ANALYSIS INSTRUCTIONS

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photoLab® 6x00 / 7x00

METHOD DATA, V 2.15

WTW
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Index

Test kits with barcode

Available methods

Here, the method for a cell test (KT) is selected with the aid of the barcode on the cell, for a reagent test (RT) with the aid of the AutoSelector. The total measuring range is related to the shown citation form. For reagent tests, the measuring range covers all possible path length (cells from 10 to 50 mm).

Parameter	Model	Order No.	Total measuring range	Method	Type[a]	Method No.
Acid Capacity to pH 4.3 (total alkalinity)	01758	252 087	0.40 – 8.00 mmol/l	Indicator reaction	KT	208
Aluminium*	00594	252 068	0.02 – 0.50 mg/l Al	Chromazurole S	KT	196
Aluminium*	14825	250 425	0.020 – 1.20 mg/l Al	Chromazurole S	RT	043
Ammonium	A6/25	252 072	0.20 – 8.00 mg/l NH_4-N	Indophenol blue	KT	003
Ammonium	14739	250 495	0.010 – 2.000 mg/l NH_4-N	Indophenol blue	KT	104
Ammonium	14558	252 000	0.20 – 8.00 mg/l NH_4-N	Indophenol blue	KT	051
Ammonium	14544	250 329	0.5 – 16.0 mg/l NH_4-N	Indophenol blue	KT	052
Ammonium	14559	250 424	4.0 – 80.0 mg/l NH_4-N	Indophenol blue	KT	053
Ammonium	14752/1 14752/2	250 426 252 081	0.010 – 3.00 mg/l NH_4-N	Indophenol blue	RT	054
Ammonium	00683	252 027	2.0 – 75.0 mg/l NH_4-N	Indophenol blue	RT	155
Ammonium	00683	252 027	5 – 150 mg/l NH_4-N	Indophenol blue	RT	163
AOX Cell*	00675	252 023	0.05 – 2.50 mg/L AOX	Oxidation to chloride	KT	156
Arsenic*	01747	252 063	0.001 – 0.100 mg/l As	Ag-DDTC	RT	132
BOD*	00687	252 028	0.5 – 3000 mg/l BOD	Modification of Winkler method	KT	157
Boron*	00826	252 041	0.05 – 2.00 mg/l B	Azomethine H	KT	164
Boron*	14839	250 427	0.050 – 0.800 mg/l B	Rosocyanine	RT	046
Bromine*	00605	252 014	0.020 – 10.00 mg/l Br_2	S-DPD	RT	146
Cadmium	14834	250 314	0.025 – 1.000 mg/l Cd	Cadion derivative	KT	067
Cadmium	01745	252 051	0.0020 – 0.500 mg/l Cd	Cadion derivative	KT	183
Calcium*	00858	252 047	10 – 250 mg/l Ca	Phthalein purple	KT	165
Calcium*	14815	250 428	5 – 160 mg/l Ca	Glyoxal-bis-hydroxyanil	RT	042
Calcium sensitive*	14815	250 428	1.0 – 15.0 mg/l Ca	Glyoxal-bis-hydroxyanil	RT	125
Chloride*	14730	250 353	5 – 125 mg/l Cl	Iron(III)-thiocyanat	KT	095
Chloride*	14897/1 14897/2	250 491 252 082	2.5 – 25.0 mg/l Cl	Iron(III)-thiocyanat	RT	110
Chloride*	14897/1 14897/2	250 491 252 082	10 – 250 mg/l Cl	Iron(III)-thiocyanat	RT	063
Chlorine* (free chlorine)	00595	250 419	0.03 – 6.00 mg/l Cl_2	S-DPD	KT	141
Chlorine* (free and total chlorine)	00597	250 420	0.03 – 6.00 mg/l Cl_2	S-DPD	KT	142
Chlorine* (free chlorine)	00598/1 00598/2	252 010 252 011	0.010 – 6.00 mg/l Cl_2	S-DPD	RT	143
Chlorine* (total chlorine)	00602/1 00602/2	252 013 252 055	0.010 – 6.00 mg/l Cl_2	S-DPD	RT	145
Chlorine* (free and total chlorine)	00599	252 012	0.010 – 6.00 mg/l Cl_2	S-DPD	RT	144
Chlorine* (free and total chlorine)	00086 00087 00088	252 077 252 078 252 079	0.010 – 6.00 mg/l Cl_2	DPD	KT	194
Chlorine dioxide*	00608	252 017	0.020 – 10.00 mg/l ClO_2	S-DPD	RT	149
Chromate*	14552	250 341	0.05 – 2.00 mg/l Cr	Diphenylcarbazide	KT	039
Chromate* (total chromium)	14552	250 341	0.05 – 2.00 mg/l Cr	Peroxodisulfate oxidation, Diphenylcarbazide	KT	039
Chromate*	14758	250 433	0.010 – 3.00 mg/l Cr	Diphenylcarbazide	RT	040
COD*	C3/25	252 070	10 – 150 mg/l COD	Chromosulfuric acid oxidation, chromate determination	KT	001

Parameter	Model	Order No.	Total measuring range	Method	Type[a]	Method No.
COD*	14560	250 303	4.0 – 40.0 mg/l COD	Chromosulfuric acid oxidation, chromate determination	KT	031
COD*	01796	252 092	5.0 – 80.0 mg/l COD	Chromosulfuric acid oxidation, chromate determination	KT	211
COD*	14540	252 001	10 – 150 mg/l COD	Chromosulfuric acid oxidation, chromate determination	KT	014
COD*	14895	250 359	15 – 300 mg/l COD	Chromosulfuric acid oxidation, chromate determination	KT	105
COD*	14690	250 304	50 – 500 mg/l COD	Chromosulfuric acid oxidation, chromate determination	KT	093
COD*	C4/25	252 071	25 – 1500 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination	KT	002
COD*	14541	252 002	25 – 1500 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination	KT	023
COD*	14691	250 351	300 – 3500 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination	KT	094
COD*	14555	250 309	500 – 10000 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination	KT	024
COD*	01797	252 093	5000 – 90000 mg/l COD	Chromosulfuric acid oxidation, chromate determination	KT	209
COD (Hg free)*	09772	250 301	10 – 150 mg/l COD	Chromosulfuric acid oxidation, chromate determination	KT	137
COD (Hg free)*	09773	250 306	100 – 1500 mg/l COD	Chromosulfuric acid oxidation, chromium(III) determination	KT	138
Copper*	14553	250 408	0.05 – 8.00 mg/l Cu	Cuprizone	KT	026
Copper*	14767	250 441	0.02 – 6.00 mg/l Cu	Cuprizone	RT	027
Cyanide* (free cyanide)	14561	250 344	0.010 – 0.500 mg/l CN	Barbituric acid and pyridinecarboxylic acid	KT	075
Cyanide* (readily liberated cyanide)	14561	250 344	0.010 – 0.500 mg/l CN	Citric acid, barbituric acid and pyridinecarboxylic acid	KT	075
Cyanide* (free cyanide)	09701	250 492	0.0020 – 0.500 mg/l CN	Barbituric acid and pyridinecarboxylic acid	RT	109
Cyanide* (readily liberated cyanide)	09701	250 492	0.0020 – 0.500 mg/l CN	Citric acid, barbituric acid and pyridinecarboxylic acid	RT	109
Cyanuric Acid	19253	252 091	2 - 160 Cyan Acid	Triazine derivative	RT	210
Fluoride*	00809	252 094	0.10 – 1.80 mg/l F	Alizarin complexone	KT	215
Fluorid sensitive	00809	250 094	0.025 – 0.500 mg/l F	Alizarin complexone	KT	216
Fluorid*	14598/1 14598/2	252 048 252 083	0.10 – 2.00 mg/l F	Alizarin complexone	RT	166
Fluorid*	14598/1 14598/2	252 048 252 083	1.0 – 20.0 mg/l F	Alizarin complexone	RT	167
Formaldehyde*	14500	250 406	0.10 – 8.00 mg/l HCHO	Chromotropic acid	KT	028
Formaldehyde*	14678	250 331	0.02 – 8.00 mg/l HCHO	Chromotropic acid	RT	091
Gold	14821	250 436	0.5 – 12.0 mg/l Au	Rhodamine B	RT	045
Hardness see Total Hardness or Residual Hardness						
Hydrazine*	09711	250 493	0.005 – 2.00 mg/l N_2H_4	4-Dimethylaminobenzaldehyde	RT	044
Hydrogenperoxide*	14731	250 402	2.0 – 20.0 mg/l H_2O_2	Titanyl sulfate	KT	099
Hydrogenperoxide sensitive*	14731	250 402	0.25 – 5.00 mg/l H_2O_2	Titanyl sulfate	KT	128
Hydrogenperoxide	18789	252 067	0.015 – 6.00 mg/l H_2O_2	Phenanthroline derivative	RT	198
Iodine*	00606	252 015	0.050 – 10.00 mg/l I_2	S-DPD	RT	147
Iron	14549	250 349	0.05 – 4.00 mg/l Fe	Triazine	KT	037
Iron*	14896	250 361	1.0 – 50.0 mg/l Fe (Fe(II) and Fe(III))	2,2'-Dipyridyl	KT	106
Iron	14761/1 14761/2	250 435 250 439	0.005 – 5.00 mg/l Fe	Triazine	KT	038
Iron*	00796	252 042	0.010 – 5.00 mg/l Fe (Fe(II) and Fe(III))	1,10-Phenanthroline	KT	161
Lead*	14833	250 313	0.10 – 5.00 mg/l Pb	PAR	KT	066
Lead*	09717	252 034	0.010 – 5.00 mg/l Pb	PAR	RT	160

Parameter	Model	Order No.	Total measuring range	Method	Type[a]	Method No.
Magnesium*	00815	252 043	5.0 – 75.0 mg/l Mg	Phthalein purple	KT	158
Manganese*	00816	252 035	0.10 – 5.00 mg/l Mn	Formaldoxime	KT	159
Manganese*	01846	252 097	0.005 – 2.00 mg/l Mn	PAN	RT	226
Manganese*	14770/1 14770/2	250 442 252 084	0.010 – 10.00 mg/l Mn	Formaldoxime	RT	019
Molybdenum	00860	252 040	0.02 – 1.00 mg/l Mo	Bromopyrogallol red	KT	175
Molybdenum	19252	252 090	0.5 – 45.0 mg/l Mo	Mercaptoacetic acid	RT	206
Monochloramine	01632	252 057	0.050 – 10.00 mg/l Cl_2	Indophenol blue	RT	185
Nickel*	14554	250 409	0.10 – 6.00 mg/l Ni	Dimethylglyoxime	KT	017
Nickel*	14785	250 443	0.02 – 5.00 mg/l Ni	Dimethylglyoxime	RT	018
Nitrate*	N2/25	252 073	0.5 – 25.0 mg/l NO_3-N	2,6-Dimethylphenol	KT	004
Nitrate*	14542	250 410	0.5 – 18.0 mg/l NO_3-N	Nitrospectral	KT	059
Nitrate*	14563	252 003	0.5 – 25.0 mg/l NO_3-N	2,6-Dimethylphenol	KT	030
Nitrate*	14764	250 347	1.0 – 50.0 mg/l NO_3-N	2,6-Dimethylphenol	KT	107
Nitrate*	00614	252 019	23 – 225 mg/l NO_3-N	2,6-Dimethylphenol	KT	151
Nitrate*	14773	250 444	0.2 – 20.0 mg/l NO_3-N	Nitrospectral	RT	060
Nitrate*	09713/1 09713/2	250 421 252 085	0.10 – 25.0 mg/l NO_3-N	2,6-Dimethylphenol	RT	139
Nitrate in seawater*	14556	250 411	0.10 – 3.00 mg/l NO_3-N	Resorcine	KT	072
Nitrate in seawater*	14942	250 422	0.2 – 17.0 mg/l NO_3-N	Resorcine	RT	140
Nitrite*	N5/25	252 074	0.010 – 0.700 mg/l NO_2-N	Griess reaction	KT	005
Nitrite*	14547	252 004	0.010 – 0.700 mg/l NO_2-N	Griess reaction	KT	035
Nitrite*	00609	252 069	1.0 – 90.0 mg/l NO_2-N	Iron(II) ethylenediammonium sulfate	KT	197
Nitrite*	14776/1 14776/2	250 445 250 440	0.002 – 1.00 mg/l NO_2-N	Griess reaction	RT	036
Nitrogen (total)	14537	250 358	0.5 – 15.0 mg/l N	Peroxodisulfate oxidation, Nitrospectral	KT	068
Nitrogen (total)*	00613	252 018	0.5 – 15.0 mg/l N	Peroxodisulfate oxidation, 2,6-Dimethylphenol	KT	153
Nitrogen (total)	14763	250 494	10 – 150 mg/l N	Peroxodisulfate oxidation, 2,6-Dimethylphenol	KT	108
Oxygen*	14694	250 403	0.5 – 12.0 mg/l O_2	Modification of Winkler method	KT	092
Oxygen Scavengers	19251	252 089	0.020 – 0.500 mg/l DEHA	FerroZine®	RT	207
Ozone*	00607/1 00607/2	252 016 252 054	0.010 – 4.00 mg/l O_3	S-DPD	RT	148
pH	01744	252 050	6.4 – 8.8	Phenol red	KT	186
Phenol*	14551	250 412	0.10 – 2.50 mg/l Phenole	MBTH	KT	073
Phenol*	00856	252 058	0.002 – 0.100 mg/l C_6H_5OH	Aminoantipyrine, by extraction	RT	176
Phenol*	00856	252 058	0.025 – 5.00 mg/l C_6H_5OH	Aminoantipyrine	RT	177
Phosphate	P6/25	252 075	0.05 – 5.00 mg/l PO_4-P	Phosphomolybdenum blue	KT	006
Phosphate (total phosphorus)	P6/25	252 075	0.05 – 5.00 mg/l P	Peroxodisulfate oxidation, Phosphomolybdenum blue	KT	006
Phosphate	P7/25	252 076	0.5 – 25.0 mg/l PO_4-P	Phosphomolybdenum blue	KT	007
Phosphate (total phosphorus)	P7/25	252 076	0.5 – 25.0 mg/l P	Peroxodisulfate oxidation, Phosphomolybdenum blue	KT	007
Phosphate	14543	250 324	0.05 – 5.00 mg/l PO_4-P	Phosphomolybdenum blue	KT	055
Phosphate (total phosphorus)	14543	250 324	0.05 – 5.00 mg/l P	Peroxodisulfate oxidation, Phosphomolybdenum blue	KT	055
Phosphate	14729	250 334	0.5 – 25.0 mg/l PO_4-P	Phosphomolybdenum blue	KT	086
Phosphate (total phosphorus)	14729	250 334	0.5 – 25.0 mg/l P	Peroxodisulfate oxidation, Phosphomolybdenum blue	KT	086
Phosphate	00616	252 021	3.0 – 100.0 mg/l PO_4-P	Phosphomolybdenum blue	KT	152
Phosphate	14848/1 14848/2	250 446 252 086	0.010 – 5.00 mg/l PO_4-P	Phosphomolybdenum blue	RT	056
Phosphate	00798	252 045	1.0 – 100.0 mg/l PO_4-P	Phosphomolybdenum blue	RT	162

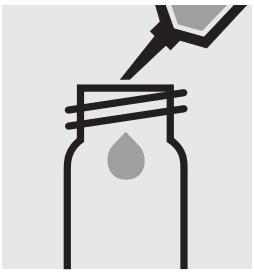
Parameter	Model	Order No.	Total measuring range	Method	Type[a]	Method No.
Phosphate*	14546	250 413	0.5 – 25.0 mg/l PO_4-P	Vanadatomolybdate	KT	069
Phosphate*	14842	250 447	0.5 – 30.0 mg/l PO_4-P	Vanadatomolybdate	RT	070
Potassium	14562	250 407	5.0 – 50.0 mg/l K	Kalignost, turbidimetric	KT	103
Potassium	00615	252 020	30 – 300 mg/l K	Kalignost, turbidimetric	KT	150
Residual Hardness*	14683	250 404	0.50 – 5.00 mg/l Ca	Phthalein purple	KT	098
Silicate (Silicic acid)	14794	250 438	0.11 – 10.70 mg/l SiO_2	Silicomolybdenum blue	RT	079
Silicate (Silicic acid)	14794	250 438	0.011 – 1.600 mg/l SiO_2	Silicomolybdenum blue	RT	081
Silicate (Silicic acid)*	00857	252 046	1.1 – 107.0 mg/l SiO_2	Molybdatosilicate	RT	169
Silicate (Silicic acid)*	00857	252 046	11 – 1070 mg/l SiO_2	Molybdatosilicate	RT	171
Silver*	14831	250 448	0.25 – 3.00 mg/l Ag	Eosine / 1,10-Phenanthroline	RT	047
Sodium in nutrient solutions*	00885	252 044	10 – 300 mg/l Na	indirectly as chloride	KT	168
Sulfate	14548	250 414	5 – 250 mg/l SO_4	Bariumsulfate, turbidimetric	KT	064
Sulfate	00617	252 022	50 – 500 mg/l SO_4	Bariumsulfate, turbidimetric	KT	154
Sulfate	14564	250 415	100 – 1000 mg/l SO_4	Bariumsulfate, turbidimetric	KT	082
Sulfate*	14791	250 449	25 – 300 mg/l SO_4	Tannin	RT	065
Sulfide*	14779	250 450	0.020 – 1.50 mg/l S	Dimethyl-p-phenylendiamine	RT	080
Sulfite*	14394	250 416	1.0 – 20.0 mg/l SO_3	Ellman's reagens	KT	127
Sulfite sensitive*	14394	250 416	0.05 – 3.00 mg/l SO_3	Ellman's reagens	KT	127
Sulfite*	01746	252 053	1.0 – 60.0 mg/l SO_3	Ellman's reagent	RT	187
Surfactants (anionic)	14697	250 333	0.05 – 2.00 mg/l MBAS (methylen blue active substances)	Methylene blue	KT	087
Surfactants (anionic)	02552	250 333	0.05 – 2.00 mg/l MBAS (methylen blue active substances)	Methylene blue	KT	231
Surfactants (cationic)*	01764	252 062	0.05 – 1.50 mg/l k-Ten	Disulfine blue	KT	192
Surfactants (nonionic)*	01787	252 061	0.10 – 7.50 mg/l n-Ten	TBPE	KT	193
Tin*	14622	250 401	0.10 – 2.50 mg/l Sn	Pyrocatechol violet	KT	100
TOC	14878	252 036	5.0 – 80.0 mg/l TOC	Peroxodisulfate oxidation, indicator	KT	172
TOC	14879	252 037	50 – 800 mg/l TOC	Peroxodisulfate oxidation, indicator	KT	173
Total Hardness*	00961	252 039	5 – 215 mg/l Ca	Phthalein purple	KT	178
Water hardness see Total Hardness or Residual Hardness						
Volatile Organic Acids*	01749	252 096	50 – 3000 mg/l CH_3COOH	Esterification	KT	222
Volatile Organic Acids*	01809	252 095	50 – 3000 mg/l CH_3COOH	Esterification	KT	223
Zinc	00861	252 049	0.025 – 1.000 mg/l Zn	PAR	KT	174
Zinc	14566	250 417	0.20 – 5.00 mg/l Zn	PAR	KT	074

a. Turbidity correction possible

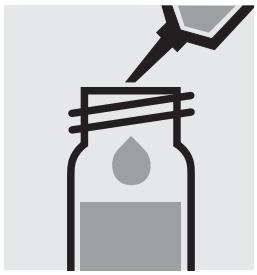
** KT = reaction cell test (16 mm round cell); RT = reagent test

01758 · Acid capacity to pH 4.3 (total alkalinity)

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

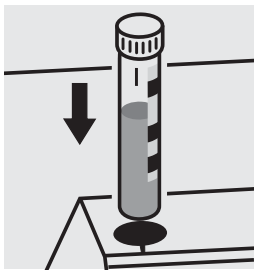


Pipette 4.0 ml of **AC-1** into a round cell.



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

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

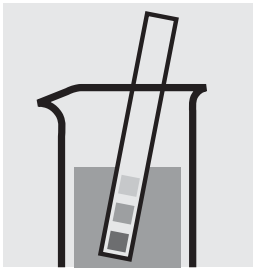


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a sodium hydroxide solution 0.1 mol/l can be used after diluting accordingly (see section “Standard solutions”).

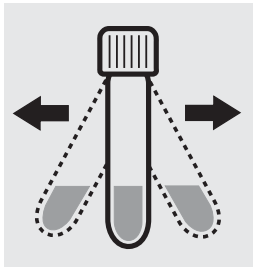
Measuring range:	0.02 – 0.50 mg/l Al Expression of results also possible in mmol/l.



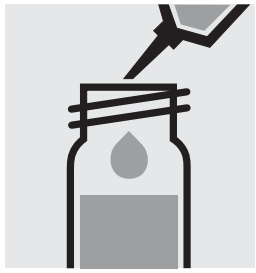
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

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

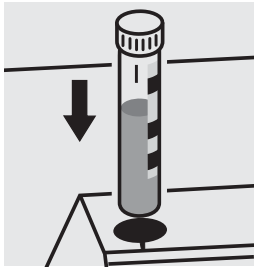


Shake the cell vigorously to dissolve the solid substance.



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

Reaction time:
5 minutes



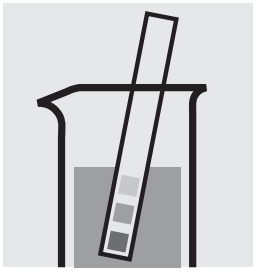
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

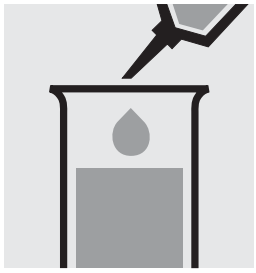
To check the measurement system (test reagents, measurement device, and handling) ready-for-use aluminium standard solution, Cat.No. 250460, concentration 1000 mg/l Al can be used after diluting accordingly.

14825 · Aluminium

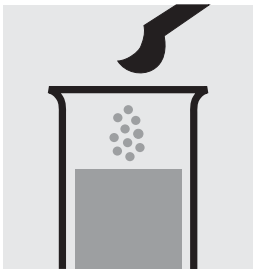
Measuring	0.10 – 1.20	mg/l Al	10-mm cell
range:	0.05 – 0.60	mg/l Al	20-mm cell
	0.020 – 0.200	mg/l Al	50-mm cell
	Expression of results also possible in mmol/l.		



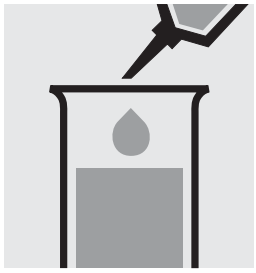
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



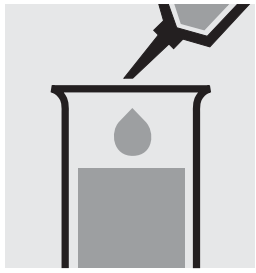
Pipette 5.0 ml of the sample into a test tube.



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

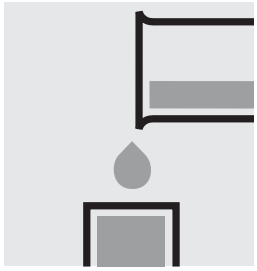


Add 1.2 ml of **Al-2** with pipette and mix.

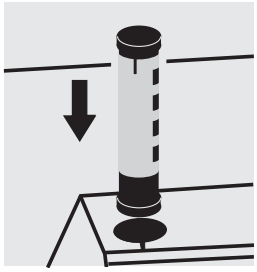


Add 0.25 ml of **Al-3** with pipette and mix.

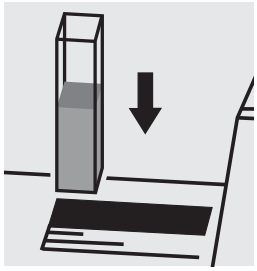
Reaction time:
2 minutes



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 can be used.

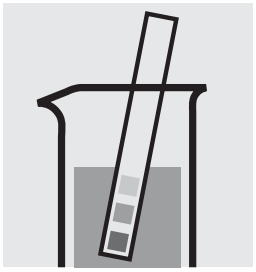
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 40, Cat.No. 250485.

Ready-for-use aluminium standard solution, Cat.No. 250460, concentration 1000 mg/l Al, can also be used after diluting accordingly.

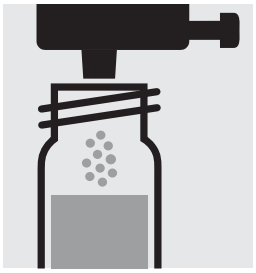
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 40) is highly recommended.

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

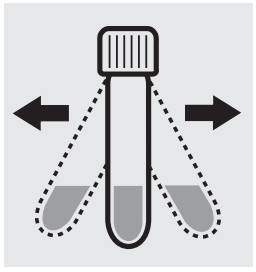


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

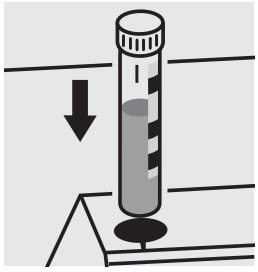


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

Important:

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

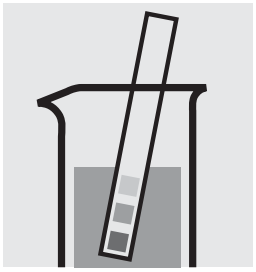
Quality assurance:

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

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

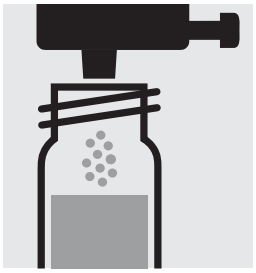
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 10) is highly recommended.

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

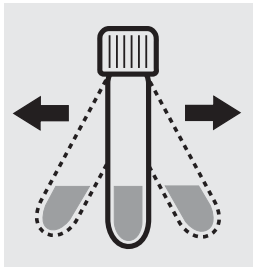


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

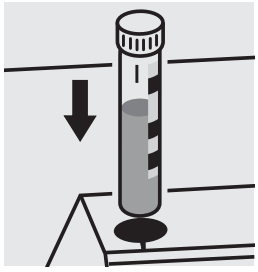


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

Important:

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

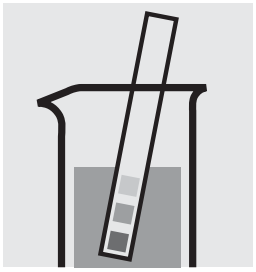
Quality assurance:

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

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

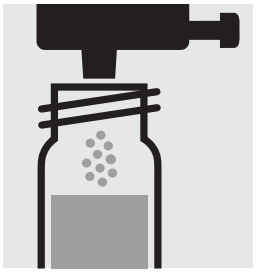
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 50) is highly recommended.

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

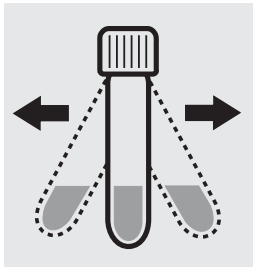


Check the pH of the sample, specified range: pH 4 – 13
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

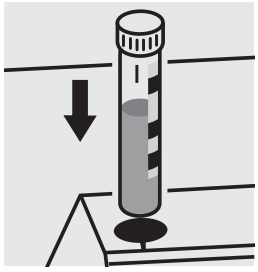


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

Important:

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

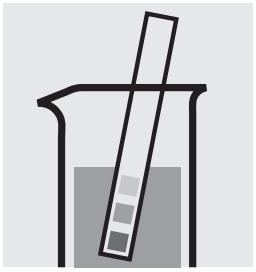
Quality assurance:

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

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

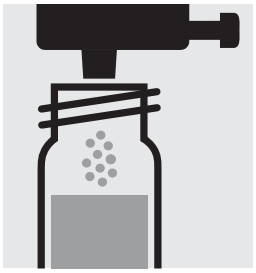
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 10) is highly recommended.

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

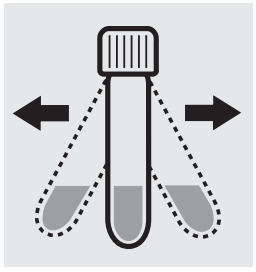


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

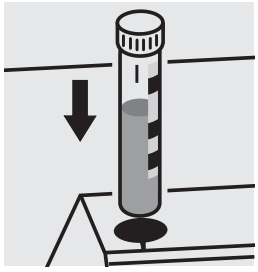


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

Important:

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

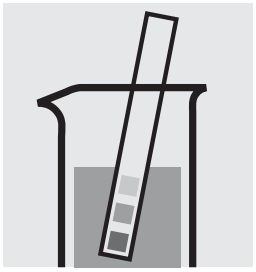
Quality assurance:

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

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

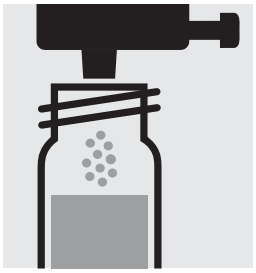
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 20) is highly recommended.

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

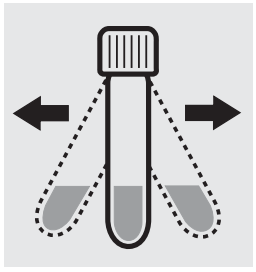


Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

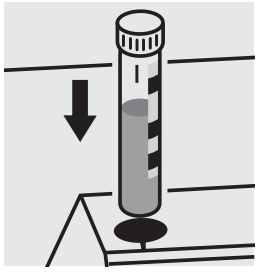


Add 1 dose of **NH_4-1K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



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

Important:

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

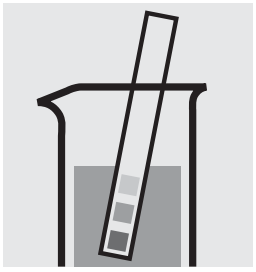
Quality assurance:

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

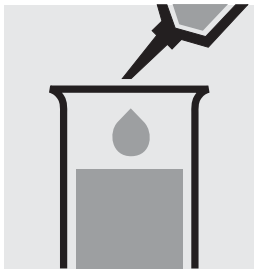
Ready-for-use ammonium standard solution, Cat.No. 250461, concentration 1000 mg/l NH_4^+, can also be used after diluting accordingly.

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

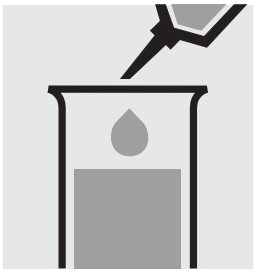
Measuring range:	0.05 – 3.00 mg/l NH_4-N	0.06 – 3.86 mg/l NH_4	10-mm cell
	0.05 – 3.00 mg/l NH_3-N	0.06 – 3.65 mg/l NH_3	10-mm cell
	0.03 – 1.50 mg/l NH_4-N	0.04 – 1.93 mg/l NH_4	20-mm cell
	0.03 – 1.50 mg/l NH_3-N	0.04 – 1.82 mg/l NH_3	20-mm cell
	0.010 – 0.500 mg/l NH_4-N	0.013 – 0.644 mg/l NH_4	50-mm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



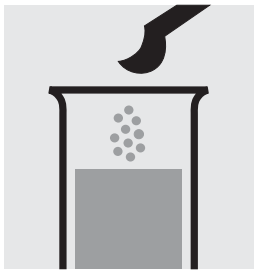
Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



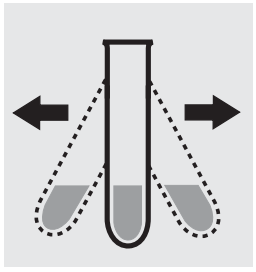
Pipette 5.0 ml of the sample into a test tube.



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

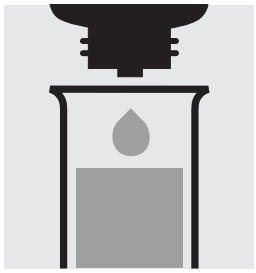


Add 1 level blue microspoon of **NH_4-2.**



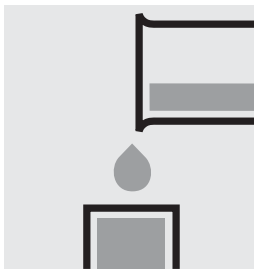
Shake vigorously to dissolve the solid substance.

Reaction time:
5 minutes

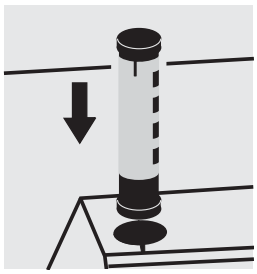


Add 4 drops of **NH_4-3** and mix.

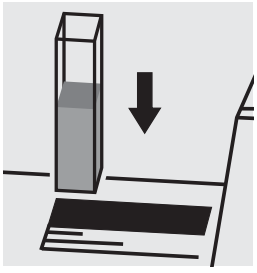
Reaction time:
5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

Very high ammonium concentrations in the sample produce turquoise-coloured 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 can be used.

Quality assurance:

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

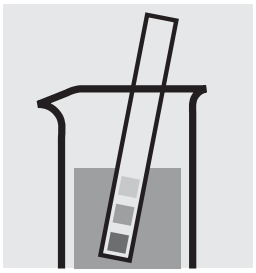
Ready-for-use ammonium standard solution, Cat.No. 250461, concentration 1000 mg/l NH_4^+, can also be used after diluting accordingly.

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

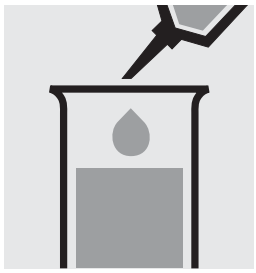
00683 · Ammonium

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

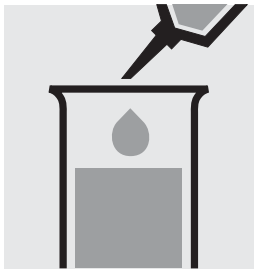
Measuring range: 2.0 – 75.0 mg/l NH_4-N



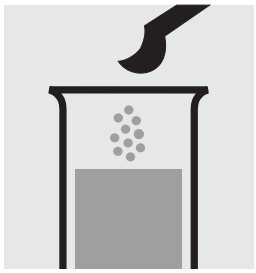
Check the pH of the sample, specified range: pH 4 – 13.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



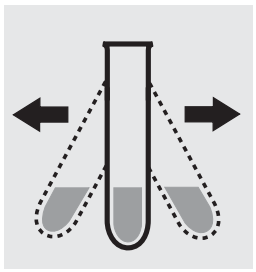
Pipette 5.0 ml of **NH_4-1** into a test tube.



Add 0.20 ml of the sample with pipette.

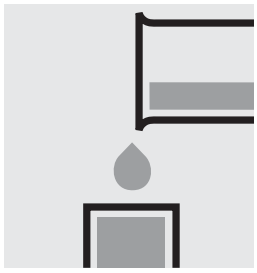


Add 1 level blue micro-spoon of **NH_4-2.**

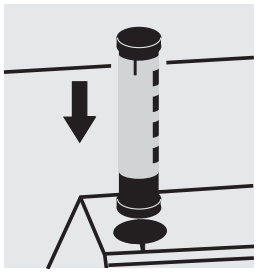


Shake vigorously to dissolve the solid substance.

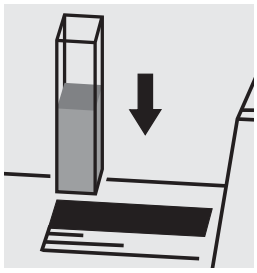
Reaction time:
15 minutes



Transfer the solution into a cell.

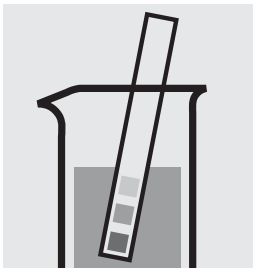


Select method with AutoSelector measuring range 2.0 – 75.0 mg/l NH_4-N.

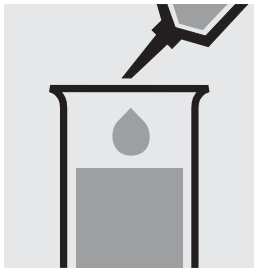


Place the cell into the cell compartment.

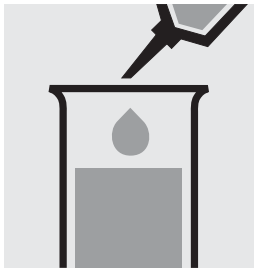
Measuring range: 5 – 150 mg/l NH_4-N



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



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



Add 0.10 ml of the sample with pipette.

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

Important:

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

Quality assurance:

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

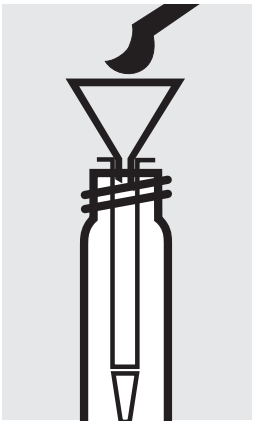
Ready-for-use ammonium standard solution, Cat.No. 250461, concentration 1000 mg/l NH_4^+, can also be used after diluting accordingly.

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

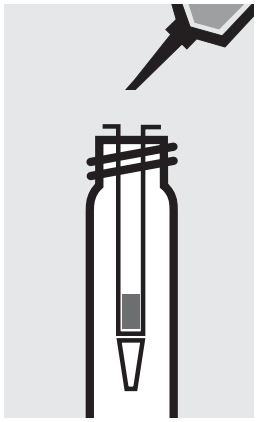
Adsorbable organic halogens (x)

Measuring range: 0.05 – 2.50 mg/l AOX

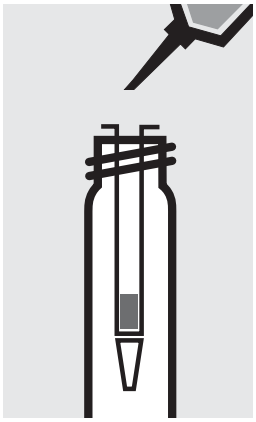
Preparation of the adsorption column:



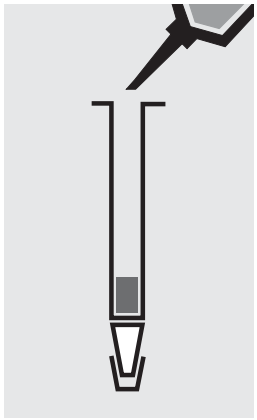
Place the column in an empty cell (Empty cells, Cat.No. 250621). Fill 1 level blue microspoon of **AOX-1** into the column using the glass funnel.



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



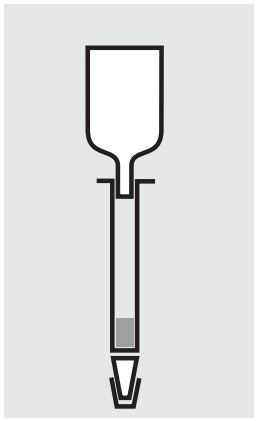
Run 3 separate 1-ml portions of **AOX-3** through the column. Discard the wash solution.



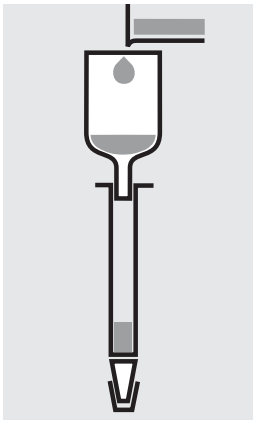
Close the bottom end of the column with the stopper. Apply to the column 1 ml of **AOX-3.** Close the top end of the column with the stopper and swirl to eliminate air bubbles. Remove the stopper on the top end and fill the column to the brim with **AOX-3.**

Sample enrichment:

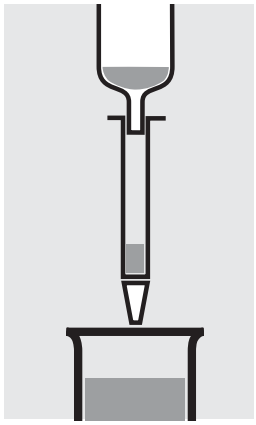
Check the pH of the sample, specified range: pH 6 – 7.
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



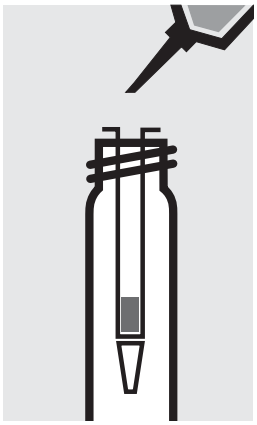
Attach the glass reservoir to the prepared column (closed at the bottom end).



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



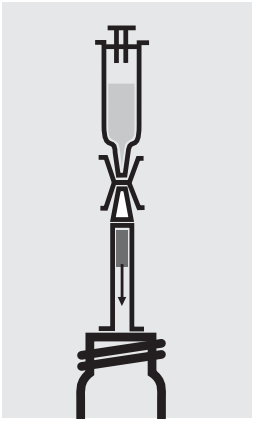
Remove the stopper from the column outlet and run the sample through completely.



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

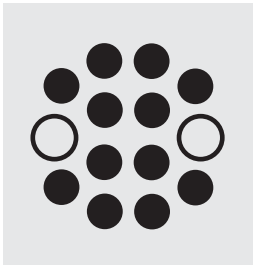
Adsorbable organic halogens (x)

Digestion:

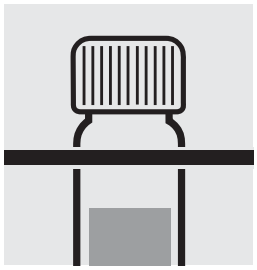


Fill the 10-ml syringe with 10 ml of reagent **AOX-5** and attach the syringe with the column outlet using the connector. Place the top end of the column on an empty cell (Empty cells, Cat.No. 250621) and rinse the charcoal filling of the column into an empty 16-mm cell.

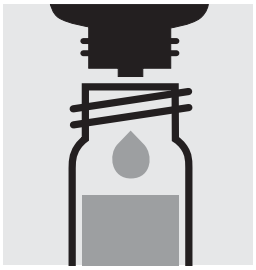
Add 2 level green microspoons of **AOX-6,** close the cell with the screw cap, and mix.



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



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



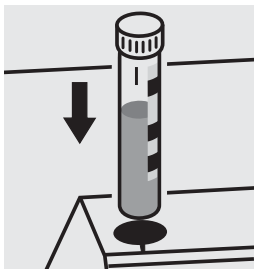
Add 5 drops of **AOX-4,** close the cell and mix; clear supernatant: **pretreated sample.**

Determination:

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

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

Reaction time: 15 minutes



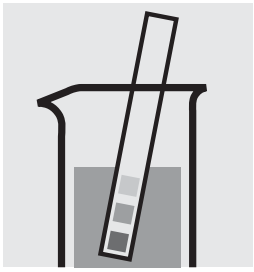
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) AOX Standard, Cat. No. 250026, concentration 0.2 – 2.0 mg/l AOX, can be used.

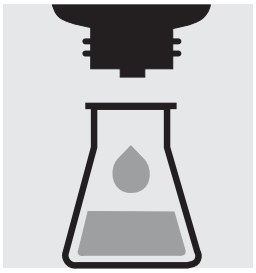
01747 · Arsenic

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

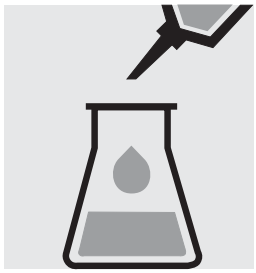


Check the pH of the sample, specified range: pH 0 – 13.

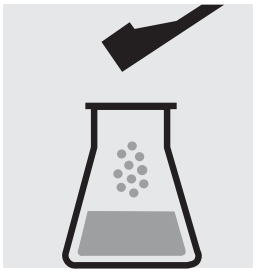
Place 350 ml of the sample into an Erlenmeyer flask with ground joint.



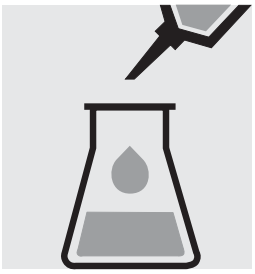
Add 5 drops of **As-1** and mix.



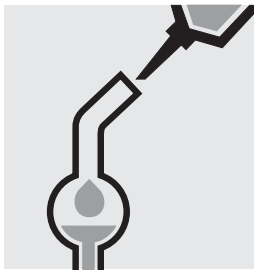
Add 20 ml of **As-2** with pipette and mix.



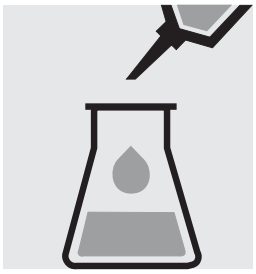
Add 1 level green dosing spoon of **As-3** and dissolve.



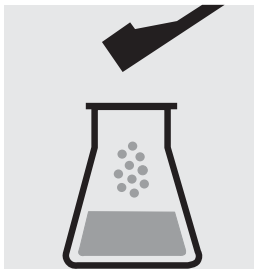
Add 1.0 ml of **As-4** with pipette and mix.



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

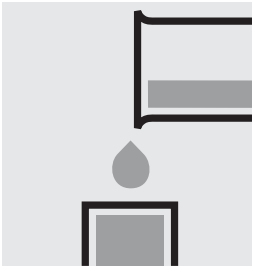


Add 1.0 ml of **As-6** with pipette to the solution in the Erlenmeyer flask and mix.

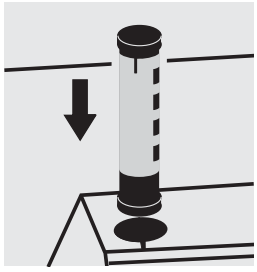


Add 3 level red dosing spoons of **As-7. Immediately** attach the absorption tube to the Erlenmeyer flask.

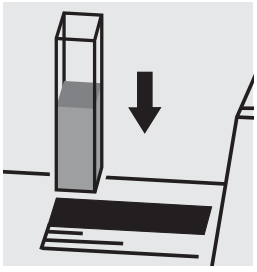
Leave to stand for 2 hours. During this time carefully swirl the flask several times or stir slowly with a magnetic stirrer.



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



Select method with AutoSelector.



Place the cell into the cell compartment.

Quality assurance:

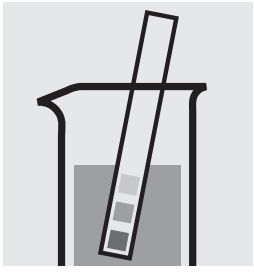
To check the measurement system (test reagents, measurement device, and handling) ready-for-use arsenic standard solution, concentration 1000 mg/l As, can be used after diluting accordingly.

00687 · BOD

Biochemical oxygen demand

Measuring range:	0.5 – 3000 mg/l BOD
	0.5 – 3000 mg/l O_2
	Expression of results also possible in mmol/l.

Preparation and incubation:



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

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

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

Measurement of inital oxygen concentration

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

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

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

Determination:

Measurement of final oxygen concentration

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

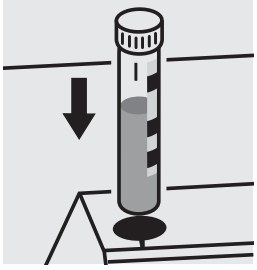
After incubation, use one bottle of **pretreated sample** and one of **inoculated nutrient-salt solution** for the measurement of the final oxygen concentration.

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

Reaction time:
1 minute

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

Fill the solution into a round cell.



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

Calculation:

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

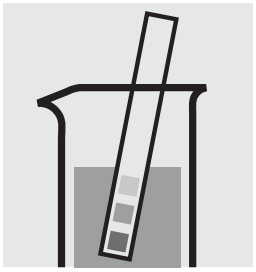
BOD of blank:
Result 1 – Result 2 (blank) = B in mg/l

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

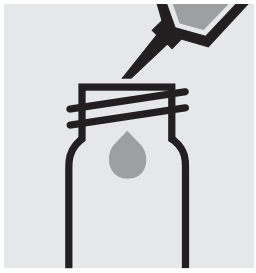
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) BOD Standard (acc. to EN 1899), Cat.No. 252030, can be used.

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

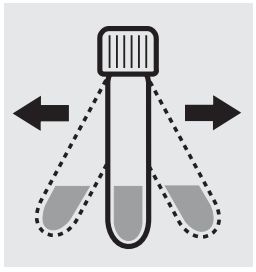


Check the pH of the sample, specified range: pH 2 – 12.
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



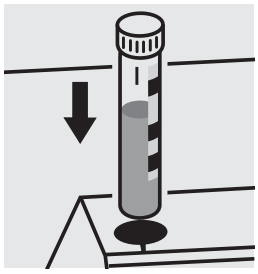
Pipette 1.0 ml of **B-1K** into a reaction cell, close with the screw cap, and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 60 minutes

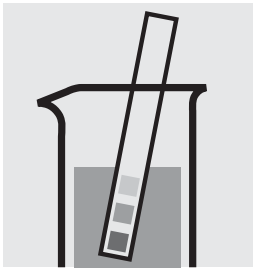


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use boron standard solution, Cat.No. 250463, concentration 1000 mg/l B can also be used after diluting accordingly.

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

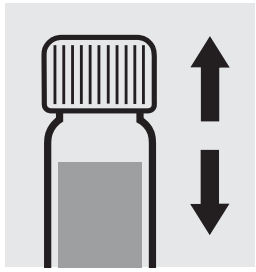


Check the pH of the sample, specified range: pH 1–13.

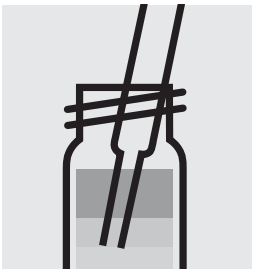
Pipette 5.0 ml of the sample into a test tube with screw cap. **(Important: Do not use test tubes made of glass containing boron!)**

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

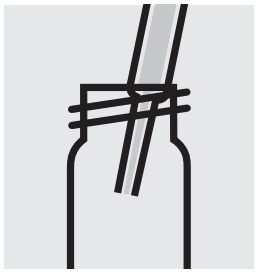
Add 1.5 ml of **B-2** with pipette and close with the screw cap.



Shake the tube vigorously for 1 minute.

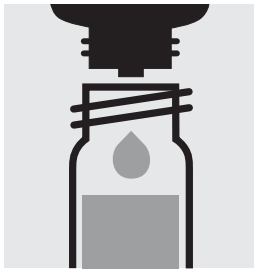


Aspirate 0.5 ml of the clear lower phase from the tube with pipette.

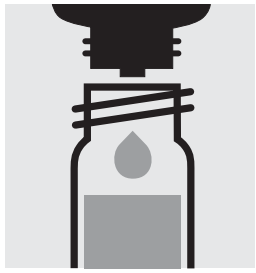


Transfer the extract to a separate fresh tube.

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



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

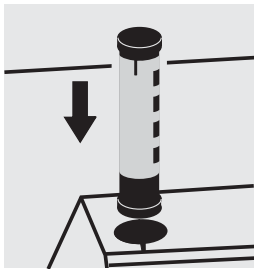


Add 15 drops of **B-5,** close with the screw cap, and mix.

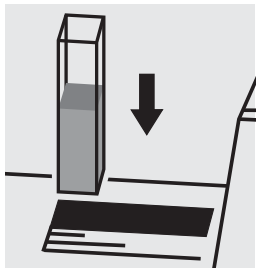
Reaction time: 12 minutes

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

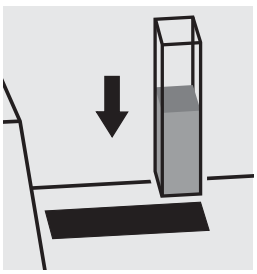
Reaction time: 2 minutes



Transfer the solution into a cell.



Select method with AutoSelector.

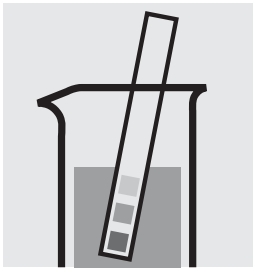


Place the cell into the cell compartment.

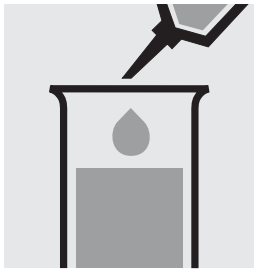
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use boron standard solution, Cat.No. 250463, concentration 1000 mg/l B, can also be used after diluting accordingly.

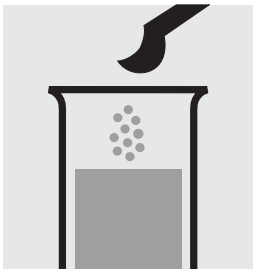
Measuring	0.10 – 10.00	mg/l Br_2	10-mm cell
range:	0.05 – 5.00	mg/l Br_2	20-mm cell
	0.020 – 2.000	mg/l Br_2	50-mm cell



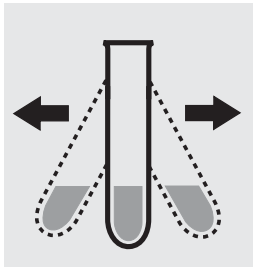
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.

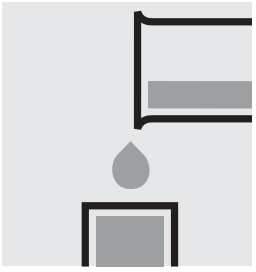


Add 1 level blue micro-spoon of **Br_2-1.**

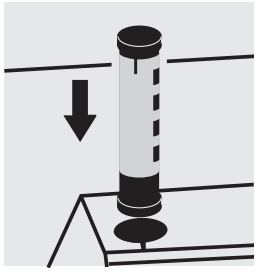


Shake vigorously to dissolve the solid substance.

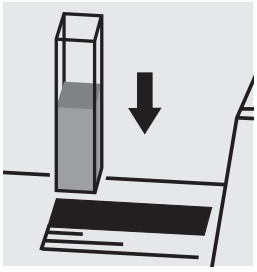
Reaction time:
3 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

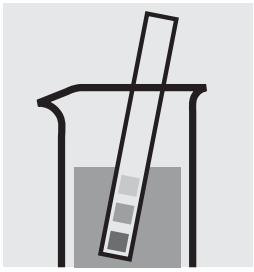
Very high bromine concentrations in the sample produce yellow-coloured solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

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”).

14834 · Cadmium

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

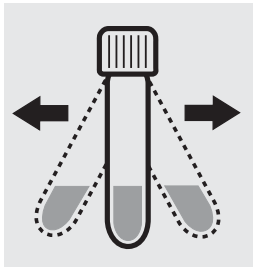


Check the pH of the sample, specified range: pH 3 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

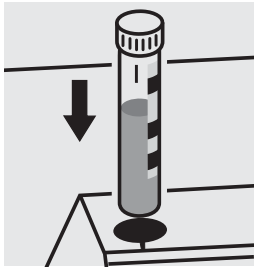
Add 0.20 ml of **Cd-1K** with pipette, close the cell with the screw cap, and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes



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

Important:

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

Result can be expressed as sum of cadmium (Σ Cd).

Quality assurance:

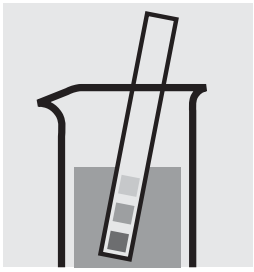
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 30, Cat.No. 250484.

Ready-for-use cadmium standard solution, Cat.No. 250464, concentration 1000 mg/l Cd, can also be used after diluting accordingly.

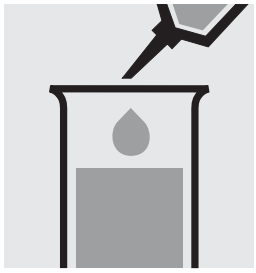
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 30) is highly recommended.

01745 · Cadmium

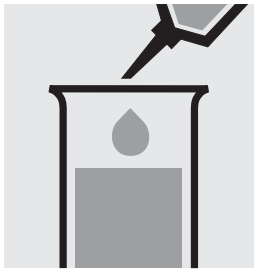
Measuring	0.010 – 0.500 mg/l	Cd	10-mm cell
range:	0.005 – 0.250 mg/l	Cd	20-mm cell
	0.0020 – 0.1000 mg/l	Cd	50-mm cell
	Expression of results also possible in mmol/l.		



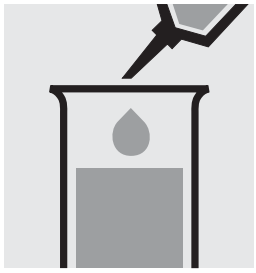
Check the pH of the sample, specified range: pH 3 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



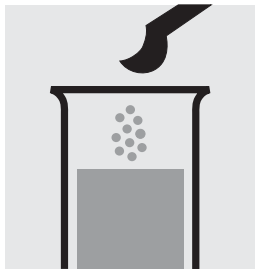
Pipette 1.0 ml of **Cd-1** into a test tube.



Add 10 ml of the sample with pipette and mix.

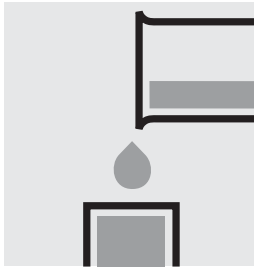


Add 0.20 ml of **Cd-2** with pipette and mix.

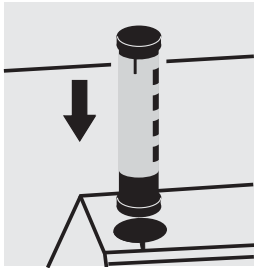


Add 1 level green microspoon of **Cd-3** and dissolve the solid substance.

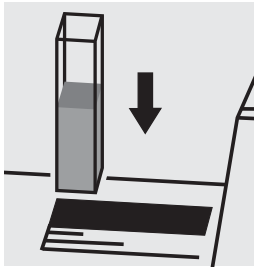
Reaction time:
2 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

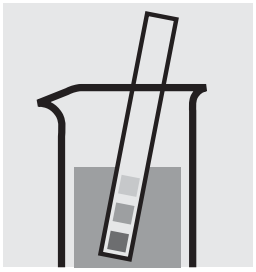
Result can be expressed as sum of cadmium (Σ Cd).

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use cadmium standard solution, Cat.No. 250464, concentration 1000 mg/l Cd, can be used after diluting accordingly.

00858 · Calcium

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

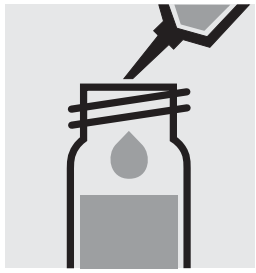


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

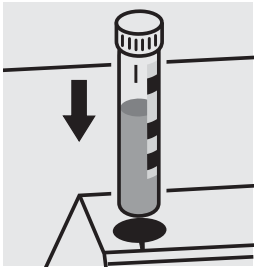
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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

Reaction time: **exactly** 3 minutes



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

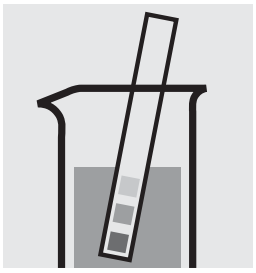


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

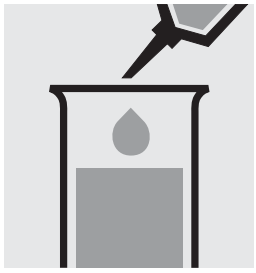
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use calcium standard solution, Cat.No. 250465, concentration 1000 mg/l Ca, can be used after diluting accordingly.

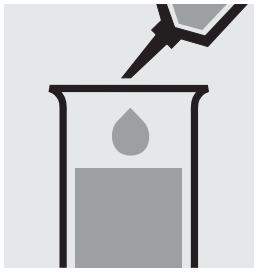
Measuring	10	– 160	mg/l Ca	14	– 224	mg/l CaO	25	– 400	mg/l $CaCO_3$	10-mm cell
range:	5	– 80	mg/l Ca	7	– 112	mg/l CaO	12	– 200	mg/l $CaCO_3$	20-mm cell
	1.0	– 15.0	mg/l Ca	1.4	– 21.0	mg/l CaO	2.5	– 37.5	mg/l $CaCO_3$	10-mm cell (see “sensitive” preparation procedure)
	Expression of results also possible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



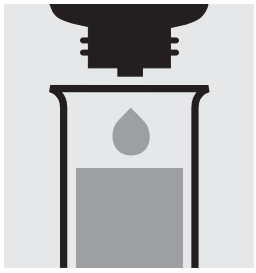
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



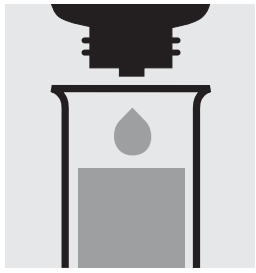
Pipette 0.10 ml of the sample into a test tube.



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

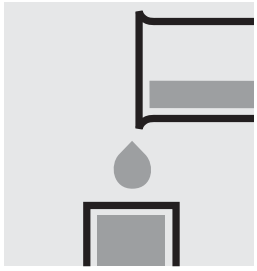


Add 4 drops of **Ca-2** and mix.

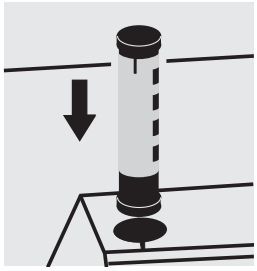


Add 4 drops of **Ca-3** and mix.

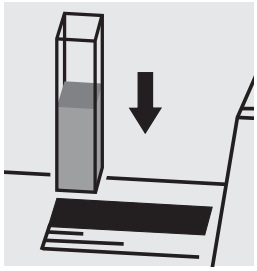
Reaction time:
8 minutes, **measure immediately.**



Transfer the solution into a corresponding cell



Select method with AutoSelector.



Place the cell into the cell compartment.

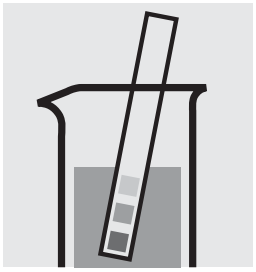
Calcium sensitive

Use the same preparation procedure as above, but add 0.50 ml of sample instead of 0.10 ml. For measurement transfer the solution into a 10-mm cell and select method **Ca sens.** in the menu (method no. 125).

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use calcium standard solution, Cat.No. 250465, concentration 1000 mg/l Ca, can be used after diluting accordingly.

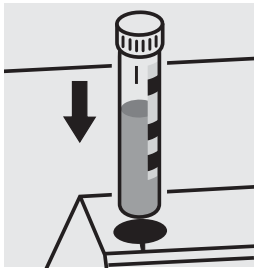
Measuring range:	5 – 125 mg/l Cl Expression of results also possible in mmol/l.



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

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

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



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

Quality assurance:

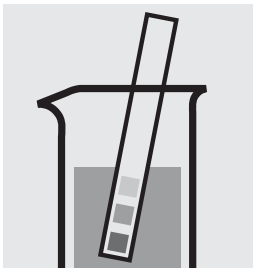
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10 and 20, Cat.Nos. 250482 and 250483.

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

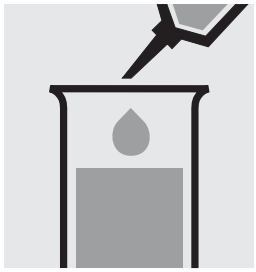
To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck) is highly recommended.

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

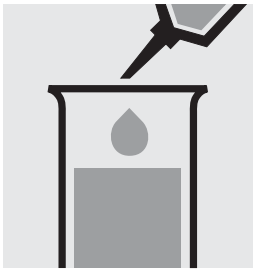
Measuring range: 10 – 250 mg/l Cl



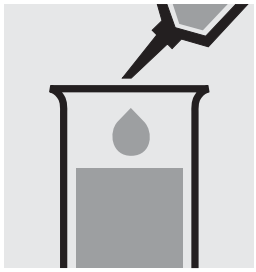
Check the pH of the sample, specified range: pH 1 – 12.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



Pipette 1.0 ml of the sample into a test tube.

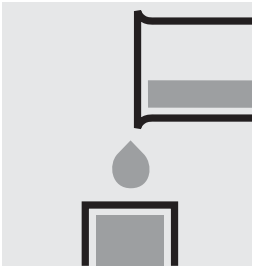


Add 2.5 ml of **CI-1** with pipette and mix.

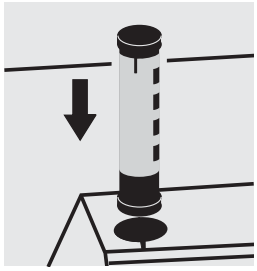


Add 0.50 ml of **CI-2** with pipette and mix.

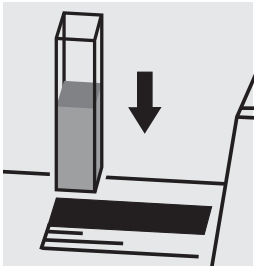
Reaction time: 1 minute



Transfer the solution into a cell.

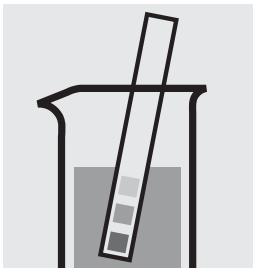


Select method with AutoSelector measuring range 10 – 250 mg/l Cl.

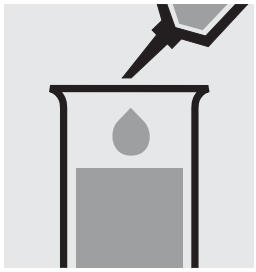


Place the cell into the cell compartment.

Measuring range: 2.5 – 25.0 mg/l Cl



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



Pipette 5.0 ml of the sample into a test tube.

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

Quality assurance:

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

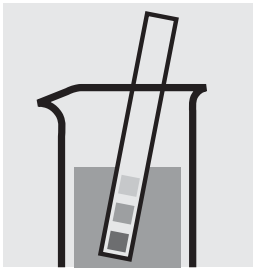
Ready-for-use chloride standard solution, Cat.No. 250466, concentration 1000 mg/l Cl^-, can also be used after diluting accordingly.

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

00595 · Chlorine

Determination of free chlorine

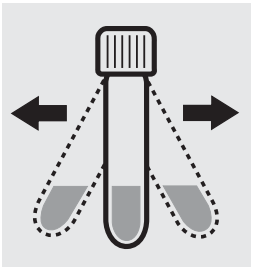
Measuring range:	0.03 – 6.00 mg/l Cl_2 Expression of results also possible in mmol/l.



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

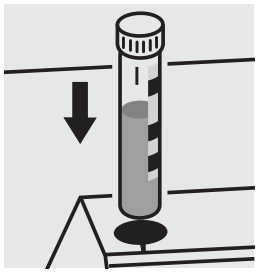
Pipette 5.0 ml of the sample into a round cell.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 1 minute



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

Important:

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

Quality assurance:

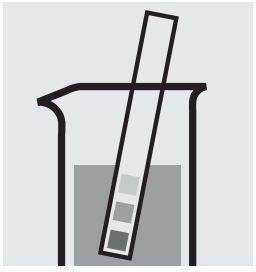
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

00597 · Chlorine

Determination of free chlorine and total chlorine

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

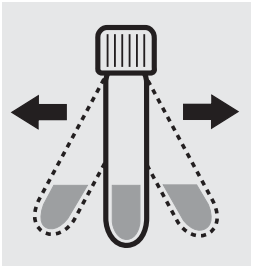
Determination of free chlorine



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

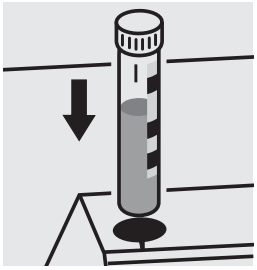
Pipette 5.0 ml of the sample into a round cell.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 3 minute



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

Determination of total chlorine

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

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

Important:

Very high chlorine concentrations in the sample produce yellow-coloured 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.

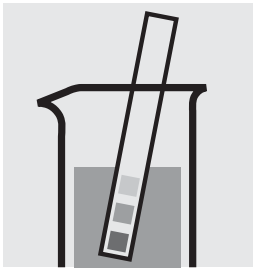
Quality assurance:

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

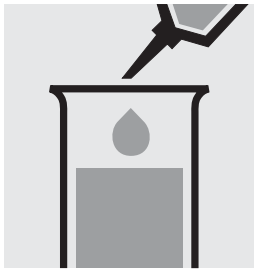
00598 · Chlorine

Determination of free chlorine

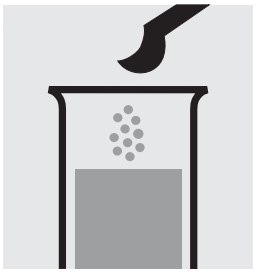
Measuring	0.05 – 6.00	mg/l Cl_2	10-mm cell
range:	0.02 – 3.00	mg/l Cl_2	20-mm cell
	0.010 – 1.000	mg/l Cl_2	50-mm cell



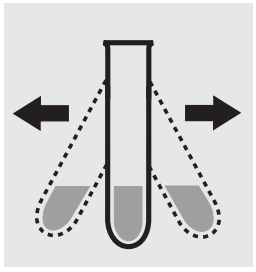
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.

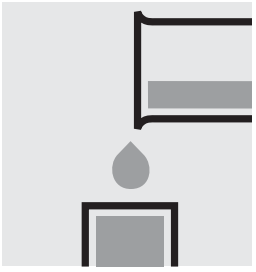


Add 1 level blue micro-spoon of **Cl_2-1.**

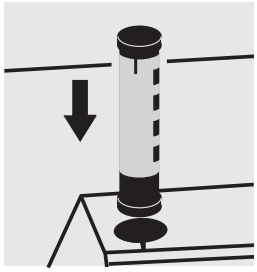


Shake vigorously to dissolve the solid substance.

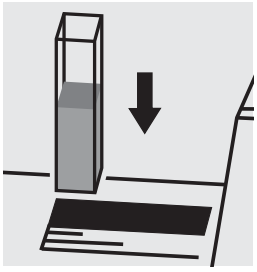
Reaction time:
3 minutes



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-coloured solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

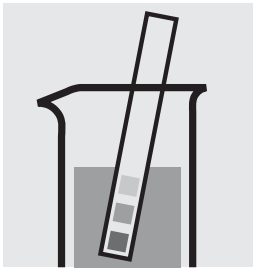
Quality assurance:

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

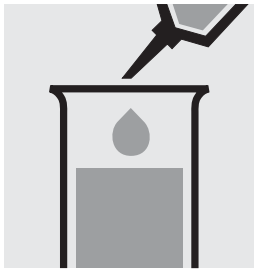
00602 · Chlorine

Determination of total chlorine

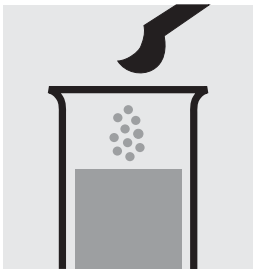
Measuring range:	0.05 – 6.00	mg/l Cl_2	10-mm cell
	0.02 – 3.00	mg/l Cl_2	20-mm cell
	0.010 – 1.000	mg/l Cl_2	50-mm cell



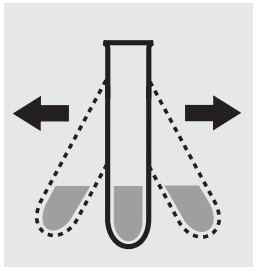
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



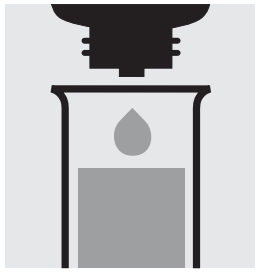
Pipette 10 ml of the sample into a test tube.



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

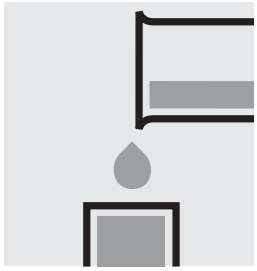


Shake vigorously to dissolve the solid substance.

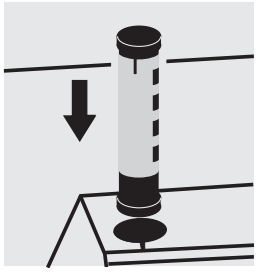


Add 2 drops of **Cl_2-2** and mix.

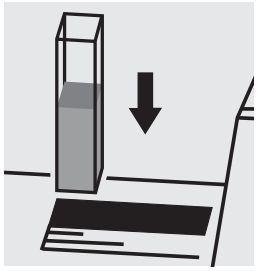
Reaction time:
3 minutes



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-coloured 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”).

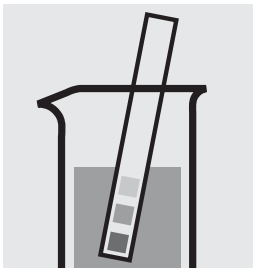
00599 · Chlorine

Determination of free chlorine and total chlorine

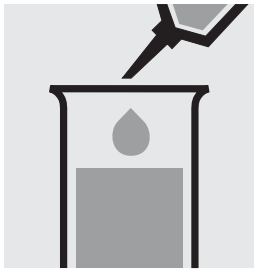
Measuring range:	0.05 – 6.00	mg/l Cl_2	10-mm cell
	0.02 – 3.00	mg/l Cl_2	20-mm cell
	0.010 – 1.000	mg/l Cl_2	50-mm cell

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

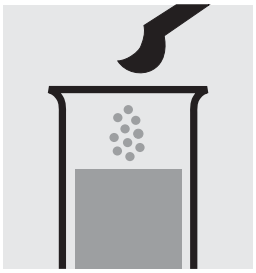
Determination of free chlorine



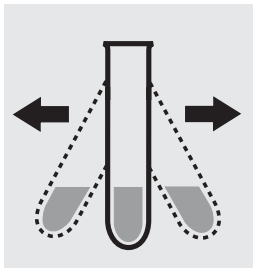
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.

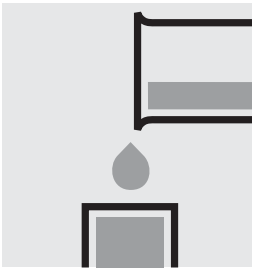


Add 1 level blue micro-spoon of **Cl_2-1.**

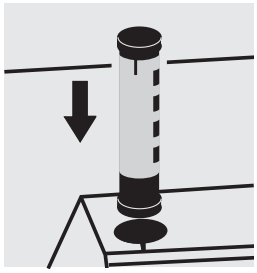


Shake vigorously to dissolve the solid substance.

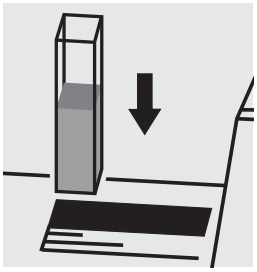
Reaction time: 3 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Determination of total chlorine

Same preparation as described above, add 2 drops of **Cl_2-2** and mix after dissolving solid.

A differentiation between free and combined chlorine [Cl_2(f) and Cl_2(b)] can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form. Then measure the free chlorine, press enter and measure the total chlorine. After pressing enter, the individual measuring values for free and combined chlorine are shown on the display.

Important:

Very high chlorine concentrations in the sample produce yellow-coloured 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:

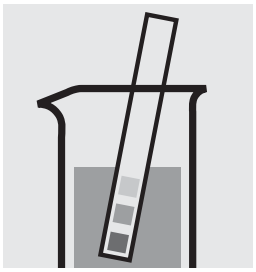
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

00086/00087/00088 · Chlorine (with liquid reagents)

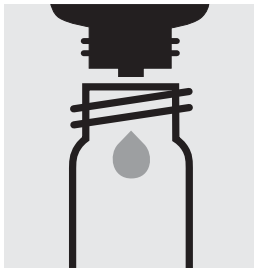
Determination of free chlorine and total chlorine

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

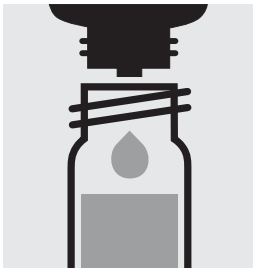
Determination of free chlorine



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



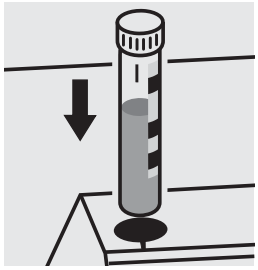
Place 6 drops of **Cl_2-1** into a round cell.



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

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

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



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

Determination of total chlorine

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

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

Important:

Very high chlorine concentrations in the sample produce yellow-coloured 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:

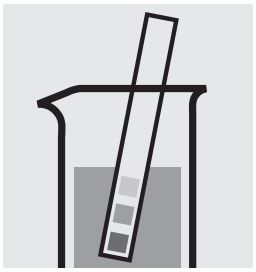
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

00086/00087/00088 · Chlorine (with liquid reagents)

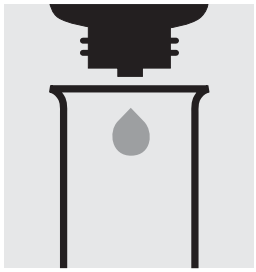
Determination of free chlorine and total chlorine

Measuring range:	0.10 – 1.00 mg/l Cl_2	50-mm cell
	Expression of results also possible in mmol/l	
	and also in free Cl_2 [Cl_2(f)], combined Cl_2	
	[Cl_2(b)], total Cl_2 [Cl_2(t)].	

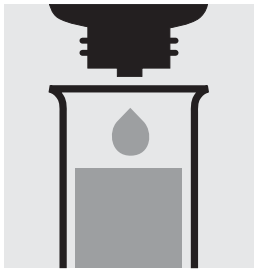
Determination of free chlorine



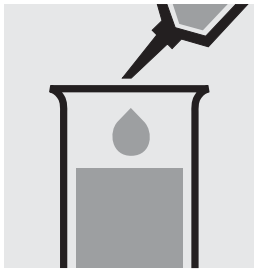
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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

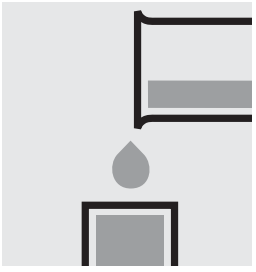


Add 3 drops of **Cl_2-2,** close with the screw cap, and mix.

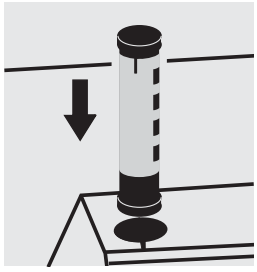


Add 10 ml of the sample with pipette, close with the screw cap, and mix.

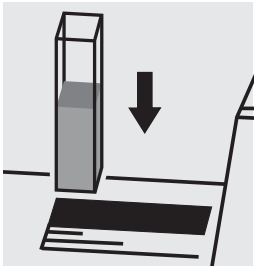
Reaction time:
3 minutes, **measure immediately.**



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Determination of total chlorine

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

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

Important:

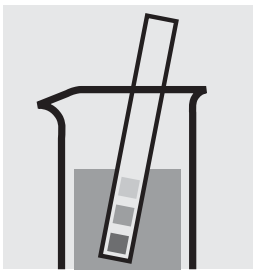
Very high chlorine concentrations in the sample produce yellow-coloured solutions (measurement solution should be red) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).
After each determination of total chlorine rinse the cell with sulfuric acid 25 % and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

Quality assurance:

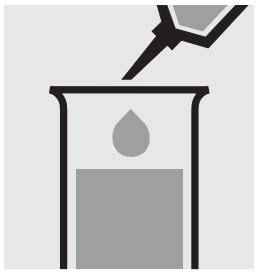
To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

00608 · Chlorine dioxide

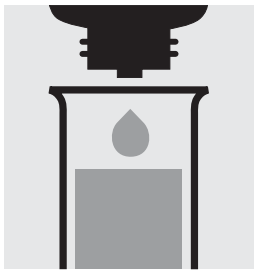
Measuring	0.10 – 10.00	mg/l ClO_2	10-mm cell
range:	0.05 – 5.00	mg/l ClO_2	20-mm cell
	0.020 – 2.000	mg/l ClO_2	50-mm cell
	Expression of results also possible in mmol/l.		



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

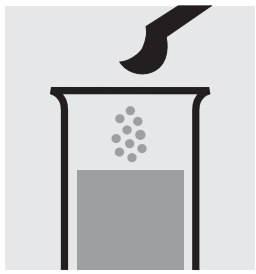


Pipette 10 ml of the sample into a test tube.

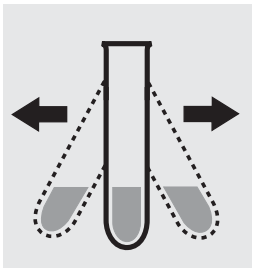


Add 2 drops of **ClO_2-1** and mix.

Reaction time:
2 minutes

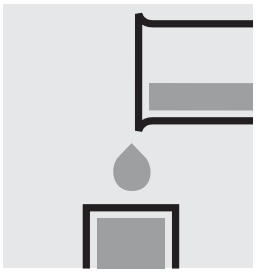


Add 1 level blue microspoon of **ClO_2-2.**

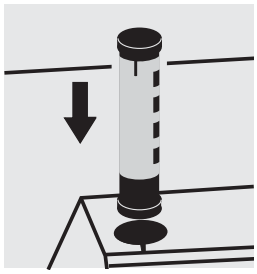


Shake vigorously to dissolve the solid substance.

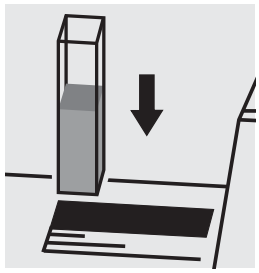
Reaction time:
3 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

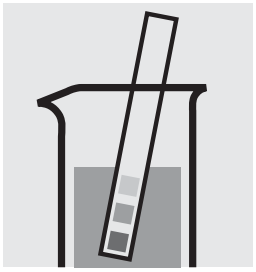
Quality assurance:

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

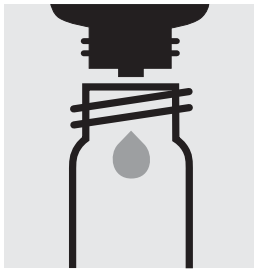
14552 · Chromate

Determination of chromium(VI)

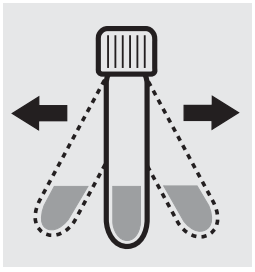
Measuring range:	0.05 – 2.00 mg/l Cr
	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l.



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



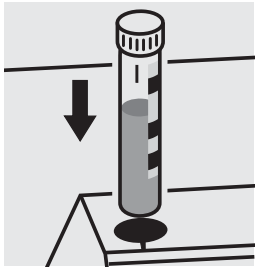
Add 6 drops of **Cr-3K** into a reaction cell, close with the screw cap.



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

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

Reaction time: 1 minute



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

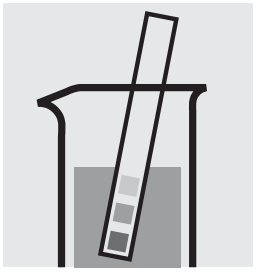
Quality assurance:

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

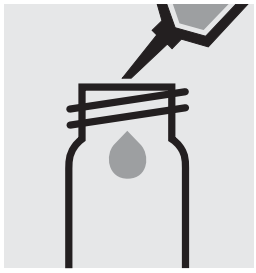
14552 · Chromate

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

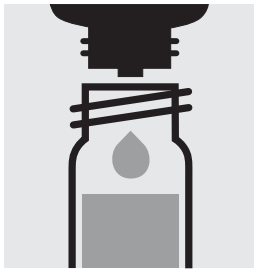
Measuring	0.05 – 2.00 mg/l Cr
range:	0.11 – 4.46 mg/l CrO_4
	Expression of results also possible in mmol/l
	and also in Cr total (Σ Cr), Cr(III), and Cr(VI).



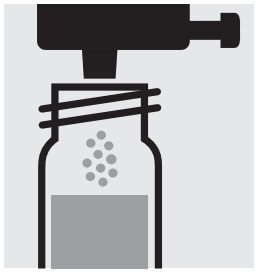
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



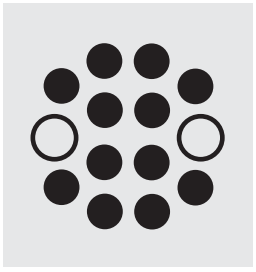
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).



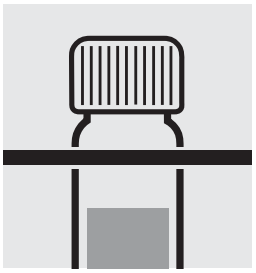
Add 1 drop of **Cr-1K,** close with the screw cap, and mix.



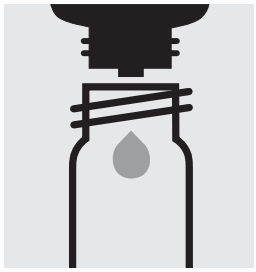
Add 1 dose of **Cr-2K** using the blue dose-metering cap, close the reaction cell with the screw cap.



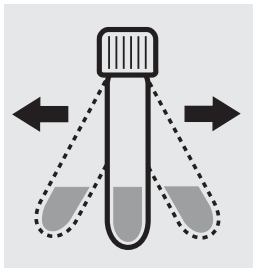
Heat the cell in the thermoreactor at 120 °C (100 °C) for 1 hour.



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



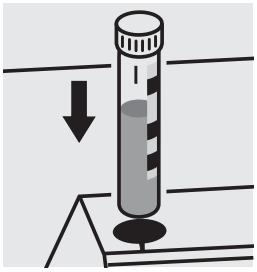
Add 6 drops of **Cr-3K** into a reaction cell, close the cell with the screw cap.



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

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

Reaction time:
1 minute



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

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

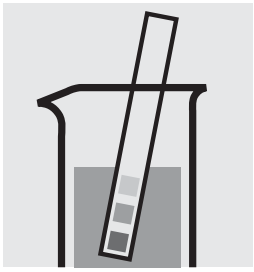
Quality assurance:

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

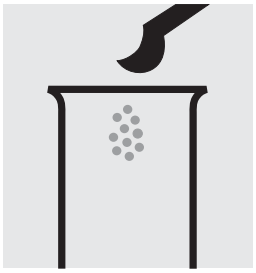
14758 · Chromate

Determination of chromium(VI)

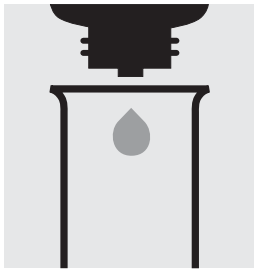
Measuring	0.05 – 3.00 mg/l Cr	0.11 – 6.69 mg/l CrO_4	10-mm cell
range:	0.03 – 1.50 mg/l Cr	0.07 – 3.35 mg/l CrO_4	20-mm cell
	0.010 – 0.600 mg/l Cr	0.02 – 1.34 mg/l CrO_4	50-mm cell
	Expression of results also possible in mmol/l.		



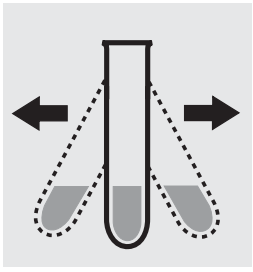
Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



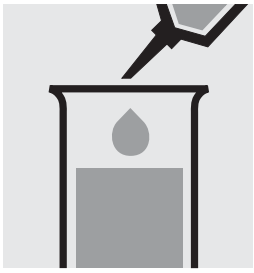
Place 1 level grey microspoon of **Cr-1** into a dry test tube.



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

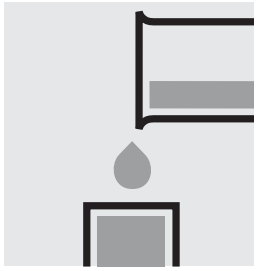


Shake the test tube vigorously to dissolve the solid substance.

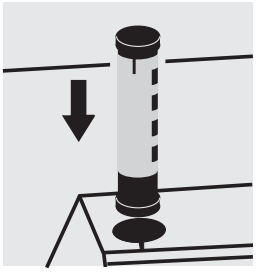


Add 5.0 ml of the sample with pipette and mix.

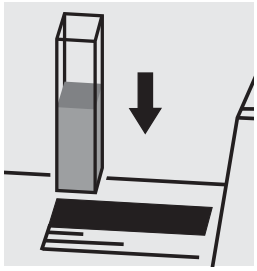
Reaction time:
1 minute



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. 252033, or Crack Set 10, Cat.No. 250496 and thermoreactor is necessary.

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

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

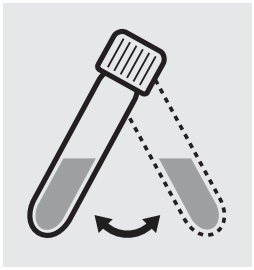
Quality assurance:

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

C3/25 · COD

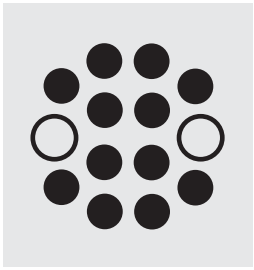
Chemical oxygen demand

Measuring range:	10 – 150 mg/l COD or O_2

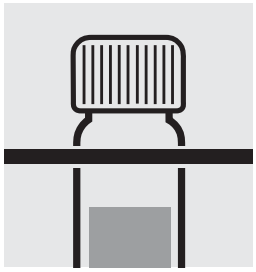


Suspend the bottom sediment in the cell by swirling.

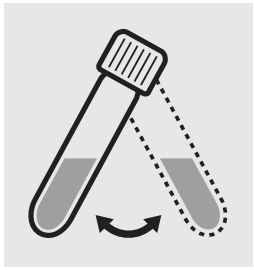
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



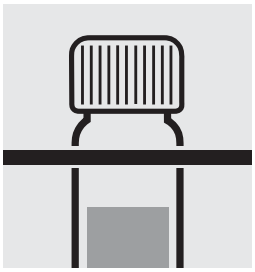
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



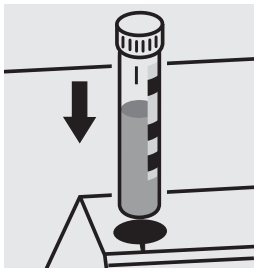
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

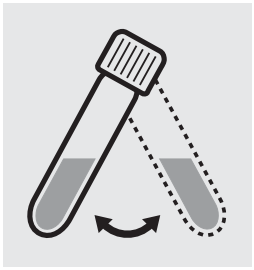
Quality assurance:

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

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

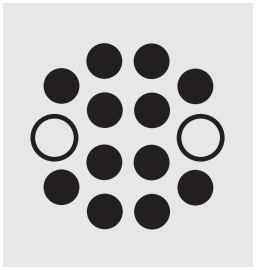
Chemical oxygen demand

Measuring range: 4.0 – 40.0 mg/l COD or O_2

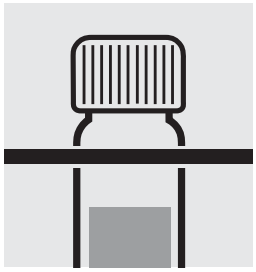


Suspend the bottom sediment in the cell by swirling.

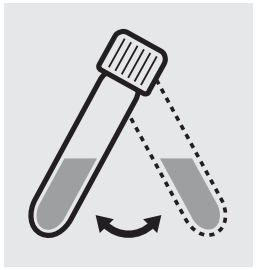
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



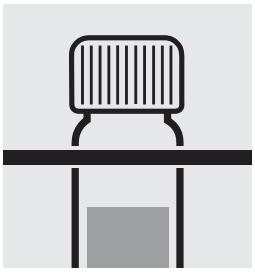
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



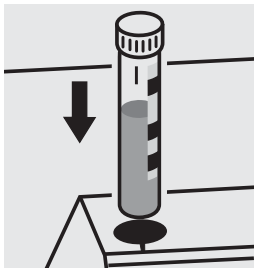
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

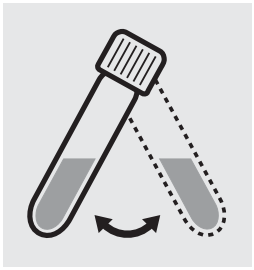
Quality assurance:

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

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

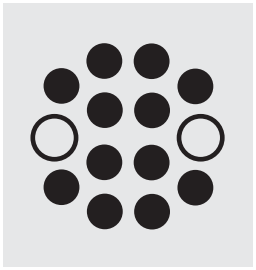
Chemical oxygen demand

Measuring range: 5.0 – 80.0 mg/l COD or O_2

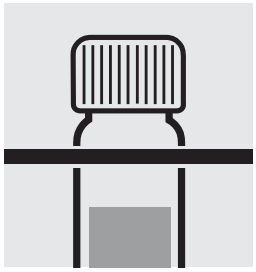


Suspend the bottom sediment in the cell by swirling.

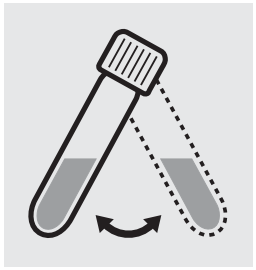
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



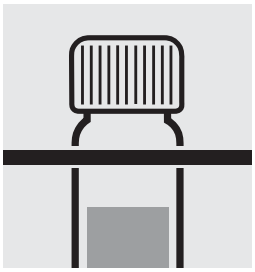
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



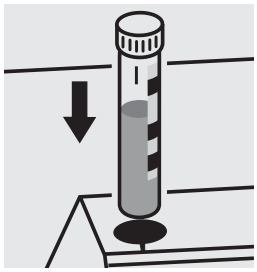
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

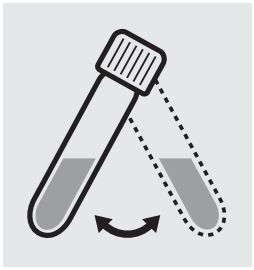
Quality assurance:

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

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

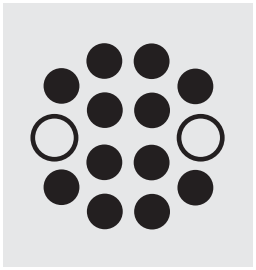
Chemical oxygen demand

Measuring range: 10 – 150 mg/l COD or O_2

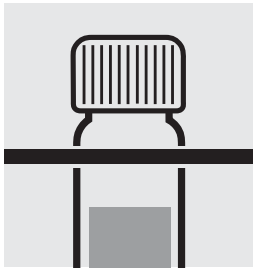


Suspend the bottom sediment in the cell by swirling.

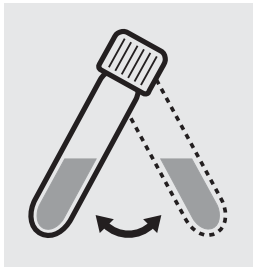
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



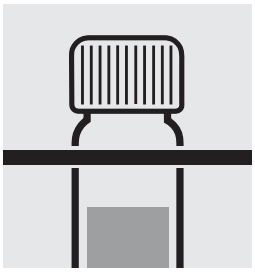
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



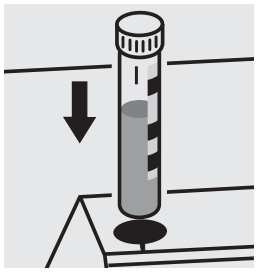
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

Quality assurance:

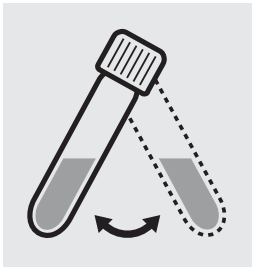
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat.No. 250482.

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

14895 · COD

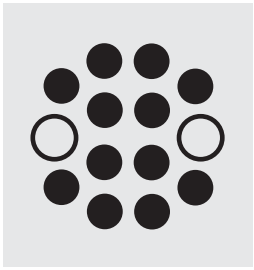
Chemical oxygen demand

Measuring range:	15 – 300 mg/l COD or O_2

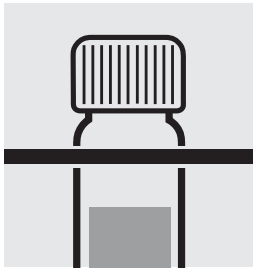


Suspend the bottom sediment in the cell by swirling.

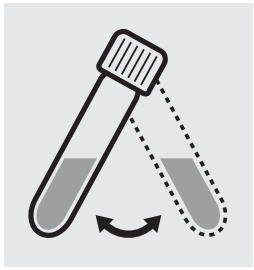
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



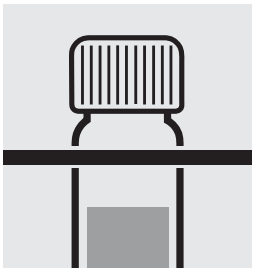
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



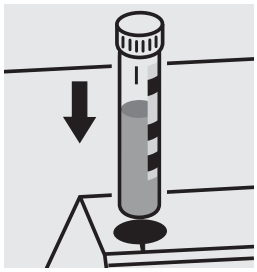
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

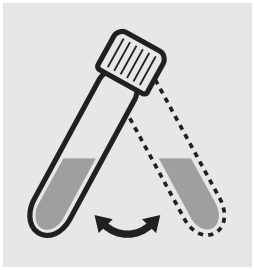
Quality assurance:

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

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

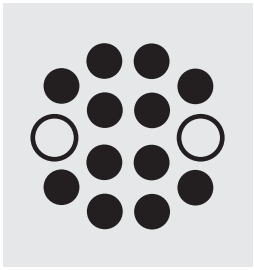
Chemical oxygen demand

Measuring range:	50 – 500 mg/l COD or O_2

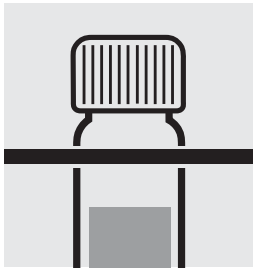


Suspend the bottom sediment in the cell by swirling.

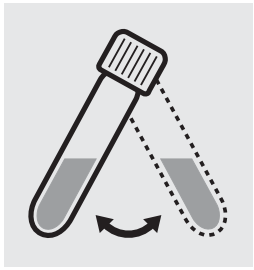
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



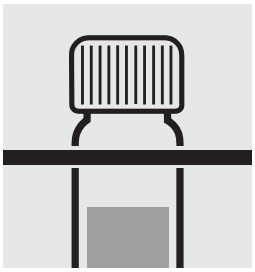
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



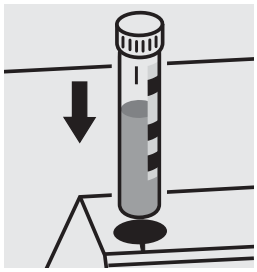
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

Quality assurance:

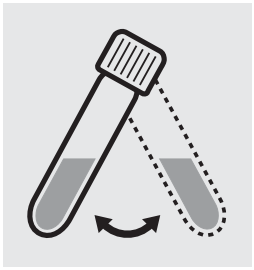
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 60, Cat.No. 250487.

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

C4/25 · COD

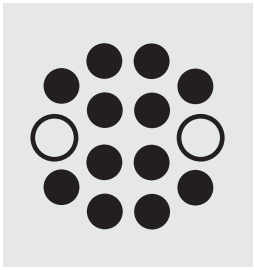
Chemical oxygen demand

Measuring range:	25 – 1500 mg/l COD or O_2

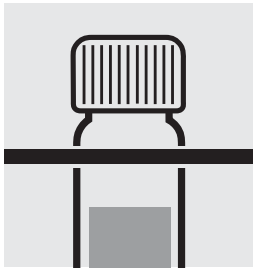


Suspend the bottom sediment in the cell by swirling.

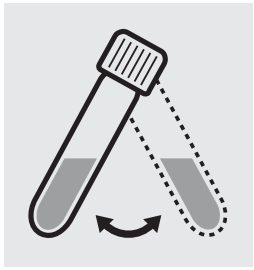
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



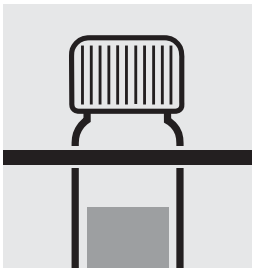
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



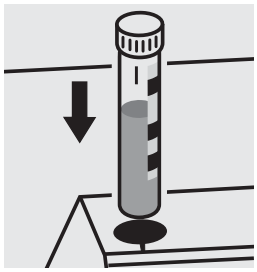
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

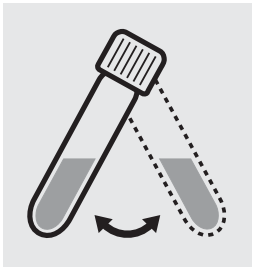
Quality assurance:

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

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

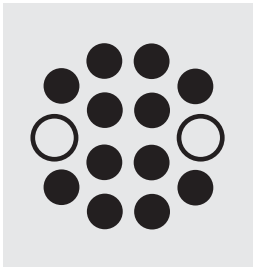
Chemical oxygen demand

Measuring range:	25 – 1500 mg/l COD or O_2

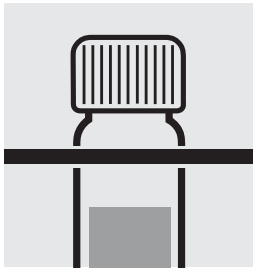


Suspend the bottom sediment in the cell by swirling.

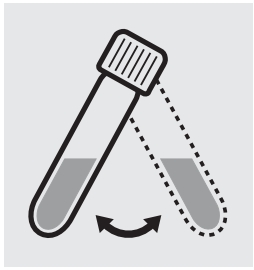
Carefully pipette 3.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



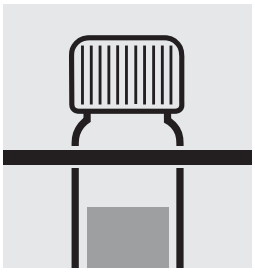
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



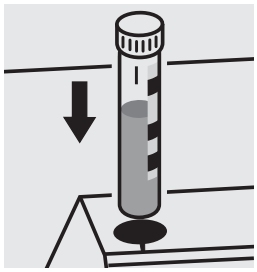
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

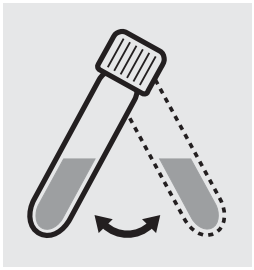
Quality assurance:

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

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

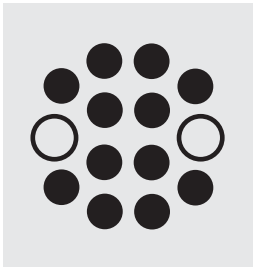
Chemical oxygen demand

Measuring range:	300 – 3500 mg/l COD or O_2

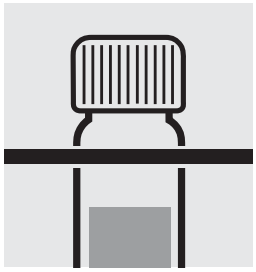


Suspend the bottom sediment in the cell by swirling.

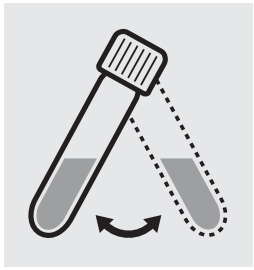
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



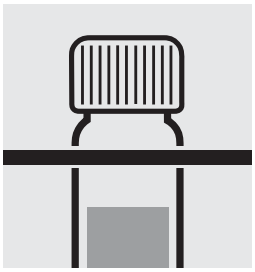
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



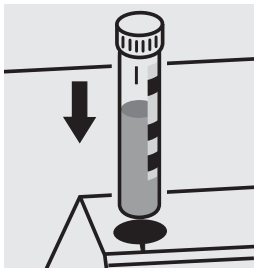
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

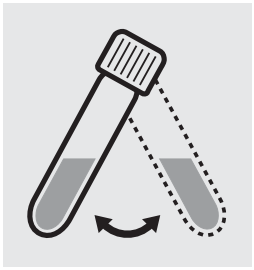
Quality assurance:

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

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

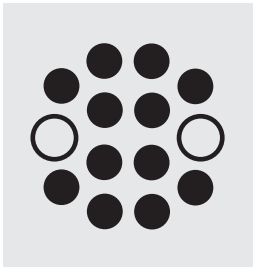
Chemical oxygen demand

Measuring range:	500 – 10 000 mg/l COD or O_2

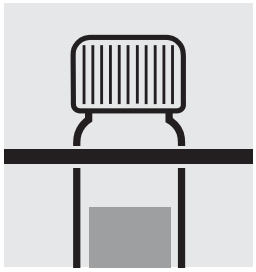


Suspend the bottom sediment in the cell by swirling.

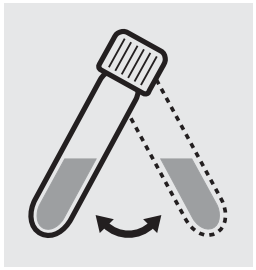
Carefully pipette 1.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



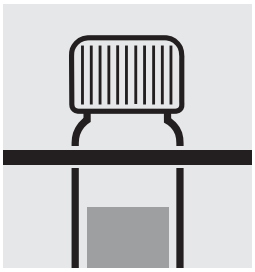
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



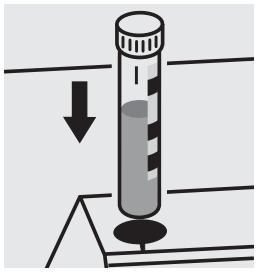
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

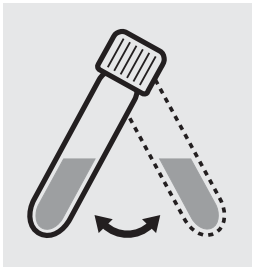
Quality assurance:

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

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

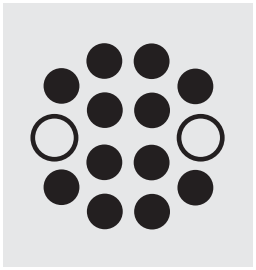
Chemical oxygen demand

Measuring range:	5000 – 90 000 mg/l COD or O_2

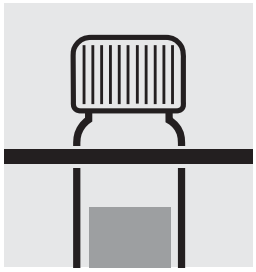


Suspend the bottom sediment in the cell by swirling.

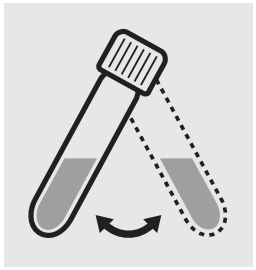
Carefully pipette 0.10 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



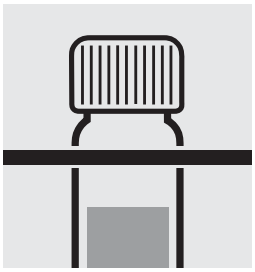
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



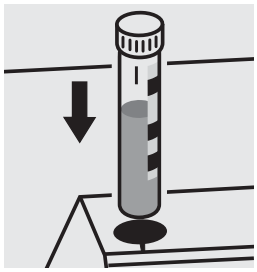
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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

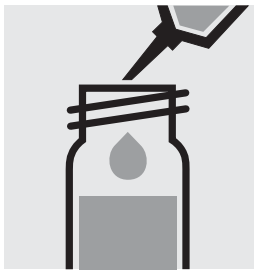


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

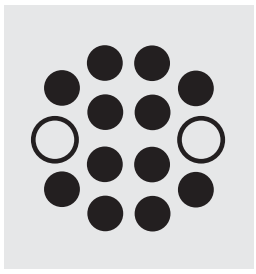
09772 · COD (Hg-free)

Chemical oxygen demand

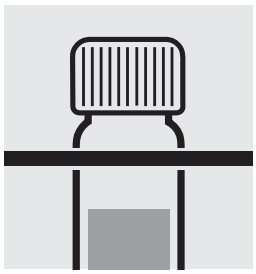
Measuring range:	10 – 150 mg/l COD or O_2



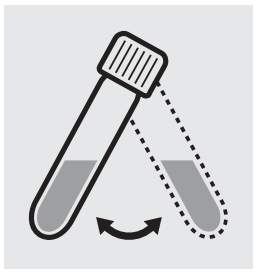
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



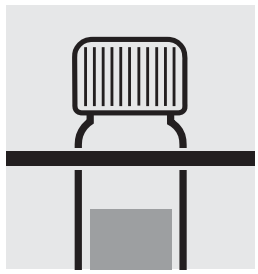
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



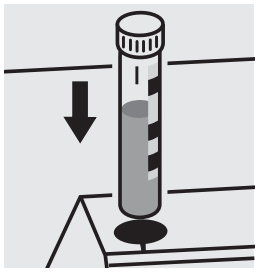
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

Quality assurance:

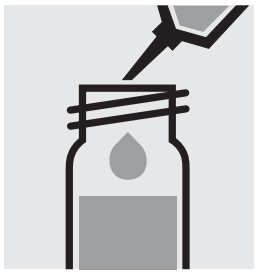
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat.No. 250482.

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

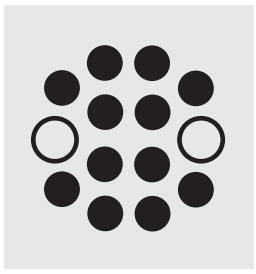
09773 · COD (Hg-free)

Chemical oxygen demand

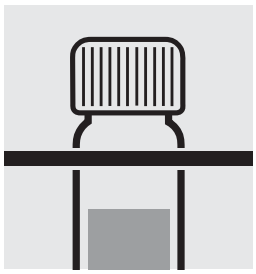
Measuring range:	100 – 1500 mg/l COD or O_2



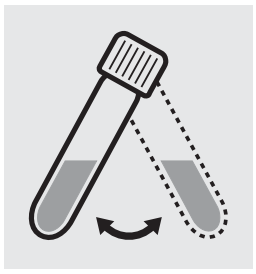
Carefully pipette 2.0 ml of the sample into a reaction cell, close tightly with the screw cap, and mix vigorously. **Caution, the cell becomes hot!**



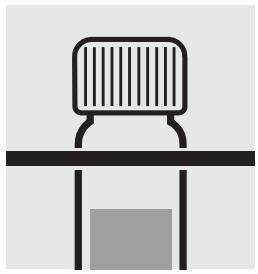
Heat the reaction cell in the thermoreactor at 148 °C for 2 hours.



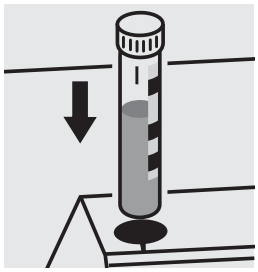
Remove the cell from the thermoreactor and place in a test-tube rack to cool.



Swirl the cell after 10 minutes.



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



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

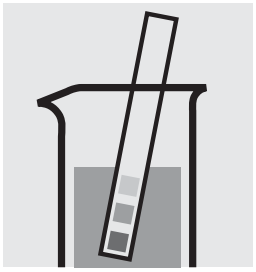
Quality assurance:

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

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

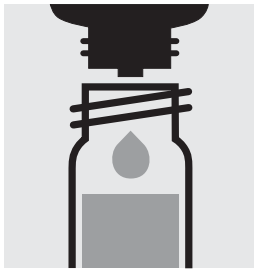
14553 · Copper

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



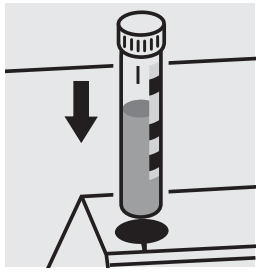
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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



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

Reaction time:
5 minutes



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

Important:

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

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

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

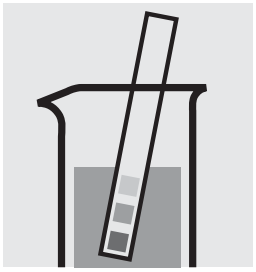
Quality assurance:

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

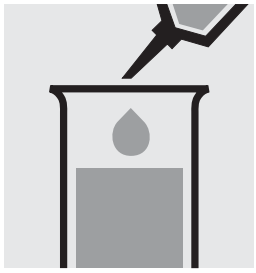
Ready-for-use copper standard solution, Cat.No. 250473, concentration 1000 mg/l Cu, can also be used after diluting accordingly.

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

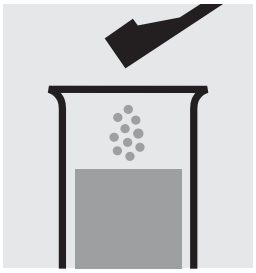
Measuring	0.10 – 6.00 mg/l Cu	10-mm cell
range:	0.05 – 3.00 mg/l Cu	20-mm cell
	0.02 – 1.20 mg/l Cu	50-mm cell
	Expression of results also possible in mmol/l.	



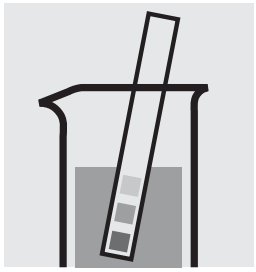
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



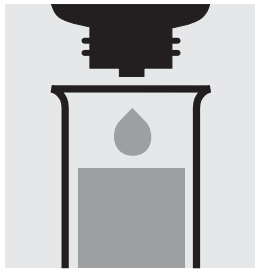
Pipette 5.0 ml of the sample into a test tube.



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

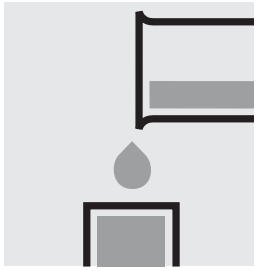


Check the pH, specified range: pH 7.0 – 9.5.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

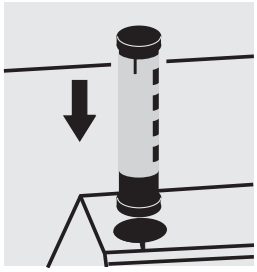


Add 5 drops of **Cu-2** and mix.

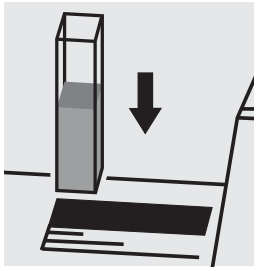
Reaction time:
5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

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

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

To measure in the 50-mm cell, only the sample volume has to be doubled.
Alternatively, the semi-microcell can be used.

Quality assurance:

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

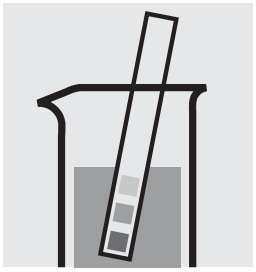
Ready-for-use copper standard solution, Cat.No. 250473, concentration 1000 mg/l Cu, can also be used after diluting accordingly.

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

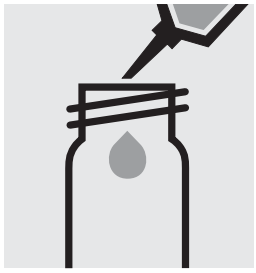
14561 · Cyanide

Determination of free cyanide

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

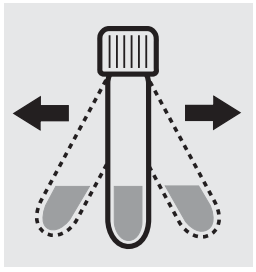


Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



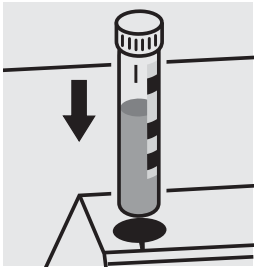
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and dissolve the solid substance.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 10 minutes



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

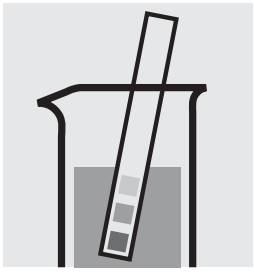
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) cyanide standard solution can be used.

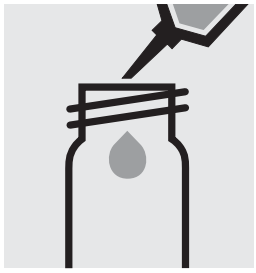
14561 · Cyanide

Determination of readily liberated cyanide

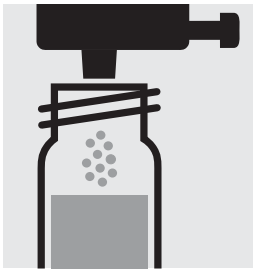
Measuring range:	0.010 – 0.500 mg/l CN Expression of results also possible in mmol/l and cyanide readily liberated [CN(v)].



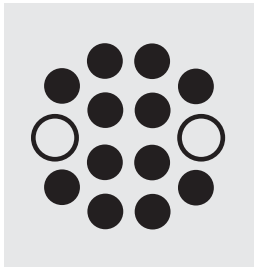
Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



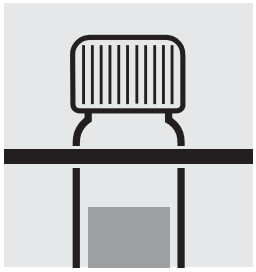
Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).



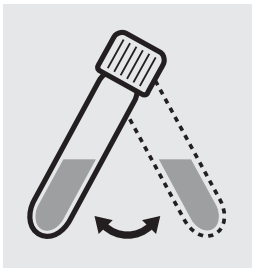
Add 1 dose of **CN-1K** using the green dose-metering cap, close the cell with the screw cap.



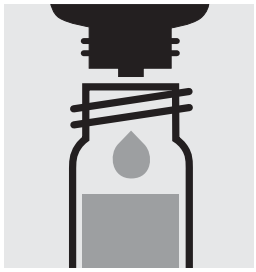
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



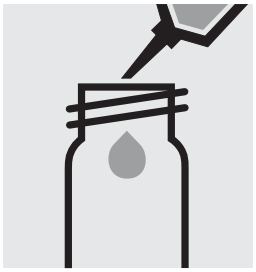
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



Swirl the cell before opening.

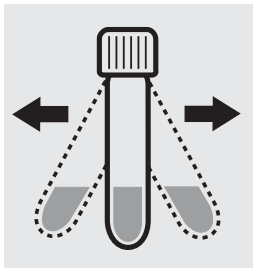


Add 3 drops of **CN-2K,** close with the screw cap, and mix: **pretreated sample.**



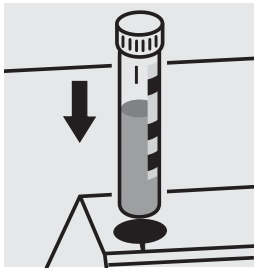
Pipette 5.0 ml of the **pretreated sample** into a reaction cell, close with the screw cap, and dissolve the solid substance.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
10 minutes



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

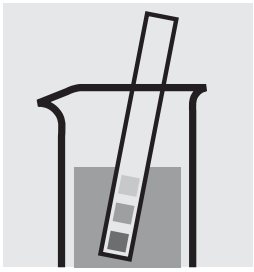
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) cyanide standard solution can be used.

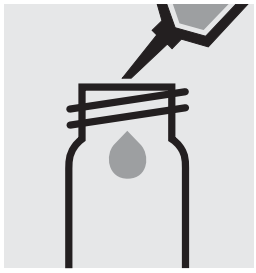
09701 · Cyanide

Determination of free cyanide

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

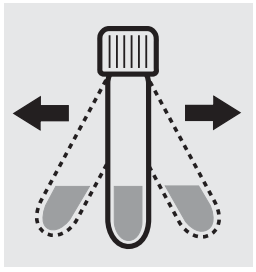


Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



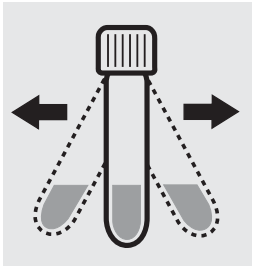
Pipette 5.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

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



Shake the cell vigorously to dissolve the solid substance.

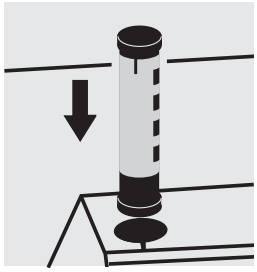
Add 1 level blue microspoon of **CN-4,** close the cell with the screw cap.



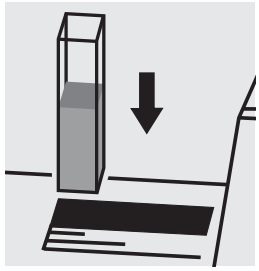
Shake the cell vigorously to dissolve the solid substance.

Reaction time:
10 minutes

Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Note:

Empty cells with screw caps, Cat.No. 250621 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 can be used.

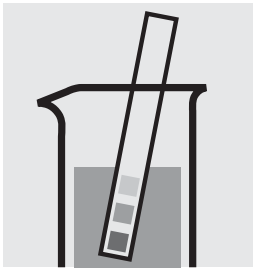
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) cyanide standard solution can be used.

09701 · Cyanide

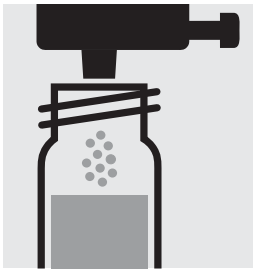
Determination of readily liberated cyanide

Measuring	0.010 – 0.500 mg/l	CN	10-mm cell
range:	0.005 – 0.250 mg/l	CN	20-mm cell
	0,0020 – 0,1000 mg/l	CN	50-mm cell
	Expression of results also possible in mmol/l and cyanide readily liberated [CN(v)].		

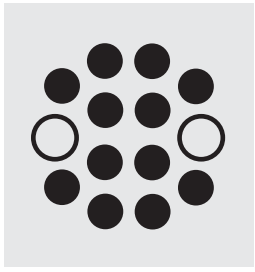


Check the pH of the sample, specified range: pH 4.5 – 8.0.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

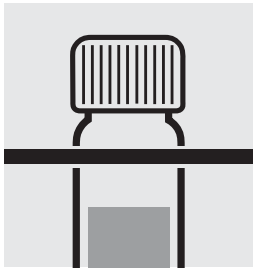
Add 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).



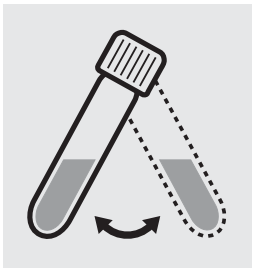
Add 1 dose of **CN-1** using the green dose-metering cap, close the cell with the screw cap.



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

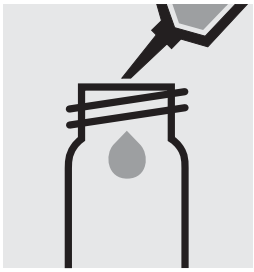


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



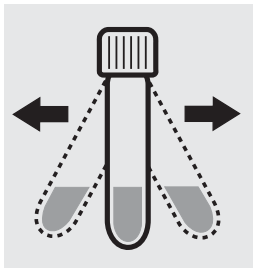
Swirl the cell before opening.

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



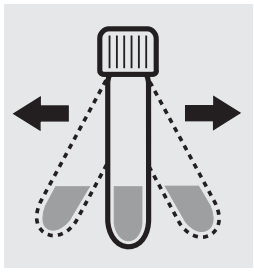
Pipette 5.0 ml of the **pretreated sample** into an empty round cell (Empty cells, Cat.No. 250621).

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



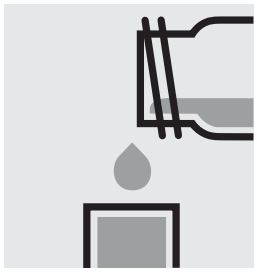
Shake the cell vigorously to dissolve the solid substance.

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

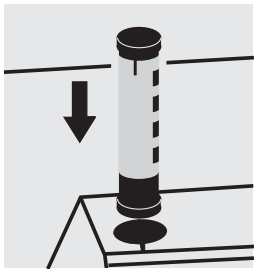


Shake the cell vigorously to dissolve the solid substance.

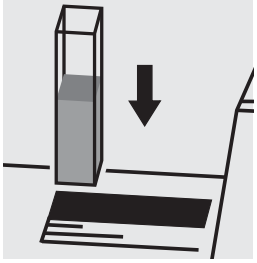
Reaction time:
10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Note:

Empty cells with screw caps, Cat.No. 250621 are recommended for the preparation. These cells can be sealed with the screw caps, thus preventing any gas losses.

Important:

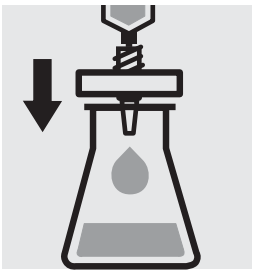
To measure in the 50-mm cell, the sample volume and the volume of the reagents CN-3 and CN-4 have to be doubled for each.
Alternatively, the semi-microcell can be used.

Quality assurance:

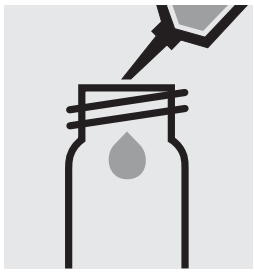
To check the measurement system (test reagents, measurement device, and handling) cyanide standard solution can be used.

19253 · Cyanuric acid

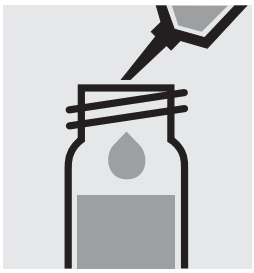
Measuring range: 2 – 160 mg/l cyanuric acid 20-mm cell



Filter turbid samples.

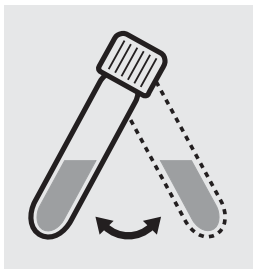


Pipette 5.0 ml of the sample into into a empty round cell (Empty cells, Cat.No. 250621).

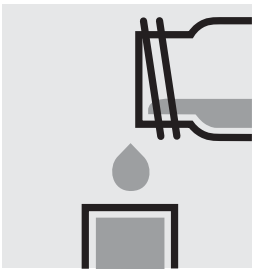


Add **5.0 ml of distilled water** with pipette, close with the screw cap, and mix.

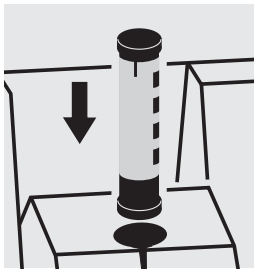
Add 1 tablet **Cyanuric Acid**, crush with stirring rod, and close with the screw cap.



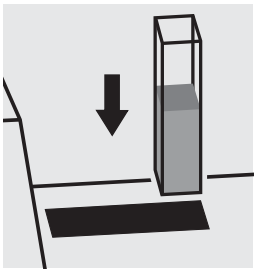
Swirl the cell to dissolve the solid substance.



Transfer the solution into a cell.



Select method with AutoSelector.



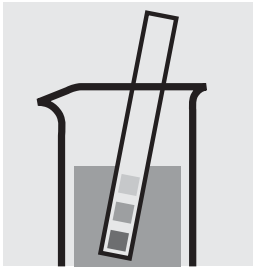
Place the cell into the cell compartment.

Quality assurance:

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

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

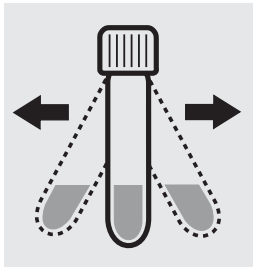
Measuring range: 0.10 – 1.80 mg/l F



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

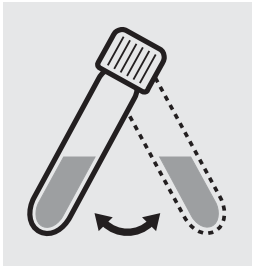
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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

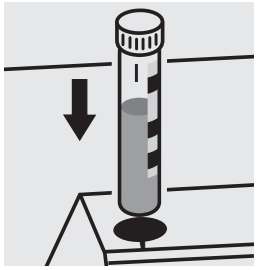


Shake the cell vigorously to dissolve the solid substance.

Reaction time: 15 minutes



Swirl the cell before measurement.



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

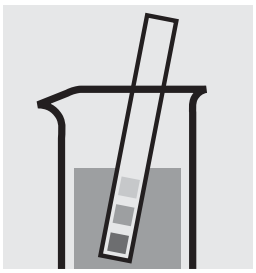
Important:

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use fluoride standard solution, Cat.No. 250470, concentration 1000 mg/l F^-, can be used after diluting accordingly.

Measuring range: 0.025 – 0.500 mg/l F



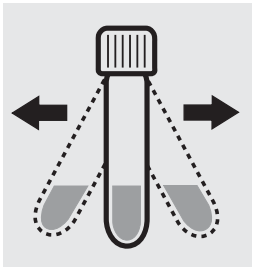
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Select method **F sens** in the menu (method no. 216).

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

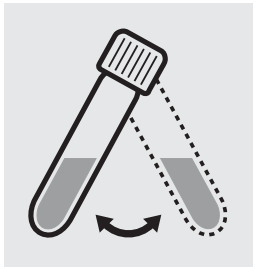
Pipette 10 ml of distilled water into a second reaction cell, close with the screw cap, and mix. (Blank)

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

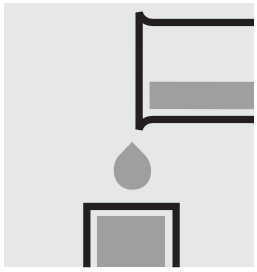


Shake both cells vigorously to dissolve the solid substance.

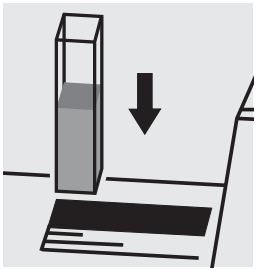
Reaction time:
15 minutes



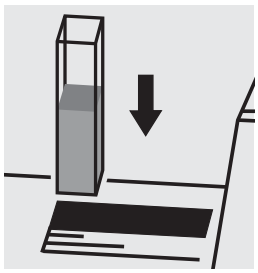
Swirl the cells.



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



Place the blank cell into the cell compartment.



Place the cell containing the sample into the cell compartment.

Important:

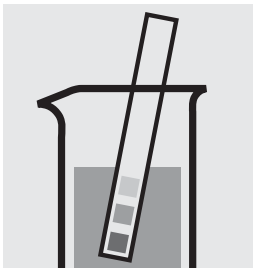
Very high fluoride concentrations in the sample produce brown-coloured solutions (measurement solution should be violet) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

Quality assurance:

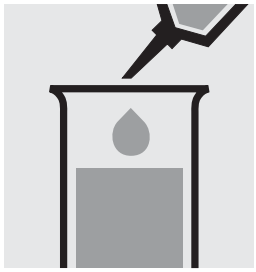
To check the measurement system (test reagents, measurement device, and handling) ready-for-use fluoride standard solution, Cat.No. 250470, concentration 1000 mg/l F^-, can be used after diluting accordingly.

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

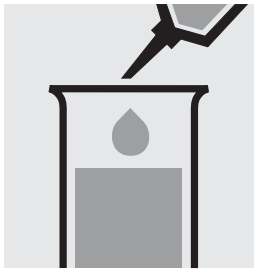
Measuring range: 0.10 – 2.00 mg/l F



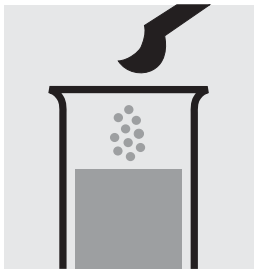
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



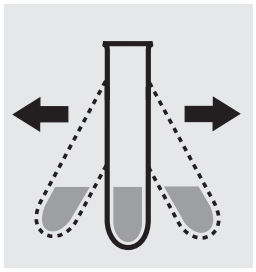
Pipette 2.0 ml of **F-1** into a test tube.



Add 5.0 ml of the sample with pipette and mix.

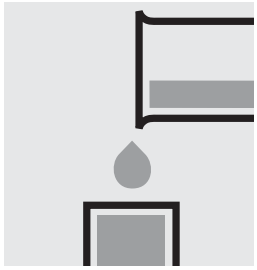


Add 1 level blue micro-spoon of **F-2** and mix.

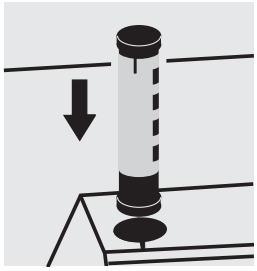


Shake the test tube vigorously to dissolve the solid substance.

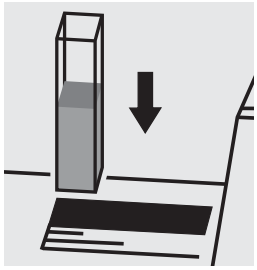
Reaction time:
5 minutes



Transfer the solution into a cell.

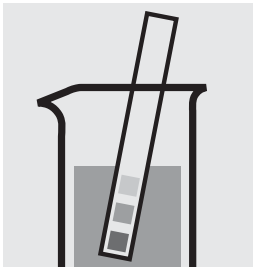


Select method with AutoSelector measuring range 0.10 – 2.00 mg/l F.

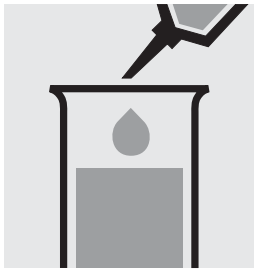


Place the cell into the cell compartment.

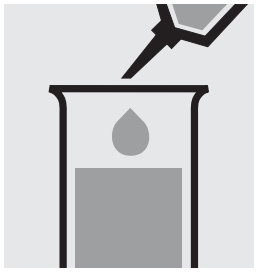
Measuring range: 1.0 – 20.0 mg/l F



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



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



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

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

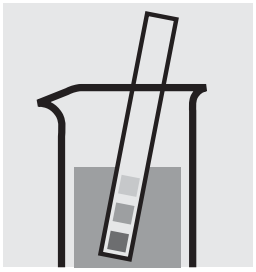
Important:

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

Quality assurance:

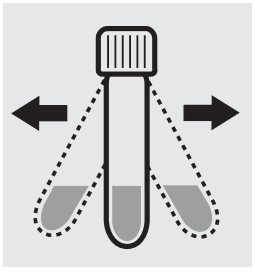
To check the measurement system (test reagents, measurement device, and handling) ready-for-use fluoride standard solution, Cat.No. 250470, concentration 1000 mg/l F^-, can be used after diluting accordingly.

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



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

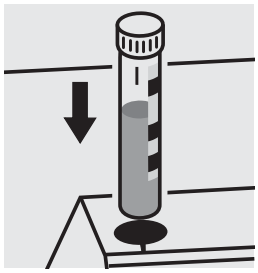
Add 1 level green microspoon of **HCHO-1K** into a reaction cell, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

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

Reaction time: 5 minutes

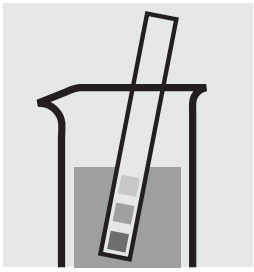


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

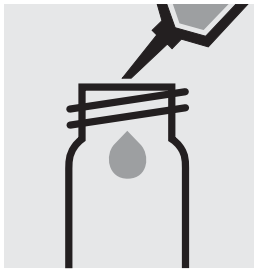
Quality assurance:

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

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

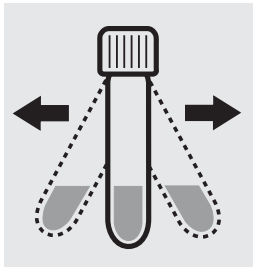


Check the pH of the sample, specified range: pH 0 – 13.

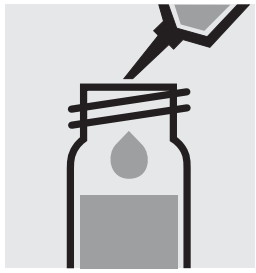


Pipette 4.5 ml of **HCHO-1** into an empty round cell (Empty cells, Cat.No. 250621).

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

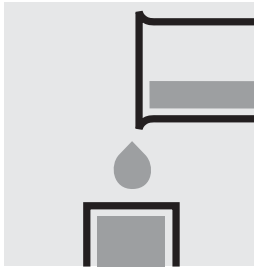


Shake the cell vigorously to dissolve the solid substance.

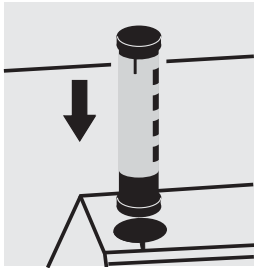


Add 3.0 ml of the sample with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

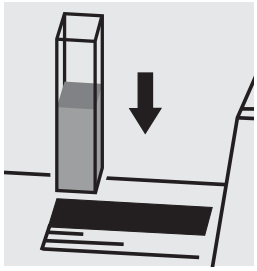
Reaction time: 5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

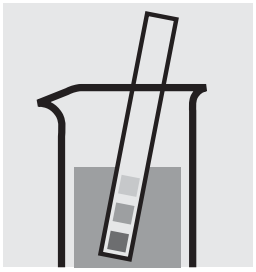
Note:

Empty cells with screw caps, Cat.No. 250621 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Quality assurance:

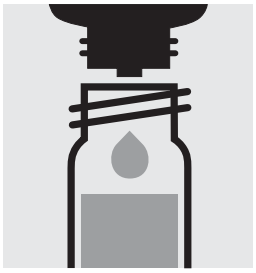
To check the measurement system (test reagents, measurement device, and handling) a formaldehyde standard solution must be prepared from Formaldehyde solution 37% (see section “Standard solutions”).

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

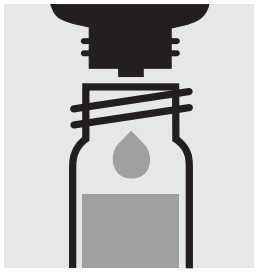


Check the pH of the sample, specified range: pH 1 – 9.
If required, add dilute hydrochloric acid drop by drop to adjust the pH.

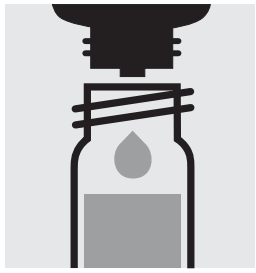
Pipette 2.0 ml of the sample into a test tube with screw cap.



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

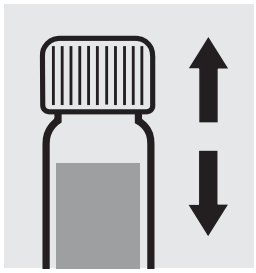


Add 4 drops of **Au-2** and mix.

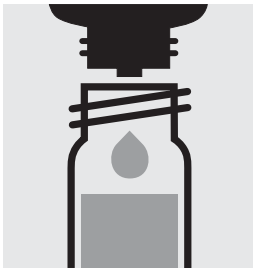


Add 6 drops of **Au-3** and mix.

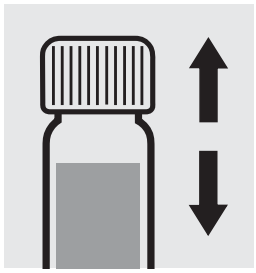
Add 6.0 ml of **Au-4** with pipette, close with the screw cap.



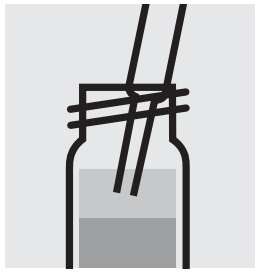
Shake the tube vigorously for 1 minute.



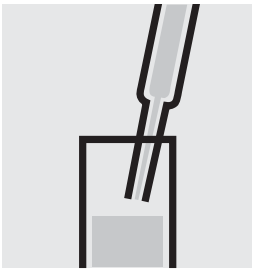
Add 6 drops of **Au-5,** close with the screw cap.



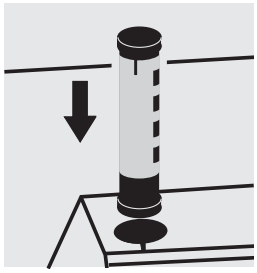
Shake the tube vigorously for 1 minute.



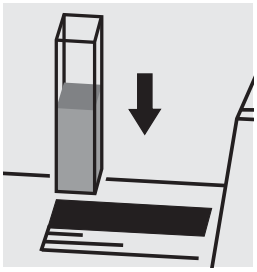
Aspirate the clear upper phase from the tube with pipette.



Transfer the solution into a cell.



Select method with AutoSelector.

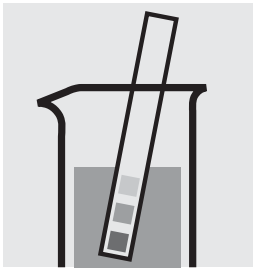


Place the cell into the cell compartment.

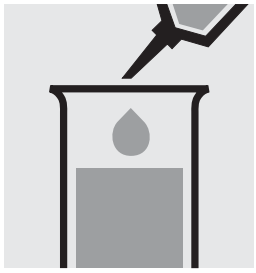
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) gold standard solution can be used.

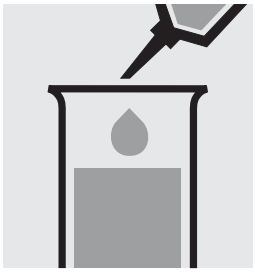
Measuring	0.02 – 2.00	mg/l N_2H_4	10-mm cell
range:	0.01 – 1.00	mg/l N_2H_4	20-mm cell
	0.005 – 0.400	mg/l N_2H_4	50-mm cell
	Expression of results also possible in mmol/l.		



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

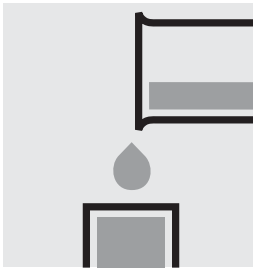


Pipette 5.0 ml of the sample into a test tube.

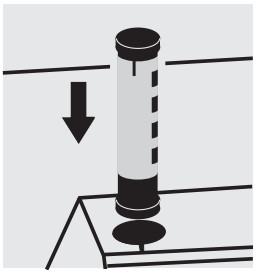


Add 2.0 ml of **Hy-1** with pipette and mix.

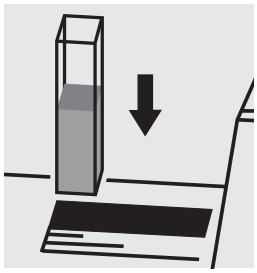
Reaction time:
5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

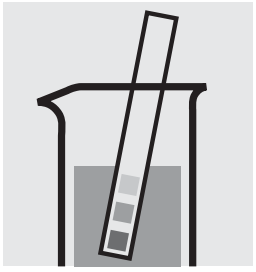
Quality assurance:

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

14731 · Hydrogenperoxide

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

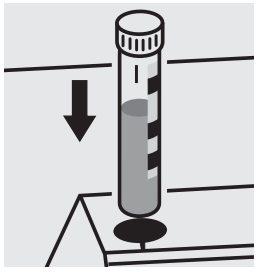
Measuring range: 2.0 – 20.0 mg/l H_2O_2



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

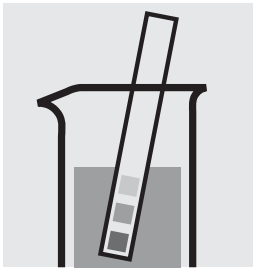
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.

Reaction time:
2 minutes



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

Measuring range: 0.25 – 5.00 mg/l H_2O_2

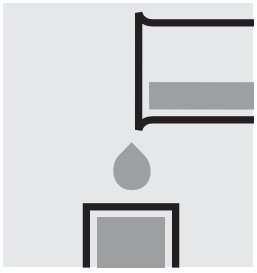


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

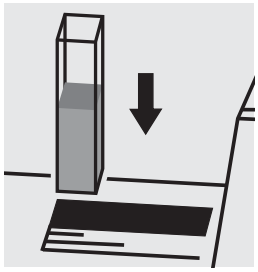
Select method **H_2O_2 sens** in the menu (method no. 128).

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

Reaction time:
2 minutes



Transfer the solution into a 50-mm cell.



Place the cell into the cell compartment.

Important:

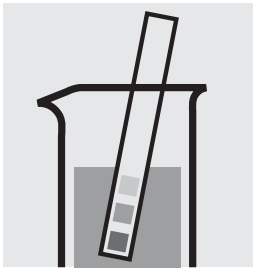
The contents of the reaction cells may be slightly yellow. However, this does not influence the measurement result.

Quality assurance:

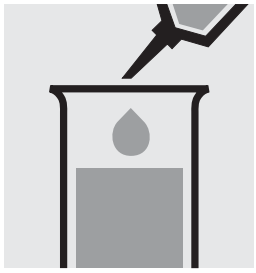
To check the measurement system (test reagents, measurement device, and handling) a hydrogenperoxide standard solution must be prepared from Perhydrol® 30 % H_2O_2 GR (see section “Standard solutions”).

18789 · Hydrogenperoxide

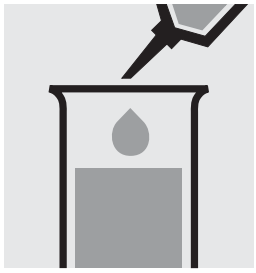
Measuring range:	0.03 – 6.00 mg/l H_2O_2	10-mm cell
	0.015 – 3.000 mg/l H_2O_2	20-mm cell
	Expression of results also possible in mmol/l.	



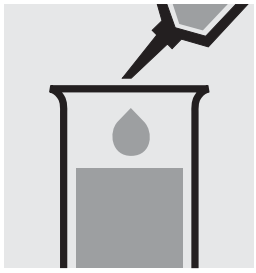
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



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

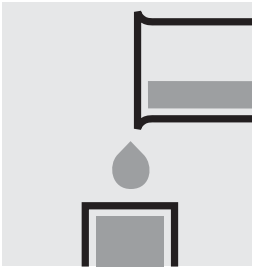


Add 8.0 ml of the sample with pipette and mix.

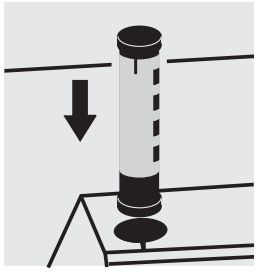


Add 0.50 ml of **H_2O_2-2** with pipette and mix.

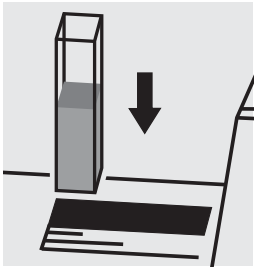
Reaction time: 10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.

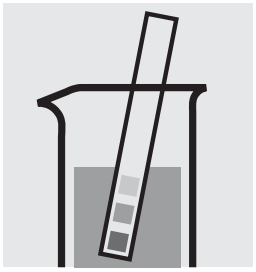


Place the cell into the cell compartment.

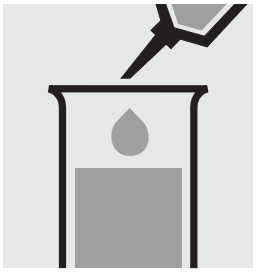
Quality assurance:

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

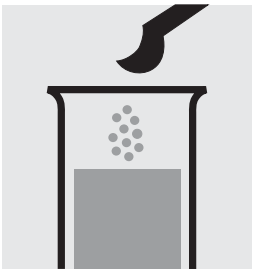
Measuring	0.20 – 10.00	mg/l I_2	10-mm cell
range:	0.10 – 5.00	mg/l I_2	20-mm cell
	0.050 – 2.000	mg/l I_2	50-mm cell



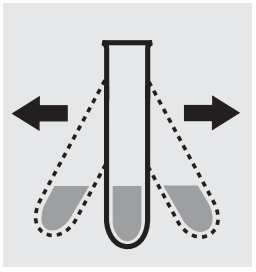
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 10 ml of the sample into a test tube.

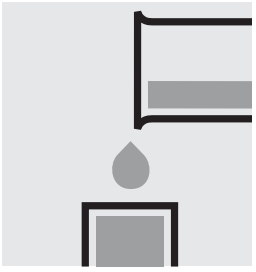


Add 1 level blue micro-spoon of **I_2-1.**

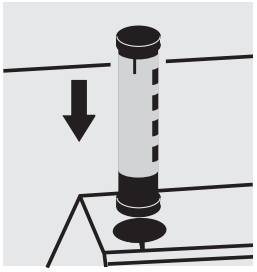


Shake vigorously to dissolve the solid substance.

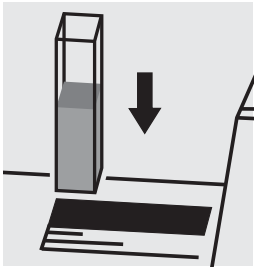
Reaction time:
3 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

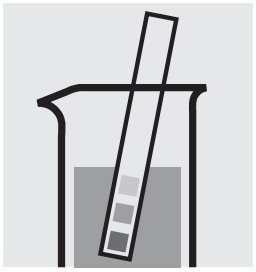
Important:

Very high iodine concentrations in the sample produce yellow-coloured 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”).

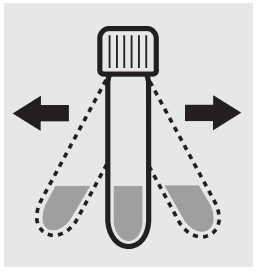
Measuring range:	0.05 – 4.00 mg/l Fe Expression of results also possible in mmol/l.



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

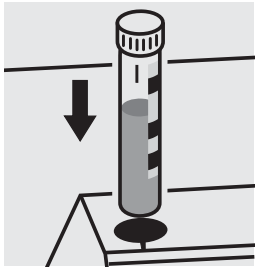
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 3 minutes



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

Important:

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

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

Quality assurance:

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

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

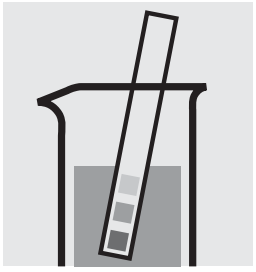
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 30) is highly recommended.

14896 · Iron

Determination of iron(II) and iron(III)

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

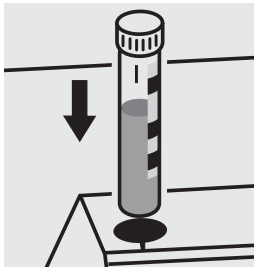
Determination of iron (II)



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

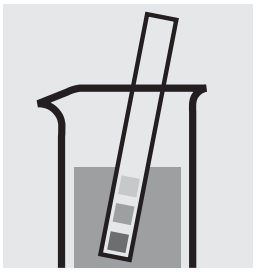
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Reaction time:
5 minutes



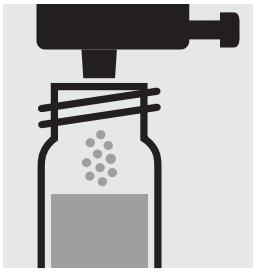
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Determination of iron (II + III)

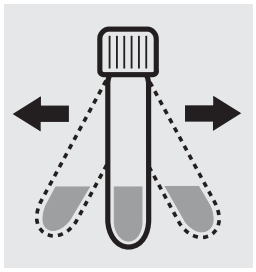


Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

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

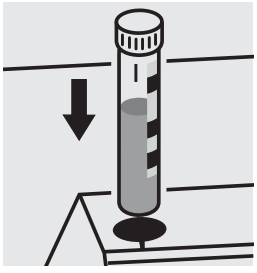


Add 1 dose of **Fe-1K** using the blue dose-metering cap, close the reaction cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

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

Important:

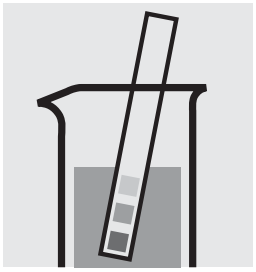
For the determination of **total iron** a pretreatment with Crack Set 10C, Cat.No. 252033, or Crack Set 10, Cat.No. 250496, and thermoreactor is necessary.

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

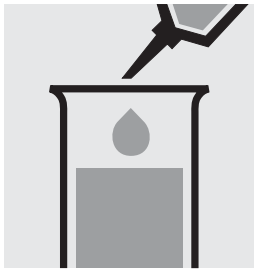
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use iron standard solution, Cat.No. 250469, concentration 1000 mg/l Fe(III), can be used after diluting accordingly.

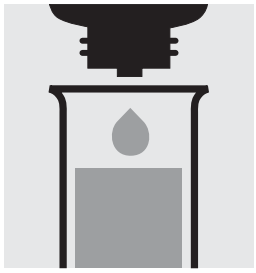
Measuring	0.05 – 5.00	mg/l Fe	10-mm cell
range:	0.03 – 2.50	mg/l Fe	20-mm cell
	0.005 – 1.000	mg/l Fe	50-mm cell
	Expression of results also possible in mmol/l.		



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

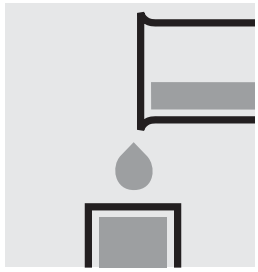


Pipette 5.0 ml of the sample into a test tube.

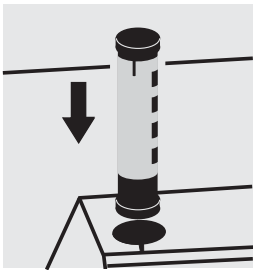


Add 3 drops of **Fe-1** and mix.

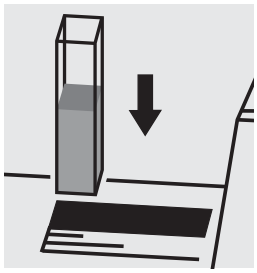
Reaction time:
3 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

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

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

Quality assurance:

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

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

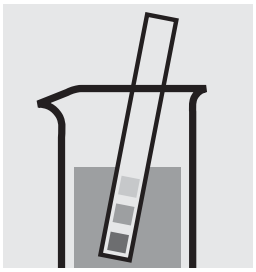
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 30) is highly recommended.

00796 · Iron

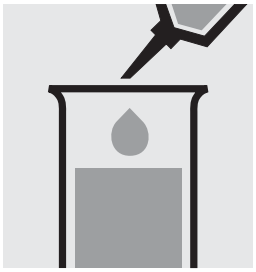
Determination of iron(II) and iron(III)

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

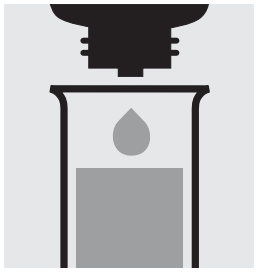
Determination of iron(II)



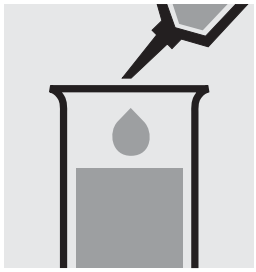
Check the pH of the sample, specified range: pH 2 – 8.
If required, add dilute sodium hydroxide solution or nitric acid drop by drop to adjust the pH.



Pipette 8.0 ml of the sample into a test tube.

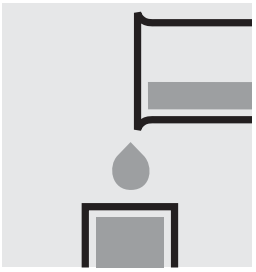


Add 1 drop of **Fe-1** and mix.

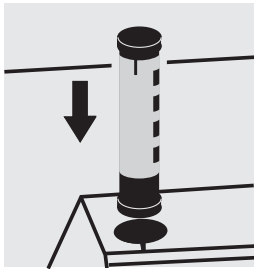


Add 0.50 ml of **Fe-2** with pipette and mix.

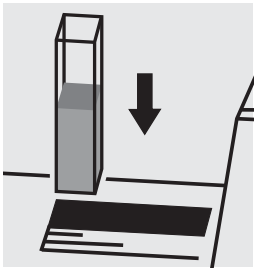
Reaction time: 5 minutes



Transfer the solution into a corresponding cell.



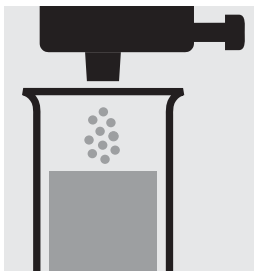
Select method with AutoSelector.



Place the cell into the cell compartment.

Determination of iron(II + III)

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



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

Reaction time: 10 minutes, then measure.

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

Important:

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

Quality assurance:

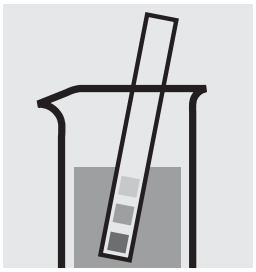
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 30, Cat.No. 250484.

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

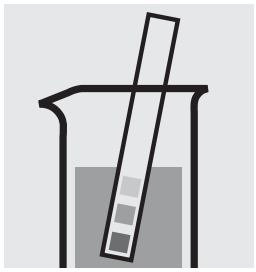
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 30) is highly recommended.

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

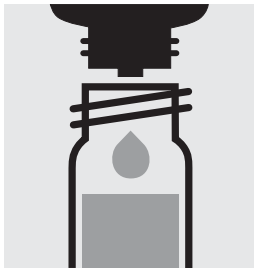
Samples of total hardness 0 – 14 °d



Check the total hardness of the sample.

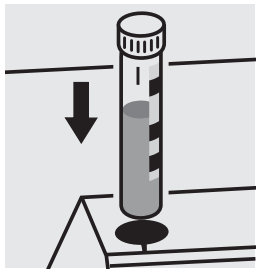


Check the pH of the sample, specified range: pH 3 – 6.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



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

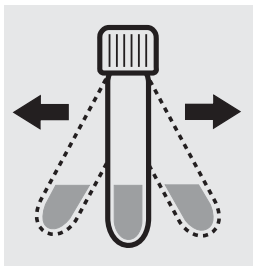
Add 5.0 ml of the sample with pipette, close the cell with the screw cap, and mix.



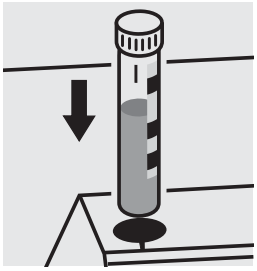
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer
= Result A

Samples of total hardness > 14 °d

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



Shake the cell vigorously to dissolve the solid substance.



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

Result A
– Result B
= mg/l Pb

Important:

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

Result can be expressed as sum of lead (Σ Pb).

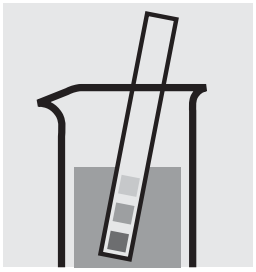
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 40, Cat.No. 250485.

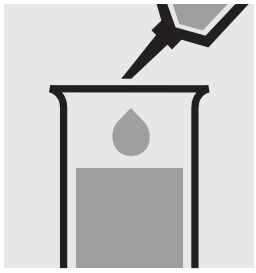
Ready-for-use lead standard solution, Cat.No. 250462, concentration 1000 mg/l Pb, can also be used after diluting accordingly.

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

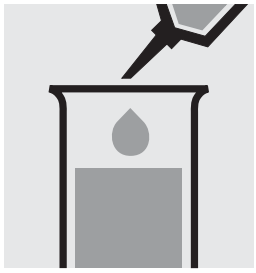
Measuring	0.10 – 5.00	mg/l Pb	10-mm cell
range:	0.05 – 2.50	mg/l Pb	20-mm cell
	0.010 – 1.000	mg/l Pb	50-mm cell
	Expression of results also possible in mmol/l.		



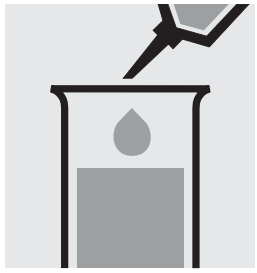
Check the pH of the sample, specified range: pH 3 – 6.
If required, add dilute ammonia solution or nitric acid drop by drop to adjust the pH.



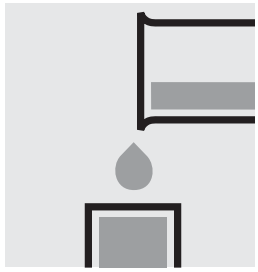
Pipette 0.50 ml of **Pb-1** into a test tube.



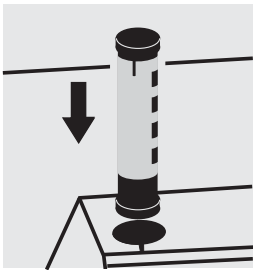
Add 0.50 ml of **Pb-2** with pipette and mix.



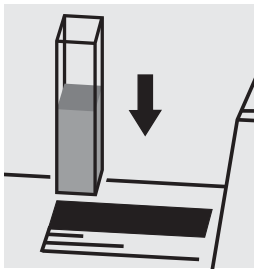
Add 8.0 ml of the sample with pipette and mix.



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

Result can be expressed as sum of lead (Σ Pb).

Quality assurance:

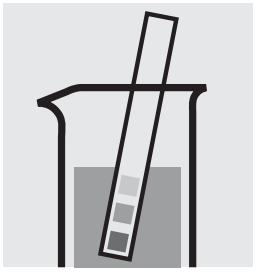
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 40, Cat.No. 250485.

Ready-for-use lead standard solution, Cat.No. 250462, concentration 1000 mg/l Pb, can also be used after diluting accordingly.

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

00815 · Magnesium

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

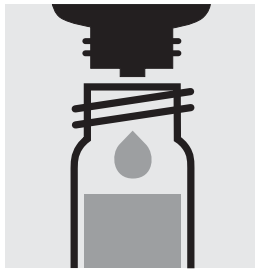


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

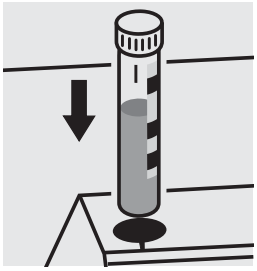
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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

Reaction time:
Exactly 3 minutes.



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



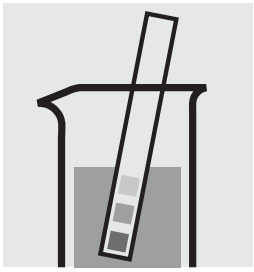
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

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

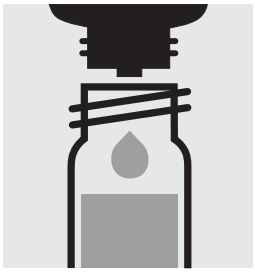
00816 · Manganese

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



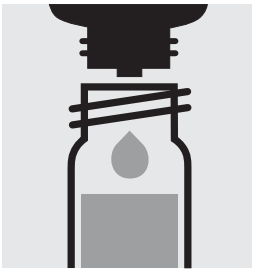
Check the pH of the sample, specified range: pH 2 – 7.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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



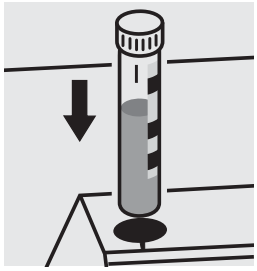
Add 2 drops of **Mn-1K,** close the cell with the screw cap, and mix.

Reaction time:
2 minutes



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

Reaction time:
5 minutes



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

Quality assurance:

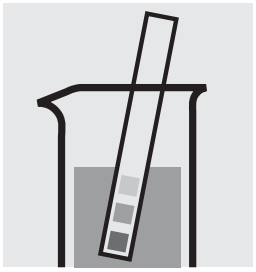
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 30, Cat.No. 250484.

Ready-for-use manganese standard solution, Cat.No. 250474, concentration 1000 mg/l Mn, can also be used after diluting accordingly.

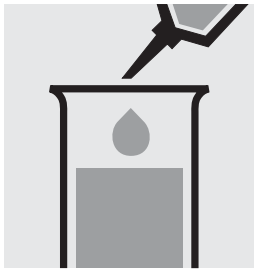
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 30) is highly recommended.

01846 · Manganese

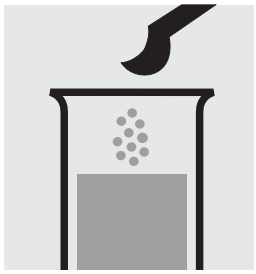
Measuring	0.05 – 2.00	mg/l Mn	10-mm cell
range:	0.03 – 1.00	mg/l Mn	20-mm cell
	0.005 – 0.400	mg/l Mn	50-mm cell
	Expression of results also possible in mmol/l.		



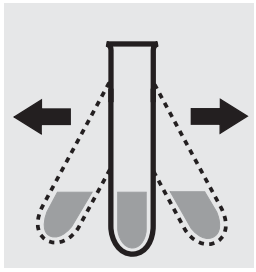
Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



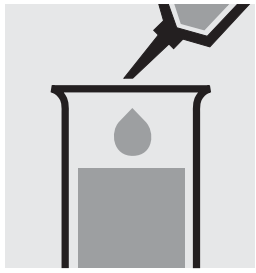
Pipette 8.0 ml of the sample into a test tube.



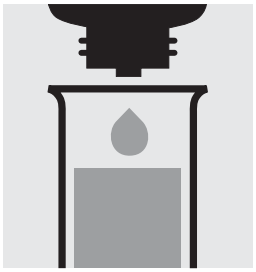
Add 1 level grey microspoon of **Mn-1**.



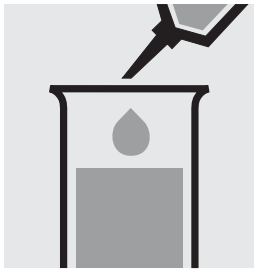
Shake the tube vigorously to dissolve the solid substance.



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

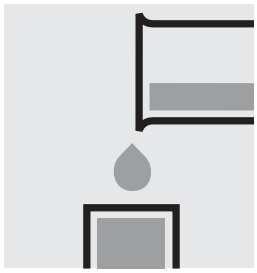


Add **carefully** 3 drops of **Mn-3** and mix.

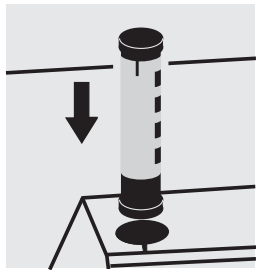


Add **carefully** 0.25 ml of **Mn-4** with pipette and mix **carefully** (**Foams! Wear eye protection!**).

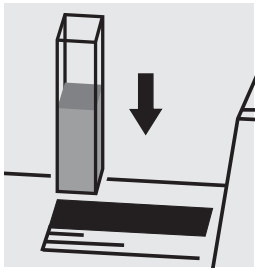
Reaction time: 10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

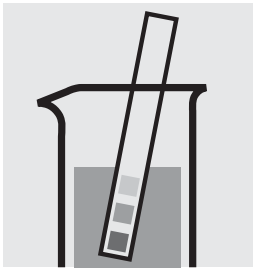
When using the 50-mm cell, perform the measurement against a separately prepared blank (preparation as per measurement sample, but with distilled water instead of sample).

Quality assurance:

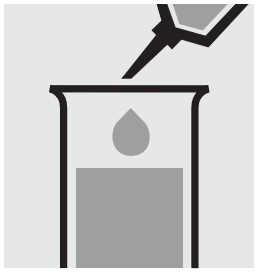
To check the measurement system (test reagents, measurement device, and handling) ready-for-use manganese standard solution, Cat.No. 250474, concentration 1000 mg/l Mn, can be used after diluting accordingly.

14770 · Manganese

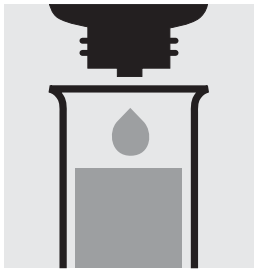
Measuring	0.50 – 10.00	mg/l Mn	10-mm cell
range:	0.25 – 5.00	mg/l Mn	20-mm cell
	0.010 – 2.000	mg/l Mn	50-mm cell
	Expression of results also possible in mmol/l.		



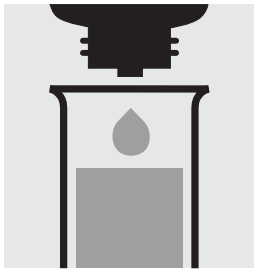
Check the pH of the sample, specified range: pH 2 – 7.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.

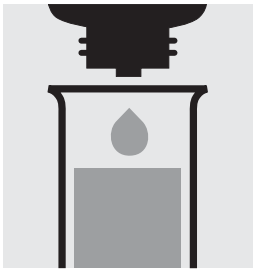


Add 4 drops of **Mn-1** and mix.



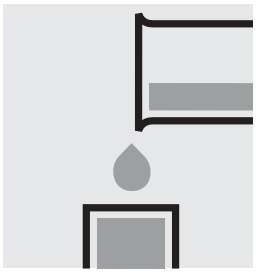
Add 2 drops of **Mn-2** and mix.
Check the pH, specified pH: approx. 11.5.

Reaction time:
2 minutes

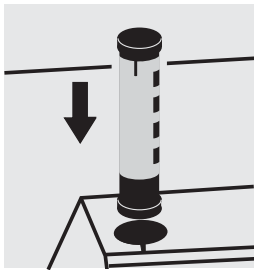


Add 2 drops of **Mn-3** and mix.

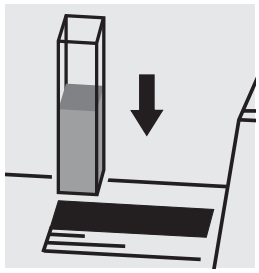
Reaction time:
2 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

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

Quality assurance:

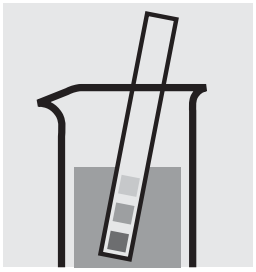
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 30, Cat.No. 250484.

Ready-for-use manganese standard solution, Cat.No. 250474, concentration 1000 mg/l Mn, can also be used after diluting accordingly.

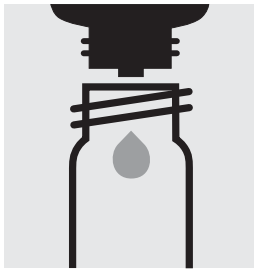
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 30) is highly recommended.

00860 · Molybdenum

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

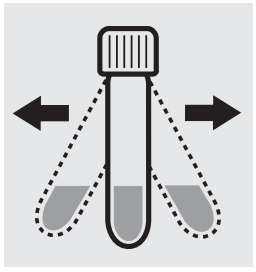


Check the pH of the sample, specified range: pH 1–10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



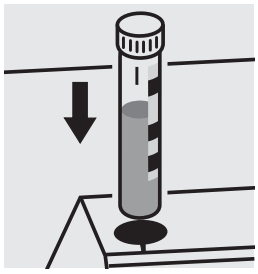
Place 2 drops of **Mo-1K** into a reaction cell and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 2 minutes



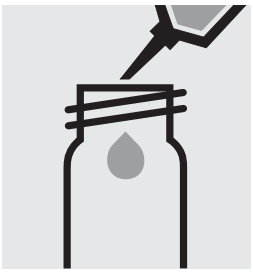
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) molybdenum standard solution can be used.

19252 · Molybdenum

Measuring range:	0.5 – 45.0 mg/l Mo	20-mm cell
	0.8 – 75.0 mg/l MoO_4	20-mm cell
	1.1 – 96.6 mg/l Na_2MoO_4	20-mm cell

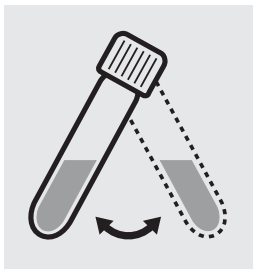


Pipette 10 ml of the sample into into a empty round cell (Empty cells, Cat.No. 250621).

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

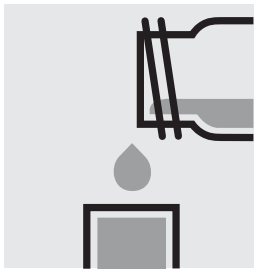
Add 1 powder pack of **Molybdenum HR2**, close with the screw cap, and dissolve the solid substance.

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

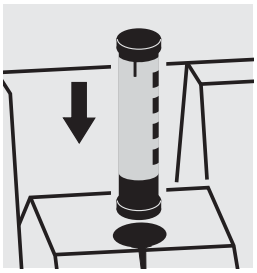


Swirl the cell to dissolve the solid substance.

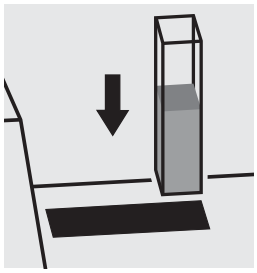
Reaction time:
5 minutes, **measure immediately**.



Transfer the solution into a cell.



Select method with AutoSelector.



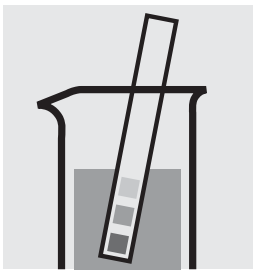
Place the cell into the cell compartment.

Quality assurance:

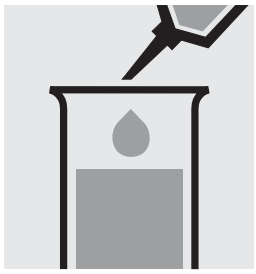
To check the measurement system (test reagents, measurement device, and handling) molybdenum standard solution can be used.

01632 · Monochloramine

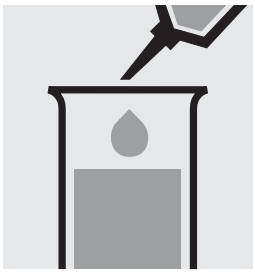
Measuring range:	0.25 – 10.00 mg/l Cl_2	0.18 – 7.25 mg/l NH_2Cl	0.05 – 1.96 mg/l NH_2Cl-N	10-mm-cell
	0.13 – 5.00 mg/l Cl_2	0.09 – 3.63 mg/l NH_2Cl	0.03 – 0.98 mg/l NH_2Cl-N	20-mm cell
	0.050 – 2.000 mg/l Cl_2	0.036 – 1.450 mg/l NH_2Cl	0.010 – 0.392 mg/l NH_2Cl-N	50-mm cell
	Expression of results also possible in mmol/l.			



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

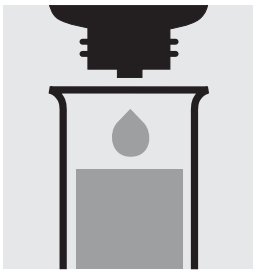


Pipette 10 ml of the sample into a test tube.



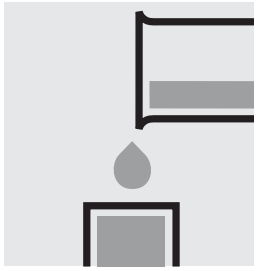
Add 0.60 ml of **MCA-1** with pipette and mix.

Reaction time:
5 minutes

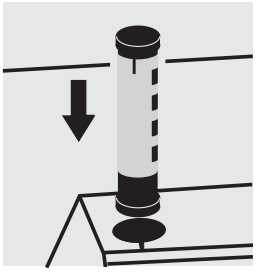


Add 4 drops of **MCA-2** and mix.

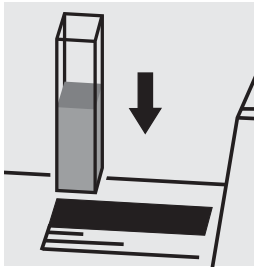
Reaction time:
5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

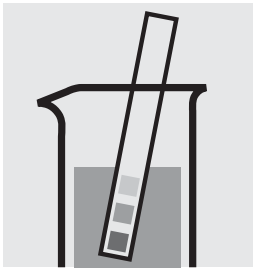
Important:

Very high monochloramine concentrations in the sample produce turquoise-coloured 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”).

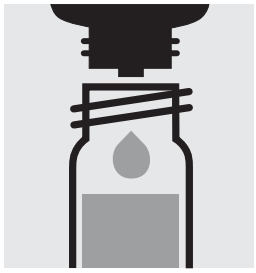
Measuring range:	0.10 – 6.00 mg/l Ni Expression of results also possible in mmol/l.



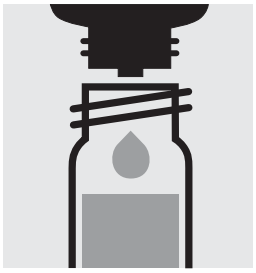
Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

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

Reaction time:
1 minute

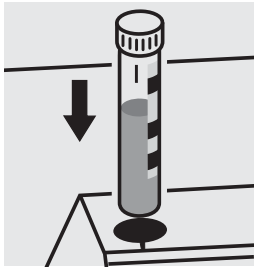


Add 2 drops of **Ni-1K,** close with the screw cap, and mix.



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

Reaction time:
2 minutes



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

Important:

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

Result can be expressed as sum of nickel (Σ Ni).

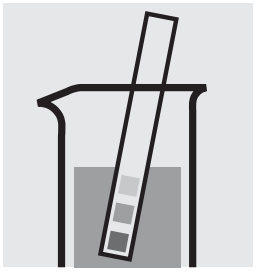
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 40, Cat.No. 250485.

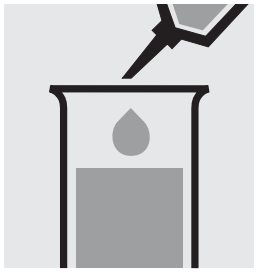
A nickel standard solution, Cat.No. 250475, concentration 1000 mg/l Ni, can also be used after diluting accordingly.

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

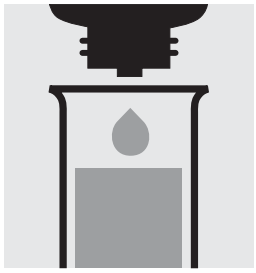
Measuring range:	0.10 – 5.00 mg/l Ni	10-mm cell
	0.05 – 2.50 mg/l Ni	20-mm cell
	0.02 – 1.00 mg/l Ni	50-mm cell
	Expression of results also possible in mmol/l.	



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.

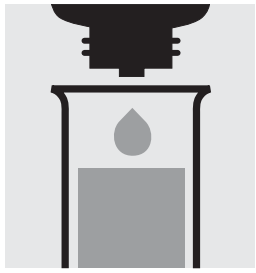


Pipette 5.0 ml of the sample into a test tube.

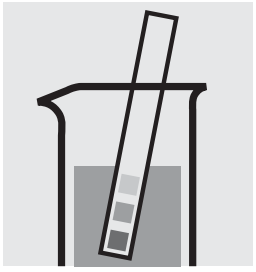


Add 1 drop of **Ni-1** and mix. If the colour disappears, continue adding drop by drop until a slight yellow colouration persists.

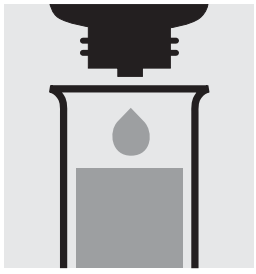
Reaction time:
1 minute



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

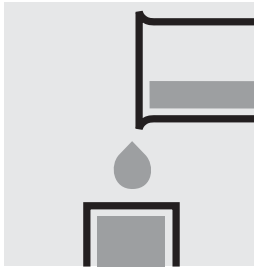


Check the pH, specified range: pH 10 – 12.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

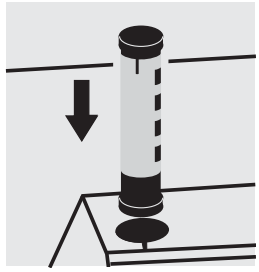


Add 2 drops of **Ni-3** and mix.

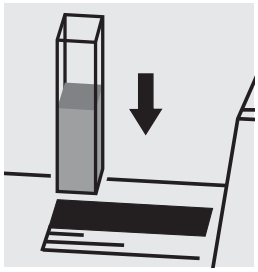
Reaction time:
2 minutes



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. 252033, or Crack Set 10, Cat.No. 250496 and thermoreactor is necessary.

Result can be expressed as sum of nickel (Σ Ni).

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

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 40, Cat.No. 250485.

A nickel standard solution, Cat.No. 250475, concentration 1000 mg/l Ni, can also be used after diluting accordingly.

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

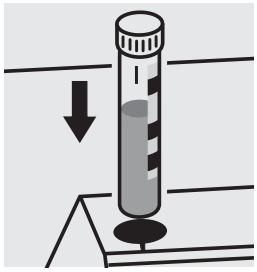
N2/25 · Nitrate

Measuring range:	0.5 – 25.0 mg/l NO_3-N
	2.2 – 110.7 mg/l NO_3
	Expression of results also possible in mmol/l.

Pipette 1.0 ml of the sample into a reaction cell, **do not mix**.

Add 1.0 ml of **NO_3-1K** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time: 10 minutes



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

Quality assurance:

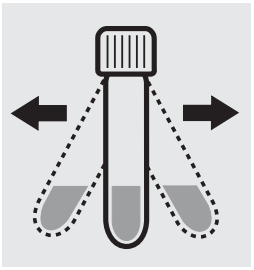
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20, Cat.No. 250483.

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

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

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

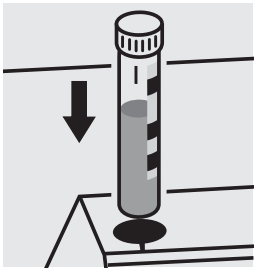
Add 1 level yellow micro-spoon of **NO_3-1K** into a reaction cell and close with the screw cap.



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

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

Reaction time: 10 minutes



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

Quality assurance:

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

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

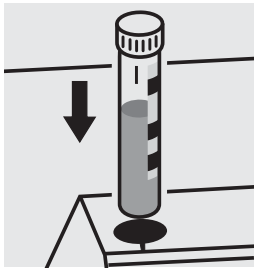
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 20) is highly recommended.

Measuring range:	0.5 – 25.0 mg/l NO_3-N
	2.2 – 110.7 mg/l NO_3
	Expression of results also possible in mmol/l.

Pipette 1.0 ml of the sample into a reaction cell, **do not mix.**

Add 1.0 ml of **NO_3-1K** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time: 10 minutes



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

Quality assurance:

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

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

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

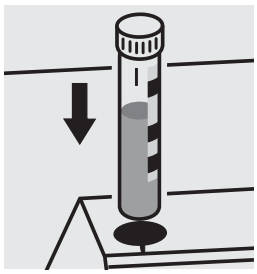
14764 · Nitrate

Measuring range:	1.0 – 50.0 mg/l NO_3-N
	4 – 221 mg/l NO_3
	Expression of results also possible in mmol/l.

Pipette 0.50 ml of the sample into a reaction cell, **do not mix.**

Add 1.0 ml of **NO_3-1K** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time: 10 minutes



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

Quality assurance:

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

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

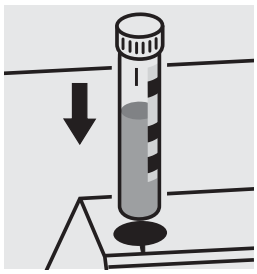
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 80) is highly recommended.

Measuring range:	23 – 225 mg/l NO_3-N
	102 – 996 mg/l NO_3
	Expression of results also possible in mmol/l.

Pipette 1.0 ml of **NO_3-1K** into a reaction cell, **do not mix.**

Add 0.10 ml of the sample with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

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



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

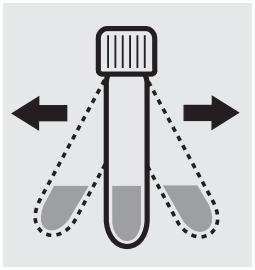
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use ready-for-use nitrate standard solution, Cat.No. 250476, concentration 1000 mg/l NO_3^-, can also be used after diluting accordingly.

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

Place 1 blue micro-spoon of **NO_3-1** into a dry empty round cell (Empty cells, Cat.No. 250621).

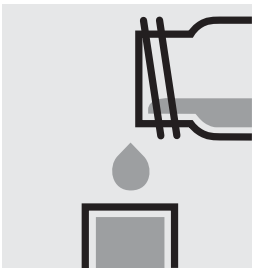
Add 5.0 ml of **NO_3-2** with pipette into the cell. Close the cell with the screw cap.



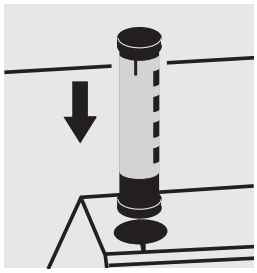
Shake vigorously for 1 minute to dissolve the solid substance.

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

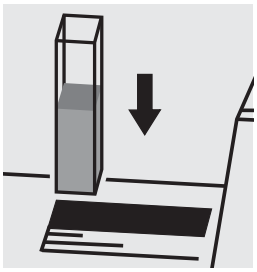
Reaction time: 10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Note:

Empty cells with screw caps, Cat.No. 250621 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

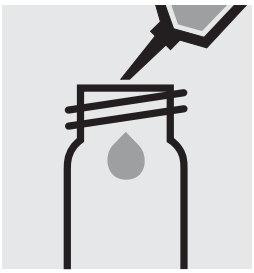
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10 and 20, Cat.Nos. 250482 and 250483.

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

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

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

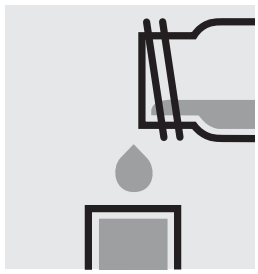


Pipette 4.0 ml of **NO_3-1** into a dry empty round cell (Empty cells, Cat. No. 250621).

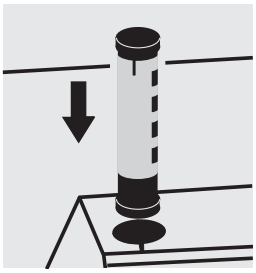
Add 0.50 ml of the sample with pipette, **do not mix.**

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

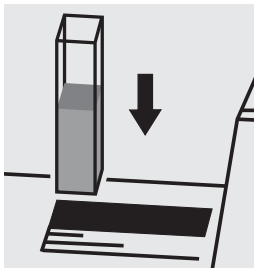
Reaction time: 10 minutes



Transfer the solution into a corresponding 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 can be used.

Note:

Empty cells with screw caps, Cat.No. 250621 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 CombiCheck 20, Cat.No. 250483.

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

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

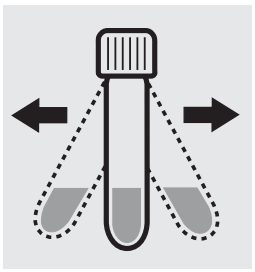
14556 · Nitrate

in seawater

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

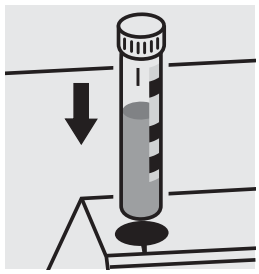
Pipette 2.0 ml of the sample into a reaction cell, **do not mix.**

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



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

Reaction time: 30 minutes



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

Quality assurance:

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

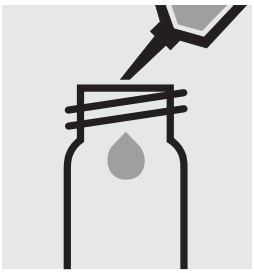
Ready-for-use nitrate standard solution, Cat.No. 250476, concentration 1000 mg/l NO_3^-, can also be used after diluting accordingly.

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

14942 · Nitrate

in seawater

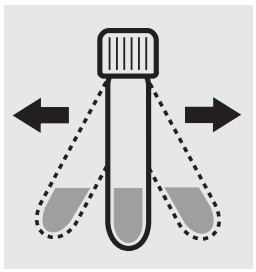
Measuring range:	0.2 – 17.0 mg/l NO_3-N	0.9 – 75.3 mg/l NO_3	10-mm cell
	Expression of results also possible in mmol/l.		



Pipette 5.0 ml of **NO_3-1** into a dry empty round cell (Empty cells, Cat. No. 250621).

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

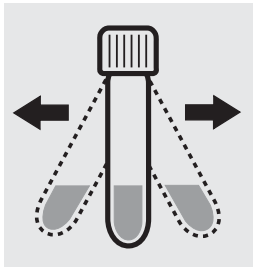
Immediately add 1.5 ml of **NO_3-2** with pipette.



Close cell tightly and shake **vigorously.**

Reaction time: 15 minutes

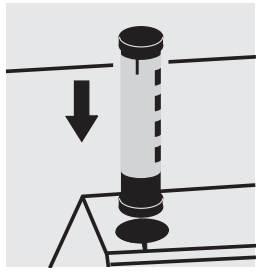
Add 2 level grey micro-spoons of **NO_3-3.**



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

Reaction time: 60 minutes

Transfer the solution into a cell.



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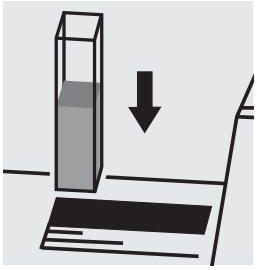


Place the cell into the cell compartment.

Important:

Empty cells with screw caps, Cat.No. 250621 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:

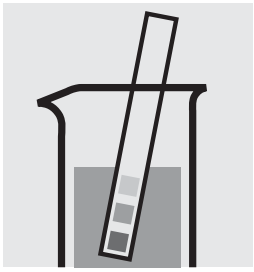
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20, Cat.No. 250483.

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

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

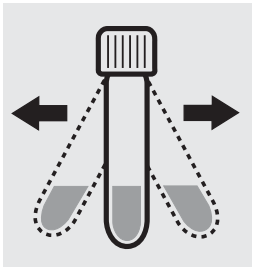
N5/25 · Nitrite

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



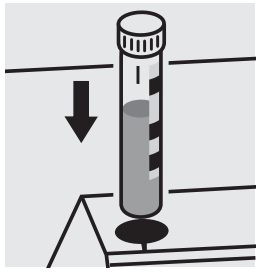
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 10 minutes



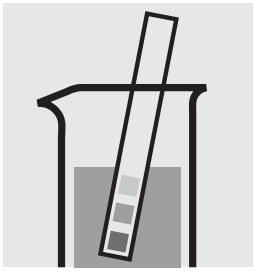
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

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

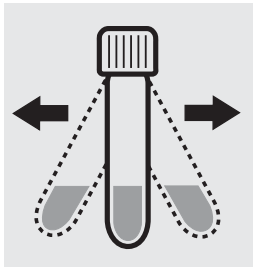
14547 · Nitrite

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



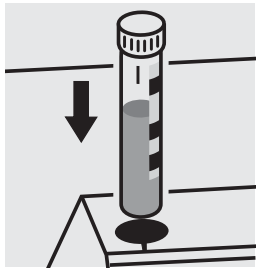
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 10 minutes

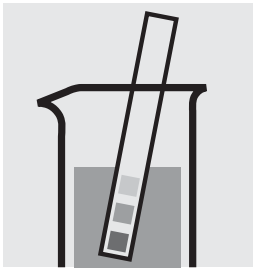


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

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

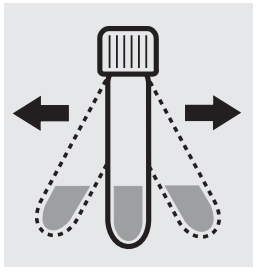
Measuring range:	1.0 – 90.0 mg/l NO_2-N
	3.3 – 295.2 mg/l NO_2
	Expression of results also possible in mmol/l.



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

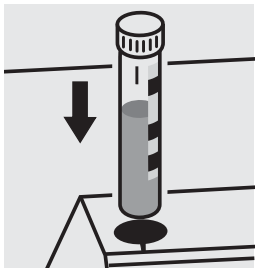
Add 2 level blue micro-spoons of **NO_2-1K** into a reaction cell.

Add 8.0 ml of the sample with pipette and close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
20 minutes, **measure immediately.**
Do not shake or swirl the cell before the measurement.



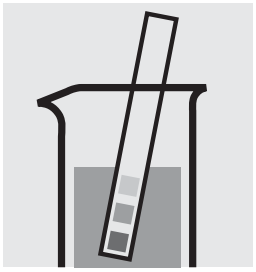
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

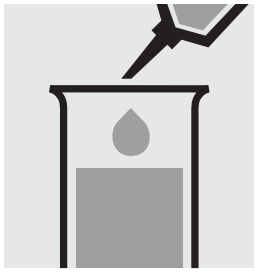
To check the measurement system (test reagents, measurement device, and handling) ready-for-use nitrite standard solution, Cat.No. 250477, concentration 1000 mg/l NO_2^-, can be used after diluting accordingly.

14776 · Nitrite

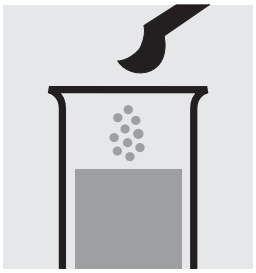
Measuring range:	0.02 – 1.00 mg/l NO_2-N	0.07 – 3.28 mg/l NO_2	10-mm cell
	0.010 – 0.500 mg/l NO_2-N	0.03 – 1.64 mg/l NO_2	20-mm cell
	0.002 – 0.200 mg/l NO_2-N	0.007 – 0.657 mg/l NO_2	50-mm cell
	Expression of results also possible in mmol/l.		



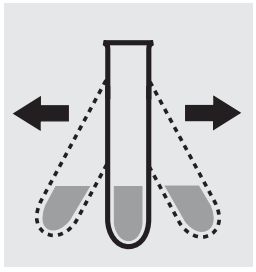
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



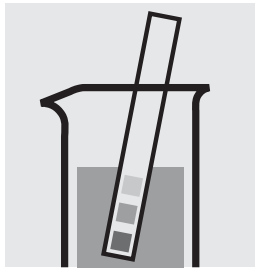
Pipette 5.0 ml of the sample into a test tube.



Add 1 level blue microspoon of **NO_2-1.**

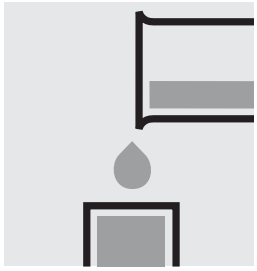


Shake vigorously to dissolve the solid substance.

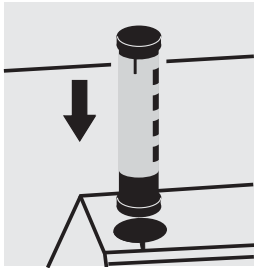


Check the pH, specified range: pH 2.0 – 2.5.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

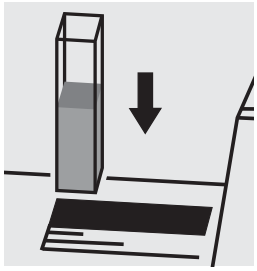
Reaction time:
10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

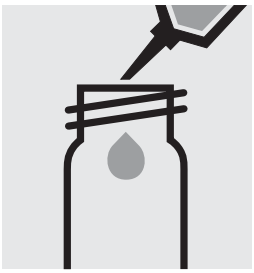
To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell can be used.

Quality assurance:

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

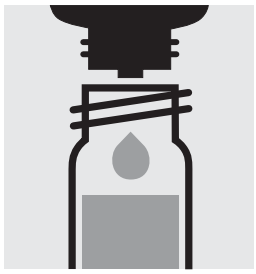
14537 · Nitrogen (total)

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

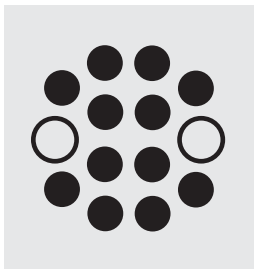


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

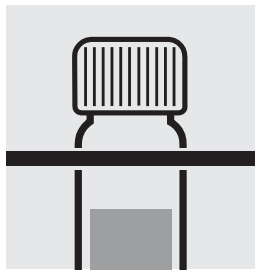
Add 1 level blue micro-spoon of **N-1K.**



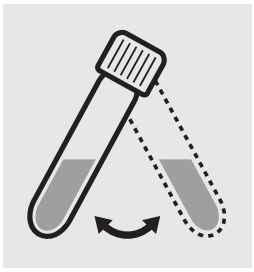
Add 6 drops of **N-2K,** close the cell with the screw cap, and mix.



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

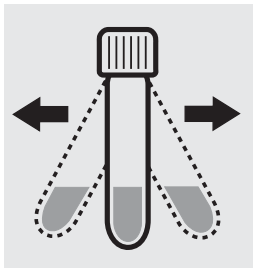


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature: **pretreated sample.**



Swirl the cell after 10 minutes.

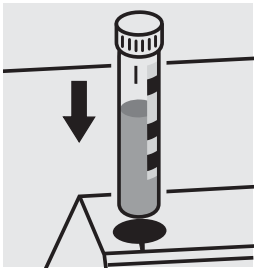
Add 1 level yellow micro-spoon of **N-3K into a reaction cell,** close the cell with the screw cap.



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 tightly with the screw cap, and mix briefly. **Caution, cell becomes hot!**

Reaction time: 10 minutes



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

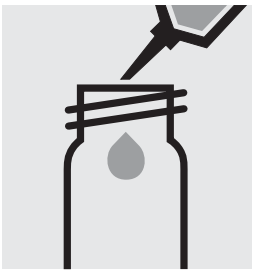
Quality assurance:

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

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

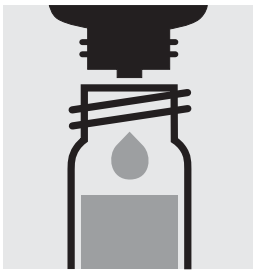
00613 · Nitrogen (total)

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

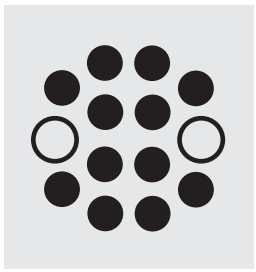


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

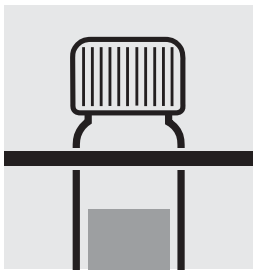
Add 1 level blue micro-spoon of **N-1K.**



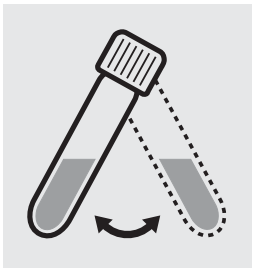
Add 6 drops of **N-2K,** close the cell with the screw cap, and mix.



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



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

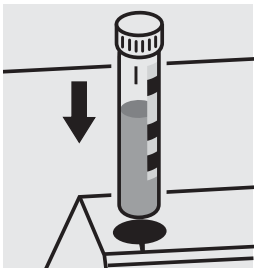


Swirl the cell after 10 minutes.

Pipette 1.0 ml of the **pretreated sample** into a reaction cell, **do not mix!**

Add 1.0 ml of **N-3K** with pipette, close the cell with the screw cap, and mix. **Caution, cell be comes hot!**

Reaction time: 10 minutes



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

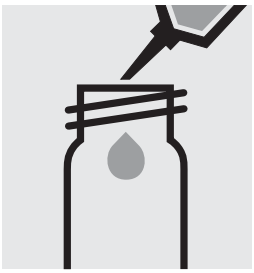
Quality assurance:

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

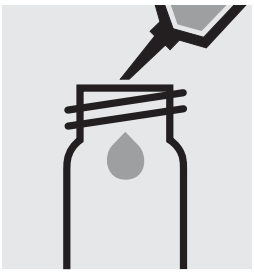
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 50) is highly recommended.

14763 · Nitrogen (total)

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

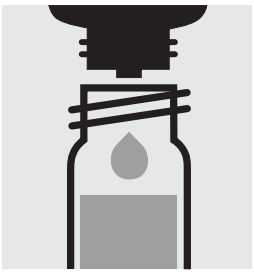


Pipette 1.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

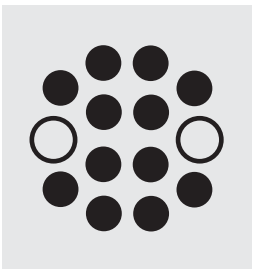


Add 9.0 ml of distilled water with pipette.

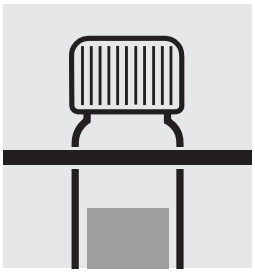
Add 1 level blue micro-spoon of **N-1K.**



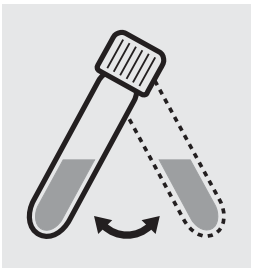
Add 6 drops of **N-2K,** close the cell with the screw cap, and mix.



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



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

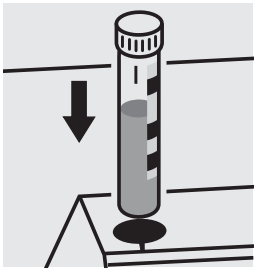


Swirl the cell after 10 minutes.

Pipette 1.0 ml of the **pretreated sample** into a reaction cell, **do not mix!**

Add 1.0 ml of **N-3K** with pipette, close the cell with the screw cap, and mix. **Caution, cell becomes hot!**

Reaction time: 10 minutes



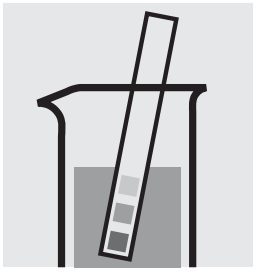
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

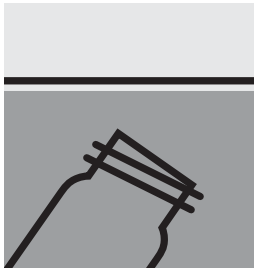
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 70, Cat.No. 250488.

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

Measuring range: 0.5 – 12.0 mg/l O_2



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



Fill watersample into a reaction cell to over-flowing and make sure, that no air bubbles are present.

Place the filled cell in a test-tube rack.

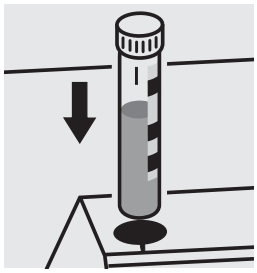
Add with microspoon 1 glass bead.

Add 5 drops of **O_2-1K.**

Add 5 drops of O_2-2K, close the cell with the screw cap, and shake for 10 seconds.

Reaction time: 1 minute

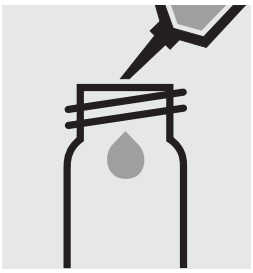
Add 10 drops of **O_2-3K,** close the cell with the screw cap, mix, and clean from outside.



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

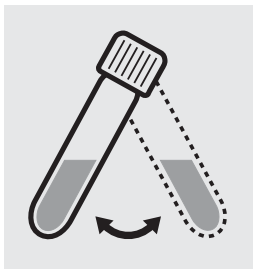
19251 · Oxygen scavengers

Measuring range:	0.020 – 0.500 mg/l DEHA*	20-mm cell
	* N,N-diethylenhydroxylamine	
	0.027 – 0.667 mg/l Carbohy*	20-mm cell
	* carbohydrazide	
	0.053 – 1.315 mg/l Hydro*	20-mm cell
	* hydroquinone	
	0.078 – 1.950 mg/l ISA*	20-mm cell
	* isoascorbic acid	
	0.087 – 2.170 mg/l MEKO*	20-mm cell
	* methylethylketoxime	



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

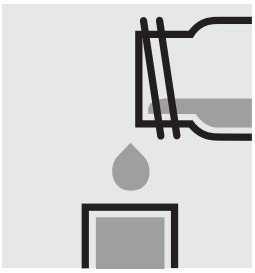
Add 1 powder pack of **Oxyscav 1** and close with the screw cap.



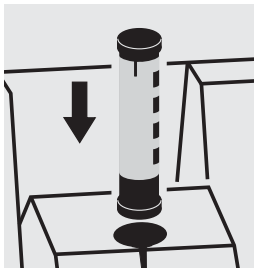
Swirl the cell to dissolve the solid substance.

Add 0.20 ml of **Oxyscav 2** with pipette, close with the screw cap, and mix.

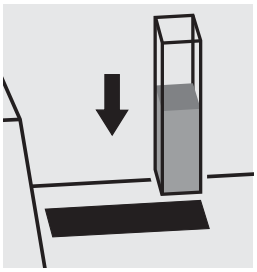
Reaction time: 10 minutes, **protect from light in the process**, **measure immediately**.



Transfer the solution into a cell.



Select method with AutoSelector.

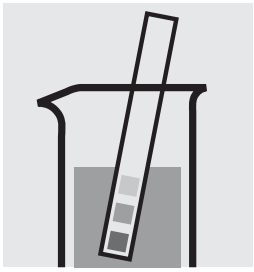


Place the cell into the cell compartment.

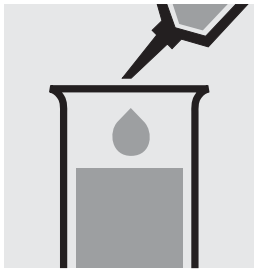
Quality assurance:

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

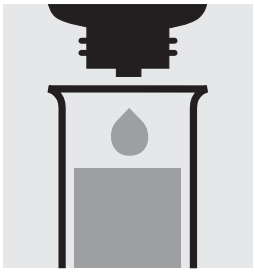
Measuring	0.05 – 4.00	mg/l O_3	10-mm cell
range:	0.02 – 2.00	mg/l O_3	20-mm cell
	0.010 – 0.800	mg/l O_3	50-mm cell
	Expression of results also possible in mmol/l.		



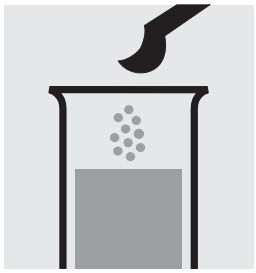
Check the pH of the sample, specified range: pH 4 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



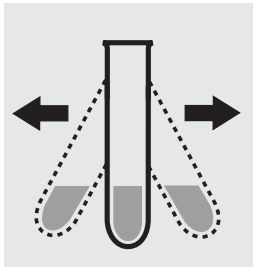
Pipette 10 ml of the sample into a test tube.



Add 2 drops of **O_3-1** and mix.

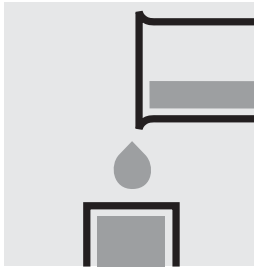


Add 1 level blue micro-spoon of **O_3-2.**

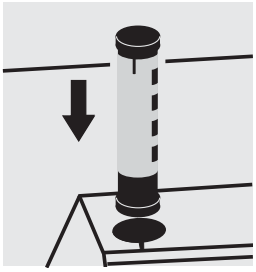


Shake vigorously to dissolve the solid substance.

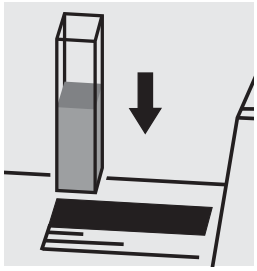
Reaction time:
3 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

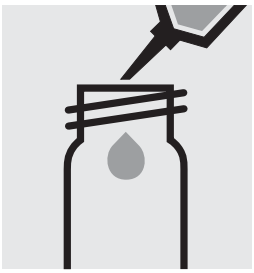
Important:

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

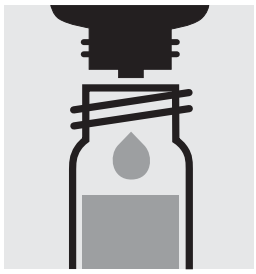
Quality assurance:

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

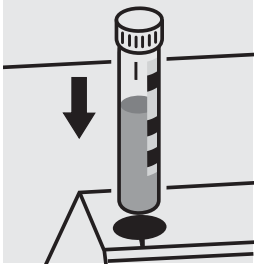
Measuring range: pH 6.4 – 8.8



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!**

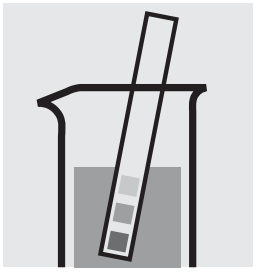


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (technical test reagents, measurement device, and handling) buffer solution pH 7.00, e.g. Cat.No. 108708, can be used.

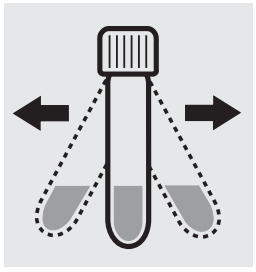
Measuring range:	0.10 – 2.50 mg/l C_6H_5OH Expression of results also possible in mmol/l.



Check the pH of the sample, specified range: pH 2 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

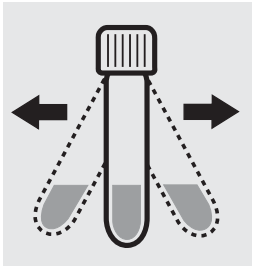
Pipette 10 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



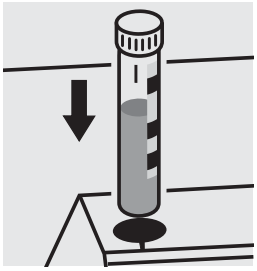
Shake the cell vigorously to dissolve the solid substance.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
1 minute



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

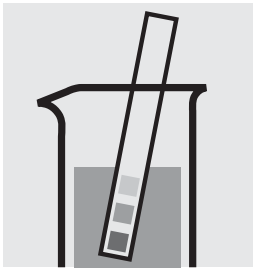
Important:

Very high phenol concentrationsin the sample result in a weakening of the colour and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

Quality assurance:

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

Measuring range:	0.002 – 0.100 mg/l C_6H_5OH Expression of results also possible in mmol/l.	20-mm cell



Check the pH of the sample, specified range: pH 2 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 200 ml of sample into a separation funnel.

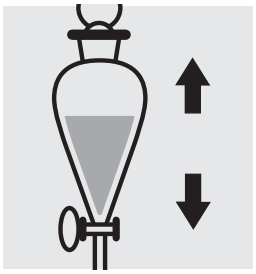
Add 5.0 ml of **Ph-1** with pipette and mix.

Add 1 level green microspoon of **Ph-2** and shake to dissolve the solid substance.

Add 1 level green microspoon of **Ph-3** and shake to dissolve the solid substance.

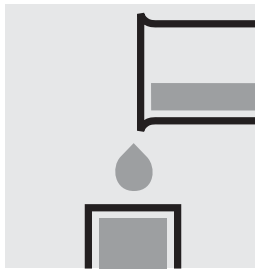
Reaction time:
30 minutes
(protected from light)

Add 10 ml of chloroform with pipette, close separation funnel.

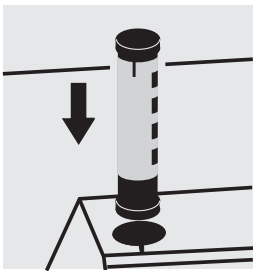


Shake vigorously for 1 minute.

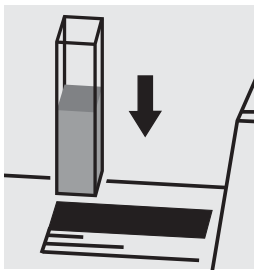
Leave to stand for 5 – 10 minutes to allow the phases to separate.



Transfer the clear **lower** phase into a cell.



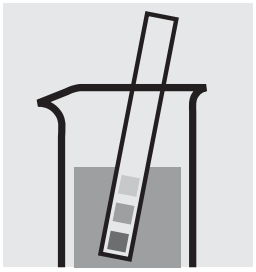
Select method with AutoSelector measuring range 0.002 – 0.100 mg/l.



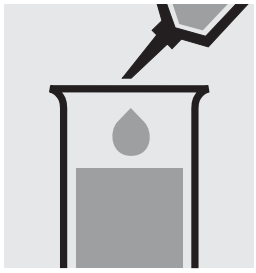
Place the cell into the cell compartment.

00856 · Phenol

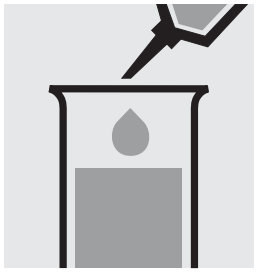
Measuring	0.10 – 5.00 mg/l C_6H_5OH	10-mm cell
range:	0.05 – 2.50 mg/l C_6H_5OH	20-mm cell
	0.025 – 1.000 mg/l C_6H_5OH	50-mm cell
	Expression of results also possible in mmol/l.	



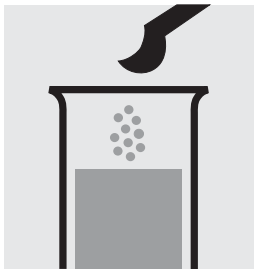
Check the pH of the sample, specified range: pH 2 – 11.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



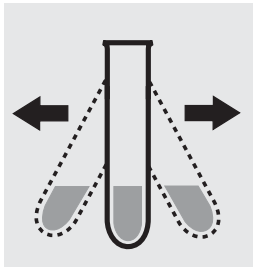
Pipette 10 ml of the sample into a test tube.



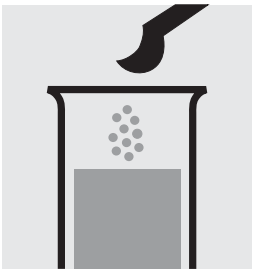
Add 1.0 ml of **Ph-1** with pipette and mix.



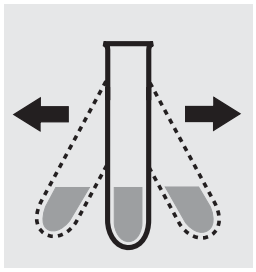
Add 1 level grey micro-spoon of **Ph-2.**



Shake vigorously to dissolve the solid substance.

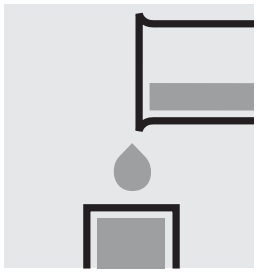


Add 1 level grey micro-spoon of **Ph-3.**

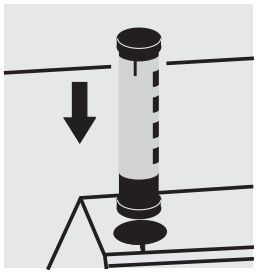


Shake vigorously to dissolve the solid substance.

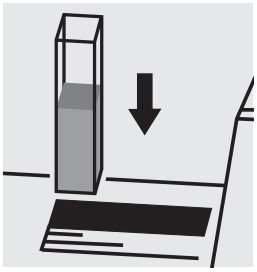
Reaction time: 10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector measuring range 0.025 – 5.00 mg/l.



Place the cell into the cell compartment.

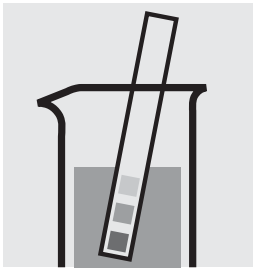
Quality assurance:

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

P6/25 · Phosphate

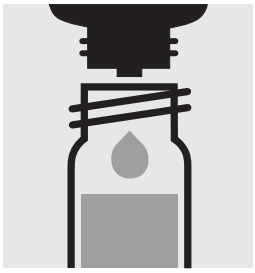
Determination of orthophosphate

Measuring	0.05 – 5.00 mg/l PO_4 -P
range:	0.2 – 15.3 mg/l PO_4
	0.11 – 11.46 mg/l P_2O_5
	Expression of results also possible in mmol/l.

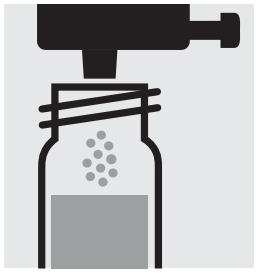


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

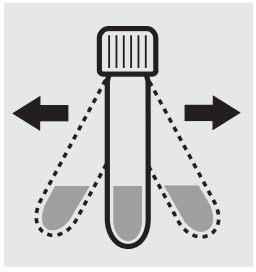
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

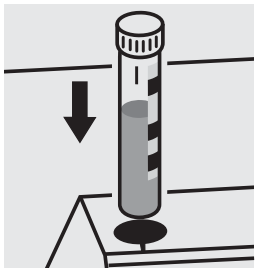


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

Quality assurance:

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

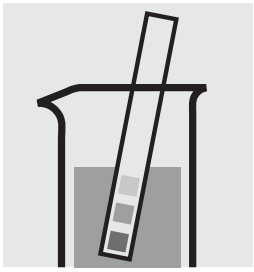
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

P6/25 · Phosphate

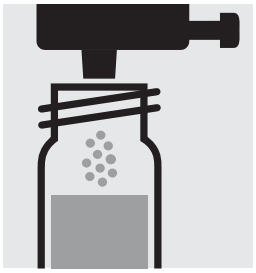
Determination of total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate

Measuring	0.05 – 5.00 mg/l P
range:	0.2 –15.3 mg/l PO_4
	0.11 – 11.46 mg/l P_2O_5
	Expression of results also possible in mmol/l and also in
	P total (Σ P), and P org* [P(o)].

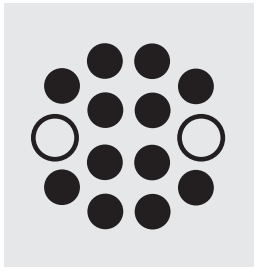


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

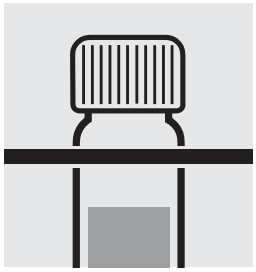
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



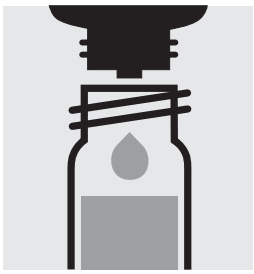
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



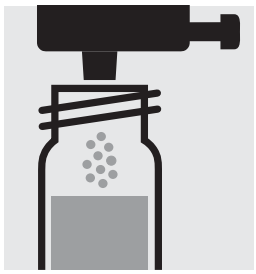
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



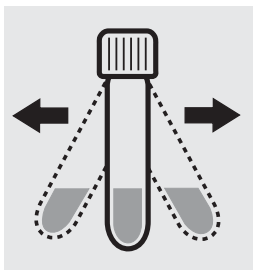
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

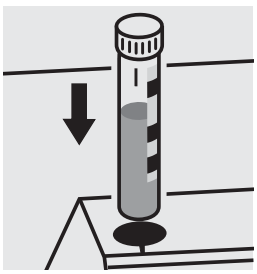


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

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

*P org is the sum of polyphosphate and organophosphate.

Quality assurance:

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

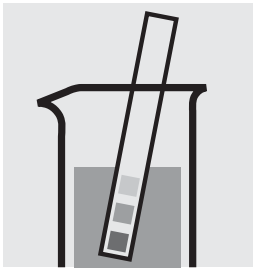
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

P7/25 · Phosphate

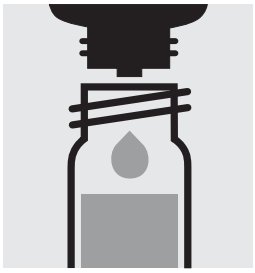
Determination of orthophosphate

Measuring	0.5 – 25.0 mg/l PO_4 -P
range:	1.5 – 76.7 mg/l PO_4
	1.1 – 57.3 mg/l P_2O_5
	Expression of results also possible in mmol/l.

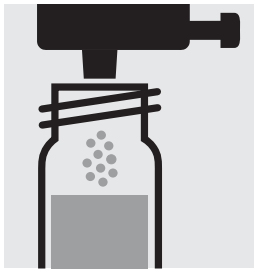


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

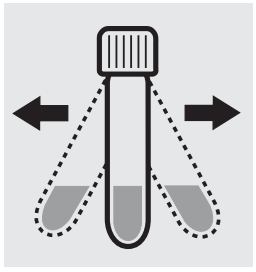
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

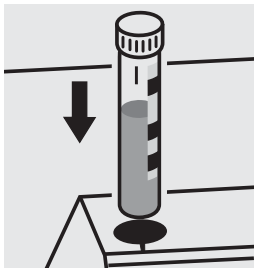


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

Quality assurance:

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

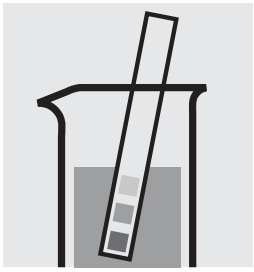
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

P7/25 · Phosphate

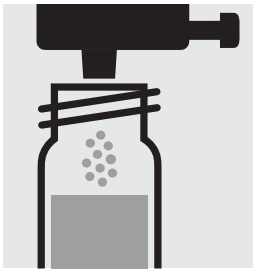
Determination of total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate

Measuring	0.5 – 25.0 mg/l P
range:	1.5 – 76.7 mg/l PO_4
	1.1 – 57.3 mg/l P_2O_5
	Expression of results also possible in mmol/l and also in
	P total (Σ P), and P org* [P(o)].

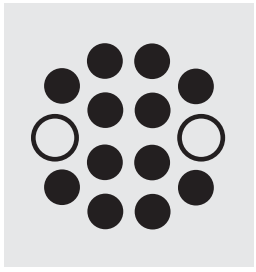


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

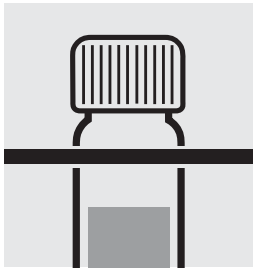
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



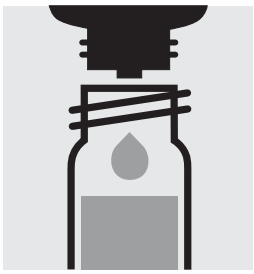
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



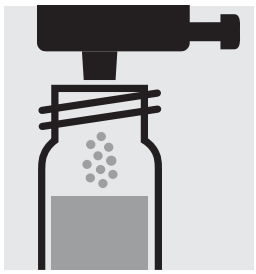
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



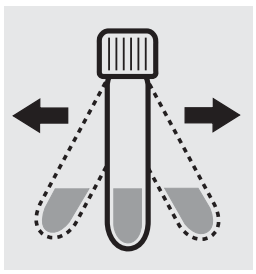
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

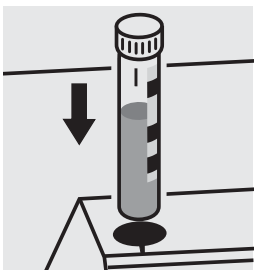


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

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

*P org is the sum of polyphosphate and organophosphate.

Quality assurance:

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

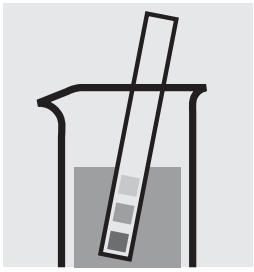
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

14543 · Phosphate

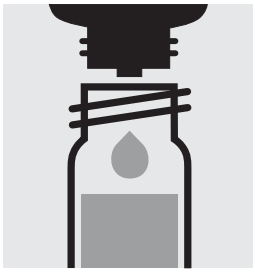
Determination of orthophosphate

Measuring	0.05 – 5.00 mg/l PO_4 -P
range:	0.2 – 15.3 mg/l PO_4
	0.11 – 11.46 mg/l P_2O_5
	Expression of results also possible in mmol/l.

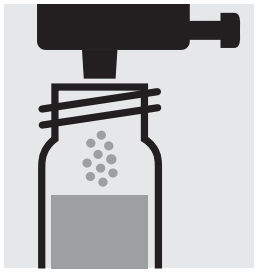


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

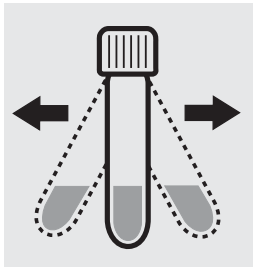
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

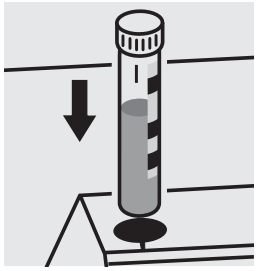


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

Quality assurance:

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

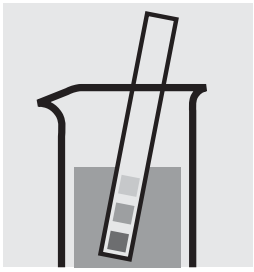
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

14543 · Phosphate

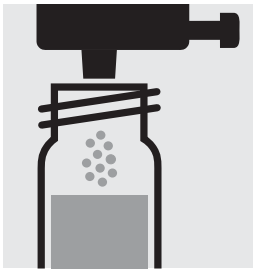
Determination of total phosphorus
= sum of orthophosphate, polyphosphate and organophosphate

Measuring	0.05 – 5.00 mg/l P
range:	0.2 – 15.3 mg/l PO_4
	0.11 – 11.46 mg/l P_2O_5
	Expression of results also possible in mmol/l and also in
	P total (Σ P), and P org* [P(o)].

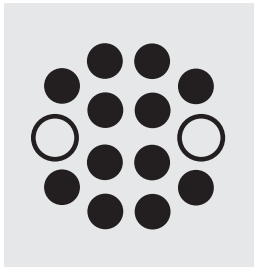


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

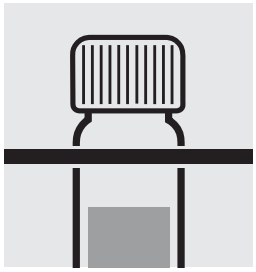
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



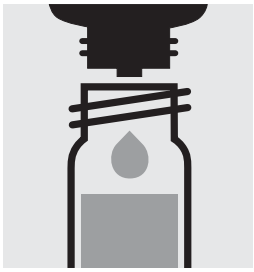
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



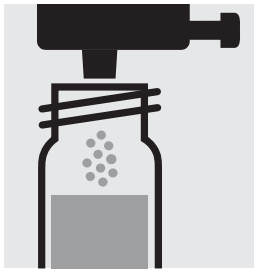
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



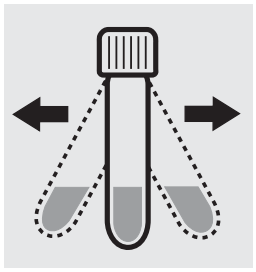
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

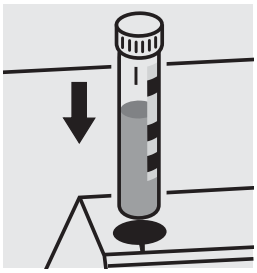


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

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

*P org is the sum of polyphosphate and organophosphate.

Quality assurance:

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

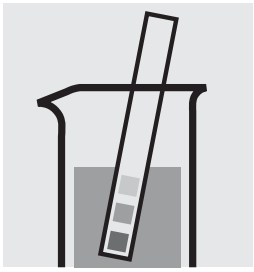
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

14729 · Phosphate

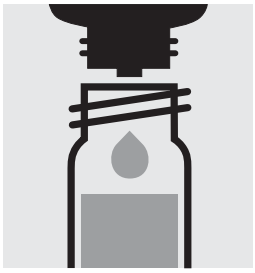
Determination of orthophosphate

Measuring range:	0.5 – 25.0 mg/l PO_4 -P
	1.5 – 76.7 mg/l PO_4
	1.1 – 57.3 mg/l P_2O_5
	Expression of results also possible in mmol/l.

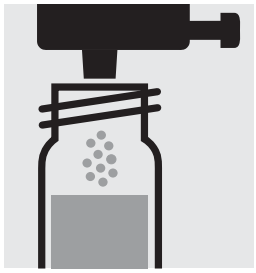


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

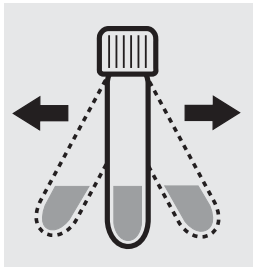
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

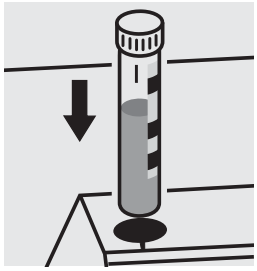


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

Quality assurance:

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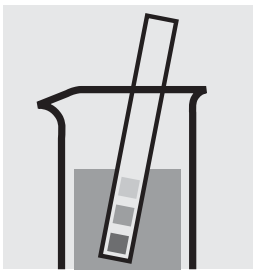
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

14729 · Phosphate

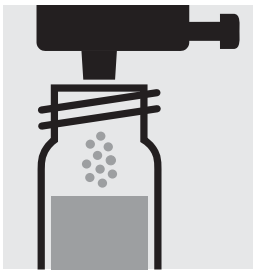
Determination of total phosphorus
= sum of orthophosphate, polyphosphate and organophosphate

Measuring	0.5 – 25.0 mg/l P
range:	1.5 – 76.7 mg/l PO_4
	1.1 – 57.3 mg/l P_2O_5
	Expression of results also possible in mmol/l and also in
	P total (Σ P), and P org* [P(o)].

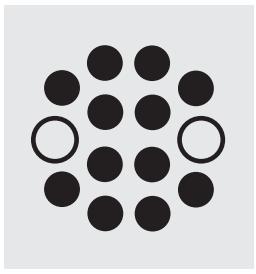


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

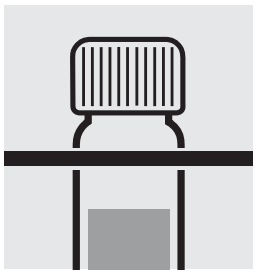
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.



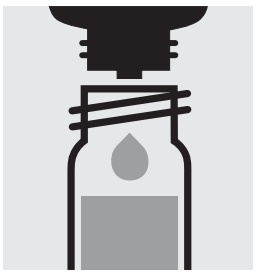
Add 1 dose of **P-1K** using the green dose-metering cap, close the cell with the screw cap.



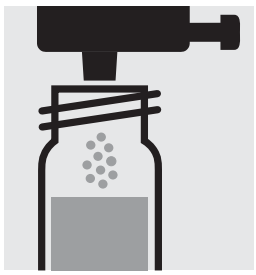
Heat the cell in the thermoreactor at 120 °C (100 °C) for 30 minutes.



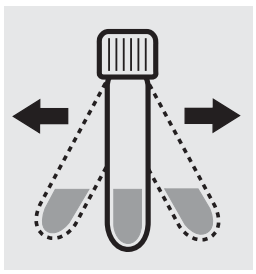
Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.



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

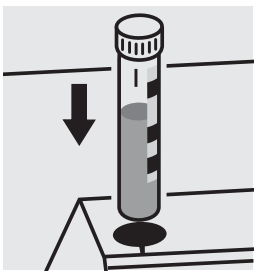


Add 1 dose of **P-3K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

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

*P org is the sum of polyphosphate and organophosphate.

Quality assurance:

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

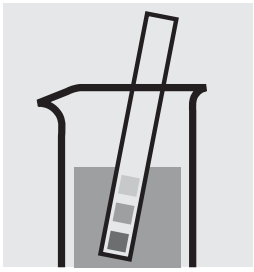
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

00616 · Phosphate

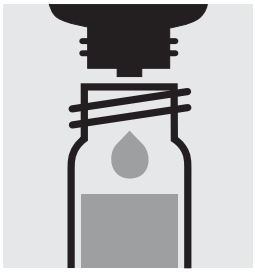
Determination of orthophosphate

Measuring	3.0 – 100.0	mg/l PO_4-P
range:	9 – 307	mg/l PO_4
	7 – 229	mg/l P_2O_5
	Expression of results also possible in mmol/l.	

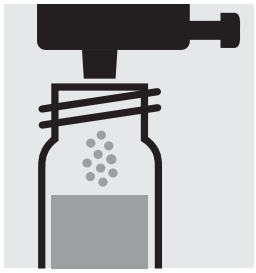


Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

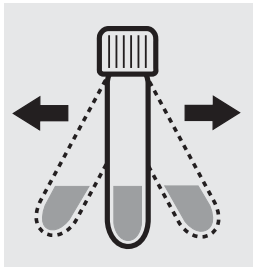
Pipette 0.20 ml of the sample into a reaction cell, close with the screw cap, and mix.



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

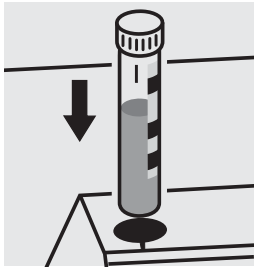


Add 1 dose of **PO_4-2K** using the blue dose-metering cap, close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
5 minutes



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

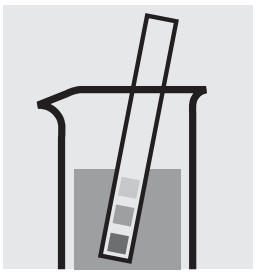
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can be used after diluting accordingly.

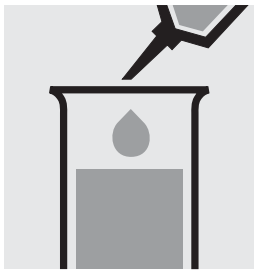
14848 · Phosphate

Determination of orthophosphate

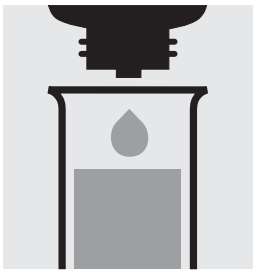
Measuring	0.05 – 5.00 mg/l PO_4-P	0.2 – 15.3 mg/l PO_4	0.11 – 11.46 mg/l P_2O_5	10-mm cell
range:	0.03 – 2.50 mg/l PO_4-P	0.09 – 7.67 mg/l PO_4	0.07 – 5.73 mg/l P_2O_5	20-mm cell
	0.010 – 1.000 mg/l PO_4-P	0.03 – 3.07 mg/l PO_4	0.02 – 2.29 mg/l P_2O_5	50-mm cell
	Expression of results also possible in mmol/l.			



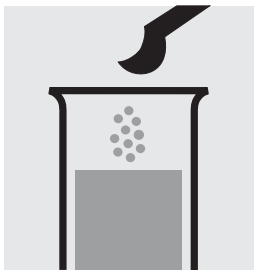
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



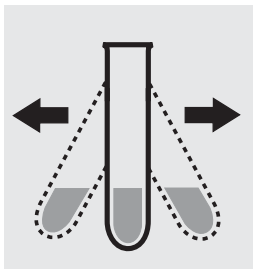
Pipette 5.0 ml of the sample into a test tube.



Add 5 drops of **PO_4-1** and mix.

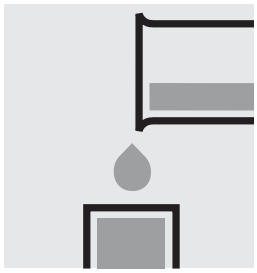


Add 1 level blue micro-spoon of **PO_4-2.**

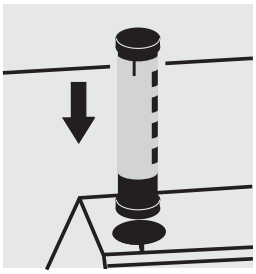


Shake vigorously to dissolve the solid substance.

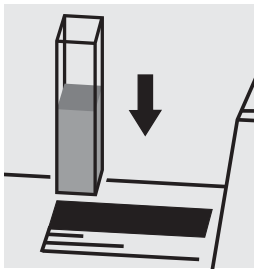
Reaction time:
5 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

For measurement in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each.
Alternatively, the semi-microcell can be used.

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate** a pretreatment with Crack Set 10C, Cat.No. 252033, or Crack Set 10, Cat.No. 250496, and thermoreactor is necessary.

Result can be expressed as sum of phosphorus (Σ P).

Quality assurance:

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

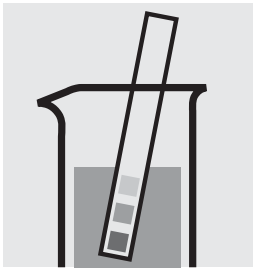
Ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can also be used after diluting accordingly.

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

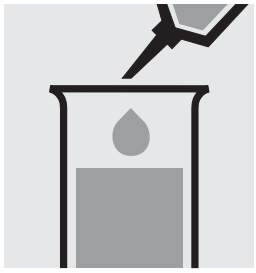
00798 · Phosphate

Determination of orthophosphate

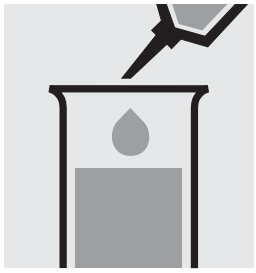
Measuring	1.0 – 100.0 mg/l PO_4-P	3 – 307 mg/l PO_4	2 – 229 mg/l P_2O_5	10-mm cell
range:	Expression of results also possible in mmol/l.			



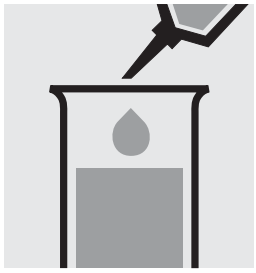
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



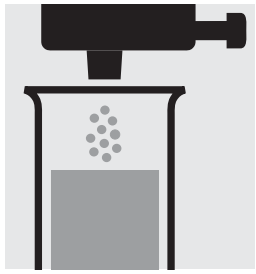
Pipette 8.0 ml of distilled water into a test tube.



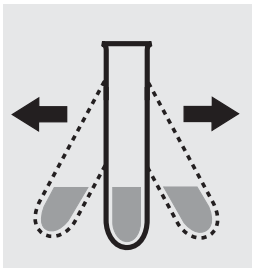
Add 0.50 ml of the sample with pipette and mix.



Add 0.50 ml of **PO_4-1** with pipette and mix.

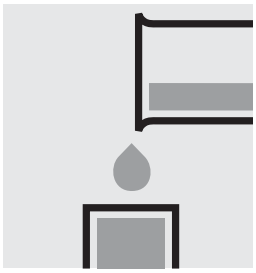


Add 1 dose of **PO_4-2** using the blue dose-metering cap.

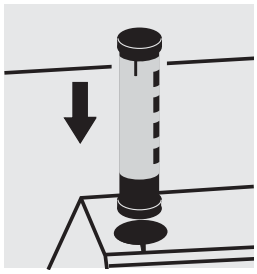


Shake vigorously to dissolve the solid substance.

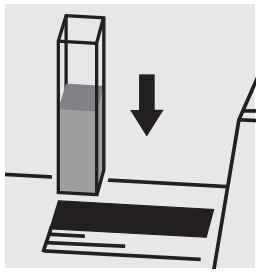
Reaction time:
5 minutes



Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

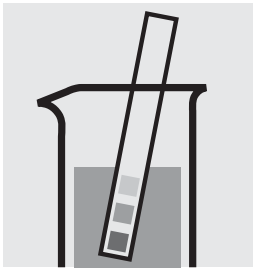
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can be used after diluting accordingly.

14546 · Phosphate

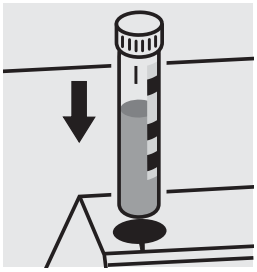
Determination of orthophosphate

Measuring range:	0.5 – 25.0 mg/l PO_4-P
	1.5 – 76.7 mg/l PO_4
	1.1 – 57.3 mg/l P_2O_5
	Expression of results also possible in mmol/l.



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

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



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

Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate** use Phosphate Cell Test, Cat.Nos. 250324 and 252076, or Phosphate Test, Cat.No. 250446, with the Crack Set 10 or 10C, Cat.Nos. 250496 or 252033.

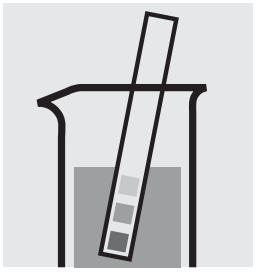
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can be used after diluting accordingly.

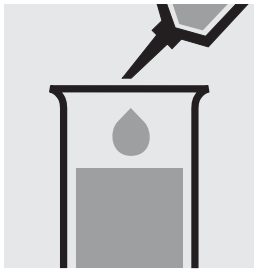
14842 · Phosphate

Determination of orthophosphate

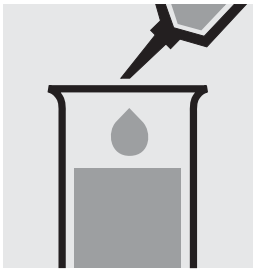
Measuring	1.0 – 30.0 mg/l PO_4-P	3.1 – 92.0 mg/l PO_4	2.3 – 68.7 mg/l P_2O_5	10-mm cell
range:	0.5 – 15.0 mg/l PO_4-P	1.5 – 46.0 mg/l PO_4	1.1 – 34.4 mg/l P_2O_5	20-mm cell
	Expression of results also possible in mmol/l.			



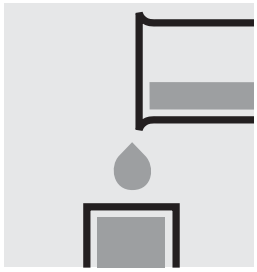
Check the pH of the sample, specified range: pH 0 – 10.
If required, add dilute sulfuric acid drop by drop to adjust the pH.



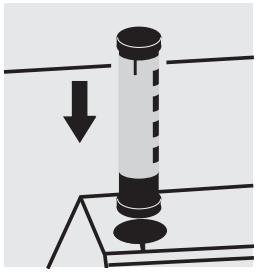
Pipette 5.0 ml of the sample into a test tube.



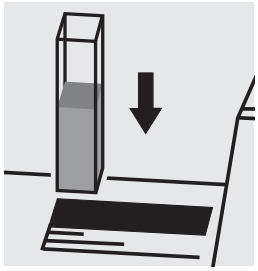
Add 1.2 ml of **PO_4-1** with piette and mix.



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

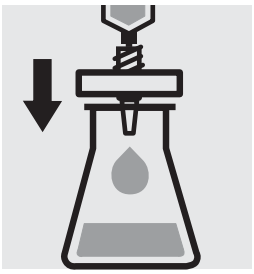
Important:

For the determination of **total phosphorus = sum of orthophosphate, polyphosphate, and organophosphate** use Phosphate Cell Test, Cat.Nos. 250324 and 252076, or Phosphate Test, Cat.No. 250446, with the Crack Set 10 or 10C, Cat.Nos. 250496 or 252033.

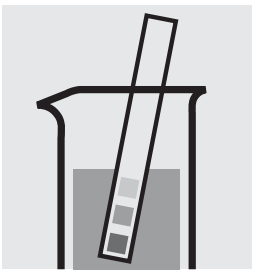
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use phosphate standard solution, Cat.No. 250478, concentration 1000 mg/l PO_4^{3-}, can be used after diluting accordingly.

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



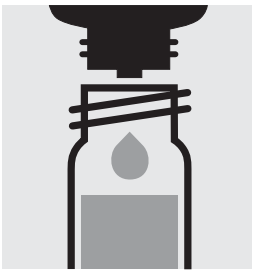
Filter turbid samples.



Check the pH of the sample, specified range: pH 3 – 12.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

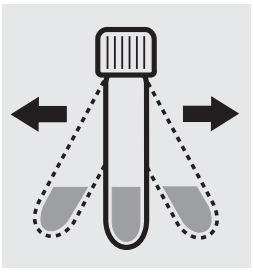
Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



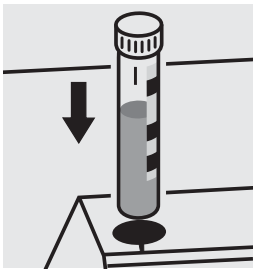
Add 6 drops of **K-1K,** close the cell with the screw cap, and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 5 minutes



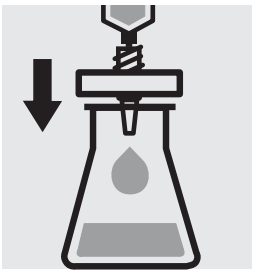
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

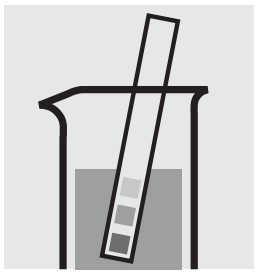
To check the measurement system (test reagents, measurement device, and handling) ready-for-use potassium standard solution, Cat.No. 252471, concentration 1000 mg/l K, can be used after diluting accordingly.

00615 · Potassium

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



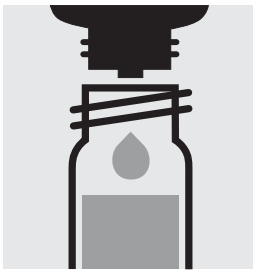
Filter turbid samples.



Check the pH of the sample, specified range: pH 3 – 12.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

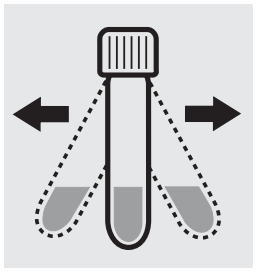
Pipette 0.50 ml of the sample into a reaction cell, close with the screw cap, and mix.

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



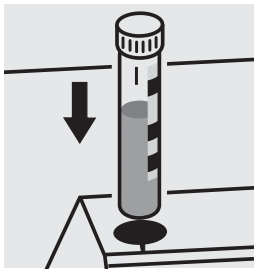
Add 6 drops of **K-1K,** close the cell with the screw cap, and mix.

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



Shake the cell vigorously to dissolve the solid substance.

Reaction time: 5 minutes



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

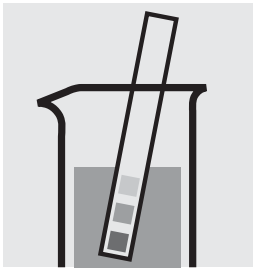
Quality assurance:

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

14683 · Residual Hardness

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

Measuring range:	0.70 – 7.00 mg/l CaO
	1.2 – 12.5 mg/l $CaCO_3$
Expression of results also possible in mmol/l.	

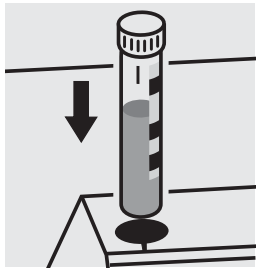


Check the pH of the sample, specified range: pH 5 – 8.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 4.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 0.20 ml of **RH-1K,** close the cell with the screw cap, and mix.

Reaction time:
10 minutes, **measure immediately.**



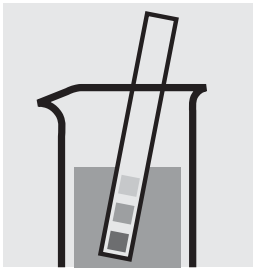
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

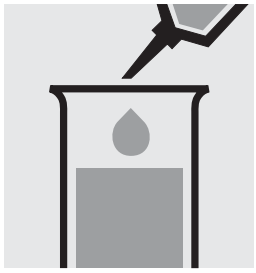
To check the measurement system (test reagents, measurement device, and handling) ready-for-use calcium standard solution, Cat.No. 250465, concentration 1000 mg/l Ca, can be used after diluting accordingly. (Pay attention to pH value!)

14794 · Silicate (silicic acid)

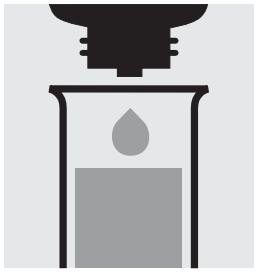
Measuring	0.21 – 10.70 mg/l SiO_2	0.10 – 5.00 mg/l Si	10-mm cell
	0.10 – 5.35 mg/l SiO_2	0.05 – 2.50 mg/l Si	20-mm cell
	0.011 – 1.600 mg/l SiO_2	0.005 – 0.750 mg/l Si	50-mm cell
	Expression of results also possible in mmol/l.		



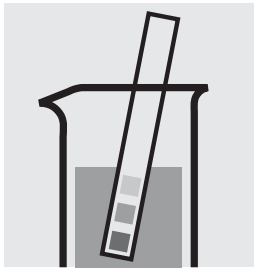
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.

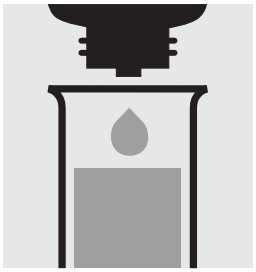


Add 3 drops of **Si-1** and mix.

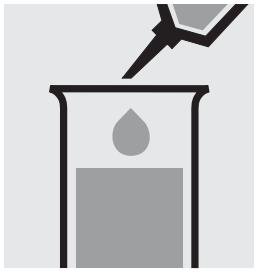


Check the pH, specified range: pH 1.2 – 1.6.

Reaction time: 3 minutes

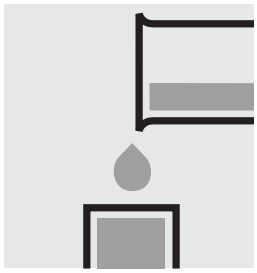


Add 3 drops of **Si-2** and mix.

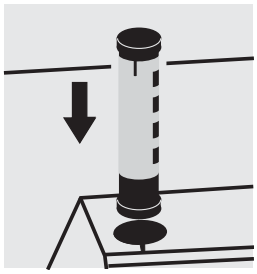


Add 0.50 ml of **Si-3** with pipette and mix.

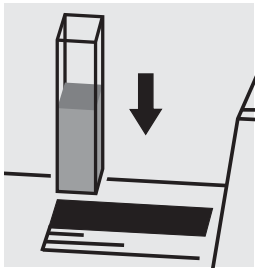
Reaction time: 10 minutes



Transfer the solution into a corresponding cell.



Select method with AutoSelector.
(Method 079 for 10 mm- and 20 mm-cells, and method 081 for the 50 mm-cell.)



Place the cell into the cell compartment.

Important:

The test kit contains two AutoSelectors that are to be chosen according to the measuring range or rectangular cell used (see label).

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 can be used.

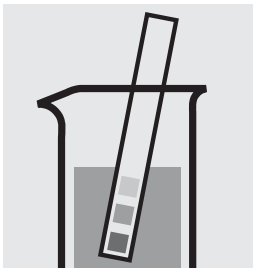
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use silicon standard solution, Cat.No. 252472, concentration 1000 mg/l Si, can be used after diluting accordingly. (Attention! Do **not** store standard solutions in glass vessels!)

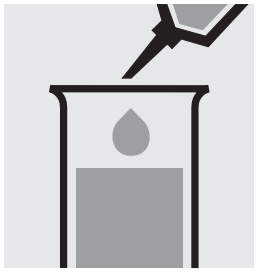
00857 · Silicate (silicic acid)

Measuring	1.1 – 107.0 mg/l SiO_2	0.5 – 50.0 mg/l Si	10-mm cell
range:	11 – 1070 mg/l SiO_2	5 – 500 mg/l Si	10-mm cell
	Expression of results also possible in mmol/l.		

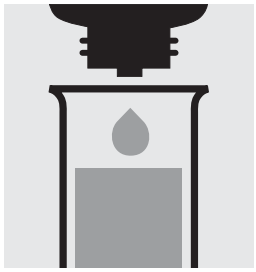
Measuring range: 1,1–107,0 mg/l SiO_2



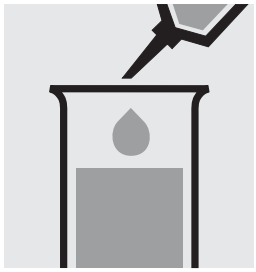
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 4.0 ml of the sample into a test tube.

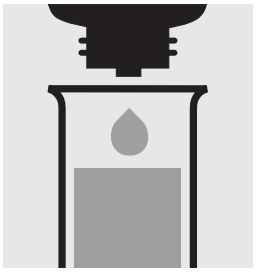


Add 4 drops of **Si-1** and mix.



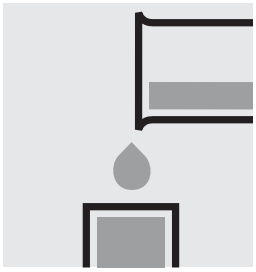
Add 2.0 ml of **Si-2** with pipette and mix.

Reaction time: 2 minutes

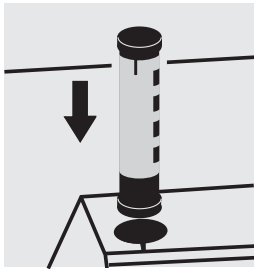


Add 4 drops of **Si-3** and mix.

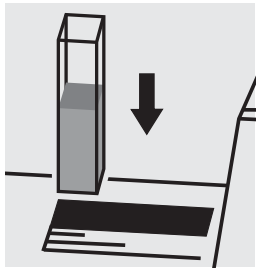
Reaction time: 2 minutes



Transfer the solution into a cell.

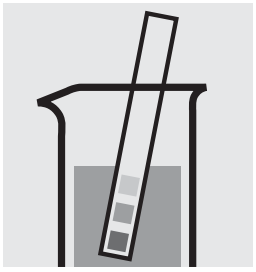


Select method with AutoSelector measuring range 0.5 – 50.0 mg/l Si.

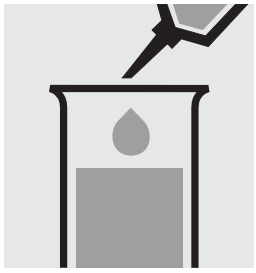


Place the cell into the cell compartment.

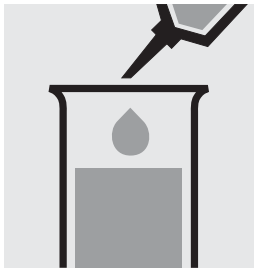
Measuring range: 11–1070 mg/l SiO_2



Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 5.0 ml of distilled water into a test tube.



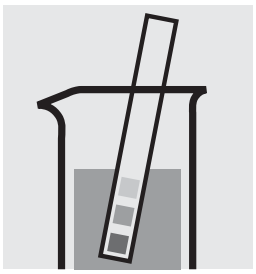
Add 0.50 ml of the sample with pipette and mix.

Continue as mentioned above; starting from the addition of **Si-1** (Fig. 3). Select method with AutoSelector measuring range 5 – 500 mg/l Si.

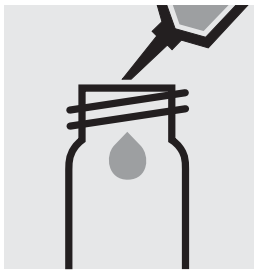
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use silicon standard solution, Cat.No. 252472, concentration 1000 mg/l Si, can be used after diluting accordingly. (Attention! Do **not** store standard solutions in glass vessels!)

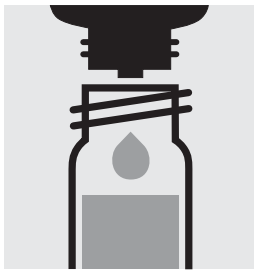
Measuring	0.50 – 3.00 mg/l Ag	10-mm cell
range:	0.25 – 1.50 mg/l Ag	20-mm cell
	Expression of results also possible in mmol/l.	



Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

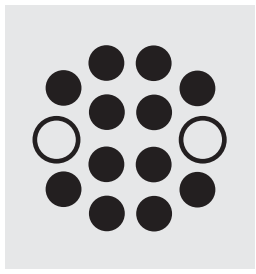


Pipette 10 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

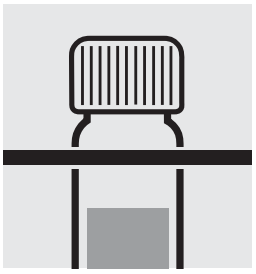


Add 2 drops of **Ag-1.**

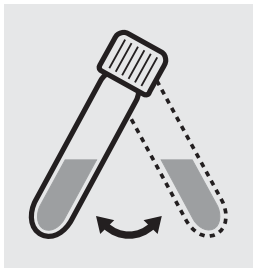
Add 1 level green microspoon of **Ag-2,** close the cell with the screw cap.



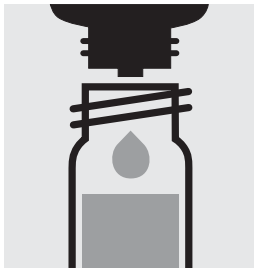
Heat the cell in the thermoreactor at 120 °C (100 °C) for 1 hours.



Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.

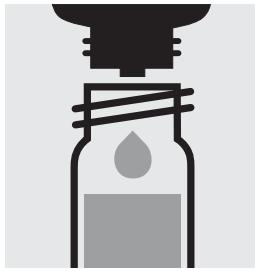


Swirl the cell before opening.

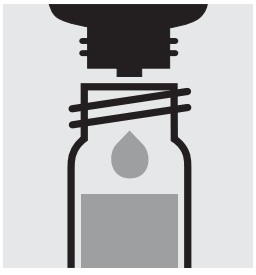


Add 3 drops of **Ag-3,** close with the screw cap, and mix.

Check the pH, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Add 1 drop of **Ag-4,** close with the screw cap, and mix.

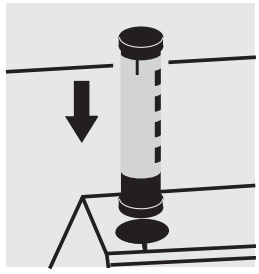


Add 5 drops of **Ag-5,** close with the screw cap, and mix.

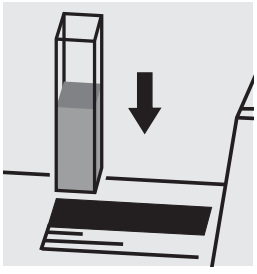
Add 1.0 ml of **Ag-6,** close with the screw cap, and mix.

Reaction time: 5 minutes

Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

Important:

Very high silver concentrations in the sample produce turbid solutions (measurement solution should be clear). In such cases the sample must be diluted (plausibility check).

Quality assurance:

To check the measurement system (test reagents,measurement device, and handling) ready-for-use silver standard solution, Cat.No. 250479, concentration 1000 mg/l Ag, can be used after diluting accordingly.

00885 · Sodium

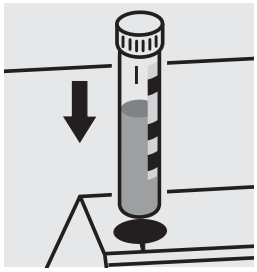
in nutrient solutions

Measuring range: 10 – 300 mg/l Na

Pipette 0.50 ml of **Na-1K** into a reaction cell and mix.

Add 0.50 ml of the sample with pipette, close the cell with the screw cap, and mix.

Reaction time: 1 minute

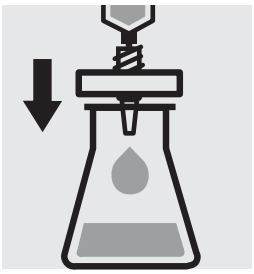


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

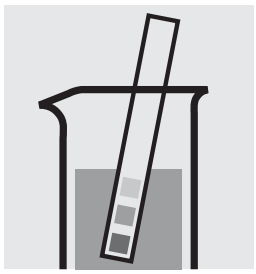
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use chloride standard solution, Cat.No. 250466, concentration 1000 mg/l Cl^- (corresponds to 649 mg/l Na), can be used after diluting accordingly (see section “Standard solutions”).

Measuring range:	5 – 250 mg/l SO_4 Expression of results also possible in mmol/l.



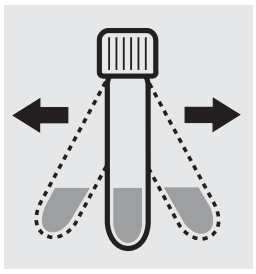
Filter turbid samples.



Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

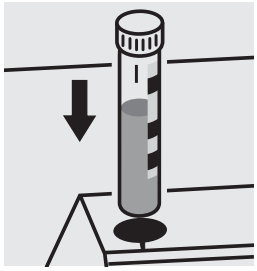
Pipette 5.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green microspoon of **SO_4-1K,** close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes, **measure immediately.**



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

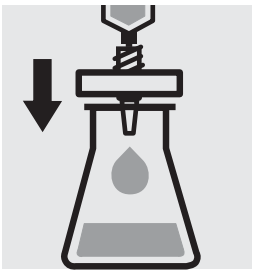
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat.No. 250482.

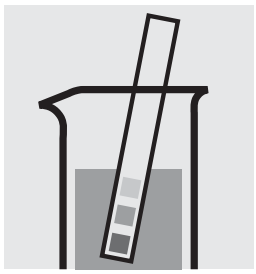
Ready-for-use sulfate standard solution, Cat.No. 250480, concentration 1000 mg/l SO_4^{2-}, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 10) is highly recommended.

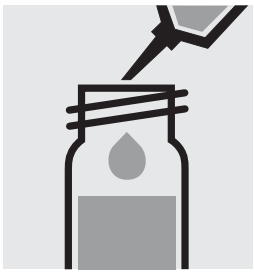
Measuring range:	50 – 500 mg/l SO_4 Expression of results also possible in mmol/l.



Filter turbid samples.

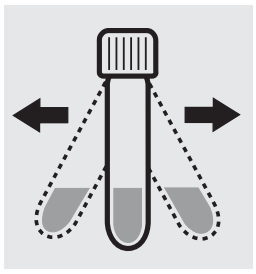


Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



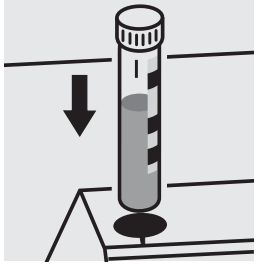
Pipette 2.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green micro-spoon of **SO_4-1K,** close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes, **measure immediately.**



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

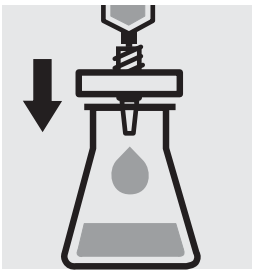
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat.No. 250482.

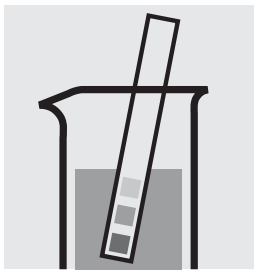
Ready-for-use sulfate standard solution, Cat.No. 250480, concentration 1000 mg/l SO_4^{2-}, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 10) is highly recommended.

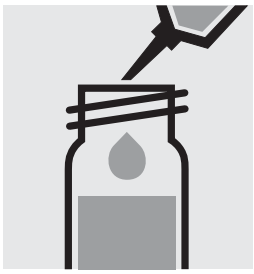
Measuring range:	100 – 1000 mg/l SO_4 Expression of results also possible in mmol/l.



Filter turbid samples.

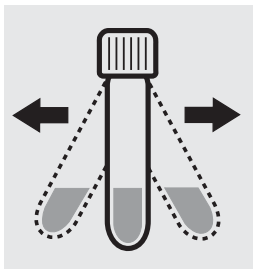


Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



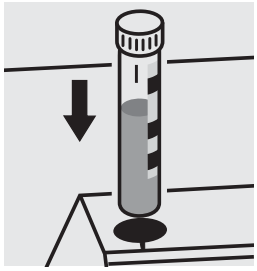
Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1 level green micro-spoon of **SO_4-1K,** close the cell with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Reaction time:
2 minutes, **measure immediately.**



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

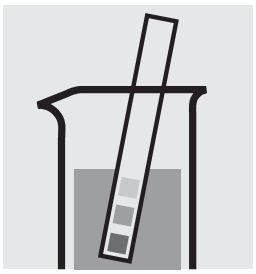
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20, Cat.No. 250483.

Ready-for-use sulfate standard solution, Cat.No. 250480, concentration 1000 mg/l SO_4^{2-}, can also be used after diluting accordingly.

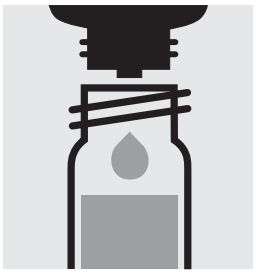
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 20) is highly recommended.

Measuring range:	25 – 300 mg/l SO_4 Expression of results also possible in mmol/l.	10-mm cell



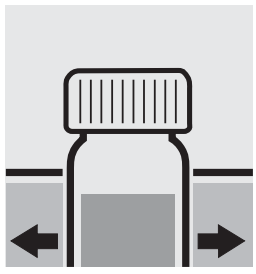
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 2.5 ml of the sample into a test tube with screw cap.



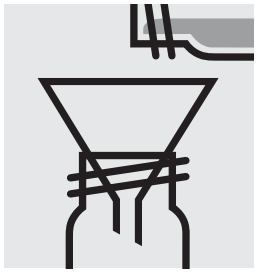
Add 2 drops of **SO_4-1** and mix.

Add 1 level green microspoon of **SO_4-2,** close the test tube with the screw cap, and mix.

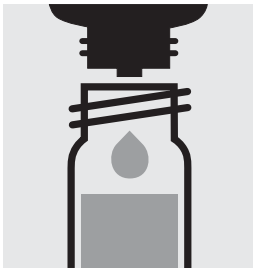


Temper the test tube in a water bath at 40 °C for 5 minutes.

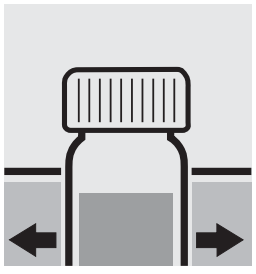
Add 2.5 ml of **SO_4-3** with pipette and mix.



Filter the content of the test tube with a round filter into another test tube with screw cap.

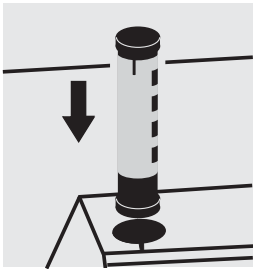


Add 4 drops of **SO_4-4** to the filtrate, close the test tube with the screw cap, and mix.

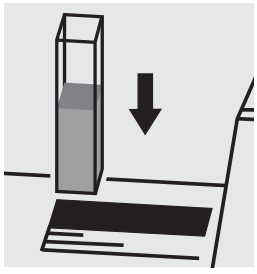


Temper the test tube again in the water bath for 7 minutes.

Transfer the solution into a cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

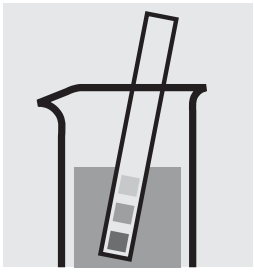
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 10, Cat.No. 250482.

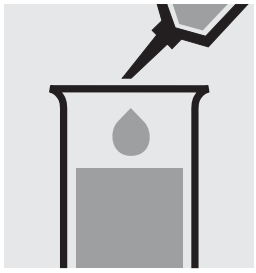
Ready-for-use sulfate standard solution, Cat.No. 250480, concentration 1000 mg/l SO_4^{2-}, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 10) is highly recommended.

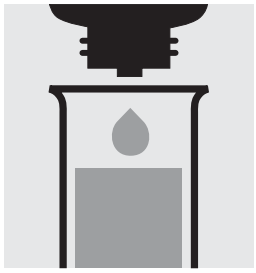
Measuring	0.10 – 1.50 mg/l S	0.10 – 1.55 mg/l HS	10-mm cell
range:	0.050 – 0.750 mg/l S	0.052 – 0.774 mg/l HS	20-mm cell
	0.020 – 0.500 mg/l S	0.021 – 0.516 mg/l HS	50-mm cell
	Expression of results also possible in mmol/l.		



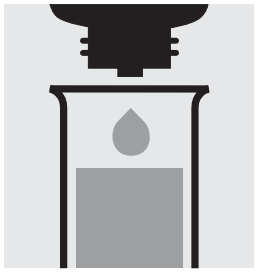
Check the pH of the sample, specified range: pH 2 – 10.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



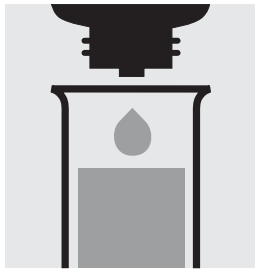
Pipette 5.0 ml of the sample into a test tube.



Add 1 drop of **S-1** and mix.

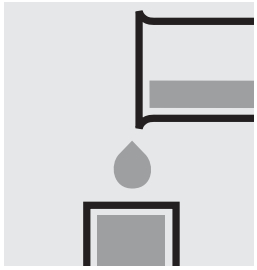


Add 5 drops of **S-2** and mix.

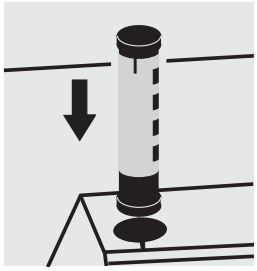


Add 5 drops of **S-3** and mix.

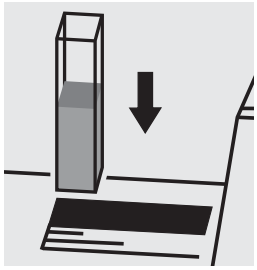
Reaction time:
1 minute.



Transfer the solution into a corresponding cell.



Select method with AutoSelector.



Place the cell into the cell compartment.

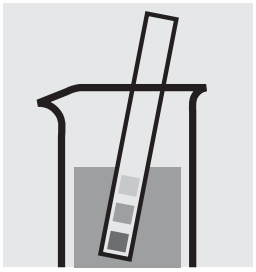
Important:

To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, the semi-microcell can be used.

Quality assurance:

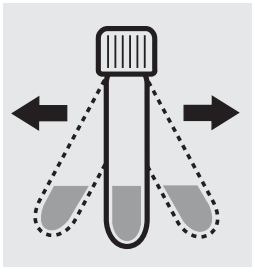
To check the measurement system (test reagents, measurement device, and handling) a sulfide standard solution must be prepared from sodium sulfide GR (see section “Standard solutions”).

Measuring range:	1.0 – 20.0 mg/l SO_3	Round cell
	0.8 – 16.0 mg/l SO_2	Round cell
	0.05 – 3.00 mg/l SO_3	50-mm cell (see “sensitive” preparation procedure)
	0.04 – 2.40 mg/l SO_3	50-mm cell (see “sensitive” preparation procedure)
	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.

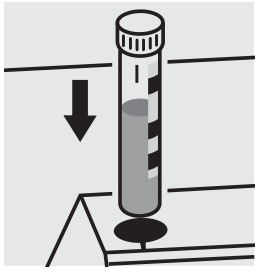
Add 1 level grey micro-spoon of **SO_3-1K** into a reaction cell, close with the screw cap.



Shake the cell vigorously to dissolve the solid substance.

Add 3.0 ml of the sample with pipette, close the cell with the screw cap, and mix.

Reaction time: 2 minutes



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

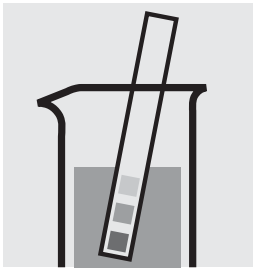
Sulfite sensitive

Use the same preparation procedure as above, but add 7.0 ml of the sample instead of 3.0 ml. Prepare an own blank by using 7.0 ml of distilled water and all reagents. For measurement transfer the solution into a 50-mm cell. Configure the photometer prior for blank-measurement. Select method **SO_3 sens** in the menu (method no. 127).

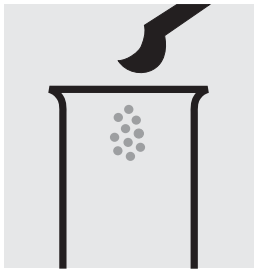
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR (see section “Standard solutions”).

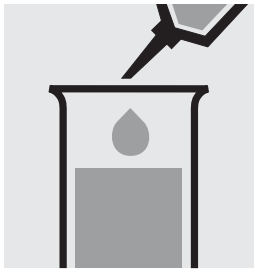
Measuring	1.0 – 60.0 mg/l SO_3	10-mm cell
range:	0.8 – 48.0 mg/l SO_2	10-mm cell
	Expression of results also possible in mmol/l.	



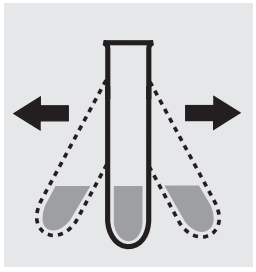
Check the pH of the sample, specified range: pH 4 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



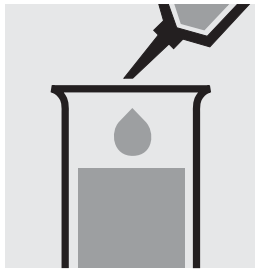
Place 1 level grey microspoon of **SO_3-1** into a dry test tube.



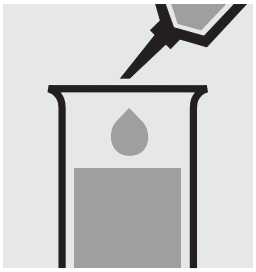
Add 3.0 ml of **SO_3-2** with pipette.



Shake vigorously to dissolve the solid substance.

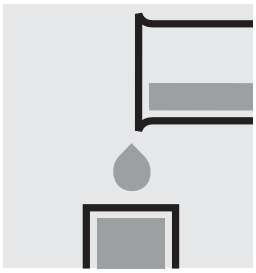


Add 5.0 ml of distilled water with pipette and mix.

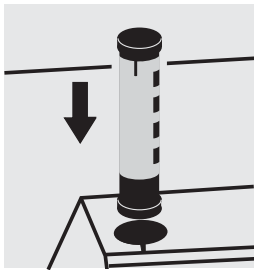


Add 2.0 ml of the sample with pipette and mix.

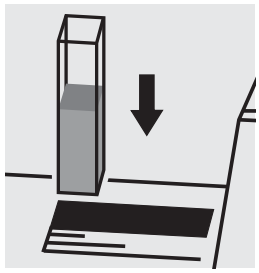
Reaction time:
2 minutes



Transfer the solution into a cell.



Select method with Auto-Selector.



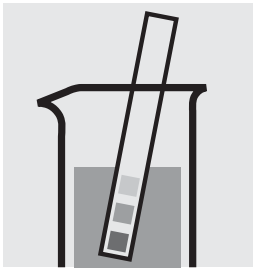
Place the cell into the cell compartment.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a sulfite standard solution must be prepared from sodium sulfite GR (see section “Standard solutions”).

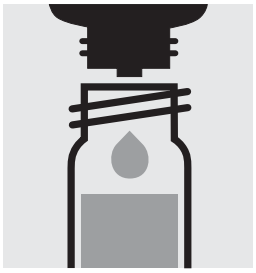
14697 · Surfactants (anionic)

Measuring range:	0.05 – 2.00 mg/l MBAS*
	* **M**ethylene-**b**lue-**a**ctive **s**ubstances
	Expression of results also possible in mmol/l.

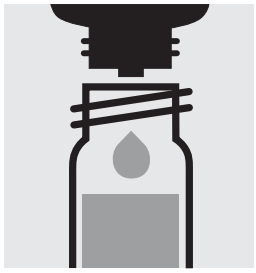


Check the pH of the sample, specified range: pH 5 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

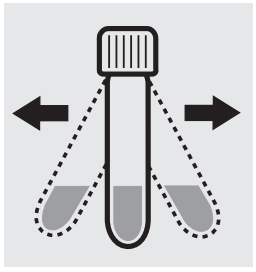
Pipette 5.0 ml of the sample into a reaction cell, **do not mix!**



Add 3 drops of **T-1K, do not mix!**

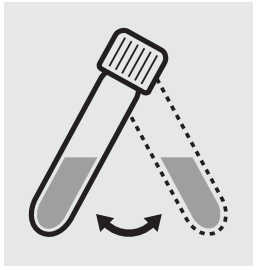


Add 2 drops of **T-2K,** close the cell with the screw cap.

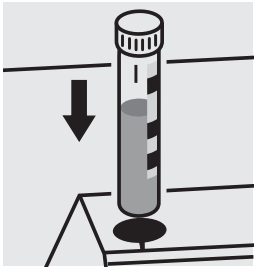


Shake the cell for 30 seconds.

Reaction time:
10 minutes



Swirl the cell before the measurement.



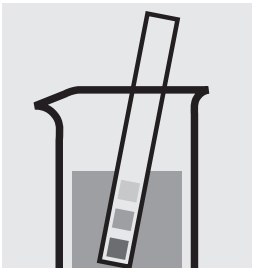
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from dodecane-1-sulfonic acid sodium salt GR (see section “Standard solutions”).

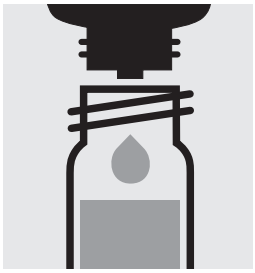
02552 · Surfactants (anionic)

Measuring range:	0,05 - 2,00 mg/l MBAS* * Methylene-blue-active substances
	Ergebnisangabe auch in mmol/l möglich

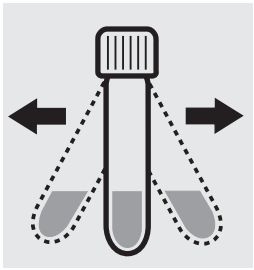


Check the pH value of the sample.
Required range:
pH 5-10.
Correct with diluted sodium hydroxide solution or hydrochloric acid as necessary.

Pipette 5.0 ml of sample into a reaction cell.
Do not mix the contents!

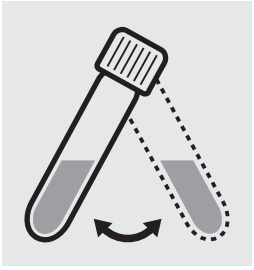


Add 2 drops of **T-1K**, close the cell with the screw cap.

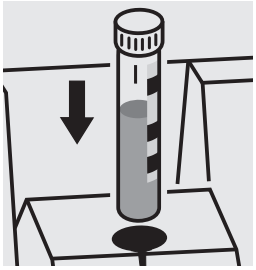


Shake the cell vigorously for 30 seconds.

Reaction time:
10 minutes



Swirl the cell before the measurement.



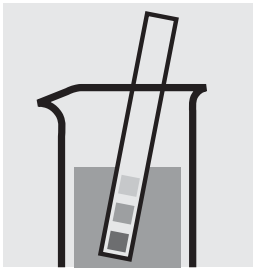
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

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 (see section “Standard solutions”).

01764 · Surfactants (cationic)

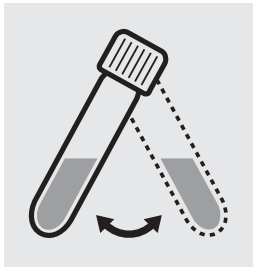
Measuring range:	0.05 – 1.50 mg/l k-Ten (calculated as N-cetyl-N,N,N-trimethylammonium bromide)



Check the pH of the sample, specified range: pH 3 – 8.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

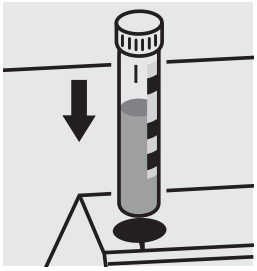
Pipette 5.0 ml of the sample into a reaction cell, **do not mix!**

Add 0.50 ml of **T-1K** with pipette and close with the screw cap.



Swirl the cell for 30 seconds.

Reaction time: 5 minutes



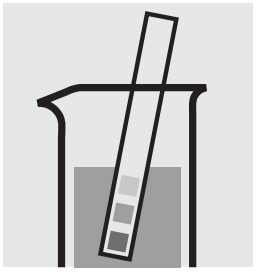
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from N-cetyl-N,N,N-trimethylammonium bromide (see section “Standard solutions”).

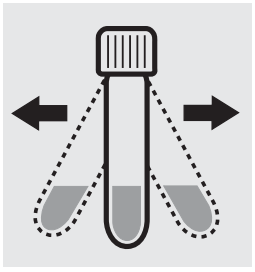
01787 · Surfactants (nonionic)

Measuring range:	0.010 – 7.50 mg/l n-Ten (calculated as Triton® X-100)



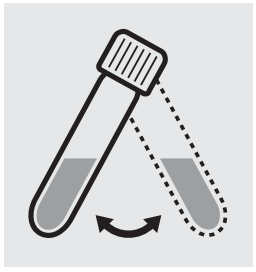
Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.

Pipette 4.0 ml of the sample into a reaction cell. Close with the screw cap.

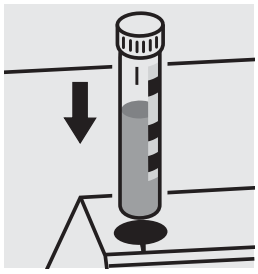


Shake the cell **for 1 minute vigorously.**

Reaction time:
2 minutes



Swirl the cell before measurement.

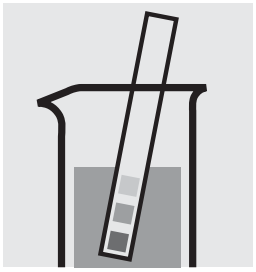


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

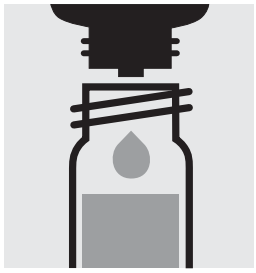
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a surfactants standard solution must be prepared from Triton® X-100 (see section “Standard solutions”).

Measuring range:	0.10 – 2.50 mg/l Sn Expression of results also possible in mmol/l.



Check the pH of the sample, specified range: pH < 3.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

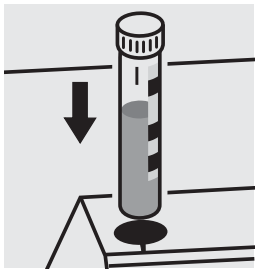


Add 6 drops of **Sn-1K** into a reaction cell, close with the screw cap, and mix.

Add 5.0 ml of the sample with pipette, close the cell with the screw cap, and mix.

Check the pH, specified range: pH 1.5 – 3.5.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

Reaction time: 15 minutes



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

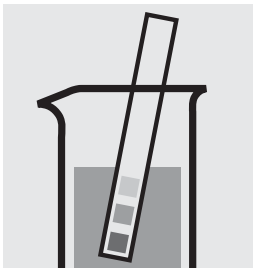
To check the measurement system (test reagents, measurement device, and handling) ready-for-use tin standard solution, Cat.No. 250501, concentration 1000 mg/l Sn, can be used after diluting accordingly in diluted hydrochloric acid.

14878 · TOC

Total Organic Carbon

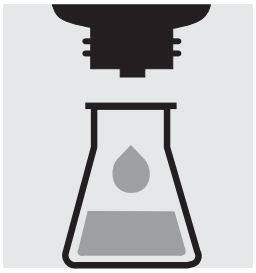
Measuring range: 5.0 – 80.0 mg/l TOC

Removal of inorganic bound carbon (TIC):



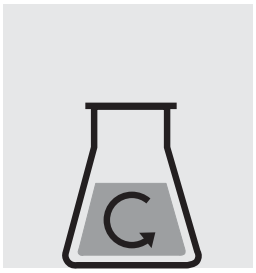
Check the pH of the sample, specified range: pH 2 – 12.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

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.

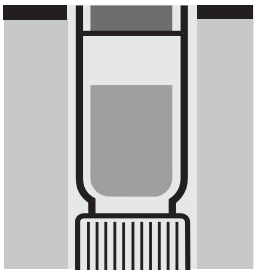


Stir for 10 minutes.

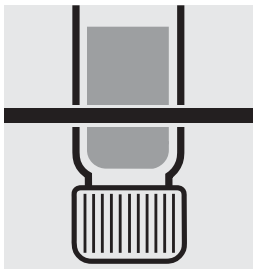
Preparation of measurement sample:

Pipette 3.0 ml of stirred sample into a reaction cell.

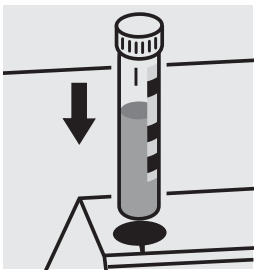
Add 1 level grey micro-spoon of **TOC-2K. Immediately** close the cell tightly with an **aluminium cap** (Cat.No. 73500).



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.

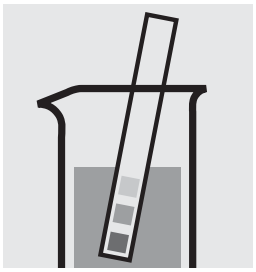
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a TOC standard solution, Cat.No. 250499, concentration 1000 mg/l TOC, can be used after diluting accordingly.

Total Organic Carbon

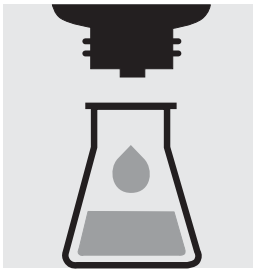
Measuring range: 50 – 800 mg/l TOC

Removal of inorganic bound carbon (TIC):



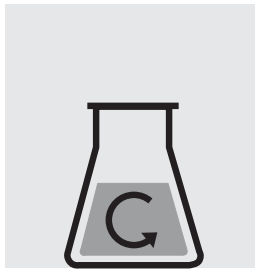
Check the pH of the sample, specified range: pH 2 – 12.
If required, add dilute sulfuric acid drop by drop to adjust the pH.

Pipette 1.0 ml of the sample and 9.0 ml of distilled water into a suitable glass vessel.



Add 2 drops of **TOC-1K** and mix.

Check the pH, specified range pH < 2.5

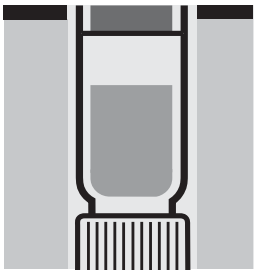


Stir for 10 minutes.

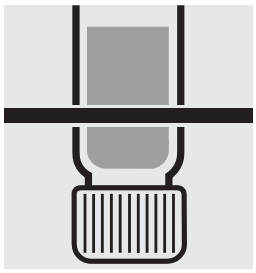
Preparation of measurement sample:

Pipette 3.0 ml of stirred sample into a reaction cell.

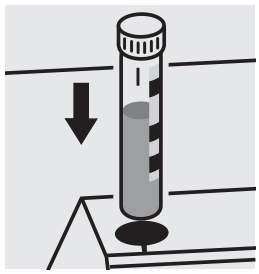
Add 1 level grey micro-spoon of **TOC-2K. Immediately** close the cell tightly with an **aluminium cap** (Cat.No. 252038).



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:

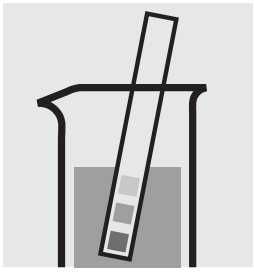
To check the measurement system (test reagents, measurement device, and handling) a TOC standard solution, Cat.No. 250499, concentration 1000 mg/l TOC, can be used after diluting accordingly.

00961 · Total Hardness

Determination of total hardness

Measuring range:	5 – 215	mg/l Ca	
	0.7 – 30.1	°d	
	0.9 – 37.6	°e	
	1.2 – 53.7	°f	

Measuring range:	7 – 301 mg/l CaO
	12 – 537 mg/l $CaCO_3$
Expression of results also possible in mmol/l	
and also in mg/l Mg.	

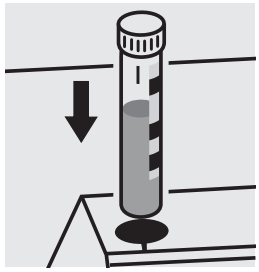


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

Add 1.0 ml of **H-1K** with pipette, close the cell with the screw cap, and mix.

Reaction time:
3 minutes



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a freshly prepared standard solution can be used (see section “Standard solutions”).

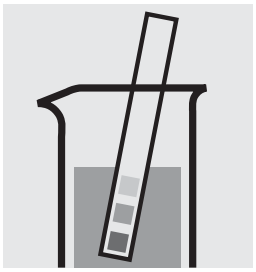
00961 · Total Hardness

Differentiation between Ca- and Mg-hardness

Measuring	0.12 –	5.36	mmol/l
range:	0.7 –	30.1	°d
	0.9 –	37.6	°e
	1.2 –	53.7	°f

Differentiation possible only in mmol/l.

A differentiation between calcium- and magnesium-hardness can be performed on the photometer. Prior to measuring, select the differentiation measurement and choose the corresponding citation form.

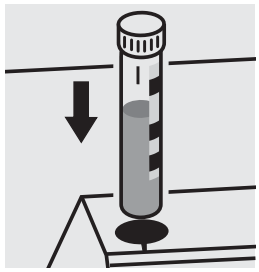


Check the pH of the sample, specified range: pH 3 – 9.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 1.0 ml of the sample into a reaction cell, close with the screw cap, and mix.

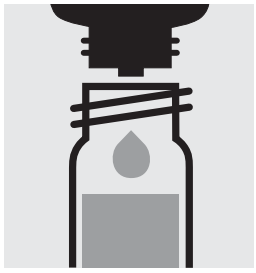
Add 1.0 ml of **H-1K** with pipette, close the cell with the screw cap, and mix.

Reaction time:
3 minutes

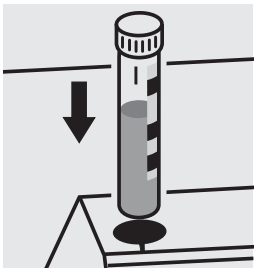


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer
= Result total hardness

Press enter, remove the cell.



Add 3 drops of **H-2K** to the already measured cell, close the cell with the screw cap, and mix.

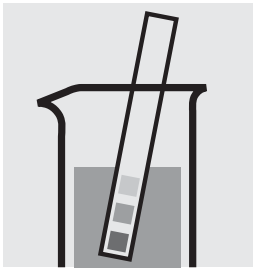


Place the cell into the cell compartment. Align the mark on the cell with that on the photometer
= Result magnesium

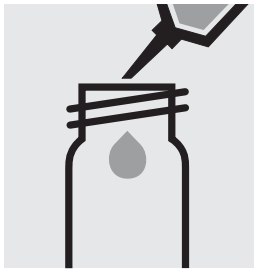
After pressing enter, the individual measuring values for Ca- and Mg-hardness are shown on the display.

01749 · Volatile Organic Acids

Measuring	50 – 3000 mg/l volatile organic acid	(calculated as acetic acid)
range:	71 – 4401 mg/l volatile organic acid	(calculated as butyric acid)

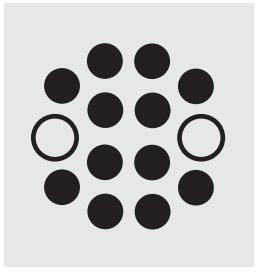


Check the pH of the sample, specified range: pH 2– 12.



Pipette 0.50 ml of **OA-1** into a round cell.

Add 0.50 ml of the sample with pipette, close with the screw cap, and mix.



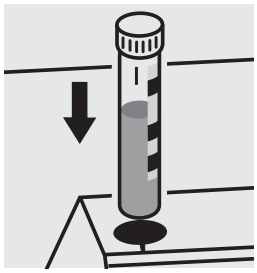
Heat the cell in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.

Add 1.0 ml of **OA-2** with pipette.

Add 1.0 ml of **OA-3** with pipette, close the cell with the screw cap, and mix.

Add 1.0 ml of **OA-4** with pipette, close the cell with the screw cap, and shake vigorously.

Reaction time:
1 minute



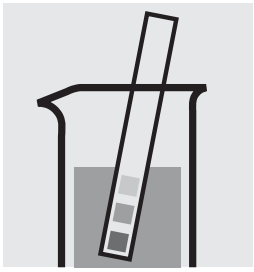
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

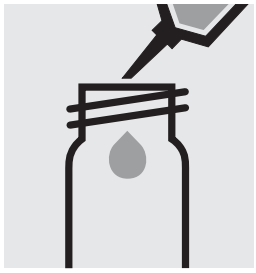
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous (see section “Standard solutions”).

01809 · Volatile Organic Acids

Measuring range:	50 – 3000 mg/l volatile organic acid	(calculated as acetic acid)
	71 – 4401 mg/l volatile organic acid	(calculated as butyric acid)



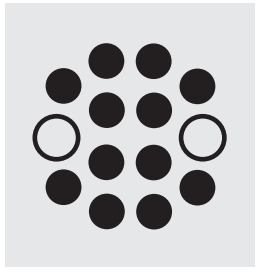
Check the pH of the sample, specified range: pH 2– 12.



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.



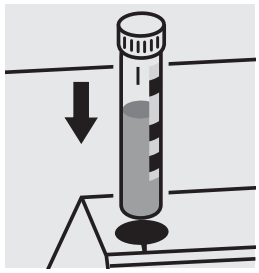
Heat the cell in the thermoreactor at 100 °C for 15 minutes. Then cool to room temperature under running water.

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



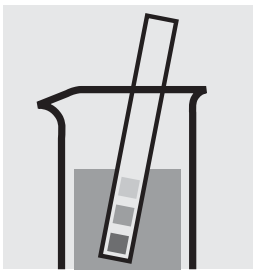
Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Quality assurance:

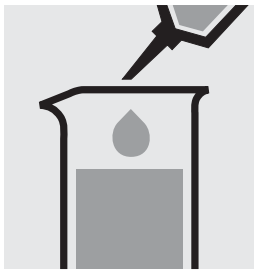
To check the measurement system (test reagents, measurement device, and handling) a standard solution must be prepared from sodium acetate anhydrous (see section “Standard solutions”).

00861 · Zinc

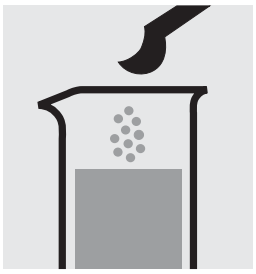
Measuring range:	0.025 – 1.000 mg/l Zn Expression of results also possible in mmol/l.



Check the pH of the sample, specified range: pH 1 – 7.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

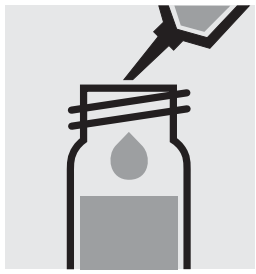


Pipette 10 ml of sample into a glass vessel.



Add 1 level green micro-spoon of **Zn-1K** and shake to dissolve the solid substance: **sample-reagent mixture.**

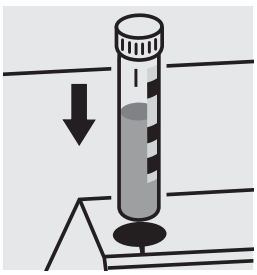
Pipette 0.50 ml of **Zn-2K** into a reaction cell, close with the screw cap, and mix.



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:

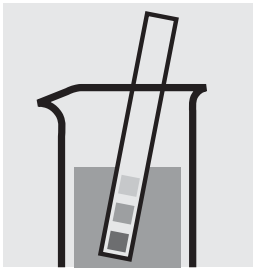
For the determination of **total zinc** a pretreatment with Crack Set 10C, Cat.No. 252033, or Crack Set 10, Cat.No. 250496, and thermoreactor is necessary.

Result can be expressed as sum of zinc (Σ Zn).

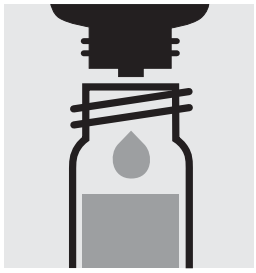
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use zinc standard solution, Cat.No. 250481, concentration 1000 mg/l Zn, can be used after diluting accordingly.

Measuring range:	0.20 – 5.00 mg/l Zn Expression of results also possible in mmol/l.

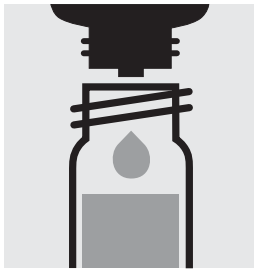


Check the pH of the sample, specified range: pH 3 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.



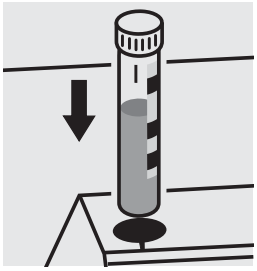
Add 5 drops of **Zn-1K** into a reaction cell, close with the screw cap, and mix.

Add 0.50 ml of the sample with pipette, close the cell with the screw cap, and mix.



Add 5 drops of **Zn-2K,** close the cell with the screw cap, and mix.

Reaction time: 15 minutes



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

Important:

For the determination of **total zinc** a pretreatment with Crack Set 10C, Cat.No. 252033, or Crack Set 10, Cat.No. 250496, and thermoreactor is necessary.

Result can be expressed as sum of zinc (Σ Zn).

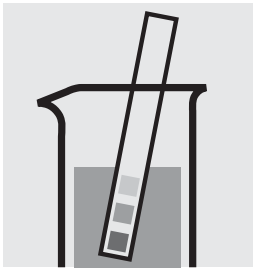
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 40, Cat.No. 250485.

Ready-for-use zinc standard solution, Cat.No. 250481, concentration 1000 mg/l Zn, can also be used after diluting accordingly.

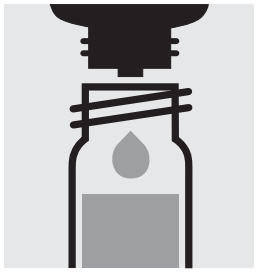
To check for sample-dependent effects the use of addition solutions (e. g. in CombiCheck 40) is highly recommended.

Measuring range:	0.05 – 2.50 mg/l Zn Expression of results also possible in mmol/l.	10-mm cell



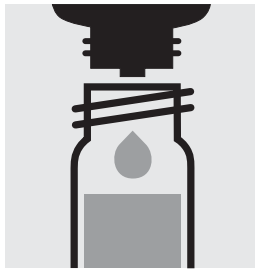
Check the pH of the sample, specified range: pH 4 – 10.
If required, add dilute sodium hydroxide solution or hydrochloric acid drop by drop to adjust the pH.

Pipette 5.0 ml of the sample into a test tube with screw cap.

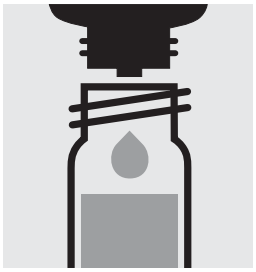


Add 5 drops of **Zn-1,** close the test tube with the screw cap, and mix.

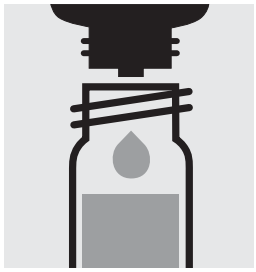
Check the pH, specified range:
pH 12 – 13.
If required, add dilute sodium hydroxide solution drop by drop to adjust the pH.



Add 2 drops of **Zn-2,** close the test tube with the screw cap, and mix.



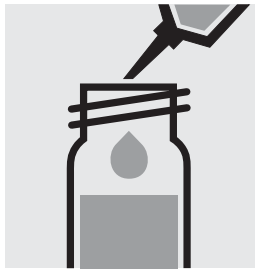
Add 5 drops of **Zn-3,** close the test tube with the screw cap, and mix.



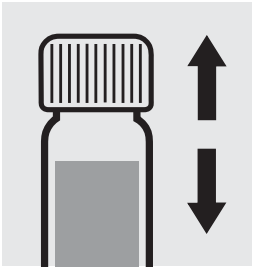
Add 3 drops of **Zn-4,** close the test tube with the screw cap, and mix.

Reaction time:
3 minutes

Add 1 level grey micro-spoon of **Zn-5,** close the test tube with the screw cap, and dissolve the solid substance.

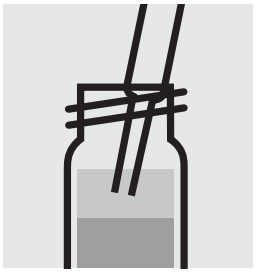


Add 5.0 ml of **Zn-6** (Cat. No. 06146, Isobutylmethy ketone) with pipette and close the test tube with the screw cap.

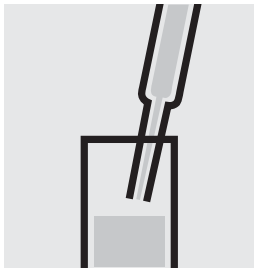


Shake the tube vigorously for 30 seconds.

Leave to stand for 2 minutes.

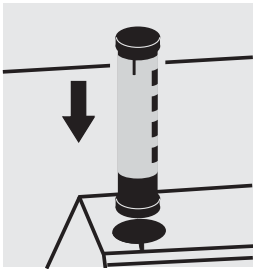


Aspirate the clear upper phase from the tube with pipette.

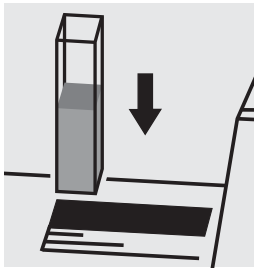


Transfer the solution into a cell.

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. 252033, or Crack Set 10, Cat.No. 250496, and thermoreactor is necessary.

Result can be expressed as sum of zinc (Σ Zn).

Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) ready-for-use zinc standard solution, Cat.No. 250481, concentration 1000 mg/l Zn, can be used after diluting accordingly.

Applications

Available methods

Applications are special photometric procedures normally not based on test sets. The analysis specifications for these are given in the last part of the section, ANALYTICAL PROCEDURES. There you will find further information on auxiliaries and reagents. For applications, the method is selected manually, using the method number given in column 1. Instructions on how to select a method are given in the section, SELECTING A METHOD MANUALLY of the functional description of the photometer.

Method No.	Parameter	Total measuring range	Method
2518	ADMI	2.0 – 100.0	Inherent color
2517	ADMI	10 – 500	Inherent color
2522	Ammonia, free	(0.010 – 0.500 mg/l NH_4-N)	as ammonium (with test 14752)
2521	Ammonia, free	(0.03 – 1.50 mg/l NH_4-N)	as ammonium (with test 14752)
2520	Ammonia, free	(0.05 – 3.00 mg/l NH_4-N)	as ammonium (with test 14752)
2523	Ammonia, free	(0.6 – 20.6 mg/l NH_4-N)	as ammonium (with test 14544)
130	Antimony in water and wastewater	0.10 – 8.00 mg/l Sb	Brilliant green
195	Bromate in water and drinking water	0.003 – 0.120 mg/l BrO_3	3,3”-Dimethylnaphtidine
2525	Carbon dioxide	(0.4 - 8.00 mg/l OH)	Indicator reaction (with test 01758)
2509	Chlorophyll-a (DIN), 10 mm	result in µg/l Chl-a	Inherent color
2510	Chlorophyll-a (DIN), 20 mm	result in µg/l Chl-a	Inherent color
2511	Chlorophyll-a (DIN), 50 mm	result in µg/l Chl-a	Inherent color
2504	Chlorophyll-a (ASTM), 10 mm	result in mg/m3 Chl-a	Inherent color
2505	Chlorophyll-a (ASTM), 20 mm	result in mg/m3 Chl-a	Inherent color
2506	Chlorophyll-a (ASTM), 50 mm	result in mg/m3 Chl-a	Inherent color
2507	Chlorophyll-a,-b,-c (ASTM), 10 mm	result in mg/m3 Chl-a,-b,-c	Inherent color
2508	Chlorophyll-a,-b,-c (ASTM), 50 mm	result in mg/m3 Chl-a, -b, -c	Inherent color
020	Chromium Baths	4.0 – 400 g/l CrO_3	Inherent color
015	Color α(436)(Color436) (Spectral Absorption Coefficient)	0.1 – 250 m^{-1}	Measurement at 436 nm
061	Color α(525)(Color525) (Spectral Absorption Coefficient)	0.1 – 250 m^{-1}	Measurement at 525 nm
078	Color α(620)(Color620) (Spectral Absorption Coefficient)	0.1 – 250 m^{-1}	Measurement at 620 nm
303	Color (410)(CU410) (EN 7887)	2 – 2500 mg/l Pt	Measurement at 410 nm
032	Color Hazen (CU340)*	0,2 – 500 CU	Platinum-cobalt-Standard Method, Measurement at 340 nm
179	Color Hazen (CU445)*	1 – 1000 CU	Platinum-cobalt-Standard Method, Measurement at 445 nm
180	Color Hazen (CU455)*	1 – 1000 CU	Platinum-cobalt-Standard Method, Measurement at 455 nm
181	Color (CU465)*	1 – 1000 CU	Platinum-cobalt-Standard Method, Measurement at 465 nm
083	Copper Baths	2.0 – 80.0 g/l Cu	Inherent color
033	Iodine color number (IodFa)	0.010 – 3.00 IFZ	Measurement at 340 nm
021	Iodine color number (IodFa)	0.2 – 50.0 IFZ	Measurement at 445 nm
135	Mercury in water and wastewater	0.025 – 1.000 mg/l Hg	Michler’s ketone
057	Nickel Baths	2.0 – 120 g/l Ni	Inherent color
2503	Nitrate	0.0 – 7.0 mg/l NO_3-N	direct measurement in the UV range
133	Palladium in water and wastewater	0.05 – 1.25 mg/l Pd	Thio-Michler’s ketone
134	Platinium in water and wastewater	0.10 – 1.25 mg/l Pt	o-Phenylendiamine
300	Spectral Absorption Coefficient α(254)	0.5 – 250 m^{-1}	Measurement at 254 nm
301	Spectral Attenuation Coefficient μ(254)*	0.5 – 250 m^{-1}	Measurement at 254 nm

Method No.	Parameter	Total measuring range	Method
302	Spectral Absorption Coefficient $\alpha(436)$	0.5 – 250 m^{-1}	Measurement at 436 nm
182	Suspended Solids	25 – 750 mg/l Susp. solids	Measurement at 820 nm
077	Turbidity (T550)	1 – 100 FAU	Measurement at 550 nm

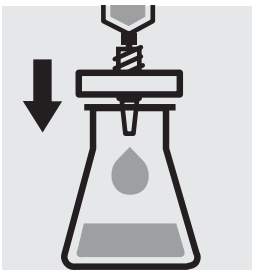
* Turbidity correction possible

Application · ADMI color measurement

analog. to APHA 2120F (ADMI Weighted-Ordinate Spectrophotometric method)

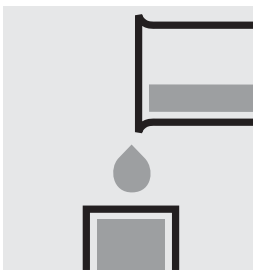
Measuring	10	– 500	10-mm cell	Method No. 2517
range:	2.0	– 100.0	50-mm cell	Method No. 2518
Attention!	The measurement is carried out in a corresponding rectangular cell against a blank, prepared from distilled water (Water for process analysis, Cat.No. 01051, is recommended).			

Preparation:

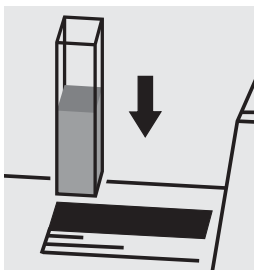


Filter turbid samples.

Determination at the original pH:

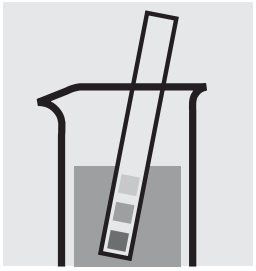


Transfer the solution into a corresponding cell.

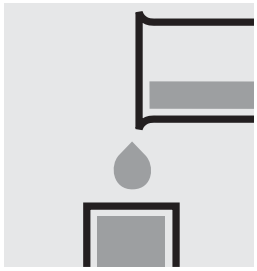


Place the cell into the cell compartment.
Select method no. **2517** or **2518**.

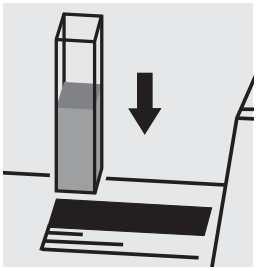
Determination at pH 7.0:



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.



Transfer the solution into a corresponding cell.



Place the cell into the cell compartment.
Select method no. **2517** or **2518**.

Note:

This method can be recalibrated by the user (one-point calibration). This method is activated by hitting the **Blank Zero** key and is subsequently menu-controlled (see the application for further details).

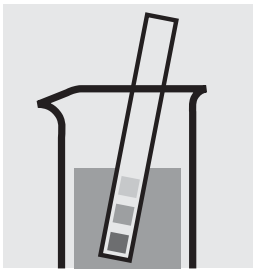
In the case of **serial measurements** the accuracy of the measurement can be enhanced by making a zero setting prior to **each** individual measurement.

Quality assurance:

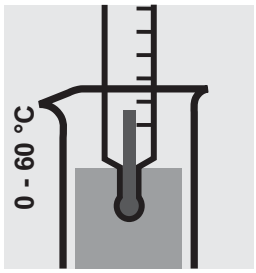
To check the measurement system (measurement device, and handling) ready-for-use platinum-cobalt colour reference solution (Hazen 500) CertiPUR®, Cat.No. 00246 (Merck), concentration 500 mg/l Pt can be used after diluting ac-cordingly.

Application · Ammonia, free (as ammonium)

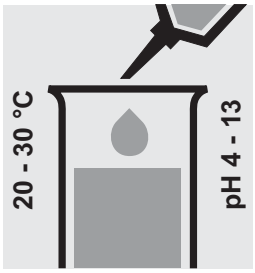
Measuring	Equivalent to 0.05 – 3.00 mg/l NH_4-N	Example*: 0.01 – 0.56 mg/l NH_3	10 mm	Method No. 2520
range:	Equivalent to 0.03 – 1.50 mg/l NH_4-N	Example*: 0.01 – 0.28 mg/l NH_3	20 mm	Method No. 2521
	Equivalent to 0.010 – 0.500 mg/l NH_4-N	Example*: 0.002 – 0.093 mg/l NH_3	50 mm	Method No. 2522
	* Measuring ranges for NH_3 or NH_3-N depending on pH value and temperature.			
	The example ranges refer to pH 8.5 and 25 °C.			



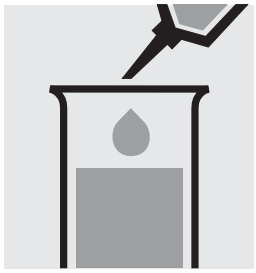
Check the pH of the sample **and note**.



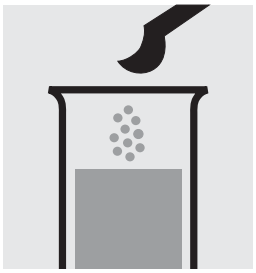
Check the temperature of the solution **and note**.



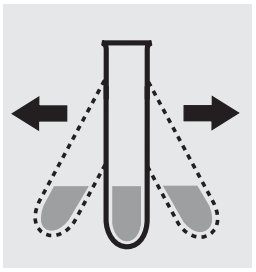
Pipette 5.0 ml of the sample into a test tube. If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH and bring the sample to the appropriate temperature.



Add 0.60 ml of **NH_4-1** (from Ammonium Test, Cat. No. 250426 or 252081) with pipette and mix.

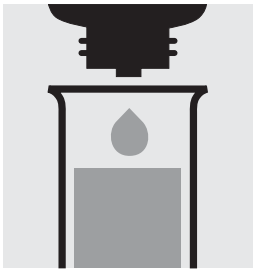


Add 1 level blue microspoon of **NH_4-2** (from Ammonium Test, Cat. No. 250426 or 252081).



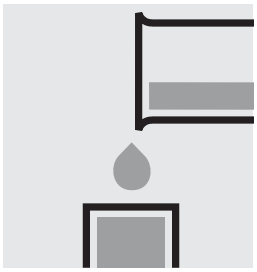
Shake vigorously to dissolve the solid substance.

Reaction time:
5 minutes



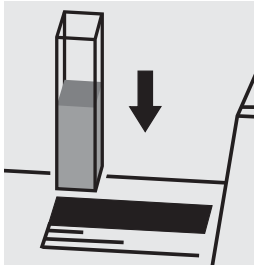
Add 4 drops of **NH_4-3** (from Ammonium Test, Cat. No. 250426 or 252081) and mix.

Reaction time:
5 minutes

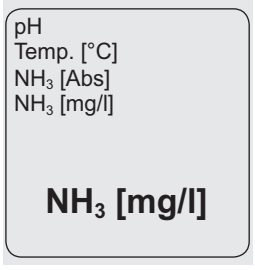


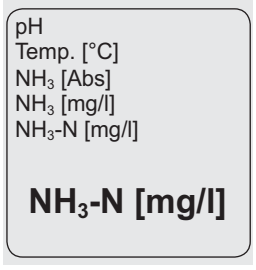
Transfer the solution into a corresponding cell.

Select method no. **2520**, **2521**, or **2518**.
Enter the pH and the temperature of the original sample.



Place the cell into the cell compartment.





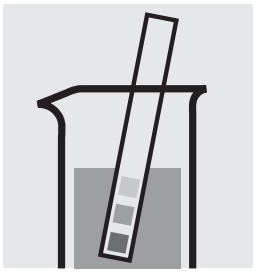
Important:

Very high ammonium concentrations in the sample produce turquoise-coloured 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).

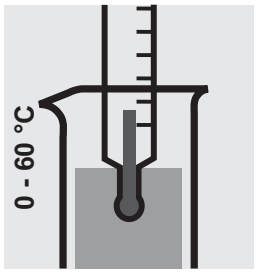
To measure in the 50-mm cell, the sample volume and the volume of the reagents have to be doubled for each. Alternatively, a semi-microcell can be used.

Application · Ammonia, free (as ammonium)

Measuring range	Equivalent to 0.5 – 16.0 mg/l NH_4-N or 0.6 - 20.6 mg/l NH_4
	Measuring ranges for NH_3 or NH_3-N depending on pH value and temperature.
	Example: 0.09 – 3.00 mg/l NH_3 at pH 8.5 and 25 °C.

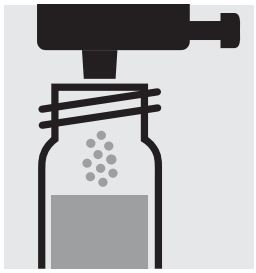


Check the pH of the sample **and note**.

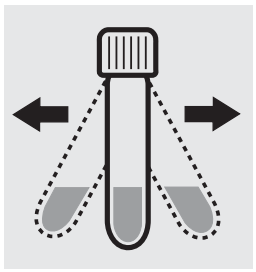


Check the temperature of the solution **and note**.

Pipette 0.50 ml of the sample into a reaction cell (from Ammonium Test, Cat. No. 250329) close with the screw cap, and mix.



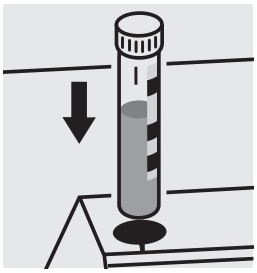
Add 1 dose of **NH_4-1K** (from Ammonium Test, Cat. No. 250329) using the blue dose-metering cap, close the cell with the screw cap.



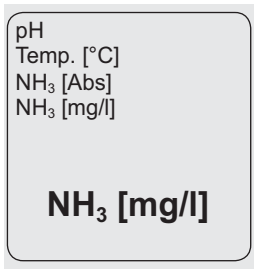
Shake the cell vigorously to dissolve the solid substance.

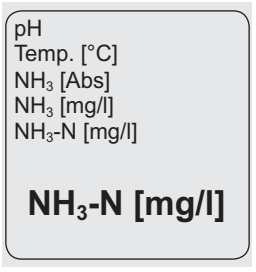
Reaction time:
15 minutes

Select method no. **2523**. Enter the pH and the temperature of the original sample.



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-coloured solutions (measurement solution should be yellow-green to green) and false-low readings are yielded. In such cases the sample must be diluted (plausibility check).

Quality assurance:

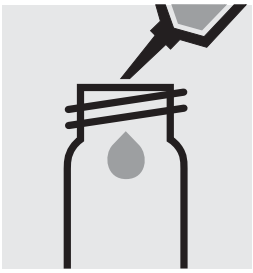
To check the measurement system (test reagents, measurement device, and handling) we recommended to use CombiCheck 20, Cat.No. 250483.

Ready-for-use ammonium standard solution, Cat.No. 250461, concentration 1000 mg/l NH_4^+, can also be used after diluting accordingly.

To check for sample-dependent effects the use of addition solutions (e.g. in CombiCheck 20) is highly recommended.

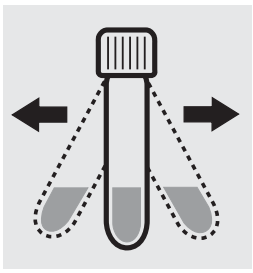
Application · Antimony in water and wastewater

Measuring range: 0.10 – 8.00 mg/l Sb 10-mm cell



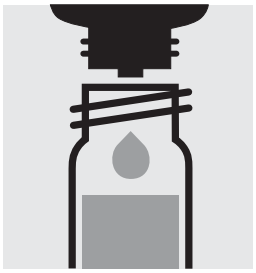
Pipette 4.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

Add approx. 1.5 g of **ammonium chloride hexahydrate extra pure,** close the cell with the screw cap.



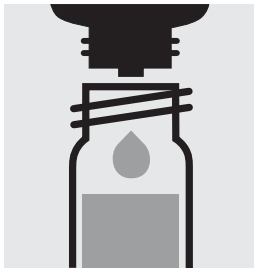
Shake the cell vigorously to dissolve the solid substance.

Add 1.0 ml **phosphoric acid 85 % GR** with pipette, close the cell with the screw cap, and mix.



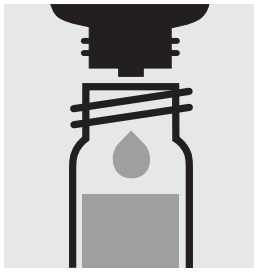
Add 2 drops of **reagent 1,** close the cell with the screw cap, and mix.

Reaction time:
3 minutes



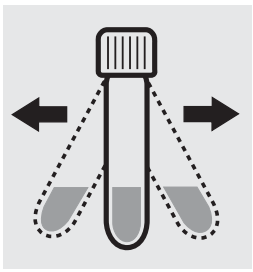
Add 2 drops of **reagent 2,** close the cell with the screw cap, and mix.

Reaction time:
2 minutes

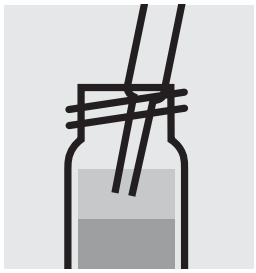


Add 2 drops of **reagent 3,** close the cell with the screw cap, and mix.

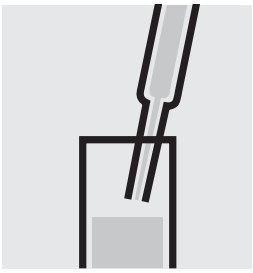
Add 5.0 ml **toluene GR** with pipette, close the cell with the screw cap.



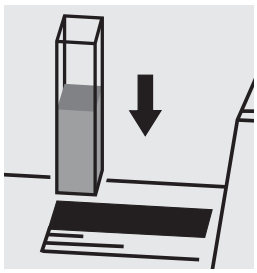
Shake the cell vigorously for 30 seconds. Leave to stand to allow phases to separate.



Aspirate the clear upper phase from the tube with pipette.



Transfer the solution into a cell.



Place the cell into the cell compartment. Select method **Antimony** in the menu (method no. **130**).

Note:

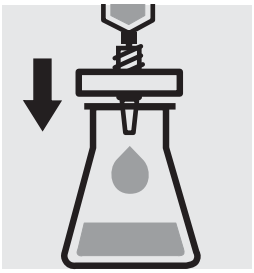
Empty cells with screw caps, Cat.No. 250621 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

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 is available on request or else can be downloaded directly at http://photometry.merck.de

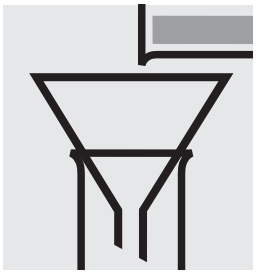
Application · Bromate in water and drinking water

Measuring range:	0.003 – 0.120 mg/l BrO_3 50-mm cell
Attention!	The measurement is carried out at 550 nm in a 50-mm rectangular cell against a blank, prepared from distilled water and the reagents in an analogous manner.

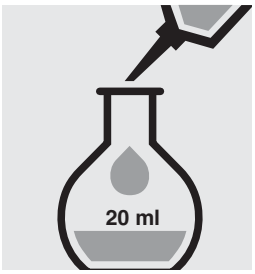


Filter turbid samples.

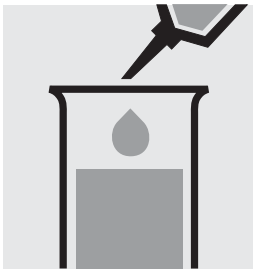
Evaporate 200 ml of sample solution in a glass beaker almost to dryness on the hob.



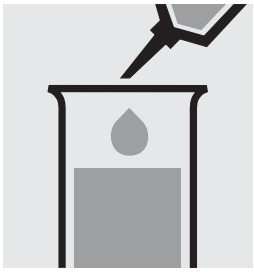
Transfer the residue to a 20-ml volumetric glass using a little distilled water.



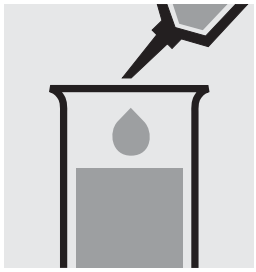
Make up the contents of the volumetric flask to the mark with distilled water and mix thoroughly: **pretreated sample.**



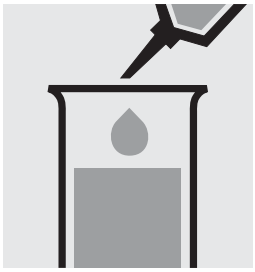
Pipette 10 ml of the pretreated sample into a test tube.



Add 0.10 ml of **reagent 1** with pipette and mix.

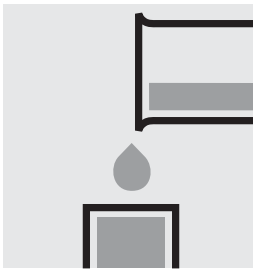


Add 0.20 ml of **reagent 2** with pipette and mix.

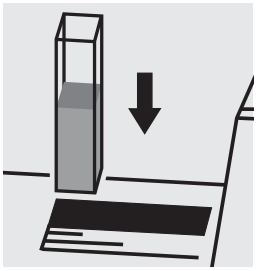


Add 0.20 ml **perchloric acid 70 – 72 % GR** with pipette and mix.

Reaction time: 30 minutes



Transfer the solution into a cell.

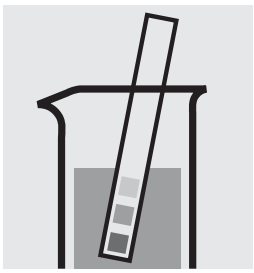


Place the cell into the cell compartment. Select method **Bromate** in the menu (method no. **195**).

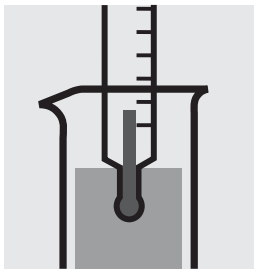
Important:

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 is available on request or else can be downloaded directly at http://photometry.merck.de

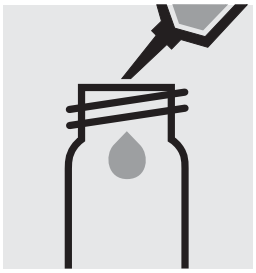
Measuring range	Equivalent to 0.40 – 8.00 mg/l OH
	Measuring ranges for CO_2 depending on pH value and temperature.
	Example: 14 – 275 mg/l CO_2 at pH 6.5 and 18.6 °C.



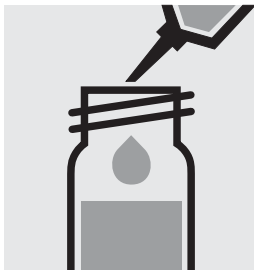
Check the pH of the sample **and note**.



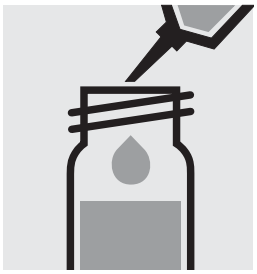
Check the temperature of the solution **and note**.



Pipette 4.0 ml of **AC-1** (from Acid Capacity Test, Cat. No. 252087) into a round cell.

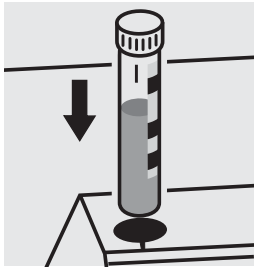


Add 1.0 ml of the sample with pipette, close the cell with the screw cap, and mix.



Add 0.50 ml of **AC-2** (from Acid Capacity Test, Cat. No. 252087) with pipette, close the cell with the screw cap, and mix.

Select method no. **2525**. Enter the pH and the temperature of the original sample.



Place the cell into the cell compartment. Align the mark on the cell with that on the photometer.

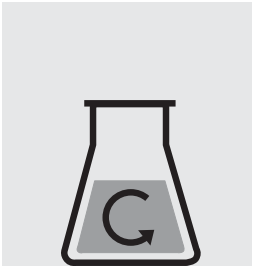
Quality assurance:

To check the measurement system (test reagents, measurement device, and handling) a sodium hydroxide solution 0.1 mol/l can be used after diluting accordingly (see section “Standard solutions”).

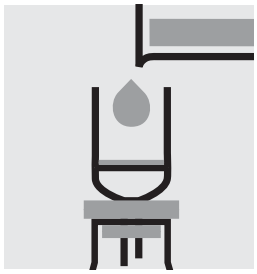
Application · Chlorophyll

Determination of chlorophyll-a and phaeophytin-a analogous to DIN 38412

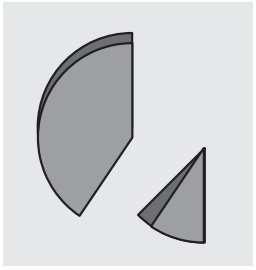
Measuring	depending on the ratio of original sample to extract	10-mm cell	Method No. 2509
range:	in µg/l Chl-a or Phaeo	20-mm cell	Method No. 2510
		50-mm cell	Method No. 2511
Attention!	The measurement is carried out in a corresponding rectangular cell against a blank, prepared from ethanol (w = 90 %).		



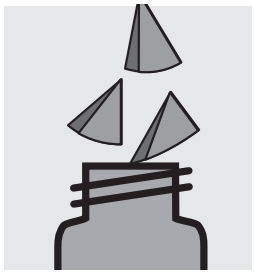
Sufficiently homogenize 0.5 - 2 l of sample. **Note the sample volume.**



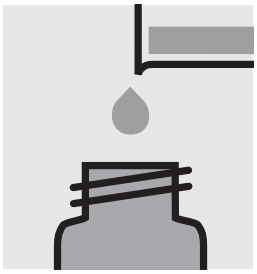
Filter the sample through a suitable filter (e. g. glass-fibre filter).



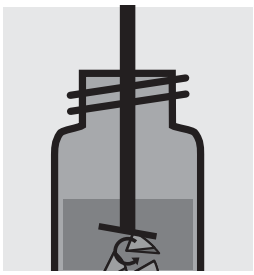
Fold the loaded filter and tear into small pieces.



Place the pieces of the filter in an extraction vessel (e. g. 100-ml amber glass bottle).

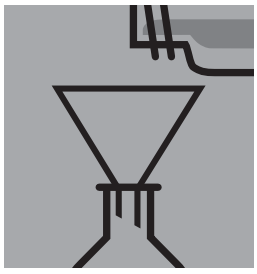


Add approx. 30 ml of boiling **ethanol** (w = 90 %) and allow to cool to room temperature.

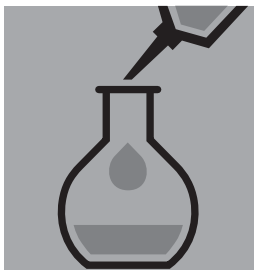


Disintegrate the filter in the homogenizer. Rinse together with a small portion of ethanol.

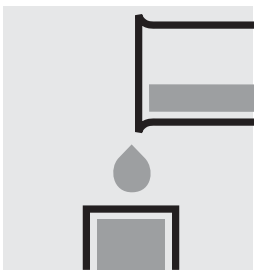
Allow to stand for 6 - 24 hours for the extraction to take place.



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.

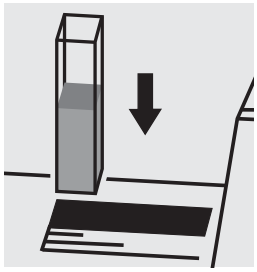


Make the contents of the volumetric flask up to the mark with ethanol, keeping them **protected from light** in the process!

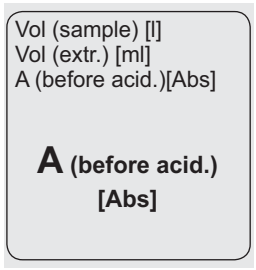


Transfer the solution into a corresponding cell.

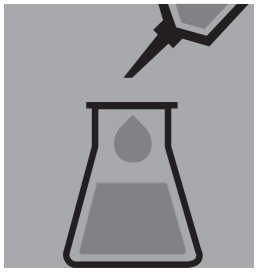
Select method no. **2509**, **2510**, or **2511**.
Enter the volumes of the original sample and extract (volumetric flask).



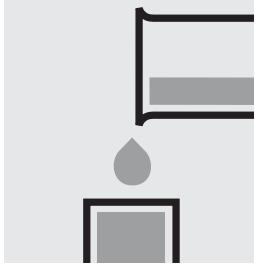
Place the cell into the cell compartment.



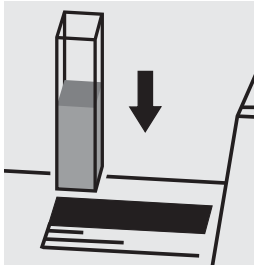
Differentiation (chlorophyll-a - phaeophytin-a):



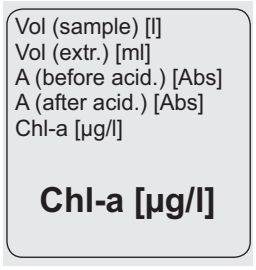
To differentiate the chlorophyll-a content and for the determination of the phaeophytin-a content, acidify a portion of the extract with **hydrochloric acid for analysis** (0.3 ml per 100 ml of extract).

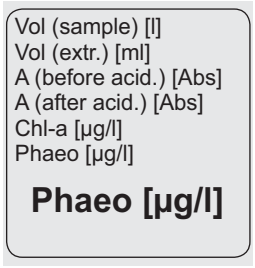


Transfer the solution into a corresponding cell.



Place the cell into the cell compartment and measure anew.

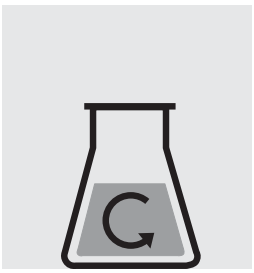




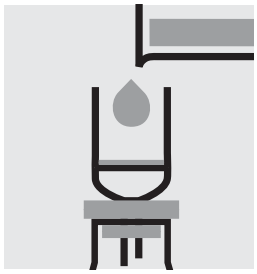
Application · Chlorophyll

Determination of chlorophyll-a and phaeophytin-a analogous to ASTM D3731-87

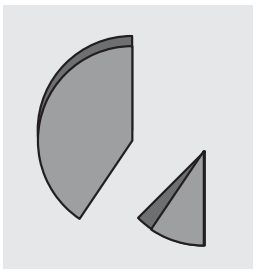
Measuring	depending on the ratio of original sample to extract	10-mm cell	Method No. 2504
range:	in mg/m^3 Chl-a or Phaeo-a	20-mm cell	Method No. 2505
		50-mm cell	Method No. 2506
Attention!	The measurement is carried out in a corresponding rectangular cell against a blank, prepared from extracting agent.		



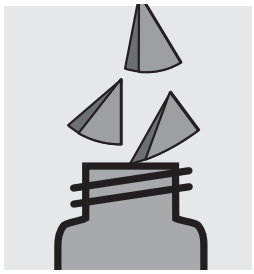
Sufficiently homogenize the sample. **Note the sample volume.**



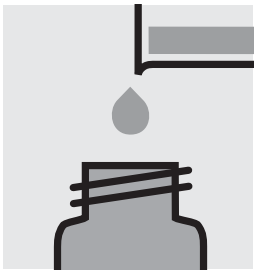
Filter the sample through a suitable filter (e. g. glass-fibre filter).



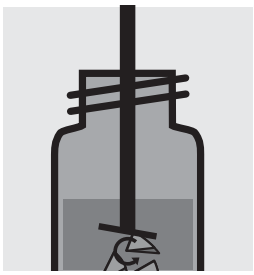
Fold the loaded filter and tear into small pieces.



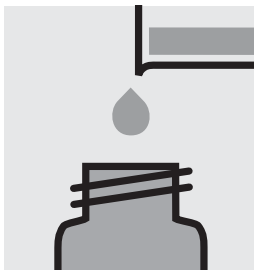
Place the pieces of the filter in an extraction vessel (**protected from light**).



Add 2 - 3 ml of **extracting agent**.

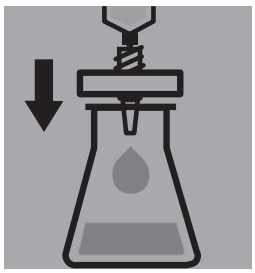


Disintegrate the filter in the homogenizer.

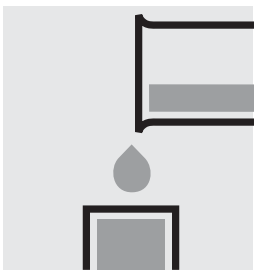


Make up to 10 ml with **extracting agent**.

Allow to stand at +4 °C for at least 2 hours for the extraction to take place.

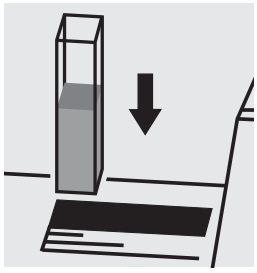


Filter the extract **protected from light** through a suitable filter.

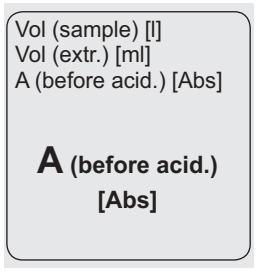


Transfer the solution into a corresponding cell.

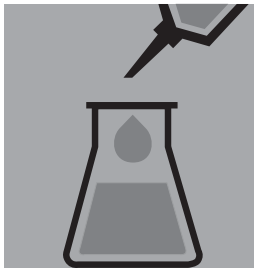
Select method no. **2504**, **2505**, or **2506**.
Enter the volumes of the original sample and extract (here: 10 ml).



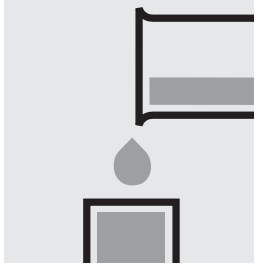
Place the cell into the cell compartment.



Differentiation (chlorophyll-a - phaeophytin-a):

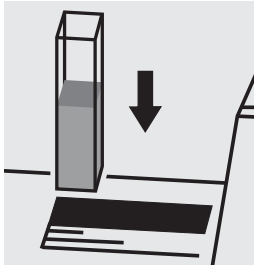


To differentiate the chlorophyll-a content and for the determination of the phaeophytin-a content, acidify a portion of the extract with **hydrochloric acid 0.1 mol/l for analysis** (0.15 ml per 5 ml of extract).



Transfer the solution into a corresponding cell.

START • ENTER



Place the cell into the cell compartment and measure anew.

Vol (sample) [l]
Vol (extr.) [ml]
A (before acid.) [Abs]
A (after acid.) [Abs]
Chl-a [mg/m^3]

Chl-a [mg/m^3]

START • ENTER

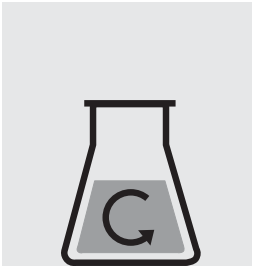
Vol (sample) [l]
Vol (extr.) [ml]
A (before acid.) [Abs]
A (after acid.) [Abs]
Chl-a [mg/m^3]
Phaeo-a [mg/m^3]

Phaeo-a [mg/m^3]

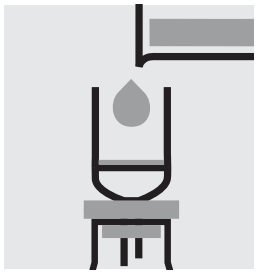
Application · Chlorophyll-a,-b,-c

Trichromatic method analogous to ASTM D3731-87

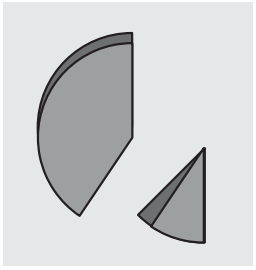
Measuring	depending on the ratio of original sample to extract	10-mm cell	Method No. 2507
range:	in mg/m³ Chl-a, -b, -c	50-mm cell	Method No. 2508
Attention!	The measurement is carried out in a corresponding rectangular cell against a blank, prepared from		
	extracting agent.		



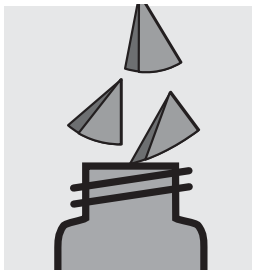
Sufficiently homogenize the sample. **Note the sample volume.**



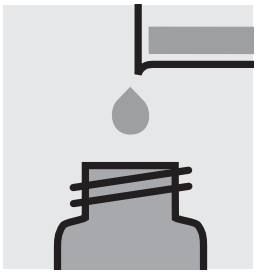
Filter the sample through a suitable filter (e. g. glass-fibre filter).



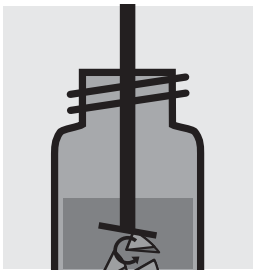
Fold the loaded filter and tear into small pieces.



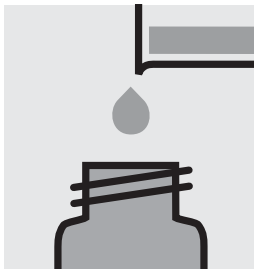
Place the pieces of the filter in an extraction vessel (**protected from light**).



Add 2 - 3 ml of **extracting agent**.

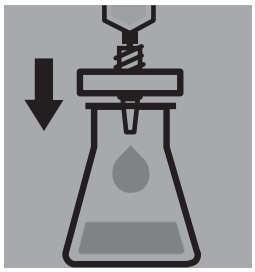


Disintegrate the filter in the homogenizer.

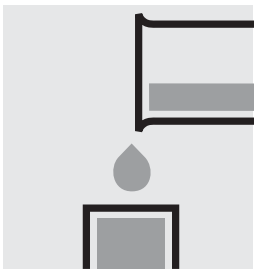


Make up to 10 ml with **extracting agent**.

Allow to stand at +4 °C for at least 2 hours for the extraction to take place.

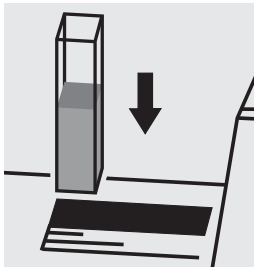


Filter the extract **protected from light** through a suitable filter.

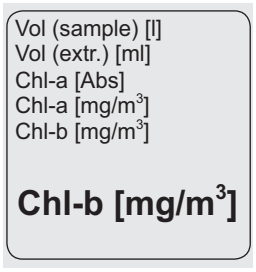


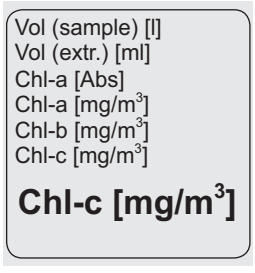
Transfer the solution into a corresponding cell.

Select method no. **2507** or **2508**.
Enter the volumes of the original sample and extract (here: 10 ml).



Place the cell into the cell compartment.

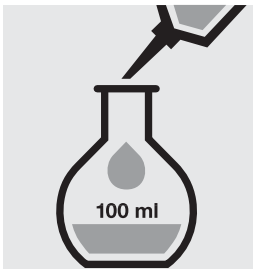




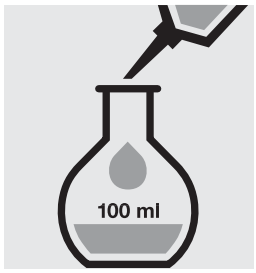
Application · Chromium in electroplating baths

Inherent colour

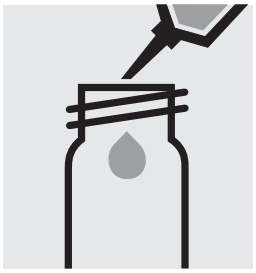
Measuring	20 – 400	g/l CrO_3	10-mm cell
range:	10 – 200	g/l CrO_3	20-mm cell
	4.0 – 80.0	g/l CrO_3	50-mm cell



Pipette 5.0 ml of the sample into a 100-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.

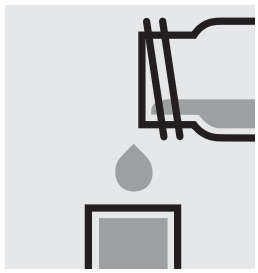


Pipette 4.0 ml of the dilute sample into a 100-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.

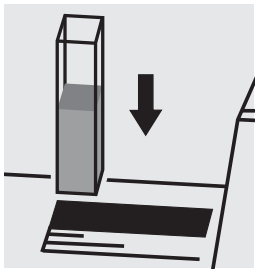


Pipette 5.0 ml of the 1:500 dilute sample into an empty round cell (Empty cells, Cat. No. 250621).

Add 5.0 ml of sulfuric acid 40 %, close the cell with the screw cap, and mix.



Transfer the solution into a corresponding cell.

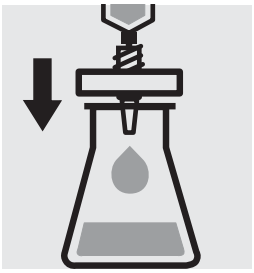


Place the cell into the cell compartment. Select method **Cr-bath** in the menu (method no. **20**).

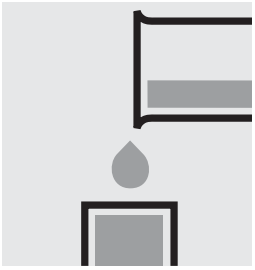
Application · Color (Spectral Absorption Coefficient)

analogous to EN ISO 7887

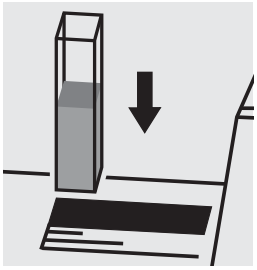
Measuring	1 – 250 m^{-1}	436 nm	10-mm cell	Method No. 015 α(436)
range:	0.3 – 125,0 m^{-1}	436 nm	20-mm cell	Method No. 015 α(436)
	0.1 – 50.0 m^{-1}	436 nm	50-mm cell	Method No. 015 α(436)
	1 – 250 m^{-1}	525 nm	10-mm cell	Method No. 061 α(525)
	0,3 – 125,0 m^{-1}	525 nm	20-mm cell	Method No. 061 α(525)
	0.1 – 50.0 m^{-1}	525 nm	50-mm cell	Method No. 061 α(525)
	1 – 250 m^{-1}	620 nm	10-mm cell	Method No. 078 α(620)
	0.3 – 125,0 m^{-1}	620 nm	20-mm cell	Method No. 078 α(620)
	0.1 – 50.0 m^{-1}	620 nm	50-mm cell	Method No. 078 α(620)



Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into a corresponding cell.



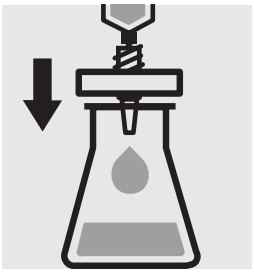
Place the cell into the cell compartment, select method no. **15**, **61**, or **78**.

Notes:
Filtered sample = true color.
Unfiltered sample = apparent color.

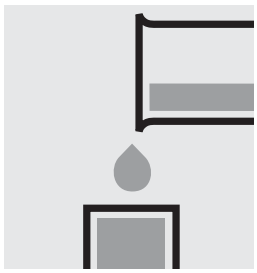
Applikation · Color (True Color - 410 nm)

analogous to EN ISO 7887

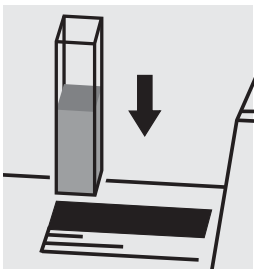
Measuring	10 – 2500	mg/l Pt	10 – 2500	mg/l Pt/Co	10 – 2500	CU	10-mm cell
range:	5 – 1250	mg/l Pt	5 – 1250	mg/l Pt/Co	5 – 1250	CU	20-mm cell
	2 – 500	mg/l Pt	2 – 500	mg/l Pt/Co	2 – 500	CU	50-mm cell



Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into a corresponding cell.

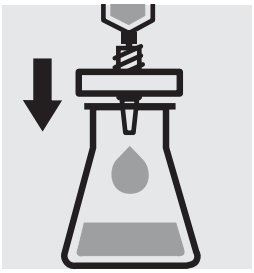


Place the cell into the cell compartment, select method no. **303**.

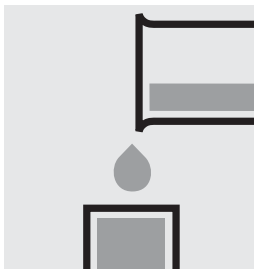
Application · Color Hazen (Platinum-Cobalt Standard Method)

analogous to APHA 2120B, DIN EN ISO 6271-2, Water Research Vol. 30, No. 11, 2771-2775, 1996

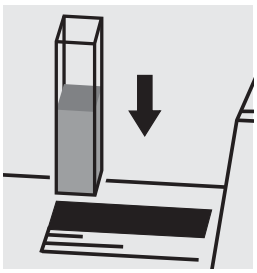
Measuring	1	- 500 mg/l Pt/Co	1	- 500 mg/l Pt	1	- 500 Hazen	1	- 500 CU	340 nm	10-mm cell
range:	1	- 250 mg/l Pt/Co	1	- 250 mg/l Pt	1	- 250 Hazen	1	- 250 CU	340 nm	20-mm cell
	0.2	- 100.0 mg/l Pt/Co	0.2	- 100.0 mg/l Pt	0.2	- 100.0 Hazen	0.2	- 100.0 CU	340 nm	50-mm cell



Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into a corresponding cell.



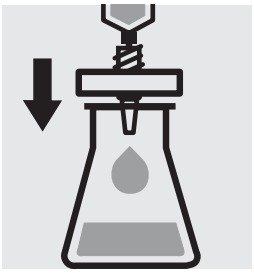
Place the cell into the cell compartment, select method no. **32**.

Notes:
Filtered sample = true color.
Unfiltered sample = apparent color.

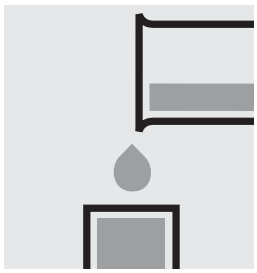
Application · Color Hazen (Platinum-Cobalt Standard Method)

analogous to APHA 2120B, DIN 53409, Water Research Vol. 30, No. 11, 2771-2775, 1996

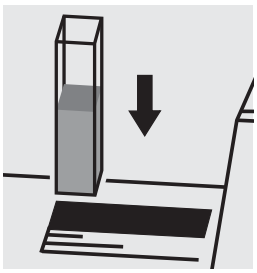
Measuring	1-1000 mg/l Pt/Co	1-1000 mg/l Pt	1-1000 Hazen	1-1000 CU	445 nm	50-mm cell	Method No. 179
range:	1-1000 mg/l Pt/Co	1-1000 mg/l Pt	1-1000 Hazen	1-1000 CU	455 nm	50-mm cell	Method No. 180
	1-1000 mg/l Pt/Co	1-1000 mg/l Pt	1-1000 Hazen	1-1000 CU	465 nm	50-mm cell	Method No. 181



Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into the cell.



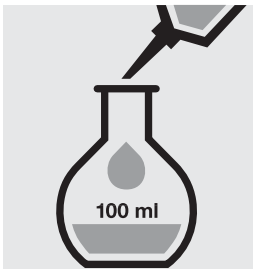
Place the cell into the cell compartment, select method no. **179, 180**, or **181**.

Notes:
Filtered sample = true color.
Unfiltered sample = apparent color.

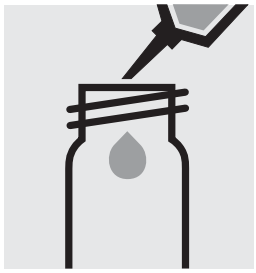
Application · Copper in electroplating baths

Inherent colour

Measuring	10.0 – 80.0 g/l Cu	10-mm cell
range:	5.0 – 40.0 g/l Cu	20-mm cell
	2.0 – 16.0 g/l Cu	50-mm cell

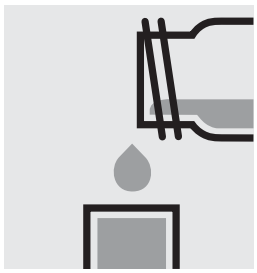


Pipette 25 ml of the sample into a 100-ml volumetric flask, fill to the mark with distilled water and mix thoroughly.

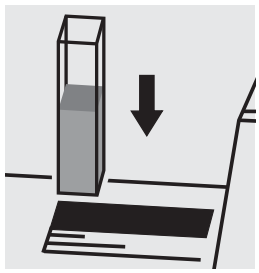


Pipette 5.0 ml of the 1:4 dilute sample into an empty round cell (Empty cells, Cat.No. 250621).

Add 5.0 ml of sulfuric acid 40 %, close the cell with the screw cap, and mix.



Transfer the solution into a corresponding cell.

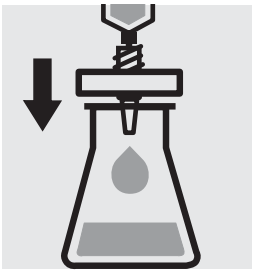


Place the cell into the cell compartment. Select method **Cu-bath** in the menu (method no. **83**).

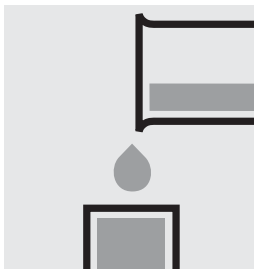
Application · Iodine colour number

analogous to DIN 6162A

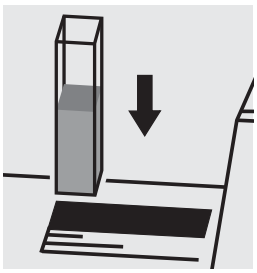
Measuring	0.05	– 3.00	IFZ	340 nm	10-mm cell
range:	0.03	– 1.50	IFZ	340 nm	20-mm cell
	0.010	– 0.600	IFZ	340 nm	50-mm cell



Filter turbid samples.



Transfer the solution into a corresponding cell.

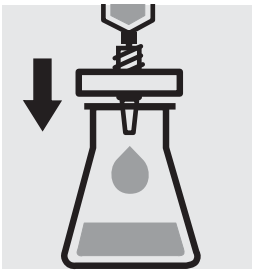


Place the cell into the cell compartment, select method in the menue (method no. **33**).

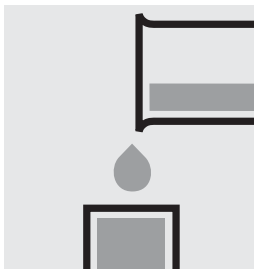
Application · Iodine colour number

analogous to DIN 6162A

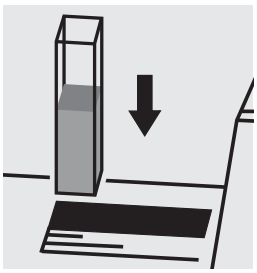
Measuring	1.0 – 50.0 IFZ	445 nm	10-mm cell
range:	0.5 – 25.0 IFZ	445 nm	20-mm cell
	0.2 – 10.0 IFZ	445 nm	50-mm cell



Filter turbid samples.

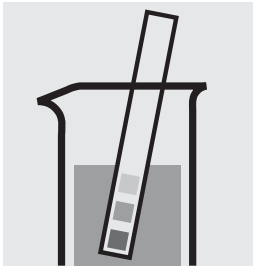


Transfer the solution into a corresponding cell.

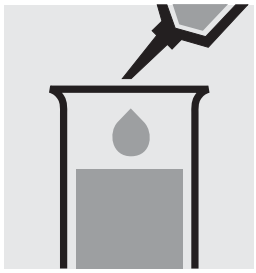


Place the cell into the cell compartment, select method in the menue (method no. **21**).

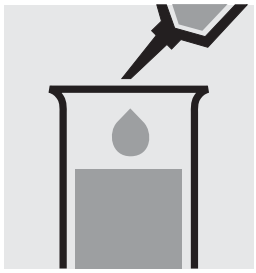
Measuring range:	0.025 – 1.000 mg/l Hg	50-mm cell



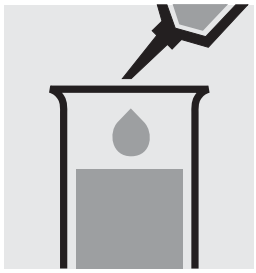
Check the pH of the sample, specified range: pH 3 – 7.
If required, add dilute sodium hydroxide solution or acetic acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into a test tube.

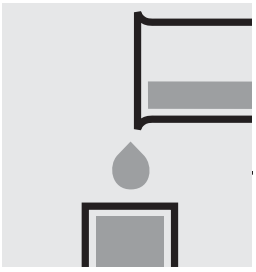


Add 1.0 ml of **reagent 1** with pipette and mix.

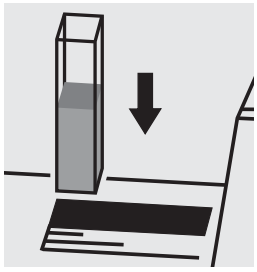


Add 1.5 ml of **reagent 2** with pipette and mix.

Reaction time:
5 minutes



Transfer the solution into a cell.



Place the cell into the cell compartment.
Select method **Mercury** in the menu (method no. **135**).

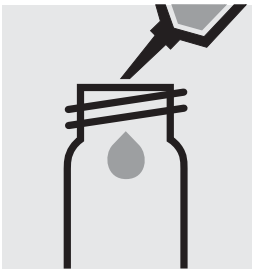
Important:

The exact composition and preparation of the reagents 1 and 2 used are given in the corresponding application, which also includes further information on the method employed. This application is available on request or else can be downloaded directly at http://photometry.merck.de

Application · Nickel in electroplating baths

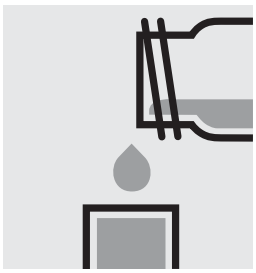
Inherent colour

Measuring	10 – 120	g/l Ni	10-mm cell
range:	5.0 – 60.0	g/l Ni	20-mm cell
	2.0 – 24.0	g/l Ni	50-mm cell

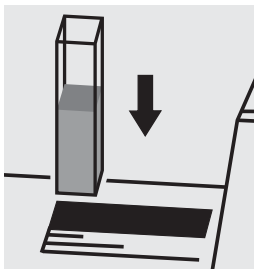


Pipette 5.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

Add 5.0 ml of sulfuric acid 40 %, close the cell with the screw cap, and mix.



Transfer the solution into a corresponding cell.

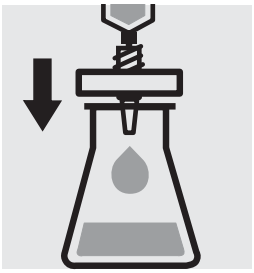


Place the cell into the cell compartment.
Select method **Ni-bath** in the menu (method no. **57**).

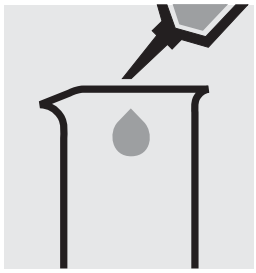
Application · Nitrate

Direct measurement in the UV range analogous to APHA 4500-NO_3^- B

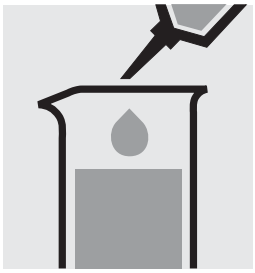
Measuring range:	0.0 – 7.0 mg/l NO_3-N	10-mm quartz cell



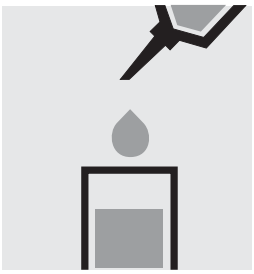
Filter turbid samples.



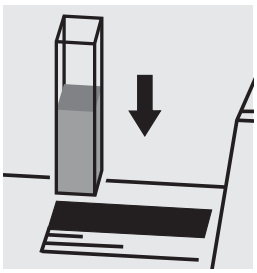
Place 50 ml of sample into a glass vessel.



Add 1 ml of **hydrochloric acid 1mol/l for analysis** with pipette and mix.



Transfer the solution into the quartz cell.



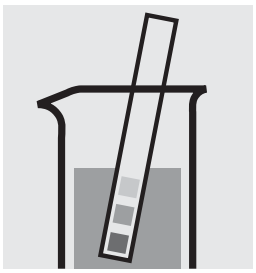
Place the cell into the cell compartment. Select method no. **2503**.

Important:

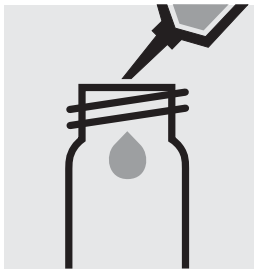
If “Condition not met” appears on the display, this is due to a sample-dependent interference (matrix effect).
In this case an evaluation is not possible.

Application · Palladium in wastewater

Measuring range: 0.05 – 1.25 mg/l Pd 10-mm cell



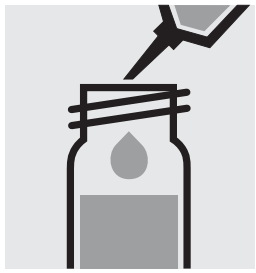
Check the pH of the sample, specified range: pH 2 – 5.
If required, add dilute sodium hydroxide solution or sulfuric acid drop by drop to adjust the pH.



Pipette 5.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

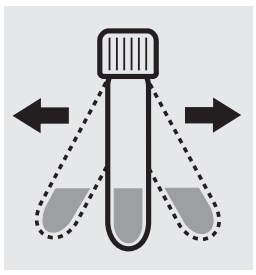
Add 1.0 ml of **reagent 1** with pipette, close the cell with the screw cap, and mix.

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.

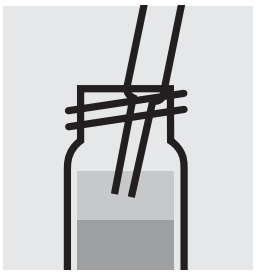


Add 0.20 ml of **reagent 2** with pipette, close the cell with the screw cap, and mix.

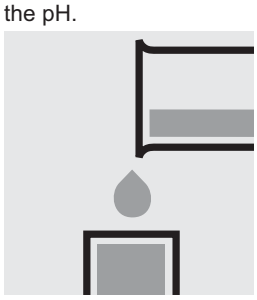
Add 5.0 ml **isoamyl alcohol GR** with pipette, close the cell with the screw cap.



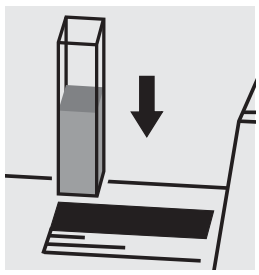
Shake the cell vigorously for 1 minute.
Leave to stand to allow phases to separate.



Aspirate the organic-clear upper phase from the tube with pipette and dry over **sodium sulfate anhydrous.**



Transfer the dried solution into a cell.



Place the cell into the cell compartment.
Select method **Palladium** in the menu (method no. **133**).

Note:

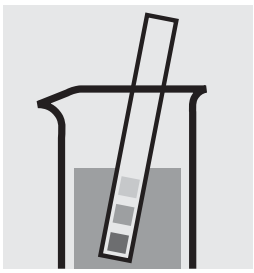
Empty cells with screw caps, Cat.No. 250621 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

Important:

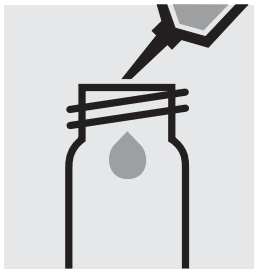
The exact composition and preparation of the reagents 1 and 2 used are given in the corresponding application, which also includes further information on the method employed. This application is available on request or else can be downloaded directly at http://photometry.merck.de

Application · Platinum in water and wastewater

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 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.

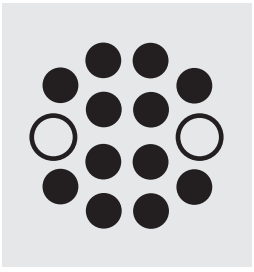


Pipette 5.0 ml of the sample into an empty round cell (Empty cells, Cat.No. 250621).

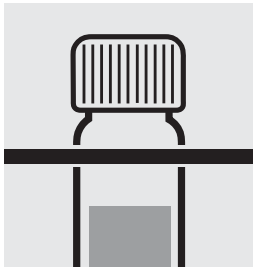
Add 1.0 ml of **reagent 1** with pipette, close the cell with the screw cap, and mix.

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.

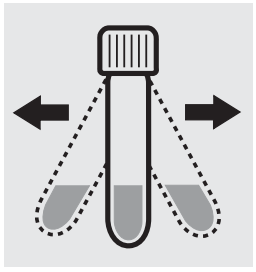


Heat the cell in the thermoreactor at 100 °C for 5 minutes.

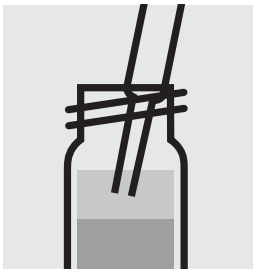


Remove the cell from the thermoreactor and place in a test-tube rack to cool to room temperature.

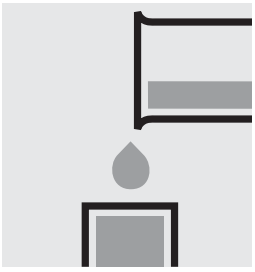
Add 5.0 ml **Isobutylmethylketone GR** with pipette, close the cell with the screw cap.



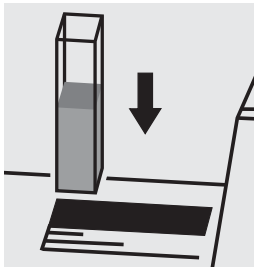
Shake the cell vigorously for 1 minute.
Leave to stand to allow phases to separate.



Aspirate the organic-clear upper phase from the tube with pipette and dry over **sodium sulfate anhydrous.**



Transfer the dried solution into a cell.



Place the cell into the cell compartment.
Select method **Platinum** in the menu (method no. **134**).

Note:

Empty cells with screw caps, Cat.No. 250621 are recommended for the preparation. These cells can be sealed with the screw caps, thus enabling a hazard-free mixing of the sample.

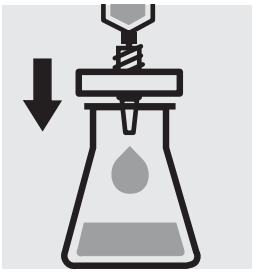
Important:

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 is available on request or else can be downloaded directly at http://photometry.merck.de

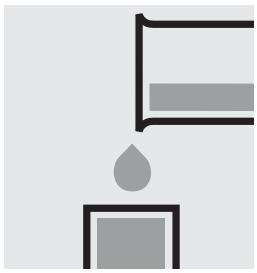
Application · Spectral Absorption Coefficient α(254)

analogous to DIN 38404

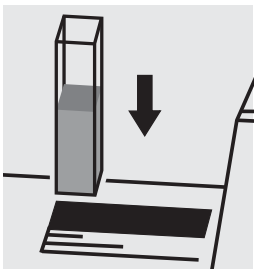
Measuring range:	3 – 250 m^{-1}	254 nm	10-mm cell
	1 – 125 m^{-1}	254 nm	20-mm cell
	0.5 – 50.0 m^{-1}	254 nm	50-mm cell



Filter sample solution through a membrane filter with 0.45 µm pore size.



Transfer the solution into the cell.

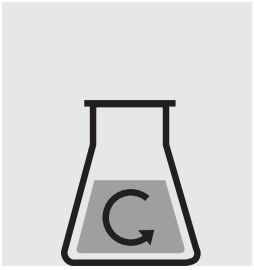


Place the cell into the cell compartment, select method in the menue (method no. **300**).

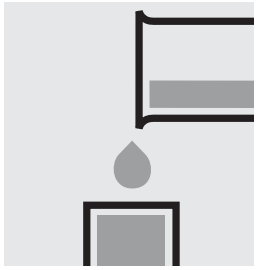
Application · Spectral Attenuation Coefficient μ(254)

analogous to DIN 38404

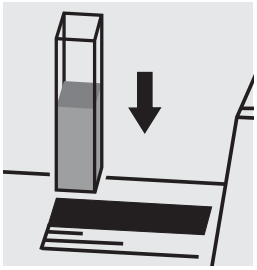
Measuring range:	3 – 250 m^{-1}	254 nm	10-mm cell
	1 – 125 m^{-1}	254 nm	20-mm cell
	0.5 – 50.0 m^{-1}	254 nm	50-mm cell



Shake the unfiltered sample solution to evenly suspend the turbidity-causing substances. Do not disperse the contents, **measure immediately**.



Transfer the solution into the cell.



Place the cell into the cell compartment, select method in the menue (method no. **301**).

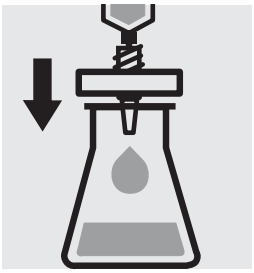
Note:

When the turbidity correction function is activated (see Description of Function, section 4.5.9 “Automatic Turbidity correction”), the **corrected spectral attenuation coefficient μ(254)korr** can be determined.
The turbidity correction is carried out as per DIN 38404 at 550 nm.

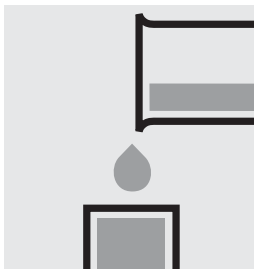
Application · Spectral Absorbtion Coefficient α(436)

analogous to EN ISO 7887

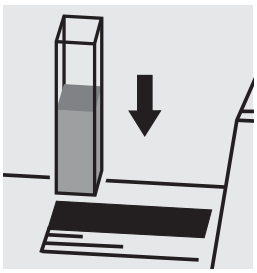
Measuring range:	3 – 250 m^{-1}	436 nm	10-mm cell
	1 – 125 m^{-1}	436 nm	20-mm cell
	0.5 – 50.0 m^{-1}	436 nm	50-mm cell



Filter sample solution through a membrane filter with 0.45 µm pore size.



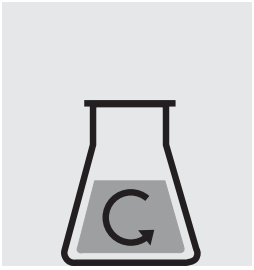
Transfer the solution into the cell.



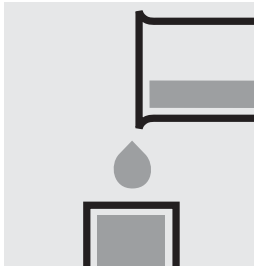
Place the cell into the cell compartment, select method in the menue (method no. **302**).

Notes:
Filtered sample = true colour.
Unfiltered sample = apparent colour.

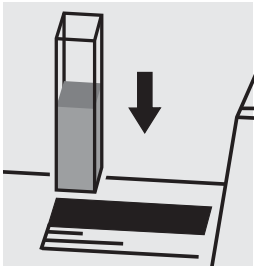
Measuring range:	25 – 750 mg/l Susp. solids	20-mm cell



Homogenize 500 ml of sample for 2 minutes in a mixer running at high speed.



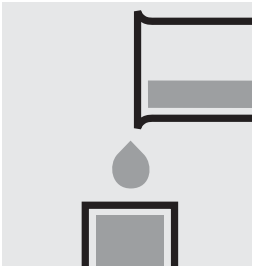
Transfer the solution into a cell.



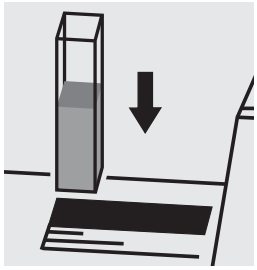
Place the cell into the cell compartment, select method in the menue (method no. **182**).

analogous to EN ISO 7027

Measuring range:	1 – 100 FAU	550 nm	50-mm cell



Transfer the sample into a cell.



Place the cell into the cell compartment, select method in the menue (method no. **77**).

Test kits without barcode

Available methods

The analysis specifications for these test sets are given in Appendix 4. Here, the method is selected manually, using the method number given in column 5. Instructions on how to select a method are given in the section, SELECTING A METHOD MANUALLY of the functional description of the photometer.

Parameter / Name	Modell	Artikel-Nr.	Gesamtmessbereich	Metho-den-Nr.	Typ**	Blindwertmessung
Alkalinity-M	KsM-1	#	5 - 200 mg/l $CaCO_3$	7339	TT	required
Alkalinity-P	KsP-1	#	5 - 300 mg/l $CaCO_3$	7340	TT	required
Ammonium vario	NH4-1 TP	251 408	0.01 - 0.50 mg/l NH_4-N	7324	PP	required
Ammonium vario LR	NH4-2 TC (LR)	251 997	0.02 - 2.50 mg/l NH_4-N	7312	KT	required
Ammonium vario HR	NH4-3 TC (HR)	251 998	0.4 - 50.0 mg/l NH_4-N	7313	KT	required
Chlor (free) vario	Cl2-1 TP	251 401	0.02 - 2.00 mg/l Cl_2	7325	PP	required
Chlor (free) vario	Cl2-2 TP	251 402	0.50 - 5.00 mg/l Cl_2	7326	PP	required
Chlor (total) vario	Cl2-3 TP	251 414	0.02 - 2.00 mg/l Cl_2	7327	PP	required
Chlor (total) vario	Cl2-4 TP	251 415	0.5 - 5.0 mg/l Cl_2	7328	PP	required
COD LR	COD1 TC (LR)	251 990	3 - 150 mg/l COD	7309	KT	required
COD MR	COD2 TC (MR)	251 991	20 - 1500 mg/l COD	7310	KT	required
COD HR	COD3 TC (HR)	251 992	200 - 15000 mg/l COD	7311	KT	required
Copper vario	Cu-1 TP	251 403	0.04 - 5.00 mg/l Cu	7302	PP	required
DEHA vario	DEHA-1 TP	251 421	0.004 - 0.450 mg/l DEHA	7335	PP	required
Iron vario TPTZ	Fe-1 TP	251 404	0.012 - 1.800 mg/l Fe	7300	PP	required
Iron vario	Fe-2 TP	251 405	0.02 - 3.00 mg/l Fe	7301	PP	required
Hydrazine vario	N2H4-1 TP	251 416	0.004 - 0.600 mg/l N_2H_4	7329	PP	required
Manganese vario	Mn-1 TP	251 406	0.2 - 20.0 mg/l Mn	7303	PP	required
Manganese vario	Mn-2 TP	251 417	0.007 - 0.700 mg/l Mn	7330	PP	required
Molybdate vario	Mo-1 TP	251 407	0.3 - 35.0 mg/l Mo	7304	PP	required
Molybdenum vario	Mo-2 TP	251 418	0.3 - 40.0 mg/l Mo	7331	PP	required
Nitrate	NO3-1 TC	251 993	0.2 - 30.0 mg/l NO_3-N	7314	KT	required
Nitrite vario	NO2-1 TP	251 409	0.002 - 0.300 mg/l NO_2-N	7305	PP	required
Nitrite LR	NO2-2 TC (LR)	251 994	0.03 - 0.60 mg/l NO_2-N	7318	KT	required
Nitrite HR	NO2-2 TC (HR)	251 994	0.3 - 3.0 mg/l NO_2-N	7317	KT	required
Nitrite vario	NO2-3 TP	251 420	0.002 - 0.300 mg/l NO_2-N	7334	PP	required
Nitrogen, total LR	Ntot1 TC (LR)	251 995	0.5 - 25.0 mg/l N_{tot}	7319	KT	required
Nitrogen, total HR	Ntot2 TC (HR)	251 996	10 - 150 mg/l N_{tot}	7320	KT	required
Phosphate vario (ortho)	PO4-1 TP	251 410	0.02 - 2.50 mg/l PO_4	7306	KT	required
Phosphate, ortho	PO4-2 TC	251 989	0.06 - 5.00 mg/l PO_4	7315	KT	required
Phosphat, total	PO4-3 TC	251 988	0.06 - 3.50 mg/l PO_4	7316	KT	required
Phosphat, total	PO4-4 TP	251 987	0.06 - 3.50 mg/l PO_4	7336	KT	required
Phosphat, acid hydrolyzable	PO4-4 TP	251 987	0.06 - 3.50 mg/l PO_4	7336	KT	required
Silica HR vario	Si-3 TP (HR)	251 422	1 - 200 mg/l SiO_2	7337	PP	required
Silica LR vario	Si-1 TP (LR)	251 411	0.01 - 1.60 mg/l SiO_2	7321	PP	required
Silica HR vario	Si-2 TP (HR)	251 412	1 - 100 mg/l SiO_2	7308	PP	required
Sulfate vario	SO4-2 TP	251 423	2 - 70 mg/l SO_4	7338	PP	required

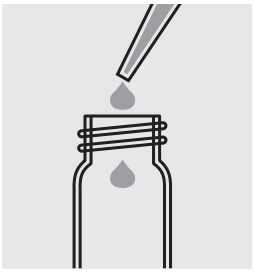
* KT = reaction cell test (16 mm round cell); RT = reagent test; TP = powder pillow test

Alkalinity-M = M-value

Program no. **7339**

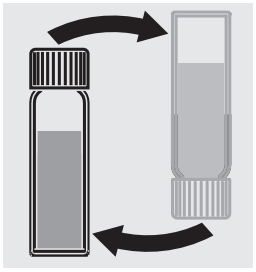
WTW model no.:	KsM-1
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	5 - 200 mg/l $CaCO_3$

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

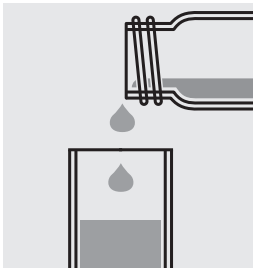


Pipette 10.0 ml of sample into the empty cell.

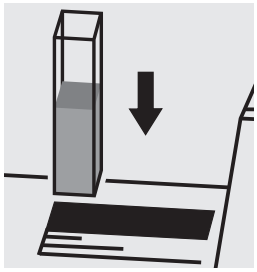
Add 1 tablet **ALKA-M-PHOTOMETER** directly from the foil; crush it with a clean stirring rod and close the cell with the screw cap.



Mix the contents by swirling the cell until the tablet has dissolved.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

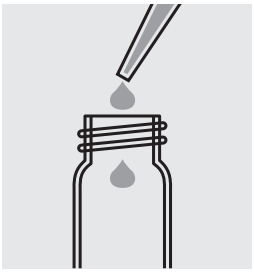
- We recommend that you determine a new reagent blank value (H2O dist instead of the sample) when starting a new pakkage.
- The coloring that has developed is not long-term stable. Therefore, measure the sample speedily after the tablet has dissolved.
- The coloring is very intensive and can discolor the stirring rod and cells. If possible, clean the utensils immediately after measuring.

Alkalinity-P = P-value

Program no. **7340**

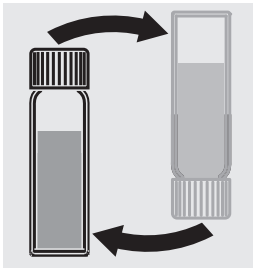
WTW model no.:	KsP-1
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	5 - 300 mg/l $CaCO_3$

Note: Before using the test with your photometer for the first time, determine the reagent blank value.



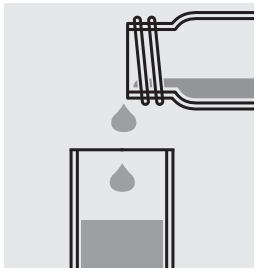
Pipette 10.0 ml of sample into the empty cell.

Add 1 tablet **ALKA-P-PHOTOMETER** directly from the foil; crush it with a clean stirring rod and close the cell with the screw cap.

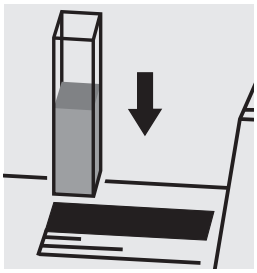


Mix the contents by swirling the cell until the tablet has dissolved.

Allow to react for 5 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

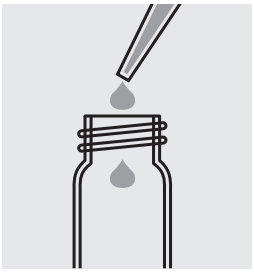
- We recommend that you determine a new reagent blank value (H2O dist instead of the sample) when starting a new pakkage.
- The coloring that has developed is not long-term stable. Therefore, measure the sample speedily after the reaction time is over.
- The coloring is very intensive and can discolor the stirring rod and cells. If possible, clean the utensils immediately after measuring.

Ammonium vario

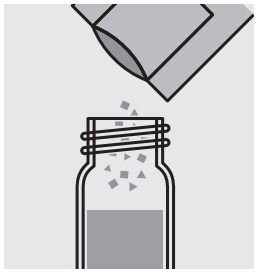
Program no. **7324**

WTW model no.:	NH4-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.01 - 0.50 mg/l NH_4-N
	0.01 - 0.64 mg/l NH_4
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

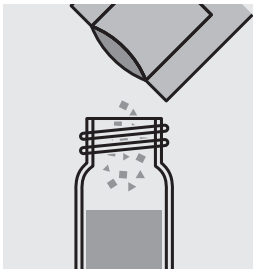


Pipette 10.0 ml of sample into the empty cell.

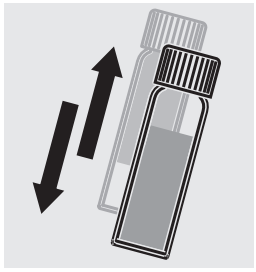


Add the contents of a **VARIO AMMONIA Salicylate F10** powder pack and close the cell with the screw cap.

Allow to react for 3 minutes (reaction time).

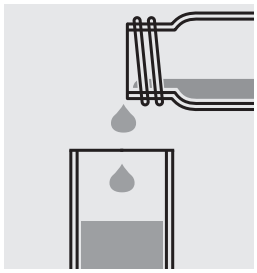


Add the contents of a **VARIO AMMONIA Cyanurate F10** powder pack and close the cell with the screw cap.

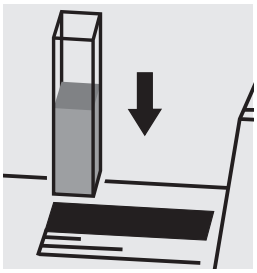


Shake the cell vigorously to dissolve solids.

Allow to react for 15 minutes (reaction time).



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

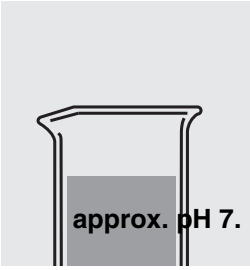
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- If NH_4-N is present in the sample, the solution will turn green after the VARIO AMMONIA Cyanurate F10 was added.
- If chlorine is present, the sample has to be treated with sodium thiosulfate immediately after sampling. To 1 liter of the sample, add one drop of a 0.1 mol/l sodium thiosulfate solution per 0.3 mg/l chlorine.

Ammonium vario LR

Program no. **7312**

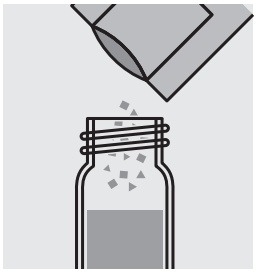
WTW model no.:	NH4-2 TC (LR)
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.02 - 2.50 mg/l NH_4-N
	0.03 - 3.20 mg/l NH_4
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

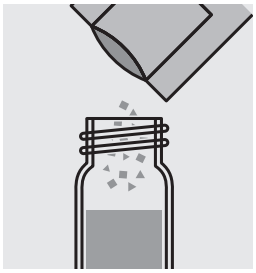


Check the pH value of the sample.
Required value: approx. pH 7.
Correct with diluted sodium hydroxide solution or hydrochloric acid as necessary.

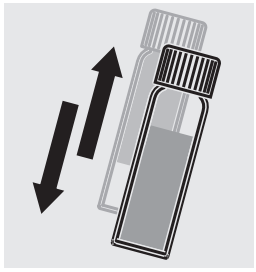
Pipette 2.0 ml of sample into a reaction cell.



Add the contents of a **VARIO AMMONIA Salicylate F5** powder pack.

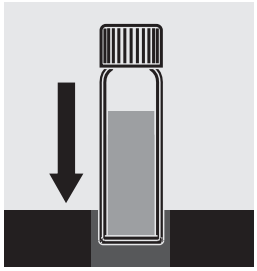


Add the contents of a **VARIO AMMONIA Cyanurate F5** powder pack and close the cell with the screw cap.



Shake the cell vigorously to dissolve solids.

Allow to react for 20 minutes.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

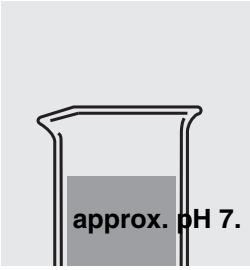
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- If NH_4-N is present in the sample, the solution will turn green after the VARIO AMMONIA Cyanurate F5 was added.
- If chlorine is present, the sample has to be treated with sodium thiosulfate immediately after sampling. To 1 liter of the sample, add one drop of a 0.1 mol/l sodium thiosulfate solution per 0.3 mg/l chlorine.
- Iron interferes with the determination and can be eliminated as follows: Determine the total iron concentration and prepare an iron standard solution with the determined concentration. Use this solution to determine the reagent blank value for the determination of ammonium (instead of distilled water).

Ammonium vario HR

Program no. **7313**

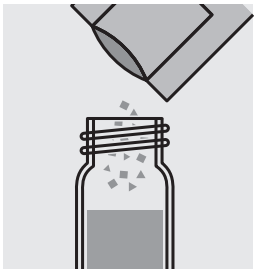
WTW model no.:	NH4-3 TC (HR)
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.4 - 50.0 mg/l NH_4-N
	0.5 - 64.4 mg/l NH_4
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

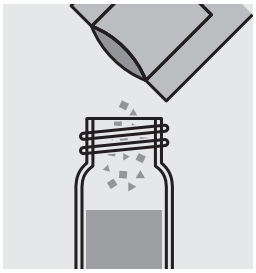


Check the pH value of the sample.
Required value: approx. pH 7.
Correct with diluted sodium hydroxide solution or hydrochloric acid as necessary.

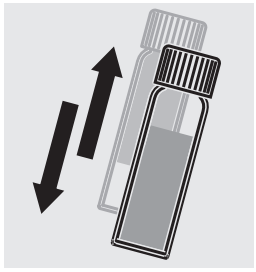
Pipette 0.1 ml of sample into a reaction cell.



Add the contents of a **VARIO AMMONIA Salicylate F5** powder pack.

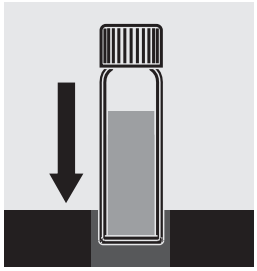


Add the contents of a **VARIO AMMONIA Cyanurate F5** powder pack and close the cell with the screw cap.



Shake the cell vigorously to dissolve solids.

Allow to react for 20 minutes.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

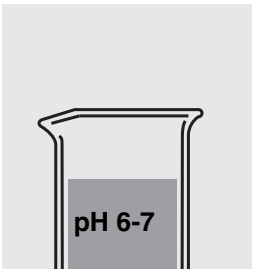
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- If NH_4-N is present in the sample, the solution will turn green after the VARIO AMMONIA Cyanurate F5 was added.
- If chlorine is present, the sample has to be treated with sodium thiosulfate immediately after sampling. To 1 liter of the sample, add one drop of a 0.1 mol/l sodium thiosulfate solution per 0.3 mg/l chlorine.
- Iron interferes with the determination and can be eliminated as follows: Determine the total iron concentration and prepare an iron standard solution with the determined concentration. Use this solution to determine the reagent blank value for the determination of ammonium (instead of distilled water).

Chlorine (free) vario

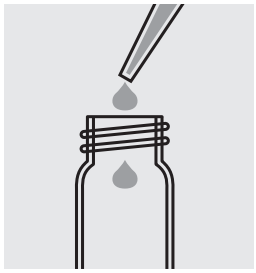
Program no. **7325**

WTW model no.:	Cl2-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.02 - 2.00 mg/l Cl_2
	Display in mmol/l possible

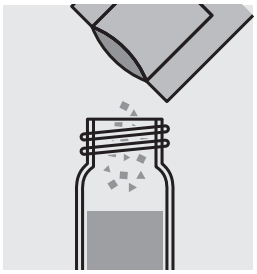
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



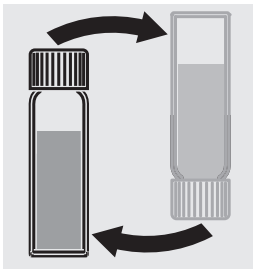
Check the pH value of the sample.
Required range: pH 6-7.
Correct with diluted sodium hydroxide solution or sulfuric acid as necessary.



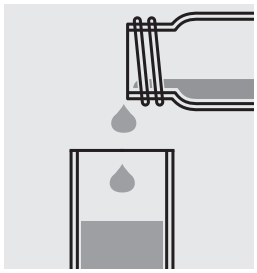
Pipette 10.0 ml of sample into the empty cell.



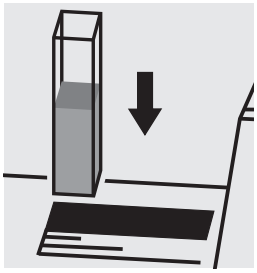
Add the contents of a **VARIO Chlorine FREE-DPD/F10** powder pack and close the cell with the screw cap.



Mix the contents by swaying the cell (20 seconds).



Fill the solution into the measuring cell.



Within one minute, insert the cell in the cell shaft of the photometer and start measurement.

Notes:

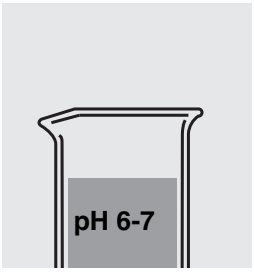
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The test sample should be pink. Very high chlorine concentrations in the sample cause yellow solutions and too low measured values. Dilute the sample in this case.

Chlorine (free) vario

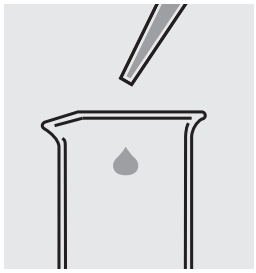
Program no. **7326**

WTW model no.:	Cl2-2 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.5 - 5.0 mg/l Cl_2
	Display in mmol/l possible

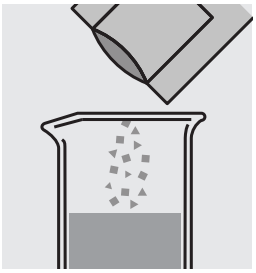
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



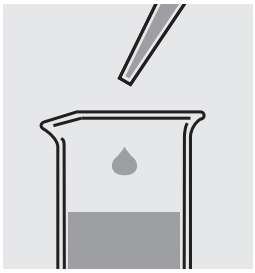
Check the pH value of the sample.
Desired range: pH 6-7.
Correct with diluted sodium hydroxide solution or sulfuric acid as necessary.



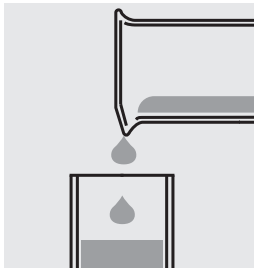
Pipette 10.0 ml of sample into an empty beaker.



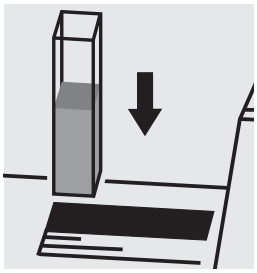
Add the contents of a **VARIO Chlorine FREE-DPD F25** powder pack and dissolve them by stirring.



Add 15.0 ml deionized water with a pipette and mix.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

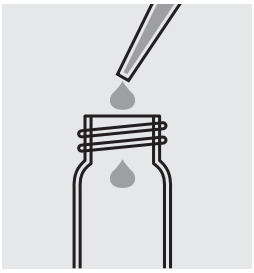
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The test sample should be pink. Very high chlorine concentrations in the sample cause yellow solutions and too low measured values. Dilute the sample in this case.

Chlorine (total) vario

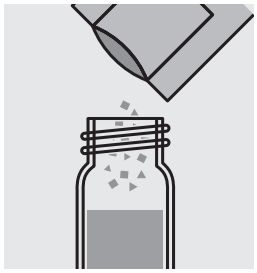
Program no. **7327**

WTW model no.:	Cl2-3 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.02 - 2.00 mg/l Cl_2
	Display in mmol/l possible

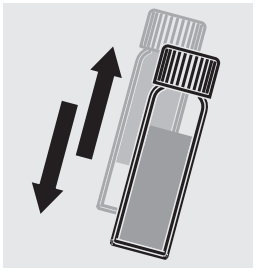
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



Pipette 10.0 ml of sample into the empty cell.

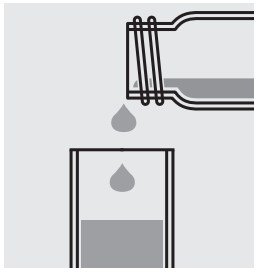


Add the contents of a **VARIO Chlorine Total DPD PP** powder pack and close the cell with the screw cap.

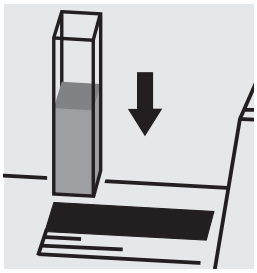


Shake the cell vigorously to dissolve solids. A small amount of solid matter may remain undissolved.

Allow to react for 3 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

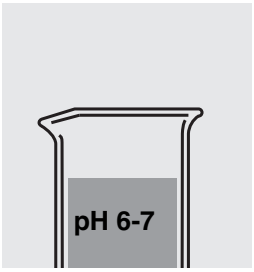
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The test sample should be pink. Very high chlorine concentrations in the sample cause yellow solutions and too low measured values. Dilute the sample in this case.
- Each time after determining total chlorine, rinse the cell with sulfuric acid 25 % and then several times with distilled water.

Chlorine (total) vario

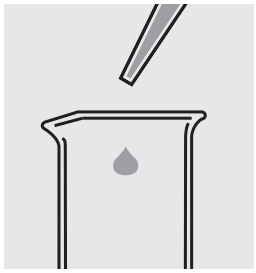
Program no. **7328**

WTW model no.:	Cl2-4 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.5 - 5.0 mg/l Cl_2
	Display in mmol/l possible

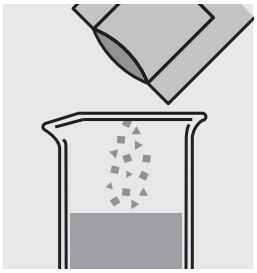
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



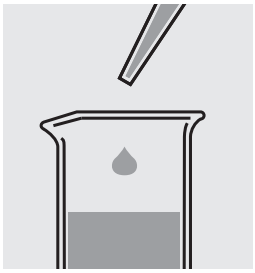
Check the pH value of the sample.
Required range: pH 6-7.
Correct with diluted sodium hydroxide solution or sulfuric acid as necessary.



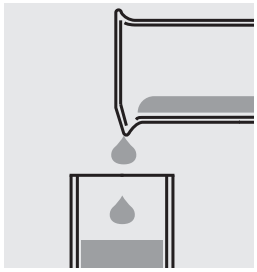
Pipette 10.0 ml of sample into an empty beaker.



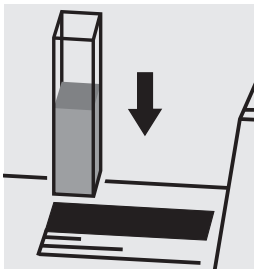
Add the contents of a **VARIO Chlorine Total-DPD F25 ml** powder pack and dissolve them by stirring.



Add 15.0 ml deionized water with a pipette and mix.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The test sample should be pink. Very high chlorine concentrations in the sample cause yellow solutions and too low measured values. Dilute the sample in this case.
- Each time after determining total chlorine, rinse the cell with sulfuric acid 25 % and then several times with distilled water.

COD LR

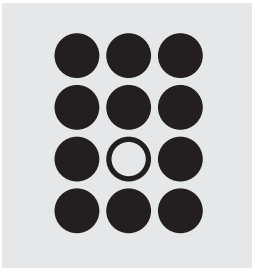
Method no. **7309**

WTW model no.:	COD1 TC (LR)
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	3 - 150 mg/l COD

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

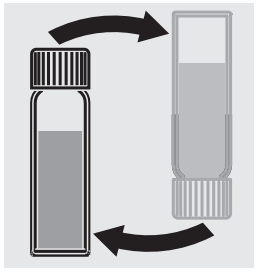
Shake the reaction cell so that the sediment is suspended.

Carefully pipette 2.0 ml of sample into the cell, close with screw cap and mix vigorously.
Caution, cell becomes very hot!

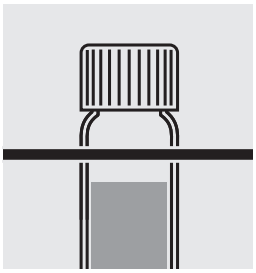


Heat the cell in the thermoreactor for two hours at 148 °C.

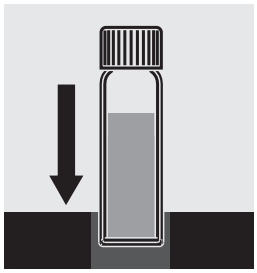
Remove the cell from the thermoreactor and let it cool down in a cell rack.



After approx. 10 min cooling time sway the cell.



Place the cell in the cell rack again and let it cool down **to room temperature**.



Carefully insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The chloride content of the sample must not exceed 1000 mg/l.
- Homogenize samples containing suspended matter with a disperser.
- Before being inserted in the thermoreactor and for photometric measurements the outside of the cell must be free of any contamination (e.g. fingerprints or drops of water). Wipe the cell with a dry cloth as necessary.
- Let the cell cool down long enough (at least 45 min) before inserting it in the photometer cell shaft. The cells remain stable for a long time after reaction and can also be left overnight and then measured.
- After cooling do not rock the cell until the measurement takes place in order not to suspend the solids that formed during the reaction. Suspended matter disturbs the photometric measurement.

COD MR

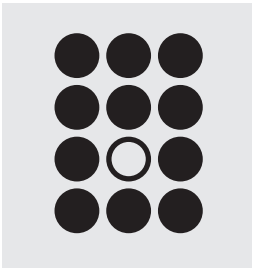
Method no. **7310**

WTW model no.:	COD2 TC (MR)
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	20 - 1500 mg/l COD

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

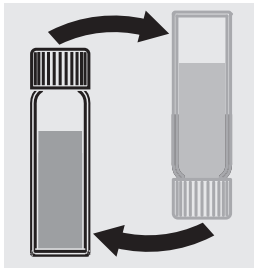
Shake the reaction cell so that the sediment is suspended.

Carefully pipette 2.0 ml of sample into the cell, close with screw cap and mix vigorously.
Caution, cell becomes very hot!

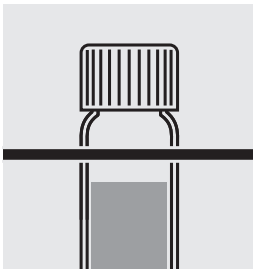


Heat the cell in the thermoreactor for two hours at 148 °C.

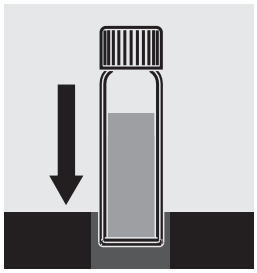
Remove the cell from the thermoreactor and let it cool down in a cell rack.



After approx. 10 min cooling time sway the cell.



Place the cell in the cell rack again and let it cool down **to room temperature**.



Carefully insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The chloride content of the sample must not exceed 1000 mg/l.
- Homogenize samples containing suspended matter with a disperser.
- Before being inserted in the thermoreactor and for photometric measurements the outside of the cell must be free of any contamination (e.g. fingerprints or drops of water). Wipe the cell with a dry cloth as necessary.
- Let the cell cool down long enough (at least 45 min) before inserting it in the photometer cell shaft. The cells remain stable for a long time after reaction and can also be left overnight and then measured.
- After cooling do not rock the cell until the measurement takes place in order not to suspend the solids that formed during the reaction. Suspended matter disturbs the photometric measurement.

COD HR

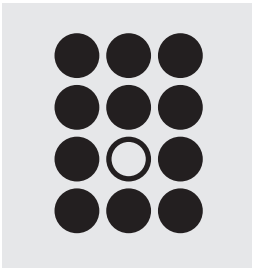
Method no. **7311**

WTW model no.:	COD3 TC (HR)
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	200 - 15000 mg/l COD

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

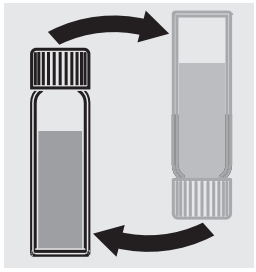
Shake the reaction cell so that the sediment is suspended.

Carefully pipette 0.2 ml of sample into the cell, close with screw cap and mix vigorously.
Caution, cell becomes very hot!

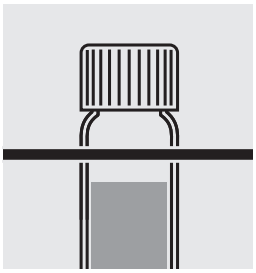


Heat the cell in the thermoreactor for two hours at 148 °C.

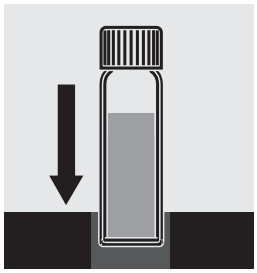
Remove the cell from the thermoreactor and let it cool down in a cell rack.



After approx. 10 min cooling time sway the cell.



Place the cell in the cell rack again and let it cool down **to room temperature**.



Carefully insert the cell in the photometer cell shaft and start measurement.

Notes:

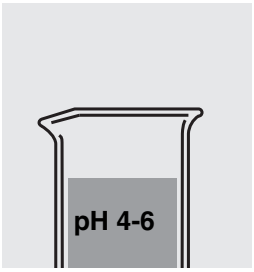
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The chloride content of the sample must not exceed 10,000 mg/l.
- Homogenize samples containing suspended matter with a disperser.
- Before being inserted in the thermoreactor and for photometric measurements the outside of the cell must be free of any contamination (e.g. fingerprints or drops of water). Wipe the cell with a dry cloth as necessary.
- Let the cell cool down long enough (at least 45 min) before inserting it in the photometer cell shaft. The cells remain stable for a long time after reaction and can also be left overnight and then measured.
- After cooling do not rock the cell until the measurement takes place in order not to suspend the solids that formed during the reaction. Suspended matter disturbs the photometric measurement.

Copper vario

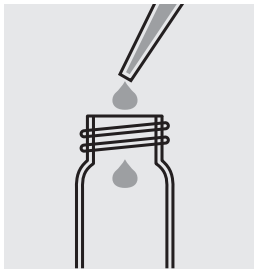
Program no. **7302**

WTW model no.:	Cu-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.04 - 5.00 mg/l Cu
	Display in mmol/l possible

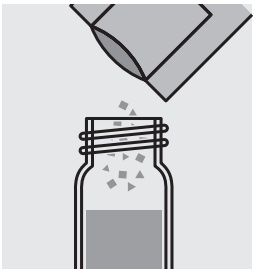
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



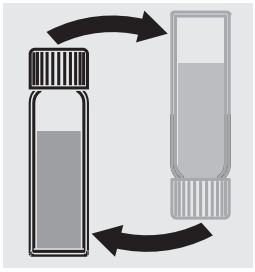
Check the pH value of the sample.
Required range: pH 4-6.
Correct with diluted sodium hydroxide solution or caustic potash solution as necessary.



Pipette 10.0 ml of sample into the empty cell.

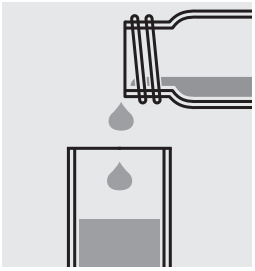


Add the contents of a **VARIO Cu1 F10** powder pack and close the cell with the screw cap.

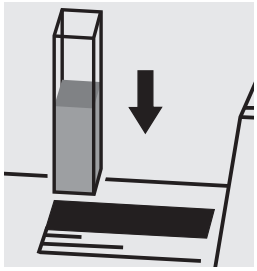


Mix the contents by carefully swaying the cell (10 times).
Any undissolved powder does not adversely affect the measurement.

Allow to react for 2 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

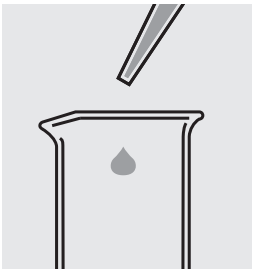
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

DEHA vario

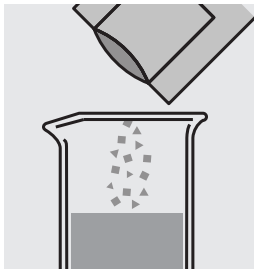
Program no. **7335**

WTW model no.:	DEHA-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.004 - 0.450 mg/l DEHA
	Display in mmol/l possible

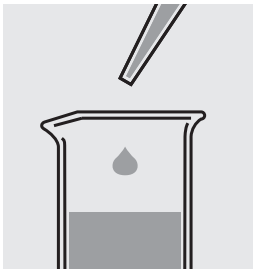
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



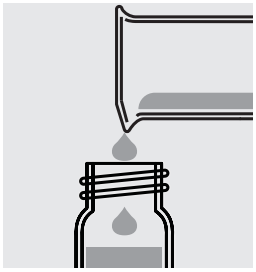
Pipette 25.0 ml of sample into an empty beaker.



Add the contents of a **Vario Oxyscav 1 RGT** powder pack and dissolve it by stirring.

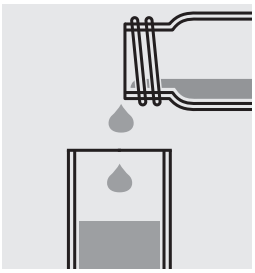


Add 0.5 ml **Vario DEHA 2 RGT** with a pipette and mix.

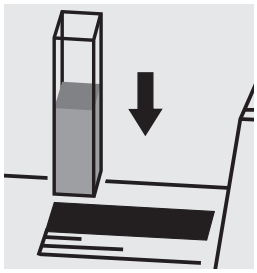


Fill an empty cell with the prepared sample, close it with the screw cap **and put it in a dark place**.

Allow the sample to react for ten minutes **in a dark place**. **Then measure immediately.**



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

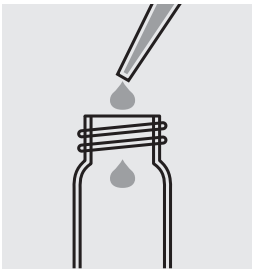
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- Clean all laboratory glassware with hydrochloric acid (approx. 20 %), then thoroughly rinse with deionized water.
- Avoid excessive movements and exposure to sun light during sampling. Store the samples hermetically sealed.
- The temperature of the samples must be 25±3 °C.

Hydrazine vario

Program no. **7329**

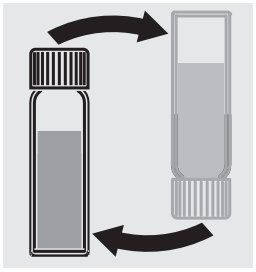
WTW model no.:	N2H4-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.004 - 0.600 mg/l N_2H_4
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.



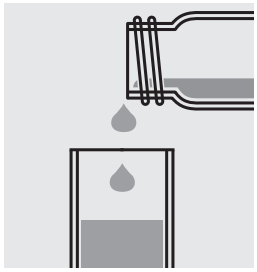
Pipette 10.0 ml of sample into the empty cell.

With a pipette add 0.5 ml **Vario Hydra2 Reagent Solution** and close the cell with the screw cap.

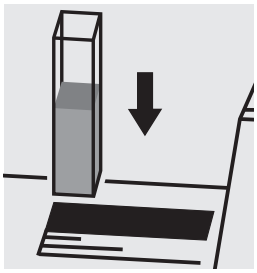


Mix the contents by carefully swaying the cell.

Allow to react for 12 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

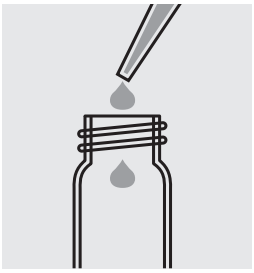
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- If any hydrazine is present, the solution develops a yellow color after the reagent is added.
- The temperature of the samples must be 21±4 °C.
- Avoid moving the sample too much or too long exposure to air.

Iron vario TPTZ

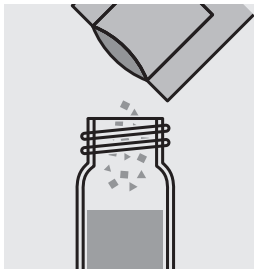
Program no. **7300**

WTW model no.:	Fe-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.012 - 1.800 mg/l Fe
	Display in mmol/l possible

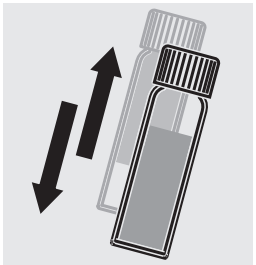
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



Pipette 10.0 ml of sample into the empty cell.

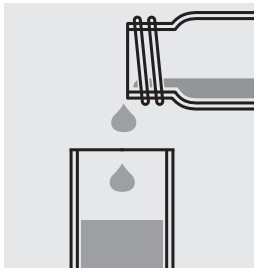


Add the contents of a **VARIO Iron TPTZ F10** powder pack and close the cell with the screw cap.

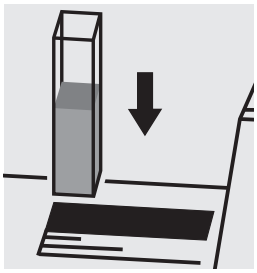


To dissolve the solids, shake the cell vigorously for approx. 30 seconds.

Allow to react for 3 minutes (reaction time).



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

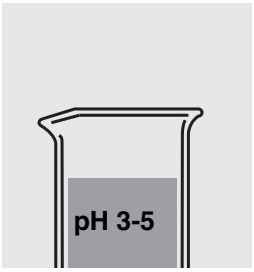
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

Iron vario

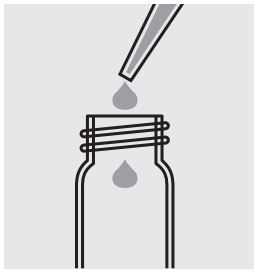
Program no. **7301**

WTW model no.:	Fe-2 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.02 - 3.00 mg/l Fe
	Display in mmol/l possible

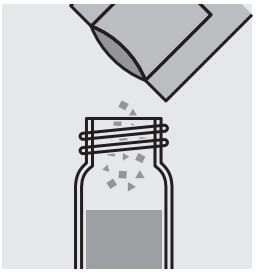
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



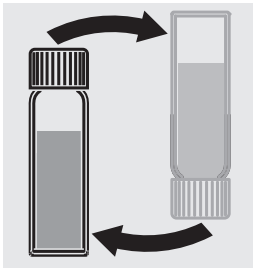
Check the pH value of the sample.
Required range: pH 3-5.
Correct with diluted sodium hydroxide solution or hydrochloric acid as necessary.



Pipette 10.0 ml of sample into the empty cell.

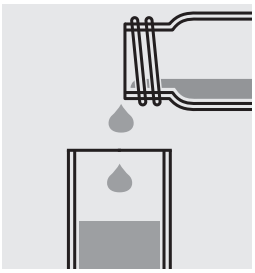


Add the contents of a **VARIO Ferro F10** powder pack and close the cell with the screw cap.

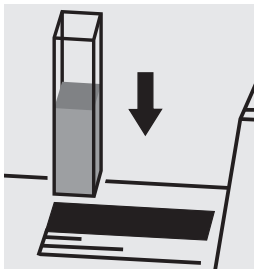


Mix the contents by carefully swaying the cell (10 times).
Any undissolved powder does not adversely affect the measurement.

Allow to react for 3 minutes (reaction time).



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

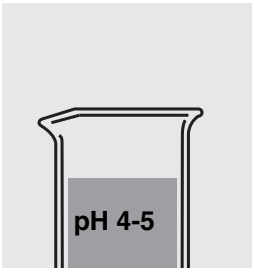
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- This method measures all types of dissolved iron and most types of undissolved iron.
- If there is visible rust in the sample the reaction time should be at least 5 minutes.

Manganese vario

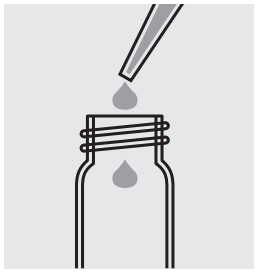
Program no. **7303**

WTW model no.:	Mn-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.2 - 20.0 mg/l Mn
	Display in mmol/l possible

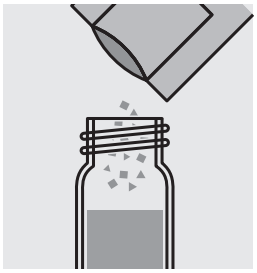
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



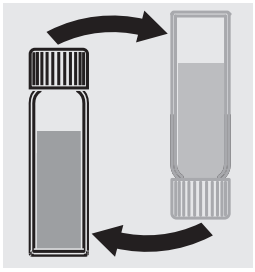
Check the pH value of the sample.
Required range: pH 4-5.
Correct with diluted nitric acid or sodium hydroxide solution as necessary.



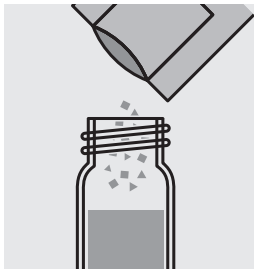
Pipette 10.0 ml of sample into the empty cell.



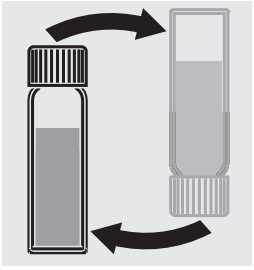
Add the contents of a **VARIO MANGANESE Citrate Buffer F10** powder pack and close the cell with the screw cap.



Mix the contents by carefully swaying the cell (10 times).

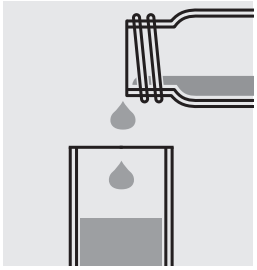


Add the contents of a **VARIO Sodium Periodate F10** powder pack and close the cell with the screw cap.

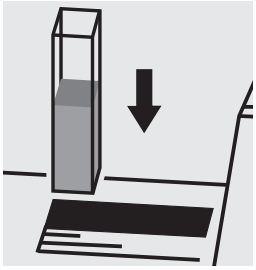


Mix the contents by carefully swaying the cell (10 times).

Allow to react for 2 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

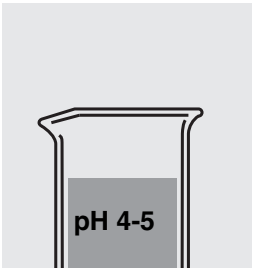
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

Manganese vario

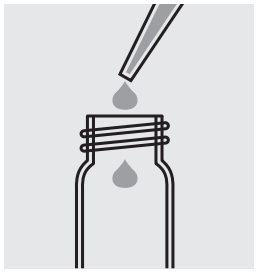
Program no. **7330**

WTW model no.:	Mn-2 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.007 - 0.700 mg/l Mn
	Display in mmol/l possible

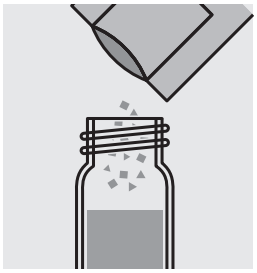
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



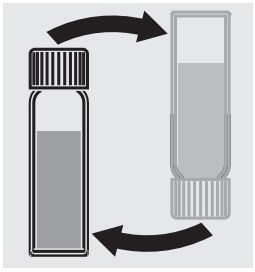
Check the pH value of the sample.
Required range: pH 4-5.
Correct with diluted nitric acid or sodium hydroxide solution as necessary.



Pipette 10.0 ml of sample into the empty cell.

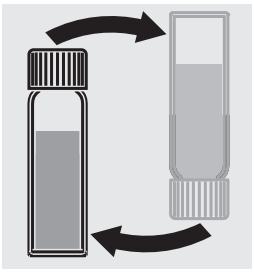


Add the contents of a **Vario Ascorbic Acid** powder pack and close the cell with the screw cap.



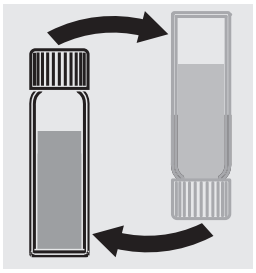
Mix the contents by carefully swaying the cell.

Add 15 drops of **Vario Alkaline-Cyanide Reagent Solution** and close the cell with the screw cap.



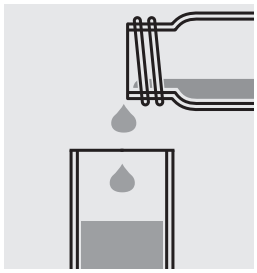
Mix the contents by carefully swaying the cell.

Add 21 drops of **Vario PAN Indicator Solution 0.1%** and close the cell with the screw cap.

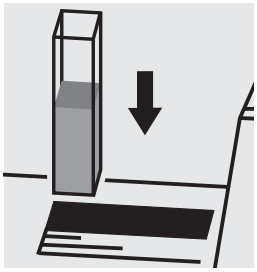


Mix the contents by carefully swaying the cell.

Allow to react for 2 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

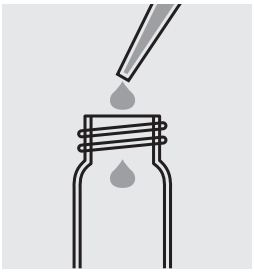
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- Clean all laboratory glassware with nitric acid, then thoroughly rinse with deionized water.

Molybdate vario

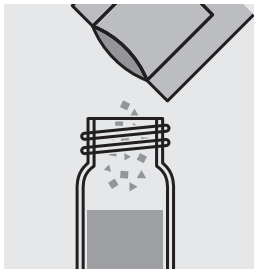
Program no. **7304**

WTW model no.:	Mo-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.3 - 35.0 mg/l Mo
	Display in mmol/l possible

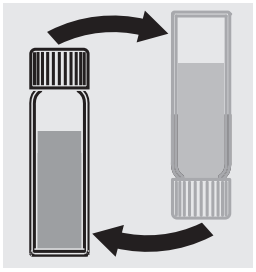
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



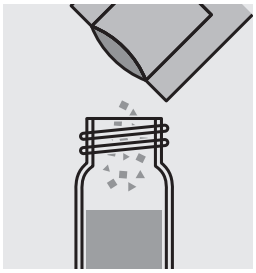
Pipette 10.0 ml of sample into the empty cell.



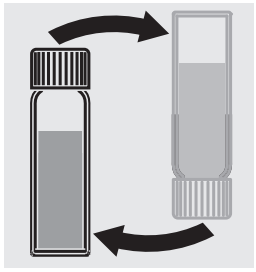
Add the contents of a **MolyVer 1 Reagenz** powder pack and close the cell with the screw cap.



Mix the contents by carefully swaying the cell (10 times).

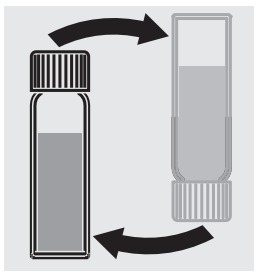


Add the contents of a **MolyVer 2 Reagenz** powder pack and close the cell with the screw cap.



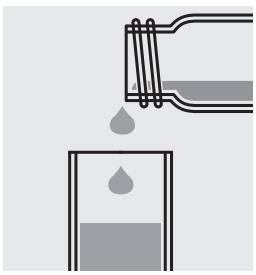
Mix the contents by carefully swaying the cell (10 times).

Add the contents of a **MolyVer 3 Reagenz** powder pack and close the cell with the screw cap.

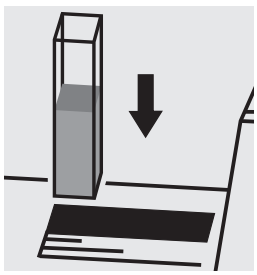


Mix the contents by carefully swaying the cell (10 times).
Any undissolved powder does not adversely affect the measurement.

Allow to react for 5 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

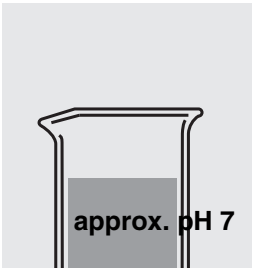
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

Molybdenum vario

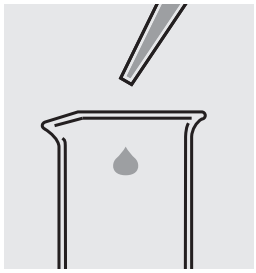
Program no. **7331**

WTW model no.:	Mo-2 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.3 - 40.0 mg/l Mo
	Display in mmol/l possible

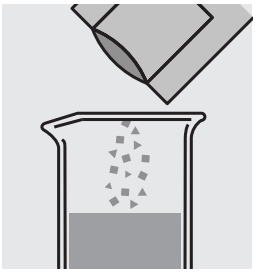
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



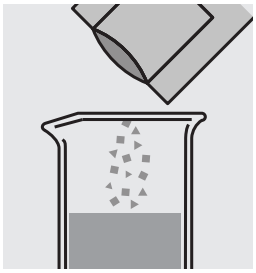
Check the pH value of the sample.
Required value: approx. pH 7.
Correct with diluted sodium hydroxide solution or nitric acid as necessary.



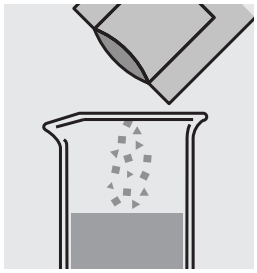
Pipette 25.0 ml of sample into an empty beaker.



Add the contents of a **Vario Molybdenum HR 1 F25 ml** powder pack and dissolve them by stirring.

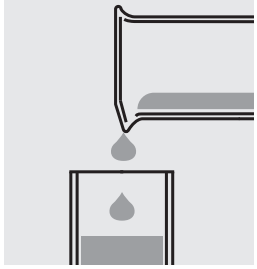


Add the contents of a **Vario Molybdenum HR 2 F25 ml** powder pack and dissolve them by stirring.

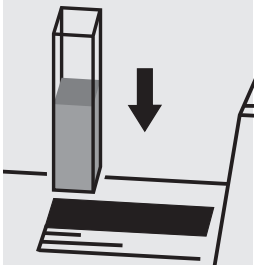


Add the contents of a **Vario Molybdenum HR 3 F25 ml** powder pack and dissolve them by stirring.

Allow to react for 5 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- If any molybdenum is present, the solution develops a yellow color after all reagents have been added.

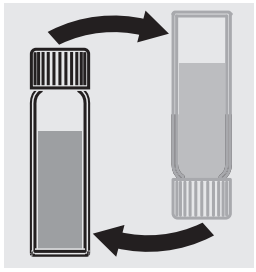
Nitrate

Program no. **7314**

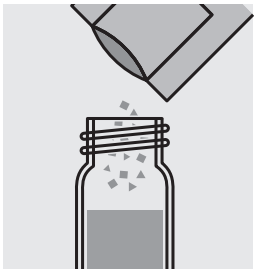
WTW model no.:	NO3-1 TC
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.2 - 30.0 mg/l NO_3-N
	1.9 - 133.0 mg/l NO_3
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

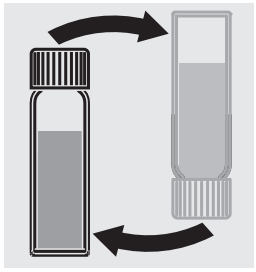
Pipette 1.0 ml of sample into a reaction cell and close the cell with the screw cap.



Mix the contents by carefully swaying the cell (10 times).

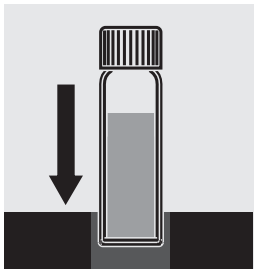


Add the contents of a **VARIO Nitrate Chromotropic** powder pack and close the cell with the screw cap.



Mix the contents by carefully swaying the cell (10 times). A small amount of solid matter may remain undissolved.

Allow to react for 5 minutes.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

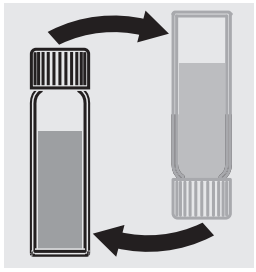
Nitrite LR

Program no. **7318**

WTW model no.:	NO2-2 TC
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.03 - 0.60 mg/l NO_2-N
	0.10 - 1.97 mg/l NO_2
	Display in mmol/l possible

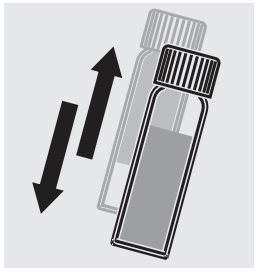
Note: Before using the test with your photometer for the first time, determine the reagent blank value.

Pipette 2.0 ml sample into a reaction cell.



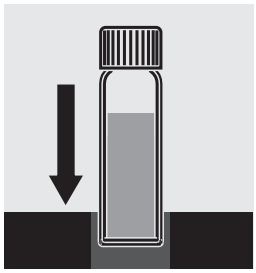
Mix the contents by carefully swaying the cell.

Add 1 level black measuring spoon of No. 8 **Nitrit-101** and close the cell with the screw cap.



Shake the cell vigorously to dissolve solids.

Allow to react for 10 minutes.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- Store the reagents closed at a temperature of +4 ... +8 °C.

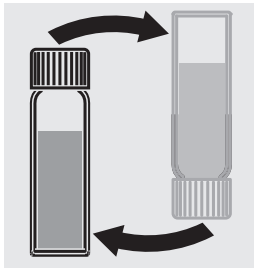
Nitrite HR

Program no. **7317**

WTW model no.:	NO2-2 TC
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.30 - 3.00 mg/l NO_2-N
	0.99 - 9.85 mg/l NO_2
	Display in mmol/l possible

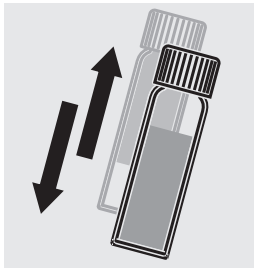
Note: Before using the test with your photometer for the first time, determine the reagent blank value.

Pipette 0.5 ml sample into a reaction cell.



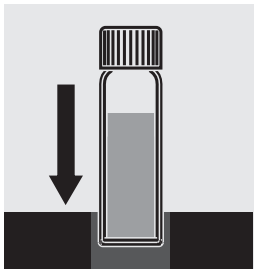
Mix the contents by carefully swaying the cell.

Add 1 level black measuring spoon of No. 8 **Nitrit-101** and close the cell with the screw cap.



Shake the cell vigorously to dissolve solids.

Allow to react for 10 minutes.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

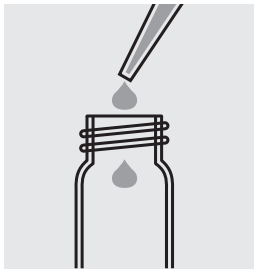
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- Store the reagents closed at a temperature of +4 ... +8 °C.

Nitrite vario

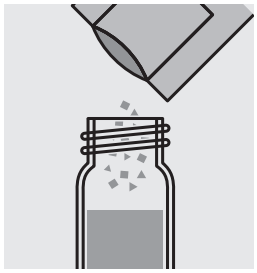
Program no. **7305**

WTW model no.:	NO2-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.002 - 0.300 mg/l NO_2-N
	0.001 - 0.091 mg/l NO_2
	Display in mmol/l possible

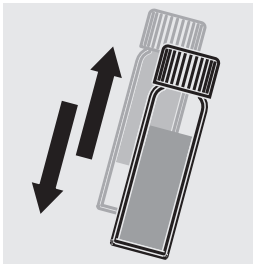
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



Pipette 10.0 ml of sample into the empty cell.

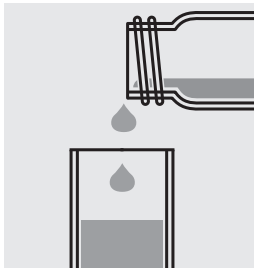


Add the contents of a **VARIO Nitri 3 F10** powder pack and close the cell with the screw cap.

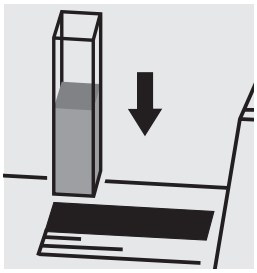


Shake the cell.
Any undissolved powder does not adversely affect the measurement.

Allow to react for 15 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

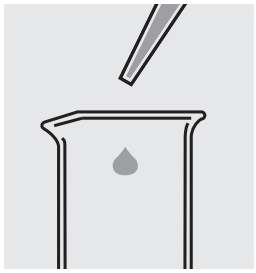
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

Nitrite vario

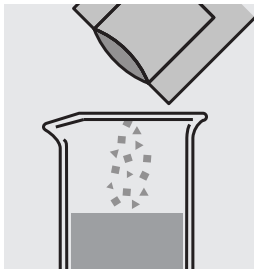
Program no. **7334**

WTW model no.:	NO2-3 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.002 - 0.300 mg/l NO_2-N
	0.007 - 0.982 mg/l NO_2
	Display in mmol/l possible

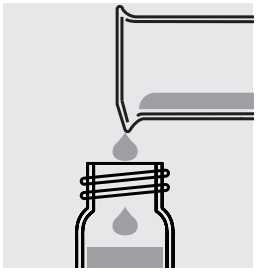
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



Pipette 25.0 ml of sample into an empty beaker.

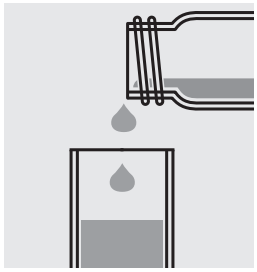


Add the contents of a **Vario Nitri3 F25 ml** powder pack and dissolve them by stirring.

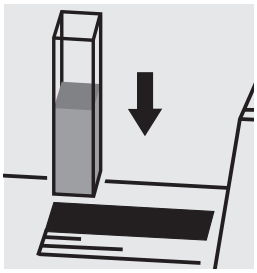


Fill an empty cell with the prepared sample and close it with the screw cap.

Allow to react for 20 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

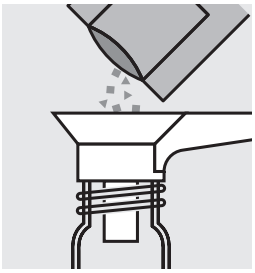
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

Nitrogen, total HR

Program no. **7320**

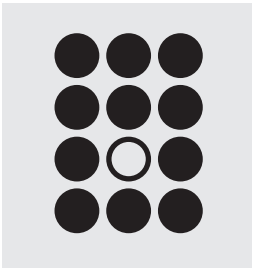
WTW model no.:	Ntot2 TC (HR)
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	10 - 150 mg/l N

Note: Before using the test with your photometer for the first time, determine the reagent blank value.



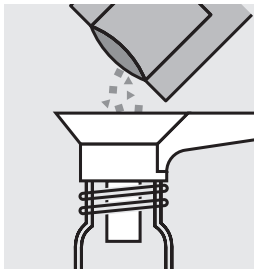
Put the contents of a **VARIO TN Persulfate Rgt.** powder pack into a **TN Hydroxide HR** digestion cell.

Add 0.5 ml sample with a pipette, close the cell with the screw cap and mix vigorously for at least 30 seconds. A small amount of solid matter may remain undissolved.



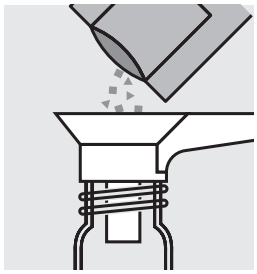
Heat the cell in the thermoreactor at 120 °C for 30 minutes.

Remove the cell from the thermoreactor and let it cool down in a cell rack.



Add the contents of a **VARIO TN Reagent A** Powder pack. Close the cell with the screw cap and mix for at least 15 s.

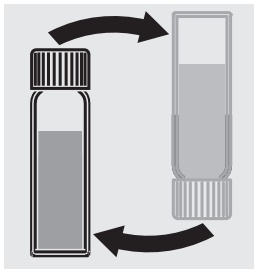
Allow to react for 3 minutes.



Add the contents of a **VARIO TN Reagent B** powder pack. Close the cell with the screw cap and mix for at least 15 s.

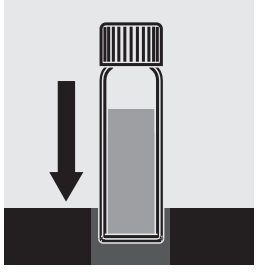
Allow to react for 2 minutes.

With a pipette add 2.0 ml of the prepared sample to a **TN Acid LR/HR (Reagent C)** and close the cell with the screw cap.



Mix the contents by carefully swaying the cell (10 x, i.e. for approx. 30 s).
Caution, cell grows hot!

Allow to react for 5 minutes.



Insert the cell in the photometer cell shaft and start measurement.

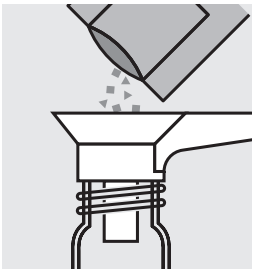
Note:
Clean the powder funnel thoroughly each time before adding the reagent!

Nitrogen, total LR

Program no. **7319**

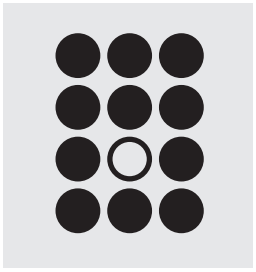
WTW model no.:	Ntot1 TC (LR)
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.5 - 25.0 mg/l N

Note: Before using the test with your photometer for the first time, determine the reagent blank value.



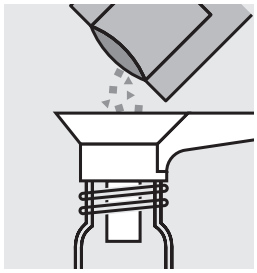
Put the contents of a **VARIO TN Persulfate Rgt.** powder pack into a **TN Hydroxide LR** digestion cell.

Add 2.0 ml sample with a pipette, close the cell with the screw cap and mix vigorously for at least 30 seconds. A small amount of solid matter may remain undissolved.



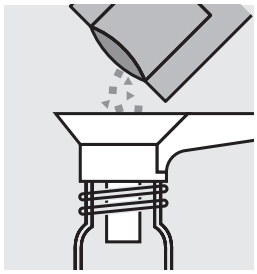
Heat the cell in the thermoreactor at 120 °C for 30 minutes.

Remove the cell from the thermoreactor and let it cool down in a cell rack.



Add the contents of a **VARIO TN Reagent A** Powder pack. Close the cell with the screw cap and mix for at least 15 s.

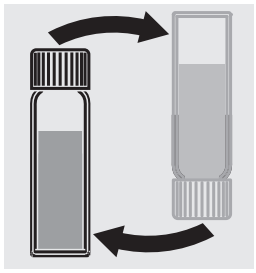
Allow to react for 3 minutes.



Add the contents of a **VARIO TN Reagent B** powder pack. Close the cell with the screw cap and mix for at least 15 s.

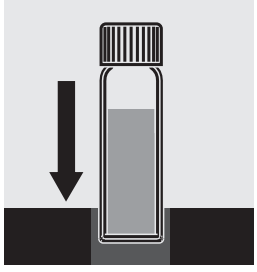
Allow to react for 2 minutes.

With a pipette add 2.0 ml of the prepared sample to a **TN Acid LR/HR (Reagent C)** and close the cell with the screw cap.



Mix the contents by carefully swaying the cell (10 x, i.e. for approx. 30 s).
Caution, cell grows hot!

Allow to react for 5 minutes.



Insert the cell in the photometer cell shaft and start measurement.

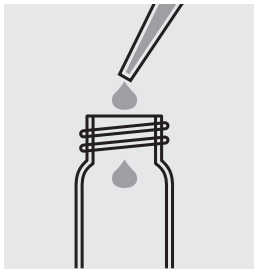
Note:
Clean the powder funnel thoroughly each time before adding the reagent!

Phosphate vario (ortho)

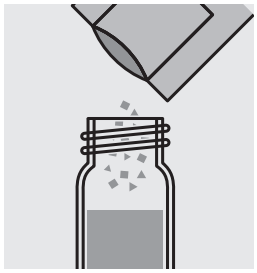
Program no. **7306**

WTW model no.:	PO4-1 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.02 - 2.50 mg/l PO_4
	0.007 - 0.800 mg/l PO_4-P
	Display in mmol/l possible

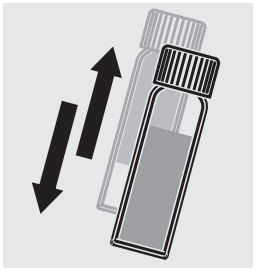
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



Pipette 10.0 ml of sample into the empty cell.

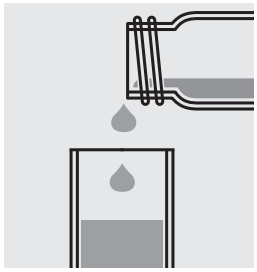


Add the contents of a **VARIO Phos 3 F10** powder pack and close the cell with the screw cap.

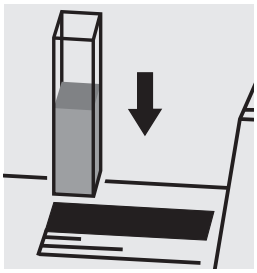


Shake the cell for 10 to 15 seconds.
Any undissolved powder does not adversely affect the measurement.

Allow to react for 2 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

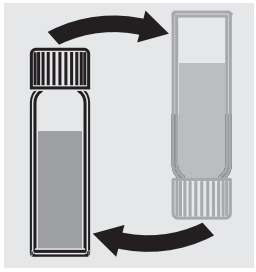
Phosphate, ortho

Program no. **7315**

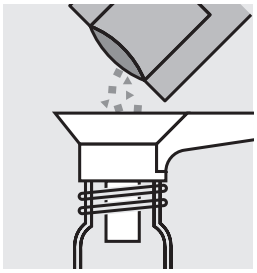
WTW model no.:	PO4-2 TC
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.06 - 5.00 mg/l PO_4
	0.02 - 1.63 mg/l PO_4-P
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

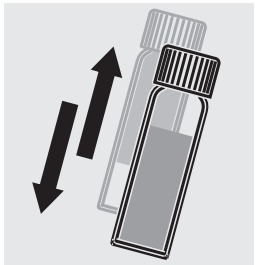
Pipette 5.0 ml of sample into a reaction cell and close the cell with the screw cap.



Mix the contents by carefully swaying the cell.

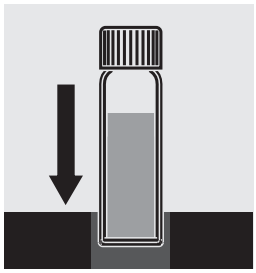


Add the contents of a **VARIO Phos 3 F10** powder pack and close the cell with the screw cap.



To dissolve the solids, shake the cell for 10 to 15 seconds. A small amount of solid matter may remain undissolved.

Allow to react for 2 minutes.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

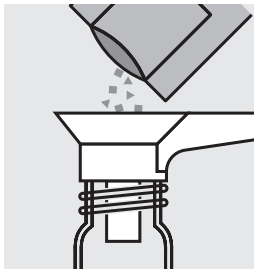
Phosphate, total

Program no. **7316**

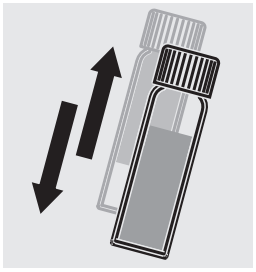
WTW model no.:	PO4-3 TC
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.06 - 3.50 mg/l PO_4
	0.020 - 1.141 mg/l PO_4-P
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

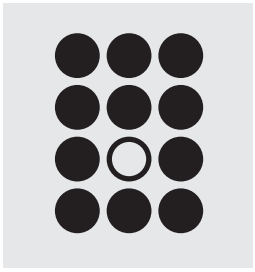
Pipette 5.0 ml of sample into a reaction cell.



Add the contents of a **Vario Potassium Persulfate F10 ml** powder pack and close the cell with the screw cap.



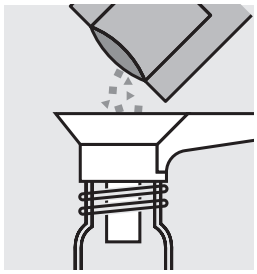
Shake the cell vigorously to dissolve solids.



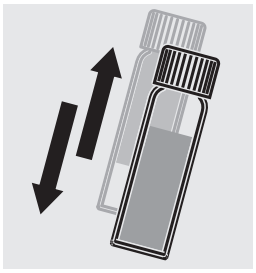
Heat the cell in the thermoreactor for 30 minutes at 120 °C.

Remove the cell from the thermoreactor and let it cool down in a cell rack.

With a pipette add 2.0 ml 1,54 N sodium hydroxide solution. Close the cell with the screw cap and mix the contents by carefully swaying the cell.

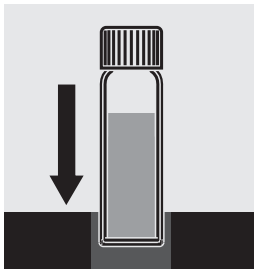


Add the contents of a **VARIO Phos 3 F10** powder pack and close the cell with the screw cap.



To dissolve the solids, shake the cell for 10 to 15 seconds. A small amount of solid matter may remain undissolved.

Allow to react for 2 minutes.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.

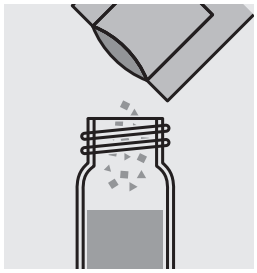
Phosphate, total

Program no. **7336**

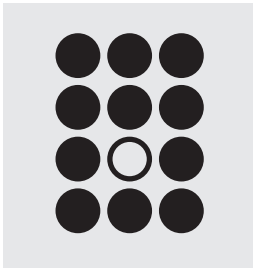
WTW model no.:	PO4-4 TC
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.06 - 3.50 mg/l PO_4
	0.020 - 1.141 mg/l PO_4-P
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

Pipette 5 ml of sample into a reaction cell.



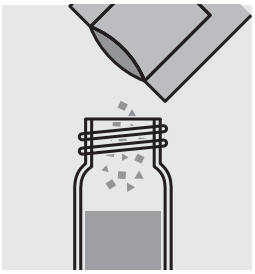
Add the contents of a **Vario Potassium Persulfate F10 ml** powder pack and close the cell with the screw cap.



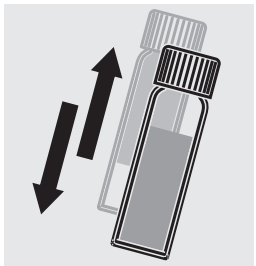
Heat the cell in the thermoreactor for 30 minutes at 120 °C.

Remove the cell from the thermoreactor and let it cool down in a cell rack.

With a pipette add 2.0 ml **Vario Sodium hydroxide 1.54N**, close the cell with the screw cap and mix.

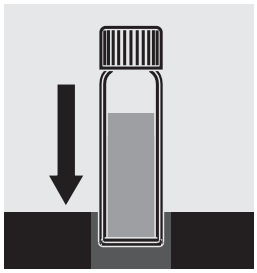


Add the contents of a **Vario Phosphate RGT F10 ml** powder pack and close the cell with the screw cap.



Shake the cell for 10-15 s. A small amount of solid matter remains undissolved.

Allow to react for 2 minutes.



Within 8 minutes after the last reagent was added:
Insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- Clean all laboratory glassware with hydrochloric acid (approx. 20 %), then thoroughly rinse with deionized water. Do not used any detergents that contain phosphate!

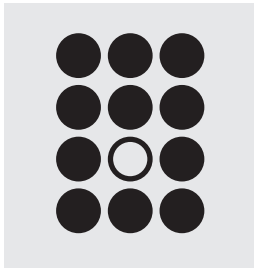
Phosphate, acid hydrolyzable

Program no. **7336**

WTW model no.:	PO4-4 TC
Category:	KT (reaction cell test)
Cell:	16 mm
Measuring range:	0.06 - 3.50 mg/l PO_4
	0.020 - 1.141 mg/l PO_4-P
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

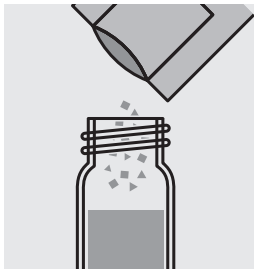
Pipette 5 ml of sample into a reaction cell and close the cell with the screw cap.



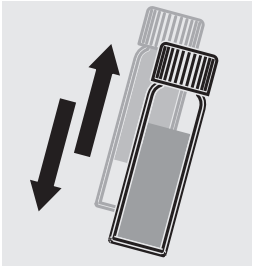
Heat the cell in the thermoreactor for 30 minutes at 120 °C.

Remove the cell from the thermoreactor and let it cool down in a cell rack.

With a pipette add 2.0 ml **Vario Sodium hydroxide 1.00 N**, close the cell with the screw cap and mix.

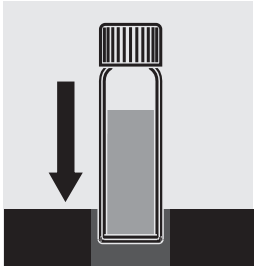


Add the contents of a **Vario Phosphate RGT F10 ml** powder pack and close the cell with the screw cap.



Shake the cell for 10-15 s. A small amount of solid matter remains undissolved.

Allow to react for 2 minutes.



Within 8 minutes after the last reagent was added:
Insert the cell in the photometer cell shaft and start measurement.

Notes:

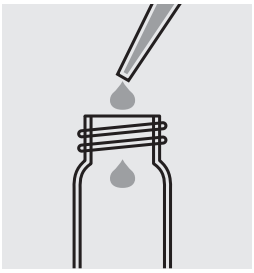
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- Clean all laboratory glassware with hydrochloric acid (approx. 20 %), then thoroughly rinse with deionized water. Do not used any detergents that contain phosphate!

Silica HR vario

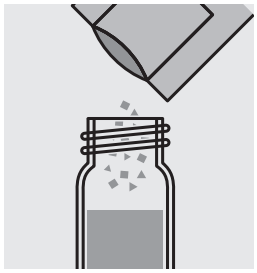
Program no. **7337**

WTW model no.:	Si-3 TP (HR)
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	1 - 200 mg/l SiO_2
	1 - 93 mg/l Si
	Display in mmol/l possible

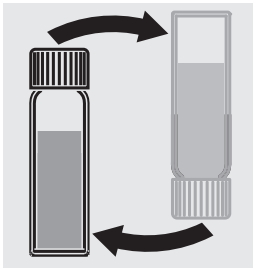
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



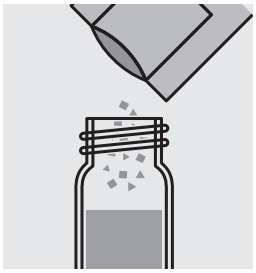
Pipette 25.0 ml of sample into the empty cell.



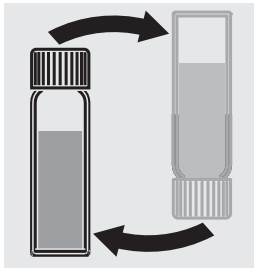
Add the contents of a **VARIO Silica HR Molybdate F25** powder pack and close the cell with the screw cap.



Mix the contents by carefully swaying the cell.

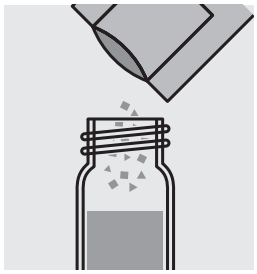


Add the contents of a **VARIO Silica HR Acid Rgt F25** powder pack and close the cell with the screw cap.

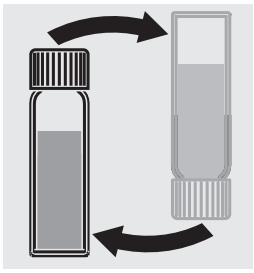


Mix the contents by carefully swaying the cell.

Allow to react for 10 minutes.

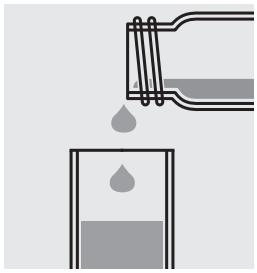


Add the contents of a **VARIO Silica HR Citric Acid F25** powder pack and close the cell with the screw cap.

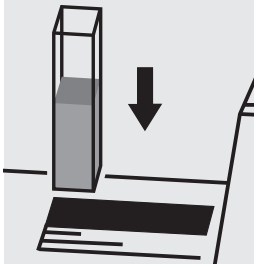


Mix the contents by carefully swaying the cell.

Allow to react for 2 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

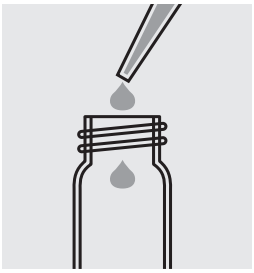
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The temperature of the samples must be in the range 15 ... 25 °C.

Silica LR vario

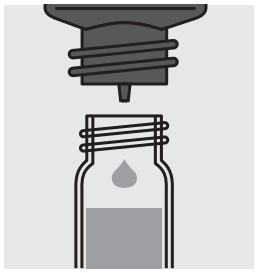
Program no. **7321**

a xylem brand

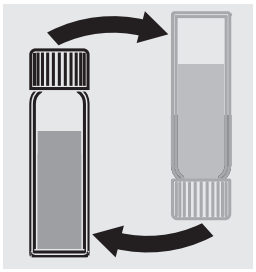
WTW model no.:	Si-1 TP (LR)
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	0.01 - 1.60 mg/l SiO_2
	0.005- 0.748 mg/l Si
	Display in mmol/l possible



Pipette 10.0 ml of sample into the empty cell.

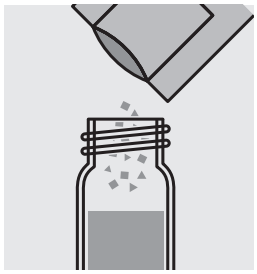


Add 15 drops of **Vario Molybdate 3 Reagent Solution** and close the cell with the screw cap.

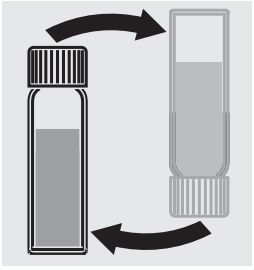


Mix the contents by carefully swaying the cell.

Allow to react for 4 minutes (temperature dependency, see note).

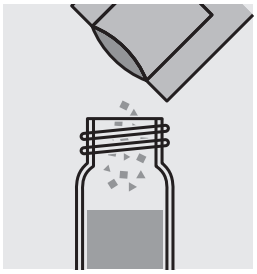


Add the contents of a **VARIO Silica Citric Acid F10** powder pack and close the cell with the screw cap.



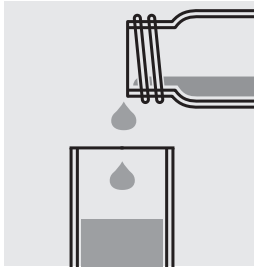
Mix the contents by carefully swaying the cell.

Allow to react for 1 minute (temperature dependency, see note).

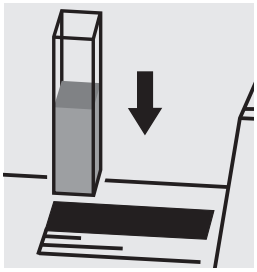


Add the contents of a **VARIO LR Silica Amino Acid F F10** powder pack. Close the cell with the screw cap and mix.

Allow to react for 2 minutes. If SiO_2 is present in the sample the solution will turn blue.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

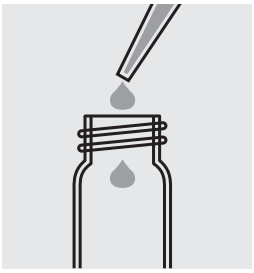
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The reaction times mentioned above apply to a room temperature of 20 °C. At 10 °C the reaction time has to be doubled, at 30 °C reduced by half.

Silica HR vario

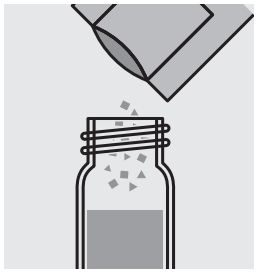
Program no. **7308**

WTW model no.:	Si-2 TP (HR)
Category:	RS (reagent test)
Cell:	16 mm
Measuring range:	1 - 100 mg/l SiO_2
	0.5 - 46.7 mg/l Si
	Display in mmol/l possible

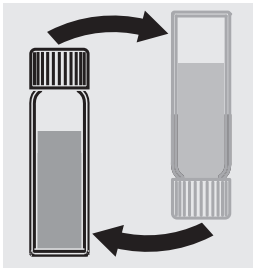
Note: Before using the test with your photometer for the first time, determine the reagent blank value.



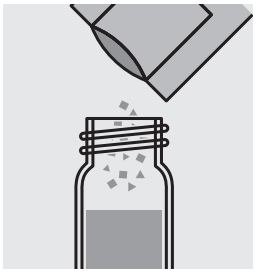
Pipette 10.0 ml of sample into the empty cell.



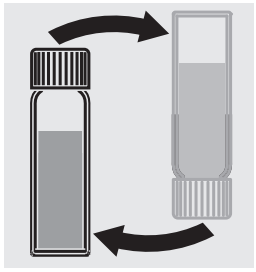
Add the contents of a **VARIO Silica HR Molybdate F10** powder pack and close the cell with the screw cap.



Mix the contents by carefully swaying the cell.

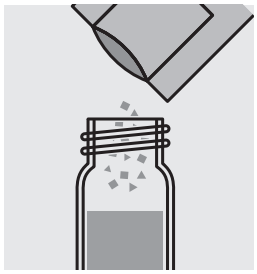


Add the contents of a **VARIO Silica HR Acid Rgt F10** powder pack and close the cell with the screw cap.

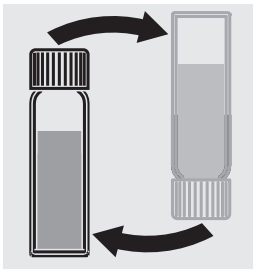


Mix the contents by carefully swaying the cell.

Allow to react for 10 minutes.

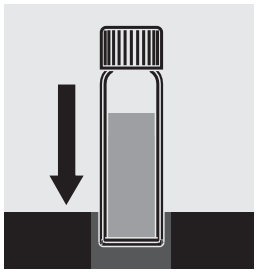


Add the contents of a **VARIO Silica Citric Acid F10** powder pack and close the cell with the screw cap.



Mix the contents by carefully swaying the cell.

Allow to react for 2 minutes.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

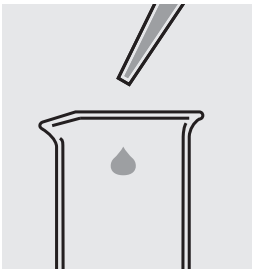
- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- The sample temperature has to be between 15 and 25 °C.

Sulfate vario

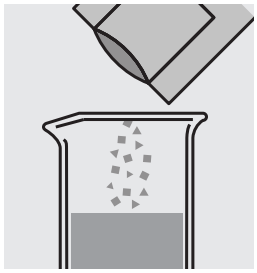
Program no. **7338**

WTW model no.:	SO4-2 TP
Category:	RS (reagent test)
Cell:	20 mm
Measuring range:	2 - 70 mg/l SO_4
	Display in mmol/l possible

Note: Before using the test with your photometer for the first time, determine the reagent blank value.

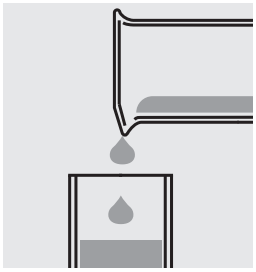


Pipette 25.0 ml of sample into an empty beaker.

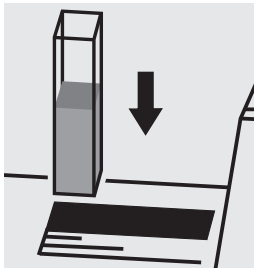


Add the contents of a **VARIO SO4-1 TP Sulfa 4 F25 ml** powder pack and dissolve them by stirring.

Allow to react for 5 minutes.



Fill the solution into the measuring cell.



Insert the cell in the photometer cell shaft and start measurement.

Notes:

- We recommend to determine a new reagent blank value (deionized water instead of sample) for each test package started.
- If any sulfate is present, a white turbidity develops.
- Powder sedimented at the bottom does not affect the measurement result.

Optical ReagentFree (OptRF) methods with PhotoLab® 7600 UV-VIS

How to measure

Preparation of the OptRF measurement

Details on usage, optimization and limitations of OptRF methods are given in the following paragraphs.

1 Open the OptRF measurement menu.

2 Select a method

3 Carry out a zero adjustment.

For the zero adjustment, use a quartz cell.
For the highest possible measuring accuracy we recommend that you carry out the zero adjustment in the very cell you are going to use for measuring the sample.

The zero adjustment remains valid for further measurements with OptRF methods. The zero adjustment is only invalid after the menu OptRF measurement is exited.

4 If necessary, dilute the sample and enter the dilution factor.

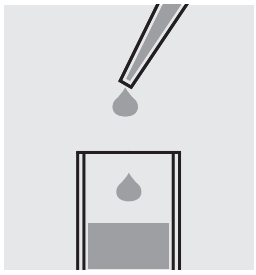
With high nitrate and nitrite concentrations, dilute the sample and enter the dilution factor. The required dilution can be different for different measured parameters.

5 Carry out a user calibration (determine and enter the raw value [#] and reference value).

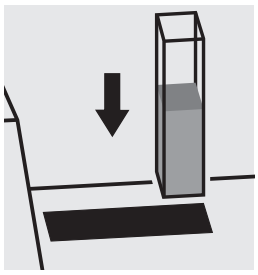
The methods are optimized for the current sample matrix with a user calibration.
Samples that do not correspond to the sample matrix of municipal waste water treatment plants are designated "Unsuitable matrix“.

COD dissolved: Always carry out the OptRF measurement with the unfiltered sample, even if the sample is filtered for the reference measurement.

Carrying out an OptRF measurement



Pipette the sample into a 10 mm quartz cell.



Insert the cell in the photometer cell shaft and start measurement.

6 If necessary, start a new measurement with the same or a different OptRF method.

Introduction into the measurement procedure with OptRF methods

The OptRF measurement of an aqueous sample is based on a direct, spectral absorbance measurement in the UV range 200 ... 390 nm without using any reagents. The measured spectrum is evaluated over the entire wavelength range. The concentration value is calculated by means of complex algorithms or evaluation models, which are stored in the photometer as OptRF methods. The available OptRF methods are specific for the relevant measured parameter as well as for the application and measurement location.

Measured parameters and range of application

The OptRF methods currently available were developed and optimized for the application range "Outlet of municipal waste water treatment plants“ and comprise the following measured parameters and measuring ranges referring to measurements in standard solutions:

OptRF measuring method	Parameter	Measuring range referring to measurements in standard solutions
3001 CODt_H_Outlet_10	COD_{total} [a]	0 - 75 mg/L
3002 CODs_H_Outlet_10	$COD_{dissolved}$ [b]	0 - 75 mg/L
3003 NO3_H_Outlet_10	NO3-N	0 - 3.0 mg/L
3004 NO2_H_Outlet_10	NO2-N	0 - 4.0 mg/L

a COD_{total}:The particulate and dissolved substances of the sample are taken into account.

b $COD_{dissolved}$: The particulate and dissolved substances of the sample are taken into account. The impact of the particulate substances on the measured value is automatically corrected. Always carry out the OptRF measurement with the unfiltered sample, even if the sample is filtered for the reference measurement.

Due to the plant-specific composition of the waste water, the measuring ranges of the different parameters can be smaller or greater than the measuring ranges quoted for the standard solutions. A user calibration (section USER CALIBRATION FOR OPTRF MEASUREMENT) can also affect the limits of the measuring range for real samples.

OptRF methods can also be used in samples with a similar matrix such as some surface waters. This has to be verified, however, on an individual basis with user tests with the reference procedures such as cell test sets (see section OPTIMIZATION AND EVALUATION OF THE MEASUREMENT QUALITY).

If using the selected OptRF method is possible, this method can also be optimized by means of the user calibration.

Limitation of measurement

Due to interfering effects such as particles, turbidity etc. and samples with very different compositions of substances, each of the OptRF methods is only suitable for a certain sample composition (sample matrix).

Generally, only light-absorbing substances in aqueous samples can be determined. Substances such as sugar, alcohol etc, which also contribute to the sum parameter COD, cannot be determined by the spectral measurement.

Measurements in solutions with high turbidity are also restricted or impossible due to negative effects such as very high absorbance values and a sedimentation behavior.

Simultaneous measurement of several parameters - different dilution

Depending on the evaluation model, the wavelengths of the spectrum that were measured are weighted differently for the different parameters. If the maximum allowed absorbance of certain wavelengths for a parameter is exceeded, this parameter cannot be reliably evaluated. The sample has to be diluted in

order to be measured reliably.

If, due to too high concentrations of some parameters in the measured sample, the absorbance values are too high, the message "dilution" is automatically generated.

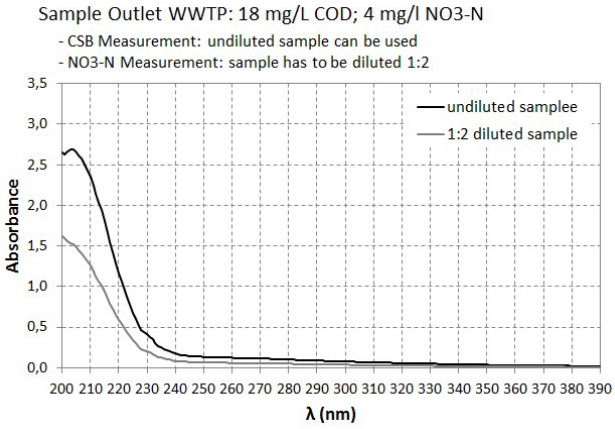
In this case, establish an individual dilution series for each OptRF method to determine the optimum dilution for this method. Depending on the sample composition, different dilutions may be required for different methods (e.g. COD, NO3-N and NO2-N).

Due to the different maximum allowed absorbance values for the different parameters, different dilution levels of the same sample can be required for the measurement of the respective parameters (see the following examples: Spectra of a sample from the outlet of a waste water treatment plant).

Example 1

COD concentration: approx. 18 mg/L
Nitrate concentration: approx. 4 mg/L NO3-N.

The COD determination can be done with the undiluted sample, the nitrate determination requires the sample to be diluted 1:2 (1+1).

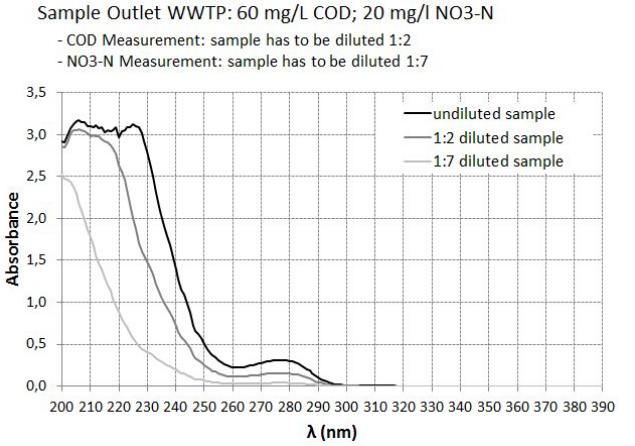


- Spectrum of the undiluted sample (for COD determination)
- Spectrum of the diluted (1:2) sample (for NO3-N determination)

Example 2

COD concentration: approx. 60 mg/L
Nitrate concentration: approx. 20 mg/L NO3-N.

The relatively high COD concentration may require a 1:2 (1+1) dilution for the determination of the COD value, though the COD concentration of the sample is still within the measuring range. To determine the nitrate concentration of this sample, it must be diluted 1:7 (1+6).



- Spectrum of the undiluted sample
- Spectrum of the diluted (1:2) sample (for COD determination)
- Spectrum of the diluted (1:7) sample (for NO3-N determination)

Optimization and evaluation of the measurement quality

The respective OptRF methods are only applicable within certain limits of variation of the sample matrix. Matrix variations can, for example, occur due to the season (e.g. increased nitrate value) or to the discharge of unusual substances. With a user calibration the OptRF methods can be optimized for the specific application location (e.g. waste water treatment plant) and the current sample composition.

User calibration for OptRF measurement

When using the OptRF measurement, you should always check whether the measurement can be used without user calibration. To do so, samples with different concentrations - if possible across the entire measuring range expected - are measured, each with OptRF measurement as well as a reference measurement (e.g. cell test sets with double determination). Normally, the entire measuring range cannot

be measured and checked in one series of measurements within a short period of time. Therefore, you should make a list with the respective measurement results of representative samples. This list should contain the raw values [#] of the OptRF measurements, the reference values and the date and time of the sampling, as shown here with the example of COD_{total}:

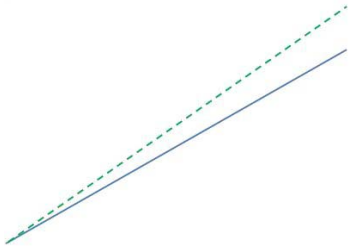
Sampling		**OptRF raw value [#]**	**Reference value**
Date	**Time**	**COD_{total} (mg/L)**	**COD_{total} (mg/L)**
03.04.2015	07:30	23.5	26
03.04.2015	09:15	28	32
05.04.2015	16:30	13.5	15
06.04.2015	14:20	19	23
…			

The raw value and reference value belonging to each other are called a value pair.

If the results of the two different determination methods deviate from each other considerably, a single-point or 2-point user calibration of the OptRF measurements should be carried out to achieve the highest possible measurement accuracy.

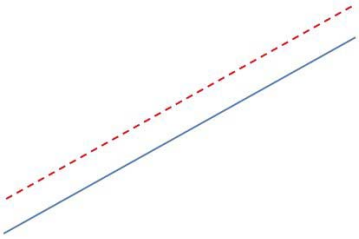
With a single-point calibration, the slope of the characteristic curve is changed while with a 2-point calibration the slope and axis intercept (offset) of the characteristic curve can be adapted (see examples).

Example 1



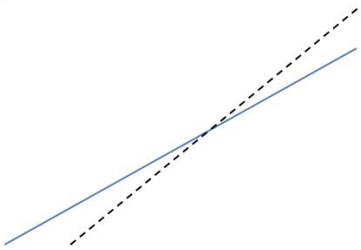
1-point calibration: Changing the value pair for the end of the measuring range (2nd value pair)

Example 2



2-point calibration:
Changing both value pairs, offset correction

Example 3



2-point calibration:
Changing both value pairs, slope correction

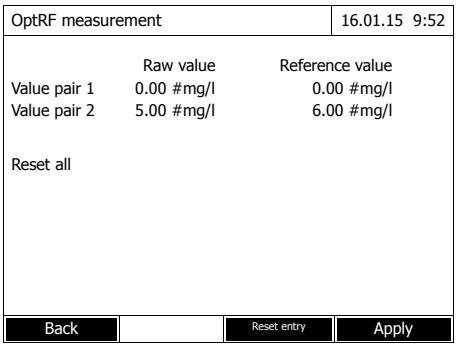
If the deviations predominantly occur in the lower **or** upper measuring range, a 1-point calibration in the relevant range of the deviation is normally sufficient. If, however, the differences are in the whole measuring range or there is an offset, a 2-point calibration has to be carried out. An offset deviation can be identified by a constant difference between raw value and reference value.

Negative raw values [#] can be displayed after the spectrum was evaluated. Negative concentration values, however, are not possible. If negative raw values are displayed, the calculated concentration value is automatically set to 0.

During a user calibration, the negative raw value [#] has to be entered with the minus sign for the lower value pair, not the adjusted concentration value "0“.

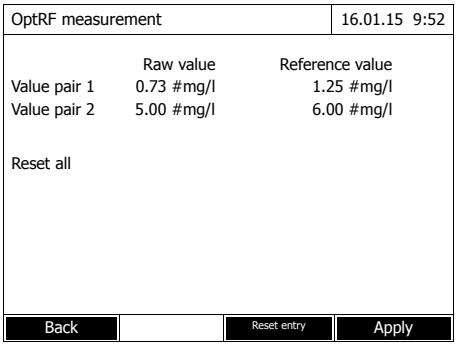
After a successful user calibration, we recommend you sporadically check the OptRF measurement with reference measurements. On the one hand, to achieve further optimization for the plant or measuring location if possible; on the other hand, to identify a possibly changing water matrix and ensure further accurate concentration measurements with a new user calibration.

Execution of a 1-point calibration



For a 1-point calibration, a suitable value pair from the beginning or end of the measuring range is entered in the input fields. The other value pair remains unchanged. In this example, the upper value pair (value pair 2) is entered. Thus only the slope but not the offset of the characteristic curve is changed:

Execution of a 2-point calibration



With a 2-point calibration, by selecting the corresponding value pairs the characteristic curve can be optimized by adjusting the slope and / or the offset.

Here, the user calibration is carried out by entering a lower (value pair 1) and an upper value pair (value pair 2).

More details on how to carry out the user calibration are given in the functional description.

Example 1: COD_{total} measurement in the outlet of a municipal waste water treatment plant

Sampling		OptRF raw value [#] NO_3-N (mg/L)	Reference value NO_3-N (mg/L)
Date	Time		
03.03.2015	07:30	23.5	26
03.03.2015	09:15	28	32
05.04.2015	16:30	13.5	15
05.04.2015	14:20	19	23
…			

In this example, we recommend for the OptRF method 3001 CODt_H Outlet a 2-point user calibration with the following value pairs:

	OptRF # raw value COD_{total} (mg/L)	Reference value COD_{total} (mg/L)
Value pair 1	13.5	15
Value pair 2	28	32

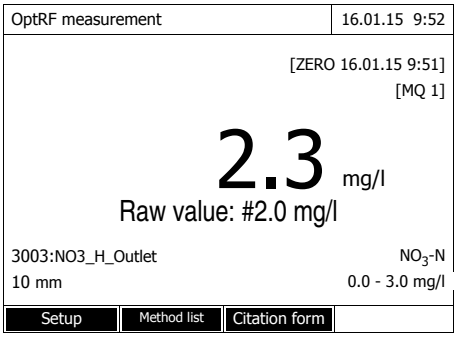
Example 2: NO3-N measurement in the outlet of a municipal waste water treatment plant

Sampling		OptRF raw value [#] NO_3-N (mg/L)	Reference value NO_3-N (mg/L)
Date	Time		
03.03.2015	07:30	12.1	10
10.03.2015	09:15	9.2	7
01.04.2015	16:30	7	5
15.04.2015	14:20	3.1	1
…			

In this example of a concentration offset of approx. 2 mg/L NO_3-N we recommend for the OptRF method 3004 NO3_H_Outlet a 2-point user calibration with the following value pairs:

	OptRF raw value [#] NO_3-N (mg/L)	Reference value NO_3-N (mg/L)
Value pair 1	3.1	1
Value pair 2	12.1	10

Evaluation of the measurement quality



In addition to the measured value, an evaluation number for the measurement quality (MQ) is shown on the display.

The evaluation number (1 - 4) gives information about how suitable the evaluation model of the OptRF method is for the current sample matrix. The better the evaluation model matches the sample matrix, the besser the quality of the measured values will be.

For the determination of the evaluation number, the recorded spectrum is evaluated without taking the user calibration into account.

Rating number	Meaning
MQ 1	Excellent measured value quality
MQ 2	Good measured value quality
MQ 3	Sufficient measured value quality
MQ 4	Insufficient measured value quality, measurement invalid, display of "Unsuitable matrix"

The user calibration optimizes the calculated concentration values. The determined evaluation number, however, is not affected by a user calibration.

Characteristics and sources of error with OptRF measurement

With OptRF methods, the preparation and execution of the measurement can have a considerable effect on the measured value. Please make sure to exclude the following sources of error.

Foreign bodies, particles and air bubbles

Very turbid samples or samples with air bubbles (e.g. samples that were pipetted too quickly) cause the absorbance to be higher and thus the measured values to be incorrect (too high), or the message "Unsuitable matrix“ is displayed.
COD dissolved: Always carry out the OptRF measurement with the unfiltered sample, even if the sample is filtered for the reference measurement.

Quartz cell

The cell must be clean, without scratches and have opaque sides (automatic cell recognition)

If the quartz cell is very dirty, it has to be cleaned according to good laboratory practice with a small brush and/or suitable cleaning solutions such as ethanol, Edisonite etc.

Zero adjustment

To achieve optimum measurement results, the necessary zero adjustment and the sample should be measured in the same cell with the same orientation. According to good laboratory practice, water that is free of nitrogen and COD has to be used for the zero adjustment (i.e. no bacteria or algae intrusion from ion exchangers seldom used).

Errors with user calibration

Please make sure that the sample to be measured is a sample representative of the application environment and that the concentration values of the required parameters of this sample are promptly determined with OptRF measurements and a suitable reference measurement.

Known sources of error during the execution of cell test sets have to be excluded (sample preparation, pipetting volume etc.). According to good laboratory practice, the measurement should at least be double plus a control standard should be measured. Thus, outliers can be identified, measured value plausibility secured and the highest possible measuring accuracy achieved. For the determination of the reference value, the value should be in the center of the measuring range of the test set used.

For user calibration, suitable value pairs have to be selected. Negative raw values [#] have to be entered with a minus sign for the lower value pair (see section USER CALIBRATION FOR OPTRF MEASUREMENT).

Seasonal fluctuations of the water matrix

With higher nitrate values (e.g. in winter), the methods used may produce different results and messages. Then, higher dilutions may possibly be required depending on the parameter and in addition to optimization with user calibration. These dilutions may partly be different for each method.

Appendix

Suitability of test kits for testing seawater

			Limit of tolerance, salts in %		
Test kit	**Model**	**Seawater**	**NaCl**	**$NaNO_3$**	**Na_2SO_4**
Acid Capacity KT	1758	no	–	–	–
Aluminium KT	594	yes	20	20	20
Aluminium RT	14825	yes	10	20	20
Ammonium KT	14544	yes	20	15	20
Ammonium KT	14558	yes	20	10	15
Ammonium KT	14559	yes	20	20	20
Ammonium KT	14739	no	5	5	5
Ammonium KT	A6/25	yes	20	10	15
Ammonium RT	683	yes	20	20	20
Ammonium RT	14752	no *	10	10	20
AOX KT	675	no	0.4	20	20
Arsenic RT	1747	no	10	10	10
BOD KT	687	yes	20	20	20
Boron KT	826	yes	10	20	20
Boron RT	14839	no	20	5	20
Bromine RT	605	no	10	10	10
Cadmium KT	14834	no	1	10	1
Cadmium RT	1745	no	1	10	1
Calcium KT	858	no	2	2	1
Calcium RT	49	no	–	–	–
Calcium RT	14815	yes	20	20	10
Chloride KT	14730	yes	–	20	1
Chloride RT	14897	yes	–	10	0.1
Chlorine dioxide RT	608	no	10	10	10
Chlorine KT	595	no	10	10	10
Chlorine KT	597	no	10	10	10
Chlorine KT (liquid reagent) (free)	00086/00087	no	10	10	10
Chlorine KT (liquid reagent) (total)	00086/ 00087/00088	no	10	10	10
Chlorine RT	598	no	10	10	10
Chlorine RT	599	no	10	10	10
Chlorine RT	602	no	10	10	10
Chlorine RT (liquid reagent) (total)	00086/ 00087/00088	no	10	10	10
ChlorineTest (liquid reagent) (free)	00086/00087	no	10	10	10
Chromate KT	14552	yes	10	10	10
Chromate RT	14758	yes	10	10	10
Chromium total	14552	no	1	10	10
COD KT	1796	no	0.4	10	10
COD KT	1797	no	10	20	20
COD KT	14540	no	0.4	10	10
COD KT	14541	no	0.4	10	10
COD KT	14555	no	1.0	10	10
COD KT	14560	no	0.4	10	10
COD KT	14690	no	0.4	20	20

			Limit of tolerance, salts in %		
Test kit	**Model**	**Seawater**	**NaCl**	**$NaNO_3$**	**Na_2SO_4**
COD KT	14691	no	0.4	20	20
COD KT	14895	no	0.4	10	10
COD KT	C3/25	no	0.4	10	10
COD KT	C4/25	no	0.4	10	10
COD KT (Hg free)	9772	no	0	10	10
COD KT (Hg free)	9773	no	0	10	10
Copper KT	14553	yes	15	15	15
Copper RT	14767	yes	15	15	15
Cyanide KT	14561	no	10	10	10
Cyanide RT	9701	no	10	10	10
Cyanuric acid RT	19253	yes	–	–	–
Fluoride KT	809	no	10	10	10
Fluoride RT	14598	yes	20	20	20
Formaldehyde KT	14500	no	5	0	10
Formaldehyde RT	14678	no	5	0	10
Gold RT	14821	yes	10	20	5
Hydrazine RT	9711	no	20	5	2
Hydrogenperoxide KT	14731	yes	20	20	20
Hydrogenperoxide RT	18789	no	0.1	1	5
Iodine RT	606	no	10	10	10
Iron KT	14549	yes	20	20	20
Iron KT	14896	no	5	5	5
Iron RT	796	yes	20	20	20
Iron RT	14761	yes	20	20	20
Lead KT	9717	no	20	5	15
Lead KT	14833	no	20	20	1
Magnesium KT	815	yes	2	2	1
Manganese KT	816	no	20	20	20
Manganese RT	1846	no	20	25	5
Manganese RT	14770	yes	20	20	20
Molybdenum KT	860	no	20	20	5
Monochloramine RT	1632	no	10	10	20
Nickel KT	14554	no	20	20	20
Nickel RT	14785	no	20	20	20
Nitrate KT	614	no	2	–	20
Nitrate KT	14542	no	0.4	–	20
Nitrate KT	14563	no	0.2	–	20
Nitrate KT	14764	no	0.5	–	20
Nitrate KT	N2/25	no	0.2	–	20
Nitrate KT (seawater)	14556	yes	20	–	20
Nitrate RT	9713	no	0.2	–	20
Nitrate RT	14773	no	0.4	–	20
Nitrate RT (seawater)	14942	yes	20	–	20
Nitrite KT	609	yes	20	20	15
Nitrite KT	14547	yes	20	20	15
Nitrite KT	N5/25	yes	20	20	15
Nitrite RT	14776	yes	20	20	15
Nitrogen (total) KT	613	no	0.2	–	10

			Limit of tolerance, salts in %		
Test kit	**Model**	**Seawater**	**NaCl**	**$NaNO_3$**	**Na_2SO_4**
Nitrogen (total) KT	14537	no	0.5	–	10
Nitrogen (total) KT	14763	no	2	–	20
Oxygen KT	14694	no	10	5	1
Ozone RT	607	no	10	10	10
pH KT	1744	yes	–	–	–
Phenol KT	14551	yes	20	20	15
Phenol RT	856	yes	20	20	20
Phosphate KT	616	yes	20	20	20
Phosphate KT	14543	yes	5	10	10
Phosphate KT	14546	yes	20	20	20
Phosphate KT	14729	yes	20	20	20
Phosphate KT	P6/25	yes	5	10	10
Phosphate KT	P7/25	yes	20	20	20
Phosphate RT	798	yes	15	20	10
Phosphate RT	14842	yes	20	20	20
Phosphate RT	14848	yes	5	10	10
Phosphorus total	14543	no	1	10	10
Phosphorus total	14729	yes	5	20	20
Phosphorus total	P6/25	no	1	10	10
Phosphorus total	P7/25	yes	5	20	20
Potassium KT	615	yes	20	20	20
Potassium KT	14562	yes	20	20	20
Residual Hardness KT	14683	no	0.01	0.01	0.01
Silicate (Silicic Acid) RT	857	no	5	10	02. Mai
Silicate (Silicic Acid) RT	14794	yes	5	10	5
Silver RT	14831	no	0	1	5
Sodium KT	885	no	–	10	1
Sulfate KT	617	yes	10	20	–
Sulfate KT	14548	yes	10	20	–
Sulfate KT	14564	yes	10	20	–
Sulfate RT	14791	no	0.2	0.2	–
Sulfide RT	14779	no	0.5	1	1
Sulfite KT	14394	no	20	20	20
Sulfite RT	1746	no	20	20	20
Surfactants (anionic) KT	14697	no	0.1	0.01	10
Surfactants (cationic) KT	1764	no	0.1	0.1	20
Surfactants (nonionic) KT	1787	no	2	5	2
Tin KT	14622	yes	20	20	20
TOC KT	14878	no	0.5	10	10
TOC KT	14879	no	5	20	20
Total Hardness KT	961	no	2	2	1
Volatile Organic Acids KT	1749	no	20	20	10
Volatile Organic Acids KT	1809	no	20	20	10
Zinc KT	861	no	20	20	1
Zinc KT	14566	no	10	10	10
Zinc RT	14832	no	5	15	15

1) This test kit is also suitable for testing seawater after the addition of sodium hydroxide solution (see package insert).

CombiCheck and standard solutions

RTkit	Cat.No.	CombiCheck, Model	Evaluation as	Confidence interval Spec.value for the standard	Tolerance	Other standards** Model
Acid Capacity KT	1758	–	OH	5.00 mmol/l*	± 0.50 mmol/l	see preparation instr.
Aluminium KT	594	–	Al	0.25 mg/l*	± 0.03 mg/l	SL Al 19770
Aluminium RT	14825	CombiCheck 40, 14692	Al	0.75 mg/l	± 0.08 mg/l	SL Al 19770
Ammonium KT	14544	CombiCheck 20, 14675	NH4-N	12.0 mg/l	± 1.0 mg/l	SL NH4 19812
Ammonium KT	14558	CombiCheck 10, 14676	NH4-N	4.00 mg/l	± 0.30 mg/l	SL NH4 19812
Ammonium KT	14559	CombiCheck 70, 14689	NH4-N	50.0 mg/l	± 5.0 mg/l	SL NH4 19812
Ammonium KT	14739	CombiCheck 50, 14695	NH4-N	1.00 mg/l	± 0.10 mg/l	SL NH4 19812
Ammonium KT	A6/25	CombiCheck 10, 14676	NH4-N	4.00 mg/l	± 0.30 mg/l	SL NH4 19812
Ammonium RT	683	CombiCheck 70, 14689	NH4-N	50.0 mg/l	± 5.0 mg/l	SL NH4 19812
Ammonium RT	14752	CombiCheck 50, 14695	NH4-N	1.00 mg/l	± 0.10 mg/l	SL NH4 19812
AOX KT	675	–	AOX	1.00 mg/l*	± 0.10 mg/l	AOX 00680
Arsenic RT	1747	–	As	0.050 mg/l*	± 0.005 mg/l	19773 (Merck-No.)***
BOD KT	687	–	O2	210 mg/l	± 20 mg/l	BSB 00718
Boron KT	826	–	B	1.00 mg/l*	± 0.15 mg/l	SL B 19500
Boron RT	14839	–	B	0.400 mg/l*	± 0.040 mg/l	SL B 19500
Bromine RT	605	–	Br2	5,00 mg/l*	± 0.50 mg/l	see preparation instr.
Cadmium KT	14834	CombiCheck 30, 14677	Cd	0.500 mg/l	± 0.060 mg/l	SL Cd 19777
Cadmium RT	1745	–	Cd	0.250 mg/l	± 0.010 mg/l	SL Cd 19777
Calcium KT	858	–	Ca	75 mg/l*	± 7 mg/l	SL Ca 19778
Calcium RT	49	–	Ca	2.00 mg/l*	± 0.20 mg/l	SL Ca 19778
Calcium RT	14815	–	Ca	80 mg/l*	± 8 mg/l	SL Ca 19778
Chloride KT	14730	CombiCheck 20, 14675	Cl	60 mg/l	± 10 mg/l	SL Cl 19897
Chloride KT	14730	CombiCheck 10, 14676	Cl	25 mg/l	± 6 mg/l	SL Cl 19897
Chloride RT	14897	CombiCheck 60, 14696	Cl	125 mg/l	± 13 mg/l	SL Cl 19897
Chloride RT	14897	–	Cl	12.5 mg/l*	± 0.13 mg/l	SL Cl 19897
Chlorine Dioxide RT	608	–	ClO2	5.00 mg/l*	± 0.50 mg/l	see preparation instr.
Chlorine KT	595	–	Cl2	3.00 mg/l*	± 0.30 mg/l	see preparation instr.
Chlorine KT	597	–	Cl2	3.00 mg/l*	± 0.30 mg/l	see preparation instr.
Chlorine KT (liquid reagent)	00086/ 00087	–	Cl2	3.00 mg/l*	± 0.30 mg/l	see preparation instr.
Chlorine KT (liquid reagent)	00086/ 00087/ 00088	–	Cl2	3.00 mg/l*	± 0.30 mg/l	see preparation instr.
Chlorine RT	598	–	Cl2	3.00 mg/l*	± 0.30 mg/l	see preparation instr.
Chlorine RT	599	–	Cl2	3.00 mg/l*	± 0.30 mg/l	see preparation instr.
Chlorine RT	602	–	Cl2	3.00 mg/l*	± 0.30 mg/l	see preparation instr.
Chlorine RT (liquid reagent)	00086/ 00087	–	Cl2	0.500 mg/l*	± 0.050 mg/l	see preparation instr.
Chlorine RT (liquid reagent)	00086/ 00087/ 00088	–	Cl2	0.500 mg/l*	± 0.050 mg/l	see preparation instr.
Chromate KT	14552	–	Cr	1.00 mg/l*	± 0.10 mg/l	SL CrO3 19780
Chromate RT	14758	–	Cr	1.00 mg/l*	± 0.10 mg/l	SL CrO3 19780
COD KT	1796	CombiCheck 50, 14695	COD	20.0 mg/l	± 4.0 mg/l	see preparation instr.
COD KT	9772	CombiCheck 10, 14676	CSB	80 mg/l	± 12 mg/l	see preparation instr.
COD KT	9773	CombiCheck 20, 14675	CSB	750 mg/l	± 75 mg/l	see preparation instr.
COD KT	14540	CombiCheck 10, 14676	COD	80 mg/l	± 12 mg/l	see preparation instr.
COD KT	14541	CombiCheck 20, 14675	COD	750 mg/l	± 75 mg/l	see preparation instr.
COD KT	14555	CombiCheck 70, 14689	COD	5000 mg/l	± 400 mg/l	see preparation instr.

RTkit	Cat.No.	CombiCheck, Model	Evaluation as	Confidence interval Spec.value for the standard	Tolerance	Other standards** Model
COD KT	14560	CombiCheck 50, 14695	COD	20.0 mg/l	± 4.0 mg/l	see preparation instr.
COD KT	14690	CombiCheck 60, 14696	COD	250 mg/l	± 25 mg/l	see preparation instr.
COD KT	14691	CombiCheck 80, 14738	COD	1500 mg/l	± 150 mg/l	see preparation instr.
COD KT	14895	CombiCheck 60, 14696	COD	250 mg/l	± 20 mg/l	see preparation instr.
COD KT	C3/25	CombiCheck 10, 14676	COD	80 mg/l	± 12 mg/l	see preparation instr.
COD KT	C4/25	CombiCheck 20, 14675	COD	750 mg/l	± 75 mg/l	see preparation instr.
Copper KT	14553	CombiCheck 30, 14677	Cu	2.00 mg/l	± 0.20 mg/l	SL Cu 19786
Copper RT	14767	CombiCheck 30, 14677	Cu	2.00 mg/l	± 0.20 mg/l	SL Cu 19786
Cyanide KT	14561	–	CN	0.250 mg/l*	± 0.030 mg/l	19533 (Merck-No.)***
Cyanide RT	9701	–	CN	0.250 mg/l*	± 0.030 mg/l	19533 (Merck-No.)***
Cyanuric Acid RT	19253	–	Cyan Acid	80 mg/l*	± 10 mg/l	see preparation instr.
Fluoride KT	809	–	F	0.75 mg/l*	± 0.08 mg/l	SL F 19814
Fluoride RT	14598	–	F	1.00 mg/l*	± 0.15 mg/l	SL F 19814
Fluoride RT	14598	–	F	10.0 mg/l*	± 1.2 mg/l	SL F 19814
Formaldehyde KT	14500	–	HCHO	5.00 mg/l*	± 0.50 mg/l	see preparation instr.
Formaldehyde RT	14678	–	HCHO	4.50 mg/l*	± 0.50 mg/l	see preparation instr.
Gold RT	14821	–	Au	6.0 mg/l*	± 0.6 mg/l	70216 (Merck-No.)***
Hardness see Total Hardness or Residual Hardness						
Hydrazine RT	9711	–	N2H4	1.00 mg/l*	± 0.10 mg/l	see preparation instr.
Hydrogenperoxide KT	14731	–	H2O2	10.0 mg/l*	± 1.0 mg/l	see preparation instr.
Hydrogenperoxide RT	18789	–	H2O2	2.00 mg/l*	± 0.20 mg/l	see preparation instr.
Iodine RT	606	–	I2	5.00 mg/l*	± 0.50 mg/l	see preparation instr.
Iron KT	14549	CombiCheck 30, 14677	Fe	1.00 mg/l	± 0.15 mg/l	SL Fe 19781
Iron KT	14896	–	Fe	25.0 mg/l*	± 2.5 mg/l	SL Fe 19781
Iron RT	796	CombiCheck 30, 14677	Fe	1.00 mg/l	± 0.15 mg/l	SL Fe 19781
Iron RT	14761	CombiCheck 30, 14677	Fe	1.00 mg/l	± 0.15 mg/l	SL Fe 19781
Lead KT	14833	CombiCheck 40, 14692	Pb	2.00 mg/l	± 0.20 mg/l	SL Pb 19776
Lead RT	9717	CombiCheck 40, 14692	Pb	2.00 mg/l	± 0.20 mg/l	SL Pb 19776
Magnesium KT	815	–	Mg	40.0 mg/l*	± 4.0 mg/l	see preparation instr.
Manganese KT	816	CombiCheck 30, 14677	Mn	1.00 mg/l	± 0.15 mg/l	SL Mn 19789
Manganese RT	1846	–	Mn	1.00 mg/l*	± 0.10 mg/l	SL Mn 19789
Manganese RT	14770	CombiCheck 30, 14677	Mn	1.00 mg/l	± 0.15 mg/l	SL Mn 19789
Molybdenum KT	860	–	Mo	0,50 mg/l*	± 0.05 mg/l	70227 (Merck-No.)***
Molybdenum RT	19252	–	Mo	25.0 mg/l*	± 2.5 mg/l	70227 (Merck-No.)***
Monochloramine RT	1632	–	Cl2	5.00 mg/l*	± 0.50 mg/l	see preparation instr.
Nickel KT	14554	CombiCheck 40, 14692	Ni	2.00 mg/l	± 0.20 mg/l	SL Ni 19792
Nickel RT	14785	CombiCheck 40, 14692	Ni	2.00 mg/l	± 0.20 mg/l	SL Ni 19792
Nitrat KT	614	–	NO3-N	100 mg/l*	± 10 mg/l	SL NO3 19811
Nitrate KT	14542	CombiCheck 20, 14675	NO3-N	9.0 mg/l	± 0.9 mg/l	SL NO3 19811
Nitrate KT	14556	CombiCheck 10, 14676	NO3-N	2.50 mg/l	± 0.25 mg/l	SL NO3 19811
Nitrate KT	14563	CombiCheck 20, 14675	NO3-N	9.0 mg/l	± 0.9 mg/l	SL NO3 19811
Nitrate KT	14764	CombiCheck 80, 14738	NO3-N	25.0 mg/l	± 2.5 mg/l	SL NO3 19811
Nitrate KT	N2/25	CombiCheck 20, 14675	NO3-N	9.0 mg/l	± 0.9 mg/l	SL NO3 19811
Nitrate RT	9713	CombiCheck 20, 14675	NO3-N	9.0 mg/l	± 0.9 mg/l	SL NO3 19811
Nitrate RT	14773	CombiCheck 20, 14675	NO3-N	9.0 mg/l	± 0.9 mg/l	SL NO3 19811
Nitrate RT	14942	CombiCheck 20, 14675	NO3-N	9.0 mg/l	± 0.9 mg/l	SL NO3 19811
Nitrite KT	609	–	NO2-N	45.0 mg/l*	± 5 mg/l	SL NO2 19899

RTkit	Cat.No.	CombiCheck, Model	Evaluation as	Confidence interval Spec.value for the standard	Tolerance	Other standards** Model
Nitrite KT	14547	–	NO2-N	0.300 mg/l*	± 0.030 mg/l	SL NO2 19899
Nitrite KT	N5/25	–	NO2-N	0.300 mg/l*	± 0.030 mg/l	SL NO2 19899
Nitrite RT	14776	–	NO2-N	0.50 mg/l*	± 0.05 mg/l	SL NO2 19899
Nitrogen (total) KT	613	CombiCheck 50, 14695	N	5.0 mg/l	± 0.7 mg/l	see preparation instr.
Nitrogen (total) KT	14537	CombiCheck 50, 14695	N	5.0 mg/l	± 0.7 mg/l	see preparation instr.
Nitrogen (total) KT	14763	CombiCheck 70, 14689	N	50 mg/l	± 7 mg/l	see preparation instr.
Oxygen KT	14694	–	O2	–	± 0.6 mg/l	compare with O2-Sensor
Oxygen Scavengers RT	19251	–	DEHA	0,250 mg/l*	± 0,030 mg/l	s. Arbeitsvorschrift
Ozone RT	607	–	O3	2.00 mg/l*	± 0.20 mg/l	see preparation instr.
pH KT	1744	–	pH	7.0	± 0.2	STP 7
Phenol KT	14551	–	C6H5OH	1.25 mg/l*	± 0.13 mg/l	see preparation instr.
Phenol RT	856	–	C6H5OH	2.50 mg/l*	± 0.25 mg/l	see preparation instr.
Phosphat KT	616	–	PO4-P	50.0 mg/l*	± 5.0 mg/l	SL PO4 19898
Phosphate KT	14543	CombiCheck 10, 14676	PO4-P	0.80 mg/l	± 0.08 mg/l	SL PO4 19898
Phosphate KT	14546	–	PO4-P	15.0 mg/l*	± 1.0 mg/l	SL PO4 19898
Phosphate KT	14729	CombiCheck 80, 14738	PO4-P	15.0 mg/l	± 1.0 mg/l	SL PO4 19898
Phosphate KT	14729	CombiCheck 20, 14675	PO4-P	8.0 mg/l	± 0.7 mg/l	SL PO4 19898
Phosphate KT	P6/25	CombiCheck 10, 14676	PO4-P	0.80 mg/l	± 0.08 mg/l	SL PO4 19898
Phosphate KT	P7/25	CombiCheck 80, 14738	PO4-P	15.0 mg/l	± 1.0 mg/l	SL PO4 19898
Phosphate KT	P7/25	CombiCheck 20, 14675	PO4-P	8.0 mg/l	± 0.7 mg/l	SL PO4 19898
Phosphate RT	798	–	PO4-P	50.0 mg/l*	± 5.0 mg/l	SL PO4 19898
Phosphate RT	14842	–	PO4-P	15.0 mg/l*	± 1.0 mg/l	SL PO4 19898
Phosphate RT	14848	CombiCheck 10, 14676	PO4-P	0.80 mg/l	± 0.08 mg/l	SL PO4 19898
PotaSLium KT	615	–	K	150 mg/l*	± 15 mg/l	SL K 70230
PotaSLium KT	14562	–	K	25.0 mg/l*	± 4.0 mg/l	SL K 70230
Residual Hardnes KT	14683	–	Ca	2.50 mg/l*	± 0.30 mg/l	SL Ca 19778
Silicate (Silicic Acid) RT	857	–	Si	25.0 mg/l*	± 2.5 mg/l	SL Si 70236
Silicate (Silicic Acid) RT	14794	–	Si	2.50 mg/l*	± 0.25 mg/l	SL Si 70236
Silicate (Silicic Acid) RT	14794	–		0.375 mg/l*	± 0.040 mg/l	SL Si 70236
Silver RT	14831	–	Ag	1.50 mg/l*	± 0.20 mg/l	SL Ag 19797
Sodium KT	885	–	Na	100 mg/l*	± 10 mg/l	see preparation instr.
Sulfat KT	617	CombiCheck 10, 14676	SO4	100 mg/l	± 15 mg/l	SL SO4 19813
Sulfate KT	14548	CombiCheck 10, 14676	SO4	100 mg/l	± 15 mg/l	SL SO4 19813
Sulfate KT	14564	CombiCheck 20, 14675	SO4	500 mg/l	± 75 mg/l	SL SO4 19813
Sulfate RT	14791	CombiCheck 10, 14676	SO4	100 mg/l	± 15 mg/l	SL SO4 19813
Sulfide RT	14779	–	S	0.75 mg/l*	± 0.08 mg/l	see preparation instr.
Sulfite KT	14394	–	SO3	12.5 mg/l*	± 1.5 mg/l	see preparation instr.
Sulfite RT	1746	–	SO3	30.0 mg/l*	± 1.0 mg/l	see preparation instr.
Surfactants (anionic) KT	14697	–	MBAS	1.00 mg/l*	± 0.20 mg/l	see preparation instr.
Surfactants (cationic) KT	1764	–	k-Ten	1.00 mg/l*	± 0.10 mg/l	see preparation instr.
Surfactants (nonionic) KT	1787	–	n-Ten	4.00 mg/l*	± 0.40 mg/l	see preparation instr.
Tin KT	14622	–	Sn	1.25 mg/l*	± 0.13 mg/l	70242 (Merck-No.)***
TOC KT	14878	–	TOC	40.0 mg/l*	± 3.0 mg/l	SL TOC 09017
TOC KT	14879	–	TOC	400 mg/l*	± 30 mg/l	SL TOC 09017

RTkit	Cat.No.	CombiCheck, Model	Evaluation as	Confidence interval Spec.value for the standard	Tolerance	Other standards** Model
Total Hardnes KT	961	–	Ca	75 mg/l*	± 7 mg/l	SL Ca 19778
Volatile Organic Acids KT	1749	–	CH3COOH	1500 mg/l*	± 80 mg/l	see preparation instr.
Volatile Organic Acids KT	1809	–	CH3COOH	1500 mg/l*	± 80 mg/l	see preparation instr.
Zinc KT	861	–	Zn	0.500 mg/l*	± 0.050 mg/l	SL Zn 19806
Zinc KT	14566	CombiCheck 40, 14692	Zn	2.00 mg/l	± 0.40 mg/l	SL Zn 19806
Zinc RT	14832	–	Zn	1.25 mg/l*	± 0.20 mg/l	SL Zn 19806

* Self prepared, recommended concentration
** c = 1000 mg/l analyte
*** The reagents are available from Merck under the stated number.

Instructions for the preparation of standard solutions

Standard solution of acid capacity

Reagents required:*

1.09141.1000	Sodium hydroxide solution 0.1 mol/l
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

A sodium hydroxide solution of 0.1 mol/l (corresponds to 100 mmol/l) is used.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability :

When stored in a cool place (refrigerator), the diluted investigational solutions remain stable for one week.

Standard solution of bromine analogous to DIN EN ISO 7393

Reagents required:*

1.02404.0100	Potassium iodate, volum. standard
1.05043.0250	Potassium iodide GR for analysis
1.09072.1000	Sulfuric acid 0.5 mol/l
1.09136.1000	Sodium hydroxide solution 2 mol/l
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a KIO_3 stock solution:

Dissolve 1.006 g of KIO_3 in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:

Transfer 11.13 ml of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.

1 ml of this solution is equivalent to 0.025 mg of bromine.

Preparation of the bromine standard solution:

Pipette 20.0 ml (full pipette) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_4 0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its colour. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 5.00 mg/l bromine.

Stability:

The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The dilute bromine standard solution is not stable and must be used immediately.

Standard solution of calcium

Reagents required:*

1.02121.0500	Calcium nitrate tetrahydrate GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 2.946 g of calcium nitrate tetrahydrate GR with distilled water in a calibrated or conformity-checked 500-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l calcium.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:

The standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solutions of free chlorine

All standard solutions described here for free chlorine yield equivalent results and are identically suited for the determination of chlorine.

Reagents required:*

1.10888.0250	Dichloroisocyanuric acid sodium salt dihydrate GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

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.

Standard solution of free chlorine analogous to DIN EN ISO 7393

Reagents required:*

1.02404.0100	Potassium iodate, volum. standard
1.05043.0250	Potassium iodide GR for analysis
1.09072.1000	Sulfuric acid 0.5 mol/l
1.09136.1000	Sodium hydroxide solution 2 mol/l
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a KIO_3 stock solution:

Dissolve 1.006 g of KIO_3 in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:

Transfer 15.00 ml (5.00 ml) of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.

1 ml of this solution is equivalent to 0.015 mg (0.005 mg) of free chlorine.

Preparation of the chlorine standard solution:

Pipette 20.0 ml (10.0 ml) (full pipette) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_4 0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its colour. 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 dilute chlorine standard solution is not stable and must be used immediately.

Note:

This procedure involves the preparation according to a standardized method.

Standard solution of free chlorine

Reagents required:*

1.00316.1000	Hydrochloric acid 25 % GR for analysis
1.05614.9025	Sodium hypochlorite solution techn. approx. 13 % active chlorine
1.09147.1000	Sodium thiosulfate solution 0.1 mol/l
1.05043.0250	Potassium iodide GR for analysis
1.05445.0500	Zinc iodidestarch solution GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

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-glassstoppered conical flask containing 60 ml of distilled water. Subsequently add to this solution 5 ml of hydrochloric acid 25% GR and 3 g of potassium iodide. Close the conical flask with the ground-glass stopper, mix thoroughly, and leave to stand for 1min.

Titrate the eliminated iodine with sodium thiosulfate solution 0.1 mol/l until a weakly yellow colour emerges. Add 2 ml of zinc iodide-starch solution and titrate from blue to colourless.

Calculation and preparation of a standard solution:

1 ml sodium thiosulfate solution = 3.55 mg free chlorine

Further investigational concentrations may be prepared from the stock solution prepared according to the procedure described above by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), a standard solution remains stable for approx. one week. The diluted standard solutions (investigational concentrations) are stable for approx. 2 hours.

Note:

This is a standard solution that is absolutely necessary for the preparation of the monochloramine standard.

Standard solution of total chlorine

Reagents required:*

1.02426.0250	Chloramine T trihydrate GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 4.00 g of chloramine T trihydrate GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l total chlorine.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solution of chlorine dioxide analogous to DIN EN ISO 7393

Reagents required:*

1.02404.0100	Potassium iodate, volum. standard
1.05043.0250	Potassium iodide GR for analysis
1.09072.1000	Sulfuric acid 0.5 mol/l
1.09136.1000	Sodium hydroxide solution 2 mol/l
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a KIO_3 stock solution:

Dissolve 1.006 g of KIO_3 in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:

Transfer 13.12 ml of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.

1 ml of this solution is equivalent to 0.025 mg of chlorine dioxide.

Preparation of the chlorine dioxide standard solution:

Pipette 20.0 ml (full pipette) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_4 0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its colour. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 5.00 mg/l chlorine dioxide.

Stability:

The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The dilute chlorine dioxide standard solution is not stable and must be used immediately.

Standard solution of COD

1.02400.0080	Potassium hydrogen phthalate GR for analysis, volum. standard
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 0.850 g of potassium hydrogen phthalate GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l COD.

Further investigational concentrations may be prepared from this stock solution by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the standard solution remains stable for one month. When stored under appropriate cool conditions (refrigerator), the diluted standard solutions (investigational concentrations) remain stable – depending on the respective concentration – for approx. one week to one month.

Standard solution of cyanuric acid

Reagents required:*

8.20358.0005	Cyanuric acid for synthesis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 1.00 g of cyanuric acid with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water. The substance is slightly soluble and the dissolution process may take several hours.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l cyanuric acid.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solution of formaldehyde

Reagents required:*

1.04003.1000	Formaldehyde solution min. 37% GR for analysis
1.09099.1000	Iodine solution 0.05 mol/l
1.09147.1000	Sodium thiosulfate solution 0.1 mol/l
1.09137.1000	Sodium hydroxide solution 1 mol/l
1.00716.1000	Sulfuric acid 25% GR for analysis
1.05445.0500	Zinc iodidestarch solution GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

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 % GR. Subsequently titrate with sodium thiosulfate solution 0.1 mol/l until the yellow iodine colour has disappeared, add 1 ml of zinc iodide-starch solution, and continue to titrate until a milky, pure white colour emerge.

Calculation and preparation of a standard solution:

C1 = consumption of sodium thiosulfate solution 0.1 mol/l

C2 = quantity of iodine solution 0.05 mol/l (50,0 ml)

mg/l formaldehyde = (C2 – C1) x 37.525

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l remains stable for one week. After this time, the stock solution must be determined anew. The diluted standard solutions (investigational concentrations) must be used immediately.

Standard solution of hydrazine

Reagents required:*

1.04603.0100	Hydrazinium sulfate GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 4.07 g of hydrazinium sulfate GR with oxygen-low (boil previously) distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with oxygen-low distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l hydrazine.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with oxygen-low distilled water.

Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solution of hydrogen peroxide

Reagents required:*

1.09122.1000	Potassium permanganate solution 0.02 mol/l
1.07209.0250	Perhydrol® 30 % GR for analysis 1.00716.1000Sulfuric acid 25 % GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a stock solution:

Place 10.0 ml of Perhydrol® 30 % H_2O_2 GR in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water. Transfer 30.0 ml (full pipette) of this solution to a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The stock solution prepared according to this procedure has a concentration of approx. 1000 mg/l hydrogen peroxide.

Precise assay of the stock solution:

Pipette 50.0 ml (full pipette) of the hydrogen peroxide stock solution into a 500-ml conical flask, dilute with 200 ml of distilled water, and add 30 ml of sulfuric acid 25 % GR.

Titrate with a 0.02 mol/l potassium permanganate solution until the colour changes to pink.

Calculation and preparation of a standard solution:

Consumption of potassium permanganate (ml) x 34.02 =
= content of hydrogen peroxide, in mg/l

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the stock solution of approx. 1000 mg/l and the diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solution of iodine analogous to DIN EN ISO 7393

Reagents required:*

1.02404.0100	Potassium iodate, volum. standard
1.05043.0250	Potassium iodide GR for analysis
1.09072.1000	Sulfuric acid 0.5 mol/l
1.09136.1000	Sodium hydroxide solution 2 mol/l
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a KIO_3 stock solution:

Dissolve 1.006 g of KIO_3 in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:

Transfer 7.00 ml of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.

1 ml of this solution is equivalent to 0.025 mg of iodine.

Preparation of the iodine standard solution:

Pipette 20.0 ml (full pipette) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_4 0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its colour. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 5.00 mg/l iodine.

Stability:

The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The dilute iodine standard solution is not stable and must be used immediately.

Standard solution of magnesium

Reagents required:*

1.05853.0500	Magnesium nitrate hexahydrate GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 1.055 g of magnesium nitrate hexahydrate GR with distilled water in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l magnesium.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:

The standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solution of monochloramine

Preparation of a standard solution:

Place 5.0 ml of chlorine standard solution 100 mg/l Cl_2 and 10.0 ml ammonium standard solution 10 mg/l NH_4-N in a calibrated or conformity-checked 100-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 5.00 mg/l Cl_2 or 3.63 mg/l NH_2Cl.

Stability:

The standard solution is not stable and must be used immediately.

Reagents required:*

Chlorine standard solution 100 mg/l Cl_2
Preparation see “Standard solution of free chlorine” with hypochlorite solution (standard solution that is absolutely necessary for the preparation of the monochloramine standard)

Ammonium standard solution 10 mg/l NH_4-N
Preparation with Ammonium standard solution Certipur®,Cat.No. 1.19812.0500, 1000 mg/l NH_4 = = 777 mg/l NH_4-N

1.16754.9010 Water GR for analysis

* The reagents are available from Merck under the stated number.

Standard solution of nitrogen (total)

Preparation of a standard solution:

Dissolve 5.36 g of glycine GR with distilled water in a calibrated or con formity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a con centration 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 GR for analysis

* The reagents are available from Merck under the stated number.

Standard solution of oxygenscavengers

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 GR for analysis

* The reagents are available from Merck under the stated number.

Standard solution of ozone analogous to DIN EN ISO 7393

Reagents required:*

1.02404.0100	Potassium iodate, volum. standard
1.05043.0250	Potassium iodide GR for analysis
1.09072.1000	Sulfuric acid 0.5 mol/l
1.09136.1000	Sodium hydroxide solution 2 mol/l
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a KIO_3 stock solution:

Dissolve 1.006 g of KIO_3 in 250 ml of distilled water in a calibrated or conformity-checked 1000-ml volumetric flask. Subsequently make up to the mark with distilled water.

Preparation of a KIO_3/KI standard solution:

Transfer 14.80 ml of the KIO_3 stock solution to a calibrated or conformity-checked 1000-ml volumetric flask, add approx. 1 g of KI and make up to the mark with distilled water.

1 ml of this solution is equivalent to 0.010 mg of ozone.

Preparation of the ozone standard solution:

Pipette 20.0 ml (full pipette) KIO_3/KI standard solution into a calibrated or conformity-checked 100-ml volumetric flask, add 2.0 ml of H_2SO_4 0.5 mol/l, leave to stand for 1 min, and then add NaOH 2 mol/l dropwise (approx. 1 ml) until the solution just loses its colour. Subsequently make up the solution to the mark with distilled water.

The concentration of the solution is 2.00 mg/l ozone.

Stability:

The KIO_3 stock solution remains stable for 4 weeks when stored in a cool place (refrigerator). The KIO_3/KI standard solution can be used for 5 hours when stored in a cool place (refrigerator). The dilute ozone standard solution is not stable and must be used immediately.

Standard solution of phenol

Reagents required:*

1.00206.0250	Phenol GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

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 disilled water.

Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

Standard solution of sodium

Reagents required:*

1.19897.0500	Chloride standard solution Certipur®
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

A chloride standard solution of 1000 mg/l is used.

1000 mg/l chloride corresponds to 649 mg/l sodium.

Further investigational concentrations may be prepared by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the diluted standard solutions (investigational concentrations) remain stable for one month.

Standard solution of sulfide

Preparation of a stock solution:

Dissolve 7.2 g of glass-clear, if necessary washed crystals of sodium sulfide hydrate GR with distilled water in a calibrated or conformitychecked 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 % GR 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 colour has disappeared, add 1 ml of zinc iodide-starch solution, and continue to titrate until a milky, pure white colour emerges.

Calculation and preparation of the standard solution:

C1 = consumption of sodium thiosulfate 0.1 mol/l

C2 = quantity of iodine solution 0.05 mol/l (25.0 ml)

mg/l sulfide = (C2 – C1) x 64.13

Further investigational concentrations may be prepared from the stock solution exactly determined according to the procedure described above by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the stock solution of approx.

1000 mg/l remains stable for at most one day. The diluted standard solutions (investigational concentrations) must be used immediately.

Reagents required:*

1.06657.0500	Sodium sulfide hydrate GR for analysis
1.09099.1000	Iodine solution 0.05mol/l
1.09147.1000	Sodium thiosulfate solution 0.1 mol/l
1.00716.1000	Sulfuric acid 25 % GR for analysis
1.05445.0500	Zinc iodidestarch solution GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Standard solution of sulfite

Reagents required:*

1.06657.0500	Sodium sulfite anhydrous GR for analysis
1.08418.0100	Titriplex® III GR for analysis
1.09099.1000	Iodine solution 0.05mol/l
1.09147.1000	Sodium thiosulfate solution 0.1 mol/l
1.00316.1000	Hydrochloric acid 25 % GR for analysis
1.05445.0500	Zinc iodidestarch solution GR for analysis
1.09461.1000	Buffer solution pH 9.00 Certipur®
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a stock solution:

Dissolve 1.57 g of sodium sulfite GR 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 % GR 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 thio-sulfate solution 0.1 mol/l until the yellow iodine colour has disappeared, add 1 ml of zinc iodide-starch solution, and continue to titrate from blue to colourless.

Calculation and preparation of the standard solution:

C1 = consumption of sodium thiosulfate 0.1 mol/l

C2 = quantity of iodine solution 0.05 mol/l (25.0 ml)

mg/l sulfite = (C2 – C1) x 80.06

Further investigational concentrations may be prepared from the stock solution exactly determined according to the pro-cedure 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)

Reagents required:*

1.12146.0005	Sodium 1-dodecanesulfonate
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 1.00 g of sodium 1-dodecanesulfonate with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l anionic surfactants.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one month. The diluted standard solutions (investigational concentrations) must be used immediately.

Standard solution of surfactants (cationic)

Reagents required:*

1.02342.0100	N-cetyl-N,N,Ntrimethylammonium bromide GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 1.00 g of N-cetyl-N,N,N-trimethyl-ammonium bromide GR with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l cat-ionic surfactants.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one month. The diluted standard solutions (investigational concentrations) must be used immediately.

Standard solution of surfactants (nonionic)

Reagents required:*

1.12298.0101	Triton® X-100
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 1.00 g of Triton® X-100 with distilled water in a calibrated or conformity-checked 1000-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l non-ionic surfactants.

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:

When stored in a cool place (refrigerator), the standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) must be used immediately.

Standard solution of total hardness

Reagents required:*

1.02121.0500	Calcium nitrate tetrahydrate GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

Preparation of a standard solution:

Dissolve 2.946 g of calcium nitrate tetrahydrate GR with distilled water in a calibrated or conformity-checked 500-ml volumetric flask and make up to the mark with distilled water.

The standard solution prepared according to this procedure has a concentration of 1000 mg/l calcium (corresponds to 175 °e).

Further investigational concentrations may be prepared from this standard solution by diluting accordingly with distilled water.

Stability:

The standard solution of 1000 mg/l remains stable for one week. The diluted standard solutions (investigational concentrations) remain stable for one day.

Standard solution of volatile organic acids

Preparation of a standard solution:

Dissolve 2,05 g of sodium acetate anhydrous 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 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 GR for analysis
1.16754.9010	Water GR for analysis

* The reagents are available from Merck under the stated number.

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2) a leading global water technology company.

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