ENVIRONMENTAL ANALYSIS CATALOG

2008 – 2009

www.waters.com

Waters

THE SCIENCE OF WHAT'S POSSIBLE.™

AT THE FOREFRONT OF TECHNICAL INNOVATION AND REGULATORY COMPLIANCE, WATERS IS YOUR PARTNER FOR ENVIRONMENTAL TESTING SOLUTIONS.

Environmental quality issues are complex, challenging, and ever expanding. Across the globe, regulatory agencies are increasing the amount of environmental testing required to insure public safety. Understanding the complex nature of this type of analysis, Waters Corporation is committed to working with our worldwide partners to keep the environment safe and make industries greener. Our solutions have been adopted by many regulatory bodies, and we are actively sought out to assist in solving new and challenging problems. Not only does Waters focus on providing the best technology, we offer tools that are easy and practical to implement. Waters strives to provide efficient, cost-effective, and compliant solutions for scientists in academia, government, and private laboratories.

Certified Reference Materials from ERA

ERA Standards

- Calibration Standards
- Wastewater, Drinking Water, Soil, Air
- Organic, Inorganic, Microbiology

Vials

- LC/GC Certified Vials
- LC/MS Certified Vials

Sep-Pak

- An Industry Standard for 30 Years
- Reversed Phase, Normal Phase, Ion Exchange
- Specialty Chemistries Include Solutions for Explosives, DNPH and Air Monitoring

Oasis

- Polymeric Sorbent Optimized for Reversed-Phase SPE
- Water-wettable, High Retention and Capacity
- Exceptional Reproducibility

Environmental LC Columns

- Carbamate Column
- PAH Column
- ACQUITY®, XBridge™, Atlantis® and SunFire™ Premier LC Columns
- XTerra®, µBondapak®, Nova-Pak® and Symmetry® Classic LC Columns

Environmental Resource Associates

An Organization Committed to Customer Satisfaction.

ERA® is proud of the loyal relationships we have developed with many of our long-standing customers. As we begin to expand our customer base through Waters international presence, we look forward to many new and exciting partnerships. We want to make certain that working with ERA is valuable to you and, therefore, we continue to strive to keep our customer and technical service the benchmark in the industry. When you reach out to us, we answer every call with a positive attitude and a desire to help that is tangible. We want you to feel the difference in our level of customer service.

As you may know, ERA was recently acquired by Waters Corporation and we assure all of our customers, old and new, that each of us will remain true to the core values that have made us the leading provider of quality assurance, validation standards and certified reference materials (CRM) in the industry. We believe that you will be able to see our commitment to customer satisfaction.

ERA's Certified Reference Materials

The word that best describes ERA's Certified Reference Material (CRM) standards is "true". We prepare every standard with starting materials traced to NIST or the highest possible metrological authority, and we verify the preparation, production, and packaging via exhaustive in-house analyses. We analyze and test every lot for accuracy, precision, and stability. We scrutinize analytical data to make certain there are no unexpected problems with the standards, and then, only after all of that, we make them available to you. When you receive Certified Reference Material from ERA, you are looking for the truth. We guarantee that is what you will find.

ENVIRONMENTAL RESOURCE ASSOCIATES®
The Industry Standard™

Wastewater Inorganics CRM

UP TO 12
UNIQUE LOTS AVAILABLE PER YEAR

The industry standard for 30 years! ERA Wastewater Inorganics CRM standards provide you the easiest way to verify the accuracy of all your water and wastewater analyses. Use these "known" CRM standards any time to compare your results against ERA's certified values and acceptance limits. Our acceptance limits, derived from over two million data points, will let you know with absolute confidence whether your analytical performance is where you need it to be.

Minerals/Solids CRMs

Minerals 186004350

One 500 mL Whole-Volume bottle is ready to analyze.

Total alkalinity as $CaCO_3$	10-120 mg/L
Chloride	35-275 mg/L
Fluoride	0.3-4 mg/L
Potassium	4-40 mg/L
Sodium	6-100 mg/L
Specific conductance at 25 °C	200-930 µmhos/cm
Sulfate	5-125 mg/L
Total dissolved solids at 180 °C	140-650 mg/L
Total solids at 105 °C	140-675 mg/L

Hardness 186004351

One 500 mL Whole-Volume bottle is ready to analyze.

Calcium	3.5-110 mg/L
Calcium hardness as $CaCO_3$	8.7-275 mg/L
Total hardness as $CaCO_3$	17-440 mg/L
Magnesium	2-40 mg/L
Non-filterable residue (TSS)	23-100 mg/L

pH 186004381

One 250 mL Whole-Volume bottle is ready to analyze. Use with electrometric methods.

pH	5-10 units

Settleable Solids 186004375

One 60 mL poly bottle with a solid concentrate yields 1 liter after dilution.

Settleable Solids	5-100 mL/L

Volatile Solids 186004376

One 12 mL screw-top vial with a solid concentrate yields 1 liter after dilution.

Volatile Solids	100-500 mg/L

Trace Metals CRMs

Trace Metals 186004345

One 15 mL screw-top vial yields up to 1 liter of sample after dilution.
Use with AA, ICP-OES, or ICP-MS and selected colorimetric methods.

Aluminum	200-4,000 µg/L
Antimony	95-900 µg/L
Arsenic	70-900 µg/L
Barium	100-2,500 µg/L
Beryllium	8-900 µg/L
Boron	800-2,000 µg/L
Cadmium	8-750 µg/L
Chromium	17-1,000 µg/L
Cobalt	28-1,000 µg/L
Copper	40-900 µg/L
Iron	200-4,000 µg/L
Lead	70-3,000 µg/L
Manganese	70-4,000 µg/L
Molybdenum	60-600 µg/L
Nickel	80-3,000 µg/L
Selenium	90-2,000 µg/L
Silver	26-600 µg/L
Strontium	30-300 µg/L
Thallium	60-900 µg/L
Vanadium	55-2,000 µg/L
Zinc	100-2,000 µg/L

Mercury 186004354

One 15 mL screw-top vial yields up to 1 liter after dilution. Contains both inorganic and organic mercury to test both digestion and analysis procedures. Use with CVAA, ICP-MS or CVAFS methods.

Mercury, total	2-30 µg/L

Low-Level Mercury 186004380

Designed for ng/L level testing. One 5 mL flame-sealed ampule yields up to 4 liters after dilution. Contains organic and inorganic mercury to test both digestion and analysis procedures. Use with sensitive CVAA methods.

Mercury, total	1-100 ng/L

Hexavalent Chromium 186004202

One 15 mL screw-top vial yields up to 2 liters after dilution. Use with colorimetric or IC methods.

Hexavalent Chromium	45-880 µg/L

Tin & Titanium 186004357

One 15 mL screw-top vial yields up to 1 liter after dilution. Use with AA, ICP-OES or ICP-MS methods.

Tin	1,000-5,000 µg/L
Titanium	80-300 µg/L

Wastewater Inorganics CRM

Demand CRMs

Demand	186004356
One 15 mL screw-top vial yields up to 2 liters after dilution.	
5-day BOD	15-250 mg/L
Carbonaceous BOD	15-250 mg/L
COD	30-250 mg/L
TOC	6-100 mg/L

Nutrient CRMs

Simple Nutrients	186004349
One 15 mL screw-top vial yields up to 2 liters after dilution. Use with colorimetric, ion selective electrode or ion chromatography methods.	
Ammonia as N	0.65-19 mg/L
Nitrate as N	0.25-40 mg/L
Nitrate plus nitrite as N	0.25-40 mg/L
Orthophosphate as P	0.5-5.5 mg/L

Complex Nutrients	186004361
One 15 mL screw-top vial yields up to 2 liters after dilution. Use with digestion followed by colorimetric, ISE or ICP methods.	
Total Kjeldahl-nitrogen as N	1.5-35 mg/L
Total phosphorus as P	0.5-10 mg/L

Nitrite	186004370
One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Use with ion chromatography or colorimetric methods.	
Nitrite as N	0.4-4 mg/L

Wastewater Inorganics CRM Set

Includes the Minerals (186004350), Hardness (186004351), pH (186004381), Trace Metals (186004345), Mercury (186004354), Demand (186004356), Simple Nutrients (186004349), Complex Nutrients (186004361), Oil & Grease (186004348), Total Residual Chlorine (186004346), and Cyanide & Phenol (186004347) CRM standards.

Set Purchase	186004342

ERA CRM standards help you ensure the quality of your everyday data.

Wastewater Inorganics CRM

Oil & Grease CRMs

Oil & Grease 186004348

One 250 mL Whole-Volume bottle is ready to analyze.
Certified values are provided for IR and gravimetric methods.

Oil & Grease ..... 20-100 mg/bottle

1 liter Oil & Grease 186004358

One liter Whole-Volume glass bottle with a 33-430 thread is ready to analyze.

Oil & Grease ..... 20-100 mg/L

1 liter Boston Round Oil & Grease 186004374

One liter Whole-Volume bottle is ready to analyze. Designed for SPE equipment with Boston Round glass bottles with a 33-400 thread.

Oil & Grease ..... 20-100 mg/L

HEM / SGT-HEM 186004359

One 5 mL flame-sealed ampule yields up to 2 liters after dilution.
Contains both hexadecane and stearic acid.

HEM ..... 5-100 mg/L
SGT-HEM ..... 5-100 mg/L

Total Petroleum Hydrocarbons (TPH) in Water # 1 186004363

One liter Whole-Volume bottle is ready to analyze for Total Petroleum Hydrocarbons without interfering fatty acids.

Total Petroleum Hydrocarbons ..... 20-170 mg/L

Total Petroleum Hydrocarbons (TPH) in Water # 2 186004364

One liter Whole-Volume bottle is ready to analyze for Total Petroleum Hydrocarbons in the presence of interfering fatty acids.

Total Petroleum Hydrocarbons ..... 20-170 mg/L

Microbiology CRMs

All ERA microbiology standards are lyophilized and require re-hydration before analysis–sterile fluid provided. This ensures stability and provides flexibility when the samples can be analyzed!

Wastewater Coliforms 186004384

Each set contains two lyophilized samples, one quantitative positive, and one negative. Use with all CWA quantitative methods - MF and MPN. Each set can be used for total coliforms and/or fecal coliforms as E.coli, which are present in the range 20–2,400 CFU/100 mL or MPN/100 mL.

Enterococci 186004383

Each set contains two lyophilized samples, one quantitative positive and one negative, for Enterococci and/or Fecal Streptococci, MF or MPN, in the range 20-1,000 CFU/100 mL or MPN/100 mL. Note that a hazardous materials shipping charge will apply.

Physical Property CRMs

Color 186004340

One 125 mL Whole-Volume bottle is ready to analyze.

Color ..... 10-75 PC units

Turbidity 186004373

One 15 mL screw-top vial yields up to 1 liter after dilution.
Use with nephelometric methods.

Turbidity ..... 1-20 NTU

Chemical CRMs

Acidity 186004377
One 250 mL Whole-Volume bottle is ready to analyze as received.
Designed for use with titrimetric methods to a pH endpoint of 8.3.
Acidity as $CaCO_3$ ..... 650-1,800 mg/L

Boron 186004379
One unpreserved 60 mL poly bottle yields in excess of 2 liters after dilution.
Designed for colorimetric methods.
Boron ..... 0.8-2 mg/L

Bromide 186004369
One 2 mL flame-sealed ampule yields up to 1 liter after dilution.
Use with ion chromatography or colorimetric methods.
Bromide ..... 1-10 mg/L

For bromate/chlorate/chlorite CRMs see page 17.

Total Residual Chlorine 186004346
One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Use with titrimetric or colorimetric methods.
Total Residual Chlorine ..... 0.5-3 mg/L

Low-Level Total Residual Chlorine 186004378
Designed for testing at low µg/L levels. One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Use with sensitive titrimetric or colorimetric methods.
Total Residual Chlorine ..... 20-250 µg/L

Cyanide & Phenol 186004347
One 15 mL screw-top vial yields up to 2 liters after dilution. As appropriate for each analyte use with digestion or distillation followed by colorimetric, titrimetric, or ISE methods.
Total Cyanide ..... 0.1-1 mg/L
Phenol ..... 0.06-5 mg/L

Total Organic Halides (TOX) 186004242
One 2 mL flame-sealed ampule yields up to 2 liters of TOX standard after dilution.
Use with adsorption pyrolysis titrimetric methods.
TOX ..... 300-1,500 µg/L

For perchlorate CRMs see page 18.

Total Phenolics (4-AAP) 186004355
One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Analyze for a mixture of phenolic compounds using 4-AAP methods.
Total Phenolics by 4-AAP ..... 0.06-5 mg/L

Silica 186004371
One unpreserved 60 mL poly bottle yields up to 1 liter after dilution.
Use with colorimetric or ICP methods.
Silica as SiO_2 ..... 50-250 mg/L

Sulfide 186004341
One 10 mL flame-sealed ampule yields up to 1 liter after dilution.
Use with titrimetric or colorimetric methods. Guaranteed stable for one year.
Sulfide ..... 1-10 mg/L

Surfactants-MBAS 186004372
One 10 mL flame-sealed ampule yields up to 2 liters after dilution.
Surfactants-MBAS ..... 0.2-1 mg/L

Small Lab Wastewater CRM

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UNIQUE LOTS AVAILABLE PER YEAR

Each ERA Small Lab Wastewater CRM standard is a "known" that comes with certified values and acceptance limits so you can get immediate feedback about the accuracy of your water and wastewater analyses. Use our CRM standards routinely for staff training and periodic evaluation or to troubleshoot problems.

Whole-Volume CRMs

The following Whole-Volume standards are ready-to-use as provided and require no dilution before analysis.

Small Lab Minerals 186004353

One 500 mL Whole-Volume bottle. The concentration of all solids analytes is designed to mimic the samples commonly found in treatment plant labs.

pH	5-10 units
Total Solids at 105 °C	500-2,500 mg/L
Total Dissolved Solids at 180 °C	500-2,000 mg/L
Non-filterable Residue (TSS)	20-120 mg/L

Oil & Grease 186004348

One 250 mL Whole-Volume bottle. Certified values are provided for IR and gravimetric methods.

Oil & Grease	20-100 mg/bottle

ERA Whole-Volume Minerals and Oil & Grease standards are easier to use and have proven for thirty years to be more reliable!

Concentrate CRMs

The following standards are provided as concentrates that require dilution before analysis.

Demand 186004356

One 15 mL screw-top vial yields up to 2 liters after dilution.

5-day BOD	15-250 mg/L
Carbonaceous BOD	15-250 mg/L
COD	30-250 mg/L
TOC	6-100 mg/L

Simple Nutrients 186004349

One 15 mL screw-top vial yields up to 2 liters after dilution.
Use with colorimetric, ion selective electrode, or ion-chromatography methods.

Ammonia as N	0.65-19 mg/L
Nitrate as N	0.25-40 mg/L
Nitrate Plus Nitrite as N	0.25-40 mg/L
Orthophosphate as P	0.5-5.5 mg/L

Complex Nutrients 186004361

One 15 mL screw-top vial yields up to 2 liters after dilution.
Use with digestion followed by colorimetric, ISE, or ICP methods.

Total Kjeldahl-nitrogen as N	1.5-35 mg/L
Total Phosphorus as P	0.5-10 mg/L

Small Lab Wastewater CRM Set

Includes one of each CRM standard listed on this page.

Set Purchase 186004343

Ready-to-Use Wastewater CRM

6
UNIQUE LOTS AVAILABLE PER YEAR

ERA Ready-to-Use Wastewater are Whole-Volume CRM standards that require no dilution before analysis. Each CRM standard comes with certified values and acceptance limits so you can get immediate feedback on the quality of your results. The Ready-to-Use standards are guaranteed stable for a minimum of one month after receipt at your facility. Just order, open, and analyze!

Whole-Volume CRMs

The following Whole-Volume standards are ready-to-use as provided and require no dilution before analysis.

Minerals 186004350
One 500 mL bottle to be analyzed for alkalinity as $CaCO_3$, chloride, conductivity at 25 °C, fluoride, potassium, sodium, sulfate, total dissolved solids at 180°C and total solids at 105 °C.

Hardness 186004351
One 500 mL bottle to be analyzed for calcium, magnesium, total hardness as $CaCO_3$, calcium hardness as $CaCO_3$ and non-filterable residue or total suspended solids (TSS).

pH 186004381
One 250 mL bottle to be analyzed for pH. Use with electrometric methods.

Oil & Grease 186004348
One 250 mL Whole-Volume bottle. Certified values are provided for IR and gravimetric methods. For additional Oil & Grease CRMs see page 5.

Trace Metals 186004366
One 500 mL bottle to be analyzed for aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, strontium, thallium, vanadium, and zinc. Use with AA, ICP-OES, or ICP-MS methods.

Demand 186004368
One 500 mL bottle to be analyzed for 5-day BOD, carbonaceous BOD, COD, and TOC.

Simple Nutrients 186004365
One 500 mL bottle to be analyzed for ammonia as N, nitrate as N, nitrate plus nitrite as N, and orthophosphate as P. Use with colorimetric, ion selective electrode, or ion-chromatography methods.

Complex Nutrients 186004367
One 500 mL bottle to be analyzed for total Kjeldahl-nitrogen as N, and total phosphorus as P. Use with digestion followed by colorimetric, ISE or ICP methods.

Ready-to-Use Wastewater CRM Set

Includes one of each CRM standard listed on this page.

Set Purchase 186004344

Just open and analyze!

Wastewater Organics CRM

UP TO 12
UNIQUE LOTS AVAILABLE PER YEAR

All ERA CRM standards are provided with certified values and acceptance limits, which are derived from over two million data points. You can rely on them with absolute confidence to identify whether your analytical performance is where you need it to be. Use ERA's Organics standards to help you make your everyday CRM program even more effective.

Volatiles CRMs

Volatiles 186004389

One 2 mL flame-sealed ampule yields in excess of 200 mL after dilution. Each standard contains at least 27 VOA analytes, randomly selected from the list below, at 5-300 µg/L after dilution. All unspiked analytes are certified at <5 µg/L.

- Acetone
- Acetonitrile
- Acrylonitrile
- Acrolein
- Benzene
- Bromodichloromethane
- Bromoform
- Bromomethane
- 2-Butanone (MEK)
- Carbon disulfide
- Carbon tetrachloride
- Chlorobenzene
- Chlorodibromomethane
- Chloroethane
- 2-Chloroethyl vinyl ether
- Chloroform
- Chloromethane
- 1,2-Dibromo-3-chloropropane (DBCP)
- 1,2-Dibromoethane (EDB)
- Dibromomethane
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- Dichlorodifluoromethane
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethene
- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- 1,2-Dichloropropane
- cis-1,3-Dichloropropene
- trans-1,3-Dichloropropene
- Ethylbenzene
- Hexachlorobutadiene
- 2-Hexanone
- Methylene chloride
- Methyl tert-butyl ether (MTBE)
- 4-Methyl-2-pentanone (MIBK)
- Naphthalene
- Styrene
- 1,1,1,2-Tetrachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethene
- Toluene
- 1,2,4-Trichlorobenzene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene
- Trichlorofluoromethane
- 1,2,3-Trichloropropane
- Vinyl acetate
- Vinyl chloride
- Xylenes, total

BTEX & MTBE in Water 186004399

One 2 mL flame-sealed ampule yields in excess of 200 mL after dilution. Contains all BTEX analytes below and Methyl tert-butyl ether (MTBE) all at 7-300 µg/L after dilution.

- Benzene
- Ethylbenzene
- Methyl tert-butyl ether (MTBE)
- Toluene
- Xylenes, total

For Gasoline Additives CRMs see page 19.

Gasoline Range Organics (GRO) in Water 186004400

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Contains unleaded regular gasoline in the range of 200-4,000 µg/L after dilution. Also certified for all BTEX analytes.

We provide performance acceptance limits with our CRM standards. They allow you to reliably compare your performance to other experienced labs!

Wastewater Organics CRM

Semivolatiles CRMs

Base/Neutrals 186004390

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains at least 31 analytes, randomly selected from the list below, at 10-225 µg/L (except Benzidine at 200-1,000 µg/L) after dilution. All unspiked analytes are certified at <10 µg/L.

- Acenaphthylene
- 2-Amino-1-methylbenzene (o-Toluidine)
- Aniline
- Anthracene
- Benzidine
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(a)pyrene
- Benzyl alcohol
- 4-Bromophenyl -phenylether
- Butylbenzylphthalate
- Carbazole
- 4-Chloroaniline
- bis(2-Chloroethoxy) methane
- bis(2-Chloroethyl)ether
- bis(2-Chloroisopropyl) ether
- 1-Chloronaphthalene
- 2-Chloronaphthalene
- 4-Chlorophenyl -phenylether
- Chrysene
- Dibenz(a,h)anthracene
- Dibenzofuran
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- 3,3'-Dichlorobenzidine
- Diethyl phthalate
- Dimethyl phthalate
- Di-n-butylphthalate
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Di-n-octylphthalate
- bis(2-Ethylhexyl)phthalate
- Fluoranthene
- Fluorene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclo-pentadiene
- Hexachloroethane
- Indeno(1,2,3-cd)pyrene
- Isophorone
- 2-Methylnaphthalene
- Naphthalene
- 2-Nitroaniline
- 3-Nitroaniline
- 4-Nitroaniline
- Nitrobenzene
- N-Nitrosodiethylamine
- N-Nitrosodimethylamine
- N-Nitroso-di-n-propylamine
- N-Nitrosodiphenylamine
- Pentachlorobenzene
- Phenanthrene
- Pyrene
- Pyridine
- 1,2,4,5-Tetrachlorobenzene
- 1,2,4-Trichlorobenzene

Acids 186004391

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains at least 13 analytes, randomly selected from the list below, at 30-200 µg/L after dilution. All unspiked analytes are certified at <30 µg/L.

- Benzoic Acid
- 4-Chloro-3-methylphenol
- 2-Chlorophenol
- 2,4-Dichlorophenol
- 2,6-Dichlorophenol
- 2,4-Dimethylphenol
- 2,4-Dinitrophenol
- 2-Methyl-4,6-dinitrophenol
- 2-Methylphenol
- 3&4-Methylphenol
- 2-Nitrophenol
- 4-Nitrophenol
- Pentachlorophenol
- Phenol
- 2,3,4,6-Tetrachlorophenol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol

Low-Level Nitroaromatics & Nitramines 186004388

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains at least 12 analytes, randomly selected from the list below, at 1-20 µg/L after dilution.

- 4-Amino-2,6-dinitrotoluene
- 2-Amino-4,6-dinitrotoluene
- 1,3-Dinitrobenzene
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- HMX
- Nitrobenzene
- 2-Nitrotoluene
- 3-Nitrotoluene
- 4-Nitrotoluene
- RDX
- Tetryl
- 1,3,5-Trinitrobenzene
- 2,4,6-Trinitrotoluene

Diesel Range Organics (DRO) in Water 186004401

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Contains No. 2 Diesel for use with modified EPA 8015 methods. DRO is in the concentration range of 500-4,000 µg/L after dilution.

Low-Level PAHs 186004393

One 2 mL flame-sealed ampule yields up to 2 liters of sample after dilution. Each standard includes at least 13 analytes, randomly selected from the list below, at 0.3-10 µg/L after dilution. The UV absorbing and fluorescent analytes are present at 2-10 and 0.3-2 µg/L, respectively.

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(a)pyrene
- Chrysene
- Dibenz(a,h)anthracene
- Fluoranthene
- Fluorene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Phenanthrene
- Pyrene

PCBs CRMs

PCBs in Water 186004398

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard includes a different Aroclor, randomly selected from the list below, at 1-15 µg/L after dilution. All unspiked Aroclors are certified at <1 µg/L.

- Aroclor 1016
- Aroclor 1221
- Aroclor 1232
- Aroclor 1242
- Aroclor 1248
- Aroclor 1254
- Aroclor 1260

PCBs in Oil 186004397

One 10 mL flame-sealed ampule is ready to analyze. Each standard contains a different Aroclor, randomly selected, at 12-50 mg/kg.

Wastewater Organics CRM Set

Includes the Volatiles (186004389), Base/Neutrals (186004390), Acids (186004391), PCBs in Water (186004398), and Organochlorine Pesticides (186004392) CRM standards.

Set Purchase 186004304

Wastewater Organics CRM

Pesticides CRMs

Organochlorine Pesticides — 186004392

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains at least 16 analytes, randomly selected from the list below, at 0.5-20 µg/L after dilution. All unspiked analytes are certified at <0.5 µg/L.

- Aldrin
- alpha-BHC
- beta-BHC
- delta-BHC
- gamma-BHC (Lindane)
- alpha-Chlordane
- gamma-Chlordane
- 4,4′-DDD
- 4,4′-DDE
- 4,4′-DDT
- Dieldrin
- Endosulfan I
- Endosulfan II
- Endosulfan sulfate
- Endrin
- Endrin aldehyde
- Endrin ketone
- Heptachlor
- Heptachlor epoxide (beta)
- Methoxychlor

Carbamate Pesticides — 186004409

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard now contains at least 10 analytes, randomly selected from the list below, at 5-200 µg/L after dilution. All unspiked analytes are certified at <5 µg/L.

- Aldicarb
- Aldicarb sulfone
- Aldicarb sulfoxide
- Baygon
- Carbaryl
- Carbofuran
- Diuron
- 3-Hydroxycarbofuran
- Methiocarb
- Methomyl
- Oxamyl (Vydate)
- Propham

Nitrogen Pesticides — 186004387

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains at least 8 analytes, randomly selected from the list below, at 2-20 µg/L after dilution. All unspiked analytes are certified at <2 µg/L.

- Alachlor
- Ametryn
- Anilazine
- Atraton
- Atrazine
- Bromacil
- Butachlor
- Butylate
- Cyanazine
- Deethyl atrazine
- Deisopropyl atrazine
- Diaminoatrazine
- EPTC (Eptam)
- Hexazinone
- Metolachlor
- Metribuzin
- Napropamide
- Prometon
- Prometryn
- Pronamide
- Propachlor
- Propazine
- Simazine
- Terbacil
- Trifluralin

Chlordane — 186004394

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains technical chlordane at 3-25 µg/L after dilution.

Toxaphene — 186004395

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains toxaphene at 20-100 µg/L after dilution.

Organophosphorus Pesticides (OPP) — 186004386

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains Diazinon, Disulfoton, Ethyl Parathion, Malathion, and Azinphos-methyl and at least 4 additional OPP analytes, randomly selected from the list below, at 2-20 µg/L after dilution.

- Azinophos-methyl (Guthion)
- Carbophenothion
- Chlorpyrifos
- Demeton O & S
- Diazinon
- Dichlorvos (DDVP)
- Dimethoate
- Dioxathion
- Disulfoton
- Ethion
- Ethoprop
- Ethyl Parathion (Parathion)
- Famphur
- Fonofos
- Malathion
- Methyl Parathion
- Phorate
- Phosmet
- Ronnel
- Stirophos (Tetrachlorovinphos)
- Terbufos

Herbicides CRM

Chlorinated Acid Herbicides — 186004396

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Four herbicides – 2,4-D, Dicamba, 2,4,5-T, and 2,4,5-TP (Silvex) – are included in every standard at 2-10 µg/L after dilution. At least 6 additional analytes, randomly selected from the list shown below, are included in every standard at 2-10 µg/L, except MCPA and MCPP, which if spiked, are included at 10-100 µg/L after dilution. All unspiked analytes are certified at <2 µg/L.

- Acifluorfen
- Bentazon
- Chloramben
- 2,4-D
- 2,4-DB
- Dacthal diacid (DCPA)
- Dalapon
- Dicamba
- 3,5-Dichlorobenzoic acid
- Dichlorprop
- Dinoseb
- MCPA
- MCPP
- 4-Nitrophenol
- Pentachlorophenol
- Picloram
- 2,4,5-T
- 2,4,5-TP (Silvex)

ERA Cal 1000 mg/L Standards

ERA 1000 mg/L standards can be used for primary calibration or to prepare second source calibration check standards. They are traceable to NIST Standard Reference Materials, where available, and are guaranteed stable for one year. The certification documentation includes manufacturing uncertainties, traceability summaries and densities to aid in performing quantitative dilutions. The documentation for metal standards includes impurities.

Inorganics - 1000 mg/L

Chemical Oxygen Demand (COD)	186004225 (500 mL Bottle)
One 1,000 mg/L standard preserved with HCl in an amber glass bottle.	186004216 (125 mL Bottle)
Total Kjeldahl-Nitrogen (TKN)	186004230 (500 mL Bottle)
One 1,000 mg/L standard preserved with HCl in a poly bottle.	186004217 (125 mL Bottle)
MBAS/LAS Surfactants	186004226
One 10 mL flame-sealed ampule containing 1,000 mg/L LAS preserved with H_2SO_4.	
Total Organic Carbon (TOC)	186004228
One 500 mL 1,000 mg/L amber glass bottle preserved with H_2SO_4.	
Total Organic Halides (TOX)	186004227
One 2 mL flame-sealed ampule at 1,000 mg/L in MeOH.	
Phenol	186004229
One 500 mL 1,000 mg/L amber glass bottle preserved with H_2SO_4.	
Sulfide	186004233
One 10 mL flame-sealed ampule with 1,000 mg/L sulfide preserved with NaOH and zinc acetate.	

Ions – 1000 mg/L Parameter	Matrix	125 mL Bottle Part No.	500 mL Bottle Part No.
Ammonia as NH_3	H_2O	186004139	186004157
Ammonia as N	H_2O	186004140	186004156
Bromate	H_2O	186004152	–
Bromide	H_2O	186004141	186004158
Chlorate	H_2O	186004153	–
Chloride	H_2O	186004142	186004159
Chlorite	H_2O	186004154	–
Free cyanide	NaOH	186004143	186004231
Complex cyanide	NaOH	186004144	186004232
Fluoride	H_2O	186004145	186004160
Nitrate as NO_3	H_2O	186004146	186004163
Nitrate as N	H_2O	186004147	186004162
Nitrite as N	H_2O	186004148	186004161
Perchlorate	H_2O	186004155	–
Phosphate as PO_4	H_2O	186004149	186004165
Phosphate as P	H_2O	186004150	186004164
Sulfate	H_2O	186004151	186004166

Metals – 1000 mg/L Parameter	Matrix	125 mL Bottle Part No.
Aluminum	HNO_3	186004170
Antimony	HNO_3	186004171
Arsenic	HNO_3	186004172
Barium	HNO_3	186004173
Beryllium	HNO_3	186004174
Bismuth	HNO_3	186004203
Boron	HNO_3	186004175
Cadmium	HNO_3	186004176
Calcium	HNO_3	186004177
Cerium	HNO_3	186004211
Chromium VI	H_2O	186004178
Total chromium	HNO_3	186004179
Cobalt	HNO_3	186004180
Copper	HNO_3	186004181
Holmium	HNO_3	186004204
Indium	HNO_3	186004205
Iron	HNO_3	186004182
Lead	HNO_3	186004183
Lithium	HNO_3	186004206
Magnesium	HNO_3	186004184
Manganese	HNO_3	186004185
Mercury	HNO_3	186004186
Molybdenum	HNO_3	186004187
Nickel	HNO_3	186004188
Phosphorus	HNO_3	186004200
Potassium	HNO_3	186004189
Rhodium	HCl	186004207
Scandium	HNO_3	186004208
Selenium	HNO_3	186004190
Silica	H_2O	186004201
Silicon	HNO_3	186004191
Silver	HNO_3	186004192
Sodium	HNO_3	186004193
Strontium	HNO_3	186004194
Terbium	HNO_3	186004209
Thallium	HNO_3	186004195
Tin	HCl	186004196
Titanium	HCl	186004197
Vanadium	HNO_3	186004198
Yttrium	HNO_3	186004210
Zinc	HNO_3	186004199

ERA Cal Metals, Anions, & pH Buffer Standards

ICP-MS Metals

These standards come with a Certificate of Traceability and Uncertainty. Use for initial as well as continuing calibration and tuning verification. Provided as convenient concentrates with densities allowing you to easily perform gravimetric dilutions.

ICP-MS Trace Metals 186004212

One 125 mL concentrate is preserved with HNO_3 and tartaric acid. Contains aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, thallium, thorium, uranium, vanadium, and zinc, each at 10.0 mg/L.

ICP-MS Major Cations 186004213

One 125 mL concentrate is preserved with HNO_3. Contains calcium, magnesium, potassium, and sodium, each at 50.0 mg/L.

ICP-MS Tuning Standard 186004215

One 125 mL concentrate is preserved with HNO_3 and HCl. Contains barium, beryllium, cerium, cobalt, indium, lead, lithium, magnesium, rhodium, thallium, uranium, and yttrium, each at 10.0 mg/L.

ICP-MS Calibration/CRM Set

Includes the ICP-MS Trace Metals (186004212) and Cations (186004213) standards.

Set Purchase 186004214

Anions

Ion Chromatography 186004382

One 15 mL screw-top vial yields up to 200 mL after dilution. Designed to calibrate or verify IC calibrations. Comes with a Certificate of NIST Traceability. Call for anion standards at lower levels.

- Bromide ..... 0.2-20 mg/L
- Chloride ..... 0.2-20 mg/L
- Fluoride ..... 0.1-10 mg/L
- Nitrate as N ..... 0.2-20 mg/L
- Phosphate as P ..... 0.5-30 mg/L
- Sulfate ..... 0.5-30 mg/L

pH Buffers

ERA Cal pH Buffers are directly traceable to NIST SRMs, mercury free, guaranteed stable for at least one year after your receipt, and are supplied with a full certificate of analysis. Choose single bottles or convenient 6-bottle cases.

Value	Volume	Single Bottles Part No.	Case of 6 Bottles Part No.
pH 4.00	1 pint	186004218	186004219
pH 7.00	1 pint	186004220	186004221
pH 10.00	1 pint	186004222	186004223
2 each of pH 4, 7 and 10	1 pint	–	186004224

AA/ICP Metals

All metals standards come with a Certificate of Traceability. The ICP Trace Metals standard also includes uncertainties. Use as initial as well as continuing calibration verification.

Flame AA Trace Metals 186004352

One 20 mL screw-top vial, preserved with HNO_3, yields up to 500 mL after dilution. Designed for flame AA. Provided with a Certificate of NIST Traceability. Includes aluminum, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, strontium, thallium, vanadium, and zinc.

Flame AA/ICP Cations 186004362

One 15 mL screw-top vial, preserved with HNO_3, yields up to 250 mL after dilution. Use with ICP and AA methods.

- Calcium ..... 10-200 mg/L
- Magnesium ..... 10-200 mg/L
- Potassium ..... 5-100 mg/L
- Sodium ..... 10-250 mg/L

ICP Trace Metals 186004360

Designed for radial and axial-view ICP. One 500 mL Whole-Volume standard, preserved with HNO_3 and HCl, is ready to use. Includes antimony, arsenic, barium, beryllium, bismuth, boron, cadmium, chromium, cobalt, copper, lead, manganese, molybdenum, nickel, phosphorus, strontium, tin, vanadium, and zinc, each at 1.0 mg/L, plus aluminum, calcium, iron, potassium, lanthanum, magnesium, selenium, and sodium, each at 10.0 mg/L.

Whole Effluent Toxicity (WET) CRM

ERA recognizes that Whole Effluent Toxicity (WET) testing has its own unique characteristics. That's why we derive the expected performance on our WET CRM standards directly from the results of our historical proficiency testing studies. They include the largest pool of participant toxicity testing laboratories available. ERA's acceptance limits, which are provided for each WET standard, are derived from these data.

ERA WET CRM standards allow you to assess the consistency and quality of your routine aquatic toxicology analyses. All toxicants are supplied as ready-to-use concentrates – simply dilute, and test.

Whole Effluent Toxicity (WET) Testing CRMs

Reference Toxicant for Test Organism and Conditions	EPA Test Code	EPA Method Code	Part No.
Fathead minnow (Pimephales promelas) 48-hour acute, non-renewal, 20 °C, MHSF	11	2000.0	186004410
Fathead minnow (Pimephales promelas) 48-hour acute, non-renewal, 25 °C, MHSF	13	2000.0	186004411
Fathead minnow (Pimephales promelas) 48-hour acute, non-renewal, 25 °C, 20% DMW	14	2000.0	186004412
Fathead minnow (Pimephales promelas) 7-day short-term chronic, daily renewal, 25 °C, MHSF	15	1000.0	186004413
Fathead minnow (Pimephales promelas) 7-day short-term chronic, daily renewal, 25 °C, 20% DMW	16	1000.0	186004414
Ceriodaphnia dubia 48-hour acute, renewal, 20 °C, MHSF	17	2002.0	186004415
Ceriodaphnia dubia 48-hour acute, renewal, 20 °C, 20% DMW	18	2002.0	186004416
Ceriodaphnia dubia 48-hour acute, renewal, 25 °C, MHSF	19	2002.0	186004417
Ceriodaphnia dubia 48-hour acute, renewal, 25 °C, 20% DMW	20	2002.0	186004418
Ceriodaphnia dubia 7-day short-term chronic, daily renewal, 25 °C, MHSF	21	1002.0	186004419
Ceriodaphnia dubia 7-day short-term chronic, daily renewal, 25 °C, 20% DMW	22	1002.0	186004420
Daphnia magna 48-hour acute, non-renewal, 20 °C, MHSF	32	2021.0	186004421
Daphnia pulex 48-hour acute, non-renewal, 20 °C, MHSF	36	2021.0	186004422
Daphnia pulex 48-hour acute, non-renewal, 25 °C, MHSF	38	2021.0	186004423
Mysid (Mysidopsis bahia) 48-hour acute, non-renewal, 20 °C, 40 fathoms seawater	42	2007.0	186004424
Mysid (Mysidopsis bahia) 7-day short-term chronic, daily renewal, 26 °C, 40 fathoms seawater	43	1007.0	186004425
Inland silverside (Menidia beryllina) 48-hour acute, non-renewal, 20 °C, 40 fathoms seawater	44	2006.0	186004426
Sheepshead minnow (Cyprinodon variegatus) 48-hour acute, non-renewal, 20 °C, 40 fathoms seawater	46	2004.0	186004427
Sheepshead minnow (Cyprinodon variegatus) 7-day short-term chronic, daily renewal, 25 °C, 40 fathoms seawater	47	1004.0	186004428

Microbiology CRM

UP TO 12
UNIQUE LOTS AVAILABLE PER YEAR

ERA standards provide you the easiest way to evaluate and improve every aspect of your microbiology analyses from dilution technique to viability of your media. Use these "known" CRM standards any time to compare your results against ERA's certified values and acceptance limits, which will let you know with absolute confidence whether your performance is where you need it to be.

All ERA Microbiology standards are lyophilized and require re-hydration before analysis–sterile fluid provided. This ensures stability and provides maximum flexibility when the samples can be analyzed!

Wastewater CRMs

Wastewater Coliforms 186004384
Each set contains two lyophilized samples, one quantitative positive, and one negative. Use with all CWA quantitative methods – MF and MPN. Each set can be used for total coliforms and/or fecal coliforms as E.coli, which are present in the range 20–2,400 CFU/100 mL or MPN/100 mL.

Enterococci 186004383
Each set contains two lyophilized samples, one quantitative positive, and one negative, which after re-hydration can be analyzed for Enterococci and/or Fecal Streptococci, MF or MPN in the range 20–1,000 CFU/100 mL or MPN/100 mL. Note that a hazardous materials shipping charge will apply.

Drinking Water CRMs

Source Water E.coli 186004257
One quantitative lyophilized sample containing E.coli. Formulated for all SDWA quantitative methods. Also use for CRM for the Long Term 2 Enhanced Surface Water Treatment Rule. Each standard contains E.coli in the range 10-300 CFU/100 mL.

Drinking Water Coliforms 186004259
Each set now contains five lyophilized samples including one total and fecal positive (Escherichia coli), one total positive and fecal negative (Enterobacter cloacae), two total and fecal negative (Proteus mirablis and Pseudomonas aeruginosa), and one blank. Use with all SDWA methods - MF, MPN, presence/absence and ONPG-MUG. Each set can be used for total coliforms and/or fecal coliforms as E.coli.

Heterotrophic Plate Count 186004258
One quantitative lyophilized sample containing a Heterotrophic bacteria present in the range 5-500 CFU/mL. Use to CRM your recreational, drinking, and wastewater analyses. Use with Standard Method 9215B-Pour Plate, and Most Probable Number (MPN) Method (Simplate).

Drinking Water Inorganics CRM

UP TO 12
UNIQUE LOTS AVAILABLE PER YEAR

ERA Drinking Water Inorganics CRM standards provide you the simplest way to verify the accuracy of your analyses of drinking and ground water samples. Use these "known" CRM standards any time to compare your results against ERA's certified values and acceptance limits. Our acceptance limits, derived from over two million data points, will let you know with absolute confidence whether your analytical performance is where you need it to be.

Minerals/Solids CRMs

Hardness 186004244
One 250 mL Whole-Volume bottle is ready to analyze. Use with AA, ICP-OES, ICP-MS, or titrimetric methods.

Calcium	30-90 mg/L
Calcium hardness as $CaCO_3$	75-375 mg/L
Total hardness as $CaCO_3$	83-307 mg/L
Magnesium	2-20 mg/L
Sodium	12-24 mg/L

Inorganics 186004248
One 500 mL Whole-Volume bottle is ready to analyze. Also includes sodium at an intentionally higher range than in the Hardness standard.

Alkalinity as $CaCO_3$	25-200 mg/L
Chloride	5-100 mg/L
Fluoride	1-8 mg/L
Nitrate as N	3-10 mg/L
Nitrate plus Nitrite as N	3.5-9 mg/L
Potassium	10-40 mg/L
Sodium	10-400 mg/L
Specific Conductance at 25 °C	250-2,500 µmhos/cm
Sulfate	5-500 mg/L
Total filterable residue (TDS) at 180 °C	200-450 mg/L

pH 186004250
One 250 mL Whole-Volume bottle is ready to analyze. Use with electrometric methods.

pH	5-10 units

Trace Metals CRMs

Metals 186004247
One 15 mL screw-top vial yields up to 2 liters after dilution. Use with AA, ICP-OES, or ICP-MS methods.

Aluminum	130-2,500 µg/L
Antimony	6-50 µg/L
Arsenic	5-50 µg/L
Barium	500-3,000 µg/L
Beryllium	1-10 µg/L
Boron	800-2,000 µg/L
Cadmium	2-50 µg/L
Chromium	10-200 µg/L
Copper	50-2,000 µg/L
Iron	100-1,800 µg/L
Lead	5-100 µg/L
Manganese	40-900 µg/L
Molybdenum	15-130 µg/L
Nickel	10-500 µg/L
Selenium	10-100 µg/L
Silver	20-300 µg/L
Thallium	2-10 µg/L
Vanadium	315-2,500 µg/L
Zinc	400- 2,500 µg/L

Mercury 186004239
One 15 mL screw-top vial yields up to 1 liter after dilution. Contains both organic and inorganic mercury to test both digestion and analysis procedures. Use with CVAA, ICP-MS, or CVAFS methods. For a ng/L level mercury standard see page 3.

Mercury, total	0.5-10 µg/L

Hexavalent Chromium 186004236
One 15 mL screw-top vial yields up to 2 liters after dilution. Use with colorimetric or IC methods.

Hexavalent Chromium	5-50 µg/L

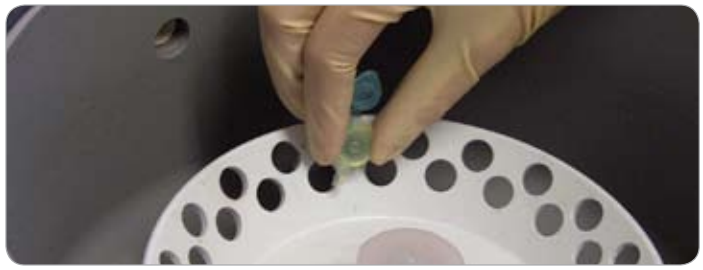
Uranium 186004254
One 15 mL screw-top vial yields up to 1 liter after dilution. Use with ICP-MS methods. For uranium CRMs in different matrices.

Uranium	3-104 µg/L

Vanadium 186004237
One 15 mL screw-top vial yields up to 2 liters after dilution. Use with AA, ICP-OES, or ICP-MS methods.

Vanadium	5-50 µg/L

Drinking Water Inorganics CRM



Drinking Water Inorganics CRM Set

Includes the Hardness (186004244), Inorganics (186004248), pH (186004250), Metals (186004247), Mercury (186004239), Drinking Water Coliforms (186004259), Nitrite (186004245), Residual Chlorine (186004246), and Turbidity (186004249) CRM standards.

Set Purchase 186004235

Inorganic Disinfection By-Products CRMs

Bromide, Bromate, and Chlorate 186004243

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Use with colorimetric, ion chromatography or ISE methods.

- Bromate ..... 7-50 µg/L
- Bromide ..... 75-500 µg/L
- Chlorate ..... 60-180 µg/L

Chlorite 186004234

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Use with ion chromatography methods.

- Chlorite ..... 100-1,000 µg/L

Nutrients CRMs

Nitrite 186004245

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Use with colorimetric or ISE methods.

- Nitrite as N ..... 0.4-2 mg/L

o-Phosphate Nutrients 186004240

One 15 mL screw-top vial yields up to 2 liters after dilution.
Use with colorimetric or IC methods.

- ortho-Phosphate as P ..... 0.5-5.5 mg/L

Microbiology CRMs

All ERA microbiology standards are lyophilized and require re-hydration before analysis–sterile fluid provided. This ensures stability and provides maximum flexibility when the samples can be analyzed!

Drinking Water Coliforms 186004259

Each set now includes five lyophilized standards: one total and fecal positive (Escherichia coli), one total positive and fecal negative (Enterobacter cloacae), two total and fecal negative (Proteus mirablis and Pseudomonas aeruginosa), and one blank. Use for all SDWA methods-MF, MPN, presence/absence and ONPG-MUG. Can be used for total coliforms and/or fecal coliforms as E. coli.

Heterotrophic Plate Count 186004258

One quantitative lyophilized sample containing a Heterotrophic bacteria present in the range 5-500 CFU/mL. Use to CRM your recreational, drinking and wastewater analyses. Use with Standard Method 9215B-Pour Plate and Most Probable Number (MPN) Method (Simplate).

Source Water E.coli 186004257

One quantitative lyophilized standard containing E.coli is formulated for all SDWA quantitative methods. Also use for CRM under proposed monitoring for the Long Term 2 Enhanced Surface Water Treatment Rule. Each standard contains E.coli in the range 10-300 CFU/100 mL.

Drinking Water Inorganics CRM

Additional Inorganic CRMs

Residual Chlorine 186004246
One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Use with titrimetric or colorimetric methods. For µg/L level residual chlorine CRMs see page 6.
- Total Residual Chlorine ..... 0.5-3 mg/L
- Free Residual Chlorine ..... 0.5-3 mg/L

Cyanide 186004256
One 15 mL screw-top vial yields up to 2 liters after dilution.
Use with digestion and/or colorimetric, titrimetric, or ISE methods.
- Cyanide ..... 0.1-0.5 mg/L

Organic Carbon 186004241
One 15 mL screw-top vial yields up to 1 liter after dilution. Use for total (TOC) and dissolved (DOC) organic carbon with combustion or persulfate oxidation procedures.
- Total Organic Carbon ..... 1.2-4.9 mg/L
- Dissolved Organic Carbon ..... 1.2-4.9 mg/L

Perchlorate 186004253
One 15 mL screw-top vial yields up to 2 liters after dilution.
Use with IC or IC-MS methods. Call for ng/L level Perchlorate CRM standards.
- Perchlorate ..... 4-20 µg/L

Silica 186004252
One 60 mL poly bottle yields 1 liter after dilution.
Use with colorimetric or ICP methods.
- Silica as SiO_2 ..... 5-50 mg/L

Surfactants - MBAS 186004251
One 10 mL flame-sealed ampule yields up to 2 liters after dilution.
- Surfactants – MBAS ..... 0.05-1 mg/L

For total organic halides (TOX) CRMs see page 6.

Physical Property CRMs

Corrosivity 186004255
One 500 mL Whole-Volume bottle is ready to use. Use for corrosivity, calcium carbonate saturation, and Langelier saturation index.
- Corrosivity ..... -4 to +4 SI units

Turbidity 186004249
One 15 mL screw-top vial yields up to 1 liter after dilution. Use with nephelometric methods.
- Turbidity ..... 0.5-8 NTU

UV 254 Absorbance 186004238
One 15 mL screw-top vial yields up to 1 liter after dilution. Use with Standard Method 5910B.
- UV 254 Absorbance 0.02-0.7 cm-1

Drinking Water Organics CRM

UP TO 12
UNIQUE LOTS AVAILABLE PER YEAR

ERA Drinking Water Organics CRM standards provide you the simplest way to verify the accuracy of your analyses of drinking and ground waters as well as other clean water samples. Use these "known" CRM standards any time to compare your results against ERA's certified values and acceptance limits. Our acceptance limits are derived from over two million data points. They will let you know with absolute confidence whether your analytical performance is where you need it to be.

Volatile Organics CRMs

Halomethanes (THMs) 186004273

One 2 mL flame-sealed ampule yields in excess of 200 mL after dilution.
Each standard is certified for all analytes below at 10-50 µg/L after dilution.

Bromodichloromethane
Bromoform
Chlorodibromomethane
Chloroform

Regulated Volatiles 186004274

One 2 mL flame-sealed ampule yields in excess of 200 mL after dilution.
Each standard contains all the analytes below at 1-50 µg/L after dilution.

Benzene
Carbon tetrachloride
Chlorobenzene
1,2-Dichlorobenzene
1,4-Dichlorobenzene
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
1,2-Dichloropropane
Ethylbenzene
Methylene Chloride
Styrene
Tetrachloroethylene
Toluene
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethylene
Vinyl chloride
Xylenes, total

Gasoline Additives 186004281

One 2 mL flame-sealed ampule yields in excess of 200 mL after dilution.
Each standard contains all the analytes below at 5-50 µg/L after dilution.

tert-Amylmethylether (TAME)
tert-Butyl Alcohol
Di-isopropylether (DIPE)
Ethyl tert-butyl ether (ETBE)
Methyl tert-butyl ether (MTBE)
Trichlorofluoromethane (Freon® 11)
Trichlorotrifluoroethane (Freon® 113)

Unregulated Volatiles 186004268

One 2 mL flame-sealed ampule yields in excess of 200 mL after dilution.
Each standard contains at least 20 analytes, randomly selected from the list below, at 5-50 µg/L, except naphthalene, which if spiked, is included at 2-50 µg/L after dilution. All unspiked analytes are certified at <5 µg/L.

Bromobenzene
Bromochloromethane
Bromomethane
n-Butylbenzene
sec-Butylbenzene
tert-Butylbenzene
Chloroethane
Chloromethane
2-Chlorotoluene
4-Chlorotoluene
Dibromomethane
1,3-Dichlorobenzene
Dichlorodifluoromethane
1,1-Dichloroethane
1,3-Dichloropropane
2,2-Dichloropropane
1,1-Dichloropropene
cis-1,3-Dichloropropene
trans-1,3-Dichloropropene
Fluorotrichloromethane
Hexachlorobutadiene
Isopropylbenzene
4-Isopropyltoluene
Methyl tert-butyl ether (MTBE)
Naphthalene
n-Propylbenzene
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
1,2,3-Trichlorobenzene
1,2,3-Trichloropropane
1,2,4-Trimethylbenzene
1,3,5-Trimethylbenzene

Semivolatile Organics CRMs

Dioxin 186004266

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Each standard contains 2,3,7,8-TCDD at 25-80 pg/L after dilution.

PCBs as Decachlorobiphenyl 186004279

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. This standard can also be used for Aroclor identification and quantitation. Each standard includes a different Aroclor, randomly selected from the list below, at 0.5-5 µg/L as decachlorobiphenyl after dilution.

Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260

Semivolatiles # 1 186004270

Includes PAHs, phthalates and adipates. One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each lot contains Benzo(a)pyrene, bis(2-Ethylhexyl)adipate, and bis(2-Ethylhexyl)phthalate plus at least 13 additional analytes, selected from the list below, at 0.2-50 µg/L after dilution.

Acenaphthene
Acenaphthylene
Anthracene
Benzo(a)anthracene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(a)pyrene
Butylbenzylphthalate
Chyrsene
Dibenz(a,h)anthracene
Di-n-butylphthalate
Diethylphthalate
Dimethylphthalate
Di-n-octylphthalate
bis(2-Ethylhexyl)adipate
bis(2-Ethylhexyl)phthalate
Fluoranthene
Fluorene
Indeno(1,2,3-cd)pyrene
Naphthalene
Phenanthrene
Pyrene

For Regulated Semivolatiles # 2 Herbicides CRMs see page 20.

Disinfection-by-Products CRMs

Chloral Hydrate 186004267

One 2 mL flame-sealed ampule yields in excess of 200 mL after dilution.
Each standard contains Chloral Hydrate at 4-30 µg/L after dilution.

Haloacetic Acids (HAA) 186004269

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Each standard contains all six analytes listed below at 10-50 µg/L after dilution.

Bromochloroacetic Acid
Dibromoacetic Acid
Dichloroacetic Acid
Monobromoacetic Acid
Monochloroacetic Acid
Trichloroacetic Acid

Drinking Water Organics CRM

Our CRM acceptance limits will let you know with absolute confidence whether your analytical performance is where you need it to be!

Pesticides CRMs

Pesticides — 186004280

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains at least 16 analytes, randomly selected from the list below, at 0.1-100 µg/L after dilution. All unspiked analytes are certified at <0.1 µg/L. Includes organochlorine, nitrogen, and organophosphorus pesticides.

- Alachlor
- Aldrin
- Atrazine
- Bromacil
- Butachlor
- Diazinon
- Dieldrin
- Endrin
- Heptachlor
- Heptachlor epoxide (beta)
- Hexachlorobenzene
- Hexachlorocyclopentadiene
- Lindane (gamma-BHC)
- Methoxychlor
- Metolachlor
- Metribuzin
- Molinate (Ordram)
- Prometon
- Propachlor
- Simazine
- Thiobencarb
- Trifluralin

Carbamate/Carbamoxyloxime Pesticides — 186004278

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Each standard contains all analytes below at 15-150 µg/L after dilution.

- Aldicarb
- Aldicarb sulfone
- Aldicarb sulfoxide
- Baygon
- Carbaryl
- Carbofuran
- 3-Hydroxycarbofuran
- Methiocarb
- Methomyl
- Oxamyl (Vydate)

Chlordane — 186004276

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Each standard contains technical chlordane at 2-20 µg/L after dilution.

Toxaphene — 186004272

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Each standard contains toxaphene at 3-20 µg/L after dilution.

EDB/DBCP/TCP — 186004277

One 2 mL flame-sealed ampule yields in excess of 200 mL after dilution.
Each lot contains all analytes below at 0.1-2 µg/L after dilution.

- 1,2-Dibromo-3-chloropropane (DBCP)
- Ethylene Dibromide (EDB)
- 1,2,3-Trichloropropane (1,2,3-TCP)

Herbicides CRMs

Chlorinated Acid Herbicides — 186004275

One 2 mL flame-sealed ampule yields up to 2 liters after dilution. Each standard contains at least 13 analytes, randomly selected from the list below, at 1-150 µg/L after dilution. All unspiked analytes are certified at <1 µg/L.

- Acifluorfen
- Bentazon
- Chloramben
- 2,4-D
- 2,4-DB
- Dacthal diacid (DCPA)
- Dalapon
- Dicamba
- 3,5-Dichlorobenzoic acid
- Dichlorprop
- Dinoseb
- 4-Nitrophenol
- Pentachlorophenol
- Picloram
- 2,4,5-T
- 2,4,5-TP (Silvex)

Semivolatiles #2 Herbicides — 186004271

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Each standard contains all the analytes below at 8-800 µg/L after dilution.

- Diquat
- Endothall
- Glyphosate
- Paraquat

Drinking Water Organics CRM Set

Includes the Halomethanes (186004273), Regulated Volatiles (186004274), Unregulated Volatiles (186004268), Pesticides (186004280), Carbamate/Carbamoxyloxime Pesticides (186004278), Chlordane (186004276), Toxaphene (186004272), EDB/DBCP/TCP (186004277), and Chlorinated Acid Herbicides (186004275) CRM standards.

Set Purchase — 186004265

Unregulated Contaminant Monitoring Rule 2 (UCMR 2) CRM

ERA is a provider of standards for UCMR 2. We are making these CRM standards available to laboratories looking to prepare for analysis of these new contaminants that are soon to become regular test analytes. Call us if you have any questions about analyzing these compounds.

Unregulated Contaminant Monitoring Rule 2 (UCMR 2) Drinking Water CRMs

UCMR 2 Pesticides and Flame Retardants in Water 186004260

One 2 mL flame-sealed ampule yields in excess of 2 liters after dilution.
Each standard contains all analytes below at 0.5-10 µg/L after dilution.

- Dimethoate
- 2,2′,4,4′,5-Pentabromodiphenyl ether (BDE-99)
- 2,2′,4,4′,6-Pentabromodiphenyl ether (BDE-100)
- 2,2′,4,4′,5,5′-Hexabromobiphenyl (245-HBB)
- 2,2′,4,4′,5,5′-Hexabromodiphenyl ether (BDE-153)
- Terbufos sulfone
- 2,2′,4,4′-Tetrabromodiphenyl ether (BDE-47)

UCMR 2 Nitrosamines in Water 186004262

One 2 mL flame-sealed ampule yields in excess of 2 liters after dilution.
Each standard contains all analytes below at 5-100 ng/L after dilution.

- N-Nitrosodiethylamine (NDEA)
- N-Nitrosodimethylamine (NDMA)
- N-Nitrosodi-n-butylamine (NDBA)
- N-Nitrosodi-n-propylamine (NDPA)
- N-Nitrosomethylethylamine (NMEA)
- N-Nitrosopyrollidine (NPYR)

UCMR 2 Explosives in Water 186004261

One 2 mL flame-sealed ampule yields in excess of 2 liters after dilution.
Each standard contains all analytes below at 1-15 µg/L after dilution.

- 1,3-Dinitrobenzene
- Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
- 2,4,6-Trinitrotoluene (TNT)

UCMR 2 Chlorinated Pesticides in Water 186004263

One 2 mL flame-sealed ampule yields in excess of 2 liters after dilution.
Each standard contains all analytes below at 1-20 µg/L after dilution.

- Acetochlor
- Alachlor
- Metolachlor

UCMR 2 Herbicide Degradates in Water 186004264

One 2 mL flame-sealed ampule yields in excess of 2 liters after dilution.
Each standard contains all analytes below at 1-20 µg/L after dilution.

- Acetochlor ethane sulfonic acid (ESA)
- Acetochlor oxanilic acid (OA)
- Alachlor ethane sulfonic acid (ESA)
- Alachlor oxanilic acid (OA)
- Metolachlor ethane sulfonic acid (ESA)
- Metolachlor oxanilic acid (OA)

Blank Soil CRM

Certified-clean ERA Blank Soils allow you to evaluate any potential contamination during sample collection, preparation, and analysis. They provide the perfect way to comply with all CRM program requirements. For volatile and inorganic analyses you can select between sand and soil matrices, whichever is most appropriate to your specific need.

Volatile Blank Sand 186004302

One 40 g clean sand sample in a VOA vial. The certified concentrations of all analytes are below the lowest NELAC required spiking concentration level of <20 µg/kg.

Volatile Blank Soil 186004301

One 40 g clean soil sample in a VOA vial. The certified concentrations of all analytes are below the lowest NELAC required spiking concentration levels of <20 µg/kg, except acetone at <150 µg/kg, and MEK, 2-hexanone, and MIBK at <50 µg/kg.

Semivolatile Blank Soil 186004303

One 60 g certified-clean soil sample in a screw-top bottle. The certified concentration of all analytes are below the lowest NELAC required spiking concentration levels of <500 µg/kg for BNAs and PCBs, <100 µg/kg for chlordane and toxaphene, <5 µg/kg for pesticides, and <10 µg/kg for herbicides. In addition, the concentration of total petroleum hydrocarbons (TPH), diesel range organics (DRO), and gasoline range organics (GRO) are certified to be <20 mg/kg.

Metals & Cyanide Blank Sand 186004283

One 40 g sand sample in a screw-top bottle. The concentrations of all EPA/NELAC including the Priority Pollutant metal and cyanide analytes are below the CLP Required Detection Limits (CRDLs) except iron, which is <250 mg/kg.

Metals & Cyanide Blank Soil 186004282

One 40 g soil sample in a screw-top bottle. The concentrations of all of the following analytes are below the CLP CRDL's: antimony, arsenic, beryllium, cadmium, cobalt, mercury, nickel, selenium, silver, sodium, thallium, and cyanide. The concentrations of the following analytes are below 10X the CLP CRDL's: barium, chromium, copper, lead, magnesium, potassium, and vanadium. The concentrations of manganese and zinc are <750 mg/kg. The concentration range for aluminum, calcium, and iron is 3,000-25,000 mg/kg.

Inorganics in Soil CRM

4
UNIQUE LOTS AVAILABLE PER YEAR

In order to ensure the quality and long-term consistency of our Inorganics in Soil CRM standards, ERA uses very carefully selected and prepared substrates along with systematic fortification, homogenization, and packaging processes. We verify the accuracy, homogeneity, and stability of every analyte in every standard.

Metals CRMs

Metals in Soil 186004288

Use for all ICP & AA, RCRA and Superfund methods. One 40 g soil standard in a screw-top bottle designed and certified for use with digestion methods 3050 hot plate and 3051 microwave. Certified values provided for the hot plate and microwave digestion procedures.

Aluminum	1,000-50,000 mg/kg
Antimony	80-300 mg/kg
Arsenic	50-400 mg/kg
Barium	80-3,000 mg/kg
Beryllium	30-200 mg/kg
Boron	80-200 mg/kg
Cadmium	40-300 mg/kg
Calcium	1,500-25,000 mg/kg
Chromium	40-300 mg/kg
Cobalt	30-200 mg/kg
Copper	40-200 mg/kg
Iron	1,000-22,000 mg/kg
Lead	50-250 mg/kg
Magnesium	1,200-25,000 mg/kg
Manganese	150-2,000 mg/kg
Mercury	1-50 mg/kg
Molybdenum	5-250 mg/kg
Nickel	40-250 mg/kg
Potassium	1,400-25,000 mg/kg
Selenium	50-250 mg/kg
Silver	50-250 mg/kg
Sodium	150-15,000 mg/kg
Strontium	5-250 mg/kg
Thallium	50-250 mg/kg
Tin	75-250 mg/kg
Titanium	10-2,000 mg/kg
Vanadium	50-250 mg/kg
Zinc	70-1,500 mg/kg

Inorganics in Soil CRM Set

Includes the Metals (186004288), Hexavalent Chromium (186004336), and Cyanide in Soil (186004289) CRM standards.

Set Purchase 186004284

Hexavalent Chromium in Soil 186004336

One 40 g soil standard in a screw-top bottle for use with all promulgated hexavalent chromium methods.

Hexavalent Chromium	40-300 mg/kg

TCLP Metals in Soil 186004292

One 105 g ready-to-extract soil standard in a screw-top bottle designed specifically to verify the quality of TCLP metals analysis methods. Certified concentrations are provided for antimony, arsenic, barium, beryllium, cadmium, chromium, lead, mercury, nickel, selenium, silver, and zinc.

Metals in Sewage Sludge 186004285

One 40 g sludge standard in a screw-top bottle that is ideal for quality control in Wastewater treatment plant laboratories.

Aluminum	1,000-50,000 mg/kg
Antimony	80-300 mg/kg
Arsenic	50-400 mg/kg
Barium	250-2,000 mg/kg
Beryllium	30-200 mg/kg
Cadmium	40-300 mg/kg
Calcium	5,000-70,000 mg/kg
Chromium	40-300 mg/kg
Cobalt	5–50 mg/kg
Copper	40-1,000 mg/kg
Iron	1,000-50,000 mg/kg
Lead	50-250 mg/kg
Magnesium	1,200-25,000 mg/kg
Manganese	100-2,000 mg/kg
Mercury	1-50 mg/kg
Molybdenum	5-250 mg/kg
Nickel	40-250 mg/kg
Potassium	1,400-25,000 mg/kg
Selenium	50-250 mg/kg
Silver	50-250 mg/kg
Sodium	150-15,000 mg/kg
Strontium	200-2,000 mg/kg
Thallium	50-250 mg/kg
Vanadium	5-250 mg/kg
Zinc	70-1,500 mg/kg

Inorganics in Soil CRM

The reliability of our new perchlorate CRM standards has been confirmed over the past several years in extensive round-robin testing.

Inorganics CRMs

Anions in Soil 186004291

CRM all major anions in soil. One 40 g soil standard designed for use with DI water extraction procedures.

Bromide	10-200 mg/kg
Chloride	25-500 mg/kg
Fluoride	25-500 mg/kg
Nitrate as N	25-500 mg/kg
Phosphate as P	10-200 mg/kg
Sulfate	25-1,000 mg/kg

Cyanide in Soil 186004289

One 40 g soil standard in a screw-top bottle for use with distillation/colorimetric methods.

Total cyanide	25-500 mg/kg

Nutrients in Soil 186004290

One 40 g soil standard in a screw-top bottle is ready for analysis.

Ammonia as N	50-1,000 mg/kg
Total Kjeldahl-nitrogen as N	100-2,000 mg/kg
Total Organic Carbon (TOC)	2,000-15,000 mg/kg
Total Phosphorus as P	100-2,000 mg/kg

Nutrients in Sludge 186004293

One 40 g sludge standard in a screw-top bottle is ready for analysis.

Ammonia as N	0.5-3% (w/w)
Total Kjeldahl-nitrogen as N	2-10% (w/w)
Total Organic Carbon (TOC)	20-40% (w/w)
Total Phosphorus as P	2-10% (w/w)

Physical Parameters in Soil CRMs

Corrosivity/pH in Soil 186004299

One 100 g soil standard in a screw-top bottle.

Ignitability/Flash Point 186004300

One standard in a 125 mL bottle. Note that a hazardous materials shipping charge will apply.

Perchlorate CRMs

All perchlorate standards are certified at a specific concentration in the µg/kg range.

Perchlorate in Soil 186004294

One screw-top bottle containing 40 g of soil suitable for deionized water leach and perchlorate analysis using any of the currently available methodologies.

Perchlorate in Sludge 186004295

One screw-top bottle containing 40 g of sludge suitable for deionized water leach and perchlorate analysis using any of the currently available methodologies.

Perchlorate in Vegetation 186004296

One screw-top bottle containing 30 g of freeze-dried vegetable tissue suitable for deionized water leach and perchlorate analysis methods.

TPH in Soil CRMs

Total Petroleum Hydrocarbons (TPH) in Soil # 1 186004297

One screw-top bottle contains 50 g of soil that contains TPH without interfering fatty acids. TPH is present in the range of 250-3,000 mg/kg.

Total Petroleum Hydrocarbons (TPH) in Soil # 2 186004298

One screw-top bottle contains 50 g of soil with TPH in the presence of interfering fatty acids. TPH is present in the range of 250-3,000 mg/kg.

Organics in Soil CRM

4
UNIQUE LOTS AVAILABLE PER YEAR

Over the past 15 years, ERA has refined the selection and preparation of our soil substrates for all our organic standards to ensure consistent extraction and analyte recovery. The accuracy, homogeneity, and stability of every analyte in every standard is verified according to NELAC and ISO protocols.

ERA's Organics in Soil CRM standards provide the simplest way to verify the accuracy of your analyses from extraction through analysis. Use these "known" CRM standards any time to compare your results against ERA's certified values and acceptance limits.

Volatiles in Soil CRMs

Volatiles in Soil — 186004316

One 2 mL flame-sealed ampule that requires spiking onto 10 g of provided solid matrix. By altering the amount of concentrate, this can be used for both low and medium level methods. Each standard contains at least 22 of the analytes, randomly selected from the list below at 20-200 µg/kg for low level and 1,000-10,000 µg/kg for medium level. All unspiked analytes are certified at <20 µg/kg for low level and <1,000 µg/kg for medium level.

- Acetone
- Acetonitrile
- Acrolein
- Benzene
- Bromodichloromethane
- Bromoform
- Bromomethane
- 2-Butanone (MEK)
- Carbon disulfide
- Carbon tetrachloride
- Chlorobenzene
- Chlorodibromomethane
- Chloroethane
- 2-Chloroethylvinylether
- Chloroform
- Chloromethane
- 1,2-Dibromo-3-chloropropane (DBCP)
- 1,2-Dibromoethane (EDB)
- Dibromomethane
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- Dichlorodifluoromethane
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- cis-1,2-Dichloroethylene
- trans-1,2-Dichloroethylene
- 1,2-Dichloropropane
- cis-1,3-Dichloropropylene
- trans-1,3-Dichloropropylene
- Ethylbenzene
- 2-Hexanone
- Methylene chloride
- Methyl tert-butyl ether (MTBE)
- 4-Methyl-2-pentanone (MIBK)
- Styrene
- 1,1,1,2-Tetrachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethene
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene
- Trichlorofluoromethane
- 1,2,3-Trichloropropane
- Vinyl acetate
- Vinyl chloride
- Xylenes, total

Ready-to-Use VOAs in Soil — 186004337

One 20 mL flame-sealed ampule with 10 g of soil and 10 mL of methanol is ready to analyze. Each standard contains at least 22 analytes, randomly selected from the list below, at 500-13,000 µg/kg. All unspiked analytes are certified at <1,000 µg/kg.

- Acetone
- Acetonitrile
- Acrolein
- Benzene
- Bromobenzene
- Bromodichloromethane
- Bromoform
- Bromomethane
- 2-Butanone (MEK)
- Carbon disulfide
- Carbon tetrachloride
- Chlorobenzene
- Chlorodibromomethane
- Chloroethane
- 2-Chloroethylvinylether
- Chloroform
- Chloromethane
- 1,2-Dibromo-3-chloropropane (DBCP)
- 1,2-Dibromoethane (EDB)
- Dibromomethane
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- Dichlorodifluoromethane
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethene
- cis-1,2-Dichloroethylene
- trans-1,2-Dichloroethylene
- 1,2-Dichloropropane
- cis-1,3-Dichloropropylene
- trans-1,3-Dichloropropylene
- Ethylbenzene
- 2-Hexanone
- Hexachlorobutadiene
- Hexachloroethane
- Isopropylbenzene
- Methylene chloride
- Methyl tert-butyl ether (MTBE)
- 4-Methyl-2-pentanone (MIBK)
- Naphthalene
- Nitrobenzene
- Styrene
- 1,1,1,2-Tetrachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethene
- Toluene
- 1,2,4-Trichlorobenzene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethene
- Trichlorofluoromethane
- 1,2,3-Trichloropropane
- Vinyl acetate
- Vinyl chloride
- Xylenes, total

Organics in Soil CRM

With decades of experience performing environmental analyses, we know what it takes to make soil standards that work for you!

Semivolatiles in Soil CRMs

Nitroaromatics & Nitramines in Soil	186004335

Two flame-sealed ampules, each with 30 g of soil are ready to analyze. Each standard contains at least 9 analytes, randomly selected from the list below, at 500-15,000 µg/kg. All unspiked analytes are certified at <500 µg/kg.

- 4-Amino-2,6-dinitrotoluene
- 2-Amino-4,6-dinitrotoluene
- 1,3-Dinitrobenzene
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- HMX
- Nitrobenzene
- 2-Nitrotoluene
- 3-Nitrotoluene
- 4-Nitrotoluene
- RDX
- Tetryl
- 1,3,5-Trinitrobenzene
- 2,4,6-Trinitrotoluene

Base/Neutrals & Acids in Soil	186004322

Two 30 g flame-sealed ampules are ready to analyze. Each standard contains at least 36 Base/Neutral and Acid analytes at 500-16,000 µg/kg. All unspiked analytes are certified at <500 µg/kg.

- Acenaphthene
- Acenaphthylene
- 2-Amino-1-methylbenzene (o-Toluidine)
- Aniline
- Anthracene
- Benzidine
- Benzoic acid
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(a)pyrene
- Benzyl alcohol
- 4-Bromophenyl-phenylether
- Butylbenzylphthalate
- Carbazole
- 4-Chloroaniline
- bis(2-Chloroethoxy) methane
- bis(2-Chloroethyl)ether
- bis(2-Chloroisopropyl)ether
- 4-Chloro-3-methylphenol
- 1-Chloronaphthalene
- 2-Chloronaphthalene
- 2-Chlorophenol
- 4-Chlorophenyl-phenylether
- Chrysene
- Dibenz(a,h)anthracene
- Dibenzofuran
- Di-n-butylphthalate
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- 3,3'-Dichlorobenzidine
- 2,4-Dichlorophenol
- 2,6-Dichlorophenol
- Diethylphthalate
- 2,4-Dimethylphenol
- Dimethylphthalate
- 2,4-Dinitrophenol
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Di-n-octylphthalate
- bis(2-Ethylhexyl)phthalate
- Fluoranthene
- Fluorene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclopentadiene
- Hexachloroethane
- Indeno(1,2,3-cd)pyrene
- Isophorone
- 2-Methyl-4,6-dinitrophenol
- 2-Methylnaphthalene
- 2-Methylphenol
- 3 & 4-Methylphenol
- Naphthalene
- 2-Nitroaniline
- 3-Nitroaniline
- 4-Nitroaniline
- Nitrobenzene
- 2-Nitrophenol
- 4-Nitrophenol
- N-Nitrosodiethylamine
- N-Nitrosodimethylamine
- N-Nitrosodiphenylamine
- N-Nitroso-di-n-propylamine
- Pentachlorobenzene
- Pentachlorophenol
- Phenanthrene
- Phenol
- Pyrene
- Pyridine
- 1,2,4,5-Tetrachlorobenzene
- 2,3,4,6-Tetrachlorophenol
- 1,2,4-Trichlorobenzene
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol

Low-Level PAHs in Soil	186004317

Two flame-sealed ampules each with 30 g of soil are ready to analyze. Includes at least 13 analytes, randomly selected from the list below, at 50-1,000 µg/kg. Includes both UV absorbing PAHs at 100-1,000 µg/kg and fluorescent PAHs at 50-200 µg/kg.

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(a)pyrene
- Chrysene
- Dibenz(a,h)anthracene
- Fluoranthene
- Fluorene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Phenanthrene
- Pyrene

Base/Neutrals & Acids and Pesticides in Soil CRM Set

Includes the Base/Neutrals & Acids (186004322) and Organochlorine Pesticides in Soil (186004323) CRM standards.

Set Purchase	186004315

Organics in Soil CRM Set

Includes the Volatiles (186004316), Base/Neutrals & Acids (186004322), and Organochlorine Pesticides in Soil (186004323) CRM standards.

Set Purchase	186004305

Organics in Soil CRM

Pesticides in Soil CRMs

Organochlorine Pesticides in Soil — 186004323

Two 30 g flame-sealed ampules are ready to analyze. Each standard includes at least 17 pesticides, randomly selected from the list below at 5-500 µg/kg. All unspiked analytes are certified at <5 µg/kg.

Aldrin	4,4′-DDD	Endrin
alpha-BHC	4,4′-DDE	Endrin aldehyde
beta-BHC	4,4′-DDT	Endrin ketone
delta-BHC	Dieldrin	Heptachlor
gamma-BHC (Lindane)	Endosulfan I	Heptachlor epoxide
alpha-Chlordane	Endosulfan II	Methoxychlor
gamma-Chlordane	Endosulfan sulfate	

Chlordane in Soil — 186004320

One screw-top bottle containing 50 g of soil is ready to analyze. Certified for technical chlordane at 100-500 µg/kg.

Toxaphene in Soil — 186004319

One screw-top bottle containing 50 g of soil is ready to analyze. Certified for toxaphene at 100-500 µg/kg.

Carbamate Pesticides in Soil — 186004339

Two flame-sealed ampules, each with 30 g of soil are ready to analyze. Each standard includes at least 7 analytes, randomly selected from the list below, at 250–2,500 µg/kg. All unspiked analytes are certified at <250 µg/kg.

Aldicarb sulfone	Diuron	Oxamyl
Aldicarb sulfoxide	3-Hydroxycarbofuran	Promecarb
Carbaryl	Methiocarb	Propham
Carbofuran	Methomyl	Propoxur
Dioxacarb		

Organophosphorus Pesticides (OPP) in Soil — 186004338

Two flame-sealed ampules, each with 30 g of soil are ready to analyze. Each standard includes Disulfoton at 5-500 µg/kg and at least 8 additional analytes, randomly selected from the list below, at 250-2,500 µg/kg. All unspiked analytes are certified at <250 µg/kg.

Azinophos-methyl (Guthion)	Dichlorvos (DDVP)	Phorate
Chlorpyrifos	Disulfoton	Ronnel
Demeton O & S	Ethyl Parathion (Parathion)	Stirophos (tetrachlorovinphos)
Diazinon	Malathion	Terbufos
	Methyl Parathion	

Herbicides in Soil CRMs

Chlorinated Acid Herbicides in Soil — 186004318

Two flame-sealed ampules, each with 30 g of soil are ready to analyze. Each standard includes 2,4-D, Dicamba, 4-Nitrophenol, Pentachlorophenol, 2,4,5-T, and 2,4,5-TP (Silvex) at 5-10,000 µg/kg and at least 6 additional analytes, randomly selected from the list shown below at 250-2,500 µg/kg. All unspiked analytes are certified at <250 µg/kg.

Acifluorfen	Dalapon	MCPP
Bentazon	Dicamba	4-Nitrophenol
Chloramben	3,5-Dichlorobenzoic acid	Pentachlorophenol
2,4-D	Dichlorprop	Picloram
2,4-DB	Dinoseb	2,4,5-T
Dacthal diacid (DCPA)	MCPA	2,4,5-TP (Silvex)

PCBs in Soil CRMs

PCBs in Soil — 186004321

One screw-top bottle containing 50 g of sample is ready to analyze. Each standard includes a different Aroclor, randomly selected from the list below, at 500-50,000 µg/kg.

Aroclor 1016	Aroclor 1242	Aroclor 1254
Aroclor 1221	Aroclor 1248	Aroclor 1260
Aroclor 1232		

PCBs in Soil/Oil/Water CRM

ERA PCBs in Soil/Oil/Water CRM standards provide you the simplest and most reliable way to verify the accuracy of your PCB analyses including extraction, clean-up, and calibration. Over the past 15 years, ERA has refined the selection and preparation of our substrates to ensure consistent extraction and analyte recovery. Use these "known" CRM standards any time to compare your results against ERA's certified values and acceptance limits.

Soil

PCBs in Soil

PCBs in Soil standards are sold individually in screw-top bottles containing 50 g of soil. Low level standards contain an Aroclor in the range 0.5-50 ppm. High level standards contain an Aroclor in the range 51-500 ppm.

Part No.	Concentration	Aroclor
186004307	Low	1242
186004308	High	1242
186004313	Low	1248
186004314	High	1248
186004309	Low	1254
186004310	High	1254
186004311	Low	1260
186004312	High	1260

Oil

PCBs in Oil

PCBs in Oil standards are sold individually in ready-to-use flame-sealed ampules with 5 g of oil. Low level standards contain an Aroclor in the range 10-50 ppm. High level standards contain an Aroclor in the range 51-500 ppm.

Part No.	Concentration	Aroclor
186004327	Low	1242
186004328	High	1242
186004333	Low	1248
186004334	High	1248
186004329	Low	1254
186004330	High	1254
186004331	Low	1260
186004332	High	1260

Water

PCBs in Water

PCBs in Water standards are sold individually in 2 mL flame-sealed ampules that yield 1 liter after dilution. Each standard contains an Aroclor at 1-15 µg/L after dilution.

Part No.	Aroclor
186004402	1016
186004403	1221
186004404	1232
186004405	1242
186004406	1248
186004407	1254
186004408	1260

Hydrocarbon Fuels in Water/Soil CRM

4
UNIQUE LOTS AVAILABLE PER YEAR

ERA Hydrocarbon Fuels in Water and Soil CRM standards provide you the simplest and most reliable way to verify your GC/FID hydrocarbon analyses. See the following pages for state-specific UST standards. Use these "known" CRM standards any time to compare your results against ERA's certified values and acceptance limits. Our acceptance limits are derived from over two million data points. They will let you know with absolute confidence whether your analytical performance is where you need it to be.

Hydrocarbon Fuels in Water CRMs

BTEX & MTBE in Water	186004399

One 2 mL flame-sealed ampule yields in excess of 200 mL after dilution.
Each standard includes all analytes below at 7-300 µg/L after dilution.

Benzene	Methyl tert-butyl ether (MTBE)	Xylenes, total
Ethylbenzene	Toluene	

Gasoline Range Organics (GRO) in Water	186004400

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Use with purge & trap methods. Contains unleaded regular gasoline at 200-4,000 µg/L after dilution. Also certified for all BTEX compounds.

Diesel Range Organics (DRO) in Water	186004401

One 2 mL flame-sealed ampule yields up to 2 liters after dilution.
Contains No. 2 Diesel. DRO is at 500-4,000 µg/L after dilution.

Designed for GC/FID hydrocarbon methods!

Hydrocarbon Fuels in Water CRM Set

Includes the BTEX & MTBE (186004399), GRO (186004400), and DRO (186004401) in Water CRM standards.

Set Purchase	186004385

Hydrocarbon Fuels in Soil CRM Set

Includes the BTEX & MTBE (186004324), GRO (186004325), and DRO (186004326) in Soil CRM standards.

Set Purchase	186004306

Designed for GC/FID Hydrocarbon methods!

Hydrocarbon Fuels in Soil CRMs

BTEX & MTBE in Soil	186004324

Includes one 2 mL flame-sealed ampule with all analytes below to be spiked onto 10 g of provided soil matrix. All analytes are at 7-500 µg/kg after spiking onto the soil.

Benzene	Methyl tert-butyl ether (MTBE)	Xylenes, total
Ethylbenzene	Toluene	

Gasoline Range Organics (GRO) in Soil	186004325

One flame-sealed ampule with 20 g of soil spiked with unleaded regular gasoline at 100-2,000 mg/kg. Use with purge & trap methods. Also certified for all BTEX compounds.

Diesel Range Organics (DRO) in Soil	186004326

One flame-sealed ampule with 20 g of soil spiked with No. 2 Diesel fuel at 100-5,000 mg/kg.

Total Petroleum Hydrocarbons in Water/Soil CRM

4
UNIQUE LOTS AVAILABLE PER YEAR

For both TPH in Water and Soil, standard #1 contains TPH only and standard #2 contains TPH plus interfering fatty acids. These standards are designed specifically to evaluate both your clean-up and analysis techniques and to work with all IR and gravimetric TPH methods.

TPH in Water CRMs

Total Petroleum Hydrocarbons (TPH) in Water # 1	186004363
One liter Whole-Volume bottle is ready to analyze for TPH in water without interfering fatty acids. TPH ..... 20-170 mg/L	
Total Petroleum Hydrocarbons (TPH) in Water # 2	186004364
One liter Whole-Volume bottle is ready to analyze for TPH in water in the presence of interfering fatty acids. TPH ..... 20-170 mg/L	

TPH in Water CRM Set

Includes the TPH # 1 (186004363) and TPH # 2 (186004364) in Water CRM standards.

Set Purchase	186004287

Designed to work with all IR and gravimetric TPH methods!

TPH in Soil CRMs

Total Petroleum Hydrocarbons (TPH) in Soil #1	186004297
One screw-top bottle contains 50 g of soil that contains total petroleum hydrocarbons without interfering fatty acids. TPH is present in the range of 250-3,000 mg/kg.	
Total Petroleum Hydrocarbons (TPH) in Soil #2	186004298
One screw-top bottle contains 50 g of soil with total petroleum hydrocarbons in the presence of interfering fatty acids. TPH is present in the range of 250-3,000 mg/kg.	

TPH in Soil CRM Set

Includes the TPH # 1 (186004297) and TPH # 2 (186004298) in Soil CRM standards.

Set Purchase	186004286

Air & Emissions CRM

Volatiles Standards

Volatiles in Gas Cylinder 186004508

One pressurized gas cylinder for use with EPA Methods TO-14 and TO-15.
Contains at least 10 analytes, randomly selected from the list below, at 1-25 ppb.

- Benzene
- Bromodichloromethane
- Bromoform
- Bromomethane
- 2-Butanone (MEK)
- tert-Butyl methyl ether (MTBE)
- Carbon tetrachloride
- Chlorobenzene
- Chlorodibromomethane
- Chloroethane
- Chloroform
- Chloromethane
- Cyclohexane
- 1,2-Dibromoethane (EDB)
- 1,2-Dichlorobenzene
- 1,4-Dichlorobenzene
- Dichlorodifluoromethane (Freon 12)
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethylene
- cis-1,2-Dichloroethylene
- 1,2-Dichloropropane
- cis-1,3-Dichloropropylene
- trans-1,3-Dichloropropylene
- 1,2-Dichlorotetrafluoroethane (Freon 114)
- Ethylbenzene
- p-Ethyltoluene
- n-Heptane
- Hexachlorobutadiene
- n-Hexane
- 2-Hexanone
- 4-Methyl-2-pentanone (MIBK)
- Propylene
- 1,1,1,2-Tetrachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethylene
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichlorotrifluoromethane (Freon 11)
- Trichlorofluoromethane (Freon 113)
- 1,2,4-Trimethylbenzene
- 1,3,5-Trimethylbenzene
- Vinyl bromide
- Vinyl chloride
- Xylenes, total

Volatiles on Sorbent 186004509

One 2 mL flame-sealed ampule for spiking client-specific sorbent. Use with EPA Methods TO-17, 0030, and 0031. Contains at least 24 analytes, randomly selected from the list below, at 50-2,000 ng/sample (200-3,000 ng/sample for Total Xylenes) after preparation.

- Acetone
- Acetonitrile
- Acrolein
- Acrylonitrile
- Benzene
- Bromodichloromethane
- Bromoform
- Bromomethane
- 2-Butanone (MEK)
- tert-Butyl methyl ether (MTBE)
- Carbon disulfide
- Carbon tetrachloride
- Chlorobenzene
- Chlorodibromomethane
- Chloroethane
- 2-Chloroethylvinylether
- Chloroform
- Chloromethane
- 1,2-Dibromo-3-chloropropane (DBCP)
- 1,2-Dibromoethane (EDB)
- Dibromomethane
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- Dichlorodifluoromethane (Freon 12)
- 1,1-Dichloroethane
- 1,2-Dichloroethane
- 1,1-Dichloroethene
- cis-1,2-Dichloroethene
- trans-1,2-Dichloroethene
- 1,2-Dichloropropane
- cis-1,3-Dichloropropene
- trans-1,3-Dichloropropene
- Ethylbenzene
- Hexachlorobutadiene
- 2-Hexanone
- Methylene Chloride
- 4-Methyl-2-pentanone (MIBK)
- Naphthalene
- Styrene
- 1,1,1,2-Tetrachloroethane
- 1,1,2,2-Tetrachloroethane
- Tetrachloroethene
- Toluene
- 1,2,4-Trichlorobenzene
- 1,1,1-Trichloroethane
- 1,1,2-Trichloroethane
- Trichloroethlyene
- Trichlorofluoromethane
- 1,2,3-Trichloropropane
- Vinyl acetate
- Vinyl chloride
- Xylenes, total

Semivolatiles Standards

Semivolatiles on PUF 186004510

Two 2 mL flame-sealed ampules plus one polyurethane foam (PUF). Use with EPA Method 0010. Contains at least 42 analytes, randomly selected from the list below, at 10-225 µg/sample (200-1,000 µg/sample for Benzidine) after preparation.

- Acenaphthene
- Acenaphthylene
- Aniline
- Anthracene
- Benzidine
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(a)pyrene
- Benzyl alcohol
- 4-Bromophenyl-phenylether
- Butylbenzylphthalate
- Carbazole
- 4-Chloroaniline
- Bis(2-chloroethoxy) methane
- Bis(2-chloroethyl)ether
- Bis(2-chloroisopropyl) ether
- Bis(2-ethylhexyl) phthalate
- 1-Chloronaphthalene
- 2-Chloronaphthalene
- 4-Chlorophenyl-phenylether
- Chrysene
- Dibenz(a,h)anthracene
- Dibenzofuran
- Di-n-butylphthalate
- 1,2-Dichlorobenzene
- 1,3-Dichlorobenzene
- 1,4-Dichlorobenzene
- 3,3'-Dichlorobenzidine
- Diethyl phthalate
- Dimethyl phthalate
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- Di-n-octylphthalate
- Fluoranthene
- Fluorene
- Hexachlorobenzene
- Hexachlorobutadiene
- Hexachlorocyclo-pentadiene
- Hexachloroethane
- Indeno(1,2,3-cd)pyrene
- Isophorone
- 2-Methylnaphthalene
- Naphthalene
- 2-Nitroaniline
- 3-Nitroaniline
- 4-Nitroaniline
- Nitrobenzene
- N-Nitrosodiethylamine
- N-Nitrosodimethylamine (NDMA)
- N-Nitrosodiphenylamine
- N-Nitroso-di-n-propylamine
- Pentachlorobenzene
- Phenanthrene
- Pyrene
- Pyridine
- o-Toluidine
- 1,2,4,5-Tetrachlorobenzene
- 1,2,4-Trichlorobenzene
- Benzoic Acid
- 4-Chloro-3-methylphenol
- 2-Chlorophenol
- 2,4-Dichlorophenol
- 2,6-Dichlorophenol
- 2,4-Dimethylphenol
- 2,4-Dinitrophenol
- 2-Methyl-4,6-dinitrophenol
- 2-Methylphenol (o-Cresol)
- 4-Methylphenol (p-Cresol)
- 2-Nitrophenol
- 4-Nitrophenol
- Pentachlorophenol
- Phenol
- 2,3,4,6-Tetrachlorophenol
- 2,4,5-Trichlorophenol
- 2,4,6-Trichlorophenol

PCBs on PUF 186004512

One 2 mL flame-sealed ampule plus one polyurethane foam (PUF). Use with EPA Methods TO-04A and TO-10A. Contains one Aroclor, randomly selected from the list below, at 1-15 µg/sample after preparation.

- Aroclor 1016
- Aroclor 1221
- Aroclor 1232
- Aroclor 1242
- Aroclor 1248
- Aroclor 1254
- Aroclor 1260

Organochlorine Pesticides on PUF 186004511

One 2 mL flame-sealed ampule plus one polyurethane foam (PUF). Use with EPA Methods TO-04A and TO-10A. Contains at least 16 analytes, randomly selected from the list below, at 0.5-20 µg/sample after preparation.

- aldrin
- Alpha-BHC
- beta-BHC
- delta-BHC
- gamma-BHC (Lindane)
- alpha-Chlordane
- gamma-Chlordane
- 4,4'-DDD
- 4,4'-DDE
- 4,4'-DDT
- Dieldrin
- Endosulfan I
- Endosulfan II
- Endosulfan sulfate
- Endrin
- Endrin aldehyde
- Endrin ketone
- Heptachlor
- Heptachlor Epoxide (beta)
- Methoxychlor

PAHs on PUF 186004513

One 2 mL flame-sealed ampule plus one polyurethane foam (PUF). Use with EPA Method TO-13A. Contains at least 13 analytes, randomly selected from the list below, at 10-200 µg/sample after preparation.

- Acenaphthene
- Acenaphthylene
- Anthracene
- Benzo(a)anthracene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- Benzo(g,h,i)perylene
- Benzo(a)pyrene
- Chrysene
- Dibenz(a,h)anthracene
- Fluoranthene
- Fluorene
- Indeno(1,2,3-cd)pyrene
- Naphthalene
- Phenanthrene
- Pyrene

Aldehydes & Ketones on Sorbent 186004514

One 2 mL flame-sealed ampule to be spiked onto Sorbent. Use with EPA method TO-11A. Contains at least 4 analytes, randomly selected from the list below, at 0.5-10 µg/sample after preparation.

- Acetaldehyde
- Acetone
- Benzaldehyde
- Butyraldehyde (butanal)
- Crotonaldehyde
- 2,5-Dimethylbenzaldehyde
- Formaldehyde
- Hexaldehyde (hexanal)
- Isovaleraldehyde
- Methyl Ethyl Ketone
- Propionaldehyde (propanal)
- o-Tolualdehyde
- m-Tolualdehyde
- p-Tolualdehyde
- Valeraldehyde (pentanal)

Air & Emissions CRM

Metals Standards

Metals on Filter Paper 186004515

One filter paper sample ready for use with EPA method 29.
Contains the metals listed below at 30-1,200 µg/filter.

Antimony	Cobalt	Phosphorus
Arsenic	Copper	Selenium
Barium	Lead	Silver
Beryllium	Manganese	Thallium
Cadmium	Nickel	Zinc
Chromium		

Metals in Impinger Solution 186004516

One impinger solution sample for use with EPA method 29.
Contains the metals listed below at 0.1-10 µg/mL after dilution.

Antimony	Cobalt	Phosphorus
Arsenic	Copper	Selenium
Barium	Lead	Silver
Beryllium	Manganese	Thallium
Cadmium	Nickel	Zinc
Chromium		

Mercury on Filter Paper 186004517

One filter paper sample ready for use with EPA method 29.
Contains Mercury at 0.3-9 µg/filter.

Mercury in Impinger Solution 186004518

One impinger solution sample for use with EPA methods 29 and 101a.
Contains Mercury at 1-30 ng/mL after dilution.

Lead on Filter Paper 186004519

One filter paper sample ready for use with EPA method 12.
Contains Lead at 25-750 µg/filter.

Lead in Impinger Solution 186004520

One impinger solution sample for use with EPA method 12.
Contains Lead at 0.1-3 µg/mL after dilution.

Chromium on Filter Paper 186004521

One filter paper sample for use with CARB method 425.
Contains Total and Hexavalent Chromium each at 1-20 µg/filter.

Hexavalent Chromium in Impinger Solution 186004522

One impinger solution sample for use with EPA method 0061/7199.
Contains Hexavalent Chromium at 45-880 µg/L after dilution.

Inorganic Standards

Hydrogen Halides & Halogens in Impinger Solution 186004523

Two impinger solution samples for use with EPA Methods 26 and 26a. Contains Total Halides and Total Halogens each at 5-100 mg/L after dilution.

Fluoride in Impinger Solution 186004524

One impinger solution sample for use with EPA Methods 13a, 13b and 14.
Contains Fluoride at 1-50 µg/mL after dilution.

Nitrogen Oxide in Impinger Solution 186004525

One impinger solution sample for use with EPA Method 7.
Contains Nitrogen Oxide at 2-400 mg/dscm after dilution.

Sulfur Dioxide in Impinger Solution 186004526

One impinger solution sample for use with EPA Method 6.
Contains Sulfur Dioxide at 200-2,400 mg/dscm after dilution.

Sulfuric Acid & Sulfur Dioxide in Impinger Solution 186004527

One impinger solution sample for use with EPA Method 8.
Contains Sulfuric Acid and Sulfur Dioxide each at 1-120 mg/dscm after dilution.

Ammonia in Impinger Solution 186004528

One impinger solution sample for use with EPA CTM 027.
Contains Ammonium at 0.1-10 mg/L after dilution.

Particulate Matter on Filter Paper 186004529

One filter paper sample ready for use with EPA Methods 5, 5A, 5B, 5D, and 5F.
Contains Particulate Matter at 50-600 mg/filter.

Particulate Matter in Impinger Solution 186004530

One impinger solution sample ready for use with EPA Methods 5, 5A, 5B, 5D, and 5F.
Contains Particulate Matter at 140-675 mg/L.

Waters Autosampler Vials

LCGC and LCMS certified vials are now available

Waters is a leading manufacturer of analytical instrumentation and consumable products. We understand the importance of autosampler vials for the performance of analytical instrumentation. There are many factors to consider in selecting the proper vial:

- Needle design
- Autosampler tray design
- Chemical compatibility
- Cleanliness
- Optic and robotic specifications
- Volatility
- Sample volume

At Waters, we take all of these factors into consideration in the design, manufacture, and delivery of our vials and accessories. Unlike our competition, who offer Type I, 33-expansion glass in North America and Type I, 51-expansion glass in Europe or Japan, Waters single-source manufacturing produces Type I, 33-expansion glass, the lowest free-ion glass available, for worldwide distribution.

Waters LCGC Certified Vials

Vials are usually manufactured by glass artisans and engineers who don't understand the requirements for their use in HPLC and GC. As a manufacturer of autosamplers and chemistry consumables, we understand the dimensional and chemical requirements of vials. We reviewed the manufacturing process, anticipated possible problem areas, and developed tests to ensure the delivery of a problem-free product. The HPLC test to ensure the delivery of residue clean vials is a radically different form of test for the vials industry.

Waters LCMS Certified Vials

In 2006, we added Waters LCMS certified vials to the product line. This is a continuation of our approach to offer a product suitable for the demands of LCMS. We took an unbiased approach in developing this product, looking for any ionized masses regardless of the source. The vials are tested by MS with specifications for total ion count and presence of clusters in the high mass range. The product introduced is cleaner than any product we tested from vendors around the globe.

Literature References

Sample Vials & Accessories Brochure, Literature Reference 720001818EN

Waters LCMS Certified Sample Vials Whitepaper, Literature Reference 720001517EN

Determination of the Level of Ion Suppression from LCMS Vials, Literature Reference WA60004

Waters Certified Sample Vials Technical Whitepaper, Literature Reference 720001303EN

Choosing the Right Vial and Septum for Your Application

There are three decisions you need to make when choosing the correct vial for your application: the septum, the closure and the vial itself. Read through the selection options below to determine the proper combination for your application. For your convenience, Waters offers many of these choices as combination packs. The vial, cap and septum come pre-packaged as packs of 100 for ease and convenience in ordering.

Septa Selection Guide

PTFE

- Recommended for single injection applications
- Ideal for use in MS applications
- Excellent solvent resistance and chemical compatibility
- Does not reseal upon puncturing
- Not recommended for long-term sample storage

PTFE/Silicone

- Recommended for multiple injections and sample storage
- Demonstrates excellent resealing characteristics
- PTFE chemical resistance until punctured, then the septum will have the chemical compatibility of silicone
- Working temperature range from –40 °C to 200 °C
  Pre-slit PTFE/Silicone
- Provides adequate venting to prevent vacuum formation in sample vial, delivering excellent sample-draw reproducibility
- Eliminates coring from bottom draw-port needles
- Good resealing capabilities
- Recommended for multiple injections
- PTFE chemical resistance until punctured, then the septum will have the chemical compatibility of silicone
- Working temperature range from –40 °C to 200 °C

PE Septumless

- Same advantages as PTFE

Vial Closures Guide

Vials are available in three closure types: crimp, snap and screw cap. Each closure has its advantages and disadvantages.

Crimp Caps squeeze the septum between the rim of the glass vial and the crimped aluminum cap. This forms an excellent seal preventing evaporation. The septum stays seated during piercing by the autosampler needle. The crimp cap vial requires crimping tools to carry out the sealing process. For few samples, manual crimper tools are the best choice. For large numbers of sample, automated crimpers are available.

Snap Caps are an extension of the crimp cap system of sealing. A plastic cap is stretched over the rim of the vial to form a seal by squeezing the septum between the glass and the stretched plastic cap. The plastic cap creates tension when trying to return to its original size. This tension forms the seal between glass, cap and septum. Plastic snap caps do not require any tools to assemble.

Snap caps are not as effective a seal as other closures.

- If the fit of the cap is very tight, the cap is hard to apply and may be subject to crack.
- If the fit is too loose, the seal is poor and the septum may dislodge.

Screw Cap vials are universal. Screwing the cap applies a mechanical force that squeezes the septum between the glass rim and the cap. Screw caps form an excellent seal and mechanically hold the septum in place during piercing. No tools are required for assembly.

LectraBond™ Screw Caps are available through Waters. This screw cap has a PTFE/Silicone septum bonded to the polypropylene cap, using a non-solvent bonding process. This bonding technology is designed to keep the septum/cap together during shipment and assembly onto vials. The bond will aid in preventing dislodging of the septum during use, but the primary sealing mechanism is the mechanical force applied by tightening the cap to the vial.

Cap tightening is the mechanism that forms the seal and holds the septum in place during needle insertion. There is no need to over-tighten the cap, as it can compromise the seal and lead to dislodging. The septum starts to cup or indent when you begin to over-tighten.

Cap Design	Strength Design	Comment
Crimp	Excellent seal	Requires tools
Snap	Moderate seal	Fast, no tools, some cap cracking
Screw	Excellent seal	Universal

Vial Selection Guide

Type 1, 33-Expansion Borosilicate Glass

The most chemically-inert glass available, generally used in high precision laboratories to prevent alteration of test results. It has an expansion coefficient of approximately 33x10–7 °C and is composed primarily of silicon and oxygen, with trace amounts of boron and sodium.

Type 1, 51-Expansion Glass

More alkaline than 33-expansion glass and is adequate for many laboratory uses. It has an expansion coefficient of 51x10–7 °C and is composed primarily of silicon and oxygen, with trace amounts of boron. All amber glassware is 51-expansion glass.

Deactivated Glass (DV)

For glass-sensitive compounds, glass vials are treated with gas phase reactive organosilane to produce a hydrophobic glass surface. Vials treated by this procedure can be stored indefinitely.

Polypropylene Plastic

Polypropylene is a non-reactive plastic and can be used where glass is not an appropriate option. Polypropylene vials can be incinerated while still sealed, minimizing exposure to potentially hazardous substances. The maximum temperature use is: 135 °C.

Deactivated Glass Vials (DV) and Inserts:

Eliminates adsorbtion of compounds onto the glass surface when working with biological or pharmaceutical compounds, natural products, pesticides and herbicides. The surface modification is permanent, resulting in an indefinite shelf life.

Waters Alliance Total Recovery Vial:

Specifically designed for the side draw-port needle and the factory needle draw depth settings of the Waters Alliance 2690/2695 HPLC. This vial delivers maximum sample capacity (~1 mL) with minimum residual volume (~9 µL).

Waters Maximum Recovery Vial:

Specifically designed for the bottom draw-port needle of the Waters ACQUITY UPLC and Alliance HT HPLC Systems. This vial delivers maximum sample capacity (~1.5 mL) with minimum residual volume. The 9 mm cap makes it ideal for use with Agilent HPLC and GC Systems.

Screw Cap 12 x 32 mm Vials for Alliance Systems

	Clear	Amber	Max Recovery	750 µL PP	300 µL PP	10 mm Cap Clear	Total Recovery	Amber Max
	7	8	9	10	11	12	13	14
LCMS Certified Combination Packs								
Vial, Cap and Silicone/PTFE Septum	600000751CV	600000752CV	600000749CV				600000750CV	600000754CV
Vial, Cap and Pre-slit Silicone/PTFE Septum	600000668CV	600000669CV	600000670CV				600000671CV	600000755CV
LCGC Certified Combination Packs								
Bonded Silicone/PTFE Septum	186000272C	186000846C	186000326C	186002635[3]	186002640[3]	WAT270946C[2]	186000384C	186003885C
Combo Deactivated	186000272DV	186000846DV	186000326DV			WAT270946DV[2]	186000384DV	
Bonded Pre-slit Silicone/PTFE Septum	186000307C	186000847C	186000327C	186002636[3]	186002639[3]		186000385C	186003886C
Combo Deactivated	186000307DV	186000847DV	186000327DV				186000385DV	
NEW Combo with PE Septum-less Cap	186004132C	186004133C	186004168C	186004113	186004112		186004167C	
Vials Only								
Vials Only	186000273	186000848	186002802	186002634	186002626	WAT063300	186002805	
Deactivated Vials Only	186000273DV	186000848DV				WAT063300DV		
Injectable Volumes Alliance 2690/2695								
Max	1100 µL	1100 µL		400 µL	280 µL	1100 µL	950 µL	
Residual	750 µL	750 µL		300 µL	20 µL	750 µL	9 µL	
Injectable Volumes Alliance 2790/2795								
Max	1700 µL	1700 µL	1500 µL	530 µL	290 µL	1700 µL		1500 µL
Residual	170 µL	170 µL	22 µL	170 µL	10 µL	170 µL		22 µL
Inserts								
300 µL with Poly Spring	WAT094170(DV)[1]	WAT094170 (DV)[1]				WAT094170 (DV)[1]		
Max Volume Injection/Max Residual Volume	230 µL / 20 µL	230 µL / 20 µL				230 µL / 20 µL		
150 µL with Poly Spring	WAT094171 (DV)[1]	WAT094171 (DV)[1]				WAT094171 (DV)[1]		
Max Volume Injection/Max Residual Volume	144 µL / 6 µL	144 µL / 6 µL				144 µL / 6 µL		
Cap and Septum								
NEW PE Septumless Caps	186004169	186004169	186004169	186004169	186004169		186004169	186004169
Cap Black						WAT058875		
Septa Silicone/PTFE						WAT058874		
Screw Cap and Septum – Silicone/PTFE								
PE Septum-less Cap	186004169	186004169	186004169	186004169	186004169		186004169	
Blue LectraBond™	186000274	186000274	186000274	186000274	186000274		186000274	
Red LectraBond	186002129	186002129	186002129	186002129	186002129		186002129	
Green LectraBond	186002130	186002130	186002130	186002130	186002130		186002130	
White LectraBond	186002456	186002456	186002456	186002456	186002456		186002456	
Screw Cap and Pre-slit Septum – Silicone/PTFE								
Blue LectraBond	186000305	186000305	186000305	186000305	186000305		186000305	
Red LectraBond	186002128	186002128	186002128	186002128	186002128		186002128	
Green LectraBond	186002127	186002127	186002127	186002127	186002127		186002127	
White LectraBond	186002457	186002457	186002457	186002457	186002457		186002457	
For Dissolution System								
Pre-assembled Vial, Cap and Pre-slit Septum	186000989(DV)[1]	186003455						

Compatible Systems								
Alliance® 2690/2695	•	•		•	•	•	•	
Alliance 2790/2795	•	•	•	•	•	•		•

All items come in quantities of 100 unless otherwise noted.

[1] When (DV) appears beside the part number, a deactivated version of this product can be ordered by adding DV to the right of the part number. [2] Septum not bonded. [3] Vials not certified.

Snap Cap 12 x 32 mm Vials for Alliance Systems

	Clear Glass	Amber	Max Recovery	PP 750 µL	PP 300 µL	Clear Glass Crimp	Amber Crimp	Total Recovery
								
	15	16	17	18	19	20	21	22
Combination Packs								
Vial, Cap and Silicone/PTFE Septum				186002638	186002642			186000234(DV)[1]
Vial, Cap and Pre-slit Silicone/PTFE Septum				186002637	186002641			
Vials								
Vials Only	WAT094219	WAT094220	186000984	186002627	186002628	WAT094222	WAT094223	186000302
Deactivated Vials Only	WAT094219DV	WAT094220DV	186000984DV			WAT094222DV	WAT094223DV	186000302DV
Injectable Volumes Alliance 2690/2695								
Max	1100 µL	1100 µL		400 µL	280 µL	1100 µL	1100 µL	950 µL
Residual	750 µL	750 µL		300 µL	20 µL	750 µL	750 µL	9 µL
Injectable Volumes Alliance 2790/2795								
Max	1700 µL	1700 µL	1500 µL	530 µL	290 µL	1700 µL	1700 µL	
Residual	170 µL	170 µL	22 µL	170 µL	10 µL	170 µL	170 µL	
Inserts								
300 µL with Poly Spring	WAT094170(DV)[1]	WAT094170 (DV)[1]				WAT094170 (DV)[1]	WAT094170 (DV)[1]	
Max Volume Injection/Max Residual Volume	230 µL / 20 µL	230 µL / 20 µL				230 µL / 20 µL	230 µL / 20 µL	
150 µL with Poly Spring	WAT094171 (DV)[1]	WAT094171 (DV)[1]				WAT094171 (DV)[1]	WAT094171 (DV)[1]	
Max Volume Injection/Max Residual Volume	144 µL / 6 µL	144 µL / 6 µL				144 µL / 6 µL	144 µL / 6 µL	
Snap Cap and Septum – Silicone/PTFE								
Blue	186000303	186000303	186000303	186000303	186000303			186000303
Black	186002649	186002649	186002649	186002649	186002649			186002649
Red	186002650	186002650	186002650	186002650	186002650			186002650
Snap Cap and Pre-slit Septum – Silicone/PTFE								
Blue	186000304	186000304	186000304	186000304	186000304			186000304
Black	186002648	186002648	186002648	186002648	186002648			186002648
Red	186002647	186002647	186002647	186002647	186002647			186002647
Snap Cap and PTFE Septum								
Blue	186000328	186000328	186000328	186000328	186000328			186000328
Black	186002645	186002645	186002645	186002645	186002645			186002645
Red	186002646	186002646	186002646	186002646	186002646			186002646
Crimp Cap								
Crimp Cap Silicone/PTFE Septum						PSL404219	PSL404219	
Crimp Cap PTFE/Silicone/PTFE Septum						PSL404231	PSL404231	
Crimper						PSL904301	PSL904301	

Compatible Systems								
Alliance 2690/2695	•	•		•	•	•	•	•
Alliance 2790/2795	•	•	•	•	•	•	•	

All items come in quantities of 100 unless otherwise noted.

[1] When (DV) appears beside the part number, a deactivated version of this product can be ordered by adding DV to the right of the part number.

Screw Cap 12 x 32 mm Vials for Compatible Systems

	Clear	Amber	Amber Max Recovery	Clear Glass Max Recovery	Qsert Vial	Amber Qsert	PP 750 µL	PP 300 µL	10 mm Cap	PP 250 µL 8 mm Cap
	34	35	36	37	38	39	40	41	42	43
LCMS Certified Combination Packs										
Vial, Cap and Silicone/PTFE Septum	600000751CV	600000752CV	600000754CV	600000749CV						
Vial, Cap and Pre-slit Silicone/PTFE Septum	600000668CV	600000669CV	600000755CV	600000670CV						
LCGC Certified Combination Packs										
Bonded Silicone/PTFE Septum	186000272C	186000846C	186003885C	186000326C	186001126C	186001130C			WAT270946C[2]	
Combo Deactivated	186000272DV	186000846DV		186000326DV	186001126DV	186001130DV			WAT270946DV[2]	
Bonded Pre-slit Silicone/PTFE Septum	186000307C	186000847C	186003886C	186000327C	186001128C	186001131C				
Combo Deactivated	186000307DV	186000847DV		186000327DV	186001128DV	186001131DV				
LCGC Combination Packs										
Bonded Silicone/PTFE Septum							186002635	186002640		
Bonded Pre-slit Silicone/PTFE Septum							186002636	186002639		
Vials Only										
Vials Only	186000273	186000848		186002802	186002804	186002803	186002634	186002626	WAT063300	WAT094172
Deactivated Vials Only	186000273DV	186000848DV							WAT063300DV	
Inserts										
300 µL with Poly Spring	WAT094170	WAT094170							WAT094170	
300 µL with Poly Spring Deactivated	WAT094170DV	WAT094170DV							WAT094170DV	
150 µL with Poly Spring	WAT094171	WAT094171							WAT094171	
150 µL with Poly Spring Deactivated	WAT094171DV	WAT094171DV							WAT094171DV	
Cap and Septum										
NEW PE Septumless Caps	186004169	186004169	186004169	186004169	186004169	186004169	186004169	186004169		
Black Cap									WAT058875	WAT210684
Silicone/PTFE Septum										WAT094174
Septum PTFE/Silicone 8 mm Pre-slit										WAT058876
Septum Silicone/PTFE 1.4 mm									WAT058874	WAT210685
Septum PTFE 8 mm										WAT058886
Screw Cap and Septum – Silicone/PTFE										
Blue LectraBond	186000274	186000274		186000274	186000274	186000274	186000274	186000274		
Red LectraBond	186002129	186002129		186002129	186002129	186002129	186002129	186002129		
Green LectraBond	186002130	186002130		186002130	186002130	186002130	186002130	186002130		
Screw Cap and Pre-slit Septum – Silicone/PTFE										
Blue LectraBond	186000305	186000305		186000305	186000305	186000305	186000305	186000305		
Red LectraBond	186002128	186002128		186002128	186002128	186002128	186002128	186002128		
Green LectraBond	186002127	186002127		186002127	186002127	186002127	186002127	186002127		

Compatible Systems										
Agilent Technologies	•	•		•	•	•	•	•		
Alcott, Antek, CTC, Spark, Thermal Separations									•	•
Beckman, Dynatech, Finnigan, Fisons, Gilson	•	•		•	•	•	•	•		
Hitachi, LDC, Perkin-Elmer, Shimadzu, Spectra-Physics, Thermo, Varian	•	•		•	•	•	•	•	•	•

All items come in quantities of 100 unless otherwise noted.

[2] Septum not bonded.

Snap and Crimp Cap 12 x 32 mm (9 mm Cap) Vials for Compatible Systems

	Clear	Amber	Max Recovery	Qsert Vial	PP 750 µL	PP 300 µL	Clear Crimp	Amber Crimp
								
	44	45	46	47	48	49	50	51
Combination Packs								
Vial, Cap and Silicone/PTFE Septum				186001124(DV)[1]	186002638	186002642		
Vial, Cap and Pre-Slit Silicone/PTFE Septum				186001125(DV)[1]	186002637	186002641		
Vial, Cap and PTFE Septum				186001127(DV)[1]				
Vials Only								
Vials Only	WAT094219	WAT094220	186000984		186002627	186002628	WAT094222	WAT094223
Deactivated Vials Only	WAT094219DV	WAT094220DV	186000984DV				WAT094222DV	WAT094223DV
Inserts								
300 µL with Poly Spring	WAT094170(DV)[1]	WAT094170(DV)[1]					WAT094170(DV)[1]	WAT094170(DV)[1]
150 µL with Poly Spring	WAT094171(DV)[1]	WAT094171(DV)[1]					WAT094171(DV)[1]	WAT094171(DV)[1]
Snap Cap and Septum – Silicone/PTFE								
Blue	186000303	186000303	186000303	186000303	186000303	186000303		
Black	186002649	186002649	186002649	186002649	186002649	186002649		
Red	186002650	186002650	186002650	186002650	186002650	186002650		
Snap Cap and Pre-slit Septum – Silicone/PTFE								
Blue	186000304	186000304	186000304	186000304	186000304	186000304		
Black	186002648	186002648	186002648	186002648	186002648	186002648		
Red	186002647	186002647	186002647	186002647	186002647	186002647		
Snap Cap and PTFE Septum								
Blue	186000328	186000328	186000328	186000328	186000328	186000328		
Black	186002645	186002645	186002645	186002645	186002645	186002645		
Red	186002646	186002646	186002646	186002646	186002646	186002646		
Crimp Cap								
Crimp Cap Silicone/PTFE Septum							PSL404219	PSL404219
Crimp Cap PTFE/Silicone/PTFE Septum							PSL404231	PSL404231
Crimper							PSL904301	PSL904301
Aluminum Crimp Cap 12 mm Rubber/Chlorobutyl/PTFE								
Aluminum Crimp Cap 12 mm Teflon 0.25 mm Thick								
PTFE Septum								

Compatible Systems								
Agilent Technologies, Beckman, Dynatech, Finnigan, Fisons, Gilson, Hitachi, LDC, Perkin-Elmer, Shimadzu, Spectra-Physics, Varian	•	•	•	•	•	•	•	•
CTC, Spark, Thermal Separations							•	•

All items come in quantities of 100 unless otherwise noted.

[1] When (DV) appears beside the part number, a deactivated version of this product can be ordered by adding DV to the right of the part number.

15 x 45 mm Vials for Compatible Systems

15 x 45 mm Vials and Accessories


4 mL Screw Neck
53


Amber Screw Neck
54


Total Recovery
55


PP Screw Neck Vial
56


PP Snap Cap
57


Glass Shell Vial
58


Amber Glass Shell Vial
59

Combination Pack							
Vial, Cap and LectraBond PTFE/Silicone Septum	186000838C	186001133C	186002629C				
Combo Deactivated	186000838DV	186001133DV					
Vial, Cap and LectraBond Pre-slit PTFE/Silicone Septum	186000839C	186001134C	186002630C				
Combo Deactivated	186000839DV	186001134DV					
Vial and PE Snap Cap					186004031	WAT025051	WAT025050
Components							
Vials Only	186000840	186001135	186002520	186000999[4]			
Deactivated Vials Only	186000840DV	186001135DV					
LectraBond Cap and Septum							
Black Cap PTFE/Silicone 100-Pack	186000841	186000841	186000841				
Screw Cap with Bonded PTFE/Silicone Septum 1000-Pack	186000965	186000965	186000965	186000965			
Black Cap Pre-slit PTFE/Silicone 100-Pack	186000842	186000842	186000842				
Caps, Septa, and Inserts							
Black Phenol Cap 144-Pack	WAT072711	WAT072711	WAT072711				
PTFE Septum 144-Pack	WAT073005	WAT073005	WAT073005				
PTFE Septum 144-Pack	WAT072714	WAT072714	WAT072714				
Self Sealing Septum 144-Pack	WAT022861	WAT022861	WAT022861				
250 µL Glass Insert	WAT072704	WAT072704	WAT072704				
250 µL Glass Insert Deactivated	WAT072704DV	WAT072704DV	WAT072704DV				
250 µL Glass Insert 144-Pack	WAT015199	WAT015199	WAT015199				
250 µL Glass Insert 144-Pack Deactivated	WAT015199DV	WAT015199DV	WAT015199DV				
250 µL Plastic Conical Insert (PMP) 144-Pack	WAT072030	WAT072030	WAT072030				
Springs for LVI 100-Pack	WAT072708	WAT072708	WAT072708				
250 µL PP Insert 100-Pack	186001729	186001729	186001729				

Compatible Systems							
Bruker, Kontron, Perkin-Elmer, Shimadzu, Tosoh, Unicam	•	•	•	•	•	•	•

GPC 2000 Vials


4 mL Screw Cap
60


10 mL Screw Neck
62

Components		
Vial	186000840	186001420
Black Screw Cap	600000162	186001421
PTFE Septum	WAT072714[6]	186001422
Aluminum Crimp Cap, Aluminum/PTFE/Silicone		

All items come in quantities of 100 unless otherwise noted.

[4] 1,000/pk

[6] 144/pk

Sep-Pak—The most referenced and widely used sample preparation technology

Sep-Pak® bonded silica devices are recognized throughout the world and remain the most referenced SPE products for GC/MS, HPLC, and LC/MS analysis.

Chemistries

- **Reversed phase (silica-based)**

  tC$_2$–bonded phase with low hydrophobic characteristics

  C$_8$–bonded phase with moderate hydrophobicity

  C$_{18}$–monofunctional bonded phase, a Waters original

  tC$_{18}$–tri-functional bonded phase with increased hydrolytic stability

- **Reversed or Normal phase (less polar alternatives to silica)**

  Amino Propyl (NH$_2$)–basic polar bonded phase

  Cyano Propyl (CN)–polar bonded phase

  Diol–neutral polar bonded phase

- **Normal phase**

  Silica–polar surface used to adsorb analytes from non-polar solvents

  Alumina (A, B & N)–acidic, basic and neutral high activity grades

  Florisil®–polar, highly active, weakly basic sorbent for adsorption of low to moderate polarity species from nonaqueous solutions

- **Ion exchange (silica-based)**

  Accell™ Plus QMA–hydrophilic strong anion-exchanger with large pore-size

  Accell Plus CM–hydrophilic weak cation-exchanger with large pore-size

- **Environmental Specialty**

  Porapak™ RDX–for analysis of explosives in ground and surface water, EPA-8330

  Sep-Pak Dry–anhydrous Na_2SO_4 for removal of residual water from SPE extracts

  DNPH-Silica–for air analysis of aldehydes and ketones, EPA-TO-11A, ASTM D-5791

  XPoSure™–for indoor air monitoring of aldehydes and ketones

  AC2–to concentrate pesticides and herbicides

  PS2–to concentrate pesticides and herbicides

  Carbon Black/Amino Propyl–for pesticides from food

Sep-Pak Cartridge Selection Guide

	Plus Short	Plus Long	Plus Light	Classic	Vac 1 cc 50 mg	Vac 1 cc 100 mg	Vac RC 100 mg
	Box of 50	Box of 50	Box of 50	Box of 50	Box of 100	Box of 100	Box of 50
Sorbent	Part No./ Mass/Volume*	Part No./ Mass/Volume*	Part No./ Mass/Volume*	Part No./ Mass/Volume*	Part No./ Volume*	Part No./ Volume*	Part No./ Volume*
C_{18}	WAT020515 360 mg 0.7 mL	WAT023635 820 mg 1.6 mL	WAT023501 130 mg 0.3 mL	WAT051910 360 mg 0.85 mL	WAT054955 0.13 mL	WAT023590 0.2 mL	WAT036935 0.2 mL
tC_{18}	WAT036810 400 mg 0.8 mL	WAT036800 900 mg 1.4 mL	WAT036805 145 mg 0.4 mL	—	WAT054960 0.11 mL	WAT036820 0.25 mL	WAT043410 0.25 mL
C_8	WAT036775 400 mg 0.8 mL	—	WAT036770 145 mg 0.4 mL	—	WAT054965 0.11 mL	WAT036785 0.25 mL	WAT043415 0.25 mL
tC_2	WAT052720 400 mg 0.8 mL	—	WAT052725 145 mg 0.4 mL	—	—	WAT052710 0.25 mL	—
Silica	—	WAT020520 690 mg 1.6 mL	WAT023537 120 mg 0.4 mL	WAT051900 690 mg 2.0 mL	WAT054980 0.15 mL	WAT023595 0.25 mL	WAT036940 0.25 mL
Florisil	—	WAT020525 910 mg 1.4 mL	WAT023543 145 mg 0.3 mL	WAT051960 900 mg 1.7 mL	WAT054985 0.12 mL	WAT023600 0.2 mL	—
AccellPlus CM	WAT020550 360 mg 0.8 mL	—	WAT023531 130 mg 0.4 mL	WAT010910 360 mg 1.1 mL	—	WAT023625 0.25 mL	—
AccellPlus QMA	WAT020545 360 mg 0.8 mL	—	WAT023525 130 mg 0.4 mL	WAT010835 360 mg 1.1 mL	—	WAT023620 0.25 mL	WAT043460 0.25 mL
Alumina A	—	WAT020500 1710 mg 1.2 mL	WAT023549 280 mg 0.35 mL	WAT051800 1850 mg 1.8 mL	—	WAT023575 0.1 mL	—
Alumina B	—	WAT020505 1710 mg 1.2 mL	WAT023555 280 mg 0.35 mL	WAT051820 1850 mg 1.8 mL	—	WAT023580 0.1 mL	—
Alumina N	—	WAT020510 1710 mg 1.2 mL	WAT023561 280 mg 0.35 mL	WAT051810 1850 mg 1.8 mL	—	WAT023585 0.1 mL	—
Amino Propyl (NH_2)	WAT020535 360 mg 0.7 mL	—	WAT023513 130 mg 0.3 mL	WAT010830 360 mg 0.85 mL	—	WAT023610 0.2 mL	WAT043475 0.2 mL
Cyano Propyl (CN)	WAT020540 360 mg 0.7 mL	—	WAT023507 130 mg 0.3 mL	WAT010823 360 mg 0.85 mL	WAT054975 0.13 mL	WAT023615 0.2 mL	—
Diol	WAT020530 360 mg 0.8 mL		WAT023519 130 mg 0.4 mL	—	—	WAT023605 0.25 mL	WAT043480 0.25 mL

Vac 3 cc
200 mg

Vac 3 cc
500 mg

Vac RC
500 mg

Vac 6 cc
500 mg

Vac 6 cc
1 gram

Vac 12 cc
2 gram

Vac 20 cc
5 gram

Vac 35 cc
10 gram

Box of 50 Part No./ Volume*	Box of 50 Part No./ Volume*	Box of 50 Part No./ Volume*	Box of 30 Part No./ Volume*	Box of 30 Part No./ Volume*	Box of 20 Part No./ Volume*	Box of 20 Part No./ Volume*	Box of 10 Part No./ Volume*	Sorbent
WAT054945 0.42 mL	WAT020805 0.8 mL	WAT036945 0.8 mL	WAT043395 1.2 mL	WAT036905 2.0 mL	WAT036915 3.6 mL	WAT036925 8.0 mL	WAT043345 16.8 mL	C_{18}
WAT054925 0.34 mL	WAT036815 1.0 mL	WAT043425 1.0 mL	WAT036790 1.1 mL	WAT036795 1.9 mL	WAT043380 3.5 mL	WAT043365 7.8 mL	WAT043350 16.3 mL	tC_{18}
WAT054940 0.34 mL	WAT036780 1.0 mL	WAT043430 1.0 mL	WAT054525 1.1 mL	WAT054570 1.9 mL	WAT054615 3.5 mL	WAT054660 7.8 mL	WAT054700 16.3 mL	C_8
—	WAT052715 1.0 mL	—	—	WAT052705 1.9 mL	—	—	—	tC_2
WAT054930 0.53 mL	WAT020810 1.2 mL	WAT036950 1.2 mL	WAT043400 1.2 mL	WAT036910 1.9 mL	WAT036920 3.9 mL	WAT036930 11.0 mL	WAT043355 23.4 mL	Silica
—	WAT020815 8 mL	WAT043435 0.8 mL	WAT043405 1.2 mL	WAT043390 2.0 mL	WAT043385 3.6 mL	WAT043370 8.0 mL	WAT043360 16.8 mL	Florisil
—	WAT020855 1.1 mL	WAT054505 1.1 mL	WAT054545 1.2 mL	WAT054590 1.9 mL	WAT054635 3.5 mL	WAT054675 7.8 mL	WAT054720 16.3 mL	AccellPlus CM
—	WAT020850 1.1 mL	WAT054500 1.1 mL	WAT054550 1.2 mL	WAT054595 1.9 mL	WAT054640 3.5 mL	WAT054680 7.8 mL	WAT054725 16.3 mL	AccellPlus QMA
—	WAT020820 0.4 mL	—	WAT054535 0.5 mL	WAT054580 0.8 mL	WAT054620 1.8 mL	WAT054670 3.9 mL	WAT054710 8.2 mL	Alumina A
—	WAT020825 0.4 mL	—	WAT054540 0.5 mL	WAT054585 0.8 mL	WAT054625 1.8 mL	WAT054665 3.9 mL	WAT054715 8.2 mL	Alumina B
—	WAT020830 0.4 mL	WAT043485 0.4 mL	WAT054530 0.5 mL	WAT054575 0.8 mL	WAT054630 1.8 mL	WAT043375 3.9 mL	WAT054705 8.2 mL	Alumina N
—	WAT020840 0.8 mL	WAT054515 0.8 mL	WAT054560 1.2 mL	WAT054605 2.0 mL	WAT054650 3.6 mL	WAT054695 8.0 mL	WAT054740 16.8 mL	Amino Propyl (NH_2)
WAT054935 0.42 mL	WAT020835 0.8 mL	—	WAT054555 1.2 mL	WAT054600 2.0 mL	WAT054645 3.6 mL	WAT054685 8.0 mL	WAT054730 16.8 mL	Cyano Propyl (CN)
—	WAT020845 1.0 mL	WAT054520 1.0 mL	WAT054565 1.1 mL	WAT054610 1.9 mL	WAT054655 3.5 mL	WAT054690 7.8 mL	WAT054735 16.3 mL	Diol

* Hold-up Volume

Sep-Pak Chemistry Selection Chart

Reversed Phase

	Description	Applications	Chemistry
C_{18} $Si(CH_3)_2C_{18}H_{37}$	Silica-based bonded phase with strong hydrophobicity; used to adsorb analytes of even weak hydrophobicity from aqueous solutions.	Applications include: • Drugs and their metabolites in serum, plasma, or urine • Desalting of peptides • Trace organics in environmental water samples • Organic acids in beverages • Similar in behavior to reversed-phase HPLC columns.	1. Particle Size – 55-105 µm 2. Pore Size – 125Å 3. Surface Area – 325 m^2/g 4. Carbon Load – 12%
tC_{18} $SiC_{18}H_{37}$	Silica-based bonded phase with strong hydrophobicity; trifunctional bonding chemistry gives it an increased hydrolytic stability over C_{18}.	Applications similar to C_{18}	1. Particle Size – 37-55 µm 2. Pore Size – 125Å 3. Surface Area – 325 m^2/g 4. Carbon Load – 17%
C_8 $Si(CH_3)_2C_8H_{17}$	Silica-based bonded phase with moderate hydrophobicity; use for methods requiring less retention than C_{18}.	Applications include: • Drugs and their metabolites in serum plasma or urine • Peptides in serum • Plasma	1. Particle Size – 37-55 µm 2. Pore Size – 125Å 3. Surface Area – 325 m^2/g 4. Carbon Load – 9%
tC_2 SiC_2H_5	Silica-based bonded phase with low hydrophobic character; use for methods requiring less retention than C_8.	Applications are similar to C_{18} and C_8	1. Particle Size – 37-55 µm 2. Pore Size – 125Å 3. Surface Area – 325 m^2/g 4. Carbon Load – 2.7%

Reversed or Normal Phase

Amino Propyl $Si(CH_2)_3NH_2$	Silica-based polar bonded phase with basic character; can be used as a polar sorbent, like silica, with different selectivity for acidic/basic analytes or as weak anion exchanger in aqueous medium.	Applications include: • Phenols and phenolic pigments • Petroleum fractionation • Saccharides • Drugs and metabolites	1. Particle Size – 55-105 µm 2. Pore Size – 125Å 3. Surface Area – 325 m^2/g 4. Carbon Load – 3.5%
Cyano Propyl $Si(CH_3)(CH_2)_3(CN)$	Silica-based polar bonded phase; can be used as less polar alternative to silica in normal-phase applications or as less hydrophobic alternative to C_{18} or C_8 in reversed phase.	Applications include: • Drugs • Drug metabolites • Pesticides	1. Particle Size – 55-105 µm 2. Pore Size – 125Å 3. Surface Area – 325 m^2/g 4. Carbon Load – 6.5%
Diol $Si(CH_2)_3OCH_2CH(OH)CH_2OH$	Silica-based polar bonded phase with neutral character; can be used as an alternative to silica in normal phase applications, where the acidic character of silica is undesirable or as very weakly interacting phase in aqueous applications.	Applications include: • Antibiotics from cosmetics • Isolation of proteins or peptides by hydrophobic-interaction chromatography	1. Particle Size – 37-55 µm 2. Pore Size – 125Å 3. Surface Area – 325 m^2/g 4. Carbon Load – 9%

Normal Phase

	Description	Applications	Chemistry
Silica SiO_2	Polar sorbent, used primarily to adsorb analytes from non polar solvents like hydrocarbons, chloro- or fluoro-substituted hydrocarbons or less polar esters and ethers; elution with more polar solvents like polar esters, ethers, alcohols, acetonitrile or water; the binding mechanism can be hydrogen bonding, or dipole-dipole interaction; silica can also be used in aqueous medium as a cation exchanger of intermediate strength.	Applications: • General normal phase	1. Particle Size – 55-105 µm 2. Pore Size – 125Å 3. Surface Area – 325 m^2/g 4. Activity Grade – high
Alumina (A, B & N) Al_2O_3	Similar in use to silica; available in acidic, basic, and neutral high activity grades; alumina also exhibits specific interactions with the π-electrons of aromatic hydrocarbons. More stable under high pH conditions than silica.	Applications: • Crude oil fractionation • Acidic and basic grades can also be used as low capacity ion exchangers	1. Particle Size – 50-300 µm 2. Pore Size – 120Å 3. Activity Grade – high • Al N pH – 7.5 • Al A pH – 4.5 • Al B pH – 10.0
Florisil $MgO•SiO_2$	Polar, highly active, weakly basic sorbent for adsorption of low to moderate polarity species from non-aqueous solutions.	Applications include: • Specifically designed for the adsorption of pesticides using official AOAC and EPA methods • Other polychlorinated biphenyls (PCB's) in transformer oil	1. Particle Size – 50-200 µm 2. Pore Size – 60Å 3. Activity Grade – high

Ion-Exchange

	Description	Applications	Chemistry
AccellPlus QMA Strong Anion Exchanger $C(O)NH(CH_2)_3N(CH_3)_3^+ Cl^-$	Silica-based, hydrophilic, strong anion exchanger with large pore size. Used for extraction of anionic analytes in aqueous and non-aqueous solutions.	Applications: • Isolation of anionic proteins, e.g., immunoglobulins, enzymes • Acidic pigments from wines, fruit juices, and food extracts, isolation of phenolic compounds • Peptide pool fractionation	1. Particle Size – 37-55 µm 2. Pore Size – 300Å 3. Carbon – 6% 4. Counter Ion – Cl 5. pH Range — 2-9 6. Loading Capacity – 200 mg BSA / gram sorbent 7. Small Molecule loading – 1.8-2.8 meq/gram 8. Ligand Density – 220 µmoles/g
AccellPlus CM Weak Cation Exchanger CO_2Na^+	Silica-based hydrophilic weak cation exchanger with large pore size; extraction of cationic analytes in aqueous and non-aqueous solutions	Applications: • Isolation of cationic proteins • Pesticides • Herbicides • Steroids	1. Particle Size – 37-55 µm 2. Pore Size – 300Å 3. Carbon – 5.5% 4. Counter Ion – Na 5. pH Range — 2-9 6. Loading Capacity – 175 mg Cytochrome C / gram sorbent 7. Small Molecule loading – 3.1-4.2 meq/gram 8. Ligand Density – 350 µmoles/g

Literature References

A Sample Preparation Primer and Guide to Solid Phase Extraction Methods Development, Literature Reference WA20300

Sample Prep Solutions Brochure, Literature Reference 720000848EN

96-well Collection Plate Options for the Waters Extraction Plate Manifold, Literature Reference 720001263EN

Waters Sep-Pak Sample Extraction Products Brochure, Literature Reference 720000860EN

Waters 96 and 384-Well Collection Plate specifications, Literature Reference WA41941

Sorbent Selection Guide for SPE Wall Chart, Literature Reference 720002007EN

Sep-Pak DNPH-Silica Cartridges for Analyzing Formaldehyde, Other Aldehydes and Ketones in Air

Formaldehyde and other aldehydes are receiving increasing attention both as toxic substances and as promoters in the photochemical formation of ozone in air. Sources of aldehydes in residential buildings include plywood and particle board, insulation, combustion appliances, tobacco smoke, and various consumer products. Aldehydes are released into the atmosphere in the exhaust of motor vehicles and other equipment in which hydrocarbon fuels are incompletely burned.

The most sensitive and specific method for analyzing aldehydes and ketones is based on their reaction with 2,4-dinitrophenylhydrazine (DNPH) and subsequent analysis of the hydrazone derivatives by HPLC. The hydrazones may be detected by absorbance in the ultraviolet region, with maximum sensitivity obtained between 350 and 380 nm.

Airborne aldehydes have traditionally been collected by drawing a sample through an impinger containing a solution of DNPH. However, the impinger collector is generally cumbersome to use and is not well suited for high flow rates or extended collection times due to solvent evaporation.

The new Sep-Pak DNPH-Silica cartridges meet the requirements of EPA Method TO-11A and provide a convenient device for sample collection. Using a vacuum pump, an air sample is drawn through the new Sep-Pak DNPH-Silica cartridge. The aldehydes and ketones react with the DNPH and form the hydrazone derivative, which is retained on the cartridge. Later, the hydrazones are eluted from the cartridge with acetonitrile and analyzed by HPLC. Detection limits can be as low as 3 ppbv for a 100 liter sample.

Advantages of Waters Sep-Pak DNPH-Silica Cartridges

These cartridges provide you with significant advantages when compared to other techniques, such as liquid impingers, for the analysis of aldehydes and ketones. In addition, a new high speed, high resolution HPLC application has been developed to provide excellent quantitation capability in the low parts-per-billion range.

- Sep-Pak DNPH-Silica cartridges meet the requirements of EPA Method TO-11A and ASTM-D-5791-1
- Results from impingers and these cartridges are in excellent agreement
- Solvent consumption, solvent exposure, and hazardous waste disposal costs are reduced
- Sep-Pak DNPH-Silica cartridges provide superior convenience and reproducibility, making them ideal for field sampling and process monitoring applications
- Sep-Pak DNPH-Silica cartridges can save time and increase productivity
- Increased safety

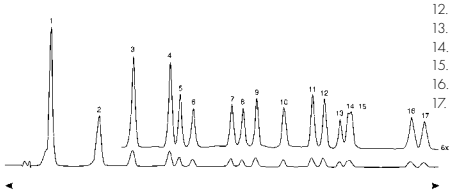
Sep-Pak DNPH-Silica Cartridge

Description	Qty	Part No.
Sep-Pak DNPH-Silica Cartridge	Box of 20	WAT037500
Sep-Pak DNPH-Silica Long Body Cartridge	Box of 20	WAT039550

HPLC Separation of DNPH Derivatives of Common Aldehydes and Ketones

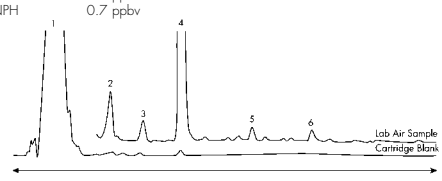
Column: Nova-Pak® C_{18} 3.9 x 150 mm
Sample: Mixture of DNPH and DNPH derivatives in acetonitrile.
Mobile Phase: A: Water/Acetonitrile/Tetrahydrofuran 60/30/10 v/v/v
B: Water/Acetonitrile 40/60 v/v 3 mL
Gradient: 100% A for 1 minute, then linear gradient from 100% A to 100% B in 10 minutes
Flow Rate: 1.5 mL/min
Injection: 20 µL
Detection: 360 nm

1. DNPH
2. Formaldehyde-DNPH
3. Acetaldehyde-DNPH
4. Acetone-DNPH
5. Acrolein-DNPH
6. Propionaldehyde-DNPH
7. Crotonaldehyde-DNPH
8. Butanone-DNPH
9. Butyraldehyde-DNPH
10. Benzaldehyde-DNPH
11. Isovaleraldehyde-DNPH
12. Valeraldehyde-DNPH
13. o-Tolualdehyde-DNPH
14. m-Tolualdehyde-DNPH
15. p-Tolualdehyde-DNPH
16. Hexaldehyde-DNPH
17. 2,5-Dimethylbenzaldehyde-DNPH



Low-Level: Aldehyde Profile from Laboratory Air

Lab Air Sample		Cartridge Blank (calculated for 100 liter sample)	
1. DNPH		1. DNPH	
2. Formaldehyde-DNPH	4.8 ppbv	2. Formaldehyde-DNPH	0.35 ppbv
3. Acetaldehyde-DNPH	1.2 ppbv	3. Acetaldehyde-DNPH	0.27 ppbv
4. Acetone-DNPH	118.0 ppbv	4. Acetone-DNPH	0.34 ppbv
5. Butanone-DNPH	0.8 ppbv		
6. Isovaleraldehyde-DNPH	0.7 ppbv		

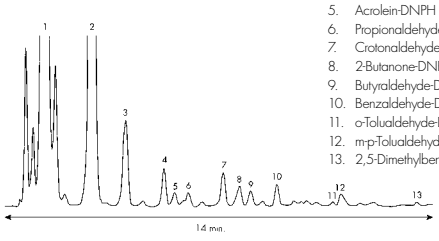


The sample was obtained in a chemical research laboratory using a portable sampling pump. One hundred liters of air was drawn through the cartridge at 0.65 L/min. The sample was found to contain low concentration of formaldehyde (4.8 ppbv), acetaldehyde (1.2 ppbv) and methyl ethyl ketone (0.8 ppbv), but a significant amount of acetone (118 ppbv). Significant concentrations of acetone are frequently found in laboratories because of its widespread use as a solvent.

High-Level: Aldehyde Profile from Diluted Auto Exhaust Emissions

Sample (8.4 L at 1 L/min) collected at US EPA Atmospheric Research Assessment Lab. Courtesy of Dr. S. B. Tejada.

1.	DNPH	
2.	Formaldehyde-DNPH	2290 ppbv
3.	Acetaldehyde-DNPH	367 ppbv
4.	Acetone-DNPH	26 ppbv
5.	Acrolein-DNPH	8 ppbv
6.	Propionaldehyde-DNPH	12 ppbv
7.	Crotonaldehyde-DNPH	36 ppbv
8.	2-Butanone-DNPH	24 ppbv
9.	Butyraldehyde-DNPH	15 ppbv
10.	Benzaldehyde-DNPH	32 ppbv
11.	o-Tolualdehyde-DNPH	5 ppbv
12.	m-p-Tolualdehyde-DNPH	11 ppbv
13.	2,5-Dimethylbenzaldehyde-DNPH	3 ppbv



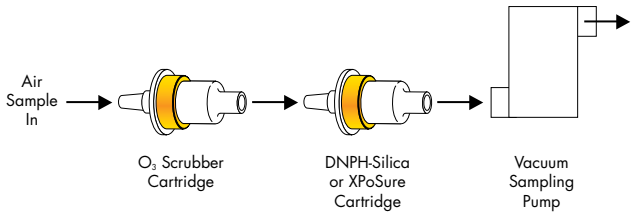
Ozone Scrubber Cartridge

Ozone has been shown to interfere with the analysis of carbonyl compounds in air samples that have been drawn through cartridges containing silica-coated with 2,4-dinitrophenylhydrazine (DNPH). Waters Ozone Scrubber cartridges are designed to remove this ozone interference.

These disposable devices are intended for use in series combination with the Waters Sep-Pak DNPH-Silica cartridges or XPoSure Aldehyde Sampler cartridges. One Ozone Scrubber cartridge replaces the 1/4" diameter by 36" long copper ozone denuder located in the heated zone of sampling systems used for outdoor air monitoring (PAMS program).

Each Ozone Scrubber cartridge contains 1.4 g of granular potassium iodide. When air containing ozone is drawn through this packed bed, iodide is oxidized to iodine, consuming the ozone. The theoretical capacity of a single cartridge is 4.2 mmoles of ozone (200 mg). The particle size of the potassium iodide granules is optimized for good mass transfer and flow characteristics.

Flow Schematic for Air Sampling System



Ozone Scrubber

Description	Qty	Part No.
Ozone Scrubber	Box of 20	WAT054420

Waters XPoSure Aldehyde Sampler Cartridges for Monitoring Aldehydes in Indoor Air

Based on an extension of our DNPH coating technology, XPoSure Aldehyde Sampler cartridges are the most sensitive active samplers available today.

Highest Sensitivity

Compared to existing sampling tube technology which have high and variable backgrounds, XPoSure cartridges are guaranteed to give consistent low aldehyde backgrounds, cartridge-to-cartridge, lot-to-lot.

High-Collection Efficiencies

You can achieve >95% collection efficiencies for all aldehydes at flows of up to a liter per minute. And, you only need to use one cartridge — no breakthrough bed is necessary.

Low Pressure Drop — Use with Portable Personal Sampling Pumps

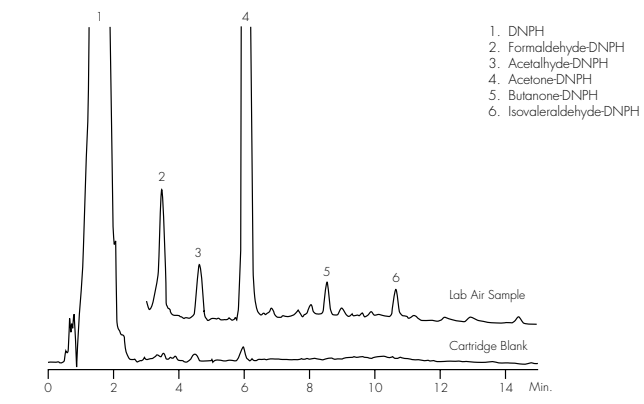
Large particle size and higher porosity frits make the XPoSure cartridge compatible with personal sampling pumps.

Easy-to-Use

Sample, elute and shoot, it's that easy. You'll never have to break open and manipulate a glass tube again. And because the cartridges are made from high density polyethylene (HDPE), breakage is not a concern.

The figure on the right shows two traces. An actual cartridge blank demonstrating extremely low background levels and as an actual laboratory air sample.

Low-Level Example: Aldehyde Profile from Laboratory Air



The above sample was collected in a chemical research laboratory using a portable sampling pump. One hundred liters of air was drawn through the cartridge at 0.65 L/min. The chromatogram shows ormaldehyde (4.8 ppbv), acetaldehyde (1.2 ppbv), acetone (118 ppbv), butanone (0.8 ppbv), and isovaleraldehyde (0.7 ppbv).

XPoSure Aldehyde Sampler Cartridge

Description	Qty	Part No.
XPoSure Aldehyde Sampler Cartridge	Box of 20	WAT047205

Porapak Rdx Sep-Pak Extraction Cartridge for the Analysis of Explosives in Surface and Ground Waters

Designed to meet or exceed the QA/QC requirements of EPA Method 8330, it is ideal for environmental testing laboratories supporting Department of Defense remediation programs.

High Sensitivity

Porapak Sep-Pak cartridges contain Porapak Rdx resin, a specially prepared, specially cleaned divinylbenzene/vinylpyrrolidone copolymer, packed in a high purity polypropylene syringe barrel. With the lowest guaranteed backgrounds and the highest cartridge-to-cartridge, lot-to-lot consistency, the Waters Porapak Rdx column is the most sensitive technology available today and allows you to perform analysis at sub ppb levels.

Unmatched Recoveries

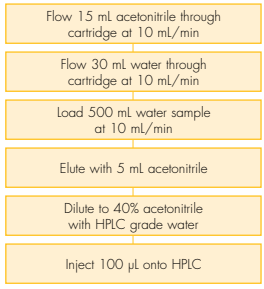
The specially prepared resin is highly selective for nitroaromatic and nitramine compounds, resulting in recoveries of 90% or greater. Recovery data from preconcentrating 500 mL of explosives standards in sterile water at two concentrations on Porapak Rdx Sep-Pak Vac columns. Number of replicates = 7.

Compound	1 ppb % Recovery	% RSD	10 ppb % Recovery	% RSD
HMX	100.5	6.7	100.5	3.9
TNB	95.9	3.5	99.3	3.3
RDX	90.9	6.4	98.7	3.2
DNB	99.5	3.2	99.2	3.2
TNT	97.0	3.0	102.	3.7
TETRYL	89.0	6.4	102.8	4.7
NB	96.5	2.5	97.9	2.8
3,5-DNA	91.2	3.3	98.2	3.6
2,4-DNT	97.3	3.4	99.9	3.4
2,6-DNT	94.5	3.4	98.7	3.4
2-Am-DNT	92.4	5.2	98.0	3.7
4-Am-DNT	90.0	4.9	97.2	4.1
4-NT	89.5	4.3	100.4	3.7
2-NT	96.8	6.6	93.4	3.0

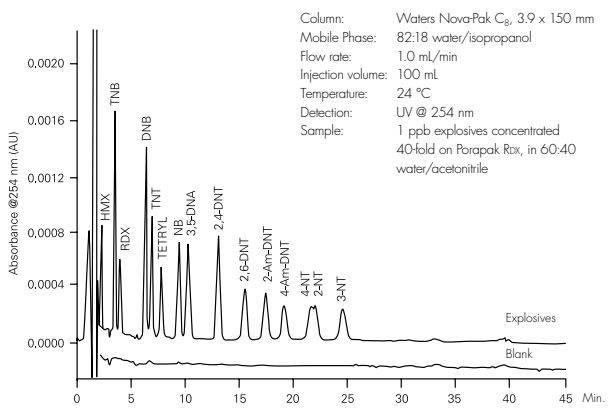
Increase Productivity and Reduce Waste

By using Porapak Rdx cartridges, you can reduce the amount of organic solvent used per sample by 10-fold and decrease your sample prep time by 3x.

Activate, Load, Elute, and Shoot



Isocratic Separation of Method 8330 Analytes



Achieve the lowest method detection limits using Waters Porapak Rdx cartridges. The chromatogram above shows the analysis of reagent H_2O spiked at the 1 ppb level. The bottom chromatogram is a reagent (H_2O) blank.

Porapak Rdx Cartridges and Accessories

Description	Qty	Part No.
Porapak Rdx Cartridges	Box of 30	WAT047220
Tubing, Tefzel™, 1/8 inch o.d. x 0.040-inch i.d.		WAT023344
Sep-Pak Vac Adapter	Box of 12	WAT054260
60 cc Sep-Pak Reservoir	Box of 12	WAT024659
Male-Male Adapter		WAT024310

Sep-Pak Dry SPE Cartridge

Waters Sep-Pak Dry cartridges are packed with 2.85 g of anhydrous sodium sulfate. These cartridges are designed to remove residual water from the SPE extract.

Sep-Pak Dry Cartridge

Description	Qty	Part No.
Sep-Pak Dry Cartridge	Box of 50	WAT054265

Oasis SPE Products

A Breakthrough in SPE

OASIS®
SAMPLE EXTRACTION PRODUCTS

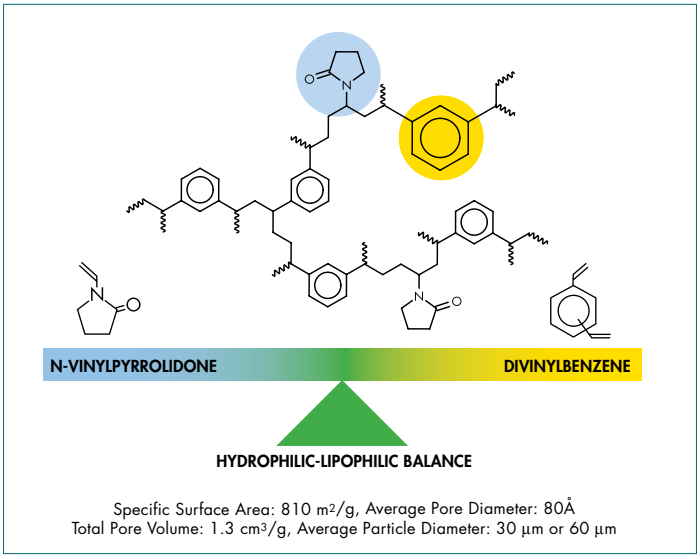
Introduction

In October 1977, Waters designed the first miniature cartridge columns (Sep-Pak cartridges) containing silica-based adsorbents for SPE.

New demands for sample preparation led to the development of a new, specially designed polymeric sorbent which performs optimally for reversed-phase SPE. The Oasis® HLB copolymer with unique Hydrophilic-Lipophilic Balance is unlike traditional SPE sorbents.

Today's goals for modern solid-phase extraction (SPE) are faster throughput, higher recovery and reproducibility, stronger retention and selectivity. Now SPE can outpace high throughput techniques such as LC/MS/MS.

Unique Water-Wettable Oasis HLB Copolymer



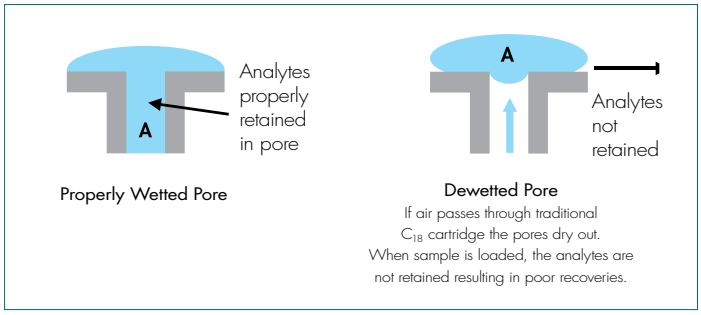
Specific Surface Area: 810 m^2/g, Average Pore Diameter: 80Å
Total Pore Volume: 1.3 cm^3/g, Average Particle Diameter: 30 µm or 60 µm

The Oasis HLB sorbent is a macroporous copolymer made from a balanced ratio of two monomers, the lipophilic divinylbenzene and the hydrophilic N-vinylpyrrolidone. It provides reversed phase capability with a special "polar-hook" for enhanced capture of polar analytes and excellent wettability.

High and Consistent Recoveries

Oasis sorbents are water-wettable maintaining high retention and capacity for a wide spectrum of analytes, especially when the SPE column runs dry. When the sorbent pores dry-out, the chromatographic retention (capture) of the analytes is reduced, resulting in poor recovery. Traditional, silica based C_{18} sorbents can easily dry-out, especially on a vacuum manifold if a particular cartridge flows quickly and allows air to be drawn in. Oasis sorbents maintain proper wetting for more consistent performance (especially important for 96-well plate devices). Even if air passes through, the Oasis pores do not dry out.

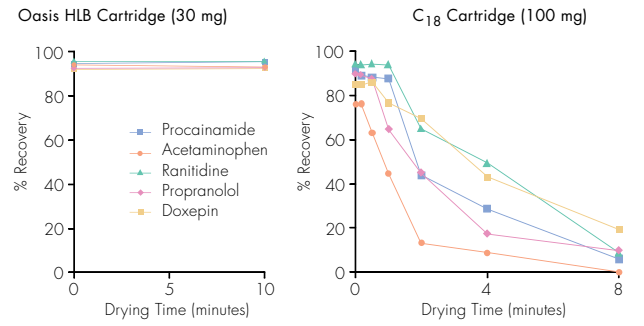
Pore Dewetting Mechanism of Sorbent Pores (Silica Based C_{18})



Current Oasis Patents:

* U.S. patents 5,882,521 (1996), 5,976,376 (1998), 6,106,721 (1999), 6,254,780 (2001), 6,322,695 (2001), 6,468,422 (2002), 6,726,842 (2004), 6,773,583 (2004), 6,723,236 (2004), additional patents pending.

Effect of Drying on Recovery - Oasis HLB Versus C_{18} Sorbents.



Oasis HLB 1 cc/30 mg and 1 cc/100 mg C_{18} cartridges were conditioned on a Waters vacuum manifold. When the methanol reached the top of the upper frit in each cartridge, vacuum was maintained for different times to vary the cartridge drying time. The SPE protocol was then continued. The data shown are the average of three replicate extractions.

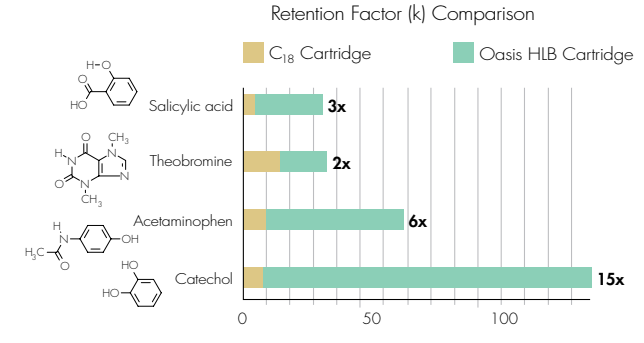
The variable recoveries seen with the C_{18} sorbents, due to the drying out effect, are often the cause for "retests", reducing laboratory productivity. In some laboratories 10% of samples are retests—this can be reduced using Oasis sorbents.

Also, Oasis sorbents retain polar compounds far better than bonded silica SPE sorbents. Note the poor recovery of the polar analyte Acetaminophen for C_{18}. Oasis sorbents work especially well when you need to capture metabolites (see figure above).

High Capacity — Use Less Sorbent

When transferring methods from a C_{18} bonded phase to Oasis products, keep in mind the greater capacity of the Oasis sorbent. The Oasis sorbent has 2-3x more surface area and shows a dramatic increase in k values compared to silica-based C_{18}, This reduces breakthrough potential. **In addition, you may be able to use ⅔ less sorbent than you would with C_{18} (30 mg Oasis HLB gives equivalent capacity to 100 mg C_{18}).**

Higher Retention Means Greater Capacity, No Breakthrough



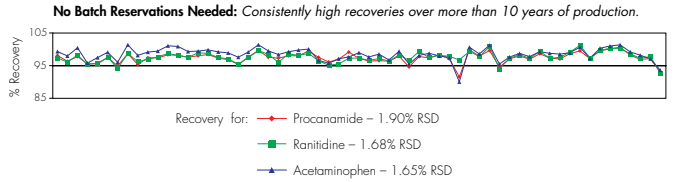
Data shown were obtained with two 3.9 x 150 mm columns, each packed with one of the sorbents, operated under the same conditions: mobile phase: 20 mM potassium phosphate, pH 7.0/methanol (95/5 v/v); temperature: 30 °C; flow rate: 1.0 mL/min; detection: UV @ 254 n

Exceptional Batch-to-Batch Reproducibility

Because of poor stability at pH extremes and relatively low ionic capacity traditional silica based mixed-mode sorbents don't have long-term batch-to-batch reproducibility and therefore require reservations of specific lots of sorbent for large projects. Oasis sorbents have demonstrated excellent long-term batch-to-batch reproducibility for over 6 years. As a result of careful process design and stringent quality controls, a new standard has been set in batch-to-batch and lot-to-lot reproducibility for SPE sorbents. The Oasis family of sorbents and devices are manufactured in a Waters ISO 9002 registered facility in compliance with cGMP guidelines of the U.S. Food and Drug Administration for class 1 medical devices.

Multiple batches of each Oasis HLB, MCX and MAX have been successfully used on validated bioanalytical assays in a regulated laboratory environment.

Batch-to-Batch Reproducibility of Oasis HLB Sorbent



Oasis SPE Applications

Oasis products come in a full range of device formats to meet your SPE requirements—the new µElution plates, on-line columns, 96-well plates, and single-use cartridges.

Try Oasis and successfully meet your SPE challenges.

Download your free Oasis Applications Notebook
at www.waters.com/oasis

Literature References

Oasis Sample Extraction Products Brochure, Literature Reference 720001692EN

Oasis µElution Plate Brochure, Literature Reference 720000476EN

Topics in Solid-Phase Extraction. Part 1. Ion Suppression in LC/MS Analysis White Paper, Literature Reference 720001237EN

Sample Prep Solutions Brochure, Literature Reference 720000848EN

Oasis WAX Sorbent for UPLC/MS Determination of PFOS and Related Compounds in Waters and Tissue, Literature Reference 720001871EN

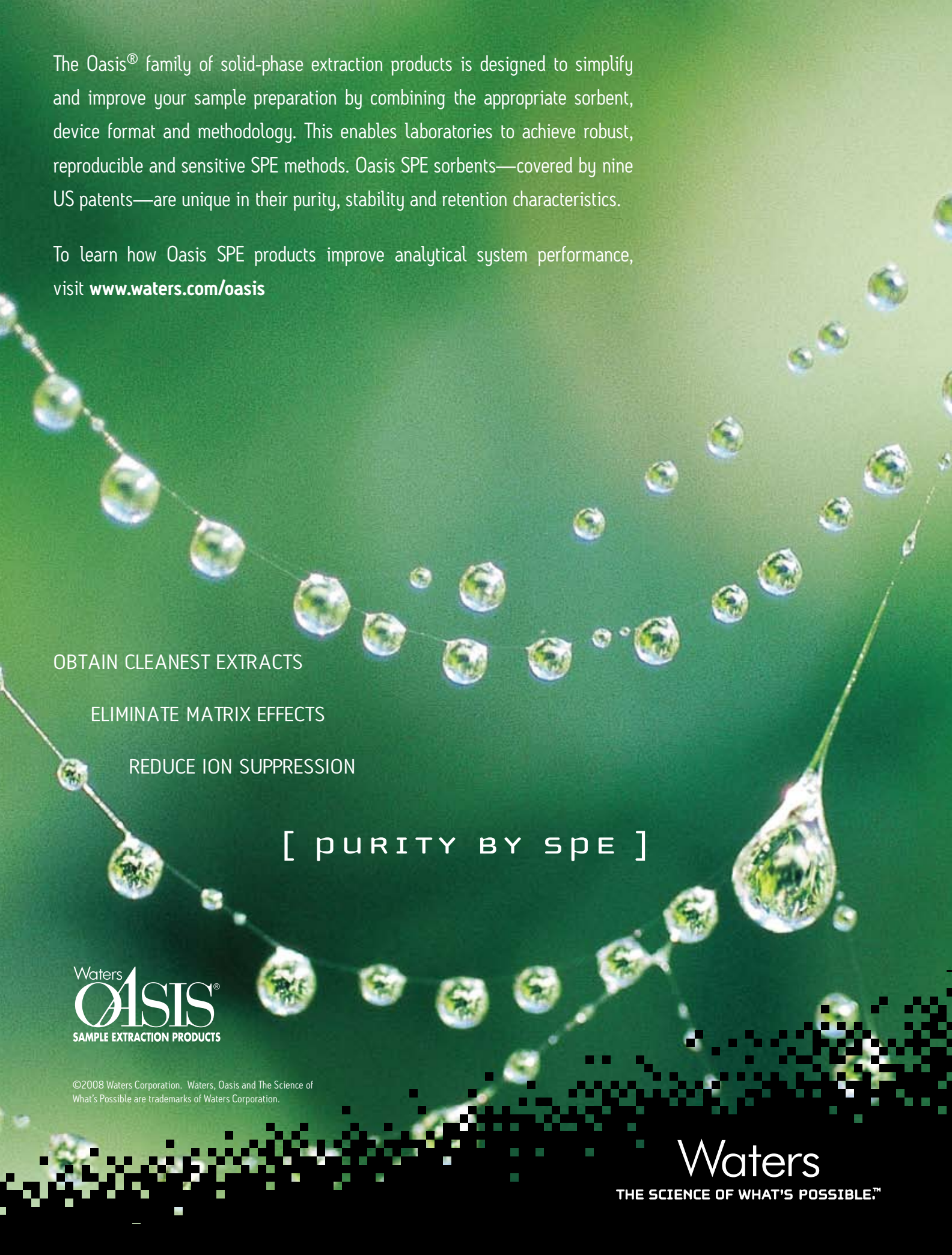
SPE Sample Preparation for UPLC®–MS Determination of Enrofloxacin (Baytril) in Chicken, Literature Reference WA43206

A Sensitive Method for the Determination of Endocrine-Disrupting Compounds in River Water by LC/MS/MS, Literature Reference 720001296EN

Oasis Product Selection Guide

	1 cc/ 10 mg	1 cc/ 30 mg	1 cc/30 mg Flangeless	1 cc/30 mg Gilson Adapter	3 cc/ 60 mg	3 cc/60 mg Flangeless	3 cc/60 mg Gilson Adapter	6 cc/ 150 mg	6 cc/ 200 mg
Sorbent	**Box of 100**	**Box of 100**	**Box of 100**	**Box of 500**	**Box of 100**	**Box of 100**	**Box of 500**	**Box of 30**	**Box of 30**
Oasis HLB 30 µm	186000383	WAT094225	186001879	WAT058882	WAT094226	186001880	WAT058883	186003365	WAT106202
Oasis HLB 60 µm	—	—	—	—	—	—	—	186003379	—
Oasis MCX 30 µm	—	186000252	186001881	186001888	186000254	186001882	—	186000256	—
Oasis MCX 60 µm	—	186000782	—	—	186000253	—	—	186000255	—
Oasis MAX 30 µm	—	186000366	186001883	—	186000367	186001884	—	186000369	—
Oasis MAX 60 µm	—	—	—	—	186000368	—	—	186000370	—
Oasis WCX 30 µm	—	186002494	—	—	186002495	—	—	186002498	—
Oasis WCX 60 µm	—	186002496	—	—	186002497	—	—	—	—
Oasis WAX 30 µm	—	186002489	—	—	186002490	—	—	186002493	—
Oasis WAX 60 µm	—	186002491	—	—	186002492	—	—	—	—

	6 cc/400 mg Flangeless	6 cc/ 500 mg	12 cc/ 500 mg	20 cc/ 1 g	35 cc/ 6 g	Plus 225 mg	Vac RC 30 mg	Vac RC 60 mg	Glass Cartridge 5 cc/200 mg
Sorbent	**Box of 100*/500****	**Box of 30**	**Box of 20**	**Box of 20**	**Box of 10**	**Box of 50**	**Box of 50**	**Box of 50**	**Box of 30**
Oasis HLB 30 µm	—	—	—	—	—	—	186000382	186000381	—
Oasis HLB 60 µm	—	186000115	186000116	186000117	186000118	186000132	—	—	186000683
Oasis MCX 30 µm	186001216**	—	—	—	—	—	—	186000261	—
Oasis MCX 60 µm	—	186000776	—	186000777	186000778	186003516	—	186000380	—
Oasis MAX 30 µm	186001855*	—	—	—	—	—	186000372	186000371	—
Oasis MAX 60 µm	—	186000865	—	—	—	186003517	—	186000378	—
Oasis WCX 30 µm	—	—	—	—	—	—	—	—	—
Oasis WCX 60 µm	—	—	—	—	—	186003518	—	—	—
Oasis WAX 30 µm	—	—	—	—	—	—	—	—	—
Oasis WAX 60 µm	—	—	—	—	—	186003519	—	—	—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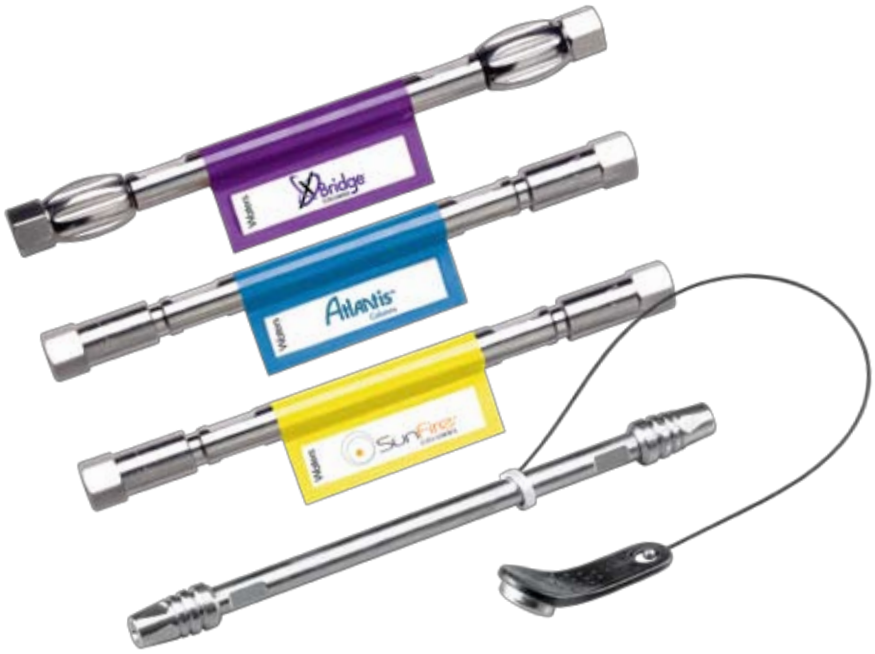

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	USP Class No.	pH Range (Room Temp.)	Temperature Limits (°C)	Particle Size (µm Spherical)	Pore Size (Angstroms)	Surface Area (m^2/g)	Carbon Load (%)
BEH C_{18}	L1	1-12	Low pH = 80 °C High pH = 60 °C	1.7	130Å	185	18%
	Selectivity Features: General purpose column ideally suited for method development due to extreme pH stability and applicability to the broadest range of compound classes. **Bonding:** Trifunctional C_{18}, fully endcapped, bonded to Ethylene Bridged Hybrid (BEH) substrate.						
BEH C_8	L7	1-12	Low pH = 60 °C High pH = 60 °C	1.7	130Å	185	13%
	Selectivity Features: General purpose column ideally suited for method development due to extreme pH stability and applicability to the broadest range of compounds classes. **Bonding:** Trifunctional C_8, fully endcapped, bonded to Ethylene Bridged Hybrid (BEH) substrate.						
BEH Shield RP18	L1	2-11	Low pH = 50 °C High pH = 45 °C	1.7	130Å	185	17%
	Selectivity Features: Alternate selectivity as compared to straight chain C_{18}, particularly with phenolic analytes. Compatible with 100% aqueous-phase composition. **Bonding:** Monofunctional embedded polar C_{18}, fully endcapped, bonded to Ethylene Bridged Hybrid (BEH) substrate.						
BEH Phenyl	L11	1-12	Low pH = 80 °C High pH = 60 °C	1.7	130Å	185	15%
	Selectivity Features: Excellent method development column for alternate selectivity, particularly in regard to polyaromatic compounds. Unique level of pH stability for a Phenyl bonded phase. **Bonding:** Trifunctional C_6 Phenyl, fully endcapped, bonded to Ethylene Bridged Hybrid (BEH) substrate.						
BEH HILIC	L3	1-8	Low pH = 45 °C High pH = 45 °C	1.7	130Å	185	NA
	Selectivity Features: Excellent for retention of very polar, basic, water soluble analytes. Specifically designed and tested for HILIC separations using mobile phases containing high concentrations of organic solvent. **Bonding:** Unbonded Ethylene Bridged Hybrid (BEH) substrate.						
HSS C_{18}	L1	2-8	Low pH = 45 °C High pH = 45 °C	1.8	100Å	230	15%
	Selectivity Features: Ultra performance C_{18} chemistry, increased retention, superior peak shape, resists acid hydrolysis at low pH. Designed for UPLC separations where silica-based C_{18} selectivities are desired. **Bonding:** High coverage trifunctional C_{18}, fully endcapped, bonded to High Strength Silica (HSS) UPLC particle substrate.						
HSS C_{18} SB	L1	2-8	Low pH = 45 °C High pH = 45 °C	1.8	100Å	230	8%
	Selectivity Features: Unique, non-endcapped C18 chemistry designed specifically for method development scientists. Offers unique Selectivity for Bases (SB) when operating under low pH conditions. **Bonding:** Intermediate coverage tri-functionally bonded C_{18}, no endcapping, bonded to High Strength Silica (HSS) UPLC particle substrate.						
HSS T3	L1	2-8	Low pH = 45 °C High pH = 45 °C	1.8	100Å	230	11%
	Selectivity Features: Aqueous mobile-phase compatible UPLC column designed for extreme retention. Combines polar compound retention with UPLC efficiencies and performance. **Bonding:** T3 (C_{18}) bonding and endcapping, bonded to High Strength Silica (HSS) UPLC particle substrate.						

ACQUITY UPLC® Columns

Chemistry	Dimension	Particle Size	Part No. Individual Column	Part No. 3 pk
BEH C_{18}	1.0 x 50 mm	1.7 µm	186002344	176000861
	1.0 x 100 mm	1.7 µm	186002346	176000862
	1.0 x 150 mm	1.7 µm	186002347	176001044
	2.1 x 30 mm	1.7 µm	186002349	176001304
	2.1 x 50 mm	1.7 µm	186002350	176000863
	2.1 x 100 mm	1.7 µm	186002352	176000864
	2.1 x 150 mm	1.7 µm	186002353	176001048
BEH Shield RP18	1.0 x 50 mm	1.7 µm	186002851	176000874
	1.0 x 100 mm	1.7 µm	186002852	176000875
	1.0 x 150 mm	1.7 µm	186003373	176001045
	2.1 x 30 mm	1.7 µm	186003909	176001309
	2.1 x 50 mm	1.7 µm	186002853	176000876
	2.1 x 100 mm	1.7 µm	186002854	176000877
	2.1 x 150 mm	1.7 µm	186003376	176001049
BEH C_8	1.0 x 50 mm	1.7 µm	186002875	176000882
	1.0 x 100 mm	1.7 µm	186002876	176000883
	1.0 x 150 mm	1.7 µm	186003374	176001046
	2.1 x 30 mm	1.7 µm	186003910	176001310
	2.1 x 50 mm	1.7 µm	186002877	176000884
	2.1 x 100 mm	1.7 µm	186002878	176000885
	2.1 x 150 mm	1.7 µm	186003377	176001050
BEH Phenyl	1.0 x 50 mm	1.7 µm	186002882	176000905
	1.0 x 100 mm	1.7 µm	186002883	176000906
	1.0 x 150 mm	1.7 µm	186003375	176001047
	2.1 x 30 mm	1.7 µm	186003911	176001311
	2.1 x 50 mm	1.7 µm	186002884	176000907
	2.1 x 100 mm	1.7 µm	186002885	176000908
	2.1 x 150 mm	1.7 µm	186003378	176001051
BEH HILIC	1.0 x 50 mm	1.7 µm	186003457	176001089
	1.0 x 100 mm	1.7 µm	186003458	176001090
	1.0 x 150 mm	1.7 µm	186003459	176001091
	2.1 x 50 mm	1.7 µm	186003460	176001092
	2.1 x 100 mm	1.7 µm	186003461	176001093
	2.1 x 150 mm	1.7 µm	186003462	176001094
HSS C_{18}	1.0 x 50 mm	1.8 µm	186003529	176001121
	1.0 x 100 mm	1.8 µm	186003530	176001122
	1.0 x 150 mm	1.8 µm	186003531	176001123
	2.1 x 30 mm	1.8 µm	186003987	176001398
	2.1 x 50 mm	1.8 µm	186003532	176001124
	2.1 x 100 mm	1.8 µm	186003533	176001125
	2.1 x 150 mm	1.8 µm	186003534	176001126
HSS C_{18} SB	1.0 x 50 mm	1.8 µm	186004114	176001556
	1.0 x 100 mm	1.8 µm	186004115	176001557
	1.0 x 150 mm	1.8 µm	186004116	176001558
	2.1 x 30 mm	1.8 µm	186004117	176001559
	2.1 x 50 mm	1.8 µm	186004118	176001560
	2.1 x 100 mm	1.8 µm	186004119	176001561
	2.1 x 150 mm	1.8 µm	186004120	176001562
HSS T3	1.0 x 50 mm	1.8 µm	186003535	176001127
	1.0 x 100 mm	1.8 µm	186003536	176001129
	1.0 x 150 mm	1.8 µm	186003537	176001130
	2.1 x 30 mm	1.8 µm	186003944	176001375
	2.1 x 50 mm	1.8 µm	186003538	176001131
	2.1 x 100 mm	1.8 µm	186003539	176001132
	2.1 x 150 mm	1.8 µm	186003540	176001133

Mixed ACQUITY UPLC Chemistries Column 4-Packs

Description	Dimensions	Part No.
High & Low pH, Widest Selectivities UPLC® Columns Kit	2.1 x 50 mm	176001042
BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	2.1 x 100 mm	176001043
UPLC Method Development Scouting Kit	2.1 x 50 mm	176001603
BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	2.1 x 100 mm	176001604
L1 UPLC Columns Kit	2.1 x 50 mm	176001605
BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	2.1 x 100 mm	176001606
Mass Spec UPLC Columns Kit	2.1 x 50 mm	176001607
BEH C_{18}, HSS C_{18}, HSS C_{18} SB, HSS T3	2.1 x 100 mm	176001608
Low pH, Widest Selectivities UPLC Columns Kit	2.1 x 50 mm	176001609
BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	2.1 x 100 mm	176001610

ACQUITY UPLC Columns Method Validation Kits*

Chemistry	Dimension	Particle Size	Part No.
BEH C_{18}	2.1 x 50 mm	1.7 µm	186004044
	2.1 x 100 mm	1.7 µm	186004045
BEH C_8	2.1 x 50 mm	1.7 µm	186004046
	2.1 x 100 mm	1.7 µm	186004047
BEH Shield RP18	2.1 x 50 mm	1.7 µm	186004048
	2.1 x 100 mm	1.7 µm	186004049
BEH Phenyl	2.1 x 50 mm	1.7 µm	186004050
	2.1 x 100 mm	1.7 µm	186004052
BEH HILIC	2.1 x 50 mm	1.7 µm	186004053
	2.1 x 100 mm	1.7 µm	186004054
HSS C_{18}	2.1 x 50 mm	1.8 µm	186004057
	2.1 x 100 mm	1.8 µm	186004058
HSS C_{18} SB	2.1 x 50 mm	1.8 µm	186004137
	2.1 x 100 mm	1.8 µm	186004138
HSS T3	2.1 x 50 mm	1.8 µm	186004055
	2.1 x 100 mm	1.8 µm	186004056

* Contains 3 columns, each packed with a different batch of packing material

VanGuard™ Pre-Columns for UPLC Column Protection

Chemistry	Dimension	Particle Size	Part No.
BEH C_{18}	2.1 x 5 mm	1.7 µm	186003975
BEH Shield RP18	2.1 x 5 mm	1.7 µm	186003977
BEH C_8	2.1 x 5 mm	1.7 µm	186003978
BEH Phenyl	2.1 x 5 mm	1.7 µm	186003979
BEH HILIC	2.1 x 5 mm	1.7 µm	186003980
HSS C_{18}	2.1 x 5 mm	1.8 µm	186003981
HSS C_{18} SB	2.1 x 5 mm	1.8 µm	186004136
HSS T3	2.1 x 5 mm	1.8 µm	186003976

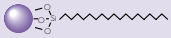
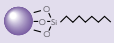
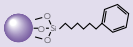
ACQUITY UPLC Column In-Line Filter Unit

Description	Part No.
In-line filter holder and six 0.2 µm stainless steel replacement filters	205000343
Five 0.2 µm stainless steel replacement filters and End Nuts for 205000343	700002775

ACQUITY UPLC Column Replacement Parts

Description	Part No.
Three 0.2 µm Inlet/Outlet Frits for 2.1 mm i.d. UPLC Columns	700003776
Three 0.2 µm Inlet/Outlet Frits for 1.0 mm i.d. UPLC Columns	700003775
One Inlet End Nut for 2.1 mm i.d. UPLC Column	700003779
One Outlet End Nut for 2.1 mm i.d. UPLC Column	700003780
One Inlet End Nut for 1.0 mm i.d. UPLC Column	700003777
One Outlet End Nut for 1.0 mm i.d. UPLC Column	700003778

XBridge COLUMNS
Featuring BEH Technology

		USP Class No.	pH Range (Room Temp.)	Temperature Limits (°C)	Particle Size (µm Spherical)	Pore Size (Angstroms)	Surface Area (m^2/g)	Carbon Load (%)
C_{18}		L1	1-12	Low pH = 80 °C High pH = 60 °C	2.5, 3.5, 5, 10	135Å	185	18%
		Selectivity Features: General purpose column ideally suited for method development due to extreme pH stability and applicability to the broadest range of compound classes. **Bonding:** Trifunctional C_{18}, fully endcapped, bonded to Ethylene Bridged Hybrid (BEH) substrate.						
Shield RP_{18}		L1	2-11	Low pH = 50 °C High pH = 45 °C	2.5, 3.5, 5, 10	135Å	185	17%
		Selectivity Features: Alternate selectivity as compared to straight chain C_{18}, particularly with phenolic analytes. Compatible with 100% aqueous-phase composition. **Bonding:** Monofunctional embedded polar C_{18}, fully endcapped, bonded to Ethylene Bridged Hybrid (BEH) substrate.						
C_8		L7	1-12	Low pH = 60 °C High pH = 60 °C	2.5, 3.5, 5, 10	135Å	185	13%
		Selectivity Features: General purpose column ideally suited for method development due to extreme pH stability and applicability to the broadest range of compounds classes. **Bonding:** Trifunctional C_8, fully endcapped, bonded to Ethylene Bridged Hybrid (BEH) substrate.						
Phenyl		L11	1-12	Low pH = 80 °C High pH = 60 °C	2.5, 3.5, 5	135Å	185	15%
		Selectivity Features: Excellent method development column for alternate selectivity, particularly in regard to polyaromatic compounds. Unique level of pH stability for a Phenyl bonded phase. **Bonding:** Trifunctional C_6 Phenyl, fully endcapped, bonded to Ethylene Bridged Hybrid (BEH) substrate.						
HILIC		L3	1-8	Low pH = 45 °C High pH = 45 °C	2.5, 3.5, 5	130Å	185	NA
		Selectivity Features: Excellent for retention of very polar, basic, water soluble analytes. Specifically designed and tested for HILIC separations using mobile phases containing high concentrations of organic solvent. **Bonding:** Unbonded Ethylene Bridged Hybrid (BEH) substrate.						

XBridge Analytical Columns

Dimensions	Type	Particle Size	C_{18}	C_8	Shield RP18	Phenyl	HILIC
1.0 x 50 mm	Column	2.5 µm	186003118	186003164	186003136	186003306	—
2.1 x 10 mm	Guard	2.5 µm	186003056[1]	186003074[1]	186003065[1]	186003359[1]	186004455
2.1 x 20 mm *IS*™	Column	2.5 µm	186003201	186003167	186003139	186003307	—
2.1 x 30 mm	Column	2.5 µm	186003084	186003099	186003091	186003308	186004456
2.1 x 50 mm	Column	2.5 µm	186003085	186003101	186003092	186003309	186004457
3.0 x 20 mm *IS*	Column	2.5 µm	186003087	186003168	186003140	186003310	—
3.0 x 20 mm	Guard	2.5 µm	186003057[2]	186003075[2]	186003066[2]	186003360[2]	—
3.0 x 30 mm	Column	2.5 µm	186003121	186003169	186003141	186003311	—
3.0 x 50 mm	Column	2.5 µm	186003122	186003170	186003142	186003312	186004458
4.6 x 20 mm *IS*	Column	2.5 µm	186003088	186003172	186003144	186003313	—
4.6 x 20 mm	Guard	2.5 µm	186003058[2]	186003076[2]	186003067[2]	186003361[2]	186004459
4.6 x 30 mm	Column	2.5 µm	186003089	186003173	186003145	186003314	—
4.6 x 50 mm	Column	2.5 µm	186003090	186003174	186003096	186003315	186004460
4.6 x 75 mm	Column	2.5 µm	186003124	186003175	186003146	186003316	186004461
1.0 x 50 mm	Column	3.5 µm	186003126	186003177	186003148	186003317	186004429
1.0 x 100 mm	Column	3.5 µm	186003127	186003178	186003149	186003318	—
1.0 x 150 mm	Column	3.5 µm	186003128	186003179	186003150	186003319	—
2.1 x 10 mm	Guard	3.5 µm	186003059[1]	186003077[1]	186003068[1]	186003362[1]	186004430
2.1 x 20 mm *IS*	Column	3.5 µm	186003019	186003180	186003151	186003320	—

[1] Requires Universal Sentry™ Guard Holder - 2.1 x 10 mm WAT097958

[2] Requires Universal Sentry Guard Holder - 3.0 x 20 mm/4.6 x 20 mm WAT046910

XBridge Analytical Columns

Dimensions	Type	Particle Size	C_{18}	C_8	Shield RP18	Phenyl	HILIC
2.1 x 30 mm	Column	3.5 µm	186003020	186003046	186003035	186003321	186004431
2.1 x 50 mm	Column	3.5 µm	186003021	186003047	186003036	186003322	186004432
2.1 x 100 mm	Column	3.5 µm	186003022	186003048	186003037	186003323	186004433
2.1 x 150 mm	Column	3.5 µm	186003023	186003049	186003038	186003324	186004434
3.0 x 20 mm *IS*™	Column	3.5 µm	186003024	186003181	186003152	186003325	—
3.0 x 20 mm	Guard	3.5 µm	186003060[2]	186003078[2]	186003069[2]	186003363[2]	—
3.0 x 30 mm	Column	3.5 µm	186003025	186003182	186003153	186003326	—
3.0 x 50 mm	Column	3.5 µm	186003026	186003050	186003039	186003327	186004435
3.0 x 100 mm	Column	3.5 µm	186003027	186003051	186003040	186003328	186004436
3.0 x 150 mm	Column	3.5 µm	186003028	186003052	186003041	186003329	—
4.6 x 20 mm *IS*	Column	3.5 µm	186003029	186003183	186003154	186003330	—
4.6 x 20 mm	Guard	3.5 µm	186003061[2]	186003079[2]	186003070[2]	186003364[2]	186004437
4.6 x 30 mm	Column	3.5 µm	186003030	186003184	186003155	186003331	186004438
4.6 x 50 mm	Column	3.5 µm	186003031	186003053	186003042	186003332	186004439
4.6 x 75 mm	Column	3.5 µm	186003032	186003185	186003043	186003333	—
4.6 x 100 mm	Column	3.5 µm	186003033	186003054	186003044	186003334	186004440
4.6 x 150 mm	Column	3.5 µm	186003034	186003055	186003045	186003335	186004441
4.6 x 250 mm	Column	3.5 µm	186003943	186003963	186003964	186003965	—
2.1 x 10 mm	Guard	5 µm	186003062[1]	186003080[1]	186003071[1]	186003366[1]	186004442
2.1 x 20 mm *IS*	Column	5 µm	186003107	186003186	186003156	186003336	—
2.1 x 30 mm	Column	5 µm	186003129	186003187	186003157	186003337	186004443
2.1 x 50 mm	Column	5 µm	186003108	186003011	186002999	186003338	186004444
2.1 x 100 mm	Column	5 µm	186003109	186003012	186003002	186003339	186004445
2.1 x 150 mm	Column	5 µm	186003110	186003013	186003003	186003340	186004446
3.0 x 20 mm *IS*	Column	5 µm	186003130	186003188	186003158	186003341	—
3.0 x 20 mm	Guard	5 µm	186003063[2]	186003081[2]	186003072[2]	186003367[2]	—
3.0 x 30 mm	Column	5 µm	186003111	186003189	186003159	186003342	—
3.0 x 50 mm	Column	5 µm	186003131	186003190	186003160	186003343	186004447
3.0 x 100 mm	Column	5 µm	186003132	186003191	186003004	186003344	186004448
3.0 x 150 mm	Column	5 µm	186003112	186003014	186003005	186003345	—
3.0 x 250 mm	Column	5 µm	186003133	186003192	186003161	186003346	—
4.6 x 20 mm *IS*	Column	5 µm	186003134	186003193	186003162	186003347	—
4.6 x 20 mm	Guard	5 µm	186003064[2]	186003082[2]	186003073[2]	186003368[2]	186004449
4.6 x 30 mm	Column	5 µm	186003135	186003194	186003163	186003348	186004450
4.6 x 50 mm	Column	5 µm	186003113	186003015	186003006	186003349	186004451
4.6 x 75 mm	Column	5 µm	186003114	186003195	186003007	186003350	—
4.6 x 100 mm	Column	5 µm	186003115	186003016	186003008	186003351	186004452
4.6 x 150 mm	Column	5 µm	186003116	186003017	186003009	186003352	186004453
4.6 x 250 mm	Column	5 µm	186003117	186003018	186003010	186003353	186004454

[1] Requires Universal Sentry™ Guard Holder - 2.1 x 10 mm WAT097958

[2] Requires Universal Sentry Guard Holder - 3.0 x 20 mm/4.6 x 20 mm WAT046910

XBridge Column Method Validation Kits

Each Method Validation Kit contains 3 columns, each from a different batch.

Dimensions	Type	Particle Size	C_{18}	C_8	Shield RP18	Phenyl
2.1 x 100 mm	MV Kit	3.5 µm	186003766	186003777	186003788	186003799
3.0 x 100 mm	MV Kit	3.5 µm	186003767	186003778	186003789	186003800
3.0 x 150 mm	MV Kit	3.5 µm	186003768	186003779	186003790	186003801
4.6 x 100 mm	MV Kit	3.5 µm	186003769	186003780	186003791	186003802
4.6 x 150 mm	MV Kit	3.5 µm	186003770	186003781	186003792	186003803
2.1 x 150 mm	MV Kit	5 µm	186003771	186003782	186003793	186003804
3.0 x 100 mm	MV Kit	5 µm	186003772	186003783	186003794	186003805
3.0 x 150 mm	MV Kit	5 µm	186003773	186003784	186003795	186003806
4.6 x 100 mm	MV Kit	5 µm	186003774	186003785	186003796	186003807
4.6 x 150 mm	MV Kit	5 µm	186003775	186003786	186003797	186003808
4.6 x 250 mm	M VKit	5 µm	186003776	186003787	186003798	186003809

Literature References

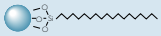
Waters XBridge HPLC Columns Brochure, Literature Reference 720001255EN

Waters XBridge HPLC Columns White Paper, Literature Reference 720001159EN

Utlizing XBridge HPLC Columns for Method Development at pH Extremes Application Note, Literature Reference WA43181

Interactive Waters Reversed-Phase Column Selectivity Chart, www.waters.com/selectivitychart

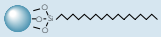
Atlantis® Columns
Featuring BEH Technology

		USP Class No.	pH Range (Room Temp.)	Temperature Limits (°C)	Particle Size (µm Spherical)	Pore Size (Angstroms)	Surface Area (m^2/g)	Carbon Load (%)
T3		L1	2-8	Low pH = 45 °C High pH = 45 °C	3, 5, 10	100Å	330	14%

Selectivity Features: Retention of polar compounds, compatible with 100% aqueous mobile phases, superior stability under low pH conditions. Specifically designed for enhanced retention of polar analytes.
Bonding: T3 (C_{18}) bonding and endcapping, bonded to high purity silica substrate.

HILIC		L3	1-5	Low pH = 45 °C High pH = 45 °C	3, 5	100Å	330	unbonded

Selectivity Features: Excellent for retention of very polar, basic, water soluble analytes. Specifically designed and tested for HILIC separations using mobile phases containing high concentrations of organic solvent.
Bonding: Unbonded high purity silica substrate.

C_{18}		L1	3-7	Low pH = 45 °C High pH = 45 °C	3, 5, 10	100Å	330	12%

Selectivity Features: Retention of polar compounds.
Designed for compatibility with 100% aqueous mobile phases.
Bonding: Difunctional C_{18} bonding, fully endcapped, bonded to high purity silica substrate.

Atlantis 3 µm Analytical Columns

Dimensions	Type	Particle Size	T3	dC_{18}	HILIC Silica
1.0 x 50 mm	Column	3 µm	186003713	186001279	186002003
1.0 x 150 mm	Column	3 µm	186003714	186001283	—
2.1 x 10 mm	Guard	3 µm	186003756[1]	186001377[1]	186002005[1]
2.1 x 15 mm	DC	3 µm	—	186002064	186002007
2.1 x 20 mm	Guard	3 µm	—	186001381[2]	—
2.1 x 20 mm *IS*	Column	3 µm	186003715	186002058	—
2.1 x 30 mm	Column	3 µm	186003716	186001287	186002009
2.1 x 50 mm	Column	3 µm	186003717	186001291	186002011
2.1 x 100 mm	Column	3 µm	186003718	186001295	186002013
2.1 x 150 mm	Column	3 µm	186003719	186001299	186002015
3.0 x 20 mm *IS*	Column	3 µm	186003720	186002060	—
3.0 x 50 mm	Column	3 µm	186003721	186001389	186002017
3.0 x 100 mm	Column	3 µm	186003722	186001303	186002019
3.0 x 150 mm	Column	3 µm	186003723	186001307	—
3.9 x 20 mm	Guard	3 µm	186003757[3]	186001313[3]	186002021[3]
3.9 x 50 mm	Cartridge	3 µm	—	186001385[4]	—
3.9 x 100 mm	Column	3 µm	—	186001393	—
3.9 x 150 mm	Column	3 µm	—	186001317	—
4.6 x 20 mm	Guard	3 µm	186003758[3]	186001321[3]	186002023[3]
4.6 x 20 mm *IS*	Column	3 µm	186003724	186002062	—
4.6 x 30 mm	Column	3 µm	186003725	186001325	186002025
4.6 x 50 mm	Column	3 µm	186003726	186001329	186002027
4.6 x 75 mm	Column	3 µm	186003727	186001333	—
4.6 x 100 mm	Column	3 µm	186003728	186001337	186002029
4.6 x 150 mm	Column	3 µm	186003729	186001342	186002031

Atlantis Columns Method Validation Kits

Dimensions	Particle Size	T3	dC_{18}	HILIC Silica
4.6 x 150 mm	3 µm	186003751	186002312	186002315
4.6 x 150 mm	5 µm	186003754	186002311	186002314
4.6 x 250 mm	5 µm	186003755	186002313	186002316

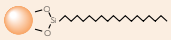
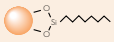
Atlantis 5 µm Analytical Columns

Dimensions	Type	Particle Size	T3	dC_{18}	HILIC Silica
1.0 x 50 mm	Column	5 µm	186003730	186001281	186002004
1.0 x 150 mm	Column	5 µm	186003731	186001285	—
2.1 x 10 mm	Guard	5 µm	186003759[1]	186001379[1]	186002006[1]
2.1 x 15 mm	DC	5 µm	—	186002065	186002008
2.1 x 20 mm	Guard	5 µm	—	186001383[2]	—
2.1 x 20 mm *IS*	Column	5 µm	186003732	186002059	—
2.1 x 30 mm	Column	5 µm	186003733	186001289	186002010
2.1 x 50 mm	Column	5 µm	186003734	186001293	186002012
2.1 x 100 mm	Column	5 µm	186003735	186001297	186002014
2.1 x 150 mm	Column	5 µm	186003736	186001301	186002016
3.0 x 20 mm *IS*	Column	5 µm	186003737	186002061	—
3.0 x 50 mm	Column	5 µm	186003738	186001391	186002018
3.0 x 100 mm	Column	5 µm	186003739	186001305	186002020
3.0 x 150 mm	Column	5 µm	186003740	186001309	—
3.0 x 250 mm	Column	5 µm	186003741	186001311	—
3.9 x 20 mm	Guard	5 µm	186003760[3]	186001315[3]	186002022[3]
3.9 x 50 mm	Cartridge	5 µm	—	186001387[4]	—
3.9 x 100 mm	Column	5 µm	—	186001395	—
3.9 x 150 mm	Column	5 µm	—	186001319	—
4.6 x 20 mm	Guard	5 µm	186003761[3]	186001323[3]	186002024[3]
4.6 x 20 mm *IS*	Column	5 µm	186003742	186002063	—
4.6 x 30 mm	Column	5 µm	186003743	186001327	186002026
4.6 x 50 mm	Column	5 µm	186003744	186001331	186002028
4.6 x 75 mm	Column	5 µm	186003745	186001335	—
4.6 x 100 mm	Column	5 µm	186003746	186001340	186002030
4.6 x 150 mm	Column	5 µm	186003747	186001344	186002032
4.6 x 250 mm	Column	5 µm	186003748	186001346	186002033

[1] Requires Sentry Guard Holder WAT097958
[2] Requires Sentry Guard Holder 186000262
[3] Requires Sentry Guard Holder WAT046910
[4] Requires Cartridge Fittings WAT037525

SunFire™ COLUMNS

Featuring BEH Technology

		USP Class No.	pH Range (Room Temp.)	Temperature Limits (°C)	Particle Size (µm Spherical)	Pore Size (Angstroms)	Surface Area (m^2/g)	Carbon Load (%)
C_{18}		L1	2-7	Low pH = 50 °C High pH = 40 °C	2.5, 3.5, 5, 10	100Å	340	16%
	Selectivity Features: General purpose method development column. Very high loading capacity, particularly for basic analytes in low pH mobile phases. Ideally suited for purification and impurity profile assays. Bonding: Difunctional C_{18}, fully endcapped, bonded to high purity silica substrate.							
C_8		L7	2-7	Low pH = 40 °C High pH = 40 °C	2.5, 3.5, 5, 10	100Å	340	12%
	Selectivity Features: General purpose method development column. Very high loading capacity, particularly for basic analytes in low pH mobile phases. Less hydrophobic, therefore, less retentive than C18 for most analytes. Bonding: Difunctional C_8, fully endcapped, bonded to high purity silica substrate.							

SunFire Analytical Columns

Dimensions	Particle Size	C_{18}	C_8
1.0 x 50 mm	2.5 µm	186003392	186003394
2.1 x 20 mm *IS*	2.5 µm	186003397	186003398
2.1 x 30 mm	2.5 µm	186003399	186003400
2.1 x 50 mm	2.5 µm	186003401	186003402
3.0 x 20 mm *IS*	2.5 µm	186003403	186003404
3.0 x 30 mm	2.5 µm	186003407	186003408
3.0 x 50 mm	2.5 µm	186003409	186003410
4.6 x 20 mm *IS*	2.5 µm	186003411	186003412
4.6 x 30 mm	2.5 µm	186003415	186003416
4.6 x 50 mm	2.5 µm	186003417	186003418
4.6 x 75 mm	2.5 µm	186003419	186003420
1.0 x 50 mm	3.5 µm	186002526	186002705
1.0 x 150 mm	3.5 µm	186002528	186002706
2.1 x 20 mm *IS*	3.5 µm	186002531	186002697
2.1 x 30 mm	3.5 µm	186002532	186002709
2.1 x 50 mm	3.5 µm	186002533	186002710
2.1 x 100 mm	3.5 µm	186002534	186002711
2.1 x 150 mm	3.5 µm	186002535	186002712
3.0 x 20 mm *IS*	3.5 µm	186002686	186002701
3.0 x 30 mm	3.5 µm	186003254	Custom
3.0 x 50 mm	3.5 µm	186002542	186002719
3.0 x 100 mm	3.5 µm	186002543	186002720
3.0 x 150 mm	3.5 µm	186002544	186002721
4.6 x 20 mm *IS*	3.5 µm	186002549	186002699
4.6 x 30 mm	3.5 µm	186002550	186002728
4.6 x 50 mm	3.5 µm	186002551	186002729
4.6 x 75 mm	3.5 µm	186002552	186002730
4.6 x 100 mm	3.5 µm	186002553	186002731
4.6 x 150 mm	3.5 µm	186002554	186002732
1.0 x 150 mm	5 µm	186002529	186002707
2.1 x 20 mm *IS*	5 µm	186002537	186002698
2.1 x 30 mm	5 µm	186002538	186002714
2.1 x 50 mm	5 µm	186002539	186002715
2.1 x 100 mm	5 µm	186002540	186002716
2.1 x 150 mm	5 µm	186002541	186002717
3.0 x 20 mm *IS*	5 µm	186002685	186002702
3.0 x 50 mm	5 µm	186002545	186002723
3.0 x 100 mm	5 µm	186002546	186002724
3.0 x 150 mm	5 µm	186002547	186002725
3.0 x 250 mm	5 µm	186002548	186002726

SunFire Analytical Columns

Dimensions	Particle Size	C_{18}	C_8
4.6 x 20 mm *IS*	5 µm	186002555	186002700
4.6 x 30 mm	5 µm	186002556	186002734
4.6 x 50 mm	5 µm	186002557	186002735
4.6 x 100 mm	5 µm	186002558	186002736
4.6 x 150 mm	5 µm	186002559	186002737
4.6 x 250 mm	5 µm	186002560	186002738

SunFire Method Validation Kits

Dimensions	Particle Size	C_{18}	C_8
2.1 x 100 mm MV Kits	3.5 µm	186002674	186002739
4.6 x 100 mm MV Kits	3.5 µm	186002675	186002740
4.6 x 150 mm MV Kits	3.5 µm	186002676	186002741
4.6 x 100 mm MV Kits	5 µm	186002677	186002742
2.1 x 150 mm MV Kits	5 µm	186002678	186002743
4.6 x 150 mm MV Kits	5 µm	186002679	186002744
4.6 x 250 mm MV Kits	5 µm	186002680	186002745

SunFire Sentry Guard Columns (2/pk)

Dimensions	Particle Size	C_{18}	C_8
2.1 x 10 mm	2.5 µm	186003395[3]	186003396[3]
3.0 x 20 mm	2.5 µm	186003405[4]	186003406[4]
4.6 x 20 mm	2.5 µm	186003413[4]	186003414[4]
2.1 x 10 mm	3.5 µm	186002530[3]	186002708[3]
3.0 x 20 mm	3.5 µm	186002681[4]	186002718[4]
4.6 x 20 mm	3.5 µm	186002682[4]	186002727[4]
2.1 x 10 mm	5 µm	186002536[3]	186002713[3]
4.6 x 20 mm	5 µm	186002684[4]	186002733[4]
3.0 x 20 mm	5 µm	186002683[4]	186002722[4]

[3] Requires Universal Sentry Guard Column Holder - 2.1 x 10 mm WAT097958
[4] Requires Universal Sentry Guard Column Holder - 3.0 x 20 mm WAT046910

Waters PAH Columns

Waters PAH Columns Improve Analysis of PAH Compounds

Polynuclear Aromatic Hydrocarbons (PAHs) are among the most frequently monitored environmental contaminants. Standard and official methods for the analysis of PAHs are found in compendia for air, drinking water, wastewater, solid waste, and food analysis[1].

Many of these methods specify HPLC, usually with UV and fluorescence detection, as the recommended analytical procedure.

Waters PAH columns are optimized for the HPLC analysis of PAHs. The chromatogram (top right) shows 16 PAH compounds, listed as target pollutants by the United States Environmental Protection Agency (U.S. EPA). The Waters PAH columns achieve baseline resolution and excellent peak symmetry for all 16 target analytes in less than 25 minutes, while employing a simple water; acetonitrile binary gradient. The resolving power of the PAH Columns provides superior peak identification and quantitation for PAHs.

Florida Administrative Code 17.700 includes 2 additional compounds (1-methyl naphthalene and 2-methyl naphthalene) in addition to the 16 compound EPA 610 mix that we currently use to show the proficiency of Waters instrumentation to analyze PAH compounds (bottom right). The new Waters PAH columns resolve these two compounds along with the other 16.

Waters PAH columns come in seven different dimensions (including a capillary format), and two particle sizes. Each column comes with a complete Certificate of Analysis backed by a world-class ISO 9002 registered documentation trail.

Reference:

[1]. AOAC 973.30; Deutsche DIN TVO; UK ISBN 0 11 & 752032 2; U.S. EPA Methods TO-13, 550 & 550.1, 610, 8310

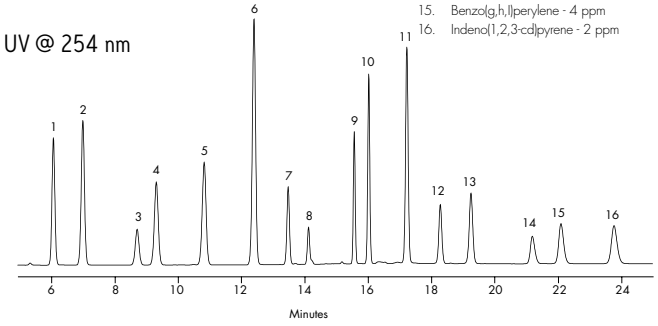
Waters PAH Columns

Particle Size	Dimensions	Part No.
5 µm	4.6 x 250 mm	186001265
5 µm	4.6 x 150 mm	186001264
3 µm	4.6 x 50 mm	186001260
5 µm	3.0 x 250 mm	186001263
5 µm	2.1 x 250 mm	186001262
5 µm	2.1 x 150 mm	186001261
5 µm	0.32 x 150 mm	186001259

PAH Analysis using Waters PAH Columns

Column: Waters PAH Column 5 µm, 4.6 x 250 mm @ 27 °C
Part No.: 186001265
System: Waters Alliance System with 2996 Photodiode Array Detector
Eluent A: Water
Eluent B: Acetonitrile
Gradient: 60% B to 100% B using curve 9 in 12 minutes, hold 11 minutes, back to initial conditions
Flow Rate: 1.2 mL/min
Injection: 20 µL
Sample: EPA-610 mixture

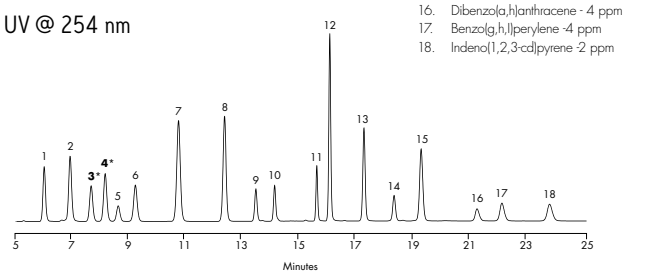
Peaks :
1. Naphthalene - 20 ppm
2. Acenaphthylene - 40 ppm
3. Acenaphthene - 20 ppm
4. Fluorene - 4 ppm
5. Phenanthrene - 2 ppm
6. Anthracene - 2 ppm
7. Fluoranthene - 4 ppm
8. Pyrene - 2 ppm
9. Benzo(a)anthracene - 2 ppm
10. Chrysene- 2 ppm
11. Benzo(b)fluoranthene - 4 ppm
12. Benzo(k)fluoranthene - 2 ppm
13. Benzo(a)pyrene - 2 ppm
14. Dibenzo(a,h)anthracene - 4 ppm
15. Benzo(g,h,I)perylene - 4 ppm
16. Indeno(1,2,3-cd)pyrene - 2 ppm



PAH Analysis According to Florida Administrative Code 17.700

Column: Waters PAH Column 5 µm, 4.6 x 250 mm @ 27 °C
Part No.: 186001265
Eluent A: Water
Eluent B: Acetonitrile
Gradient: 60% B to 100% B using curve 9 in 12 minutes, hold 11 minutes, back to initial conditions
Flow Rate: 1.2 mL/min
Injection: 20 µL
Sample: EPA-610 mixture plus two compounds*

Peaks :
1. Naphthalene - 20 ppm
2. Acenaphthylene - 40 ppm
3*. 1-methyl naphthalene - 25 ppm
4*. 2-methyl naphthalene - 25 ppm
5. Acenaphthene - 20 ppm
6. Fluorene - 4 ppm
7. Phenanthrene - 2 ppm
8. Anthracene - 2 ppm
9. Fluoranthene - 4 ppm
10. Pyrene - 2 ppm
11. Benzo(a)anthracene - 2 ppm
12. Chrysene - 4 ppm
13. Benzo(b)fluoranthene - 4 ppm
14. Benzo(k)fluoranthene - 2 ppm
15. Benzo(a)pyrene - 2 ppm
16. Dibenzo(a,h)anthracene - 4 ppm
17. Benzo(g,h,I)perylene -4 ppm
18. Indeno(1,2,3-cd)pyrene -2 ppm



Transition Metal Analysis

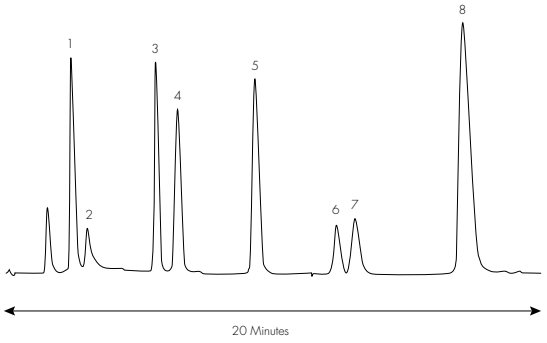
Transition metals can be separated on a dynamically coated C_{18} column and detected at low ppb levels using post-column addition of PAR reagent with UV detection. This method provides excellent resolution with good selectivity and analysis time.

Transition Metal Analysis using Post-Column Derivatization

Column:	Delta-Pak™ C_{18}, 5 µm, 100Å, 3.9 x 150 mm
Part No.:	WAT011795
Injection:	100 µL
Flow Rate:	0.8 mL/min
Eluent:	2 mM Sodium Octanesulfonate, 35 mM Sodium Tartrate, 5% Acetonitrile, adjust to pH 3.65 with NaOH
Post-column Reagent:	0.2 mM PAR [4-(2-pyridylazo)resorcinol], 1 M Acetic Acid, 3 M Ammonium Hydroxide, 0.5 mL/min

Working Standard

1	Cu	=	0.5 ppm
2	Pb	=	1.0 ppm
3	Zn	=	0.5 ppm
4	Ni	=	1.0 ppm
5	Co	=	0.5 ppm
6	Cd	=	1.0 ppm
7	Fe(II)	=	2.0 ppm
8	Mn	=	1.0 ppm



Ordering Information

Description	Particle Size	Pore Size	Dimensions	Part No.
Delta-Pak C_{18}	5 µm	100Å	3.9 x 150 mm	WAT011795

Pesticide Analysis

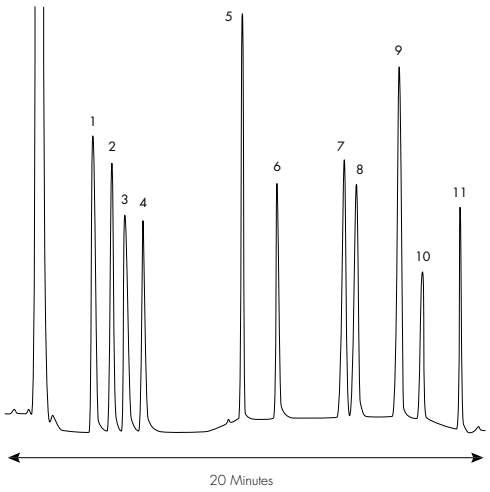
When used with the Waters Carbamate Analysis System, the Carbamate Analysis column provides a guaranteed analysis of the carbamate pesticides that exceeds the sensitivity required by AOAC Method 985.23.

The baseline resolution and high sensitivity of this separation, coupled with the optimized system configuration, provide state-of-the-art analysis of carbamates. The separation of eleven carbamate pesticides and carbamate metabolites is accomplished in 20 minutes.

Carbamate Analysis

Column:	Carbamate Analysis column 3.9 x 150 mm
Part No.:	WAT035577
Mobile Phase:	Water/methanol/acetonitrile complex gradient
Flow Rate:	1.5 mL/min
Sample:	10 ng of each analyte on column
Injection Volume:	400 µL
Post Column Addition:	OPA/NaOH @ 0.5 mL/min
Detector:	Model 470 Fluorescence Detector Excitation: 339 nm lambda Emission: 445 nm lambda

1	Aldicarb sulfoxide
2	Aldicarb sulfone
3	Oxamyl
4	Methomyl
5	3-Hydroxycarbofuran
6	Aldicarb
7	Propoxur
8	Carbofuran
9	Carbaryl
10	1-Naphthol
11	Methiocarb



Carbamate Analysis Column for Pesticides

Column	Dimensions	Part No.
Carbamate Analysis	3.9 x 150 mm	WAT035577

Ion Analysis

Waters offers an array of products for ion chromatography as well as innovative capillary electrophoresis products for ion analysis (see the Capillary Electrophoresis section). In ion chromatography, anions and cations are typically measured in two separate analyses. The columns offered for each type of analysis are briefly described below.

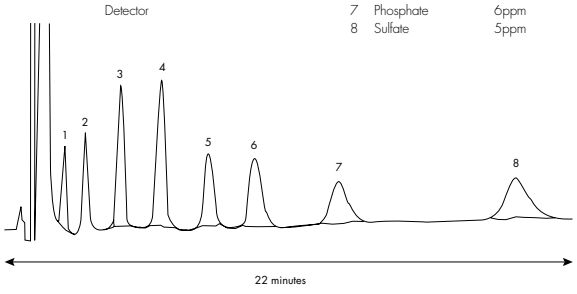
Waters IC-Pak™ resin-based columns allow you to analyze a full range of ions from numerous sample matrices, both simple and complex. They offer an exceptional linear loading range of less than 1.0 ppb to greater than 400 ppm without dilution and without pH limitations on eluent or sample. The flexibility exists for accurate and reproducible anion and cation analyses at all concentration levels. The IC-Pak series of resin-based columns shares the same chemistry and gives you identical elution order profiles.

The IC-Pak Anion series of columns is used for the analysis of inorganic anions, while the IC-Pak Ion Exclusion columns are used for organic acid analysis. Organic acid analysis is discussed in the Food and Beverage section.

The selection of a cation analysis column depends on the type of cation being measured. The IC-Pak C M/D column separates alkali and alkaline earths more efficiently than the traditional IC-Pak Cation column. The IC-Pak C M/D column also separates ethanolamine-related organic cations. Transition metals can be separated using a Delta-Pak C_{18} column. The lanthanide series can be separated using Resolve™ C_{18} (a nonendcapped C_{18} material). Finally, metallocyanides can be analyzed on a Nova-Pak C_{18} column.

IC-Pak Anion HC Column

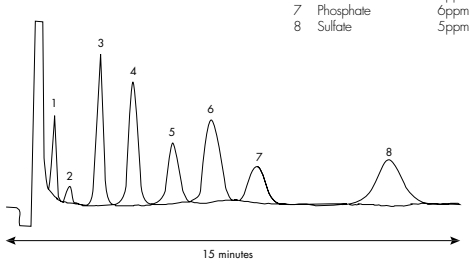
Column:	IC-Pak Anion HC column, 4.6 x 150 mm	1	Fluoride	1ppm
Part No.:	WAT026770	2	Bicarbonate	—
Sample:	Seven anion standard	3	Chloride	2ppm
Eluent:	Borate/gluconate	4	Nitrite	4ppm
Detection:	Waters 431 Conductivity Detector	5	Bromide	4ppm
		6	Nitrate	4ppm
		7	Phosphate	6ppm
		8	Sulfate	5ppm



IC-Pak Anion HC (high capacity) columns use the same packing material as the IC-Pak Anion columns and are best suited for applications where there are orders of magnitude differences in the concentrations of the analytes. This is often the case with water and soil samples where you may have to measure ppb levels of phosphate in the presence of ppm levels of chloride and nitrate. The IC-Pak Anion HC column gives excellent resolution, even with injection volumes up to 500 µL.

IC-Pak Anion Column

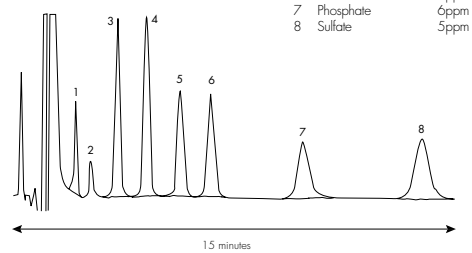
Column:	IC-Pak Anion, 4.6 x 50 mm	1	Fluoride	1ppm
Part No.:	WAT007355	2	Bicarbonate	—
Sample:	Seven anion standard	3	Chloride	2ppm
Eluent:	Borate/gluconate	4	Nitrite	4ppm
Detection:	Waters 431 Conductivity Detector	5	Bromide	4ppm
		6	Nitrate	4ppm
		7	Phosphate	6ppm
		8	Sulfate	5ppm



The IC-Pak Anion column is a configuration of 10 µm anion exchange packing material and a short column length which makes this the column of choice for rapid routine analyses.

IC-Pak Anion HR Column

Column:	IC-Pak Anion HR, 4.6 x 75 mm	1	Fluoride	1ppm
Part No.:	WAT026765	2	Bicarbonate	—
Sample:	Seven anion standard	3	Chloride	2ppm
Eluent:	Borate/gluconate	4	Nitrite	4ppm
Detection:	Waters 431 Conductivity Detector	5	Bromide	4ppm
		6	Nitrate	4ppm
		7	Phosphate	6ppm
		8	Sulfate	5ppm



IC-Pak Anion HR (high resolution) columns are packed with smaller 6 µm particles. This column is designed for the most demanding separations where the column's high efficiency gives enhanced resolution and outstanding sensitivity.

IC-Pak Anion Analysis Columns

A family of anion exchange columns with different characteristics has been developed to meet the needs of even the most demanding separations.

Description	Dimensions	Part No.
IC-Pak Anion	4.6 x 50 mm	WAT007355
IC-Pak Anion HR	4.6 x 75 mm	WAT026765
IC-Pak Anion HC	4.6 x 150 mm	WAT026770
IC-Pak Anion Guard-Pak™ Kit (Guard-Pak Holder and 5 inserts)		WAT007357
IC-Pak Anion Concentrator Inserts*	(5/pkg)	WAT007358
IC-Pak Anion Guard-Pak Inserts*	(5/pkg)	WAT010551
Guard-Pak Holder		WAT088141

* Requires Guard-Pak Holder

Ion Analysis

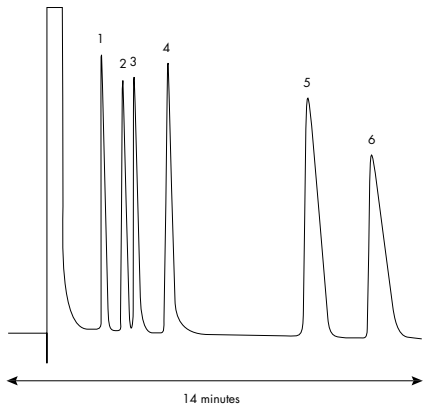
The silica-based IC-Pak C M/D column allows a simultaneous analysis of monovalent and divalent cations under isocratic conditions. This technology provides the analytical chemist with the most sensitive means of analyzing monovalent cations such as Na^+, K^+, Li^+ and NH_4^+.

The IC-Pak Cation column is packed with 10 µm sulfonated styrene divinylbenzene particles. Monovalent and divalent cations may be analyzed in two separate runs. Different mobile phase compositions are used for the two analyses.

IC-Pak C M/D

Method: Waters IC-Method C-207
Column: Waters IC-Pak C M/D, 3.9 x 150 mm
Part No.: WAT036570
Eluent: 0.1 mM EDTA/3.0 mM Nitric Acid
Flow Rate: 1 mL/min
Injection: 100 µL
Detection: Conductivity

Cation	Standards
1 Lithium	0.54 ppm
2 Sodium	1.0 ppm
3 Ammonium	2.0 ppm
4 Potassium	4.0 ppm
5 Magnesium	2.0 ppm
6 Calcium	3.0 ppm



IC-Pak Cation Analysis Columns

Description	Dimensions	Part No.
IC-Pak C M/D column	3.9 x 150 mm	WAT036570
IC-Pak C M/D Guard-Pak inserts* (10/pkg)		WAT044250
IC-Pak Cation column	4.6 x 50 mm	WAT007354
IC-Pak Cation Guard column	4.6 x 50 mm	WAT007356
IC-Pak Cation Concentrator inserts* (5/pkg)		WAT010565

Ion-Exclusion Columns

Waters IC-Pak ion-exclusion columns are used for the analysis of weak acid anions such as fluoride and short chain organic acids from formate to butyrate.

Description	Dimensions	Part No.
IC-Pak Ion Exclusion column	7.8 x 150 mm	WAT010295
IC-Pak Ion Exclusion column	7.8 x 300 mm	WAT010290
IC-Pak Ion Exclusion Guard-Pak inserts*	(10/pkg)	WAT020770
Guard-Pak Holder		WAT088141

* Requires Guard-Pak Holder

Waters Alliance HPLC System

The Alliance® HPLC systems offer flexibility with easy-to-configure instrumentation modules that address the needs of multiple applications. Alliance is built around the 2695 Separations Module, which offers integrated solvent and sample management. The 2695 Separations Module is designed to work with both MassLynx™ mass spectrometry and Empower™ 2 chromatography software, the complete range of Waters HPLC column chemistries and a variety of Waters high performance detectors, including photodiode array (PDA), multi-wavelength fluorescence and dual-wavelength absorbance.

Waters Alliance System for Carbamate Analysis

The Alliance HPLC system for carbamate analysis is a completely integrated system that detects carbamate at parts-per-trillion levels necessary for regulatory compliance, and exceeds precision and accuracy requirements mandated by the United States Environmental Protection Agency (US EPA) and AOAC methods. The analysis of glyphosate can also be performed on the same system.

Waters ACQUITY UPLC System with the TQ Detector

The ACQUITY TQD is a smaller, easier to use, enhanced capability tandem quadrupole mass detector specifically designed as an affordable, fast MS/MS system compatible with UPLC. Labs will benefit from robust and reliable performance and walk-up operation. Interactive IntelliStart™ diagnostics software allows for worry-free system optimization and performance checks.

Waters Quattro micro API Mass Spectrometer

The Waters Quattro micro™ API incorporates the finest high-precision tandem quadrupole mass analyzer technology in only 15.3 in (390 mm) of linear bench space. The mass analyzer has a standard m/z range of 2 to 2000 and a sensitivity equivalent to systems that are three times the size.

Waters ACQUITY UPLC System

The ACQUITY UPLC® system features a novel liquid chromatography technology that utilizes 1.7 µm stationary phase pressure-tolerant particles. When combined with high pressure fluidic modules, a fast response detector and integrated data analysis software, UPLC® technology delivers faster run times, better resolution and greater sensitivity.

Waters AquaAnalysis System

The AquaAnalysis System for drinking water analysis has been developed specifically to overcome the challenges faced by water testing laboratories providing parallel analyte extraction, separation, and detection in one turn-key solution. It is the only parallel on-line sample prep plus separation and detection system in the market today, providing a holistic solution from point of sample collection to report print out.

Waters Certified Reference Materials and QC Standard Solutions

With the addition of Environmental Resource Associates (ERA) to the Waters family, we are pleased to provide a wide range of Certified Reference Materials (CRMs) and QC Standards for your environmental testing needs. Based upon the highest levels of technical and manufacturing excellence, these products ensure accurate and compliant results. For your convenience, we have listed the Analytical Techniques and EPA Methods (as well as several other widely utilized methods) supported by our CRM and QC Standards offering in the form of a Quick Reference Chart.

Certfied Reference Materials/QC Standards Quick Reference Chart

Waters is pleased to be able to provide Certified Reference Materials and/or QC Standards for the following Analytical Techniques:

Atomic Absorption Spectrometry (AA)

Colorimetric

Inductively Coupled Plasma - Optimcal Emmission Spectroscopy (ICP-OES)

Inductively Coupled Plasma - Mass Spectrometry (ICP-MS)

Ion Chromatography (IC)

Infrared Spectroscopy (IR)

Gravimetric

Nephelometric

Titrimetric

Ion - Selectivity Electrodes (ISE)

Distillation

Purge and Trap

Whole Effluent Testing (WET)

Gas Chromatography (GC)

High Performance Liquid Chromatography (HPLC)

UltraPerformance Liquid Chromatography (UPLC)

Resource Conservation and Recovery Act Methods (RCRA)

Superfund Methods

EPA Methods

EPA Method Number			
5	413.1	548	8091
5a	413.2	549	8141
5b	418	550	8151
5d	418.1	551	8260
5f	425.1	552	8270
6	502.2	555	8280
7	504	608	8290
8	505	610	8310
0010	506	613	8318
13a	507	614	8330
12	508	619	8440
14	508a	622	9071B
26	508.1	625	CTM 027
26a	515.1	632	TO-04A
29	515.2	633	TO-10A
0030	515.3	1613	TO-11A
0031	515.4	1664	TO-13A
0061/7119	521	3050	TO-14
101A	524.2	3051	TO-15
110.1	525	4020	TO-17
110.2	525.2	5520	
110.3	529	8015	
160.4	531.1	8021	
200.8	535	8081	
331.2	547	8082	

Other Methods

ASTM D5673-03
California ELAP Requirements
CARB Method 425
Long Term 2 Enhanced Surface Water Treatment Rule
SDWA Quantitative Methods
Standard Method 2120B
Standard Method 2120C
Standard Method 2120E
Standard Method 2540E
Standard Method 3125
Standard Method 5910B
Standard Method 9215B

Waters SPE Solutions

In addition to our complete Environmental Analysis Solutions, Waters also supplies solid-phase extraction tools which can be utilized with a wide number of EPA Methods. Featuring our revolutionary Oasis and classic Sep-Pak technologies, we can assist you by providing fast, reliable, and compliant extractions of your environmental samples. For your convenience, we have listed EPA Methods and the corresponding Waters SPE cartridges below in the form of two Quick Reference Charts.

Florisil SPE Quick Reference Chart

EPA Method Number			
430	611	636	8061
506	614	638	8080
509	617	639	8081
515.1	619	645	8111
606	622.1	646	8121
607	629	1656	8131
608.2	632	1658	8141
609	633.1	8032	

For detailed information on our environmental methods, see
Waters Environmental Chromatography Methods Guide
(Literature code: 720002543EN),
or visit **www.waters.com/environment**

SPE Quick Reference Chart

EPA Method Number	SPE Phase
504	Sep-Pak Silica
506	Sep-Pak C_{18}
507	Sep-Pak C_{18}
508.1	Sep-Pak C_{18}
513	Sep-Pak C_{18}
525	Sep-Pak C_{18}/Oasis HLB
532	Sep-Pak C_{18}
535	Oasis HLB
547	Oasis MAX
548	Sep-Pak C_{18}/Oasis HLB
549	Sep-Pak C_8/Oasis WCX
550.1	Sep-Pak C_{18}
552.1	Oasis HLB, Oasis MAX
553	Sep-Pak C_{18}
554	Sep-Pak Silica
555	Sep-Pak Silica
608	Sep-Pak C_{18}
625	Oasis HLB
629	Oasis HLB
632	Oasis MCX
1613	Sep-Pak C_{18}
1614	Sep-Pak C_{18}
1657	Sep-Pak C_{18}
1668	Sep-Pak C_{18}
1694	Oasis HLB
8080	Sep-Pak C_{18}
8082	Sep-Pak C_{18}
8315a	Sep-Pak C_{18}
8318a	Oasis HLB
8330	Pora-Pak RDX
8440	Sep-Pak Silica
TO-11A	Sep-Pak DNPH
Emerging Contaminants	
PFOS, PFOA	Oasis WAX
Pharmaceutical Compounds	Oasis HLB
Endocrine Disruptors	Oasis HLB

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4. How will my order be shipped?

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