Brackish And Seawater Methods List for Automated Ion Analyzers

Flow Injection Analysis

19 January 2018

Introduction

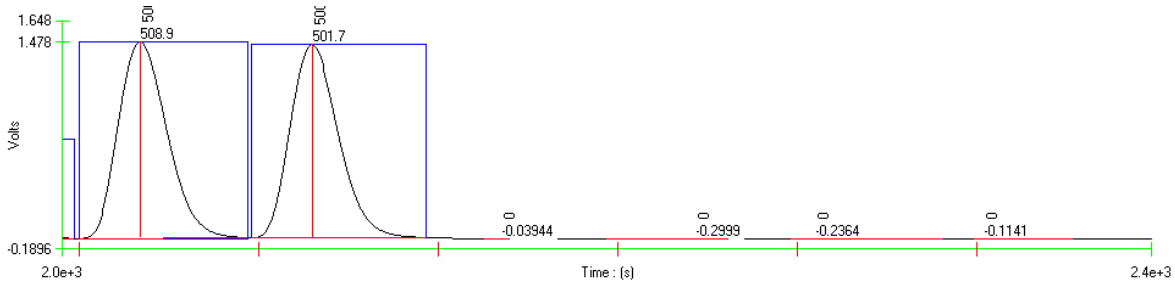
Lachat Instruments has many methods for the analysis of nutrients and other ions in seawater and brackish waters. A key feature of these methods is that Lachat's brackish chemistries **do not require matrix matching**.

→The **methods can be used with samples over the range of 0-35 ppt salinity**!

→**Standards are prepared in DI water** as well.

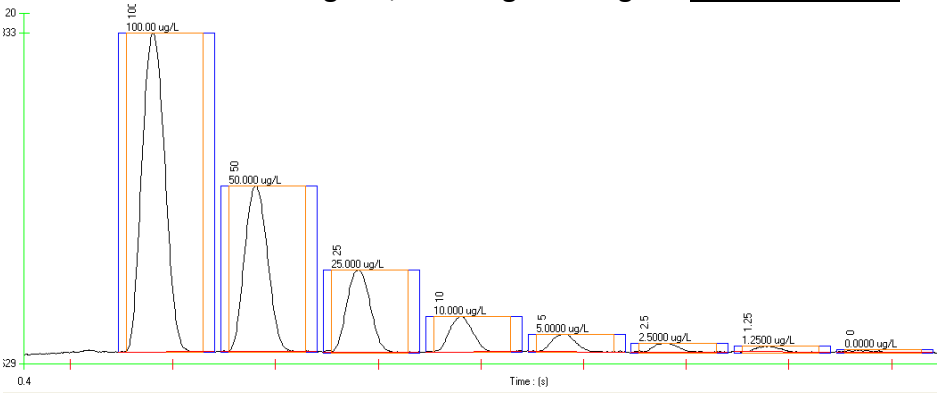
→**All Lachat methods are designed to prevent the "memory effect" (i.e. carryover**), which can be problematic for segmented flow analyzers.

The data shown below is from a high range nitrate method, which covers the range of 5-500 mg N/L. The high standard was injected in duplicate, followed by 4 replicate blank injections:



Carryover Study: 500 mg N/L followed by 4 blanks; Carryover passed
Filename: 5-500 Supp run 3 .omn Date: 11 June 2009

Below is a calibration Fiagram, covering the range of 1.25-100 µg N/L as ammonia!



File Name: Supp 1 10 27 08.OMN
Acq. Date: 27 October 2008

The pages that follow contain information on Lachat's brackish water methods. These cover a wide range of analytes and analyte levels. Ranges from sub single ppb to 10's or even 100's of ppm are available.


XYZ Rail Sampler
LACHAT
QuikChem
LACHAT

Lachat QuikChem® Method Number Key

XX	-	XXX	-	XX	-	X	-	X
matrix		analyte		form		chemistry		concentration

Matrix:

30	Brackish waters	31	Brackish or seawater

Analyte:

The first three numbers indicate the predominant chemical moiety.

Class (Ion Chromatography)

510	Anions	511	Rapid IC Anions
520	Cations	540	Oxyhalides

Element

105	Boron	107	Nitrogen
109	Fluorine	111	Sodium
112	Magnesium	113	Aluminum
114	Silicate	115	Phosphorus
116	Sulfur	117	Chlorine
119	Potassium	120	Calcium
123	Molybdenum	124	Chromium (Hexavalent)
125	Uranium	126	Iron
129	Copper	131	Manganese
135	Bromine	136	Iodine
140	Carbon		

Molecules

201	Reducing sugars (Total)	203	Glucose
204	Cyanide	206	Urea
210	Phenol	218	Total amino acids
221	Formaldehyde	224	Chlorate
225	Hydroxide	226	Hypochlorite
241	Sulfur dioxide	244	Amylose
245	Monochloramine	246	Reducing Substances

Parameters

301	Hardness (Total)	302	Conductivity
303	Alkalinity	304	pH
305	Acidity	306	Surfactants
308	Color		

Form:

The method either determines this form of the analyte or converts the analyte to this form for determination.

00	Form given by previous three numbers	01	Phosphate (PO_4^{3-})
02	Calcium (Ca^{2+})	03	Potassium (K^+)
04	Nitrate (NO_3^-)	05	Nitrite (NO_2^-)
06	Ammonium (NH_4^+), Ammonia (NH_3)	07	Chloride (Cl^-)
08	Boric Acid (H_3BO_3)	09	Iodide (I^-)
10	Sulfate (SO_4^{2-})	11	Sulfite (SO_3^{2-})
12	Fluoride (F^-)	13	Chromium (VI) (Cr)
18	Total Iron (Fe^{2+} + Fe^{3+})	19	Iron (II) (Fe^{2+})
21	Bromide (Br^-)	23	Molybdenum (VI) (Mo)
24	Hydronium (H_3O^+, H^+)	25	Hydroxide (OH^-)
26	Magnesium (Mg^{2+})	27	Silicate (SiO_2)
29	Sulfide (S^{2-})	31	Calcium carbonate ($CaCO_3$)
32	Sodium cation (Na^+)	33	Aluminum (inorganic) (Al)
34	Aluminum (organic) (Al)	35	Chlorate (ClO_3^-)
36	Hypochlorite (OCl^-)	40	Perchlorate
42	Sulfur dioxide		

Chemistry:

Some analytes have more than one chemistry.

Example:		
Ammonia	**10-107-06-**1	phenolate, phenate
	10-107-06-2	salicylate
	10-107-06-5	gas diffusion

Concentration:

Each range of concentrations for an analyte is given by a single letter. See the methods list for the ranges. Some methods cover more than one range.

Heaters:

Standard heater: Standard heaters have a 175 cm section of 0.032" i.d. (0.8mm) and a 650 cm section of 0.032" i.d. tubing

Non-standard heater: Has a different type and/or length of tubing than that listed above. (Controller and heater block are the same; only the tubing is different).

In the list of methods that follows:

Designation in the methods list means the method is EPA accepted as equivalent for NPDWR, NPDES, or both
^ Designation in the methods list means the method is equivalent for NPDES reporting under the MUR

[R] **Designation means the manifold is compliant with RoHS-2**. (Verify with your sales person that the method can be sold into the EU).

Flow Injection Analysis

Ammonia

10-107-06-5-J^{R}^	0.01-1.0 0.1-20	0.002 0.02	mg N/Las NH_3	Waters	Gas Diffusion method. Salicylate/DCIC. May be used for TKN as well as brackish/saline samples. 660 nm. **Requires a standard heater**.	16-Jan-15
31-107-06-1-B^{R}^	5 – 600 **0.36-42.86**	0.7	µg N/L as NH_3 **µM N/L as NH_3**	Brackish / Seawaters	Alkaline phenol-based method; Can be used for determination of samples w/ 0 to 35 ppt salinity; 630 nm. **Requires a standard heater.** NPDES Equivalent (350.1)	18-Sep-08
31-107-06-1-F^	0.005 – 2.0 **0.36-142.86**	0.002	mg N/L as NH_3 **µM N/L as NH_3**	Brackish / Seawaters	Alkaline phenol-based method; 630 nm. Can be used for determination of samples w/ 0 to 35 ppt salinity; **Requires a standard heater.** NPDES Equivalent (350.1)	12-Nov-07
31-107-06-1-G^{R}^	1.25 – 100 **0.089-7.143**	0.41	µg N/L as NH_3 **µM N/L as NH_3**	Brackish / Seawaters	Alkaline phenol-based method; DCIC. 630 nm **2-cm detector method; QC8500 only;** Can used for determination of samples w/ 0 to 35 ppt salinity; **Requires a non-standard heater**. NPDES Equivalent (350.1)	26-Jan-10
31-107-06-1-H^{R}^	0.25 – 30.0 **0.018-2.143**	0.025	mg N/L as NH_3 **mM N/L as NH_3**	Brackish / Seawaters	Alkaline phenol-based method; 630 nm. high range method; Can used for determination of samples w/ 0 to 35 ppt salinity; Ultra-High Throughput method (>120 samples/hr) **Requires a standard heater.**	31-Oct-08
31-107-06-1-I	5-500 **0.3571-35.71**	0.47	µg N/L as NH_3 **µM N/L as NH_3**	Brackish / Seawaters	Alkaline phenol-based method, citrate/tartrate buffer. 630 nm, **Requires a standard heater.**	21-Feb-12
31-107-06-1-Q^	0.005-2.0 **0.36-142.86**	0.0022	mg N/L as NH_3 **µM N/L as NH_3**	Brackish / Seawaters	Alkaline phenol-based method, citrate buffer. 630 nm, **Requires a standard heater.** NPDES Equivalent to 349.0	17-Aug-10

Bromide

30-135-21-1-B^{R}	5.0 – 60.0 **0.0625-0.751**	0.22	mg Br^-/L **mM Br^-/L**	Brackish / Seawaters	Phenol Red method. 590 nm. Follows Standard Methods (4500-Br-D) 590 nm.	3-Sep-03

Method No	Range	MDL	Units	Matrix	Comments	Rev Date
Chromium						
31-124-13-1-A[R]	2– 200 **0.038-3.85**	0.66 **0.0127**	µg Cr/L as Cr(VI) **µM Cr/L as Cr(VI)**	Brackish / Seawaters	Hexavalent chromium in seawater/brackish waters. Diphenylcarbazide; 540 nm.	24-Aug-09
Iron						
31-126-18-1-A[R]	0.5-30 mg Fe/L	0.024	mg Fe/L	Brackish / Seawaters	Total soluble iron as Fe (II and III); TPTZ indicator. 600 nm. **Inert sample probe required.**	15-Sep-03
31-126-18-1-B[R]	0.05 – 0.500 0.895-8.95	0.004	mg Fe/L µg Fe/L	Brackish / Seawaters	Total soluble iron as Fe (II and III); TPTZ indicator. 600 nm. **Inert sample probe required.**	15-Sep-03
31-126-19-1-A[R]	0.50 – 30.0 0.00895-0.537	0.23	mg Fe/L mM Fe/L	Brackish / Seawaters	Total soluble iron as Fe (II); TPTZ indicator 600 nm. **Inert sample probe required.**	26-Nov-08
Kjeldahl Nitrogen (TKN)						
10-107-06-5-J	0.1-5.0 0.25-20	0.02 0.05	mg N/L	Waters	Kjeldahl Digests, Salicylate/DCIC **660 nm. copper catalyst**. Gas diffusion method. Sea/brackish water. Can also be used for Ammonia	26-Sept-12
10-107-06-6-D^	0.5 – 20	0.25	mg N/L	Waters	Kjeldahl digests; **copper catalyst**; inline distillation method; NPDES Equivalent (351.2); samples w/ particulates not suitable. 660 nm. Can be used with brackish/seawater digests. **Requires an in-line module and a standard heater or two heated channels (with one heater non-standard).**	31-Jul-09
Nitrate + Nitrite						
30-107-04-1-C[R]^	0.05 – 2.0 **3.57-142.86**	0.0029	mg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cd reduction method; 520 nm multi-range method; NPDES Equivalent (353.2).	20-Nov-08
31-107-04-1-A[R]^	0.1 – 10 **0.0071-0.713**	0.0049	mg N/L **mM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cd reduction method; 520 nm. NPDES Equivalent (353.2)	2-May-08
	17.5 – 70 **1.25-5.0**	0.126	µg N/L **µM N/L**			

Method No	Range	MDL	Units	Matrix	Comments	Rev Date
31-107-04-1-C^{R}^	0.07 – 0.70 **5.0-50.0**	0.00168	mg N/L **µM N/L**	Brackish/ Seawaters	Sulfanilamide/NED Cd reduction method; 520 nm.NPDES Equivalent (353.2)	2-May-08
31-107-04-1-D^{R}^	0.5 – 14 **0.036-1.0**	0.2	µg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cd reduction method; 540 nm NPDES Equivalent (353.2). .**Requires a standard heater**.	2-May-08
31-107-04-1-E^{E}^	5 – 400 **0.36-28.57**	0.51	µg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cd reduction method; 540 nm NPDES Equivalent (353.2).	19-Aug-03
31-107-04-1-F^{R}^	0.25 – 14 **0.018-1.0**	0.042	µg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED. Cd reduction method; 540 nm. 2-cm detector method; **QC8500 only**; NPDES Equivalent (353.2). **Requires a standard heater.**	8-Jul-08
31-107-04-1-G^{R}^	0.25 – 10 **0.018-0.714** 0.01– 1.0 **0.714-71.43**	0.05 0.002	mg N/L **mM N/L** mg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cd reduction method; 540 nm Ultra High Throughput method . (>120 samples/hr); multi-range; NPDES Equivalent (353.2)	24-Apr-08
31-107-04-1-H^{R}^	0.25 – 30 **0.18-2.143**	0.025	mg N/L **mM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cd reduction method; 540 nm can also use w/ non-saline matrix; NPDES Equivalent (353.2)	28-Oct-08
31-107-04-1-I^{R}	5 – 500 **0.357-35.71**	0.025	mg N/L **mM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cd reduction method; 540 nm. Ultra high level, inline dialysis method	12-Jul-09
31-107-04-1-J^{R}^	1-100 **0.071-7.143**	0.2	µg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cd reduction method; 520 nm. NPDES Equivalent (353.2)	30-Jun-10
31-107-04-1-K^{R}	1-100 **0.071-7.143**	0.2	µg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED, Cd reduction method. **Imidazole buffer**. 540 nm. NPDES Equivalent (353.2)	20-May-11
31-107-04-5-A^{R}	0.01 – 5.0 **1.43-357.14**	0.009	mg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED **Nitrate Reductase method**; 540 nm. Enzymatic reagents must be purchased from NECi.	11-Feb-09
31-107-04-6-A^{R}	0.05 – 5.0 **0.0036-0.357** 0.2-20.0 **0.0143-1.43**	0.006	mg N/L **mM N/L** mg N/L **mM N/L**	Brackish / Seawaters	**UV Nitrate Reduction**; Sulfanilamide/NED 540 nm. Multi-range method PATENTED. **Requires an in-line module with UV lamp.**	19-Jun-09

Method No	Range	MDL	Units	Matrix	Comments	Rev Date
Nitrite		***See also IC section***				
31-107-05-1-A^{R}^	17.5 – 70 **1.25-5.0**	**0.01**	µg N/L as NO_2^- **µM N/L as NO_2^-**	Brackish / Seawaters	Nitrite only; Sulfanilamide/NED 540 nm. NPDES Equivalent (353.2)	13-May-08
31-107-05-1-B^{R}^	0.1 – 15 **0.007-1.07**	0.01	mg N/L as NO_2^- **mM N/L as NO_2^-**	Brackish / Seawaters	Nitrite only; Sulfanilamide/NED 540 nm. NPDES Equivalent (353.2)	29-Oct-08
Nitrogen - Total Nitrogen						
31-107-04-3-A^{R}	25 – 1000 **1.79-71.43**	4.90	µg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cadmium reduction ,. 540 nm. Total N; alkaline persulfate inline digestion method; samples w/ particulates not suitable.	3-Feb-10
31-107-04-4-B^{R}	0.02– 5.00 **1.43-357.14** 1.0– 40.0 **0.071-2.86**	0.0068 0.111	mg N/L **µM N/L** mg N/L **mM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cadmium reduction , 520 nm. Total N; **manual persulfate** digestion w/ Cd reduction; low-flow method; **total phosphorus can be measured from same digest (31-115-01-4-B);** multi-range method.	16-Jun-08 21-Feb-12
31-107-04-4-C^{R}	0.02– 5.00 **1.43-357.14** 1.0– 40.0 **0.071-2.86** **NO_2 + NO_3-N:** **2.5-500** **NO_2- N:** **1-125**	0.0068 0.111 0.44 0.2	mg N/L **µM N/L** mg N/L **mM N/L** µg N/L **µM N/L** µg N/L **µM N/L**	Brackish / Seawaters	Sulfanilamide/NED Cadmium reduction , 520 nm. Total N; **manual dual persulfate digestion** Imidazole buffer; low-flow method; total phosphorus can be measured from same digest (31-115-01-4-B**);** **Can also use for NO_2 + NO_3 and NO_2.** (Support for NO_2 + NO_3 and NO_2 included).	

Method No	Range	MDL	Units	Matrix	Comments	Rev Date
Orthophosphate						
31-115-01-1-G^{R}^	62 – 310 **2.0-10.0**		µg P/L as PO_4^{2-} **µM P/L as PO_4^{2-}**	Brackish / Seawaters	Orthophosphate; molybdate based method; 880 nm. NPDES Equivalent (365.5). **Requires a standard heater**	13-May-08
31-115-01-1-H^{R}^	5 – 400 **0.16-12.9**	1.0	µg P/L as PO_4^{2-} **µM P/L as PO_4^{2-}**	Brackish / Seawaters	Orthophosphate; molybdate based method; 880 nm. NPDES Equivalent (365.5). **Requires a standard heater**	13-May-08
31-115-01-1-I^{R}^	1-100 **0.032-3.23**	0.25	µg P/L as PO_4^{2-} **µM P/L as PO_4^{2-}**	Brackish / Seawaters	Orthophosphate; molybdate based method; 880 nm. NPDES Equivalent (365.5) **Requires a standard heater**	13-May-08
31-115-01-1-J^{R}^	0.01 – 2.0 **0.323-64.52** 0.5-20 0.016-0.645	0.002 0.01	mg P/L as PO_4^{2-} **µM P/L as PO_4^{2-}** mg P/L as PO_4^{2-} **mM P/L as PO_4^{2-}**	Brackish / Seawaters	Orthophosphate; molybdate based method; 880 nm. NPDES Equivalent (365.5) **Requires a standard heater**	30-Nov-07
31-115-01-1-W^{R}^	0.25 – 20 **0.008-0.645**	0.007	µg P/L as PO_4^{2-} **µM P/L as PO_4^{2-}**	Brackish / Seawaters	Orthophosphate; molybdate based method; 880nm 2-cm detector method; **QC8500 only**; **for samples with very low or no silicate**; NPDES Equivalent (365.5). **Requires a non-standard Heater** PN 58112 allows replicates from a single sample tube.	22-Feb-08
31-115-01-1-Y^{R}*^	0.5 – 100 **0.016-3.23**	0.164	µg P/L as PO_4^{2-} **µM P/L as PO_4^{2-}**	Brackish / Seawaters	Orthophosphate; molybdate based method; 880nm 2-cm detector method**; QC8500 only**; for samples with high silicate; NPDES Eq. (365.5) **Requires a non-standard heater** PN 58112 allows replicates from a single sample tube.	29-Feb-08
Phosphorus, Total (Acidic Persulfate)						
31-115-01-3-D^{R}	0.050 – 1.0 **1.63-32.36**	0.002	mg P/L **µM P/L**	Brackish / Seawaters	Total P; molybdate method; 880 nm. inline persulfate digestion; samples w/ particulates not suitable. glass calibration vials. **Requires an in-line sample prep module.**	5-Jul-07

Method No	Range	MDL	Units	Matrix	Comments	Rev Date
31-115-01-3-F^{R}	2-100 **0.065-3.23**	0.59	µg P/L **µM P/L**	Brackish / Seawaters	Total P; molybdate based method; 880nm, inline persulfate digestion; samples w/ particulates not suitable **Requires glass standard and sample vials an in-line sample prep module, and non-standard heater.**	13-Oct-08
31-115-01-4-A^{R}^	12.5 – 400 **0.40-12.9**	1.66	µg P/L **µM P/L**	Brackish / Seawaters	Total P; molybdate based method; 880 nm. **manual persulfate** digestion; **Requires a standard heater and autoclave** for the digestion. NPDES Equivalent (365.3)	17-Sep-03
31-115-01-4-B^{R}	0.005 – 1.0 **0.16-32.23**	0.0038	mg P/L **µM P/L**	Brackish / Seawaters	Total P; molybdate based method;880nm, **manual persulfate** digestion; low-flow method; dual-	12-Dec-09
	0.25 – 10 **0.008-0.323**	0.0358	mg P/L **mM P/L**		Digest . **Total N Can be measured simultaneously using 31-107-04-4-B;** multi-range method Can also analyze particulate phosphorus and orthophosphorus with this method. **Requires a standard heater and block digester for the digestion.**	
OP:	5 – 1000 **0.16-32.23**	0.7	µg P/L			
	0.25 – 10 **0.008-0.323**	0.013	mg P/L			
pP:	0.1-5.0	0.015	mg P/L			

Silicate

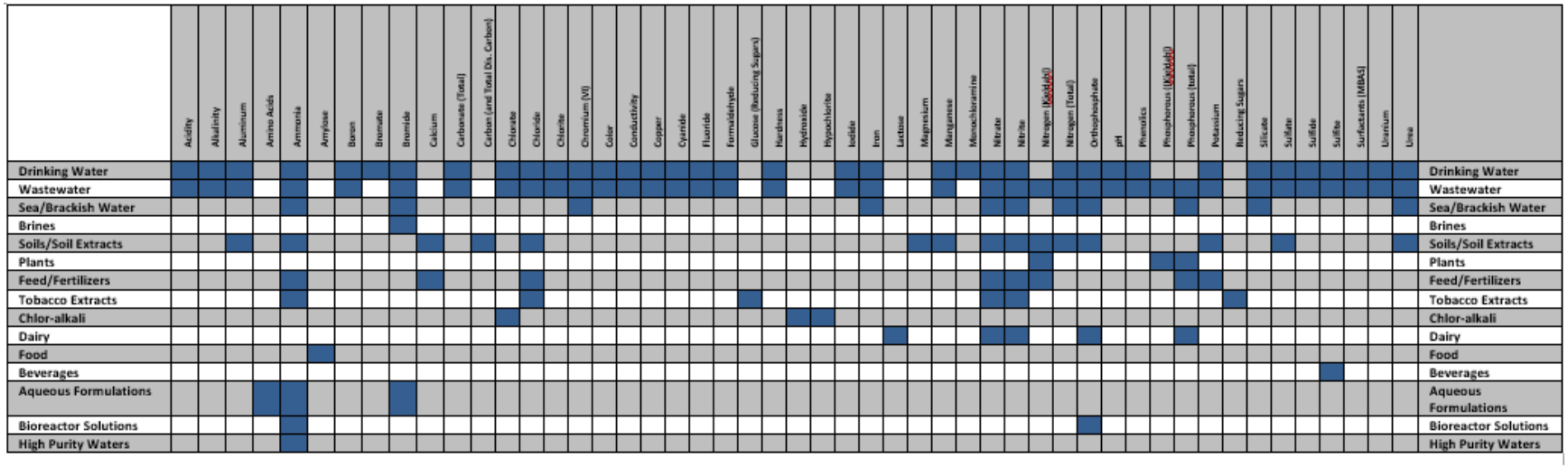
31-114-27-1-A^{R}^	1,202-6,009 **20 – 100**	**0.2**	µg SiO_2/L **µM SiO_2/L**	Brackish / Seawaters	Molybdate reactive method; Stannous chloride reductant. 820 nm. **Requires a standard heater.** NPDES Equivalent (USGS I-2700-85)	17-Sep-03
31-114-27-1-B^{R}^	75.0-300.45 **1.25 – 5.0**	**0.01**	µg SiO_2/L **µM SiO_2/L**	Brackish/ Seawaters	Molybdate reactive method; Stannous chloride reductant. 820 nm. **Requires a standard heater and plastic sample vials.** NPDES Equivalent (USGS I-2700-85)	17-Sep-03
31-114-27-1-D^{R}^	10 – 1700 **0.166-28.29**	1.43	µg SiO_2/L **µM SiO_2/L**	Brackish/ Seawaters	Molybdate reactive method; Stannous chloride reductant. 820 nm. **Requires a standard heater.** NPDES Equivalent (USGS I-2700-85)	17-Sep-03

Method No	Range	MDL	Units	Matrix	Comments	Rev Date
31-114-27-1-E^{R}^	2.5 – 100 **0.042-1.66**	0.606	µg SiO_2/L **µM SiO_2/L**	Brackish / Seawaters	Molybdate reactive method; 820 nm, **2cm detector method; QC8500 only; Requires a standard heater and** p**lastic sample and standard vials.** NPDES Equivalent (USGS I-2700-85)	28-Feb-08
31-114-27-1-F^{R}^	0.5 – 30 **0.0083-0.499**	0.05 **0.00083**	mg SiO_2/L **mM SiO_2/L**	Brackish / Seawaters	Molybdate reactive method; Stannous chloride reductant 820 nm, NPDES Equivalent. (USGS I-2700-85) . **Requires a standard heater**.	23-Oct-08
31-114-27-2-A^{R}	60.09-6009 **1-100**	0.6 **0.1**	µg SiO_2/L **µM SiO_2/L**	Brackish / Seawaters	Molybdate reactive method; **Ascorbic acid** reductant 820 nm. NPDES Equivalent (366.0) **Requires a standard heater and** p**lastic sample and standard vials**.	23-Nov-10

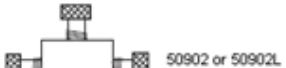
Urea

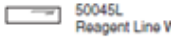
31-206-00-1-A^{R}	10 – 400 **0.714-28.57**	2.9	µg N/L as Urea **µM N/L as Urea**	Brackish / Seawaters	Diacetyl monoxime/thiosemicarbazide method. 530 nm. **Requires non-standard heater and 60 position sample racks**.	16-Sep-03
31-206-00-1-B^{R}	0.025 – 5.00 **1.79-357.14** 0.2 – 20 **0.0143-1.429**	0.004 0.026	mg N/L as Urea **µM N/L as Urea** mg N/L **mM N/L as Urea**	Brackish / Seawaters	Multi-range method. Diacetyl monoxime/thiosemicarbazide. 530 nm. **Requires non-standard heater and 60 position sample racks**.	7-Dec-07

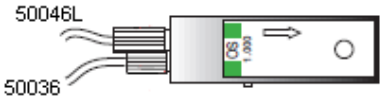
Method Matrix



Selected Parts. Please note this is NOT a complete listing







50237A Cadmium Column

50254 Cadmium Column Maintainence kit

50065 Flow cell flare, 13 cm
50067 Flow cell flare, 35 cm
31933 Flow cell, 10mm

Nipples

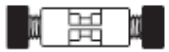
50015 Large
50015A Small
50014L Reducing
50019 Stainless Steel

Interference Filters
89### ### indicates the wavelength

24927 Switching Valve
50962 Flare Kit for Nitrate
50963 Flare Kit for Sulfate
24012 Connector, Amber
24015 Washer

Union Fitting

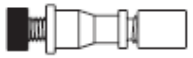
50913



50901

Small Pump Tube Adapter

50906



85287 for QC8500

Large Pump Tube Adapter

85293 for QC8500

50907

PumpTube Adapter

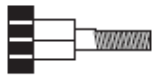
50905

85269 for QC8500

50009
Tube Connector, Amber

31077 for QC8000 Valve
Valve Connector, White

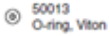
85245
One-piece fitting
for QC8500 valve

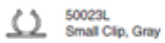


28051L
Rheodyne Nut & Ferrule

28058 Rheodyne Ferrule

28057
Upchurch Nut & Ferrule





50913 Teflon
Union Fitting

(ultem nuts)

50007 or 85258 for QC8500
Large Collar, Black

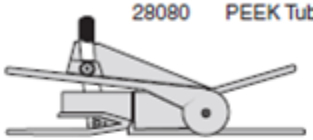
50006 or 85257 for QC8500
Small Collar, White

50060
O-ring Probe

50100L
Degassing Tube

50031
Scalpel

28081
Blades for PEEK Tubing Cutter



28080 PEEK Tubing Cutter

50021
Transmission Tubing, PVC, 0.030" ID

50029
Transmission Tubing, PVC, 0.060" ID

Teflon Tubing

50927 Manifold, 0.022" ID, Green
50928 Manifold, 0.032" ID
41300L Tefzel Tubing, 0.040" ID x 0.060" OD
30928 Zeus Tubing, 0.032" ID

50091 Microloop Tubing, Teflon, 16 cm
50092 Microloop Tubing, Teflon, 12.5 cm

hole to hole (in), end to end (cm)

Coils

Size	Coil Support Only	Wrapped, Teflon 0.022" ID	Wrapped, Teflon 0.032" ID
1" or 4.5 cm	50016L	50981	50916
2" or 7cm	50018L	50982	50918
2.5" or 8 cm	50017	50983	50917
4" or 12cm	50020	50984	50920
8" or 22 cm	50022L	N/A	50922

Alternating Coils 12 cm

Coil Support Only	Wrapped, Teflon 0.022" ID	Wrapped, Teflon 0.032" ID
50039	50985	50921

Pump Tubing

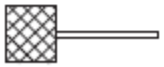
534XX PVC
544XX Duraprene
494XX Silicone
654XX Acidflex

XX is the number that specifies the pump tube color:

05 Orange-Yellow, 0.020" ID
06 Orange-White, 0.025" ID
07 Black-Black, 0.030" ID
08 Orange-Orange, 0.035" ID
09 White-White, 0.040" ID
10 Red-Red, 0.045" ID
11 Gray-Gray, 0.051" ID
12 Yellow-Yellow, 0.056" ID
13 Blue-Blue, 0.065" ID
14 Green-Green, 0.073" ID
15 Purple-Purple, 0.081" ID
16 Purple-Black, 0.090" ID
17 Purple-Orange, 0.100" ID
18 Purple-White, 0.110" ID
19 Yellow-Blue, 0.060" ID

Bottles

28193L Glass Bottle, 1000 mL
35102 Glass Bottle, 2000 mL
43915 Glass Bottle, 100 mL (includes cap)



50012
O-ring Remover

50062
Drill Bit

28101L
End Plug

LIT 2836 Rev. 4 Jan 19 2018

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