Programming Data for Spectroquant® Test Kits

Calibration Information: wavelength, slope and blank value

For swift, secure analysis, there's no better choice than Spectroquant® test kits. Consisting of validated, standard-compliant reagents, the kits are pre-programmed for use with Spectroquant® instruments to ensure rapid, reliable results. As a result of their excellent quality, most of our kits conform to international standards, allowing you to test with absolute confidence.

Spectroquant® Reagent Tests contain all reagents for your photometric analyses and can be used with any existing cells of various pathlengths (10 - 100-mm rectangular cells or 16-mm / 1-inch round cells). The measurement range and programming data depend on the size of the cells (which must be acquired separately). In the table below, these Reagent Tests are abbreviated as **RT**.

Spectroquant® Cell Tests are ready-to-use 16-mm (OD) round cells prefilled with reagents; no additional cell is needed. They are even more easy-to-use and convenient. In the table below, these Cell Tests are abbreviated as **CT**.

All test kits can be used seamlessly with **Spectroquant® Photometers**. Calibration data are pre-programmed, and the workflow is designed to enable fast and reliable results with additional features for convenience. For example, the **Spectroquant® Prove** photometer series can read Live ID barcodes that provide batch-specific information such as the shelf-life. It also automatically recognizes the inserted cell and adapts the measurement range to display the correct result without any action needed from the user. The system also includes ready-to-use reference materials and is designed to comply with highest requirements in terms of analytical quality assurance. For further details, please visit www.sigmaaldrich.com/photometry.

If you already have a photometer in your lab and want to experience the outstanding quality and reliability of the Spectroquant® test kit series, you may use the programming data provided in this document. Please make sure that the instruments can (a) measure at the listed wavelength and (b) hold the respective cell sizes as there can be different models available (especially relevant for the round cell dimensions) and if e.g., an adapter is needed.

The calibration data where obtained on different reference photometers from different manufacturers at a certain point in time. Please note that we cannot guarantee the quality of measurement results in this case, as we neither monitor potential changes in the instruments from other manufacturers nor control the performance of your photometer in terms of wavelength precision, repeatability, and linearity of absorbance. In any case we recommend to validate each new method with standards after programming it on your device.

But if your instrument is high-quality, and is regularly subjected to the appropriate quality assurance (e.g. with Supelco® reference standards), Spectroquant® test kits can provide a unique experience in terms of precision, convenience, and compliance.

When programming a method you will also need to measure against a blank in most cases. The blanks the below methods are calibrated for can be:

- Dist. Water (DW) means distilled water without reagents and poured into the same type of cell used for the measurement.
- Own blank (OB) means distilled water and all reagents in the same quantity as used for the measuring sample preparation (can also be called reagent blank). Separately prepared in standard test tubes and poured into the same type of cell used for the measurement.
- Sample blank (SB) means to measure the sample material as a blank (turbid samples have to be filtered), without reagents and poured into the same type of cell used for the measurement.

If the calibration function of the respective test kit is not linear, you will find the remark A) in the factor column, and the respective calibration information is given from page 18.

If you need more information, please contact our technical service at www.sigmaaldrich.com, or your trusted dealer.

Programming Data

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Acid Capacity to pH 4.3	1.01758	CT	0.40	8.00	mmol/l	**OH^-**	16 mm	A)	605	DW
			0.40	8.00	mmol/l	**OH^-**	10 mm			
			20	400	mg/l	**$CaCO_3$**	16 mm			
			20	400	mg/l	**$CaCO_3$**	10 mm			
Acid Capacity to pH 4.3	1.01762	CT	replaced by 1.01758							
Alcohol	Test deleted									
Alkalinity	see Acid capacity to pH 4.3									
Aluminium	1.14825	RT	0.10	1.20	mg/l	**Al**	10 mm	A)	550	DW
			0.020	0.200	mg/l	**Al**	50 mm			
			0.039	0.472	mg/l	**Al**	1 inch			
Aluminium	1.00594	CT	0.02	0.50	mg/l	**Al**	16 mm	A)	545	DW
			0.02	0.50	mg/l	**Al**	10 mm			
Ammonium	1.14739	CT	0.010	2.000	mg/l	**NH_4-N**	16 mm	0.877	690	OB
			0.010	2.000	mg/l	**NH_4-N**	10 mm	1.18		
			0.01	2.58	mg/l	**NH_4^+**	16 mm	1.13		
			0.01	2.58	mg/l	**NH_4^+**	10 mm	1.53		
			0.010	2.000	mg/l	**NH_3-N**	16 mm	0.877		
			0.010	2.000	mg/l	**NH_3-N**	10 mm	1.18		
			0.01	2.43	mg/l	**NH_3**	16 mm	1.065		
			0.01	2.43	mg/l	**NH_3**	10 mm	1.433		
Ammonium	1.14752	RT	0.05	3.00	mg/l	**NH_4-N**	10 mm	1.23	690	OB
			0.03	1.50	mg/l	**NH_4-N**	20 mm	0.615		
			0.010	0.500	mg/l	**NH_4-N**	50 mm	0.246		
			0.02	1.18	mg/l	**NH_4-N**	1 inch	0.483		
			0.06	3.86	mg/l	**NH_4^+**	10 mm	1.58		
			0.04	1.93	mg/l	**NH_4^+**	20 mm	0.792		
			0.013	0.644	mg/l	**NH_4^+**	50 mm	0.316		
			0.024	1.520	mg/l	**NH_4^+**	1 inch	0.622		
			0.05	3.00	mg/l	**NH_3-N**	10 mm	1.23		
			0.03	1.50	mg/l	**NH_3-N**	20 mm	0.615		
			0.010	0.500	mg/l	**NH_3-N**	50 mm	0.246		
			0.02	1.18	mg/l	**NH_3-N**	1 inch	0.483		
			0.06	3.65	mg/l	**NH_3**	10 mm	1.494		
			0.04	1.82	mg/l	**NH_3**	20 mm	0.747		
			0.016	0.608	mg/l	**NH_3**	50 mm	0.384		
			0.03	1.44	mg/l	**NH_3**	1 inch	0.588		

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

A) For programming data (non-linear calibration and absorbance-concentration-table) see Appendix page 18 and from page 20.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Ammonium	1.14558	CT	0.20	8.00	mg/l	**NH_4-N**	16 mm	4.26	690	OB
			0.20	8.00	mg/l	**NH_4-N**	10 mm	5.75		
			0.26	10.30	mg/l	**NH_4^+**	16 mm	5.49		
			0.26	10.30	mg/l	**NH_4^+**	10 mm	7.41		
			0.20	8.00	mg/l	**NH_3-N**	16 mm	4.26		
			0.20	8.00	mg/l	**NH_3-N**	10 mm	5.75		
			0.24	9.73	mg/l	**NH_3**	16 mm	5.17		
			0.24	9.73	mg/l	**NH_3**	10 mm	6.98		
Ammonium	1.14544	CT	0.5	16.0	mg/l	**NH_4-N**	16 mm	7.84	690	OB
			0.5	16.0	mg/l	**NH_4-N**	10 mm	10.6		
			0.6	20.6	mg/l	**NH_4^+**	16 mm	10.1		
			0.6	20.6	mg/l	**NH_4^+**	10 mm	13.6		
			0.5	16.0	mg/l	**NH_3-N**	16 mm	7.84		
			0.5	16.0	mg/l	**NH_3-N**	10 mm	10.6		
			0.6	19.5	mg/l	**NH_3**	16 mm	9.52		
			0.6	19.5	mg/l	**NH_3**	10 mm	12.87		
Ammonium	1.00683	RT	2.0	75.0	mg/l	**NH_4-N**	10 mm	27.8	690	OB
			5	150	mg/l	**NH_4-N**	10 mm	55.6		
			2.6	96.6	mg/l	**NH_4-N**	10 mm	35.8		
			6	193	mg/l	**NH_4^+**	10 mm	71.5		
			2.0	75.0	mg/l	**NH_3-N**	10 mm	27.8		
			5	150	mg/l	**NH_3-N**	10 mm	55.6		
			2.4	91.2	mg/l	**NH_3**	10 mm	33.8		
			6	182	mg/l	**NH_3**	10 mm	67.5		
Ammonium	1.14559	CT	4.0	80.0	mg/l	**NH_4-N**	16 mm	36.4	690	OB
			4.0	80.0	mg/l	**NH_4-N**	10 mm	49.1		
			5.2	103.0	mg/l	**NH_4^+**	16 mm	46.8		
			5,2	103.0	mg/l	**NH_4^+**	10 mm	63.3		
			4.0	80.0	mg/l	**NH_3-N**	16 mm	36.4		
			4.0	80.0	mg/l	**NH_3-N**	10 mm	49.1		
			4.9	97.3	mg/l	**NH_3**	16 mm	44.2		
				97.3	mg/l	**NH_3**	10 mm	59.6		
AOX	1.00675	RT	0.05	2.50	mg/l	**AOX**	16 mm	4.00	445	OB
			0.05	2.50	mg/l	**AOX**	10 mm	5.40		
Antimony	C)		0.10	8.00	mg/l	**Sb**	10 mm	3.45	620	OB
Arsenic	1.01747	RT	0.005	0.100	mg/l	**As**	10 mm	0.1138	525	DW
			0.001	0.020	mg/l	**As**	20 mm	0.0568		
			0.002	0.039	mg/l	**As**	1 inch	0.0447		
BOD	1.00687	CT	0.5	3000	mg/l	**BOD**	16 mm	13.5	500	DW
			0.5	3000	mg/l	**BOD**	10 mm	18.2		
Boron	1.14839	RT	0.050	0.800	mg/l	**B**	10 mm	0.328	565	OB
Boron	1.00826	CT	0.05	2.00	mg/l	**B**	16 mm	1.38	405	OB
			0.05	2.00	mg/l	**B**	10 mm	1.86		

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Bromine	E)	RT	0.10	10.00	mg/l	**Br_2**	10 mm	7.52	550	DW
			0.05	5.00	mg/l	**Br_2**	20 mm	3.76		
			0.020	2.000	mg/l	**Br_2**	50 mm	1.50		
			0.039	3.937	mg/l	**Br_2**	1 inch	2.960		
Cadmium	1.01745	RT	0.010	0.500	mg/l	**Cd**	10 mm	0.680	525	OB
			0.005	0.250	mg/l	**Cd**	20 mm	0.340		
			0.002	0.100	mg/l	**Cd**	50 mm	0.136		
			0.005	0.197	mg/l	**Cd**	1 inch	0.268		
Cadmium	1.14834	CT	0.025	1.000	mg/l	**Cd**	16 mm	0.595	550	OB
			0.025	1.000	mg/l	**Cd**	10 mm	0.804		
Calcium	1.00049	RT	0.20	4.00	mg/l	**Ca**	10 mm	D)	565	OB
Calcium	1.14815	RT	10	160	mg/l	**Ca**	10 mm	137	550	OB
			25	400	mg/l	**$CaCO_3$**	10 mm	342		
			14	224	mg/l	**CaO**	10 mm	192		
			5	80	mg/l	**Ca**	20 mm	68.5		
			12	200	mg/l	**$CaCO_3$**	20 mm	171		
			7	112	mg/l	**CaO**	20 mm	95.9		
			1.0	15.0	mg/l	**Ca**	10 mm	29.4		
			2.5	37.5	mg/l	**$CaCO_3$**	10 mm	73.5		
				21.0	mg/l	**CaO**	10 mm	41.2		
Calcium	1.00858	CT	10	250	mg/l	**Ca**	16 mm	A)	565	DW
			25	625	mg/l	**$CaCO_3$**	16 mm			
			14	350	mg/l	**CaO**	16 mm			
			10	250	mg/l	**Ca**	10 mm			
			25	625	mg/l	**$CaCO_3$**	10 mm			
				350	mg/l	**CaO**	10 mm			
Carbohydrazide	see Oxygen Scavengers									
Chloride	1.01807	RT	0.10	5.00	mg/l	**Cl^-**	50 mm	A)	500	OB
Chloride	1.01804	CT	0.5	15.0	mg/l	**Cl^-**	16 mm	A)	445	DW
			0.5	15.0	mg/l	**Cl^-**	10 mm			
Chloride	1.14897	RT	10	250	mg/l	**Cl^-**	10 mm	107	500	OB
			2.5	125	mg/l	**Cl^-**	10 mm	28.2	445	
Chloride	1.14730	CT	5	125	mg/l	**Cl^-**	16 mm	114	525	OB
			5	125	mg/l	**Cl^-**	10 mm	153		
Chlorine (free chlorine)	1.00598	RT	0.05	6.00	mg/l	**Cl_2**	10 mm	3.33	550	DW
			0.02	3.00	mg/l	**Cl_2**	20 mm	1.67		
			0.010	1.000	mg/l	**Cl_2**	50 mm	0.667		
			0.02	3.00	mg/l	**Cl_2**	1 inch	1.312		
Chlorine (free chlorine)	1.00595	CT	0.03	6.00	mg/l	**Cl_2**	16 mm	2.47	550	DW

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

A) For programming data (non-linear calibration and absorbance-concentration-table) see Appendix page 18 and from page 20.

D) Instrument-specific calibration needed. See Appendix page 19.

E) Can be determined with Chlorine test, 1.00598 (see corresponding application notes on www.sigmaaldrich.com).

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Chlorine (total chlorine)	1.00602	RT	0.05	6.00	mg/l	**Cl_2**	10 mm	3.33	550	DW
			0.02	3.00	mg/l	**Cl_2**	20 mm	1.67		
			0.010	1.000	mg/l	**Cl_2**	50 mm	0.667		
			0.02	2.36	mg/l	**Cl_2**	1 inch	1.312		
Chlorine (free + total chlorine)	1.00597	CT	0.03	6.00	mg/l	**Cl_2**	16 mm	2.47	550	DW
Chlorine (free + total chlorine)	1.00599	RT	0.05	6.00	mg/l	**Cl_2**	10 mm	3.33	550	DW
			0.02	3.00	mg/l	**Cl_2**	20 mm	1.67		
			0.010	1.000	mg/l	**Cl_2**	50 mm	0.667		
			0.02	2.36	mg/l	**Cl_2**	1 inch	1.312		
Chlorine (liquid) (free + total chlorine)	1.00086	RT	0.03	6.00	mg/l	**Cl_2**	16 mm	2.47	550	DW
	1.00087		0.010	1.000	mg/l	**Cl_2**	50 mm	0.667		
	1.00088		0.010	1.000	mg/l	**Cl_2**	50 mm	0.667		
	1.00089		0.010	1.000	mg/l	**Cl_2**	50 mm	0.667		
Chlorine	1.14828	RT	replaced by 1.00599 or 1.00598 or 1.00602							
Chlorine	1.19254	RT	0	2.00	mg/l	**Cl_2**	10 mm	B)	520 or 530	OB
			0	2.00	mg/l	**Cl_2**	1 inch	B)	520 or 530	
Chlorine Dioxide	1.00608	RT	0.10	10.00	mg/l	**ClO_2**	10 mm	6.33	550	DW
			0.05	5.00	mg/l	**ClO_2**	20 mm	3.16		
			0.020	2.000	mg/l	**ClO_2**	50 mm	1.27		
			0.04	3.94	mg/l	**ClO_2**	1 inch	2.49		
Chlorine Dioxide	1.14732		replaced by 1.00608							
Chromate	1.14758	RT	0.05	3.00	mg/l	**Cr**	10 mm	1.30	550	DW
			0.03	1.50	mg/l	**Cr**	20 mm	0.650		
			0.010	0.600	mg/l	**Cr**	50 mm	0.260		
			0.020	1.181	mg/l	**Cr**	1 inch	0.511		
			0.11	6.69	mg/l	**CrO_4^{2-}**	10 mm	2.90		
			0.07	3.35	mg/l	**CrO_4^{2-}**	20 mm	1.45		
			0.02	1.34	mg/l	**CrO_4^{2-}**	50 mm	0.579		
			0.044	2.635	mg/l	**CrO_4^{2-}**	1 inch	1.14		
Chromate	1.14552	CT	0.05	2.00	mg/l	**Cr**	16 mm	0.971	550	DW
			0.05	2.00	mg/l	**Cr**	10 mm	1.31		
			0.11	4.46	mg/l	**CrO_4^{2-}**	16 mm	2.17		
			0.11	4.46	mg/l	**CrO_4^{2-}**	10 mm	2.92		
Chromium Bath	C)		20	400	g/l	**CrO_3**	10 mm	556	445	DW
			10	200	g/l	**CrO_3**	20 mm	278		
			4.0	80.0	g/l	**CrO_3**	50 mm	111		
Cobalt	1.17244	CT	0.05	2.00	mg/l	**Co**	16 mm	3.715	500	OB
			0.05	2.00	mg/l	**Co**	10 mm	5.02		
COD	1.14560	CT	4.0	40.0	mg/l	**COD**	16 mm	-41.7	340	OB
			4.0	40.0	mg/l	**COD**	10 mm	-56.3		
COD	1.01796	CT	5.0	80.0	mg/l	**COD**	16 mm	-40.7	340	OB
			5.0	80.0	mg/l	**COD**	10 mm	-54.9		

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

B) This test can (also) be used with Hach® factory-programmed instrument calibrations. No calibration factor/table is necessary. For the corresponding Hach program number see Appendix page 18.

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
COD	1.14540	CT	10	150	mg/l	**COD**	16 mm	-210	445	OB
			10	150	mg/l	**COD**	10 mm	-284		
COD	1.14895	CT	15	300	mg/l	**COD**	16 mm	-222	445	OB
			15	300	mg/l	**COD**	10 mm	-300		
COD	1.14690	CT	50	500	mg/l	**COD**	16 mm	-397	445	OB
			50	500	mg/l	**COD**	10 mm	-536		
COD	1.14541	CT	25	1500	mg/l	**COD**	16 mm	1667	605	OB
			25	1500	mg/l	**COD**	10 mm	2249		
COD	1.14691	CT	300	3500	mg/l	**COD**	16 mm	3226	605	OB
			300	3500	mg/l	**COD**	10 mm	4355		
COD	1.14555	CT	500	10000	mg/l	**COD**	16 mm	4608	605	OB
			500	10000	mg/l	**COD**	10 mm	6221		
COD	1.01797	CT	5000	90000	mg/l	**COD**	16 mm	42553	605	OB
			5000	90000	mg/l	**COD**	10 mm	57803		
COD (Hg free)	1.09772	CT	10	150	mg/l	**COD**	16 mm	-238	445	OB
			10	150	mg/l	**COD**	10 mm	-321		
COD (Hg free)	1.09773	CT	100	1500	mg/l	**COD**	16 mm	1923	605	OB
			100	1500	mg/l	**COD**	10 mm	2596		
COD for Seawater	1.17058	CT	5.0	60.0	mg/l	**COD**	16 mm	-57.5	340	OB
			5.0	60.0	mg/l	**COD**	10 mm	-77.5		
COD for Seawater	1.17059	CT	50	3000	mg/l	**COD**	16 mm	3650	605	OB
			50	3000	mg/l	**COD**	10 mm	4926		
COD	1.18750	CT	0	40	mg/l	**COD**	16 mm	B)	350	OB
COD	1.18751	CT	0	150	mg/l	**COD**	16 mm	B)	420	OB
COD	1.18752	CT	0	1500	mg/l	**COD**	16 mm	B)	620	OB
COD	1.18753	CT	0	15000	mg/l	**COD**	16 mm	B)	620	OB
Color (EN ISO 7887)	C)		2	500		**CU**	50 mm	380	410	DW
			0.5	50.0	**m^{-1}**		50 mm	20.0	445	
			0.5	50.0	**m^{-1}**		50 mm	20.0	535	
			0.5	50.0	**m^{-1}**		50 mm	20.0	620	
Color 436	C)		1	250	**m^{-1}**		10 mm	20.0	436	DW
			0.3	125.0	**m^{-1}**		20 mm	10.0		
			0.1	50.0	**m^{-1}**		50 mm	4.00		
Color 525	C)		1	250	**m^{-1}**		10 mm	20.0	525	DW
			0.3	125.0	**m^{-1}**		20 mm	10.0		
			0.1	50.0	**m^{-1}**		50 mm	4.00		
Color 620	C)		1	250	**m^{-1}**		10 mm	20.0	620	DW
			0.3	125.0	**m^{-1}**		20 mm	10.0		
			0.1	50.0	**m^{-1}**		50 mm	4.00		
Color Measurement	see Hazen Color number					**Pt/Co or HZ**				

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

B) This test can (also) be used with Hach® factory-programmed instrument calibrations. No calibration factor/table is necessary. For the corresponding Hach program number see Appendix page 18.

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Copper	1.14767	RT	0.10	6.00	mg/l	**Cu**	10 mm	4.44	605	DW
			0.05	3.00	mg/l	**Cu**	20 mm	2.22		
			0.02	1.20	mg/l	**Cu**	50 mm	0.889		
			0.04	2.36	mg/l	**Cu**	1 inch	1.75		
Copper	1.14553	CT	0.05	8.00	mg/l	**Cu**	16 mm	3.60	605	DW
			0.05	8.00	mg/l	**Cu**	10 mm	4.86		
Copper Bath	C)		10.0	80.0	g/l	**Cu**	10 mm	43.1	820	DW
			5.0	40.0	g/l	**Cu**	20 mm	21.6		
			2.0	16.0	g/l	**Cu**	50 mm	8.62		
Cyanide	1.09701	RT	0.010	0.500	mg/l	**CN^-**	10 mm	0.221	605	DW
			0.005	0.2500	mg/l	**CN^-**	20 mm	0.110		
			0.002	0.100	mg/l	**CN^-**	50 mm	0.0442		
			0.004	0.197	mg/l	**CN^-**	1 inch	0.0871		
Cyanide	1.14561	CT	0.010	0.500	mg/l	**CN^-**	16 mm	0.161	605	DW
Cyanuric Acid	1.19253	RT	2	160	mg/l	**CyA**	20 mm	B), turbidity D)	525	DW
			2	160	mg/l	**CyA**	1 inch			
Detergents	see Surfactants									
Dissolved Oxygen	see Oxygen									
Ethanol	see Alcohol									
Fluoride	1.14557	CT	replaced by 1.00809							
Fluoride	1.00809	CT	0.10	1.80	mg/l	**F^-**	16 mm	1.43	620	OB
			0.10	1.80	mg/l	**F^-**	10 mm	1.93		
			0.025	0.500	mg/l	**F^-**	50 mm	0.312		
Fluoride	1.00822	RT	0.02	2.00	mg/l	**F^-**	50 mm	A), B)	605	OB
			0.02	2.00	mg/l	**F^-**	1 inch			
Fluoride	1.17236	RT	0.02	2.00	mg/l	**F^-**	50 mm	A), B)	605	OB
			0.02	2.00	mg/l	**F^-**	1 inch			
Fluoride	1.17243	CT	0.10	2.50	mg/l	**F^-**	16 mm	A), B)	605	OB
			0.10	2.50	mg/l	**F^-**	50 mm			
Fluoride	1.14598	RT	0.10	2.00	mg/l	**F^-**	10 mm	2.02	620	OB
			1.0	20.0	mg/l	**F^-**	10 mm	21.5		
Formaldehyde	1.14678	RT	0.10	8.00	mg/l	**HCHO**	10 mm	4.22	565	DW
			0.05	4.00	mg/l	**HCHO**	20 mm	2.11		
			0.02	1.50	mg/l	**HCHO**	50 mm	0.844		
			0.04	3.15	mg/l	**HCHO**	1 inch	1.66		
Formaldehyde	1.14500	CT	0.10	8.00	mg/l	**HCHO**	16 mm	3.23	565	DW
			0.10	8.00	mg/l	**HCHO**	10 mm	4.36		
Gold	1.14821	RT	0.5	12.0	mg/l	**Au**	10 mm	6.25	550	OB
Hardness	see Residual Hardness or Total Hardness									

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

A) For programming data (non-linear calibration and absorbance-concentration-table) see Appendix page 18 and from page 20.

B) This test can (also) be used with Hach® factory-programmed instrument calibrations. No calibration factor/table is necessary. For the corresponding Hach program number see Appendix page 18.

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

D) Instrument-specific calibration needed. See Appendix page 19.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Hazen Color Number			0	500		**CU, HZ, Pt or Pt/Co**	10 mm	370	340	DW
			0	250		**CU, HZ, Pt or Pt/Co**	20 mm	185		
			0	100		**CU, HZ, Pt or Pt/Co**	50 mm	74		
Hazen Color Number			0	1000		**CU, HZ, Pt or Pt/Co**	50 mm	813	445	DW
Hazen Color Number			0	1000		**CU, HZ, Pt or Pt/Co**	50 mm	752	455	DW
Hazen Color Number			0	1000		**CU, HZ, Pt or Pt/Co**	50 mm	775	465	DW
Hydrazine	1.14797	RT	replaced by 1.09711							
Hydrazine	1.09711	RT	0.02	2.00	mg/l	**N_2H_4**	10 mm	0.870	445	DW
			0.01	1.00	mg/l	**N_2H_4**	20 mm	0.435		
			0.005	0.400	mg/l	**N_2H_4**	50 mm	0.174		
			0.008	0.787	mg/l	**N_2H_4**	1 inch	0.342		
Hydrogen Peroxide	1.14731	CT	2.0	20.0	mg/l	**H_2O_2**	16 mm	38.5	410	DW
			2.0	20.0	mg/l	**H_2O_2**	10 mm	52.3		
			0.25	5.00	mg/l	**H_2O_2**	50 mm	10.5		
Hydrogen Peroxide	1.18789	RT	0.03	6.00	mg/l	**H_2O_2**	10 mm	2.67	445	OB
			0.015	3.000	mg/l	**H_2O_2**	20 mm	1.34		
			0.01	2.36	mg/l	**H_2O_2**	1 inch	1.04		
Hydrogen Sulfide	see Sulfide									
Hydroquinone	see Oxygen Scavengers									
Iodine	E)	RT	0.20	10.00	mg/l	**I_2**	10 mm	11.9	550	DW
			0.10	5.00	mg/l	**I_2**	20 mm	5.95		
			0.050	2.000	mg/l	**I_2**	50 mm	2.38		
			0.08	3.94	mg/l	**I_2**	1 inch	4.69		
Iodine Color Number			0.05	3.00		**IFZ**	10 mm	1.27	340	DW
			0.03	1.50		**IFZ**	20 mm	0.637		
			0.010	0.600		**IFZ**	50 mm	0.255		
Iodine Color Number			1.0	50.0		**IFZ**	10 mm	17.1	445	DW
			0.5	25.0		**IFZ**	20 mm	8.55		
			0.2	10.0		**IFZ**	50 mm	3.42		
Iron	1.14761	RT	0.05	5.00	mg/l	**Fe**	10 mm	2.08	565	DW
			0.03	2.50	mg/l	**Fe**	20 mm	1.04		
			0.005	1.000	mg/l	**Fe**	50 mm	0.416		
			0.0025	0.5000	mg/l	**Fe**	100 mm	0.208		
			0.02	1.97	mg/l	**Fe**	1 inch	0.820		
Iron	1.00796	RT	0.10	5.00	mg/l	**Fe**	10 mm	5.56	500	DW
			0.05	2.50	mg/l	**Fe**	20 mm	2.78		
			0.010	1.000	mg/l	**Fe**	50 mm	1.11		
			0.04	1.97	mg/l	**Fe**	1 inch	2.19		

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

E) Can be determined with Chlorine test, 1.00598 (see corresponding application notes on www.sigmaaldrich.com).

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Iron	1.14549	CT	0.05	4.00	mg/l	**Fe**	16 mm	1.64	565	DW
			0.05	5.00	mg/l	**Fe**	10 mm	2.21		
Iron	1.14896	CT	1.0	50.0	mg/l	**Fe**	16 mm	28.3	525	DW
			1.0	50.0	mg/l	**Fe**	10 mm	38.2		
Lead	1.09717	RT	0.10	5.00	mg/l	**Pb**	10 mm	6.25	525	OB
			0.05	2.50	mg/l	**Pb**	20 mm	3.13		
			1.010	1.000	mg/l	**Pb**	50 mm	1.25		
			0.039	1.970	mg/l	**Pb**	1 inch	2.46		
Isoascorbic Acid (Erythorbic Acid)	see Oxygen Scavengers									
Lead	1.14833	CT	0.10	5.00	mg/l	**Pb**	16 mm	4.39	525	OB
			0.10	5.00	mg/l	**Pb**	10 mm	5.93		
Magnesium	1.00815	CT	5.0	75.0	mg/l	**Mg**	16 mm	A)	565	DW
			5.0	75.0	mg/l	**Mg**	10 mm			
Mercury	C)		0.025	1.000	mg/l	**Hg**	50 mm	0.563	565	OB
Manganese	1.01739	RT	replaced by 1.01846							
Manganese	1.01846	RT	0.05	2.00	mg/l	**Mn**	10 mm	1.67	565	OB
				1.00	mg/l	**Mn**	20 mm	0.836		
			0.005	0.400	mg/l	**Mn**	50 mm	0.334		
			0.020	0.790	mg/l	**Mn**	1 inch	0.657		
Manganese	1.14770	RT	0.50	10.00	mg/l	**Mn**	10 mm	5.62	445	DW
			0.25	5.00	mg/l	**Mn**	20 mm	2.81		
			0.01	2.00	mg/l	**Mn**	50 mm	1.12		
			0.20	3.94	mg/l	**Mn**	1 inch	2.21		
Manganese	1.00816	CT	0.10	5.00	mg/l	**Mn**	16 mm	4.13	445	DW
			0.10	5.00	mg/l	**Mn**	10 mm	5.58		
Methylethylketoxime (2-Butanone-etoxime)	see Oxygen Scavengers									
Molybdenum	1.00860	CT	0.02	1.00	mg/l	**Mo**	16 mm	1.10	620	OB
			0.02	1.00	mg/l	**Mo**	10 mm	1.49		
			0.03	1.67	mg/l	**MoO_4^{2-}**	16 mm	1.84		
			0.03	1.67	mg/l	**MoO_4^{2-}**	10 mm	2.48		
			0.04	2.15	mg/l	**Na_2MoO_4**	16 mm	2.37		
			0.04	2.15	mg/l	**Na_2MoO_4**	10 mm	3.19		

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

A) For programming data (non-linear calibration and absorbance-concentration-table) see Appendix page 18 and from page 20.

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Monochloramine	1.01632	RT	0.25	10.00	mg/l	**Cl_2**	10 mm	5.00	690	OB
			0.13	5.00	mg/l	**Cl_2**	20 mm	2.50		
			0.050	2.000	mg/l	**Cl_2**	50 mm	1.00		
			0.10	3.94	mg/l	**Cl_2**	1 inch	1.97		
			0.18	7.25	mg/l	**NH_2Cl**	10 mm	3.67		
			0.09	3.63	mg/l	**NH_2Cl**	20 mm	1.83		
			0.036	1.450	mg/l	**NH_2Cl**	50 mm	0.733		
			0.09	2.85	mg/l	**NH_2Cl**	1 inch	1.44		
			0.05	1.96	mg/l	**NH_2Cl-N**	10 mm	0.988		
			0.03	0.98	mg/l	**NH_2Cl-N**	20 mm	0.494		
			0.010	0.392	mg/l	**NH_2Cl-N**	50 mm	0.198		
			0.02	0.77	mg/l	**NH_2Cl-N**	1 inch	0.389		
Nickel	1.14785	RT	0.10	5.00	mg/l	**Ni**	10 mm	4.76	445	DW
			0.05	2.50	mg/l	**Ni**	20 mm	2.38		
			0.02	1.00	mg/l	**Ni**	50 mm	0.952		
			0.04	1.97	mg/l	**Ni**	1 inch	1.87		
Nickel	1.14554	CT	0.10	6.00	mg/l	**Ni**	16 mm	3.82	445	OB
			0.10	6.00	mg/l	**Ni**	10 mm	5.16		
Nickel Bath	C)		10	120	g/l	**Ni**	10 mm	60.6	690	DW
			5.0	60.0	g/l	**Ni**	20 mm	30.3		
			2.0	24.0	g/l	**Ni**	50 mm	12.1		
Nitrate	1.09713	RT	1.0	25.0	mg/l	**NO_3-N**	10 mm	19.6	340	OB
			0.5	12.5	mg/l	**NO_3-N**	20 mm	9.80		
			0.10	5.00	mg/l	**NO_3-N**	50 mm	3.92		
			0.4	9.8	mg/l	**NO_3-N**	1 inch	7.72		
			4.4	110.7	mg/l	**NO_3^-**	10 mm	86.8		
			2.2	55.4	mg/l	**NO_3^-**	20 mm	43.4		
			0.4	22.1	mg/l	**NO_3^-**	50 mm	17.4		
			1.7	43.6	mg/l	**NO_3^-**	1 inch	34.2		
Nitrate	1.14773	RT	0.5	20.0	mg/l	**NO_3-N**	10 mm	9.62	525	OB
			0.2	10.0	mg/l	**NO_3-N**	20 mm	4.81		
			0.2	7.9	mg/l	**NO_3-N**	1 inch	3.79		
			2.2	88.5	mg/l	**NO_3^-**	10 mm	42.6		
			0.9	44.3	mg/l	**NO_3^-**	20 mm	21.3		
			0.9	34.8	mg/l	**NO_3^-**	1 inch	16.8		
Nitrate	1.14542	CT	0.5	18.0	mg/l	**NO_3-N**	16 mm	7.14	525	OB
			0.5	18.0	mg/l	**NO_3-N**	10 mm	9.64		
			2.2	79.7	mg/l	**NO_3^-**	16 mm	31.6		
			2.2	79.7	mg/l	**NO_3^-**	10 mm	42.7		

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Nitrate	1.14563	CT	0.5	25.0	mg/l	**NO_3-N**	16 mm	14.7	340	OB
			0.5	25.0	mg/l	**NO_3-N**	10 mm	19.9		
			2.2	110.7	mg/l	**NO_3^-**	16 mm	65.1		
			2.2	110.7	mg/l	**NO_3^-**	10 mm	87.9		
Nitrate	1.14764	CT	1.0	50.0	mg/l	**NO_3-N**	16 mm	27.9	340	OB
			1.0	50.0	mg/l	**NO_3-N**	10 mm	37.7		
			4	221	mg/l	**NO_3^-**	16 mm	124		
			4	221	mg/l	**NO_3^-**	10 mm	167		
Nitrate	1.00614	CT	23	225	mg/l	**NO_3-N**	16 mm	132	340	OB
			23	225	mg/l	**NO_3-N**	10 mm	180		
			102	996	mg/l	**NO_3^-**	16 mm	586		
			102	996	mg/l	**NO_3^-**	10 mm	797		
Nitrate in Seawater	1.14556	CT	0.10	3.00	mg/l	**NO_3-N**	16 mm	A)	500	DW
			0.10	2.50	mg/l	**NO_3-N**	10 mm			
			0.4	13.3	mg/l	**NO_3^-**	16 mm			
			0.4	11.1	mg/l	**NO_3^-**	10 mm			
Nitrate in Seawater	1.14942	RT	0.2	17.0	mg/l	**NO_3^-**	10 mm	A)	500	DW
			0.9	75.3	mg/l	**NO_3^-**	10 mm			
Nitrite	1.14776	RT	0.02	1.00	mg/l	**NO_2-N**	10 mm	0.376	525	DW
			0.010	0.500	mg/l	**NO_2-N**	20 mm	0.188		
			0.002	0.200	mg/l	**NO_2-N**	50 mm	0.0751		
			0.008	0.394	mg/l	**NO_2-N**	1 inch	0.148		
			0.07	3.28	mg/l	**NO_2^-**	10 mm	1.24		
			0.03	1.64	mg/l	**NO_2^-**	20 mm	0.620		
			0.007	0.657	mg/l	**NO_2^-**	50 mm	0.248		
			0.026	1.293	mg/l	**NO_2^-**	1 inch	0.479		
Nitrite	1.14547	CT	0.010	0.700	mg/l	**NO_2-N**	16 mm	0.274	525	DW
			0.010	0.700	mg/l	**NO_2-N**	10 mm	0.370		
			0.03	2.30	mg/l	**NO_2-N**	16 mm	0.900		
			0.03	2.30	mg/l	**NO_2^-**	10 mm	1.22		
Nitrite	1.00609	CT	1.0	90.0	mg/l	**NO_2-N**	16 mm	82.6	605	DW
			1.0	90.0	mg/l	**NO_2-N**	10 mm	112.4		
			3.3	295.2	mg/l	**NO_2^-**	16 mm	271.3		
			3.3	295.2	mg/l	**NO_2^-**	10 mm	369.2		
Nitrogen (total)	1.00613	CT	0.5	15.0	mg/l	**N**	16 mm	15.3	340	OB
			0.5	15.0	mg/l	**N**	10 mm	20.6		
Nitrogen (total)	1.14537	CT	0.5	15.0	mg/l	**N**	16 mm	7.81	525	OB
			0.5	15.0	mg/l	**N**	10 mm	10.5		
Nitrogen (total)	1.14763	CT	10	150	mg/l	**N**	16 mm	154	340	OB
			10	150	mg/l	**N**	10 mm	208		
Nitrogen, Ammonium	see Ammonium									
Nitrogen, Nitrate	see Nitrate									
Nitrogen, Nitrite	see Nitrite									

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

A) For programming data (non-linear calibration and absorbance-concentration-table) see Appendix page 18 and from page 20.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Organic Acids, Volatile	see Volatile organic acids									
Organic Carbon, Volatile	see TOC									
Oxygen, dissolved	1.14694	CT	0.5	12.0	mg/l	**O_2**	16 mm	13.5	500	DW
			0.5	12.0	mg/l	**O_2**	10 mm	18.2		
Oxygen Scavengers	1.19251	RT	0.020	0.500	mg/l	**DEHA**	20 mm	0.408	565	OB
			0	450	µg/l	**DEHA**	1 inch	B)	562	
			0.027	0.667	mg/l	**Carbohy**	20 mm	0.544	565	
			0	600	µg/l	**Carbohy**	1 inch	B)	562	
			0.053	1.315	mg/l	**Hydro**	20 mm	1.073	565	
			0	1000	µg/l	**Hydro**	1 inch	B)	562	
			0.078	1.950	mg/l	**ISA**	20 mm	1.592	565	
			0	1500	µg/l	**ISA**	1 inch	B)	562	
			0.087	2.170	mg/l	**MEKO**	20 mm	1.771	565	
			0	1000	µg/l	**MEKO**	1 inch	B)	562	
Oxygen Demand, Biological	see BOD									
Oxygen Demand, Chemical	see COD									
Ozone	1.00607	RT	0.05	4.00	mg/l	**O_3**	10 mm	2.25	550	DW
			0.02	2.00	mg/l	**O_3**	20 mm	1.13		
			0.010	0.800	mg/l	**O_3**	50 mm	0.450		
			0.020	1.575	mg/l	**O_3**	1 inch	0.887		
Ozone	1.14732	RT	replaced by 1.00607							
Palladium	C)	RT	0.05	1.25	mg/l	**Pd**	10 mm	0.588	525	OB
Peroxide	see Hydrogen Peroxide									
pH	1.01744	CT	6.4	8.8	pH units	**pH**	16 mm	A)	550	DW
			6.4	8.8	pH units	**pH**	10 mm			
Phenol	1.00856	RT	0.002	0.100	mg/l	**Phenol**	20 mm	0.114	445	OB
			0.10	5.00	mg/l	**Phenol**	10 mm	8.33	500	
			0.002	0.100	mg/l	**Phenol**	1 inch	0.0895	445	
			0.013	2.500	mg/l	**Phenol**	20 mm	4.17	500	
			0.025	1.000	mg/l	**Phenol**	50 mm	1.67	500	
			0.07	1.97	mg/l	**Phenol**	1 inch	3.28	495	
Phenol	1.14551	CT	0.10	2.50	mg/l	**Phenol**	16 mm	3.39	500	OB
			0.10	2.50	mg/l	**Phenol**	10 mm	4.58		

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

A) For programming data (non-linear calibration and absorbance-concentration-table) see Appendix page 18 and from page 20.

B) This test can (also) be used with Hach® factory-programmed instrument calibrations. No calibration factor/table is necessary. For the corresponding Hach program number see Appendix page 18.

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Phosphate (PMB)	1.14848	RT	0.05	5.00	mg/l	**PO_4-P**	10 mm	2.08	690	OB
			0.03	2.50	mg/l	**PO_4-P**	20 mm	1.04		
			0.005	1.000	mg/l	**PO_4-P**	50 mm	0.417		
			0.0025	0.5000	mg/l	**PO_4-P**	100 mm	0.208		
			0.02	1.97	mg/l	**PO_4-P**	1 inch	0.820		
			0.2	15.3	mg/l	**PO_4^{3-}**	10 mm	6.38		
			0.09	7.67	mg/l	**PO_4^{3-}**	20 mm	3.19		
			0.015	3.07	mg/l	**PO_4^{3-}**	50 mm	1.275		
			0.0077	1.5331	mg/l	**PO_4^{3-}**	100 mm	0.638		
			0.06	6.04	mg/l	**PO_4^{3-}**	1 inch	2.51		
			0.11	11.46	mg/l	**P_2O_5**	10 mm	4.76		
			0.07	5.73	mg/l	**P_2O_5**	20 mm	2.38		
			0.02	2.29	mg/l	**P_2O_5**	50 mm	0.952		
			0.011	1.146	mg/l	**P_2O_5**	100 mm	0.476		
			0.05	4.51	mg/l	**P_2O_5**	1 inch	1.88		
(o)-Phosphate (PMB)	1.00474	CT	0.05	5.00	mg/l	**PO_4-P**	16 mm	1.61	690	OB
			0.05	5.00	mg/l	**PO_4-P**	10 mm	2.18		
			0.2	15.3	mg/l	**PO_4^{3-}**	16 mm	4.95		
			0.2	15.3	mg/l	**PO_4^{3-}**	10 mm	6.68		
			0.11	11.46	mg/l	**P_2O_5**	16 mm	3.70		
			0.11	11.46	mg/l	**P_2O_5**	10 mm	4.99		
Phosphate (PMB)	1.14543	CT	0.05	5.00	mg/l	**PO_4-P**	16 mm	1.61	690	OB
			0.05	5.00	mg/l	**PO_4-P**	10 mm	2.18		
			0.2	15.3	mg/l	**PO_4^{3-}**	16 mm	4.95		
			0.2	15.3	mg/l	**PO_4^{3-}**	10 mm	6.68		
			0.11	11.46	mg/l	**P_2O_5**	16 mm	3.70		
			0.11	11.46	mg/l	**P_2O_5**	10 mm	4.99		
(o)-Phosphate (PMB)	1.00475	CT	0.5	25.0	mg/l	**PO_4-P**	16 mm	8.06	690	OB
			0.5	25.0	mg/l	**PO_4-P**	10 mm	10.9		
			1.5	76.7	mg/l	**PO_4^{3-}**	16 mm	24.7		
			1.5	76.7	mg/l	**PO_4^{3-}**	10 mm	33.4		
			1.1	57.3	mg/l	**P_2O_5**	16 mm	18.5		
			1.1	57.3	mg/l	**P_2O_5**	10 mm	24.9		
Phosphate (PMB)	1.14729	CT	0.5	25.0	mg/l	**PO_4-P**	16 mm	8.06	690	OB
			0.5	25.0	mg/l	**PO_4-P**	10 mm	10.9		
			1.5	76.7	mg/l	**PO_4^{3-}**	16 mm	24.7		
			1.5	76.7	mg/l	**PO_4^{3-}**	10 mm	33.4		
			1.1	57.3	mg/l	**P_2O_5**	16 mm	18.5		
			1.1	57.3	mg/l	**P_2O_5**	10 mm	24.9		

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Phosphate (VM)	1.14546	CT	0.5	25.0	mg/l	**PO_4-P**	16 mm	13.4	410	OB
			0.5	25.0	mg/l	**PO_4-P**	10 mm	18.2		
			1.5	76.7	mg/l	**PO_4^{3-}**	16 mm	41.2		
			1.5	76.7	mg/l	**PO_4^{3-}**	10 mm	55.6		
			1.1	57.3	mg/l	**P_2O_5**	16 mm	30.8		
			1.1	57.3	mg/l	**P_2O_5**	10 mm	41.5		
Phosphate (VM)	1.14842	RT	1.0	30.0	mg/l	**PO_4-P**	10 mm	18.0	410	OB
			0.5	15.0	mg/l	**PO_4-P**	20 mm	9.00		
			0.4	11.8	mg/l	**PO_4-P**	1 inch	7.09		
			3.1	92.0	mg/l	**PO_4^{3-}**	10 mm	55.2		
			1.5	46.0	mg/l	**PO_4^{3-}**	20 mm	27.6		
			1.2	36.2	mg/l	**PO_4^{3-}**	1 inch	21.7		
			2.3	68.7	mg/l	**P_2O_5**	10 mm	41.3		
			1.1	34.4	mg/l	**P_2O_5**	20 mm	20.6		
			0.9	27.0	mg/l	**P_2O_5**	1 inch	16.2		
Phosphate (PMB)	1.00798	RT	1.0	100.0	mg/l	**PO_4-P**	10 mm	35.1	690	OB
			0.4	39.4	mg/l	**PO_4-P**	1 inch	13.8		
			3	307	mg/l	**PO_4^{3-}**	10 mm	108		
			1.2	120.9	mg/l	**PO_4^{3-}**	1 inch	42.4		
			2	229	mg/l	**P_2O_5**	10 mm	80.4		
			1	90	mg/l	**P_2O_5**	1 inch	31.6		
(o)-Phosphate (PMB)	1.00616	CT	3.0	100.0	mg/l	**PO_4-P**	16 mm	39.2	690	OB
			3.0	100.0	mg/l	**PO_4-P**	10 mm	52.9		
			9	307	mg/l	**PO_4^{3-}**	16 mm	120		
			9	307	mg/l	**PO_4^{3-}**	10 mm	162		
			7	229	mg/l	**P_2O_5**	16 mm	89.9		
			7	229	mg/l	**P_2O_5**	10 mm	121		
Phosphate (PMB)	1.00673	CT	3.0	100.0	mg/l	**PO_4-P**	16 mm	39.2	690	OB
			3.0	100.0	mg/l	**PO_4-P**	10 mm	52.9		
			9	307	mg/l	**PO_4^{3-}**	16 mm	120		
			9	307	mg/l	**PO_4^{3-}**	10 mm	162		
			7	229	mg/l	**P_2O_5**	16 mm	89.9		
			7	229	mg/l	**P_2O_5**	10 mm	121		
Platinum	C)	RT	0.10	1.25	mg/l	**Pt**	10 mm	2.38	690	OB
Platinum-Cobalt Standard	see Hazen Color number					**Pt/Co or HZ**				
Potassium	1.14562	CT	5.0	50.0	mg/l	**K**	16 mm	turbidity D)	690	DW
			5.0	50.0	mg/l	**K**	10 mm			
Potassium	1.00615	CT	30	300	mg/l	**K**	16 mm	turbidity D)	690	DW
			30	300	mg/l	**K**	10 mm			

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

D) Instrument-specific calibration needed. See Appendix page 19.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Residual Hardness	1.14683	CT	0.50	5.00	mg/l	**Ca**	16 mm	A)	565	DW
			1.25	12.5	mg/l	**$CaCO_3$**	16 mm			
			0.70	7.00	mg/l	**CaO**	16 mm			
			0.070	0.700		**°d**	16 mm			
			0.088	0.875		**°e**	16 mm			
			0.125	1.250		**°f**	16 mm			
			0.50	5.00	mg/l	**Ca**	10 mm			
			1.25	12.50	mg/l	**$CaCO_3$**	10 mm			
			0.70	7.00	mg/l	**CaO**	10 mm			
			0.070	0.700		**°d**	10 mm			
			0.088	0.875		**°e**	10 mm			
			0.125	1.250		**°f**	10 mm			
Silicate	1.01813	RT	0.5	500.0	µg/l	**SiO_2**	50 mm	0.599	820	OB
			0.001	1.000	mg/l	**SiO_2**	1 inch *)	1.179		
			0.2	233.7	µg/l	**Si**	50 mm	0.280		
			0.0004	0.500	mg/l	**Si**	1 inch *)	0.551		
			0.25	250.00	µg/l	**SiO_2**	100 mm	0.299		
			0.12	116.85	µg/l	**Si**	100 mm	0.140		
Silicate	1.14794	RT	0.21	10.70	mg/l	**SiO_2**	10 mm	7.98	665	DW
			0.11	5.35	mg/l	**SiO_2**	20 mm	3.99		
			0.01	1.60	mg/l	**SiO_2**	50 mm	0.611	820	
			0.08	4.21	mg/l	**SiO_2**	1 inch	3.15	665	
			0.10	5.00	mg/l	**Si**	10 mm	3.73	665	
			0.05	2.50	mg/l	**Si**	20 mm	1.87		
			0.005	0.750	mg/l	**Si**	50 mm	0.286	820	
			0.04	1.97	mg/l	**Si**	1 inch	1.47	665	
Silicate	1.00857	RT	1.1	107.0	mg/l	**SiO_2**	10 mm	59.8	410	DW
			0.4	42.1	mg/l	**SiO_2**	1 inch	23.5		
			11	1070	mg/l	**SiO_2**	10 mm	602		
			4	421	mg/l	**SiO_2**	1 inch	237		
			0.5	50	mg/l	**Si**	10 mm	27.9		
			0.2	19.7	mg/l	**Si**	1 inch	11.0		
			5	500	mg/l	**Si**	10 mm	282		
			2.0	196.9	mg/l	**Si**	1 inch	111		
Silver	C)		0.50	3.00	mg/l	**Ag**	10 mm	2.22	550	OB
			0.25	1.50	mg/l	**Ag**	20 mm	1.11		
			0.20	1.18	mg/l	**Ag**	1 inch	0.874		
Sodium in Nutrient Solutions for Fertilization	1.00885	CT	10	300	mg/l	**Na**	16 mm	263	550	OB
			10	300	mg/l	**Na**	10 mm	355		

*) The programming data for the 1 inch Pour-Thru Cell and the "normal" 1-inch cell are identical.
When using the 1-inch Pour-Thru Cell please use instead of 10 ml of sample and blank 50 ml of sample and blank.

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

A) For programming data (non-linear calibration and absorbance-concentration-table) see Appendix page 18 and from page 20.

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Sulfate	1.01812	RT	2.5	50.0	mg/l	**SO_4^{2-}**	10 mm	turbidity D)	445	SB
			1.3	25.0	mg/l	**SO_4^{2-}**	20 mm			
			0.50	10.00	mg/l	**SO_4^{2-}**	50 mm			
			1.0	19.7	mg/l	**SO_4^{2-}**	1 inch			
Sulfate	1.02532	CT	1.0	50.0	mg/l	**SO_4^{2-}**	16 mm	turbidity D)	445	SB
			1.0	50.0	mg/l	**SO_4^{2-}**	10 mm			
Sulfate	1.14548	CT	5	250	mg/l	**SO_4^{2-}**	16 mm	turbidity D)	525	SB
			5	250	mg/l	**SO_4^{2-}**	10 mm			
Sulfate	1.02537	RT	5	300	mg/l	**SO_4^{2-}**	10 mm	turbidity D)	525	SB
Sulfate	1.00617	CT	50	500	mg/l	**SO_4^{2-}**	16 mm	turbidity D)	525	SB
			50	500	mg/l	**SO_4^{2-}**	10 mm			
Sulfate	1.14564	CT	100	1000	mg/l	**SO_4^{2-}**	16 mm	turbidity D)	820	SB
			100	1000	mg/l	**SO_4^{2-}**	10 mm			
Sulfide	1.14779	RT	0.10	1.50	mg/l	**S^{2-}**	10 mm	A)	665	DW
			0.020	0.500	mg/l	**S^{2-}**	50 mm	0.244		
Sulfite	1.14394	CT	1.0	20.0	mg/l	**SO_3^{2-}**	16 mm	8.77	410	OB
			1.0	20.0	mg/l	**SO_3^{2-}**	10 mm	11.8		
			0.05	3.00	mg/l	**SO_3^{2-}**	50 mm	1.69		
			0.8	16.0	mg/l	**SO_2**	16 mm	7.02		
			0.8	16.0	mg/l	**SO_2**	10 mm	9.44		
			0.04	2.40	mg/l	**SO_2**	50 mm	1.35		
Sulfite	1.01746	RT	1.0	60.0	mg/l	**SO_3^{2-}**	10 mm	29.4	410	OB
			0.8	48.0	mg/l	**SO_2**	10 mm	23.5		
Surfactants (anionic)	1.14697	CT	replaced by 1.02552							
Surfactants (anionic)	1.02552	CT	0.05	2.00	mg/l	**SDSA**	16 mm	1.85	653	OB
			0.06	2.56	mg/l	**SDBS**	16 mm	2.368		
			0.05	2.12	mg/l	**SDS**	16 mm	1.96		
			0.08	3.26	mg/l	**SDOSSA**	16 mm	3.016		
Surfactants (cationic)	1.01764	CT	0.05	1.50	mg/l	**CTAB**	16 mm	1.92	620	OB
Surfactants (non-ionic)	1.01787	CT	0.10	7.50	mg/l	**Triton X-100**	16 mm	6.06	605	OB
Suspended Solids	C)		25	750	mg/l	**SuS**	20 mm	turbidity D)	820	DW
Tensides										
Tin	1.14622	CT	replaced by 1.17265							
Tin	1.17265	CT	0.10	2.50	mg/l	**Sn**	16 mm	A)	665	DW
			0.10	2.50	mg/l	**Sn**	10 mm			
TOC	1.14878	CT	5.0	80.0	mg/l	**TOC**	16 mm	-64.5	605	OB
TOC	1.14879	CT	50	800	mg/l	**TOC**	16 mm	-645	605	OB
Total Alkalinity	see Acid capacity to pH 4.3									

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

SB **Sample blank** - clear sample without reagent (turbid samples must be filtered)

A) For programming data (non-linear calibration and absorbance-concentration-table) see Appendix page 18 and from page 20.

D) Instrument-specific calibration needed. See Appendix page 19.

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Factor	Wave-length [nm]	Blank
Total Hardness	1.00961	CT	5	215	mg/l	**Ca**	16 mm	A)	565	DW
			13	538	mg/l	**$CaCO_3$**	16 mm			
			7	301	mg/l	**CaO**	16 mm			
			0.7	30.1		**°d**	16 mm			
			0.9	37.6		**°e**	16 mm			
			1.3	53.8		**°f**	16 mm			
			5	215	mg/l	**Ca**	10 mm			
			13	538	mg/l	**$CaCO_3$**	10 mm			
			7	301	mg/l	**CaO**	10 mm			
			0.7	30.1		**°d**	10 mm			
			0.9	37.6		**°e**	10 mm			
			1.3	53.8		**°f**	10 mm			
Total Nitrogen	see Nitrogen (total)									
Turbidity	C)		1	100		**FAU**	50 mm	turbidity D)	550	DW
Volatile Organic Acids	1.01763		replaced by 1.01749 or 1.01809							
Volatile Organic Acids	1.01749	CT	50	3000	mg/l	**HOAc**	16 mm	1841	500	OB
			50	3000	mg/l	**HOAc**	10 mm	2486		
			73	4401	mg/l	**Butyric Acid**	16 mm	2701		
			73	4401	mg/l	**Butyric Acid**	10 mm	3648		
Volatile Organic Acids	1.01809	CT	50	3000	mg/l	**HOAc**	16 mm	1841	500	OB
			50	3000	mg/l	**HOAc**	10 mm	2486		
			73	4401	mg/l	**Butyric Acid**	16 mm	2701		
			73	4401	mg/l	**Butyric Acid**	10 mm	3648		
Water Hardness	see Residual Hardness or Total Hardness									
Zinc	1.00861	CT	0.025	1.000	mg/l	**Zn**	16 mm	1.36	500	OB
			0.025	1.000	mg/l	**Zn**	10 mm	1.84		
Zinc	1.14832	RT	0.05	2.50	mg/l	**Zn**	10 mm	1.08	565	DW
Zinc	1.14566	CT	0.20	5.00	mg/l	**Zn**	16 mm	4.88	500	OB
			0.20	5.00	mg/l	**Zn**	10 mm	6.59		

DW Distilled water (without reagents, poured into the type of cell used)

OB Own blank (distilled water and all reagents in the same quantity as used for the measuring sample preparation. Separately prepared in standard test tubes and poured into the type of cell used)

A) For programming data (non-linear calibration and absorbance-concentration-table) see Appendix page 18 and from page 20.

C) No ready-to-use kit. Find detailed information in the respective application note on www.sigmaaldrich.com.

D) Instrument-specific calibration needed. See Appendix page 19.

Appendix

A) Non-linear Calibration and Absorbance-Concentration-Table

Calibration curves for the methods are non-linear.

1. Use the mentioned concentration-absorbance-tables (from page 20)
2. Besides using the concentration-absorbance-table you can enter a non-linear curve by using the coefficients of the following formula.

   $C = a + bx + cx^2 + dx^3$

Check your instrument and enter the coefficients according the given list. The calibration is always done against distilled water.

We recommend taking a standard and checking if the calibration is done correctly because also spectrophotometers have small differences from instrument to instrument.

B) Use with Hach® factory-programmed instrument calibrations

The following tests can be used with Hach® factory-programmed instrument calibrations, so no calibration table is necessary. The corresponding Hach program number can be found in the following table:

Parameter	Order No.	Hach program No.
COD	1.18750	431
COD	1.18751	430
COD	1.18752	435
COD	1.18753	435
Chlorine	1.19254	80
Cyanuric Acid	1.19253	170
Fluoride	1.00822	190
Fluoride	1.17236	190
Fluoride	1.17243	190
Oxygen Scavengers Carbohyrazide	1.19251	180
Oxygen Scavengers DEHA	1.19251	181
Oxygen Scavengers Hydroquinone	1.19251	182
Oxygen Scavengers Isoascorbic acid	1.19251	183
Oxygen Scavengers Methylethylketoxime	1.19251	184

C) Alternative Methods

There are no test kits available for this parameter. The methods used here are reported in analytical literature. Applications and instructions how to perform the methods are available on the Internet homepage of Merck KGaA, Darmstadt, Germany: www.sigmaaldrich.com.

D) Turbidity Measurement

The following parameters are methods where light attenuation by turbidity is measured. As the optical system of every spectrophotometer is different, we are not proposing any factor for your spectrophotometer but suggest you prepare standards of different concentrations and determine the individual calibration factor for your respective setup.

Parameter	Order No.
Cyanuric Acid	1.19253
Potassium	1.14562
Potassium	1.00615
Sulfate	1.14548
Sulfate	1.00617
Sulfate	1.14564
Sulfate	1.01812
Sulfate	1.02532
Sulfate	1.02537
Suspended Solids	physical measurement - application
Turbidity	physical measurement - application

Acid Capacity Cell Test (Ord. No. 1.01758)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Acid Capacity to pH 4.3	1.01758	CT	0.40	8.00	mmol/l	**OH^-**	16 mm	605	DW
			0.40	8.00	mmol/l	**OH^-**	10 mm		
			20	400	mg/l	**$CaCO_3$**	16 mm		
			20	400	mg/l	**$CaCO_3$**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	mmol/l OH^-	mg/l $CaCO_3$
0.462	0	0
0.488	0.40	20
0.529	1.00	50
0.593	1.90	95
0.660	2.80	140
0.728	3.70	185
0.789	4.50	225
0.856	5.40	270
0.921	6.30	315
0.984	7.20	360
1.036	8.00	400

Absorbance (A) 10-mm Cell	mmol/l OH^-	mg/l $CaCO_3$
0.345	0	0
0.364	0.40	20
0.395	1.00	50
0.443	1.90	95
0.493	2.80	140
0.543	3.70	185
0.589	4.50	225
0.639	5.40	270
0.687	6.30	315
0.734	7.20	360
0.773	8.00	400

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	16-mm Round Cell	10-mm Cell	10-mm Cell
	0.40 – 8.00 mmol/l OH^-	20 – 400 mg/l $CaCO_3$	0.40 – 8.00 mmol/l OH^-	20 – 400 mg/l $CaCO_3$
coefficient a:	-10.07	-503.5	-10.07	-503.5
coefficient b:	30.24	1512	40.52	2026
coefficient c:	-23.08	-1154	-41.44	-2072
coefficient d:	10.36	517.9	24.93	1246

Aluminium Test (Ord. No. 1.14825)

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
Aluminium	1.14825	RT	0.10	1.20	mg/l	**Al**	10 mm	550	DW
			0.020	0.200	mg/l	**Al**	50 mm		
			0.039	0.472	mg/l	**Al**	1 inch		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 10-mm Cell	mg/l Al
0.189	0
0.248	0.05
0.310	0.10
0.374	0.15
0.441	0.20
0.585	0.30
0.745	0.40
1.110	0.60
1.525	0.80
1.936	1.00
2.293	1.20

Absorbance (A) 50-mm Cell	mg/l Al
0.950	0
1.062	0.020
1.181	0.040
1.301	0.060
1.424	0.080
1.549	0.100
1.676	0.120
1.805	0.140
1.936	0.160
2.070	0.180
2.206	0.200

Absorbance (A) 1-inch Cell	mg/l Al
0.565	0.040
0.680	0.080
0.800	0.120
0.958	0.170
1.088	0.210
1.259	0.260
1.400	0.300
1.547	0.340
1.738	0.390
1.901	0.430
2.196	0.500

Non-linear curve, calibration against distilled water

Non-linear Calibration	10-mm Cell 0.10 – 1.20 mg/l Al	50-mm Cell 0.020 – 0.240 mg/l Al	1-inch Cell 0.040 – 0.500 mg/l Al
Coefficient a:	-0.1747	-0.1747	-0.1747
Coefficient b:	0.9866	0.1973	0.4128
Coefficient c:	-0.3455	-0.01382	-0.06049
Coefficient d:	0.0771	0.000617	0.00565

Aluminium Cell Test (Ord. No. 1.00594)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Aluminium	1.00594	CT	0.02	0.50	mg/l	**Al**	16 mm	545	DW
			0.02	0.50	mg/l	**Al**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	mg/l Al
0.294	0
0.366	0.05
0.446	0.10
0.533	0.15
0.630	0.20
0.737	0.25
0.854	0.30
0.980	0.35
1.109	0.40
1.237	0.45
1.357	0.50

Absorbance (A) 10-mm Cell	mg/l Al
0.219	0
0.273	0.05
0.332	0.10
0.398	0.15
0.470	0.20
0.550	0.25
0.637	0.30
0.731	0.35
0.828	0.40
0.923	0.45
1.012	0.50

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	10-mm Cell
	0.02 – 0.50 mg/l Al	0.02 – 0.50 mg/l Al
Coefficient a:	-0.2533	-0.2533
Coefficient b:	1.022	1.370
Coefficient c:	-0.5990	-1.076
Coefficient d:	0.1876	0.4514

Calcium Cell Test (Ord. No. 1.00858)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Calcium	1.00858	CT	10	250	mg/l	**Ca**	16 mm	565	DW
			25	625	mg/l	**$CaCO_3$**	16 mm		
			14	350	mg/l	**CaO**	16 mm		
			10	250	mg/l	**Ca**	10 mm		
			25	625	mg/l	**$CaCO_3$**	10 mm		
				350	mg/l	**CaO**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	mg/l Ca	mg/l $CaCO_3$	mg/l CaO
0.073	0	0	0
0.100	10	25	14
0.171	35	88	49
0.248	60	150	84
0.333	85	213	119
0.446	115	288	161
0.573	145	363	203
0.711	175	438	245
0.833	200	500	280
0.956	225	563	315
1.074	250	625	350

Absorbance (A) 10-mm Cell	mg/l Ca	mg/l $CaCO_3$	mg/l CaO
0.054	0	0	0
0.075	10	25	14
0.128	35	88	49
0.185	60	150	84
0.249	85	213	119
0.333	115	288	161
0.428	145	363	203
0.531	175	438	245
0.622	200	500	280
0.713	225	563	315
0.801	250	625	350

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	16-mm Round Cell	16-mm Round Cell
	10 – 250 mg/l Ca	25 – 625 mg/l $CaCO_3$	14 – 350 mg/l CaO
coefficient a:	-29.29	-73.15	-40.99
coefficient b:	416.8	1.041	583.2
coefficient c:	-252.3	-630.0	-353.0
coefficient d:	99.16	247.6	138.7

Non-linear Calibration	10-mm Cell	10-mm Cell	10-mm Cell
	10 – 250 mg/l Ca	25 – 625 mg/l $CaCO_3$	14 – 350 mg/l CaO
coefficient a:	-29.29	-73.15	-40.99
coefficient b:	558.6	1.395	781.5
coefficient c:	-453.0	-1.131	-633.8
coefficient d:	238.6	595.8	333.8

Chloride Test (Ord. No. 1.01807)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Chloride	1.01807	RT	0.10	5.00	mg/l	**Cl^-**	50 mm	500	OB

Absorbance-Concentration-Table, calibration against own blank

Absorbance (A) 50-mm Cell	mg/l Cl^-
0.000	0
0.020	0.10
0.062	0.30
0.193	0.90
0.329	1.50
0.469	2.10
0.607	2.70
0.740	3.30
0.867	3.90
0.984	4.50
1.075	5.00

Non-linear curve, calibration against own blank

Non-linear Calibration	50-mm Cell
	0.10-5.00 mg/l Cl^-
coefficient a:	0.004689
coefficient b:	4.873
coefficient c:	-1.357
coefficient d:	1.066

Chloride Cell Test (Ord. No. 1.01804)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Chloride	1.01804	CT	0.5	15.0	mg/l	**Cl^-**	16 mm	445	DW
			0.5	15.0	mg/l	**Cl^-**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	mg/l Cl^-
0.120	0
0.156	0.5
0.272	2.0
0.387	3.5
0.499	5.0
0.607	6.5
0.709	8.0
0.805	9.5
0.895	11.0
1.007	13.0
1.109	15.0

Absorbance (A) 10-mm Cell	mg/l Cl^-
0.090	0
0.116	0.5
0.203	2.0
0.289	3.5
0.373	5.0
0.453	6.5
0.529	8.0
0.601	9.5
0.668	11.0
0.751	13.0
0.828	15.0

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	10-mm Cell
	0.5-15.0 mg/l Cl^-	0.5-15.0 mg/l Cl^-
coefficient a:	-1.537	-1.537
coefficient b:	13.35	17.89
coefficient c:	-2.082	-3.738
coefficient d:	3.146	7.570

Fluoride Test (Ord. No. 1.00822)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Fluoride	1.00822	RT	0.02	2.00	mg/l	F^-	50 mm	605	OB
			0.02	2.00	mg/l	F^-	1 inch*)		

Absorbance-Concentration-Table, calibration against own blank

Absorbance (A) 50-mm Cell	mg/l F^-
0.001	0
-0.010	0.02
-0.146	0.25
-0.296	0.50
-0.447	0.75
-0.594	1.00
-0.708	1.20
-0.816	1.40
-0.920	1.60
-1.018	1.80
-1.111	2.00

Non-linear curve, calibration against own blank

Non-linear Calibration	50-mm Cell
	0.02 – 2.00 mg/l F^-
coefficient a:	0.002
coefficient b:	-1.729
coefficient c:	-0.253
coefficient d:	-0.284

*) The Fluoride Test 1.00822 can be used with Hach factory-programmed instrument calibrations (Hach program no. 190). No calibration table is necessary.

Handling is identical to the corresponding Hach test. Details can be found in the package insert, which is included in the box.

Fluoride Test (Ord. No. 1.17236)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Fluoride	1.17236	RT	0.02	2.00	mg/l	F^-	50 mm	605	OB
			0.02	2.00	mg/l	F^-	1 inch		

Absorbance-Concentration-Table, calibration against own blank

Absorbance (A) 50-mm Cell	mg/l F^-
0.000	0.00
-0.018	0.02
-0.155	0.25
-0.307	0.50
-0.458	0.75
-0.605	1.00
-0.730	1.20
-0.842	1.40
-0.950	1.60
-1.054	1.80
-1.141	2.00

Non-linear curve, calibration against own blank

Non-linear Calibration	50-mm Cell
	0.02 – 2.00 mg/l F^-
coefficient a:	0.002385
coefficient b:	-1.729
coefficient c:	-0.2529
coefficient d:	-0.2843

*) The Fluoride Test 1.17236 can be used with Hach factory-programmed instrument calibrations (Hach program no. 190). No calibration table is necessary.

Handling is identical to the corresponding Hach test. Details can be found in the package insert, which is included in the box.

Fluoride Cell Test (Ord. No. 1.17243)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Fluoride	1.17243	CT	0.10	2.50	mg/l	F^-	16 mm	605	OB
			0.10	2.50	mg/l	F^-	50 mm		

Absorbance-Concentration-Table, calibration against own blank

Absorbance (A) 16-mm Round Cell	mg/l F^-
0.000	0.00
-0.030	0.10
-0.072	0.30
-0.117	0.50
-0.168	0.75
-0.225	1.00
-0.288	1.30
-0.345	1.60
-0.410	2.00
-0.441	2.25
-0.464	2.50

Absorbance (A) 50-mm Cell	mg/l F^-
0.000	0.00
-0.111	0.10
-0.268	0.30
-0.434	0.50
-0.623	0.75
-0.832	1.00
-1.065	1.30
-1.276	1.60
-1.519	2.00
-1.635	2.25
-1.719	2.50

Non-linear curve, calibration against own blank

Non-linear Calibration	16-mm Round Cell	50-mm Cell
	0.10 – 2.50 mg/l F^-	0.10 – 2.50 mg/l F^-
coefficient a:	-0.02737	-0.02737
coefficient b:	-5.140	-1.388
coefficient c:	-6.015	-0.4385
coefficient d:	-14.00	-0.2755

*) The Fluoride Cell Test 1.17243 can be used with Hach factory-programmed instrument calibrations (Hach program no. 190). No calibration table is necessary.

Handling is identical to the corresponding Hach test. Details can be found in the package insert, which is included in the box.

Magnesium Cell Test (Ord. No. 1.00815)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Magnesium	1.00815	CT	5.0	75.0	mg/l	**Mg**	16 mm	565	DW
			5.0	75.0	mg/l	**Mg**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	mg/l Mg
0.069	0
0.087	5.0
0.119	13.0
0.151	20.0
0.190	28.0
0.235	36.0
0.284	44.0
0.337	52.0
0.384	59.0
0.436	67.0
0.484	75.0

Absorbance (A) 10-mm Cell	mg/l Mg
0.051	0
0.065	5.0
0.089	13.0
0.112	20.0
0.142	28.0
0.175	36.0
0.212	44.0
0.251	52.0
0.287	59.0
0.325	67.0
0.361	75.0

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	10-mm Cell
	5.0 – 75.0 mg/l Mg	5.0 – 75.0 mg/l Mg
coefficient a:	-21.51	-21.5
coefficient b:	350.6	469.7
coefficient c:	-577.9	-1038
coefficient d:	548.8	1320

Nitrate Cell Test in seawater (Ord. No. 1.14556)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Nitrate in Seawater	1.14556	CT	0.10	3.00	mg/l	**NO_3-N**	16 mm	500	DW
			0.10	2.50	mg/l	**NO_3-N**	10 mm		
			0.4	13.3	mg/l	**NO_3^-**	16 mm		
			0.4	11.1	mg/l	**NO_3^-**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	mg/l NO_3-N	mg/l NO_3^-
0.000	0	0
0.088	0.10	0.4
0.118	0.15	0.7
0.279	0.40	1.8
0.492	0.70	3.1
0.726	1.00	4.4
0.986	1.30	5.8
1.275	1.60	7.1
1.583	1.90	8.4
1.904	2.20	9.7
2.216	2.50	11.1
2.510	2.80	12.4
2.690	3.00	13.3

Absorbance (A) 10-mm Cell	mg/l NO_3-N	mg/l NO_3^-
0.000	0	0
0.066	0.10	0.4
0.088	0.15	0.7
0.208	0.40	1.8
0.367	0.70	3.1
0.542	1.00	4.4
0.736	1.30	5.8
0.951	1.60	7.1
1.181	1.90	8.4
1.421	2.20	9.7
1.654	2.50	11.1
1.873	2.80	12.4
2.007	3.00	13.3

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	16-mm Round Cell	10-mm Cell	10-mm Cell
	0.10 – 3.00 mg/l NO_3-N	0.4 – 13.3 mg/l NO_3^-	0.10 – 3.00 mg/l NO_3-N	0.4 – 13.3 mg/l NO_3^-
coefficient a:	-0.0476	-0.2107	-0.04760	-0.2107
coefficient b:	1.718	7.604	2.302	10.19
coefficient c:	-0.4382	-1.940	-0.7868	-3.483
coefficient d:	0.08210	0.3634	0.1975	0.8745

Nitrate Test in seawater (Ord. No. 1.14942)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Nitrate in Seawater	1.14942	RT	0.2	17.0	mg/l	**NO_3^-**	10 mm	500	DW
			0.9	75.3	mg/l	**NO_3^-**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 10-mm Cell	mg/l NO_3-N	mg/l NO_3^-
0.000	0.0	0.0
0.070	1.0	4.4
0.195	2.0	8.9
0.320	3.0	13.3
0.575	5.0	22.1
0.845	7.0	31.0
1.120	9.0	39.8
1.407	11.0	48.7
1.706	13.0	57.6
2.012	15.0	66.4
2.335	17.0	75.3

Non-linear curve, calibration against distilled water

Non-linear Calibration	10-mm Cell	10-mm Cell
	0.2 – 17.0 mg/l NO_3-N	0.9 – 75.3 mg/l NO_3^-
coefficient a:	0.4213	1.865
coefficient b:	8.251	36.53
coefficient c:	-0.5679	-2.514
coefficient d:	0.0335	0.1481

pH Cell Test (Ord. No. 1.01744)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
pH	1.01744	CT	6.4	8.8	pH units	**pH**	16 mm	550	DW
			6.4	8.8	pH units	**pH**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	pH
0.000	6.2
0.068	6.4
0.192	6.7
0.345	7.0
0.470	7.2
0.615	7.4
0.800	7.6
1.020	7.8
1.260	8.0
1.640	8.4
1.890	8.8

Absorbance (A) 10-mm Cell	pH
0.000	6.2
0.051	6.4
0.143	6.7
0.257	7.0
0.351	7.2
0.459	7.4
0.597	7.6
0.761	7.8
0.940	8.0
1.224	8.4
1.410	8.8

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	10-mm Cell
	pH 6.4 – 8.8	pH 6.4 – 8.8
coefficient a:	6.217	6.217
coefficient b:	2.836	3.800
coefficient c:	-1.824	-3.275
coefficient d:	0.5531	1.331

Residual Hardness Cell Test (Ord. No. 1.14683)

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
Residual Hardness	1.14683	CT	0.50	5.00	mg/l	**Ca**	16 mm	565	DW
			1.25	12.5	mg/l	**$CaCO_3$**	16 mm		
			0.70	7.00	mg/l	**CaO**	16 mm		
			0.070	0.700		**°d**	16 mm		
			0.088	0.875		**°e**	16 mm		
			0.125	1.250		**°f**	16 mm		
			0.50	5.00	mg/l	**Ca**	10 mm		
			1.25	12.50	mg/l	**$CaCO_3$**	10 mm		
			0.70	7.00	mg/l	**CaO**	10 mm		
			0.070	0.700		**°d**	10 mm		
			0.088	0.875		**°e**	10 mm		
			0.125	1.250		**°f**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	mg/l Ca	mg/l $CaCO_3$	mg/l CaO	°d	°e	°f
0.100	0	0.0	0	0	0	0.00
0.219	0.50	1.3	0.70	0.070	0.088	0.13
0.343	1.00	2.5	1.40	0.140	0.175	0.25
0.473	1.50	3.8	2.10	0.210	0.263	0.38
0.609	2.00	5.0	2.80	0.280	0.350	0.50
0.751	2.50	6.3	3.50	0.350	0.438	0.63
0.898	3.00	7.5	4.20	0.420	0.525	0.75
1.201	4.00	10.0	5.60	0.560	0.700	1.00
1.503	5.00	12.5	7.00	0.700	0.875	1.25

Absorbance (A) 10-mm Cell	mg/l Ca	mg/l $CaCO_3$	mg/l CaO	°d	°e	°f
0.075	0	0.0	0	0	0	0.00
0.164	0.50	1.3	0.70	0.070	0.088	0.13
0.255	1.00	2.5	1.40	0.140	0.175	0.25
0.353	1.50	3.8	2.10	0.210	0.263	0.38
0.454	2.00	5.0	2.80	0.280	0.350	0.50
0.560	2.50	6.3	3.50	0.350	0.438	0.63
0.670	3.00	7.5	4.20	0.420	0.525	0.75
0.896	4.00	10.0	5.60	0.560	0.700	1.00
1.121	5.00	12.5	7.00	0.700	0.875	1.25

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	16-mm Round Cell	16-mm Round Cell	16-mm Round Cell	16-mm Round Cell	16-mm Round Cell
	0.50 – 5.00 mg/l Ca	1.25 – 12.50 mg/l $CaCO_3$	0.70 – 7.00 mg/l CaO	0.070 – 0.700 °d	0.088 – 0.875 °e	0.125 – 1.250 °f
coefficient a:	-0.4615	-1.152	-0.6457	-0.06458	-0.08065	-0.1153
coefficient b:	4.623	11.54	6.467	0.6468	0.8079	1.154
coefficient c:	-1.141	-2.849	-1.596	-0.1596	-0.1994	-0.2849
coefficient d:	0.3236	0.8080	0.4527	0.04528	0.05655	0.08081

Non-linear Calibration	10-mm Cell	10-mm Cell	10-mm Cell	10-mm Cell	10-mm Cell	10-mm Cell
	0.50 – 5.00 mg/l Ca	1.25 – 12.50 mg/l $CaCO_3$	0.70 – 7.00 mg/l CaO	0.070 – 0.700 °d	0.088 – 0.875 °e	0.125 – 1.250 °f
coefficient a:	-0.4615	-1.152	-0.6457	-0.06458	-0.08065	-0.1153
coefficient b:	6.195	15.47	8.666	0.8668	1.083	1.547
coefficient c:	-2.048	-5.115	-2.866	-0.2866	-0.3580	-0.5116
coefficient d:	0.7786	1.944	1.089	0.1089	0.1361	0.1944

Sulfide Test (Ord. No. 1.14779)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Sulfide	1.14779	RT	0.10	1.50	mg/l	**S^{2-}**	10 mm	665	DW

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 10-mm Cell	mg/l S^{2-}
0.000	0
0.078	0.10
0.204	0.25
0.328	0.40
0.450	0.55
0.569	0.70
0.720	0.90
0.827	1.05
1.028	1.35
1.121	1.50

Non-linear curve, calibration against distilled water

Non-linear Calibration	10-mm Cell
	0.10 – 1.50 mg/l S^{2-}
coefficient a:	0.007200
coefficient b:	1.193
coefficient c:	-0.03710
coefficient d:	0.1430

Tin Cell Test (Ord. No. 1.17265)

Parameter	Order No.	Test Type	Measuring range		Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
			lower limit	upper limit					
Tin	1.17265	CT	0.10	2.50	mg/l	**Sn**	16 mm	665	DW
			0.10	2.50	mg/l	**Sn**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	mg/l Sn
0.000	0.00
0.067	0.10
0.294	0.40
0.529	0.70
0.765	1.00
0.937	1.20
1.180	1.50
1.361	1.70
1.625	2.00
1.860	2.30
1.989	2.50

Absorbance (A) 10-mm Cell	mg/l Sn
0.000	0.00
0.049	0.10
0.218	0.40
0.391	0.70
0.566	1.00
0.694	1.20
0.874	1.50
1.008	1.70
1.204	2.00
1.378	2.30
1.473	2.50

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	10-mm Cell
	0.10 – 2.50 mg/l Sn	0.10 – 2.50 mg/l Sn
coefficient a:	-0.001857	-0.001857
coefficient b:	1.466	1.979
coefficient c:	-0.2730	-0.4976
coefficient d:	0.08289	0.2039

Total Hardness Cell Test (Ord. No. 1.00961)

Parameter	Order No.	Test Type	Measuring range lower limit	Measuring range upper limit	Unit	Chemical Form	Cell size used	Wave-length [nm]	Blank
Total Hardness	1.00961	CT	5	215	mg/l	**Ca**	16 mm	565	DW
			13	538	mg/l	**$CaCO_3$**	16 mm		
			7	301	mg/l	**CaO**	16 mm		
			0.7	30.1		**°d**	16 mm		
			0.9	37.6		**°e**	16 mm		
			1.3	53.8		**°f**	16 mm		
			5	215	mg/l	**Ca**	10 mm		
			13	538	mg/l	**$CaCO_3$**	10 mm		
			7	301	mg/l	**CaO**	10 mm		
			0.7	30.1		**°d**	10 mm		
			0.9	37.6		**°e**	10 mm		
			1.3	53.8		**°f**	10 mm		

Absorbance-Concentration-Table, calibration against distilled water

Absorbance (A) 16-mm Round Cell	mg/l Ca	mg/l $CaCO_3$	mg/l CaO	°d	°e	°f
0.068	0	0	0	0	0	0
0.085	5	13	7	0.7	0.9	1.3
0.152	25	63	35	3.5	4.4	6.3
0.245	50	125	70	7.0	8.8	12.5
0.348	75	188	105	10.5	13.1	18.8
0.464	100	250	140	14.0	17.5	25.0
0.567	120	300	168	16.8	21.0	30.0
0.708	145	363	203	20.3	25.4	36.3
0.862	170	425	238	23.8	29.8	42.5
1.021	195	488	273	27.3	34.1	48.8
1.144	215	538	301	30.1	37.6	53.8

Absorbance (A) 10-mm Cell	mg/l Ca	mg/l $CaCO_3$	mg/l CaO	°d	°e	°f
0.051	0	0	0	0	0	0
0.063	5	13	7	0.7	0.9	1.3
0.113	25	63	35	3.5	4.4	6.3
0.183	50	125	70	7.0	8.8	12.5
0.260	75	188	105	10.5	13.1	18.8
0.346	100	250	140	14.0	17.5	25.0
0.423	120	300	168	16.8	21.0	30.0
0.528	145	363	203	20.3	25.4	36.3
0.643	170	425	238	23.8	29.8	42.5
0.762	195	488	273	27.3	34.1	48.8
0.854	215	538	301	30.1	37.6	53.8

Non-linear curve, calibration against distilled water

Non-linear Calibration	16-mm Round Cell	16-mm Round Cell	16-mm Round Cell	16-mm Round Cell	16-mm Round Cell	16-mm Round Cell
	5 – 215 mg/l Ca	13 – 538 mg/l $CaCO_3$	7 – 301 mg/l CaO	0.7 – 30.1 °d	0.9 – 37.6 °e	1.3 – 53.8 °f
coefficient a:	-22.35	-55.82	-31.27	-3.128	-3.907	-5.582
coefficient b:	340.0	848.9	475.6	47.57	59.41	84.90
coefficient c:	-195.3	-487.6	-273.2	-27.32	-34.12	-48.76
coefficient d:	69.67	174.0	97.47	9.748	12.18	17.40

Non-linear Calibration	10-mm Cell	10-mm Cell	10-mm Cell	10-mm Cell	10-mm Cell	10-mm Cell
	5 – 215 mg/l Ca	13 – 538 mg/l $CaCO_3$	7 – 301 mg/l CaO	0.7 – 30.1 °d	0.9 – 37.6 °e	1.3 – 53.8 °f
coefficient a:	-22.35	-55.82	-31.27	-3.128	-3.907	-5.582
coefficient b:	455.6	1.138	637.3	63.74	79.61	113.8
coefficient c:	-350.6	-875.5	-490.5	-49.06	-61.27	-87.55
coefficient d:	167.6	418.6	234.5	23.46	29.30	41.86

Merck KGaA, 64271 Darmstadt, Germany, Tel. +49(0)6151 72-2440
www.sigmaaldrich.com
EMD Millipore Corporation, 400 Summit Drive, Burlington MA 01803, USA,
Tel. +1-978-715-4321
Sigma-Aldrich Canada Co. or Millipore (Canada) Ltd. 2149 Winston Park,
Dr. Oakville, Ontario, L6H 6J8, Phone: +1 800-565-1400

Lit. No. MK_UG8213EN Ver. 2.0
01-01-02023
04/2023