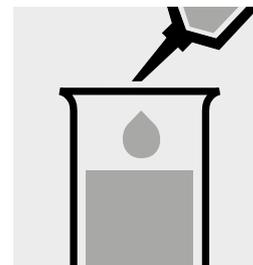
Place 1 level grey micro-spoon of **Cr-1** into a dry test tube.



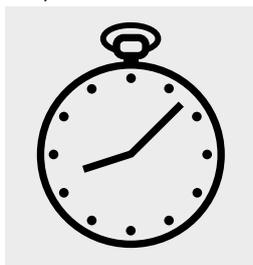
Add 6 drops of **Cr-2**.



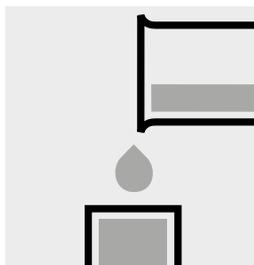
Shake the test tube vigorously to dissolve the solid substance.



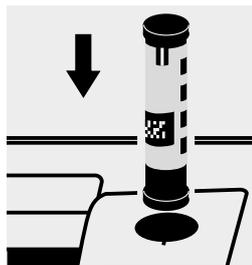
Add 5.0 ml of the sample with pipette and mix.



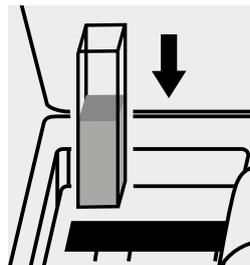
Reaction time:  
1 minute



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 ( $\Sigma$  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.

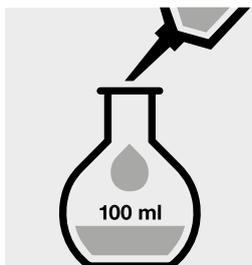
### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use chromate standard solution Certipur<sup>®</sup>, Cat.No. 119780, concentration 1000 mg/l CrO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 133012 and 133013.

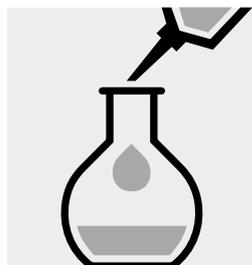
# Chromium in electroplating baths

## Inherent color

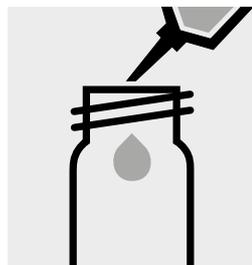
<b>Measuring range:</b>	20 – 400 g/l CrO <sub>3</sub>	10-mm cell
	10 – 200 g/l CrO <sub>3</sub>	20-mm cell
	4.0 – 80.0 g/l CrO <sub>3</sub>	50-mm cell



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).



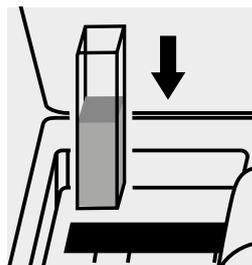
Add 5.0 ml of **sulfuric acid 40 %**, close the cell with the screw cap, and mix.



Transfer the solution into a corresponding cell.



Select method no. 20.



Place the cell into the cell compartment. The measurement is performed automatically.

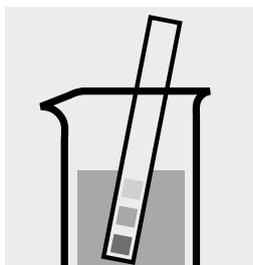
# Cobalt

117244

Cell Test

**Measuring** 0.05 – 2.00 mg/l Co

**range:** Expression of results also possible in mmol/l.



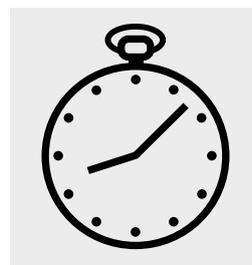
Check the pH of the sample, specified range: pH 2.5 – 7.5. If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



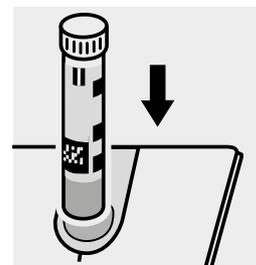
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



Reaction time:  
10 minutes



Place the cell into the 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-to-use cobalt standard solution Certipur<sup>®</sup>, Cat.No. 119785, concentration 1000 mg/l Co, can be used after diluting accordingly.

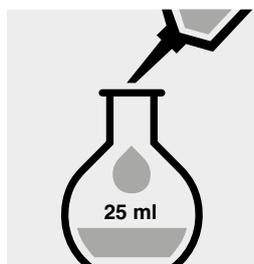
# Cobalt in water

Application

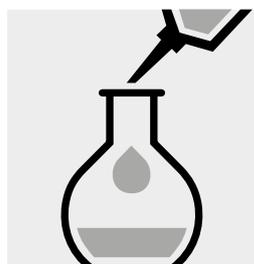
**Measuring range:** 0.5 – 10.0 mg/l Co

10-mm cell

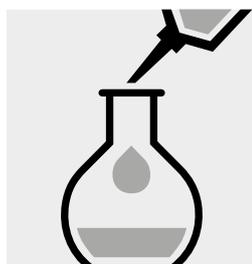
**Attention!** The measurement is carried out at 495 nm in a 10-mm rectangular cell against a blank, prepared from distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) and the reagents in an analogous manner.



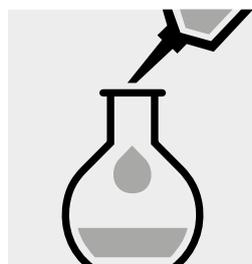
Pipette 4.0 ml of the sample into a 25-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.



Add 0.25 ml of **reagent 1** with pipette.



Add 2.0 ml of **reagent 2** with pipette.



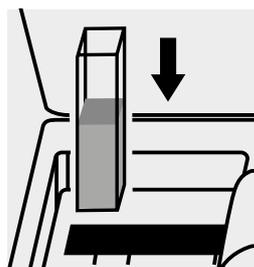
Add 1.0 ml of **reagent 3** with pipette, fill to the mark with distilled water, and mix thoroughly.



Transfer the solution into a cell.



Select method no. **305**.



Place the cell into the cell compartment. The measurement is performed automatically.

## 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](http://www.analytical-test-kits.com).

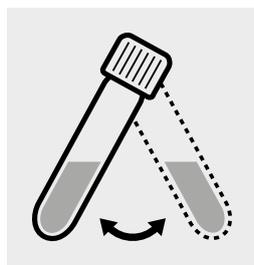
# COD

## Chemical Oxygen Demand

114560

Cell Test

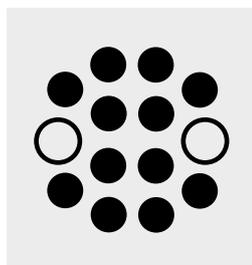
<b>Measuring</b>	4.0 – 40.0 mg/l COD or O <sub>2</sub>
<b>range:</b>	Expression of results also possible in mmol/l.



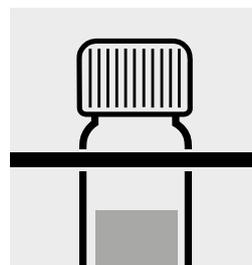
Suspend the bottom sediment in the cell by swirling.



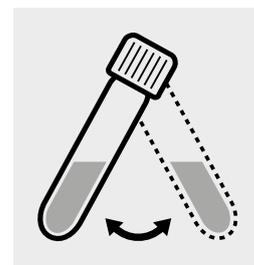
**Carefully** pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



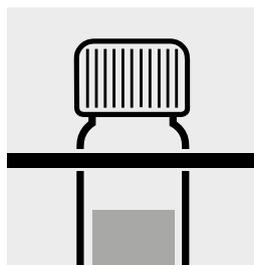
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



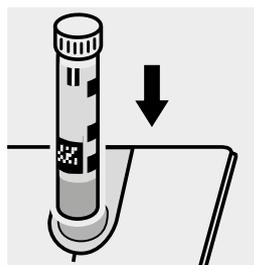
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

### Note:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50, 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.

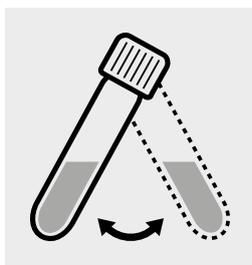
# COD

## Chemical Oxygen Demand

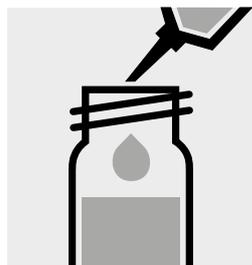
101796

Cell Test

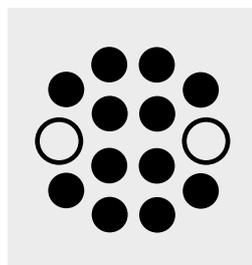
<b>Measuring</b>	5.0 – 80.0 mg/l COD or O <sub>2</sub>
<b>range:</b>	Expression of results also possible in mmol/l.



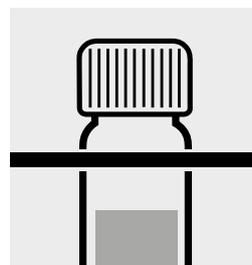
Suspend the bottom sediment in the cell by swirling.



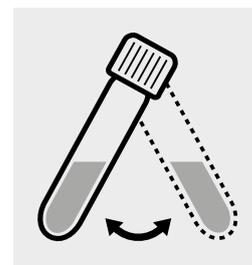
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



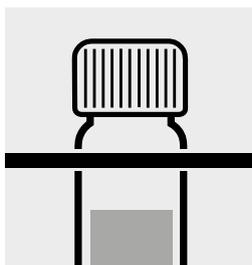
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



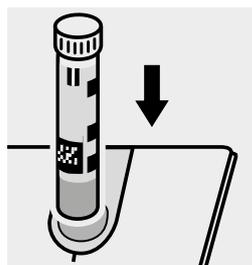
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

### Note:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 50, 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

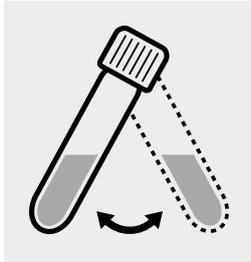
## Chemical Oxygen Demand

114540

Cell Test

**Measuring** 10 – 150 mg/l COD or O<sub>2</sub>

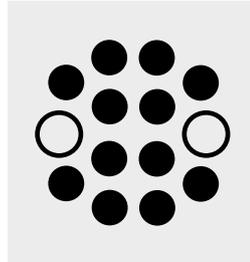
**range:** Expression of results also possible in mmol/l.



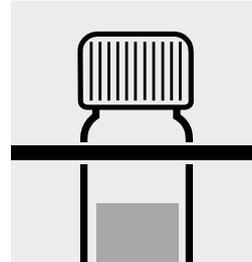
Suspend the bottom sediment in the cell by swirling.



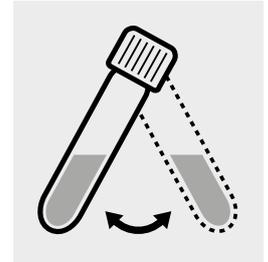
**Carefully** pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



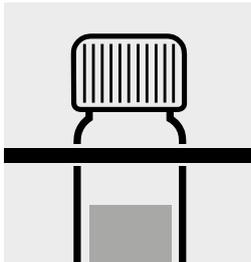
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



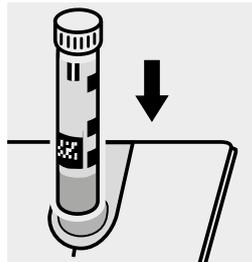
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

### Note:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 10, 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

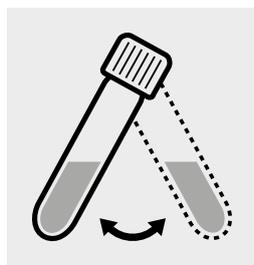
## Chemical Oxygen Demand

114895

Cell Test

**Measuring** 15 – 300 mg/l COD or O<sub>2</sub>

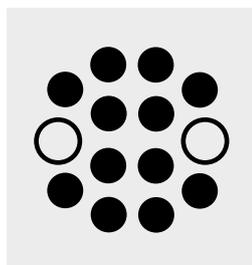
**range:** Expression of results also possible in mmol/l.



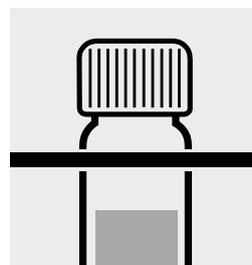
Suspend the bottom sediment in the cell by swirling.



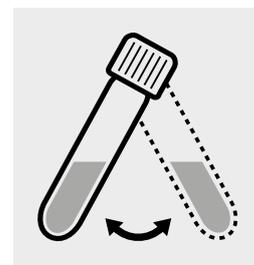
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



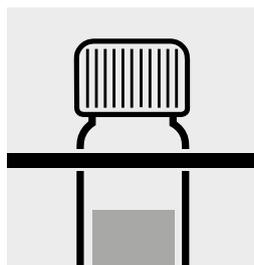
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



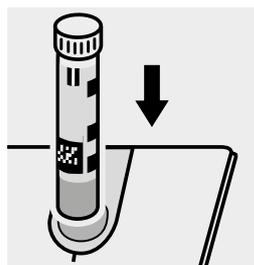
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

### Note:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 60, Cat.No. 114696, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125029 and 125030.

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

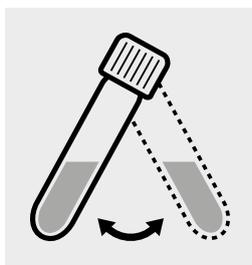
# COD

## Chemical Oxygen Demand

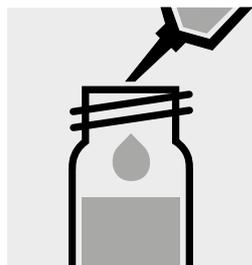
114690

Cell Test

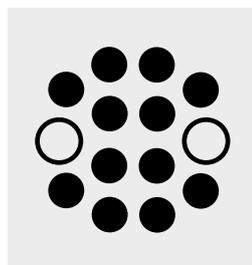
<b>Measuring</b>	50 – 500 mg/l COD or O <sub>2</sub>
<b>range:</b>	Expression of results also possible in mmol/l.



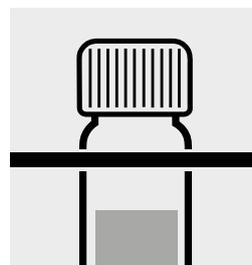
Suspend the bottom sediment in the cell by swirling.



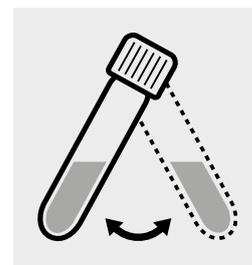
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



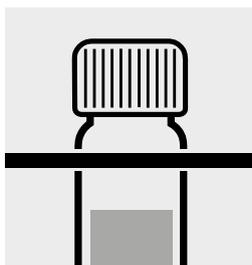
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



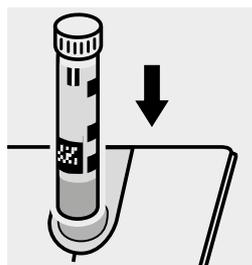
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

### Note:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 60, Cat.No. 114696, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125029, 125030, and 125031.

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

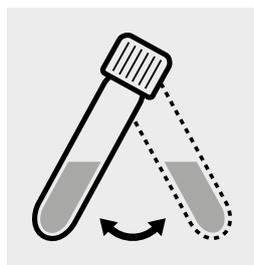
# COD

## Chemical Oxygen Demand

114541

Cell Test

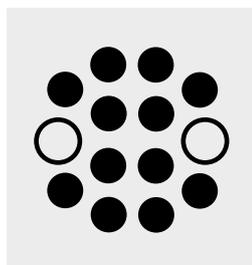
<b>Measuring</b>	25 – 1500 mg/l COD or O <sub>2</sub>
<b>range:</b>	Expression of results also possible in mmol/l.



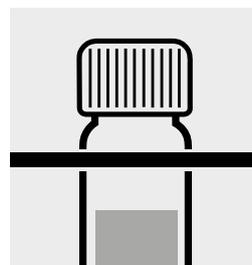
Suspend the bottom sediment in the cell by swirling.



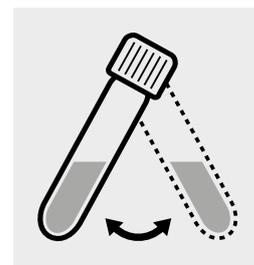
**Carefully** pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



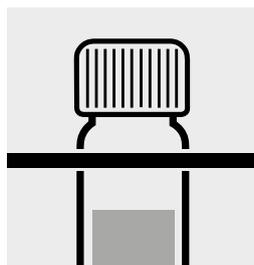
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



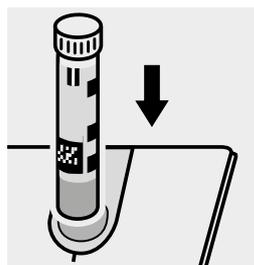
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

### Note:

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

### Quality assurance:

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

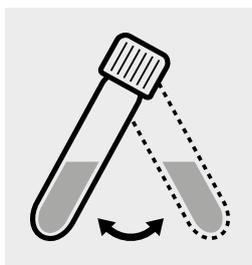
## Chemical Oxygen Demand

114691

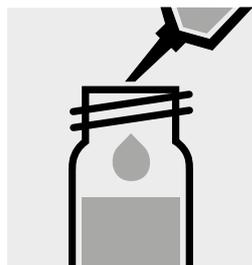
Cell Test

**Measuring** 300 – 3500 mg/l COD or O<sub>2</sub>

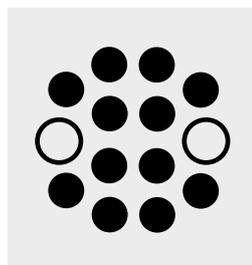
**range:** Expression of results also possible in mmol/l.



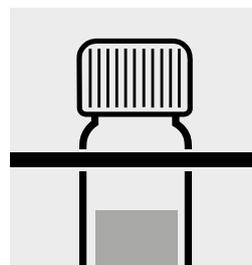
Suspend the bottom sediment in the cell by swirling.



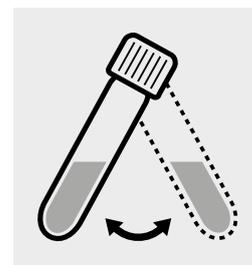
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



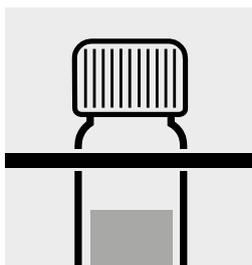
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



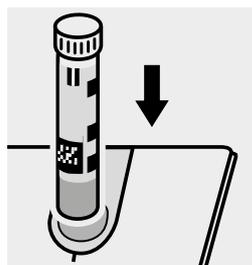
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

### Note:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 80, Cat.No. 114738, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125031, 125032, and 125033.

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

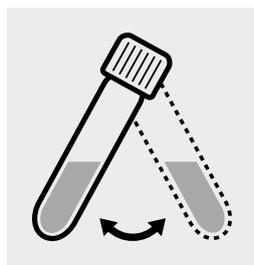
# COD

## Chemical Oxygen Demand

114555

Cell Test

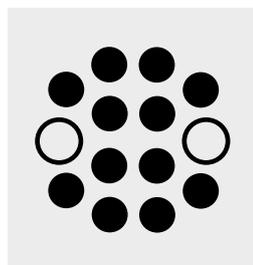
<b>Measuring</b>	500 – 10000 mg/l COD or O <sub>2</sub>
<b>range:</b>	Expression of results also possible in mmol/l.



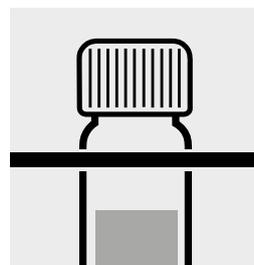
Suspend the bottom sediment in the cell by swirling.



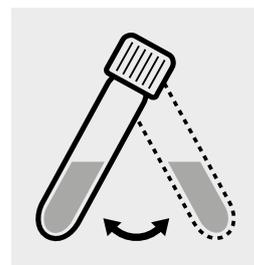
**Carefully** pipette 1.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



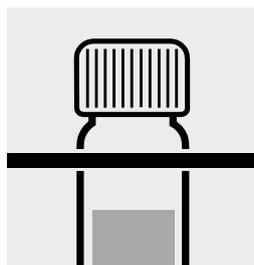
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



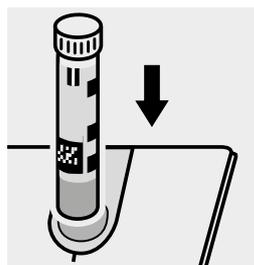
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

### Note:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 70, Cat.No. 114689, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125032, 125033, and 125034.

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

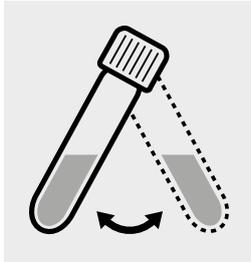
# COD

## Chemical Oxygen Demand

101797

Cell Test

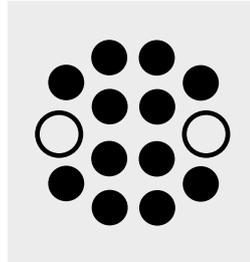
<b>Measuring</b>	5000 – 90000 mg/l COD or O <sub>2</sub>
<b>range:</b>	Expression of results also possible in mmol/l.



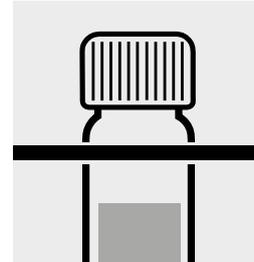
Suspend the bottom sediment in the cell by swirling.



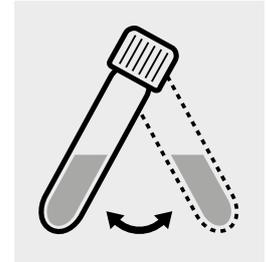
**Carefully** pipette 0.10 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



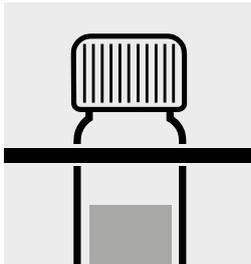
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



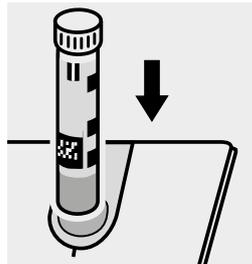
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

### Note:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use the Standard solutions for photometric applications, CRM, Cat.Nos. 125034 and 125035.

# COD (Hg-free)

Chemical Oxygen Demand

109772

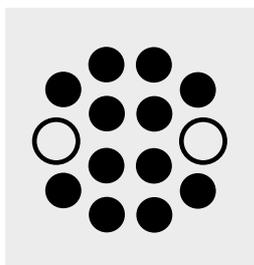
Cell Test

**Measuring** 10 – 150 mg/l COD or O<sub>2</sub>

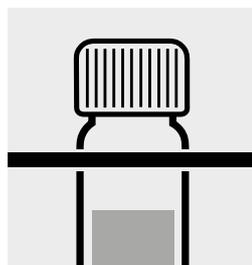
**range:** Expression of results also possible in mmol/l.



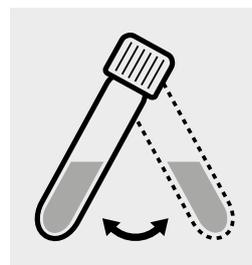
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



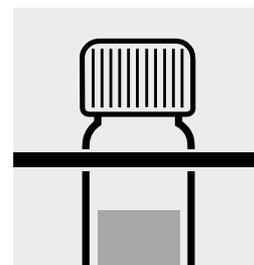
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



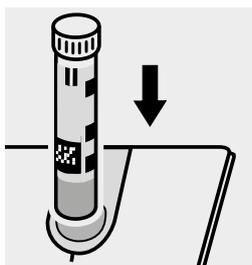
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

## Note:

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

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use the Standard solutions for photometric applications, CRM, Cat.Nos. 125028 and 125029.

# COD (Hg-free)

Chemical Oxygen Demand

109773

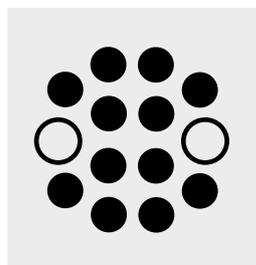
Cell Test

**Measuring** 100 – 1500 mg/l COD or O<sub>2</sub>

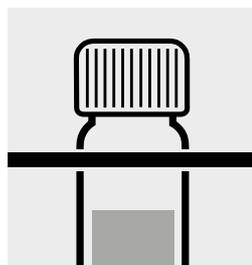
**range:** Expression of results also possible in mmol/l.



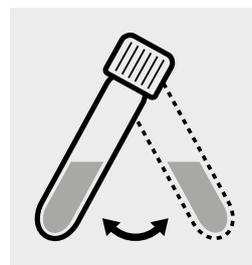
**Carefully** pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



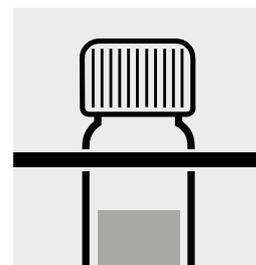
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



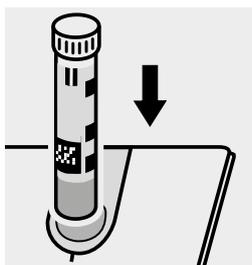
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



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.

## Note:

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

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use the Standard solutions for photometric applications, CRM, Cat.Nos. 125029, 125030, 125031, and 125032.

# COD

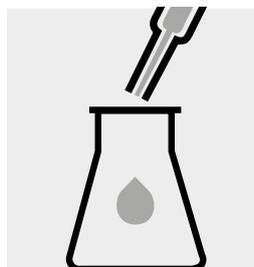
## Chemical Oxygen Demand for seawater / high chloride contents

117058

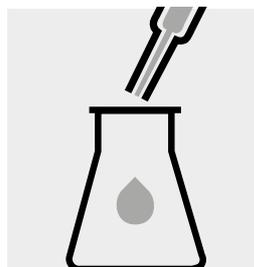
Cell Test

<b>Measuring</b>	5.0 – 60.0 mg/l COD or O <sub>2</sub>
<b>range:</b>	Expression of results also possible in mmol/l.

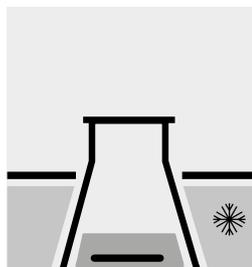
### Chloride depletion:



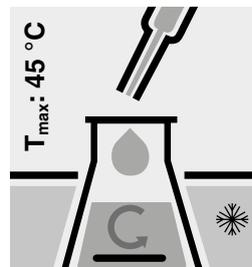
Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



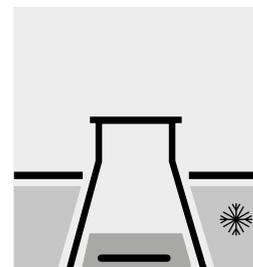
Pipette with glass pipette 20 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.



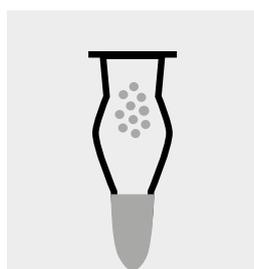
Add to each a magnetic stirring rod, and cool in the ice bath.



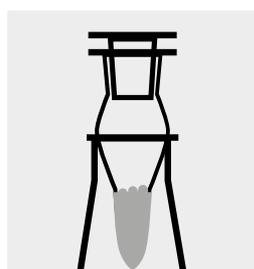
Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.



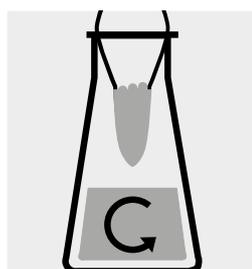
Cool both Erlenmeyer flasks to room temperature in the ice bath.



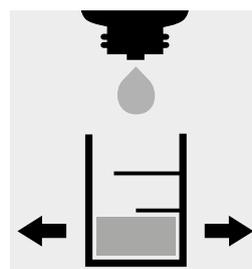
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



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<sup>-</sup>.

### 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**

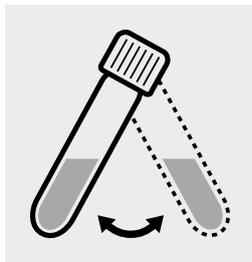
# COD

Chemical Oxygen Demand  
for seawater / high chloride contents

117058

Cell Test

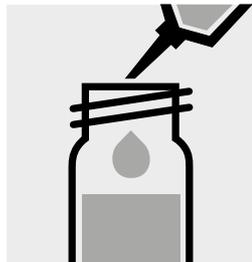
## Determination:



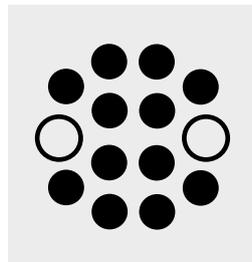
Suspend the bottom sediment in two cells by swirling.



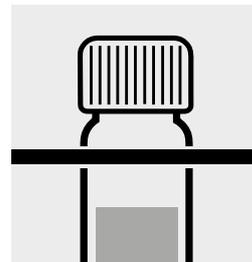
Carefully pipette 5.0 ml of the **depleted sample** into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



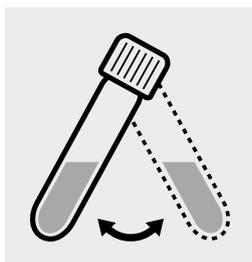
Carefully pipette 5.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**  
(Blank cell)



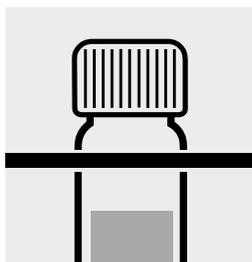
Heat both cells in the thermoreactor at 148 °C for 2 hours.



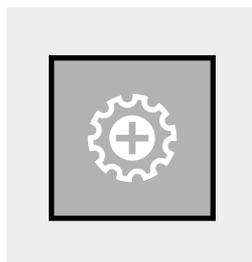
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



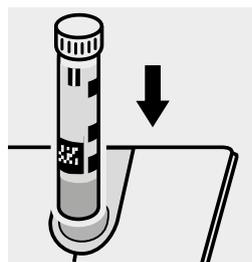
Swirl both cells after 10 minutes.



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



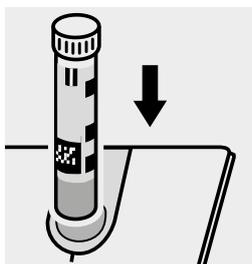
Tap the <Settings> button. Select "Reagent blank".



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



Select "User RB". Confirm with <OK>.



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. 106406 (see section "Standard solutions").

# COD

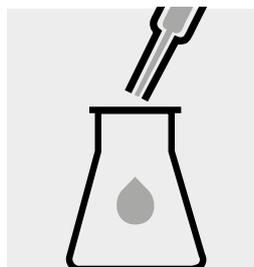
## Chemical Oxygen Demand for seawater / high chloride contents

117059

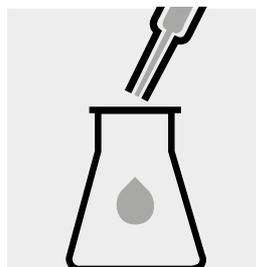
Cell Test

<b>Measuring</b>	50 – 3000 mg/l COD or O <sub>2</sub>
<b>range:</b>	Expression of results also possible in mmol/l.

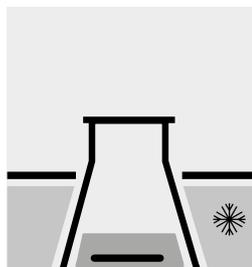
### Chloride depletion:



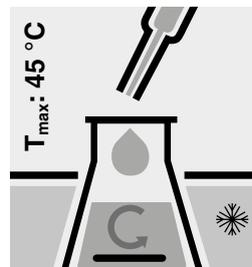
Pipette with glass pipette 20 ml of the sample into a 300-ml Erlenmeyer flask with NS 29/32.



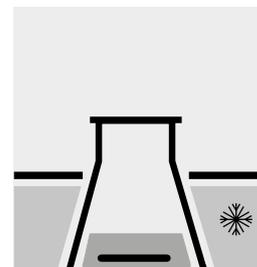
Pipette with glass pipette 20 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a second 300-ml Erlenmeyer flask with NS 29/32.



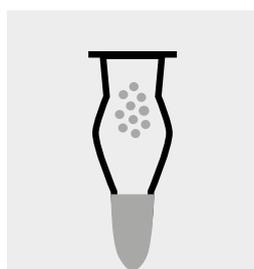
Add to each a magnetic stirring rod, and cool in the ice bath.



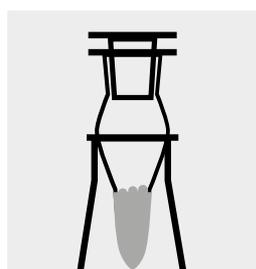
Add **slowly** to each Erlenmeyer flask 25 ml of **Sulfuric acid for the determination of COD** (Cat. No. 117048) with glass pipette **under cooling and stirring**.



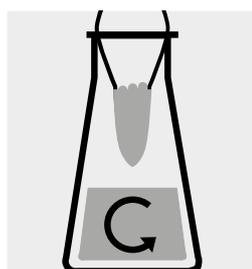
Cool both Erlenmeyer flasks to room temperature in the ice bath.



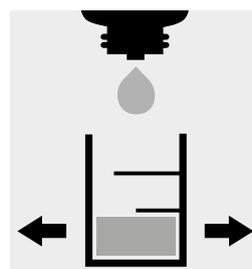
Fill 6 - 7 g each of **Sodalime with indicator** (Cat. No. 106733) into two absorption tubes (Cat. No. 115955).



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 <250 mg/l Cl<sup>-</sup>.

### 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**

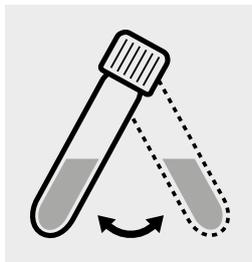
# COD

Chemical Oxygen Demand  
for seawater / high chloride contents

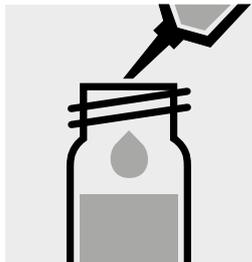
117059

Cell Test

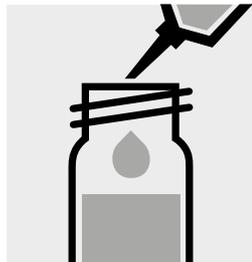
## Determination:



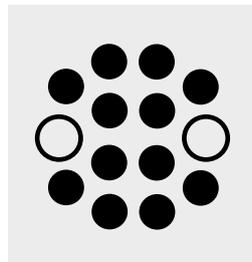
Suspend the bottom sediment in two cells by swirling.



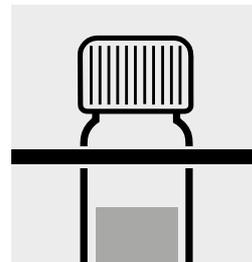
Carefully pipette 3.0 ml of the **depleted sample** into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



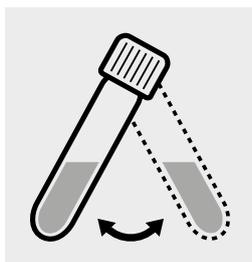
Carefully pipette 3.0 ml of the **depleted blank** into a second reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**  
(Blank cell)



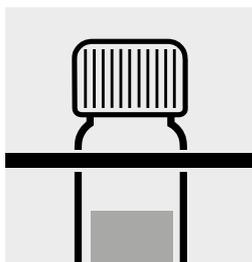
Heat both cells in the thermoreactor at 148 °C for 2 hours.



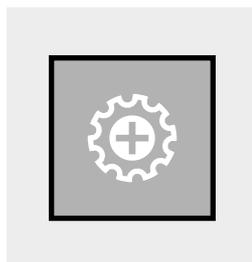
Remove both cells from the thermoreactor and place in a test-tube rack to cool.



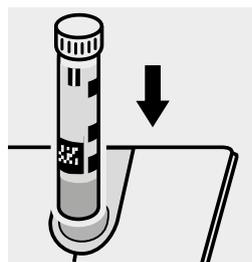
Swirl both cells after 10 minutes.



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



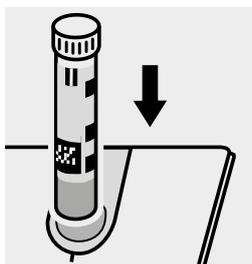
Tap the <Settings> button. Select "Reagent blank".



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



Select "User RB". Confirm with <OK>.



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

## Quality assurance:

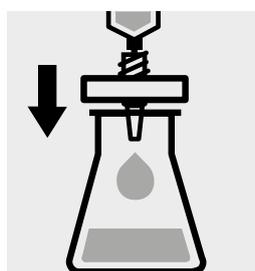
To check the measurement system (test reagents, measurement device, and handling) a COD/chloride standard solution must be prepared from Potassium hydrogen phthalate, Cat.No. 102400 and Sodium chloride, Cat.No. 106406 (see section "Standard solutions").

# Color

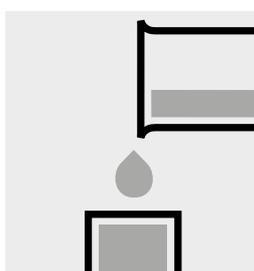
## (Spectral Absorption Coefficient)

analogous to **EN ISO 7887**

<b>Measuring range:</b>	1 – 250 m <sup>-1</sup>	436 nm	10-mm cell	Method No. 015 α(436)
	0.3 – 125.0 m <sup>-1</sup>	436 nm	20-mm cell	Method No. 015 α(436)
	0.1 – 50.0 m <sup>-1</sup>	436 nm	50-mm cell	Method No. 015 α(436)
	1 – 250 m <sup>-1</sup>	525 nm	10-mm cell	Method No. 061 α(525)
	0.3 – 125.0 m <sup>-1</sup>	525 nm	20-mm cell	Method No. 061 α(525)
	0.1 – 50.0 m <sup>-1</sup>	525 nm	50-mm cell	Method No. 061 α(525)
	1 – 250 m <sup>-1</sup>	620 nm	10-mm cell	Method No. 078 α(620)
	0.3 – 125.0 m <sup>-1</sup>	620 nm	20-mm cell	Method No. 078 α(620)
	0.1 – 50.0 m <sup>-1</sup>	620 nm	50-mm cell	Method No. 078 α(620)



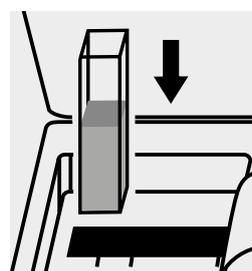
Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into a corresponding cell.



Select method no. **15**, **61**, or **78**.



Place the cell into the cell compartment. The measurement is performed automatically.

### Notes:

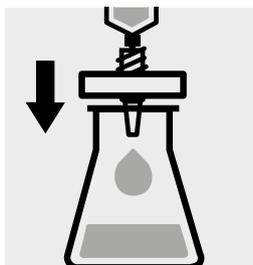
Filtered sample = true color.

Unfiltered sample = apparent color.

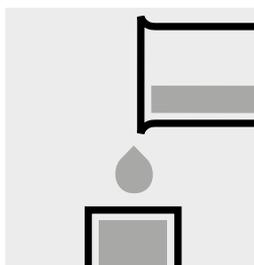
# Color

(True Color - 410 nm)  
analogous to **EN ISO 7887**

<b>Measuring range:</b>	10 – 2500 mg/l Pt	10 – 2500 mg/l Pt/Co	10 – 2500 CU	10-mm cell
	5 – 1250 mg/l Pt	5 – 1250 mg/l Pt/Co	5 – 1250 CU	20-mm cell
	2 – 500 mg/l Pt	2 – 500 mg/l Pt/Co	2 – 500 CU	50-mm cell



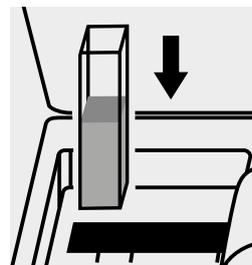
Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into a corresponding cell.



Select method no. **303**.

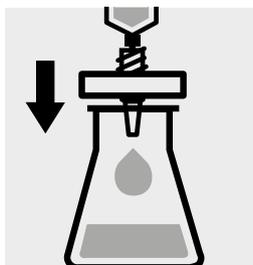


Place the cell into the cell compartment. The measurement is performed automatically.

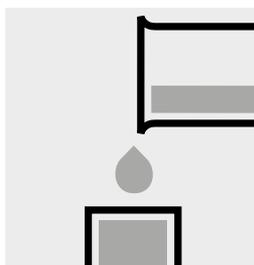
# Color Hazen (Platinum-Cobalt Standard Method)

analogous to **DIN EN ISO 6271-2**

<b>Measuring range:</b>	1 – 500 mg/l Pt/Co	1 – 500 mg/l Pt	1 – 500 Hazen	1 – 500 CU	340 nm	10-mm cell
	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



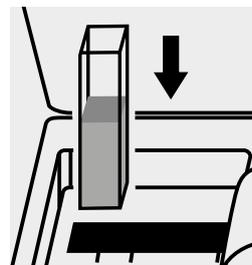
Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into a corresponding cell.



Select method no. **32**.



Place the cell into the cell compartment. The measurement is performed automatically.

#### Notes:

Filtered sample = true color.

Unfiltered sample =

apparent color.

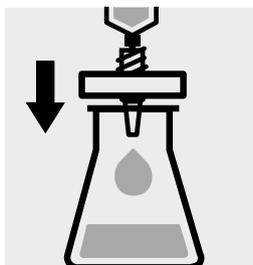
#### Quality assurance:

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

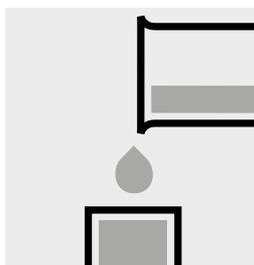
# Color Hazen (Platinum-Cobalt Standard Method)

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

<b>Measuring range:</b>	1–1000 mg/l Pt/Co	1–1000 mg/l Pt	1–1000 Hazen	1–1000 CU	445 nm	50-mm cell	Method No. 179*
	1–1000 mg/l Pt/Co	1–1000 mg/l Pt	1–1000 Hazen	1–1000 CU	455 nm	50-mm cell	Method No. 180
	1–1000 mg/l Pt/Co	1–1000 mg/l Pt	1–1000 Hazen	1–1000 CU	465 nm	50-mm cell	Method No. 181
* not analogous to APHA 2120C							



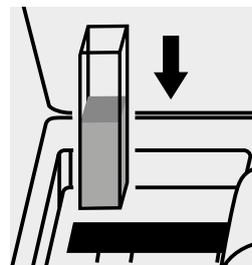
Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into the cell.



Select method no. **179**, **180**, or **181**.



Place the cell into the cell compartment. The measurement is performed automatically.

#### Notes:

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

#### Quality assurance:

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

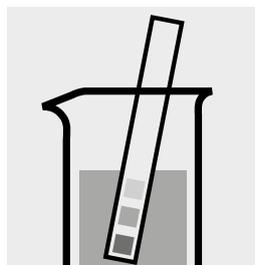
# Copper

114553

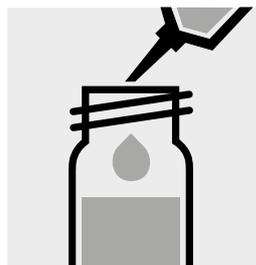
Cell Test

**Measuring** 0.05 – 8.00 mg/l Cu

**range:** Expression of results also possible in mmol/l.



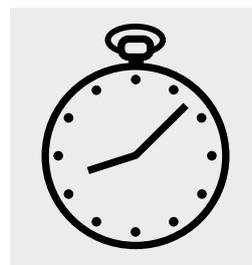
Check the pH of the sample, specified range: pH 4 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



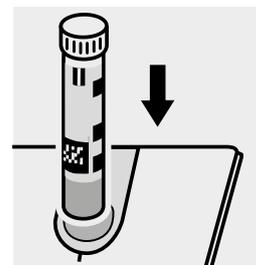
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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 ( $\Sigma$  Cu).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700.

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

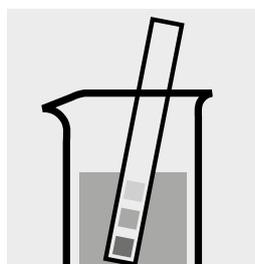
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Copper

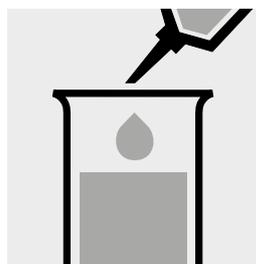
114767

Test

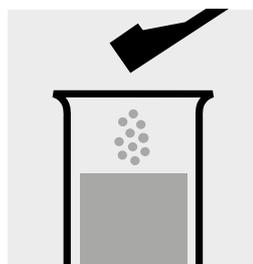
<b>Measuring</b>	0.10 – 6.00 mg/l Cu	10-mm cell
<b>range:</b>	0.05 – 3.00 mg/l Cu	20-mm cell
	0.02 – 1.20 mg/l Cu	50-mm cell
	Expression of results also possible in mmol/l.	



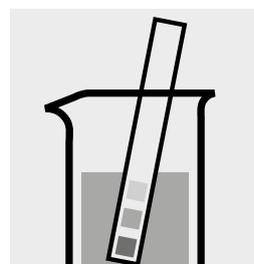
Check the pH of the sample, specified range: pH 4 – 10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



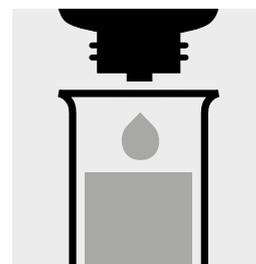
Pipette 5.0 ml of the sample into a test tube.



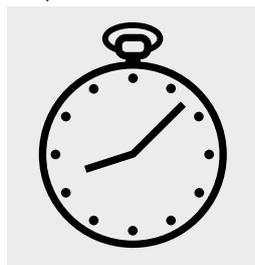
Add 1 green dosing spoon of **Cu-1** and dissolve the solid substance.



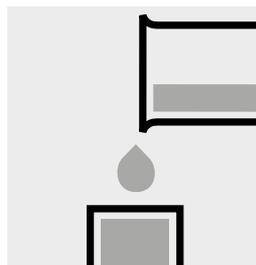
Check the pH, specified range: pH 7.0 – 9.5.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



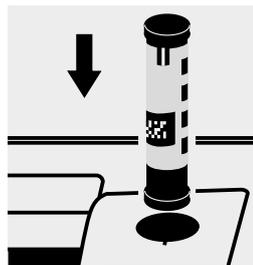
Add 5 drops of **Cu-2** and mix.



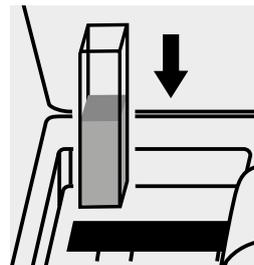
Reaction time:  
5 minutes



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 ( $\Sigma$  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 and 90, Cat.Nos. 114677 and 118700.

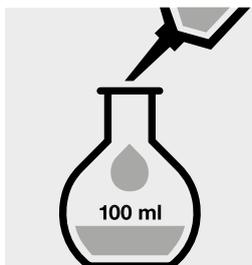
Ready-to-use copper standard solution Certipur®, Cat.No. 119786, concentration 1000 mg/l Cu, can also be used after diluting accordingly.

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

# Copper in electroplating baths

## Inherent color

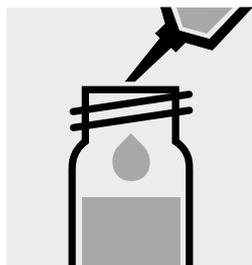
<b>Measuring</b>	10.0 –80.0 g/l Cu	10-mm cell
<b>range:</b>	5.0 – 40.0 g/l Cu	20-mm cell
	2.0 – 16.0 g/l Cu	50-mm cell



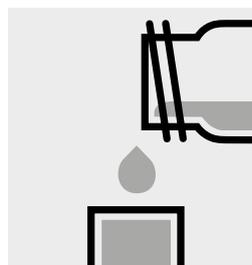
Pipette 25 ml of the sample into a 100-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.



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



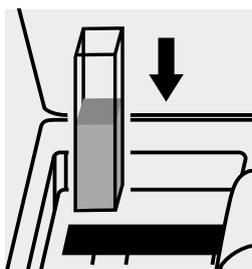
Add 5.0 ml of **sulfuric acid 40 %**, close the cell with the screw cap, and mix.



Transfer the solution into a corresponding cell.



Select method no. **83**.



Place the cell into the cell compartment. The measurement is performed automatically.

# Cyanide

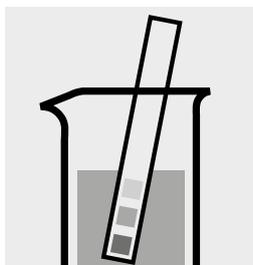
102531

## Determination of free cyanide

Cell Test

**Measuring** 0.010 – 0.500 mg/l CN

**range:** Expression of results also possible in mmol/l and cyanide free [CN(f)].



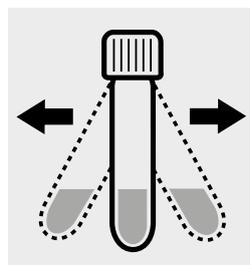
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



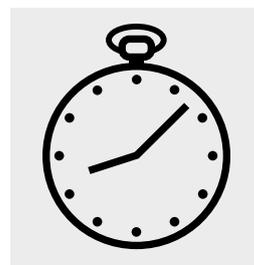
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and dissolve the solid substance.



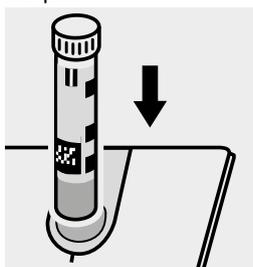
Add 1 level blue microspoon of **CN-1K**, close the cell with the screw cap.



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-to-use cyanide standard solution Certipur<sup>®</sup>, Cat.No. 119533, concentration 1000 mg/l CN<sup>-</sup>, can be used after diluting accordingly.

# Cyanide

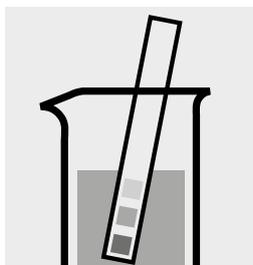
114561

## Determination of free cyanide

Cell Test

**Measuring** 0.010 – 0.500 mg/l CN

**range:** Expression of results also possible in mmol/l and cyanide free [CN(f)].



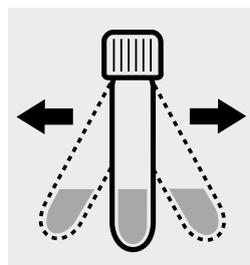
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



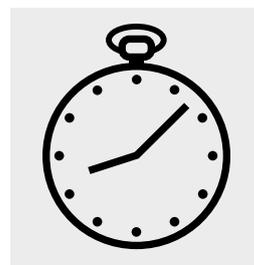
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and dissolve the solid substance.



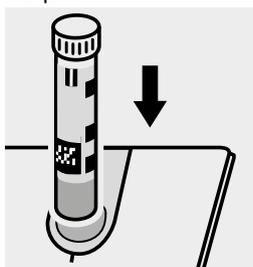
Add 1 level blue micro-spoon of **CN-3K**, close the cell with the screw cap.



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-to-use cyanide standard solution Certipur<sup>®</sup>, Cat.No. 119533, concentration 1000 mg/l CN<sup>-</sup>, can be used after diluting accordingly.

# Cyanide

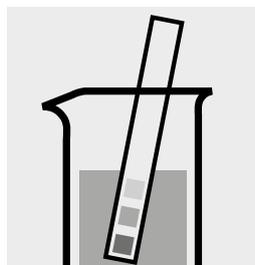
114561

## Determination of readily liberated cyanide

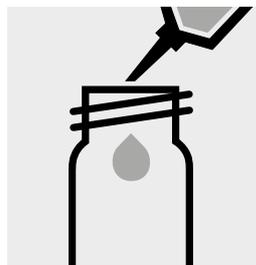
Cell Test

**Measuring** 0.010 – 0.500 mg/l CN

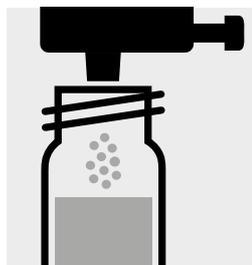
**range:** Expression of results also possible in mmol/l and cyanide readily liberated [CN(v)].



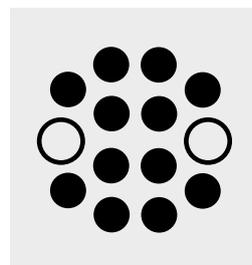
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



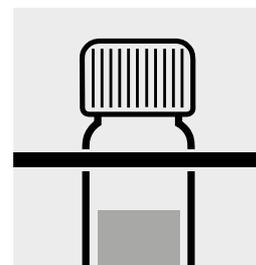
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



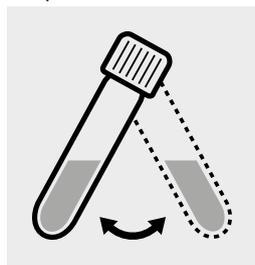
Add 1 dose of **CN-1K** using the green dose-metering cap, close the cell with the screw cap.



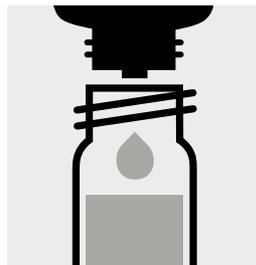
Heat the cell in the thermoreactor at 120 °C for 30 minutes.



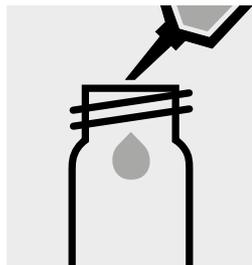
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



Swirl the cell before opening.



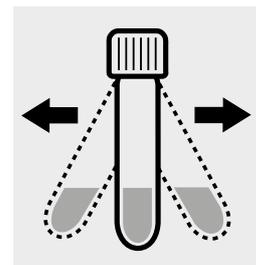
Add 3 drops of **CN-2K**, close with the screw cap, and mix: **pretreated sample**.



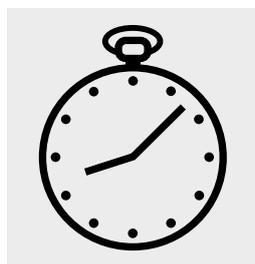
Pipette 5.0 ml of the **pretreated sample** into a reaction cell, close with the screw cap, and dissolve the solid substance.



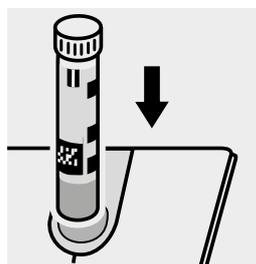
Add 1 level blue micro-spoon of **CN-3K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



Reaction time: 10 minutes



Place the cell into the 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-to-use cyanide standard solution Certipur<sup>®</sup>, Cat.No. 119533, concentration 1000 mg/l CN<sup>-</sup>, can be used after diluting accordingly.

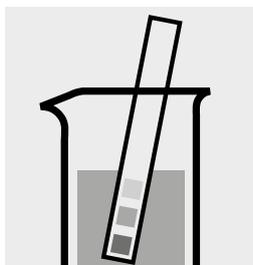
# Cyanide

109701

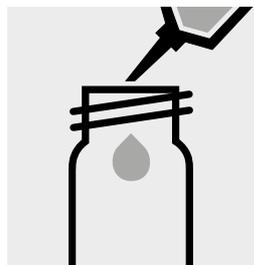
## Determination of free cyanide

Test

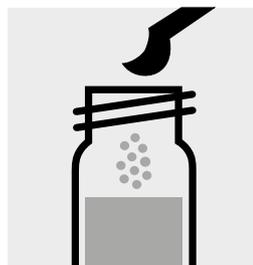
<b>Measuring</b>	0.010 – 0.500 mg/l CN	10-mm cell
<b>range:</b>	0.005 – 0.250 mg/l CN	20-mm cell
	0.0020 – 0.1000 mg/l CN	50-mm cell
Expression of results also possible in mmol/l and cyanide free [CN(f)].		



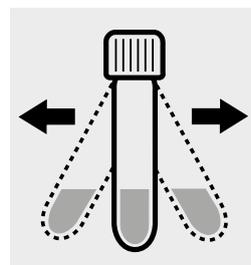
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



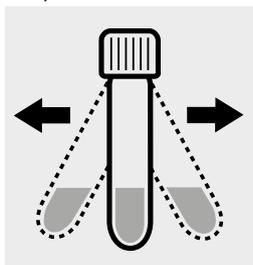
Add 1 level green micro-spoon of **CN-3**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



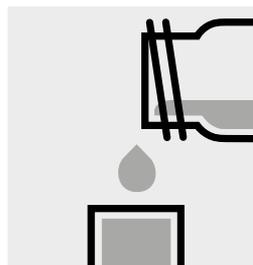
Add 1 level blue micro-spoon of **CN-4**, close the cell with the screw cap.



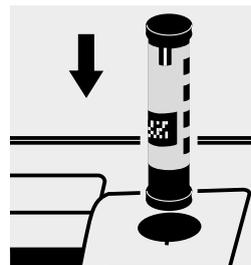
Shake the cell vigorously to dissolve the solid substance.



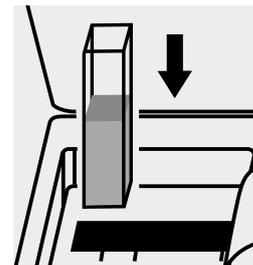
Reaction time: 10 minutes



Transfer the solution into a corresponding rectangular 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.

### Quality assurance:

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

### 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.

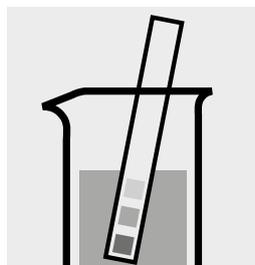
# Cyanide

109701

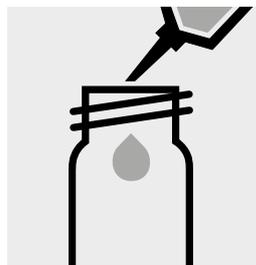
## Determination of readily liberated cyanide

Test

<b>Measuring</b>	0.010 – 0.500 mg/l CN	10-mm cell
<b>range:</b>	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)].		



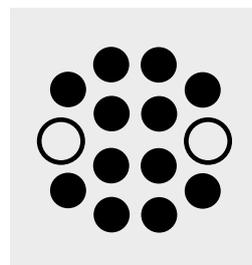
Check the pH of the sample, specified range: pH 4.5 – 8.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



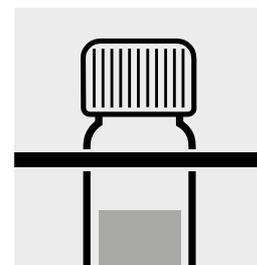
Add 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



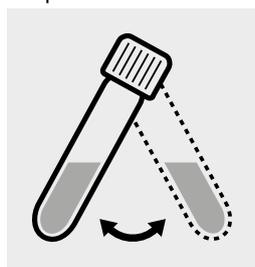
Add 1 dose of **CN-1** using the green dosing cap, close the cell with the screw cap.



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



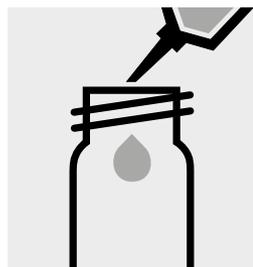
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



Swirl the cell before opening.



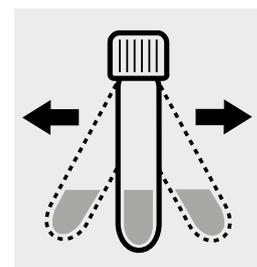
Add 3 drops of **CN-2**, close with the screw cap, and mix: **pretreated sample**.



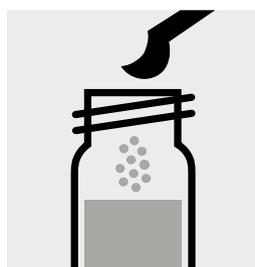
Pipette 5.0 ml of the **pretreated sample** into an empty round cell (Empty cells, Cat.No. 114724).



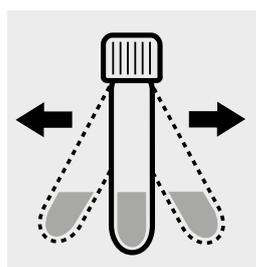
Add 1 level green microspoon of **CN-3**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



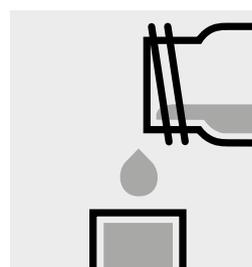
Add 1 level blue microspoon of **CN-4**, close the cell with the screw cap.



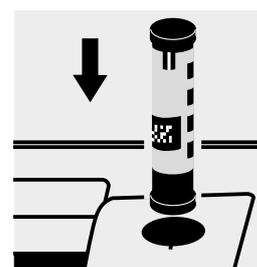
Shake the cell vigorously to dissolve the solid substance.



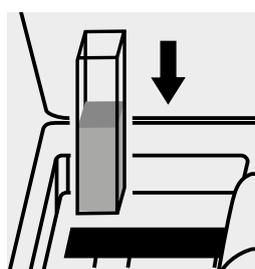
Reaction time: 10 minutes



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 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-to-use cyanide standard solution Certipur®, Cat.No. 119533, concentration 1000 mg/l CN<sup>-</sup>, can be used after diluting accordingly.

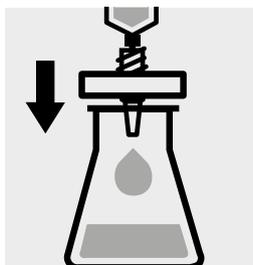
# Cyanuric Acid

119253

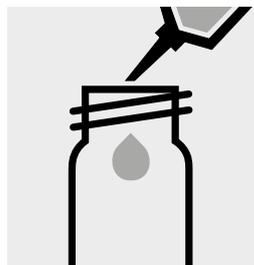
Test

**Measuring** 2 – 160 mg/l cyanuric acid 20-mm cell

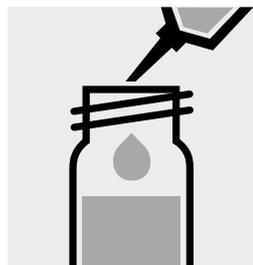
**range:** Expression of results also possible in mmol/l.



Filter turbid samples.



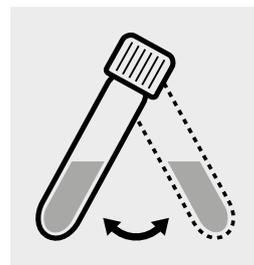
Pipette 5.0 ml of the sample into an empty test tube (e. g. flat-bottomed tubes cells, Cat.No. 114902).



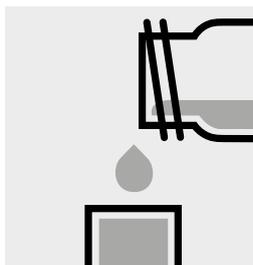
Add **5.0 ml of distilled water** (Water for analysis EMSURE<sup>®</sup>, Cat.No. 116754, is recommended) with pipette, close with the screw cap, and mix.



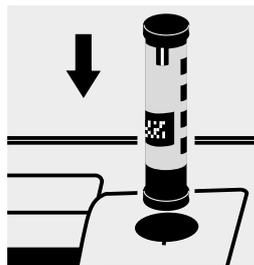
Add 1 **reagent tablet Cyanuric Acid**, crush with stirring rod, and close with the screw cap.



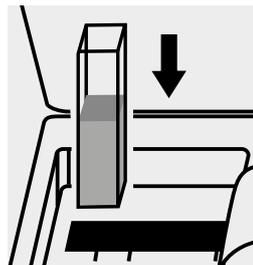
Swirl the cell to dissolve the solid substance.



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").

# $\Delta K_{268}$ nm of olive oil

corresponds to **Commission Regulation (EEC) No 2568/91 Annex IX**

## Application

**Measuring range:** -0.10 – 1.00  $\Delta K_{268}$

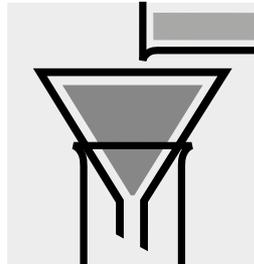
10-mm quartz cell

**Attention!**

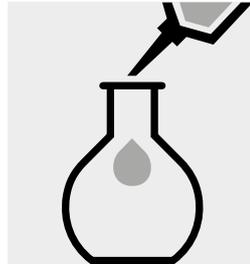
Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from isoctane, is recommended. This zero value remains valid until the method is exited.



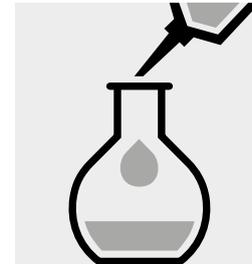
(Melt, if necessary) the sample and homogenize.



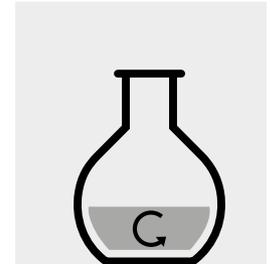
If contaminations are present, filter the sample over a fast filtering paper.



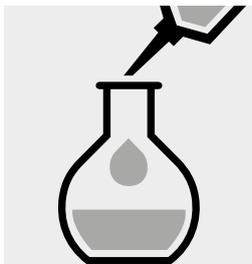
Weigh the sample into a volumetric flask, accurately weighed to 1 mg.



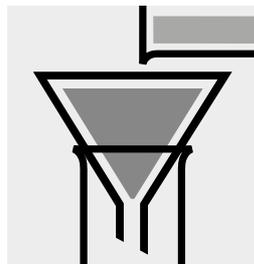
Add a few milliliters of **isooctane for spectroscopy Uvasol®** (Cat. No. 104718).



Dissolve the sample at room temperature.



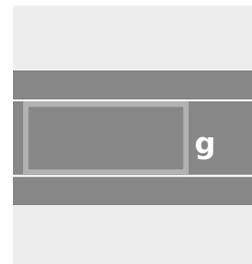
Make up the contents of the volumetric flask to the mark with **isooctane for spectroscopy Uvasol®** (Cat. No. 104718) and mix.



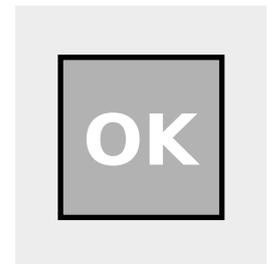
Filter turbid solutions over a paper filter.



Select method no. **2528**. Perform the zero adjustment and confirm by pressing the <OK> button.



Enter the sample weight in grams.



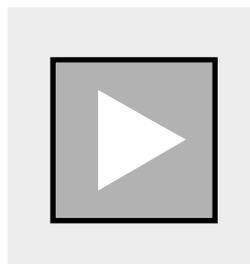
Confirm with <OK>.



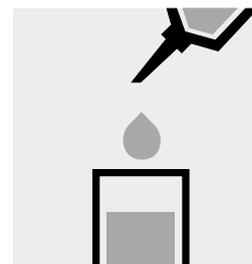
Enter the volume of the sample solution in milliliters.



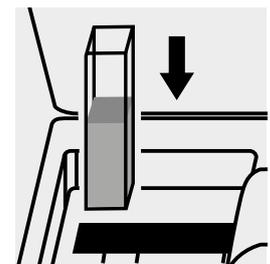
Confirm with <OK>.



Tap the <Start> button.



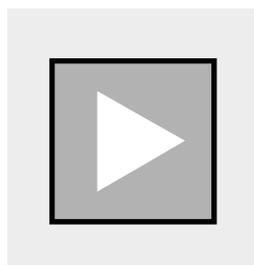
Transfer the solution into the quartz cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The  $\Delta K_{268}$  value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

### Important:

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# $\Delta K_{270}$ nm of olive oil

corresponds to **Commission Regulation (EEC) No 2568/91 Annex IX**

## Application

**Measuring range:** -0.10 – 1.00  $\Delta K_{270}$

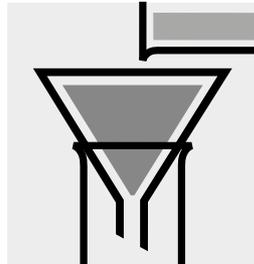
10-mm quartz cell

**Attention!**

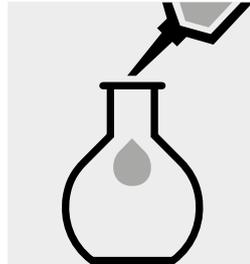
Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from cyclohexane, is recommended. This zero value remains valid until the method is exited.



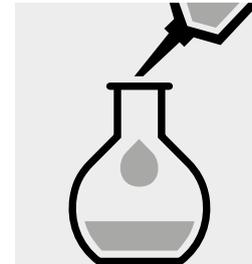
(Melt, if necessary) the sample and homogenize.



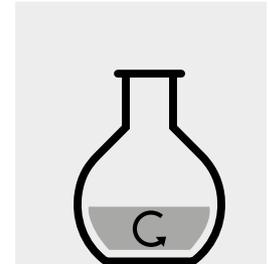
If contaminations are present, filter the sample over a fast filtering paper.



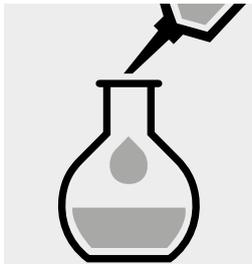
Weigh the sample into a volumetric flask, accurately weighed to 1 mg.



Add a few milliliters of **cyclohexane for spectroscopy Uvasol®** (Cat. No. 102822).



Dissolve the sample at room temperature.



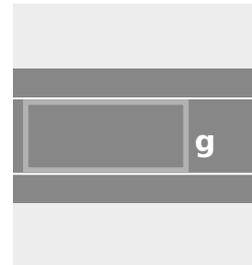
Make up the contents of the volumetric flask to the mark with **cyclohexane for spectroscopy Uvasol®** (Cat. No. 102822) and mix.



Filter turbid solutions over a paper filter.



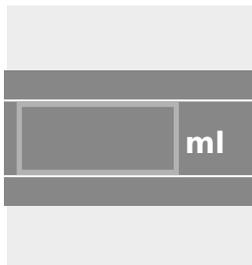
Select method no. **2529**. Perform the zero adjustment and confirm by pressing the <OK> button.



Enter the sample weight in grams.



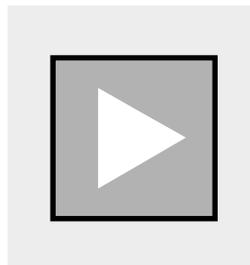
Confirm with <OK>.



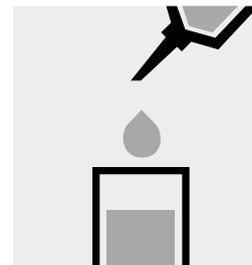
Enter the volume of the sample solution in milliliters.



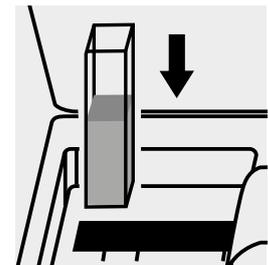
Confirm with <OK>.



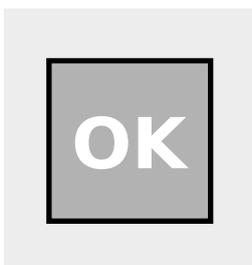
Tap the <Start> button.



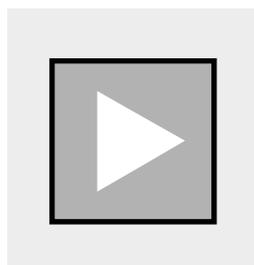
Transfer the solution into the quartz cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The  $\Delta K_{270}$  value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

### Important:

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# DOBI (Deterioration of the bleachability index) of raw palm oil

Application

corresponds to **DIN EN ISO 17932:2011**

**Measuring range:** 0 – 4.00 DOBI

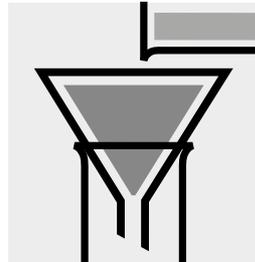
10-mm quartz cell

**Attention!**

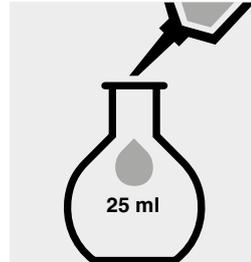
Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from isooctane, is recommended. This zero value remains valid until the method is exited.



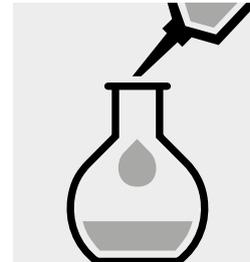
Melt the sample at 60 - 70 °C and homogenize.



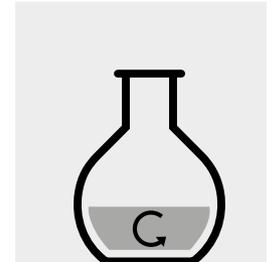
If contaminations are present, filter the sample over a fast filtering paper.



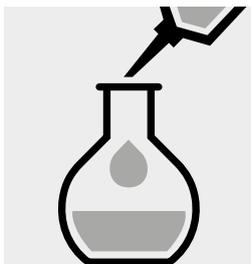
Weigh **between 100 mg to 500 mg of sample** into a 25-ml volumetric flask.



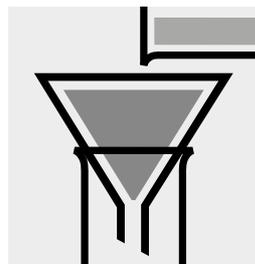
Add a few milliliters of **isooctane for spectroscopy Uvasol®** (Cat. No. 104718).



Dissolve the sample at room temperature.



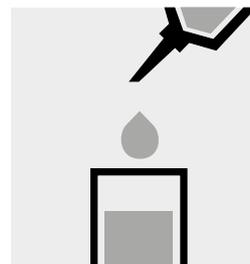
Make up the contents of the volumetric flask to the mark with **isooctane for spectroscopy Uvasol®** (Cat. No. 104718) and mix.



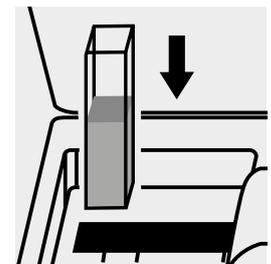
Filter turbid solutions over a paper filter.



Select method no. **2524**. Perform the zero adjustment and confirm by pressing the <OK> button.



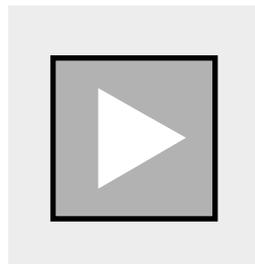
Transfer the solution into the quartz cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The DOBI value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

**Important:**

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

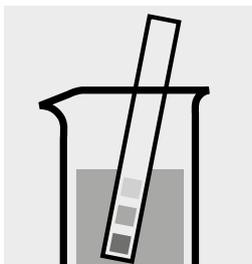
# Fluoride

100809

Cell Test

<b>Measuring</b>	0.10 – 1.80 mg/l F	Round cell
<b>range:</b>	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



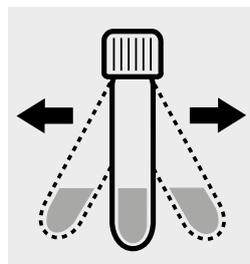
Check the pH of the sample, specified range: pH 3 – 8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



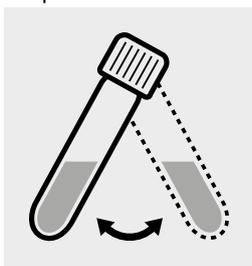
Add 1 level blue micro-spoon of **F-1K**, close the cell with the screw cap.



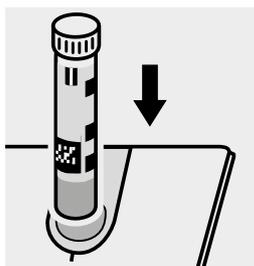
Shake the cell vigorously to dissolve the solid substance.



Reaction time: 15 minutes



Swirl the cell before measurement.



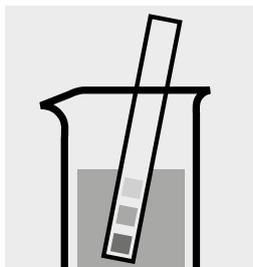
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

# Fluoride

100809

Cell Test

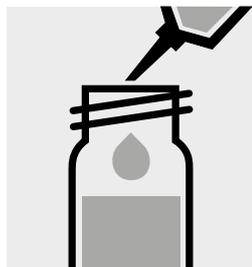
Measuring range: 0.025 – 0.500 mg/l F



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



Select method no. 216.



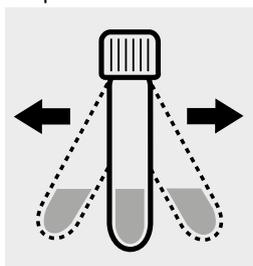
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



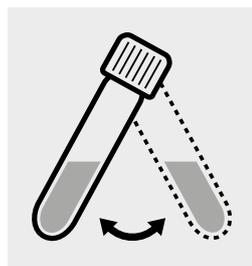
Add 1 level blue micro-spoon of F-1K to each cell, close with the screw cap.



Shake both cells vigorously to dissolve the solid substance.



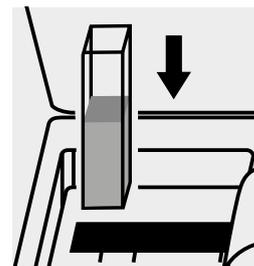
Reaction time: 15 minutes



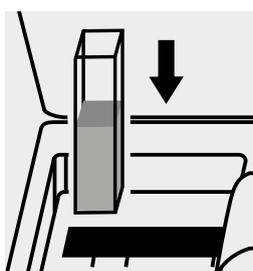
Swirl the cells.



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-to-use fluoride standard solution Certipur<sup>®</sup>, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235, and 132236.

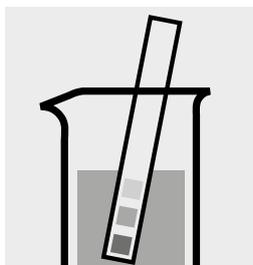
# Fluoride

117243

Cell Test

**Measuring** 0.10 – 2.50 mg/l F

**range:** Expression of results also possible in mmol/l.



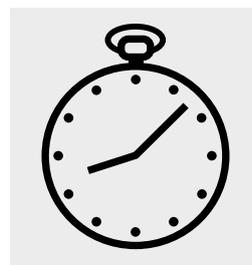
Check the pH of the sample, specified range: pH 2 – 12. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



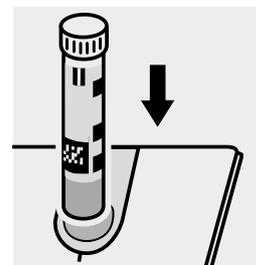
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



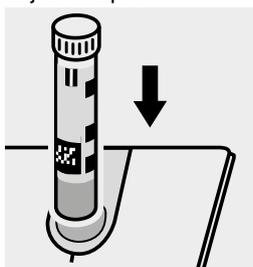
Pipette 5.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a second reaction cell, close with the screw cap, and mix. (Blank)



Reaction time: 1 minute



Place the blank cell into the 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) ready-to-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235, and 132236.

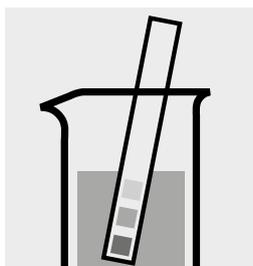
# Fluoride

114598

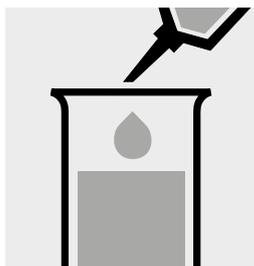
Test

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.	

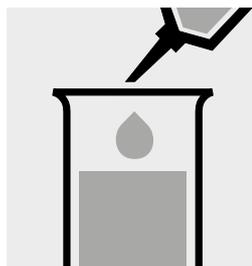
## Measuring range: 0.10 – 2.00 mg/l F



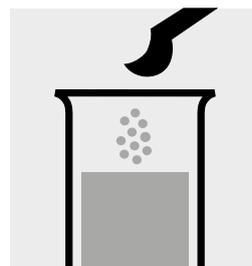
Check the pH of the sample, specified range: pH 3 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



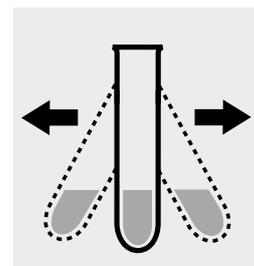
Pipette 2.0 ml of F-1 into a test tube.



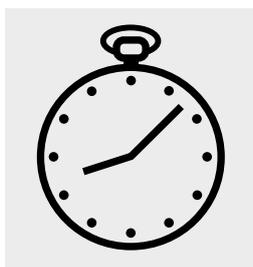
Add 5.0 ml of the sample with pipette and mix.



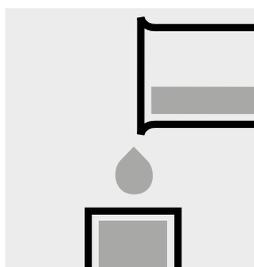
Add 1 level microspoon of F-2 and mix.



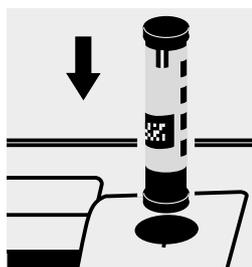
Shake the test tube vigorously to dissolve the solid substance.



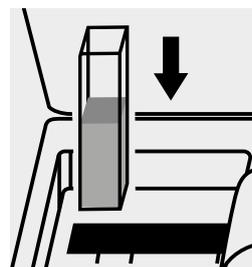
Reaction time:  
5 minutes



Transfer the solution into a cell.



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



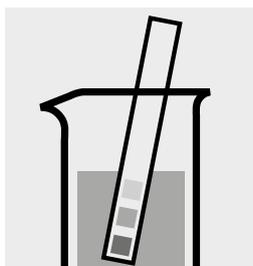
Place the cell into the cell compartment.

# Fluoride

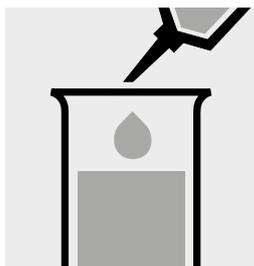
114598

Test

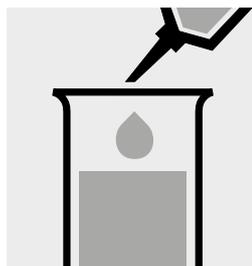
Measuring range: 1.0 – 20.0 mg/l F



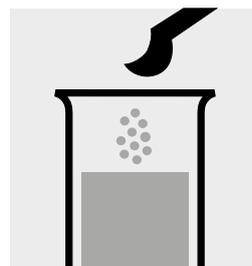
Check the pH of the sample, specified range: pH 3 – 8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



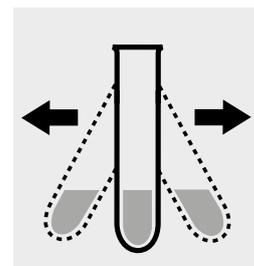
Pipette 2.0 ml of F-1 into a test tube.



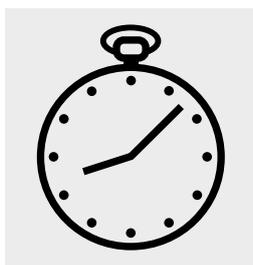
Add 5.0 ml of water and 0.5 ml of the sample with pipette and mix.



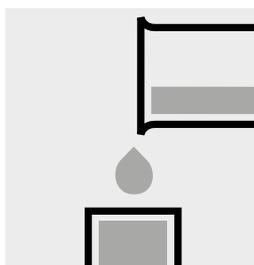
Add 1 level microspoon of F-2 and mix.



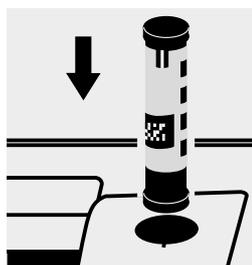
Shake the test tube vigorously to dissolve the solid substance.



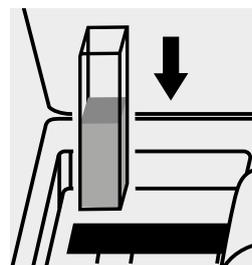
Reaction time: 5 minutes



Transfer the solution into a cell.



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



Place the cell 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-to-use fluoride standard solution Certipur<sup>®</sup>, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235, and 132236.

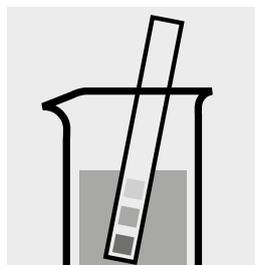
# Fluoride

100822

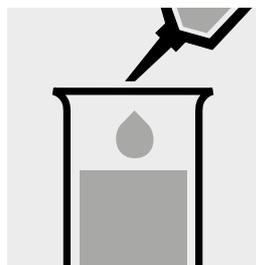
Test

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

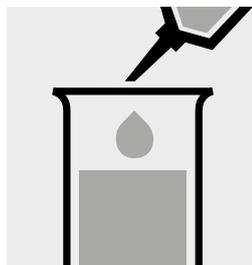
Expression of results also possible in mmol/l.



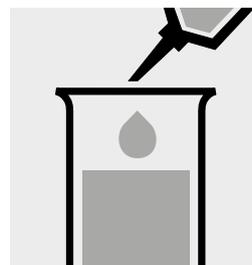
Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.



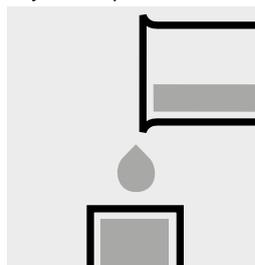
Pipette 5.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a second test tube. (Blank)



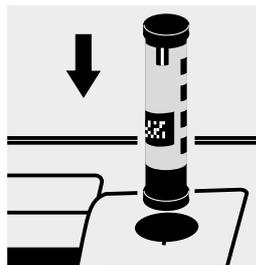
Add to each tube 1.0 ml of F-1 with pipette and mix.



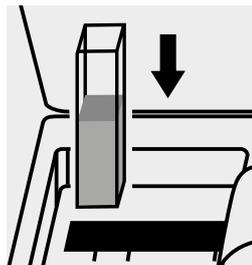
Reaction time: 1 minute



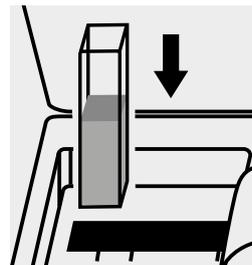
Transfer both solutions into a separate **semi-microcell**.



Select method with AutoSelector.



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**, **Cat. No. 114944**, 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-to-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235, and 132236.

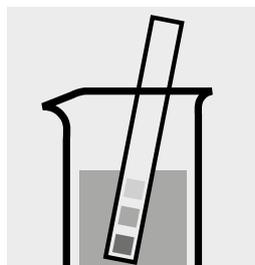
# Fluoride

117236

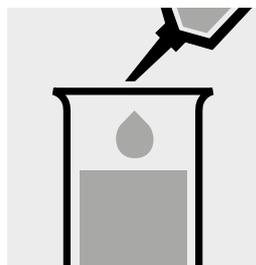
Test

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

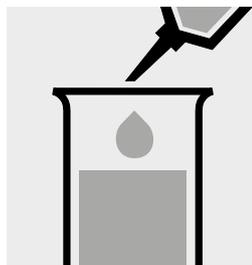
Expression of results also possible in mmol/l.



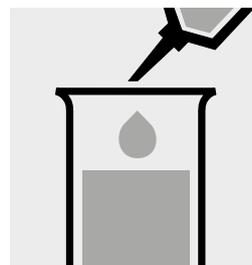
Check the pH of the sample, specified range: pH 2 – 12. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.



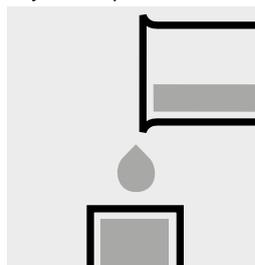
Pipette 5.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a second test tube. (Blank)



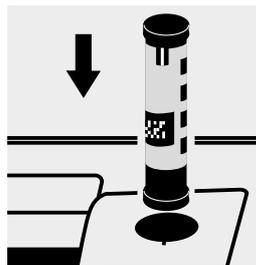
Add to each tube 1.0 ml of F-1 with pipette and mix.



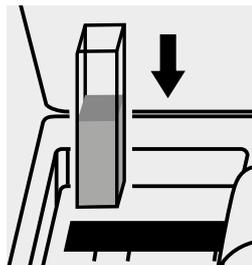
Reaction time: 1 minute



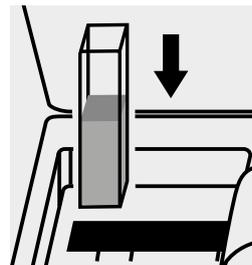
Transfer both solutions into a separate **semi-microcell**.



Select method with AutoSelector.



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**, **Cat. No. 114944**, 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-to-use fluoride standard solution Certipur®, Cat.No. 119814, concentration 1000 mg/l F<sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132233, 132234, 132235, and 132236.

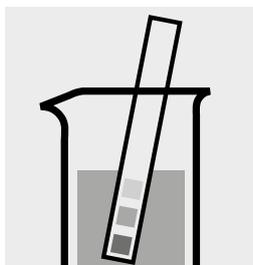
# Formaldehyde

114500

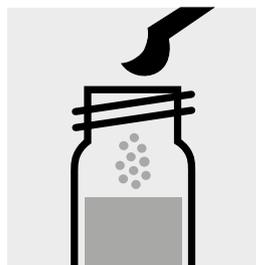
Cell Test

**Measuring** 0.10 – 8.00 mg/l HCHO

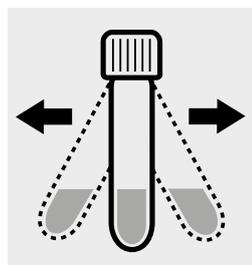
**range:** Expression of results also possible in mmol/l.



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



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



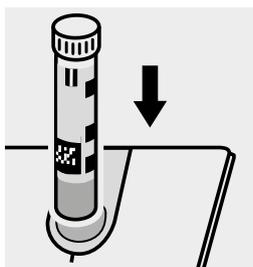
Shake the cell vigorously to dissolve the solid substance.



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



Reaction time: 5 minutes



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

## Quality assurance:

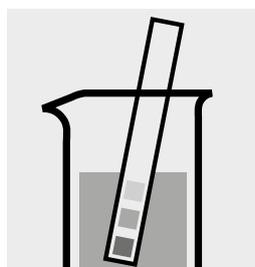
To check the measurement system (test reagents, measurement device, and handling) a formaldehyde standard solution must be prepared from Formaldehyde solution 37%, Cat.No. 104003 (see section "Standard solutions").

# Formaldehyde

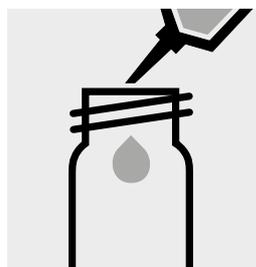
114678

Test

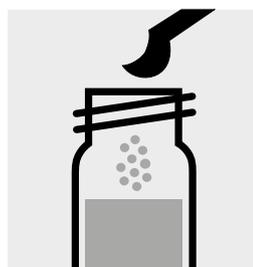
<b>Measuring</b>	0.10 – 8.00 mg/l HCHO	10-mm cell
<b>range:</b>	0.05 – 4.00 mg/l HCHO	20-mm cell
	0.02 – 1.50 mg/l HCHO	50-mm cell
	Expression of results also possible in mmol/l.	



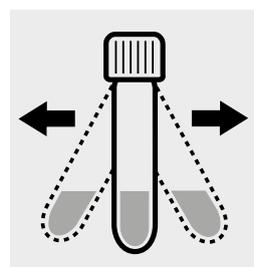
Check the pH of the sample, specified range: pH 0 – 13.



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



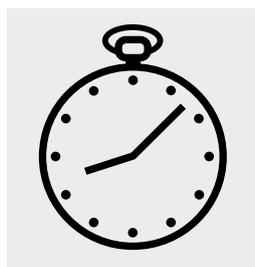
Add 1 level green micro-spoon of **HCHO-2**, close the cell with the screw cap.



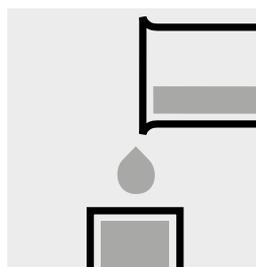
Shake the cell vigorously to dissolve the solid substance.



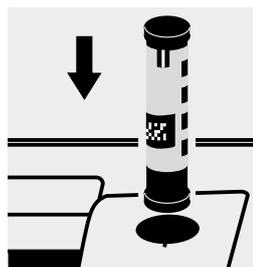
Add 3.0 ml of the sample with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**



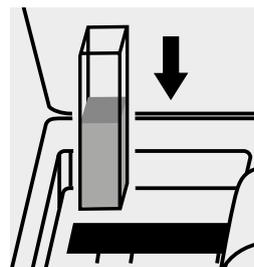
Reaction time: 5 minutes



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").

# Gardner Color Measurement

Application

analogous to **ASTM D6166** and **DIN EN ISO 4630-2**

**Measuring range:** 1.0 – 18.0 Gardner Color 10-mm cell Method No. 2561

**Attention!** Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from distilled water (Water for analysis EMSURE<sup>®</sup>, Cat.No. 116754), is recommended. This zero value remains valid until the method is exited.

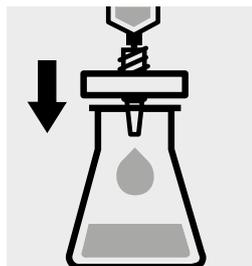
## Preparation:



Contains the sample air or gas bubbles: degassing in ultrasonic bath.



Melt solid samples and homogenize.

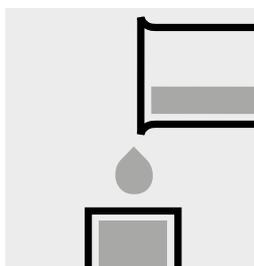


Filter or centrifuge turbid samples.

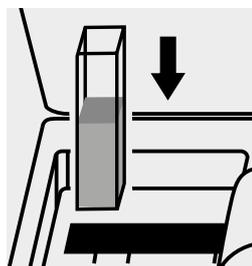
## Determination



Select method no. **2561**. Perform the zero adjustment and confirm by pressing the <OK> button.



Transfer the solution into the cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. Gardner Color is shown in the display.



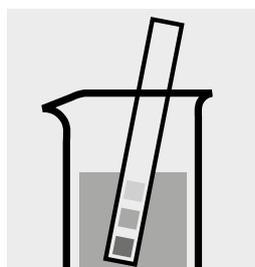
Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

# Gold

114821

Test

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



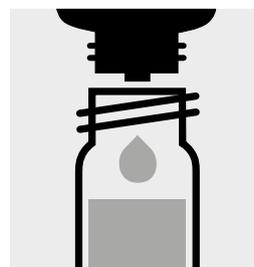
Check the pH of the sample, specified range: pH 1 – 9.  
If required, add dilute hydrochloric acid drop by drop to adjust the pH.



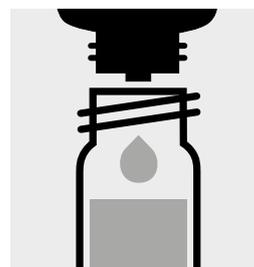
Pipette 2.0 ml of the sample into a test tube with screw cap.



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



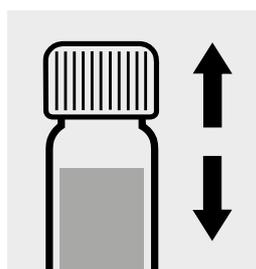
Add 4 drops of **Au-2** and mix.



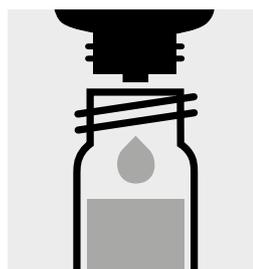
Add 6 drops of **Au-3** and mix.



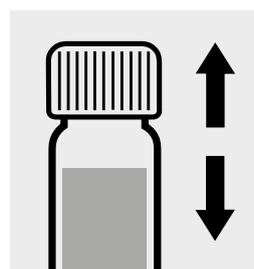
Add 6.0 ml of **Au-4** with pipette, close with the screw cap.



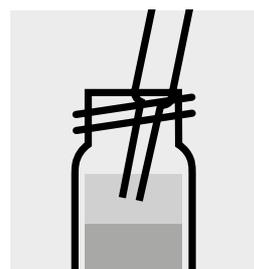
Shake the tube vigorously for 1 minute.



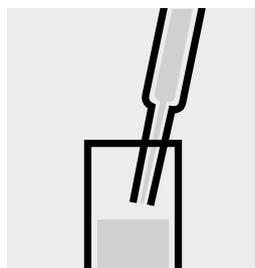
Add 6 drops of **Au-5**, close with the screw cap.



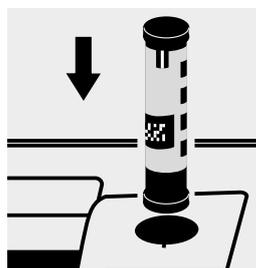
Shake the tube vigorously for 1 minute.



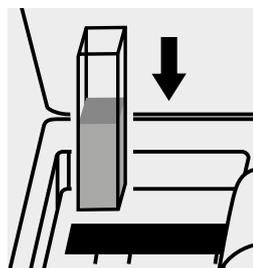
Aspirate the clear upper phase from the tube with pipette.



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

### Quality assurance:

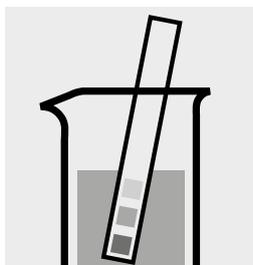
To check the measurement system (test reagents, measurement device, and handling) ready-to-use gold standard solution Certipur®, Cat.No. 170216, concentration 1000 mg/l Au, can be used after diluting accordingly.

# Hydrazine

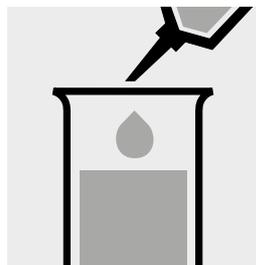
109711

Test

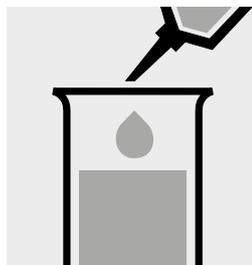
<b>Measuring</b>	0.02 – 2.00 mg/l N <sub>2</sub> H <sub>4</sub>	10-mm cell
<b>range:</b>	0.01 – 1.00 mg/l N <sub>2</sub> H <sub>4</sub>	20-mm cell
	0.005 – 0.400 mg/l N <sub>2</sub> H <sub>4</sub>	50-mm cell
	Expression of results also possible in mmol/l.	



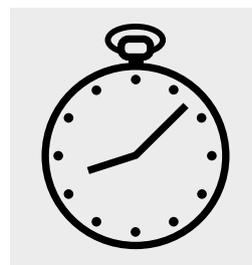
Check the pH of the sample, specified range: pH 2 – 10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



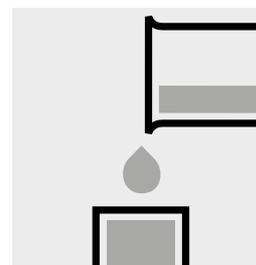
Pipette 5.0 ml of the sample into a test tube.



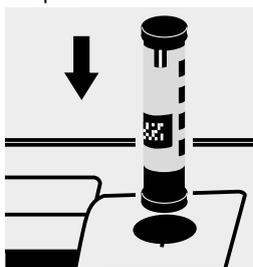
Add 2.0 ml of **Hy-1** with pipette and mix.



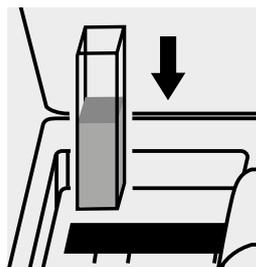
Reaction time: 5 minutes



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").

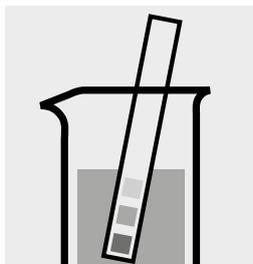
# Hydrogen Peroxide

114731

Cell Test

<b>Measuring</b>	2.0 – 20.0 mg/l H <sub>2</sub> O <sub>2</sub>	Round cell
<b>range:</b>	0.25 – 5.00 mg/l H <sub>2</sub> O <sub>2</sub>	50-mm cell
Expression of results also possible in mmol/l.		

## Measuring range: 2.0 – 20.0 mg/l H<sub>2</sub>O<sub>2</sub>



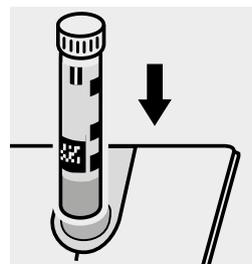
Check the pH of the sample, specified range: pH 0 – 10.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



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

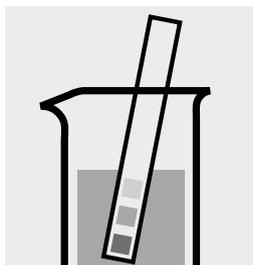


Reaction time:  
2 minutes



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

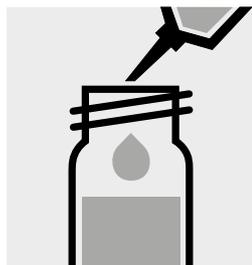
## Measuring range: 0.25 – 5.00 mg/l H<sub>2</sub>O<sub>2</sub>



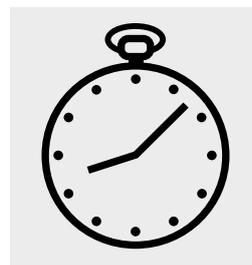
Check the pH of the sample, specified range: pH 0 – 10.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



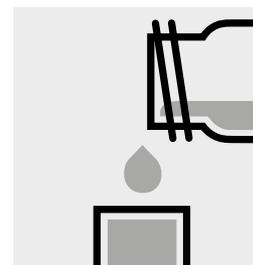
Select method no. **128**.



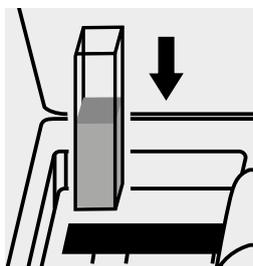
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.



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:

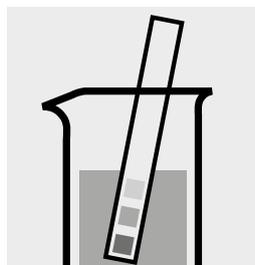
To check the measurement system (test reagents, measurement device, and handling) a hydrogenperoxide standard solution must be prepared from Perhydrol® 30% H<sub>2</sub>O<sub>2</sub> GR, Cat.No. 107209 (see section "Standard solutions").

# Hydrogen Peroxide

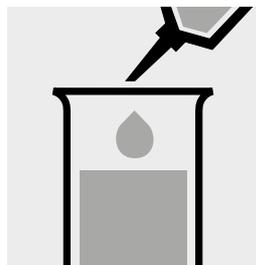
118789

Test

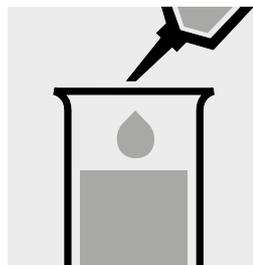
<b>Measuring</b>	0.03 – 6.00 mg/l H <sub>2</sub> O <sub>2</sub>	10-mm cell
<b>range:</b>	0.015 – 3.000 mg/l H <sub>2</sub> O <sub>2</sub>	20-mm cell
Expression of results also possible in mmol/l.		



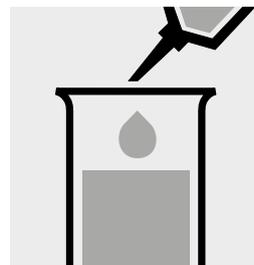
Check the pH of the sample, specified range: pH 4 – 10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



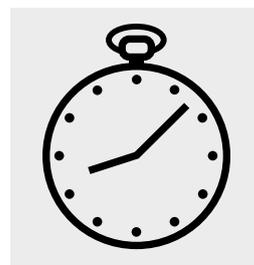
Pipette 0.50 ml of H<sub>2</sub>O<sub>2</sub>-1 into a test tube.



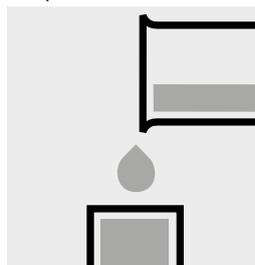
Add 8.0 ml of the sample with pipette and mix.



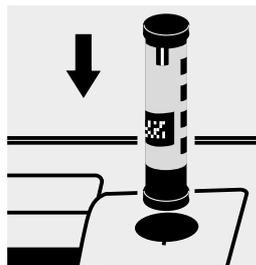
Add 0.50 ml of H<sub>2</sub>O<sub>2</sub>-2 with pipette and mix.



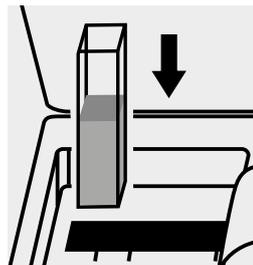
Reaction time: 10 minutes



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<sub>2</sub>O<sub>2</sub> GR, Cat.No. 107209 (see section “Standard solutions”).

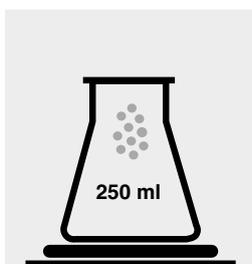
# ICUMSA Color

## Color of sugar solutions

corresponds to ICUMSA method GS1/3-7

## Application

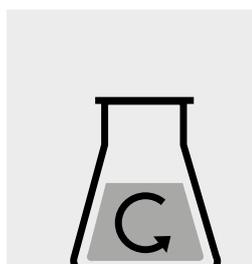
<b>Measuring</b>	0 – 50 000 IU <sub>7,0</sub>	10-mm cell
<b>range:</b>	0 – 25 000 IU <sub>7,0</sub>	20-mm cell
	0 – 10 000 IU <sub>7,0</sub>	50-mm cell
<b>Attention!</b>	Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from distilled water (Water for analysis EMSURE®, Cat.No. 116754), is recommended. This zero value remains valid until the method is exited.	



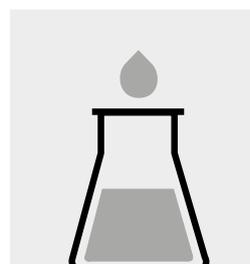
Weigh in **5.0 g of homogenized sample**, accurately weighed to 0.1 g, or **10/30/50 g of homogenized sample**, accurately weighed to 1 g, depending on the anticipated color value.



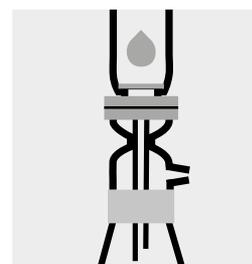
Add **distilled water** (Water for analysis EMSURE®, Cat.No. 116754, is recommended) until a **total volume of 100 g** is achieved



Dissolve the sample at room temperature.



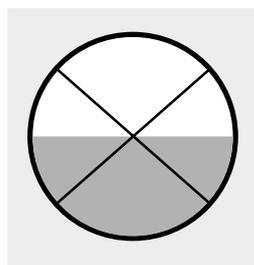
**Adjust the pH of the prepared sample** with sodium hydroxide solution 0.1 mol/l (Cat. No. 109141) or, respectively, hydrochloric acid 0.1 mol/l (Cat. No. 109060) to  $7.0 \pm 0.1$ .



Vacuum-filter the **adjusted solution** over a membrane filter into a clean and dry conical flask.



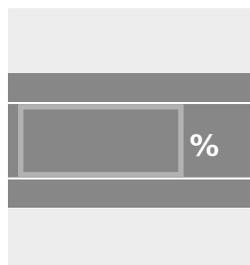
Degas for **3 minutes** in the ultrasonic bath.



Determine the **% RDS value** (refractometric dry substance) of the solution.



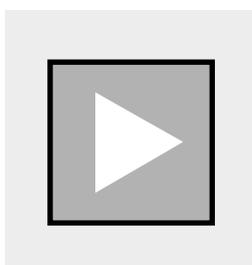
Select method no. **2548**. Perform the zero adjustment and confirm by pressing the <OK> button.



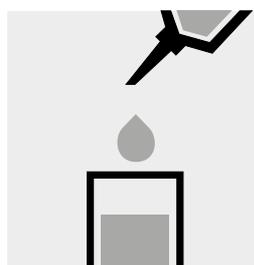
Enter the RDS value in %.



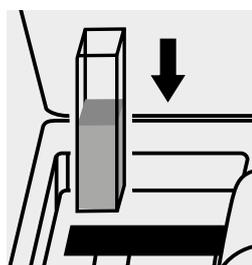
Confirm with <OK>.



Tap the <Start> button.



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The IU<sub>7,0</sub> value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

### Important:

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

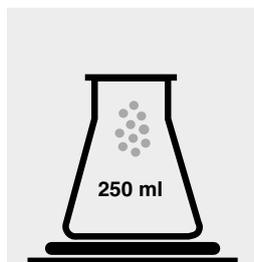
# ICUMSA Color

## Color of sugar solutions at pH 7.0

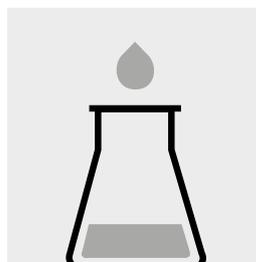
corresponds to ICUMSA method GS2/3-9

Application

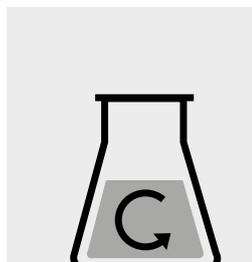
<b>Measuring range:</b> 0 – 600 IU <sub>7.0</sub>	50-mm cell, 100-mm cell
<b>Attention!</b>	Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from buffer solution, is recommended. This zero value remains valid until the method is exited.



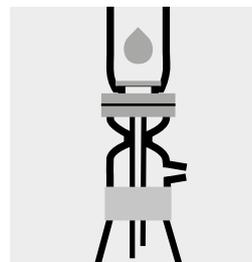
Weigh  $50.0 \pm 0.1$  g of homogenized sample into a 250-ml conical flask.



Add  $50.0 \pm 0.1$  g of buffer solution.



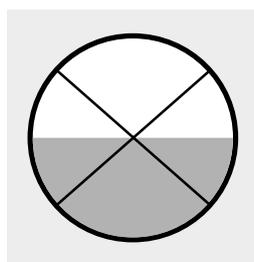
Dissolve the sample at room temperature.



Vacuum-filter the pre-treated solution over a membrane filter into a clean and dry conical flask.



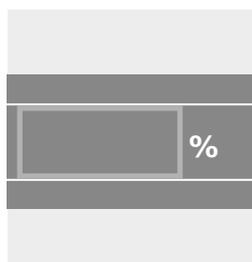
Degas for 3 minutes in the ultrasonic bath.



Determine the % RDS value (refractometric dry substance) of the solution.



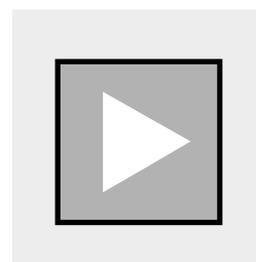
Select method no. 2549. Perform the zero adjustment and confirm by pressing the <OK> button.



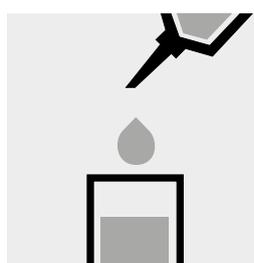
Enter the RDS value in %.



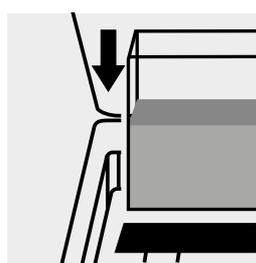
Confirm with <OK>.



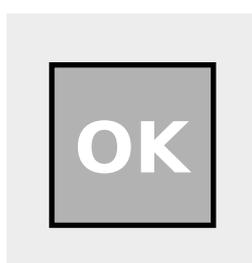
Tap the <Start> button.



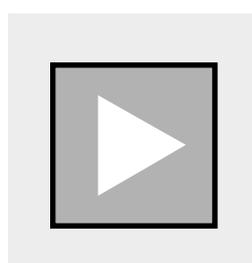
Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The IU<sub>7.0</sub> value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

### Note:

When using the 100-mm rectangular cell, the round-cell holder must be removed before the measurement.

### Important:

The exact procedure and the composition and preparation of the buffer solution 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](http://www.analytical-test-kits.com).

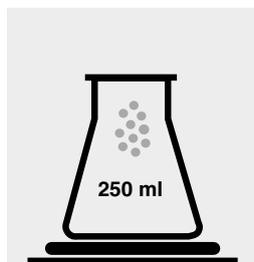
# ICUMSA Color

## Color of sugar solutions of white sugar

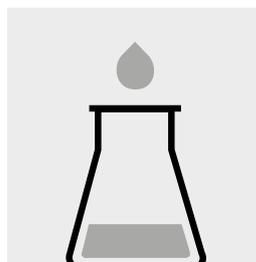
corresponds to ICUMSA method GS2/3-10

Application

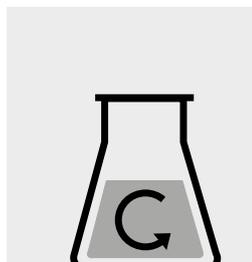
<b>Measuring range:</b> 0 – 50 IU <sub>7,0</sub>	50-mm cell, 100-mm cell
<b>Attention!</b>	Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from distilled water (Water for analysis EMSURE <sup>®</sup> , Cat.No. 116754), is recommended. This zero value remains valid until the method is exited.



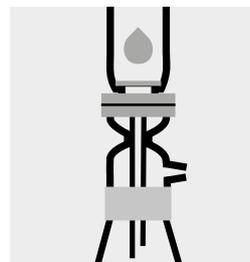
Weigh  $50.0 \pm 0.1$  g of homogenized sample into a 250-ml conical flask.



Add  $50.0 \pm 0.1$  g of distilled water (Water for analysis EMSURE<sup>®</sup>, Cat.No. 116754, is recommended).



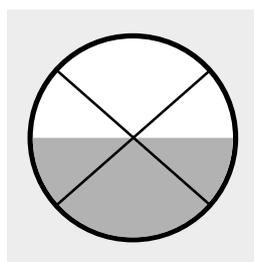
Dissolve the sample at room temperature.



Vacuum-filter the pre-treated solution over a membrane filter into a clean and dry conical flask.



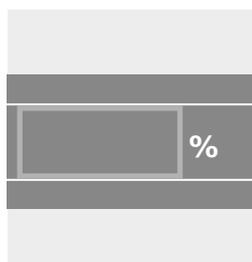
Degas for 3 minutes in the ultrasonic bath.



Determine the % RDS value (refractometric dry substance) of the solution.



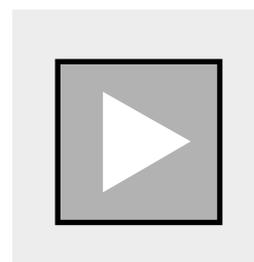
Select method no. 2550. Perform the zero adjustment and confirm by pressing the <OK> button.



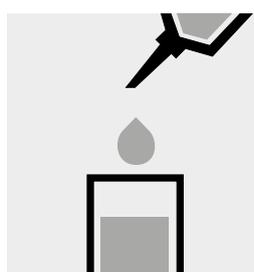
Enter the RDS value in %.



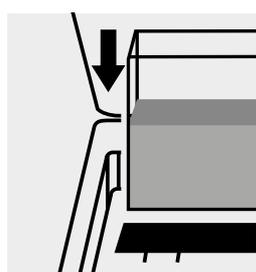
Confirm with <OK>.



Tap the <Start> button.



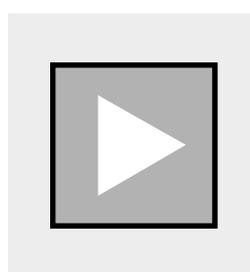
Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The IU<sub>7,0</sub> value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

### Note:

When using the 100-mm rectangular cell, the round-cell holder must be removed before the measurement.

### Important:

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

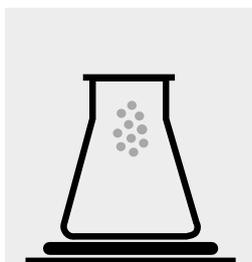
# ICUMSA Color

## Color of sugar solutions at pH 7.0

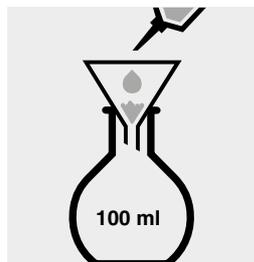
corresponds to **ICUMSA method GS9/1/2/3-8 (MOPS buffer method)**

### Application

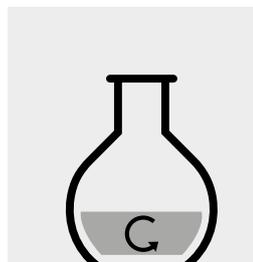
<b>Measuring</b>	0 – 20 000 IU <sub>7.0</sub>	10-mm cell
<b>range:</b>	0 – 10 000 IU <sub>7.0</sub>	20-mm cell
	0 – 4 000 IU <sub>7.0</sub>	50-mm cell
<b>Attention!</b>	Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from reference solution, is recommended. This zero value remains valid until the method is exited.	



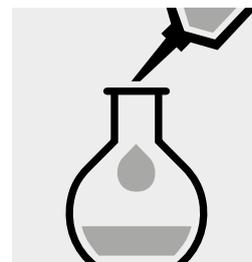
Weigh in **5.0/10.0/20.0 g of homogenized sample**, accurately weighed to 0.1 g, depending on the anticipated color value.



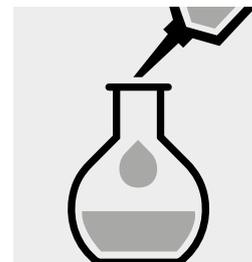
Transfer the sample to a 100-ml volumetric flask by rinsing with **80 ml of distilled water** (Water for analysis EMSURE®, Cat.No. 116754, is recommended).



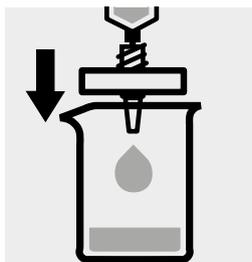
Dissolve the sample at room temperature.



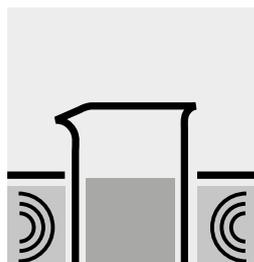
Add **10.0 ml of MOPS buffer**.



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.



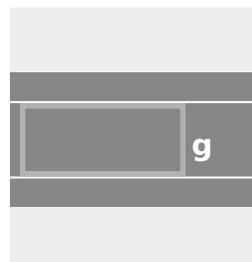
Filter **10 - 20 ml of the pretreated solution** over a membrane filter into a clean and dry beaker.



Degas for **3 minutes** in the ultrasonic bath.



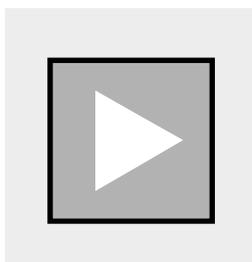
Select method no. **2551**. Perform the zero adjustment and confirm by pressing the <OK> button.



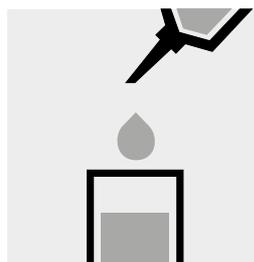
Enter the sample weight in grams.



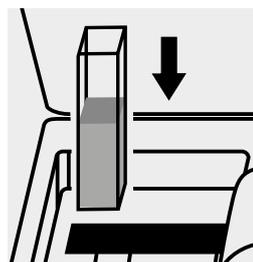
Confirm with <OK>.



Tap the <Start> button.



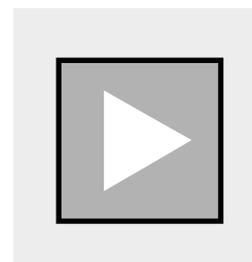
Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The IU<sub>7.0</sub> value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

#### Important:

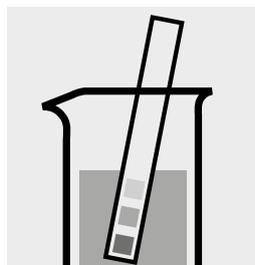
The exact procedure and the composition and preparation of the buffer and reference solution used are given in the corresponding application, which also includes further information on the method employed. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# Iodine

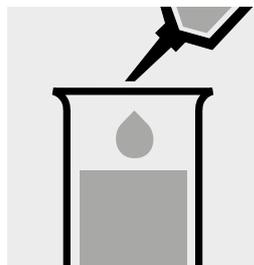
100606

Test

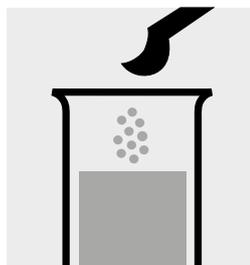
<b>Measuring</b>	0.20 – 10.00 mg/l I <sub>2</sub>	10-mm cell
<b>range:</b>	0.10 – 5.00 mg/l I <sub>2</sub>	20-mm cell
	0.050 – 2.000 mg/l I <sub>2</sub>	50-mm cell
Expression of results also possible in mmol/l.		



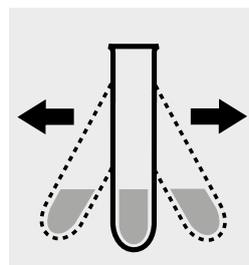
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.



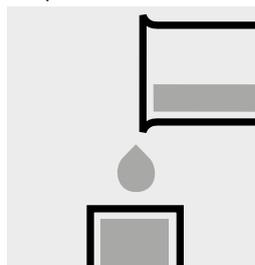
Add 1 level blue micro-spoon of I<sub>2</sub>-1.



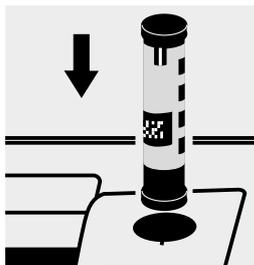
Shake vigorously to dissolve the solid substance.



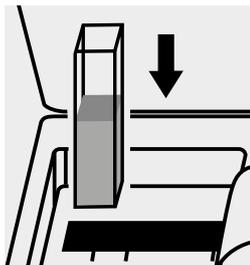
Reaction time:  
1 minute



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).

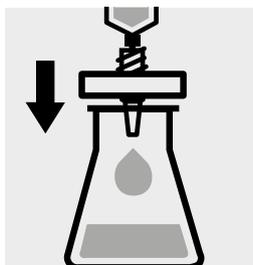
## Quality assurance:

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

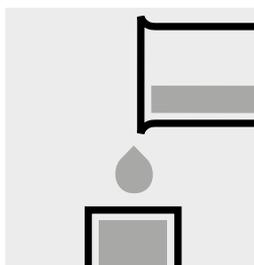
# Iodine Color Number

analogous to **DIN 6162A**

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



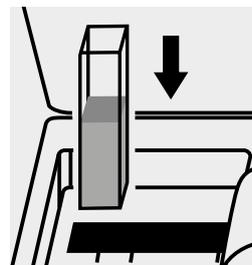
Filter turbid samples.



Transfer the solution into a corresponding cell.



Select method no. **33**.

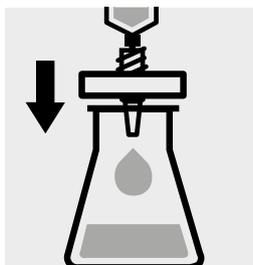


Place the cell into the cell compartment. The measurement is performed automatically.

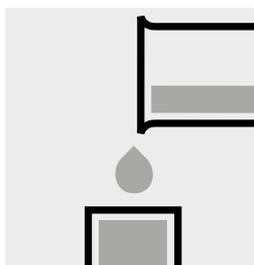
# Iodine Color Number

analogous to **DIN 6162A**

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



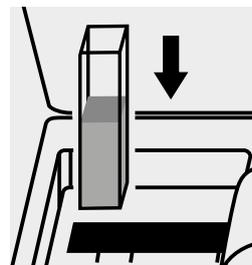
Filter turbid samples.



Transfer the solution into a corresponding cell.



Select method no. **21**.



Place the cell into the cell compartment. The measurement is performed automatically.

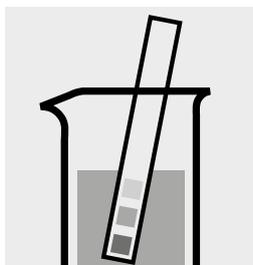
# Iron

114549

Cell Test

**Measuring** 0.05 – 4.00 mg/l Fe

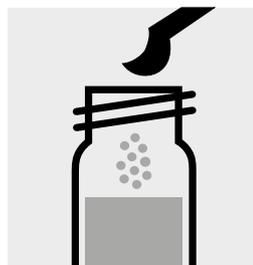
**range:** Expression of results also possible in mmol/l.



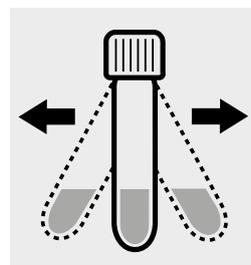
Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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



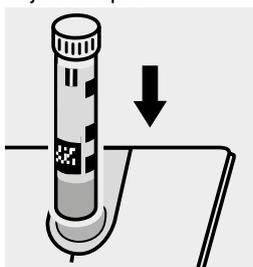
Add 1 level blue microspoon of **Fe-1K**, close the cell with the screw cap.



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. 114688, or Crack Set 10, Cat.No. 114687 and thermoreactor is necessary.

Result can be expressed as sum of iron ( $\Sigma$  Fe).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700 or the Standard solutions for photometric applications, CRM, Cat.Nos. 133018, 133019 and 133020.

Ready-to-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) is highly recommended.

# Iron

114896

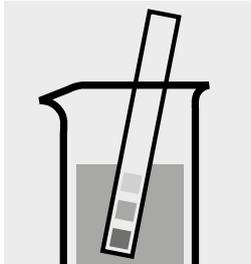
## Determination of iron(II) and iron(III)

Cell Test

**Measuring** 1.0 – 50.0 mg/l Fe

**range:** Expression of results also possible in mmol/l.

### Determination of iron (II)



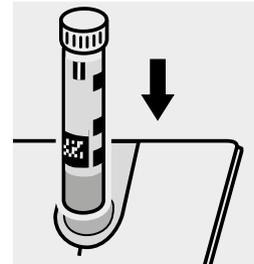
Check the pH of the sample, specified range: pH 3 – 8.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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

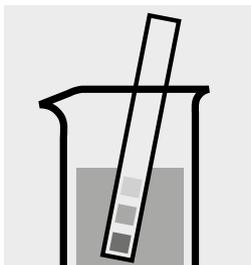


Reaction time:  
5 minutes

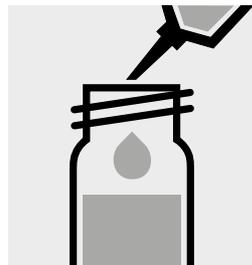


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

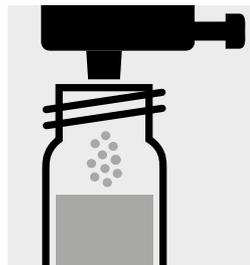
### Determination of iron (II + III)



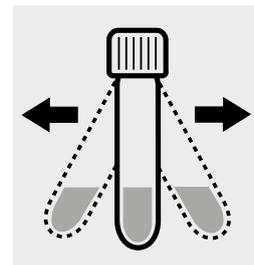
Check the pH of the sample, specified range: pH 3 – 8.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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



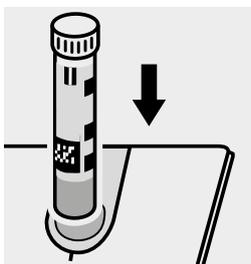
Add 1 dose of **Fe-1K** using the blue dose-metering cap, close the reaction cell with the screw cap.



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.

### 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 ( $\Sigma$  Fe).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use iron standard solution Certipur®, Cat.No. 119781, concentration 1000 mg/l Fe(III), can be used after diluting accordingly.

# Iron

114896

## Differentiation between iron(II) and iron(III)

Cell Test

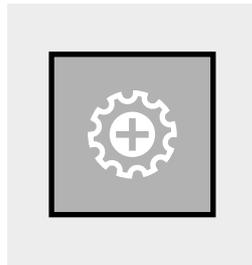
**Measuring range:** 1.0 – 50.0 mg/l Fe

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

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



Select method no. **106**.



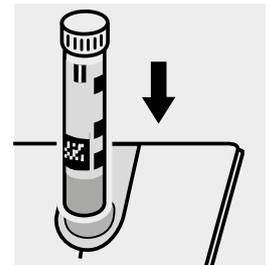
Tap the <Settings> button. Select "Differentiation" and activate.



Confirm with <OK>.

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

After the reaction time has expired:



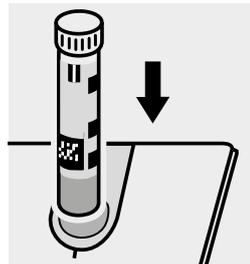
Place the **cell A** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>.

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

After the reaction time has expired:



Place the **cell B** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>. The results A (Fe(II+III)), B (Fe(II)), and C (Fe(III)) are shown in the display in mg/l.

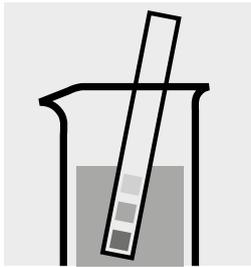
# Iron

114761

Test

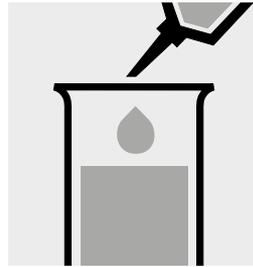
<b>Measuring range:</b>	0.05 – 5.00 mg/l Fe	10-mm cell
	0.03 – 2.50 mg/l Fe	20-mm cell
	0.005 – 1.000 mg/l Fe	50-mm cell
	0.0025 – 0.5000 mg/l Fe	100-mm cell
	Expression of results also possible in mmol/l.	

## Measuring ranges: 0.005 – 5.00 mg/l Fe

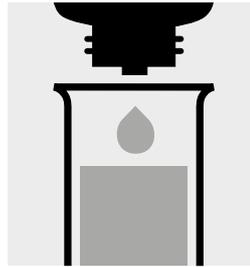


Check the pH of the sample, specified range: pH 1 – 10.

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



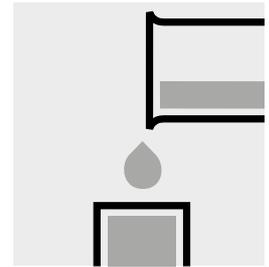
Pipette 5.0 ml of the sample into a test tube.



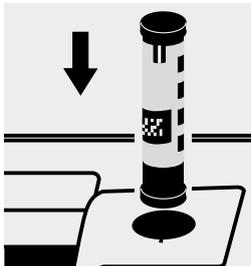
Add 3 drops of **Fe-1** and mix.



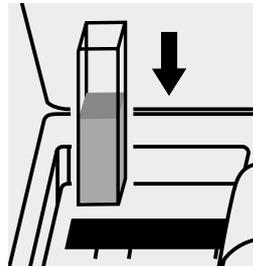
Reaction time: 3 minutes



Transfer the solution into a corresponding 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 ( $\Sigma$  Fe).

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

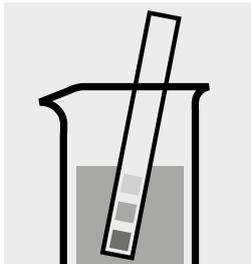
### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700 or the Standard solutions for photometric applications, CRM, Cat.Nos. 133014, 133018, 133019 and 133020.

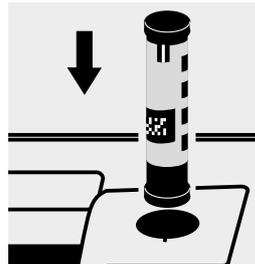
Ready-to-use iron standard solution Certipur®, Cat.No. 119781, concentration 1000 mg/l Fe, can also be used after diluting accordingly.

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

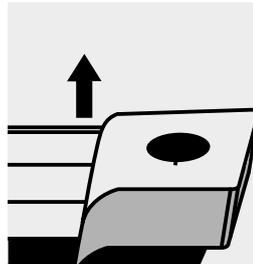
Measuring range: 0.0025 – 0.5000 mg/l Fe



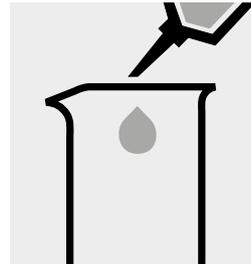
Check the pH of the sample, specified range: pH 1 – 10.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



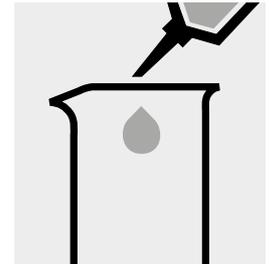
Select method with AutoSelector.



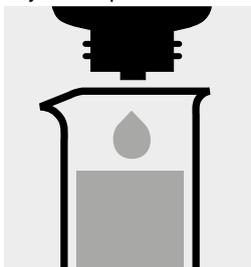
Remove the round-cell holder.



Place 20 ml of sample into a suitable vessel.



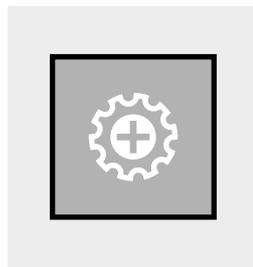
Place 20 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754 is recommended) into a second suitable vessel. (Blank)



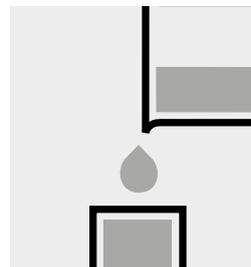
Add to each vessel 12 drops of **Fe-1** and mix.



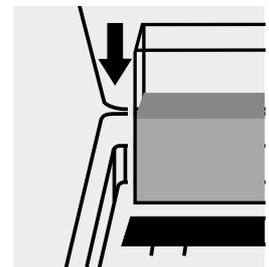
Reaction time: 3 minutes



Tap the <Settings> button.  
Select "Reagent blank".



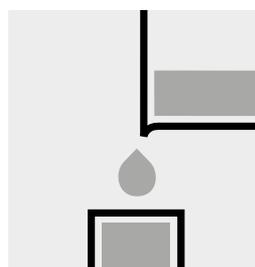
Transfer the blank into the cell.



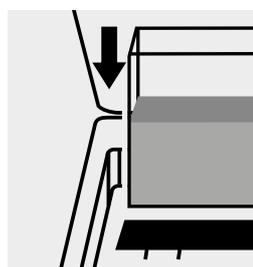
Insert the blank cell into the cell compartment.



Select "User RB".  
Confirm with <OK>.



Transfer the measurement sample into the cell.



Insert the cell containing the sample into the cell compartment.

### Important:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use iron standard solution Certipur®, Cat.No. 119781, concentration 1000 mg/l Fe, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132214, 133018, and 133019.

# Iron

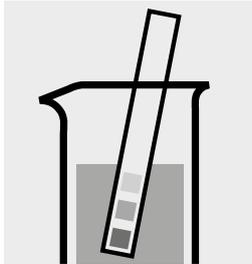
100796

## Determination of iron(II) and iron(III)

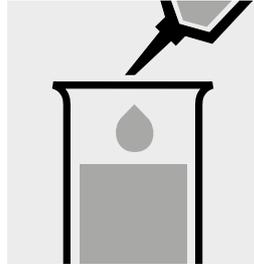
Test

<b>Measuring</b>	0.10 – 5.00 mg/l Fe	10-mm cell
<b>range:</b>	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.		

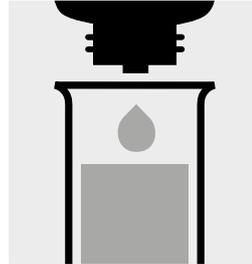
### Determination of iron(II)



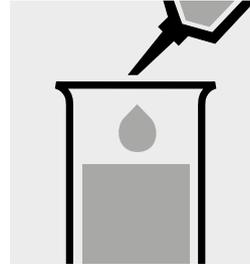
Check the pH of the sample, specified range: pH 2 – 8.  
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



Pipette 8.0 ml of the sample into a test tube.



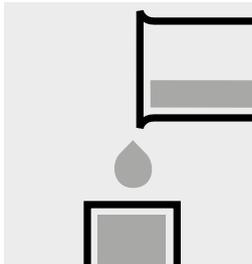
Add 1 drop of **Fe-1** and mix.



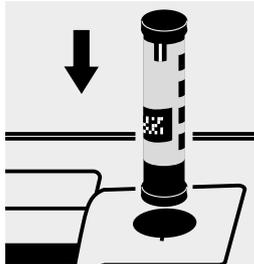
Add 0.50 ml of **Fe-2** with pipette and mix.



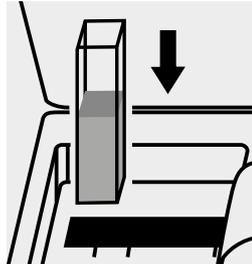
Reaction time: 5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

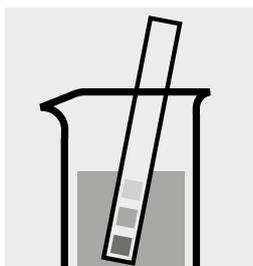
# Iron

100796

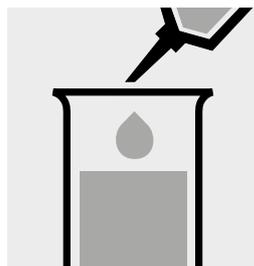
## Determination of iron(II) and iron(III)

Test

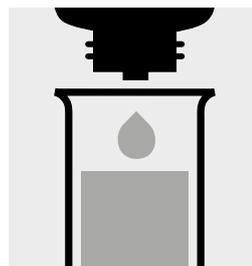
### Determination of iron(II + III)



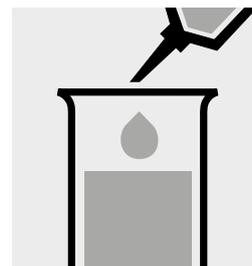
Check the pH of the sample, specified range: pH 2 – 8.  
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



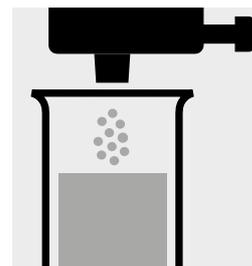
Pipette 8.0 ml of the sample into a test tube.



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



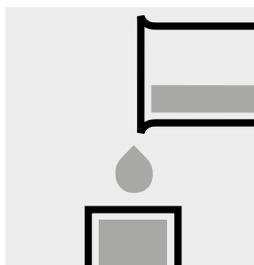
Add 0.50 ml of **Fe-2** with pipette and mix.



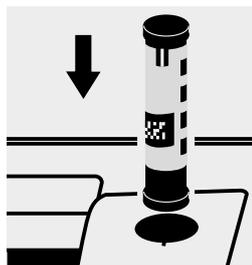
Add 1 dose of **Fe-3** using the blue dose-metering cap and dissolve the solid substance.



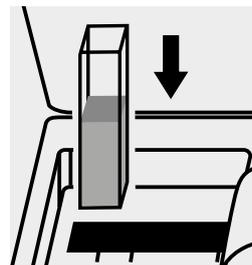
Reaction time:  
10 minutes



Transfer the solution into a corresponding 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.

#### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700 or the Standard solutions for photometric applications, CRM, Cat.Nos. 133014, 133018, 133019 and 133020.

Ready-to-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) is highly recommended.

# Iron

100796

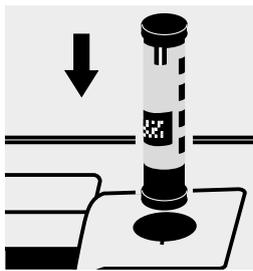
## Differentiation between iron(II) and iron(III)

Test

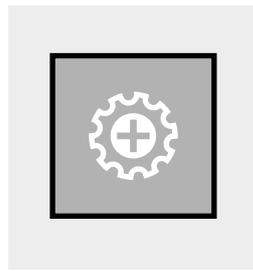
<b>Measuring</b>	0.10 – 5.00 mg/l Fe	10-mm cell
<b>range:</b>	0.05 – 2.50 mg/l Fe	20-mm cell
	0.010 – 1.000 mg/l Fe	50-mm cell

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

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



Select method with AutoSelector.



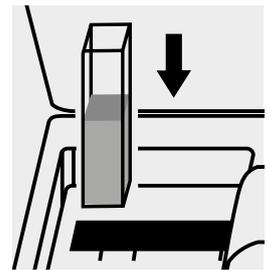
Tap the <Settings> button. Select “Differentiation” and activate.



Confirm with <OK>.

Perform determination of **iron(II + III)** (see analytical procedure “Determination of iron(II + III)” with 100796). = **cell A**

After the reaction time has expired:



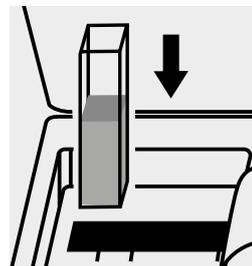
Place the **cell A** into the cell compartment. The measurement is performed automatically.



Confirm with <OK>.

Perform determination of **iron(II)** (see analytical procedure “Determination of iron(II)” with 100796). = **cell B**

After the reaction time has expired:



Place the **cell B** into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The results A (Fe(II+III)), B (Fe(II)), and C (Fe(III)) are shown in the display in mg/l.

# K<sub>232</sub> nm of olive oil

corresponds to **Commission Regulation (EEC) No 2568/91 Annex IX**

## Application

**Measuring range:** 0 – 4.00 K<sub>232</sub>

10-mm quartz cell

**Attention!**

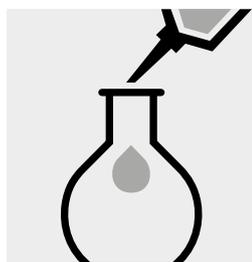
Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from isooctane or cyclohexane, is recommended. This zero value remains valid until the method is exited.



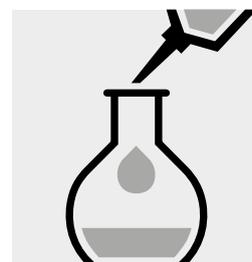
(Melt, if necessary) the sample and homogenize.



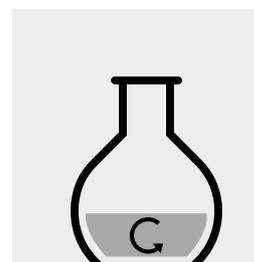
If contaminations are present, filter the sample over a fast filtering paper.



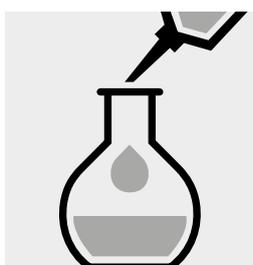
Weigh the sample into a volumetric flask, accurately weighed to 1 mg.



Add a few milliliters of **isooctane for spectroscopy Uvasol®** (Cat. No. 104718) or **cyclohexane for spectroscopy Uvasol®** (Cat. No. 102822).



Dissolve the sample at room temperature.



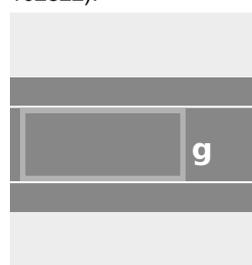
Make up the contents of the volumetric flask to the mark with **isooctane for spectroscopy Uvasol®** (Cat. No. 104718) or **cyclohexane for spectroscopy Uvasol®** (Cat. No. 102822) and mix.



Filter turbid solutions over a paper filter.



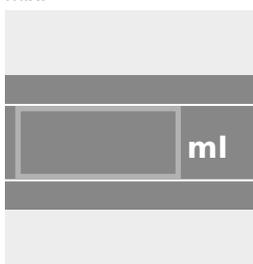
Select method no. **2525**. Perform the zero adjustment and confirm by pressing the <OK> button.



Enter the sample weight in grams.



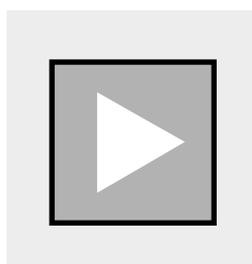
Confirm with <OK>.



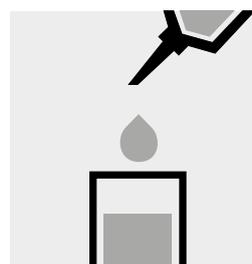
Enter the volume of the sample solution in milliliters.



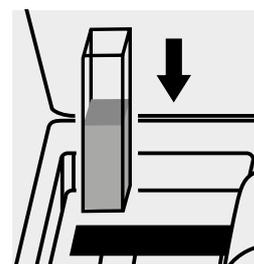
Confirm with <OK>.



Tap the <Start> button.



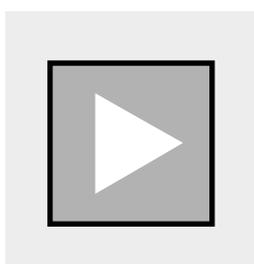
Transfer the solution into the quartz cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The K<sub>232</sub> value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

### Important:

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# K<sub>268</sub> nm of olive oil

corresponds to **Commission Regulation (EEC) No 2568/91 Annex IX**

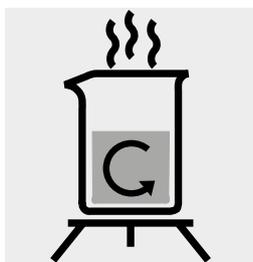
## Application

**Measuring range:** 0 – 4.00 K<sub>268</sub>

10-mm quartz cell

**Attention!**

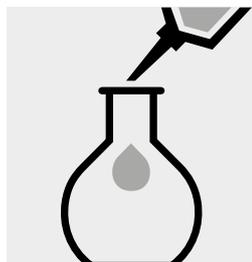
Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from isooctane, is recommended. This zero value remains valid until the method is exited.



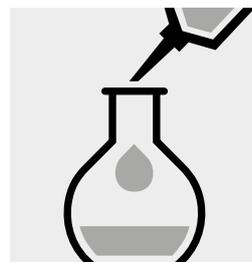
(Melt, if necessary) the sample and homogenize.



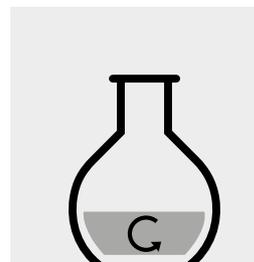
If contaminations are present, filter the sample over a fast filtering paper.



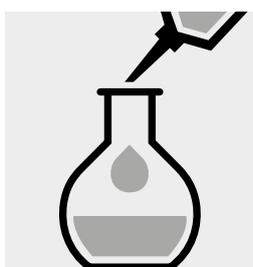
Weigh the sample into a volumetric flask, accurately weighed to 1 mg.



Add a few milliliters of **isooctane for spectroscopy Uvasol®** (Cat. No. 104718).



Dissolve the sample at room temperature.



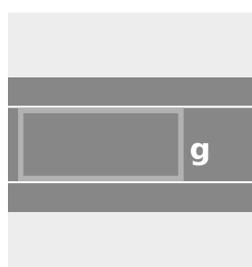
Make up the contents of the volumetric flask to the mark with **isooctane for spectroscopy Uvasol®** (Cat. No. 104718) and mix.



Filter turbid solutions over a paper filter.



Select method no. **2526**. Perform the zero adjustment and confirm by pressing the <OK> button.



Enter the sample weight in grams.



Confirm with <OK>.



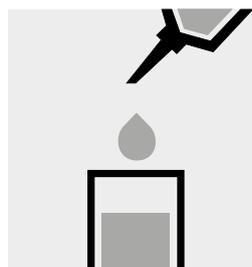
Enter the volume of the sample solution in milliliters.



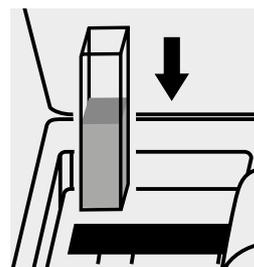
Confirm with <OK>.



Tap the <Start> button.



Transfer the solution into the quartz cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The K<sub>268</sub> value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

### Important:

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# K<sub>270</sub> nm of olive oil

corresponds to **Commission Regulation (EEC) No 2568/91 Annex IX**

## Application

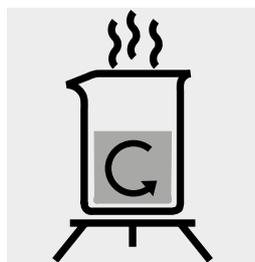
**Measuring range:** 0 – 4.00 K<sub>270</sub>

10-mm quartz cell

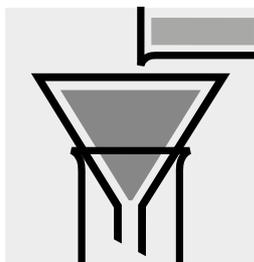
**Attention!**

Prior to the measurement of the first sample, the system automatically prompts a zero adjustment

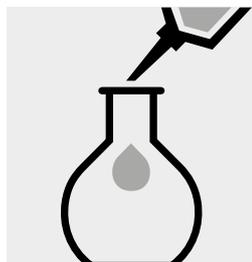
prepared from cyclohexane, is recommended. This zero value remains valid until the method is exited.



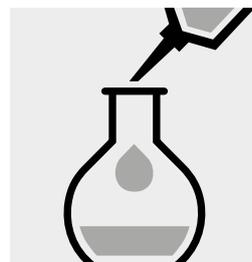
(Melt, if necessary) the sample and homogenize.



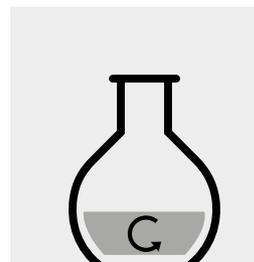
If contaminations are present, filter the sample over a fast filtering paper.



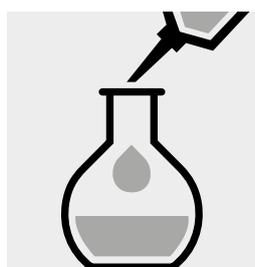
Weigh the sample into a volumetric flask, accurately weighed to 1 mg.



Add a few milliliters of **cyclohexane for spectroscopy Uvasol®** (Cat. No. 102822).



Dissolve the sample at room temperature.



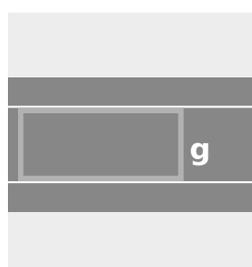
Make up the contents of the volumetric flask to the mark with **cyclohexane for spectroscopy Uvasol®** (Cat. No. 102822) and mix.



Filter turbid solutions over a paper filter.



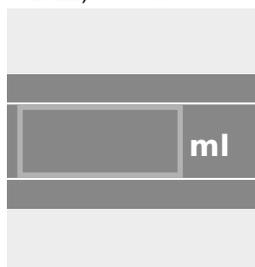
Select method no. **2527**. Perform the zero adjustment and confirm by pressing the <OK> button.



Enter the sample weight in grams.



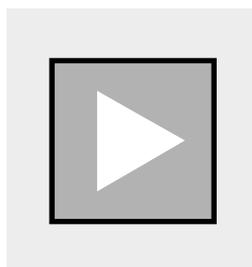
Confirm with <OK>.



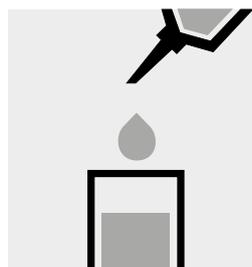
Enter the volume of the sample solution in milliliters.



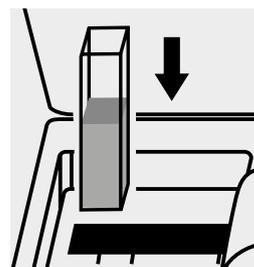
Confirm with <OK>.



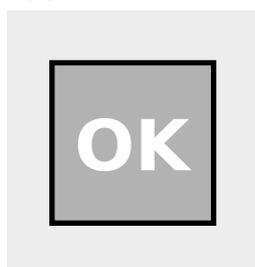
Tap the <Start> button.



Transfer the solution into the quartz cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. The K<sub>270</sub> value is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

### Important:

The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# Lead

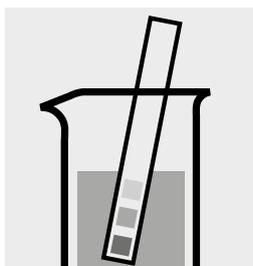
114833

Cell Test

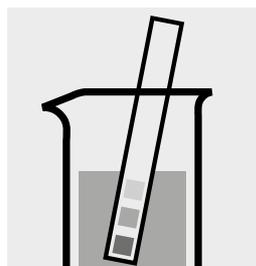
**Measuring** 0.10 – 5.00 mg/l Pb

**range:** Expression of results also possible in mmol/l.

## Samples of total hardness 0–10 °d



Check the total hardness of the sample.



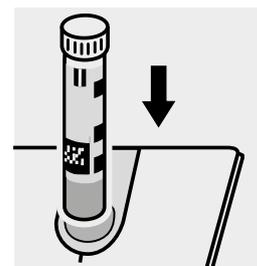
Check the pH of the sample, specified range: pH 3–6.  
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



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

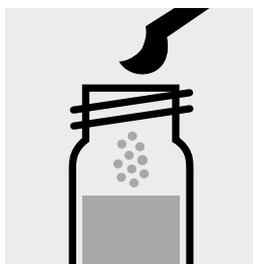


Add 5.0 ml of the sample with pipette, close the cell with the screw cap, and mix.

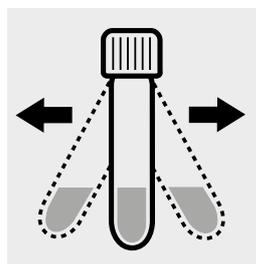


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer = **Result A**

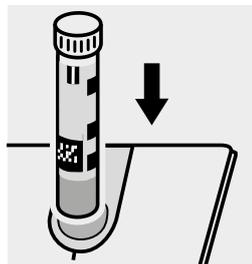
## Samples of total hardness >10 °d



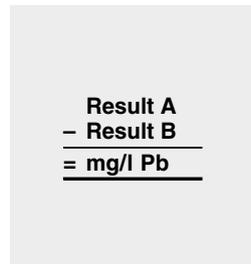
Add 1 level grey micro-spoon of **Pb-2K** to the already measured cell, close the cell with the screw cap.



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**



$$\begin{array}{r} \text{Result A} \\ - \text{Result B} \\ \hline = \text{mg/l Pb} \end{array}$$

### 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 ( $\Sigma$  Pb).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 40 and 100, Cat.Nos. 114692 and 118701.

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

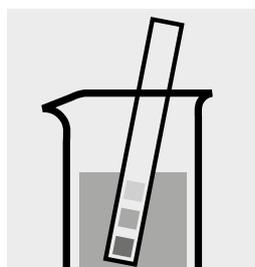
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Lead

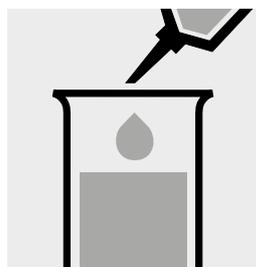
109717

Test

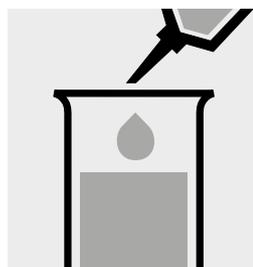
<b>Measuring</b>	0.10 – 5.00 mg/l Pb	10-mm cell
<b>range:</b>	0.05 – 2.50 mg/l Pb	20-mm cell
	0.010 – 1.000 mg/l Pb	50-mm cell
Expression of results also possible in mmol/l.		



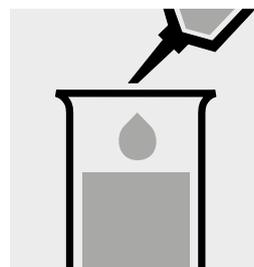
Check the pH of the sample, specified range: pH 3 – 6. If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



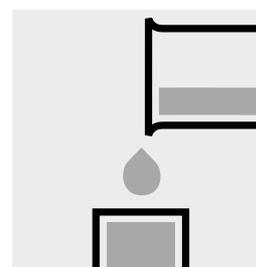
Pipette 0.50 ml of **Pb-1** into a test tube.



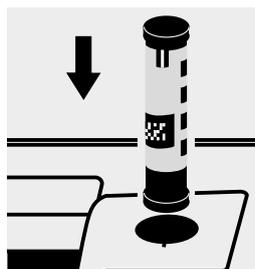
Add 0.50 ml of **Pb-2** with pipette and mix.



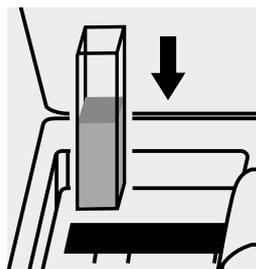
Add 8.0 ml of the sample with pipette and mix.



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 ( $\Sigma$  Pb).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 40 and 100, Cat.Nos. 114692 and 118701 or the Standard solutions for photometric applications, CRM, Cat.Nos. 133003 and 133004.

Ready-to-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) is highly recommended.

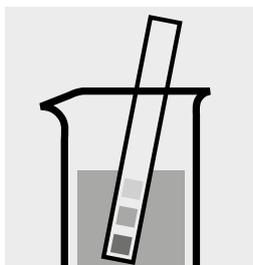
# Magnesium

100815

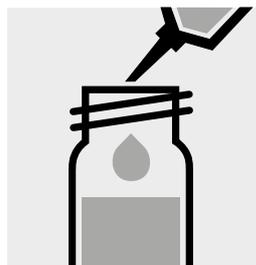
Cell Test

**Measuring** 5.0 – 75.0 mg/l Mg

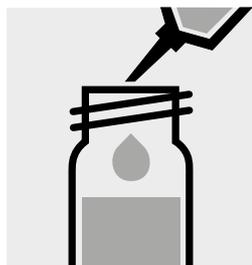
**range:** Expression of results also possible in mmol/l.



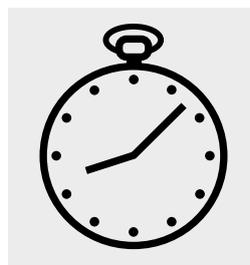
Check the pH of the sample, specified range: pH 3 – 9. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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



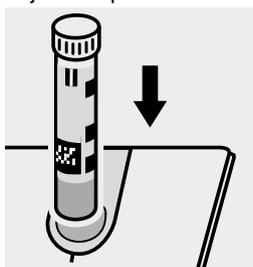
Add 1.0 ml of **Mg-1K** with pipette, close the cell with the screw cap, and mix.



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").

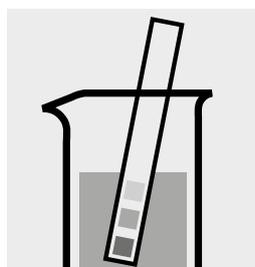
# Manganese

100816

Cell Test

**Measuring** 0.10 – 5.00 mg/l Mn

**range:** Expression of results also possible in mmol/l.



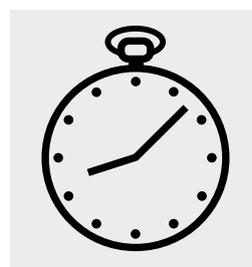
Check the pH of the sample, specified range: pH 2 – 7. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



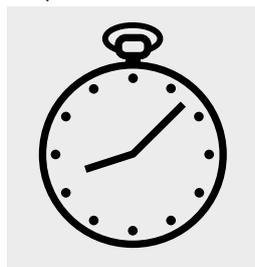
Add 2 drops of **Mn-1K**, close the cell with the screw cap, and mix.



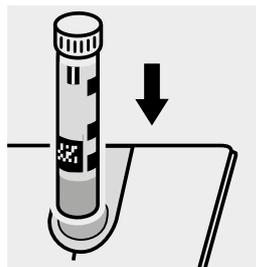
Reaction time:  
2 minutes



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



Reaction time:  
10 minutes



Place the cell into the 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 and 90, Cat.Nos. 114677 and 118700 or the Standard solutions for photometric applications, CRM, Cat.Nos. 132238 and 132239.

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

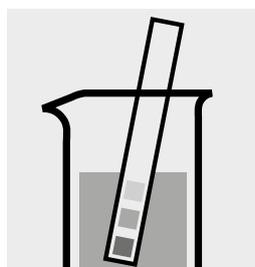
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Manganese

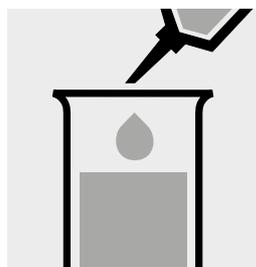
114770

Test

<b>Measuring</b>	0.50 – 10.00 mg/l Mn	10-mm cell
<b>range:</b>	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.		



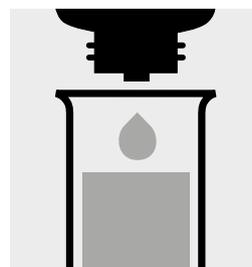
Check the pH of the sample, specified range: pH 2 – 7.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.



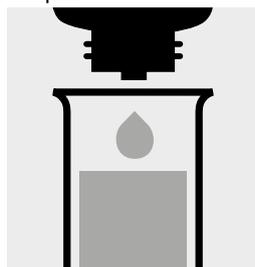
Add 4 drops of **Mn-1** and mix.  
Check the pH, specified pH: approx. 11.5.



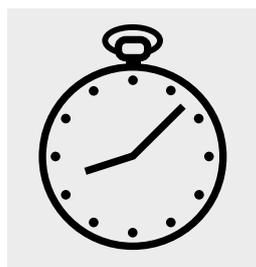
Add 2 drops of **Mn-2** and mix.



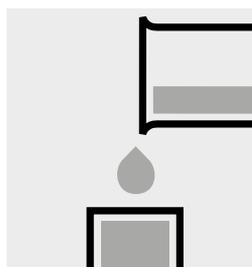
Reaction time:  
2 minutes



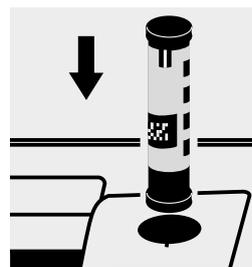
Add 2 drops of **Mn-3** and mix.



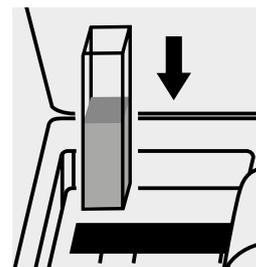
Reaction time:  
10 minutes



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) we recommended to use Spectroquant® CombiCheck 30 and 90, Cat.Nos. 114677 and 118700 or the Standard solutions for photometric applications, CRM, Cat.Nos. 132237, 132238 and 132239.

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

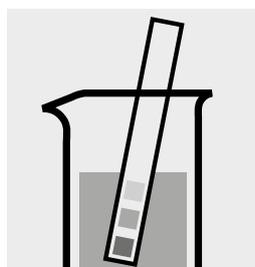
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Manganese

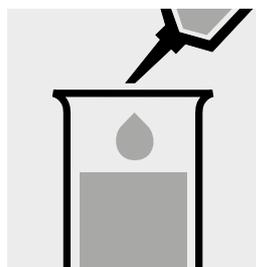
101846

Test

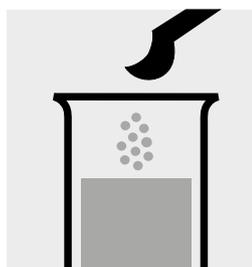
<b>Measuring</b>	0.05 – 2.00 mg/l Mn	10-mm cell
<b>range:</b>	0.03 – 1.00 mg/l Mn	20-mm cell
	0.005 – 0.400 mg/l Mn	50-mm cell
Expression of results also possible in mmol/l.		



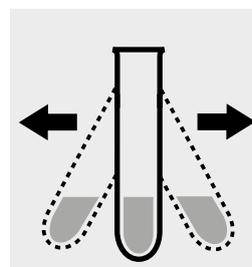
Check the pH of the sample, specified range: pH 3 – 10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



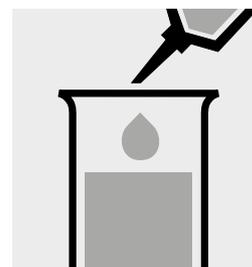
Pipette 8.0 ml of the sample into a test tube.



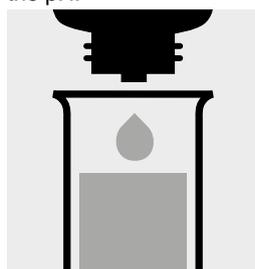
Add 1 level grey micro-spoon of **Mn-1**.



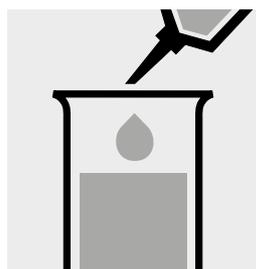
Shake the tube vigorously to dissolve the solid substance.



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



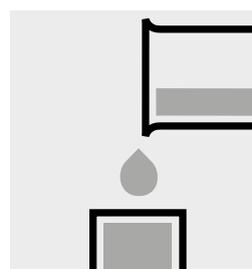
Add **carefully** 3 drops of **Mn-3** and mix.



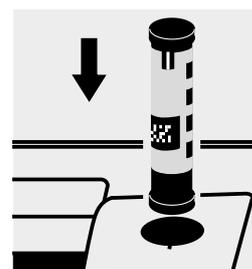
Add **carefully** 0.25 ml of **Mn-4** with pipette and mix **carefully** (Foams! Wear eye protection!).



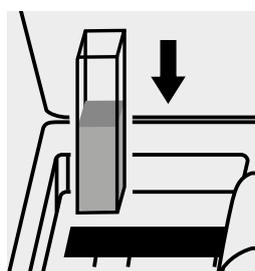
Reaction time: 10 minutes



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) we recommended to use Spectroquant® CombiCheck 90, Cat.No. 118700 or the Standard solutions for photometric applications, CRM, Cat.Nos. 132237, 132238 and 132239.

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

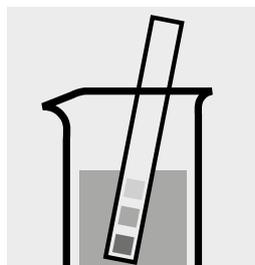
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 90) is highly recommended.

# Mercury in water and wastewater

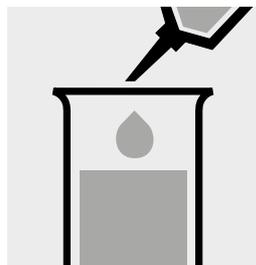
Application

Measuring range: 0.025 – 1.000 mg/l Hg

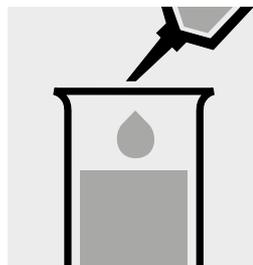
50-mm cell



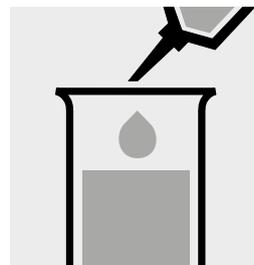
Check the pH of the sample, specified range: pH 3 – 7. If required, add dilute sodium hydroxide solution or acetic acid drop by drop to adjust the pH.



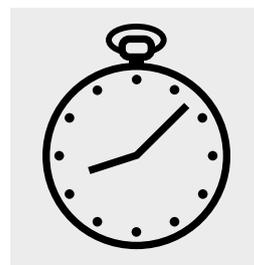
Pipette 5.0 ml of the sample into a test tube.



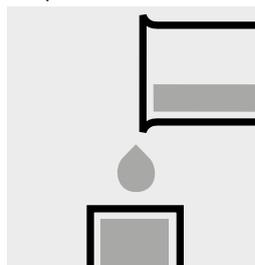
Add 1.0 ml of **reagent 1** with pipette and mix.



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



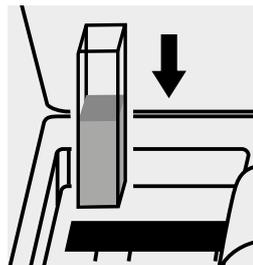
Reaction time: 5 minutes



Transfer the solution into a cell.



Select method no. **135**.



Place the cell into the cell compartment. The measurement is performed automatically.

## Important:

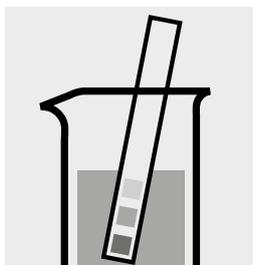
The exact composition and preparation of the reagents 1 and 2 used are given in the corresponding application, which also includes further information on the method employed. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# Molybdenum

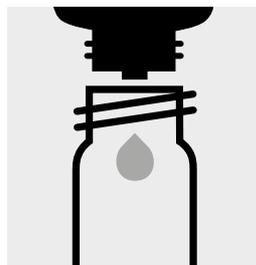
100860

Cell Test

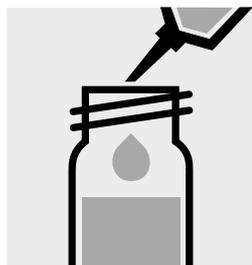
<b>Measuring</b>	0.02 – 1.00 mg/l Mo
<b>range:</b>	0.03 – 1.67 mg/l MoO <sub>4</sub>
	0.04 – 2.15 mg/l Na <sub>2</sub> MoO <sub>4</sub>
	Expression of results also possible in mmol/l.



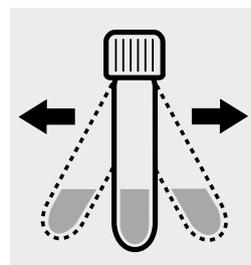
Check the pH of the sample, specified range: pH 1 – 10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



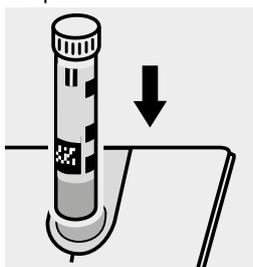
Add 10 ml of the sample with pipette, close the cell with the screw cap.



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:

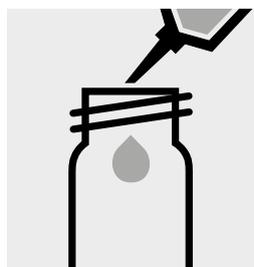
To check the measurement system (test reagents, measurement device, and handling) a ready-to-use molybdenum standard solution Certipur®, Cat.No. 170227, concentration 1000 mg/l Mo, can be used after diluting accordingly.

# Molybdenum

119252

Test

<b>Measuring</b>	0.5 – 45.0 mg/l Mo	20-mm cell
<b>range:</b>	0.8 – 75.0 mg/l MoO <sub>4</sub>	20-mm cell
	1.1 – 96.6 mg/l Na <sub>2</sub> MoO <sub>4</sub>	20-mm cell
Expression of results also possible in mmol/l.		



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



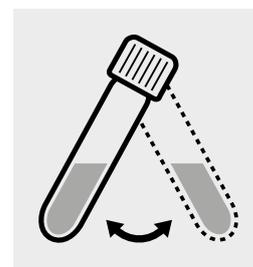
Add 1 powder pack of **Molybdenum HR1**, close with the screw cap, and dissolve the solid substance.



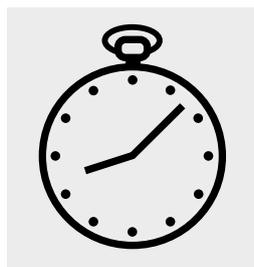
Add 1 powder pack of **Molybdenum HR2**, close with the screw cap, and dissolve the solid substance.



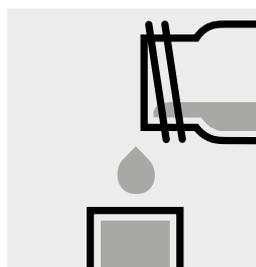
Add 1 powder pack of **Molybdenum HR3** and close with the screw cap.



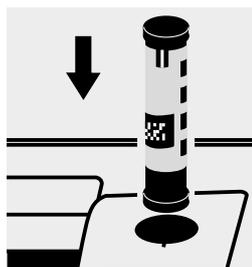
Swirl the cell to dissolve the solid substance.



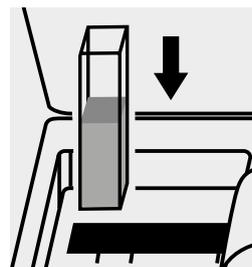
Reaction time: 5 minutes, **measure immediately**.



Transfer the solution into a rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

## Quality assurance:

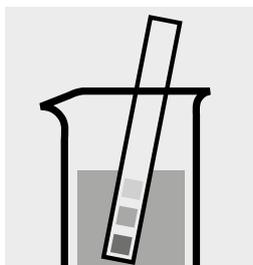
To check the measurement system (test reagents, measurement device, and handling) a ready-to-use molybdenum standard solution Certipur®, Cat.No. 170227, concentration 1000 mg/l Mo, can be used after diluting accordingly.

# Monochloramine

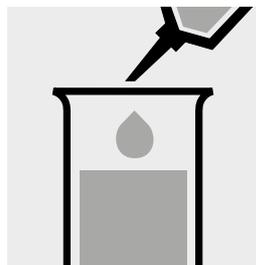
101632

Test

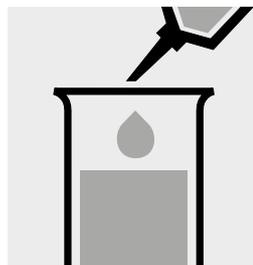
<b>Measuring range:</b>	0.25 – 10.00 mg/l Cl <sub>2</sub>	0.18 – 7.26 mg/l NH <sub>2</sub> Cl	0.05 – 1.98 mg/l NH <sub>2</sub> Cl-N	10-mm cell
	0.13 – 5.00 mg/l Cl <sub>2</sub>	0.09 – 3.63 mg/l NH <sub>2</sub> Cl	0.026 – 0.988 mg/l NH <sub>2</sub> Cl-N	20-mm cell
	0.050 – 2.000 mg/l Cl <sub>2</sub>	0.04 – 1.45 mg/l NH <sub>2</sub> Cl	0.010 – 0.395 mg/l NH <sub>2</sub> Cl-N	50-mm cell
Expression of results also possible in mmol/l.				



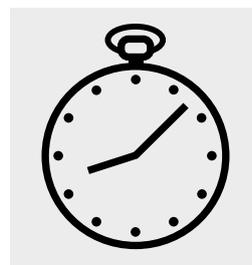
Check the pH of the sample, specified range: pH 4 – 13.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.



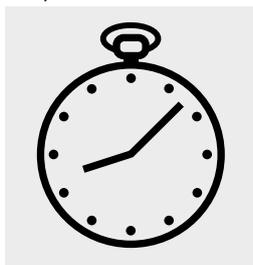
Add 0.60 ml of **MCA-1** with pipette and mix.



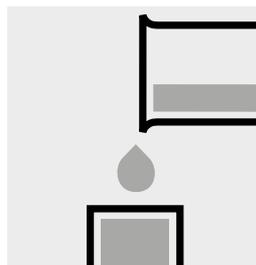
Reaction time:  
5 minutes



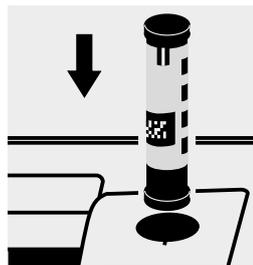
Add 4 drops of **MCA-2** and mix.



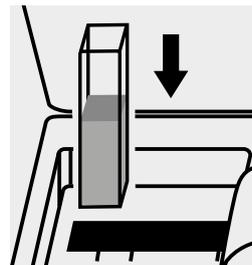
Reaction time:  
10 minutes



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 solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

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

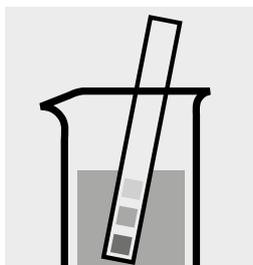
# Nickel

114554

Cell Test

**Measuring** 0.10 – 6.00 mg/l Ni

**range:** 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.



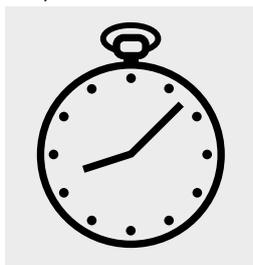
Reaction time:  
1 minute



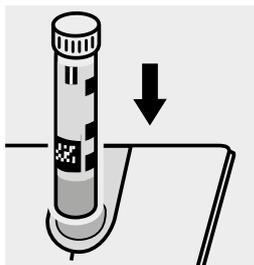
Add 2 drops of **Ni-1K**, close with the screw cap, and mix.



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 ( $\Sigma$  Ni).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 40 and 100, Cat.Nos. 114692 and 118701.

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

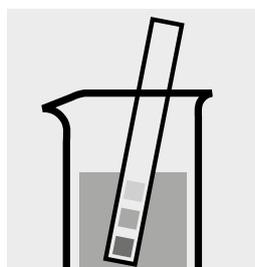
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Nickel

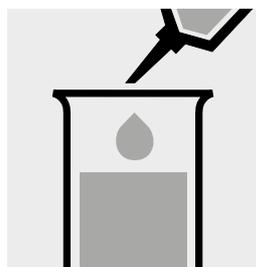
114785

Test

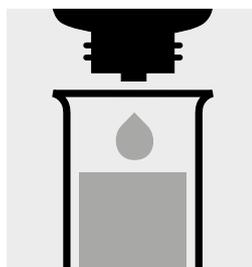
<b>Measuring range:</b>	0.10 – 5.00 mg/l Ni	10-mm cell
	0.05 – 2.50 mg/l Ni	20-mm cell
	0.02 – 1.00 mg/l Ni	50-mm cell
	Expression of results also possible in mmol/l.	



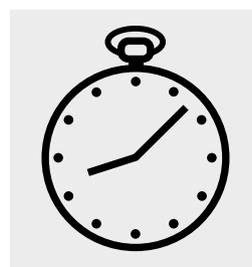
Check the pH of the sample, specified range: pH 3–8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



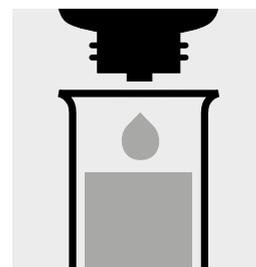
Pipette 5.0 ml of the sample into a test tube.



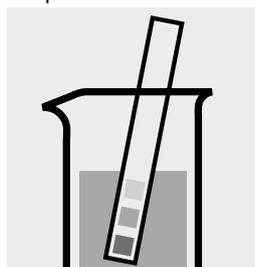
Add 1 drop of Ni-1 and mix. If the color disappears, continue adding drop by drop until a slight yellow coloration persists.



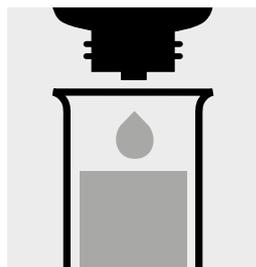
Reaction time:  
1 minute



Add 2 drops of Ni-2 and mix.



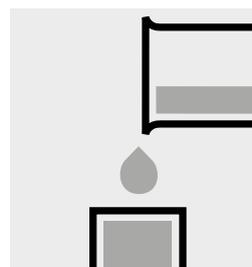
Check the pH, specified range: pH 10–12.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



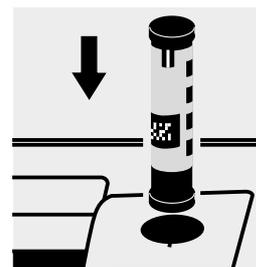
Add 2 drops of Ni-3 and mix.



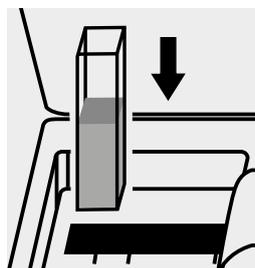
Reaction time:  
2 minutes



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 ( $\Sigma$  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 and 100, Cat.Nos. 114692 and 118701.

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) is highly recommended.

# Nickel in electroplating baths

## Inherent color

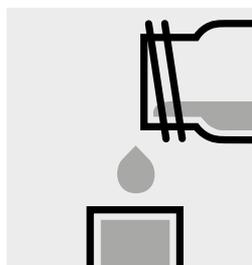
<b>Measuring range:</b>	10 – 120 g/l Ni	10-mm cell
	5.0 – 60.0 g/l Ni	20-mm cell
	2.0 – 24.0 g/l Ni	50-mm cell



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



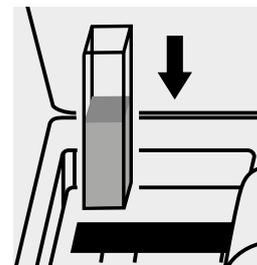
Add 5.0 ml of **sulfuric acid 40 %**, close the cell with the screw cap, and mix.



Transfer the solution into a corresponding cell.



Select method no. **57**.



Place the cell into the cell compartment. The measurement is performed automatically.

# Nitrate

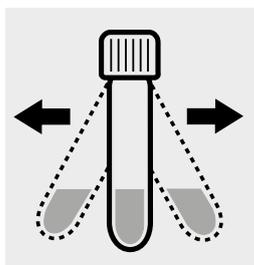
114542

Cell Test

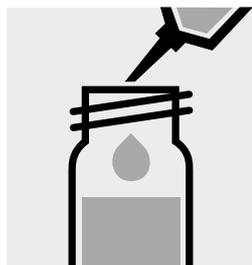
<b>Measuring</b>	0.5 – 18.0 mg/l NO <sub>3</sub> -N
<b>range:</b>	2.2 – 79.7 mg/l NO <sub>3</sub>
	Expression of results also possible in mmol/l.



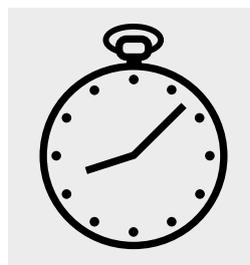
Add 1 level microspoon of **NO<sub>3</sub>-1K** into a reaction cell and close with the screw cap.



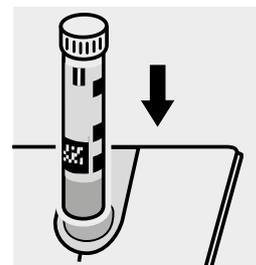
**Shake** the cell **vigorously for 1 minute** to dissolve the solid substance.



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



Reaction time:  
10 minutes



Place the cell into the 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 solutions for photometric applications, CRM, Cat.Nos. 125037, 125038, 132241, and 132242.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, 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

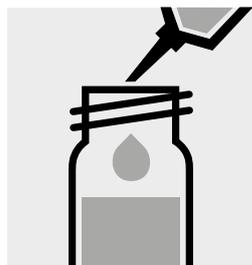
114563

Cell Test

<b>Measuring</b>	0.5 – 25.0 mg/l NO <sub>3</sub> -N
<b>range:</b>	2.2 – 110.7 mg/l NO <sub>3</sub>
	Expression of results also possible in mmol/l.



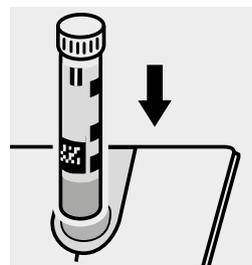
Pipette 1.0 ml of the sample into a reaction cell, **do not mix**.



Add 1.0 ml of **NO<sub>3</sub>-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 solutions for photometric applications, CRM, Cat.Nos. 125037, 125038, 132241, and 132242.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, 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

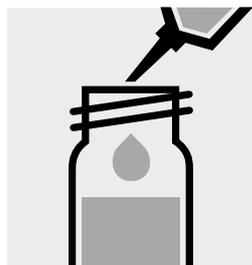
114764

Cell Test

<b>Measuring</b>	1.0 – 50.0 mg/l NO <sub>3</sub> -N
<b>range:</b>	4 – 221 mg/l NO <sub>3</sub>
	Expression of results also possible in mmol/l.



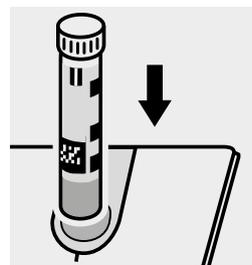
Pipette 0.50 ml of the sample into a reaction cell, **do not mix**.



Add 1.0 ml of **NO<sub>3</sub>-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 solutions for photometric applications, CRM, Cat.Nos. 125037, 125038, 125039, 132241, and 132242.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, 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

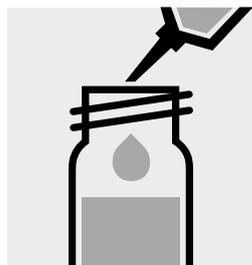
100614

Cell Test

<b>Measuring</b>	23 – 225 mg/l NO <sub>3</sub> -N
<b>range:</b>	102 – 996 mg/l NO <sub>3</sub>
	Expression of results also possible in mmol/l.



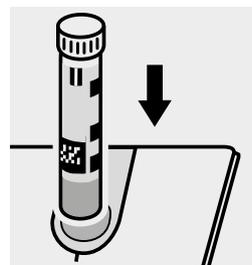
Pipette 1.0 ml of **NO<sub>3</sub>-1K** into a reaction cell, **do not mix**.



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:

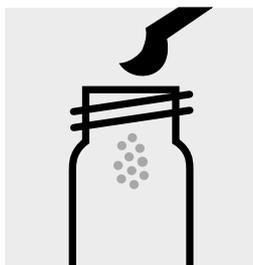
To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 125039 and 125040.

# Nitrate

**114773**

Test

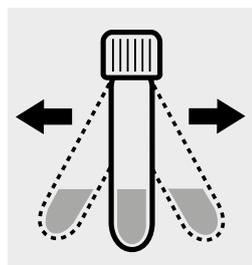
<b>Measuring</b>	0.5 – 20.0 mg/l NO <sub>3</sub> -N	2.2 – 88.5 mg/l NO <sub>3</sub>	10-mm cell
<b>range:</b>	0.20 – 10.00 mg/l NO <sub>3</sub> -N	0.89 – 44.27 mg/l NO <sub>3</sub>	20-mm cell
Expression of results also possible in mmol/l.			



Place 1 microspoon of **NO<sub>3</sub>-1** into a dry empty round cell (Empty cells, Cat.No. 114724).



Add 5.0 ml of **NO<sub>3</sub>-2** with pipette into the cell. Close the cell with the screw cap.



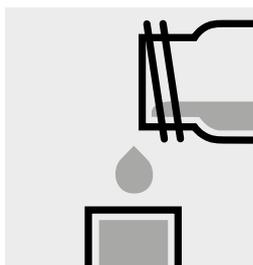
**Shake vigorously for 1 minute** to dissolve the solid substance.



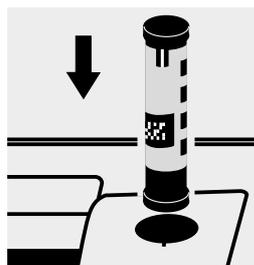
Add very slowly 1.5 ml of the sample with pipette, close the cell with the screw cap, and mix **briefly**. **Caution, cell becomes hot!**



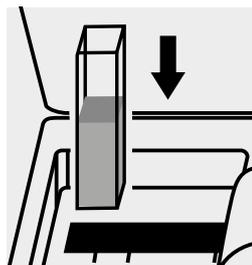
Reaction time:  
10 minutes



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.Nos. 114676 and 114675, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125036, 125037, 125038, 132240, 132241, and 132242.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, can also be used after diluting accordingly.

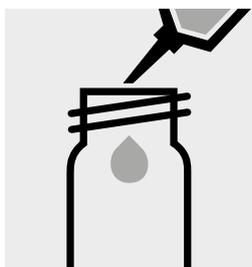
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

# Nitrate

109713

Test

<b>Measuring range:</b>	1.0 – 25.0 mg/l NO <sub>3</sub> -N	4.4 – 110.7 mg/l NO <sub>3</sub>	10-mm cell
	0.5 – 12.5 mg/l NO <sub>3</sub> -N	2.2 – 55.3 mg/l NO <sub>3</sub>	20-mm cell
	0.10 – 5.00 mg/l NO <sub>3</sub> -N	0.4 – 22.1 mg/l NO <sub>3</sub>	50-mm cell
Expression of results also possible in mmol/l.			



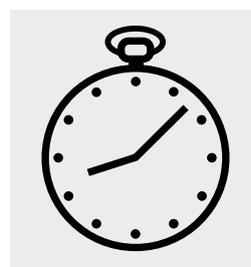
Pipette 4.0 ml of **NO<sub>3</sub>-1** into a dry empty round cell (Empty cells, Cat. No. 114724).



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



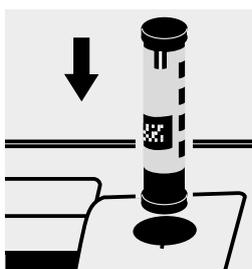
Add 0.50 ml of **NO<sub>3</sub>-2** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**



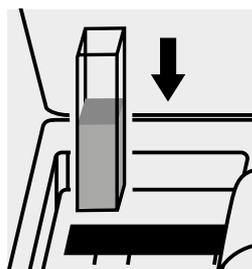
Reaction time: 10 minutes



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.Nos. 114676 and 114675, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125036, 125037, 125038, 132240, 132241, and 132242.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, 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

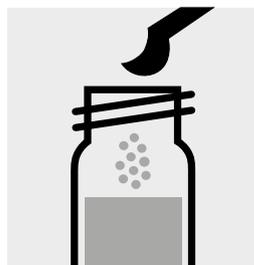
114556

Cell Test

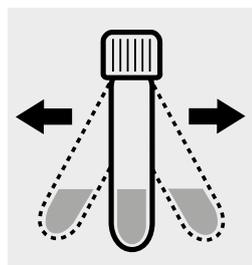
<b>Measuring</b>	0.10 – 3.00 mg/l NO <sub>3</sub> -N
<b>range:</b>	0.4 – 13.3 mg/l NO <sub>3</sub>
Expression of results also possible in mmol/l.	



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



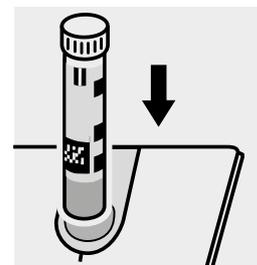
Add 1 level blue micro-spoon of **NO<sub>3</sub>-1K**, **immediately** close the cell tightly with the screw cap. **Caution, foams strongly (eye protection, protective gloves)!**



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 solutions for photometric applications, CRM, Cat.Nos. 125036, 125037, 132240, and 132241.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, 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.

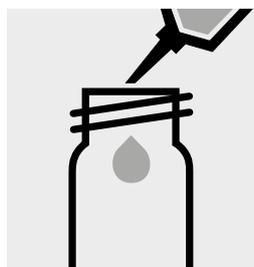
# Nitrate

in seawater

114942

Test

<b>Measuring</b>	0.2 – 17.0 mg/l NO <sub>3</sub> -N	0.9 – 75.3 mg/l NO <sub>3</sub>	10-mm cell
<b>range:</b>	Expression of results also possible in mmol/l.		



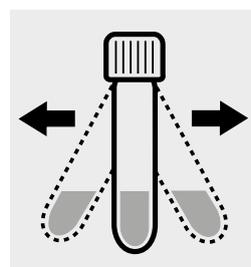
Pipette 5.0 ml of **NO<sub>3</sub>-1** into a dry empty round cell (Empty cells, Cat. No. 114724).



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



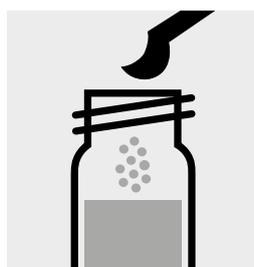
**Immediately** add 1.5 ml of **NO<sub>3</sub>-2** with pipette.



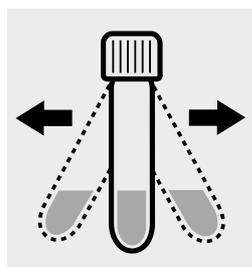
Close cell tightly and shake **vigorously**.



Reaction time: 15 minutes



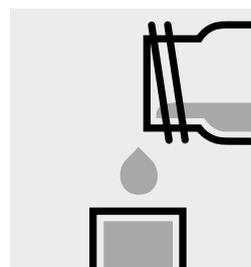
Add 2 level grey microspoons of **NO<sub>3</sub>-3**.



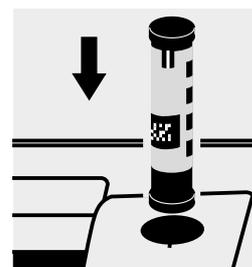
Close cell tightly and shake **vigorously** until the reagent is completely dissolved.



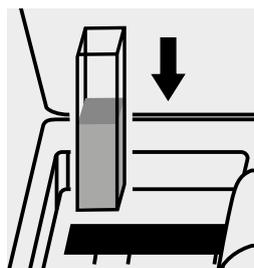
Reaction time: 60 minutes



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 solutions for photometric applications, CRM, Cat.Nos. 125036, 125037, 125038, 132240, 132241, and 132242.

Ready-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, can also be used after diluting accordingly.

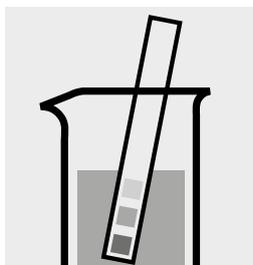
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

# Nitrate

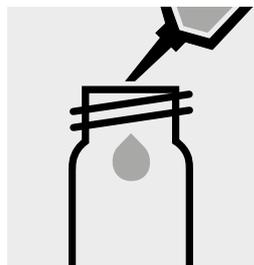
101842

Test

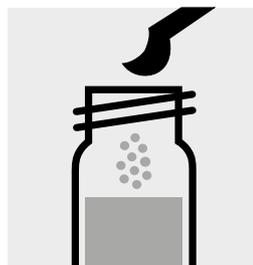
<b>Measuring range:</b>	0.3 – 30.0 mg/l NO <sub>3</sub> -N	1.3 – 132.8 mg/l NO <sub>3</sub>	50-mm cell
	Expression of results also possible in mmol/l.		



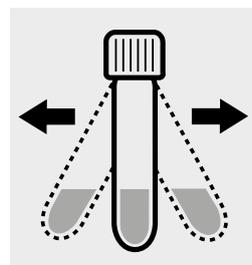
Check the pH of the sample, specified range: pH 3 – 9. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



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



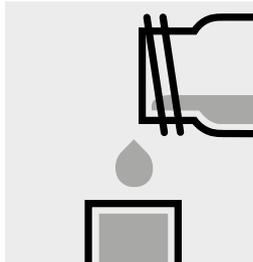
Add 1 level blue micro-spoon of NO<sub>3</sub>-1, **immediately** close tightly with the screw cap.



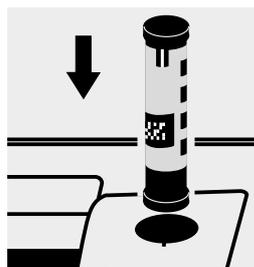
**Shake** the tube **vigorously for 1 minute** to dissolve the solid substance.



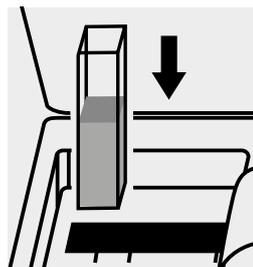
Reaction time: 5 minutes, **measure immediately**.



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-to-use nitrate standard solution Certipur®, Cat.No. 119811, concentration 1000 mg/l NO<sub>3</sub><sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132241 and 132242.

# Nitrate

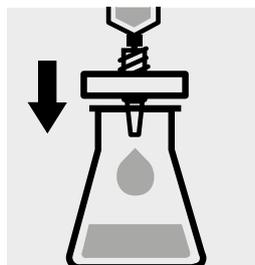
(Direct measurement in the UV range)

analogous to APHA 4500-NO<sub>3</sub><sup>-</sup> B

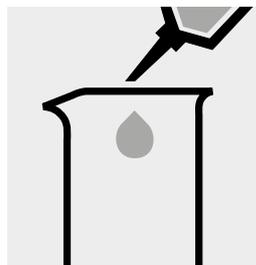
Application

Measuring range: 0.0 – 7.0 mg/l NO<sub>3</sub>-N

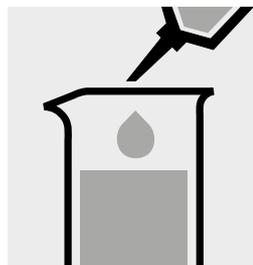
10-mm quartz cell



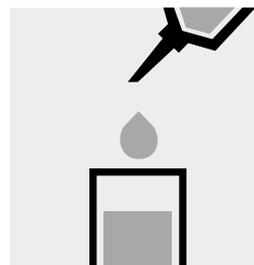
Filter turbid samples.



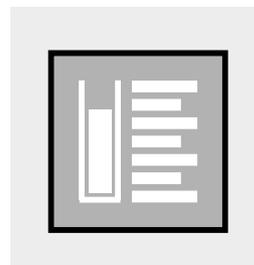
Place 50 ml of sample into a glass vessel.



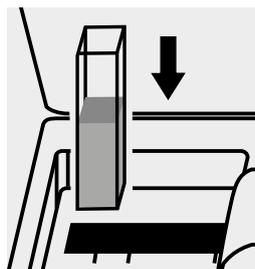
Add 1 ml of **hydrochloric acid 1 mol/l Titripur**<sup>®</sup> (Cat. No. 109057) with pipette and mix.



Transfer the solution into the quartz cell.



Select method no. **2503**.



Place the cell into the cell compartment. The measurement is performed automatically.

### Important:

If “Condition not met” appears on the display, this is due to a sample-dependent interference (matrix effect). In this case an evaluation is not possible.

### Important:

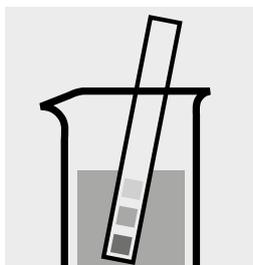
The exact procedure as well as further details on the method used can be found in the corresponding application. This application can be downloaded directly at [www.analytical-test-kits.com](http://www.analytical-test-kits.com).

# Nitrite

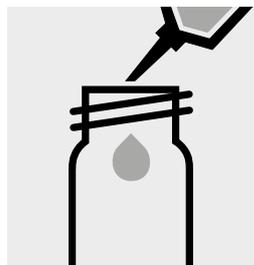
114547

Cell Test

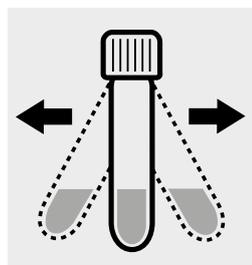
<b>Measuring</b>	0.010 – 0.700 mg/l NO <sub>2</sub> -N
<b>range:</b>	0.03 – 2.30 mg/l NO <sub>2</sub>
	Expression of results also possible in mmol/l.



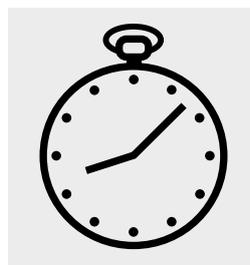
Check the pH of the sample, specified range: pH 2 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



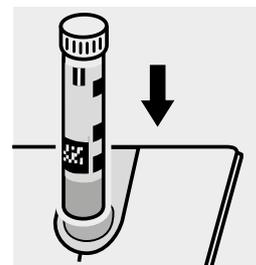
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap.



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:

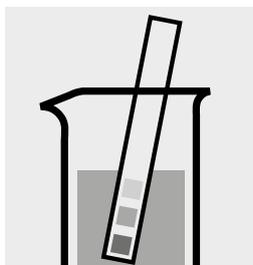
To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrite standard solution Certipur<sup>®</sup>, Cat.No. 119899, concentration 1000 mg/l NO<sub>2</sub><sup>-</sup>, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125041.

# Nitrite

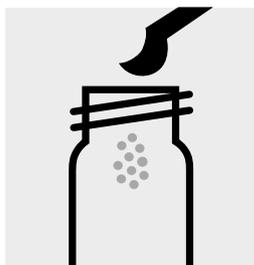
100609

Cell Test

<b>Measuring</b>	1.0 – 90.0 mg/l NO <sub>2</sub> -N
<b>range:</b>	3 – 296 mg/l NO <sub>2</sub>
	Expression of results also possible in mmol/l.



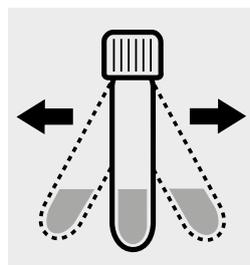
Check the pH of the sample, specified range: pH 1 – 12. If required, add dilute sulfuric acid drop by drop to adjust the pH.



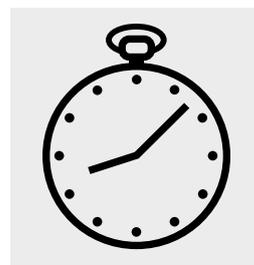
Add 2 level blue microspoons of **NO<sub>2</sub>-1K** into a reaction cell.



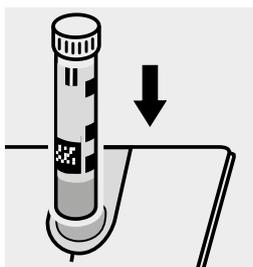
Add 8.0 ml of the sample with pipette and close with the screw cap.



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:

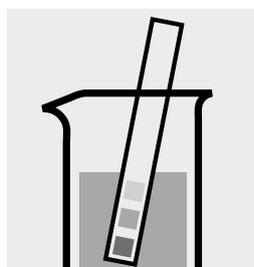
To check the measurement system (test reagents, measurement device, and handling) ready-to-use nitrite standard solution Certipur<sup>®</sup>, Cat.No. 119899, concentration 1000 mg/l NO<sub>2</sub><sup>-</sup>, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 125042.

# Nitrite

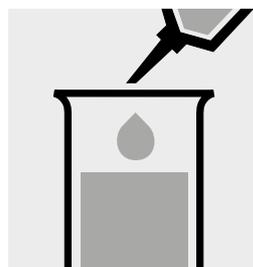
114776

Test

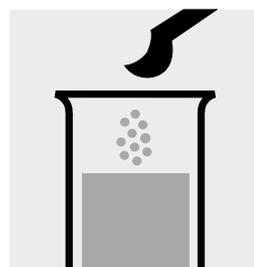
<b>Measuring</b>	0.02 – 1.00 mg/l NO <sub>2</sub> -N	0.07 – 3.28 mg/l NO <sub>2</sub>	10-mm cell
<b>range:</b>	0.010 – 0.500 mg/l NO <sub>2</sub> -N	0.03 – 1.64 mg/l NO <sub>2</sub>	20-mm cell
	0.002 – 0.200 mg/l NO <sub>2</sub> -N	0.007 – 0.657 mg/l NO <sub>2</sub>	50-mm cell
Expression of results also possible in mmol/l.			



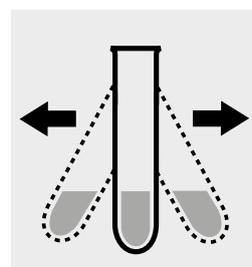
Check the pH of the sample, specified range: pH 2 – 10.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



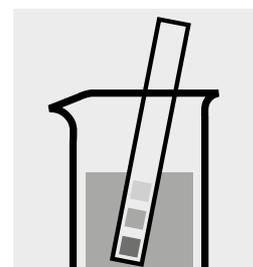
Pipette 5.0 ml of the sample into a test tube.



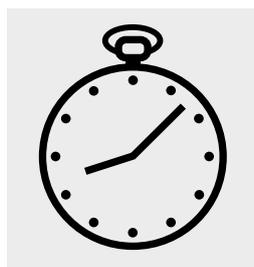
Add 1 level blue micro-spoon of NO<sub>2</sub><sup>-</sup>.



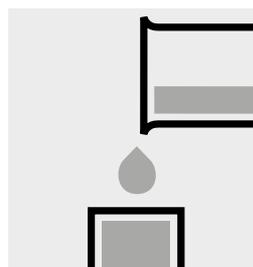
Shake vigorously to dissolve the solid substance.



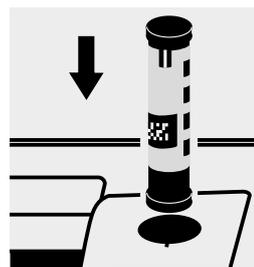
Check the pH, specified range: pH 2.0 – 2.5.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



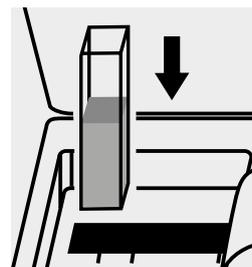
Reaction time:  
10 minutes



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-to-use nitrite standard solution Certipur<sup>®</sup>, Cat.No. 119899, concentration 1000 mg/l NO<sub>2</sub><sup>-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 125041 and 133021.

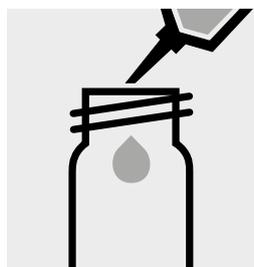
# Nitrogen (total)

114537

Cell Test

**Measuring** 0.5 – 15.0 mg/l N

**range:** Expression of results also possible in mmol/l.



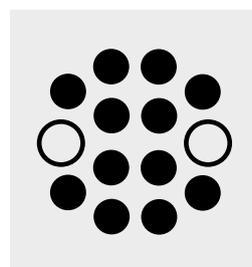
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



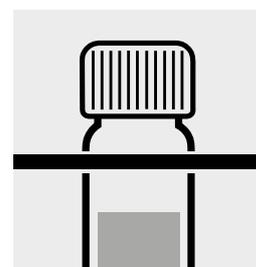
Add 1 level blue microspoon of **N-1K**.



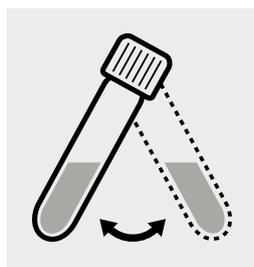
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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



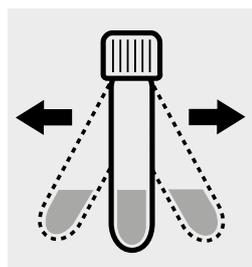
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.



Swirl the cell after 10 minutes.



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



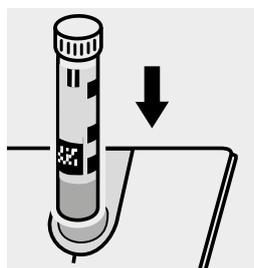
**Shake** the cell **vigorously for 1 minute** to dissolve the solid substance.



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



Reaction time: 10 minutes



Place the cell into the 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 solutions for photometric applications, CRM, Cat.Nos. 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

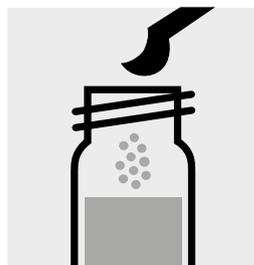
Cell Test

**Measuring** 0.5 – 15.0 mg/l N

**range:** Expression of results also possible in mmol/l.



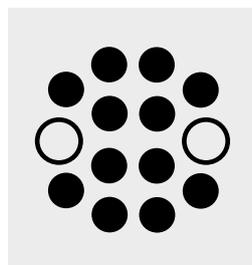
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



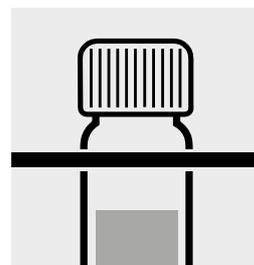
Add 1 level blue micro-spoon of **N-1K**.



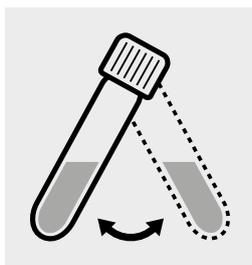
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



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



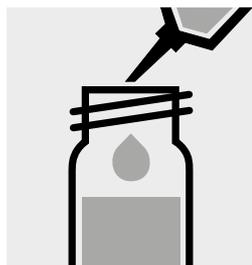
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample**.



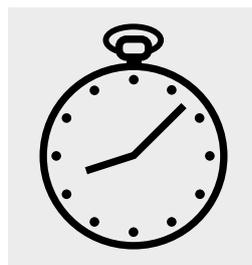
Swirl the cell after 10 minutes.



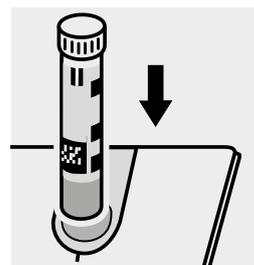
Pipette 1.0 ml of the **pretreated sample** into a reaction cell, **do not mix!**



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 solutions for photometric applications, CRM, Cat.Nos. 125043 and 125044.

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

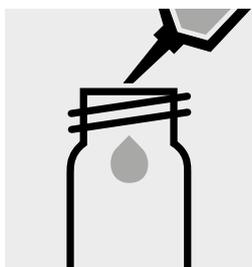
# Nitrogen (total)

114763

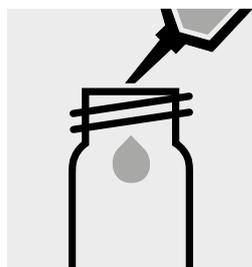
Cell Test

**Measuring** 10 – 150 mg/l N

**range:** 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).



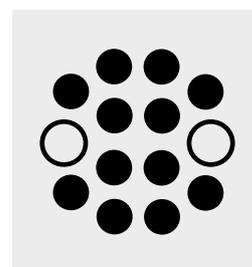
Add 9.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) with pipette.



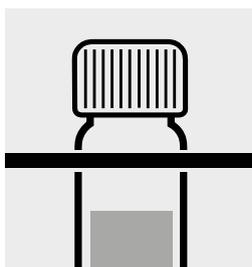
Add 1 level blue micro-spoon of **N-1K**.



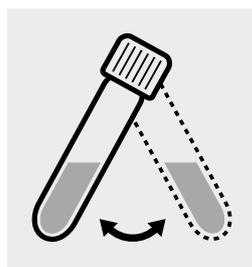
Add 6 drops of **N-2K**, close the cell with the screw cap, and mix.



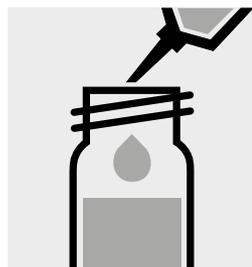
Heat the cell in the thermoreactor at 120 °C for 1 hour.



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



Swirl the cell after 10 minutes.



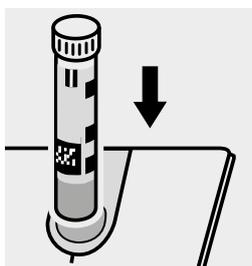
Pipette 1.0 ml of the **pretreated sample** into a reaction cell, **do not mix!**



Add 1.0 ml of **N-3K** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**



Reaction time: 10 minutes



Place the cell into the 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 solutions for photometric applications, CRM, Cat.Nos. 125044 and 125045.

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

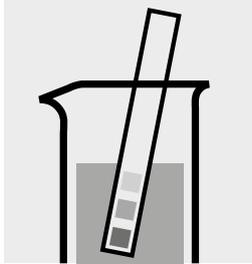
# Oxygen

114694

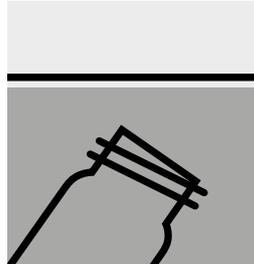
Cell Test

**Measuring** 0.5 – 12.0 mg/l O<sub>2</sub>

**range:** Expression of results also possible in mmol/l.



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



Fill watersample into a reaction cell to overflowing and make sure, that no air bubbles are present.



Place the filled cell in a test-tube rack.



Add with microspoon 1 glass bead.



Add 5 drops of O<sub>2</sub>-1K.



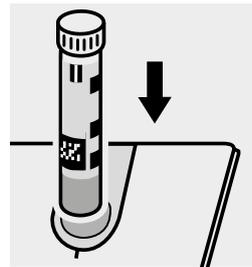
Add 5 drops of O<sub>2</sub>-2K, close the cell with the screw cap, and shake for 10 seconds.



Reaction time: 1 minute



Add 10 drops of O<sub>2</sub>-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:

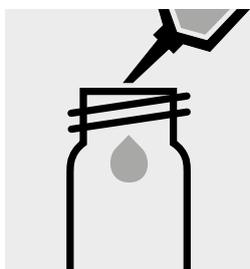
To check the measurement system (test reagents, measurement device, and handling) a oxygen standard solution must be prepared (application see the website).

# Oxygen Scavengers

119251

Test

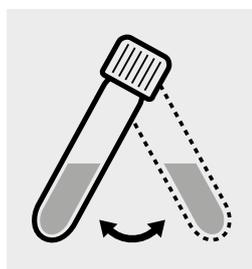
<b>Measuring</b>	0.020 – 0.500 mg/l DEHA*	20-mm cell
<b>range:</b>	*N,N-diethylenhydroxylamine	
	0.027 – 0.666 mg/l Carbohy*	20-mm cell
	*carbohydrazide	
	0.05 – 1.32 mg/l Hydro*	20-mm cell
	*hydroquinone	
	0.08 – 1.95 mg/l ISA*	20-mm cell
	*isoascorbic acid	
	0.09 – 2.17 mg/l MEKO*	20-mm cell
	*methylethylketoxime	



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.



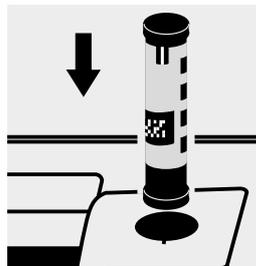
Add 0.20 ml of **Oxyscav 2** with pipette, close with the screw cap, and mix.



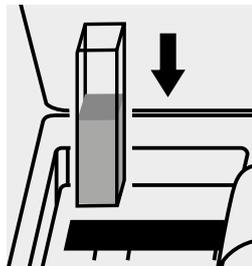
Reaction time: 10 minutes, **protect from light in the process, measure immediately.**



Transfer the solution into a rectangular cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

## Quality assurance:

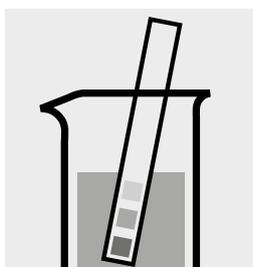
To check the measurement system (test reagents, measurement device, and handling) a oxygen scavengers standard solution must be prepared from N,N-diethylhydroxylamine, Cat.No. 818473 (see section "Standard solutions").

# Ozone

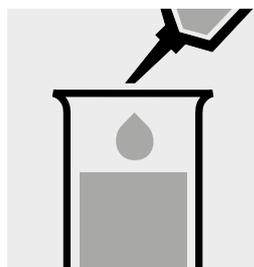
100607

Test

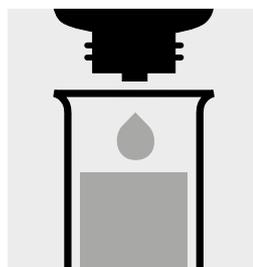
<b>Measuring</b>	0.05 – 4.00 mg/l O <sub>3</sub>	10-mm cell
<b>range:</b>	0.02 – 2.00 mg/l O <sub>3</sub>	20-mm cell
	0.010 – 0.800 mg/l O <sub>3</sub>	50-mm cell
	Expression of results also possible in mmol/l.	



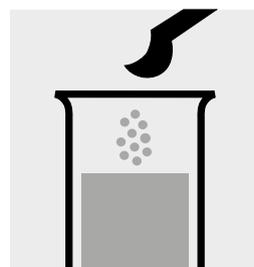
Check the pH of the sample, specified range: pH 4 – 8.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



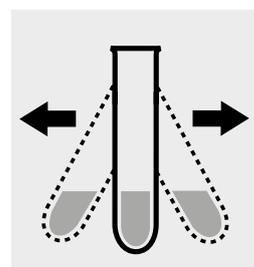
Pipette 10 ml of the sample into a test tube.



Add 2 drops of O<sub>3</sub>-1 and mix.



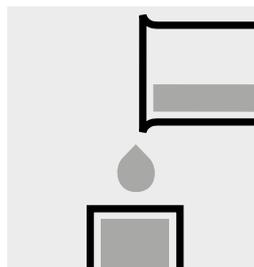
Add 1 level blue micro-spoon of O<sub>3</sub>-2.



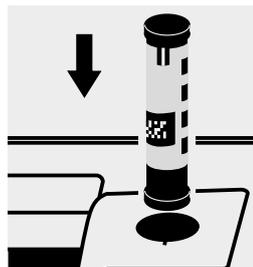
Shake vigorously to dissolve the solid substance.



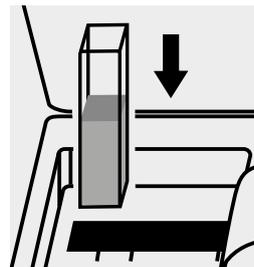
Reaction time:  
1 minute



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).

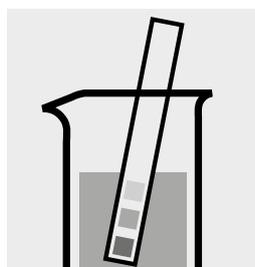
## Quality assurance:

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

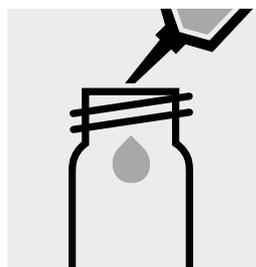
# Palladium in water and wastewater

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.



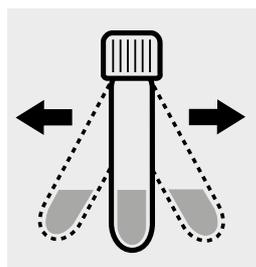
Check the pH of the sample, specified value: pH 3.0. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



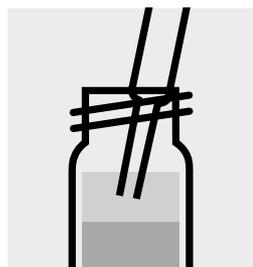
Add 0.20 ml of **reagent 2** with pipette, close the cell with the screw cap, and mix.



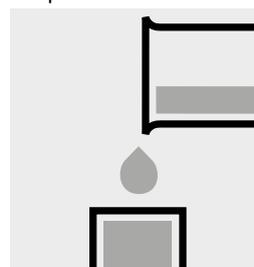
Add 5.0 ml **isoamyl alcohol GR** (Cat.No. 100979) with pipette, close the cell with the screw cap.



Shake the cell vigorously for 1 minute. Leave to stand to allow phases to separate.



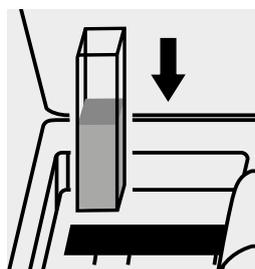
Aspirate the organic-clear upper phase from the tube with pipette and dry over **sodium sulfate anhydrous** (Cat.No. 106649).



Transfer the dried solution into a cell.



Select method no. **133**.



Place the cell into the cell compartment. The measurement is performed automatically.

## 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](http://www.analytical-test-kits.com).

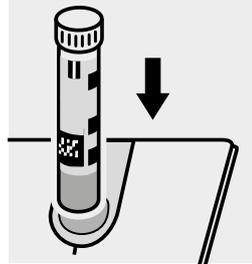
Measuring range: pH 6.4 – 8.8



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<sup>®</sup>, Cat.No. 109407, can be used.

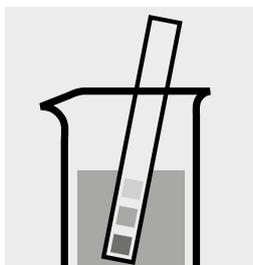
# Phenol

114551

Cell Test

**Measuring** 0.10 – 2.50 mg/l phenol

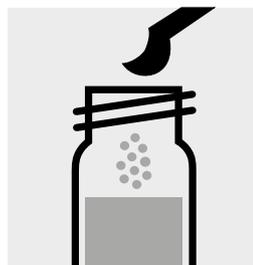
**range:** Expression of results also possible in mmol/l.



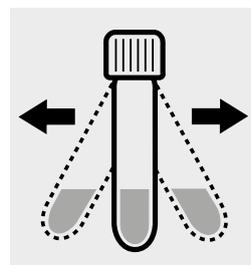
Check the pH of the sample, specified range: pH 2 – 11. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



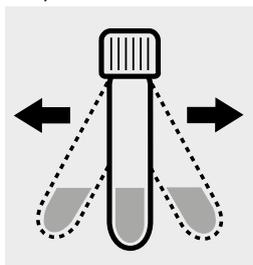
Add 1 level grey microspoon of **Ph-1K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



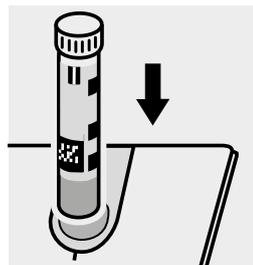
Add 1 level green microspoon of **Ph-2K**, close the cell with the screw cap.



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 concentrations in the sample result in a weakening of the color and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

## Quality assurance:

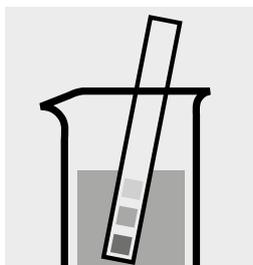
To check the measurement system (test reagents, measurement device, and handling) a phenol standard solution must be prepared from Phenol GR, Cat.No. 100206 (see section "Standard solutions").

# Phenol

100856

Test

<b>Measuring</b>	0.002 – 0.100 mg/l C <sub>6</sub> H <sub>5</sub> OH	20-mm cell
<b>range:</b>	Expression of results also possible in mmol/l.	
<b>Attention!</b>	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.	



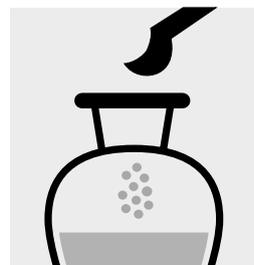
Check the pH of the sample, specified range: pH 2 – 11. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



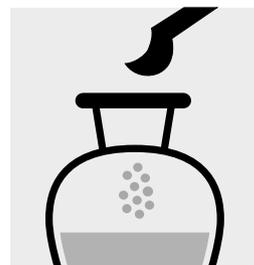
Pipette 200 ml of sample into a separation funnel.



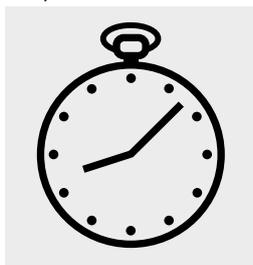
Add 5.0 ml of **Ph-1** with pipette and mix.



Add 1 level green micro-spoon of **Ph-2** and shake to dissolve the solid substance.



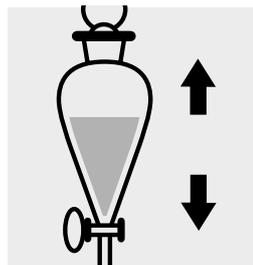
Add 1 level green micro-spoon of **Ph-3** and shake to dissolve the solid substance.



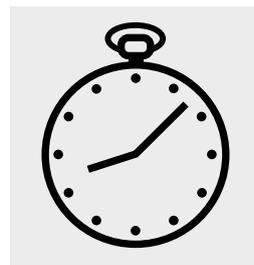
Reaction time: 30 minutes (protected from light)



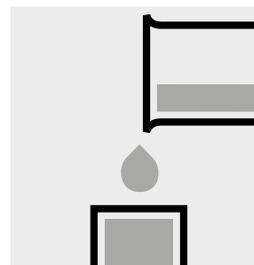
Add 10 ml of chloroform with pipette, close separation funnel.



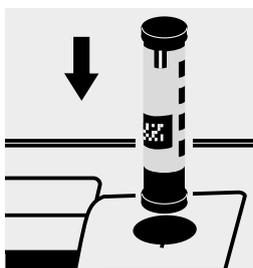
Shake vigorously for 1 minute.



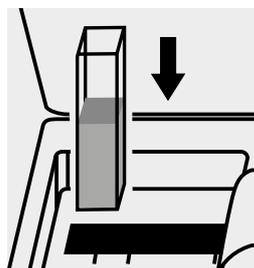
Leave to stand for 5 – 10 minutes to allow the phases to separate.



Transfer the clear **lower** phase into a cell.



Select method with AutoSelector measuring range 0.002 – 0.100 mg/l.



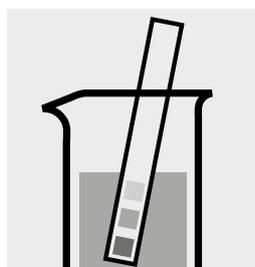
Place the cell into the cell compartment.

# Phenol

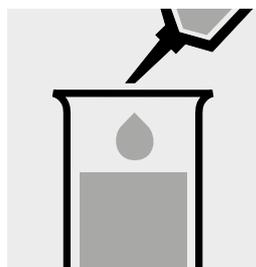
100856

Test

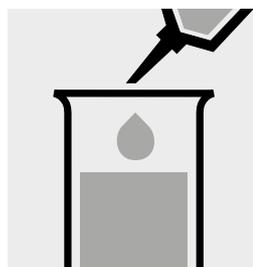
<b>Measuring</b>	0.10 – 5.00 mg/l C <sub>6</sub> H <sub>5</sub> OH	10-mm cell
<b>range:</b>	0.05 – 2.50 mg/l C <sub>6</sub> H <sub>5</sub> OH	20-mm cell
	0.025 – 1.000 mg/l C <sub>6</sub> H <sub>5</sub> OH	50-mm cell
Expression of results also possible in mmol/l.		



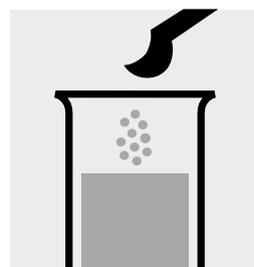
Check the pH of the sample, specified range: pH 2 – 11.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



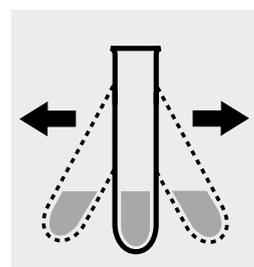
Pipette 10 ml of the sample into a test tube.



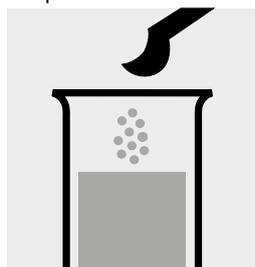
Add 1.0 ml of **Ph-1** with pipette and mix.



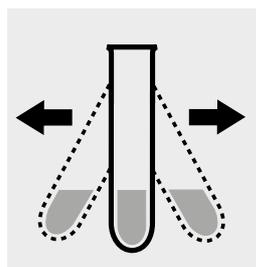
Add 1 level grey micro-spoon of **Ph-2**.



Shake vigorously to dissolve the solid substance.



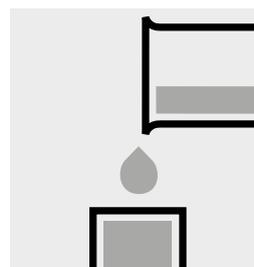
Add 1 level grey micro-spoon of **Ph-3**.



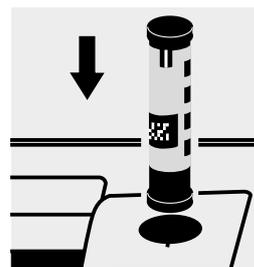
Shake vigorously to dissolve the solid substance.



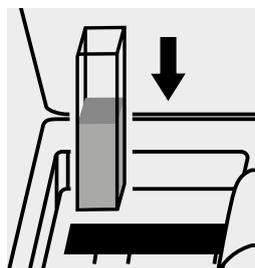
Reaction time: 10 minutes



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").

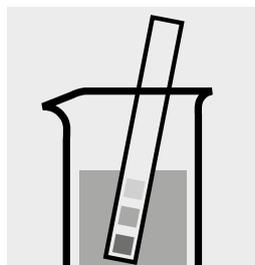
# Phosphate

100474

## Determination of orthophosphate

Cell Test

<b>Measuring</b>	0.05 – 5.00 mg/l PO <sub>4</sub> -P
<b>range:</b>	0.2 – 15.3 mg/l PO <sub>4</sub>
	0.11 – 11.46 mg/l P <sub>2</sub> O <sub>5</sub>
	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.



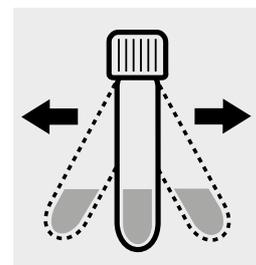
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



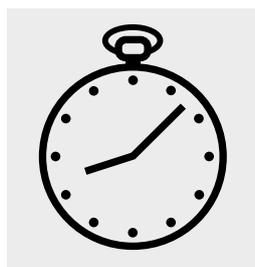
Add 5 drops of **P-1K**, close the cell with the screw cap, and mix.



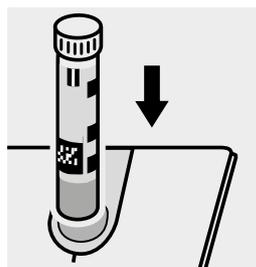
Add 1 dose of **P-2K** using the blue dose-metering cap, close the cell with the screw cap.



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-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

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

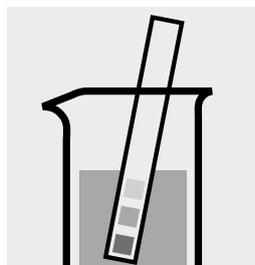
# Phosphate

114543

## Determination of orthophosphate

Cell Test

<b>Measuring</b>	0.05 – 5.00 mg/l PO <sub>4</sub> -P
<b>range:</b>	0.2 – 15.3 mg/l PO <sub>4</sub>
	0.11 – 11.46 mg/l P <sub>2</sub> O <sub>5</sub>
	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.



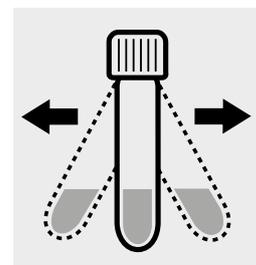
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



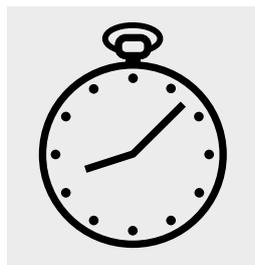
Add 5 drops of **P-2K**, close the cell with the screw cap, and mix.



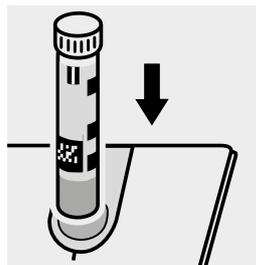
Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, 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.

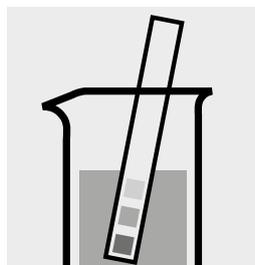
# Phosphate

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

114543

Cell Test

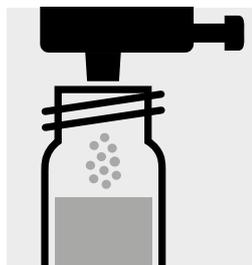
<b>Measuring</b>	0.05 – 5.00 mg/l P
<b>range:</b>	0.2 – 15.3 mg/l PO <sub>4</sub>
	0.11 – 11.46 mg/l P <sub>2</sub> O <sub>5</sub>
	Expression of results also possible in mmol/l.



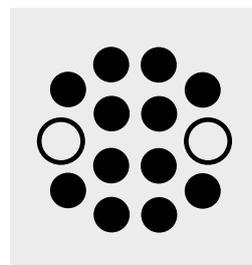
Check the pH of the sample, specified range: pH 0 – 10.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



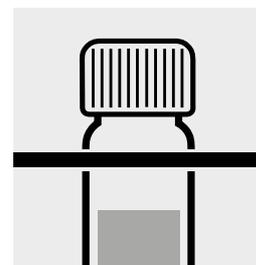
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



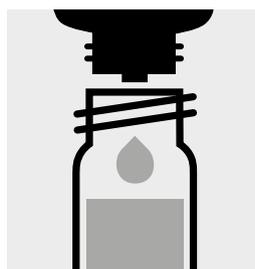
Add 1 dose of **P-1K** using the green dosing cap, close the cell with the screw cap.



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



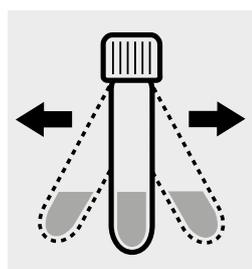
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



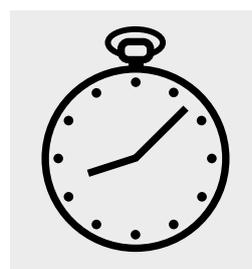
Add 5 drops of **P-2K**, close the cell with the screw cap, and mix.



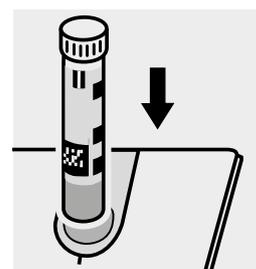
Add 1 dose of **P-3K** using the blue dosing cap, close the cell with the screw cap.



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, or the Standard solutions for photometric applications, CRM, Cat.Nos. 125046 and 125047.

Ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

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

# Phosphate

Differentiation between total phosphorus, orthophosphate, and organophosphate

114543

Cell Test

<b>Measuring</b>	0.05 – 5.00 mg/l PO <sub>4</sub> -P or P
<b>range:</b>	0.2 – 15.3 mg/l PO <sub>4</sub>
	0.11 – 11.46 mg/l P <sub>2</sub> O <sub>5</sub>

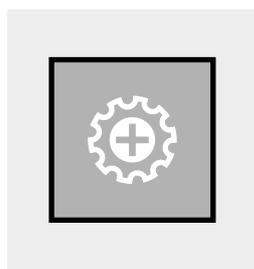
If the aim is to differentiate between orthophosphate (PO<sub>4</sub>-P) and P org\*, after selecting the method it is possible to set the method-specific “Differentiation” mode.

\* P<sub>org</sub> is the sum of polyphosphate and organophosphate.

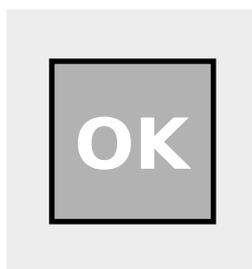
**Note:** If no differentiation is to be measured, the “Differentiation” mode must be deactivated again.



Select method no. 55.



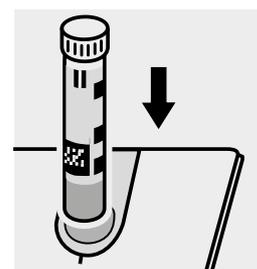
Tap the <Settings> button. Select “Differentiation” and activate.



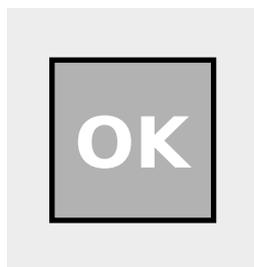
Confirm with <OK>.

Perform determination of **total phosphorus** (see analytical procedure “Determination of total phosphorus” with 114543). = **cell Σ P**

After the reaction time has expired:



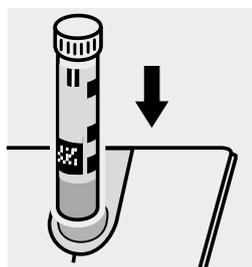
Place the **cell Σ P** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>.

Perform determination of **orthophosphate** (see analytical procedure “Determination of orthophosphate” with 114543). = **cell PO<sub>4</sub>-P**

After the reaction time has expired:



Place the **cell PO<sub>4</sub>-P** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>. The results A (Σ P), B (PO<sub>4</sub>-P), and C (P<sub>org</sub>) are shown in the display in mg/l.

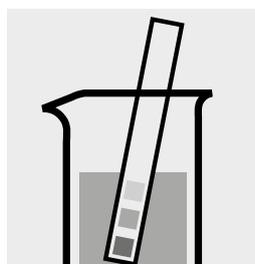
# Phosphate

100475

## Determination of orthophosphate

Cell Test

<b>Measuring</b>	0.5 – 25.0 mg/l PO <sub>4</sub> -P
<b>range:</b>	1.5 – 76.7 mg/l PO <sub>4</sub>
	1.1 – 57.3 mg/l P <sub>2</sub> O <sub>5</sub>
	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.



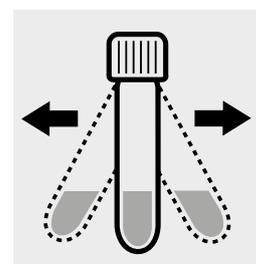
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



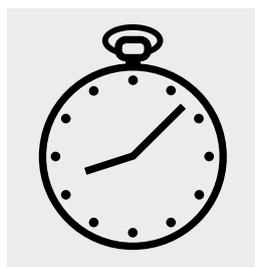
Add 5 drops of **P-1K**, close the cell with the screw cap, and mix.



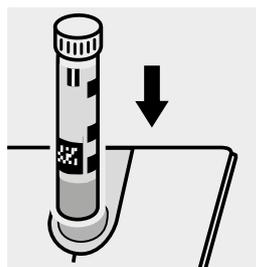
Add 1 dose of **P-2K** using the blue dosing cap, close the cell with the screw cap.



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. Nos. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. Nos. 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-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

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

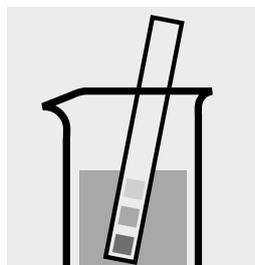
# Phosphate

114729

## Determination of orthophosphate

Cell Test

<b>Measuring</b>	0.5 – 25.0 mg/l PO <sub>4</sub> -P
<b>range:</b>	1.5 – 76.7 mg/l PO <sub>4</sub>
	1.1 – 57.3 mg/l P <sub>2</sub> O <sub>5</sub>
	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.



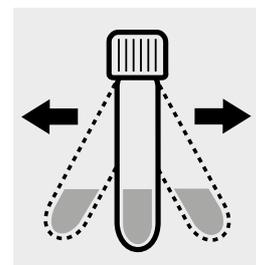
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



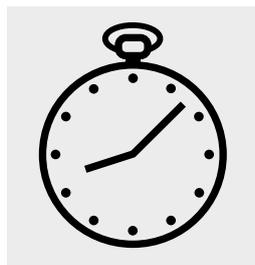
Add 5 drops of **P-2K**, close the cell with the screw cap, and mix.



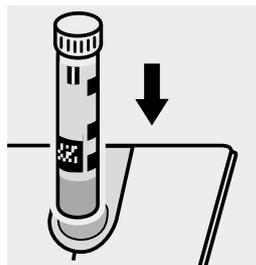
Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



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-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

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

# Phosphate

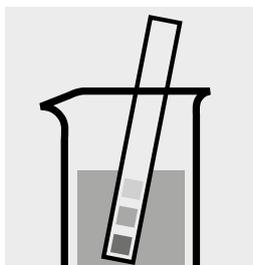
114729

Determination of total phosphorus

= sum of orthophosphate, polyphosphate, and organophosphate

Cell Test

<b>Measuring</b>	0.5 – 25.0 mg/l P
<b>range:</b>	1.5 – 76.7 mg/l PO <sub>4</sub>
	1.1 – 57.3 mg/l P <sub>2</sub> O <sub>5</sub>
	Expression of results also possible in mmol/l.



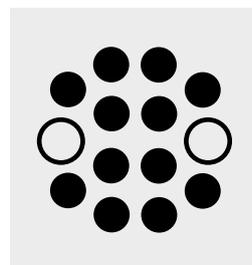
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



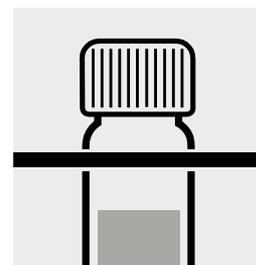
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



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



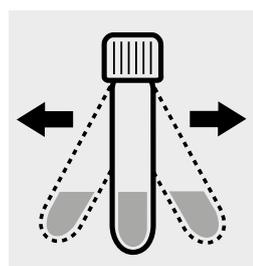
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



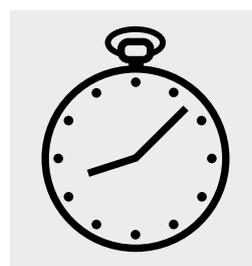
Add 5 drops of **P-2K**, close the cell with the screw cap, and mix.



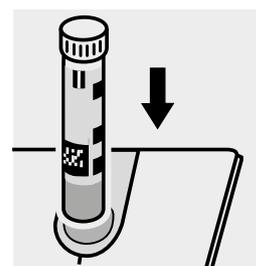
Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes



Place the cell into the 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, or as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 125047 and 125048.

Ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

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

# Phosphate

Differentiation between total phosphorus, orthophosphate, and organophosphate

114729

Cell Test

<b>Measuring</b>	0.5 – 25.0 mg/l PO <sub>4</sub> -P or P
<b>range:</b>	1.5 – 76.7 mg/l PO <sub>4</sub>
	1.1 – 57.3 mg/l P <sub>2</sub> O <sub>5</sub>

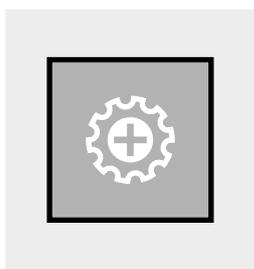
If the aim is to differentiate between orthophosphate (PO<sub>4</sub>-P) and P org\*, after selecting the method it is possible to set the method-specific “Differentiation” mode.

\* P<sub>org</sub> is the sum of polyphosphate and organophosphate.

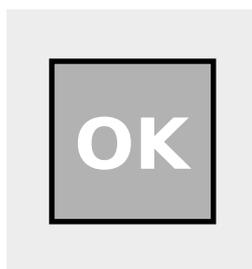
**Note:** If no differentiation is to be measured, the “Differentiation” mode must be deactivated again.



Select method no. **86**.



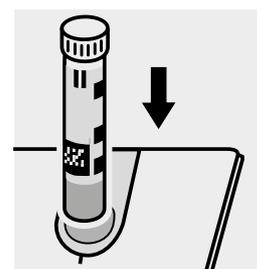
Tap the <Settings> button. Select “Differentiation” and activate.



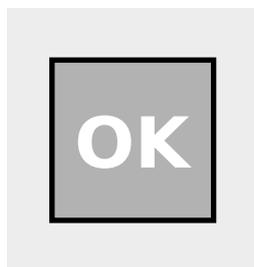
Confirm with <OK>.

Perform determination of **total phosphorus** (see analytical procedure “Determination of total phosphorus” with 114729). = **cell Σ P**

After the reaction time has expired:



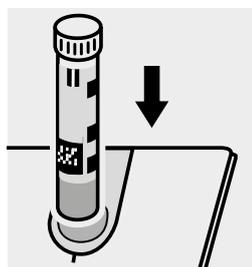
Place the **cell Σ P** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>.

Perform determination of **orthophosphate** (see analytical procedure “Determination of orthophosphate” with 114729). = **cell PO<sub>4</sub>-P**

After the reaction time has expired:



Place the **cell PO<sub>4</sub>-P** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>. The results A (Σ P), B (PO<sub>4</sub>-P), and C (P<sub>org</sub>) are shown in the display in mg/l.

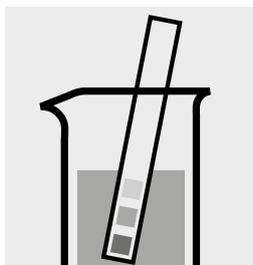
# Phosphate

100616

## Determination of orthophosphate

Cell Test

<b>Measuring</b>	3.0 – 100.0 mg/l PO <sub>4</sub> -P
<b>range:</b>	9 – 307 mg/l PO <sub>4</sub>
	7 – 229 mg/l P <sub>2</sub> O <sub>5</sub>
	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.



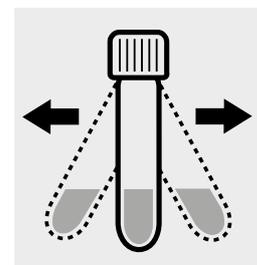
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



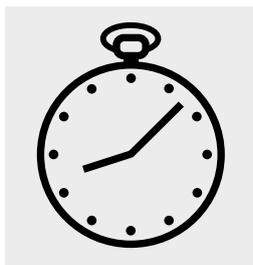
Add 5 drops of **PO<sub>4</sub>-1K**, close the cell with the screw cap, and mix.



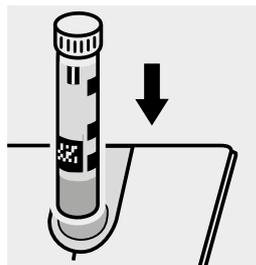
Add 1 dose of **PO<sub>4</sub>-2K** using the blue dose-metering cap, close the cell with the screw cap.



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. Nos. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. Nos. 114687 resp. 114688 can be used.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

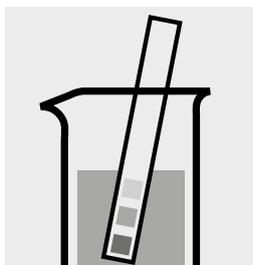
# Phosphate

100673

## Determination of orthophosphate

Cell Test

<b>Measuring</b>	3.0 – 100.0 mg/l PO <sub>4</sub> -P
<b>range:</b>	9 – 307 mg/l PO <sub>4</sub>
	7 – 229 mg/l P <sub>2</sub> O <sub>5</sub>
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.



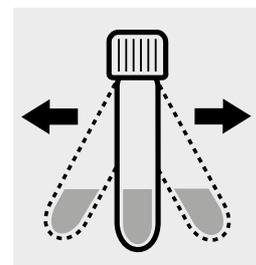
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



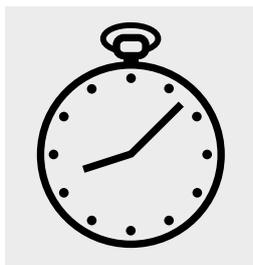
Add 5 drops of **P-2K**, close the cell with the screw cap, and mix.



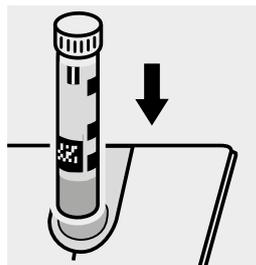
Add 1 dose of **P-3K** using the blue dosing cap, close the cell with the screw cap.



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-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

# Phosphate

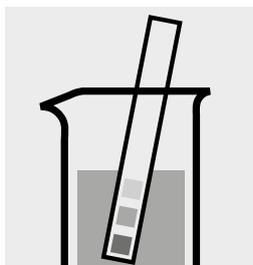
100673

Determination of total phosphorus

= sum of orthophosphate, polyphosphate, and organophosphate

Cell Test

<b>Measuring</b>	3.0 – 100.0 mg/l P
<b>range:</b>	9 – 307 mg/l PO <sub>4</sub>
	7 – 229 mg/l P <sub>2</sub> O <sub>5</sub>
Expression of results also possible in mmol/l.	



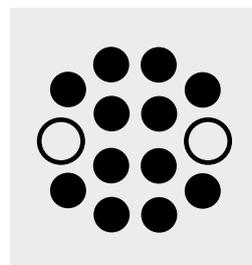
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



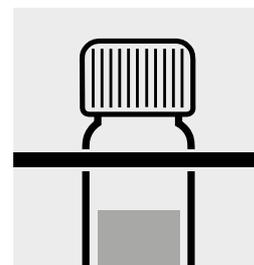
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



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



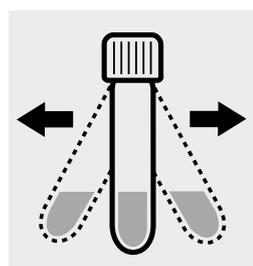
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



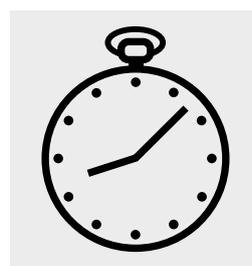
Add 5 drops of **P-2K**, close the cell with the screw cap, and mix.



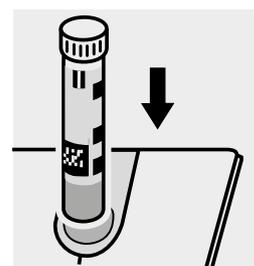
Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



Reaction time: 5 minutes



Place the cell into the 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-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 125047, 125048, and 125049.

# Phosphate

Differentiation between total phosphorus, orthophosphate, and organophosphate

100673

Cell Test

<b>Measuring</b>	3.0 – 100.0 mg/l PO <sub>4</sub> -P or P
<b>range:</b>	9 – 307 mg/l PO <sub>4</sub>
	7 – 229 mg/l P <sub>2</sub> O <sub>5</sub>

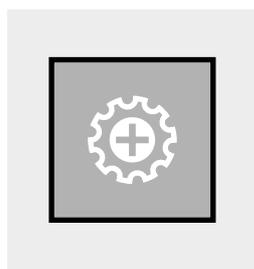
If the aim is to differentiate between orthophosphate (PO<sub>4</sub>-P) and P org\*, after selecting the method it is possible to set the method-specific “Differentiation” mode.

\* P<sub>org</sub> is the sum of polyphosphate and organophosphate.

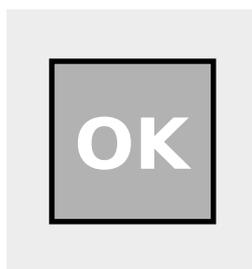
**Note:** If no differentiation is to be measured, the “Differentiation” mode must be deactivated again.



Select method no. **214**.



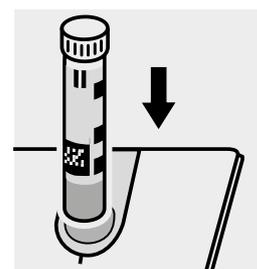
Tap the <Settings> button. Select “Differentiation” and activate.



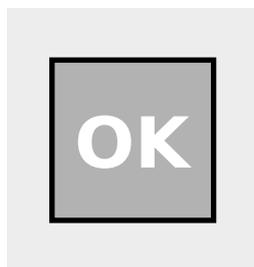
Confirm with <OK>.

Perform determination of **total phosphorus** (see analytical procedure “Determination of total phosphorus” with 100673).  
= **cell Σ P**

After the reaction time has expired:



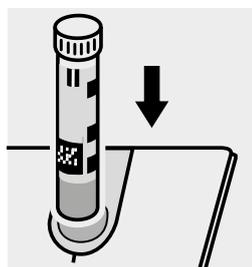
Place the **cell Σ P** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>.

Perform determination of **orthophosphate** (see analytical procedure “Determination of orthophosphate” with 100673).  
= **cell PO<sub>4</sub>-P**

After the reaction time has expired:



Place the **cell PO<sub>4</sub>-P** into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically.



Confirm with <OK>. The results A (Σ P), B (PO<sub>4</sub>-P), and C (P<sub>org</sub>) are shown in the display in mg/l.

# Phosphate

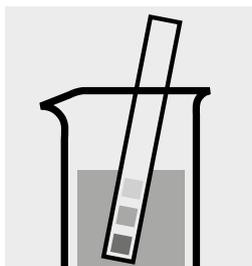
**114848**

## Determination of orthophosphate

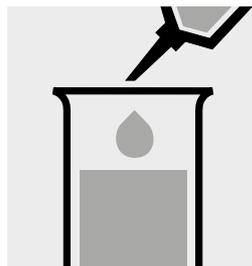
Test

<b>Measuring range:</b>	0.05 – 5.00 mg/l PO <sub>4</sub> -P	0.2 – 15.3 mg/l PO <sub>4</sub>	0.11 – 11.46 mg/l P <sub>2</sub> O <sub>5</sub>	10-mm cell
	0.03 – 2.50 mg/l PO <sub>4</sub> -P	0.09 – 7.67 mg/l PO <sub>4</sub>	0.07 – 5.73 mg/l P <sub>2</sub> O <sub>5</sub>	20-mm cell
	0.005 – 1.000 mg/l PO <sub>4</sub> -P	0.015 – 3.066 mg/l PO <sub>4</sub>	0.011 – 2.291 mg/l P <sub>2</sub> O <sub>5</sub>	50-mm cell
	0.0025 – 0.5000 mg/l PO <sub>4</sub> -P	0.0077 – 1.5331 mg/l PO <sub>4</sub>	0.0057 – 1.1457 mg/l P <sub>2</sub> O <sub>5</sub>	100-mm cell
Expression of results also possible in mmol/l.				

### Measuring ranges: 0.005 – 5.00 mg/l PO<sub>4</sub>-P



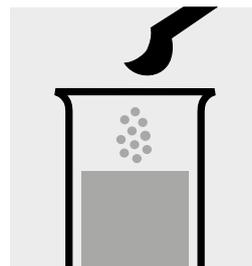
Check the pH of the sample, specified range: pH 0 – 10.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



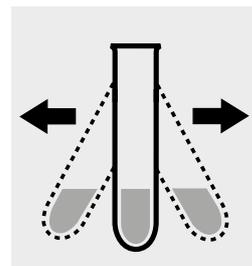
Pipette 5.0 ml of the sample into a test tube.



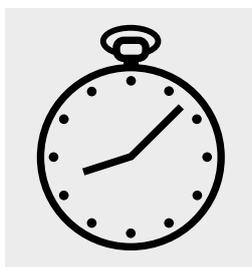
Add 5 drops of PO<sub>4</sub>-1 and mix.



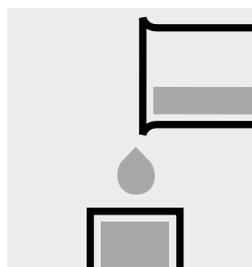
Add 1 level blue micro-spoon of PO<sub>4</sub>-2.



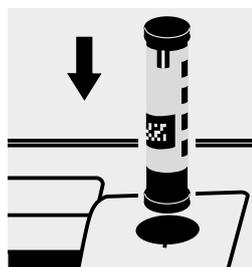
Shake vigorously to dissolve the solid substance.



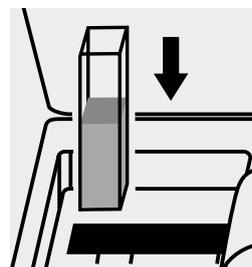
Reaction time:  
5 minutes



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 ( $\Sigma$  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-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can also be used after diluting accordingly.

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

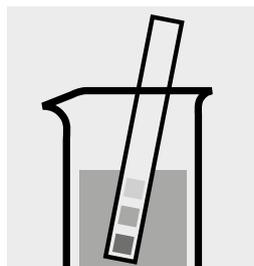
# Phosphate

## Determination of orthophosphate

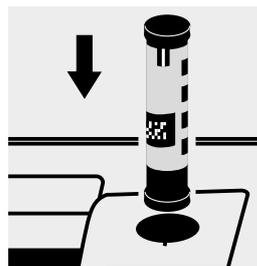
114848

Test

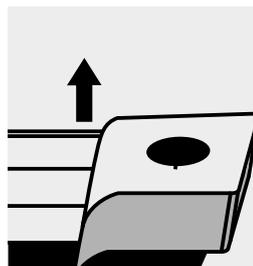
Measuring range: 0.0025 – 0.5000 mg/l PO<sub>4</sub>-P



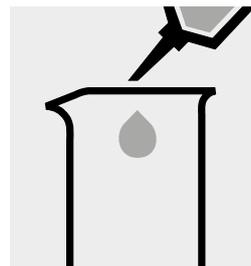
Check the pH of the sample, specified range: pH 0 – 10.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



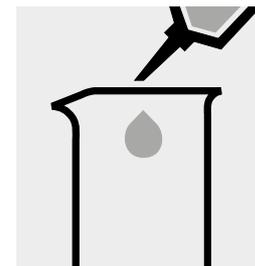
Select method with AutoSelector.



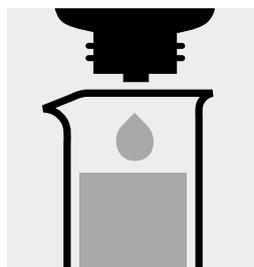
Remove the round-cell holder.



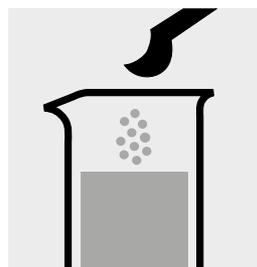
Place 20 ml of sample into a suitable vessel.



Place 20 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754 is recommended) into a second suitable vessel.  
(Blank)



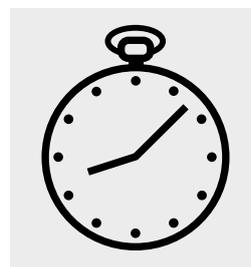
Add to each vessel 20 drops of PO<sub>4</sub>-1 and mix.



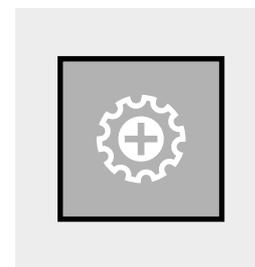
Add to each vessel 4 level blue microspones of PO<sub>4</sub>-2.



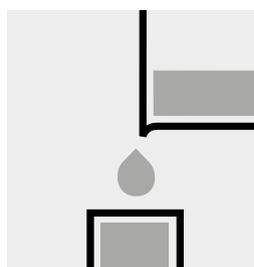
Shake both vessels vigorously to dissolve the solid substance.



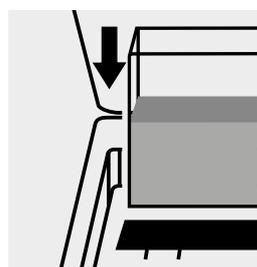
Reaction time: 5 minutes



Tap the <Settings> button.  
Select "Reagent blank".



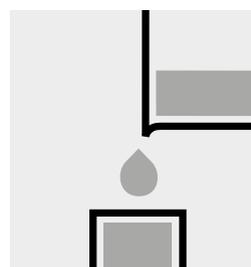
Transfer the blank into the cell.



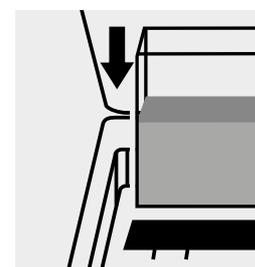
Insert the blank cell into the cell compartment.



Select "User RB".  
Confirm with <OK>.



Transfer the measurement sample into the cell.



Insert the cell containing the sample into the cell compartment.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

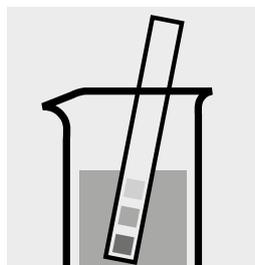
# Phosphate

100798

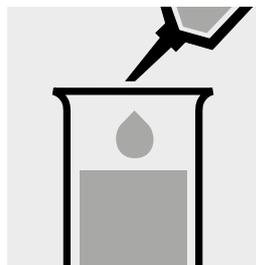
## Determination of orthophosphate

Test

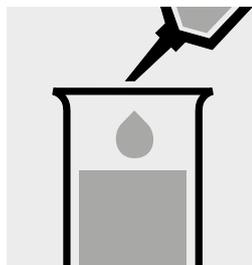
<b>Measuring</b>	1.0 – 100.0 mg/l PO <sub>4</sub> -P	3 – 307 mg/l PO <sub>4</sub>	2 – 229 mg/l P <sub>2</sub> O <sub>5</sub>	10-mm cell
<b>range:</b>	Expression of results also possible in mmol/l.			



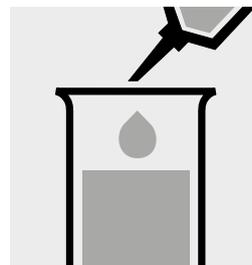
Check the pH of the sample, specified range: pH 0 – 10. If required, add dilute sulfuric acid drop by drop to adjust the pH.



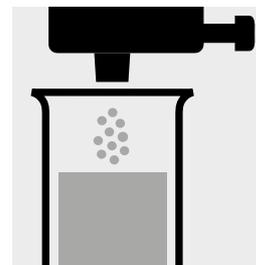
Pipette 8.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a test tube.



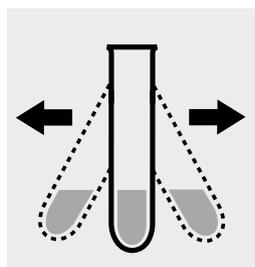
Add 0.50 ml of the sample with pipette and mix.



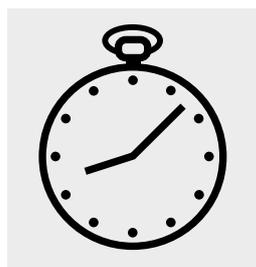
Add 0.50 ml of PO<sub>4</sub>-1 with pipette and mix.



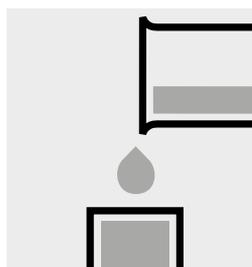
Add 1 dose of PO<sub>4</sub>-2 using the blue dose-metering cap.



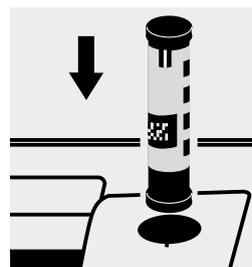
Shake vigorously to dissolve the solid substance.



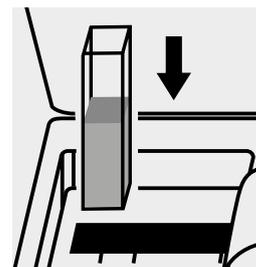
Reaction time: 5 minutes



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. Nos. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. Nos. 114687 resp. 114688 can be used.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur®, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

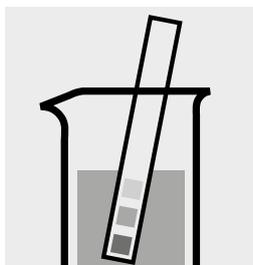
# Phosphate

114546

## Determination of orthophosphate

Cell Test

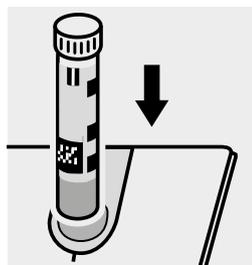
<b>Measuring</b>	0.5 – 25.0 mg/l PO <sub>4</sub> -P
<b>range:</b>	1.5 – 76.7 mg/l PO <sub>4</sub>
	1.1 – 57.3 mg/l P <sub>2</sub> O <sub>5</sub>
	Expression of results also possible in mmol/l.



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. Nos. 114543, 114729, and 100673 or Phosphate Test, Cat. No. 114848 in conjunction with Crack Set 10/10C, Cat. Nos. 114687 resp. 114688 can be used.

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur<sup>®</sup>, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

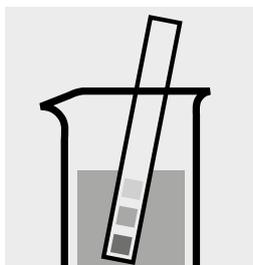
# Phosphate

114842

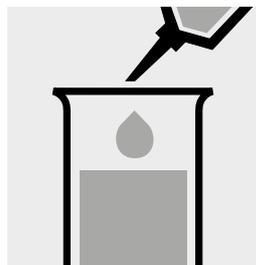
## Determination of orthophosphate

Test

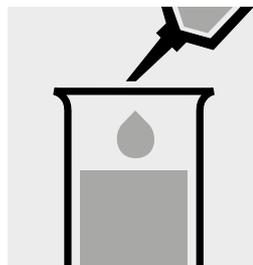
<b>Measuring</b>	1.0 – 30.0 mg/l PO <sub>4</sub> -P	3.1 – 92.0 mg/l PO <sub>4</sub>	2.3 – 68.7 mg/l P <sub>2</sub> O <sub>5</sub>	10-mm cell
<b>range:</b>	0.5 – 15.0 mg/l PO <sub>4</sub> -P	1.5 – 46.0 mg/l PO <sub>4</sub>	1.1 – 34.4 mg/l P <sub>2</sub> O <sub>5</sub>	20-mm cell
Expression of results also possible in mmol/l.				



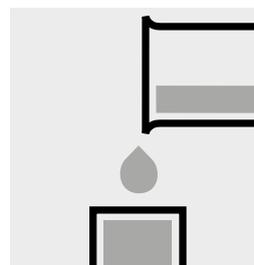
Check the pH of the sample, specified range: pH 0 – 10.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



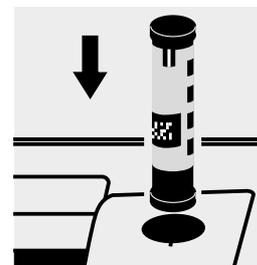
Pipette 5.0 ml of the sample into a test tube.



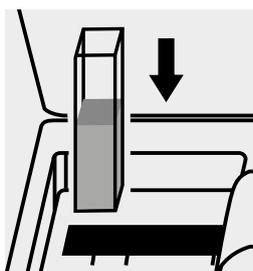
Add 1.2 ml of **PO<sub>4</sub>-1** with pipette and mix.



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

### Important:

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

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-to-use phosphate standard solution Certipur<sup>®</sup>, Cat.No. 119898, concentration 1000 mg/l PO<sub>4</sub><sup>3-</sup>, can be used after diluting accordingly.

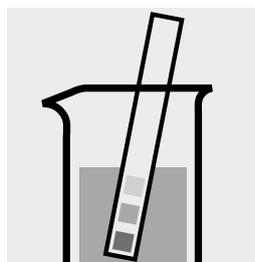
# Platinum in water and wastewater

Application

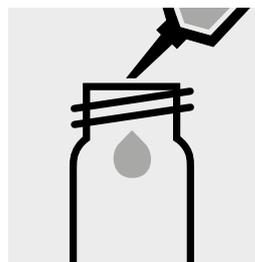
**Measuring range:** 0.10 – 1.25 mg/l Pt

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).



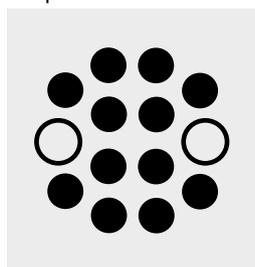
Add 1.0 ml of **reagent 1** with pipette, close the cell with the screw cap, and mix.



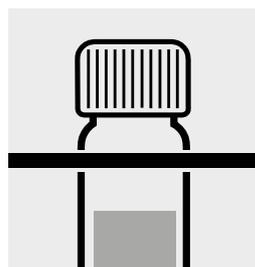
Add 0.50 ml of **reagent 2** with pipette, close the cell with the screw cap, and mix.



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.



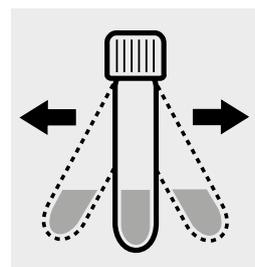
Heat the cell in the thermoreactor at 100 °C for 5 minutes.



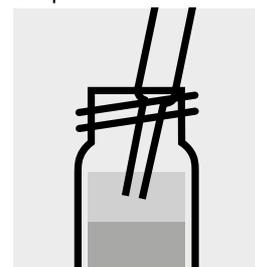
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



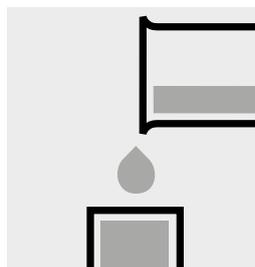
Add 5.0 ml **Isobutylmethylketone GR** (Cat.No. 106146) with pipette, close the cell with the screw cap.



Shake the cell vigorously for 1 minute. Leave to stand to allow phases to separate.



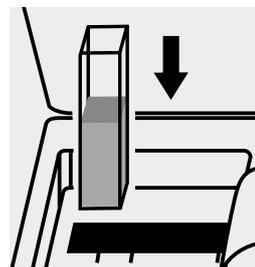
Aspirate the organic-clear upper phase from the tube with pipette and dry over **sodium sulfate anhydrous** (Cat.No. 106649).



Transfer the dried solution into a cell.



Select method no. **134**.



Place the cell into the cell compartment. The measurement is performed automatically.

## 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](http://www.analytical-test-kits.com).

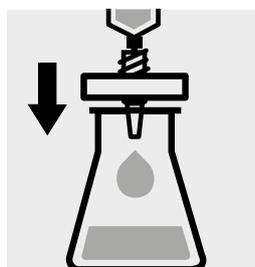
# Potassium

114562

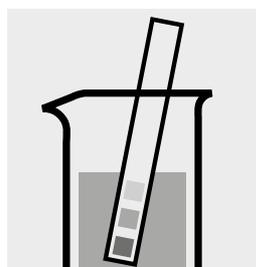
Cell Test

**Measuring** 5.0 – 50.0 mg/l K

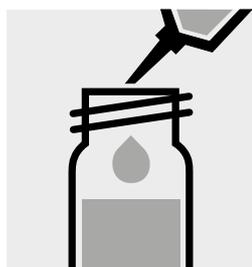
**range:** Expression of results also possible in mmol/l.



Filter turbid samples.



Check the pH of the sample, specified range: pH 3 – 12.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



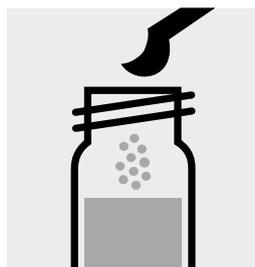
Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



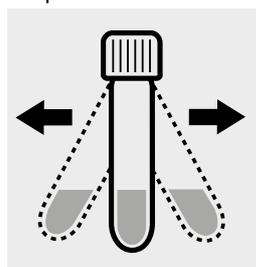
Check the pH, specified range: pH 10.0 – 11.5.



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



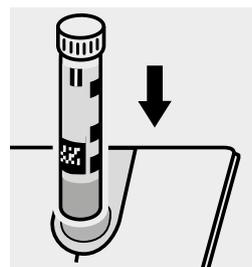
Add 1 level blue micro-spoon of **K-2K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



Reaction time:  
5 minutes



Place the cell **without re-shaking** into the 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-to-use potassium standard solution Certipur®, Cat.No. 170230, concentration 1000 mg/l K, can be used after diluting accordingly.

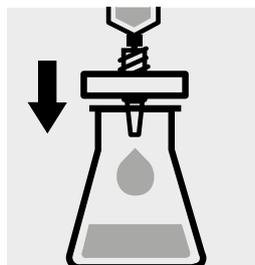
# Potassium

100615

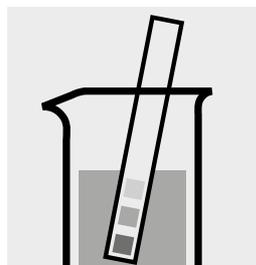
Cell Test

**Measuring** 30 – 300 mg/l K

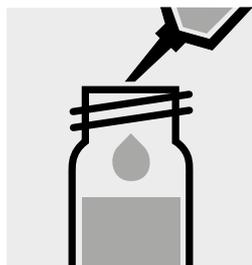
**range:** Expression of results also possible in mmol/l.



Filter turbid samples.



Check the pH of the sample, specified range: pH 3 – 12. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



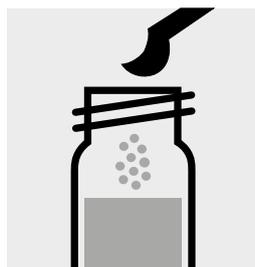
Pipette 0.50 ml of the sample into a reaction cell, close with the screw cap, and mix.



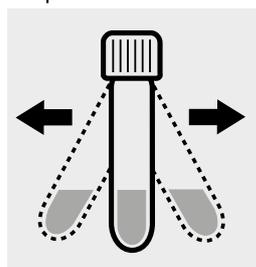
Check the pH, specified range: pH 10.0 – 11.5.



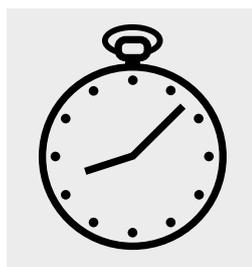
Add 6 drops of **K-1K**, close the cell with the screw cap, and mix.



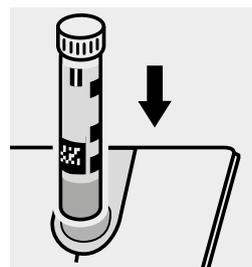
Add 1 level blue micro-spoon of **K-2K**, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.



Reaction time:  
5 minutes



Place the cell **without re-shaking** into the 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-to-use potassium standard solution Certipur®, Cat.No. 170230, concentration 1000 mg/l K, can be used after diluting accordingly.

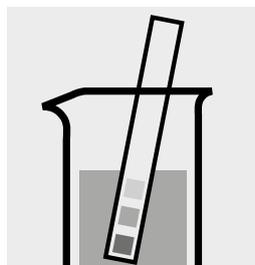
# Residual Hardness

114683

Cell Test

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

<b>Measuring</b>	0.70 – 7.00 mg/l CaO
<b>range:</b>	1.2 – 12.5 mg/l CaCO <sub>3</sub>
	Expression of results also possible in mmol/l.



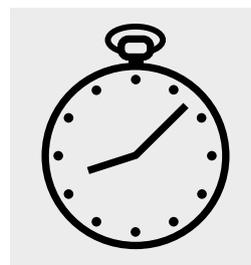
Check the pH of the sample, specified range: pH 5–8.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



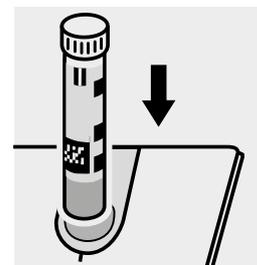
Pipette 4.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

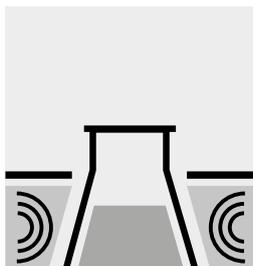
# Saybolt Color Measurement

Application

analogous to **ASTM D6045**

<b>Measuring range:</b>	-15 – 30 Saybolt Color	50-mm cell	Method No. 2563
	-15 – 30 Saybolt Color	100-mm cell	Method No. 2564
<b>Attention!</b>	Prior to the measurement of the first sample, the system automatically prompts a zero adjustment prepared from distilled water (Water for analysis EMSURE®, Cat.No. 116754), is recommended. This zero value remains valid until the method is exited.		

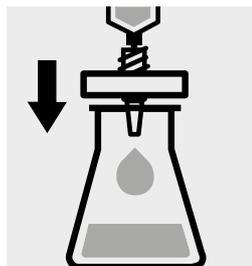
## Preparation:



Contains the sample air or gas bubbles: degassing in ultrasonic bath.



Melt solid samples and homogenize.

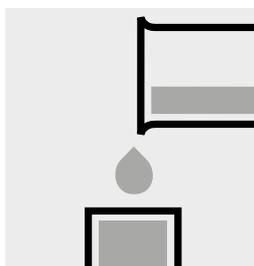


Filter or centrifuge turbid samples.

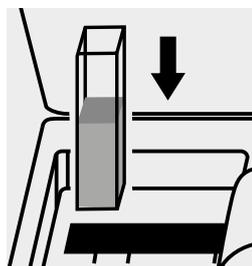
## Determination



Select method no. **2563** or **2564**. Perform the zero adjustment and confirm by pressing the <OK> button.



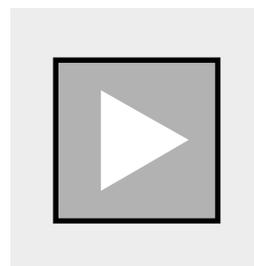
Transfer the solution into a corresponding cell.



Place the cell into the cell compartment. The measurement is performed automatically.



Confirm with <OK>. Saybolt Color is shown in the display.



Tap the <Start> button to start the measurement procedure for the next sample. The system does not prompt a repeat of the zero adjustment.

## Note:

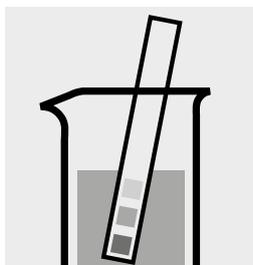
When using the 100-mm rectangular cell, the round-cell holder must be removed before the measurement.

# Silicate (Silicic Acid)

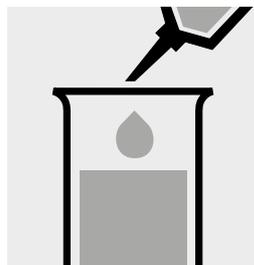
114794

Test

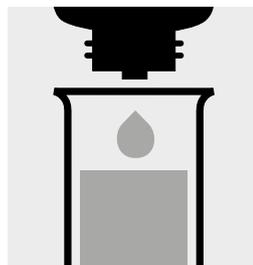
<b>Measuring range:</b>	0.21 – 10.70 mg/l SiO <sub>2</sub>	0.10 – 5.00 mg/l Si	10-mm cell
	0.10 – 5.35 mg/l SiO <sub>2</sub>	0.05 – 2.50 mg/l Si	20-mm cell
	0.011 – 1.600 mg/l SiO <sub>2</sub>	0.005 – 0.750 mg/l Si	50-mm cell
Expression of results also possible in mmol/l.			



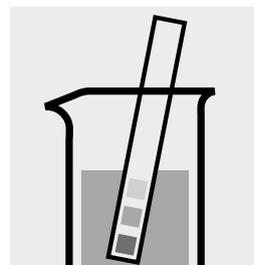
Check the pH of the sample, specified range: pH 2–10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



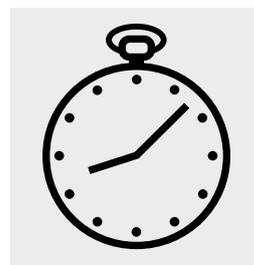
Pipette 5.0 ml of the sample into a test tube.



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



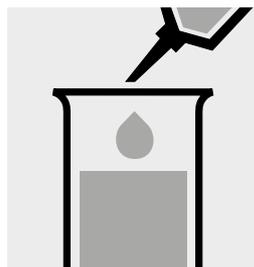
Check the pH, specified range: pH 1.2 – 1.6.



Reaction time: 3 minutes



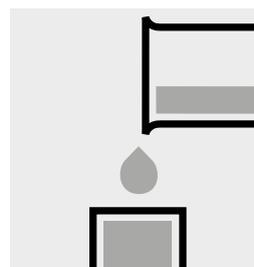
Add 3 drops of **Si-2** and mix.



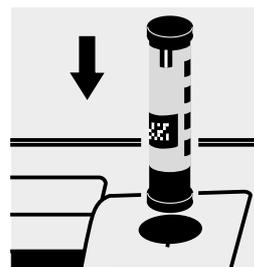
Add 0.50 ml of **Si-3** with pipette and mix.



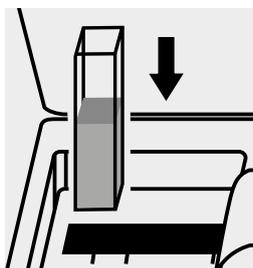
Reaction time: 10 minutes



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-to-use silicon standard solution Certipur®, Cat.No. 170236, concentration 1000 mg/l Si, can be used after diluting accordingly as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132243, 132244, and 132245. (Attention! Do **not** store standard solutions in glass vessels - see section "Standard solutions"!)

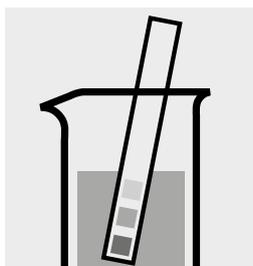
# Silicate (Silicic Acid)

100857

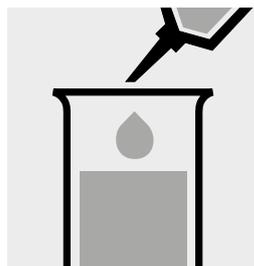
Test

<b>Measuring range:</b>	1.1 – 107.0 mg/l SiO <sub>2</sub>	0.5 – 50.0 mg/l Si	10-mm cell
<b>range:</b>	11 – 1070 mg/l SiO <sub>2</sub>	5 – 500 mg/l Si	10-mm cell
Expression of results also possible in mmol/l.			

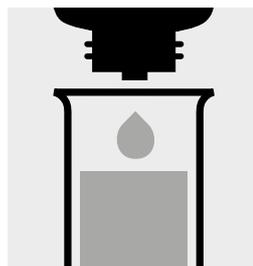
## Measuring range: 1.1 – 107.0 mg/l SiO<sub>2</sub>



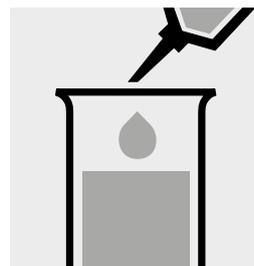
Check the pH of the sample, specified range: pH 2–10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



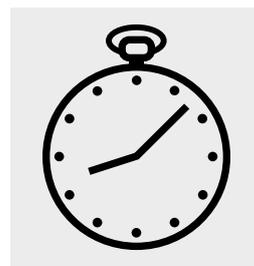
Pipette 4.0 ml of the sample into a test tube.



Add 4 drops of **Si-1** and mix.



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



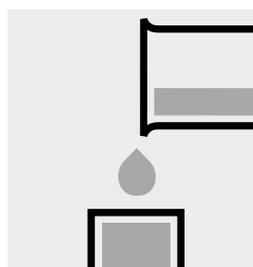
Reaction time: 2 minutes



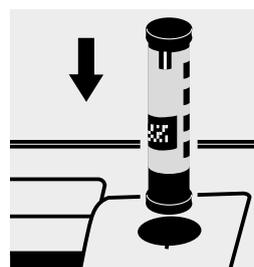
Add 4 drops of **Si-3** and mix.



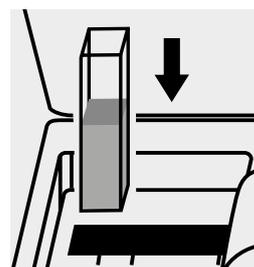
Reaction time: 2 minutes



Transfer the solution into a cell.



Select method with AutoSelector measuring range 0.5 – 50.0 mg/l Si.



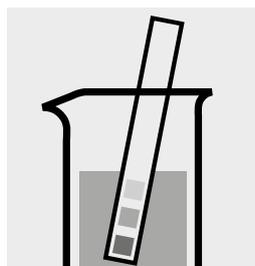
Place the cell into the cell compartment.

# Silicate (Silicic Acid)

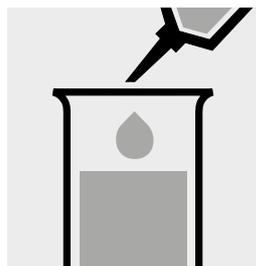
100857

Test

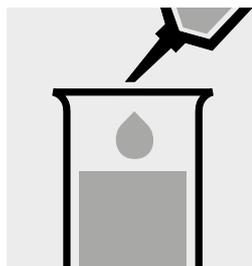
Measuring range: 11 – 1070 mg/l SiO<sub>2</sub>



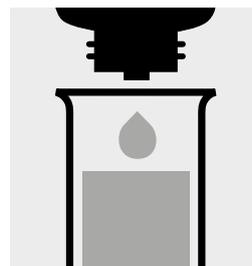
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



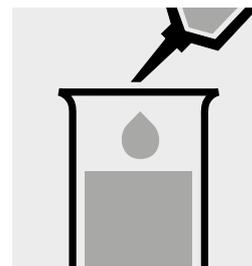
Pipette 5.0 ml of distilled water (Water for analysis EMSURE®, Cat.No. 116754, is recommended) into a test tube.



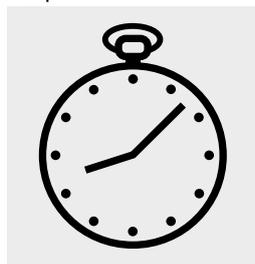
Add 0.50 ml of the sample with pipette and mix.



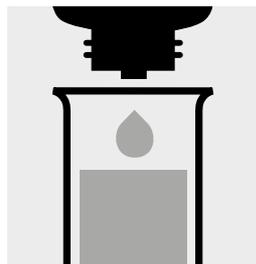
Add 4 drops of **Si-1** and mix.



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



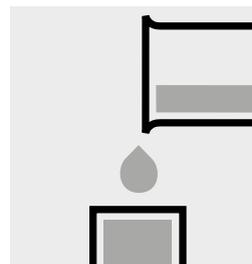
Reaction time:  
2 minutes



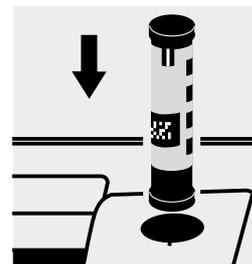
Add 4 drops of **Si-3** and mix.



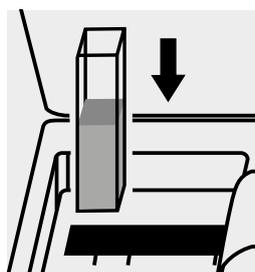
Reaction time:  
2 minutes



Transfer the solution into a cell.



Select method with AutoSelector measuring range 5 – 500 mg/l Si.



Place the cell into the cell compartment.

## Quality assurance:

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

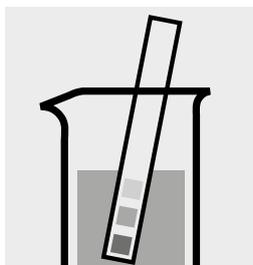
# Silicate (Silicic Acid)

101813

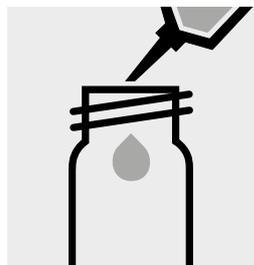
Test

<b>Measuring range:</b>	0.5 – 500.0 µg/l SiO <sub>2</sub>	0.2 – 233.7 µg/l Si	50-mm cell
	0.25 – 250.00 µg/l SiO <sub>2</sub>	0.12 – 116.85 µg/l Si	100-mm cell
Expression of results also possible in mmol/l.			

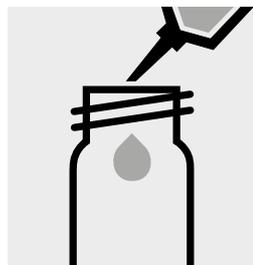
## Measuring range: 0.5 – 500.0 µg/l SiO<sub>2</sub>



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**).



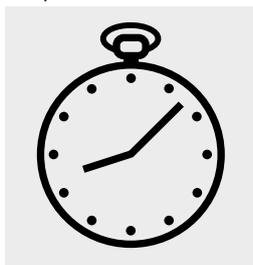
Pipette 10 ml of distilled water (Water Ultrapur, Cat.No. 101262, is recommended) into a second plastic vessel (**Flat-bottomed tubes, Cat.No. 117988**). (Blank)



Add to each vessel 0.10 ml of **Si-1** with pipette, close with the screw cap, and mix.



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



Reaction time: 5 minutes



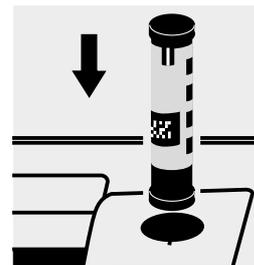
Add to each vessel 0.10 ml of **Si-2** with pipette, close with the screw cap, and mix.



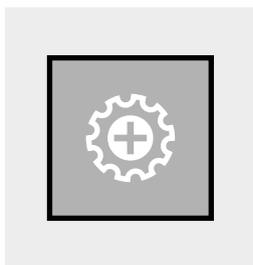
Add to each vessel 0.50 ml of **Si-3** with pipette, close with the screw cap, and mix.



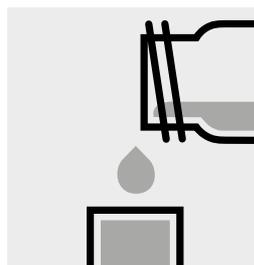
Reaction time: 5 minutes



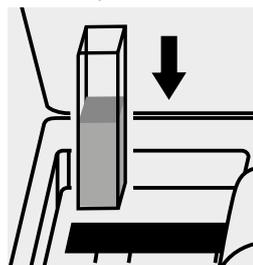
Select method with AutoSelector.



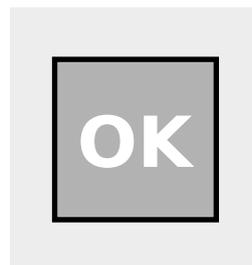
Tap the <Settings> button. Select “Reagent blank”.



Transfer the blank into the cell and measure **immediately**.



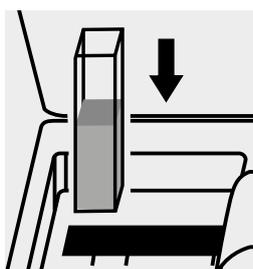
Insert the blank cell into the cell compartment.



Select “User RB”. Confirm with <OK>.



Transfer the measurement sample into the cell and measure **immediately**.



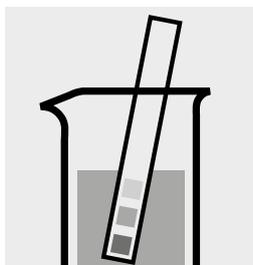
Insert the cell containing the sample into the cell compartment.

# Silicate (Silicic Acid)

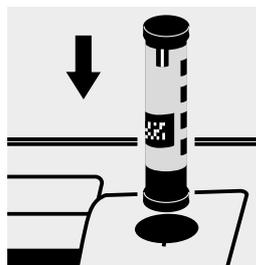
101813

Test

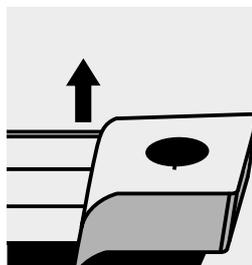
Measuring range: 0.25 – 250.00 µg/l SiO<sub>2</sub>



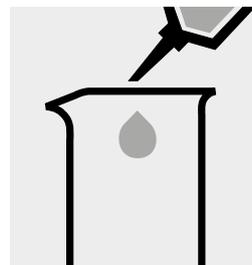
Check the pH of the sample, specified range: pH 2–10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



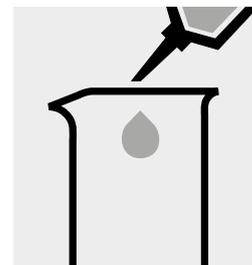
Select method with AutoSelector.



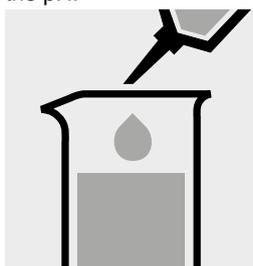
Remove the round-cell holder.



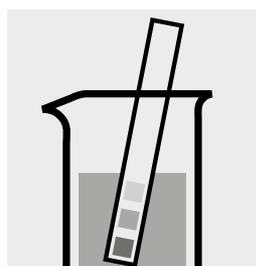
Place 20 ml of sample into a plastic vessel.



Place 20 ml of distilled water (Water Ultrapur, Cat.No. 101262, is recommended) into a second plastic vessel. (Blank)



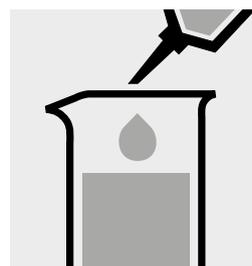
Add to each vessel 0.20 ml of Si-1 with pipette and mix.



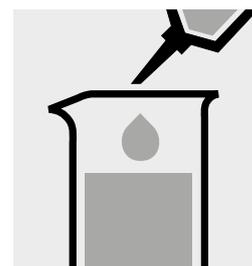
Check the pH, specified range: pH 1.2 – 1.6.



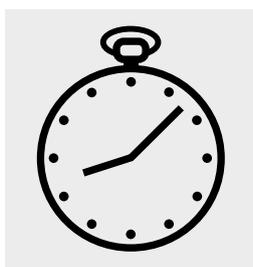
Reaction time: 5 minutes



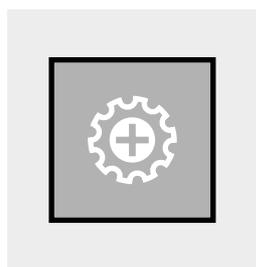
0.20 ml of Si-2 with pipette and mix.



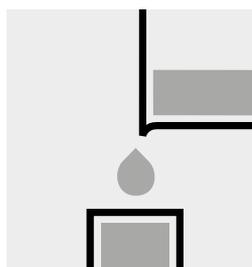
Add to each vessel 1.0 ml of Si-3 with pipette and mix.



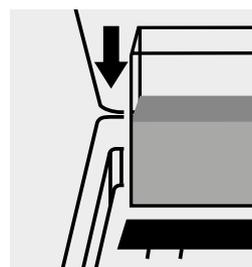
Reaction time: 5 minutes



Tap the <Settings> button.  
Select "Reagent blank".



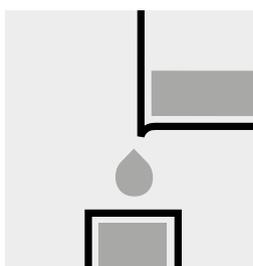
Transfer the blank into the cell and measure **immediately**.



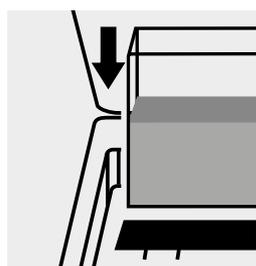
Insert the blank cell into the cell compartment.



Select "User RB".  
Confirm with <OK>.



Transfer the measurement sample into the 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:

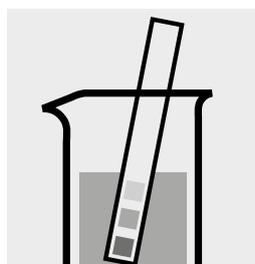
To check the measurement system (test reagents, measurement device, and handling) ready-to-use silicon standard solution Certipur®, Cat.No. 170236, concentration 1000 mg/l Si, can be used after diluting accordingly as well as the Standard solution for photometric applications, CRM, Cat.No. 132244. (Attention! Do **not** store standard solutions in glass vessels - see section "Standard solutions").

# Silver

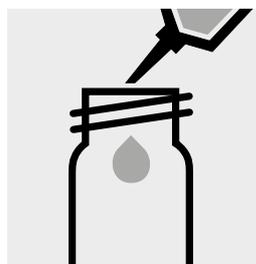
114831

Test

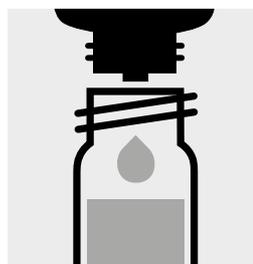
<b>Measuring</b>	0.50 – 3.00 mg/l Ag	10-mm cell
<b>range:</b>	0.25 – 1.50 mg/l Ag	20-mm cell
Expression of results also possible in mmol/l.		



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.



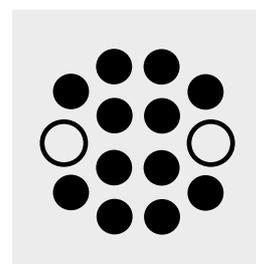
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 114724).



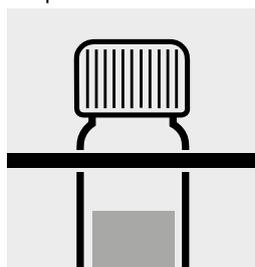
Add 2 drops of **Ag-1**.



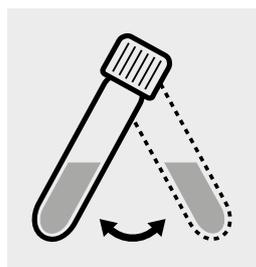
Add 1 level green microspoon of **Ag-2**, close the cell with the screw cap.



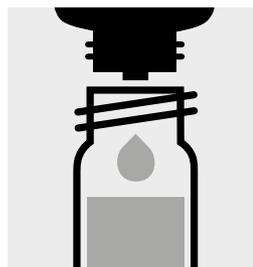
Heat the cell in the thermoreactor at 120 °C for 1 hours.



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



Swirl the cell before opening.



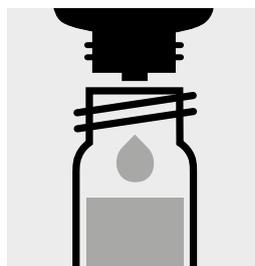
Add 3 drops of **Ag-3**, close with the screw cap, and mix.



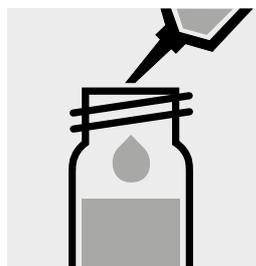
Check the pH, specified range: pH 4–10. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Add 1 drop of **Ag-4**, close with the screw cap, and mix.



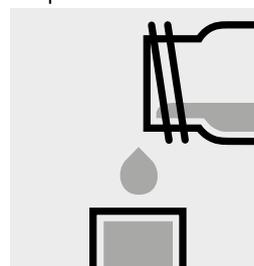
Add 5 drops of **Ag-5**, close with the screw cap, and mix.



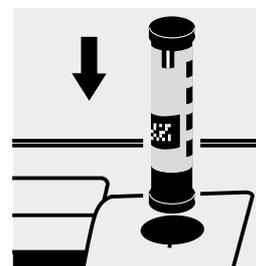
Add 1.0 ml of **Ag-6**, close with the screw cap, and mix.



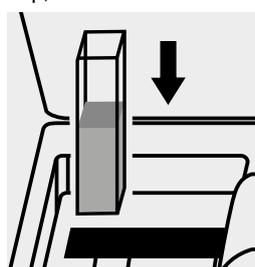
Reaction time: 5 minutes



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-to-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** 10 – 300 mg/l Na

**range:** Expression of results also possible in mmol/l.



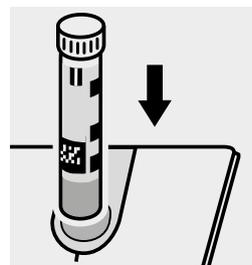
Pipette 0.50 ml of **Na-1K** into a reaction cell and mix.



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:

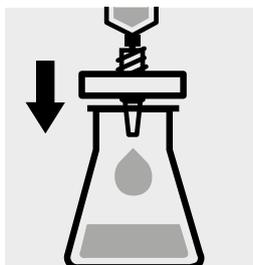
To check the measurement system (test reagents, measurement device, and handling) ready-to-use chloride standard solution Certipur<sup>®</sup>, Cat.No. 119897, concentration 1000 mg/l Cl<sup>-</sup> (corresponds to 649 mg/l Na), can be used after diluting accordingly (see section "Standard solutions").

# Spectral Absorption Coefficient

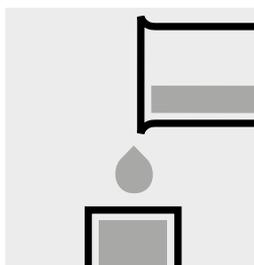
$\alpha(254)$

analogous to **DIN 38404**

<b>Measuring</b>	1 – 250 m <sup>-1</sup>	254 nm	10-mm cell
<b>range:</b>	0.3 – 125.0 m <sup>-1</sup>	254 nm	20-mm cell
	0.1 – 50.0 m <sup>-1</sup>	254 nm	50-mm cell



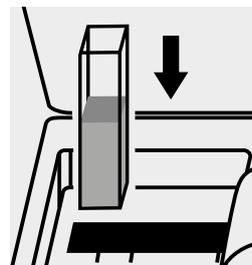
Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into a corresponding cell.



Select method no. **300**.



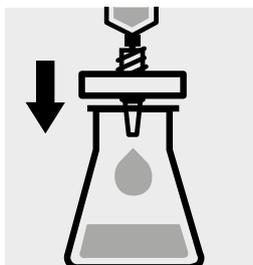
Place the cell into the cell compartment. The measurement is performed automatically.

# Spectral Absorption Coefficient

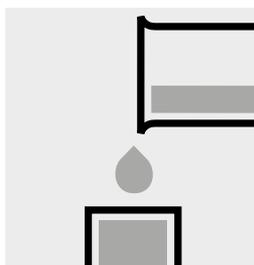
$\alpha(436)$

analogous to **EN ISO 7887**

<b>Measuring range:</b>	1 – 250 $\text{m}^{-1}$	436 nm	10-mm cell
	0.3 – 125.0 $\text{m}^{-1}$	436 nm	20-mm cell
	0.1 – 50.0 $\text{m}^{-1}$	436 nm	50-mm cell



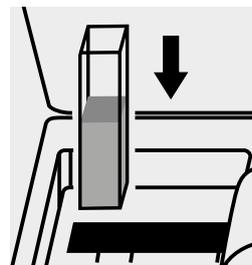
Filter sample solution through a membrane filter with 0.45  $\mu\text{m}$  pore size.



Transfer the solution into a corresponding cell.



Select method no. **302**.



Place the cell into the cell compartment. The measurement is performed automatically.

## Notes:

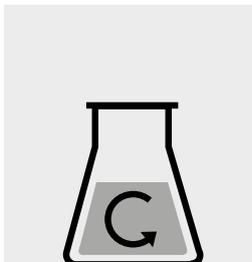
Filtered sample = true color.

Unfiltered sample = apparent color.

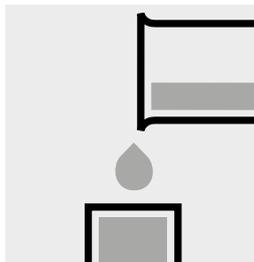
# Spectral Attenuation Coefficient

$\mu(254)$   
analogous to **DIN 38404**

<b>Measuring range:</b>	1 – 250 m <sup>-1</sup>	254 nm	10-mm cell
	0.3 – 125.0 m <sup>-1</sup>	254 nm	20-mm cell
	0.1 – 50.0 m <sup>-1</sup>	254 nm	50-mm cell



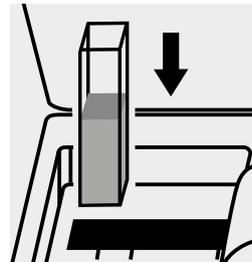
Shake the unfiltered sample solution to evenly suspend the turbidity-causing substances. Do not disperse the contents, **measure immediately**.



Transfer the solution into a corresponding cell.



Select method no. **301**.



Place the cell into the cell compartment. The measurement is performed automatically.

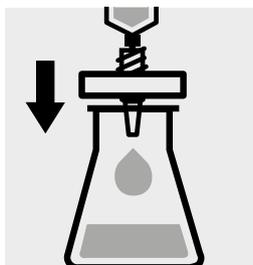
# Sulfate

102532

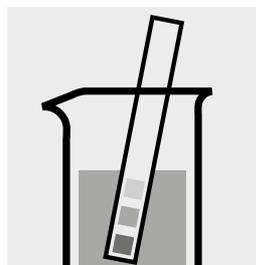
Cell Test

**Measuring** 1.0 – 50.0 mg/l SO<sub>4</sub>

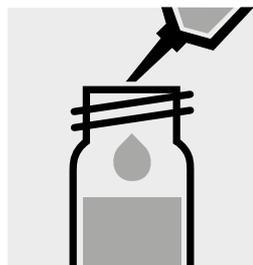
**range:** Expression of results also possible in mmol/l.



Filter turbid samples.



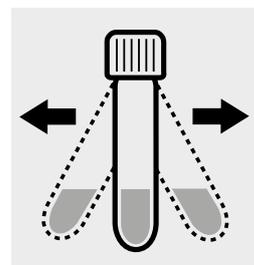
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



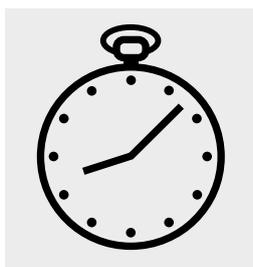
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.



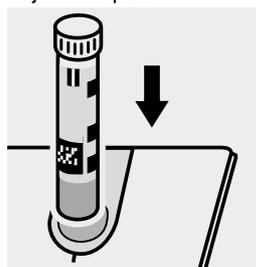
Add 1 level green microspoon of SO<sub>4</sub>-1K, close the cell with the screw cap.



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-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly.

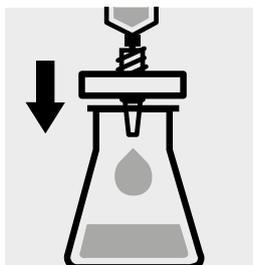
# Sulfate

114548

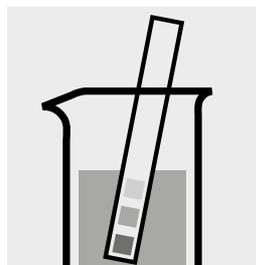
Cell Test

**Measuring** 5 – 250 mg/l SO<sub>4</sub>

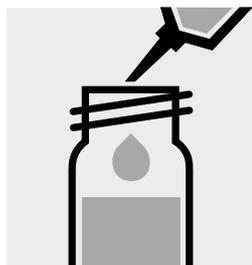
**range:** Expression of results also possible in mmol/l.



Filter turbid samples.



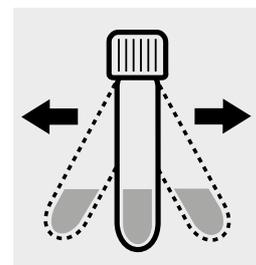
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



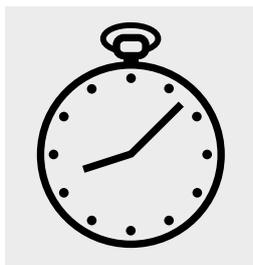
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



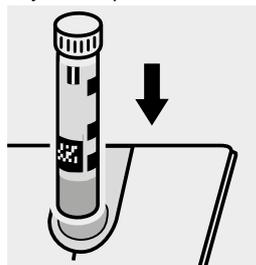
Add 1 level green micro-spoon of SO<sub>4</sub>-1K, close the cell with the screw cap.



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 solutions for photometric applications, CRM, Cat.Nos. 125050 and 125051.

Ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, 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.

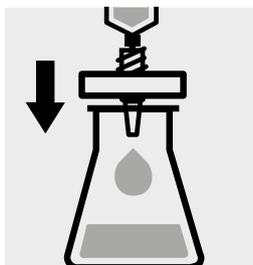
# Sulfate

100617

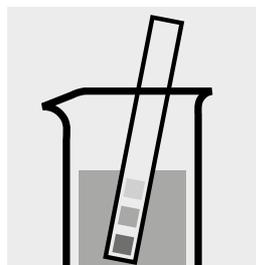
Cell Test

**Measuring** 50 – 500 mg/l SO<sub>4</sub>

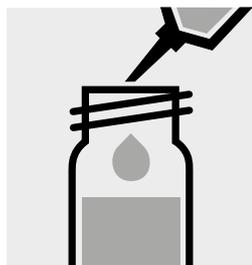
**range:** Expression of results also possible in mmol/l.



Filter turbid samples.



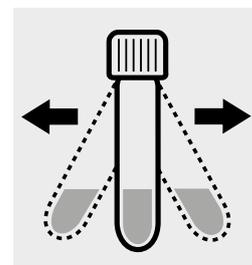
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



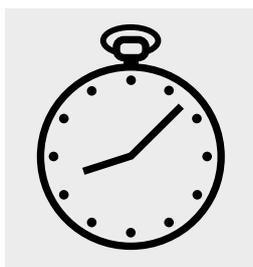
Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



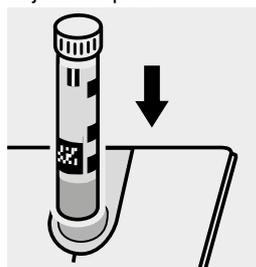
Add 1 level green microspoon of SO<sub>4</sub>-1K, close the cell with the screw cap.



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 solutions for photometric applications, CRM, Cat.Nos. 125051 and 125052.

Ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, 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.

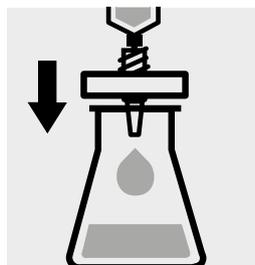
# Sulfate

114564

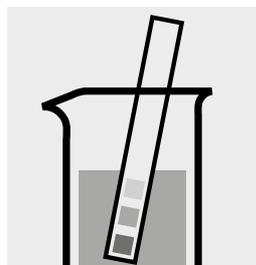
Cell Test

**Measuring** 100 – 1000 mg/l SO<sub>4</sub>

**range:** Expression of results also possible in mmol/l.



Filter turbid samples.



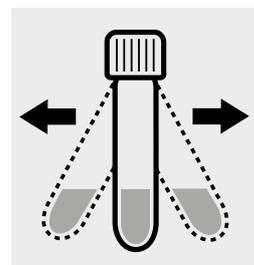
Check the pH of the sample, specified range: pH 2–10. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



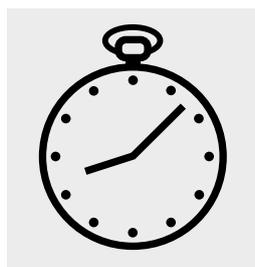
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



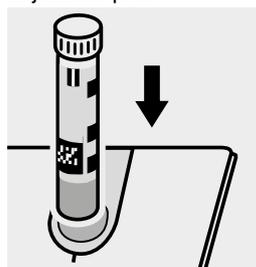
Add 1 level green microspoon of SO<sub>4</sub>-1K, close the cell with the screw cap.



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 solutions for photometric applications, CRM, Cat.Nos. 125051, 125052 and 125053.

Ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can also be used after diluting accordingly.

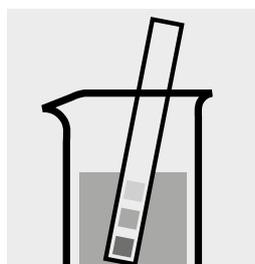
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

# Sulfate

114791

Test

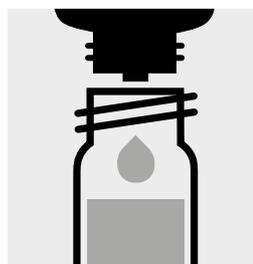
<b>Measuring</b>	25 – 300 mg/l SO <sub>4</sub>	10-mm cell
<b>range:</b>	Expression of results also possible in mmol/l.	



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



Pipette 2.5 ml of the sample into a test tube with screw cap.



Add 2 drops of SO<sub>4</sub>-1 and mix.



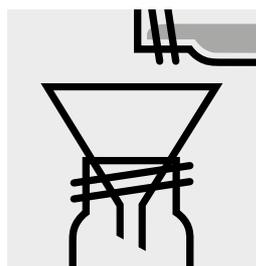
Add 1 level green micro-spoon of SO<sub>4</sub>-2, close the test tube with the screw cap, and mix.



Temper the test tube in a water bath at 40 °C for 5 minutes.



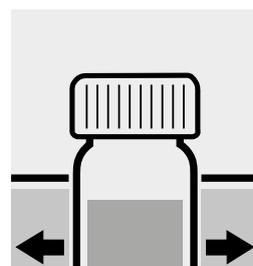
Add 2.5 ml of SO<sub>4</sub>-3 with pipette and mix.



Filter the content of the test tube with a round filter into another test tube with screw cap.



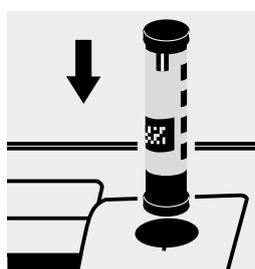
Add 4 drops of SO<sub>4</sub>-4 to the filtrate, close the test tube with the screw cap, and mix.



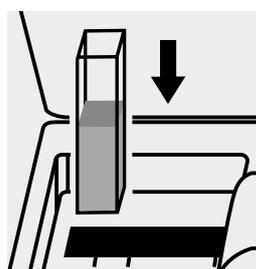
Temper the test tube again in the water bath for 7 minutes.



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 solutions for photometric applications, CRM, Cat.Nos. 125050 and 125051.

Ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can also be used after diluting accordingly.

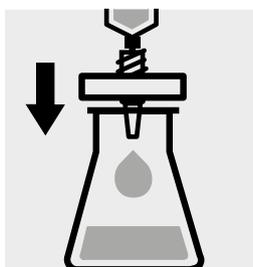
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

# Sulfate

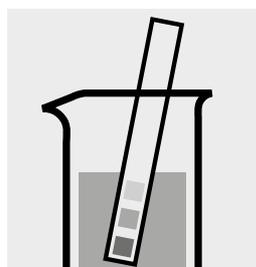
101812

Test

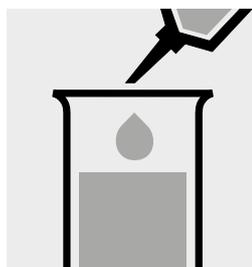
<b>Measuring</b>	2.5 – 50.0 mg/l SO <sub>4</sub>	10-mm cell
<b>range:</b>	1.3 – 25.0 mg/l SO <sub>4</sub>	20-mm cell
	0.50 – 10.00 mg/l SO <sub>4</sub>	50-mm cell
Expression of results also possible in mmol/l.		



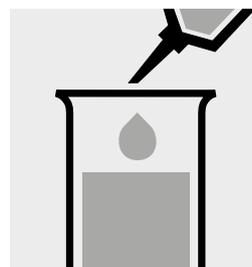
Filter turbid samples.



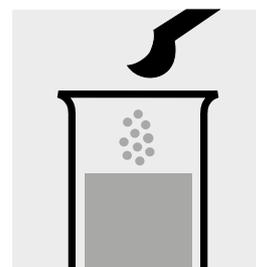
Check the pH of the sample, specified range: pH 2–10.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



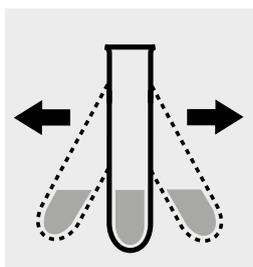
Pipette 0.50 ml of **SO<sub>4</sub>-1** into a test tube.



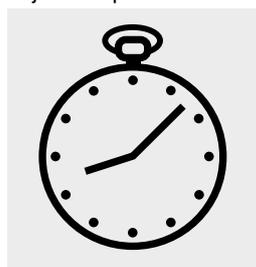
Add 10 ml of the sample with pipette and mix.



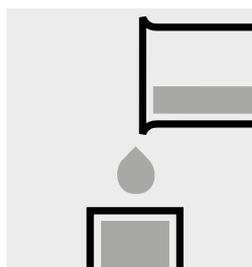
Add 1 level green microspoon of **SO<sub>4</sub>-2**.



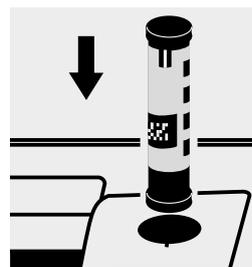
Shake the test tube vigorously to dissolve the solid substance.



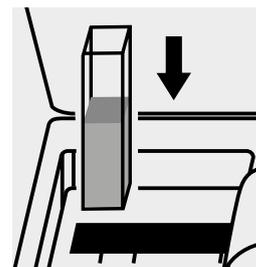
Reaction time: 2 minutes, **measure immediately**.



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-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l SO<sub>4</sub><sup>2-</sup>, can be used after diluting accordingly.

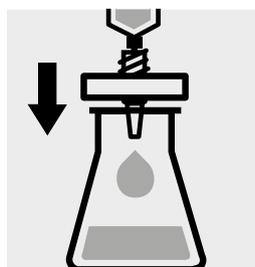
# Sulfate

102537

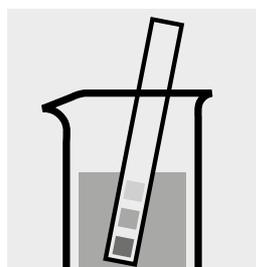
Test

**Measuring** 5 – 300 mg/l  $\text{SO}_4$  10-mm cell

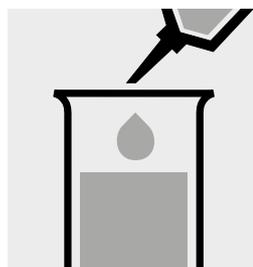
**range:** Expression of results also possible in mmol/l.



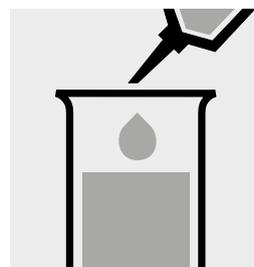
Filter turbid samples.



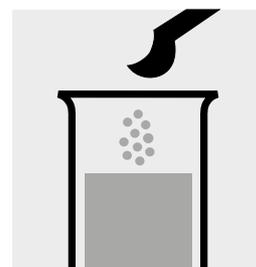
Check the pH of the sample, specified range: pH 2–10.  
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



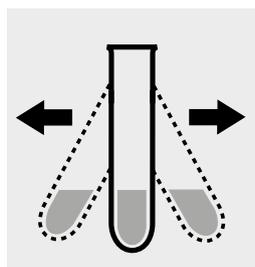
Pipette 0.50 ml of  $\text{SO}_4\text{-1}$  into a test tube.



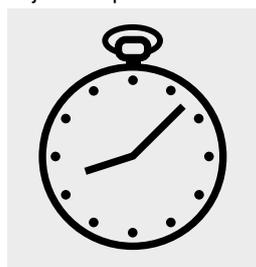
Add 5.0 ml of the sample with pipette and mix.



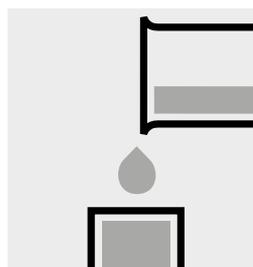
Add 1 level blue micro-spoon of  $\text{SO}_4\text{-2}$ .



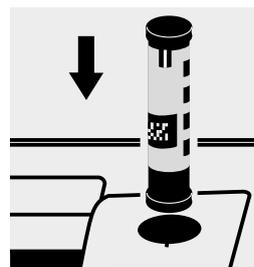
Shake the test tube vigorously to dissolve the solid substance.



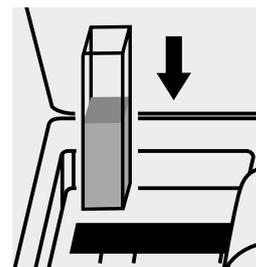
Reaction time: 2 minutes, **measure immediately**.



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 solutions for photometric applications, CRM, Cat.Nos. 125050 and 125051.

Ready-to-use sulfate standard solution Certipur®, Cat.No. 119813, concentration 1000 mg/l  $\text{SO}_4^{2-}$ , can also be used after diluting accordingly.

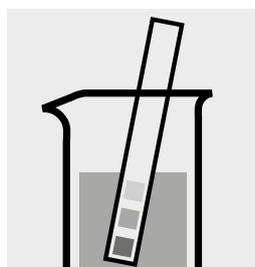
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 10) is highly recommended.

# Sulfide

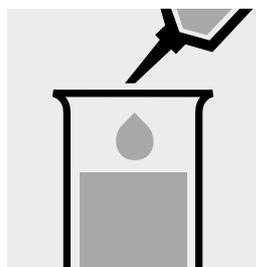
114779

Test

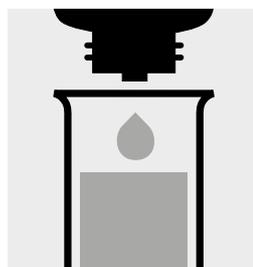
<b>Measuring range:</b>	0.10 – 1.50 mg/l S	0.10 – 1.55 mg/l HS	10-mm cell
	0.050 – 0.750 mg/l S	0.052 – 0.774 mg/l HS	20-mm cell
	0.020 – 0.500 mg/l S	0.021 – 0.516 mg/l HS	50-mm cell
Expression of results also possible in mmol/l.			



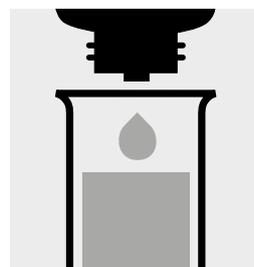
Check the pH of the sample, specified range: pH 2 – 10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



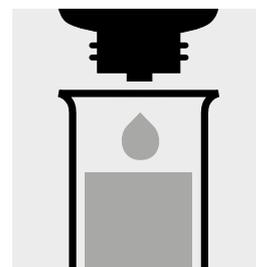
Pipette 5.0 ml of the sample into a test tube.



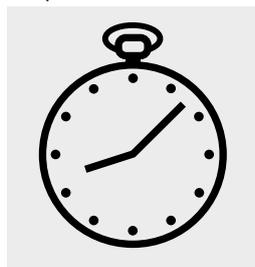
Add 1 drop of **S-1** and mix.



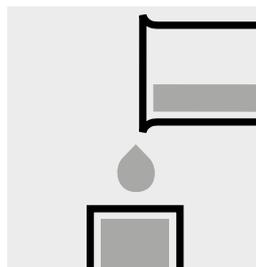
Add 5 drops of **S-2** and mix.



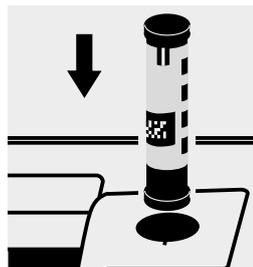
Add 5 drops of **S-3** and mix.



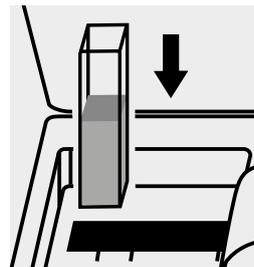
Reaction time:  
1 minute



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").

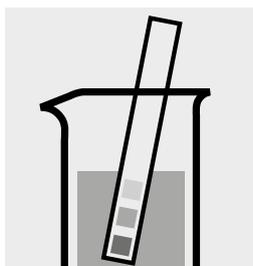
# Sulfite

114394

Cell Test

<b>Measuring range:</b>	1.0 – 20.0 mg/l SO <sub>3</sub>	0.8 – 16.0 mg/l SO <sub>2</sub>	Round cell
	0.05 – 3.00 mg/l SO <sub>3</sub>	0.04 – 2.40 mg/l SO <sub>2</sub>	50-mm cell
Expression of results also possible in mmol/l.			

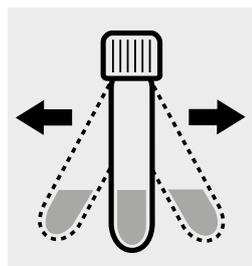
## Measuring range: 1.0 – 20.0 mg/l SO<sub>3</sub>



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<sub>3</sub>-1K** into a reaction cell, close with the screw cap.



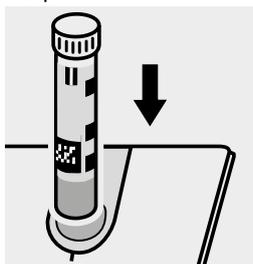
Shake the cell vigorously to dissolve the solid substance.



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

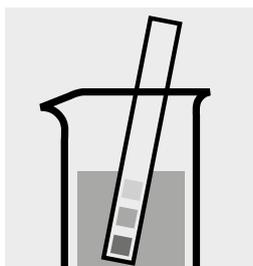


Reaction time:  
2 minutes



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

Measuring range: 0.05 – 3.00 mg/l SO<sub>3</sub>



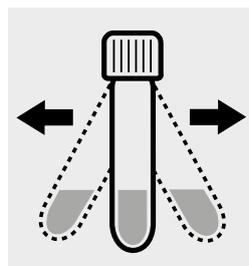
Check the pH of the sample, specified range: pH 4–9. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Select method no. **127**.



Add 1 level grey micro-spoon each of **SO<sub>3</sub>-1K** into two reaction cells, close with the screw cap.



Shake both cells vigorously to dissolve the solid substance.



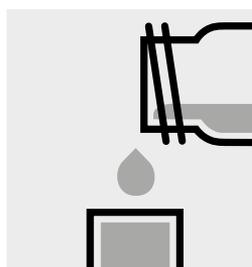
Add 7.0 ml of the sample with pipette to one reaction cell, close with the screw cap, and mix.



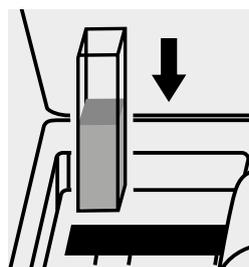
Add 7.0 ml of distilled water with pipette to the second reaction cell, close with the screw cap, and mix. (Blank)



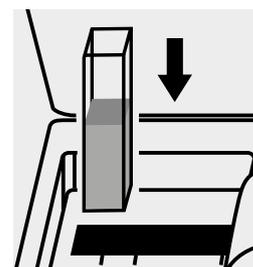
Reaction time: 2 minutes



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:

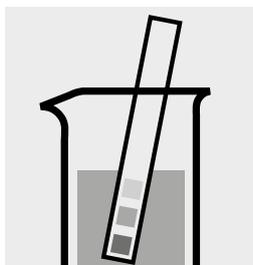
To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR, Cat.No. 106657 (see section “Standard solutions”).

# Sulfite

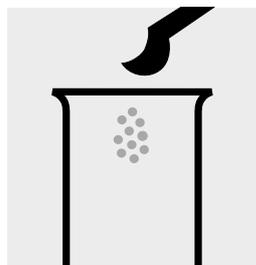
101746

Test

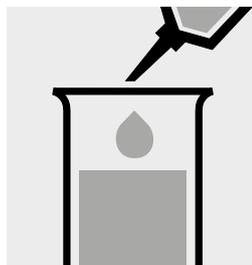
<b>Measuring</b>	1.0 – 60.0 mg/l SO <sub>3</sub>	10-mm cell
<b>range:</b>	0.8 – 48.0 mg/l SO <sub>2</sub>	10-mm cell
Expression of results also possible in mmol/l.		



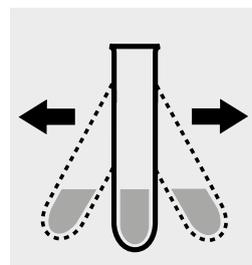
Check the pH of the sample, specified range: pH 4–9.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



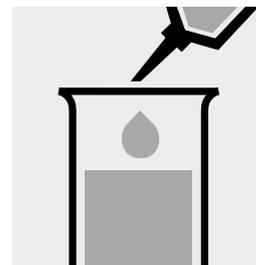
Place 1 level grey micro-spoon of **SO<sub>3</sub>-1** into a dry test tube.



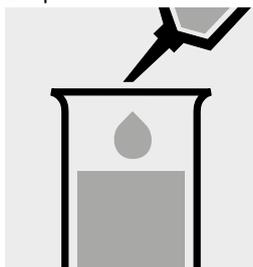
Add 3.0 ml of **SO<sub>3</sub>-2** with pipette.



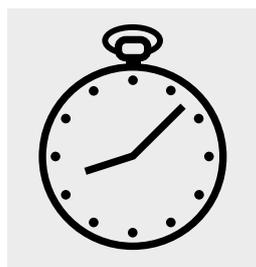
Shake vigorously to dissolve the solid substance.



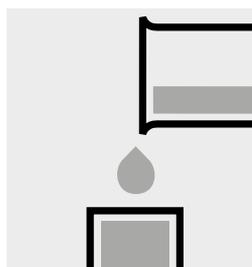
Add 5.0 ml of distilled water with pipette and mix.



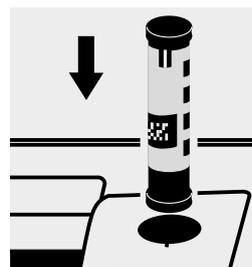
Add 2.0 ml of the sample with pipette and mix.



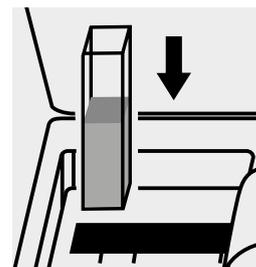
Reaction time: 2 minutes



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

## Quality assurance:

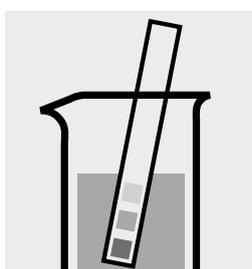
To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR, Cat.No. 106657 (see section “Standard solutions”).

# Surfactants (anionic)

102552

Cell Test

<b>Measuring</b>	0.05 – 2.00 mg/l SDAS*
<b>range:</b>	*sodium 1-dodecanesulfonate
	0.06 – 2.56 mg/l SDBS*
	*sodium dodecylbenzenesulfonate
	0.05 – 2.12 mg/l SDS*
	*sodium dodecyl sulfate
	0.08 – 3.26 mg/l SDOSSA*
	*sodium dioctyl sulfosuccinate
	Expression of results also possible in mmol/l.



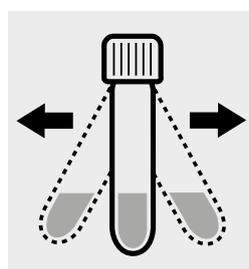
Check the pH of the sample, specified range: pH 5 – 10.  
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



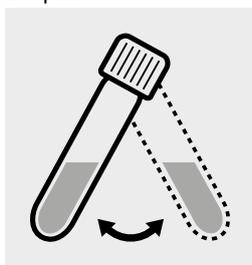
Add 2 drops of **T-1K**, close the cell with the screw cap.



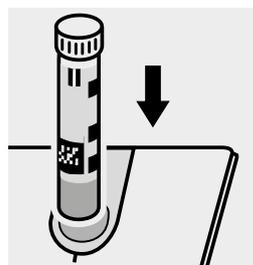
Shake the cell **vigorously for 30 seconds**.



Reaction time: 10 minutes



Swirl the cell before the measurement.



Place the cell into the 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").

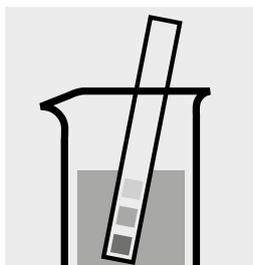
# Surfactants (cationic)

101764

Cell Test

**Measuring** 0.05 – 1.50 mg/l surfactants (cationic)

**range:** (calculated as N-cetyl-N,N,N-trimethylammonium bromide)



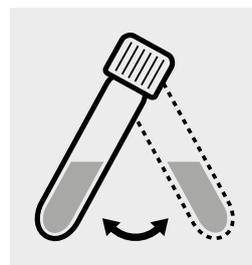
Check the pH of the sample, specified range: pH 3 – 8. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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



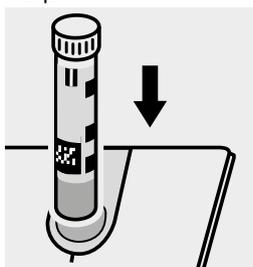
Add 0.50 ml of **T-1K** with pipette and close with the screw cap.



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 Cetyltrimethylammonium Bromide, Cat.No. 219374 (see section "Standard solutions").

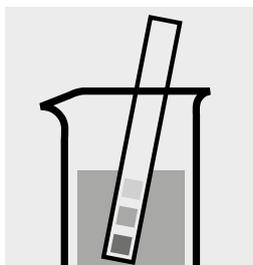
# Surfactants (nonionic)

101787

Cell Test

**Measuring** 0.10 – 7.50 mg/l surfactants (nonionic)

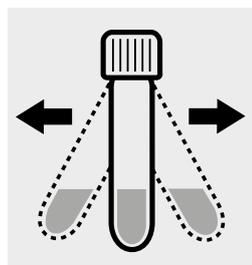
**range:** (calculated as Triton® X-100)



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.



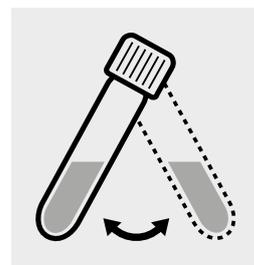
Pipette 4.0 ml of the sample into a reaction cell. Close with the screw cap.



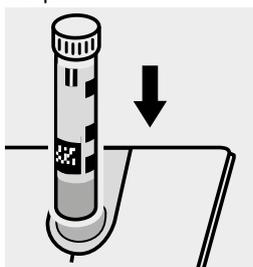
Shake the cell for **1 minute vigorously**.



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.

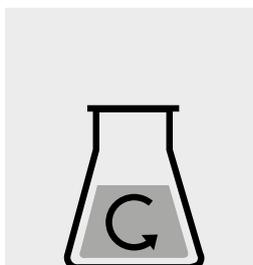
## Quality assurance:

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").

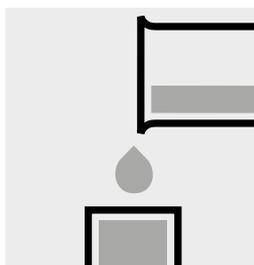
Standard solutions for photometric applications, CRM, Cat. Nos. 133022, 133023, and 133024 can also be used.

# Suspended Solids

<b>Measuring</b>	5 – 750 mg/l of suspended solid	20-mm cell
<b>range:</b>	2 – 300 mg/l of suspended solid	50-mm cell
	1 – 150 mg/l of suspended solid	100-mm cell



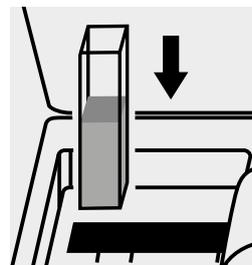
Homogenize 500 ml of sample for 2 minutes in a mixer running at high speed.



Transfer the solution into a cell.



Select method no. **182**.



Place the cell into the cell compartment. The measurement is performed automatically.

## Note:

When using the 100-mm rectangular cell, the round-cell holder must be removed before the measurement.

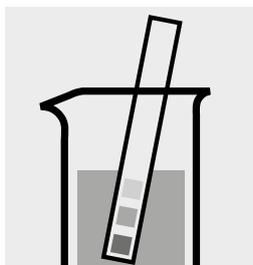
# Tin

114622

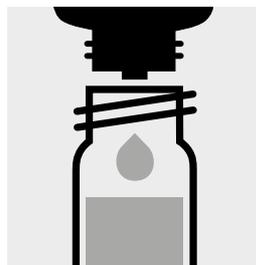
Cell Test

**Measuring** 0.10 – 2.50 mg/l Sn

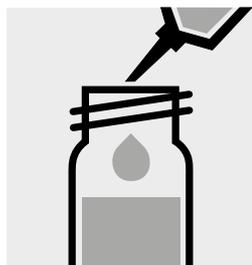
**range:** Expression of results also possible in mmol/l.



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.



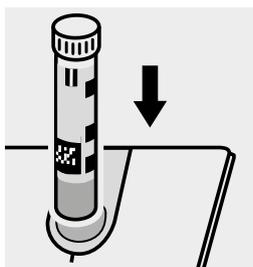
Add 5.0 ml of the sample with pipette, close the cell with the screw cap, and mix.



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-to-use tin standard solution Certipur®, Cat.No. 170242, concentration 1000 mg/l Sn (see section “Standard solutions”).

# TOC

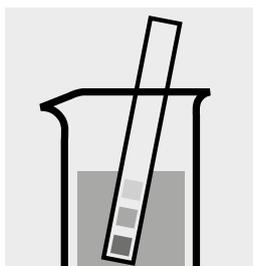
## Total Organic Carbon

114878

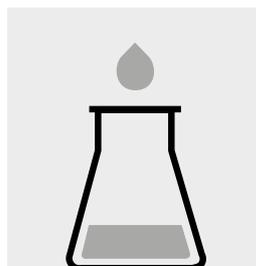
Cell Test

Measuring range: 5.0 – 80.0 mg/l TOC

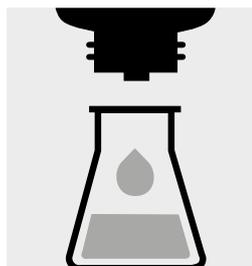
### Removal of inorganic bound carbon (TIC):



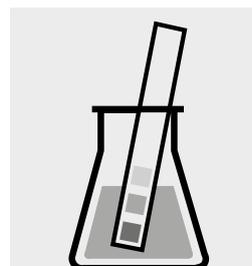
Check the pH of the sample, specified range: pH 2– 12.  
If required, add dilute sulfuric acid drop by drop to adjust the pH.



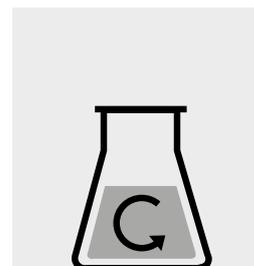
Place 25 ml of the sample into a suitable glass vessel.



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



Check the pH, specified range pH < 2.5.

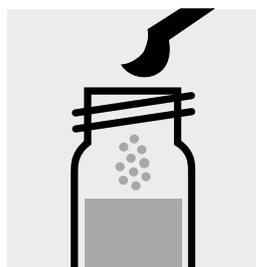


Stir for 10 minutes.

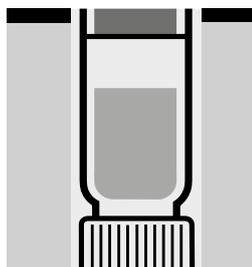
### Preparation of measurement sample:



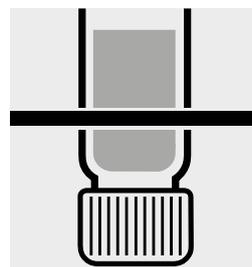
Pipette 3.0 ml of stirred sample into a reaction cell.



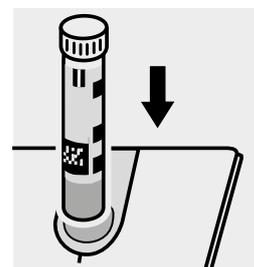
Add 1 level grey micro-spoon of **TOC-2K**. **Immediately** close the cell tightly with an **aluminium cap** (Cat.No. 173500).



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 as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132247, 132248, and 132249.

# TOC

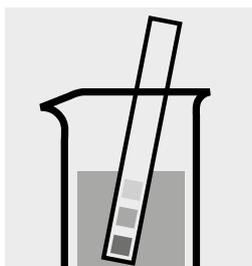
## Total Organic Carbon

114879

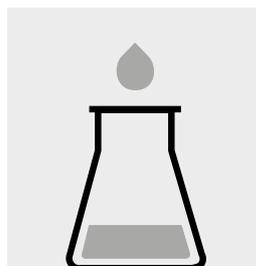
Cell Test

Measuring range: 50 – 800 mg/l TOC

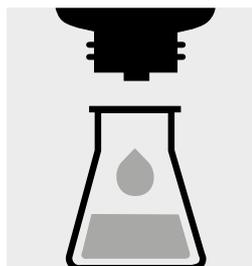
### Removal of inorganic bound carbon (TIC):



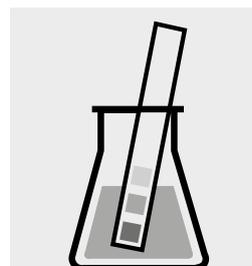
Check the pH of the sample, specified range: pH 2–12. If required, add dilute sulfuric acid drop by drop to adjust the pH.



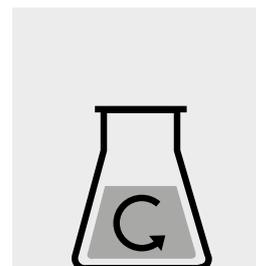
Pipette 1.0 ml of the sample and 9.0 ml of distilled water (Water for chromatography LiChrosolv®, Cat.No. 115333, is recommended) into a suitable glass vessel.



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



Check the pH, specified range pH < 2.5

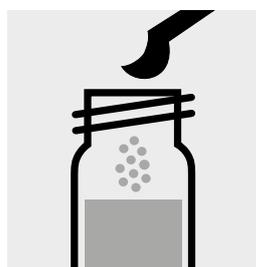


Stir for 10 minutes.

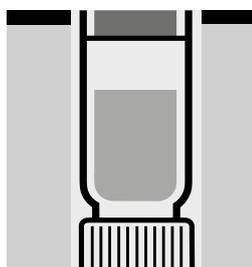
### Preparation of measurement sample:



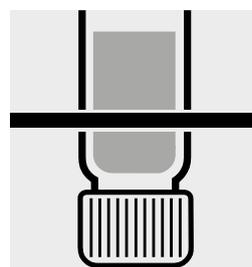
Pipette 3.0 ml of stirred sample into a reaction cell.



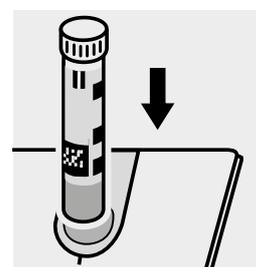
Add 1 level grey micro-spoon of **TOC-2K**. **Immediately** close the cell tightly with an **aluminium cap** (Cat.No. 173500).



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 as well as the Standard solutions for photometric applications, CRM, Cat.Nos. 132251, 132252, and 132253.

# Total Hardness

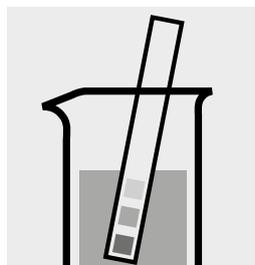
100961

Determination of total hardness

Cell Test

<b>Measuring</b>	5 – 215 mg/l Ca
<b>range:</b>	0.7 – 30.1 °d
	0.9 – 37.6 °e
	1.2 – 53.7 °f

<b>Measuring</b>	7 – 301 mg/l CaO
<b>range:</b>	12 – 537 mg/l CaCO <sub>3</sub>
	0.12 – 5.36 mmol/l Ca/Mg
	Expression of results also possible in mmol/l.



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



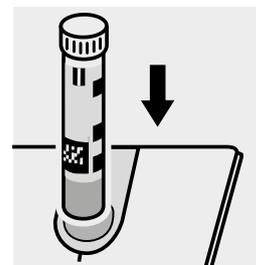
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



Reaction time: 3 minutes



Place the cell into the 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

100961

Differentiation between Ca- and Mg-hardness

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

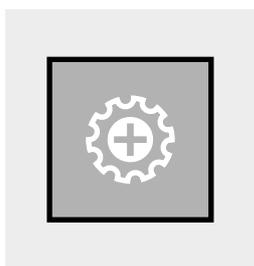
If the aim is to differentiate between Calcium- and Magnesium-hardness, after selecting the method it is possible to set the method-specific “Differentiation” mode.

**Differentiation possible only in mmol/l.**

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



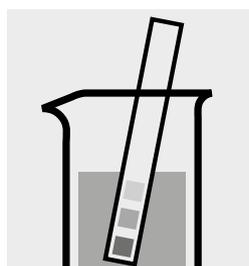
Select method no. 178.



Tap the <Settings> button. Select “Differentiation” and activate.



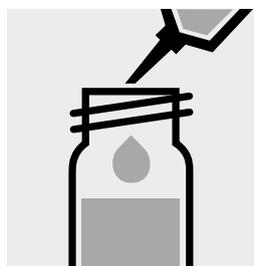
Confirm with <OK>.



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.



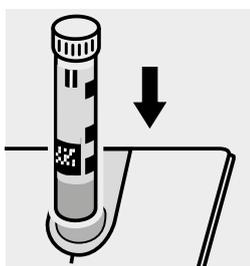
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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



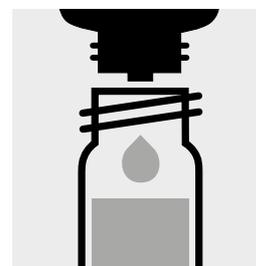
Reaction time: 3 minutes



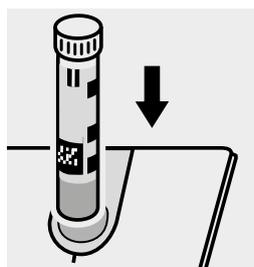
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer. The measurement is performed automatically. = cell A



Confirm with <OK>.



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. The measurement is performed automatically. = cell B

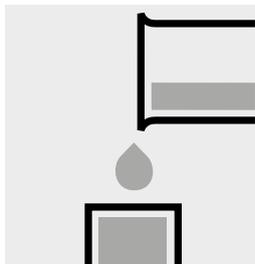


Confirm with <OK>. The results A ( $\Sigma$  Ca/Mg), B (Mg), and C (Ca) are shown in the display in mg/l.

# Turbidity

analogous to **EN ISO 7027**

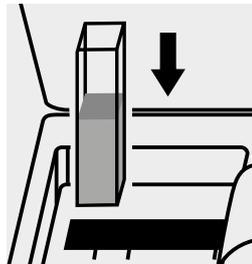
**Measuring range:** 1 – 100 FAU    550 nm    50-mm cell



Transfer the sample into a cell.



Select method no. **77**.



Place the cell into the cell compartment.  
The measurement is performed automatically.

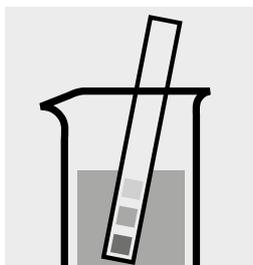
# Volatile Organic Acids

101749

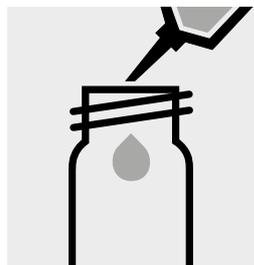
Cell Test

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

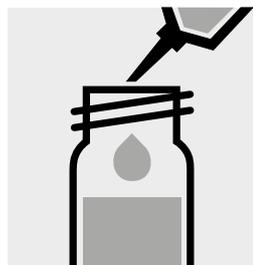
**range:** 71 – 4401 mg/l volatile organic acid (calculated as butyric acid)



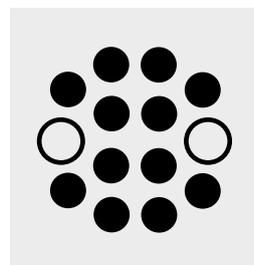
Check the pH of the sample, specified range: pH 2– 12.



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



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



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



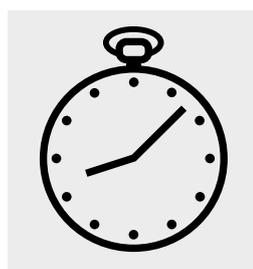
Add 1.0 ml of **OA-2K** with pipette.



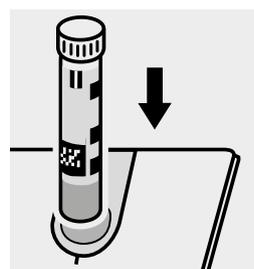
Add 1.0 ml of **OA-3K** with pipette, close the cell with the screw cap, and mix.



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



Reaction time:  
1 minute



Place the cell into the 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”).

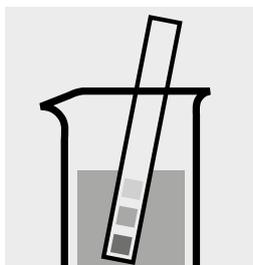
# Volatile Organic Acids

101809

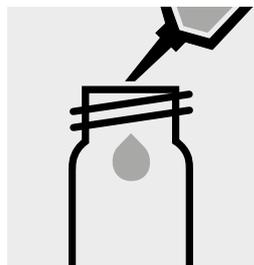
Test

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

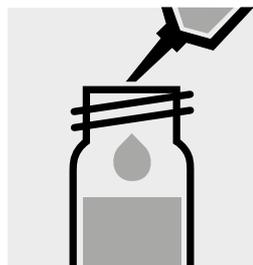
**range:** 71 – 4401 mg/l volatile organic acid (calculated as butyric acid)



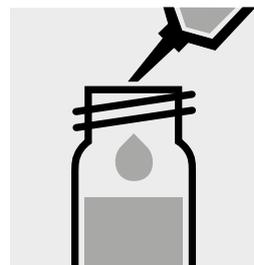
Check the pH of the sample, specified range: pH 2– 12.



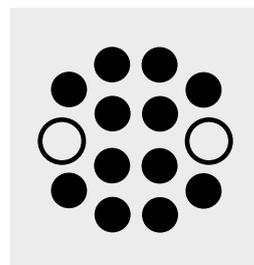
Pipette 0.75 ml of **OA-1** into a round cell.



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.



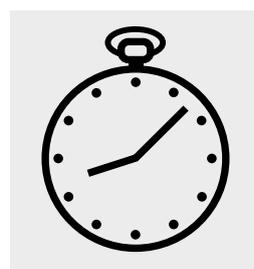
Add 1.0 ml of **OA-3** with pipette.



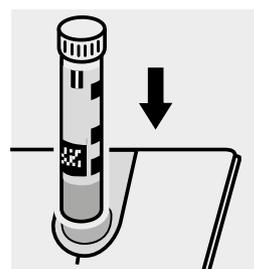
Add 1.0 ml of **OA-4** with pipette, close the cell with the screw cap, and mix.



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”).

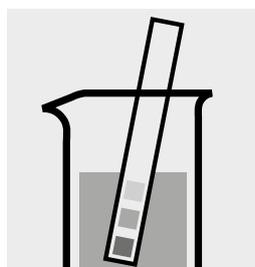
# Zinc

100861

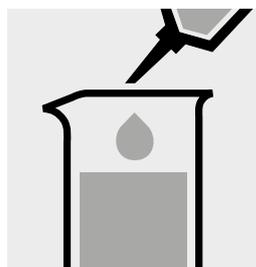
Cell Test

**Measuring** 0.025 – 1.000 mg/l Zn

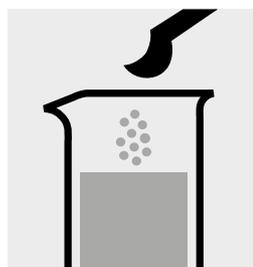
**range:** Expression of results also possible in mmol/l.



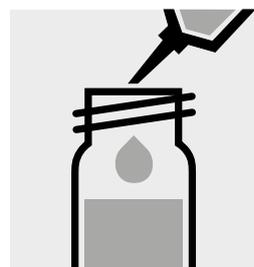
Check the pH of the sample, specified range: pH 1–7. If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



Pipette 10 ml of sample into a glass vessel.



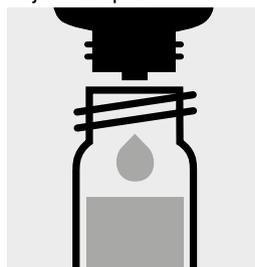
Add 1 level green micro-spoon of **Zn-1K** and shake to dissolve the solid substance: **sample-reagent mixture**.



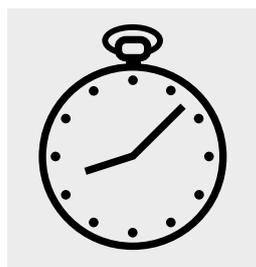
Pipette 0.50 ml of **Zn-2K** into a reaction cell, close with the screw cap, and mix.



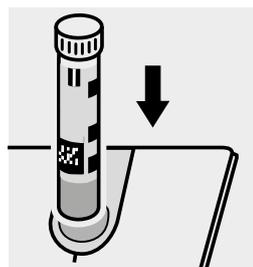
Add 2.0 ml of the **sample-reagent mixture** with pipette, close the cell with the screw cap, and mix.



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 ( $\Sigma$  Zn).

## Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100, Cat.No. 118701.

Ready-to-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 100) is highly recommended.

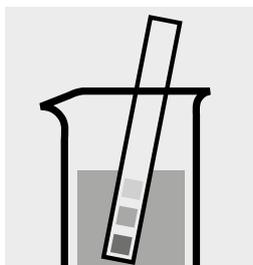
# Zinc

114566

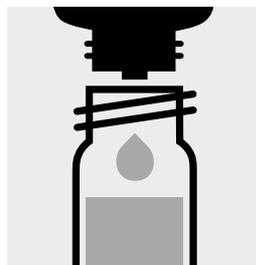
Cell Test

**Measuring** 0.20 – 5.00 mg/l Zn

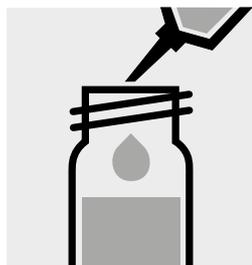
**range:** Expression of results also possible in mmol/l.



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.



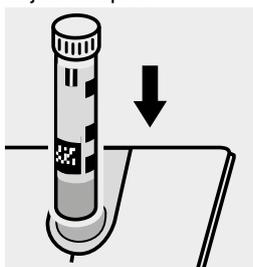
Add 0.50 ml of the sample with pipette, close the cell with the screw cap, and mix.



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 ( $\Sigma$  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-to-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.

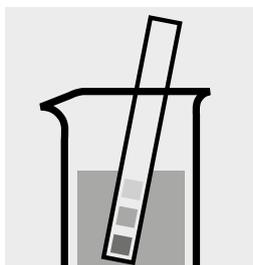
# Zinc

114832

Test

**Measuring** 0.05 – 2.50 mg/l Zn 10-mm cell

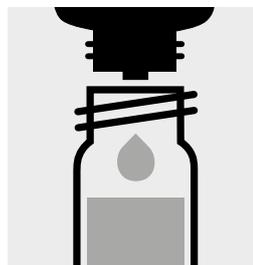
**range:** Expression of results also possible in mmol/l.



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



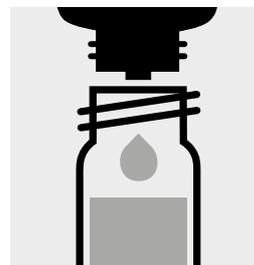
Pipette 5.0 ml of the sample into a test tube with screw cap.



Add 5 drops of **Zn-1**, close the test tube with the screw cap, and mix.



Check the pH, specified range: pH 12 – 13.  
If required, add dilute sodium hydroxide solution drop by drop to adjust the pH.



Add 2 drops of **Zn-2**, close the test tube with the screw cap, and mix.



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



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



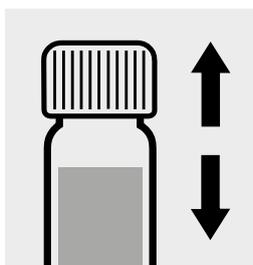
Reaction time: 3 minutes



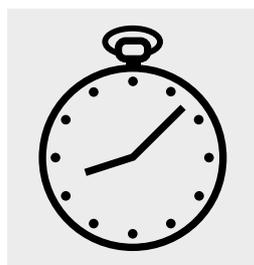
Add 1 level grey micro-spoon of **Zn-5**, close the test tube with the screw cap, and dissolve the solid substance.



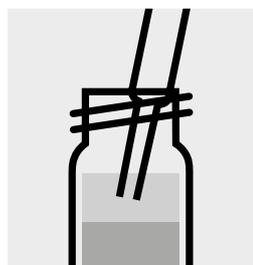
Add 5.0 ml of **Zn-6** (Cat.No. 106146, Isobutyl-methylketone) with pipette and close the test tube with the screw cap.



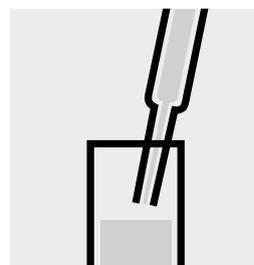
Shake the tube vigorously for 30 seconds.



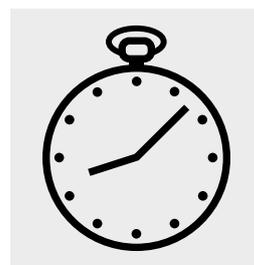
Leave to stand for 2 minutes.



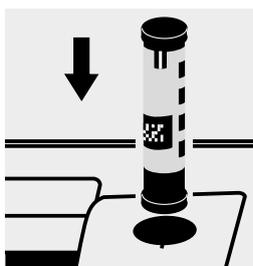
Aspirate the clear upper phase from the tube with pipette.



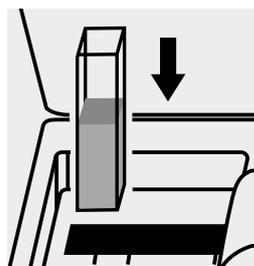
Transfer the solution into a cell.



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 ( $\Sigma$  Zn).

### Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use Spectroquant® CombiCheck 100, Cat.No. 118701.

Ready-to-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 100) is highly recommended.

# Analytical Procedures and Appendices

## II Suitability of test kits for testing seawater and tolerance limits of neutral salts

Test kit	Cat. No.	Limit of tolerance, salts in %			
		suitable for seawater	NaCl	NaNO <sub>3</sub>	Na <sub>2</sub> SO <sub>4</sub>
Acid Capacity Cell Test	101758	no	-	-	-
Aluminium Cell Test	100594	yes	20	20	20
Aluminium Test	114825	yes	10	20	20
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 <sup>1)</sup>	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
Calcium Test	100049	no	-	-	-
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

<sup>1)</sup> this test kit is also suitable for testing seawater after the addition of sodium hydroxide solution (see package insert)

## Analytical Procedures and Appendice –

### II Suitability of test kits for testing seawater and tolerance limits of neutral salts

Test kit	Cat. No.	suitable for seawater	Limit of tolerance, salts in %		
			NaCl	NaNO <sub>3</sub>	Na <sub>2</sub> SO <sub>4</sub>
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
Cobalt Cell Test	117244	yes	10	10	20
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	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	114561	no	10	10	10
Cyanide Cell Test	102531	no	10	10	10
Cyanide Test	109701	no	10	10	10
Cyanuric Acid Test	119253	yes	-	-	-
Fluoride Cell Test	100809	no	10	10	10
Fluoride Cell Test	117243	yes <sup>2)</sup>	0.2	0.2	0.001
Fluoride Test	114598	yes	20	20	20
Fluoride Test	100822	yes <sup>2)</sup>	0.05	0.05	0.001
Fluoride Test	117236	yes <sup>2)</sup>	0.2	0.2	0.002
Formaldehyde Cell Test	114500	no	5	0	10
Formaldehyde Test	114678	no	5	0	10
Gold Test	114821	yes	10	20	5

<sup>2)</sup> distill beforehand analogous APHA 4500-F<sup>-</sup> B

## Analytical Procedures and Appendice –

### II Suitability of test kits for testing seawater and tolerance limits of neutral salts

Test kit	Cat. No.	suitable for seawater	Limit of tolerance, salts in %		
			NaCl	NaNO <sub>3</sub>	Na <sub>2</sub> SO <sub>4</sub>
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
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 Test	109717	no	20	5	15
Magnesium Cell Test	100815	yes	2	2	1
Manganese Cell Test	100816	no	20	20	20
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
Nitrat 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	114547	yes	20	20	15
Nitrite Cell Test	100609	yes	20	15	15
Nitrite Test	114776	yes	20	20	15
Nitrogen (total) Cell Test	114537	no	0.5	-	10

## Analytical Procedures and Appendice –

### II Suitability of test kits for testing seawater and tolerance limits of neutral salts

Test kit	Cat. No.	suitable for seawater	Limit of tolerance, salts in %		
			NaCl	NaNO <sub>3</sub>	Na <sub>2</sub> SO <sub>4</sub>
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	100474	yes	5	10	10
Phosphate Cell Test (ortho-phosphates)	114543	yes	5	10	10
Phosphate Cell Test (phosphorus total)	114543	no	1	10	10
Phosphat Cell Test	100475	yes	20	20	20
Phosphate Cell Test (ortho-phosphates)	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 (ortho-phosphates)	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
Sodium Cell Test	100885	no	-	10	1
Sulfate Cell Test	102532	no	2	0.007	-

## Analytical Procedures and Appendice –

### II Suitability of test kits for testing seawater and tolerance limits of neutral salts

Test kit	Cat. No.	suitable for seawater	Limit of tolerance, salts in %		
			NaCl	NaNO <sub>3</sub>	Na <sub>2</sub> SO <sub>4</sub>
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	-
Sulfate Test	101812	no	2	0.007	-
Sulfate Test	102537	yes	10	0.015	-
Sulfide Test	114779	no	0.5	1	1
Sulfite Cell Test	114394	no	20	20	20
Sulfite Test	101746	no	20	20	20
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	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

# Analytical Procedures and Appendices

## III Spectroquant® CombiCheck and Standard solutions

Test kit Cat. No. or method	Evaluation as	CombiCheck Cat. No.	Confidence interval		Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Spec. value for the standard	Max. working tolerance	Cat. No.	Concen- tration	Expanded measurement uncertainty	
Acid Capacity Cell Test, 101758	OH	-	5.00 mmol/l <sup>1)</sup>	± 0.50 mmol/l	-	-	-	see prep. instruction
ADMI	-	-	50 <sup>1)</sup>	-	-	-	-	100246
ADMI	-	-	250 <sup>1)</sup>	-	-	-	-	100246
Aluminium Cell Test, 100594	Al	CC 100, 118701	0.40 mg/l	± 0.05 mg/l	132226 132225	0.0500 mg/l 0.200 mg/l	± 0.0020 mg/l ± 0.006 mg/l	119770
Aluminium Test, 114825	Al	CC 40, 114692 CC 100, 118701	0.75 mg/l 0.40 mg/l	± 0.08 mg/l ± 0.05 mg/l	132226 132225	0.0500 mg/l 0.200 mg/l	± 0.0020 mg/l ± 0.006 mg/l	119770
Ammonium Cell Test, 114739	NH <sub>4</sub> -N	CC 50, 114695	1.00 mg/l	± 0.10 mg/l	125022 125023	0.400 mg/l 1.00 mg/l	± 0.012 mg/l ± 0.04 mg/l	119812
	NH <sub>4</sub>	-	-	-	132227	0.250 mg/l	± 0.011 mg/l	119812
Ammonium Cell Test, 114558	NH <sub>4</sub> -N	CC 10, 114676	4.00 mg/l	± 0.30 mg/l	125022 125023 125024 125025	0.400 mg/l 1.00 mg/l 2.00 mg/l 6.00 mg/l	± 0.012 mg/l ± 0.04 mg/l ± 0.07 mg/l ± 0.13 mg/l	119812
Ammonium Cell Test, 114544	NH <sub>4</sub> -N	CC 20, 114675	12.0 mg/l	± 1.0 mg/l	125023 125024 125025 125026	1.00 mg/l 2.00 mg/l 6.00 mg/l 12.0 mg/l	± 0.04 mg/l ± 0.07 mg/l ± 0.13 mg/l ± 0.4 mg/l	119812
Ammonium Cell Test, 114559	NH <sub>4</sub> -N	CC 70, 114689	50.0 mg/l	± 5.0 mg/l	125025 125026 125027	6.00 mg/l 12.0 mg/l 50.0 mg/l	± 0.13 mg/l ± 0.4 mg/l ± 1.2 mg/l	119812
Ammonium Test, 114752	NH <sub>4</sub> -N	CC 50, 114695	1.00 mg/l	± 0.10 mg/l	125022 125023 125024	0.400 mg/l 1.00 mg/l 2.00 mg/l	± 0.012 mg/l ± 0.04 mg/l ± 0.07 mg/l	119812
	NH <sub>4</sub>	-	-	-	132227	0.250 mg/l	± 0.011 mg/l	119812
Ammonium Test, 100683	NH <sub>4</sub> -N	CC 70, 114689	50.0 mg/l	± 5.0 mg/l	125025 125026 125027	6.00 mg/l 12.0 mg/l 50.0 mg/l	± 0.13 mg/l ± 0.4 mg/l ± 1.2 mg/l	119812
AOX Cell Test, 100675	AOX	-	1.00 mg/l <sup>1)</sup>	± 0.10 mg/l	-	-	-	100680
Arsenic Test, 101747	As	-	0.050 mg/l <sup>1)</sup>	± 0.005 mg/l	133002	1.00 mg/l	± 0.05 mg/l	119773
BOD Cell Test, 100687	O <sub>2</sub>	-	210 mg/l	± 20 mg/l	-	-	-	100718
Boron Cell Test, 100826	B	-	1.00 mg/l <sup>1)</sup>	± 0.15 mg/l	133005	1.00 mg/l	± 0.06 mg/l	119500
Boron Test, 114839	B	-	0.400 mg/l <sup>1)</sup>	± 0.040 mg/l	-	-	-	119500
Bromine Test, 00605	Br <sub>2</sub>	-	5.00 mg/l <sup>1)</sup>	± 0.50 mg/l	-	-	-	see prep. instruction
Cadmium Cell Test, 114834	Cd	CC 30, 114677 CC 90, 118700	0.500 mg/l 0.250 mg/l	± 0.060 mg/l ± 0.030 mg/l	132228	0.100 mg/l	± 0.003 mg/l	119777
Cadmium Test, 101745	Cd	CC 90, 118700	0.250 mg/l	± 0.030 mg/l	133008 132228	0.00500 mg/l 0.100 mg/l	± 0.003 mg/l ± 0.00020 mg/l	119777
Calcium Cell Test, 100858	Ca	-	75 mg/l <sup>1)</sup>	± 7 mg/l	-	-	-	see prep. instruction

1) self prepared, recommended concentration

## Analytical Procedures and Appendice – III Spectroquant® CombiCheck and Standard solutions

Test kit Cat. No. or method	Evaluation as	CombiCheck Cat. No.	Confidence interval		Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Spec. value for the standard	Max. working tolerance	Cat. No.	Concen- tration	Expanded measurement uncertainty	
Calcium Test, 114815	Ca	-	80 mg/l <sup>1)</sup>	± 8 mg/l	-			119778
Calcium Test, 100049	Ca	-	2.00 mg/l <sup>1)</sup>	± 0.20 mg/l	-			119778
Chloride Cell Test, 114730	Cl	CC 20, 114675	60 mg/l	± 10 mg/l	132229	10.0 mg/l	± 0.5 mg/l	119897
		CC 10, 114676	25 mg/l	± 6 mg/l	132230	50 mg/l	± 3 mg/l	
Chloride Test, 114897	Cl	CC 60, 114696	125 mg/l	± 13 mg/l	132229	10.0 mg/l	± 0.5 mg/l	119897
		-	12.5 mg/l <sup>1)</sup>	± 1.3 mg/l	132230	50 mg/l	± 3 mg/l	
Chloride Cell Test, 101804	Cl	-	7.5 mg/l <sup>1)</sup>	± 0.8 mg/l	133010	1.00 mg/l	± 0.04 mg/l	119897
					133011	2.50 mg/l	± 0.08 mg/l	
					132229	10.0 mg/l	± 0.5 mg/l	
Chloride Test, 101807	Cl	-	2.50 mg/l <sup>1)</sup>	± 0.25 mg/l	133010	1.00 mg/l	± 0.04 mg/l	119897
					133011	2.50 mg/l	± 0.08 mg/l	
Chlorine Cell Test, 100595	Cl <sub>2</sub>	-	3.00 mg/l <sup>1)</sup>	± 0.30 mg/l	-			see prep. instruction
Chlorine Cell Test, 100597	Cl <sub>2</sub>	-	3.00 mg/l <sup>1)</sup>	± 0.30 mg/l	-			see prep. instruction
Chlorine Test, 100598	Cl <sub>2</sub>	-	3.00 mg/l <sup>1)</sup>	± 0.30 mg/l	-			see prep. instruction
Chlorine Test, 100602	Cl <sub>2</sub>	-	3.00 mg/l <sup>1)</sup>	± 0.30 mg/l	-			see prep. instruction
Chlorine Test, 100599	Cl <sub>2</sub>	-	3.00 mg/l <sup>1)</sup>	± 0.30 mg/l	-			see prep. instruction
Chlorine Cell Test (liquid reagent), 100086/100087	Cl <sub>2</sub>	-	3.00 mg/l <sup>1)</sup>	± 0.30 mg/l	-			see prep. instruction
Chlorine Test (liquid reagent), 100086/100087	Cl <sub>2</sub>	-	0.500 mg/l <sup>1)</sup>	± 0.050 mg/l	-			see prep. instruction
Chlorine Cell Test (liquid reagent), 100086/100087/100088	Cl <sub>2</sub>	-	3.00 mg/l <sup>1)</sup>	± 0.30 mg/l	-			see prep. instruction
Chlorine Test (liquid reagent), 100086/100087/100088	Cl <sub>2</sub>	-	0.500 mg/l <sup>1)</sup>	± 0.050 mg/l	-			see prep. instruction
Chlorine Dioxide Test, 100608	ClO <sub>2</sub>	-	5.00 mg/l <sup>1)</sup>	± 0.50 mg/l	-			see prep. instruction
Chromate Cell Test, 114552	Cr	-	1.00 mg/l <sup>1)</sup>	± 0.10 mg/l	133013	1.00 mg/l	± 0.03 mg/l	119780
Chromate Test, 114758	Cr	-	1.00 mg/l <sup>1)</sup>	± 0.10 mg/l	133012	0.050 mg/l	± 0.002 mg/l	119780
					133013	1.00 mg/l	± 0.03 mg/l	
Cobalt Cell Test, 117244	Co	-	1.00 mg/l <sup>1)</sup>	± 0.10 mg/l	-			119785
COD Cell Test, 114560	COD	CC 50, 114695	20.0 mg/l	± 4.0 mg/l	125028	20.0 mg/l	± 0.7 mg/l	see prep. instruction
COD Cell Test, 101796	COD	CC 50, 114695	20.0 mg/l	± 2.0 mg/l	125028	20.0 mg/l	± 0.7 mg/l	see prep. instruction
COD Cell Test, 114540	COD	CC 10, 114676	80 mg/l	± 12 mg/l	125029	100 mg/l	± 3 mg/l	see prep. instruction
COD Cell Test, 114895	COD	CC 60, 114696	250 mg/l	± 20 mg/l	125029	100 mg/l	± 3 mg/l	see prep. instruction
					125030	200 mg/l	± 4 mg/l	
COD Cell Test, 114690	COD	CC 60, 114696	250 mg/l	± 25 mg/l	125029	100 mg/l	± 3 mg/l	see prep. instruction
					125030	200 mg/l	± 4 mg/l	
					125031	400 mg/l	± 5 mg/l	

1) self prepared, recommended concentration

## Analytical Procedures and Appendice – III Spectroquant® CombiCheck and Standard solutions

Test kit Cat. No. or method	Evaluation as	CombiCheck Cat. No.	Confidence interval		Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Spec. value for the standard	Max. working tolerance	Cat. No.	Concen- tration	Expanded measurement uncertainty	
COD Cell Test, 114541	COD	CC 20, 114675	750 mg/l	± 75 mg/l	125029	100 mg/l	± 3 mg/l	see prep. instruction
					125030	200 mg/l	± 4 mg/l	
					125031	400 mg/l	± 5 mg/l	
					125032	1000 mg/l	± 11 mg/l	
COD Cell Test, 114691	COD	CC 80, 114738	1500 mg/l	± 150 mg/l	125031	400 mg/l	± 5 mg/l	see prep. instruction
					125032	1000 mg/l	± 11 mg/l	
					125033	2000 mg/l	± 32 mg/l	
COD Cell Test, 114555	COD	CC 70, 114689	5000 mg/l	± 400 mg/l	125032	1000 mg/l	± 11 mg/l	see prep. instruction
					125033	2000 mg/l	± 32 mg/l	
					125034	8000 mg/l	± 68 mg/l	
COD Cell Test, 101797	COD	-	50 000 mg/l <sup>1)</sup>	± 5000 mg/l	125034	8000 mg/l	± 68 mg/l	see prep. instruction
					125035	50 000 mg/l	± 894 mg/l	
COD Cell Test, 109772	COD	-	80 mg/l <sup>1)</sup>	± 12 mg/l	125028	20.0 mg/l	± 0.7 mg/l	see prep. instruction
					125029	100 mg/l	± 3 mg/l	
COD Cell Test, 109773	COD	-	750 mg/l <sup>1)</sup>	± 75 mg/l	125029	100 mg/l	± 3 mg/l	see prep. instruction
					125030	200 mg/l	± 4 mg/l	
					125031	400 mg/l	± 5 mg/l	
					125032	1000 mg/l	± 11 mg/l	
COD Cell Test, 117058	COD	-	30.0 mg/l <sup>1)</sup>	± 3.0 mg/l	-	-	see prep. instruction	
COD Cell Test, 117059	COD	-	1500 mg/l <sup>1)</sup>	± 150 mg/l	-	-	see prep. instruction	
Color Hazen	Pt/Co (Ha- zen)	-	250 mg/l <sup>1)</sup>	-	-	-	100246	
Color Hazen	Pt/Co (Ha- zen)	-	500 mg/l	-	-	-	100246	
Copper Cell Test, 114553	Cu	CC 30, 114677	2.00 mg/l	± 0.20 mg/l	-	-	119786	
		CC 90, 118700	2.00 mg/l	± 0.20 mg/l	-	-		
Copper Test, 114767	Cu	CC 30, 114677	2.00 mg/l	± 0.20 mg/l	-	-	119786	
		CC 90, 118700	2.00 mg/l	± 0.20 mg/l	-	-		
Cyanide Cell Test, 102531	CN	-	0.250 mg/l <sup>1)</sup>	± 0.030 mg/l	-	-	119533	
Cyanide Cell Test, 114561	CN	-	0.250 mg/l <sup>1)</sup>	± 0.030 mg/l	-	-	119533	
Cyanide Test, 109701	CN	-	0.250 mg/l <sup>1)</sup>	± 0.030 mg/l	-	-	119533	
Cyanuric Acid Test, 119253	Cyan Acid	-	80 mg/l <sup>1)</sup>	± 10 mg/l	-	-	see prep. instruction	
Fluoride Cell Test, 100809	F	-	0.75 mg/l <sup>1)</sup>	± 0.08 mg/l	132234	0.200 mg/l	± 0.012 mg/l	119814
					132233	0.50 mg/l	± 0.02 mg/l	
					132235	1.00 mg/l	± 0.03 mg/l	
					132236	1.50 mg/l	± 0.04 mg/l	
Fluoride Cell Test, 117243	F	-	1.00 mg/l <sup>1)</sup>	± 0.15 mg/l	132234	0.200 mg/l	± 0.012 mg/l	119814
					132233	0.50 mg/l	± 0.02 mg/l	
					132235	1.00 mg/l	± 0.03 mg/l	
					132236	1.50 mg/l	± 0.04 mg/l	

1) self prepared, recommended concentration

## Analytical Procedures and Appendice – III Spectroquant® CombiCheck and Standard solutions

Test kit Cat. No. or method	Evaluation as	CombiCheck Cat. No.	Confidence interval		Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Spec. value for the standard	Max. working tolerance	Cat. No.	Concen- tration	Expanded measurement uncertainty	
Fluoride Test, 114598	F	-	1.00 mg/l <sup>1)</sup>	± 0.15 mg/l	132234	0.200 mg/l	± 0.012 mg/l	119814
			10.0 mg/l <sup>1)</sup>	± 1.2 mg/l	132233	0.50 mg/l	± 0.02 mg/l	
					132235	1.00 mg/l	± 0.03 mg/l	
					132236	1.50 mg/l	± 0.04 mg/l	
Fluoride Test, 100822	F	-	1.00 mg/l <sup>1)</sup>	± 0.15 mg/l	132234	0.200 mg/l	± 0.012 mg/l	119814
					132233	0.50 mg/l	± 0.02 mg/l	
					132235	1.00 mg/l	± 0.03 mg/l	
					132236	1.50 mg/l	± 0.04 mg/l	
Fluoride Test, 117236	F	-	1.00 mg/l <sup>1)</sup>	± 0.15 mg/l	132234	0.200 mg/l	± 0.012 mg/l	119814
					132233	0.50 mg/l	± 0.02 mg/l	
					132235	1.00 mg/l	± 0.03 mg/l	
					132236	1.50 mg/l	± 0.04 mg/l	
Formaldehyde Cell Test, 114500	HCHO	-	5.00 mg/l <sup>1)</sup>	± 0.50 mg/l	-	-	-	see prep. instruction
Formaldehyde Test, 114678	HCHO	-	4.50 mg/l <sup>1)</sup>	± 0.50 mg/l	-	-	-	see prep. instruction
Gold Test, 114821	Au	-	6.0 mg/l <sup>1)</sup>	± 0.6 mg/l	-	-	-	170216
Hydrazine Test, 109711	N <sub>2</sub> H <sub>4</sub>	-	1.00 mg/l <sup>1)</sup>	± 0.10 mg/l	-	-	-	see prep. instruction
Hydrogenperoxide Cell Test, 114731	H <sub>2</sub> O <sub>2</sub>	-	10.0 mg/l <sup>1)</sup>	± 1.0 mg/l	-	-	-	see prep. instruction
Hydrogenperoxide Test, 118789	H <sub>2</sub> O <sub>2</sub>	-	2.00 mg/l <sup>1)</sup>	± 0.20 mg/l	-	-	-	see prep. instruction
Iodine Test, 100606	I <sub>2</sub>	-	5.00 mg/l <sup>1)</sup>	± 0.50 mg/l	-	-	-	see prep. instruction
Iron Cell Test, 114549	Fe	CC 30, 114677	1.00 mg/l	± 0.15 mg/l	133018	0.1000 mg/l	± 0.0030 mg/l	119781
		CC 90, 118700	1.00 mg/l	± 0.15 mg/l	133019	0.300 mg/l	± 0.009 mg/l	
				133020	1.00 mg/l	± 0.04 mg/l		
Iron Cell Test, 114896	Fe	-	25.0 mg/l <sup>1)</sup>	± 2.5 mg/l	-	-	-	119781
Iron Test, 114761	Fe	CC 30, 114677	1.00 mg/l	± 0.15 mg/l	133014	0.0500 mg/l	± 0.0015 mg/l	119781
		CC 90, 118700	1.00 mg/l	± 0.15 mg/l	133018	0.1000 mg/l	± 0.0030 mg/l	
				133019	0.300 mg/l	± 0.009 mg/l		
				133020	1.00 mg/l	± 0.04 mg/l		
Iron Test, 100796	Fe	CC 30, 114677	1.00 mg/l	± 0.15 mg/l	133014	0.0500 mg/l	± 0.0015 mg/l	119781
		CC 90, 118700	1.00 mg/l	± 0.15 mg/l	133018	0.1000 mg/l	± 0.0030 mg/l	
				133019	0.300 mg/l	± 0.009 mg/l		
				133020	1.00 mg/l	± 0.04 mg/l		
Lead Cell Test, 114833	Pb	CC 40, 114692	2.00 mg/l	± 0.20 mg/l	-	-	-	119776
		CC 100, 118701	2.00 mg/l	± 0.20 mg/l				
Lead Test, 109717	Pb	CC 40, 114692	2.00 mg/l	± 0.20 mg/l	133003	0.0500 mg/l	± 0.0040 mg/l	119776
		CC 100, 118701	2.00 mg/l	± 0.20 mg/l	133004	0.100 mg/l	± 0.005 mg/l	
Magnesium Cell Test, 100815	Mg	-	40.0 mg/l <sup>1)</sup>	± 4.0 mg/l	-	-	-	see prep. instruction
Manganese Cell Test, 100816	Mn	CC 30, 114677	1.00 mg/l	± 0.15 mg/l	132238	0.200 mg/l	± 0.005 mg/l	119789
		CC 90, 118700	1.00 mg/l	± 0.15 mg/l	132239	1.00 mg/l	± 0.03 mg/l	

1) self prepared, recommended concentration

## Analytical Procedures and Appendice – III Spectroquant® CombiCheck and Standard solutions

Test kit Cat. No. or method	Evaluation as	CombiCheck Cat. No.	Confidence interval		Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Spec. value for the standard	Max. working tolerance	Cat. No.	Concen- tration	Expanded measurement uncertainty	
Manganese Test, 114770	Mn	CC 30, 114677	1.00 mg/l	± 0.15 mg/l	132237	0.050 mg/l	± 0.004 mg/l	119789
		CC 90, 118700	1.00 mg/l	± 0.15 mg/l	132238	0.200 mg/l	± 0.005 mg/l	
					132239	1.00 mg/l	± 0.03 mg/l	
Manganese Test, 101846	Mn	CC 90, 118700	1.00 mg/l	± 0.15 mg/l	132237	0.050 mg/l	± 0.004 mg/l	119789
					132238	0.200 mg/l	± 0.005 mg/l	
					132239	1.00 mg/l	± 0.03 mg/l	
Molybdenum Cell Test, 100860	Mo	-	0.50 mg/l <sup>1)</sup>	± 0.05 mg/l	-			170227
Molybdenum Test, 119252	Mo	-	25.0 mg/l <sup>1)</sup>	± 2.5 mg/l	-			170227
Monochloramine Test, 101632	Cl <sub>2</sub>	-	5.00 mg/l <sup>1)</sup>	± 0.50 mg/l	-			see prep. instruction
Nickel Cell Test, 114554	Ni	CC 40, 114692	2.00 mg/l	± 0.20 mg/l	-			109989
		CC 100, 118701	2.00 mg/l	± 0.20 mg/l				
Nickel Test, 114785	Ni	CC 40, 114692	2.00 mg/l	± 0.20 mg/l	-			109989
		CC 100, 118701	2.00 mg/l	± 0.20 mg/l				
Nitrate Cell Test, 114542	NO <sub>3</sub> -N	CC 20, 114675	9.0 mg/l	± 0.9 mg/l	125037	2.50 mg/l	± 0.06 mg/l	119811
					125038	15.0 mg/l	± 0.4 mg/l	
					132241	10.0 mg/l	± 0.3 mg/l	
					132242	50.0 mg/l	± 2.0 mg/l	119811
Nitrate Cell Test, 114563	NO <sub>3</sub> -N	CC 20, 114675	9.0 mg/l	± 0.9 mg/l	125037	2.50 mg/l	± 0.06 mg/l	119811
					125038	15.0 mg/l	± 0.4 mg/l	
					132241	10.0 mg/l	± 0.3 mg/l	
					132242	50.0 mg/l	± 2.0 mg/l	119811
Nitrate Cell Test, 114764	NO <sub>3</sub> -N	CC 80, 114738	25.0 mg/l	± 2.5 mg/l	125037	2.50 mg/l	± 0.06 mg/l	119811
					125038	15.0 mg/l	± 0.4 mg/l	
					125039	40.0 mg/l	± 1.0 mg/l	
					132241	10.0 mg/l	± 0.3 mg/l	119811
					132242	50.0 mg/l	± 2.0 mg/l	119811
Nitrate Cell Test, 100614	NO <sub>3</sub> -N	-	100 mg/l <sup>1)</sup>	± 10 mg/l	125039	40.0 mg/l	± 1.0 mg/l	119811
					125040	200 mg/l	± 5 mg/l	
Nitrate Test, 114773	NO <sub>3</sub> -N	CC 20, 114675	9.0 mg/l	± 0.9 mg/l	125036	0.500 mg/l	± 0.05 mg/l	119811
		CC 10, 114676	2.50 mg/l	± 0.25 mg/l	125037	2.50 mg/l	± 0.06 mg/l	
					125038	15.0 mg/l	± 0.4 mg/l	
					132240	1.00 mg/l	± 0.03 mg/l	119811
					132241	10.0 mg/l	± 0.3 mg/l	119811
					132242	50.0 mg/l	± 2.0 mg/l	119811
Nitrate Test, 109713	NO <sub>3</sub> -N	CC 20, 114675	9.0 mg/l	± 0.9 mg/l	125036	0.500 mg/l	± 0.05 mg/l	119811
		CC 10, 114676	2.50 mg/l	± 0.25 mg/l	125037	2.50 mg/l	± 0.06 mg/l	
					125038	15.0 mg/l	± 0.4 mg/l	
					132240	1.00 mg/l	± 0.03 mg/l	119811
					132241	10.0 mg/l	± 0.3 mg/l	119811
					132242	50.0 mg/l	± 2.0 mg/l	119811
Nitrate Cell Test, 114556	NO <sub>3</sub> -N	CC 10, 114676	2.50 mg/l	± 0.25 mg/l	125036	0.500 mg/l	± 0.05 mg/l	119811
					125037	2.50 mg/l	± 0.06 mg/l	
					132240	1.00 mg/l	± 0.03 mg/l	
					132241	10.0 mg/l	± 0.3 mg/l	119811

1) self prepared, recommended concentration

## Analytical Procedures and Appedice – III Spectroquant® CombiCheck and Standard solutions

Test kit Cat. No. or method	Evaluation as	CombiCheck Cat. No.	Confidence interval		Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution
			Spec. value for the standard	Max. working tolerance	Cat. No.	Concen- tration	Expanded measurement uncertainty	Cat. No.
Nitrate Test, 114942	NO <sub>3</sub> -N	CC 20, 114675	9.0 mg/l	± 0.9 mg/l	125036	0.500 mg/l	± 0.05 mg/l	119811
					125037	2.50 mg/l	± 0.06 mg/l	
	125038	15.0 mg/l	± 0.4 mg/l					
	132240	1.00 mg/l	± 0.03 mg/l					
	132241	10.0 mg/l	± 0.3 mg/l					
	NO <sub>3</sub>	-			132242	50.0 mg/l	± 2.0 mg/l	119811
Nitrate Test, 101842	NO <sub>3</sub> -N	-	10.0 mg/l <sup>1)</sup>	± 1.5 mg/l	132241	10.0 mg/l	± 0.3 mg/l	119811
	NO <sub>3</sub>	-			132242	50.0 mg/l	± 2.0 mg/l	119811
Nitrite Cell Test, 114547	NO <sub>2</sub> -N	-	0.300 mg/l <sup>1)</sup>	± 0.030 mg/l	125041	0.200 mg/l	± 0.009 mg/l	119899
Nitrite Cell Test, 100609	NO <sub>2</sub> -N	-	45.0 mg/l <sup>1)</sup>	± 5 mg/l	125042	40.0 mg/l	± 1.3 mg/l	119899
Nitrite Test, 114776	NO <sub>2</sub> -N	-	0.50 mg/l <sup>1)</sup>	± 0.05 mg/l	125041	0.200 mg/l	± 0.009 mg/l	119899
	NO <sub>2</sub>	-			133021	0.0100 mg/l	± 0.0012 mg/l	119899
Nitrogen (total) Cell Test, 114537	N	CC 50, 114695	5.0 mg/l	± 0.7 mg/l	125043	2.50 mg/l	± 0.06 mg/l	see prep. instruction
					125044	12.0 mg/l	± 0.3 mg/l	
Nitrogen (total) Cell Test, 100613	N	CC 50, 114695	5.0 mg/l	± 0.7 mg/l	125043	2.50 mg/l	± 0.06 mg/l	see prep. instruction
					125044	12.0 mg/l	± 0.3 mg/l	
Nitrogen (total) Cell Test, 114763	N	CC 70, 114689	50 mg/l	± 7 mg/l	125044	12.0 mg/l	± 0.3 mg/l	see prep. instruction
					125045	100 mg/l	± 3 mg/l	
Oxygen Cell Test, 114694	O <sub>2</sub>	-	-	± 0.6 mg/l	-	-	-	see the website
Oxygen Scavengers Test, 119251	DEHA	-	0.250 mg/l <sup>1)</sup>	± 0.030 mg/l	-	-	-	see prep. instruction
Ozone Test, 100607	O <sub>3</sub>	-	2.00 mg/l <sup>1)</sup>	± 0.20 mg/l	-	-	-	see prep. instruction
pH Cell Test, 101744	pH	-	7.0	± 0.2	-	-	-	109407
Phenol Cell Test, 114551	C <sub>6</sub> H <sub>5</sub> OH	-	1.25 mg/l <sup>1)</sup>	± 0.13 mg/l	-	-	-	see prep. instruction
Phenol Test, 100856	C <sub>6</sub> H <sub>5</sub> OH	-	2.50 mg/l <sup>1)</sup>	± 0.25 mg/l	-	-	-	see prep. instruction
Phosphate Cell Test, 100474	PO <sub>4</sub> -P	CC 10, 114676	0.80 mg/l	± 0.08 mg/l	-	-	-	119898
Phosphate Cell Test, 114543	PO <sub>4</sub> -P	CC 10, 114676	0.80 mg/l	± 0.08 mg/l	125046	0.400 mg/l	± 0.016 mg/l	119898
					125047	4.00 mg/l	± 0.08 mg/l	
Phosphate Cell Test, 100475	PO <sub>4</sub> -P	CC 80, 114738	15.0 mg/l	± 1.0 mg/l	-	-	-	119898
		CC 20, 114675	8.0 mg/l	± 0.7 mg/l				
Phosphate Cell Test, 114729	PO <sub>4</sub> -P	CC 80, 114738	15.0 mg/l	± 1.0 mg/l	125047	4.00 mg/l	± 0.08 mg/l	119898
		CC 20, 114675	8.0 mg/l	± 0.7 mg/l	125048	15.0 mg/l	± 0.4 mg/l	
Phosphate Cell Test, 100616	PO <sub>4</sub> -P	-	50.0 mg/l <sup>1)</sup>	± 5.0 mg/l	-	-	-	119898
Phosphate Cell Test, 100673	PO <sub>4</sub> -P	-	50.0 mg/l <sup>1)</sup>	± 5.0 mg/l	125047	4.00 mg/l	± 0.08 mg/l	119898
					125048	15.0 mg/l	± 0.4 mg/l	
					125049	75.0 mg/l	± 1.6 mg/l	
Phosphate Test, 114848	PO <sub>4</sub> -P	CC 10, 114676	0.80 mg/l	± 0.08 mg/l	-	-	-	119898
Phosphate Test, 100798	PO <sub>4</sub> -P	-	50.0 mg/l <sup>1)</sup>	± 5.0 mg/l	-	-	-	119898
Phosphate Cell Test, 114546	PO <sub>4</sub> -P	-	15.0 mg/l <sup>1)</sup>	± 1.0 mg/l	-	-	-	119898
Phosphate Test, 114842	PO <sub>4</sub> -P	-	15.0 mg/l <sup>1)</sup>	± 1.0 mg/l	-	-	-	119898

1) self prepared, recommended concentration

## Analytical Procedures and Appendice – III Spectroquant® CombiCheck and Standard solutions

Test kit Cat. No. or method	Evaluation as	CombiCheck Cat. No.	Confidence interval		Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution Cat. No.
			Spec. value for the standard	Max. working tolerance	Cat. No.	Concen- tration	Expanded measurement uncertainty	
Potassium Cell Test, 114562	K	-	25.0 mg/l <sup>1)</sup>	± 4.0 mg/l	-			170230
Potassium Cell Test, 100615	K	-	150 mg/l <sup>1)</sup>	± 15 mg/l	-			170230
Residual Hardness Cell Test, 114683	Ca	-	2.50 mg/l <sup>1)</sup>	± 0.30 mg/l	-			119778
Silicate Test, 114794	SiO <sub>2</sub>	-	5.00 mg/l <sup>1)</sup> 0.750 mg/l <sup>1)</sup>	± 0.50 mg/l ± 0.075 mg/l	132244	0.1000 mg/l	± 0.0040 mg/l	
					132243	0.500 mg/l	± 0.025 mg/l	
					132245	1.000 mg/l	± 0.030 mg/l	170236
Silicate Test, 100857	SiO <sub>2</sub>	-	50.0 mg/l <sup>1)</sup>	± 5.0 mg/l	-			170236
Silicate Test, 101813	SiO <sub>2</sub>	-	0.1000 mg/l <sup>1)</sup>	± 0.0100 mg/l	132244	0.1000 mg/l	± 0.0040 mg/l	170236
Silver Test, 114831	Ag	-	1.50 mg/l <sup>1)</sup>	± 0.20 mg/l	-			119797
Sodium Cell Test, 100885	Na	-	100 mg/l <sup>1)</sup>	± 10 mg/l	-			see prep. instruction
Sulfate Cell Test, 102532	SO <sub>4</sub>	-	25.0 mg/l <sup>1)</sup>	± 3.0 mg/l	-			119813
Sulfate Cell Test, 114548	SO <sub>4</sub>	CC 10, 114676	100 mg/l	± 15 mg/l	125050	40 mg/l	± 6 mg/l	
					125051	125 mg/l	± 6 mg/l	119813
Sulfate Cell Test, 100617	SO <sub>4</sub>	CC 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 <sub>4</sub>	CC 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 <sub>4</sub>	CC 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 <sub>4</sub>	-	5.00 mg/l <sup>1)</sup>	± 0.50 mg/l	-			119813
Sulfate Test, 102537	SO <sub>4</sub>	CC 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 <sup>1)</sup>	± 0.08 mg/l	-			see prep. instruction
Sulfite Cell Test, 114394	SO <sub>3</sub>	-	12.5 mg/l <sup>1)</sup>	± 1.5 mg/l	-			see prep. instruction
Sulfite Test, 101746	SO <sub>3</sub>	-	30.0 mg/l <sup>1)</sup>	± 1.0 mg/l	-			see prep. instruction
Surfactants (anionic) Cell Test, 102552	SDAS	-	1.00 mg/l <sup>1)</sup>	± 0.20 mg/l	-			see prep. instruction
Surfactants (cationic) Cell Test, 101764	k-Ten	-	1.00 mg/l <sup>1)</sup>	± 0.10 mg/l	-			see prep. instruction
Surfactants (nonionic) Cell Test, 101787	n-Ten	-	4.00 mg/l <sup>1)</sup>	± 0.40 mg/l	133022	1.00 mg/l	± 0.16 mg/l	
					133023	5.00 mg/l	± 0.30 mg/l	see prep. instruction
Tin Cell Test, 114622	Sn	-	1.25 mg/l <sup>1)</sup>	± 0.13 mg/l	-			see prep. instruction
TOC Cell Test, 114878	TOC	-	40.0 mg/l <sup>1)</sup>	± 3.0 mg/l	132247	10.0 mg/l	± 0.2 mg/l	
					132248	25.0 mg/l	± 0.5 mg/l	
					132249	50.0 mg/l	± 1.0 mg/l	109017
TOC Cell Test, 114879	TOC	-	400 mg/l <sup>1)</sup>	± 30 mg/l	132251	100 mg/l	± 2 mg/l	
					132252	200 mg/l	± 4 mg/l	
					132253	500 mg/l	± 10 mg/l	109017

1) self prepared, recommended concentration

Test kit Cat. No. or method	Evaluation as	CombiCheck Cat. No.	Confidence interval		Diluted and ready-to-use standard solutions, CRM			Ready-to-use standard solution
			Spec. value for the standard	Max. working tolerance	Cat. No.	Concen- tration	Expanded measurement uncertainty	Cat. No.
Total Hardness Cell Test, 100961	Ca	-	75 mg/l <sup>1)</sup>	± 7 mg/l	-			see prep. instruction
Volatile Organic Acids Cell Test, 101749	CH <sub>3</sub> COOH -		1500 mg/l <sup>1)</sup>	± 80 mg/l	-			see prep. instruction
Volatile Organic Acids Test, 101809	CH <sub>3</sub> COOH -		1500 mg/l <sup>1)</sup>	± 80 mg/l	-			see prep. instruction
Zinc Cell Test, 100861	Zn	CC 100, 118701	0.750 mg/l	± 0.150 mg/l	-			119806
Zinc Cell Test, 114566	Zn	CC 40, 114692	2.00 mg/l	± 0.40 mg/l	-			119806
Zinc Test, 114832	Zn	CC 100, 118701	0.75 mg/l	± 0.15 mg/l	-			119806

1) self prepared, recommended concentration

# Analytical Procedures and Appendices

I

## IV Instructions for the preparation of standard solutions

### Standard solution of acid capacity

#### Preparation of a standard solution:

A sodium hydroxide solution of 0.1 mol/l (corresponds to 100 mmol/l) is used.

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

#### Stability:

When stored in a cool place (refrigerator), the diluted investigational solutions remain stable for one week.

#### Reagents required:

1.09141.1000 Sodium hydroxide solution 0.1 mol/l Titripur®

1.16754.9010 Water for analysis EMSURE®

II

### Standard solution of bromine analogous to DIN EN ISO 7393

#### Preparation of a KIO<sub>3</sub> stock solution:

Dissolve 1.006 g of KIO<sub>3</sub> 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<sub>3</sub>/KI standard solution:

Transfer 11.13 ml of the KIO<sub>3</sub> 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 a bromine standard solution:

Pipette 20.0 ml (full pipette) KIO<sub>3</sub>/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H<sub>2</sub>SO<sub>4</sub> 0.5 mol/l, leave to stand for 1 minute, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 5.00 mg/l bromine.

#### Stability:

The KIO<sub>3</sub> stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO<sub>3</sub>/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted bromine standard solution is not stable and must be used immediately.

#### Reagents required:

1.02404.0100 Potassium iodate, volum. standard

1.05043.0250 Potassium iodide for analysis EMSURE®

1.09072.1000 Sulfuric acid 0.5 mol/l Titripur®

1.09136.1000 Sodium hydroxide solution 2 mol/l Titripur®

1.16754.9010 Water for analysis EMSURE®

III

IV

### Standard solution of calcium

#### Preparation of a standard solution:

Dissolve 2.946 g of calcium nitrate tetrahydrate with distilled water in a calibrated or conformity-checked 500-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l calcium.

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

#### Stability:

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

#### Reagents required:

1.02121.0500 Calcium nitrate tetrahydrate for analysis EMSURE®

1.16754.9010 Water for analysis EMSURE®

### Standard solutions of free chlorine

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

#### Standard solution of free chlorine

#### Preparation of a standard solution:

Dissolve 1.85 g of dichloroisocyanuric acid sodium salt dihydrate GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l free chlorine.

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

#### Stability:

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

#### Note:

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

#### Reagents required:

1.10888.0250 Dichloroisocyanuric acid sodium salt GR for analysis

1.16754.9010 Water for analysis EMSURE®

I

### 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 (0.05 mg) of free chlorine.

#### Preparation of a chlorine standard solution:

Pipette 20.0 ml (10.0 ml) (full pipette)  $KIO_3$ /KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of  $H_2SO_4$  0.5 mol/l, leave to stand for 1 minute, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 3.00 mg/l (0.500 mg/l) free chlorine.

#### Stability:

The  $KIO_3$  stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The  $KIO_3$ /KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted chlorine standard solution is not stable and must be used immediately.

#### Note:

This procedure involves the preparation according to a standardized method.

#### Reagents required:

1.02404.0100	Potassium iodate, volum. standard
1.05043.0250	Potassium iodide for analysis EMSURE®
1.09072.1000	Sulfuric acid 0.5 mol/l Titripur®
1.09136.1000	Sodium hydroxide solution 2 mol/l Titripur®
1.16754.9010	Water for analysis EMSURE®

II

III

IV

**Standard solution of free chlorine**

**Preparation of a stock solution:**

First prepare a 1:10 dilution using a sodium hypochlorite solution containing approx. 13% of active chlorine. For this pipette 10 ml of sodium hypochlorite solution into a calibrated or conformity-checked 100-ml volumetric flask and then make up to the mark with distilled water.

**Precise assay of the stock solution:**

Pipette 10.0 ml of the stock solution into a 250-ml ground-glass-stoppered conical flask containing 60 ml of distilled water. Subsequently add to this solution 5 ml of hydrochloric acid 25% and 3 g of potassium iodide. Close the conical flask with the ground-glass stopper, mix thoroughly, and leave to stand for 1 minute.

Titrate the eliminated iodine with sodium thiosulfate solution 0.1 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:**

$$\text{Consumption of sodium thiosulfate solution } 0.1 \text{ mol/l (ml)} \cdot 355 = \\ = \text{content of free chlorine, in mg/l}$$

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**

**Preparation of a standard solution:**

Dissolve 4.00 g of chloramine T GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l total chlorine.

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

**Stability:**

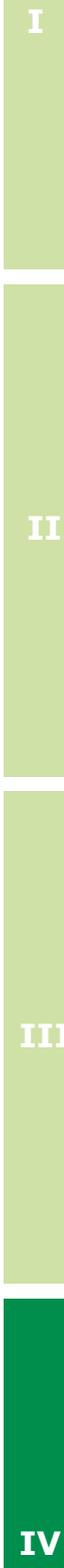
When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

**Reagents required:**

1.00316.1000	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®

**Reagents required:**

1.02426.0250	Chloramine T trihydrate GR for analysis
1.16754.9010	Water for analysis EMSURE®



I

**Standard solution of chlorine dioxide analogous to DIN EN ISO 7393**

**Preparation of a KIO<sub>3</sub> stock solution:**

Dissolve 1.006 g of KIO<sub>3</sub> 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<sub>3</sub>/KI standard solution:**

Transfer 13.12 ml of the KIO<sub>3</sub> 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 a chlorine dioxide standard solution:**

Pipette 20.0 ml (full pipette) KIO<sub>3</sub>/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H<sub>2</sub>SO<sub>4</sub> 0.5 mol/l, leave to stand for 1 minute, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 5.00 mg/l chlorine dioxide.

**Stability:**

The KIO<sub>3</sub> stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO<sub>3</sub>/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted chlorine dioxide standard solution is not stable and must be used immediately.

**Reagents required:**

1.02404.0100	Potassium iodate, 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®

II

**Standard solution of COD**

**Preparation of a standard solution:**

Dissolve 0.851 g of potassium hydrogen phthalate GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l COD.

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

**Stability:**

When stored in a cool place (refrigerator), the standard solution 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.

**Reagents required:**

1.02400.0080	Potassium hydrogen phthalate GR for analysis, volum. standard
1.16754.9010	Water for analysis EMSURE®

III

IV

**Standard solution COD/chloride**

**Preparation of a chloride dilution solution:**

Dissolve 32.9 g of sodium chloride (free from organic material, e. g. Suprapur®) with distilled water in a calibrated or conformity-checked 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<sup>-</sup>

**Preparation of a COD/chloride standard solution:**

Dissolve 0.851 g of potassium hydrogen phthalate GR with **dilution solution** in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with **dilution solution**.

The standard solution prepared according to this procedure has a concentration of 10 000 mg/l COD and 20 g/l Cl<sup>-</sup>.

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<sup>-</sup> and the standard solution of 10 000 mg/l COD / 20 g/l Cl<sup>-</sup> remain stable for one month. When stored under appropriate cool conditions (refrigerator), the diluted standard solutions (investigational concentrations) remain stable - depending on the respective concentration - for approximately one week to one month.

**Reagents required:**

1.02400.0080	Potassium hydrogen phthalate GR for analysis, volum. standard
1.06406.0050	Sodium chloride 99.99 Suprapur®
1.16754.9010	Water for analysis EMSURE®

**Standard solution of cyanuric acid**

**Preparation of a standard solution:**

Dissolve 1.00 g of cyanuric acid with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water. The substance is slightly soluble and the dissolution process may take several hours.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l cyanuric acid.

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

**Stability:**

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

**Reagents required:**

8.20358.0005	Cyanuric acid for synthesis
1.16754.9010	Water for analysis EMSURE®

I

### 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)

$$\text{mg/l formaldehyde} = (C2 - C1) \cdot 37.525$$

Further investigational concentrations may be prepared from the stock solution prepared according to the procedure described above by diluting accordingly with distilled water.

#### Stability:

When stored in a cool place (refrigerator), the stock solution of approx. 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.

II

### Standard solution of hydrazine

#### Preparation of a standard solution:

Dissolve 4.07 g of hydrazinium sulfate GR with oxygen-low (boil previously) distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with oxygen-low distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l hydrazine.

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

#### Stability:

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

#### Reagents required:

1.04003.1000 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®

#### Reagents required:

1.04603.0100 Hydrazinium sulfate GR for analysis

1.16754.9010 Water for analysis EMSURE®

III

IV

### Standard solution of hydrogenperoxide

#### Preparation of a stock solution:

Place 10.0 ml of Perhydrol® 30% H<sub>2</sub>O<sub>2</sub> 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 hydrogenperoxide.

#### Precise assay of the stock solution:

Pipette 50.0 ml (full pipette) of the hydrogen peroxide stock solution into a 500-ml conical flask, dilute with 200 ml of distilled water, and add 30 ml of sulfuric acid 25%. Titrate with a 0.02 mol/l potassium permanganate solution until the color changes to pink.

#### Calculation and preparation of a standard solution:

*Consumption of potassium permanganate solution 0.02 mol/l (ml) · 34.02 = content of hydrogenperoxide, in mg/l*

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

#### Stability:

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

### Standard solution of iodine analogous to DIN EN ISO 7393

#### Preparation of a KIO<sub>3</sub> stock solution:

Dissolve 1.006 g of KIO<sub>3</sub> 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<sub>3</sub>/KI standard solution:

Transfer 7.00 ml of the KIO<sub>3</sub> 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 a iodine standard solution:

Pipette 20.0 ml (full pipette) KIO<sub>3</sub>/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H<sub>2</sub>SO<sub>4</sub> 0.5 mol/l, leave to stand for 1 minute, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 5.00 mg/l iodine.

#### Stability:

The KIO<sub>3</sub> stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO<sub>3</sub>/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted iodine standard solution is not stable and must be used immediately.

#### Reagents required:

1.09122.1000	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®

#### 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®

I

**Standard solution of magnesium**

**Preparation of a standard solution:**

Dissolve 1.055 g of magnesium nitrate hexahydrate with distilled water in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l magnesium.

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

**Stability:**

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

**Reagents required:**

1.05853.0500 Magnesium nitrate hexahydrate for analysis EMSURE®

1.16754.9010 Water for analysis EMSURE®

II

**Standard solution of monochloramine**

**Preparation of a standard solution:**

Place 5.0 ml of chlorine standard solution 100 mg/l Cl<sub>2</sub> and 10.0 ml ammonium standard solution 10 mg/l NH<sub>4</sub>-N in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 5.00 mg/l free chlorine or 3.63 mg/l monochloramine.

**Stability:**

The standard solution is not stable and must be used immediately.

**Reagents required:**

Chlorine standard solution 100 mg/l Cl<sub>2</sub>  
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<sub>4</sub>-N  
Preparation with Ammonium standard solution Certipur®, Cat.No. 1.19812.0500, 1000 mg/l NH<sub>4</sub> = 777 mg/l NH<sub>4</sub>-N

1.16754.9010 Water for analysis EMSURE®

III

**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®

IV

**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®

**Standard solution of ozone analogous to DIN EN ISO 7393**

**Preparation of a KIO<sub>3</sub> stock solution:**

Dissolve 1.006 g of KIO<sub>3</sub> 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<sub>3</sub>/KI standard solution:**

Transfer 14.80 ml of the KIO<sub>3</sub> 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 a ozone standard solution:**

Pipette 20.0 ml (full pipette) KIO<sub>3</sub>/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H<sub>2</sub>SO<sub>4</sub> 0.5 mol/l, leave to stand for 1 minute, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its color. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 2.00 mg/l ozone.

**Stability:**

The KIO<sub>3</sub> stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO<sub>3</sub>/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The diluted ozone standard solution is not stable and must be used immediately.

**Reagents required:**

1.02404.0100	Potassium iodate, volum. standard
1.05043.0250	Potassium iodide for analysis EMSURE®
1.09072.1000	Sulfuric acid 0.5 mol/l Titripur®
1.09136.1000	Sodium hydroxide solution 2 mol/l Titripur®
1.16754.9010	Water for analysis EMSURE®

I

## Standard solution of phenol

### Preparation of a standard solution:

Dissolve 1.00 g of phenol GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l phenol.

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

### Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

### Reagents required:

1.00206.0250 Phenol GR for analysis

1.16754.9010 Water for analysis  
EMSURE®

II

## Standard solution of silicate

### 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<sub>2</sub>.

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

### Example:

Mix 4.675 ml of silicon standard solution (1000 mg/l Si) with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 10.00 mg/l SiO<sub>2</sub>.

After its preparation, the solution must be immediately transferred to a clean polyethylene vessel for further storage.

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

After its preparation, the solution with the desired working concentration must be immediately transferred to a clean polyethylene vessel for further storage.

### Stability:

The diluted standard solutions (investigational concentrations) remain stable - depending on the respective concentration - for one day to approximately six months.

### Reagents required:

1.70236.0100 Silicone standard solution  
Certipur®

1.16754.9010 Water for analysis  
EMSURE®

III

## Standard solution of sodium

### Preparation of a standard solution:

A chloride standard solution of 1000 mg/l is used.  
1000 mg/l chloride corresponds to 649 mg/l sodium.

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

### Stability:

When stored in a cool place (refrigerator), the diluted standard solutions (investigational concentrations) remain stable for one month.

### Reagents required:

1.19897.0500 Chloride standard solution  
Certipur®

1.16754.9010 Water for analysis  
EMSURE®

IV

**Standard solution of sulfide**

**Preparation of a stock solution:**

Dissolve 7.5 g of glass-clear, if necessary washed crystals of sodium sulfide nonahydrate GR with distilled water in a calibrated or conformity-checked 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 a standard solution:**

*C1 = consumption of sodium thiosulfate 0.1 mol/l (ml)*

*C2 = quantity of iodine solution 0.05 mol/l (25.0 ml)*

$$mg/l \text{ sulfide} = (C2 - C1) \cdot 64.13$$

Further investigational concentrations may be prepared from the stock solution prepared according to the procedure described above by diluting accordingly with distilled water.

**Stability:**

When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l remains stable for at most one day. The diluted standard solutions (investigational concentrations) must be used immediately.

**Reagents required:**

	Sodium sulfide nonahydrat GR for analysis
1.09099.1000	Iodine solution 0.05 mol/l Titripur®
1.09147.1000	Sodium thiosulfate solution 0.1 mol/l Titripur®
1.00716.1000	Sulfuric acid 25% for analysis EMSURE®
1.05445.0500	Zinc iodide-starch solution GR for analysis
1.16754.9010	Water for analysis EMSURE®

I

II

III

IV

**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 a standard solution:**

$C_1$  = consumption of sodium thiosulfate 0.1 mol/l (ml)

$C_2$  = quantity of iodine solution 0.05 mol/l (25.0 ml)

$$\text{mg/l sulfite} = (C_2 - C_1) \cdot 80.06$$

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.

**Standard solution of surfactants (anionic)**
**Preparation of a standard solution:**

Dissolve 1.00 g of dodecane-1-sulfonic acid sodium salt with distilled water in a calibrated or conformity-checked 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 surfactant.

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

**Stability:**

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one month. 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®

**Reagents required:**

1.12146.0005	Dodecane-1-sulfonic acid sodium salt
1.16754.9010	Water for analysis EMSURE®

**Standard solution of surfactants (cationic)**

**Preparation of a standard solution:**

Dissolve 1.00 g of Cetyltrimethylammonium Bromide, Molecular Biology Grade with distilled water in a calibrated or conformity-checked 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 cationic surfactant.

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

**Stability:**

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one month. The diluted standard solutions (investigational concentrations) must be used immediately.

**Reagents required:**

219374 Cetyltrimethylammonium Bromide, Molecular Biology Grade Calbiochem® (CTAB)

1.16754.9010 Water for analysis EMSURE®

**Standard solution of surfactants (nonionic)**

**Preparation of a standard solution:**

Dissolve 1.00 g of Triton® X-100 with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l nonionic surfactant.

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

**Stability:**

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

**Reagents required:**

1.12298.0101 Triton® X-100

1.16754.9010 Water for analysis EMSURE®

**Standard solution of tin**

**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.

**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®

I

### Standard solution of total hardness

#### Preparation of a standard solution:

Dissolve 2.946 g of calcium nitrate tetrahydrate with distilled water in a calibrated or conformity-checked 500-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l calcium (corresponds to 175 °e).

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

#### Stability:

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

#### Reagents required:

---

1.02121.0500 Calcium nitrate tetrahydrate for analysis EMSURE®

1.16754.9010 Water for analysis EMSURE®

II

### Standard solution of volatile organic acids

#### Preparation of a standard solution:

Dissolve 2,05 g of sodium acetate anhydrous with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1500 mg/l acetic acid.

#### Stability:

When stored in a cool place (refrigerator), the standard solution remains stable for one week.

#### Reagents required:

---

1.06268.0250 Sodium acetate anhydrous for analysis EMSURE®

1.16754.9010 Water for analysis EMSURE®

III

IV

We provide information and advice to our customers on application technologies and regulatory matters to the best of our knowledge and ability, but without obligation or liability. Existing laws and regulations are to be observed in all cases by our customers. This also applies in respect to any rights of third parties. Our information and advice do not relieve our customers of their own responsibility for checking the suitability of our products for the envisaged purpose.

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

