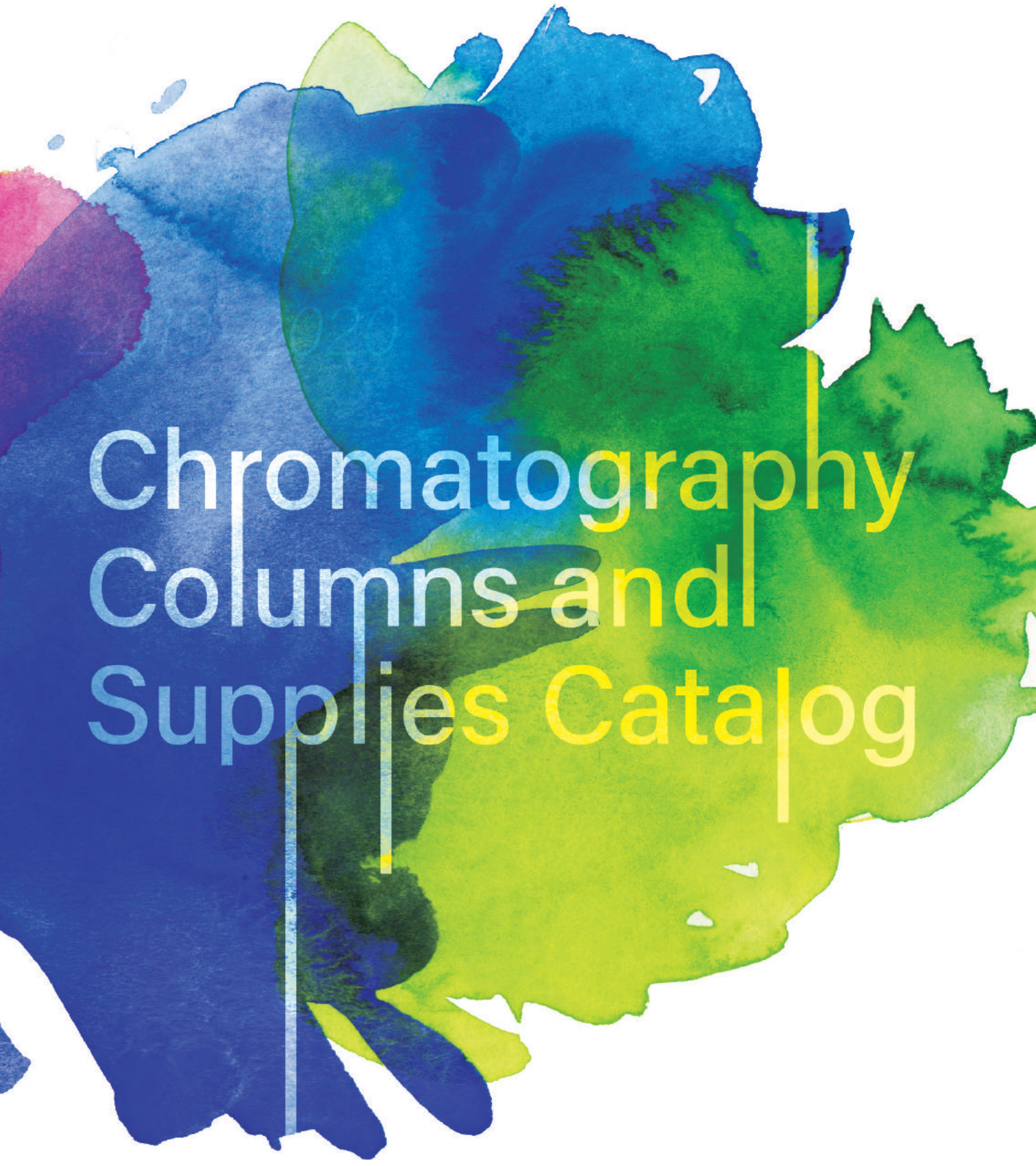
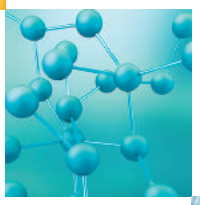


Chromatography Columns and Supplies Catalog

Waters

THE SCIENCE OF WHAT'S POSSIBLE.™

Table of Contents


Quality Policy

Meeting Customer Requirements, Exceeding Expectations.

We provide innovative technological solutions that enable customer success, by consistently delivering safe, effective, and reliable products and services.

We maintain the effectiveness of our quality management system and foster an environment of continual improvement while meeting statutory and regulatory requirements.

We are dedicated to customer experience excellence through our core values, the engagement of our people, and our strategic vision.

Christopher J. O'Connell
President and Chief Executive Officer, Waters Corporation

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January 2017. 730000639, v01.

Sample Preparation

Sample Preparation

Contents

Sample Preparation

Goals of Sample Preparation

Successful sample preparation for most analytical techniques (HPLC, UPLC,™LC-MS, UV, GC, etc.) has a threefold objective. It needs to provide the sample component of interest:

- In solution
- Free from interfering matrix elements
- At a concentration appropriate for detection or measurement

Waters™ Sample Preparation Solutions for quantitative analysis make it easy to deliver a sample that is reproducible with high recovery and free of interferences. Based on simple, logical workflows that produce clean samples through selective separations, Waters Sample Preparation Products maximize sensitivity, increase throughput, and enable the development of robust methods.

Benefits of Solid-Phase Extraction

Solid-phase extraction (SPE) is a sample preparation technology that uses solid particle, chromatographic packing material contained in a device to chemically separate the different components of a sample. It is used across many different industries and application areas to insure that the sample of interest is in an appropriate state of cleanliness and concentration to achieve successful analytical results for a variety of analytical measurement techniques.

While there are many reasons for using SPE, there are several major benefits that SPE provides:

- Simplification of complex sample matrix - SPE separates the compound of interest from matrix interferences that make accurate analysis difficult to obtain
- Reduce ion suppression or enhancement in MS applications - SPE provides cleaner sample extracts resulting in improved MS-signal response and overall method robustness
- Trace enrichment of very low level compounds - SPE provides the ability to concentrate specific compounds of interest in a sample to improve method sensitivity and detection limits
- Ability to fractionate compounds by class from a sample matrix - SPE can target and isolate specific classes of compounds depending on the needs of the analysis
- Improve robustness of analytical methods - SPE provides a cleaner sample extract that translates directly to more robust and reproducible analytical results
- Increase column lifetime - SPE removes matrix interferences which can accumulate on chromatographic columns and cause poor lifetime and premature column failure

Selecting the Correct SPE Format

Formats		
µElution Plates	■ Patented µElution™ plate design. ■ Ideal for SPE cleanup and analyte enrichment of sample volumes ranging from 10 µL to 375 µL. ■ No evaporation and reconstitution necessary due to elution volumes as low as 25 µL. ■ Up to a 15× increase in concentration. ■ Compatible with most liquid-handling robotic systems for automated, reliable, high-throughput SPE (HT-SPE).	
96-well Extraction Plates	■ Innovative, award-winning, two-stage well design. ■ High throughput and high recovery. ■ Available with 5 mg, 10 mg, 30 mg, and 60 mg of sorbent per well. ■ Compatible with most liquid-handling robotic systems for automated, reliable, high throughput SPE (HT-SPE).	
Syringe-barrel Cartridges	■ Ultra-clean syringe barrel and frits. ■ Available with cartridge sizes ranging from 1 cc/10 mg up to 35 cc/6 g. ■ Flangeless syringe-barrel cartridges available in 1 cc, 3 cc, and 6 cc configurations.	
Luer-tip Plus Cartridge (Format)	■ Plus-style cartridge with Luer inlet hub easily attaches to a syringe. ■ Allows for easy SPE without the need for a vacuum manifold. ■ Available in many sorbent types and specialty chemistries.	
Glass Cartridges	■ Ultra-clean glass syringe with Teflon frit. ■ For trace level detection and analysis at part-per-trillion levels. ■ Available in 5 cc with 200 mg of sorbent configuration.	
On-line Columns and Cartridges	■ For rugged, reproducible, and ultra-fast online analysis. ■ Wide choice of configurations, particle sizes, and sorbent chemistries. ■ Available with six, patented, Oasis™ Sorbents—HLB, PRiME HLB, MCX, MAX, WCX, and WAX. ■ High recovery and reproducible results for a wide range of compounds. ■ Cartridge format for use with Spark Holland Prospekt-2/Symbiosis systems also available.	

Sorbent Amount and Solvent Selection for the Generic SPE Method

The suggested amount of sorbent in a cartridge or a plate required for your application is given in the table to the right. Due to the increased capacity of the Oasis sorbents, you can use less sorbent than you would normally need if you used a silica-based packing. When converting from C_{18} silica-based sorbents to Oasis SPE Sorbents, use approximately two-thirds less Oasis sorbent (100 mg C_{18} sorbent = 30 mg Oasis sorbent).

Capacity and Elution Volume of Oasis 96-well Plates and Cartridges

Sorbent Per Device	Maximum Mass Capacity	Typical Sample Volumes	Elution Volume
2 mg (µElution Plate)*	60–400 µg	10–375 µL	25 µL**
5 mg*	0.15–1 mg	10–100 µL	≤150 µL
10 mg	0.35–2 mg	50–200 µL	≤250 µL
30 mg	1–5 mg	100 µL–1 mL	≥400 µL
60 mg	2–10 mg	200 µL–2 mL	≥800 µL

* Available only in 96-well plate formats.
** µElution Plate requires no evaporation step.

Tips for Selecting Elution Solvents for the Generic SPE Method (1-D)* *The elution solvent is selected based on polarity of analyte.*

Solvent	Solvent Type	Relative Elution Strength**	Comments
Methanol	Proton donor	1.0	Disrupts H-bonding
Acetonitrile	Dipole-dipole	3.1	Medium polarity drugs
Tetrahydrofuran	Dipole-dipole	3.7	Medium polarity drugs
Acetone	Dipole-dipole	8.8	Medium polarity drugs
Ethyl acetate	Dipole-dipole	High	Non-polar drugs and GC compatible
Methylene chloride	Dipole-dipole	High	Non-polar drugs and GC compatible

* When using solvents other than methanol, add 10–30% of proton donor solvent such as methanol to disrupt H-bonding on the Oasis HLB sorbent.

** High-Purity Solvent Guide. Burdick and Jackson Laboratories, Inc. Solvent Properties of Common Liquids, L.R. Snyder, J. Chromatogr., 92, 223 (1974); J. Chromatogr. Sci. 16, 223 (1978).

DID YOU KNOW...

Sample Pretreatment Suggestion

Applying one or more of the following steps before loading your sample may improve your results:

1. Dilute sample 1:1 with buffer to improve flow during loading
2. Dilute 1:1 or greater with 4% phosphoric acid or other acids
3. Filter through 0.45 µm membrane
4. Centrifuge @ ≥3000 rpm

APPLICATION AREA: Sample Preparation for Analysis of THC and Metabolites in Whole Blood from Impaired Drivers

"After evaluating many of the SPE products currently on the market on the criteria of recovery, matrix cleanup, ease of use, and cost, Oasis PRiME HLB µElution plate by far is the best option for the analysis of drugs of abuse in whole blood samples. Waters provided excellent support through application notes, in-person training and method development, troubleshooting, and equipment support throughout the optimization and validation process. The µElution plates demonstrate excellent reproducibility, recovery, and matrix cleanup, even with a complex matrix such as whole blood. The 96-well plate form factor will support a lot of scalability for our lab as we receive additional samples, and the Waters positive pressure manifold makes sample processing extremely easy and rapid. Overall, a great system for tricky analytes and matrices!"

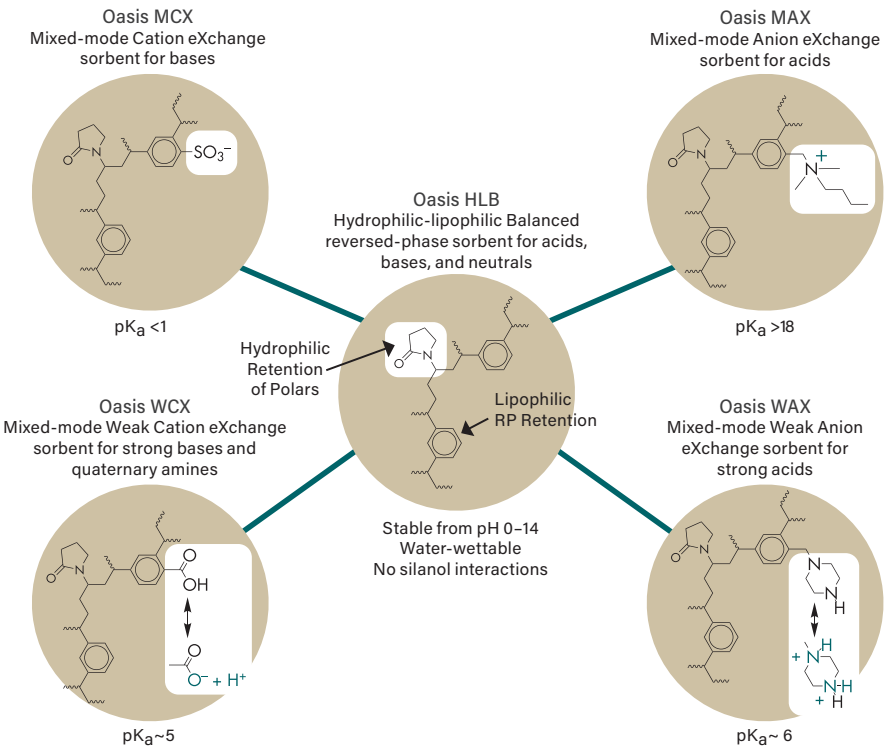
REVIEWER: David Patlak
ORGANIZATION: Vermont Forensic Laboratory

Oasis Solid-Phase Extraction (SPE) Products

Waters introduced Oasis HLB in 1996, effectively changing the way scientists performed SPE. Constructed with a water-wettable copolymer that is stable from pH 0–14, Oasis HLB created a whole new range of solid-phase extraction method development possibilities. It is the gold standard in SPE, trusted by scientists around the world.

The Oasis SPE Family of Sorbents

As a unique, water-wettable polymeric sorbent, Oasis products can be used without the conditioning and equilibration steps required by other polymeric and silica-based sorbents. Historically, those steps were required to obtain retention of analytes by reversed-phase SPE. The water-wettable nature of Oasis sorbents allows direct loading of aqueous samples without sacrificing recovery.



Oasis PRiME HLB* was designed to make solid-phase extraction easy to implement into routine laboratory use by providing generic, simple methods that remove 95% of common matrix interferences such as phospholipids, fats, salts, and proteins. It produces the cleanest sample eluates with a simple, two- or three-step protocol.

Oasis PRiME MCX combines the simplicity and cleanliness of Oasis PRiME HLB with the specificity of a cation-exchanger for compounds with basic characteristics, and provides the perfect solution for targeted sample cleanup.

Oasis HLB is the backbone of all Oasis sorbents. It is a multi-purpose, reversed-phase sorbent that provides high capacity for a wide range of compounds.

Analyte specificity and sensitivity can be increased by using a **Mixed-Mode Oasis** sorbent, which includes both reversed-phase and ion-exchange functionality for orthogonal sample preparation.

*Oasis PRiME HLB is a proprietary, patent-pending sorbent.

A BREAKTHROUGH IN SPE

Through the combination of innovative sorbent technology and hardware design, Oasis products have become the first choice in solid-phase extraction (SPE). Oasis products are trusted by separation scientists across the globe to meet a wide variety of sample preparation needs, ranging from a simple and fast matrix cleanup to the need to solve the most difficult and highly selective sample preparation challenges. Researchers rely on the superior technical performance of Oasis products to achieve unmatched purity, consistency, and quality in their sample preparation methods.

What Is the Ideal SPE Method?

✓ Easy to implement ✓ Reproducible and robust ✓ Fast ✓ Achieves your goals

[Start Here]

Oasis HLB	Oasis PRiME HLB	Oasis Mixed-Mode
Choose If: Require ultra-high capacity of very polar compounds	**First Choice:** Reversed-phase SPE cleanup of samples in routine analysis	**Choose If:** Higher analyte specificity, sensitivity, and/or cleanliness required
All matrices	**All matrices**	**All matrices**
▪ Reversed-Phase Solid-Phase Extraction ▪ No condition and equilibration steps required ▪ High capacity for extremely polar compounds ▪ Compatible with solvents pH 0–14	▪ Reversed-Phase Solid-Phase Extraction ▪ Simple and fast protocol with no condition and equilibration steps required ▪ Reduces matrix effects with more than 95% of common matrix interferences removed ▪ One method provides high recoveries for a diverse, wide range of analytes ▪ High throughput with faster flows and less plugging	▪ Mixed Mode Solid-Phase Extraction ▪ Enriches/concentrates ▪ Cleanest extracts ▪ Best reduction of matrix effects ▪ Highest sensitivity ▪ Dual retention mechanism ▪ Provides orthogonality and selectivity ▪ Two screening protocols, four sorbents

Oasis HLB	Oasis PRiME HLB
Load sample	Load sample
Wash with 5% CH_3OH in H_2O	Wash with 5% CH_3OH in H_2O
Elute 100% CH_3OH	Elute with 90/10 ACN/CH_3OH

Oasis Mixed-Mode Sorbents

Oasis 2 × 4 Strategy: Only two protocols and four sorbents to analyze all types of compounds: acids, bases, and neutrals

For Weak Bases pK_a 2–10:	For Strong Acids pK_a <1:	For Weak Acids pK_a 2–8:	For Strong Bases pK_a >10:
Use Oasis MCX	Use Oasis WAX	Use Oasis MAX	Use Oasis WCX
Apply Protocol 1		**Apply Protocol 2**	
Load pre-treated sample		Load pre-treated sample	
Wash: 2% HCOOH		Wash: 5% NH_4OH	
Elute 1: 100% CH_3OH		Elute 1: 100% CH_3OH	
Elute 2: 5% NH_4OH in CH_3OH		Elute 2: 2% HCOOH in CH_3OH	

SIMPLEST — Combined Advantage with Oasis PRiME HLB — CLEANEST

Ordering Information

Oasis Product Selection Guide

	1 cc/10 mg	1 cc/10 mg Flangeless	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	3 cc/150 mg	3 cc/540 mg	3 cc/540 mg Flangeless	6 cc/150 mg
Sorbent	**100/box**	**100/box**	**100/box**	**100/box**	**500/box**	**100/box**	**100/box**	**500/box**	**100/box**	**100/box**	**100/box**	**30/box**
Oasis PRiME HLB	–	–	186008055	–	–	186008056	–	–	186008717	–	–	–
Oasis PRiME MCX	–	–	186008917	–	–	186008918	–	–	–	–	–	186008919
Oasis HLB 30 µm	186000383	186006339	WAT094225	186001879	WAT058882	WAT094226	186001880	WAT058883	–	–	–	186003365
Oasis HLB 60 µm	–	–	–	–	–	–	–	–	–	186004134	186003852	186003379
Oasis MCX 30 µm	186004648	186006340	186000252	186001881	186001888	186000254	186001882	–	–	–	–	186000256
Oasis MCX 60 µm	–	–	186000782	–	–	186000253	–	–	–	–	–	186000255
Oasis MAX 30 µm	186004649	186006341	186000366	186001883	–	186000367	186001884	–	–	–	–	186000369
Oasis MAX 60 µm	–	–	–	–	–	186000368	–	–	–	–	–	186000370
Oasis WCX 30 µm	186004650	186006342	186002494	186006499	–	186002495	186006501	–	–	–	–	186002498
Oasis WCX 60 µm	–	–	186002496	–	–	186002497	–	–	–	–	–	–
Oasis WAX 30 µm	186004651	186006343	186002489	186006500	–	186002490	186006502	–	–	–	–	186002493
Oasis WAX 60 µm	–	–	186002491	–	–	186002492	–	–	–	–	–	–

Simplifying Solid-Phase Extraction

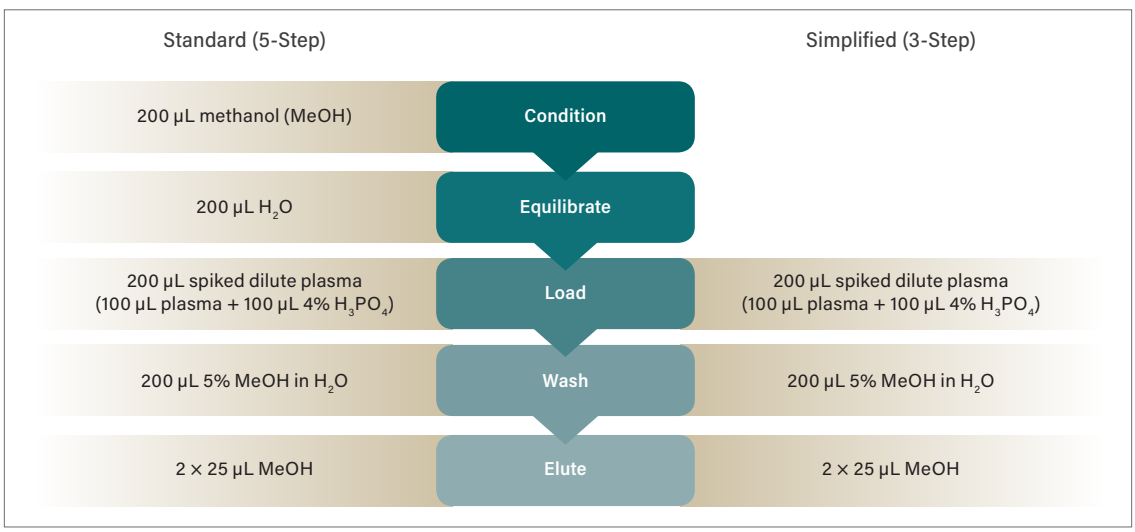
Traditionally, solid-phase extraction methods have required condition and equilibration steps to prepare the sorbent for sample introduction. The condition step was required to wet the sorbent and allow liquid to enter the pores, enabling retention within the sorbent. Once wetted, the sorbent needed to be equilibrated with aqueous solution to prepare it for aqueous sample loading. Since Oasis HLB is a water-wettable sorbent, the analytes can interact with the sorbent and are retained when loaded directly onto the sorbent in an aqueous sample solution. This eliminates the condition and equilibration steps from the traditional solid-phase extraction protocol and reduces the number of processing steps from 5 to 3. The result is an average reduction in solvent consumption of up to 70% and a 40% savings in sample preparation time.

The ability to simplify and shorten SPE protocols is due to the unique water-wettable, balanced nature of the hydrophilic/lipophilic Oasis sorbent.

Sorbent	6 cc/200 mg 30/box	6 cc/400 mg Flangeless 100/box	6 cc/500 mg 30/box	12 cc/500 mg 20/box	20 cc/1 g 20/box	35 cc/6 g 10/box	225 mg Plus Short 50/box	100 mg Plus Light 50/box	30 mg Vac RC 50/box	60 mg Vac RC 50/box	5 cc/200 mg Glass Cartridge 30/box
Oasis PRiME HLB	186008057	–	186008718	–	–	–	186008887[1]	186008886	–	–	–
Oasis HLB 30 µm	WAT106202	–	–	–	–	–	–	186005125[2]	186000382	186000381	–
Oasis HLB 60 µm	–	–	186000115	186000116	186000117	186000118	186000132	–	–	–	186000683
Oasis MCX 30 µm	–	–	–	–	–	–	–	–	–	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	–	–	186004646	–	–	–	186003518	–	–	–	–
Oasis WAX 30 µm	–	–	–	–	–	–	–	–	–	–	–
Oasis WAX 60 µm	–	–	186004647	–	–	–	186003519	–	–	–	–

[1]335 mg for Oasis PRiME HLB.
[2]30 mg for Oasis HLB.

Save Time and Solvent by Moving from a 5-Step Protocol to a 3-Step Protocol



Traditional 5-step SPE protocol vs. the 3-step SPE protocol using an Oasis HLB µElution Plate. (Typical loading range between 10–375 µL undiluted plasma.)

OASIS PRiME HLB

Oasis PRiME HLB is the first-of-its-kind SPE sorbent that sets the new performance standard for routine analyses. The unique, patent-pending Oasis PRiME HLB sorbent provides cleaner samples in less time and with less effort.

- Removes 95% of common matrix interferences such as salts, proteins, and phospholipids
- Ability to concentrate analytes
- Faster, more predictable analysis times
- Directly load pre-treated samples without conditioning and equilibration

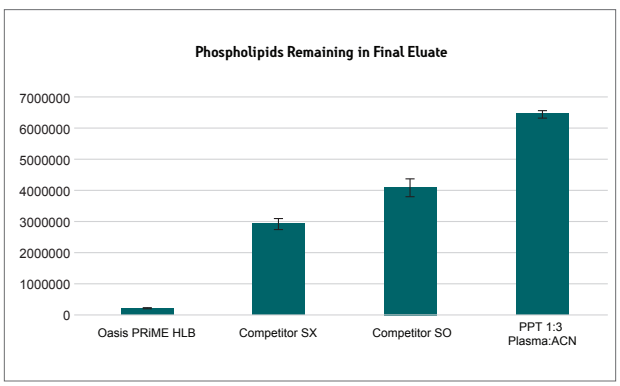
Simpler: Easy, efficient protocols

The Oasis PRiME HLB copolymer is extremely water-wettable, making it possible to eliminate the condition and equilibration steps that are absolutely essential when using silica-based or other polymeric sorbents. This saves valuable sample processing time and costly solvent purchase and disposal.

Faster: More even flows across cartridges and plates with less plugging

Oasis PRiME HLB has been designed to increase speed within the device and in your workflow. Flow times through the device are 30–50% faster for urine and plasma. Desired flow rates are achieved using less vacuum or positive pressure than required with other SPE devices.

Phospholipids Remaining in Final Eluate



Fewer phospholipids remain in the final sample eluate with the Oasis PRiME HLB sorbent and 3-step protocol, compared to the final eluates using traditional 5-step protocol on the competitors' sorbents or protein precipitation (PPT). This removal is also more reproducible with Oasis PRiME HLB as indicated by the error bars (n=5).

Even Cleaner: The optimally designed sorbent removes more than 95% of common matrix interferences like proteins, salts, fats, and phospholipids

Choose the sample preparation method that meets your analytical needs.

3-Step Cleanup (Catch and Release)

- Load pre-treated sample
- Wash: 5% MeOH
- Elute: 90/10 acetonitrile/ MeOH

Use 3-step solid-phase extraction to remove the most matrix interferences, including salts, phospholipids, and proteins. This technique also allows for sample concentration/enrichment. Perfectly suited for routine bioanalytical sample cleanup.

2-Step Cleanup (Pass-through)

- Load pre-treated sample Analytes pass through unretained
- Rinse to collect hold up volume

Use 2-step sample cleanup to remove matrix interferences quickly if your beginning sample solution is high organic, and concentration and/or salt removal is not required. Perfectly suited for multiple residue veterinary drug screening in meats.

Ordering Information

Oasis PRiME HLB Sample Extraction Products

Description	Format	Qty.	P/N
Oasis PRiME HLB Cartridge	1 cc/30 mg	100/box	186008055
Oasis PRiME HLB Cartridge	3 cc/150 mg	100/box	186008717
Oasis PRiME HLB Cartridge	6 cc/500 mg	30/box	186008718
Oasis PRiME HLB Cartridge	3 cc/60 mg	100/pk	186008056
Oasis PRiME HLB Cartridge	6 cc/200 mg	30/pk	186008057
Oasis PRiME HLB Plus Light Cartridge	100 mg	50/box	186008886
Oasis PRiME HLB Plus Short Cartridge	335 mg	50/box	186008887
Oasis PRiME HLB µElution Plate	3 mg/96-well	1/pk	186008052
Oasis PRiME HLB Plate	10 mg/96-well	1/pk	186008053
Oasis PRiME HLB Plate	30 mg/96-well	1/pk	186008054

DID YOU KNOW...

Oasis Cartridges and Plates are available in two particle sizes (30 µm and 60 µm).

This allows you to select the appropriate product based on the viscosity and turbidity of your sample. For extraction of most plasma, serum, and human urine, choose the 30 µm sorbent. For more viscous samples such as animal urine, excellent flow can be achieved using the 60 µm sorbent in either cartridges or plates.

Ordering Information

Oasis HLB Sample Extraction Products

Description	Format	Particle Size	Qty.	P/N
Oasis HLB Cartridge	1 cc/10 mg	30 µm	100/box	186000383
Oasis HLB Cartridge	1 cc/30 mg	30 µm	100/box	WAT094225
Oasis HLB Cartridge	1 cc/30 mg	30 µm	1000/box	186003908
Oasis HLB Flangeless Cartridge	1 cc/30 mg	30 µm	100/box	186001879
Oasis HLB Cartridge with Gilson ASPEC Adapter	1 cc/10 mg	30 µm	500/box	186000988
Oasis HLB Cartridge with Gilson ASPEC Adapter	1 cc/30 mg	30 µm	500/box	WAT058882
Oasis HLB Cartridge	3 cc/60 mg	30 µm	100/box	WAT094226
Oasis HLB Cartridge	3 cc/60 mg	30 µm	1000/box	186007646
Oasis HLB Flangeless Cartridge	3 cc/60 mg	30 µm	100/box	186001880
Oasis HLB Cartridge with Gilson ASPEC Adapter	3 cc/60 mg	30 µm	500/box	WAT058883
Oasis HLB Cartridge	6 cc/200 mg	30 µm	30/box	WAT106202
Oasis HLB Cartridge	3 cc/400 mg	60 µm	100/box	186003849
Oasis HLB Cartridge	3 cc/540 mg	60 µm	100/box	186004134
Oasis HLB Flangeless Cartridge	3 cc/540 mg	60 µm	100/box	186003852
Oasis HLB Cartridge	6 cc/150 mg	30 µm	30/box	186003365
Oasis HLB Cartridge	6 cc/150 mg	60 µm	30/box	186003379
Oasis HLB Cartridge	6 cc/500 mg	60 µm	30/box	186000115
Oasis HLB Cartridge	12 cc/500 mg	60 µm	20/box	186000116
Oasis HLB Cartridge	20 cc/1 g	60 µm	20/box	186000117
Oasis HLB Cartridge	35 cc/6 g	60 µm	10/box	186000118
Oasis HLB Plus Short Cartridge	225 mg	60 µm	50/box	186000132
Oasis HLB Plus Light Cartridge	30 mg	30 µm	50/box	186005125
Oasis HLB Vac RC Cartridge	20 cc/30 mg	30 µm	50/box	186000382
Oasis HLB Vac RC Cartridge	20 cc/60 mg	30 µm	50/box	186000381
Oasis HLB Glass Cartridge	5 cc/200 mg	60 µm	30/box	186000683
Oasis HLB µElution Plate	2 mg/96-well	30 µm	1/pk	186001828BA
Oasis HLB Plate	5 mg/96-well	30 µm	1/pk	186000309
Oasis HLB Plate	10 mg/96-well	30 µm	1/pk	186000128
Oasis HLB Plate	30 mg/96-well	30 µm	1/pk	WAT058951
Oasis HLB Plate	60 mg/96-well	60 µm	1/pk	186000679

OASIS PRiME MCX

Oasis PRiME MCX is a highly efficient, orthogonal (reversed-phase and ion-exchange) solid-phase extraction product based on Oasis MCX technology.

SIMPLER: A defined, generic 3-or 4-step SPE protocol based on the water wettable Oasis MCX strong cation-exchange/ reversed-phase sorbent that does not require extensive method development. It allows targeted cleanup of basic compounds with pKa ≥ 4.5. Methods are patent pending.

CLEANER: Simpler methods remove up to 99% of phospholipids, a major cause of matrix effects, ion suppression, shorter column lifetimes, increased MS maintenance, and higher variability in LC-MS quantification. Oasis PRiME MCX is QC tested with this protocol for phospholipid removal.

FASTER: Cartridges and plates are designed with a manufacturing optimization to increase flow reproducibility across devices, making processing time more predictable. No conditioning and equilibration steps are required.

Oasis PRiME MCX 3- and 4-Step Protocols

3-Step Oasis PRiME MCX Protocol*

Load	▪ Pre-treated sample ▪ Diluted 1:1 (v/v) with an aqueous solution of 200 mM ammonium formate with 4% H_3PO_4
Wash 1	▪ 100% methanol
Elute	▪ 5% NH_4OH in methanol

** The sample is diluted 1:1 with 200 mM ammonium formate with 4% H_3PO_4, making a final concentration of 100 mM ammonium formate and 2% H_3PO_4.*

4-Step Oasis PRiME MCX Protocol**

Load	▪ Pre-treated sample ▪ Typically acidified by diluting 1:1 (v/v) with 4% H_3PO_4 in water
Wash 1	▪ 100 mM ammonium formate with 2% formic acid in water
Wash 2	▪ 100% methanol
Elute	▪ 5% NH_4OH in methanol

*** Contains an extra wash step that can be used to remove additional matrix interferences if needed.*

Oasis PRiME MCX methods are designed to capture and concentrate basic compounds while matrix interferences are removed from the sample. The 3-step method provides the simplest path to cleaner, while the 4-step method contains an additional wash step to remove even more matrix components, if needed.

Ordering Information

Oasis PRiME MCX Sample Extraction Products

Description	Format	Particle Size	Qty.	P/N
Oasis PRiME MCX Vac Cartridge	1 cc/30 mg	30 µm	100/box	186008917
Oasis PRiME MCX Vac Cartridge	3 cc/60 mg	30 µm	100/box	186008918
Oasis PRiME MCX Vac Cartridge	6 cc/150 mg	30 µm	100/box	186008919
Oasis PRiME MCX Plate	10 mg/96-well	30 µm	1/pk	186008915
Oasis PRiME MCX Plate	30 mg/96-well	30 µm	1/pk	186008916
Oasis PRiME MCX µElution Plate	2 mg/96-well	30 µm	1/pk	186008914

OASIS MCX FOR BASIC COMPOUNDS

Obtain selective retention of basic drugs with cation-exchange groups on the sorbent surface. The Oasis MCX (Mixed-Mode Cation eXchange) Sorbent has a tightly controlled ion-exchange capacity (1 meq/g). There are no silanol groups to complicate the retention mode or method development. This novel, water-wettable, polymeric sorbent is stable from pH 0–14, making method development simple and fast.

Ordering Information

Oasis MCX Sample Extraction Products (Cation Exchange)

Description	Format	Particle Size	Qty.	P/N
Oasis MCX Cartridge	1 cc/10 mg	30 µm	100/box	186004648
Oasis MCX Cartridge	1 cc/30 mg	30 µm	100/box	186000252
Oasis MCX Flangeless Cartridge	1 cc/30 mg	30 µm	100/box	186001881
Oasis MCX Cartridge	1 cc/30 mg	60 µm	100/box	186000782
Oasis MCX Cartridge	3 cc/60 mg	30 µm	100/box	186000254
Oasis MCX Flangeless Cartridge	3 cc/60 mg	30 µm	100/box	186001882
Oasis MCX Cartridge	3 cc/60 mg	60 µm	100/box	186000253
Oasis MCX Cartridge	6 cc/150 mg	30 µm	30/box	186000256
Oasis MCX Cartridge	6 cc/150 mg	60 µm	30/box	186000255
Oasis MCX Cartridge	6 cc/500 mg	60 µm	30/box	186000776
Oasis MCX Cartridge	20 cc/1 g	60 µm	20/box	186000777
Oasis MCX Cartridge	35 cc/6 g	60 µm	10/box	186000778
Oasis MCX Plus Short Cartridge	225 mg	60 µm	50/box	186003516
Oasis MCX Vac RC Cartridge	20 cc/60 mg	30 µm	50/box	186000261
Oasis MCX Vac RC Cartridge	20 cc/60 mg	60 µm	50/box	186000380
Oasis MCX µElution Plate	2 mg/96-well	30 µm	1/pk	186001830BA
Oasis MCX Plate	10 mg/96-well	30 µm	1/pk	186000259
Oasis MCX Plate	30 mg/96-well	30 µm	1/pk	186000248
Oasis MCX Plate	30 mg/96-well	60 µm	1/pk	186000250
Oasis MCX Plate	60 mg/96-well	60 µm	1/pk	186000678

APPLICATION AREA: Peptide Desalting and Enrichment

"The best part of (Oasis) PRiME line products is being able to load samples directly without pre-conditioning, which saves time and solvent. It is more "GREEN" than other products."

REVIEWER: Hui Chen

ORGANIZATION: University of Illinois at Chicago

OASIS MAX FOR ACIDIC COMPOUNDS

The Oasis MAX (Mixed-Mode Anion eXchange) sorbent has a tightly controlled ion-exchange capacity of 0.25 meq/g, ensuring reproducible SPE protocols for extraction of acidic compounds and metabolites from biological fluids. There are no silanol groups to complicate the retention mode or method development. This novel, water-wettable, polymeric sorbent is stable from pH 0–14, making method development simple and fast.

DID YOU KNOW...

When compared to other sample preparation techniques, SPE offers:

- Faster sample prep
- Lower cost
- Greater recoveries
- Greater accuracy
- Powerful enrichment of analytes
- Additional selectivity and specificity

Ordering Information

Oasis MAX Sample Extraction Products (Anion Exchange)

Description	Format	Particle Size	Qty.	P/N
Oasis MAX Cartridge	1 cc/10 mg	30 µm	100/box	186004649
Oasis MAX Cartridge	1 cc/30 mg	30 µm	100/box	186000366
Oasis MAX Flangeless Cartridge	1 cc/30 mg	30 µm	100/box	186001883
Oasis MAX Cartridge	3 cc/60 mg	30 µm	100/box	186000367
Oasis MAX Cartridge	3 cc/60 mg	60 µm	100/box	186000368
Oasis MAX Flangeless Cartridge	3 cc/60 mg	30 µm	100/box	186001884
Oasis MAX Cartridge	6 cc/150 mg	30 µm	30/box	186000369
Oasis MAX Cartridge	6 cc/150 mg	60 µm	30/box	186000370
Oasis MAX Cartridge	6 cc/500 mg	60 µm	30/box	186000865
Oasis MAX Plus Short Cartridge	225 mg	60 µm	50/box	186003517
Oasis MAX Vac RC Cartridge	20 cc/30 mg	30 µm	50/box	186000372
Oasis MAX Vac RC Cartridge	20 cc/60 mg	30 µm	50/box	186000371
Oasis MAX Vac RC Cartridge	20 cc/60 mg	60 µm	50/box	186000378
Oasis MAX µElution Plate	2 mg/96-well	30 µm	1/pk	186001829
Oasis MAX Plate	10 mg/96-well	30 µm	1/pk	186000375
Oasis MAX Plate	30 mg/96-well	30 µm	1/pk	186000373
Oasis MAX Plate	60 mg/96-well	30 µm	1/pk	186001256
Oasis MAX Plate	60 mg/96-well	60 µm	1/pk	186001205

OASIS WCX FOR STRONG BASIC COMPOUNDS

The Oasis WCX (Weak Cation eXchange) SPE material provides better sample preparation for strong bases and quaternary amines. The retention mechanism is mixed mode (both ion exchange and reversed phase), which improves retention for all types of basic analytes, especially strong bases.

Ordering Information

Oasis WCX Sample Extraction Products (Weak Cation Exchange)

Description	Format	Particle Size	Qty.	P/N
Oasis WCX Cartridge	1 cc/10 mg	30 µm	100/box	186004650
Oasis WCX Cartridge	1 cc/30 mg	30 µm	100/box	186002494
Oasis WCX Cartridge	3 cc/60 mg	30 µm	100/box	186002495
Oasis WCX Cartridge	6 cc/150 mg	30 µm	30/box	186002498
Oasis WCX Cartridge	1 cc/30 mg	60 µm	100/box	186002496
Oasis WCX Cartridge	3 cc/60 mg	60 µm	100/box	186002497
Oasis WCX Cartridge	6 cc/500 mg	60 µm	30/box	186004646
Oasis WCX Plus Short Cartridge	225 mg	60 µm	50/box	186003518
Oasis WCX µElution Plate	2 mg/96-well	30 µm	1/pk	186002499
Oasis WCX 96-well Plate	10 mg/96-well	30 µm	1/pk	186002501
Oasis WCX 96-well Plate	30 mg/96-well	30 µm	1/pk	186002503

OASIS WAX FOR STRONG ACIDIC COMPOUNDS

The Oasis WAX (Weak Anion eXchange) SPE material provides sample preparation for strong acidic compounds. The retention mechanism is mixed mode (both ion exchange and reversed phase), which improves retention for strong acidic compounds.

Ordering Information

Oasis WAX Sample Extraction Products (Weak Anion Exchange)

Description	Format	Particle Size	Qty.	P/N
Oasis WAX Cartridge	1 cc/10 mg	30 µm	100/box	186004651
Oasis WAX Cartridge	1 cc/30 mg	30 µm	100/box	186002489
Oasis WAX Cartridge	3 cc/60 mg	30 µm	100/box	186002490
Oasis WAX Cartridge	6 cc/150 mg	30 µm	30/box	186002493
Oasis WAX Cartridge	1 cc/30 mg	60 µm	100/box	186002491
Oasis WAX Cartridge	3 cc/60 mg	60 µm	100/box	186002492
Oasis WAX Cartridge	6 cc/500 mg	60 µm	30/box	186004647
Oasis WAX Plus Cartridge	225 mg	60 µm	50/box	186003519
Oasis WAX µElution Plate	2 mg/96-well	30 µm	1/pk	186002500
Oasis WAX 96-well Plate	10 mg/96-well	30 µm	1/pk	186002502
Oasis WAX 96-well Plate	30 mg/96-well	30 µm	1/pk	186002504
Oasis WAX 96-well Plate	60 mg	30 µm	1/pk	186003915

DID YOU KNOW...

You can reduce non-specific binding, as well as sample loss, when working with therapeutic peptides on µElution plates.

Oasis 2 × 4 Method Development Protocol

OASIS SORBENT SELECTION TOOLS FOR CONVENIENT METHOD DEVELOPMENT

The Oasis Sorbent Selection Plate and Cartridge Kits enable rapid development of SPE methods for LC-MS analysis. Having all four Oasis ion-exchange sorbents (MCX, MAX, WAX, and WCX) in a single plate or a cartridge kit is convenient for scouting the best methods to accomplish efficient isolation of unknown analytes, zwitterionic compounds, or mixtures of analytes with different retention/elution properties.

Ordering Information

Oasis Method Development Kits

Description	Format	Particle Size	P/N
Oasis Sorbent Selection Plate, 3 rows each: MCX, MAX, WCX, and WAX	10 mg/96-well	30 µm	186003249
Oasis µElution Sorbent Selection Plate, 3 rows each: MCX, MAX, WCX, and WAX	2 mg/96-well	30 µm	186004475
Oasis Sorbent Selection Cartridge Kit, 10 each: MCX, MAX, WCX, and WAX	1 cc/30 mg	30 µm	186003463
Oasis Sorbent Selection Flangeless Cartridge Kit, 10 each: MCX, MAX, WCX, and WAX	1 cc/10 mg	30 µm	186006344
Oasis Sorbent Selection Flangeless Cartridge Kit, 10 each: MCX, MAX, WCX, and WAX	1 cc/30 mg	30 µm	186006345

Oasis µElution 96-well Plates

Description	Particle Size	Qty.	P/N
Oasis PRiME HLB	—	1/pk	186008052
Oasis HLB	30 µm	1/pk	186001828BA
Oasis PRiME MCX	30 µm	1/pk	186008914
Oasis MCX	30 µm	1/pk	186001830BA
Oasis MAX	30 µm	1/pk	186001829
Oasis WCX	30 µm	1/pk	186002499
Oasis WAX	30 µm	1/pk	186002500
Oasis Method Development	30 µm	1/pk	186004475
Peptide Method Development	30 µm	1/pk	186004713

Oasis 96-well Plates

Description	Particle Size	5 mg/ 96-well	10 mg/ 96-well	30 mg/ 96-well	60 mg/ 96-well
		1/pk	1/pk	1/pk	1/pk
Oasis PRiME HLB	—	—	186008053	186008054	—
Oasis HLB	30 µm	186000309	186000128	WAT058951	—
Oasis HLB	60 µm	—	—	—	186000679
Oasis PRiME MCX	—	—	186008915	186008916	—
Oasis MCX	30 µm	—	186000259	186000248	—
Oasis MCX	60 µm	—	—	186000250	186000678
Oasis MAX	30 µm	—	186000375	186000373	186001256
Oasis MAX	60 µm	—	—	—	186001205
Oasis WCX	30 µm	—	186002501	186002503	—
Oasis WAX	30 µm	—	186002502	186002504	186003915

Oasis Symbiosis/ Prospekt-2 Cartridges

Description	Format	Particle Size	Qty.	P/N
Oasis HLB Symbiosis/ Prospekt-2 Cartridge	1 × 10 mm	30 µm	96/box	186005781
Oasis HLB Symbiosis/ Prospekt-2 Cartridge	1 × 20 mm	30 µm	96/box	186005786
Oasis MCX Symbiosis/ Prospekt-2 Cartridge	1 × 10 mm	30 µm	96/box	186005782
Oasis MCX Symbiosis/ Prospekt-2 Cartridge	1 × 20 mm	30 µm	96/box	186004653
Oasis MAX Symbiosis/ Prospekt-2 Cartridge	1 × 10 mm	30 µm	96/box	186005783
Oasis MAX Symbiosis/ Prospekt-2 Cartridge	1 × 20 mm	30 µm	96/box	186004654
Oasis WCX Symbiosis/ Prospekt-2 Cartridge	1 × 10 mm	30 µm	96/box	186005784
Oasis WCX Symbiosis/ Prospekt-2 Cartridge	1 × 20 mm	30 µm	96/box	186004655
Oasis WAX Symbiosis/ Prospekt-2 Cartridge	1 × 10 mm	30 µm	96/box	186005785
Oasis WAX Symbiosis/ Prospekt-2 Cartridge	1 × 20 mm	30 µm	96/box	186004656

On-Line SPE Columns and Cartridge Columns

Description	Format	Particle Size	Qty.	P/N
Oasis HLB Column	2.1 × 20 mm	5 µm	1/pk	186002034
Oasis HLB Column	3.0 × 20 mm	5 µm	1/pk	186002037
Oasis HLB Column	3.9 × 20 mm	5 µm	1/pk	186002040
Oasis HLB Cartridge Column	3.9 × 20 mm	5 µm	1/pk	186001413
Oasis HLB Column	4.6 × 20 mm	5 µm	1/pk	186002043
Oasis HLB Column	2.1 × 20 mm	15 µm	1/pk	186002035
Oasis HLB Column	3.0 × 20 mm	15 µm	1/pk	186002038
Oasis HLB Column	3.9 × 20 mm	15 µm	1/pk	186002041
Oasis HLB Cartridge Column	3.9 × 20 mm	15 µm	1/pk	186001414
Oasis HLB Column	4.6 × 20 mm	15 µm	1/pk	186002044
Oasis HLB Column	2.1 × 20 mm	25 µm	1/pk	186002036
Oasis HLB Cartridge Column	2.1 × 20 mm	25 µm	1/pk	186000706
Oasis HLB Column	3.0 × 20 mm	25 µm	1/pk	186002039
Oasis HLB Column	4.6 × 20 mm	25 µm	1/pk	186002045
Oasis HLB Direct Connect Column	2.0 × 15 mm	25 µm	1/pk	186001792
Oasis MCX Column	2.1 × 20 mm	30 µm	1/pk	186002046
Oasis MCX Cartridge Column	2.1 × 20 mm	30 µm	1/pk	186002051
Oasis MCX Column	3.0 × 20 mm	30 µm	1/pk	186002047
Oasis MCX Column	3.9 × 20 mm	30 µm	1/pk	186002048
Oasis MCX Column	4.6 × 20 mm	30 µm	1/pk	186002049
Oasis MAX Column	2.1 × 20 mm	30 µm	1/pk	186002052
Oasis MAX Cartridge Column	2.1 × 20 mm	30 µm	1/pk	186002057
Oasis MAX Column	3.0 × 20 mm	30 µm	1/pk	186002053
Oasis MAX Column	3.9 × 20 mm	30 µm	1/pk	186002054
Oasis MAX Column	4.6 × 20 mm	30 µm	1/pk	186002055
Oasis WCX Column	2.1 × 20 mm	30 µm	1/pk	186002505
Oasis WCX Column	3.9 × 20 mm	30 µm	1/pk	186002507
Oasis WAX Column	2.1 × 20 mm	30 µm	1/pk	186002508
Oasis WAX Column	3.9 × 20 mm	30 µm	1/pk	186002509

Custom sorbents and configurations available upon request.

On-Line Solid-Phase Extraction (SPE) Cartridge

Description	Format	Particle Size	Qty.	P/N
Oasis WCX OSM Cartridge	1 × 10 mm	30 µm	96/pk	186005671

XBRIDGE OSM CARTRIDGES

The XBridge™ C_{18} and C_8 sorbents use Waters' proprietary Ethylene Bridged Hybrid (BEH™) Technology to produce a sorbent with high mechanical strength and excellent stability for reversed-phase separations. These sorbents can provide separations with superior peak shape and high efficiency.

Ordering Information

XBridge OSM Cartridges

Description	Format	Particle Size	Qty.	P/N
XBridge C_{18} OSM Cartridge	1 × 10 mm	10 µm	96/pk	186005672
XBridge C_8 OSM Cartridge	1 × 10 mm	10 µm	96/pk	186005673

SPE COLUMNS FOR WATERS UPLC WITH ON-LINE SPE TECHNOLOGY

UPLC with On-Line SPE Technology combines automated sample handling, chromatographic media, and ultra-sensitive optical and mass spectrometry detection into an on-line SPE-LC-MS/MS solution. When paired with one of the three UPLC pressure-enabled on-line SPE column chemistries, you have the ability to extract a wide range of analytes.

This proven system and column chemistries dramatically streamlines the analysis of drinking water samples by providing analyte extraction, concentration, separation, and detection in one turnkey solution.

Ordering Information

Oasis Bulk Sorbents

Description	Dimension	Particle Size	Qty.	P/N
Oasis HLB	—	30 µm/100 gm	—	186007549
Oasis HLB	—	30 µm/250 gm	—	186007550
Oasis MAX	—	30 µm/100 gm	—	186007553
Oasis MAX	—	30 µm/250 gm	—	186007554
Oasis MCX	—	30 µm/100 gm	—	186007551
Oasis MCX	—	30 µm/250 gm	—	186007552
Oasis HLB Glass Cartridge	—	60 µm	30/box	186000683
Oasis HLB Direct Connect HP Column	2.1 × 30 mm	20 µm	1/pk	186005231
XBridge C_{18} Direct Connect HP Column	2.1 × 30 mm	10 µm	1/pk	186005232
XBridge C_8 Direct Connect HP Column	2.1 × 30 mm	10 µm	1/pk	186005233

Columns for On-Line Sample Manager (OSM)

Description	Dimension	Particle Size	Qty.	P/N
Oasis HLB Direct Connect HP Column	2.1 × 30 mm	20 µm	1/pk	186005231
XBridge C_{18} Direct Connect HP Column	2.1 × 30 mm	10 µm	1/pk	186005232
XBridge C_8 Direct Connect HP Column	2.1 × 30 mm	10 µm	1/pk	186005233

OASIS GLASS CARTRIDGES FOR PPT DETECTION LEVELS

Oasis Glass Cartridges are available in a 5 cc (200 mg) configuration with Teflon Frits for trace analysis at parts per trillion (PPT) levels. Each lot is tested for the presence of bisphenol A and other phenols and phthalates, assuring that endocrine disruptors in water samples can be analyzed to PPT levels.

Ordering Information

Oasis HLB Glass Cartridge

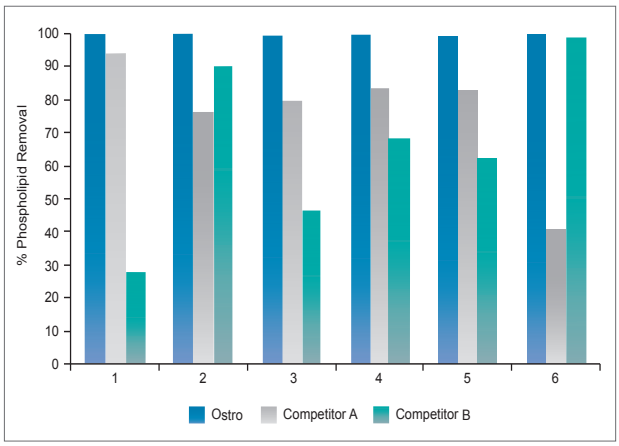
Description	Dimension	Particle Size	Qty.	P/N
Oasis HLB Glass Cartridge	—	60 µm	30/box	186000683

Ostro Pass-Through Sample Preparation Product

The Simplest Way to Cleaner Samples: Ostro™ Pass-through 96-well Plate provides a novel solution for cleanup, requiring minimal-to-no method development, using a combination of filtration and sorbent interactions to produce cleaner samples in less time.

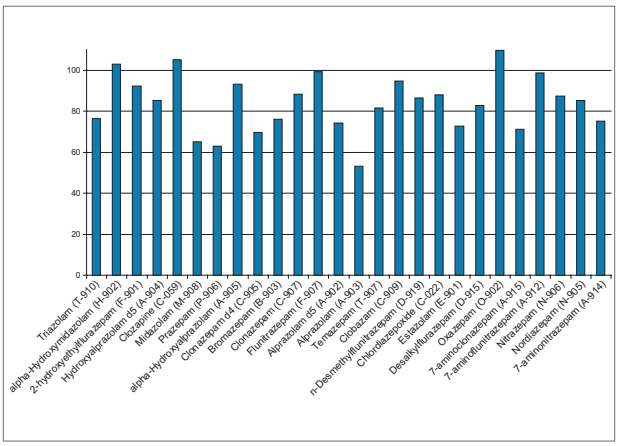
- Pass-through sample preparation technique
- Removes 95% of phospholipids and proteins
- For reproducible, consistent, and robust methods
- Increases throughput with easy-to-implement protocol

Reproducibility



Comparative % removal of total phospholipids from six different lots of plasma using the Ostro (0.19% RSD), phospholipid removal plate from competitor A (24.5% RSD) and phospholipid removal plate from competitor B (40.9% RSD).

Recovery



The Ostro Plate can be used with its standard protocol in a drug discovery setting for rapid sample cleanup. In this example, proteins and the vast majority of phospholipids were removed from a sample containing 26 structural analogs and metabolites while maintaining high analyte recovery.

Increased Instrument Uptime

Phospholipids can build up on your LC column and MS system. This leads to unpredictable, inaccurate results and necessitates extensive system cleaning and instrument downtime. Removing these contaminants before they enter your system provides increased instrument robustness, improved results, and maximum laboratory efficiency.

Ordering Information

Ostro Pass-Through Sample Preparation Plate

Description	Qty.	P/N
Ostro Protein Precipitation and Phospholipid Removal Plate, 25 mg	1/pk	186005518

Protocol

Minimizing method development time, the standard Ostro protocol will provide excellent results for a wide variety of acidic, basic, and neutral compounds.

Place Ostro Plate onto collection plate

↓

Pipette 50–200 µL of plasma into wells*

↓

Forcefully add 1% formic acid in acetonitrile, 3:1 solvent:plasma (methanol not recommended)

↓

Mix thoroughly by aspirating 3× with pipette

↓

Pass through samples using 15" vacuum manifold for 5–10 min. or 60 psi positive processor manifold for 5 min.

↓

Analyze samples by direct injection, dilution and injection, or by evaporation, reconstitution and injection

*For sample volumes 50 µL or less, a higher solvent to plasma ratio may be necessary.

Sep-Pak Solid-Phase Extraction (SPE) Products

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 product for sample preparation. A diverse selection of formats and sorbents make Sep-Pak SPE Products ideally suited for all types of samples for GC, HPLC, and UPLC analysis methods.

Formats:

- Cartridges
- 96-Well plate
- µElution plate

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
- PSA–Primary-Secondary Amine
- Normal-Phase
- Silica–polar surface used to adsorb analytes from non-polar solvents
- Alumina (A, B, N)– a highly active grade of alumina that is available in acidic, basic and neutral surface chemistries
- Florisil–polar, highly active, weakly basic sorbent for adsorption of low-to-moderate polarity species from nonaqueous solutions
- Ion-Exchange (silica-based)
- AccellPlus QMA–hydrophilic strong anion-exchanger with large pore size
- AccellPlus CM–hydrophilic weak cation-exchanger with large pore size
- 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 non-aqueous 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–activated carbon used to concentrate pesticides and herbicides
- PS2–styrene-divinyl benzene polymer used to concentrate pesticides and herbicides
- Carbon Black/Amino Propyl–for pesticides from food
- Carbon Black/PSA–for concentrating pesticides from food

Sep-Pak Sorbent Selection Guide

Reversed Phase			
	Description	**Applications**	**Properties**
Sep-Pak C_{18} $Si(CH_3)_2C_{18}H_{37}$	Hydrophobic, silica-based bonded phase used to adsorb analytes from aqueous solutions. Monofunctional bonding provides alternate selectivity versus tC_{18}.	▪ Lipid fractionation; ganglioside isolation ▪ Organic acids in fruit juice, wine ▪ JPMHLW and CDFA official methods for pesticides in food ▪ Natural products ▪ AOAC methods for food colors, sugars	▪ Particle size: 55–105 µm ▪ Pore size: 125 Å ▪ Surface area: 325 m^2/g ▪ Carbon load: 12% ▪ pH range: 2–8
Sep-Pak tC_{18} $SiC_{18}H_{37}$	Strongly hydrophobic, silica-based bonded phase used to adsorb analytes from aqueous solutions. Trifunctional bonding chemistry for increased hydrolytic stability.	▪ JPMHLW official methods for pesticides in water ▪ JPMHLW official methods for odorants in water	▪ Particle size: 37–55 µm ▪ Pore size: 125 Å ▪ Surface area: 325 m^2/g ▪ Carbon load: 17% ▪ pH range: 2–8
Sep-Pak C_8 $Si(CH_3)_2C_8H_{17}$	Moderately hydrophobic, silica-based bonded phase used in methods when less retention than that of HLB or C_{18} is required.	▪ Drugs and their metabolites in biofluids ▪ Peptides in serum and plasma	▪ Particle size: 37–55 µm ▪ Pore size: 125 Å ▪ Surface area: 325 m^2/g ▪ Carbon load: 9% ▪ pH range: 2–8
Sep-Pak tC_2 SiC_2H_5	Weakly hydrophobic, silica-based bonded phase used in methods when less retention than that of C_8 is required. Trifunctional bonding chemistry for increased hydrolytic stability.	▪ Applications are similar to those of C_{18} and C_8	▪ Particle size: 37–55 µm ▪ Pore size: 125 Å ▪ Surface area: 325 m^2/g ▪ Carbon load: 2.7% ▪ pH range: 2–8

Reversed or Normal Phase			
	Description	**Applications**	**Properties**
Sep-Pak Aminopropyl $Si(CH_2)_3NH_2$	Moderately polar, silica-based bonded phase with weakly basic surface. Can be used as a polar sorbent with different selectivity for acidic/basic analytes or as weak anion exchanges in aqueous medium below pH 8.	▪ Phenols, phenolic pigments, natural products ▪ Petroleum fractionation ▪ Saccharides ▪ Drugs and drug metabolites ▪ JPMHLW official methods for pesticides in food	▪ Particle size: 55–105 µm ▪ Pore size: 125 Å ▪ Surface area: 325 m^2/g ▪ Carbon load: 3.5% ▪ pH range: 2–8
Sep-Pak Cyanopropyl $Si(CH_3)(CH_2)_3(CN)$	Silica-based bonded phase with low hydrophobicity. Can be used as a less polar alternative to silica or as a less hydrophobic alternative to C_{18} or C_8.	▪ Drugs and their metabolites ▪ Pesticides	▪ Particle size: 55–105 µm ▪ Pore size: 125 Å ▪ Surface area: 325 m^2/g ▪ Carbon load: 6.5% ▪ pH range: 2–8
Sep-Pak Diol $Si(CH_2)_3OCH_2CH(OH)CH_2OH$	Moderately polar, neutral, silica-based bonded phase. Used in normal-phase applications where acidic character of silica is undesirable or as a weakly hydrophobic phase in aqueous media.	▪ Antibiotics in cosmetics ▪ Protein and peptide isolation by HIC (hydrophobic-interaction chromatography)	▪ Particle size: 37–55 µm ▪ Pore size: 300 Å ▪ Surface area: 100 m^2/g ▪ Carbon load: 2% ▪ pH range: 2–8

AOAC = Association of Official Analytical Chemists; ASTM = American Society for Testing and Materials [International]; CDFA = California Department of Agriculture; EPA = U.S. Environmental Protection Agency; JPMHLW = Japanese Ministry of Health, Labour and Welfare; JPMOE = Japanese Ministry of the Environment; NIOSH = National Institute for Occupational Safety and Health.

Sep-Pak Sorbent Selection Guide *Continued*

Normal Phase			
	Description	**Applications**	**Properties**
Sep-Pak Silica SiO_2	Polar sorbent binds analytes in non-aqueous solvents. Also used as an intermediate-strength cation exchanger in aqueous media and as a support for liquid-liquid partition separations.	▪ Vitamins and food additives ▪ Lipid classification ▪ Synthetic organic compounds ▪ Natural products, plant pigments ▪ JPMHLW official methods for pesticides in food	▪ Particle size: 55–105 µm ▪ Pore size: 125 Å ▪ Surface area: 325 m^2/g ▪ Activity: High (≤3.2% water)
Sep-Pak Alumina (A, B, N) Al_2O_3	Highly surface-active polar, acidic (A), neutral (N), and basic (B) sorbents. Exhibits specific pi-electron interactions with aromatic hydrocarbons. Acidic and basic alumina are also low-capacity ion exchangers in aqueous media, unaffected by high-energy radioactivity.	▪ Petroleum, synthetic crude oil fractionation (N) ▪ Radioactive compound isolation, isotope generators (A, B) ▪ Phospholipids, steroids, catecholamines (B) ▪ Food, feed additives (A, N), synthetic organic compounds (N) ▪ Pesticide, herbicide, priority pollutant isolation (N, B) ▪ Alternative to official AOAC and EPA methods (A, N, B)	▪ Particle size: 50–300 µm ▪ Pore size: 120 Å ▪ Activity: High, ≤1 on Brockmann scale (≤1.5% water) ▪ pH of 10% aqueous slurry: A: 4, N: 7.5, B: 10
Sep-Pak Florisil $MgO{\cdot}SiO_2$	Polar, highly active, weakly basic sorbent for the adsorption of low-to-moderately polar species from non-aqueous solutions.	▪ AOAC and EPA official methods for pesticides ▪ JPMHLW official methods for pesticides in food ▪ Polychlorinated biphenyls (PCBs) in transformer oil	▪ Particle size: 50–200 µm ▪ Pore size: 60 Å ▪ Activity: High (≤2.5% water) ▪ pH of 10% aqueous slurry: 8.5

Ion Exchange			
	Description	**Applications**	**Properties**
Sep-Pak Accell Plus 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 to extract anionic analytes in aqueous and non-aqueous solutions.	▪ Isolation of anionic proteins ▪ Acidic pigments in wine, fruit juices, food extracts ▪ Phenolic compounds ▪ Peptide pool fractionation ▪ Inorganic anions in environmental samples	▪ Particle size: 37–55 µm ▪ Pore size: 300 Å ▪ pH range: 2–9 ▪ Carbon load: 6% ▪ Ligand density: 220 µmol/g
Sep-Pak AccellPlus CM Weak Cation Exchanger COO^-Na^+	Silica-based, hydrophilic, weak cation exchanger with large pore size used to extract cationic analytes in aqueous and non-aqueous solutions.	▪ Isolation of cationic proteins ▪ Pesticides, herbicides ▪ Steroids ▪ Inorganic cations in environmental samples	▪ Particle size: 37–55 µm ▪ Pore size: 300 Å ▪ pH range: 2–9 ▪ Carbon load: 5.5% ▪ Ligand density: 350 µmol/g

AOAC = Association of Official Analytical Chemists; ASTM = American Society for Testing and Materials [International]; CDFA = California Department of Agriculture; EPA = U.S. Environmental Protection Agency; JPMHLW = Japanese Ministry of Health, Labour and Welfare; JPMOE = Japanese Ministry of the Environment; NIOSH = National Institute for Occupational Safety and Health.

Application Specific			
	Description	**Applications**	**Properties**
PoraPak RDX Divinylbenzene/ vinylpyrrolidone	For the analysis of explosives in surface and ground water. Meets or exceeds requirements of EPA Method 8330. Reduces use of organic solvent by 10-fold. PoraPak RDX is a divinylbenzene/ vinylpyrrolidone copolymer.	▪ EPA Method 8330 Nitroaromatics, Nitrosamines ▪ EPA Method 529 Explosives and Related Compounds	▪ Particle size: 125–150 µm ▪ Pore size: 200 Å
Sep-Pak DNPH Diphenylhydrazine coated on silica	Acidified dinitrophenylhydrazine reagent coated on silica used for collection of air samples. Aldehydes and ketones react *in situ* to form hydrazone derivatives; these are then eluted and quantitated by HPLC analysis.	▪ EPA Method TO–11A; ASTM D5197 for carbonyl compounds in air ▪ JPMOE Official Methods for aldehydes: odor in outdoor air and in exhaust gas	▪ Particle size: 55–105 µm ▪ Pore size: 125 Å ▪ Recommended maximum capacity: 75 µg (2.5 µmol) formaldehyde/ cartridge
Sep-Pak XPoSure Aldehyde sampler Diphenylhydrazine coated on silica	Acidified dinitrophenylhydrazine reagent coated on silica used for collection of air samples. Aldehydes and ketones react *in situ* to form hydrazone derivatives; these are then eluted and quantitated by HPLC analysis. Larger particle size optimized for low-pressure personal air monitors.	▪ JPMHLW official methods for aldehydes in indoor air ▪ EPA Methods TO–11A and IP–6A, ASTM D5197 for carbonyl compounds in air ▪ NIOSH Method 2532 for glutaraldehyde in air	▪ Particle size: 500–1000 µm ▪ Pore size: 125 Å ▪ Recommended maximum capacity: 70 µg (2.3 µmol) formaldehyde/ cartridge
Sep-Pak Ozone Scrubber Potassium iodide	Potassium iodide cartridge is used in series with Sep-Pak DNPH and XPoSure Aldehyde Sampler cartridges to remove ozone interferences.	▪ EPA Method IP–6A and ASTM D5197 for carbonyl compounds in air	▪ Quantity: 1.4 g KI ▪ Capacity: 4.2 mmol ozone/cartridge (theoretical)
Sep-Pak Dry Anhydrous sodium sulfate	High-capacity desiccant used to remove residual water from normal-phase SPE extracts (in water-immiscible organic solvents).	▪ General purpose	▪ Quantity: 2.85 g anhydrous Na_2SO_4 ▪ Theoretical capacity: 3.6 g H_2O
Sep-Pak PS2 Styrene–DVB copolymer	Very hydrophobic copolymer designed for multi-residue pesticide analysis in water samples.	▪ JPMHLW official methods for pesticides in water ▪ JPMHLW official methods for pesticides in food	▪ Particle size: 80 µm ▪ Quantity: 265 mg/cartridge
Sep-Pak AC2 Activated carbon	Highly hydrophobic, low ash content, activated carbon used to remove or enrich very polar organic molecules from water.	▪ JPMHLW official method for 1,4-dioxane analysis in water ▪ Pesticides, herbicides, especially highly polar small molecules	▪ Particle size: 85 µm ▪ Quantity: 400 mg/ cartridge
Sep-Pak Carbon Black/Aminopropyl Carbon black aminopropyl silica	Two-layer sorbent bed used for pesticide cleanup in food matrices prior to GC analysis.	▪ JPMHLW official methods for pesticides in food ▪ JPMHLW official method for propham	▪ Particle size: 37–105 µm (carbon black, top layer); 55–105 µm (aminopropyl silica, bottom layer) ▪ Quantity: 500 mg of each sorbent, separated by frit
Sep-Pak Carbon Black/PSA Primary-secondary amine silica	Two-layer sorbent bed used for pesticide cleanup in food matrices prior to GC analysis. PSA provides alternative selectivity compared to aminopropyl.	▪ JPMHLW official methods for pesticides in food	▪ Particle size: 37–105 µm (carbon black, top layer); 37–55 µm (PSA, bottom layer) ▪ Quantity: 500 mg of each sorbent, separated by frit

Sep-Pak Cartridge Selection Guide

	Plus Short	Plus Long	Plus Light	Classic Short	Classic Long	Vac 1 cc/50 mg	Vac 1 cc/100 mg	Vac RC/100 mg
	50/box	50/box	50/box	50/box	50/box	100/box	100/box	50/box
Sorbent	**P/N Mass/Volume***	**P/N Mass/Volume***	**P/N Mass/Volume***	**P/N Mass/Volume***	**P/N Mass/Volume***	**P/N Volume***	**P/N Volume***	**P/N 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	–
Aminopropyl (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
Cyanopropyl (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	–
PSA	186004538 360 mg/0.7 mL	–	186004578 130 mg/0.3 mL	186004560 360 mg/0.85 mL	–	186004562 0.1 mL	186004561 0.2 mL	186004567 0.2 mL
Diol	WAT020530 360 mg/0.8 mL	–	WAT023519 130 mg/0.4 mL	–	–	–	WAT023605 0.25 mL	–

*Hold-up volume.

Sep-Pak 96-well Plates

Description	P/N
Sep-Pak tC_{18}, 25 mg Plate	186002319
Sep-Pak tC_{18}, 40 mg Plate	186002320
Sep-Pak tC_{18}, 100 mg Plate	186002321
Sep-Pak AccellPlus QMA, 100 mg Plate	186001917
Sep-Pak C_{18}, 40 mg Plate	186003966

	Vac 3 cc/200 mg	Vac 3 cc/500 mg	Vac RC/500 mg	Vac 6 cc/500 mg	Vac 6 cc/1 g	Vac 12 cc/2 g	Vac 20 cc/5 g	Vac 35 cc/10 g
	50/box	50/box	50/box	30/box	30/box	20/box	20/box	10/box
Sorbent	**P/N Volume***	**P/N Volume***	**P/N Volume***	**P/N Volume***	**P/N Volume***	**P/N Volume***	**P/N Volume***	**P/N Volume***
C_{18}	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
tC_{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
C_8	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
tC_2	–	WAT052715 1.0 mL	–	–	WAT052705 1.9 mL	–	–	–
Silica	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
Florisil	–	WAT020815 0.8 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
AccellPlus CM	–	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 QMA	–	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
Alumina A	–	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 B	–	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 N	–	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
Aminopropyl (NH_2)	–	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
Cyanopropyl (CN)	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
PSA	186004598 0.42 mL	186004536 0.8 mL	186004568 0.8 mL	186004563 1.2 mL	186004537 2.0 mL	186004564 3.6 mL	186004565 8.0 mL	186004566 16.8 mL
Diol[a]	–	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

*Hold-up volume.

Sep-Pak 96-well µElution Plate

Description	P/N
Sep-Pak tC_{18}, 10 mg µElution Plate	186002318

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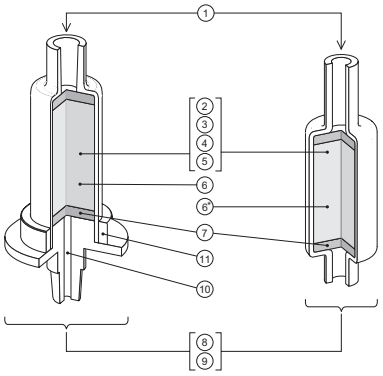
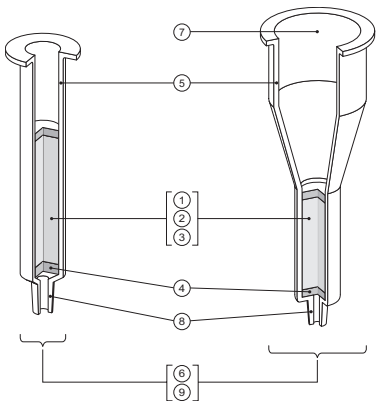
See page 327 for more information.

ANATOMY OF SEP-PAK CARTRIDGES



The Anatomy of Sep-Pak Plus and Classic Cartridge Design

1. Female Luer inlet accepts male Luer tip. Plus cartridge design can be stacked.
2. Highest quality sorbents designed and made specifically for sample preparation; clean, dry, reproducible in activity and capacity with optimal surface area, pore, and particle size distributions.
3. Broad range of sorbent surface activities available; each lot is tested under rigid specifications for chromatographic activity, retention, and selectivity.
4. Sorbent type and bed dimensions equal to corresponding Sep-Pak Classic Cartridges enable direct transfer of previously developed and published methods to new Plus design.
5. Weight of sorbent in each cartridge is controlled within +/- 5% of specification to assure reproducible performance.
6. Advanced bed formation to minimize voids and channels. Patented* Radial Compression Technology used to form homogeneous packed bed free of voids and channels.
7. Special blend of HD and UHMW polyethylenes used for 20 µm frits imparts excellent solvent resistance, extremely low extractables level, and good flow properties. Frit also acts as depth filter for small amounts of sample debris.
8. Polyethlene body has excellent solvent resistance. All body parts are quality tested to verify extremely low level of UV-absorbing extractables. Plus design is molded for precise dimensions making it suitable for automated equipment.
9. Cartridges are sealed in a special polyfoil pouch to protect product integrity, sorbent activity, and purity.
10. Male Luer outlet has reduced internal volume for minimal sample hold up.
11. Color-coded ring compresses and seals the cartridge and identifies sorbent.



The Anatomy of Sep-Pak Vac and Vac RC Cartridge Designs

1. Highest quality sorbents design and made specially for sample preparation; clean, dry, reproducible in activity and capacity, with optimal surface area, pore, and particle size.
2. Broad range of sorbent surface activities available; each lot is tested under rigid specifications for chromatographic activity, retention, and selectivity.
3. Weight of sorbent in each cartridge is controlled within +/- 5% of specification to assure reproducible performance.
4. Special blend of HD and UHMW polyethylenes used for 20 µm frits.
5. Molded, medical-grade, polypropylene body.
6. Cartridges are sealed in a special polyfoil pouch to protect product integrity, sorbent activity, and purity.
7. Integral reservoir approximately 20 mL, robotic compatible.
8. Outlet make Luer tip.
9. Color-coded labeling in the cartridge to identify the sorbent.

*P.D. McDonald, C.W. Rausch, Radial Compression of Packed Beds, U.S. Patent #4,250,035 (1981); Great Britain # 1,568,700 (1976); Canada # 1,101,785 (1981); Japan # 1,400.983 (1987); Sweden # 450,750 (1987); Germany # 2,655,650 (1988); other patents pending.

GENERAL EXTRACTION PROTOCOLS FOR SEP-PAK CARTRIDGES

Normal-Phase Chromatography with Sep-Pak Cartridges

To perform normal-phase chromatography with Sep-Pak Cartridges, use a gradient of non-polar solvents with polar silica, florisil, NH_2, diol, CN, alumina A, B, or N as a sorbent*.

1. You may condition the cartridge with 6–10 hold-up volumes of non-polar solvent, usually the sample solvent.
2. Load the sample into the cartridge.
3. Elute unwanted components with a non-polar solvent.
4. Elute the first component of interest with a polar solvent.
5. Elute remaining components of interest with progressively more polar solvents.
6. When you recover all of your components, discard the used cartridge in an appropriate manner.

*Depending upon your chromatographic conditions, you may also use CN as a packing material for normal-phase chromatography.

Reversed-Phase Chromatography with Sep-Pak Cartridges

To perform reversed-phase chromatography with Sep-Pak Cartridges, use a gradient of strongly-to-weakly polar solvents with non-polar C_{18}, tC_{18}, C_8, tC_8, diol, NH_2, or CN as a sorbent.

1. Solvate the bonded phase with 6–10 cartridge hold-up volumes of methanol or acetonitrile. Flush the cartridge with 6–10 hold-up volumes of water or buffer. Do not allow the cartridge to dry out.
2. Load the sample dissolved in a strongly polar solvent.
3. Elute unwanted components with a strongly polar solvent.
4. Elute weakly held components of interest with a less polar solvent.
5. Elute more tightly bound components with progressively more non-polar solvents.
6. When you recover all of your components, discard the used cartridge in an appropriate manner.

Ion-Exchange Chromatography with Sep-Pak Cartridges

To perform ion-exchange chromatography with Sep-Pak Cartridges, use a gradient of pH or ionic strength with AccellPlus CM, AccellPlus QMA, or NH_2 as a sorbent.

1. Condition the cartridge with 6–10 held-up volumes of deionized water or weak buffer.
2. Load the sample dissolved in a solution of deionized water or buffer.
3. Elute unwanted weakly bound components with a weak buffer.
4. Elute the first component of interest with a stronger buffer (change the pH or ionic strength).
5. Elute other components of interest with progressively stronger buffers.
6. When you recover all of your components, discard the used cartridge in an appropriate manner.

General Elution Protocol for Normal-Phase Chromatography on Sep-Pak Cartridges (Silica, Alumina, Florisil, Diol, NH_2)

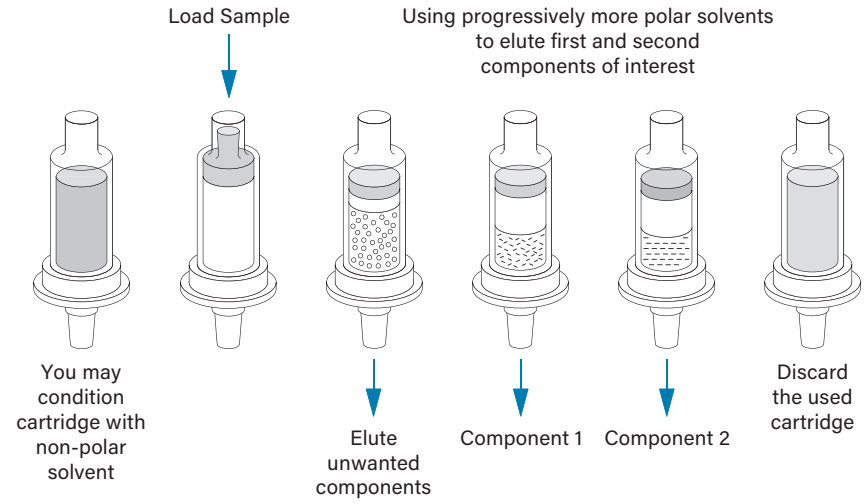
1. Load sample.
2. Use progressively more polar solvents to elute first and second components of interest.
3. You may condition cartridge with non-polar solvent.
4. Elute unwanted components.
5. Elute first component of interest (Component 1).
6. Elute second component of interest (Component 2).
7. Discard the used cartridge.

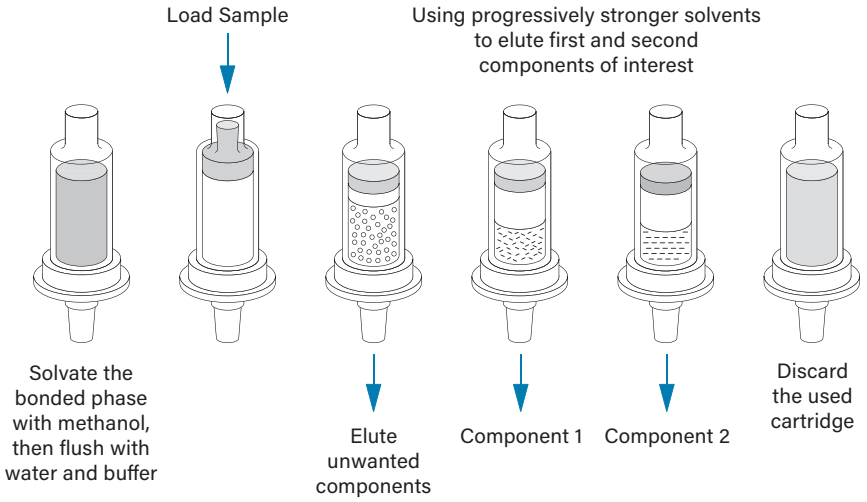
General Elution Protocol for Reversed-Phase Chromatography on Sep-Pak Cartridges (C_{18}, CN)

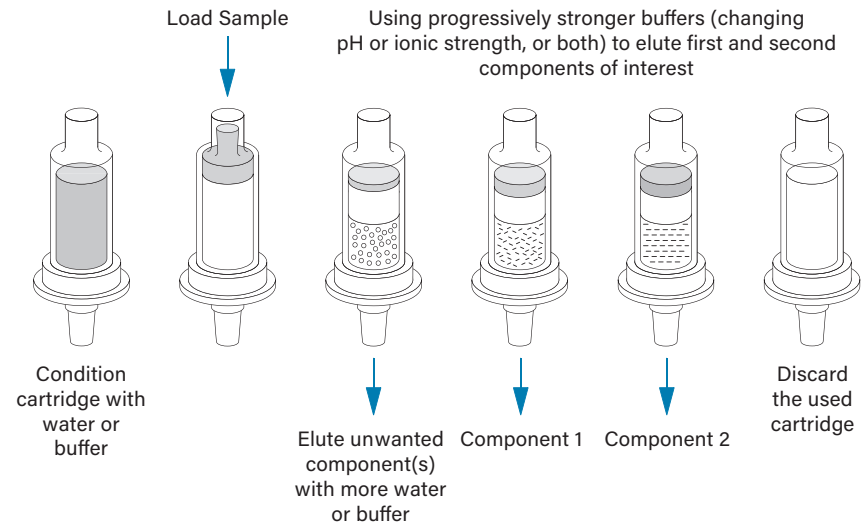
1. Load sample.
2. Use progressively stronger solvents to elute first and second components of interest.
3. Solvate the bonded phase with methanol, then flush with water and buffer.
4. Elute unwanted components.
5. Elute first component of interest (Component 1).
6. Elute second component of interest (Component 2).
7. Discard the used cartridge.

General Elution Protocol for Ion-Exchange Chromatography on Sep-Pak Cartridges (NH_2, AccellPlus QMA, AccellPlus CM)

1. Load sample.
2. Use progressively stronger buffers (changing pH or ionic strength) to elute first and second components of interest.
3. Condition cartridge with water or buffer.
4. Elute unwanted component(s) with more water or buffer.
5. Elute first component of interest (Component 1).
6. Elute second component of interest (Component 2).
7. Discard the used cartridge.


Load Sample
Using progressively more polar solvents to elute first and second components of interest
You may condition cartridge with non-polar solvent
Elute unwanted components
Component 1
Component 2
Discard the used cartridge


Load Sample
Using progressively stronger solvents to elute first and second components of interest
Solvate the bonded phase with methanol, then flush with water and buffer
Elute unwanted components
Component 1
Component 2
Discard the used cartridge


Load Sample
Using progressively stronger buffers (changing pH or ionic strength, or both) to elute first and second components of interest
Condition cartridge with water or buffer
Elute unwanted component(s) with more water or buffer
Component 1
Component 2
Discard the used cartridge

Advantages of 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

Ordering Information

Sep-Pak DNPH-Silica Cartridge

Description	Qty.	P/N
Sep-Pak DNPH-Silica Short Body Cartridge	20/box	WAT037500
Sep-Pak DNPH-Silica Long Body Cartridge	20/box	WAT039550

Ozone Scrubber Cartridges

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

These disposable devices are intended for use in series combination with Sep-Pak DNPH-Silica Cartridges or XPoSure Aldehyde Sampler Cartridges.

Ordering Information

Sep-Pak Ozone Scrubber

Description	Qty.	P/N
Sep-Pak Ozone Scrubber	20/box	WAT054420

Sep-Pak XPoSure Aldehyde Sampler Cartridges for Monitoring Aldehydes in Indoor Air

Based on an extension of Waters' DNPH coating technology, Sep-Pak XPoSure Aldehyde Sampler Cartridges are the most sensitive active samplers available today.

Ordering Information

Sep-Pak XPoSure Aldehyde Sampler Cartridge

Description	Qty.	P/N
Sep-Pak XPoSure Aldehyde Sampler Cartridge	20/box	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, the PoraPak RDX Sep-Pak Extraction Cartridge is ideal for environmental testing laboratories supporting Department of Defense remediation programs.

Ordering Information

PoraPak RDX Cartridges and Accessories

Description	Qty.	P/N
PoraPak RDX Cartridges	30/box	WAT047220
Tubing, Tefzel, 1/8 in. O.D. × 0.040 in. I.D.	10 ft.	WAT023344
Sep-Pak Vac Adapter	12/box	WAT054260
60 cc Sep-Pak Reservoir	12/box	186005587
Male-Male Adapter	100/box	WAT024310

Sep-Pak Dry SPE Cartridge

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.

Ordering Information

Sep-Pak Dry Cartridge

Description	Qty.	P/N
Sep-Pak Dry Cartridge	50/box	WAT054265

Sep-Pak Specialty Chemistries

Description	Mass/Volume/Type	Qty.	P/N
Air Testing			
Sep-Pak DNPH-Silica Cartridge	350 mg/0.7 mL/Plus Short	20/box	WAT037500
Sep-Pak DNPH-Silica Cartridge	800 mg/1.6 mL/Plus Long	20/box	WAT039550
Sep-Pak XPoSure Aldehyde Sampler Cartridge	350 mg/0.7 mL/Plus Short	20/box	WAT047205
Sep-Pak Ozone Scrubber Cartridge	1.4 g/1.6 mL/Plus Short	20/box	WAT054420
Food, Environmental, and Biological Testing			
PoraPak RDX Cartridge	500 mg/1 mL/6 cc Vac	30/box	WAT047220
Sep-Pak Dry Cartridge	2.85 g/1.6 mL/Plus Long	50/box	WAT054265
Sep-Pak Carbon Black/Aminopropyl Cartridge	500 mg carbon black, 500 mg aminopropyl/1.4 mL/6 cc Vac	30/box	186003369
Sep-Pak Carbon Black/PSA Silica Cartridge	500 mg carbon black, 500 mg PSA/1.4 mL/6 cc Vac	30/box	186004590
Sep-Pak AccellPlus QMA Carbonate Cartridge	150 mg/0.4 mL/Plus Light	50/box	186004051
Sep-Pak AccellPlus QMA Carbonate Plus Light Cartridge	46 mg/0.15 mL/Plus Light	50/box	186004540

Certified Sep-Pak Solid-Phase Extraction (SPE) Cartridges

As a pioneer in SPE, Waters has advanced SPE performance and quality by offering Certified Sep-Pak Sample Preparation Products. By manufacturing these devices to strict performance and cleanliness specifications, we ensure that the detection limits and performance of your analytical methods will not be compromised by interfering substances commonly found in SPE hardware.

Improve Workflow and Reduce Solvent Waste

Certified Sep-Pak Sample Preparation Devices are available in the most commonly used formats and sorbents to allow easy integration into your sample preparation protocol. Reduced background interferences reduce solvent waste by eliminating unnecessary solvent pre-washing steps that are often required for trace residue methods.

Manufacturing

Our world-class manufacturing facilities strive to improve quality expectations for SPE product performance. We manufacture under the highest quality standard in the industry including ISO 9001, ISO 13485, and current Good Manufacturing Practices (CGMP). Each Certified Sep-Pak product is thoroughly QC tested.

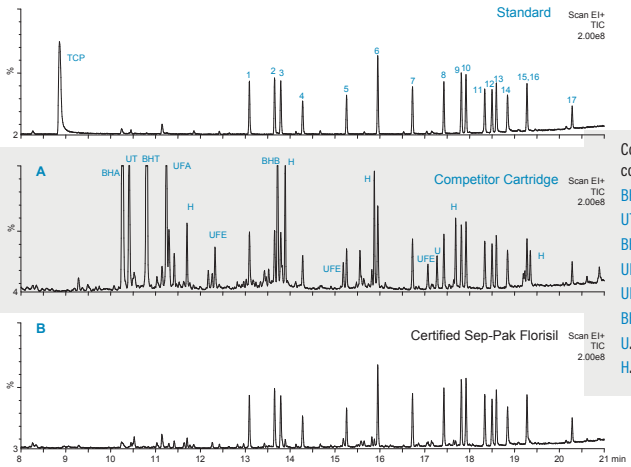
Sorbent specifications based on:

- Contaminants including hydrocarbons and other environmental contaminants
- Sorbent functionality including:
  - ligand density
  - particle size distribution
  - surface activity
- Chromatographic performance

Assembly specifications based on:

- Frit and barrel dimensional tolerance
- Chromatographic testing of total residual extractables including:
  - hydrocarbons
  - plasticizers
  - antioxidants
- Sorbent bed voiding
- Consistent sample flow characteristics

Comparison of Extracted Interference Levels in Organochlorine Pesticide Analysis at 1 ppm



Contaminants found in competitor's SPE devices:
- BHA. butylated hydroxyanisole
- UT. unknown terpene
- BHT. butylated hydroxytoluene
- UFA. unknown fatty alcohol
- UFE. unknown fatty ester
- BHB. butylated hydroxy benzaldehyde
- U. unknown
- H. hydrocarbon (alkane)

SPE Procedure

Certified Sep-Pak Florisil, 3 cc/500 mg
p/n: 186004611

Load:
1 mL hexane extract sample using gravity flow

Elute:
5 mL 90:10 hexane/acetone (v/v)

Evaporate:
To just under 1 mL and adjust to 1.0 mL final volume

Compounds

α-HCH (hexachlorocyclohexane)	Endosulfan I	DDD
β-HCH	DDE	Endrin aldehyde
γ-HCH (lindane)	Dieldrin	Endosulfan sulfate
-HCH	Endrin	DDT
Heptachlor	Endosulfan II	Methoxychlor
Aldrin		
Heptachlor epoxide		

GC Analysis

Instruments:	Waters Quattro micro GC with Agilent 6890 Full Scan 50–400 *m/z*
Column:	RTX 5 MS Column 30 M × 0.25 mm (0.25 µm df)
Injection:	2.0 µL (splitless) 250 °C injection, 300 °C transfer to MS
Temp. program:	Initial temp.: 50 °C for 1 min
Ramp:	10 °C/min
Final temp.:	320 °C

TCP (trichlorophenol) is added to the target compound mix as a polar probe to test sorbent specificity. Quantitative removal of TCP is expected using florisil sorbent under these SPE conditions.

CERTIFIED SEP-PAK SORBENT SELECTION GUIDE

C_{18}

- Silica-based, trifunctionally-bonded octadecyl sorbent
- High carbon load provides excellent hydrolytic stability for a wide range of samples
- Strong hydrophobic sorbent used to adsorb analytes of even weak hydrophobicity from aqueous solutions
- Typical applications include drugs and their metabolites in serum, plasma or urine; desalting of peptides; trace organics in environmental water samples; organic acids in beverages

Silica

- Unbonded, highly activated silica stationary phase
- A polar sorbent for analyte isolation from non-polar solvents like hydrocarbons and less polar esters and ethers
- Analyte retention can occur through hydrogen bonding or dipole-dipole interactions in non-aqueous samples
- Silica provides a slightly acidic surface for moderate cation-exchange interactions in aqueous samples
- Elution with more polar solvents like polar esters, ethers, alcohols, acetonitrile, or water

Ordering Information

C_{18} Sorbent

	3 cc/200 mg	3 cc/500 mg	6 cc/500 mg	6 cc/1 g
Sorbent	**50/box**	**50/box**	**30/box**	**30/box**
C_{18}	186004618	186004619	186004620	186004621

Ordering Information

Silica Sorbent

	3 cc/200 mg	3 cc/500 mg	6 cc/500 mg	6 cc/1 g
Sorbent	**50/box**	**50/box**	**30/box**	**30/box**
Silica	186004614	186004615	186004616	186004617

Alumina (A, B, N)

- Alumina is very similar to silica; however, the alumina surface tends to be slightly more stable under high pH conditions than unfunctionalized silica
- The aluminum oxide surface provides an extremely polar surface for analyte retention and has properties of a Lewis acid
- Depending on the sorbent's surface treatment, alumina is available in three forms: Alumina A, Alumina B, and Alumina N
- Alumina exhibits specific interactions with the π-electrons of aromatic hydrocarbons, making it useful for applications like crude oil fractionation
- Acidic and basic grades can be used as low-capacity ion exchangers

Ordering Information

Alumina (A, B, N) Sorbents

	3 cc/500 mg	6 cc/500 mg	6 cc/1 g
Sorbent	**50/box**	**30/box**	**30/box**
Alumina A	186004602	186004603	186004604
Alumina B	186004605	186004606	186004607
Alumina N	186004608	186004609	186004610

Florisil

- Very-polar, highly-active, weakly-basic sorbent for adsorption of low-to-moderate polarity species from non-aqueous solutions
- Specifically designed for the adsorption of pesticides using official AOAC, EPA, and JPMHLW regulated methods
- Applications include polychlorinated biphenyls (PCBs) in transformer oil

Ordering Information

Florisil Sorbent

	3 cc/500 mg	6 cc/500 mg	6 cc/1 g
Sorbent	**50/box**	**30/box**	**30/box**
Florisil	186004611	186004612	186004613

DID YOU KNOW...

Strategies for Isolating and Cleaning Up Analytes of Interest

Two general SPE strategies are implemented for isolating and cleaning up sample components of interest. A retention-cleanup-elution strategy is frequently used when the compounds of interest are present in levels too low for accurate and precise quantitation. Concentration of dilute samples and trace enrichment of compounds are achieved by this strategy. A pass-through cleanup strategy may be chosen when the desired sample component is present at a high concentration. However, no sample enrichment occurs when a pass-through cleanup strategy is used.

PoraPak Rxn Cartridges for Post-Synthesis Cleanup

PoraPak products are polymer based for superior cleanup of synthetic reactions. They are available in two chemistries:

- PoraPak Rxn CX (strong cation-exchange sorbent)
- PoraPak Rxn RP (reversed-phase sorbent)

PoraPak Rxn Sorbents are available in fritted, syringe-barrel devices in 6, 20, and 60 cc volumes. The resins are also sold in bulk units, and custom configurations are available on request.

New Solutions for Faster Results

PoraPak Rxn Sorbents are based on copolymers that exhibit these properties:

- Hard material that does not develop increasing back pressure with flow
- Little swelling or shrinking across a range of solvents and pH extremes
- Low hydraulic resistance enables flow by gravity
- pH extreme tolerance without dissolution or hydrolysis, both limitations of silica-based sorbents

This combination of physical and chemical properties makes PoraPak Rxn Cartridges ideal for synthesis cleanup. The polymers characteristics and particle size maintain gravity-, pressure-, or vacuum-assisted flow; even when reaction mixtures contain precipitate that may contribute additional resistance to flow. The sample will still pass through the cartridge.

The polymer used in PoraPak Rxn Products is resistant to shrinking or swelling in the organic solvents typically used in synthetic reactions. Tests with the following solvents demonstrate that the packed bed maintains good flow properties:

- DCE
- DMF
- DCM
- THF
- DMSO
- Acetone

Some medicinal chemists are familiar with silica-based chromatographic products for reaction cleanup. One of the limitations of these silica-based ion-exchange materials is pH. Silica will dissolve at high pH, while bonded phases are hydrolyzed at low pH; both conditions result in loss of sample and/or impurities (silica and bonded phase) collected in product fractions. PoraPak Rxn polymer-based chromatographic phases are stable at extreme pH. This feature permits using pH as a very powerful tool to create a separation, particularly in ion-exchange mode.

Providing Separations Solutions

Waters is highly respected worldwide for its expertise in chromatography. Coupled with our ability to seamlessly link critical instrumentation, chemistries, separation technologies, and software, this expertise puts us in a unique position to deliver value-added solutions to our customers.

Manufacturing

Our world-class manufacturing facilities are continuously expanded and upgraded to keep pace with market demand for our new and existing products. We manufacture under the highest quality standards in the industry, including ISO 9001, ISO 13485, and Current Good Manufacturing Practices (cGMP).

Ordering Information

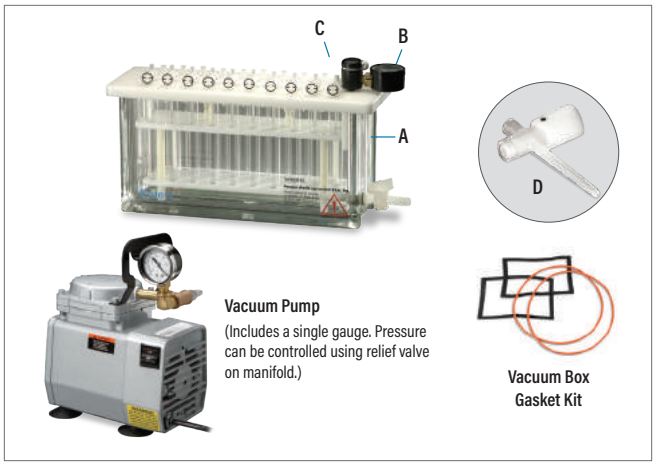
PoraPak Rxn Cartridges and Bulk Material

Description	PoraPak Rxn CX	PoraPak Rxn RP
6 cc Flanged Cartridges, 400 mg, 30/pk	186004541	186004545
6 cc Flangeless Cartridges, 400 mg, 30/pk	186004542	186004546
20 cc Cartridges, 2 g, 20/pk	186004543	186004547
60 cc Cartridges, 5 g, 10/pk	186004544	186004548
Bulk, 200 mL Container	186004569	186004570

Accessories

VACUUM MANIFOLD FOR USE WITH SPE CARTRIDGES

The vacuum manifold has the capacity to process up to 20 samples simultaneously. The extraction manifold has enhanced features designed for use with conventional silica-based, SPE cartridges as well as modifications that allow you to take full advantage of the unique performance characteristics of our Oasis Extraction Cartridges.



This manifold offers:

A. Precision-machined Delrin cover with alignment posts for quick and easy alignment with test tube rack.

B. Vacuum gauge placement on cover, not in fluid path, allows for quick and easy waste removal at bottom by vacuum.

C. Enhanced vacuum control valve designed for use with Oasis Extraction Cartridges, allows for a quick and momentary rise in vacuum above the frit bubble point at the touch of a finger.

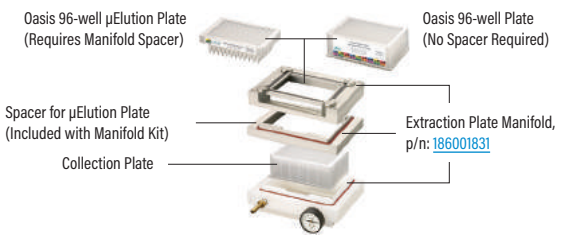
D. High-purity, polypropylene needle valves and needle tips with minimum dead volume (opening and closing the valves is required to prevent silica-based SPE cartridges from drying out).

Ordering Information

Spare Parts for Waters Extraction Manifolds

Description	Qty.	P/N
Needle Valves (required when using silica-based SPE cartridges; not required for use with extraction cartridges)	20/pk	WAT200685
Needle Tips	20/pk	WAT200691
Cover, 20 Position without Gauge Assembly	1/pk	186008990
Gauge Assembly, Vacuum	1/pk	WAT200687
Reservoir, Glass with Outlet Valve	1/pk	186008991
Outlet Valve Kit	1/pk	WAT200689
Gasket for Cover	1/pk	WAT200690
Ejector Tool	1/pk	WAT058839
Luer Plugs	25/pk	WAT058851
Rubber Ball Ring (for vacuum gauge assembly)	1/pk	WAT058840
Reversible Vial Rack for 1 mL or 4 mL Autosampler Vials	1/pk	186009084
2 mL Vial Rack for Manifold	1/pk	186009083
13 × 75 mm Test Tube Rack	1/pk	186008994
13 × 100 mm Test Tube Rack	1/pk	186008995
16 × 75 mm Test Tube Rack	1/pk	186008996
16 × 100 mm Test Tube Rack	1/pk	186008997
Reservoir, 30 cc (for Plus, Light, Vac, and Classic Cartridges)	48/pk	WAT011390
Reservoir, 60 cc (for Plus, Light, and Vac Cartridges)	12/pk	186005587
Adapter, Male-Male Luer (for Classic Cartridges)	100/pk	WAT024310
Adapter (to attach reservoir to 1, 3, and 6 cc Vac Cartridges)	12/pk	WAT054260
Adapter (to attach reservoir to 12, 20, and 35 cc Vac Cartridges)	10/pk	WAT048160
Vacuum Pump (110 V, 60 Hz)	1/pk	725000417
Vacuum Pump (220 V, 50 Hz)	1/pk	725000604

Manifold and Accessories for Extraction Plate



Description	Qty.	P/N
Extraction Plate Manifold for Oasis 96-well Plates	1/pk	186001831
Extraction Plate Manifold Kit A (includes extraction plate manifold, reservoir tray, sealing cap, and 350 µL sample collection plate)	—	WAT097944
Extraction Plate Manifold Kit B (as Kit A, with 1 mL sample collection plate)	—	WAT097945
Extraction Plate Manifold Kit C (as Kit A, with 2 mL sample collection plate)	—	WAT097946
Disposable Reservoir Tray	25/box	WAT058942
Sample Collection Plate, 350 µL	50/box	WAT058943
Sample Collection Plate, 2 mL	50/box	WAT058958
Sealing Cap for 96-well Collection Plate	50/box	WAT058959
Vacuum Pump (115 V, 60 Hz)	1/pk	725000417
Vacuum Pump (240 V, 50 Hz)	1/pk	725000604
Vacuum Box Gasket Kit (Kit contains: 2 foam top gaskets, 2 orange O-rings)	—	186003522

Manifold and Accessories for Extraction Cartridges

Description	Qty.	P/N
Waters Extraction Manifold, 20-position without rack (includes 20 needle tips, 25 plugs, and ejector tool)	1/pk	186008998
Waters Extraction Manifold, 20-position (complete with rack for 13 × 75 mm tubes)	1/pk	WAT200606
Waters Extraction Manifold, 20-position (complete with rack for 13 × 100 mm tubes)	1/pk	WAT200607
Waters Extraction Manifold, 20-position (complete with rack for 16 × 75 mm tubes)	1/pk	WAT200608
Waters Extraction Manifold, 20-position (complete with rack for 16 × 100 mm tubes)	1/pk	WAT200609
Female Luer Plugs	100/pk	WAT044385
30 cc Reservoir	48/pk	WAT011390
60 cc Reservoir	12/pk	186005587
Reservoir Adapters for 1, 3, and 6 cc Cartridges	12/pk	WAT054260
Reservoir Adapters for 12, 20, and 35 cc Cartridges	10/pk	WAT048160
Male-Male Adapter	100/pk	WAT024310
Male Luer Plugs	100/pk	WAT044395

POSITIVE PRESSURE-96 PROCESSOR

The Positive Pressure-96 Processor offers state-of-the-art operation for 96-well plates and 1 cc flangeless cartridge formats. Each of the 96 holes in the processor is restricted in order to maintain constant pressure, even if all the plate well positions are not filled. Positive pressure processing offers many advantages over traditional methods, including:

- Highly uniform flow from well to well
- Superior flow for viscous samples
- Highly reproducible assays
- Easy-to-use design

Ordering Information

Positive Pressure-96 Processor

Description	Qty.	P/N
Positive Pressure-96 Processor	1/pk	186006961
96-Flangeless Cartridge Holder	1/pk	186005523
96-Place Sealing Gasket	1/pk	186005522
µElution Positive Pressure Spacer	1/pk	405006528
Gas Supply Adapter, includes 1/8 in. to 1/4 in. NPT fitting, 6 ft. of 1/4 in. tubing	1/pk	186005524
10 mL × 24 Waste Collection Plate	1/pk	186005586

SEP-PAK CARTRIDGE CONNECTIONS KIT

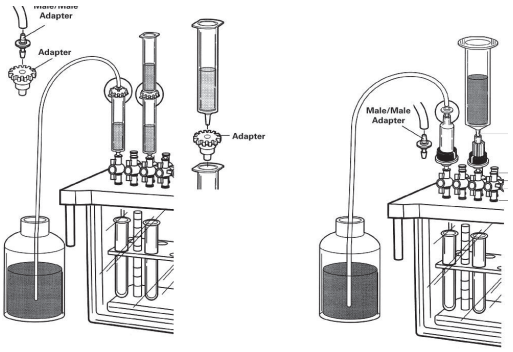
This kit contains a selection of the most commonly needed fittings, adapters, valves, and tubing for use with Sep-Pak Cartridges.

Ordering Information

Sep-Pak Cartridge Connections Kit

Description	P/N
Sep-Pak Connections Kit	WAT011400

SEP-PAK CARTRIDGE ACCESSORIES



Ordering Information

Accessories for Extraction Columns and Cartridges

Description	Qty.	P/N
Holder Kit for 2.1 × 20 mm Cartridge Column	1/pk	186000262
Holder Kit for 3.9 × 20 mm Cartridge Column	1/pk	WAT046910
Extraction Column Connector	1/pk	WAT082745
Inline Pre-Column Filter Kit	1/pk	WAT084560
Replacement Filters	5/pk	WAT005139
Vacuum Pump (115 V, 60 Hz)	1/pk	725000417
Vacuum Pump (240 V, 50 Hz)	1/pk	725000604
Reservoir, 30 cc (for Plus, Light, and Vac Cartridges)	48/pk	WAT011390
Reservoir, 60 cc (for Plus, Light, and Vac Cartridges)	12/pk	186005587
Adapter, Male-Male Luer (for Classic Cartridges)	100/pk	WAT024310
Adapter (to attach reservoir to 1, 3, and 6 cc Vac Cartridges)	12/pk	WAT054260
Adapter (to attach reservoir to 12, 20, and 35 cc Vac Cartridges)	10/pk	WAT048160
2 mL Vial Rack for Manifold	1/pk	186005234

DisQuE Sample Preparation Solutions for QuEChERS

DisQuE™ Dispersive Sample Preparation

QuEChERS (an acronym for Quick, Easy, Cheap, Effective, Rugged, and Safe) methods offer a simple and straightforward sample preparation technique ideal for multi-residue analysis for pesticides, veterinary drugs, and mycotoxins in a wide variety of food and agricultural products. DisQuE Dispersive Sample Preparation Products are conveniently packaged with pre-weighed sorbents and buffers in pouches and tubes as described in regulatory methods and protocols.

These products offer several advantages over traditional sample preparation techniques:

- Simplified QuEChERS protocols
- Decreased sample preparation time
- Efficient and cost-effective sample preparation
- Consistent, high-quality sorbents and packaging

DisQuE KITTED SOLUTIONS

Complete solutions and kitted methods add value to your laboratory function by addressing the need for simple, easy-to-follow protocols that require very little training.

Waters offers several different versions of pre-packaged QuEChERS kits which conform to both AOAC and CEN protocols.

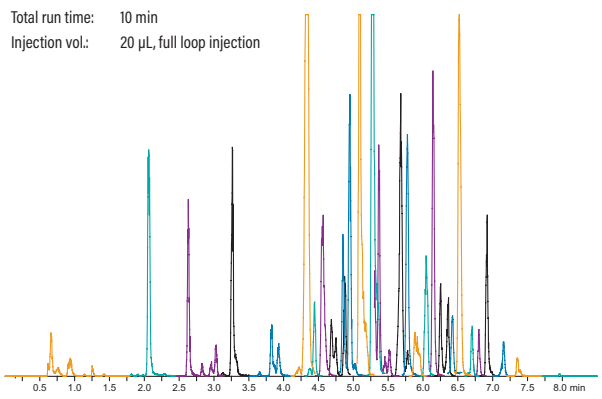
402 Pesticide Residues at 10 ppb ng/g In One 10-Minute Run

UPLC Conditions

System:	ACQUITY UPLC Column: ACQUITY UPLC BEH C_{18}, 1.7 µm, 2.1 × 100 mm (p/n: 186002352)
Column temp.:	40 °C
Sample temp.:	4 °C
Flow rate:	0.450 mL/min
Mobile phase A:	98:2 water: methanol + 0.1% formic acid
Mobile phase B:	Methanol + 0.1% formic acid
Gradient:	Time (min) / Profile A%
	0.00 / 90
	0.25 / 90
	7.75 / 0
	8.50 / 0
	8.51 / 90
Total run time:	10 min
Injection vol.:	20 µL, full loop injection

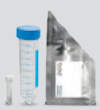
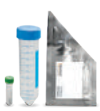
MS Conditions

System:	ACQUITY TQ Detector
Ionization mode:	ESI positive polarity
Capillary voltage:	1 kV
Desolvation gas:	Nitrogen, 800 L/Hr, 400 °C
Cone gas:	Nitrogen, 5 L/Hr
Source temp.:	120 °C
Acquisition:	Multiple Reaction Monitoring (MRM)
Collision gas:	Argon at 3.5 mBar



Ordering Information

DisQuE Dispersive Sample Preparation Kits

Description		P/N
DisQuE Kits		
DisQuE AOAC Dispersive SPE Kit–Pouch Format 	■ **Pouch:** 1.5 g sodium acetate and 6 g $MgSO_4$ ■ **50 mL Tube:** Empty ■ **2 mL Tube:** 150 mg $MgSO_4$ and 50 mg PSA	176002922
DisQuE CEN Dispersive SPE Kit–Pouch Format 	■ **Pouch:** 1 g trisodium citrate dihydrate, 0.5 g disodium hydrogencitrate sesquihydrate, 1 NaCl and 4 g $MgSO_4$ ■ **50 mL Tube:** Empty ■ **2 mL Tube:** 150 mg $MgSO_4$, 25 mg PSA, and 25 mg C_{18}	176002923
DisQuE AOAC Dispersive SPE Kit 	■ **Tube 1:** 50 mL tube containing: 1.5 g sodium acetate and 6 g $MgSO_4$ ■ **Tube 2:** 2 mL tube containing: 150 mg $MgSO_4$ and 50 mg PSA	176001676
DisQuE CEN Dispersive SPE Kit 	■ **Tube 1:** 50 mL tube containing: 1 g trisodium citrate dihydrate, 0.5 g disodium hydrogencitrate sesquihydrate, 1 g NaCl and 4 g $MgSO_4$ ■ **Tube 2:** 2 mL tube containing: 150 mg $MgSO_4$, 25 mg PSA, and 25 mg C_{18}	176001903

DisQuE EXTRACTION AND CLEANUP TUBES AND POUCHES

DisQuE Extraction and Cleanup Tubes and Pouches are available separately for customized applications and method development. The salts contained in the 50 mL tubes are also available in a pouch format for greater flexibility. The cleanup tubes are available in a standard 2 mL size as well as a 15 mL size for sample enrichment.

Ordering Information

DisQuE Dispersive Sample Preparation Products

Description		P/N
Individual Extraction Tubes (Tube 1)		
50 mL Empty Tube for QuEChERS Extraction	50/pk	186006814
DisQuE 50 mL Tube/ AOAC–Acetate 	**DisQuE 50 mL tube containing:** 1.5 g sodium acetate and 6 g $MgSO_4$, 100/pk	186004571
DisQuE 50 mL Tube/ CEN–Citrate 	**DisQuE 50 mL tube containing:** 1 g trisodium citrate dihydrate, 0.5 g disodium hydrogencitrate sesquihydrate, 1 g NaCl and 4 g $MgSO_4$, 100/pk	186004837

Description		P/N
Individual Extraction Pouch		
DisQuE Pouch 	1.5 g sodium acetate, 6 g $MgSO_4$, 50/pk	186006812
	4 g $MgSO_4$, 1 g NaCl, 1 g trisodium citrate dehydrate, 0.5 g disodium hydrogencitrate sesquihydrate, 50/pk	186006813

DisQuE Cleanup Tubes (Tube 2)

AOAC Method

Description	Tube Size	P/N
DisQuE Tube containing: 150 mg $MgSO_4$ and 50 mg PSA, 100/pk	2 mL	186004572
DisQuE Tube containing: 150 mg $MgSO_4$, 50 mg PSA and 50 mg C_{18}, 100/pk	2 mL	186004830
DisQuE Tube containing: 900 mg $MgSO_4$ and 300 mg PSA, 50/pk	15 mL	186008077
DisQuE Tube containing: 900 mg $MgSO_4$, 300 mg PSA and 300 mg C_{18}, 50/pk	15 mL	186008078
DisQuE Tube containing: 1200 mg $MgSO_4$ and 400 mg PSA, 50/pk	15 mL	186008072
DisQuE Tube containing: 1200 mg $MgSO_4$, 400 mg PSA and 400 mg C_{18}, 50/pk	15 mL	186008073
DisQuE Tube containing: 1200 mg $MgSO_4$, 400 mg PSA, 400 mg C_{18}, and 400 mg GCB, 50/pk	15 mL	186008074

DisQuE Cleanup Tubes (Tube 2)

CEN Method

Description	Tube Size	P/N
DisQuE Tube containing: 150 mg $MgSO_4$ and 25 mg PSA, 100/pk	2 mL	186004831
DisQuE Tube containing: 150 mg $MgSO_4$, 25 mg PSA, and 25 mg C_{18}, 100/pk	2 mL	186004832
DisQuE Tube containing: 150 mg MgSO4, 25 mg PSA, and 2.5 mg GCB, 100/pk	2 mL	186008076
DisQuE Tube containing: 900 mg $MgSO_4$, 150 mg PSA, 50/pk	15 mL	186004833
DisQuE Tube containing: 900 mg $MgSO_4$, 150 mg PSA, and 150 mg C_{18}, 50/pk	15 mL	186004834

DisQuE Cleanup Tubes (Tube 2)

Specialty Cleanup Tubes

Description	Tube Size	P/N
DisQuE Tube containing: 150 mg $MgSO_4$ and 50 mg C_{18}, 100/pk	2 mL	186008075
DisQuE Tube containing: 150 mg $MgSO_4$, 25 mg PSA, 25 mg C_{18}, and 7 mg GCB, 100/pk	2 mL	186008071
DisQuE Tube containing: 900 mg $MgSO_4$, 450 mg PSA, 300 mg C_{18}, and 50 mg GCB, 50/pk	15 mL	186008079
DisQuE Tube containing: 150 mg $MgSO_4$, 50 mg PSA, 30 mg C_{18}, and 30 mg alumina-N, 100/pk	2 mL	186008081
DisQuE Tube containing: 750 mg $MgSO_4$, 250 mg PSA, 150 mg C_{18}, and 150 mg alumina-N, 50/pk	15 mL	186008080
DisQuE Tube containing: 900 mg $MgSO_4$, 150 mg PSA, and 15 mg GCB, 50/pk	15 mL	186009047
DisQuE Tube containing: 900 mg $MgSO_4$, 300 mg PSA, 300 mg C_{18}, and 45 mg GCB, 50/pk	15 mL	186009187
DisQuE Tube containing: 150 mg $MgSO_4$, 50 mg PSA, 50 mg C_{18}, and 7.5 mg GCB, 100/pk	2 mL	186009229

Bulk Sorbents

Description	P/N
Graphitized Carbon Black, 25 g Bottle	186004835
C_{18}, 100 g Bottle	WAT035672

Waters/Pall Life Sciences Sample and Solvent Filtration Products

Filtration of samples and solvents is a preventative maintenance procedure that saves lab time and money. Filtration provides immediate protection for the components of column and instrumentation by minimizing down time.

Waters/Pall Life Sciences Filters have been certified for compliance; which means they have been designed and developed to assist customers in complying with their regulatory and quality objectives.

Waters carries a broad range of Pall Life Sciences Filter Products, a range of different membranes for solvent and sample compatibility, and a variety of devices for various filtration applications.

Choosing the Right Filter for Your Application

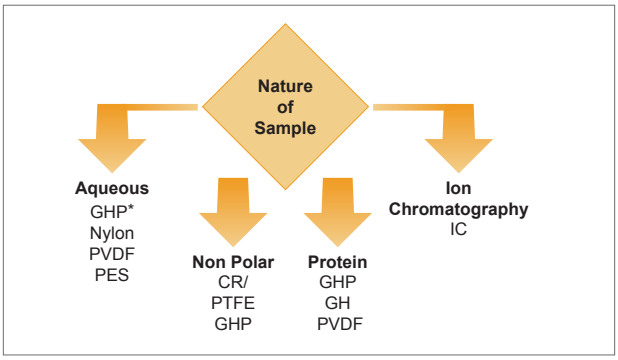
To choose the right filter, you need to consider sample characteristics, volume, pore size; and decide if the sample may require prefiltration because it is laden with particulate matter.

Membrane Choices

- **GHP Acrodiscs:** Hydrophilic propylene membrane suitable for aqueous, organic, and has low protein binding
- **Nylon Acrodiscs:** Hydrophilic nylon membrane
- **GHP Acrodisc GF and Nylon Acrodisc GF:** Designed with a glass fiber prefilter over the membrane for hard to filter samples laden with particulate matter
- **Glass Fiber Acrodiscs:** Can be used alone or as a prefilter with another Acrodisc in series
- **Acrodisc LC (PVDF):** Hydrophilic polyvinylidene fluoride good for aqueous and organic solvents
- **Acrodisc CR (PTFE):** Used for aggressive organic solvents
- **Ion Chromatography (IC) Acrodisc:** Certified to contain low ionic backgrounds

Concerned about particulate matter in your sample?

Step 1: What is the nature of your sample?



*For samples with laden particulate that are difficult to filter, it is best to use a syringe filter with a glass fiber prefilter over the membrane. These are available in GHP and Nylon.

Step 2: What micron size are the particles in the column you are using?

Column	Pore Size of Filter
>3 µm	0.45 µm
<3 µm	0.20 µm

Step 3: What is the volume of your sample?

Volume	Acrodisc Size	Hold Up Volume
<2 mL	4 mm	<10 µL
<10 mL	13 mm minispike	<14 µL
<10 mL	13 mm male Luer	<30 µL
<100 mL	25 mm	<100 µL

Example 1: 1.5 mL of aqueous sample to be filtered for injection on a 5 µm column

Step	Question	Answer	Choice
1	Sample	Aqueous	GHP and others
2	Column's particle size	5 µm	0.45 µm
3	Volume	1.5 mL	4 mm or larger

Choice: Membrane 0.45 µm GHP Acrodisc in 4 mm or larger. You can also use the Nylon, PVDF or PES (other choices of hydrophilic membranes under the aqueous sample path). In terms of device size, if you are injecting only a few µL of sample on the column, you can use any device size. The 13 and 25 mm Acrodiscs have hold up volumes of at most 100 µL, leaving plenty of filtered sample for the application.

FILTER DESIGN AND MEMBRANE CHOICES

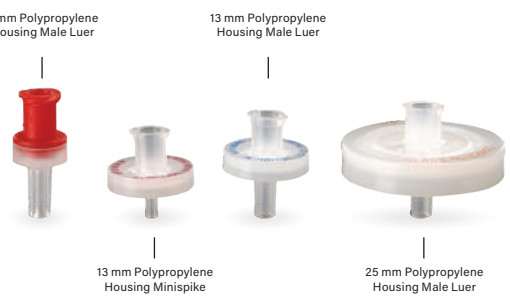
	Acetone	Acetonitrile	Acetic acid, glacial	n-Butanol	Chloroform	Dioxane	Dimethyl formamide	Dimethyl sulfoxide	Ethanol	Ethyl acetate	Ethyl ether	Freon TF	Hydrochloric acid (1N)	Hexane, dry	Methanol	Methylene chloride	Methyl ethyl ketone	N-methylpyrrolidone	Isopropanol	Sodium hydroxide (5N)	Tetrahydrofuran	Tetrahydrofuran/water (50/50)	Toluene	Water
GH Polypro Syringe Filters																								
GHP Acrodisc 13 (13 mm)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
GHP Acrodisc (25 mm)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
GHP Acrodisc GF (25 mm)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
PTFE Syringe Filters																								
Acrodisc 4CR PTFE (4 mm)	R*	R	R	R	LR	R	R*	R*	R	R*	R	R	R	R	R	LR	R*	R*	R	LR	LR	▪	LR*	R
Acrodisc 13CR PTFE (13 mm)	R*	R	R	R	R	R	R*	R*	R	R*	R	R	R	R	R	R	R*	R*	R	R	R	R	R*	R
Acrodisc CR PTFE (25 mm)	R*	R	R	R	R	R	R*	R*	R	R*	R	R	R	R	R	R	R*	R*	R	R	R	R	R*	R
PVDF Syringe Filters																								
Acrodisc LC13 PVDF (13 mm)	NR*	R	R	R	R	R	NR*	NR*	R	R*	R	R	R	R	R	R	NR*	NR*	R	NR	R	R	R*	R
Acrodisc LC PVDF (25 mm)	NR*	R	R	R	R	R	NR*	NR*	R	R*	R	R	R	R	R	R	NR*	NR*	R	NR	R	R	R*	R
Nylon Syringe Filters																								
Nylon Acrodisc 4 (4 mm)	R*	R	R	R	NR	▪	R*	R*	R	R*	NR	R	NR	R	R	NR	R*	R*	R	R	NR	LR	R*	R
Nylon Acrodisc 13 (13 mm)	R*	R	R	R	NR	▪	R*	R*	R	R*	NR	R	NR	R	R	NR	R*	R*	R	R	NR	LR	R*	R
Nylon Acrodisc (25 mm)	R*	R	R	R	NR	▪	R*	R*	R	R*	NR	R	NR	R	R	NR	R*	R*	R	R	NR	LR	R*	R
Nylon Acrodisc GF (25 mm)	R*	R	R	R	NR	▪	R*	R*	R	R*	NR	R	NR	R	R	NR	R*	R*	R	R	NR	LR	R*	R
Ion Chromatography Syringe Filters																								
IC Acrodisc (13 mm & 25 mm)	NR	LR	NR	R	NR	▪	NR	NR	▪	LR	R	LR	▪	LR	R	NR	▪	NR	▪	▪	NR	▪	R	R
Glass Fibre Syringe Filters																								
GF Acrodisc	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	NR	R	R	R	R
Acrylic Copolymer Syringe Filters																								
Non-Sterile Acrodisc (25 mm)	NR	NR	NR	R	NR	NR	NR	NR	R	NR	NR	R	LR	NR	R	NR	NR	NR	R	R	NR	NR	NR	R
Disc Filters																								
GH Polypro	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
FP Verciel (PVDF)	NR	R	R	R	R	LR	NR	NR	R	R	R	R	R	R	R	R	LR	NR	R	NR	LR	▪	R	R
Nylaflo (Nylon)	R	R	NR	R	NR	R	R	R	R	R	R	R	NR	▪	LR	NR	NR	R	R	R	R	R	NR	R
TF (PTFE)	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

Note:
R = Resistant
No significant change was observed in flow rate or bubble point of the membrane.
*UV absorbance was set at 254 nm.

LR = Limited Resistance
Moderate changes in physical properties or dimension of the membrane were observed.
The filter may be suitable for short term, non-critical use at room temperature.

NR = Not Resistant
The membrane is basically unstable. In most cases, extensive shrinkage or swelling occurs.
The filter may gradually weaken or partially dissolve after extended exposure.

▪ = Insufficient Data



Ordering Information

Syringe Filters

Acrodisc 13 mm

Sample	Membrane	P/N (100/pk)	P/N (1000/pk)	P/N (100/pk)	P/N (1000/pk)
		Pore Size: 0.2 µm		Pore Size: 0.45 µm	
Aqueous	Nylon	WAT200524	WAT200834	WAT200520	WAT200832
	PVDF	WAT200806	—	WAT200512	WAT200827
Non Polar	CR	WAT200506	WAT200823	WAT200502	WAT200821
Protein	PVDF	WAT200806	—	WAT200512	WAT200827
Ion Chromatography	IC	WAT200810	WAT200844	WAT200812	WAT200842

Acrodisc 13 mm Minispike

		Pore Size: 0.2 µm		Pore Size: 0.45 µm	
Aqueous	GHP	WAT097962	186005595	WAT200516	WAT200830
	Nylon	WAT200562	WAT200835	WAT200564	WAT200836
	PVDF	WAT200804	WAT200838	WAT200560	WAT200828
Non Polar	CR	WAT200556	WAT200824	WAT200558	WAT200825
	GHP	WAT097962	186005595	WAT200516	WAT200830
Protein	PVDF	WAT200804	WAT200838	WAT200560	WAT200828

Acrodisc 25 mm

		Pore Size: 0.2 µm		Pore Size: 0.45 µm	
Aqueous	GHP	WAT097964	186005596	WAT200514	WAT200829
	Nylon	WAT200522	WAT200833	WAT200518	WAT200831
	PVDF	WAT200808	WAT200839	WAT200510	WAT200826
	GHP GF*	—	—	WAT200802	WAT058853
	NYLON GF*	—	—	WAT200800	WAT200846
	GF**	—	—	WAT200818	WAT200840
Non Polar	CR	WAT200504	WAT200822	WAT200500	WAT200820
	GHP	WAT097964	186005596	WAT200514	WAT200829
Protein	PVDF	WAT200808	WAT200839	WAT200510	WAT200826
Ion Chromatography	IC	—	—	—	WAT200843

* GHP GF and Nylon GF are glass fiber prefilters in combination with GHP and Nylon filters for precipitate laden samples.
**Glass fiber filters are 1 µm in pore size.

Waters Filter Selector

Select the most appropriate filter for your analysis. Simply answer three easy questions about particle size, sample volume, and sample type; and we will identify the most suitable filter.

For more information about Waters Filter Selector, please visit: www.waters.com/filterselector

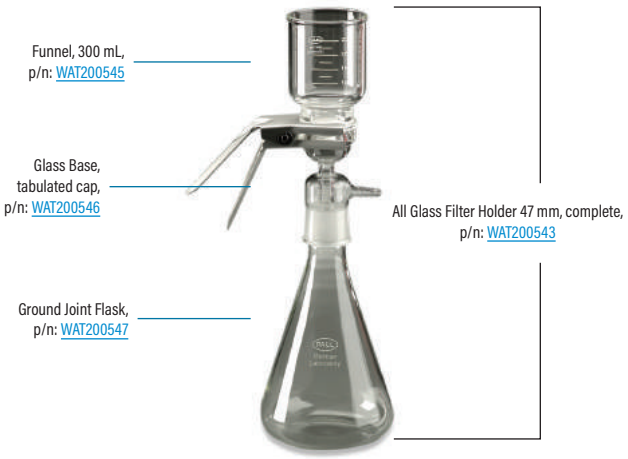
SOLVENT FILTRATION APPARATUS

The 300 mL capacity 47 mm Glass Filter Funnel and 1 L capacity 47 mm Glass Funnel/Support Assembly are ideal for vacuum filtration of liquids and degassing of HPLC solvent and mobile phases. The 100% borosilicate glass construction assures resistance to even the most aggressive solvents.

Ordering Information

Solvent Filtration Apparatus

Description	P/N
Solvent Filtration Apparatus 110 V, 60 Hz	176002986
Solvent Filtration Apparatus 220 V, 50 Hz	176002987
All Glass Filter Holder 47 mm, complete	WAT200543
Funnel, 300 mL	WAT200545
Glass Base, tabulated cap	WAT200546
Ground Joint Flask	WAT200547
Swinney Holder	WAT200566
Vacuum Pump 110 V, 60 Hz	725000417
Vacuum Pump 220 V, 50 Hz	725000604



Solvent Filtration Membranes

Description	Diameter	Pore Size	Qty.	P/N
Nylon Filter	47 mm	0.45 µm	100/pk	WAT200532
PTFE Filter	47 mm	0.45 µm	100/pk	WAT200534
	13 mm	0.45 µm	100/pk	WAT200536
GH Polypro Filter	47 mm	0.45 µm	100/pk	WAT200537
Supor (PES) Filter	47 mm	0.45 µm	100/pk	WAT200538
	13 mm	0.45 µm	100/pk	WAT200540
Nylon Filter	47 mm	0.2 µm	100/pk	WAT200533
PTFE Filter	47 mm	0.2 µm	100/pk	WAT200535
GHP Filter	47 mm	0.2 mm	100/pk	186003524
Supor (PES) Filter	47 mm	0.2 µm	100/pk	WAT200539

Sample Vials and Accessories

Sample Vials and Accessories

Contents

Sample Vials and Accessories

Your choices of vials or plates should be well informed and consistent with your application and instrumentation. To facilitate your decisions, we organized information about vials and accessories into three sections. The first section covers technical information to consider when selecting the materials of construction for vials, septa, plates, and seals. It is important to take into consideration the nature of analytes and sample diluent used when selecting the vials and septa, or plates and seals. The second section includes quick selection guides that list the most frequently purchased products, organized by instrument model. The third section includes a complete listing of vials and accessories according to size, combination packs, vials only, caps/septa only, and low-volume inserts.

Certified Vials

Waters offers three lines of certified vials:

- LC/GC Certified
- LCMS Certified
- TruView™ LCMS Certified

DIMENSIONAL TEST

All lines of Waters Vials are certified to be within the dimensional tolerances for height, width, neck opening, neck center, threads, and bottom thickness specified for autosamplers. Conformance of vials to these permissible limits is essential. Out-of-dimension vials can cause needle damage and consequent system downtime.

CHEMISTRY TESTS

LC/GC Certified Vials are UV tested by HPLC. The HPLC test detects trace levels of chemicals used in the manufacturing and packaging process. These chemicals include lubricants, surfactants, antistatic agents, and antioxidants from packaging. To ensure cleanliness, we test each batch of vials after it has been packaged for several days. An additional test, a headspace GC test, determines whether the silicone septa cured properly.

LCMS Certified Vials are MS tested using an unbiased test to look for any ionized masses, regardless of their source. The test, performed in the mass spectrometer's scan mode, determines the total ion count and the presence of clusters in the high-mass range.

TruView LCMS Certified Vials are tested to ensure their conformance to stringent dimensional tolerances, UV and MS cleanliness, and polar-analyte adsorption. The vials are manufactured by a process that limits the concentration of free ions on the glass surface. Ionic sites can cause non-specific binding of polar analytes. Waters TruView LCMS Certified Vials are tested for high recovery of analyte at a concentration of 1 ng/mL using UPLC-MS/MS (MRM) and yield little adsorption. These vials exhibit the lowest adsorption of autosampler vials in the market.

Types of Certified Vials

Certification Tests	CERTIFIED	LCMS CERTIFIED	TruView LCMS CERTIFIED
Dimensional Test	✓	✓	✓
Septum GC Test	✓	✓	✓
HPLC UV Test	✓	✓	✓
MS Scan		✓	✓
Low Adsorption Test			✓
To download these whitepapers, visit www.waters.com and search by their part numbers.	Waters Certified Sample Vials Whitepaper 720001303EN	Waters LCMS Certified Sample Vials Whitepaper 720001517EN	TruView LCMS Certified Sample Vials Whitepaper 720004097EN

Vial Selection

CHOOSING THE RIGHT VIAL

Choosing the correct vial for your application is important. Equally important, however, is your choice of septum and closure.

The selection options below help you choose the appropriate combination of vial and accessories. For convenience in ordering, we offer many of these items in combination packs of 100.

Step 1

Septa Selection Guide

PTFE	PTFE/Silicone	Pre-slit PTFE/Silicone	PE Septumless
Recommended for single injection applications.	Recommended for multiple injections and sample storage.	Provides adequate venting to prevent vacuum formation in sample vial, delivering excellent sample-draw reproducibility.	Same advantages as PTFE.
Excellent solvent resistance and chemical compatibility.	Demonstrates excellent resealing characteristics.	Eliminates coring from bottom draw needles.	—
Does not reseal upon puncturing.	PTFE chemical resistance until punctured, then the septum will have the chemical compatibility of silicone.	Good resealing capabilities.	—
Not recommended for long-term sample storage.	Working temperature range from -40 ˚C to 200 ˚C.	Recommended for multiple injections.	—
—	—	Working temperature range from -40 ˚C to 200 ˚C.	—

Waters recommends pre-slit PTFE/silicone septa, for venting and accurate sample draw. They also reduce the possibility of septum coring in bottom-draw needles.

For applications with a volatile solvent that require non-slit septa, there are simple steps you can take to reduce creating a vacuum. Do not fill the vial; leave headspace. You may have to reduce the syringe draw rate to improve sample volume accuracy. (Refer to your sample manager's operator guide on how to adjust draw rate.)

Step 2

Vial Closures Guide

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

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

Crimp caps squeeze the septum between the vial's rim and the crimped aluminum cap forming an excellent seal. The crimp cap vial requires the use of a crimping tool to form the cap around the glass vial lip. When you plan to sample only a few vials, a manual crimper suffices. For large numbers of samples, however, the use of automated crimpers is more efficient.

Snap caps function similarly to crimp caps. The use of plastic snap caps requires no tools.

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

- If the cap fits too tightly, it proves difficult to apply and may crack
- If the cap fits too loosely, the resultant seal is inadequate, and the septum may dislodge

Screw caps, which are universal, form an excellent seal. A cap screwed onto a vial applies a mechanical force that squeezes the septum between the vial rim and the cap. The use of screw caps requires no tools.

Step 3

Vial Selection Guide		
Analyte Concentration	**Detection Source**	**Recommended Product**
µg/mL	UV, RI (non-MS)	LC/GC Certified Vials
100's ng/mL	Older single quadrupole and MS-MS	LCMS Certified Vials
1 ng/mL and lower	MS-MS, Tof	TruView LCMS Certified Vials

Type 1, 33-Expansion Borosilicate Glass

Analytical laboratories use type 1, 33-expansion glass, the most chemically-inert glass obtainable, in for high-quality test results. Composed primarily of silicone and oxygen, with trace amounts of boron and sodium, the expansion coefficient of this glass is approximately 33×10^{-7} °C. All of our clear glass vials are made using type 1, 33-expansion glass.

Type 1, 51-Expansion Glass

More alkaline than type 1, 33-expansion glass, type 1, 51-expansion glass, is nonetheless adequate for use in many laboratories. Composed primarily of silicone and oxygen, with trace amounts of boron, its expansion coefficient is 51×10^{-7} °C. All of our amber glassware is made using type 1, 51-expansion glass.

Deactivated Glass (DV)

For highly polar analytes that may associate with the polar glass surface, deactivated vials are an effective choice. These glass vials are treated with gas-phase, reactive organosilane, producing a hydrophobic glass surface. Deactivated vials can be stored dry indefinitely.

Polypropylene Plastic

Nonreactive polypropylene plastic (PP) are useful where glass is not an appropriate option. The vials can be incinerated while sealed, minimizing personal exposure to potentially hazardous substances. The maximum-temperature use is 135 °C.

APPLICATION AREA: Analyze Metabolites in *in vitro* Dissolutions and Tissue Samples

"Excellent reproducibility and compatibility with multiple analysis systems and metabolites. We use these for storage as well as sample preparation and running samples. Very happy with the product as a whole."

REVIEWER: Erik Pierstorff

ORGANIZATION: O-Ray

Sample Plates and Seals

SAMPLE PLATES

We offer a selection of 96- and 384-well sample plates for use in autosamplers. The plates are SBS/ANSI compliant, for robot compatible systems. The 96-well plates can also serve as collection plates for 96-well SPE and filtration-plate formats. All of our plates are made of polypropylene, for chemical resistance. We also offer 96-well plates fitted with glass inserts that maintain sample in contact only with a glass surface. The glass inserts are also available in deactivated glass format. Refer to the vials section for information about glass and deactivated glass.

The sample plates can be centrifuged to the following maximum centrifugal forces. Exceeding this limit can deform the plates. A deformed plate can cause autosampler error and instrument shutdown.

Ordering Information

96- and 384-well Plates

Description	Maximum Centrifugal Force	P/N
96-well Plate, 350 µL per well	5000 g	186002643
96-well Plate, 700 µL per well	2000 g	186005837
96-well Plate, 800 µL per well	2000 g	186002481
96-well Plate, 2 mL per well	5000 g	186002482
384-well Plate, 100 µL per well	5000 g	186002631
384-well Plate, 250 µL per well	5000 g	186002632

SEALS

Waters offers a selection of cap mats, heat seals, and an adhesive seal for plates.

Polypropylene Cap Mats

The selection of polypropylene cap mats fits all 96-well plates and offer the chemical resistance of polypropylene. The temperature range is -20 to 55 °C.

Silicone/PTFE Cap Mats

Silicone/PTFE cap mats, manufactured in slit and non-slit versions, are available for 96-well plates, including those fitted with glass inserts. We recommend using the slit versions in autosamplers, where they promote proper venting and accuracy of sample draw. We recommend the non-slit versions for long-term sample storage. The temperature range is -40 to 200 °C.

Clear Polyester Heat Seal

The clear polyester seal, usable between -80 °C and 80 °C, is effective for most sample solvents and buffers, including DMSO. To use the seal, place its shiny side facing up, and then use a heat sealer to apply heat in both directions for two to three seconds.

Aluminum Foil Heat Seal

The aluminum foil heat seal is a polyester/aluminum laminate. The addition of the aluminum layer reduces the gas permeability of the seal. For long-term storage, the aluminum foil heat seal is a better choice for reducing evaporative loss. The seal is usable over the temperature range from -200 °C to 90 °C. Position the seal with its white side facing up, and then apply heat in both directions for three seconds using a heat sealer.

Adhesive Seal

The adhesive seal is a polyolefin film with a synthetic rubber adhesive. This seal is ideal for protein and peptide analyses, where samples are in buffers. The adhesive, which is usable between -80 °C and 80 °C, is resistant to low concentrations (0–30%) of polar organic solvents. No heat sealing equipment is needed to apply the seal.

Vials and Accessories for ACQUITY UPLC Systems

The family of ACQUITY™ UPLC Systems continues to evolve and expand, providing various solutions for improved resolution, sensitivity, and throughput. Several different UPLC sample managers are available, each of which offer a choice of needle type to meet the requirements of a laboratory's workflow. Following is the approved selection of vials, plates, and plate seals for current ACQUITY UPLC System configurations.

Compatibility Tables

The tables below recommend vials and plates for the ACQUITY UPLC System configurations.

Fixed Loop Needle
Vials: ACQUITY UPLC, ACQUITY UPLC M-Class, nanoACQUITY™ UPLC, ACQUITY UPC², and ACQUITY UPLC I-Class FL; Sample Managers
Plates: ACQUITY UPLC, ACQUITY UPLC M-Class, nanoACQUITY UPLC, and ACQUITY UPLC I-Class FL; Metal and Metal Tip Needles
ACQUITY UPLC, ACQUITY UPLC M-Class, nanoACQUITY UPLC, ACQUITY UPC² and ACQUITY UPLC I-Class FL; PEEK and PEEKsil Needles

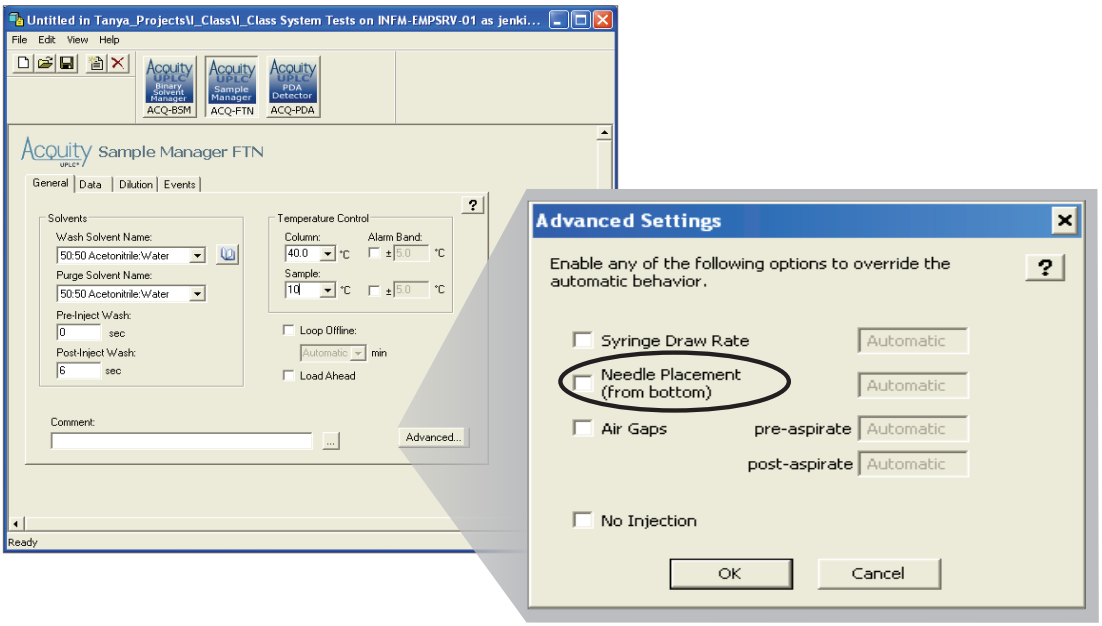
Flow Through Needle
Vials: ACQUITY UPLC H-Class/H-Class Bio, ACQUITY Arc,™ ACQUITY Arc™ Bio, ACQUITY UPLC I-Class FTN, and ACQUITY Advanced Polymer Chromatography™
Plates: ACQUITY UPLC H-Class/H-Class Bio, ACQUITY Arc/Arc Bio, and ACQUITY UPLC I-Class FTN

Residual Volumes

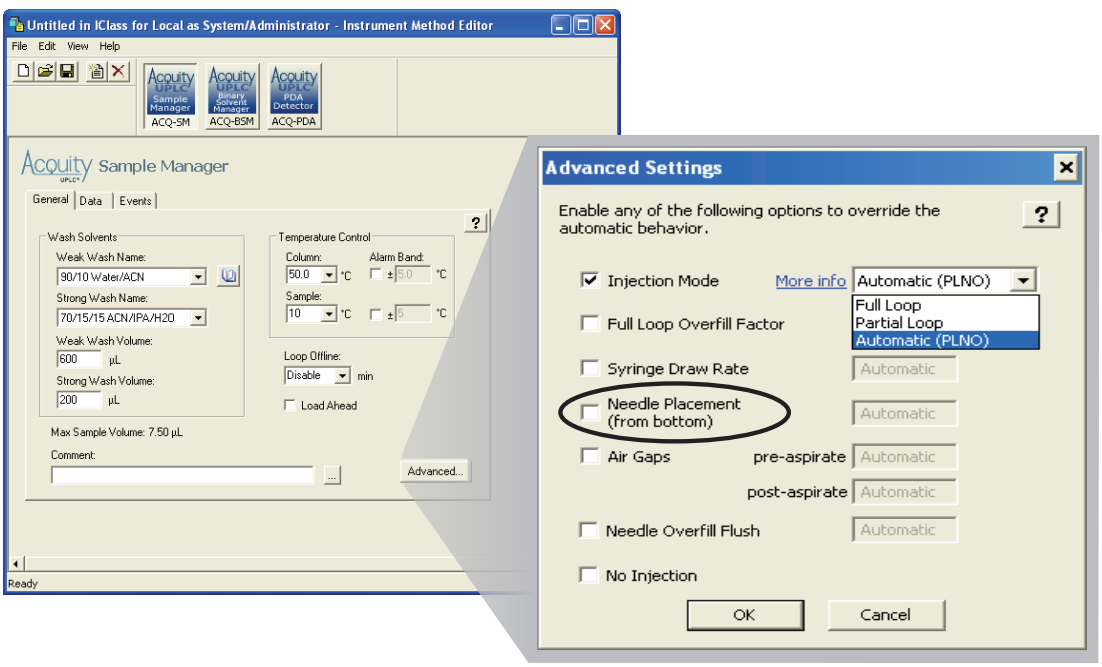
All residual volumes shown in the following table are calculated at the default needle placement setting. For sample-limited applications, you can adjust the needle placement via the software, in the Advanced Settings dialog box of the sample manager's instrument method editor (see figure on the following page). In the case of flow through needles (FTN), exercise care when specifying a lower needle-placement setting: FTN needle tips are susceptible to damage caused by striking against hard surfaces, resulting in sealing or carryover problems.

Default Needle Placement		
Needle Type	**Plates**	**Vials**
FTN	2 mm	4 mm
FL	2 mm	2 mm

Flow Through Needle (FTN) ACQUITY UPLC H-Class/H-Class Bio, ACQUITY UPLC I-Class, ACQUITY APC, and ACQUITY Arc/Arc Bio Systems



Fixed Loop Needle (FL)



QUICK SELECTION GUIDE: FIXED-LOOP-NEEDLE ACQUITY SYSTEMS

The tables below, which show the most frequently purchased vials and plates for fixed-loop-needle ACQUITY Systems, serve as a quick selection guide.

Ordering Information

Vials for ACQUITY UPLC, ACQUITY UPLC I-Class, ACQUITY UPLC M-Class, nanoACQUITY UPLC, and ACQUITY UPC²

Fixed Loop (FL), All Needles	Clear	Amber	Max Recovery	Amber Max	300 µL PP	750 µL PP	Clear Glass with Septumless Cap	Total Recovery
12 × 32 mm								
Vial Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
TruView LCMS Certified Combination Packs								
Vial, Cap, and Pre-slit Silicone/ PTFE Septum	186005666CV	186005661CV	186005662CV	186005670CV	–	–	–	186005663CV
LCMS Certified Combination Packs								
Vial, Cap, and Pre-slit Silicone/ PTFE Septum	600000668CV	600000669CV	600000670CV	600000755CV	–	–	–	600000671CV
LC/GC Certified Combination Packs								
Bonded Pre-slit Silicone/PTFE Septum	186000307C	186000847C	186000327C	186003886C	–	–	–	186000385C
Combination with PE Septumless Cap	186004132C	186004133C	186004168C	–	–	–	186004132C	186004167C
Combination Packs								
Bonded Pre-slit Silicone/PTFE Septum Deactivated	186000307DV	186000847DV	186000327DV	–	–	–	–	186000385DV
Bonded Pre-slit Silicone/PTFE Septum	–	–	–	–	186002639	186005221	–	–
Combination with PE Septumless Cap	–	–	–	–	186004112	186005230	–	–
Injectable Volumes								
Max	1600 µL	1600 µL	1100 µL	1100 µL	210 µL	530 µL	1600 µL	950 µL
Residual	165 µL	165 µL	22 µL	22 µL	20 µL	70 µL	165 µL	4 µL
Vial Selection from Chromatography Data System	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder
Storage Cap								
Black Solid 9 mm Cap with Silicone/PTFE Liner for Sample Storage	186007187	186007187	186007187	186007187	186007187	186007187	186007187	186007187

All items come in quantities of 100 unless otherwise noted.

ACQUITY Sample Organizer Accessories

Description	P/N
Vial Holder, 48-well, 2 mL Vial	700011047
Label, 48-well, 2 mL Vial, Open Access	615003783
Sleeve, 2 mL Vials within the Standard 4 mL Auxiliary Position in the Sample Manager Shuttle Tray, 4/pk	700005338

For the complete selection of vials and accessories for ACQUITY Systems, refer to page 60.

Plates for ACQUITY UPLC, ACQUITY UPLC I-Class, ACQUITY UPLC M-Class, and nanoACQUITY UPLC

Fixed Loop (FL), Metal and Metal Tip Needles	96-well Plates				384-well Plates	
Well Shape						
Plates	186002643	186005837	186002481	186002482	186002632	186002631
Pack Size	100	25	50	50	50	50
Well Volume	350 µL	700 µL	800 µL	2 mL	250 µL	100 µL
Sealing Options						
PTFE/Silicone Pre-slit, 5/pk	186006332	186006332	186006332	186006335	—	—
Polypropylene Cap Mat, 50/pk	—	186002483	186002483	186002484	—	—
Clear Polyester Heat Seal, 100/pk	186002788	186002788	186002788	186002788	186002788	186002788
Aluminum Foil Laminate Heat Seal, 100/pk	186002789	186002789	186002789	186002789	186002789	186002789
Adhesive Seal, 100/pk	186006336	186006336	186006336	186006336	186006336	186006336
Number of Plates in Sample Organizer	21	10	10	7	10	21
Shape	Round	Round	Round	Square	Square	Square
Bottom	Round	Conical	Conical	Conical	Conical	Conical
Material	PP	PP	PP	PP	PP	PP
Plate Height	14 mm	31 mm	31 mm	42.5 mm	22 mm	15.5 mm
Well Depth	11.25 mm	27 mm	27 mm	39 mm	19.5 mm	12.3 mm
Residual Volume in ACQUITY at Default Needle Placement of 2 mm	35 µL	8 µL	15 µL	20 µL	15 µL	15 µL
Plate Selection from Chromatography Data System	ANSI-96-well 350 µL	ANSI-96-well 1 mL	ANSI-96-well 1 mL	ANSI-96-well 2 mL	ANSI-384-well 250 µL	ANSI-384-well 100 µL

	96-well Glass Inserts	
Glass Insert 96-well Plates	**700 µL**	**1 mL**
Plate for Quick Load Inserts, 20/pk	186001438	186001438
Quick Load Glass Insert, 1/pk	186001437(DV)	186001436(DV)
96-well Plate with Inserts	186000349(DV), 1/pk	186000855(DV), 18/pk
Pre-slit PTFE Silicone Seal, 5/pk (Clear)—seals against plate wall	186006335	—
Clear Polyester Heat Seal, 100/pk	186002788	—
Aluminum Foil Laminate Heat Seal, 100/pk	186002789	—
Adhesive Seal,* 100/pk	186006336	—
Residual Volume in ACQUITY at Default Needle Placement of 2 mm	15 µL	15 µL
Plate Selection from Chromatography Data System	ANSI-96-well 700 µL Glass Insert	ANSI-96-well 1 mL Glass Insert

When (DV) appears beside a number, a deactivated version of the part can be ordered by adding a DV to the right of the part number.
*Adhesive seal is designed for use with buffer solutions and can tolerate alcohols and acetonitrile content in buffers.

Plates for ACQUITY UPLC, ACQUITY UPLC I-Class, ACQUITY UPLC M-Class, nanoACQUITY UPLC, and ACQUITY UPC²

Fixed Loop (FL), PEEK and PEEKsil Needles	96-well Plates				384-well Plates	
Well Shape						
Plates	186002643	186005837	186002481	186002482	186002632	186002631
Pack Size	100	25	50	50	50	50
Well Volume	350 µL	700 µL	800 µL	2 mL	250 µL	100 µL
Sealing Options						
Polypropylene Cap Mat, 50/pk	–	186002483	186002483	186002484	–	–
Clear Polyester Heat Seal, 100/pk	186002788	186002788	186002788	186002788	186002788	186002788
Aluminum Foil Laminate Heat Seal, 100/pk	186002789	186002789	186002789	186002789	186002789	186002789
Adhesive Seal,* 100/pk	186006336	186006336	186006336	186006336	186006336	186006336
Number of Plates in Sample Organizer	21	10	10	7	10	21
Shape	Round	Round	Round	Square	Square	Square
Bottom	Round	Conical	Conical	Conical	Conical	Conical
Material	PP	PP	PP	PP	PP	PP
Plate Height	14 mm	31 mm	31 mm	42.5 mm	22 mm	15.5 mm
Well Depth	11.25 mm	27 mm	27 mm	39 mm	19.5 mm	12.3 mm
Residual Volume in ACQUITY at Default Needle Placement of 2 mm	35 µL	8 µL	15 µL	20 µL	15 µL	15 µL
Plate Selection from Chromatography Data System	ANSI-96-well 350 µL	ANSI-96-well 1 mL	ANSI-96-well 1 mL	ANSI-96-well 2 mL	ANSI-384-well 250 µL	ANSI-384-well 100 µL

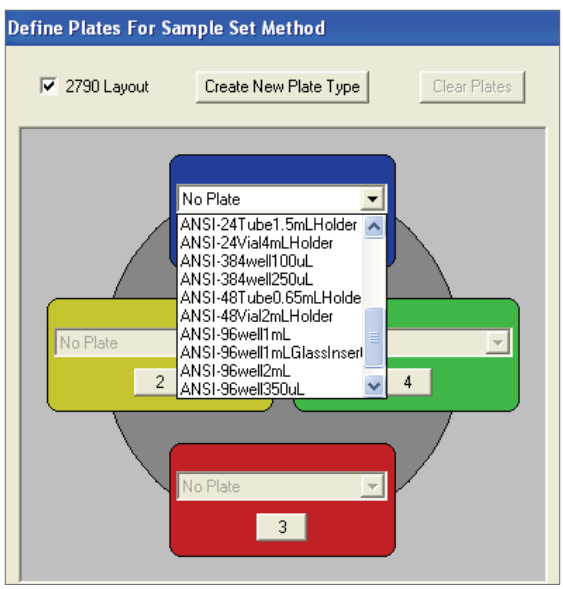
*Adhesive seal is designed for use with buffer solutions and can tolerate alcohols and acetonitrile content in buffers.

	96-well Glass Inserts
Glass Insert 96-well Plates	**700 µL**
Plate for Quick Load Inserts, 20/pk	186001438
Quick Load Glass Insert, 1/pk	186001437(DV)
96-well Plate with Inserts	186000349(DV), 1/pk
Clear Polyester Heat Seal, 100/pk	186002788
Aluminum Foil Laminate Heat Seal, 100/pk	186002789
Adhesive Seal,* 100/pk	186006336
Residual Volume in ACQUITY at Default Needle Placement of 2 mm	15 µL
Plate Selection from Chromatography Data System	ANSI-96-well 700 µL Glass Insert

When (DV) appears beside a number, a deactivated version of the part can be ordered by adding a DV to the right of the part number.
*Adhesive seal is designed for use with buffer solutions and can tolerate alcohols and acetonitrile content in buffers.

Plate Selection

Chromatographic system: Plate selection indicates a preprogrammed geometric plate configuration, with the proper x, y, and z dimensions for the plate. Select the proper plate from the drop-down menu.



QUICK SELECTION GUIDE: FLOW-THROUGH-NEEDLE ACQUITY SYSTEMS

The tables below, which show the most frequently purchased vials and plates for flow-through-needle ACQUITY Systems, serve as a quick selection guide.

Ordering Information

Vials for ACQUITY UPLC H-Class/H-Class Bio, ACQUITY UPLC I-Class, ACQUITY Arc/Arc Bio, and ACQUITY APC Systems

Flow Through Needles (FTN)	Clear	Amber	Max Recovery	Amber Max	300 µL PP	750 µL PP	Clear Glass with Septumless Cap	Total Recovery
12 × 32 mm								
Vial Number	1	2	3	4	5	6	7	8
TruView LCMS Certified Combination Packs								
Vial, Cap, and Pre-slit Silicone/PTFE Septum	186005666CV	186005661CV	186005662CV	186005670CV	–	–	–	186005663CV
LCMS Certified Combination Packs								
Vial, Cap, and Pre-slit Silicone/PTFE Septum	600000668CV	600000669CV	600000670CV	600000755CV	–	–	–	600000671CV
LC/GC Certified Combination Packs								
Bonded Pre-slit Silicone/PTFE Septum	186000307C	186000847C	186000327C	186003886C	–	–	–	186000385C
Combination with PE Septumless Cap	186004132C	186004133C	186004168C	–	–	–	186004132C	186004167C
Combination Packs								
Bonded Pre-slit Silicone/PTFE Septum Deactivated	186000307DV	186000847DV	186000327DV	–	–	–	–	186000385DV
Bonded Pre-slit Silicone/PTFE Septum	–	–	–	–	186002639	186005221	–	–
Combination with PE Septumless Cap	–	–	–	–	186004112	186005230	–	–
Injectable Volumes								
Max	1450 µL	1450 µL	1365 µL	1365 µL	290 µL	610 µL	1450 µL	940 µL
Residual	360 µL	360 µL	135 µL	135 µL	10 µL	90 µL	360 µL	10 µL
Vial Selection from Chromatography Data System	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder	ANSI-48-vial 2 mL Holder
Storage Cap								
Black Solid 9 mm Cap with Silicone/PTFE Liner for Sample Storage	186007187	186007187	186007187	186007187	186007187	186007187	186007187	186007187

All items come in quantities of 100 unless otherwise noted.

ACQUITY Sample Organizer Accessories

Description	P/N
Vial Holder, 48-well, 2 mL Vial	700011047
Label, 48-well, 2 mL Vial, Open Access	615003783
Sleeve, 2 mL Vials within the Standard 4 mL Auxiliary Position in the Sample Manager Shuttle Tray, 4/pk	700005338

For the complete selection of vials and accessories for ACQUITY Systems, refer to page 60.

Plates for ACQUITY UPLC H-Class/H-Class Bio, ACQUITY Arc/Arc Bio, and ACQUITY UPLC I-Class

Flow Through Needle	96-well Plates				384-well Plates
Well Shape					
Plates	186002643	186005837	186002481	186002482	186002632
Pack Size	100	25	50	50	50
Well Volume	350 µL	700 µL	800 µL	2 mL	250 µL
Sealing Options					
PTFE/Silicone Pre-slit, 5/pk	186006332	186006332	186006332	186006335	—
Clear Polyester Heat Seal, 100/pk	186002788	186002788	186002788	186002788	186002788
Adhesive Seal,* 100/pk	186006336	186006336	186006336	186006336	186006336
Number of Plates in Sample Organizer	21	10	10	7	10
Shape	Round	Round	Round	Square	Square
Bottom	Round	Conical	Conical	Conical	Conical
Material	PP	PP	PP	PP	PP
Plate Height	14 mm	31 mm	31 mm	42.5 mm	22 mm
Well Depth	11.25 mm	27 mm	27 mm	39 mm	19.5 mm
Residual Volume in ACQUITY at Default Needle Placement of 2 mm	35 µL	8 µL	15 µL	20 µL	15 µL
Plate Selection from Chromatography Data System	ANSI-96-well 350 µL	ANSI-96-well 1 mL	ANSI-96-well 1 mL	ANSI-96-well 2 mL	ANSI-384-well 250 µL
Plate Selection from Chromatography Data System	ANSI-96-well 350 µL	ANSI-96-well 1 mL	ANSI-96-well 1 mL	ANSI-96-well 2 mL	ANSI-384-well 250 µL

*Adhesive seal is designed for use with buffer solutions and can tolerate alcohols and acetonitrile content in buffers.

	96-well Glass Inserts	
Glass Insert 96-well Plates	**700 µL**	**1 mL**
Plate for Quick Load Inserts, 20/pk	186001438	186001438
Quick-Load Glass Insert, 1/pk	186001437(DV)	186001436(DV)
96-well Plate with Inserts	186000349(DV), 1/pk	186000855(DV), 18/pk
Pre-slit PTFE Silicone Seal, 5/pk (Clear)—Seals Against Plate Wall	186006335	—
Clear Polyester Heat Seal, 100/pk	186002788	—
Adhesive Seal,* 100/pk	186006336	—
Residual Volume in ACQUITY at Default Needle Placement of 2 mm	15 µL	15 µL
Plate Selection from Chromatography Data System	ANSI-96-well 700 µL Glass Insert	ANSI-96-well 1 mL Glass Insert

When (DV) appears beside a number, a deactivated version of the part can be ordered by adding a DV to the right of the part number.
*Adhesive seal is designed for use with buffer solutions and can tolerate alcohols and acetonitrile content in buffers.

Vials and Accessories for Alliance HPLC Systems

Alliance HPLC System.

AUTOSAMPLER VIALS, PLATES, AND SEALS FOR USE WITH ALLIANCE HPLC SYSTEMS

We offer a complete selection of vials, including certified and low-recovery vials suited to the needle designs used in Alliance™ Systems. We also offer a complete line of plate and seal options for the Alliance 2790/2795 HTS System.

SETTINGS FOR ALLIANCE HPLC VIALS AND LOW VOLUME INSERTS (LVI)

The Waters Alliance Separations Module is set initially to accept vials with a bottom thickness of less than 1.6 mm. Any vial that does not meet this criterion must not be used without first adding a positive needle-offset value to the sample draw depth specified in the software. Failure to do so can cause vial breakage or needle damage.

Alliance 2690 and 2695 Needle Offset

Settings for Alliance 2690 and 2695	
Vial	**Needle Offset (add)**
300 µL Polypropylene Vial	1 mm
750 µL Polypropylene Vial	1 mm
Crimp Cap Vial	1 mm
Low Volume Insert and Vial	1 mm

SelectScience TRUSTED REVIEWS

APPLICATION AREA: Sample Preparation for Sphingolipid Biomarkers in Biofluids and Tissues

"Using Waters Certified Vials for my research provides me with the confidence that my prepared samples are safely contained in certified clean vials and that there are no contaminants which might interfere with the LC-MS/MS analysis. I can inject from very low volumes knowing that the vials are shaped to maximize the sample depth to assure good reproducibility between injections. My samples are precious and many are "one-of-a-kind" which I don't want to risk putting into any vial other than Waters Certified vials."

REVIEWER: Christopher Willis

ORGANIZATION: Sanofi

QUICK SELECTION GUIDE: ALLIANCE HPLC SYSTEMS

This selection of 12 × 32 mm vials are the most commonly ordered vials by customers using Waters' Alliance Separations Modules. This page is intended to be a quick selection guide. For the complete selection of vials and accessories for Alliance Systems, turn to page 60.

Ordering Information

Vials for Alliance 2690/2695/e2695 and 2790/2795 Systems

	Clear	Amber	Max Recovery	300 µL PP	10 mm Cap Clear	Total Recovery	Amber Max	Clear Glass with Septumless Cap
12 × 32 mm								
Vial Number	9	10	11	12	13	14	15	16
Compatible Systems								
Alliance 2690/2695	•	•	—	•	•	•	—	•
Alliance 2790/2795	•	•	•	•	—	—	•	•
TruView LCMS Certified Combination Packs								
Vial, Cap, and Pre-slit Silicone/PTFE Septum	186005666CV	186005661CV	186005662CV	—	—	186005663CV	186005670CV	—
LCMS Certified Combination Packs								
Vial, Cap, and Pre-slit Silicone/PTFE Septum	600000668CV	600000669CV	600000670CV	—	—	600000671CV	600000755CV	—
LC/GC Certified Combination Packs								
Bonded Pre-slit Silicone/PTFE Septum	186000307C	186000847C	186000327C	186002639*	—	186000385C	186003886C	—
Silicone/PTFE Septum	—	—	—	—	WAT270946C	—	—	—
Combination with PE Septumless Cap	—	—	—	—		—	—	186004132C
Combination Packs								
Combination Deactivated	186000307DV	186000847DV	186000327DV	—	—	186000385DV	—	—
Injectable Volumes Alliance 2690/2695								
Max	1100 µL	1100 µL	—	280 µL	1100 µL	950 µL	—	1100 µL
Residual	750 µL	750 µL	—	20 µL	750 µL	9 µL	—	750 µL
Injectable Volumes Alliance 2790/2795								
Max	1700 µL	1700 µL	1500 µL	290 µL	1700 µL	—	1500 µL	1700 µL
Residual	170 µL	170 µL	22 µL	10 µL	170 µL	—	22 µL	170 µL
Insert								
150 µL with Poly Spring	WAT094171(DV)	WAT094171(DV)	—	—	WAT094171(DV)	—	—	WAT094171(DV)
Max Volume Injection/ Max Residual Volume	144 µL/6 µL	144 µL/6 µL	—	—	144 µL/6 µL	—	—	144 µL/6 µL
Storage Cap								
Black Solid 9 mm Cap with Silicone/PTFE Liner for Sample Storage	186007187	186007187	186007187	186007187	—	186007187	186007187	186007187

All items come in quantities of 100 unless otherwise noted.
When (DV) appears beside a number, a deactivated version of the part can be ordered by adding a DV to the right of the part number.
*Not certified.

Complete Listing of 12 × 32 mm Vials and Accessories

Screw Cap Vials	Clear	Amber	Max Recovery	300 µL PP	750 µL PP	10 mm Cap Clear	Total Recovery	Amber Max
12 × 32 mm								
Vial Number	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Compatible Systems								
Alliance 2690/2695	•	•	—	•	•	•	•	—
Alliance 2790/2795	•	•	•	•	•	—	—	•
ACQUITY	•	•	•	•	•	—	•	•
TruView LCMS Certified Combination Packs								
Vial, Cap, and Silicone/PTFE Septum	186005660CV	186005667CV	186005668CV	—	—	—	186005669CV	186005664CV
Vial, Cap, and Pre-slit Silicone/PTFE Septum	186005666CV	186005661CV	186005662CV	—	—	—	186005663CV	186005670CV
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
LC/GC Certified Combination Packs								
Bonded Silicone/PTFE Septum	186000272C	186000846C	186000326C	186002640*	186005220*	WAT270946C	186000384C	186003885C
Combination Deactivated*	186000272DV	186000846DV	186000326DV	—	—	WAT270946DV	186000384DV	—
Bonded Pre-slit Silicone/PTFE Septum	186000307C	186000847C	186000327C	186002639*	186005221*	—	186000385C	186003886C
Combination Deactivated*	186000307DV	186000847DV	186000327DV	—	—	—	186000385DV	—
Combination with PE Septumless Cap	186004132C	186004133C	186004168C	186004112*	186005230*	—	186004167C	—
LC/GC Certified Combination Pack with Cap and PTFE Septum	186007193C	186007194C	186007195C	—	—	—	186007197C	186007196C
Certified Combination Pack with Cap and LB Silicone/PTFE Septum	186007199C	186007200C	186007201C	—	—	—	186007203C	186007202C
Vials Only								
Vials Only	186000273	186000848	186002802	186002626	186005219	WAT063300	186002805	—
Deactivated Vials Only	186000273DV	186000848DV	—	—	—	WAT063300DV	—	—
Injectable Volumes Alliance 2690/2695								
Max	1100 µL	1100 µL	—	280 µL	400 µL	1100 µL	950 µL	—
Residual	750 µL	750 µL	—	20 µL	300 µL	750 µL	9 µL	—
Injectable Volumes Alliance 2790/2795								
Max	1700 µL	1700 µL	1500 µL	290 µL	530 µL	1700 µL	—	1500 µL
Residual	170 µL	170 µL	22 µL	10 µL	170 µL	170 µL	—	22 µL

All items come in quantities of 100 unless otherwise noted.
*Not certified.

Complete Listing of 12 × 32 mm Vials and Accessories

	Clear	Amber	Max Recovery	300 µL PP	750 µL PP	10 mm Cap Clear	Total Recovery	Amber Max
12 × 32 mm								
Vial Number	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
Compatible Systems								
Alliance 2690/2695	•	•	—	•	•	•	•	—
Alliance 2790/2795	•	•	•	•	•	—	—	•
ACQUITY	•	•	•	•	•	—	•	•
Inserts								
300 µL with Poly Spring	WAT094170(DV)	WAT094170(DV)	—	—	—	WAT094170(DV)	—	—
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)	WAT094171(DV)	—	—	—	WAT094171(DV)	—	—
Max Volume Injection/ Max Residual Volume	144 µL/6 µL	144 µL/6 µL	—	—	—	144 µL/6 µL	—	—
Black Screw Cap for TruView Vials								
PTFE/Silicone Septum	186005826	186005826	186005826	—	—	—	186005826	186005826
Pre-slit PTFE/Silicone Septum	186005827	186005827	186005827	—	—	—	186005827	186005827
Light Blue Screw Cap for LCMS Certified Vials								
PTFE/Silicone Septum	186005828	186005828	186005828	—	—	—	186005828	186005828
Pre-slit PTFE/Silicone Septum	186005829	186005829	186005829	—	—	—	186005829	186005829
Screw Cap and Septum–Silicone/PTFE								
PE Septumless Cap	186004169	186004169	186004169	186004169	186004169	—	186004169	186004169
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
White LectraBond	186002456	186002456	186002456	186002456	186002456	—	186002456	186002456
Black Cap with PTFE Septum, 100/pk	186007198	186007198	186007198	186007198	186007198	—	186007198	186007198
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
White LectraBond	186002457	186002457	186002457	186002457	186002457	—	186002457	186002457
For Dissolution System								
Pre-assembled Vial, Cap, and Pre-slit Septum	186000989(DV)	186003455	—	—	—	—	—	—
Storage Cap								
Black Solid 9 mm Cap with Silicone/ PTFE Liner for Sample Storage	186007187	186007187	186007187	186007187	186007187	—	186007187	186007187
Black Cap	—	—	—	—	—	WAT058875	—	—
Septum Only, Silicone/PTFE	—	—	—	—	—	WAT058874	—	—

All items come in quantities of 100 unless otherwise noted.
When (DV) appears beside a number, a deactivated version of the part can be ordered by adding a DV to the right of the part number.

Complete Listing of 12 × 32 mm Vials and Accessories *Continued*

Snap and Crimp Cap Vials	Clear	Amber	Max Recovery	300 µL PP	750 µL PP	Clear Glass Crimp	Amber Crimp	Total Recovery
12 × 32 mm								
Vial Number	25	26	27	28	29	30	31	32
Compatible Systems								
Alliance 2690/2695	•	•	–	•	•	•	•	•
Alliance 2790/2795	•	•	•	•	•	•	•	–
ACQUITY	•	•	•	•	•	•	•	•
Combination Packs								
Vial, Cap, and Silicone/PTFE Septum	–	–	–	186002642	186005223	–	–	186000234(DV)
Vial, Cap, and Pre-slit Silicone/PTFE Septum	–	–	–	186002641	186005222	–	–	–
Vials								
Vials Only	WAT094219	WAT094220	186000984	186002628	186005224	WAT094222	WAT094223	186000302
Deactivated Vials Only	WAT094219DV	WAT094220DV	186000984DV	–	–	WAT094222DV	WAT094223DV	186000302DV
Injectable Volumes Alliance 2690/2695								
Max	1100 µL	1100 µL	–	280 µL	400 µL	1100 µL	1100 µL	950 µL
Residual	750 µL	750 µL	–	20 µL	300 µL	750 µL	750 µL	9 µL
Injectable Volumes Alliance 2790/2795								
Max	1700 µL	1700 µL	1500 µL	290 µL	530 µL	1700 µL	1700 µL	–
Residual	170 µL	170 µL	22 µL	10 µL	170 µL	170 µL	170 µL	–
Inserts								
300 µL with Poly Spring	WAT094170(DV)	WAT094170(DV)	–	–	–	WAT094170(DV)	WAT094170(DV)	–
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)	WAT094171(DV)	–	–	–	WAT094171(DV)	WAT094171(DV)	–
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	–
Crimp Cap with Silicone/PTFE Septa	–	–	–	–	–	186006967	186006967	–
Crimper	–	–	–	–	–	PSL904301	PSL904301	–

All items come in quantities of 100 unless otherwise noted.
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.

Plates for Alliance 2790/2795 Systems

	96-well Plates				384-well Plates	
Well Shape						
Plates	186002643	186005837	186002481	186002482	186002632	186002631
Pack Size	100	25	50	50	50	50
Well Volume	350 µL	700 µL	800 µL	2 mL	250 µL	100 µL
Sealing Options						
PTFE/Silicone, 5/pk	186006333	186006333	186006333	186006334	–	–
PTFE/Silicone Pre-slit, 5/pk	186006332	186006332	186006332	186006335	–	–
Polypropylene Cap Mat, 50/pk	186002483	186002483	186002483	186002484	–	–
Clear Polyester Heat Seal, 100/pk	186002788	186002788	186002788	186002788	186002788	186002788
Aluminum Foil Laminate Heat Seal, 100/pk	186002789	186002789	186002789	186002789	186002789	186002789
Adhesive Seal,* 100/pk	186006336	186006336	186006336	186006336	186006336	186006336
Number of Plates in Sample Organizer	21	10	10	7	10	21
Shape	Round	Round	Round	Square	Square	Square
Bottom	Round	Conical	Conical	Conical	Conical	Conical
Material	PP	PP	PP	PP	PP	PP
Plate Height	14 mm	31 mm	31 mm	42.5 mm	22 mm	15.5 mm
Well Depth	11.25 mm	27 mm	27 mm	39 mm	19.5 mm	12.3 mm
Residual Volume in Alliance 2795 at Default Needle Placement of 2 mm	35 µL	8 µL	15 µL	20 µL	15 µL	15 µL

*Adhesive seal is designed for use with buffer solutions and can tolerate alcohols and acetonitrile content in buffers.

Roller for Cap Mats

Description	P/N
Roller for Cap Mats	186002633

Holder for 12 × 32 mm Vials

Description	P/N
Holder for 12 × 32 mm Vials, 5/pk	186004487

AUTOSAMPLER VIALS FOR WATERS SYSTEMS

Vials for Waters 717 Autosampler

	4 mL Screw Neck	Amber Screw Neck	Total Recovery	PP Screw Neck Vial	PP Conical	Glass Shell Vial	Amber Glass Shell Vial
15 × 45 mm							
48-position Carousel	33	34	35	36	37	38	39
Combination Packs							
Vial, Cap, and LectraBond PTFE/Silicone Septum	186000838C	186001133C	186002629C	–	–	–	–
Combination Deactivated	186000838DV	186001133DV	–	–	–	–	–
Vial, Cap, and LectraBond Pre-slit PTFE/Silicone Septum	186000839C	186001134C	186002630C	–	–	–	–
Combination Deactivated	186000839DV	186001134DV	–	–	–	–	–
Vial and PE Snap Cap	–	–	–	–	186004031	WAT025051	WAT025050
Components							
Vials Only	186000840(DV)	186001135(DV)	186002520	186000999[1]	–	–	–
Max Volume Injection/Max Residual Volume	2400 µL/1600 µL	2400 µL/1600 µL	3000 µL/40 µL	2000 µL/1000 µL	2950 µL/50 µL	2400 µL/1600 µL	2400 µL/1600 µL
Cap LectraBond PTFE/Silicone 100/pk	186000841	186000841	186000841	–	–	–	–
Screw Cap with Bonded PTFE/Silicone Septum, 1000/pk	–	–	–	186000965	–	–	–
Cap LectraBond Pre-slit PTFE/Silicone, 100/pk	186000842	186000842	186000842	–	–	–	–
Black Phenol Cap, 144/pk	WAT072711	WAT072711	WAT072711	–	–	–	–
PTFE Septum, 1440/pk	WAT073005	WAT073005	WAT073005	–	–	–	–
PTFE Septum, 144/pk	WAT072714	WAT072714	WAT072714	–	–	–	–
Self Sealing Septum, 144/pk	WAT022861	WAT022861	WAT022861	–	–	–	–
250 µL Glass Insert[2]	WAT072704(DV)	WAT072704(DV)	–	–	–	–	–
Max Volume Injection/Max Residual Volume	244 µL/6 µL	244 µL/6 µL	–	–	–	–	–
250 µL Glass Insert, 144/pk[2]	WAT015199(DV)	WAT015199(DV)	–	–	–	–	–
Max Volume Injection/Max Residual Volume	230 µL/20 µL	230 µL/20 µL	–	–	–	–	–
250 µL Plastic Conical Insert (PMP), 144/pk[2]	WAT072030	WAT072030	–	–	–	–	–
Max Volume Injection/Max Residual Volume	230 µL/20 µL	230 µL/20 µL	–	–	–	–	–
Springs for LVI, 100/pk	WAT072708	WAT072708	–	–	–	–	–
Storage Cap							
Solid Black Cap with Silicone/ PTFE Liner for Sample Storage	186007224	186007224	186007224	–	–	–	–

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.

[1]Item contains 1000 vials.

[2]Inserts require springs, p/n: WAT072708.

Vials for Waters 717 Autosampler

	1 mL Shell	Amber	Total Recovery	PP Conical
8 × 40 mm				
96-position Carousel	40	41	42	43

Components				
Shell Vial and Snap Cap	WAT025054C	WAT025053C	186000837C	WAT022476*
Shell Vial and Snap Cap Deactivated	WAT025054DV	WAT025053DV	186000837DV	—
Pack Size	250	250	100	100
Max Volume Injection/Max Residual Volume	600 µL/400 µL	600 µL/400 µL	700 µL/6 µL	650 µL/50 µL
150 µL Glass Insert (requires spring)	WAT072294(DV)	WAT072294(DV)	—	—
Max Volume Injection/Max Residual Volume	144 µL/6 µL	144 µL/6 µL	—	—
PE Snap Cap, 1000/pk	WAT078515	WAT078515	WAT078515	WAT078515
200 µL PE Vial Insert with Poly Spring, 1000/pk	186001728	186001728	—	—
1 mL Shell Vial Assembled for Dissolution System, 500/pk	WAT022479	—	—	—

All items come in quantities of 100 unless otherwise noted.
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.
*Vials not certified.

Vials for GPC 2000

	4 mL Screw Cap	10 mL Screw Neck
		
Vial Number	75	76

Components	P/N	P/N
Vial	186000840	186001420
Black Screw Cap	WAT072711*	186001421
PTFE Septum	WAT072714*	186001422
Black Solid Cap with Silicone/PTFE Liner for Sample Storage, 4 mL	186007224	—

*Item contains 144 pieces.

PATROL™ UPLC Process Analysis System.

Vials for Aqua Analysis System

Components	P/N
22 mL Vial with Pre-slit Silicone/PTFE Septum, 100/pk	186004108
Solid Cap, PTFE/Silicone Liner, 100/pk	186004109
Mailing Box for 22 mL vials, 100/pk	186004111

Vials for PATROL UPLC Process Analysis System

Components	P/N
15 × 75 mm Clear Glass with PTFE/Silicone Non-slit Septum, 100/pk	186004902C
15 × 75 mm Clear Glass with PTFE/Silicone Slit Septum, 100/pk	186004903C
15 × 75 mm Clear Glass Total Recovery Vial only, 100/pk	186007573

Screw Cap Vials for Waters 2707 Autosampler and 2777 Sample Manager

	Clear	Amber	Max Recovery	Amber Max	300 µL PP	10 mL Screw Neck
12 × 32 mm						
Vial Number	44	45	46	47	48	49
LCMS Certified Combination Packs						
Vial, Cap, and Pre-slit Silicone/PTFE Septum	600000668CV	600000669CV	600000670CV	600000755CV	–	–
LC/GC Certified Combination Packs						
Bonded Pre-slit Silicone/PTFE Septum	186000307C	186000847C	186000327C	186003886C	–	–
Bonded Pre-slit Silicone/PTFE Septum Deactivated	186000307DV	186000847DV	186000327DV	–	–	–
Bonded Silicone/PTFE Septum	186000272C	186000846C	186000326C	186003885C	–	–
Combination Packs						
Bonded Pre-slit Silicone/PTFE Septum	–	–	–	–	186002639	–
Bonded Silicone/PTFE Septum	–	–	–	–	186002640	–
Injectable Volumes ACQUITY UPLC						
Max	1600 µL	1600 µL	1100 µL	1100 µL	240 µL	–
Residual	150 µL	150 µL	10 µL	10 µL	10 µL	500 µL*
Components						
150 µL with Poly Spring	WAT094171	WAT094171	–	–	–	–
Max Volume Injection/Max Residual Volume	144 µL/6 µL	144 µL/6 µL	–	–	–	–
22 × 45 mm Clear Glass Vial	–	–	–	–	–	186001420
Cap with X-Slit PTFE Silicone Septa	–	–	–	–	–	186004632
Storage Cap						
Black Solid 9 mm Cap with Silicone/PTFE Liner for Sample Storage	186007187	186007187	186007187	186007187	186007187	–

All items come in quantities of 100 unless otherwise noted. For more details, see vials descriptions on page 71.
*500 µL residual volume for the 2707 Autosampler; 1500 µL residual volume for the 2777 Sample Manager.

Plates for Waters 2707 Autosampler

	96-well Plates				384-well Plates	
Well Shape						
Plates	186002643	186005837	186002481	186002482	186002632	186002631
Pack Size	100	25	50	50	50	50
Well Volume	350 µL	700 µL	800 µL	2 mL	250 µL	100 µL
Sealing Options						
PTFE/Silicone, 5/pk	186006333	186006333	186006333	186006334	–	–
PTFE/Silicone, Pre-slit, 5/pk	186006332	186006332	186006332	186006335	–	–
Polypropylene Cap Mat, 50/pk	186002483	186002483	186002483	186002484	–	–
Clear Polyester Heat Seal, 100/pk	186002788	186002788	186002788	186002788	186002788	186002788
Aluminum Foil Laminate Heat Seal, 100/pk	186002789	186002789	186002789	186002789	186002789	186002789
Adhesive Seal,* 100/pk	186006336	186006336	186006336	186006336	186006336	186006336
Residual Volume	125 µL	20 µL	40 µL	60 µL	40 µL	40 µL

*Adhesive seal is designed for use with buffer solutions and can tolerate alcohols and acetonitrile content in buffers.

AUTOSAMPLER VIALS FOR COMPATIBLE SYSTEMS

Waters' high-quality vials are compatible with other manufacturers' autosamplers. The following tables serve as a quick selection guide.

Ordering Information

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

	Clear	Amber	Max Recovery	Qsert Vial	PP 300 µL	PP 750 µL	Clear Crimp	Amber Crimp
12 × 32 mm								
Vial Number	**60**	**61**	**62**	**63**	**64**	**65**	**66**	**67**
Compatible Systems								
Agilent Technologies, Beckman, Dynatech, Finnigan, Fisons, Gilson, Hitachi, LDC, Perkin-Elmer, Shimadzu, Spectra-Physics, Varian	•	•	•	•	•	•	•	•
CTC, Spark, Thermal Separations	–	–	–	–	–	–	•	•
Combination Packs								
Vial, Cap, and Silicone/PTFE Septum	–	–	–	186001124(DV)	186002642	186005223	–	–
Vial, Cap, and Pre-slit Silicone/PTFE Septum	–	–	–	186001125(DV)	186002641	186005222	–	–
Vial, Cap, and PTFE Septum	–	–	–	186001127(DV)	–	–	–	–
Vials Only								
Vials Only	WAT094219	WAT094220	186000984	–	186002628	186005224	WAT094222	WAT094223
Deactivated Vials Only	WAT094219DV	WAT094220DV	186000984DV	–	–	–	WAT094222DV	WAT094223DV
Inserts								
300 µL with Poly Spring	WAT094170(DV)	WAT094170(DV)	–	–	–	–	WAT094170(DV)	WAT094170(DV)
150 µL with Poly Spring	WAT094171(DV)	WAT094171(DV)	–	–	–	–	WAT094171(DV)	WAT094171(DV)
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

All items come in quantities of 100 unless otherwise noted.
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.

For the complete selection of 12 × 32 mm vials refer to page 60.

Screw Cap Vials for Compatible Systems

	Clear	Amber	Amber Max Recovery	Clear Glass Max Recovery	Qsert Vial	Amber Qsert	PP 300 µL	PP 750 µL	10 mm Cap	PP 250 µL 8 mm Cap
12 × 32 mm										
Vial Number	50	51	52	53	54	55	56	57	58	59
Compatible Systems										
Agilent Technologies	•	•	•	•	•	•	•	•	—	—
Alcott, Antek, CTC, Spark Thermal Separations	—	—	—	—	—	—	—	—	•	•
Beckman, Dynatech, Finnigan, Fisons, Gilson	•	•	•	•	•	•	•	•	—	—
Hitachi, LDC, Perkin-Elmer, Shimadzu, Spectra-Physics, Thermo, Varian	•	•	•	•	•	•	•	•	•	•
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	—	—	—	—	—	—
LC/GC Certified Combination Packs										
Bonded Silicone/PTFE Septum	186000272C	186000846C	186003885C	186000326C	186001126C	186001130C	—	—	WAT270946C[1]	—
Combination Deactivated[2]	186000272DV	186000846DV	—	186000326DV	186001126DV	186001130DV	—	—	WAT270946DV	—
Bonded Pre-slit Silicone/PTFE Septum	186000307C	186000847C	186003886C	186000327C	186001128C	186001131C	—	—	—	—
Combination Deactivated[2]	186000307DV	186000847DV	—	186000327DV	186001128DV	186001131DV	—	—	—	—
Combination Packs										
Bonded Silicone/PTFE Septum	—	—	—	—	—	—	186002640	186005220	—	—
Bonded Pre-slit Silicone/PTFE Septum	—	—	—	—	—	—	186002639	186005221	—	—
Vials Only										
Vials Only	186000273	186000848	—	186002802	186002804	186002803	186002626	186005219	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	—

All items come in quantities of 100 unless otherwise noted.
[1] Septum not bonded.
[2] Not certified.

Screw Cap Vials for Compatible Systems

	Clear	Amber	Amber Max Recovery	Clear Glass Max Recovery	Qsert Vial	Amber Qsert	PP 300 µL	PP 750 µL	10 mm Cap	PP 250 µL 8 mm Cap
12 × 32 mm										
Vial Number	50	51	52	53	54	55	56	57	58	59
Compatible Systems										
Agilent Technologies	•	•	•	•	•	•	•	•	–	–
Alcott, Antek, CTC, Spark Thermal Separations	–	–	–	–	–	–	–	–	•	•
Beckman, Dynatech, Finnigan, Fisons, Gilson	•	•	•	•	•	•	•	•	–	–
Hitachi, LDC, Perkin-Elmer, Shimadzu, Spectra-Physics, Thermo, Varian	•	•	•	•	•	•	•	•	•	•
Cap and Septum										
PE Septumless Caps	186004169	186004169	186004169	186004169	186004169	186004169	186004169	186004169	–	–
Black Cap	–	–	–	–	–	–	–	–	WAT058875	186004717
Cap and Septum, Silicone/PTFE, Assembled	–	–	–	–	–	–	–	–	–	WAT094174
Septum Only, PTFE/Silicone, Pre-slit	–	–	–	–	–	–	–	–	–	WAT058876
Septum Only, Silicone/PTFE	–	–	–	–	–	–	–	–	WAT058874	WAT210685
Septum Only, PTFE	–	–	–	–	–	–	–	–	–	WAT058886
Screw Cap and Septum–Silicone/PTFE										
Blue LectraBond	186000274	186000274	186000274	186000274	186000274	186000274	186000274	186000274	–	–
Red LectraBond	186002129	186002129	186002129	186002129	186002129	186002129	186002129	186002129	–	–
Green LectraBond	186002130	186002130	186002130	186002130	186002130	186002130	186002130	186002130	–	–
Screw Cap and Pre-slit Septum–Silicone/PTFE										
Blue LectraBond	186000305	186000305	186000305	186000305	186000305	186000305	186000305	186000305	–	–
Red LectraBond	186002128	186002128	186002128	186002128	186002128	186002128	186002128	186002128	–	–
Green LectraBond	186002127	186002127	186002127	186002127	186002127	186002127	186002127	186002127	–	–
Storage Cap										
Black Solid Cap 9 mm with Silicone/PTFE Liner	186007187	186007187	186007187	186007187	186007187	186007187	186007187	186007187	–	–

All items come in quantities of 100 unless otherwise noted.

SelectScience® TRUSTED REVIEWS

APPLICATION AREA: Pharmacokinetics, Drug Metabolism, Proteomics

"The best vials I have used. It not only provides reproducible results, but also it is easy to use. It's the best choice for your sample, especially for the precious samples."

REVIEWER: Zhihong Peng

ORGANIZATION: University of Notre Dame

Vials for Compatible Systems

	4 mL Screw Neck	Amber Screw Neck	Total Recovery	PP Screw Neck Vial	PP Snap Cap	Glass Shell Vial	Amber Glass Shell Vial
15 × 45 mm							
Vial Number	68	69	70	71	72	73	74
Compatible Systems							
Bruker, Kontron, Perkin-Elmer, Shimadzu, Tosoh, Unicam	•	•	•	•	•	•	•
Combination Packs							
Vial, Cap, and LectraBond PTFE/Silicone Septum	186000838C	186001133C	186002629C	–	–	–	–
Combination Deactivated	186000838DV	186001133DV	–	–	–	–	–
Vial, Cap, and LectraBond Pre-slit PTFE/Silicone Septum	186000839C	186001134C	186002630C		–	–	–
Combination Deactivated	186000839DV	186001134DV	–	–	–	–	–
Vial and PE Snap Cap	–	–	–	–	186004031	WAT025051	WAT025050
Components							
Vials Only	186000840	186001135	186002520	186000999[1]	–	–	–
Deactivated Vials Only	186000840DV	186001135DV	–	–	–	–	–
LectraBond Cap and Septum							
Black Cap PTFE/Silicone, 100/pk	186000841	186000841	186000841	–	–	–	–
Screw Cap with Bonded PTFE/Silicone Septum, 1000/pk	–	–	–	186000965	–	–	–
Black Cap Pre-slit PTFE/Silicone, 100/pk	186000842	186000842	186000842	–	–	–	–
Caps, Septa, and Inserts							
Black Phenol Cap, 144/pk	WAT072711	WAT072711	WAT072711	–	–	–	–
PTFE Septum, 1440/pk	WAT073005	WAT073005	WAT073005	–	–	–	–
PTFE Septum, 144/pk	WAT072714	WAT072714	WAT072714	–	–	–	–
Self Sealing Septum, 144/pk	WAT022861	WAT022861	WAT022861	–	–	–	–
250 µL Glass Insert	WAT072704	WAT072704	WAT072704	–	–	–	–
250 µL Glass Insert Deactivated	WAT072704DV	WAT072704DV	WAT072704DV	–	–	–	–
250 µL Glass Insert, 144/pk	WAT015199	WAT015199	WAT015199	–	–	–	–
250 µL Glass Insert, Deactivated, 144/pk	WAT015199DV	WAT015199DV	WAT015199DV	–	–	–	–
250 µL Plastic Conical Insert (PMP), 144/pk	WAT072030	WAT072030	WAT072030	–	–	–	–
Springs for LVI, 100/pk	WAT072708	WAT072708	WAT072708	–	–	–	–
Storage Cap							
Black Solid Cap with Silicone/PTFE Liner for Sample Storage, 100/pk	186007224	186007224	186007224	–	–	–	–

[1]Item contains 1000 vials.

Beware of Poor Quality Look-Alike Vials

- Only Waters Alliance Total Recovery Vials and Maximum Recovery Vials utilize a proprietary manufacturing process, ensuring that the slope of the internal taper will deliver all of the sample to the bottom of the vial
- The bottom thickness is held to a close tolerance, eliminating needle damage caused by bottoming out

Vials Descriptions

Vials for ACQUITY UPLC Systems

Vial Number	Screw Cap 12 × 32 mm Vials for ACQUITY UPLC Systems
1	Clear 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
2	Amber 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
3	Clear Maximum Recovery, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
4	Amber Maximum Recovery, 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
5	Polypropylene 12 × 32, 300 µL, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). Reformulate clean PP vial.
6	Polypropylene 12 × 32, 750 µL, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). Reformulate clean PP vial.
7	Clear 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design, (6 mm opening, 9 mm septumless cap).
8	Total Recovery, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).

Vials for Alliance Systems

Number	Most Commonly Used Vials for Alliance Systems
9	Clear, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
10	Amber, 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
11	Clear Maximum Recovery, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
12	Polypropylene, 12 × 32, 300 µL, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). Reformulate clean PP vial.
13	Clear, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck (7 mm opening, 10 mm cap).
14	Clear Total Recovery, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
15	Amber Maximum Recovery, 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
16	Clear, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm septumless cap).

Number	Screw Cap 12 × 32 mm Vials for Alliance Systems
17	Clear, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
18	Amber, 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
19	Clear Maximum Recovery, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
20	Polypropylene, 12 × 32, 300 µL, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). Reformulate clean PP vial.
21	Polypropylene, 12 × 32, 750 µL, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). Reformulate clean PP vial.
22	Clear, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck (7 mm opening, 10 mm cap).
23	Clear Total Recovery, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
24	Amber Maximum Recovery, 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).

Number	Snap Cap 12 × 32 mm Vials for Alliance Systems
25	Clear, 12 × 32, Type 1, 33-Expansion Glass, Snap Cap (6 mm opening, 9 mm cap).
26	Amber, 12 × 32, Type 1, 51-Expansion Glass, Snap Cap (6 mm opening, 9 mm cap).
27	Clear Maximum Recovery, 12 × 32, Type 1, 33-Expansion Glass, Snap Cap (6 mm opening, 9 mm cap).
28	Polypropylene, 12 × 32, 300 µL, Snap Cap (6 mm opening, 9 mm cap). Reformulate clean PP vial.
29	Polypropylene, 12 × 32, 750 µL, Snap Cap (6 mm opening, 9 mm cap). Reformulate clean PP vial.
30	Clear, 12 × 32, Type 1, 33-Expansion Glass, Crimp Top (6 mm opening, 12 mm cap).
31	Amber, 12 × 32, Type 1, 51-Expansion Glass, Crimp Top (6 mm opening, 12 mm cap).
32	Clear Total Recovery, 12 × 32, Type 1, 33-Expansion Glass, Snap Cap (6 mm opening, 9 mm cap).

Number	15 × 45 mm Vials for Waters 717 Autosampler
33	Clear, 15 × 45, Type 1, 33-Expansion Glass, Screw Neck.
34	Amber, 15 × 45, Type 1, 51-Expansion Glass, Screw Neck.
35	Clear Glass Total Recovery, 15 × 45, Type 1, 33-Expansion Glass Screw Neck.
36	Polypropylene, 15 × 45, 3 mL Round Bottom, Screw Neck.
37	Polypropylene Snap Cap with Conical Bottom, PE Snap Caps.
38	4 mL Glass Shell, Type 1, 51-Expansion Glass with Polyethylene Snap Cap.
39	4 mL Amber Shell, Type 1, 51-Expansion Glass with Polyethylene Snap Cap.

Number	8 × 40 mm Vials for Waters 717 Autosampler
40	1 mL Clear Glass Shell, (8 × 40 mm), Type 1, 51-Expansion Glass with Polyethylene Snap Cap.
41	1 mL Amber Glass Shell, (8 × 40 mm), Type 1, 51-Expansion Glass with Polyethylene Snap Cap.
42	Clear Glass Total Recovery, (8 × 40 mm), Type 1, 51-Expansion Glass with Polyethylene Snap Cap.
43	650 µL Polypropylene (8 × 40 mm), with Polyethylene Snap Cap.

Vials for Compatible Systems

Number	Vials for Waters 2707 Autosampler
44	Clear, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
45	Amber, 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
46	Maximum Recovery, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
47	Amber Maximum Recovery, 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
48	Polypropylene, 12 × 32, 300 µL, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). Reformulate clean PP vial.
49	Clear, 22 × 45 mm, Type I, 33-Expansion Glass with Screw Neck.

Number	Screw Cap 12 × 32 mm Vials for Compatible Systems
50	Clear, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
51	Amber, 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
52	Amber Maximum Recovery, 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
53	Clear Maximum Recovery, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).
54	Qsert Clear Screw Cap Glass, Quick Thread Design with Fused in Glass Insert (6 mm opening, 9 mm cap).
55	Qsert Amber Screw Cap Glass, Quick Thread Design with Fused in Glass Insert (6 mm opening, 9 mm cap).
56	Polypropylene, 12 × 32, 300 µL, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). Reformulate clean PP vial.
57	Polypropylene, 12 × 32, 750 µL, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). Reformulate clean PP vial.
58	Clear, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck (6 mm opening, 10 mm cap).
59	Polypropylene, 12 × 32, 250 µL, Screw Neck (6 mm opening, 8 mm cap).

Number	Snap and Crimp Cap 12 × 32 mm (9 mm Cap) Vials for Compatible Systems
60	Clear, 12 × 32, Type 1, 33-Expansion Glass, Snap Cap (6 mm opening, 9 mm cap).
61	Amber, 12 × 32, Type 1, 51-Expansion Glass, Snap Cap (6 mm opening, 9 mm cap).
62	Maximum Recovery, 12 × 32, Type 1, 33-Expansion Glass, Snap Cap (6 mm opening, 9 mm cap).
63	Qsert Clear Snap Cap Glass with Fused in Glass Insert (6 mm opening, 9 mm cap).
64	Polypropylene, 12 × 32, 300 µL with Snap Cap (6 mm opening, 9 mm cap). Reformulate clean PP vial.
65	Polypropylene, 12 × 32, 750 µL with Snap Cap (6 mm opening, 9 mm cap). Reformulate clean PP vial.
66	Clear, 12 × 32, Type 1, 33-Expansion Glass with Crimp Top (6 mm opening, 12 mm cap).
67	Amber, 12 × 32, Type 1, 51-Expansion Glass with Crimp Top (6 mm opening, 12 mm cap).

Vial Number	15 × 45 mm Vials for Compatible Systems
68	Clear, 15 × 45, Type 1, 33-Expansion Glass with Screw Neck.
69	Amber, 15 × 45, Type 1, 51-Expansion Glass with Screw Neck.
70	Clear Glass Total Recovery, 15 × 45, Type 1, 33-Expansion Glass with Screw Neck.
71	Polypropylene, 15 × 45, 3 mL Screw Neck.
72	Polypropylene Snap Cap with Conical Bottom, PE Snap Caps.
73	4 mL Glass Shell, Type 1, 51-Expansion Glass with Polyethylene Snap Cap.
74	4 mL Amber Shell, Type 1, 51-Expansion Glass with Polyethylene Snap Cap.

Vial Number	15 × 45 mm Vials for Compatible Systems: GPC 2000 Vials
75	4 mL Glass Screw Neck, Type 1, 33-Expansion Glass.
76	10 mL Screw Neck Glass.

Vials Troubleshooting Guide

Problem	Impact	Solution
Septum dislodged during shipment or use	▪ Need to insert septum or rerun analysis ▪ Loss of time	▪ Check to see if needle is piercing in center of septa ▪ Check to see if needle is sharp
Vacuum forms in vial during sample draw	▪ Sample spill over ▪ Sample draw reproducibility problems	▪ Use pre-slit septa, which provides proper venting, eliminating sample spill over and insuring reproducible sample draw volumes*
Sample-limited applications require the use of cumbersome low-volume inserts	▪ Increased labor required for inserting the LVI into the vial leads to delays in sample processing ▪ Increased labor time and difficulty when pipetting into small neck opening of LVI ▪ Additional handling increases chance of contamination ▪ Increased costs from purchasing multiple components: vial, cap, and LVI	▪ Use Waters Total Recovery Vial and Maximum Recovery Vial: ▪ No need to use LVIs ▪ Wide neck opening for easy sample pipetting ▪ One less handling step reduces chance of contamination ▪ Only need one component, saving storage space and costs
Need to perform multiple injections with minimum residual volume in each vial requires LVI to obtain minimum residual volume, but maximum capacity is only 300 µL	▪ Increased labor to fill additional sample vials ▪ Increased cost to purchase additional sample vials and LVIs	▪ Use Waters Total Recovery Vial and Maximum Recovery Vial ▪ The increased capacity and low residual volume allows you to perform multiple injections with minimum residual volume in a single vial
Need to use glass inserts in a 96-well plate format but it requires capping each insert one at a time.	▪ Delay in sample processing	▪ The glass inserts in the Waters 96-well format allows for the use of a sealing cap mat, saving time and labor
Frequent needle damage	▪ Downtime causing missed deadlines ▪ Cost of repairs	▪ All Waters vials have dimensional specifications that eliminate the potential of needle damage
Laboratory owns HPLC instruments from several different manufacturers	▪ Purchasing several different vials ▪ Increased number of purchase orders ▪ Unable to take advantage of quantity discounts, leading to higher costs	▪ The tight dimensional tolerances on all Waters vials and accessories make them ideal for use with virtually all HPLC systems ▪ Reduce the number of purchase orders and take advantage of quantity discounts by buying all your sample vials from Waters
Analyte compounds are sticking to the glass surface of the vial	▪ Loss of sample ▪ Loss of time ▪ Need to run the analysis again	▪ Deactivated glass vials and inserts: Waters uses a gas phase deactivation process that renders the glass surface inert. Unlike other deactivated vials, the surface modification is permanent, resulting in an indefinite shelf life
Inconsistent quality between laboratory sites	▪ N/A	▪ Waters vials are distributed worldwide from the same source

*Adjust sample draw rate to a slower speed (refer to your sample manager's operator guide on how to adjust draw rate).

Certified Containers

Certified Containers are designed to provide every chromatography and mass spectrometry scientist with mobile phase containers free from extraneous peaks and background noise that may result from high total organic carbon (TOC). This added attention to detail results in the cleanest and highest quality mobile phase reservoirs, which can be extremely critical when high sensitivity is required. Each Certified Container is constructed of Type 1, Class A borosilicate glass processed to contain <15 ppb TOC, making them ultra clean for high sensitivity chromatography or mass spectrometry analysis. To maintain this level of cleanliness after manufacture, each Certified Container is individually sealed in a Mylar bag to prevent particulate and phthalate contamination. Each container is supplied with a Certificate of Analysis that documents TOC level.

Ordering Information

Certified Containers

Description	Contents	P/N
Certified Container Kit	Kit contains: (4) 1 L certified containers, (3) 500 mL certified containers, (1) certified container cap kit	186007088
Certified Container, 1000 mL	1 certified container	186007089
Certified Container, 500 mL	1 certified container	186007090
Certified Container Cap Kit	Certified container cap kit contains 7 solid caps and 7 open caps with liners and plugs	205000642
Certified Container Low Volume Kit	Kit contains: (5) 250 mL certified containers, (1) 500 mL certified container, (1) certified container cap kit	186007278

Related Parts to Certified Containers

Description	P/N
Solvent Bottle Caps, 4 L, 4/pk - fits all certified containers	WAT062341
ACQUITY/Alliance Bottle Accessory Kit	205000589
Solvent Bottle Filter, 1/pk	700003615
Solvent Bottle Filter, 7/pk	700003616

SelectScience® TRUSTED REVIEWS

APPLICATION AREA: Analyze Mycotoxins in Animal Feed

"TruView vials provide the quality product needed for our process. Amber glass protects our solution from degradation and the slated glass is critical in avoiding compound plating out on the glass. The slit top caps reduce pressure on the injection needle and we feel it maintains even atmospheric pressure in the vial resulting in consistent needle draws. The vials are easy to manipulate and cap. Waters provides superb support and sales follow up and the price has stayed quite stable for a while now."

REVIEWER: Steven Mobley

ORGANIZATION: Alltech

For additional information, please go to www.waters.com/certifiedcontainers

How to Choose a Column

Contents

How to Choose a Column

Separation scientists continue to search for innovative solutions to improve chromatographic performance. With a wide array of column choices and formats, they have the ability to select the ideal column for their application. The following section introduces Waters' particle technologies and column formats to help you choose the best column to deliver throughput, resolution, and efficiency for your next chromatographic challenge.

Particle Technology

Reproducibility and transferability are the cornerstones of Waters' BEH, CSH,™ HSS, and solid-core particle technologies. Our premier lines of scalable LC columns exhibit all of the chemical and physical characteristics you would expect from modern LC packing materials.

BEH Technology*

- High retentivity for basic compounds
- Exceptional peak shape at elevated pH
- Good universal column choice for a wide variety of compounds
- Stable across a wide pH range
- For separations at high temperatures (80 °C)

CSH Technology

- Good separations for basic compounds under low pH conditions
- Excellent MS performance with formic acid as a mobile phase modifier
- Fast pH switching and column equilibration

HSS Technology

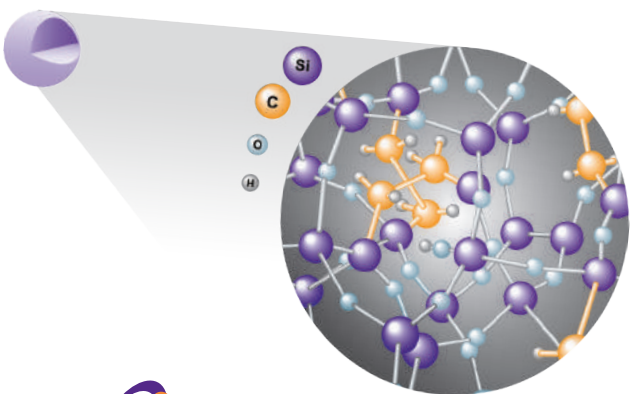
- High retentivity for polar organic compounds and metabolites
- Balanced retention of polar and hydrophobic analytes
- High strength silica for mechanical stability

Solid-Core Technology

- Maximum efficiency
- Increased sensitivity
- Seamless scalability from UPLC to UHPLC to HPLC

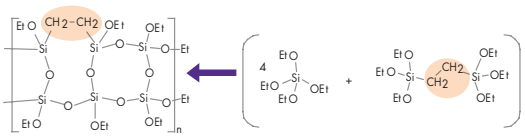
ETHYLENE BRIDGED HYBRID (BEH) PARTICLE TECHNOLOGY

Ethylene Bridged Hybrid (BEH) columns lead the industry for chromatographic versatility, chemical resistance, and mechanical stability. You can use them at extremes of pH and temperature to enhance retention and specificity for complex mixtures of acidic, basic, and neutral analytes. The BEH-particle family includes general-purpose and application-specific bonded phases that serve application areas that rely on ACQUITY UPLC, ACQUITY UPC², ACQUITY APC,™ and XBridge Columns.



BEH Technology™

Particle Synthesis



Polyethoxysilane (BPEOS) | Tetraethoxysilane (TEOS) | Bis(triethoxysilyl)ethane (BTEE)

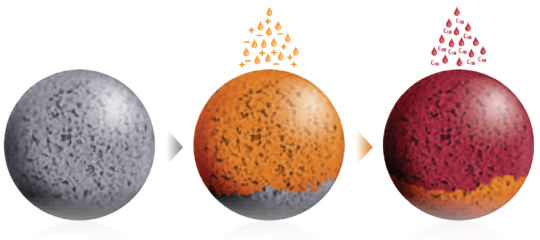
*US Patents 6,686,035; 7,223,473; 7,250,214.

Refer to "Ethylene-Bridged (BEH Technology™) Hybrids and Their Use in Liquid Chromatography" whitepaper (p/n: 720001159EN) for further detail.

CHARGED SURFACE HYBRID (CSH) PARTICLE TECHNOLOGY

Columns packed with charged surface hybrid (CSH) particles manifest the best attributes of BEH particles. CSH stationary phases provide chromatographic selectivity and superior performance in the presence of mobile phases of low ionic strength. The optimized surface charge, pore properties, and bonded phases make charged-surface, hybrid-based columns ideal for rapid method development. ACQUITY UPLC CSH and XSelect™ CSH HPLC Columns offer easy, scalable, analytical solutions from sub-2-µm to preparative particle dimensions.

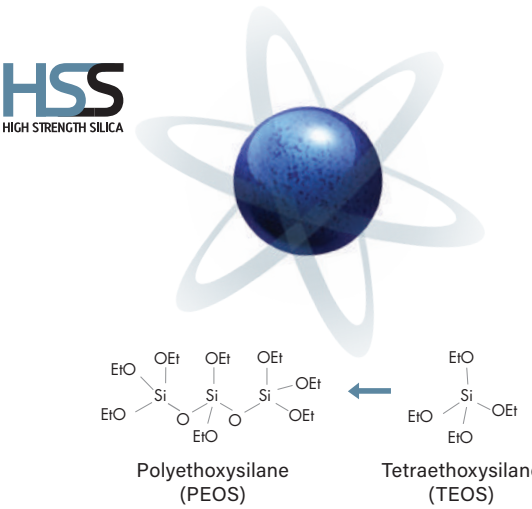
The Charged-Surface Hybrid Particle



Unbonded BEH Particle | Apply Controlled Surface Charge | Bond and End Cap

HIGH STRENGTH SILICA (HSS) PARTICLE TECHNOLOGY

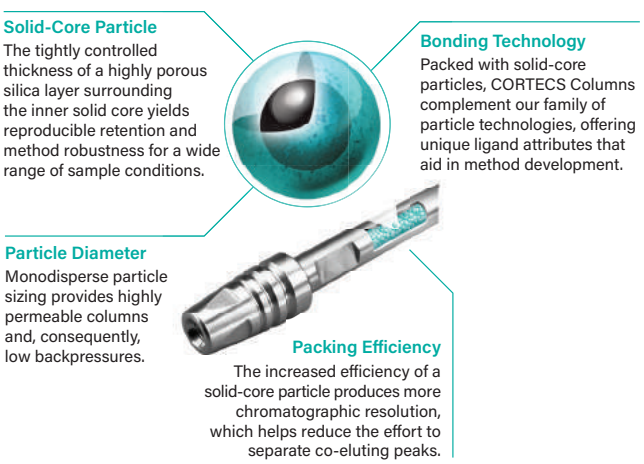
High strength silica (HSS) technology was developed specifically to complement the chromatographic performance of BEH and CSH particles. Compared with the ethylene-bridged BEH and CSH particles, the HSS particle's higher silanophilicity (100% silica) offers chromatographers significant advantages, including increased retention of polar compounds and significantly different selectivity. Additionally, as its name implies, the HSS particle possesses the mechanical strength to operate at pressures as high as 18,000 psi (1240 bar). ACQUITY UPLC HSS and XSelect HSS Columns are the first choice for proven, silica-based, chromatographic performance.



Polyethoxysilane (PEOS) | Tetraethoxysilane (TEOS)

SOLID-CORE PARTICLE TECHNOLOGY

Compared to columns packed with fully porous particles, columns packed with solid-core particles demonstrate higher chromatographic efficiency and lower backpressures. The optimized porous layer that surrounds the solid-silica core gives rise to the key benefits of speed and efficiency. UPLC columns packed with CORTECS™ 1.6 µm particles yield maximum efficiency when used with the ultra-low dispersion ACQUITY UPLC instrument platform. CORTECS Columns packed with 2.7 µm particles offer maximum flexibility, providing increased efficiencies at the backpressure limits of UHPLC and HPLC operation.



Column Selection

Our quality mission is to ensure that the Waters' Columns you use today are the most reproducible and reliable LC columns available. As a primary manufacturer of silica and hybrid particles, scientists can be assured of consistent column performance, batch-to-batch reproducibility, and product availability over the life of the analytical method.

The following table lists all Waters Column Brands that are registered according to classifications prescribed in the United States Pharmacopeia (USP).

USP "L" COLUMN LISTING

L1	Octadecyl silane chemically bonded to porous or non-porous silica or ceramic micro-particles, 1.5 to 10 µm in diameter, or monolithic rod		
Brand	**Particle Size**	**Type**	**Page**
AccQTag Ultra RP C_{18}	1.7 µm	Spherical	315
ACQUITY UPLC BEH130	1.7 µm	Spherical	346
ACQUITY UPLC BEH300	1.7 µm	Spherical	346
ACQUITY UPLC BEH C_{18}	1.7 µm	Spherical	98
ACQUITY UPLC BEH Shield RP18	1.7 µm	Spherical	98
ACQUITY UPLC CSH C_{18}	1.7 µm	Spherical	94
ACQUITY UPLC HSS C_{18}	1.7 µm	Spherical	102
ACQUITY UPLC HSS C_{18} SB	1.7 µm	Spherical	102
ACQUITY UPLC HSS T3	1.7 µm	Spherical	102
ACQUITY UPLC Oligonucleotide C_{18}	1.7 µm	Spherical	335
ACQUITY UPLC Peptide BEH C_{18}	1.7 µm	Spherical	346
Atlantis dC_{18}	3, 5, 10 µm	Spherical	189,266
Atlantis T3	3, 5, 10 µm	Spherical	188,265
CORTECS C_{18}	2.7 µm	Spherical	116
CORTECS C_{18}+	2.7 µm	Spherical	116
CORTECS Shield RP18	2.7 µm	Spherical	118
CORTECS T3	2.7 µm	Spherical	119
CORTECS UPLC C_{18}	1.6 µm	Spherical	105
CORTECS UPLC C_{18}+	1.6 µm	Spherical	104
CORTECS UPLC Shield RP18	1.6 µm	Spherical	106
CORTECS UPLC T3	1.6 µm	Spherical	106
Delta-Pak C_{18}	5 µm	Spherical	214
µBondapak C_{18}	10 µm	Irregular	215
µBondapak C_{18} Radial-Pak	10 µm	Irregular	284

L1	Octadecyl silane chemically bonded to porous or non-porous silica or ceramic micro-particles, 1.5 to 10 µm in diameter, or a monolithic rod		
Brand	**Particle Size**	**Type**	**Page**
Nova-Pak C_{18}	4, 6 µm	Spherical	212
Prep Nova-Pak HR C_{18}	6 µm	Spherical	282
Radial-Pak C_{18}	Spherical	Spherical	288
Resolve C_{18}	5, 10 µm	Spherical	213, 290
Spherisorb ODS1	3, 5, 10 µm	Spherical	208, 278
Spherisorb ODS2	3, 5, 10 µm	Spherical	208, 278
Spherisorb ODS-B	5 µm	Spherical	208
SunFire C_{18}	2.5, 3.5, 5, 10 µm	Spherical	151,192, 260
Symmetry C_{18}	3.5, 5 µm	Spherical	197
SymmetryPrep C_{18}	5, 7 µm	Spherical	274
Symmetry 300 C_{18}	3.5, 5 µm	Spherical	199, 276
SymmetryShield RP18	3.5, 5 µm	Spherical	198, 275
XBridge C_{18}	2.5, 3.5, 5, 10 µm	Spherical	126, 164, 237
XBridge Peptide BEH, 130 Å	3.5, 5, 10 µm	Spherical	347
XBridge Peptide BEH, 300 Å	3.5, 5, 10 µm	Spherical	347
XBridge BEH C_{18}	2.5, 3.5, 5, 10 µm	Spherical	126, 164, 237
XBridge Oligonucleotide C_{18}	2.5 µm	Spherical	335
XBridge Shield RP18	2.5, 3.5, 5, 10 µm	Spherical	128, 166, 239
XSelect CSH C_{18}	2.5, 3.5, 5 µm	Spherical	138, 178, 250
XSelect HSS C_{18}	2.5, 3.5, 5 µm	Spherical	146, 181, 253
XSelect HSS C_{18} SB	2.5, 3.5, 5 µm	Spherical	146, 181, 253
XSelect HSS T3	2.5, 3.5, 5 µm	Spherical	147, 182, 254
XTerra MS C_{18}	2.5, 3.5, 5, 10 µm	Spherical	156, 202, 269
XTerra RP18	3.5, 5, 10 µm	Spherical	204, 271

( ) - Denotes particle sizes available outside of L class.

Source: United States Pharmacopeia.

L2 Octadecyl silane chemically bonded to silica gel of a controlled surface porosity that has been bonded to a solid spherical core, 30 to 50 µm in diameter

Brand	Particle Size	Type	Page
Bondapak Prep C_{18}	15–20 µm	Irregular	283

L3 Porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod

Brand	Particle Size	Type	Page
ACQUITY UPLC BEH HILIC	1.7 µm	Spherical	98
Atlantis HILIC Silica	3, 5 µm	Spherical	190,267
CORTECS HILIC	2.7 µm	Spherical	117
CORTECS UPLC HILIC	1.6 µm	Spherical	92
µPorasil	10 µm	Spherical	216,283
Nova-Pak Silica	4, 6 µm	Spherical	212
Prep Nova-Pak HR Silica	6 µm	Spherical	282
Resolve Silica	5, 10 µm	Spherical	213,290
Spherisorb Silica	3, 5, 10 µm	Spherical	210,281
SunFire Silica	5, 10 µm	Spherical	194,262
XBridge BEH HILIC	2.5, 3.5, 5, 10 µm	Spherical	130,168, 241

L4 Silica gel controlled surface porosity bonded to a solid spherical core, 30 to 50 µm in diameter

Brand	Particle Size	Type	Page
Porasil Prep Silica	15–20 µm	Spherical	283

L7 Octylsilane chemically bonded to totally or superficially porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod

Brand	Particle Size	Type	Page
ACQUITY UPLC BEH C_8	1.7 µm	Spherical	98
CORTECS C_8	2.7 µm	Spherical	121
CORTECS UPLC C_8	1.6 µm	Spherical	104
CORTECS Phenyl	2.7 µm	Spherical	118
CORTECS UPLC Phenyl	1.6 µm	Spherical	92
Nova-Pak C_8	4, 6 µm	Spherical	212, 282
Resolve C_8	10 µm	Spherical	213,290
Spherisorb C_8	3, 5, 10 µm	Spherical	209,279
SunFire C_8 Silica	3.5, 5, 10 µm	Spherical	194,262
Symmetry C_8	3.5, 5, 7 µm	Spherical	198
SymmetryPrep C_8	7 µm	Spherical	275
SymmetryShield RP8	3.5, 5 µm	Spherical	198,276
XBridge BEH C_8	2.5 3.5, 5, 10 µm	Spherical	127,165, 238
XTerra MS C_8	2.5 3.5, 5, 10 µm	Spherical	157,203, 270
XTerra Shield RP8	3.5, 5, 10 µm	Spherical	205,272

( ) - Denotes particle sizes available outside of L class.

Source: United States Pharmacopeia.

L8 An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 1.5 to 10 µm in diameter, or a monolithic silica rod

Brand	Particle Size	Type	Page
High Performance Carbohydrate Analysis	3, 5 µm	–	217
µBondapak NH_2	10 µm	Irregular	215,283
Spherisorb NH_2	3, 5, 10 µm	Spherical	209,280

L9 Irregular or spherical, totally porous silica gel having a chemically bonded, strongly acidic cation-exchange coating, 3 to 10 µm in diameter

Brand	Particle Size	Type	Page
Spherisorb SCX	5, 10 µm	Spherical	211, 281

L10 Nitrile groups chemically boned to porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod

Brand	Particle Size	Type	Page
ACQUITY UPLC HSS CN	1.7 µm	Spherical	103
µBondapak CN	10 µm	Irregular	215,283
NovaPak CN HP	4 µm	Spherical	212
Resolve CN	10 µm	Spherical	290
Spherisorb CN	3, 5, 10 µm	Spherical	210,281
Spherisorb CN RP	3, 5, 10 µm	Spherical	210,281
XSelect HSS CN	2.5, 3.5, 5 µm	Spherical	148,183, 255

L11 Phenyl groups chemically bonded to porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod

Brand	Particle Size	Type	Page
ACQUITY UPLC BEH Phenyl	1.7 µm	Spherical	99
ACQUITY UPLC CSH Phenyl-Hexyl	1.7 µm	Spherical	94
CORTECS Phenyl	2.7 µm	Spherical	118
CORTECS UPLC Phenyl	1.6 µm	Spherical	92
µBondapak Phenyl	10 µm	Irregular	215,283
NovaPak Phenyl	4 µm	Spherical	212
Spherisorb Phenyl	3, 5, 10 µm	Spherical	210,280
XBridge BEH Phenyl	2.5, 3.5, 5 µm	Spherical	129,167, 240
XSelect CSH Phenyl-Hexyl	2.5, 3.5, 5 µm	Spherical	140,180, 252
XTerra Phenyl	3.5, 5 µm	Spherical	206

L12 A strong anion-exchange packing made by chemically bonding a quaternary amine to a solid silica spherical core, 30 to 50 µm in diameter

Brand	Particle Size	Type	Page
AccellPlus QMA	40 µm	Irregular	398

L13 Trimethylsilane chemically bonded to porous silica particles, 3 to 10 µm in diameter

Brand	Particle Size	Type	Page
Spherisorb C_1	3, 5, 10 µm	Spherical	209,279

L14 Silica gel having a chemically bonded strongly basic quaternary ammonium anion-exchange coating, 5 to 10 µm in diameter

Brand	Particle Size	Type	Page
Spherisorb SAX	5, 10 µm	Spherical	211, 281

L15 Hexylsilane chemically bonded to totally porous silica particles, 3 to 10 µm in diameter

Brand	Particle Size	Type	Page
Spherisorb C_6	3, 5, 10 µm	Spherical	209, 279

L17 Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 6 to 12 µm in diameter

Brand	Particle Size	Type	Page
Fast Fruit Juice	N/A	N/A	219
IC-Pak Cation	10 µm	Irregular	219
IC-Pak Ion Exclusion	7 µm	Spherical	219
Shodex RSpak DC-613	6 µm	Spherical	219

L19 Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the calcium form, 5 to 15 µm in diameter

Brand	Particle Size	Type	Page
Shodex Sugar SC-1011	7 µm	Spherical	218
Sugar-Pak 1	9 µm	Spherical	218

L20 Dihydroxypropane groups chemically bonded to porous silica or hybrid particles, 1.5 to 10 µm in diameter, or a monolithic silica rod

Brand	Particle Size	Type	Page
ACQUITY BEH200SEC	1.7 µm	Spherical	377
BioSuite 125, 250, 450 series	4, 5, 8, 10, (13), (17) µm	Spherical	382
Insulin HMWP	–	N/A	374
Protein-Pak 60	10 µm	Spherical	382
Protein-Pak 125	10 µm	Spherical	382
Protein-Pak 200SW and 300SW	10 µm	Spherical	382
XBridge Protein BEH SEC, 125 Å	3.5 µm	Spherical	379
XBridge Protein BEH SEC, 200 Å	3.5 µm	Spherical	379
XBridge Protein BEH SEC, 450 Å	3.5 µm	Spherical	379

L21 A rigid, spherical styrene-divinylbenzene copolymer, 3 to 30 µm in diameter

Brand	Particle Size	Type	Page
Shodex RSpak RP18-613	6 µm	Spherical	216
Styragel HR 0.5, 1, 2, 3 and 4	–	Spherical	406
Styragel HR 4E	–	Spherical	406
Styragel HR 5E	–	Spherical	406

( ) - Denotes particle sizes available outside of L class.

Source: United States Pharmacopeia.

L22 A cation-exchange resin made of porous polystyrene gel with sulfonic acid groups, 5 to 15 µm in diameter

Brand	Particle Size	Type	Page
IC-Pak Ion Exclusion	7 µm	Spherical	221
Shodex RSpak DC-613	6 µm	Spherical	216
Shodex Sugar SP0810	8 µm	Spherical	218

L23 An anion-exchange resin made of porous polymethacrylate or polyacrylate gel with quaternary ammonium groups, 7 to 12 µm in size

Brand	Particle Size	Type	Page
BioSuite DEAE	(2.5), 10, 13 µm	Spherical	393
BioSuite Q AXC	10, 13 µm	Spherical	393
BioSuite Q-PEEK	10 µm	Spherical	393
IC-Pak Anion	10 µm	Spherical	221
IC-Pak A HC	10 µm	Spherical	221
Protein-Pak Q 8HR	8 µm	Spherical	389

L25 Packing having the capacity to separate compounds with a molecular weight range from 100-5000 (as determined by polyethylene oxide), applied to neutral, anionic, and cationic water-soluble polymers. A polymethacrylate resin base, cross-linked with polyhydroxylated ether (surface contained some residual carboxyl functional groups) was found suitable

Brand	Particle Size	Type	Page
Ultrahydrogel DP, +120	10 µm	Spherical	414

L26 Butyl silane chemically bonded to totally porous or superficially porous silica particles, 1.5 to 10 µm in diameter

Brand	Particle Size	Type	Page
ACQUITY UPLC BEH300 C_4	1.7 µm	Spherical	346
Delta-Pak C_4	5 µm	Spherical	214
Symmetry300 C_4	3.5, 5 µm	Spherical	200, 277
XBridge BEH300 C_4	3.5, 5, 10 µm	Spherical	367

L27 Porous silica particles, 30 to 50 µm in diameter

Brand	Particle Size	Type	Page
Porasil	37–55 µm	Spherical	216, 283

L33 Packing having the capacity to separate dextrans by molecular size over a range of 4000 to 500,000 Da. It is spherical, silica-based, and processed to provide pH stability

Brand	Particle Size	Type	Page
ACQUITY UPLC Protein BEH SEC, 125 Å	1.7 µm	Spherical	377

L34 Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the lead form, 7 to 9 µm in diameter

Brand	Particle Size	Type	Page
Shodex Sugar SP-0810	N/A	Spherical	218

L37 Packing having the capacity to separate proteins by molecular size over a range of 2000 to 40,000 Da. It is a polymethacrylate gel

Brand	Particle Size	Type	Page
Ultrahydrogel 250	N/A	Spherical	414

L38 A methacrylate-based size-exclusion packing for water-soluble samples

Brand	Particle Size	Type	Page
Ultrahydrogel series	N/A	Spherical	414

L39 A hydrophilic polyhydroxymethacrylate gel of totally porous spherical resin

Brand	Particle Size	Type	Page
Ultrahydrogel series	N/A	Spherical	414

L43 Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 1.5 to 10 µm in diameter

Brand	Particle Size	Type	Page
ACQUITY UPLC CSH Fluoro-Phenyl	1.7 µm	Spherical	94
ACQUITY UPLC HSS PFP	1.8 µm	Spherical	103
XSelect CSH Fluoro-Phenyl	2.5, 3.5, 5 µm	Spherical	139,179, 251
XSelect HSS PFP	2.5, 3.5, 5 µm	Spherical	147,182, 254

L52 A strong cation exchange resin made of porous silica with sulfopropyl or sulfoethyl groups, 1 to 10 µm in diameter

Brand	Particle Size	Type	Page
IC-Pak Cation	10 µm	Irregular	221

L55 A strong cation exchange resin made of porous silica coated with polybutadiene-maleic acid copolymer, about 5 µm in diameter

Brand	Particle Size	Type	Page
IC-Pak C M/D	N/A	N/A	221

L59 Packing for the size-exclusion separations of proteins (separation by molecular weight) over the range of 5 to 7000 kDa. The packing is spherical 1.5 to 10 µm, silica or hybrid packing with a hydrophilic coating

Brand	Particle Size	Type	Page
ACQUITY BEH200 SEC	1.7 µm	Spherical	377
BioSuite 125, 250, 450 series	4–17 µm	Spherical	382
Protein-Pak 60	10 µm	Spherical	382
Protein-Pak 300SW	10 µm	Spherical	382

L68 Spherical, porous silica, 10 µm or less in diameter, the surface of which has been covalently modified with alkyl amide groups and not endcapped

Brand	Particle Size	Type	Page
ACQUITY UPLC Glycan BEH Amide	1.7 µm	Spherical	330
ACQUITY UPLC BEH Amide	1.7 µm	Spherical	98
XBridge BEH Amide Glycan	2.5, 3.5 µm	Spherical	331
XBridge BEH Amide	2.5, 3.5 µm	Spherical	131,169, 242

APPLICATION AREA: Urine Drug Testing by LC-MS/MS

"We depend on the consistency of these columns for our analysis because of the minimal lot-to-lot variation. Retention times and column life are always consistent. Any small problem with an LC column has high impact on our lab which processes thousands of samples per day. Technical and customer support are above reproach, which gives us another level of confidence in Waters. The XBridge ***XP*** LC columns are first selected for method development by our Research and Development team because of their relatively high recovery, resolution and peak shape for most analytes."

REVIEWER: Francine Leone

ORGANIZATION: Dominion Diagnostics

( ) - Denotes particle sizes available outside of L class.

Source: United States Pharmacopeia.

Column Configurations for Any LC System

COLUMN NOMENCLATURE

Our fully scalable particle technologies ensure that our LC columns perform with a broad range of chromatographic instrumentation. Depending on the goals of a separation, the instrument platform used, or the sample type, you can choose the most suitable column that is matched to your system's configuration without adversely affecting the chromatographic result.

The following table serves as a guide for selecting an appropriate LC column according to instrument classification.

Nano/Micro	UPLC	UHPLC	HPLC	Preparative
ACQUITY UPLC M-CLASS BEH (1.7 µm)	ACQUITY UPLC BEH (1.7 µm)	XBridge BEH ***XP*** (2.5 µm)	XBridge BEH (3.5, 5 µm)	XBridge BEH OBD™ (5, 10 µm)
ACQUITY UPLC M-CLASS CSH (1.7 µm)	ACQUITY UPLC CSH (1.7 µm)	XSelect CSH ***XP*** (2.5 µm)	XSelect CSH ***XP*** (3.5, 5 µm)	XSelect CSH OBD (5, 10 µm)
ACQUITY UPLC M-CLASS HSS (1.8 µm)	ACQUITY UPLC HSS (1.8 µm)	XSelect HSS ***XP*** (2.5 µm)	XSelect HSS ***XP*** (3.5, 5 µm)	XSelect HSS OBD (5 µm)
—	CORTECS UPLC (1.6 µm)	CORTECS (2.7 µm)	—	—

COLUMN CONFIGURATION

System dispersion is inherent in every chromatographic system. It is the instrument's contribution to chromatographic band broadening and is dependent on the system's tubing volume, valve fittings, column fittings, and flow cell volume. System dispersion, in combination with column dispersion, makes up the total dispersion of a given separation. Therefore, it is important to understand the system's impact on chromatographic band broadening when choosing your column configuration. Systems that have high dispersion values will obtain the best column performance using columns that have larger volumes; and, systems that have low dispersion values are able to obtain excellent column performance using columns that have smaller volumes.

The following table summarizes the characteristics of Waters LC Systems and matches the column configuration that maintains chromatographic efficiency.





System	Nano/Micro	UPLC	UHPLC	HPLC	Preparative
Dispersion	1 µL	<20 µL	22–29 µL	>40 µL	—
Routine Pressure	<15,000 psi	<18,000 psi	<10,000 psi	<4000 psi	<4000 psi
Particle Size	<2 µm	<2 µm	2–3 µm	3–5 µm	>5 µm
Column I.D.	75–300 µm	2.1 mm (1.0 mm)	3.0 mm (2.1 mm)	4.6 mm (3.0 mm)	>7.8 mm
Column Length	50–250 mm	<150 mm	50–150 mm	75–300 mm	50–300 mm

When you transfer LC methods, instrument dispersion is one of the most practical LC-instrument parameters to determine. Knowing the bandspread value helps you develop your own compatible methods, allowing you to seamlessly scale column dimensions or transfer methods between different instrumentation platforms and laboratory functions. The following table recommends column configurations based on nominal instrument bandspread values.

System	Bandspread*	Recommended Column Particle Sizes and I.D.s
Shimadzu Prominence UFLC	41 µL	CORTECS 2.7 µm XBridge 3.5, 5 µm XSelect 3.5, 5 µm **3.0–4.6 mm I.D.**
Alliance 2695 HPLC	29 µL	
Agilent 1260 UHPLC (600 bar)	28 µL	
ACQUITY Arc	23 µL	XBridge 2.5, 3.5, 5 µm XSelect 2.5, 3.5, 5 µm CORTECS 2.7 µm **3.0 mm I.D.**
Thermo Accela UHPLC	21 µL	XBridge 2.5, 3.5, 5 µm XSelect 2.5, 3.5, 5 µm CORTECS 2.7 µm **3.0 mm I.D.**
Agilent 1290 UHPLC (1200 bar)	17 µL	

System	Bandspread*	Recommended Column Particle Sizes and I.D.s
ACQUITY UPLC	12 µL	ACQUITY UPLC BEH 1.7 µm ACQUITY UPLC CSH 1.7 µm ACQUITY UPLC HSS 1.8 µm CORTECS UPLC 1.6 µm **2.1 mm I.D.**
ACQUITY UPLC H-Class with Column Manager	12 µL	
ACQUITY UPLC H-Class	9 µL	
ACQUITY UPLC I-Class (FTN)	7.5 µL	ACQUITY UPLC BEH 1.7 µm ACQUITY UPLC CSH 1.7 µm ACQUITY UPLC HSS 1.8 µm CORTECS UPLC 1.6 µm **1.0–2.1 mm I.D.**
ACQUITY UPLC I-Class (FL)	5.5 µL	

*These data are based on nominal values for unmodified systems. As such, they are intended for reference only. Any adjustment to a system's plumbing, connectivity, and configuration will change the instrument's bandspread, affecting the quality of chromatography.

L/d_p COMPARISON CHART FOR LC COLUMNS

To convert an HPLC method to a UPLC or UHPLC method with no loss in resolution, select columns that have equivalent length-to-particle-size (L/d_p) ratio.

Waters uses this ratio to compare the resolving power of columns. If you keep the L/d_p ratio the same for two columns, you will obtain the same resolution. Therefore, for two columns with the same L/d_p ratio, the more efficient, shorter column (packed with smaller particles) will provide the same resolution in less time.

EXAMPLE: $\frac{150\text{ mm}}{5\text{ µm}} = \frac{150{,}000\text{ µm}}{5\text{ µm}} = 30{,}000$

L/d_p			Column length (mm)						
			20	30	50	75	100	150	250
Particle size (µm)	Fully porous	1.7	–	17,600	29,400	44,100	58,000	88,200	–
		2.5	8,000	12,000	20,000	30,000	40,000	60,000	–
		3.5	5,700	8,600	14,300	21,400	28,600	42,900	71,400
		5.0	4,000	6,000	10,000	15,000	20,000	30,000	50,000

Sub-2-µm UPLC Columns

Contents

Sub-2-µm UPLC Columns

UltraPerformance Liquid Chromatography

UltraPerformance Liquid Chromatography (UPLC) combines innovations in both instrumentation and column technology, providing maximum separation efficiency.

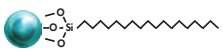
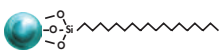
Column efficiency can be increased in two ways: by reducing the size of stationary-phase particles and by utilizing solid-core particle technology. The result is significant improvements in the resolution, speed, and sensitivity of separations. Efficiency gains are maximized when UPLC Columns are used in conjunction with low-dispersive ACQUITY UPLC Systems. A momentous advance in LC technology, the ACQUITY UPLC System maximizes column efficiency by maintaining ultra-low system dispersion. Narrow-bore columns packed with small particles, 1.6–1.8 µm particle sizes, can achieve maximum performance while operating at pressures as high as 1240 bar (12,400 pK_a; 18,000 psi).

Our sub-2-µm UPLC Columns continues to evolve. Among its offerings are solid-core and fully porous particle substrates (CORTECS, BEH 125 Å, 130 Å, 200 Å, 300 Å, and 450 Å; HSS; and CSH) consisting of 28 chemistries, scalable between HPLC, UHPLC, and UPLC particle sizes. Additionally, we offer nine application-directed UPLC chemistries for SEC, amino acid analysis, proteins, peptides, oligonucleotides, and glycan analysis. Our vast range of selectivity choices, for both small-molecule and biopharmaceutical applications, ensures that there is a UPLC Column for your specific application.

CORTECS UPLC Columns

CORTECS UPLC 1.6 µm Solid-Core Particle Columns are the performance standard. The sub-2-µm, solid-core particle technology provides the highest column efficiencies when used with low-dispersive UPLC instrumentation. There are seven unique CORTECS chemistries to choose from, available in either reversed-phase or HILIC, that provide flexibility to rapidly separate a wide array of compounds. CORTECS UPLC 1.6 µm Solid-Core Columns produce sharper, narrower peaks when compared with fully porous particles of similar size. They are the best column choice for increased resolution, speed, and sensitivity.

Column Characteristics

	C_{18}+, 90 Å	C_{18}, 90 Å	Shield RP18, 90 Å
	UPLC: 1.6 µm	**UPLC: 1.6 µm**	**UPLC: 1.6 µm**
Particle/Ligand			
Ligand Density*	2.4 µmol/m²	2.7 µmol/m²	3.2 µmol/m²
Carbon Load*	5.7%	6.6%	6.4%
Endcapped	Yes	Yes	Yes
USP Class No.	L1	L1	L1
pH Range	2–8	2–8	2–8
Temperature Limits	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C
Surface Area*	100 m²/g	100 m²/g	100 m²/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

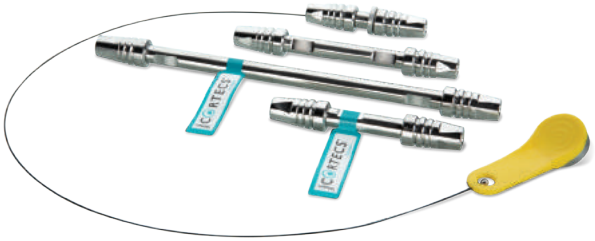
*Expected or approximate value.

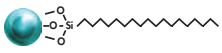
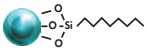
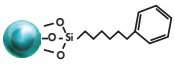
DID YOU KNOW...

We offer CORTECS Columns packed with 2.7 µm particles to use with HPLC and UHPLC systems.

For more information, see page 114.

CORTECS™ COLUMNS



T3, 120 Å	C_8, 90 Å	Phenyl, 90 Å	HILIC, 90 Å
UPLC: 1.6 µm	UPLC: 1.6 µm	UPLC: 1.6 µm	UPLC: 1.6 µm
			
1.6 µmol/m²	3.4 µmol/m²	3.2 µmol/m²	N/A
4.7%	4.5%	5.9%	Unbonded
Yes	Yes	Yes	N/A
L1	L7	L11	L3
2–8	2–8	2–8	1–5
Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C
100 m²/g	100 m²/g	100 m²/g	100 m²/g
Neutrals QC Reference Material p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**HILIC QC Reference Material** p/n: 186007226
Reversed-Phase QC Reference Material p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	–

SelectScience TRUSTED REVIEWS

APPLICATION AREA: Compounds Related to Oak Maturation of Spirits

"The CORTECS range are now the go to columns for UPLC application in our lab. Improved resolution and sensitivity over anything we have seen so far. Robust as well making for value for money."

REVIEWER: Peter Cockburn

ORGANIZATION: The Scotch Whisky Research Institute

Ordering Information

CORTECS UPLC Columns

	Particle Size: 1.6 µm			Particle Size: 2.7 µm		
	Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	P/N (3/pk)
C_{18}+	2.1 × 30 mm	186007113	176003166	2.1 × 30 mm	186007394	176003289
	2.1 × 50 mm	186007114	176003167	2.1 × 50 mm	186007395	176003290
	2.1 × 75 mm	186007115	176003168	2.1 × 75 mm	186007396	176003291
	2.1 × 100 mm	186007116	176003169	2.1 × 100 mm	186007397	176003292
	2.1 × 150 mm	186007117	176003170	2.1 × 150 mm	186007398	176003293
	3.0 × 30 mm	186007118	176003171	3.0 × 30 mm	186007399	176003294
	3.0 × 50 mm	186007119	176003172	3.0 × 50 mm	186007400	176003295
	3.0 × 75 mm	186007120	176003173	3.0 × 75 mm	186007401	176003296
	3.0 × 100 mm	186007121	176003174	3.0 × 100 mm	186007402	176003297
	3.0 × 150 mm	186007122	176003175	3.0 × 150 mm	186007403	176003298
				4.6 × 30 mm	186007404	176003322
				4.6 × 50 mm	186007405	176003323
				4.6 × 75 mm	186007406	176003324
				4.6 × 100 mm	186007407	176003325
				4.6 × 150 mm	186007408	176003326
C_{18}	2.1 × 30 mm	186007092	176003146	2.1 × 30 mm	186007364	176003269
	2.1 × 50 mm	186007093	176003147	2.1 × 50 mm	186007365	176003270
	2.1 × 75 mm	186007094	176003148	2.1 × 75 mm	186007366	176003271
	2.1 × 100 mm	186007095	176003149	2.1 × 100 mm	186007367	176003272
	2.1 × 150 mm	186007096	176003150	2.1 × 150 mm	186007368	176003273
	3.0 × 30 mm	186007097	176003151	3.0 × 30 mm	186007369	176003274
	3.0 × 50 mm	186007098	176003152	3.0 × 50 mm	186007370	176003275
	3.0 × 75 mm	186007099	176003153	3.0 × 75 mm	186007371	176003276
	3.0 × 100 mm	186007100	176003154	3.0 × 100 mm	186007372	176003277
	3.0 × 150 mm	186007102	176003155	3.0 × 150 mm	186007373	176003278
				4.6 × 30 mm	186007374	176003312
				4.6 × 50 mm	186007375	176003313
				4.6 × 75 mm	186007376	176003314
				4.6 × 100 mm	186007377	176003315
				4.6 × 150 mm	186007378	176003316

SeparationSolutions TRUSTED REVIEWS

APPLICATION AREA: Analysis of Glycosphingolipids

"This (CORTECS) column provides excellent and reproducible LC-MS chromatogram for my glycosphingolipids analysis. In addition, I am getting very narrow peaks which increases my peak capacity. This could be due to the very small particles (1.6 µm) and core-shell type silica particles it has."

REVIEWER: Rodell Barrientos

ORGANIZATION: The University of North Carolina Greensboro

CORTECS UPLC Columns *Continued*

	Particle Size: 1.6 µm			Particle Size: 2.7 µm		
	Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	P/N (3/pk)
Shield RP18	2.1 × 30 mm	186008691	176003927	2.1 × 30 mm	186008661	176003912
	2.1 × 50 mm	186008692	176003928	2.1 × 50 mm	186008662	176003913
	2.1 × 75 mm	186008693	176003929	2.1 × 75 mm	186008663	176003914
	2.1 × 100 mm	186008694	176003930	2.1 × 100 mm	186008664	176003915
	2.1 × 150 mm	186008695	176003931	2.1 × 150 mm	186008665	176003916
	3.0 × 30 mm	186008701	176003932	3.0 × 30 mm	186008671	176003917
	3.0 × 50 mm	186008702	176003933	3.0 × 50 mm	186008672	176003918
	3.0 × 75 mm	186008703	176003934	3.0 × 75 mm	186008673	176003919
	3.0 × 100 mm	186008704	176003935	3.0 × 100 mm	186008674	176003920
	3.0 × 150 mm	186008705	176003936	3.0 × 150 mm	186008675	176003921
				4.6 × 30 mm	186008681	176003922
				4.6 × 50 mm	186008682	176003923
				4.6 × 75 mm	186008683	176003924
				4.6 × 100 mm	186008684	176003925
				4.6 × 150 mm	186008685	176003926
T3	2.1 × 30 mm	186008496	176003891	2.1 × 30 mm	186008481	176003876
	2.1 × 50 mm	186008497	176003892	2.1 × 50 mm	186008482	176003877
	2.1 × 75 mm	186008498	176003893	2.1 × 75 mm	186008483	176003878
	2.1 × 100 mm	186008499	176003894	2.1 × 100 mm	186008484	176003879
	2.1 × 150 mm	186008500	176003895	2.1 × 150 mm	186008485	176003880
	3.0 × 30 mm	186008501	176003896	3.0 × 30 mm	186008486	176003881
	3.0 × 50 mm	186008502	176003897	3.0 × 50 mm	186008487	176003882
	3.0 × 75 mm	186008503	176003898	3.0 × 75 mm	186008488	176003883
	3.0 × 100 mm	186008504	176003899	3.0 × 100 mm	186008489	176003884
	3.0 × 150 mm	186008505	176003900	3.0 × 150 mm	186008490	176003885
				4.6 × 30 mm	186008491	176003886
				4.6 × 50 mm	186008492	176003887
				4.6 × 75 mm	186008493	176003888
				4.6 × 100 mm	186008494	176003889
				4.6 × 150 mm	186008495	176003890
C_8	2.1 × 30 mm	186008398	176003829	2.1 × 30 mm	186008348	176003804
	2.1 × 50 mm	186008399	176003830	2.1 × 50 mm	186008349	176003805
	2.1 × 75 mm	186008400	176003831	2.1 × 75 mm	186008350	176003806
	2.1 × 100 mm	186008401	176003832	2.1 × 100 mm	186008351	176003807
	2.1 × 150 mm	186008402	176003833	2.1 × 150 mm	186008352	176003808
	3.0 × 30 mm	186008408	176003834	3.0 × 30 mm	186008358	176003809
	3.0 × 50 mm	186008409	176003835	3.0 × 50 mm	186008359	176003810
	3.0 × 75 mm	186008410	176003836	3.0 × 75 mm	186008360	176003811
	3.0 × 100 mm	186008411	176003837	3.0 × 100 mm	186008361	176003812
	3.0 × 150 mm	186008412	176003838	3.0 × 150 mm	186008362	176003813
				4.6 × 30 mm	186008368	176003814
				4.6 × 50 mm	186008369	176003815
				4.6 × 75 mm	186008370	176003816
				4.6 × 100 mm	186008371	176003817
				4.6 × 150 mm	186008372	176003818

CORTECS UPLC Columns *Continued*

	Particle Size: 1.6 µm			Particle Size: 2.7 µm		
	Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	P/N (3/pk)
Phenyl	2.1 × 30 mm	186008378	176003819	2.1 × 30 mm	186008318	176003789
	2.1 × 50 mm	186008379	176003820	2.1 × 50 mm	186008319	176003790
	2.1 × 75 mm	186008380	176003821	2.1 × 75 mm	186008320	176003791
	2.1 × 100 mm	186008381	176003822	2.1 × 100 mm	186008321	176003792
	2.1 × 150 mm	186008382	176003823	2.1 × 150 mm	186008322	176003793
	3.0 × 30 mm	186008388	176003824	3.0 × 30 mm	186008328	176003794
	3.0 × 50 mm	186008389	176003825	3.0 × 50 mm	186008329	176003795
	3.0 × 75 mm	186008390	176003826	3.0 × 75 mm	186008330	176003796
	3.0 × 100 mm	186008391	176003827	3.0 × 100 mm	186008331	176003797
	3.0 × 150 mm	186008392	176003828	3.0 × 150 mm	186008332	176003798
				4.6 × 30 mm	186008338	176003799
				4.6 × 50 mm	186008339	176003800
				4.6 × 75 mm	186008340	176003801
				4.6 × 100 mm	186008341	176003802
				4.6 × 150 mm	186008342	176003803
HILIC	2.1 × 30 mm	186007103	176003156	2.1 × 30 mm	186007379	176003279
	2.1 × 50 mm	186007104	176003157	2.1 × 50 mm	186007380	176003280
	2.1 × 75 mm	186007105	176003158	2.1 × 75 mm	186007381	176003281
	2.1 × 100 mm	186007106	176003159	2.1 × 100 mm	186007382	176003282
	2.1 × 150 mm	186007107	176003160	2.1 × 150 mm	186007383	176003283
	3.0 × 30 mm	186007108	176003161	3.0 × 30 mm	186007384	176003284
	3.0 × 50 mm	186007109	176003162	3.0 × 50 mm	186007385	176003285
	3.0 × 75 mm	186007110	176003163	3.0 × 75 mm	186007386	176003286
	3.0 × 100 mm	186007111	176003164	3.0 × 100 mm	186007387	176003287
	3.0 × 150 mm	186007112	176003165	3.0 × 150 mm	186007388	176003288
				4.6 × 30 mm	186007389	176003317
				4.6 × 50 mm	186007390	176003318
				4.6 × 75 mm	186007391	176003319
				4.6 × 100 mm	186007392	176003320
				4.6 × 150 mm	186007393	176003321

CORTECS UPLC VanGuard Pre-columns (Guard Columns)

	Particle Size: 1.6 µm			Particle Size: 1.6 µm	
	Dimension	P/N (3/pk)		Dimension	P/N (3/pk)
C_{18}+	2.1 × 5 mm	186007125	**C_8**	2.1 × 5 mm	186008423
C_{18}	2.1 × 5 mm	186007123	**Phenyl**	2.1 × 5 mm	186008420
Shield RP18	2.1 × 5 mm	186008713	**HILIC**	2.1 × 5 mm	186007124
T3	2.1 × 5 mm	186008508			

Quality Control Reference Materials

Description	P/N
Neutrals QC Reference Material	186006360
Reversed-Phase QC Reference Material	186006363
HILIC QC Reference Material	186007226

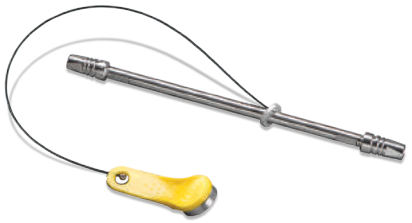
ACQUITY UPLC Columns In-line Filter Unit

Description	P/N
In-line filter holder and six, 0.2 µm stainless steel replacement filters	205000343
0.2 µm stainless steel replacement filters (×5), with end nuts - for use with p/n: 205000343	700002775

ACQUITY UPLC Columns

ACQUITY UPLC Columns are designed to work seamlessly with ACQUITY UPLC Systems. The sub-2-µm, fully porous particles technologies (BEH, CSH, and HSS) provide high efficiencies along with the widest sub-2-µm selectivity space. Rugged, base-particle technologies provide best-in-class column stability and ultimate flexibility for high-throughput method development.

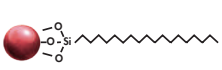
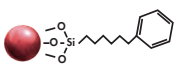
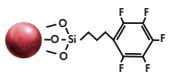
CSH™ Technology



ACQUITY UPLC CHARGED SURFACE HYBRID (CSH) COLUMNS

Reversed-phase bonded phases typically have poor peak shape for basic compounds when using formic acid, even at analytical mass loads; but, ACQUITY UPLC CSH Columns are the exception. When used with formic acid or other low-ionic-strength, acidic mobile phases, these rugged columns provide superior peak shape for basic analytes. The controlled, low-level, positive surface charge bonded to the ethylene-bridged hybrid (BEH) particles provides excellent peak shape for bases—without the need for the use of ion-pairing reagents.

Column Characteristics

	CSH C_{18}, 130 Å	CSH Phenyl-Hexyl, 130 Å	CSH Fluoro-Phenyl, 130 Å
	UPLC: 1.7 µm	**UPLC: 1.7 µm**	**UPLC: 1.7 µm**
Particle/Ligand			
Ligand Density*	2.3 µmol/m²	2.3 µmol/m²	2.3 µmol/m²
Carbon Load*	15%	14%	10%
Endcapped	Yes	Yes	No
USP Class No.	L1	L11	L43
pH Range	1–11	1–11	1–8
Temperature Limits	Low pH = 80 ˚C, High pH = 45 ˚C	Low pH = 80 ˚C, High pH = 45 ˚C	Low pH = 60 ˚C, High pH = 45 ˚C
Surface Area*	185 m²/g	185 m²/g	185 m²/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

*Expected or approximate value.

Ordering Information

ACQUITY UPLC CSH Columns

	Particle Size: 1.7 µm		Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (3/pk)
CSH C_{18}	1.0 × 50 mm	186005292	1.0 × 50 mm	176002136
	1.0 × 100 mm	186005293	1.0 × 100 mm	176002137
	1.0 × 150 mm	186005294	1.0 × 150 mm	176002138
	2.1 × 30 mm	186005295	2.1 × 30 mm	176002139
	2.1 × 50 mm	186005296	2.1 × 50 mm	176002140
	2.1 × 75 mm	186005620	2.1 × 100 mm	176002141
	2.1 × 100 mm	186005297	2.1 × 150 mm	176002142
	2.1 × 150 mm	186005298	3.0 × 30 mm	176002143
	3.0 × 30 mm	186005299	3.0 × 50 mm	176002144
	3.0 × 50 mm	186005300	3.0 × 100 mm	176002145
	3.0 × 75 mm	186005623	3.0 × 150 mm	176002146
	3.0 × 100 mm	186005301		
	3.0 × 150 mm	186005302		
CSH Phenyl-Hexyl	1.0 × 50 mm	186005404	1.0 × 50 mm	176002161
	1.0 × 100 mm	186005402	1.0 × 100 mm	176002159
	1.0 × 150 mm	186005403	1.0 × 150 mm	176002160
	2.1 × 30 mm	186005405	2.1 × 30 mm	176002162
	2.1 × 50 mm	186005406	2.1 × 50 mm	176002163
	2.1 × 75 mm	186005621	2.1 × 100 mm	176002164
	2.1 × 100 mm	186005407	2.1 × 150 mm	176002165
	2.1 × 150 mm	186005408	3.0 × 30 mm	176002166
	3.0 × 30 mm	186005409	3.0 × 50 mm	176002167
	3.0 × 50 mm	186005410	3.0 × 100 mm	176002168
	3.0 × 75 mm	186005624	3.0 × 150 mm	176002169
	3.0 × 100 mm	186005411		
	3.0 × 150 mm	186005412		
CSH Fluoro-Phenyl	1.0 × 50 mm	186005349	1.0 × 50 mm	176002150
	1.0 × 100 mm	186005347	1.0 × 100 mm	176002148
	1.0 × 150 mm	186005348	1.0 × 150 mm	176002149
	2.1 × 30 mm	186005350	2.1 × 30 mm	176002151
	2.1 × 50 mm	186005351	2.1 × 50 mm	176002152
	2.1 × 75 mm	186005622	2.1 × 100 mm	176002153
	2.1 × 100 mm	186005352	2.1 × 150 mm	176002154
	2.1 × 150 mm	186005353	3.0 × 30 mm	176002155
	3.0 × 30 mm	186005354	3.0 × 50 mm	176002156
	3.0 × 50 mm	186005355	3.0 × 100 mm	176002157
	3.0 × 75 mm	186005625	3.0 × 150 mm	176002158
	3.0 × 100 mm	186005356		
	3.0 × 150 mm	186005357		

ACQUITY UPLC CSH Columns *Continued*

	Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)
Peptide CSH C_{18}, 130 Å	1.0 × 50 mm	186006933
	1.0 × 100 mm	186006934
	1.0 × 150 mm	186006935
	2.1 × 50 mm	186006936
	2.1 × 100 mm	186006937
	2.1 × 150 mm	186006938

ACQUITY UPLC CSH VanGuard Pre-columns (Guard Columns)

	Particle Size: 1.7 µm	
	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 5 mm	186005303
CSH Phenyl-Hexyl	2.1 × 5 mm	186005413
CSH Fluoro-Phenyl	2.1 × 5 mm	186005358
Peptide CSH C_{18}	2.1 × 5 mm	186006939
	2.1 × 5 mm	176003067[2]

[2]Kit includes column and one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.

ACQUITY UPLC Peptide CSH C_{18} VanGuard Columns

	Particle Size: 1.7 µm	
	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 5 mm	186006939
	2.1 × 5 mm	176003067[2]

[2]Kit includes column and one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.

ACQUITY UPLC Columns In-line Filter Unit

Description	P/N
In-line filter holder and six 0.2 µm stainless steel replacement filters	205000343
0.2 µm stainless steel replacement filters (×5), with end nuts - for use with p/n: 205000343	700002775

Quality Control Reference Materials

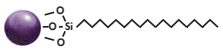
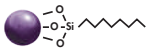
Description	P/N
Neutrals QC Reference Material	186006360
Reversed-Phase QC Reference Material	186006363

For more information on ACQUITY UPLC Peptide Columns, refer to page 340.

ACQUITY UPLC ETHYLENE BRIDGED HYBRID (BEH) COLUMNS

ACQUITY UPLC BEH Columns provide unprecedented levels of peak asymmetry, efficiency, and chemical stability. Available in both reversed-phase and HILIC, with chemistries that provide selectivity for many small-molecule compounds, these robust columns can operate at conditions of extreme pH. With the ruggedness to operate under extreme pH conditions, ACQUITY UPLC BEH Columns enable the ability to utilize a wide pH range to influence retention, selectivity, and sensitivity of ionizable compounds.

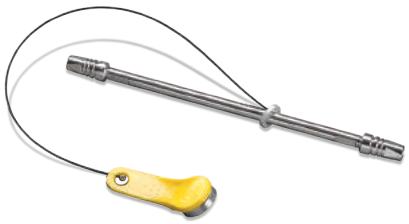
Column Characteristics

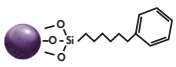
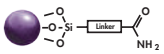
	BEH C_{18}, 130 Å	BEH C_8, 130 Å	BEH Shield RP18, 130 Å
	UPLC: 1.7 µm	UPLC: 1.7 µm	UPLC: 1.7 µm
Particle/Ligand			
Ligand Density	3.1 µmol/m^2	3.2 µmol/m^2	3.3 µmol/m^2
Carbon Load	18%	13%	17%
Endcapped	Yes	Yes	Yes
USP Class No.	L1	L7	L1
pH Range	1–12	1–12	2–11
Temperature Limits	Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 60 ˚C, High pH = 60 ˚C	Low pH = 50 ˚C, High pH = 45 ˚C
Surface Area	185 m^2/g	185 m^2/g	185 m^2/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

*Expected or approximate value.

BEH Technology is also available in HPLC particle sizes (XBridge HPLC BEH), please refer to pages 161 and 236.

BEH Technology™



BEH Phenyl, 130 Å	BEH HILIC, 130 Å	BEH Amide, 130 Å
UPLC: 1.7 µm	UPLC: 1.7 µm	UPLC: 1.7 µm
		
3.0 µmol/m^2	N/A	7.5 µmol/m^2
15%	Unbonded	12%
Yes	N/A	N/A
L11	L3	L68
1–12	1–9	2–11
Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 90 ˚C, High pH = 90 ˚C
185 m^2/g	185 m^2/g	185 m^2/g
Neutrals QC Reference Material p/n: 186006360	**HILIC QC Reference Material** p/n: 186007226	**HILIC QC Reference Material** p/n: 186007226
Reversed-Phase QC Reference Material p/n: 186006363	–	–

APPLICATION AREA: Targeted Metabolomics

"BEH columns are the best - great separation - even for isomers, long column life and peak shapes. I develop all my methods with use of BEH columns."

REVIEWER: Kamil Kuś

ORGANIZATION: Jagiellonian Center for Experimental Therapeutics

ACQUITY UPLC BEH Columns

	Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)
BEH C_{18}	1.0 × 50 mm	186002344
	1.0 × 100 mm	186002346
	1.0 × 150 mm	186002347
	2.1 × 30 mm	186002349
	2.1 × 50 mm	186002350
	2.1 × 75 mm	186005604
	2.1 × 100 mm	186002352
	2.1 × 150 mm	186002353
	3.0 × 30 mm	186004659
	3.0 × 50 mm	186004660
	3.0 × 75 mm	186005609
	3.0 × 100 mm	186004661
	3.0 × 150 mm	186004690
BEH Shield RP18	1.0 × 50 mm	186002851
	1.0 × 100 mm	186002852
	1.0 × 150 mm	186003373
	2.1 × 30 mm	186003909
	2.1 × 50 mm	186002853
	2.1 × 75 mm	186005605
	2.1 × 100 mm	186002854
	2.1 × 150 mm	186003376
	3.0 × 30 mm	186004667
	3.0 × 50 mm	186004668
	3.0 × 75 mm	186005610
	3.0 × 100 mm	186004669
	3.0 × 150 mm	186004670
BEH C_8	1.0 × 50 mm	186002875
	1.0 × 100 mm	186002876
	1.0 × 150 mm	186003374
	2.1 × 30 mm	186003910
	2.1 × 50 mm	186002877
	2.1 × 75 mm	186005606
	2.1 × 100 mm	186002878
	2.1 × 150 mm	186003377
	3.0 × 30 mm	186004663
	3.0 × 50 mm	186004664
	3.0 × 75 mm	186005611
	3.0 × 100 mm	186004665
	3.0 × 150 mm	186004666

	Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)
BEH Phenyl	1.0 × 50 mm	186002882
	1.0 × 100 mm	186002883
	1.0 × 150 mm	186003375
	2.1 × 30 mm	186003911
	2.1 × 50 mm	186002884
	2.1 × 75 mm	186005607
	2.1 × 100 mm	186002885
	2.1 × 150 mm	186003378
	3.0 × 30 mm	186004671
	3.0 × 50 mm	186004672
	3.0 × 75 mm	186005612
	3.0 × 100 mm	186004673
	3.0 × 150 mm	186004674
BEH HILIC	1.0 × 50 mm	186003457
	1.0 × 100 mm	186003458
	1.0 × 150 mm	186003459
	2.1 × 50 mm	186003460
	2.1 × 75 mm	186005608
	2.1 × 100 mm	186003461
	2.1 × 150 mm	186003462
	3.0 × 50 mm	186004675
	3.0 × 75 mm	186005613
	3.0 × 100 mm	186004676
	3.0 × 150 mm	186004677
BEH Amide	1.0 × 50 mm	186004848
	1.0 × 100 mm	186004849
	1.0 × 150 mm	186004850
	2.1 × 30 mm	186004839
	2.1 × 50 mm	186004800
	2.1 × 75 mm	186005657
	2.1 × 100 mm	186004801
	2.1 × 150 mm	186004802
	3.0 × 30 mm	186004803
	3.0 × 50 mm	186004804
	3.0 × 75 mm	186005658
	3.0 × 100 mm	186004805
	3.0 × 150 mm	186004806

Our Professional Services team is comprised of dedicated, certified, experienced, scientists, and informatics engineers. We offer a comprehensive suite of professional services to help you accelerate product production, improve laboratory effectiveness, and manage your resources.

ACQUITY UPLC BEH Columns *Continued*

	Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)
Glycan BEH Amide, 130 Å	2.1 × 50 mm	186004740
	2.1 × 100 mm	186004741
	2.1 × 150 mm	186004742
Peptide BEH C_{18}, 130 Å	2.1 × 50 mm	186003554
	2.1 × 100 mm	186003555
	2.1 × 150 mm	186003556
	2.1 × 300 mm	186005792
Peptide BEH C_{18}, 300 Å	1.0 × 50 mm	186005592
	1.0 × 100 mm	186005593
	1.0 × 150 mm	186005594
	2.1 × 50 mm	186003685
	2.1 × 100 mm	186003686
	2.1 × 150 mm	186003687
Protein BEH SEC, 125 Å	4.6 × 30 mm, Guard Column	186006504
	4.6 × 150 mm, Column	186006505
	4.6 × 150 mm, Column and Standard[2]	176003906
	4.6 × 300 mm, Column	186006506
	4.6 × 300 mm, Column and Standard[2]	176003907
Protein BEH SEC, 200 Å	2.1 × 150 mm, Column	186008471
	4.6 × 30 mm, Guard Column	186005793
	4.6 × 150 mm, Column	186005225
	4.6 × 150 mm, Column and Standard[1]	176003904
	4.6 × 300 mm, Column	186005226
	4.6 × 300 mm, Column and Standard[1]	176003905

[1] Includes one BEH200 SEC standard.
[2] Includes one BEH125 SEC standard.

ACQUITY UPLC BEH VanGuard Pre-columns (Guard Columns)

	Particle Size: 1.7 µm	
	Dimension	P/N (3/pk)
BEH C_{18}	2.1 × 5 mm	186003975
BEH Shield RP18	2.1 × 5 mm	186003977
BEH C_8	2.1 × 5 mm	186003978
BEH Phenyl	2.1 × 5 mm	186003979
BEH HILIC	2.1 × 5 mm	186003980
BEH Amide	2.1 × 5 mm	186004799
Glycan BEH Amide, 130 Å	2.1 × 5 mm	186004739
Peptide BEH C_{18}, 130 Å	2.1 × 5 mm	186003975

Quality Control Reference Materials

Description	P/N
Neutrals QC Reference Materials	186006360
Reversed-Phase QC Reference Materials	186006363
HILIC QC Reference Materials	186007226

ACQUITY UPLC Protein BEH SEC Column Accessories

Description	P/N
ELSD Outlet Tubing (0.004" I.D. × 6" length)	430001562
SEC UPLC Connection Tubing (0.005" I.D. × 1.75" length), 2/pk	186006613

ACQUITY UPLC Columns In-line Filter Unit

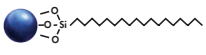
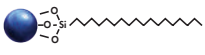
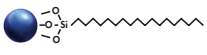
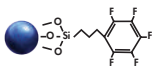
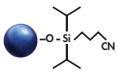
Description	P/N
In-line filter holder and six 0.2 µm stainless steel replacement filters	205000343
0.2 µm stainless steel replacement filters (×5), with end nuts - for p/n: 205000343	700002775

For more information on ACQUITY UPLC Protein Columns, refer to page 372.

ACQUITY UPLC HIGH STRENGTH SILICA (HSS) COLUMNS

ACQUITY UPLC HSS Columns provide increased retention for both polar and non-polar analytes when compared to CORTECS, CSH, and BEH particles. The thermally treated silica particle provides mechanical strength and stability when operating under UPLC system pressures. Available in five bonded phases, this robust particle technology maximizes the selectivity space. The ample array of bonded phases associated with ACUITY UPLC HSS Columns enable traditional hydrophobic, reversed-phase interactions as well as dipole-dipole, aromatic, and hydrogen-bonding interactions.

Column Characteristics

	HSS C_{18}, 100 Å	HSS C_{18} SB, 100 Å	HSS T3 , 100 Å	HSS PFP, 100 Å	HSS CN , 100 Å
	UPLC: 1.8 µm	**UPLC: 1.8 µm**	**UPLC: 1.8 µm**	**UPLC: 1.8 µm**	**UPLC: 1.8 µm**
Particle/Ligand					
Ligand Density	3.2 µmol/m^2	1.6 µmol/m^2	1.6 µmol/m^2	3.2 µmol/m^2	2.0 µmol/m^2
Carbon Load	15%	8%	11%	7%	5%
Endcapped	Yes	N/A	Yes	N/A	N/A
USP Class No.	L1	L1	L1	L43	L10
pH Range	1–8	2–8	2–8	2–8	2–8
Temperature Limits	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C
Surface Area	230 m^2/g	230 m^2/g	230 m^2/g	230 m^2/g	230 m^2/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	–

*Expected or approximate value.

Ordering Information

ACQUITY UPLC HSS Columns

	Particle Size: 1.8 µm		Particle Size: 1.8 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (3/pk)
HSS T3	1.0 × 50 mm	186003535	1.0 × 50 mm	176001127
	1.0 × 100 mm	186003536	1.0 × 100 mm	176001129
	1.0 × 150 mm	186003537	1.0 × 150 mm	176001130
	2.1 × 30 mm	186003944	2.1 × 30 mm	176001375
	2.1 × 50 mm	186003538	2.1 × 50 mm	176001131
	2.1 × 75 mm	186005614	2.1 × 100 mm	176001132
	2.1 × 100 mm	186003539	2.1 × 150 mm	176001133
	2.1 × 150 mm	186003540	3.0 × 30 mm	176001813
	3.0 × 30 mm	186004678	3.0 × 50 mm	176001814
	3.0 × 50 mm	186004679	3.0 × 100 mm	176001815
	3.0 × 75 mm	186005617	3.0 × 150 mm	176001816
	3.0 × 100 mm	186004680		
	3.0 × 150 mm	186004681		
HSS C_{18}	1.0 × 50 mm	186003529	1.0 × 50 mm	176001121
	1.0 × 100 mm	186003530	1.0 × 100 mm	176001122
	1.0 × 150 mm	186003531	1.0 × 150 mm	176001123
	2.1 × 30 mm	186003987	2.1 × 30 mm	176001398
	2.1 × 50 mm	186003532	2.1 × 50 mm	176001124
	2.1 × 75 mm	186005615	2.1 × 100 mm	176001125
	2.1 × 100 mm	186003533	2.1 × 150 mm	176001126
	2.1 × 150 mm	186003534	3.0 × 30 mm	176001817
	3.0 × 30 mm	186004682	3.0 × 50 mm	176001818
	3.0 × 50 mm	186004683	3.0 × 100 mm	176001819
	3.0 × 75 mm	186005618	3.0 × 150 mm	176001820
	3.0 × 100 mm	186004684		
	3.0 × 150 mm	186004685		
HSS C_{18} SB	1.0 × 50 mm	186004114	1.0 × 50 mm	176001556
	1.0 × 100 mm	186004115	1.0 × 100 mm	176001557
	1.0 × 150 mm	186004116	1.0 × 150 mm	176001558
	2.1 × 30 mm	186004117	2.1 × 30 mm	176001559
	2.1 × 50 mm	186004118	2.1 × 50 mm	176001560
	2.1 × 75 mm	186005616	2.1 × 100 mm	176001561
	2.1 × 100 mm	186004119	2.1 × 150 mm	176001562
	2.1 × 150 mm	186004120	3.0 × 30 mm	176001821
	3.0 × 30 mm	186004686	3.0 × 50 mm	176001822
	3.0 × 50 mm	186004687	3.0 × 100 mm	176001823
	3.0 × 75 mm	186005619	3.0 × 150 mm	176001824
	3.0 × 100 mm	186004826		
	3.0 × 150 mm	186004689		

For more information on Peptide HSS Columns, refer to page 344.

ACQUITY UPLC HSS Columns *Continued*

	Particle Size: 1.8 µm		Particle Size: 1.8 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (3/pk)
HSS Cyano	1.0 × 50 mm	186005982	1.0 × 50 mm	176002703
	1.0 × 100 mm	186005983	1.0 × 100 mm	176002704
	1.0 × 150 mm	186005984	1.0 × 150 mm	176002705
	2.1 × 30 mm	186005985	2.1 × 30 mm	176002706
	2.1 × 50 mm	186005986	2.1 × 50 mm	176002707
	2.1 × 75 mm	186005987	2.1 × 75 mm	176002708
	2.1 × 100 mm	186005988	2.1 × 100 mm	176002709
	2.1 × 150 mm	186005989	2.1 × 150 mm	176002710
	3.0 × 30 mm	186005990	3.0 × 30 mm	176002711
	3.0 × 50 mm	186005991	3.0 × 50 mm	176002712
	3.0 × 75 mm	186005992	3.0 × 75 mm	176002713
	3.0 × 100 mm	186005993	3.0 × 100 mm	176002714
	3.0 × 150 mm	186005994	3.0 × 150 mm	176002715
HSS PFP	1.0 × 50 mm	186005961	1.0 × 50 mm	176002690
	1.0 × 100 mm	186005962	1.0 × 100 mm	176002691
	1.0 × 150 mm	186005963	1.0 × 150 mm	176002692
	2.1 × 30 mm	186005964	2.1 × 30 mm	176002693
	2.1 × 50 mm	186005965	2.1 × 50 mm	176002694
	2.1 × 75 mm	186005966	2.1 × 75 mm	176002695
	2.1 × 100 mm	186005967	2.1 × 100 mm	176002696
	2.1 × 150 mm	186005968	2.1 × 150 mm	176002697
	3.0 × 30 mm	186005969	3.0 × 30 mm	176002698
	3.0 × 50 mm	186005970	3.0 × 50 mm	176002699
	3.0 × 75 mm	186005971	3.0 × 75 mm	176002700
	3.0 × 100 mm	186005972	3.0 × 100 mm	176002701
	3.0 × 150 mm	186005973	3.0 × 150 mm	176002702

ACQUITY UPLC HSS VanGuard Pre-columns (Guard Columns)

	Particle Size: 1.8 µm	
	Dimension	P/N (3/pk)
HSS C_{18}	2.1 × 5 mm	186003981
HSS C_{18} SB	2.1 × 5 mm	186004136
HSS T3	2.1 × 5 mm	186003976

	Particle Size: 1.8 µm	
	Dimension	P/N (3/pk)
HSS PFP	2.1 × 5 mm	186005974
HSS Cyano	2.1 × 5 mm	186005995

Quality Control Reference Materials

Description	P/N
Neutrals QC Reference Materials	186006360
Reversed-Phase QC Reference Materials	186006363

ACQUITY UPLC Columns In-line Filter Unit

Description	P/N
In-line filter holder and six 0.2 µm stainless steel replacement filters	205000343
0.2 µm stainless steel replacement filters (×5), with end nuts - for use with p/n: 205000343	700002775

ACQUITY UPLC and CORTECS 1.6 µm Method Validation Kits

The reproducibility of a chromatographic column's performance significantly affects the long-term reliability and robustness of an analytical method. Reproducibility, however, is beyond the direct control of analysts. Yet all isn't lost. Our long-established, highly controlled particle- and column-manufacturing processes ensure batch-to-batch and column-to-column reproducibility that provide confidence in the continued use of your methods. ACQUITY UPLC Method Validation Kits include three batches of chromatographic media (derived from different base particles) to evaluate the quality, reliability, and consistency of your method.

Ordering Information

CORTECS UPLC Columns Method Validation Kits (MVK)*

	Particle Size: 1.6 µm		Particle Size: 2.7 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
C_8	2.1 × 30 mm	186008403	2.1 × 30 mm	186008353
	2.1 × 50 mm	186008404	2.1 × 50 mm	186008354
	2.1 × 75 mm	186008405	2.1 × 75 mm	186008355
	2.1 × 100 mm	186008406	2.1 × 100 mm	186008356
	2.1 × 150 mm	186008407	2.1 × 150 mm	186008357
	3.0 × 30 mm	186008413	3.0 × 30 mm	186008363
	3.0 × 50 mm	186008414	3.0 × 50 mm	186008364
	3.0 × 75 mm	186008415	3.0 × 75 mm	186008365
	3.0 × 100 mm	186008416	3.0 × 100 mm	186008366
	3.0 × 150 mm	186008417	3.0 × 150 mm	186008367
			4.6 × 30 mm	186008373
			4.6 × 50 mm	186008374
			4.6 × 75 mm	186008375
			4.6 × 100 mm	186008376
			4.6 × 150 mm	186008377
C_{18}+	2.1 × 30 mm	186007176	2.1 × 30 mm	186007439
	2.1 × 50 mm	186007177	2.1 × 50 mm	186007440
	2.1 × 75 mm	186007178	2.1 × 75 mm	186007441
	2.1 × 100 mm	186007179	2.1 × 100 mm	186007442
	2.1 × 150 mm	186007180	2.1 × 150 mm	186007443
	3.0 × 30 mm	186007181	3.0 × 30 mm	186007444
	3.0 × 50 mm	186007182	3.0 × 50 mm	186007445
	3.0 × 75 mm	186007183	3.0 × 75 mm	186007446
	3.0 × 100 mm	186007184	3.0 × 100 mm	186007447
	3.0 × 150 mm	186007185	3.0 × 150 mm	186007448
			4.6 × 30 mm	186007449
			4.6 × 50 mm	186007450
			4.6 × 75 mm	186007451
			4.6 × 100 mm	186007452
			4.6 × 150 mm	186007453

*Each kit contains three columns from three batches of material.

CORTECS UPLC Columns Method Validation Kits (MVK)* *Continued*

	Particle Size: 1.6 µm		Particle Size: 2.7 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
C_{18}	2.1 × 30 mm	186007156	2.1 × 30 mm	186007409
	2.1 × 50 mm	186007157	2.1 × 50 mm	186007410
	2.1 × 75 mm	186007158	2.1 × 75 mm	186007411
	2.1 × 100 mm	186007159	2.1 × 100 mm	186007412
	2.1 × 150 mm	186007160	2.1 × 150 mm	186007413
	3.0 × 30 mm	186007161	3.0 × 30 mm	186007414
	3.0 × 50 mm	186007162	3.0 × 50 mm	186007415
	3.0 × 75 mm	186007163	3.0 × 75 mm	186007416
	3.0 × 100 mm	186007164	3.0 × 100 mm	186007417
	3.0 × 150 mm	186007165	3.0 × 150 mm	186007418
			4.6 × 30 mm	186007419
			4.6 × 50 mm	186007420
			4.6 × 75 mm	186007421
			4.6 × 100 mm	186007422
			4.6 × 150 mm	186007423
HILIC	2.1 × 30 mm	186007166	2.1 × 30 mm	186007424
	2.1 × 50 mm	186007167	2.1 × 50 mm	186007425
	2.1 × 75 mm	186007168	2.1 × 75 mm	186007426
	2.1 × 100 mm	186007169	2.1 × 100 mm	186007427
	2.1 × 150 mm	186007170	2.1 × 150 mm	186007428
	3.0 × 30 mm	186007171	3.0 × 30 mm	186007429
	3.0 × 50 mm	186007172	3.0 × 50 mm	186007430
	3.0 × 75 mm	186007173	3.0 × 75 mm	186007431
	3.0 × 100 mm	186007174	3.0 × 100 mm	186007432
	3.0 × 150 mm	186007175	3.0 × 150 mm	186007433
			4.6 × 30 mm	186007434
			4.6 × 50 mm	186007435
			4.6 × 75 mm	186007436
			4.6 × 100 mm	186007437
			4.6 × 150 mm	186007438
Phenyl	2.1 × 30 mm	186008383	2.1 × 30 mm	186008323
	2.1 × 50 mm	186008384	2.1 × 50 mm	186008324
	2.1 × 75 mm	186008405	2.1 × 75 mm	186008325
	2.1 × 100 mm	186008386	2.1 × 100 mm	186008326
	2.1 × 150 mm	186008387	2.1 × 150 mm	186008327
	3.0 × 30 mm	186008393	3.0 × 30 mm	186008333
	3.0 × 50 mm	186008394	3.0 × 50 mm	186008334
	3.0 × 75 mm	186008395	3.0 × 75 mm	186008335
	3.0 × 100 mm	186008396	3.0 × 100 mm	186008336
	3.0 × 150 mm	186008397	3.0 × 150 mm	186008337
			4.6 × 30 mm	186008343
			4.6 × 50 mm	186008344
			4.6 × 75 mm	186008345
			4.6 × 100 mm	186008346
			4.6 × 150 mm	186008347

*Each kit contains three columns from three batches of material.

CORTECS UPLC Columns Method Validation Kits (MVK)* *Continued*

	Particle Size: 1.6 µm		Particle Size: 2.7 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
T3	2.1 × 30 mm	186008529	2.1 × 30 mm	186008509
	2.1 × 50 mm	186008530	2.1 × 50 mm	186008510
	2.1 × 75 mm	186008531	2.1 × 75 mm	186008516
	2.1 × 100 mm	186008536	2.1 × 100 mm	186008517
	2.1 × 150 mm	186008537	2.1 × 150 mm	186008518
	3.0 × 30 mm	186008538	3.0 × 30 mm	186008519
	3.0 × 50 mm	186008539	3.0 × 50 mm	186008520
	3.0 × 75 mm	186008540	3.0 × 75 mm	186008521
	3.0 × 100 mm	186008541	3.0 × 100 mm	186008522
	3.0 × 150 mm	186008542	3.0 × 150 mm	186008523
			4.6 × 30 mm	186008524
			4.6 × 50 mm	186008525
			4.6 × 75 mm	186008526
			4.6 × 100 mm	186008527
			4.6 × 150 mm	186008528
Shield RP18	2.1 × 30 mm	186008696	2.1 × 30 mm	186008666
	2.1 × 50 mm	186008697	2.1 × 50 mm	186008667
	2.1 × 75 mm	186008698	2.1 × 75 mm	186008668
	2.1 × 100 mm	186008699	2.1 × 100 mm	186008669
	2.1 × 150 mm	186008700	2.1 × 150 mm	186008670
	3.0 × 30 mm	186008706	3.0 × 30 mm	186008676
	3.0 × 50 mm	186008707	3.0 × 50 mm	186008677
	3.0 × 75 mm	186008708	3.0 × 75 mm	186008678
	3.0 × 100 mm	186008709	3.0 × 100 mm	186008679
	3.0 × 150 mm	186008710	3.0 × 150 mm	186008680
			4.6 × 30 mm	186008686
			4.6 × 50 mm	186008687
			4.6 × 75 mm	186008688
			4.6 × 100 mm	186008689
			4.6 × 150 mm	186008690

*Each kit contains three columns from three batches of material.

ACQUITY UPLC Method Validation Kits* *Continued*

	Particle Size: 1.7 µm	
	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 50 mm	186005571
	2.1 × 100 mm	186005572
	2.1 × 150 mm	186006016
	3.0 × 50 mm	186005573
	3.0 × 100 mm	186005574
CSH Phenyl-Hexyl	2.1 × 50 mm	186005579
	2.1 × 100 mm	186005580
	2.1 × 150 mm	186006017
	3.0 × 50 mm	186005581
	3.0 × 100 mm	186005582
CSH Fluoro-Phenyl	2.1 × 50 mm	186005575
	2.1 × 100 mm	186005576
	2.1 × 150 mm	186006018
	3.0 × 50 mm	186005577
	3.0 × 100 mm	186005578
BEH C_{18}	2.1 × 50 mm	186004044
	2.1 × 100 mm	186004045
	2.1 × 150 mm	186006019
	3.0 × 50 mm	186004691
	3.0 × 100 mm	186004692
BEH C_8	2.1 × 50 mm	186004046
	2.1 × 100 mm	186004047
	2.1 × 150 mm	186006020
	3.0 × 50 mm	186004693
	3.0 × 100 mm	186004694
BEH Shield RP18	2.1 × 50 mm	186004048
	2.1 × 100 mm	186004049
	2.1 × 150 mm	186006021
	3.0 × 50 mm	186004695
	3.0 × 100 mm	186004696

	Particle Size: 1.7 µm	
	Dimension	P/N (3/pk)
BEH Phenyl	2.1 × 50 mm	186004050
	2.1 × 100 mm	186004052
	2.1 × 150 mm	186006022
	3.0 × 50 mm	186004697
	3.0 × 100 mm	186004698
BEH HILIC	2.1 × 50 mm	186004053
	2.1 × 100 mm	186004054
	2.1 × 150 mm	186006023
	3.0 × 50 mm	186004699
	3.0 × 100 mm	186004700
BEH Amide	2.1 × 50 mm	186004807
	2.1 × 100 mm	186004808
	2.1 × 150 mm	186006024
	3.0 × 50 mm	186004809
	3.0 × 100 mm	186004810
Glycan BEH Amide, 130 Å	2.1 × 100 mm	186004907
Peptide BEH C_{18}, 130 Å	2.1 × 100 mm	186004896
	2.1 × 150 mm	186006517
Peptide CSH C_{18}, 130 Å	1.0 × 50 mm	176003061[1]
	1.0 × 100 mm	176003062[1]
	1.0 × 150 mm	176003063[1]
	2.1 × 50 mm	176003064[1]
	2.1 × 100 mm	176003065[1]
	2.1 × 150 mm	186006940
	2.1 × 150 mm	176003068[1]

* Each kit contains three columns from three batches of material.

[1] Kit includes column and one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.

ACQUITY UPLC Method Validation Kits* *Continued*

	Particle Size: 1.8 µm	
	Dimension	**P/N (3/pk)**
HSS T3	2.1 × 50 mm	186004055
	2.1 × 100 mm	186004056
	2.1 × 150 mm	186006025
	3.0 × 50 mm	186004701
	3.0 × 100 mm	186004702
HSS C_{18}	2.1 × 50 mm	186004057
	2.1 × 100 mm	186004058
	2.1 × 150 mm	186006026
	3.0 × 50 mm	186004703
	3.0 × 100 mm	186004704
HSS C_{18} SB	2.1 × 50 mm	186004137
	2.1 × 100 mm	186004138
	2.1 × 150 mm	186006027
	3.0 × 50 mm	186004705
	3.0 × 100 mm	186004709
HSS Cyano	2.1 × 50 mm	186005996
	2.1 × 100 mm	186005997
	3.0 × 50 mm	186005998
	3.0 × 100 mm	186005999
HSS PFP	2.1 × 50 mm	186005975
	2.1 × 100 mm	186005976
	3.0 × 50 mm	186005977
	3.0 × 100 mm	186005978

ACQUITY UPLC Method Development Kits

With a seemingly endless number of method parameters to try, developing a new chromatographic method can be an overwhelming, time-consuming experience. Finding a column that reliably and robustly delivers the desired separation results is essential to any method development strategy. The UPLC Columns in our Method Development Kits cover a broad range of selectivity, facilitating all method-development approaches.

Description	Chemistries	Method Development Strategy
Maximum Selectivity UPLC Method Development Kit	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C_{18} SB	The widest selectivity offering for method development at low and high pH. Best choice for low ionic strength additives (i.e., formic acid).
High and Low pH, Widest Selectivities UPLC Columns Kit	BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	Maximize separation selectivity by exploring low and high mobile-phase pH.
UPLC Method Development Kit	BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	Maximize separation selectivity by exploring low and high mobile phase pH (BEH columns) and accommodate for the retention of polar compounds (HSS T3 columns).
L1 UPLC Columns Kit	BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	C_{18} columns that differ in silanol activity and hydrophobicity within the US Pharmacopeia L1 classification.
Mass Spec UPLC Columns Kit	BEH C_{18}, HSS C_{18}, HSS T3, HSS C_{18} SB	Straight-chain-alkyl C_{18} columns that differ in silanol activity, shape, selectivity, and hydrophobicity; and exhibit no MS bleed.
Low pH, Widest Selectivities UPLC Columns Kit	BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	A diverse grouping of column selectivities for the development of a reversed-phase method in low-pH mobile phases.
Maximum Selectivity RP and HILIC UPLC Method Development Kit	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, BEH Amide	Offers the widest separation selectivity by combining CSH reversed-phase and HILIC stationary phases to retain analytes encompassing a broad range of polarity.
UPLC RP and HILIC Method Development Kit	BEH C_{18}, BEH Shield RP18, BEH Amide, HSS C_{18} SB	A novel approach that maximizes separation selectivity by combining distinct RP and HILIC stationary phases to retain analytes encompassing a broad range of polarity.
UPLC HILIC Method Development Kit	BEH Amide, BEH HILIC	Effortlessly develop HILIC methods at low pH (bases) or high pH (acids) for polar and/or ionizable compounds.

Ordering Information

ACQUITY UPLC Method Development Kits

Description	Qty.	Chemistries	Particle Size(s)	Dimension	P/N
Maximum Selectivity UPLC	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C_{18} SB	CSH: 1.7 µm; HSS: 1.8 µm	2.1 × 50 mm	176002123
Maximum Selectivity UPLC	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C_{18} SB	CSH: 1.7 µm; HSS: 1.8 µm	2.1 × 100 mm	176002124
Maximum Selectivity UPLC	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C_{18} SB	CSH: 1.7 µm; HSS: 1.8 µm	3.0 × 50 mm	176002125
Maximum Selectivity UPLC	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C_{18} SB	CSH: 1.7 µm; HSS: 1.8 µm	3.0 × 100 mm	176002126
High and Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	BEH: 1.7 µm	2.1 × 50 mm	176001042
High and Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	BEH: 1.7 µm	2.1 × 100 mm	176001043
High and Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	BEH: 1.7 µm	3.0 × 50 mm	176001881
High and Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	BEH: 1.7 µm	3.0 × 100 mm	176001882
UPLC	4/pk	BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 50 mm	176001603
UPLC	4/pk	BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 100 mm	176001604
UPLC	4/pk	BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 50 mm	176001883
UPLC	4/pk	BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 100 mm	176001884
L1 UPLC Columns Kit	4/pk	BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 50 mm	176001605
L1 UPLC Columns Kit	4/pk	BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 100 mm	176001606
L1 UPLC Columns Kit	4/pk	BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 50 mm	176001885
L1 UPLC Columns Kit	4/pk	BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 100 mm	176001886
Mass Spec UPLC Columns Kit	4/pk	BEH C_{18}, HSS C_{18}, HSS C_{18} SB, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 50 mm	176001607
Mass Spec UPLC Columns Kit	4/pk	BEH C_{18}, HSS C_{18}, HSS C_{18} SB, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 100 mm	176001608
Mass Spec UPLC Columns Kit	4/pk	BEH C_{18}, HSS C_{18}, HSS C_{18} SB, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 50 mm	176001887
Mass Spec UPLC Columns Kit	4/pk	BEH C_{18}, HSS C_{18}, HSS C_{18} SB, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 100 mm	176001888
Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 50 mm	176001609
Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 100 mm	176001610
Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 50 mm	176001889
Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 100 mm	176001890
Maximum Selectivity RP and HILIC	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, BEH Amide	CSH: 1.7 µm; BEH: 1.7 µm	2.1 × 50 mm	176002127
Maximum Selectivity RP and HILIC	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, BEH Amide	CSH: 1.7 µm; BEH: 1.7 µm	2.1 × 100 mm	176002128
Maximum Selectivity RP and HILIC	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, BEH Amide	CSH: 1.7 µm; BEH: 1.7 µm	3.0 × 50 mm	176002129
Maximum Selectivity RP and HILIC	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, BEH Amide	CSH: 1.7 µm; BEH: 1.7 µm	3.0 × 100 mm	176002130
UPLC RP and HILIC	4/pk	BEH C_{18}, BEH Shield RP18, BEH Amide, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 50 mm	176001959
UPLC RP and HILIC	4/pk	BEH C_{18}, BEH Shield RP18, BEH Amide, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	2.1 × 100 mm	176001960
UPLC RP and HILIC	4/pk	BEH C_{18}, BEH Shield RP18, BEH Amide, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 50 mm	176001961
UPLC RP and HILIC	4/pk	BEH C_{18}, BEH Shield RP18, BEH Amide, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	3.0 × 100 mm	176001962
UPLC HILIC	2/pk	BEH Amide, BEH HILIC	BEH: 1.7 µm	2.1 × 50 mm	176001963
UPLC HILIC	2/pk	BEH Amide, BEH HILIC	BEH: 1.7 µm	2.1 × 100 mm	176001964
UPLC HILIC	2/pk	BEH Amide, BEH HILIC	BEH: 1.7 µm	3.0 × 50 mm	176001965
UPLC HILIC	2/pk	BEH Amide, BEH HILIC	BEH: 1.7 µm	3.0 × 100 mm	176001966

2.x µm UHPLC Columns

2.x µm UHPLC Columns

Contents

2.x µm UHPLC Columns

Choosing the correct column configuration, one that matches a particular LC system, significantly improves the chromatographic results. System dispersion is inherent to all chromatographic instrumentation and contributes to measured losses in column efficiency. The cumulative dispersion from tubing, valves, and instrument components, such as detector flow cells, causes sample peaks to broaden through dilution in a process that begins at the sample injector and ends at the detector's outflow. As column particle size is reduced, or the internal diameter and length of the column decreases, the potential peak broadening in a non-optimized LC system increases.

The full benefit of higher-efficiency UHPLC columns is realized only when system dispersion does not substantially degrade column performance. For smaller particle columns, the increased efficiency produces narrower peaks and improves resolution; however, the narrower peaks are more susceptible to extra-column dispersion. Therefore, matching the column configuration to the system dispersion is critical to maintain separation performance.

Column Selection Guide

System	HPLC	UHPLC	UPLC
Measured Dispersion	>40 µL	22–29 µL	<20 µL
Routine Pressure	<4000 psi	<10,000 psi	<18,000 psi
Particle Size	3–5 µm	2–3 µm	<2 µm
Column I.D.	4.6 mm (3.0 mm)	3.0 mm (2.1 mm)	2.1 mm (1.0 mm)
Column Length	75–250 mm	50–100 mm	≤150 mm

Recommended column dimension matched for Waters LC Systems.

Ideal Column Configurations for Any LC System

When transferring LC methods, instrument bandspread is one of the most practical LC instrument parameters to determine. Knowing the bandspread value gives the separation scientist the ability to develop compatible methods on any LC system, independent of the instrument manufacturer. The following table recommends column configurations based on nominal instrument bandspread values.

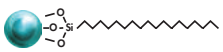
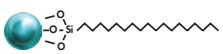
System	LC Technique	Bandspread*	Recommended Column Particle Sizes and I.D.s
Shimadzu Prominence UFLC	HPLC	41 µL	XBridge 3.5, 5 µm; XSelect 3.5, 5 µm; CORTECS 2.7 µm 3.0–4.6 mm I.D.
Alliance 2695 HPLC	HPLC	29 µL	
Agilent 1260 UHPLC (600 bar)	HPLC	28 µL	
Thermo Accela UHPLC	HPLC	21 µL	XBridge 2.5, 3.5, 5 µm; XSelect 2.5, 3.5, 5 µm; CORTECS 2.7 µm 3.0 mm I.D.
Agilent 1290 UHPLC (1200 bar)	UHPLC	17 µL	
ACQUITY Arc	UHPLC	23 µL	XBridge 2.5, 3.5, 5 µm; XSelect 2.5, 3.5, 5 µm; ACQUITY UPLC HSS 1.8 µm, CORTECS 2.7 µm 3.0 mm I.D.
ACQUITY UPLC	UHPLC	12 µL	ACQUITY UPLC BEH 1.7 µm; ACQUITY UPLC CSH 1.7 µm; ACQUITY UPLC HSS 1.8 µm, CORTECS 1.6 µm 2.1 mm I.D.
ACQUITY UPLC H-Class w/Column Manager	UPLC	12 µL	
ACQUITY UPLC H-Class	UPLC	9 µL	

*These data are based on nominal values for unmodified systems, and are intended for reference only. Any adjustment to the system's plumbing, connectivity and configuration changes the instrument bandspread.

CORTECS 2.7 µm Columns

CORTECS 2.7 µm Solid-Core Particle Columns maximize resolution and peak capacity for all LC separations. Optimized to extend the performance of HPLC and UHPLC instruments, their innovative, solid-core technology and bonding chemistry is available in both reversed-phase and HILIC phases, offering the flexibility to rapidly separate a wide range of compound classes. Compared with columns using fully-porous substrates, the improved efficiency of CORTECS 2.7 µm Solid-Core Columns produces sharper and narrower peaks, allowing faster flow rates at lower operational backpressure.

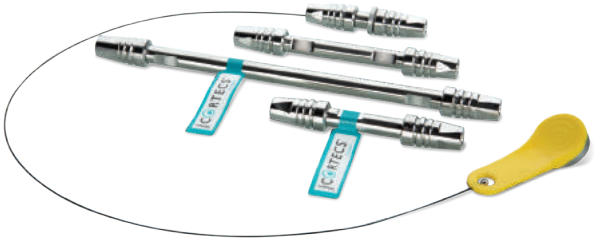
Column Characteristics

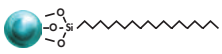
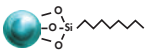
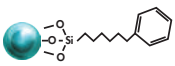
	C_{18}+, 90 Å	C_{18}, 90 Å	Shield RP18, 90 Å
	UPLC: 1.6 µm, UHPLC: 2.7 µm	**UPLC: 1.6 µm, UHPLC: 2.7 µm**	**UPLC: 1.6 µm, UHPLC: 2.7 µm**
Particle/Ligand			
Ligand Density*	2.4 µmol/m²	2.7 µmol/m²	3.2 µmol/m²
Carbon Load*	5.7%	6.6%	6.4%
Endcapped	Yes	Yes	Yes
USP Class No.	L1	L1	L1
pH Range	2–8	2–8	2–8
Temperature Limits	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C
Surface Area*	100 m²/g	100 m²/g	100 m²/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

*Expected or approximate value.

For more information on CORTECS Columns, refer to page 88.

CORTECS™ COLUMNS



T3, 120 Å	C_8, 90 Å	Phenyl, 90 Å	HILIC, 90 Å
UPLC: 1.6 µm, UHPLC: 2.7 µm	UPLC: 1.6 µm, UHPLC: 2.7 µm	UPLC: 1.6 µm, UHPLC: 2.7 µm	UPLC: 1.6 µm, UHPLC: 2.7 µm
			
1.6 µmol/m²	3.4 µmol/m²	3.2 µmol/m²	N/A
4.7%	4.5%	5.9%	Unbonded
Yes	Yes	Yes	N/A
L1	L7	L11	L3
2–8	2–8	2–8	1–5
Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C
100 m²/g	100 m²/g	100 m²/g	100 m²/g
Neutrals QC Reference Material p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**HILIC QC Reference Material** p/n: 186007226
Reversed-Phase QC Reference Material p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	—

Ordering Information

CORTECS Columns

	Particle Size: 1.6 µm			Particle Size: 2.7 µm		
	Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	P/N (3/pk)
C_{18}+	2.1 × 30 mm	186007113	176003166	2.1 × 30 mm	186007394	176003289
	2.1 × 50 mm	186007114	176003167	2.1 × 50 mm	186007395	176003290
	2.1 × 75 mm	186007115	176003168	2.1 × 75 mm	186007396	176003291
	2.1 × 100 mm	186007116	176003169	2.1 × 100 mm	186007397	176003292
	2.1 × 150 mm	186007117	176003170	2.1 × 150 mm	186007398	176003293
	3.0 × 30 mm	186007118	176003171	3.0 × 30 mm	186007399	176003294
	3.0 × 50 mm	186007119	176003172	3.0 × 50 mm	186007400	176003295
	3.0 × 75 mm	186007120	176003173	3.0 × 75 mm	186007401	176003296
	3.0 × 100 mm	186007121	176003174	3.0 × 100 mm	186007402	176003297
	3.0 × 150 mm	186007122	176003175	3.0 × 150 mm	186007403	176003298
				4.6 × 30 mm	186007404	176003322
				4.6 × 50 mm	186007405	176003323
				4.6 × 75 mm	186007406	176003324
				4.6 × 100 mm	186007407	176003325
				4.6 × 150 mm	186007408	176003326
C_{18}	2.1 × 30 mm	186007092	176003146	2.1 × 30 mm	186007364	176003269
	2.1 × 50 mm	186007093	176003147	2.1 × 50 mm	186007365	176003270
	2.1 × 75 mm	186007094	176003148	2.1 × 75 mm	186007366	176003271
	2.1 × 100 mm	186007095	176003149	2.1 × 100 mm	186007367	176003272
	2.1 × 150 mm	186007096	176003150	2.1 × 150 mm	186007368	176003273
	3.0 × 30 mm	186007097	176003151	3.0 × 30 mm	186007369	176003274
	3.0 × 50 mm	186007098	176003152	3.0 × 50 mm	186007370	176003275
	3.0 × 75 mm	186007099	176003153	3.0 × 75 mm	186007371	176003276
	3.0 × 100 mm	186007100	176003154	3.0 × 100 mm	186007372	176003277
	3.0 × 150 mm	186007102	176003155	3.0 × 150 mm	186007373	176003278
				4.6 × 30 mm	186007374	176003312
				4.6 × 50 mm	186007375	176003313
				4.6 × 75 mm	186007376	176003314
				4.6 × 100 mm	186007377	176003315
				4.6 × 150 mm	186007378	176003316

CORTECS Columns *Continued*

	Particle Size: 1.6 µm			Particle Size: 2.7 µm		
	Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	P/N (3/pk)
C_8	2.1 × 30 mm	186008398	176003829	2.1 × 30 mm	186008348	176003804
	2.1 × 50 mm	186008399	176003830	2.1 × 50 mm	186008349	176003805
	2.1 × 75 mm	186008400	176003831	2.1 × 75 mm	186008350	176003806
	2.1 × 100 mm	186008401	176003832	2.1 × 100 mm	186008351	176003807
	2.1 × 150 mm	186008402	176003833	2.1 × 150 mm	186008352	176003808
	3.0 × 30 mm	186008408	176003834	3.0 × 30 mm	186008358	176003809
	3.0 × 50 mm	186008409	176003835	3.0 × 50 mm	186008359	176003810
	3.0 × 75 mm	186008410	176003836	3.0 × 75 mm	186008360	176003811
	3.0 × 100 mm	186008411	176003837	3.0 × 100 mm	186008361	176003812
	3.0 × 150 mm	186008412	176003838	3.0 × 150 mm	186008362	176003813
				4.6 × 30 mm	186008368	176003814
				4.6 × 50 mm	186008369	176003815
				4.6 × 75 mm	186008370	176003816
				4.6 × 100 mm	186008371	176003817
				4.6 × 150 mm	186008372	176003818
HILIC	2.1 × 30 mm	186007103	176003156	2.1 × 30 mm	186007379	176003279
	2.1 × 50 mm	186007104	176003157	2.1 × 50 mm	186007380	176003280
	2.1 × 75 mm	186007105	176003158	2.1 × 75 mm	186007381	176003281
	2.1 × 100 mm	186007106	176003159	2.1 × 100 mm	186007382	176003282
	2.1 × 150 mm	186007107	176003160	2.1 × 150 mm	186007383	176003283
	3.0 × 30 mm	186007108	176003161	3.0 × 30 mm	186007384	176003284
	3.0 × 50 mm	186007109	176003162	3.0 × 50 mm	186007385	176003285
	3.0 × 75 mm	186007110	176003163	3.0 × 75 mm	186007386	176003286
	3.0 × 100 mm	186007111	176003164	3.0 × 100 mm	186007387	176003287
	3.0 × 150 mm	186007112	176003165	3.0 × 150 mm	186007388	176003288
				4.6 × 30 mm	186007389	176003317
				4.6 × 50 mm	186007390	176003318
				4.6 × 75 mm	186007391	176003319
				4.6 × 100 mm	186007392	176003320
				4.6 × 150 mm	186007393	176003321

CORTECS Columns *Continued*

	Particle Size: 1.6 µm			Particle Size: 2.7 µm		
	Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	P/N (3/pk)
Phenyl	2.1 × 30 mm	186008378	176003819	2.1 × 30 mm	186008318	176003789
	2.1 × 50 mm	186008379	176003820	2.1 × 50 mm	186008319	176003790
	2.1 × 75 mm	186008380	176003821	2.1 × 75 mm	186008320	176003791
	2.1 × 100 mm	186008381	176003822	2.1 × 100 mm	186008321	176003792
	2.1 × 150 mm	186008382	176003823	2.1 × 150 mm	186008322	176003793
	3.0 × 30 mm	186008388	176003824	3.0 × 30 mm	186008328	176003794
	3.0 × 50 mm	186008389	176003825	3.0 × 50 mm	186008329	176003795
	3.0 × 75 mm	186008390	176003826	3.0 × 75 mm	186008330	176003796
	3.0 × 100 mm	186008391	176003827	3.0 × 100 mm	186008331	176003797
	3.0 × 150 mm	186008392	176003828	3.0 × 150 mm	186008332	176003798
				4.6 × 30 mm	186008338	176003799
				4.6 × 50 mm	186008339	176003800
				4.6 × 75 mm	186008340	176003801
				4.6 × 100 mm	186008341	176003802
				4.6 × 150 mm	186008342	176003803
Shield RP18	2.1 × 30 mm	186008691	176003927	2.1 × 30 mm	186008661	176003912
	2.1 × 50 mm	186008692	176003928	2.1 × 50 mm	186008662	176003913
	2.1 × 75 mm	186008693	176003929	2.1 × 75 mm	186008663	176003914
	2.1 × 100 mm	186008694	176003930	2.1 × 100 mm	186008664	176003915
	2.1 × 150 mm	186008695	176003931	2.1 × 150 mm	186008665	176003916
	3.0 × 30 mm	186008701	176003932	3.0 × 30 mm	186008671	176003917
	3.0 × 50 mm	186008702	176003933	3.0 × 50 mm	186008672	176003918
	3.0 × 75 mm	186008703	176003934	3.0 × 75 mm	186008673	176003919
	3.0 × 100 mm	186008704	176003935	3.0 × 100 mm	186008674	176003920
	3.0 × 150 mm	186008705	176003936	3.0 × 150 mm	186008675	176003921
				4.6 × 30 mm	186008681	176003922
				4.6 × 50 mm	186008682	176003923
				4.6 × 75 mm	186008683	176003924
				4.6 × 100 mm	186008684	176003925
				4.6 × 150 mm	186008685	176003926

CORTECS Columns *Continued*

	Particle Size: 1.6 µm			Particle Size: 2.7 µm		
	Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	P/N (3/pk)
T3	2.1 × 30 mm	186008496	176003891	2.1 × 30 mm	186008481	176003876
	2.1 × 50 mm	186008497	176003892	2.1 × 50 mm	186008482	176003877
	2.1 × 75 mm	186008498	176003893	2.1 × 75 mm	186008483	176003878
	2.1 × 100 mm	186008499	176003894	2.1 × 100 mm	186008484	176003879
	2.1 × 150 mm	186008500	176003895	2.1 × 150 mm	186008485	176003880
	3.0 × 30 mm	186008501	176003896	3.0 × 30 mm	186008486	176003881
	3.0 × 50 mm	186008502	176003897	3.0 × 50 mm	186008487	176003882
	3.0 × 75 mm	186008503	176003898	3.0 × 75 mm	186008488	176003883
	3.0 × 100 mm	186008504	176003899	3.0 × 100 mm	186008489	176003884
	3.0 × 150 mm	186008505	176003900	3.0 × 150 mm	186008490	176003885
				4.6 × 30 mm	186008491	176003886
				4.6 × 50 mm	186008492	176003887
				4.6 × 75 mm	186008493	176003888
				4.6 × 100 mm	186008494	176003889
				4.6 × 150 mm	186008495	176003890

CORTECS Columns Method Validation Kits*

	Particle Size: 1.6 µm		Particle Size: 2.7 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
C_{18}+	2.1 × 30 mm	186007176	2.1 × 30 mm	186007439
	2.1 × 50 mm	186007177	2.1 × 50 mm	186007440
	2.1 × 75 mm	186007178	2.1 × 75 mm	186007441
	2.1 × 100 mm	186007179	2.1 × 100 mm	186007442
	2.1 × 150 mm	186007180	2.1 × 150 mm	186007443
	3.0 × 30 mm	186007181	3.0 × 30 mm	186007444
	3.0 × 50 mm	186007182	3.0 × 50 mm	186007445
	3.0 × 75 mm	186007183	3.0 × 75 mm	186007446
	3.0 × 100 mm	186007184	3.0 × 100 mm	186007447
	3.0 × 150 mm	186007185	3.0 × 150 mm	186007448
			4.6 × 30 mm	186007449
			4.6 × 50 mm	186007450
			4.6 × 75 mm	186007451
			4.6 × 100 mm	186007452
			4.6 × 150 mm	186007453
C_{18}	2.1 × 30 mm	186007156	2.1 × 30 mm	186007409
	2.1 × 50 mm	186007157	2.1 × 50 mm	186007410
	2.1 × 75 mm	186007158	2.1 × 75 mm	186007411
	2.1 × 100 mm	186007159	2.1 × 100 mm	186007412
	2.1 × 150 mm	186007160	2.1 × 150 mm	186007413
	3.0 × 30 mm	186007161	3.0 × 30 mm	186007414
	3.0 × 50 mm	186007162	3.0 × 50 mm	186007415
	3.0 × 75 mm	186007163	3.0 × 75 mm	186007416
	3.0 × 100 mm	186007164	3.0 × 100 mm	186007417
	3.0 × 150 mm	186007165	3.0 × 150 mm	186007418
			4.6 × 30 mm	186007419
			4.6 × 50 mm	186007420
			4.6 × 75 mm	186007421
			4.6 × 100 mm	186007422
			4.6 × 150 mm	186007423

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

CORTECS Columns Method Validation Kits* *Continued*

	Particle Size: 1.6 µm		Particle Size: 2.7 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
C_8	2.1 × 30 mm	186008403	2.1 × 30 mm	186008353
	2.1 × 50 mm	186008404	2.1 × 50 mm	186008354
	2.1 × 75 mm	186008405	2.1 × 75 mm	186008355
	2.1 × 100 mm	186008406	2.1 × 100 mm	186008356
	2.1 × 150 mm	186008407	2.1 × 150 mm	186008357
	3.0 × 30 mm	186008413	3.0 × 30 mm	186008363
	3.0 × 50 mm	186008414	3.0 × 50 mm	186008364
	3.0 × 75 mm	186008415	3.0 × 75 mm	186008365
	3.0 × 100 mm	186008416	3.0 × 100 mm	186008366
	3.0 × 150 mm	186008417	3.0 × 150 mm	186008367
			4.6 × 30 mm	186008373
			4.6 × 50 mm	186008374
			4.6 × 75 mm	186008375
			4.6 × 100 mm	186008376
			4.6 × 150 mm	186008377
HILIC	2.1 × 30 mm	186007166	2.1 × 30 mm	186007424
	2.1 × 50 mm	186007167	2.1 × 50 mm	186007425
	2.1 × 75 mm	186007168	2.1 × 75 mm	186007426
	2.1 × 100 mm	186007169	2.1 × 100 mm	186007427
	2.1 × 150 mm	186007170	2.1 × 150 mm	186007428
	3.0 × 30 mm	186007171	3.0 × 30 mm	186007429
	3.0 × 50 mm	186007172	3.0 × 50 mm	186007430
	3.0 × 75 mm	186007173	3.0 × 75 mm	186007431
	3.0 × 100 mm	186007174	3.0 × 100 mm	186007432
	3.0 × 150 mm	186007175	3.0 × 150 mm	186007433
			4.6 × 30 mm	186007434
			4.6 × 50 mm	186007435
			4.6 × 75 mm	186007436
			4.6 × 100 mm	186007437
			4.6 × 150 mm	186007438

CORTECS Columns Method Validation Kits* *Continued*

	Particle Size: 1.6 µm		Particle Size: 2.7 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
Phenyl	2.1 × 30 mm	186008383	2.1 × 30 mm	186008323
	2.1 × 50 mm	186008384	2.1 × 50 mm	186008324
	2.1 × 75 mm	186008405	2.1 × 75 mm	186008325
	2.1 × 100 mm	186008386	2.1 × 100 mm	186008326
	2.1 × 150 mm	186008387	2.1 × 150 mm	186008327
	3.0 × 30 mm	186008393	3.0 × 30 mm	186008333
	3.0 × 50 mm	186008394	3.0 × 50 mm	186008334
	3.0 × 75 mm	186008395	3.0 × 75 mm	186008335
	3.0 × 100 mm	186008396	3.0 × 100 mm	186008336
	3.0 × 150 mm	186008397	3.0 × 150 mm	186008337
			4.6 × 30 mm	186008343
			4.6 × 50 mm	186008344
			4.6 × 75 mm	186008345
			4.6 × 100 mm	186008346
			4.6 × 150 mm	186008347
Shield RP18	2.1 × 30 mm	186008696	2.1 × 30 mm	186008666
	2.1 × 50 mm	186008697	2.1 × 50 mm	186008667
	2.1 × 75 mm	186008698	2.1 × 75 mm	186008668
	2.1 × 100 mm	186008699	2.1 × 100 mm	186008669
	2.1 × 150 mm	186008700	2.1 × 150 mm	186008670
	3.0 × 30 mm	186008706	3.0 × 30 mm	186008676
	3.0 × 50 mm	186008707	3.0 × 50 mm	186008677
	3.0 × 75 mm	186008708	3.0 × 75 mm	186008678
	3.0 × 100 mm	186008709	3.0 × 100 mm	186008679
	3.0 × 150 mm	186008710	3.0 × 150 mm	186008680
			4.6 × 30 mm	186008686
			4.6 × 50 mm	186008687
			4.6 × 75 mm	186008688
			4.6 × 100 mm	186008689
			4.6 × 150 mm	186008690

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

CORTECS Columns Method Validation Kits* *Continued*

	Particle Size: 1.6 µm		Particle Size: 2.7 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
T3	2.1 × 30 mm	186008529	2.1 × 30 mm	186008509
	2.1 × 50 mm	186008530	2.1 × 50 mm	186008510
	2.1 × 75 mm	186008531	2.1 × 75 mm	186008516
	2.1 × 100 mm	186008536	2.1 × 100 mm	186008517
	2.1 × 150 mm	186008537	2.1 × 150 mm	186008518
	3.0 × 30 mm	186008538	3.0 × 30 mm	186008519
	3.0 × 50 mm	186008539	3.0 × 50 mm	186008520
	3.0 × 75 mm	186008540	3.0 × 75 mm	186008521
	3.0 × 100 mm	186008541	3.0 × 100 mm	186008522
	3.0 × 150 mm	186008542	3.0 × 150 mm	186008523
			4.6 × 30 mm	186008524
			4.6 × 50 mm	186008525
			4.6 × 75 mm	186008526
			4.6 × 100 mm	186008527
			4.6 × 150 mm	186008528

CORTECS VanGuard Cartridges

	Particle Size: 2.7 µm	
	Dimension	P/N (1/pk)
C_{18}+	2.1 × 5 mm	186007685
	3.9 × 5 mm	186007687
C_{18}	2.1 × 5 mm	186007682
	3.9 × 5 mm	186007684
C_8	2.1 × 5 mm	186008421
	3.9 × 5 mm	186008422
HILIC	2.1 × 5 mm	186007688
	3.9 × 5 mm	186007690
Phenyl	2.1 × 5 mm	186008418
	3.9 × 5 mm	186008419
Shield RP18	2.1 × 5 mm	186008712
	3.9 × 5 mm	186008711
T3	2.1 × 5 mm	186008506
	3.9 × 5 mm	186008507

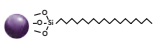
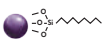
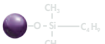
Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

XBridge BEH *XP* Columns

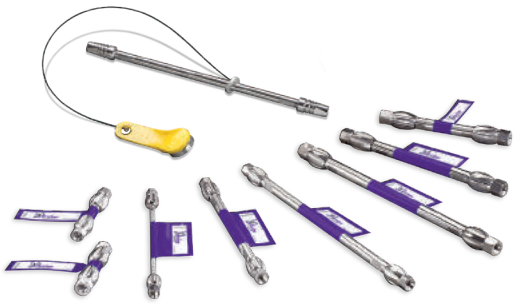
XBridge BEH ***XP*** [e***X***tended ***P***erformance] Columns offer rugged and repeatable performance that maximize efficiency and retention for all HPLC and UHPLC separation conditions. The 2.5 µm particle columns are fully scalable and complement the full range of XBridge BEH particle sizes.

Column Characteristics

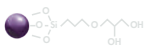
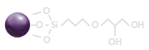
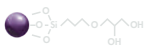
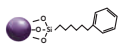
	General-Purpose Columns			Application-Specific Columns		
	BEH C_{18}, 130 Å	**BEH C_8, 130 Å**	**BEH Shield RP18, 130 Å**	**Peptide BEH C_{18}, 130 Å**	**Peptide BEH C_{18}, 300 Å**	**Protein BEH C_4, 300 Å**
	UHPLC: 2.5 µm *XP* HPLC: 3.5, 5, 10 µm	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5, 10 µm**	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5, 10 µm**	**HPLC: 3.5, 5, 10 µm**	**HPLC: 3.5, 5, 10 µm**	**HPLC: 3.5 µm**
Particle/Ligand						
Ligand Density*	3.1 µmol/m^2	3.2 µmol/m^2	3.3 µmol/m^2	3.1 µmol/m^2	3.1 µmol/m^2	2.4 µmol/m^2
Carbon Load*	18%	13%	17%	18%	12%	8%
Endcapped	Yes	Yes	Yes	Yes	Yes	No
USP Class No.	L1	L7	L1	L1	L1	L26
pH Range	1–12	1–12	2–11	1–12	1–12	1–10
Temperature Limits	Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 60 ˚C, High pH = 60 ˚C	Low pH = 50 ˚C, High pH = 45 ˚C	Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 80 ˚C, High pH = 50 ˚C
Surface Area*	185 m^2/g	185 m^2/g	185 m^2/g	185 m^2/g	90 m^2/g	90 m^2/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Cytochrome *c* Digestion Standard** p/n: 186006371	**Cytochrome *c* Digestion Standard** p/n: 186006371	**MassPREP Protein Standard Mix** p/n: 186004900
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006360	**Reversed-Phase QC Reference Material** p/n: 186006360	**Reversed-Phase QC Reference Material** p/n: 186006360	**Peptide Retention Standard** p/n: 186006555	**Peptide Retention Standard** p/n: 186006555	—

BEH Technology is also available in UPLC particle sizes (ACQUITY UPLC BEH 1.7 µm), please refer to page 96.
*Expected or approximate value.

For more information on XBridge BEH HPLC Columns, refer to page 161.



Application-Specific Columns

Protein BEH SEC, 125 Å	Protein BEH SEC, 200 Å	Protein BEH SEC, 450 Å	Oligonucleotide BEH C_{18}, 130 Å	Glycan BEH Amide, 130 A	BEH Phenyl, 130 Å	BEH HILIC, 130 Å	BEH Amide, 130 Å
HPLC: 3.5 µm	HPLC: 3.5 µm	HPLC: 3.5 µm	HPLC: 2.5 µm	UHPLC: 2.5 µm ***XP*** HPLC: 3.5 µm	UHPLC: 2.5 µm ***XP*** HPLC: 3.5, 5, 10 µm	UHPLC: 2.5 µm ***XP*** HPLC: 3.5 µm	UHPLC: 2.5 µm ***XP*** HPLC: 3.5 µm
							
4.9 µmol/m²	5.5 µmol/m²	4.8 µmol/m²	3.1 µmol/m²	7.5 µmol/m²	3.0 µmol/m²	N/A	7.5 µmol/m²
15%	12%	9%	18%	12%	15%	Unbonded	12%
No	No	No	Yes	No	Yes	N/A	No
L33	L33	L33	L1	L68	L11	L3	L68
1–8	1–8	1–8	1–12	2–11	1–12	1–9	2–11
Low pH = 60 ˚C, High pH = 60 ˚C	Low pH = 60 ˚C, High pH = 60 ˚C	Low pH = 60 ˚C, High pH = 60 ˚C	Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 90 ˚C, High pH = 90 ˚C	Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 90 ˚C, High pH = 90 ˚C
395 m²/g	220 m²/g	80 m²/g	90 m²/g	185 m²/g	185 m²/g	185 m²/g	185 m²/g
BEH 125 Protein Standard Mix p/n: 186006519	**BEH200 SEC Protein Standard Mix** p/n: 186006518	**BEH450 SEC Protein Standard Mix** p/n: 186006842	**MassPREP OST Standard** p/n: 186004135	**HILIC QC Reference Material** p/n: 186007226	**Neutrals QC Reference Material** p/n: 186006360	**HILIC QC Reference Material** p/n: 186007226	**HILIC QC Reference Material** p/n: 186007226
—	—	—	—	—	**Reversed-Phase QC Reference Material** p/n: 186006363	—	—

SepatScience TRUSTED REVIEWS

APPLICATION AREA: Oligonucleotides (Preparation and Analytical)

"Gold standard for separation of oligos."

REVIEWER: Jan Zimmermann

ORGANIZATION: ADX

XBridge Columns

BEH C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006028	176002546	2.1 × 20 mm *IS*	186003019	2.1 × 20 mm *IS*	186003107
2.1 × 50 mm *XP*	186006029	176002547	2.1 × 30 mm	186003020	2.1 × 30 mm	186003129
2.1 × 75 mm *XP*	186006030	176002548	2.1 × 50 mm	186003021	2.1 × 50 mm	186003108
2.1 × 100 mm *XP*	186006031	176002549	2.1 × 100 mm	186003022	2.1 × 100 mm	186003109
2.1 × 150 mm *XP*	186006709	176002879	2.1 × 150 mm	186003023	2.1 × 150 mm	186003110
3.0 × 30 mm *XP*	186006032	176002550	3.0 × 30 mm	186003025	3.0 × 30 mm	186003111
3.0 × 50 mm *XP*	186006033	176002551	3.0 × 50 mm	186003026	3.0 × 50 mm	186003131
3.0 × 75 mm *XP*	186006034	176002552	3.0 × 100 mm	186003027	3.0 × 100 mm	186003132
3.0 × 100 mm *XP*	186006035	176002553	3.0 × 150 mm	186003028	3.0 × 150 mm	186003112
3.0 × 150 mm *XP*	186006710	176002880	4.6 × 30 mm	186003030	3.0 × 250 mm	186003133
4.6 × 30 mm *XP*	186006036	—	4.6 × 50 mm	186003031	4.6 × 30 mm	186003135
4.6 × 50 mm *XP*	186006037	—	4.6 × 75 mm	186003032	4.6 × 50 mm	186003113
4.6 × 75 mm *XP*	186006038	—	4.6 × 100 mm	186003033	4.6 × 75 mm	186003114
4.6 × 100 mm *XP*	186006039	—	4.6 × 150 mm	186003034	4.6 × 100 mm	186003115
4.6 × 150 mm *XP*	186006711	—	4.6 × 250 mm	186003943	4.6 × 150 mm	186003116
					4.6 × 250 mm	186003117

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002972[1]	10 × 10 mm	Guard Cartridge	186003889[1]
10 × 50 mm	OBD Column	186008164	19 × 10 mm	Guard Cartridge	186003892[2]
10 × 100 mm	OBD Column	186008165	30 × 10 mm	Guard Cartridge	186006892[3]
10 × 150 mm	OBD Column	186008166	10 × 150 mm	OBD Column	186008210
10 × 250 mm	OBD Column	186008167	10 × 250 mm	OBD Column	186008211
19 × 10 mm	Guard Cartridge	186002975[2]	19 × 50 mm	OBD Column	186003893
19 × 50 mm	OBD Column	186002977	19 × 100 mm	OBD Column	186003901
19 × 100 mm	OBD Column	186002978	19 × 150 mm	OBD Column	186003894
19 × 150 mm	OBD Column	186002979	19 × 250 mm	OBD Column	186003895
19 × 250 mm	OBD Column	186004021	30 × 75 mm	OBD Column	186004711
30 × 10 mm	Guard Cartridge	186006893[3]	30 × 100 mm	OBD Column	186003930
30 × 50 mm	OBD Column	186002980	30 × 150 mm	OBD Column	186003896
30 × 75 mm	OBD Column	186002981	30 × 250 mm	OBD Column	186003897
30 × 100 mm	OBD Column	186002982	50 × 50 mm	OBD Column	186003898
30 × 150 mm	OBD Column	186003284	50 × 100 mm	OBD Column	186003902
30 × 250 mm	OBD Column	186004025	50 × 150 mm	OBD Column	186003899
50 × 50 mm	OBD Column	186003933	50 × 250 mm	OBD Column	186003900
50 × 100 mm	OBD Column	186003937			
50 × 150 mm	OBD Column	186003929			
50 × 250 mm	OBD Column	186004107			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH C_8

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006040	176002554	2.1 × 30 mm	186003046	2.1 × 30 mm	186003187
2.1 × 50 mm *XP*	186006041	176002555	2.1 × 50 mm	186003047	2.1 × 50 mm	186003011
2.1 × 75 mm *XP*	186006042	176002556	2.1 × 100 mm	186003048	2.1 × 100 mm	186003012
2.1 × 100 mm *XP*	186006043	176002557	2.1 × 150 mm	186003049	2.1 × 150 mm	186003013
2.1 × 150 mm *XP*	186006712	176002881	3.0 × 30 mm	186003182	3.0 × 30 mm	186003189
3.0 × 30 mm *XP*	186006044	176002558	3.0 × 50 mm	186003050	3.0 × 50 mm	186003190
3.0 × 50 mm *XP*	186006045	176002559	3.0 × 100 mm	186003051	3.0 × 100 mm	186003191
3.0 × 75 mm *XP*	186006046	176002560	3.0 × 150 mm	186003052	3.0 × 150 mm	186003014
3.0 × 100 mm *XP*	186006047	176002561	4.6 × 30 mm	186003184	3.0 × 250 mm	186003192
3.0 × 150 mm *XP*	186006713	176002882	4.6 × 50 mm	186003053	4.6 × 30 mm	186003194
4.6 × 30 mm *XP*	186006048	—	4.6 × 75 mm	186003185	4.6 × 50 mm	186003015
4.6 × 50 mm *XP*	186006049	—	4.6 × 100 mm	186003054	4.6 × 75 mm	186003195
4.6 × 75 mm *XP*	186006050	—	4.6 × 150 mm	186003055	4.6 × 100 mm	186003016
4.6 × 100 mm *XP*	186006051	—	4.6 × 250 mm	186003963	4.6 × 150 mm	186003017
4.6 × 150 mm *XP*	186006714	—			4.6 × 250 mm	186003018

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002991[1]	10 × 10 mm	Guard Cartridge	186004003[1]
10 × 50 mm	OBD Column	186008172	19 × 10 mm	Guard Cartridge	186004006[2]
10 × 100 mm	OBD Column	186008173	30 × 10 mm	Guard Cartridge	186006894[3]
10 × 150 mm	OBD Column	186008174	10 × 150 mm	OBD Column	186008215
10 × 250 mm	OBD Column	186008175	10 × 250 mm	OBD Column	186008216
19 × 10 mm	Guard Cartridge	186002992[2]	19 × 50 mm	OBD Column	186004007
19 × 50 mm	OBD Column	186002993	19 × 100 mm	OBD Column	186004008
19 × 100 mm	OBD Column	186002994	19 × 150 mm	OBD Column	186004009
19 × 150 mm	OBD Column	186002995	19 × 250 mm	OBD Column	186004010
19 × 250 mm	OBD Column	186004023	30 × 150 mm	OBD Column	186004011
30 × 10 mm	Guard Cartridge	186006895[3]	30 × 250 mm	OBD Column	186004012
30 × 50 mm	OBD Column	186002996	50 × 50 mm	OBD Column	186004013
30 × 75 mm	OBD Column	186003269	50 × 100 mm	OBD Column	186004014
30 × 100 mm	OBD Column	186002997	50 × 150 mm	OBD Column	186004015
30 × 150 mm	OBD Column	186003083	50 × 250 mm	OBD Column	186004016
50 × 50 mm	OBD Column	186003934			
50 × 100 mm	OBD Column	186003938			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH Shield RP18

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006052	176002562	2.1 × 30 mm	186003035	2.1 × 30 mm	186003157
2.1 × 50 mm *XP*	186006053	176002563	2.1 × 50 mm	186003036	2.1 × 50 mm	186002999
2.1 × 75 mm *XP*	186006054	176002564	2.1 × 100 mm	186003037	2.1 × 100 mm	186003002
2.1 × 100 mm *XP*	186006055	176002565	2.1 × 150 mm	186003038	2.1 × 150 mm	186003003
2.1 × 150 mm *XP*	186006715	176002883	3.0 × 30 mm	186003153	3.0 × 50 mm	186003160
3.0 × 20 mm *IS*	186003140	—	3.0 × 50 mm	186003039	3.0 × 100 mm	186003004
3.0 × 30 mm *XP*	186006056	176002566	3.0 × 100 mm	186003040	3.0 × 150 mm	186003005
3.0 × 50 mm *XP*	186006057	176002567	3.0 × 150 mm	186003041	3.0 × 250 mm	186003161
3.0 × 75 mm *XP*	186006058	176002568	4.6 × 30 mm	186003155	4.6 × 50 mm	186003006
3.0 × 100 mm *XP*	186006059	176002569	4.6 × 50 mm	186003042	4.6 × 75 mm	186003007
3.0 × 150 mm *XP*	186006716	176002884	4.6 × 75 mm	186003043	4.6 × 100 mm	186003008
4.6 × 20 mm *IS*	186003144	—	4.6 × 100 mm	186003044	4.6 × 150 mm	186003009
4.6 × 30 mm *XP*	186006060	—	4.6 × 150 mm	186003045	4.6 × 250 mm	186003010
4.6 × 50 mm *XP*	186006061	—	4.6 × 250 mm	186003964		
4.6 × 75 mm *XP*	186006062	—				
4.6 × 100 mm *XP*	186006063	—				
4.6 × 150 mm *XP*	186006717	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002983[1]	10 × 10 mm	Guard Cartridge	186003988[1]
10 × 50 mm	OBD Column	186008168	19 × 10 mm	Guard Cartridge	186003991[2]
10 × 100 mm	OBD Column	186008169	30 × 10 mm	Guard Cartridge	186006897[3]
10 × 150 mm	OBD Column	186008170	10 × 150 mm	OBD Column	186008213
10 × 250 mm	OBD Column	186008171	10 × 250 mm	OBD Column	186008214
19 × 10 mm	Guard Cartridge	186002984[2]	19 × 50 mm	OBD Column	186003992
19 × 50 mm	OBD Column	186002985	19 × 100 mm	OBD Column	186003993
19 × 100 mm	OBD Column	186002986	19 × 150 mm	OBD Column	186003994
19 × 150 mm	OBD Column	186002987	19 × 250 mm	OBD Column	186003995
19 × 250 mm	OBD Column	186004022	30 × 150 mm	OBD Column	186003996
30 × 10 mm	Guard Cartridge	186006898[3]	30 × 250 mm	OBD Column	186003997
30 × 50 mm	OBD Column	186002988	50 × 50 mm	OBD Column	186003998
30 × 75 mm	OBD Column	186003262	50 × 100 mm	OBD Column	186003999
30 × 100 mm	OBD Column	186002989	50 × 150 mm	OBD Column	186004001
30 × 150 mm	OBD Column	186002990	50 × 250 mm	OBD Column	186004002
50 × 50 mm	OBD Column	186003935			
50 × 100 mm	OBD Column	186003939			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH Phenyl

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006064	176002570	2.1 × 30 mm	186003321	2.1 × 50 mm	186003338
2.1 × 50 mm *XP*	186006065	176002571	2.1 × 50 mm	186003322	2.1 × 100 mm	186003339
2.1 × 75 mm *XP*	186006066	176002572	2.1 × 100 mm	186003323	2.1 × 150 mm	186003340
2.1 × 100 mm *XP*	186006067	176002573	2.1 × 150 mm	186003324	3.0 × 50 mm	186003343
2.1 × 150 mm *XP*	186006718	176002885	3.0 × 50 mm	186003327	3.0 × 100 mm	186003344
3.0 × 30 mm *XP*	186006068	176002574	3.0 × 100 mm	186003328	3.0 × 150 mm	186003345
3.0 × 50 mm *XP*	186006069	176002575	3.0 × 150 mm	186003329	3.0 × 250 mm	186003346
3.0 × 75 mm *XP*	186006070	176002576	4.6 × 30 mm	186003331	4.6 × 50 mm	186003349
3.0 × 100 mm *XP*	186006071	176002577	4.6 × 50 mm	186003332	4.6 × 75 mm	186003350
3.0 × 150 mm *XP*	186006719	176002886	4.6 × 75 mm	186003333	4.6 × 100 mm	186003351
4.6 × 30 mm *XP*	186006072	—	4.6 × 100 mm	186003334	4.6 × 150 mm	186003352
4.6 × 50 mm *XP*	186006073	—	4.6 × 150 mm	186003335	4.6 × 250 mm	186003353
4.6 × 75 mm *XP*	186006074	—	4.6 × 250 mm	186003965		
4.6 × 100 mm *XP*	186006075	—				
4.6 × 150 mm *XP*	186006720	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186003354[1]
10 × 50 mm	OBD Column	186008176
10 × 100 mm	OBD Column	186008177
10 × 150 mm	OBD Column	186008178
10 × 250 mm	OBD Column	186008179
19 × 10 mm	Guard Cartridge	186003355[2]
19 × 50 mm	OBD Column	186003356
19 × 100 mm	OBD Column	186003357
19 × 150 mm	OBD Column	186003358
19 × 250 mm	OBD Column	186004024
30 × 10 mm	Guard Cartridge	186006891[3]
30 × 50 mm	OBD Column	186003277
30 × 75 mm	OBD Column	186003278
30 × 100 mm	OBD Column	186003279
30 × 150 mm	OBD Column	186003276
50 × 50 mm	OBD Column	186003936
50 × 100 mm	OBD Column	186003940

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH HILIC

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006076	176002578	2.1 × 50 mm	186004432	2.1 × 50 mm	186004444
2.1 × 50 mm *XP*	186006077	176002579	2.1 × 100 mm	186004433	2.1 × 100 mm	186004445
2.1 × 75 mm *XP*	186006078	176002580	2.1 × 150 mm	186004434	2.1 × 150 mm	186004446
2.1 × 100 mm *XP*	186006079	176002581	3.0 × 100 mm	186004436	3.0 × 100 mm	186004448
2.1 × 150 mm *XP*	186006721	176002887	4.6 × 50 mm	186004439	4.6 × 50 mm	186004451
3.0 × 30 mm *XP*	186006080	176002582	4.6 × 100 mm	186004440	4.6 × 100 mm	186004452
3.0 × 50 mm *XP*	186006081	176002583	4.6 × 150 mm	186004441	4.6 × 150 mm	186004453
3.0 × 75 mm *XP*	186006082	176002584			4.6 × 250 mm	186004454
3.0 × 100 mm *XP*	186006083	176002585				
3.0 × 150 mm *XP*	186006722	176002888				
4.6 × 30 mm *XP*	186006084	–				
4.6 × 50 mm *XP*	186006085	–				
4.6 × 75 mm *XP*	186006086	–				
4.6 × 100 mm *XP*	186006087	–				
4.6 × 150 mm *XP*	186006723	–				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004720[1]
10 × 50 mm	OBD Column	186008217
10 × 100 mm	OBD Column	186008218
19 × 10 mm	Guard Cartridge	186004723[2]
19 × 50 mm	OBD Column	186004724
19 × 100 mm	OBD Column	186004725
19 × 150 mm	OBD Column	186004726
19 × 250 mm	OBD Column	186004730
30 × 10 mm	Guard Cartridge	186006896[3]
30 × 50 mm	OBD Column	186004727
30 × 100 mm	OBD Column	186004728
30 × 150 mm	OBD Column	186004729
30 × 250 mm	OBD Column	186004731
50 × 50 mm	OBD Column	186004732
50 × 100 mm	OBD Column	186004733
50 × 150 mm	OBD Column	186004734
50 × 250 mm	OBD Column	186004735

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH Amide

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006088	176002586	2.1 × 30 mm	186004858	2.1 × 30 mm	186006587
2.1 × 50 mm *XP*	186006089	176002587	2.1 × 50 mm	186004859	2.1 × 50 mm	186006588
2.1 × 75 mm *XP*	186006090	176002588	2.1 × 100 mm	186004860	2.1 × 100 mm	186006589
2.1 × 100 mm *XP*	186006091	176002589	2.1 × 150 mm	186004861	2.1 × 150 mm	186006590
2.1 × 150 mm *XP*	186006724	176002889	3.0 × 50 mm	186004863	3.0 × 50 mm	186006591
3.0 × 30 mm *XP*	186006092	176002590	3.0 × 100 mm	186004864	3.0 × 100 mm	186006592
3.0 × 50 mm *XP*	186006093	176002591	4.6 × 50 mm	186004867	4.6 × 50 mm	186006593
3.0 × 75 mm *XP*	186006094	176002592	4.6 × 100 mm	186004868	4.6 × 100 mm	186006594
3.0 × 100 mm *XP*	186006095	176002593	4.6 × 150 mm	186004869	4.6 × 150 mm	186006595
3.0 × 150 mm *XP*	186006725	176002890	4.6 × 250 mm	186004870	4.6 × 250 mm	186006596
4.6 × 30 mm *XP*	186006096	—				
4.6 × 50 mm *XP*	186006097	—				
4.6 × 75 mm *XP*	186006098	—				
4.6 × 100 mm *XP*	186006099	—				
4.6 × 150 mm *XP*	186006726	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186006597[1]
10 × 50 mm	OBD Column	186008260
10 × 100 mm	OBD Column	186008261
10 × 150 mm	OBD Column	186008262
10 × 250 mm	OBD Column	186008263
19 × 10 mm	Guard Cartridge	186006598[2]
19 × 50 mm	OBD Column	186006603
19 × 100 mm	OBD Column	186006604
19 × 150 mm	OBD Column	186006605
19 × 250 mm	OBD Column	186006606
30 × 10 mm	Guard Cartridge	186006890[3]
30 × 50 mm	OBD Column	186006607
30 × 75 mm	OBD Column	186006608
30 × 100 mm	OBD Column	186006609
30 × 150 mm	OBD Column	186006610
30 × 250 mm	OBD Column	186006611

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

Glycan BEH Amide, 130 Å

ANALYTICAL COLUMNS

Particle Size: 2.5 µm		Particle Size: 3.5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm *XP*	186007263	2.1 × 50 mm	186007502
2.1 × 100 mm *XP*	186007264	2.1 × 100 mm	186007503
2.1 × 150 mm *XP*	186007265	2.1 × 150 mm	186007504
3.0 × 30 mm *XP*	186008038	4.6 × 50 mm	186007273
3.0 × 75 mm *XP*	186008039	4.6 × 100 mm	186007274
3.0 × 150 mm *XP*	186008040	4.6 × 150 mm	186007275
4.6 × 50 mm *XP*	186007268	4.6 × 250 mm	186007276
4.6 × 100 mm *XP*	186007269		
4.6 × 150 mm *XP*	186007270		

Peptide BEH C_{18}, 130 Å

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
1.0 × 50 mm	186003560	1.0 × 50 mm	186003571
1.0 × 100 mm	186003561	1.0 × 100 mm	186003572
1.0 × 150 mm	186003562	1.0 × 150 mm	186003573
2.1 × 50 mm	186003563	2.1 × 50 mm	186003574
2.1 × 100 mm	186003564	2.1 × 100 mm	186003575
2.1 × 150 mm	186003565	2.1 × 150 mm	186003576
2.1 × 250 mm	186003566	2.1 × 250 mm	186003577
4.6 × 50 mm	186003567	4.6 × 50 mm	186003578
4.6 × 100 mm	186003568	4.6 × 100 mm	186003579
4.6 × 150 mm	186003569	4.6 × 150 mm	186003580
4.6 × 250 mm	186003570	4.6 × 250 mm	186003581

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004469[1]	4.6 × 50 mm	OBD Column	186003648
10 × 50 mm	OBD Column	186008186	4.6 × 100 mm	OBD Column	186003649
10 × 100 mm	OBD Column	186008187	4.6 × 150 mm	OBD Column	186003650
10 × 150 mm	OBD Column	186008188	4.6 × 250 mm	OBD Column	186003651
10 × 250 mm	OBD Column	186008189	10 × 10 mm	Guard Cartridge	186004465[1]
19 × 10 mm	Guard Cartridge	186004468[2]	10 × 50 mm	OBD Column	186008194
19 × 50 mm	OBD Column	186003586	10 × 100 mm	OBD Column	186008195
19 × 100 mm	OBD Column	186003587	10 × 150 mm	OBD Column	186008196
19 × 150 mm	OBD Column	186003945	10 × 250 mm	OBD Column	186008197
			19 × 10 mm	Guard Cartridge	186004464[2]
			19 × 50 mm	OBD Column	186003656
			19 × 150 mm	OBD Column	186003657
			19 × 250 mm	OBD Column	186003658
			30 × 50 mm	OBD Column	186003659
			30 × 100 mm	OBD Column	186003660
			30 × 150 mm	OBD Column	186003661
			30 × 250 mm	OBD Column	186003662

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

SelectScience® TRUSTED REVIEWS

APPLICATION AREA: Analyze Marine Biotoxins

"High quality and repeatability. We are accredited by ISO 17025. Great results and necessary for our Institute! The most important is the support and the seminars that Waters offers."

REVIEWER: Anna Safont
ORGANIZATION: IRTA

Peptide BEH C_{18}, 300 Å

ANALYTICAL COLUMNS

Particle Size: 2.5 µm		Particle Size: 3.5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006028	1.0 × 50 mm	186003604
2.1 × 50 mm *XP*	186006029	1.0 × 100 mm	186003605
2.1 × 75 mm *XP*	186006030	1.0 × 150 mm	186003606
2.1 × 100 mm *XP*	186006031	2.1 × 50 mm	186003607
2.1 × 150 mm *XP*	186006709	2.1 × 100 mm	186003608
3.0 × 30 mm *XP*	186006032	2.1 × 150 mm	186003609
3.0 × 50 mm *XP*	186006033	2.1 × 250 mm	186003610
3.0 × 75 mm *XP*	186006034	4.6 × 50 mm	186003611
3.0 × 100 mm *XP*	186006035	4.6 × 100 mm	186003612
3.0 × 150 mm *XP*	186006710	4.6 × 150 mm	186003613
4.6 × 30 mm *XP*	186006036	4.6 × 250 mm	186003614
4.6 × 50 mm *XP*	186006037		
4.6 × 75 mm *XP*	186006038		
4.6 × 100 mm *XP*	186006039		
4.6 × 150 mm *XP*	186006711		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004471[1]	4.6 × 50 mm	OBD Column	186003663
10 × 50 mm	OBD Column	186008190	4.6 × 100 mm	OBD Column	186003664
10 × 100 mm	OBD Column	186008191	4.6 × 150 mm	OBD Column	186003665
10 × 150 mm	OBD Column	186008192	4.6 × 250 mm	OBD Column	186003666
10 × 250 mm	OBD Column	186008193	10 × 10 mm	Guard Cartridge	186004467[1]
19 × 10 mm	Guard Cartridge	186004470[2]	10 × 50 mm	OBD Column	186008198
19 × 50 mm	OBD Column	186003630	10 × 100 mm	OBD Column	186008199
19 × 100 mm	OBD Column	186003631	10 × 150 mm	OBD Column	186008200
19 × 150 mm	OBD Column	186003946	10 × 250 mm	OBD Column	186008201
			19 × 10 mm	Guard Cartridge	186004466[2]
			19 × 50 mm	OBD Column	186003671
			19 × 150 mm	OBD Column	186003672
			19 × 250 mm	OBD Column	186003673
			30 × 10 mm	Guard Cartridge	186006882[3]
			30 × 50 mm	OBD Column	186003674
			30 × 100 mm	OBD Column	186003675
			30 × 150 mm	OBD Column	186003676
			30 × 250 mm	OBD Column	186003677

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Cartridge Holder, p/n: 186006912.

Protein BEH C_4, 300 Å

ANALYTICAL COLUMNS		PREPARATIVE COLUMNS					
Particle Size: 3.5 µm		Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	P/N (1/pk)	Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
2.1 × 50 mm	186004498	10 × 10 mm	Guard Cartridge	186007305[1]	10 × 10 mm	Guard Cartridge	186007325[1]
2.1 × 100 mm	186004499	10 × 50 mm	OBD Column	186008272	10 × 50 mm	OBD Column	186008276
2.1 × 150 mm	186004500	10 × 100 mm	OBD Column	186008273	10 × 100 mm	OBD Column	186008277
2.1 × 250 mm	186004501	10 × 150 mm	OBD Column	186008274	10 × 150 mm	OBD Column	186008278
4.6 × 50 mm	186004502	10 × 250 mm	OBD Column	186008275	10 × 250 mm	OBD Column	186008279
4.6 × 100 mm	186004503	19 × 10 mm	Guard Cartridge	186007310[2]	19 × 10 mm	Guard Cartridge	186007330[2]
4.6 × 150 mm	186004504	19 × 50 mm	OBD Column	186007311	19 × 50 mm	OBD Column	186007331
4.6 × 250 mm	186004505	19 × 100 mm	OBD Column	186007312	19 × 100 mm	OBD Column	186007332
		19 × 150 mm	OBD Column	186007313	19 × 150 mm	OBD Column	186007333
		19 × 250 mm	OBD Column	186007314	19 × 250 mm	OBD Column	186007334
		30 × 10 mm	Guard Cartridge	186007315[3]	30 × 10 mm	Guard Cartridge	186007335[3]
		30 × 50 mm	OBD Column	186007316	30 × 50 mm	OBD Column	186007336
		30 × 75 mm	OBD Column	186007317	30 × 75 mm	OBD Column	186007337
		30 × 100 mm	OBD Column	186007318	30 × 100 mm	OBD Column	186007338
		30 × 150 mm	OBD Column	186007319	30 × 150 mm	OBD Column	186007339
		30 × 250 mm	OBD Column	186007320	30 × 250 mm	OBD Column	186007340

Oligonucleotide BEH C_{18}, 130 Å

PREPARATIVE COLUMNS		
Particle Size: 2.5 µm		
Dimension	Type	P/N (1/pk)
10 × 50 mm	OBD Column	186008212

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

APPLICATION AREA: Analyte/Metabolite Analysis from Human Plasma Samples

"I've always been a big fan of XBridge columns. Their versatility across wide pH ranges and ruggedness to withstand thousands of injections is ideal for our fast paced CRO environment. High plate counts demonstrate great column efficiency allowing us the versatility to forgo UPLC applications. Column durability and applicability across highly variable analyte chemistries make XBridge columns very attractive for our workflows."

REVIEWER: Matthew Mascarie

ORGANIZATION: Syneos Health

XBridge Columns Method Validation Kits*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
BEH C_{18}	2.1 × 50 mm *XP*	186006197	2.1 × 100 mm	186003766	2.1 × 150 mm	186003771
	2.1 × 100 mm *XP*	186006198	3.0 × 100 mm	186003767	3.0 × 100 mm	186003772
	2.1 × 150 mm *XP*	186006757	3.0 × 150 mm	186003768	3.0 × 150 mm	186003773
	3.0 × 50 mm *XP*	186006199	4.6 × 100 mm	186003769	4.6 × 100 mm	186003774
	3.0 × 100 mm *XP*	186006200	4.6 × 150 mm	186003770	4.6 × 150 mm	186003775
	3.0 × 150 mm *XP*	186006758			4.6 × 250 mm	186003776
	4.6 × 50 mm *XP*	186006201				
	4.6 × 100 mm *XP*	186006202				
	4.6 × 150 mm *XP*	186006759				
BEH C_8	2.1 × 50 mm *XP*	186006203	2.1 × 100 mm	186003777	2.1 × 150 mm	186003782
	2.1 × 100 mm *XP*	186006204	3.0 × 100 mm	186003778	3.0 × 100 mm	186003783
	2.1 × 150 mm *XP*	186006760	3.0 × 150 mm	186003779	3.0 × 150 mm	186003784
	3.0 × 50 mm *XP*	186006205	4.6 × 100 mm	186003780	4.6 × 100 mm	186003785
	3.0 × 100 mm *XP*	186006206	4.6 × 150 mm	186003781	4.6 × 150 mm	186003786
	3.0 × 150 mm *XP*	186006761			4.6 × 250 mm	186003787
	4.6 × 50 mm *XP*	186006207				
	4.6 × 100 mm *XP*	186006208				
	4.6 × 150 mm *XP*	186006762				
BEH Shield RP18	2.1 × 50 mm *XP*	186006209	2.1 × 100 mm	186003788	2.1 × 150 mm	186003793
	2.1 × 100 mm *XP*	186006210	3.0 × 100 mm	186003789	3.0 × 100 mm	186003794
	2.1 × 150 mm *XP*	186006763	3.0 × 150 mm	186003790	3.0 × 150 mm	186003795
	3.0 × 50 mm *XP*	186006211	4.6 × 100 mm	186003791	4.6 × 100 mm	186003796
	3.0 × 100 mm *XP*	186006212	4.6 × 150 mm	186003792	4.6 × 150 mm	186003797
	3.0 × 150 mm *XP*	186006774			4.6 × 250 mm	186003798
	4.6 × 50 mm *XP*	186006213				
	4.6 × 100 mm *XP*	186006214				
	4.6 × 150 mm *XP*	186006775				
BEH Phenyl	2.1 × 50 mm *XP*	186006215	2.1 × 100 mm	186003799	2.1 × 150 mm	186003804
	2.1 × 100 mm *XP*	186006216	3.0 × 100 mm	186003800	3.0 × 100 mm	186003805
	2.1 × 150 mm *XP*	186006776	3.0 × 150 mm	186003801	3.0 × 150 mm	186003806
	3.0 × 50 mm *XP*	186006217	4.6 × 100 mm	186003802	4.6 × 100 mm	186003807
	3.0 × 100 mm *XP*	186006218	4.6 × 150 mm	186003803	4.6 × 150 mm	186003808
	3.0 × 150 mm *XP*	186006777			4.6 × 250 mm	186003809
	4.6 × 50 mm *XP*	186006219				
	4.6 × 100 mm *XP*	186006220				
	4.6 × 150 mm *XP*	186006778				

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

XBridge Columns Method Validation Kits* *Continued*

Particle Size: 2.5 µm		
	Dimension	P/N (3/pk)
HILIC	2.1 × 50 mm *XP*	186006221
	2.1 × 100 mm *XP*	186006222
	2.1 × 150 mm *XP*	186006779
	3.0 × 50 mm *XP*	186006223
	3.0 × 100 mm *XP*	186006224
	3.0 × 150 mm *XP*	186006780
	4.6 × 50 mm *XP*	186006225
	4.6 × 100 mm *XP*	186006226
	4.6 × 150 mm *XP*	186006781

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

Particle Size: 2.5 µm		
	Dimension	P/N (3/pk)
Amide	2.1 × 50 mm *XP*	186006227
	2.1 × 100 mm *XP*	186006228
	2.1 × 150 mm *XP*	186006782
	3.0 × 50 mm *XP*	186006229
	3.0 × 100 mm *XP*	186006230
	3.0 × 150 mm *XP*	186006783
	4.6 × 50 mm *XP*	186006231
	4.6 × 100 mm *XP*	186006232
	4.6 × 150 mm *XP*	186006784
Glycan BEH Amide, 130 Å	2.1 × 150 mm *XP*	186007266
	4.6 × 150 mm *XP*	186007271
Oligonucleotide BEH C_{18}, 130 Å	4.6 × 50 mm	186004906

XBridge VanGuard Cartridges

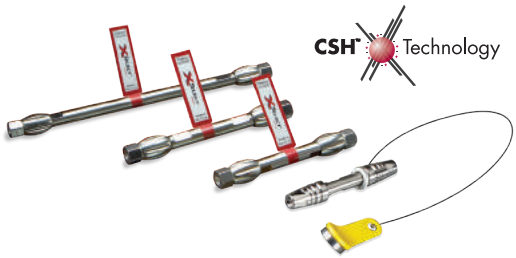
	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
BEH C_{18}	2.1 × 5 mm *XP*	186007772	2.1 × 5 mm	186007766	2.1 × 5 mm	186007769
	3.9 × 5 mm *XP*	186007774	3.9 × 5 mm	186007768	3.9 × 5 mm	186007771
BEH C_8	2.1 × 5 mm *XP*	186007781	2.1 × 5 mm	186007775	2.1 × 5 mm	186007778
	3.9 × 5 mm *XP*	186007783	3.9 × 5 mm	186007777	3.9 × 5 mm	186007780
BEH Shield RP18	2.1 × 5 mm *XP*	186007808	2.1 × 5 mm	186007802	2.1 × 5 mm	186007805
	3.9 × 5 mm *XP*	186007810	3.9 × 5 mm	186007804	3.9 × 5 mm	186007807
BEH Phenyl	2.1 × 5 mm *XP*	186007799	2.1 × 5 mm	186007793	2.1 × 5 mm	186007796
	3.9 × 5 mm *XP*	186007801	3.9 × 5 mm	186007795	3.9 × 5 mm	186007798
BEH HILIC	2.1 × 5 mm *XP*	186007790	2.1 × 5 mm	186007784	2.1 × 5 mm	186007787
	3.9 × 5 mm *XP*	186007792	3.9 × 5 mm	186007786	3.9 × 5 mm	186007789
BEH Amide	2.1 × 5 mm *XP*	186007763	2.1 × 5 mm	186007757	2.1 × 5 mm	186007760
	3.9 × 5 mm *XP*	186007765	3.9 × 5 mm	186007759	3.9 × 5 mm	186007762

Universal VanGuard Cartridge Holder

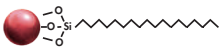
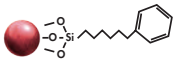
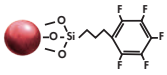
Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

XSelect CSH *XP* and HSS *XP* Columns

For the method developer, columns that maximize separation selectivity are among the most powerful tools for influencing chromatographic behavior. The carefully chosen bonded ligands used for XSelect CSH ***XP*** and XSelect HSS ***XP*** Columns redefine the broadly selective phases tailored for modern UHPLC separations. With a selection of two base particle technologies combined with eight selectivity optimized bonded phases, XSelect Columns help reduce method development effort.



Column Characteristics

	CSH C_{18}, 130 Å	CSH Phenyl-Hexyl, 130 Å	CSH Fluoro-Phenyl, 130 Å
	UHPLC: 2.5 µm ***XP*** HPLC: 3.5, 5, 10 µm	UHPLC: 2.5 µm ***XP*** HPLC: 3.5, 5 µm	UHPLC: 2.5 µm ***XP*** HPLC: 3.5, 5 µm
Particle/Ligand			
Ligand Density*	2.3 µmol/m²	2.3 µmol/m²	2.3 µmol/m²
Carbon Load*	15%	14%	10%
Endcapped	Yes	Yes	No
USP Class No.	L1	L11	L43
pH Range	1–11	1–11	1–8
Temperature Limits	Low pH = 80 °C, High pH = 45 °C	Low pH = 80 °C, High pH = 45 °C	Low pH = 60 °C, High pH = 45 °C
Surface Area*	185 m²/g	185 m²/g	185 m²/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

XSelect Columns are also available in UPLC particle sizes (ACQUITY UPLC CSH 1.7 µm and ACQUITY UPLC HSS 1.8 µm), refer to pages 93 and 101.
*Expected or approximate value.

SelectScience® TRUSTED REVIEWS

APPLICATION AREA: Analyze PAH Metabolites in Water Samples

"The XSelect (column) has been very effective in proper chromatographic separation of OHPAHs."

REVIEWER: Lisandra Trine

ORGANIZATION: Oregon State University

For more information on XSelect CSH and HSS HPLC Columns, refer to page 176.

Ordering Information

XSelect CSH Columns

CSH C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm ***XP***	186006100	176002594	1.0 × 50 mm	186005249	2.1 × 50 mm	186005274
2.1 × 50 mm ***XP***	186006101	176002595	1.0 × 150 mm	186005251	2.1 × 100 mm	186005275
2.1 × 75 mm ***XP***	186006102	176002596	2.1 × 30 mm	186005254	2.1 × 150 mm	186005276
2.1 × 100 mm ***XP***	186006103	176002597	2.1 × 50 mm	186005255	3.0 × 30 mm	186005279
2.1 × 150 mm ***XP***	186006727	176002891	2.1 × 75 mm	186005644	3.0 × 50 mm	186005280
3.0 × 30 mm ***XP***	186006104	176002598	2.1 × 100 mm	186005256	3.0 × 100 mm	186005281
3.0 × 50 mm ***XP***	186006105	176002599	2.1 × 150 mm	186005257	3.0 × 150 mm	186005282
3.0 × 75 mm ***XP***	186006106	176002600	3.0 × 30 mm	186005260	3.0 × 250 mm	186005283
3.0 × 100 mm ***XP***	186006107	176002601	3.0 × 50 mm	186005261	4.6 × 50 mm	186005287
3.0 × 150 mm ***XP***	186006728	176002892	3.0 × 75 mm	186005647	4.6 × 100 mm	186005289
4.6 × 30 mm ***XP***	186006108	—	3.0 × 100 mm	186005262	4.6 × 150 mm	186005290
4.6 × 50 mm ***XP***	186006109	—	3.0 × 150 mm	186005263	4.6 × 250 mm	186005291
4.6 × 75 mm ***XP***	186006110	—	4.6 × 50 mm	186005267		
4.6 × 100 mm ***XP***	186006111	—	4.6 × 75 mm	186005268		
4.6 × 150 mm ***XP***	186006729	—	4.6 × 100 mm	186005269		
			4.6 × 150 mm	186005270		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186005491[1]	Guard Cartridge	10 × 10 mm	186007285
10 × 50 mm	OBD Column	186008236	OBD Column	10 × 50 mm	186008268
10 × 100 mm	OBD Column	186008237	OBD Column	10 × 100 mm	186008269
10 × 150 mm	OBD Column	186008238	OBD Column	10 × 150 mm	186008270
10 × 250 mm	OBD Column	186008239	OBD Column	10 × 250 mm	186008271
19 × 10 mm	Guard Cartridge	186005418[2]	Guard Cartridge	19 × 10 mm	186007290
19 × 50 mm	OBD Column	186005420	OBD Column	19 × 50 mm	186007291
19 × 100 mm	OBD Column	186005421	OBD Column	19 × 100 mm	186007292
19 × 150 mm	OBD Column	186005422	OBD Column	19 × 150 mm	186007293
19 × 250 mm	OBD Column	186005492	OBD Column	19 × 250 mm	186007294
30 × 10 mm	Guard Cartridge	186006899[3]	Guard Cartridge	30 × 10 mm	186007295
30 × 50 mm	OBD Column	186005423	OBD Column	30 × 50 mm	186007296
30 × 75 mm	OBD Column	186005424	OBD Column	30 × 75 mm	186007297
30 × 100 mm	OBD Column	186005425	OBD Column	30 × 100 mm	186007298
30 × 150 mm	OBD Column	186005426	OBD Column	30 × 150 mm	186007299
30 × 250 mm	OBD Column	186005493	OBD Column	30 × 250 mm	186007300
50 × 50 mm	OBD Column	186005494	OBD Column	50 × 50 mm	186007301
50 × 100 mm	OBD Column	186005495	OBD Column	50 × 100 mm	186007302
50 × 150 mm	OBD Column	186005496	OBD Column	50 × 150 mm	186007303
50 × 250 mm	OBD Column	186005497	OBD Column	50 × 250 mm	186007304

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

CSH Fluoro-Phenyl

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006112	176002602	2.1 × 50 mm	186005310	2.1 × 50 mm	186005329
2.1 × 50 mm *XP*	186006113	176002603	2.1 × 75 mm	186005646	2.1 × 100 mm	186005330
2.1 × 75 mm *XP*	186006114	176002604	2.1 × 100 mm	186005311	2.1 × 150 mm	186005331
2.1 × 100 mm *XP*	186006115	176002605	2.1 × 150 mm	186005312	3.0 × 50 mm	186005335
2.1 × 150 mm *XP*	186006730	176002893	3.0 × 50 mm	186005316	3.0 × 100 mm	186005336
3.0 × 30 mm *XP*	186006116	176002606	3.0 × 75 mm	186005649	3.0 × 150 mm	186005337
3.0 × 50 mm *XP*	186006117	176002607	3.0 × 100 mm	186005317	3.0 × 250 mm	186005338
3.0 × 75 mm *XP*	186006118	176002608	3.0 × 150 mm	186005318	4.6 × 50 mm	186005342
3.0 × 100 mm *XP*	186006119	176002609	4.6 × 50 mm	186005322	4.6 × 75 mm	186005343
3.0 × 150 mm *XP*	186006731	176002894	4.6 × 75 mm	186005323	4.6 × 100 mm	186005344
4.6 × 30 mm *XP*	186006120	—	4.6 × 100 mm	186005324	4.6 × 150 mm	186005345
4.6 × 50 mm *XP*	186006121	—	4.6 × 150 mm	186005325	4.6 × 250 mm	186005346
4.6 × 75 mm *XP*	186006122	—				
4.6 × 100 mm *XP*	186006123	—				
4.6 × 150 mm *XP*	186006732	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186005498[1]
10 × 50 mm	OBD Column	186008240
10 × 100 mm	OBD Column	186008241
10 × 150 mm	OBD Column	186008242
10 × 250 mm	OBD Column	186008243
19 × 10 mm	Guard Cartridge	186005431[2]
19 × 50 mm	OBD Column	186005433
19 × 100 mm	OBD Column	186005434
19 × 150 mm	OBD Column	186005435
19 × 250 mm	OBD Column	186005499
30 × 10 mm	Guard Cartridge	186006900[3]
30 × 50 mm	OBD Column	186005436
30 × 75 mm	OBD Column	186005437
30 × 100 mm	OBD Column	186005438
30 × 150 mm	OBD Column	186005439
30 × 250 mm	OBD Column	186005500
50 × 50 mm	OBD Column	186005501
50 × 100 mm	OBD Column	186005502
50 × 150 mm	OBD Column	186005503
50 × 250 mm	OBD Column	186005504

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

CSH Phenyl-Hexyl

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm ***XP***	186006124	176002610	2.1 × 50 mm	186005365	2.1 × 50 mm	186005384
2.1 × 50 mm ***XP***	186006125	176002611	2.1 × 75 mm	186005645	2.1 × 100 mm	186005385
2.1 × 75 mm ***XP***	186006126	176002612	2.1 × 100 mm	186005366	2.1 × 150 mm	186005386
2.1 × 100 mm ***XP***	186006127	176002613	2.1 × 150 mm	186005367	3.0 × 50 mm	186005390
2.1 × 150 mm ***XP***	186006733	176002895	3.0 × 50 mm	186005371	3.0 × 100 mm	186005391
3.0 × 30 mm ***XP***	186006128	176002614	3.0 × 75 mm	186005648	3.0 × 150 mm	186005392
3.0 × 50 mm ***XP***	186006129	176002615	3.0 × 100 mm	186005372	3.0 × 250 mm	186005393
3.0 × 75 mm ***XP***	186006130	176002616	3.0 × 150 mm	186005373	4.6 × 50 mm	186005397
3.0 × 100 mm ***XP***	186006131	176002617	4.6 × 50 mm	186005377	4.6 × 75 mm	186005398
3.0 × 150 mm ***XP***	186006734	176002896	4.6 × 75 mm	186005378	4.6 × 100 mm	186005399
4.6 × 30 mm ***XP***	186006132	—	4.6 × 100 mm	186005379	4.6 × 150 mm	186005400
4.6 × 50 mm ***XP***	186006133	—	4.6 × 150 mm	186005380	4.6 × 250 mm	186005401
4.6 × 75 mm ***XP***	186006134	—				
4.6 × 100 mm ***XP***	186006135	—				
4.6 × 150 mm ***XP***	186006735	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186005505[1]
10 × 50 mm	OBD Column	186008244
10 × 100 mm	OBD Column	186008245
10 × 150 mm	OBD Column	186008246
10 × 250 mm	OBD Column	186008247
19 × 10 mm	Guard Cartridge	186005444[2]
19 × 50 mm	OBD Column	186005446
19 × 100 mm	OBD Column	186005447
19 × 150 mm	OBD Column	186005448
19 × 250 mm	OBD Column	186005506
30 × 10 mm	Guard Cartridge	186006901[3]
30 × 50 mm	OBD Column	186005520
30 × 75 mm	OBD Column	186005450
30 × 100 mm	OBD Column	186005451
30 × 150 mm	OBD Column	186005452
30 × 250 mm	OBD Column	186005507
50 × 50 mm	OBD Column	186005508
50 × 100 mm	OBD Column	186005509
50 × 150 mm	OBD Column	186005510
50 × 250 mm	OBD Column	186005511

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

Peptide CSH C_{18}, 130 Å

ANALYTICAL COLUMNS

Particle Size: 2.5 µm		Particle Size: 3.5 µm	
Dimension	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
2.1 × 50 mm ***XP***	186006941	2.1 × 50 mm	186006950
2.1 × 100 mm ***XP***	186006942	2.1 × 100 mm	186006951
2.1 × 150 mm ***XP***	186006943	2.1 × 150 mm	186006952
4.6 × 50 mm ***XP***	186006946	4.6 × 50 mm	186006955
4.6 × 100 mm ***XP***	186006947	4.6 × 100 mm	186006956
4.6 × 150 mm ***XP***	186007038	4.6 × 150 mm	186006957

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	**Type**	**P/N (1/pk)**	**Dimension**	**Type**	**P/N (1/pk)**
4.6 × 50 mm	Column	186007076[4]	19 × 250 mm	OBD Column	186007031
4.6 × 100 mm	Column	186007077[4]	30 × 50 mm	OBD Column	186007026
4.6 × 150 mm	Column	186007078[4]	30 × 100 mm	OBD Column	186007025
10 × 10 mm	Guard	186007015[1]	30 × 150 mm	OBD Column	186007023
10 × 50 mm	OBD Column	186008264	30 × 250 mm	OBD Column	186007024
10 × 100 mm	OBD Column	186008265	50 × 50 mm	OBD Column	186007030
10 × 150 mm	OBD Column	186008266	50 × 100 mm	OBD Column	186007027
10 × 250 mm	OBD Column	186008267	50 × 150 mm	OBD Column	186007028
19 × 10 mm	Guard	186007019[3]	50 × 250 mm	OBD Column	186007029
19 × 50 mm	OBD Column	186007022			
19 × 100 mm	OBD Column	186007020			
19 × 150 mm	OBD Column	186007021			

[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[3]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[4]For use in developing lab-scale preparative chromatography.

APPLICATION AREA: HPLC Method Development

"The XSelect ***XP*** series of columns is definitely what you are looking for when seeking sharp peaks and great resolution with small particle size. The information provided with the column is easy to understand and utilize for best performance and the Waters staff is always willing to help in any way possible. I always have a few of these on hand and have developed multiple methods utilizing them!"

REVIEWER: Zahuindanda DeForrest
ORGANIZATION: Moses Lake Industries

XSelect CSH Columns Method Validation Kits*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 50 mm *XP*	186006233	2.1 × 100 mm	186005538	2.1 × 150 mm	186005543
	2.1 × 100 mm *XP*	186006234	3.0 × 100 mm	186005539	3.0 × 100 mm	186005544
	2.1 × 150 mm *XP*	186006785	3.0 × 150 mm	186005540	3.0 × 150 mm	186005545
	3.0 × 50 mm *XP*	186006235	4.6 × 100 mm	186005541	4.6 × 100 mm	186005546
	3.0 × 100 mm *XP*	186006236	4.6 × 150 mm	186005542	4.6 × 150 mm	186005547
	3.0 × 150 mm *XP*	186006786			4.6 × 250 mm	186005548
	4.6 × 50 mm *XP*	186006237				
	4.6 × 100 mm *XP*	186006238				
	4.6 × 150 mm *XP*	186006787				
CSH Fluoro-Phenyl	2.1 × 50 mm *XP*	186006239	2.1 × 100 mm	186005549	2.1 × 150 mm	186005554
	2.1 × 100 mm *XP*	186006240	3.0 × 100 mm	186005550	3.0 × 100 mm	186005555
	2.1 × 150 mm *XP*	186006788	3.0 × 150 mm	186005551	3.0 × 150 mm	186005556
	3.0 × 50 mm *XP*	186006241	4.6 × 100 mm	186005552	4.6 × 100 mm	186005557
	3.0 × 100 mm *XP*	186006242	4.6 × 150 mm	186005553	4.6 × 150 mm	186005558
	3.0 × 150 mm *XP*	186006789			4.6 × 250 mm	186005559
	4.6 × 50 mm *XP*	186006243				
	4.6 × 100 mm *XP*	186006244				
	4.6 × 150 mm *XP*	186006790				
CSH Phenyl-Hexyl	2.1 × 50 mm *XP*	186006245	2.1 × 100 mm	186005560	2.1 × 150 mm	186005565
	2.1 × 100 mm *XP*	186006246	3.0 × 100 mm	186005561	3.0 × 100 mm	186005566
	2.1 × 150 mm *XP*	186006791	3.0 × 150 mm	186005562	3.0 × 150 mm	186005567
	3.0 × 50 mm *XP*	186006247	4.6 × 100 mm	186005563	4.6 × 100 mm	186005568
	3.0 × 100 mm *XP*	186006248	4.6 × 150 mm	186005564	4.6 × 150 mm	186005569
	3.0 × 150 mm *XP*	186006792			4.6 × 250 mm	186005570
	4.6 × 50 mm *XP*	186006249				
	4.6 × 100 mm *XP*	186006250				
	4.6 × 150 mm *XP*	186006793				
Peptide CSH C_{18}	2.1 × 100 mm *XP*	186006945	2.1 × 100 mm	186006953		
	4.6 × 100 mm *XP*	186006966	4.6 × 100 mm	186006959		

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

XSelect VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 5 mm ***XP***	186007817	2.1 × 5 mm	186007811	2.1 × 5 mm	186007814
	3.9 × 5 mm ***XP***	186007819	3.9 × 5 mm	186007813	3.9 × 5 mm	186007816
CSH Fluoro-Phenyl	2.1 × 5 mm ***XP***	186007827	2.1 × 5 mm	186007820	2.1 × 5 mm	186007824
	3.9 × 5 mm ***XP***	186007829	3.9 × 5 mm	186007822	3.9 × 5 mm	186007826
CSH Phenyl-Hexyl	2.1 × 5 mm ***XP***	186007839	2.1 × 5 mm	186007830	2.1 × 5 mm	186007836
	3.9 × 5 mm ***XP***	186007841	3.9 × 5 mm	186007832	3.9 × 5 mm	186007838

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

APPLICATION AREA: Analyze Main Product and Its Impurities

"Basically, XSelect (columns) saved my job. I couldn't separate main products of its impurities but with XSelect I have managed to do it. Peaks are sharp and well separated."

REVIEWER: Michał Irzyłowski

ORGANIZATION: OncoArendi Therapeutics SA

APPLICATION AREA: Pharmaceuticals and Metabolites

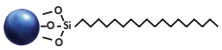
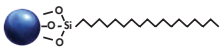
"This (XSelect ***XP***) column has provided amazing and very reproducible results when coupling HPLC to MS. Great peak shapes and no retention time drifts after long batches of analysis."

REVIEWER: Javier Jimenez Villarin

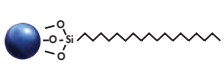
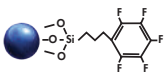
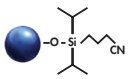
ORGANIZATION: University of Barcelona

HSS
HIGH STRENGTH SILICA

Column Characteristics

	HSS C_{18}, 100 Å	HSS C_{18} SB, 100 Å
	UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm**
Particle/Ligand		
Ligand Density*	3.2 µmol/m^2	1.6 µmol/m^2
Carbon Load*	15%	8%
Endcapped	Yes	No
USP Class No.	L1	L1
pH Range	1–8	2–8
Temperature Limits	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C
Surface Area*	230 m^2/g	230 m^2/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

The HSS Technology is available in UPLC particle sizes (ACQUITY UPLC HSS 1.8 µm).
*Expected or approximate value.

HSS T3, 100 Å	HSS PFP, 100 Å	HSS CN, 100 Å
UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm**	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm**
		
1.6 µmol/m^2	3.2 µmol/m^2	2.0 µmol/m^2
11%	7%	5%
Yes	No	No
L1	L43	L10
2–8	2–8	2–8
Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C
230 m^2/g	230 m^2/g	230 m^2/g
Neutrals QC Reference Material p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Reversed-Phase QC Reference Material p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	–

HSS C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006136	176002618	2.1 × 30 mm	186006380	2.1 × 50 mm	186006391
2.1 × 50 mm *XP*	186006137	176002619	2.1 × 50 mm	186006381	2.1 × 100 mm	186006392
2.1 × 75 mm *XP*	186006138	176002620	2.1 × 75 mm	186006382	2.1 × 150 mm	186006393
2.1 × 100 mm *XP*	186006139	176002621	2.1 × 100 mm	186006383	3.0 × 50 mm	186006396
2.1 × 150 mm *XP*	186006736	176002897	2.1 × 150 mm	186006384	3.0 × 100 mm	186006397
3.0 × 30 mm *XP*	186006140	176002622	3.0 × 30 mm	186004765	3.0 × 150 mm	186006398
3.0 × 50 mm *XP*	186006141	176002623	3.0 × 50 mm	186004766	3.0 × 250 mm	186006399
3.0 × 75 mm *XP*	186006142	176002624	3.0 × 75 mm	186005642	4.6 × 50 mm	186004852
3.0 × 100 mm *XP*	186006143	176002625	3.0 × 100 mm	186004762	4.6 × 75 mm	186006402
3.0 × 150 mm *XP*	186006737	176002898	3.0 × 150 mm	186004763	4.6 × 100 mm	186006403
4.6 × 30 mm *XP*	186006144	–	4.6 × 50 mm	186004772	4.6 × 150 mm	186004773
4.6 × 50 mm *XP*	186006145	–	4.6 × 75 mm	186006387	4.6 × 250 mm	186004775
4.6 × 75 mm *XP*	186006146	–	4.6 × 100 mm	186004767		
4.6 × 100 mm *XP*	186006147	–	4.6 × 150 mm	186004768		
4.6 × 150 mm *XP*	186006738	–	4.6 × 250 mm	186004770		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004776[1]	10 × 100 mm	OBD Column	186008223
10 × 50 mm	OBD Column	186008222	10 × 150 mm	OBD Column	186008224

HSS C_{18} SB

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006160	176002634	2.1 × 50 mm	186006422	2.1 × 50 mm	186006432
2.1 × 50 mm *XP*	186006161	176002635	2.1 × 75 mm	186006423	2.1 × 100 mm	186006433
2.1 × 75 mm *XP*	186006162	176002636	2.1 × 100 mm	186006424	2.1 × 150 mm	186006434
2.1 × 100 mm *XP*	186006163	176002637	2.1 × 150 mm	186006425	3.0 × 50 mm	186006437
2.1 × 150 mm *XP*	186006742	176002901	3.0 × 50 mm	186004747	3.0 × 100 mm	186006438
3.0 × 30 mm *XP*	186006164	176002638	3.0 × 75 mm	186005643	3.0 × 150 mm	186006439
3.0 × 50 mm *XP*	186006165	176002639	3.0 × 100 mm	186004743	3.0 × 250 mm	186006440
3.0 × 75 mm *XP*	186006166	176002640	3.0 × 150 mm	186004744	4.6 × 50 mm	186004757
3.0 × 100 mm *XP*	186006167	176002641	4.6 × 50 mm	186004753	4.6 × 75 mm	186006443
3.0 × 150 mm *XP*	186006743	176002902	4.6 × 75 mm	186006428	4.6 × 100 mm	186006444
4.6 × 30 mm *XP*	186006168	–	4.6 × 100 mm	186004748	4.6 × 150 mm	186004754
4.6 × 50 mm *XP*	186006169	–	4.6 × 150 mm	186004749	4.6 × 250 mm	186004756
4.6 × 75 mm *XP*	186006170	–	4.6 × 250 mm	186004751		
4.6 × 100 mm *XP*	186006171	–				
4.6 × 150 mm *XP*	186006744	–				

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004758[1]	10 × 100 mm	OBD Column	186008220
10 × 50 mm	OBD Column	186008219	10 × 150 mm	OBD Column	186008221

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779. [2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709. [3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

HSS T3

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006148	176002626	1.0 × 100 mm	186006459	2.1 × 50 mm	186006473
2.1 × 50 mm *XP*	186006149	176002627	1.0 × 150 mm	186006460	2.1 × 100 mm	186006474
2.1 × 75 mm *XP*	186006150	176002628	2.1 × 30 mm	186006462	2.1 × 150 mm	186006475
2.1 × 100 mm *XP*	186006151	176002629	2.1 × 50 mm	186006463	3.0 × 50 mm	186006478
2.1 × 150 mm *XP*	186006739	176002899	2.1 × 75 mm	186006464	3.0 × 100 mm	186006479
3.0 × 30 mm *XP*	186006152	176002630	2.1 × 100 mm	186006465	3.0 × 150 mm	186006480
3.0 × 50 mm *XP*	186006153	176002631	2.1 × 150 mm	186006466	3.0 × 250 mm	186006481
3.0 × 75 mm *XP*	186006154	176002632	3.0 × 30 mm	186004783	4.6 × 50 mm	186004794
3.0 × 100 mm *XP*	186006155	176002633	3.0 × 50 mm	186004784	4.6 × 75 mm	186006484
3.0 × 150 mm *XP*	186006740	176002900	3.0 × 75 mm	186005641	4.6 × 100 mm	186006485
4.6 × 30 mm *XP*	186006156	—	3.0 × 100 mm	186004780	4.6 × 150 mm	186004791
4.6 × 50 mm *XP*	186006157	—	3.0 × 150 mm	186004781	4.6 × 250 mm	186004793
4.6 × 75 mm *XP*	186006158	—	4.6 × 50 mm	186004790		
4.6 × 100 mm *XP*	186006159	—	4.6 × 75 mm	186006469		
4.6 × 150 mm *XP*	186006741	—	4.6 × 100 mm	186004785		
			4.6 × 150 mm	186004786		
			4.6 × 250 mm	186004788		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004795[1]	10 × 150 mm	OBD Column	186008227
10 × 50 mm	OBD Column	186008225	10 × 250 mm	OBD Column	186008280
10 × 100 mm	OBD Column	186008226			

HSS PFP

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006172	176002642	2.1 × 50 mm	186005847	2.1 × 50 mm	186005869
2.1 × 50 mm *XP*	186006173	176002643	2.1 × 75 mm	186005848	2.1 × 100 mm	186005871
2.1 × 75 mm *XP*	186006174	176002644	2.1 × 100 mm	186005849	2.1 × 150 mm	186005872
2.1 × 100 mm *XP*	186006175	176002645	2.1 × 150 mm	186005850	3.0 × 50 mm	186005875
2.1 × 150 mm *XP*	186006745	176002903	3.0 × 30 mm	186005852	3.0 × 100 mm	186005877
3.0 × 30 mm *XP*	186006176	176002646	3.0 × 50 mm	186005853	3.0 × 150 mm	186005878
3.0 × 50 mm *XP*	186006177	176002647	3.0 × 75 mm	186005854	3.0 × 250 mm	186005879
3.0 × 75 mm *XP*	186006178	176002648	3.0 × 100 mm	186005855	4.6 × 50 mm	186005882
3.0 × 100 mm *XP*	186006179	176002649	3.0 × 150 mm	186005856	4.6 × 75 mm	186005883
3.0 × 150 mm *XP*	186006746	176002904	4.6 × 50 mm	186005859	4.6 × 100 mm	186005884
4.6 × 30 mm *XP*	186006180	—	4.6 × 75 mm	186005860	4.6 × 150 mm	186005885
4.6 × 50 mm *XP*	186006181	—	4.6 × 100 mm	186005861	4.6 × 250 mm	186005886
4.6 × 75 mm *XP*	186006182	—	4.6 × 150 mm	186005862		
4.6 × 100 mm *XP*	186006183	—	4.6 × 250 mm	186005863		
4.6 × 150 mm *XP*	186006747	—				

[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

XSelect HSS Columns *Continued*

HSS CN

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006184	176002650	2.1 × 50 mm	186005907	2.1 × 50 mm	186005929
2.1 × 50 mm *XP*	186006185	176002651	2.1 × 75 mm	186005908	2.1 × 100 mm	186005931
2.1 × 75 mm *XP*	186006186	176002652	2.1 × 100 mm	186005909	2.1 × 150 mm	186005932
2.1 × 100 mm *XP*	186006187	176002653	2.1 × 150 mm	186005910	3.0 × 50 mm	186005935
2.1 × 150 mm *XP*	186006748	176002905	3.0 × 50 mm	186005913	3.0 × 100 mm	186005937
3.0 × 30 mm *XP*	186006188	176002654	3.0 × 75 mm	186005914	3.0 × 150 mm	186005938
3.0 × 50 mm *XP*	186006189	176002655	3.0 × 100 mm	186005915	3.0 × 250 mm	186005939
3.0 × 75 mm *XP*	186006190	176002656	3.0 × 150 mm	186005916	4.6 × 50 mm	186005942
3.0 × 100 mm *XP*	186006191	176002657	4.6 × 50 mm	186005919	4.6 × 75 mm	186005943
3.0 × 150 mm *XP*	186006749	176002906	4.6 × 75 mm	186005920	4.6 × 100 mm	186005944
4.6 × 30 mm *XP*	186006192	–	4.6 × 100 mm	186005921	4.6 × 150 mm	186005945
4.6 × 50 mm *XP*	186006193	–	4.6 × 150 mm	186005922	4.6 × 250 mm	186005946
4.6 × 75 mm *XP*	186006194	–	4.6 × 250 mm	186005923		
4.6 × 100 mm *XP*	186006195	–				
4.6 × 150 mm *XP*	186006750	–				

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

XSelect HSS Columns Method Validation Kits*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
HSS C_{18}	2.1 × 50 mm *XP*	186006251	2.1 × 100 mm	186006406	2.1 × 150 mm	186006411
	2.1 × 100 mm *XP*	186006252	3.0 × 100 mm	186006407	3.0 × 100 mm	186006412
	2.1 × 150 mm *XP*	186006794	3.0 × 150 mm	186006408	3.0 × 150 mm	186006413
	3.0 × 50 mm *XP*	186006253	4.6 × 100 mm	186006409	4.6 × 100 mm	186006414
	3.0 × 100 mm *XP*	186006254	4.6 × 150 mm	186006410	4.6 × 150 mm	186006415
	3.0 × 150 mm *XP*	186006795			4.6 × 250 mm	186006416
	4.6 × 50 mm *XP*	186006255				
	4.6 × 100 mm *XP*	186006256				
	4.6 × 150 mm *XP*	186006796				
HSS C_{18} SB	2.1 × 50 mm *XP*	186006263	2.1 × 100 mm	186006447	2.1 × 150 mm	186006452
	2.1 × 100 mm *XP*	186006264	3.0 × 100 mm	186006448	3.0 × 100 mm	186006453
	2.1 × 150 mm *XP*	186006800	3.0 × 150 mm	186006449	3.0 × 150 mm	186006454
	3.0 × 50 mm *XP*	186006265	4.6 × 100 mm	186006450	4.6 × 100 mm	186006455
	3.0 × 100 mm *XP*	186006266	4.6 × 150 mm	186006451	4.6 × 150 mm	186006456
	3.0 × 150 mm *XP*	186006801			4.6 × 250 mm	186006457
	4.6 × 50 mm *XP*	186006267				
	4.6 × 100 mm *XP*	186006268				
	4.6 × 150 mm *XP*	186006802				

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

XSelect HSS Columns Method Validation Kits* *Continued*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
HSS T3	2.1 × 50 mm *XP*	186006257	2.1 × 100 mm	186006488	2.1 × 150 mm	186006493
	2.1 × 100 mm *XP*	186006258	3.0 × 100 mm	186006489	3.0 × 100 mm	186006494
	2.1 × 150 mm *XP*	186006797	3.0 × 150 mm	186006490	3.0 × 150 mm	186006495
	3.0 × 50 mm *XP*	186006259	4.6 × 100 mm	186006491	4.6 × 100 mm	186006496
	3.0 × 100 mm *XP*	186006260	4.6 × 150 mm	186006492	4.6 × 150 mm	186006497
	3.0 × 150 mm *XP*	186006798			4.6 × 250 mm	186006498
	4.6 × 50 mm *XP*	186006261				
	4.6 × 100 mm *XP*	186006262				
	4.6 × 150 mm *XP*	186006799				
HSS PFP	2.1 × 50 mm *XP*	186006815	2.1 × 100 mm	186005890	2.1 × 150 mm	186005895
	2.1 × 100 mm *XP*	186006816	3.0 × 100 mm	186005891	3.0 × 100 mm	186005896
	2.1 × 150 mm *XP*	186006803	3.0 × 150 mm	186005892	3.0 × 150 mm	186005897
	3.0 × 50 mm *XP*	186006817	4.6 × 100 mm	186005893	4.6 × 100 mm	186005898
	3.0 × 100 mm *XP*	186006818	4.6 × 150 mm	186005894	4.6 × 150 mm	186005899
	3.0 × 150 mm *XP*	186006804			4.6 × 250 mm	186005900
	4.6 × 50 mm *XP*	186006273				
	4.6 × 100 mm *XP*	186006274				
	4.6 × 150 mm *XP*	186006805				
HSS CN	2.1 × 50 mm *XP*	186006275	2.1 × 100 mm	186005950	2.1 × 150 mm	186005955
	2.1 × 100 mm *XP*	186006276	3.0 × 100 mm	186005951	3.0 × 100 mm	186005956
	2.1 × 150 mm *XP*	186006806	3.0 × 150 mm	186005952	3.0 × 150 mm	186005957
	3.0 × 50 mm *XP*	186006277	4.6 × 100 mm	186005953	4.6 × 100 mm	186005958
	3.0 × 100 mm *XP*	186006278	4.6 × 150 mm	186005954	4.6 × 150 mm	186005959
	3.0 × 150 mm *XP*	186006807			4.6 × 250 mm	186005960
	4.6 × 50 mm *XP*	186006279				
	4.6 × 100 mm *XP*	186006280				
	4.6 × 150 mm *XP*	186006808				

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

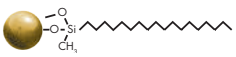
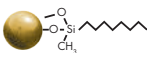
XSelect HSS VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
HSS C_{18}	2.1 × 5 mm *XP*	186007857	2.1 × 5 mm	186007851	2.1 × 5 mm	186007854
	3.9 × 5 mm *XP*	186007859	3.9 × 5 mm	186007853	3.9 × 5 mm	186007856
HSS C_{18} SB	2.1 × 5 mm *XP*	186007848	2.1 × 5 mm	186007842	2.1 × 5 mm	186007845
	3.9 × 5 mm *XP*	186007850	3.9 × 5 mm	186007844	3.9 × 5 mm	186007847
HSS T3	2.1 × 5 mm *XP*	186007884	2.1 × 5 mm	186007878	2.1 × 5 mm	186007881
	3.9 × 5 mm *XP*	186007886	3.9 × 5 mm	186007880	3.9 × 5 mm	186007883
HSS PFP	2.1 × 5 mm *XP*	186007875	2.1 × 5 mm	186007869	2.1 × 5 mm	186007872
	3.9 × 5 mm *XP*	186007877	3.9 × 5 mm	186007871	3.9 × 5 mm	186007874
HSS CN	2.1 × 5 mm *XP*	186007866	2.1 × 5 mm	186007860	2.1 × 5 mm	186007863
	3.9 × 5 mm *XP*	186007868	3.9 × 5 mm	186007862	3.9 × 5 mm	186007865

SunFire Columns

SunFire™ Columns set the standard for state-of-the-art bonded C_{18} and C_8 silica HPLC columns. Benefiting from years of research and product development, SunFire Columns represent the best in particle and bonding expertise and deliver the industry-leading level of chromatographic performance. The smaller 2.5 µm particle size allows chromatographers to gain improved sensitivity and greater efficiency. SunFire Columns with 2.5 µm particle size enable faster run times while maintaining the same resolution.

Column Characteristics

	C_{18}, 100 Å	C_8, 100 Å
	HPLC: 2.5, 3.5, 5, 10 µm	**HPLC: 2.5, 3.5, 5, 10 µm**
Particle/Ligand		
Ligand Density*	3.5 µmol/m²	3.5 µmol/m²
Carbon Load*	16%	12%
Endcapped	Yes	Yes
USP Class No.	L1	L7
pH Range	2–8	2–8
Temperature Limits	Low pH = 50 ˚C, High pH = 40 ˚C	Low pH = 40 ˚C, High pH = 40 ˚C
Surface Area*	340 m²/g	340 m²/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363 **HILIC QC Reference Material** p/n: 186007226

SunFire HPLC Columns are rated for pressures up to 6000 psi (410 bar).
*Expected or approximate value.

APPLICATION AREA: Analyze Small Molecules from Engineered Bacterial Fermentation Broth

"The column is very easy to use and the separation reproduces very well from run to run. The separation of small molecules is great with very sharp peaks. This is a very good C_{18} column as well as XBridge C_{18} column for isolating small molecules."

REVIEWER: Ende Pan

ORGANIZATION: Warp Drive Bio

For more information on SunFire Columns, refer to page 191.

SunFire Columns

C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm	186003399	2.1 × 50 mm	186002533	2.1 × 50 mm	186002539
2.1 × 50 mm	186003401	2.1 × 100 mm	186002534	2.1 × 100 mm	186002540
2.1 × 75 mm	186005634	2.1 × 150 mm	186002535	2.1 × 150 mm	186002541
3.0 × 30 mm	186003407	3.0 × 50 mm	186002542	3.0 × 50 mm	186002545
3.0 × 50 mm	186003409	3.0 × 100 mm	186002543	3.0 × 100 mm	186002546
3.0 × 75 mm	186005636	3.0 × 150 mm	186002544	3.0 × 150 mm	186002547
4.6 × 50 mm	186003417	4.6 × 20 mm *IS*	186002549	3.0 × 250 mm	186002548
		4.6 × 50 mm	186002551	4.6 × 30 mm	186002556
		4.6 × 75 mm	186002552	4.6 × 50 mm	186002557
		4.6 × 100 mm	186002553	4.6 × 100 mm	186002558
		4.6 × 150 mm	186002554	4.6 × 150 mm	186002559
				4.6 × 250 mm	186002560

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002565[1]	10 × 10 mm	Guard Cartridge	186002663[1]
10 × 50 mm	OBD Column	186008152	10 × 50 mm	OBD Column	186008208
10 × 100 mm	OBD Column	186008153	10 × 150 mm	OBD Column	186008156
10 × 150 mm	OBD Column	186008154	10 × 250 mm	OBD Column	186008157
10 × 250 mm	OBD Column	186008155	19 × 10 mm	Guard Cartridge	186002666[2]
19 × 10 mm	Guard Cartridge	186002569[2]	19 × 50 mm	OBD Column	186002667
19 × 50 mm	OBD Column	186002566	19 × 150 mm	OBD Column	186002668
19 × 100 mm	OBD Column	186002567	19 × 250 mm	OBD Column	186002669
19 × 150 mm	OBD Column	186002568	30 × 10 mm	Guard Cartridge	186006884[3]
19 × 250 mm	OBD Column	186004027	30 × 50 mm	OBD Column	186003854
30 × 10 mm	Guard Cartridge	186006885[3]	30 × 100 mm	OBD Column	186003971
30 × 50 mm	OBD Column	186002570	30 × 150 mm	OBD Column	186002670
30 × 75 mm	OBD Column	186002571	30 × 250 mm	OBD Column	186002671
30 × 100 mm	OBD Column	186002572	50 × 50 mm	OBD Column	186002871
30 × 150 mm	OBD Column	186002797	50 × 100 mm	OBD Column	186003972
30 × 250 mm	OBD Column	186003969	50 × 150 mm	OBD Column	186002672
50 × 50 mm	OBD Column	186002867	50 × 250 mm	OBD Column	186002673
50 × 100 mm	OBD Column	186002869			
50 × 150 mm	OBD Column	186003941			
50 × 250 mm	OBD Column	186003970			

*Recommended maximum pressure of 6000 psi (400 bar).
[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

C_8

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
3.0 × 50 mm	186003410	2.1 × 50 mm	186002710	2.1 × 50 mm	186002715
		2.1 × 100 mm	186002711	2.1 × 100 mm	186002716
		2.1 × 150 mm	186002712	2.1 × 150 mm	186002717
		3.0 × 50 mm	186002719	3.0 × 50 mm	186002723
		3.0 × 100 mm	186002720	3.0 × 100 mm	186002724
		3.0 × 150 mm	186002721	3.0 × 150 mm	186002725
		4.6 × 50 mm	186002729	4.6 × 30 mm	186002734
		4.6 × 75 mm	186002730	4.6 × 50 mm	186002735
		4.6 × 100 mm	186002731	4.6 × 100 mm	186002736
		4.6 × 150 mm	186002732	4.6 × 150 mm	186002737
				4.6 × 250 mm	186002738

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002750[1]	10 × 10 mm	Guard Cartridge	186002758[1]
10 × 50 mm	OBD Column	186008158	10 × 50 mm	OBD Column	186008209
10 × 100 mm	OBD Column	186008159	10 × 150 mm	OBD Column	186008162
10 × 150 mm	OBD Column	186008160	10 × 250 mm	OBD Column	186008163
10 × 250 mm	OBD Column	186008161	19 × 10 mm	Guard Cartridge	186002761[2]
19 × 10 mm	Guard Cartridge	186002754[2]	19 × 150 mm	OBD Column	186002763
19 × 50 mm	OBD Column	186002751	19 × 250 mm	OBD Column	186002764
19 × 100 mm	OBD Column	186002752	30 × 10 mm	Guard Cartridge	186006886[3]
19 × 150 mm	OBD Column	186002753	30 × 50 mm	OBD Column	186003853
19 × 250 mm	OBD Column	186004028	30 × 150 mm	OBD Column	186002765
30 × 10 mm	Guard Cartridge	186006887[3]	30 × 250 mm	OBD Column	186002766
30 × 50 mm	OBD Column	186002755	50 × 50 mm	OBD Column	186002872
30 × 75 mm	OBD Column	186002756	50 × 150 mm	OBD Column	186002767
30 × 100 mm	OBD Column	186002757	50 × 250 mm	OBD Column	186002768
30 × 150 mm	OBD Column	186002795			
50 × 50 mm	OBD Column	186002868			
50 × 100 mm	OBD Column	186002870			

*Recommended maximum pressure of 6000 psi (400 bar).
[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

SunFire Columns *Continued*

Silica

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
4.6 × 150 mm	186003453	4.6 × 150 mm	186003467
4.6 × 250 mm	186003454	4.6 × 250 mm	186003468

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	**Type**	**P/N (1/pk)**	**Dimension**	**Type**	**P/N (1/pk)**
10 × 10 mm	Guard Cartridge	186003429[1]	10 × 10 mm	Guard Cartridge	186003441[1]
10 × 50 mm	OBD Column	186008180	10 × 150 mm	OBD Column	186008184
10 × 100 mm	OBD Column	186008181	10 × 250 mm	OBD Column	186008185
10 × 150 mm	OBD Column	186008182	19 × 10 mm	Guard Cartridge	186003444[2]
10 × 250 mm	OBD Column	186008183	19 × 50 mm	OBD Column	186003445
19 × 10 mm	Guard Cartridge	186003434[2]	19 × 150 mm	OBD Column	186003446
19 × 50 mm	OBD Column	186003431	19 × 250 mm	OBD Column	186003447
19 × 100 mm	OBD Column	186003432	30 × 10 mm	Guard Cartridge	186006888[3]
19 × 150 mm	OBD Column	186003433	30 × 50 mm	OBD Column	186003855
19 × 250 mm	OBD Column	186004029	30 × 150 mm	OBD Column	186003448
30 × 10 mm	Guard Cartridge	186006889[3]	30 × 250 mm	OBD Column	186003449
30 × 50 mm	OBD Column	186003435	50 × 50 mm	OBD Column	186003450
30 × 75 mm	OBD Column	186003436	50 × 150 mm	OBD Column	186003451
30 × 100 mm	OBD Column	186003437	50 × 250 mm	OBD Column	186003452
30 × 150 mm	OBD Column	186003438			
50 × 50 mm	OBD Column	186003439			
50 × 100 mm	OBD Column	186003440			

*Recommended maximum pressure of 6000 psi (400 bar).
[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

SunFire Preparative Scouting Columns

C_{18}

PREPARATIVE COLUMNS

Particle Size: 10 µm	
Dimension	**P/N (1/pk)**
4.6 × 150 mm	186003390
4.6 × 250 mm	186003391

Silica

Particle Size: 5 µm		Particle Size: 10 µm	
Dimension	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
4.6 × 150 mm	186003453	4.6 × 150 mm	186003467
4.6 × 250 mm	186003454	4.6 × 250 mm	186003468

SunFire Columns Method Validation Kits*

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
C_{18}	4.6 × 100 mm	186002675	4.6 × 150 mm	186002679
	4.6 × 150 mm	186002676	4.6 × 250 mm	186002680
C_8	4.6 × 100 mm	186002740	4.6 × 150 mm	186002744
	4.6 × 150 mm	186002741	4.6 × 250 mm	186002745

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

SunFire VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
C_{18}	2.1 × 5 mm	186007691	2.1 × 5 mm	186007694	2.1 × 5 mm	186007697
	3.9 × 5 mm	186007693	3.9 × 5 mm	186007696	3.9 × 5 mm	186007699
C_8	2.1 × 5 mm	186007700	2.1 × 5 mm	186007703	2.1 × 5 mm	186007706
	3.9 × 5 mm	186007702	3.9 × 5 mm	186007705	3.9 × 5 mm	186007708

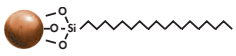
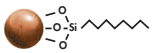
Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

XTerra Columns

XTerra™ MS and Phenyl 2.5 µm Columns combine the best properties of silica- and polymeric-bonded phases with patented Hybrid Particle Technology (HPT), which replaces one out of every three silanol groups with a methyl group during particle synthesis. HPT overcomes the limitations of silica-based materials while maintaining its best attributes for mechanical strength, chemical resistance, and easy scale up from analytical to preparative chromatography.

Column Characteristics

	MS C_{18}, 125 Å	MS C_8, 125 Å
	HPLC: 2.5, 3.5, 5, 10 µm	HPLC: 2.5, 3.5, 5, 10 µm
Particle/Ligand		
Carbon Load*	15.5%	12%
Endcapped	Yes	Yes
USP Class No.	L1	L7
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

XTerra HPLC Columns are rated for pressures up to 6000 psi (410 bar).

SpectroScience TRUSTED REVIEWS

APPLICATION AREA: High Performance Liquid Chromatography

"These columns are the best value for your money. The reproducible results you get, along with the sharp peaks can't be matched. I highly recommend these to anyone looking for great results. The prices I feel are right on target with other columns that work as awesome as these."

REVIEWER: Michael Parsowith

ORGANIZATION: Akorn

For more information on XTerra Columns, refer to page 201.

XTerra Columns

MS C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm	186000592	2.1 × 30 mm	186000398	2.1 × 20 mm *IS*	186001979
4.6 × 20 mm *IS*	186001889	2.1 × 50 mm	186000400	2.1 × 50 mm	186000446
4.6 × 30 mm	186000600	2.1 × 100 mm	186000404	2.1 × 100 mm	186000450
4.6 × 50 mm	186000602	2.1 × 150 mm	186000408	2.1 × 150 mm	186000454
4.6 × 75 mm	186000981	3.0 × 50 mm	186000414	2.1 × 250 mm	186000458
		3.0 × 100 mm	186000418	3.0 × 50 mm	186000462
		3.0 × 150 mm	186000422	3.0 × 100 mm	186000466
		3.9 × 100 mm	186000426	3.0 × 150 mm	186000470
		4.6 × 30 mm	186000430	3.0 × 250 mm	186000474
		4.6 × 50 mm	186000432	3.9 × 150 mm	186000478
		4.6 × 100 mm	186000436	4.6 × 50 mm	186000482
		4.6 × 150 mm	186000440	4.6 × 100 mm	186000486
		4.6 × 250 mm	186001470	4.6 × 150 mm	186000490
				4.6 × 250 mm	186000494

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186001168[5]	7.8 × 10 mm	Guard Cartridge	186001172[5]
7.8 × 50 mm	Column	186001152	7.8 × 150 mm	Column	186001160
7.8 × 100 mm	Column	186001156	7.8 × 300 mm	Column	186001164
7.8 × 150 mm	Column	186001475	10 × 10 mm	Guard Cartridge	186001002[1]
10 × 10 mm	Guard Cartridge	186001001[1]	10 × 150 mm	OBD Column	186008129
10 × 50 mm	OBD Column	186008103	10 × 250 mm	OBD Column	186008133
10 × 100 mm	OBD Column	186008107	10 × 300 mm	OBD Column	186008137
10 × 150 mm	OBD Column	186008141	19 × 10 mm	Guard Cartridge	186001034[2]
19 × 10 mm	Guard Cartridge	186001104[2]	19 × 50 mm	OBD Column	186002254
19 × 50 mm	OBD Column	186001930	19 × 150 mm	OBD Column	186002255
19 × 100 mm	OBD Column	186001934	19 × 250 mm	OBD Column	186002259
19 × 150 mm	OBD Column	186002379	19 × 300 mm	OBD Column	186002263
30 × 10 mm	Guard Cartridge	186006903[3]	30 × 10 mm	Guard Cartridge	186006902[3]
30 × 50 mm	OBD Column	186001938	30 × 150 mm	OBD Column	186002267
30 × 100 mm	OBD Column	186001942	30 × 250 mm	OBD Column	186002271
50 × 50 mm	OBD Column	186002218	30 × 300 mm	OBD Column	186002275
50 × 100 mm	OBD Column	186002222	50 × 50 mm	OBD Column	186002279
			50 × 150 mm	OBD Column	186002843
			50 × 250 mm	OBD Column	186002847

*Recommended maximum pressure of 6000 psi (400 bar).
[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.
[5]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

MS C_8

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 50 mm	186000603	2.1 × 50 mm	186000401	2.1 × 50 mm	186000447
		2.1 × 100 mm	186000405	2.1 × 100 mm	186000451
		2.1 × 150 mm	186000409	2.1 × 150 mm	186000455
		3.9 × 100 mm	186000427	2.1 × 250 mm	186000459
		4.6 × 50 mm	186000433	3.9 × 150 mm	186000479
		4.6 × 100 mm	186000437	4.6 × 50 mm	186000483
		4.6 × 150 mm	186000441	4.6 × 100 mm	186000487
		4.6 × 250 mm	186001471	4.6 × 150 mm	186000491
				4.6 × 250 mm	186000495

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186001169[5]	7.8 × 10 mm	Guard Cartridge	186001173[5]
7.8 × 50 mm	Column	186001153	7.8 × 150 mm	Column	186001161
7.8 × 100 mm	Column	186001157	7.8 × 300 mm	Column	186001165
7.8 × 150 mm	Column	186001476	10 × 150 mm	OBD Column	186008130
10 × 50 mm	OBD Column	186008104	10 × 250 mm	OBD Column	186008134
10 × 150 mm	OBD Column	186008142	10 × 300 mm	OBD Column	186008138
19 × 10 mm	Guard Cartridge	186001105[2]	19 × 10 mm	Guard Cartridge	186001035[2]
19 × 50 mm	OBD Column	186001931	19 × 150 mm	OBD Column	186002256
19 × 100 mm	OBD Column	186001935	19 × 250 mm	OBD Column	186002260
19 × 150 mm	OBD Column	186002380	19 × 300 mm	OBD Column	186002264
30 × 10 mm	Guard Cartridge	186006904[3]	30 × 150 mm	OBD Column	186002268
30 × 75 mm	OBD Column	186002388	30 × 250 mm	OBD Column	186002272
30 × 100 mm	OBD Column	186001943	30 × 300 mm	OBD Column	186002276
50 × 50 mm	OBD Column	186002219	50 × 50 mm	OBD Column	186002280
50 × 100 mm	OBD Column	186002223	50 × 150 mm	OBD Column	186002844

*Recommended maximum pressure of 6000 psi (400 bar).
[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.
[5] Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

XTerra Columns *Continued*

	ANALYTICAL COLUMNS			
	Particle Size: 3.5 µm		Particle Size: 5 µm	
Phenyl	**Dimension**	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
	2.1 × 50 mm	186001179	3.9 × 150 mm	186001184
	2.1 × 100 mm	186001180	4.6 × 50 mm	186001144
	2.1 × 150 mm	186001181	4.6 × 100 mm	186001145
	3.0 × 100 mm	186001142	4.6 × 150 mm	186001146
	3.0 × 150 mm	186001143	4.6 × 250 mm	186001147
	3.9 × 150 mm	186001178		
	4.6 × 50 mm	186001138		
	4.6 × 100 mm	186001139		
	4.6 × 150 mm	186001140		
	4.6 × 250 mm	186001474		

XTerra Columns Method Validation Kits*

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	**P/N (3/pk)**	**Dimension**	**P/N (3/pk)**
MS C_{18}	4.6 × 150 mm	186000826	4.6 × 150 mm	186000829
			4.6 × 250 mm	186000830
Shield RP18	4.6 × 150 mm	186000861	4.6 × 150 mm	186000862
			4.6 × 250 mm	186000863

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

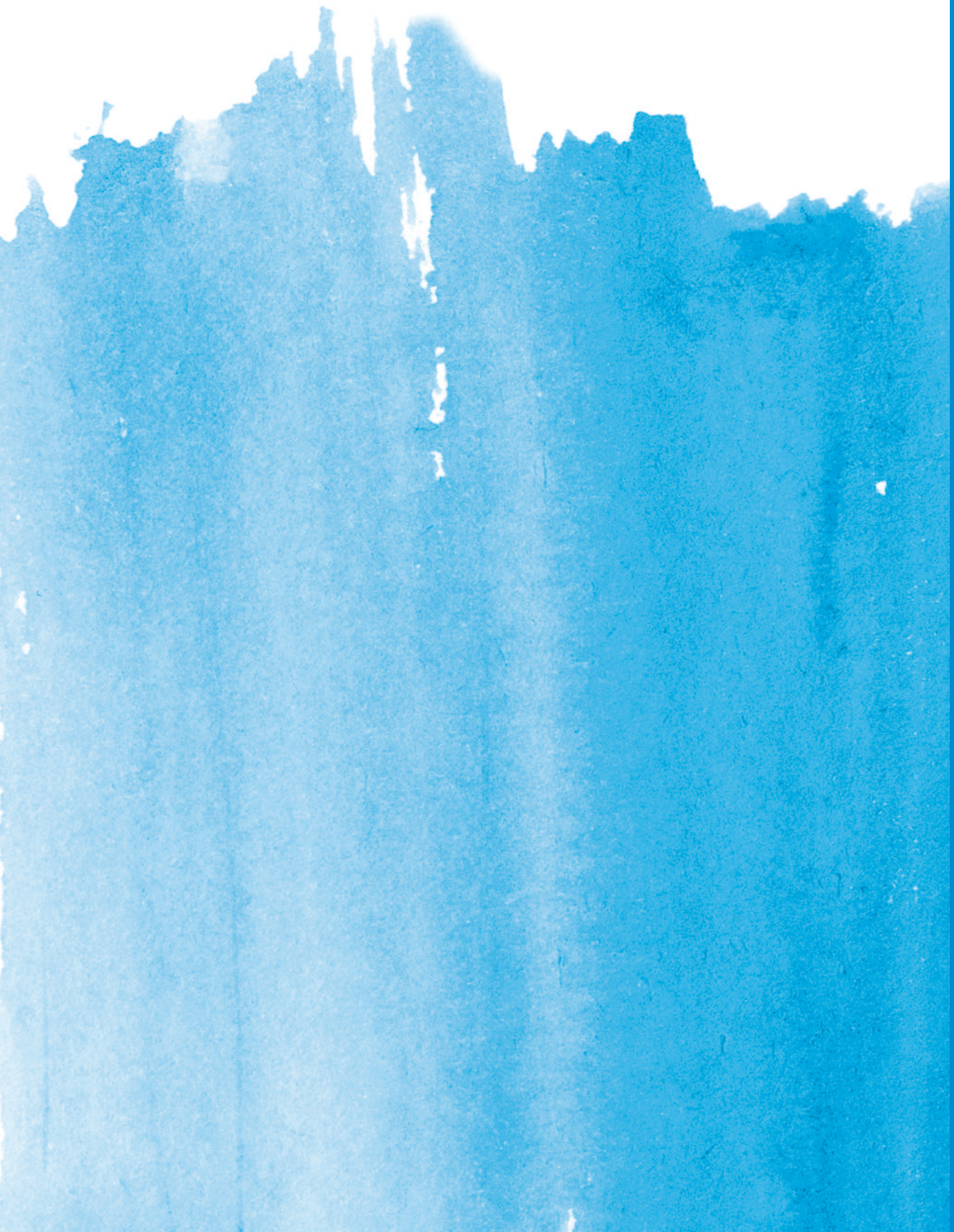
XTerra VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	**P/N (3/pk)**	**Dimension**	**P/N (3/pk)**	**Dimension**	**P/N (3/pk)**
MS C_{18}	2.1 × 5 mm	186007887	2.1 × 5 mm	186007892	2.1 × 5 mm	186007896
	3.9 × 5 mm	186007889	3.9 × 5 mm	186007894	3.9 × 5 mm	186007899
MS C_8	2.1 × 5 mm	186007901	2.1 × 5 mm	186007905	2.1 × 5 mm	186007909
	3.9 × 5 mm	186007903	3.9 × 5 mm	186007735	3.9 × 5 mm	186007739
Shield RP18			2.1 × 5 mm	186007929	2.1 × 5 mm	186007933
			3.9 × 5 mm	186007931	3.9 × 5 mm	186007935
Shield RP8			2.1 × 5 mm	186007941	3.9 × 5 mm	186007947
			3.9 × 5 mm	186007943		
Phenyl			2.1 × 5 mm	186007917	2.1 × 5 mm	186007921
			3.9 × 5 mm	186007919	3.9 × 5 mm	186007923

Universal VanGuard Cartridge Holder

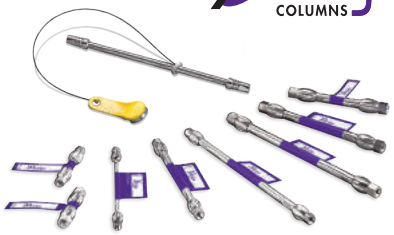
Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

≥3 µm Analytical HPLC Columns



Contents

≥3 µm Analytical HPLC Columns



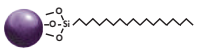
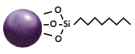
XBridge BEH Columns

XBridge BEH HPLC Columns are designed for one purpose—to maximize productivity. Whether you are creating a quality-control method or developing a leading-edge LC-MS assay, there is an XBridge Column that will fit your separation needs.

- Unique, mobile-phase, pH stability, increasing column lifetime
- Remarkable column reliability, ensuring the ruggedness of assays
- Exceptional particle efficiency, providing unmatched peak shape and capacity

With 10 general-purpose, application-specific sorbents and the widest range of particle sizes available, no other HPLC column family offers the tools you need to meet the most demanding chromatographic challenges. Whether you require robust HPLC methods, seamless UPLC transferability, or preparative scaling for product isolation, count on the versatility of an XBridge BEH HPLC Column.

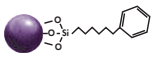
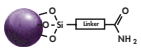
Column Characteristics

	BEH C_{18}, 130 Å	BEH Shield RP18, 130 Å	BEH C_8, 130 Å
	UHPLC: 2.5 µm *XP* HPLC: 3.5, 5, 10 µm	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5, 10 µm**	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5, 10 µm**
Particle/Ligand			
Ligand Density*	3.1 µmol/m^2	3.3 µmol/m^2	3.2 µmol/m^2
Carbon Load*	18%	17%	13%
Endcapped	Yes	Yes	Yes
USP Class No.	L1	L1	L7
pH Range	1–12	2–11	1–12
Temperature Limits	Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 50 ˚C, High pH = 45 ˚C	Low pH = 60 ˚C, High pH = 60 ˚C
Surface Area*	185 m^2/g	185 m^2/g	185 m^2/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

*Expected or approximate value.

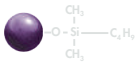
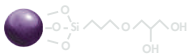
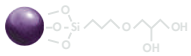
BEH Technology is also available in UPLC particle sizes (ACQUITY UPLC BEH 1.7 µm), please refer to page 96.

Column Characteristics *Continued*

	BEH Phenyl, 130 Å	BEH HILIC, 130 Å	BEH Amide, 130 Å	Glycan BEH Amide, 130 Å	Peptide BEH C_{18}, 130 Å
	UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm	UHPLC: 2.5 µm *XP* HPLC: 3.5 µm	UHPLC: 2.5 µm *XP* HPLC: 3.5 µm	UHPLC: 2.5 µm *XP* HPLC: 3.5 µm	HPLC: 3.5, 5, 10 µm
Particle/Ligand					
Ligand Density*	3.0 µmol/m^2	N/A	7.5 µmol/m^2	7.5 µmol/m^2	3.1 µmol/m^2
Carbon Load*	15%	Unbonded	12%	12%	18%
Endcapped	Yes	Yes	No	No	Yes
USP Class No.	L11	L3	L68	L68	L1
pH Range	1–12	1–9	2–11	2–11	1–12
Temperature Limits	Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 90 ˚C, High pH = 90 ˚C	Low pH = 90 ˚C, High pH = 90 ˚C	Low pH = 80 ˚C, High pH = 60 ˚C
Surface Area*	185 m^2/g	185 m^2/g	185 m^2/g	185 m^2/g	185 m^2/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**HILIC QC Reference Material** p/n: 186007226	**HILIC QC Reference Material** p/n: 186007226	**Glycan Performance Test Standard** p/n: 186006349	**Cytochrome *c* Digestion Standard** p/n: 186006371
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**HILIC QC Reference Material** p/n: 186007226	**HILIC QC Reference Material** p/n: 186007226	**Glycan Performance Test Standard** p/n: 186006349 **Dextran Calibration Standard** p/n: 186006841	**Peptide Retention Standard** p/n: 186006555

*Expected or approximate value.

BEH Technology is also available in UPLC particle sizes (ACQUITY UPLC BEH 1.7 µm), please refer to page 96.

Oligonucleotide BEH C_{18}, 130 Å	Protein BEH C_4, 300 Å	Protein BEH SEC, 125 Å	Protein BEH SEC, 200 Å	Protein BEH SEC, 450 Å
HPLC: 2.5 µm	HPLC: 3.5, 5, 10 µm	HPLC: 3.5 µm	HPLC: 3.5 µm	HPLC: 3.5 µm
				
3.1 µmol/m^2	2.4 µmol/m^2	4.9 µmol/m^2	5.5 µmol/m^2	4.8 µmol/m^2
18%	8%	15%	12%	9%
Yes	No	No	No	No
L1	L26	L33	L33	L33
1–12	1–10	1–8	1–8	1–8
Low pH = 80 ˚C, High pH = 60 ˚C	Low pH = 80 ˚C, High pH = 50 ˚C	Low pH = 60 ˚C, High pH = 60 ˚C	Low pH = 60 ˚C, High pH = 60 ˚C	Low pH = 60 ˚C, High pH = 60 ˚C
90 m^2/g	90 m^2/g	395 m^2/g	220 m^2/g	80 m^2/g
MassPREP OST Standard p/n: 186004135	**MassPREP Protein Standard Mix** p/n: 186004900	**BEH125 Protein Standard Mix** p/n: 186006519	**BEH200 SEC Protein Standard Mix** p/n: 186006518	**BEH450 SEC Protein Standard Mix** p/n: 186006842
MassPREP OST Standard p/n: 186004135	**MassPREP Protein Standard Mix** p/n: 186004900	**BEH125 Protein Standard Mix** p/n: 186006519	**BEH200 SEC Protein Standard Mix** p/n: 186006518	**BEH450 SEC Protein Standard Mix** p/n: 186006842

XBridge Columns

BEH C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006028	176002546	2.1 × 20 mm *IS*	186003019	2.1 × 20 mm *IS*	186003107
2.1 × 50 mm *XP*	186006029	176002547	2.1 × 30 mm	186003020	2.1 × 30 mm	186003129
2.1 × 75 mm *XP*	186006030	176002548	2.1 × 50 mm	186003021	2.1 × 50 mm	186003108
2.1 × 100 mm *XP*	186006031	176002549	2.1 × 100 mm	186003022	2.1 × 100 mm	186003109
2.1 × 150 mm *XP*	186006709	176002879	2.1 × 150 mm	186003023	2.1 × 150 mm	186003110
3.0 × 30 mm *XP*	186006032	176002550	3.0 × 30 mm	186003025	3.0 × 30 mm	186003111
3.0 × 50 mm *XP*	186006033	176002551	3.0 × 50 mm	186003026	3.0 × 50 mm	186003131
3.0 × 75 mm *XP*	186006034	176002552	3.0 × 100 mm	186003027	3.0 × 100 mm	186003132
3.0 × 100 mm *XP*	186006035	176002553	3.0 × 150 mm	186003028	3.0 × 150 mm	186003112
3.0 × 150 mm *XP*	186006710	176002880	4.6 × 30 mm	186003030	3.0 × 250 mm	186003133
4.6 × 30 mm *XP*	186006036	—	4.6 × 50 mm	186003031	4.6 × 30 mm	186003135
4.6 × 50 mm *XP*	186006037	—	4.6 × 75 mm	186003032	4.6 × 50 mm	186003113
4.6 × 75 mm *XP*	186006038	—	4.6 × 100 mm	186003033	4.6 × 75 mm	186003114
4.6 × 100 mm *XP*	186006039	—	4.6 × 150 mm	186003034	4.6 × 100 mm	186003115
4.6 × 150 mm *XP*	186006711	—	4.6 × 250 mm	186003943	4.6 × 150 mm	186003116
					4.6 × 250 mm	186003117

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002972[1]	10 × 10 mm	Guard Cartridge	186003889[1]
10 × 50 mm	OBD Column	186008164	19 × 10 mm	Guard Cartridge	186003892[2]
10 × 100 mm	OBD Column	186008165	30 × 10 mm	Guard Cartridge	186006892[3]
10 × 150 mm	OBD Column	186008166	10 × 150 mm	OBD Column	186008210
10 × 250 mm	OBD Column	186008167	10 × 250 mm	OBD Column	186008211
19 × 10 mm	Guard Cartridge	186002975[2]	19 × 50 mm	OBD Column	186003893
19 × 50 mm	OBD Column	186002977	19 × 100 mm	OBD Column	186003901
19 × 100 mm	OBD Column	186002978	19 × 150 mm	OBD Column	186003894
19 × 150 mm	OBD Column	186002979	19 × 250 mm	OBD Column	186003895
19 × 250 mm	OBD Column	186004021	30 × 75 mm	OBD Column	186004711
30 × 10 mm	Guard Cartridge	186006893[3]	30 × 100 mm	OBD Column	186003930
30 × 50 mm	OBD Column	186002980	30 × 150 mm	OBD Column	186003896
30 × 75 mm	OBD Column	186002981	30 × 250 mm	OBD Column	186003897
30 × 100 mm	OBD Column	186002982	50 × 50 mm	OBD Column	186003898
30 × 150 mm	OBD Column	186003284	50 × 100 mm	OBD Column	186003902
30 × 250 mm	OBD Column	186004025	50 × 150 mm	OBD Column	186003899
50 × 50 mm	OBD Column	186003933	50 × 250 mm	OBD Column	186003900
50 × 100 mm	OBD Column	186003937			
50 × 150 mm	OBD Column	186003929			
50 × 250 mm	OBD Column	186004107			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH C_8

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006040	176002554	2.1 × 30 mm	186003046	2.1 × 30 mm	186003187
2.1 × 50 mm *XP*	186006041	176002555	2.1 × 50 mm	186003047	2.1 × 50 mm	186003011
2.1 × 75 mm *XP*	186006042	176002556	2.1 × 100 mm	186003048	2.1 × 100 mm	186003012
2.1 × 100 mm *XP*	186006043	176002557	2.1 × 150 mm	186003049	2.1 × 150 mm	186003013
2.1 × 150 mm *XP*	186006712	176002881	3.0 × 30 mm	186003182	3.0 × 30 mm	186003189
3.0 × 30 mm *XP*	186006044	176002558	3.0 × 50 mm	186003050	3.0 × 50 mm	186003190
3.0 × 50 mm *XP*	186006045	176002559	3.0 × 100 mm	186003051	3.0 × 100 mm	186003191
3.0 × 75 mm *XP*	186006046	176002560	3.0 × 150 mm	186003052	3.0 × 150 mm	186003014
3.0 × 100 mm *XP*	186006047	176002561	4.6 × 30 mm	186003184	3.0 × 250 mm	186003192
3.0 × 150 mm *XP*	186006713	176002882	4.6 × 50 mm	186003053	4.6 × 30 mm	186003194
4.6 × 30 mm *XP*	186006048	—	4.6 × 75 mm	186003185	4.6 × 50 mm	186003015
4.6 × 50 mm *XP*	186006049	—	4.6 × 100 mm	186003054	4.6 × 75 mm	186003195
4.6 × 75 mm *XP*	186006050	—	4.6 × 150 mm	186003055	4.6 × 100 mm	186003016
4.6 × 100 mm *XP*	186006051	—	4.6 × 250 mm	186003963	4.6 × 150 mm	186003017
4.6 × 150 mm *XP*	186006714	—			4.6 × 250 mm	186003018

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002991[1]	10 × 10 mm	Guard Cartridge	186004003[1]
10 × 50 mm	OBD Column	186008172	19 × 10 mm	Guard Cartridge	186004006[2]
10 × 100 mm	OBD Column	186008173	30 × 10 mm	Guard Cartridge	186006894[3]
10 × 150 mm	OBD Column	186008174	10 × 150 mm	OBD Column	186008215
10 × 250 mm	OBD Column	186008175	10 × 250 mm	OBD Column	186008216
19 × 10 mm	Guard Cartridge	186002992[2]	19 × 50 mm	OBD Column	186004007
19 × 50 mm	OBD Column	186002993	19 × 100 mm	OBD Column	186004008
19 × 100 mm	OBD Column	186002994	19 × 150 mm	OBD Column	186004009
19 × 150 mm	OBD Column	186002995	19 × 250 mm	OBD Column	186004010
19 × 250 mm	OBD Column	186004023	30 × 150 mm	OBD Column	186004011
30 × 10 mm	Guard Cartridge	186006895[3]	30 × 250 mm	OBD Column	186004012
30 × 50 mm	OBD Column	186002996	50 × 50 mm	OBD Column	186004013
30 × 75 mm	OBD Column	186003269	50 × 100 mm	OBD Column	186004014
30 × 100 mm	OBD Column	186002997	50 × 150 mm	OBD Column	186004015
30 × 150 mm	OBD Column	186003083	50 × 250 mm	OBD Column	186004016
50 × 50 mm	OBD Column	186003934			
50 × 100 mm	OBD Column	186003938			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH Shield RP18

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006052	176002562	2.1 × 30 mm	186003035	2.1 × 30 mm	186003157
2.1 × 50 mm *XP*	186006053	176002563	2.1 × 50 mm	186003036	2.1 × 50 mm	186002999
2.1 × 75 mm *XP*	186006054	176002564	2.1 × 100 mm	186003037	2.1 × 100 mm	186003002
2.1 × 100 mm *XP*	186006055	176002565	2.1 × 150 mm	186003038	2.1 × 150 mm	186003003
2.1 × 150 mm *XP*	186006715	176002883	3.0 × 30 mm	186003153	3.0 × 50 mm	186003160
3.0 × 20 mm *IS*	186003140	—	3.0 × 50 mm	186003039	3.0 × 100 mm	186003004
3.0 × 30 mm *XP*	186006056	176002566	3.0 × 100 mm	186003040	3.0 × 150 mm	186003005
3.0 × 50 mm *XP*	186006057	176002567	3.0 × 150 mm	186003041	3.0 × 250 mm	186003161
3.0 × 75 mm *XP*	186006058	176002568	4.6 × 30 mm	186003155	4.6 × 50 mm	186003006
3.0 × 100 mm *XP*	186006059	176002569	4.6 × 50 mm	186003042	4.6 × 75 mm	186003007
3.0 × 150 mm *XP*	186006716	176002884	4.6 × 75 mm	186003043	4.6 × 100 mm	186003008
4.6 × 20 mm *IS*	186003144	—	4.6 × 100 mm	186003044	4.6 × 150 mm	186003009
4.6 × 30 mm *XP*	186006060	—	4.6 × 150 mm	186003045	4.6 × 250 mm	186003010
4.6 × 50 mm *XP*	186006061	—	4.6 × 250 mm	186003964		
4.6 × 75 mm *XP*	186006062	—				
4.6 × 100 mm *XP*	186006063	—				
4.6 × 150 mm *XP*	186006717	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002983[1]	10 × 10 mm	Guard Cartridge	186003988[1]
10 × 50 mm	OBD Column	186008168	19 × 10 mm	Guard Cartridge	186003991[2]
10 × 100 mm	OBD Column	186008169	30 × 10 mm	Guard Cartridge	186006897[3]
10 × 150 mm	OBD Column	186008170	10 × 150 mm	OBD Column	186008213
10 × 250 mm	OBD Column	186008171	10 × 250 mm	OBD Column	186008214
19 × 10 mm	Guard Cartridge	186002984[2]	19 × 50 mm	OBD Column	186003992
19 × 50 mm	OBD Column	186002985	19 × 100 mm	OBD Column	186003993
19 × 100 mm	OBD Column	186002986	19 × 150 mm	OBD Column	186003994
19 × 150 mm	OBD Column	186002987	19 × 250 mm	OBD Column	186003995
19 × 250 mm	OBD Column	186004022	30 × 150 mm	OBD Column	186003996
30 × 10 mm	Guard Cartridge	186006898[3]	30 × 250 mm	OBD Column	186003997
30 × 50 mm	OBD Column	186002988	50 × 50 mm	OBD Column	186003998
30 × 75 mm	OBD Column	186003262	50 × 100 mm	OBD Column	186003999
30 × 100 mm	OBD Column	186002989	50 × 150 mm	OBD Column	186004001
30 × 150 mm	OBD Column	186002990	50 × 250 mm	OBD Column	186004002
50 × 50 mm	OBD Column	186003935			
50 × 100 mm	OBD Column	186003939			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH Phenyl

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006064	176002570	2.1 × 30 mm	186003321	2.1 × 50 mm	186003338
2.1 × 50 mm *XP*	186006065	176002571	2.1 × 50 mm	186003322	2.1 × 100 mm	186003339
2.1 × 75 mm *XP*	186006066	176002572	2.1 × 100 mm	186003323	2.1 × 150 mm	186003340
2.1 × 100 mm *XP*	186006067	176002573	2.1 × 150 mm	186003324	3.0 × 50 mm	186003343
2.1 × 150 mm *XP*	186006718	176002885	3.0 × 50 mm	186003327	3.0 × 100 mm	186003344
3.0 × 30 mm *XP*	186006068	176002574	3.0 × 100 mm	186003328	3.0 × 150 mm	186003345
3.0 × 50 mm *XP*	186006069	176002575	3.0 × 150 mm	186003329	3.0 × 250 mm	186003346
3.0 × 75 mm *XP*	186006070	176002576	4.6 × 30 mm	186003331	4.6 × 50 mm	186003349
3.0 × 100 mm *XP*	186006071	176002577	4.6 × 50 mm	186003332	4.6 × 75 mm	186003350
3.0 × 150 mm *XP*	186006719	176002886	4.6 × 75 mm	186003333	4.6 × 100 mm	186003351
4.6 × 30 mm *XP*	186006072	—	4.6 × 100 mm	186003334	4.6 × 150 mm	186003352
4.6 × 50 mm *XP*	186006073	—	4.6 × 150 mm	186003335	4.6 × 250 mm	186003353
4.6 × 75 mm *XP*	186006074	—	4.6 × 250 mm	186003965		
4.6 × 100 mm *XP*	186006075	—				
4.6 × 150 mm *XP*	186006720	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186003354[1]
10 × 50 mm	OBD Column	186008176
10 × 100 mm	OBD Column	186008177
10 × 150 mm	OBD Column	186008178
10 × 250 mm	OBD Column	186008179
19 × 10 mm	Guard Cartridge	186003355[2]
19 × 50 mm	OBD Column	186003356
19 × 100 mm	OBD Column	186003357
19 × 150 mm	OBD Column	186003358
19 × 250 mm	OBD Column	186004024
30 × 10 mm	Guard Cartridge	186006891[3]
30 × 50 mm	OBD Column	186003277
30 × 75 mm	OBD Column	186003278
30 × 100 mm	OBD Column	186003279
30 × 150 mm	OBD Column	186003276
50 × 50 mm	OBD Column	186003936
50 × 100 mm	OBD Column	186003940

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH HILIC

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006076	176002578	2.1 × 50 mm	186004432	2.1 × 50 mm	186004444
2.1 × 50 mm *XP*	186006077	176002579	2.1 × 100 mm	186004433	2.1 × 100 mm	186004445
2.1 × 75 mm *XP*	186006078	176002580	2.1 × 150 mm	186004434	2.1 × 150 mm	186004446
2.1 × 100 mm *XP*	186006079	176002581	3.0 × 100 mm	186004436	3.0 × 100 mm	186004448
2.1 × 150 mm *XP*	186006721	176002887	4.6 × 50 mm	186004439	4.6 × 50 mm	186004451
3.0 × 30 mm *XP*	186006080	176002582	4.6 × 100 mm	186004440	4.6 × 100 mm	186004452
3.0 × 50 mm *XP*	186006081	176002583	4.6 × 150 mm	186004441	4.6 × 150 mm	186004453
3.0 × 75 mm *XP*	186006082	176002584			4.6 × 250 mm	186004454
3.0 × 100 mm *XP*	186006083	176002585				
3.0 × 150 mm *XP*	186006722	176002888				
4.6 × 30 mm *XP*	186006084	—				
4.6 × 50 mm *XP*	186006085	—				
4.6 × 75 mm *XP*	186006086	—				
4.6 × 100 mm *XP*	186006087	—				
4.6 × 150 mm *XP*	186006723	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004720[1]
10 × 50 mm	OBD Column	186008217
10 × 100 mm	OBD Column	186008218
19 × 10 mm	Guard Cartridge	186004723[2]
19 × 50 mm	OBD Column	186004724
19 × 100 mm	OBD Column	186004725
19 × 150 mm	OBD Column	186004726
19 × 250 mm	OBD Column	186004730
30 × 10 mm	Guard Cartridge	186006896[3]
30 × 50 mm	OBD Column	186004727
30 × 100 mm	OBD Column	186004728
30 × 150 mm	OBD Column	186004729
30 × 250 mm	OBD Column	186004731
50 × 50 mm	OBD Column	186004732
50 × 100 mm	OBD Column	186004733
50 × 150 mm	OBD Column	186004734
50 × 250 mm	OBD Column	186004735

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH Amide

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006088	176002586	2.1 × 30 mm	186004858	2.1 × 30 mm	186006587
2.1 × 50 mm *XP*	186006089	176002587	2.1 × 50 mm	186004859	2.1 × 50 mm	186006588
2.1 × 75 mm *XP*	186006090	176002588	2.1 × 100 mm	186004860	2.1 × 100 mm	186006589
2.1 × 100 mm *XP*	186006091	176002589	2.1 × 150 mm	186004861	2.1 × 150 mm	186006590
2.1 × 150 mm *XP*	186006724	176002889	3.0 × 50 mm	186004863	3.0 × 50 mm	186006591
3.0 × 30 mm *XP*	186006092	176002590	3.0 × 100 mm	186004864	3.0 × 100 mm	186006592
3.0 × 50 mm *XP*	186006093	176002591	4.6 × 50 mm	186004867	4.6 × 50 mm	186006593
3.0 × 75 mm *XP*	186006094	176002592	4.6 × 100 mm	186004868	4.6 × 100 mm	186006594
3.0 × 100 mm *XP*	186006095	176002593	4.6 × 150 mm	186004869	4.6 × 150 mm	186006595
3.0 × 150 mm *XP*	186006725	176002890	4.6 × 250 mm	186004870	4.6 × 250 mm	186006596
4.6 × 30 mm *XP*	186006096	—				
4.6 × 50 mm *XP*	186006097	—				
4.6 × 75 mm *XP*	186006098	—				
4.6 × 100 mm *XP*	186006099	—				
4.6 × 150 mm *XP*	186006726	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186006597[1]
10 × 50 mm	OBD Column	186008260
10 × 100 mm	OBD Column	186008261
10 × 150 mm	OBD Column	186008262
10 × 250 mm	OBD Column	186008263
19 × 10 mm	Guard Cartridge	186006598[2]
19 × 50 mm	OBD Column	186006603
19 × 100 mm	OBD Column	186006604
19 × 150 mm	OBD Column	186006605
19 × 250 mm	OBD Column	186006606
30 × 10 mm	Guard Cartridge	186006890[3]
30 × 50 mm	OBD Column	186006607
30 × 75 mm	OBD Column	186006608
30 × 100 mm	OBD Column	186006609
30 × 150 mm	OBD Column	186006610
30 × 250 mm	OBD Column	186006611

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

Glycan BEH Amide, 130 Å

ANALYTICAL COLUMNS

Particle Size: 2.5 µm		Particle Size: 3.5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm *XP*	186007263	2.1 × 50 mm	186007502
2.1 × 100 mm *XP*	186007264	2.1 × 100 mm	186007503
2.1 × 150 mm *XP*	186007265	2.1 × 150 mm	186007504
3.0 × 30 mm *XP*	186008038	4.6 × 50 mm	186007273
3.0 × 75 mm *XP*	186008039	4.6 × 100 mm	186007274
3.0 × 150 mm *XP*	186008040	4.6 × 150 mm	186007275
4.6 × 50 mm *XP*	186007268	4.6 × 250 mm	186007276
4.6 × 100 mm *XP*	186007269		
4.6 × 150 mm *XP*	186007270		

Peptide BEH C_{18}, 130 Å

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
1.0 × 50 mm	186003560	1.0 × 50 mm	186003571
1.0 × 100 mm	186003561	1.0 × 100 mm	186003572
1.0 × 150 mm	186003562	1.0 × 150 mm	186003573
2.1 × 50 mm	186003563	2.1 × 50 mm	186003574
2.1 × 100 mm	186003564	2.1 × 100 mm	186003575
2.1 × 150 mm	186003565	2.1 × 150 mm	186003576
2.1 × 250 mm	186003566	2.1 × 250 mm	186003577
4.6 × 50 mm	186003567	4.6 × 50 mm	186003578
4.6 × 100 mm	186003568	4.6 × 100 mm	186003579
4.6 × 150 mm	186003569	4.6 × 150 mm	186003580
4.6 × 250 mm	186003570	4.6 × 250 mm	186003581

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004469[1]	4.6 × 50 mm	OBD Column	186003648
10 × 50 mm	OBD Column	186008186	4.6 × 100 mm	OBD Column	186003649
10 × 100 mm	OBD Column	186008187	4.6 × 150 mm	OBD Column	186003650
10 × 150 mm	OBD Column	186008188	4.6 × 250 mm	OBD Column	186003651
10 × 250 mm	OBD Column	186008189	10 × 10 mm	Guard Cartridge	186004465[1]
19 × 10 mm	Guard Cartridge	186004468[2]	10 × 50 mm	OBD Column	186008194
19 × 50 mm	OBD Column	186003586	10 × 100 mm	OBD Column	186008195
19 × 100 mm	OBD Column	186003587	10 × 150 mm	OBD Column	186008196
19 × 150 mm	OBD Column	186003945	10 × 250 mm	OBD Column	186008197
			19 × 10 mm	Guard Cartridge	186004464[2]
			19 × 50 mm	OBD Column	186003656
			19 × 150 mm	OBD Column	186003657
			19 × 250 mm	OBD Column	186003658
			30 × 50 mm	OBD Column	186003659
			30 × 100 mm	OBD Column	186003660
			30 × 150 mm	OBD Column	186003661
			30 × 250 mm	OBD Column	186003662

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

Peptide BEH C_{18}, 300 Å

ANALYTICAL COLUMNS

Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006028	1.0 × 50 mm	186003604	1.0 × 50 mm	186003615
2.1 × 50 mm *XP*	186006029	1.0 × 100 mm	186003605	1.0 × 100 mm	186003616
2.1 × 75 mm *XP*	186006030	1.0 × 150 mm	186003606	1.0 × 150 mm	186003617
2.1 × 100 mm *XP*	186006031	2.1 × 50 mm	186003607	2.1 × 50 mm	186003618
2.1 × 150 mm *XP*	186006709	2.1 × 100 mm	186003608	2.1 × 100 mm	186003619
3.0 × 30 mm *XP*	186006032	2.1 × 150 mm	186003609	2.1 × 150 mm	186003620
3.0 × 50 mm *XP*	186006033	2.1 × 250 mm	186003610	2.1 × 250 mm	186003621
3.0 × 75 mm *XP*	186006034	4.6 × 50 mm	186003611	4.6 × 50 mm	186003622
3.0 × 100 mm *XP*	186006035	4.6 × 100 mm	186003612	4.6 × 100 mm	186003623
3.0 × 150 mm *XP*	186006710	4.6 × 150 mm	186003613	4.6 × 150 mm	186003624
4.6 × 30 mm *XP*	186006036	4.6 × 250 mm	186003614	4.6 × 250 mm	186003625
4.6 × 50 mm *XP*	186006037				
4.6 × 75 mm *XP*	186006038				
4.6 × 100 mm *XP*	186006039				
4.6 × 150 mm *XP*	186006711				

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004471[1]	4.6 × 50 mm	OBD Column	186003663
10 × 50 mm	OBD Column	186008190	4.6 × 100 mm	OBD Column	186003664
10 × 100 mm	OBD Column	186008191	4.6 × 150 mm	OBD Column	186003665
10 × 150 mm	OBD Column	186008192	4.6 × 250 mm	OBD Column	186003666
10 × 250 mm	OBD Column	186008193	10 × 10 mm	Guard Cartridge	186004467[1]
19 × 10 mm	Guard Cartridge	186004470[2]	10 × 50 mm	OBD Column	186008198
19 × 50 mm	OBD Column	186003630	10 × 100 mm	OBD Column	186008199
19 × 100 mm	OBD Column	186003631	10 × 150 mm	OBD Column	186008200
19 × 150 mm	OBD Column	186003946	10 × 250 mm	OBD Column	186008201
			19 × 10 mm	Guard Cartridge	186004466[2]
			19 × 50 mm	OBD Column	186003671
			19 × 150 mm	OBD Column	186003672
			19 × 250 mm	OBD Column	186003673
			30 × 10 mm	Guard Cartridge	186006882[3]
			30 × 50 mm	OBD Column	186003674
			30 × 100 mm	OBD Column	186003675
			30 × 150 mm	OBD Column	186003676
			30 × 250 mm	OBD Column	186003677

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Cartridge Holder, p/n: 186006912.

Protein BEH C_4, 300 Å

ANALYTICAL COLUMNS		PREPARATIVE COLUMNS					
Particle Size: 3.5 µm		Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	P/N (1/pk)	Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
2.1 × 50 mm	186004498	10 × 10 mm	Guard Cartridge	186007305[1]	10 × 10 mm	Guard Cartridge	186007325[1]
2.1 × 100 mm	186004499	10 × 50 mm	OBD Column	186008272	10 × 50 mm	OBD Column	186008276
2.1 × 150 mm	186004500	10 × 100 mm	OBD Column	186008273	10 × 100 mm	OBD Column	186008277
2.1 × 250 mm	186004501	10 × 150 mm	OBD Column	186008274	10 × 150 mm	OBD Column	186008278
4.6 × 50 mm	186004502	10 × 250 mm	OBD Column	186008275	10 × 250 mm	OBD Column	186008279
4.6 × 100 mm	186004503	19 × 10 mm	Guard Cartridge	186007310[2]	19 × 10 mm	Guard Cartridge	186007330[2]
4.6 × 150 mm	186004504	19 × 50 mm	OBD Column	186007311	19 × 50 mm	OBD Column	186007331
4.6 × 250 mm	186004505	19 × 100 mm	OBD Column	186007312	19 × 100 mm	OBD Column	186007332
		19 × 150 mm	OBD Column	186007313	19 × 150 mm	OBD Column	186007333
		19 × 250 mm	OBD Column	186007314	19 × 250 mm	OBD Column	186007334
		30 × 10 mm	Guard Cartridge	186007315[3]	30 × 10 mm	Guard Cartridge	186007335[3]
		30 × 50 mm	OBD Column	186007316	30 × 50 mm	OBD Column	186007336
		30 × 75 mm	OBD Column	186007317	30 × 75 mm	OBD Column	186007337
		30 × 100 mm	OBD Column	186007318	30 × 100 mm	OBD Column	186007338
		30 × 150 mm	OBD Column	186007319	30 × 150 mm	OBD Column	186007339
		30 × 250 mm	OBD Column	186007320	30 × 250 mm	OBD Column	186007340

Oligonucleotide BEH C_{18}, 130 Å

PREPARATIVE COLUMNS		
Particle Size: 2.5 µm		
Dimension	Type	P/N (1/pk)
10 × 50 mm	OBD Column	186008212

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

XBridge Columns Method Validation Kits*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
BEH C_{18}	2.1 × 50 mm *XP*	186006197	2.1 × 100 mm	186003766	2.1 × 150 mm	186003771
	2.1 × 100 mm *XP*	186006198	3.0 × 100 mm	186003767	3.0 × 100 mm	186003772
	2.1 × 150 mm *XP*	186006757	3.0 × 150 mm	186003768	3.0 × 150 mm	186003773
	3.0 × 50 mm *XP*	186006199	4.6 × 100 mm	186003769	4.6 × 100 mm	186003774
	3.0 × 100 mm *XP*	186006200	4.6 × 150 mm	186003770	4.6 × 150 mm	186003775
	3.0 × 150 mm *XP*	186006758			4.6 × 250 mm	186003776
	4.6 × 50 mm *XP*	186006201				
	4.6 × 100 mm *XP*	186006202				
	4.6 × 150 mm *XP*	186006759				
BEH C_8	2.1 × 50 mm *XP*	186006203	2.1 × 100 mm	186003777	2.1 × 150 mm	186003782
	2.1 × 100 mm *XP*	186006204	3.0 × 100 mm	186003778	3.0 × 100 mm	186003783
	2.1 × 150 mm *XP*	186006760	3.0 × 150 mm	186003779	3.0 × 150 mm	186003784
	3.0 × 50 mm *XP*	186006205	4.6 × 100 mm	186003780	4.6 × 100 mm	186003785
	3.0 × 100 mm *XP*	186006206	4.6 × 150 mm	186003781	4.6 × 150 mm	186003786
	3.0 × 150 mm *XP*	186006761			4.6 × 250 mm	186003787
	4.6 × 50 mm *XP*	186006207				
	4.6 × 100 mm *XP*	186006208				
	4.6 × 150 mm *XP*	186006762				
BEH Shield RP18	2.1 × 50 mm *XP*	186006209	2.1 × 100 mm	186003788	2.1 × 150 mm	186003793
	2.1 × 100 mm *XP*	186006210	3.0 × 100 mm	186003789	3.0 × 100 mm	186003794
	2.1 × 150 mm *XP*	186006763	3.0 × 150 mm	186003790	3.0 × 150 mm	186003795
	3.0 × 50 mm *XP*	186006211	4.6 × 100 mm	186003791	4.6 × 100 mm	186003796
	3.0 × 100 mm *XP*	186006212	4.6 × 150 mm	186003792	4.6 × 150 mm	186003797
	3.0 × 150 mm *XP*	186006774			4.6 × 250 mm	186003798
	4.6 × 50 mm *XP*	186006213				
	4.6 × 100 mm *XP*	186006214				
	4.6 × 150 mm *XP*	186006775				
BEH Phenyl	2.1 × 50 mm *XP*	186006215	2.1 × 100 mm	186003799	2.1 × 150 mm	186003804
	2.1 × 100 mm *XP*	186006216	3.0 × 100 mm	186003800	3.0 × 100 mm	186003805
	2.1 × 150 mm *XP*	186006776	3.0 × 150 mm	186003801	3.0 × 150 mm	186003806
	3.0 × 50 mm *XP*	186006217	4.6 × 100 mm	186003802	4.6 × 100 mm	186003807
	3.0 × 100 mm *XP*	186006218	4.6 × 150 mm	186003803	4.6 × 150 mm	186003808
	3.0 × 150 mm *XP*	186006777			4.6 × 250 mm	186003809
	4.6 × 50 mm *XP*	186006219				
	4.6 × 100 mm *XP*	186006220				
	4.6 × 150 mm *XP*	186006778				
Oligonucleotide BEH C_{18}, 130 Å	4.6 × 50 mm	186004906				

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

XBridge Columns Method Validation Kits* *Continued*

	Particle Size: 2.5 µm	
	Dimension	**P/N (3/pk)**
HILIC	2.1 × 50 mm ***XP***	186006221
	2.1 × 100 mm ***XP***	186006222
	2.1 × 150 mm ***XP***	186006779
	3.0 × 50 mm ***XP***	186006223
	3.0 × 100 mm ***XP***	186006224
	3.0 × 150 mm ***XP***	186006780
	4.6 × 50 mm ***XP***	186006225
	4.6 × 100 mm ***XP***	186006226
	4.6 × 150 mm ***XP***	186006781
Amide	2.1 × 50 mm ***XP***	186006227
	2.1 × 100 mm ***XP***	186006228
	2.1 × 150 mm ***XP***	186006782
	3.0 × 50 mm ***XP***	186006229
	3.0 × 100 mm ***XP***	186006230
	3.0 × 150 mm ***XP***	186006783
	4.6 × 50 mm ***XP***	186006231
	4.6 × 100 mm ***XP***	186006232
	4.6 × 150 mm ***XP***	186006784
Glycan BEH Amide, 130 Å	2.1 × 150 mm ***XP***	186007266
	4.6 × 150 mm ***XP***	186007271

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

XBridge VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
BEH C_{18}	2.1 × 5 mm ***XP***	186007772	2.1 × 5 mm	186007766	2.1 × 5 mm	186007769
	3.9 × 5 mm ***XP***	186007774	3.9 × 5 mm	186007768	3.9 × 5 mm	186007771
BEH C_8	2.1 × 5 mm ***XP***	186007781	2.1 × 5 mm	186007775	2.1 × 5 mm	186007778
	3.9 × 5 mm ***XP***	186007783	3.9 × 5 mm	186007777	3.9 × 5 mm	186007780
BEH Shield RP18	2.1 × 5 mm ***XP***	186007808	2.1 × 5 mm	186007802	2.1 × 5 mm	186007805
	3.9 × 5 mm ***XP***	186007810	3.9 × 5 mm	186007804	3.9 × 5 mm	186007807
BEH Phenyl	2.1 × 5 mm ***XP***	186007799	2.1 × 5 mm	186007793	2.1 × 5 mm	186007796
	3.9 × 5 mm ***XP***	186007801	3.9 × 5 mm	186007795	3.9 × 5 mm	186007798
BEH HILIC	2.1 × 5 mm ***XP***	186007790	2.1 × 5 mm	186007784	2.1 × 5 mm	186007787
	3.9 × 5 mm ***XP***	186007792	3.9 × 5 mm	186007786	3.9 × 5 mm	186007789
BEH Amide	2.1 × 5 mm ***XP***	186007763	2.1 × 5 mm	186007757	2.1 × 5 mm	186007760
	3.9 × 5 mm ***XP***	186007765	3.9 × 5 mm	186007759	3.9 × 5 mm	186007762

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

APPLICATION AREA: Pharmaceutical Analysis

"Column protection products are very useful for samples with significant residual matrix, even after the use of small micron filtration. They are especially useful for UPLC, where column frits are much smaller than in traditional HPLC."

REVIEWER: Barrett Remington

ORGANIZATION: Particle Sciences, Inc.

XSelect Columns

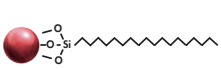
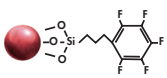
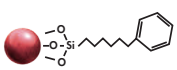
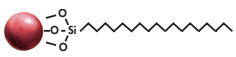
XSelect HPLC Columns are designed for the method-development scientist who requires a diverse selection of sorbents to easily separate the most difficult analyte co-elutions.

XSelect Columns are:

- Designed for selectivity, improving the separation of closely eluting peaks
- Intended for isolation and purification, loading the highest analyte mass of any columns
- Ideal for rapid method development, reducing the time and cost spent developing methods

The base particle or substrate critically influences analyte selectivity; the bonded ligand influences selectivity to a lesser extent. Neither the substrate nor the ligand alone provides dramatic selectivity changes. Yet in combination, they provide the ultimate means of enhancing analyte selectivity, while ensuring reproducible and robust methods. Accordingly, the XSelect Column family offers the unique optimization of bonded ligands embodied in the particle technologies of high strength silica (HSS) and charged surface hybrid (CSH).

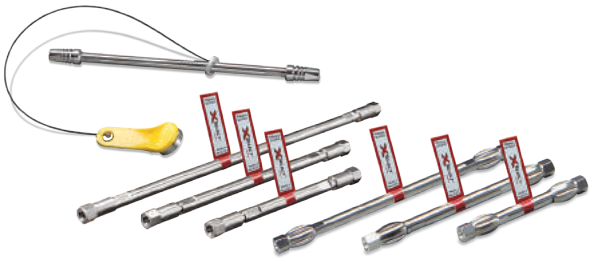
Column Characteristics

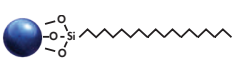
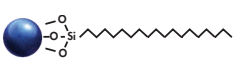
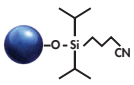
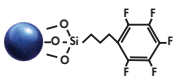
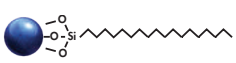
	CSH C_{18}, 130 Å	CSH Fluoro-Phenyl, 130 Å	CSH Phenyl-Hexyl, 130 Å	Peptide CSH C_{18}, 130A
	UHPLC: 2.5 µm *XP* HPLC: 3.5, 5, 10 µm	UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm	UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm	UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm
Particle/Ligand				
Ligand Density*	2.3 µmol/m²	2.3 µmol/m²	2.3 µmol/m²	2.3 µmol/m²
Carbon Load*	15%	10%	14%	15%
Endcapped	Yes	No	Yes	Yes
USP Class No.	L1	L43	L11	L1
pH Range	1–11	1–8	1–11	1–11
Temperature Limits	Low pH = 80 °C, High pH = 45 °C	Low pH = 60 °C, High pH = 45 °C	Low pH = 80 °C, High pH = 45 °C	Low pH = 80 °C, High pH = 45 °C
Surface Area*	185 m²/g	185 m²/g	185 m²/g	185 m²/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Cytochrome *c* Digestion Standard** p/n: 186006371
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Peptide Retention Standard** p/n: 186006555

*Expected or approximate value.

XSelect Columns are also available in UPLC particle sizes (ACQUITY UPLC CSH and ACQUITY UPLC HSS), please refer to pages 93 and 101.

XSELECT™ Columns



HSS C_{18}, 130 Å	HSS C_{18} SB, 130 Å	HSS CN, 130 Å	HSS PFP, 130 Å	HSS T3, 130 Å
UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm**	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm**	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm**	**UHPLC: 2.5 µm *XP* HPLC: 3.5, 5 µm**
				
3.2 µmol/m²	1.6 µmol/m²	2.0 µmol/m²	3.2 µmol/m²	1.6 µmol/m²
15%	8%	5%	7%	11%
Yes	No	No	No	Yes
L1	L1	L10	L43	L1
1–8	2–8	2–8	2–8	2–8
Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C
230 m²/g	230 m²/g	230 m²/g	230 m²/g	230 m²/g
Neutrals QC Reference Material p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Reversed-Phase QC Reference Material p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	–	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

Ordering Information

XSelect Columns

CSH C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006100	176002594	1.0 × 50 mm	186005249	2.1 × 50 mm	186005274
2.1 × 50 mm *XP*	186006101	176002595	1.0 × 150 mm	186005251	2.1 × 100 mm	186005275
2.1 × 75 mm *XP*	186006102	176002596	2.1 × 30 mm	186005254	2.1 × 150 mm	186005276
2.1 × 100 mm *XP*	186006103	176002597	2.1 × 50 mm	186005255	3.0 × 30 mm	186005279
2.1 × 150 mm *XP*	186006727	176002891	2.1 × 75 mm	186005644	3.0 × 50 mm	186005280
3.0 × 30 mm *XP*	186006104	176002598	2.1 × 100 mm	186005256	3.0 × 100 mm	186005281
3.0 × 50 mm *XP*	186006105	176002599	2.1 × 150 mm	186005257	3.0 × 150 mm	186005282
3.0 × 75 mm *XP*	186006106	176002600	3.0 × 30 mm	186005260	3.0 × 250 mm	186005283
3.0 × 100 mm *XP*	186006107	176002601	3.0 × 50 mm	186005261	4.6 × 50 mm	186005287
3.0 × 150 mm *XP*	186006728	176002892	3.0 × 75 mm	186005647	4.6 × 100 mm	186005289
4.6 × 30 mm *XP*	186006108	—	3.0 × 100 mm	186005262	4.6 × 150 mm	186005290
4.6 × 50 mm *XP*	186006109	—	3.0 × 150 mm	186005263	4.6 × 250 mm	186005291
4.6 × 75 mm *XP*	186006110	—	4.6 × 50 mm	186005267		
4.6 × 100 mm *XP*	186006111	—	4.6 × 75 mm	186005268		
4.6 × 150 mm *XP*	186006729	—	4.6 × 100 mm	186005269		
			4.6 × 150 mm	186005270		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186005491[1]	Guard Cartridge	10 × 10 mm	186007285
10 × 50 mm	OBD Column	186008236	OBD Column	10 × 50 mm	186008268
10 × 100 mm	OBD Column	186008237	OBD Column	10 × 100 mm	186008269
10 × 150 mm	OBD Column	186008238	OBD Column	10 × 150 mm	186008270
10 × 250 mm	OBD Column	186008239	OBD Column	10 × 250 mm	186008271
19 × 10 mm	Guard Cartridge	186005418[2]	Guard Cartridge	19 × 10 mm	186007290
19 × 50 mm	OBD Column	186005420	OBD Column	19 × 50 mm	186007291
19 × 100 mm	OBD Column	186005421	OBD Column	19 × 100 mm	186007292
19 × 150 mm	OBD Column	186005422	OBD Column	19 × 150 mm	186007293
19 × 250 mm	OBD Column	186005492	OBD Column	19 × 250 mm	186007294
30 × 10 mm	Guard Cartridge	186006899[3]	Guard Cartridge	30 × 10 mm	186007295
30 × 50 mm	OBD Column	186005423	OBD Column	30 × 50 mm	186007296
30 × 75 mm	OBD Column	186005424	OBD Column	30 × 75 mm	186007297
30 × 100 mm	OBD Column	186005425	OBD Column	30 × 100 mm	186007298
30 × 150 mm	OBD Column	186005426	OBD Column	30 × 150 mm	186007299
30 × 250 mm	OBD Column	186005493	OBD Column	30 × 250 mm	186007300
50 × 50 mm	OBD Column	186005494	OBD Column	50 × 50 mm	186007301
50 × 100 mm	OBD Column	186005495	OBD Column	50 × 100 mm	186007302
50 × 150 mm	OBD Column	186005496	OBD Column	50 × 150 mm	186007303
50 × 250 mm	OBD Column	186005497	OBD Column	50 × 250 mm	186007304

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

CSH Fluoro-Phenyl

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006112	176002602	2.1 × 50 mm	186005310	2.1 × 50 mm	186005329
2.1 × 50 mm *XP*	186006113	176002603	2.1 × 75 mm	186005646	2.1 × 100 mm	186005330
2.1 × 75 mm *XP*	186006114	176002604	2.1 × 100 mm	186005311	2.1 × 150 mm	186005331
2.1 × 100 mm *XP*	186006115	176002605	2.1 × 150 mm	186005312	3.0 × 50 mm	186005335
2.1 × 150 mm *XP*	186006730	176002893	3.0 × 50 mm	186005316	3.0 × 100 mm	186005336
3.0 × 30 mm *XP*	186006116	176002606	3.0 × 75 mm	186005649	3.0 × 150 mm	186005337
3.0 × 50 mm *XP*	186006117	176002607	3.0 × 100 mm	186005317	3.0 × 250 mm	186005338
3.0 × 75 mm *XP*	186006118	176002608	3.0 × 150 mm	186005318	4.6 × 50 mm	186005342
3.0 × 100 mm *XP*	186006119	176002609	4.6 × 50 mm	186005322	4.6 × 75 mm	186005343
3.0 × 150 mm *XP*	186006731	176002894	4.6 × 75 mm	186005323	4.6 × 100 mm	186005344
4.6 × 30 mm *XP*	186006120	—	4.6 × 100 mm	186005324	4.6 × 150 mm	186005345
4.6 × 50 mm *XP*	186006121	—	4.6 × 150 mm	186005325	4.6 × 250 mm	186005346
4.6 × 75 mm *XP*	186006122	—				
4.6 × 100 mm *XP*	186006123	—				
4.6 × 150 mm *XP*	186006732	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186005498[1]
10 × 50 mm	OBD Column	186008240
10 × 100 mm	OBD Column	186008241
10 × 150 mm	OBD Column	186008242
10 × 250 mm	OBD Column	186008243
19 × 10 mm	Guard Cartridge	186005431[2]
19 × 50 mm	OBD Column	186005433
19 × 100 mm	OBD Column	186005434
19 × 150 mm	OBD Column	186005435
19 × 250 mm	OBD Column	186005499
30 × 10 mm	Guard Cartridge	186006900[3]
30 × 50 mm	OBD Column	186005436
30 × 75 mm	OBD Column	186005437
30 × 100 mm	OBD Column	186005438
30 × 150 mm	OBD Column	186005439
30 × 250 mm	OBD Column	186005500
50 × 50 mm	OBD Column	186005501
50 × 100 mm	OBD Column	186005502
50 × 150 mm	OBD Column	186005503
50 × 250 mm	OBD Column	186005504

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

CSH Phenyl-Hexyl

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006124	176002610	2.1 × 50 mm	186005365	2.1 × 50 mm	186005384
2.1 × 50 mm *XP*	186006125	176002611	2.1 × 75 mm	186005645	2.1 × 100 mm	186005385
2.1 × 75 mm *XP*	186006126	176002612	2.1 × 100 mm	186005366	2.1 × 150 mm	186005386
2.1 × 100 mm *XP*	186006127	176002613	2.1 × 150 mm	186005367	3.0 × 50 mm	186005390
2.1 × 150 mm *XP*	186006733	176002895	3.0 × 50 mm	186005371	3.0 × 100 mm	186005391
3.0 × 30 mm *XP*	186006128	176002614	3.0 × 75 mm	186005648	3.0 × 150 mm	186005392
3.0 × 50 mm *XP*	186006129	176002615	3.0 × 100 mm	186005372	3.0 × 250 mm	186005393
3.0 × 75 mm *XP*	186006130	176002616	3.0 × 150 mm	186005373	4.6 × 50 mm	186005397
3.0 × 100 mm *XP*	186006131	176002617	4.6 × 50 mm	186005377	4.6 × 75 mm	186005398
3.0 × 150 mm *XP*	186006734	176002896	4.6 × 75 mm	186005378	4.6 × 100 mm	186005399
4.6 × 30 mm *XP*	186006132	—	4.6 × 100 mm	186005379	4.6 × 150 mm	186005400
4.6 × 50 mm *XP*	186006133	—	4.6 × 150 mm	186005380	4.6 × 250 mm	186005401
4.6 × 75 mm *XP*	186006134	—				
4.6 × 100 mm *XP*	186006135	—				
4.6 × 150 mm *XP*	186006735	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186005505[1]
10 × 50 mm	OBD Column	186008244
10 × 100 mm	OBD Column	186008245
10 × 150 mm	OBD Column	186008246
10 × 250 mm	OBD Column	186008247
19 × 10 mm	Guard Cartridge	186005444[2]
19 × 50 mm	OBD Column	186005446
19 × 100 mm	OBD Column	186005447
19 × 150 mm	OBD Column	186005448
19 × 250 mm	OBD Column	186005506
30 × 10 mm	Guard Cartridge	186006901[3]
30 × 50 mm	OBD Column	186005520
30 × 75 mm	OBD Column	186005450
30 × 100 mm	OBD Column	186005451
30 × 150 mm	OBD Column	186005452
30 × 250 mm	OBD Column	186005507
50 × 50 mm	OBD Column	186005508
50 × 100 mm	OBD Column	186005509
50 × 150 mm	OBD Column	186005510
50 × 250 mm	OBD Column	186005511

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

HSS C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006136	176002618	2.1 × 30 mm	186006380	2.1 × 50 mm	186006391
2.1 × 50 mm *XP*	186006137	176002619	2.1 × 50 mm	186006381	2.1 × 100 mm	186006392
2.1 × 75 mm *XP*	186006138	176002620	2.1 × 75 mm	186006382	2.1 × 150 mm	186006393
2.1 × 100 mm *XP*	186006139	176002621	2.1 × 100 mm	186006383	3.0 × 50 mm	186006396
2.1 × 150 mm *XP*	186006736	176002897	2.1 × 150 mm	186006384	3.0 × 100 mm	186006397
3.0 × 30 mm *XP*	186006140	176002622	3.0 × 30 mm	186004765	3.0 × 150 mm	186006398
3.0 × 50 mm *XP*	186006141	176002623	3.0 × 50 mm	186004766	3.0 × 250 mm	186006399
3.0 × 75 mm *XP*	186006142	176002624	3.0 × 75 mm	186005642	4.6 × 50 mm	186004852
3.0 × 100 mm *XP*	186006143	176002625	3.0 × 100 mm	186004762	4.6 × 75 mm	186006402
3.0 × 150 mm *XP*	186006737	176002898	3.0 × 150 mm	186004763	4.6 × 100 mm	186006403
4.6 × 30 mm *XP*	186006144	—	4.6 × 50 mm	186004772	4.6 × 150 mm	186004773
4.6 × 50 mm *XP*	186006145	—	4.6 × 75 mm	186006387	4.6 × 250 mm	186004775
4.6 × 75 mm *XP*	186006146	—	4.6 × 100 mm	186004767		
4.6 × 100 mm *XP*	186006147	—	4.6 × 150 mm	186004768		
4.6 × 150 mm *XP*	186006738	—	4.6 × 250 mm	186004770		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004776[1]	10 × 100 mm	OBD Column	186008223
10 × 50 mm	OBD Column	186008222	10 × 150 mm	OBD Column	186008224

HSS C_{18} SB

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006160	176002634	2.1 × 50 mm	186006422	2.1 × 50 mm	186006432
2.1 × 50 mm *XP*	186006161	176002635	2.1 × 75 mm	186006423	2.1 × 100 mm	186006433
2.1 × 75 mm *XP*	186006162	176002636	2.1 × 100 mm	186006424	2.1 × 150 mm	186006434
2.1 × 100 mm *XP*	186006163	176002637	2.1 × 150 mm	186006425	3.0 × 50 mm	186006437
2.1 × 150 mm *XP*	186006742	176002901	3.0 × 50 mm	186004747	3.0 × 100 mm	186006438
3.0 × 30 mm *XP*	186006164	176002638	3.0 × 75 mm	186005643	3.0 × 150 mm	186006439
3.0 × 50 mm *XP*	186006165	176002639	3.0 × 100 mm	186004743	3.0 × 250 mm	186006440
3.0 × 75 mm *XP*	186006166	176002640	3.0 × 150 mm	186004744	4.6 × 50 mm	186004757
3.0 × 100 mm *XP*	186006167	176002641	4.6 × 50 mm	186004753	4.6 × 75 mm	186006443
3.0 × 150 mm *XP*	186006743	176002902	4.6 × 75 mm	186006428	4.6 × 100 mm	186006444
4.6 × 30 mm *XP*	186006168	—	4.6 × 100 mm	186004748	4.6 × 150 mm	186004754
4.6 × 50 mm *XP*	186006169	—	4.6 × 150 mm	186004749	4.6 × 250 mm	186004756
4.6 × 75 mm *XP*	186006170	—	4.6 × 250 mm	186004751		
4.6 × 100 mm *XP*	186006171	—				
4.6 × 150 mm *XP*	186006744	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004758[1]	10 × 100 mm	OBD Column	186008220
10 × 50 mm	OBD Column	186008219	10 × 150 mm	OBD Column	186008221

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

HSS T3

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006148	176002626	1.0 × 100 mm	186006459	2.1 × 50 mm	186006473
2.1 × 50 mm *XP*	186006149	176002627	1.0 × 150 mm	186006460	2.1 × 100 mm	186006474
2.1 × 75 mm *XP*	186006150	176002628	2.1 × 30 mm	186006462	2.1 × 150 mm	186006475
2.1 × 100 mm *XP*	186006151	176002629	2.1 × 50 mm	186006463	3.0 × 50 mm	186006478
2.1 × 150 mm *XP*	186006739	176002899	2.1 × 75 mm	186006464	3.0 × 100 mm	186006479
3.0 × 30 mm *XP*	186006152	176002630	2.1 × 100 mm	186006465	3.0 × 150 mm	186006480
3.0 × 50 mm *XP*	186006153	176002631	2.1 × 150 mm	186006466	3.0 × 250 mm	186006481
3.0 × 75 mm *XP*	186006154	176002632	3.0 × 30 mm	186004783	4.6 × 50 mm	186004794
3.0 × 100 mm *XP*	186006155	176002633	3.0 × 50 mm	186004784	4.6 × 75 mm	186006484
3.0 × 150 mm *XP*	186006740	176002900	3.0 × 75 mm	186005641	4.6 × 100 mm	186006485
4.6 × 30 mm *XP*	186006156	—	3.0 × 100 mm	186004780	4.6 × 150 mm	186004791
4.6 × 50 mm *XP*	186006157	—	3.0 × 150 mm	186004781	4.6 × 250 mm	186004793
4.6 × 75 mm *XP*	186006158	—	4.6 × 50 mm	186004790		
4.6 × 100 mm *XP*	186006159	—	4.6 × 75 mm	186006469		
4.6 × 150 mm *XP*	186006741	—	4.6 × 100 mm	186004785		
			4.6 × 150 mm	186004786		
			4.6 × 250 mm	186004788		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004795[1]	10 × 150 mm	OBD Column	186008227
10 × 50 mm	OBD Column	186008225	10 × 250 mm	OBD Column	186008280
10 × 100 mm	OBD Column	186008226			

HSS PFP

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006172	176002642	2.1 × 50 mm	186005847	2.1 × 50 mm	186005869
2.1 × 50 mm *XP*	186006173	176002643	2.1 × 75 mm	186005848	2.1 × 100 mm	186005871
2.1 × 75 mm *XP*	186006174	176002644	2.1 × 100 mm	186005849	2.1 × 150 mm	186005872
2.1 × 100 mm *XP*	186006175	176002645	2.1 × 150 mm	186005850	3.0 × 50 mm	186005875
2.1 × 150 mm *XP*	186006745	176002903	3.0 × 30 mm	186005852	3.0 × 100 mm	186005877
3.0 × 30 mm *XP*	186006176	176002646	3.0 × 50 mm	186005853	3.0 × 150 mm	186005878
3.0 × 50 mm *XP*	186006177	176002647	3.0 × 75 mm	186005854	3.0 × 250 mm	186005879
3.0 × 75 mm *XP*	186006178	176002648	3.0 × 100 mm	186005855	4.6 × 50 mm	186005882
3.0 × 100 mm *XP*	186006179	176002649	3.0 × 150 mm	186005856	4.6 × 75 mm	186005883
3.0 × 150 mm *XP*	186006746	176002904	4.6 × 50 mm	186005859	4.6 × 100 mm	186005884
4.6 × 30 mm *XP*	186006180	—	4.6 × 75 mm	186005860	4.6 × 150 mm	186005885
4.6 × 50 mm *XP*	186006181	—	4.6 × 100 mm	186005861	4.6 × 250 mm	186005886
4.6 × 75 mm *XP*	186006182	—	4.6 × 150 mm	186005862		
4.6 × 100 mm *XP*	186006183	—	4.6 × 250 mm	186005863		
4.6 × 150 mm *XP*	186006747	—				

[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

HSS CN

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006184	176002650	2.1 × 50 mm	186005907	2.1 × 50 mm	186005929
2.1 × 50 mm *XP*	186006185	176002651	2.1 × 75 mm	186005908	2.1 × 100 mm	186005931
2.1 × 75 mm *XP*	186006186	176002652	2.1 × 100 mm	186005909	2.1 × 150 mm	186005932
2.1 × 100 mm *XP*	186006187	176002653	2.1 × 150 mm	186005910	3.0 × 50 mm	186005935
2.1 × 150 mm *XP*	186006748	176002905	3.0 × 50 mm	186005913	3.0 × 100 mm	186005937
3.0 × 30 mm *XP*	186006188	176002654	3.0 × 75 mm	186005914	3.0 × 150 mm	186005938
3.0 × 50 mm *XP*	186006189	176002655	3.0 × 100 mm	186005915	3.0 × 250 mm	186005939
3.0 × 75 mm *XP*	186006190	176002656	3.0 × 150 mm	186005916	4.6 × 50 mm	186005942
3.0 × 100 mm *XP*	186006191	176002657	4.6 × 50 mm	186005919	4.6 × 75 mm	186005943
3.0 × 150 mm *XP*	186006749	176002906	4.6 × 75 mm	186005920	4.6 × 100 mm	186005944
4.6 × 30 mm *XP*	186006192	—	4.6 × 100 mm	186005921	4.6 × 150 mm	186005945
4.6 × 50 mm *XP*	186006193	—	4.6 × 150 mm	186005922	4.6 × 250 mm	186005946
4.6 × 75 mm *XP*	186006194	—	4.6 × 250 mm	186005923		
4.6 × 100 mm *XP*	186006195	—				
4.6 × 150 mm *XP*	186006750	—				

Peptide CSH C_{18}, 130 Å

ANALYTICAL COLUMNS

Particle Size: 2.5 µm		Particle Size: 3.5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm *XP*	186006941	2.1 × 50 mm	186006950
2.1 × 100 mm *XP*	186006942	2.1 × 100 mm	186006951
2.1 × 150 mm *XP*	186006943	2.1 × 150 mm	186006952
4.6 × 50 mm *XP*	186006946	4.6 × 50 mm	186006955
4.6 × 100 mm *XP*	186006947	4.6 × 100 mm	186006956
4.6 × 150 mm *XP*	186007038	4.6 × 150 mm	186006957

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
4.6 × 50 mm	Column	186007076[4]	19 × 250 mm	OBD Column	186007031
4.6 × 100 mm	Column	186007077[4]	30 × 50 mm	OBD Column	186007026
4.6 × 150 mm	Column	186007078[4]	30 × 100 mm	OBD Column	186007025
10 × 10 mm	Guard	186007015[1]	30 × 150 mm	OBD Column	186007023
10 × 50 mm	OBD Column	186008264	30 × 250 mm	OBD Column	186007024
10 × 100 mm	OBD Column	186008265	50 × 50 mm	OBD Column	186007030
10 × 150 mm	OBD Column	186008266	50 × 100 mm	OBD Column	186007027
10 × 250 mm	OBD Column	186008267	50 × 150 mm	OBD Column	186007028
19 × 10 mm	Guard	186007019[3]	50 × 250 mm	OBD Column	186007029
19 × 50 mm	OBD Column	186007022			
19 × 100 mm	OBD Column	186007020			
19 × 150 mm	OBD Column	186007021			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[3] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[4] For use in developing lab-scale preparative chromatography.

XSelect Columns Method Validation Kits*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 50 mm *XP*	186006233	2.1 × 100 mm	186005538	2.1 × 150 mm	186005543
	2.1 × 100 mm *XP*	186006234	3.0 × 100 mm	186005539	3.0 × 100 mm	186005544
	2.1 × 150 mm *XP*	186006785	3.0 × 150 mm	186005540	3.0 × 150 mm	186005545
	3.0 × 50 mm *XP*	186006235	4.6 × 100 mm	186005541	4.6 × 100 mm	186005546
	3.0 × 100 mm *XP*	186006236	4.6 × 150 mm	186005542	4.6 × 150 mm	186005547
	3.0 × 150 mm *XP*	186006786			4.6 × 250 mm	186005548
	4.6 × 50 mm *XP*	186006237				
	4.6 × 100 mm *XP*	186006238				
	4.6 × 150 mm *XP*	186006787				
CSH Fluoro-Phenyl	2.1 × 50 mm *XP*	186006239	2.1 × 100 mm	186005549	2.1 × 150 mm	186005554
	2.1 × 100 mm *XP*	186006240	3.0 × 100 mm	186005550	3.0 × 100 mm	186005555
	2.1 × 150 mm *XP*	186006788	3.0 × 150 mm	186005551	3.0 × 150 mm	186005556
	3.0 × 50 mm *XP*	186006241	4.6 × 100 mm	186005552	4.6 × 100 mm	186005557
	3.0 × 100 mm *XP*	186006242	4.6 × 150 mm	186005553	4.6 × 150 mm	186005558
	3.0 × 150 mm *XP*	186006789			4.6 × 250 mm	186005559
	4.6 × 50 mm *XP*	186006243				
	4.6 × 100 mm *XP*	186006244				
	4.6 × 150 mm *XP*	186006790				
CSH Phenyl-Hexyl	2.1 × 50 mm *XP*	186006245	2.1 × 100 mm	186005560	2.1 × 150 mm	186005565
	2.1 × 100 mm *XP*	186006246	3.0 × 100 mm	186005561	3.0 × 100 mm	186005566
	2.1 × 150 mm *XP*	186006791	3.0 × 150 mm	186005562	3.0 × 150 mm	186005567
	3.0 × 50 mm *XP*	186006247	4.6 × 100 mm	186005563	4.6 × 100 mm	186005568
	3.0 × 100 mm *XP*	186006248	4.6 × 150 mm	186005564	4.6 × 150 mm	186005569
	3.0 × 150 mm *XP*	186006792			4.6 × 250 mm	186005570
	4.6 × 50 mm *XP*	186006249				
	4.6 × 100 mm *XP*	186006250				
	4.6 × 150 mm *XP*	186006793				
Peptide CSH C_{18}	2.1 × 100 mm *XP*	186006945	2.1 × 100 mm	186006953		
	4.6 × 100 mm *XP*	186006966	4.6 × 100 mm	186006959		

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

XSelect Columns Method Validation Kits* *Continued*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
HSS C_{18}	2.1 × 50 mm *XP*	186006251	2.1 × 100 mm	186006406	2.1 × 150 mm	186006411
	2.1 × 100 mm *XP*	186006252	3.0 × 100 mm	186006407	3.0 × 100 mm	186006412
	2.1 × 150 mm *XP*	186006794	3.0 × 150 mm	186006408	3.0 × 150 mm	186006413
	3.0 × 50 mm *XP*	186006253	4.6 × 100 mm	186006409	4.6 × 100 mm	186006414
	3.0 × 100 mm *XP*	186006254	4.6 × 150 mm	186006410	4.6 × 150 mm	186006415
	3.0 × 150 mm *XP*	186006795			4.6 × 250 mm	186006416
	4.6 × 50 mm *XP*	186006255				
	4.6 × 100 mm *XP*	186006256				
	4.6 × 150 mm *XP*	186006796				
HSS C_{18} SB	2.1 × 50 mm *XP*	186006263	2.1 × 100 mm	186006447	2.1 × 150 mm	186006452
	2.1 × 100 mm *XP*	186006264	3.0 × 100 mm	186006448	3.0 × 100 mm	186006453
	2.1 × 150 mm *XP*	186006800	3.0 × 150 mm	186006449	3.0 × 150 mm	186006454
	3.0 × 50 mm *XP*	186006265	4.6 × 100 mm	186006450	4.6 × 100 mm	186006455
	3.0 × 100 mm *XP*	186006266	4.6 × 150 mm	186006451	4.6 × 150 mm	186006456
	3.0 × 150 mm *XP*	186006801			4.6 × 250 mm	186006457
	4.6 × 50 mm *XP*	186006267				
	4.6 × 100 mm *XP*	186006268				
	4.6 × 150 mm *XP*	186006802				
HSS T3	2.1 × 50 mm *XP*	186006257	2.1 × 100 mm	186006488	2.1 × 150 mm	186006493
	2.1 × 100 mm *XP*	186006258	3.0 × 100 mm	186006489	3.0 × 100 mm	186006494
	2.1 × 150 mm *XP*	186006797	3.0 × 150 mm	186006490	3.0 × 150 mm	186006495
	3.0 × 50 mm *XP*	186006259	4.6 × 100 mm	186006491	4.6 × 100 mm	186006496
	3.0 × 100 mm *XP*	186006260	4.6 × 150 mm	186006492	4.6 × 150 mm	186006497
	3.0 × 150 mm *XP*	186006798			4.6 × 250 mm	186006498
	4.6 × 50 mm *XP*	186006261				
	4.6 × 100 mm *XP*	186006262				
	4.6 × 150 mm *XP*	186006799				
HSS PFP	2.1 × 50 mm *XP*	186006815	2.1 × 100 mm	186005890	2.1 × 150 mm	186005895
	2.1 × 100 mm *XP*	186006816	3.0 × 100 mm	186005891	3.0 × 100 mm	186005896
	2.1 × 150 mm *XP*	186006803	3.0 × 150 mm	186005892	3.0 × 150 mm	186005897
	3.0 × 50 mm *XP*	186006817	4.6 × 100 mm	186005893	4.6 × 100 mm	186005898
	3.0 × 100 mm *XP*	186006818	4.6 × 150 mm	186005894	4.6 × 150 mm	186005899
	3.0 × 150 mm *XP*	186006804			4.6 × 250 mm	186005900
	4.6 × 50 mm *XP*	186006273				
	4.6 × 100 mm *XP*	186006274				
	4.6 × 150 mm *XP*	186006805				

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

XSelect Columns Method Validation Kits* *Continued*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
HSS CN	2.1 × 50 mm *XP*	186006275	2.1 × 100 mm	186005950	2.1 × 150 mm	186005955
	2.1 × 100 mm *XP*	186006276	3.0 × 100 mm	186005951	3.0 × 100 mm	186005956
	2.1 × 150 mm *XP*	186006806	3.0 × 150 mm	186005952	3.0 × 150 mm	186005957
	3.0 × 50 mm *XP*	186006277	4.6 × 100 mm	186005953	4.6 × 100 mm	186005958
	3.0 × 100 mm *XP*	186006278	4.6 × 150 mm	186005954	4.6 × 150 mm	186005959
	3.0 × 150 mm *XP*	186006807			4.6 × 250 mm	186005960
	4.6 × 50 mm *XP*	186006279				
	4.6 × 100 mm *XP*	186006280				
	4.6 × 150 mm *XP*	186006808				

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

XSelect VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 5 mm *XP*	186007817	2.1 × 5 mm	186007811	2.1 × 5 mm	186007814
	3.9 × 5 mm *XP*	186007819	3.9 × 5 mm	186007813	3.9 × 5 mm	186007816
CSH Fluoro-Phenyl	2.1 × 5 mm *XP*	186007827	2.1 × 5 mm	186007820	2.1 × 5 mm	186007824
	3.9 × 5 mm *XP*	186007829	3.9 × 5 mm	186007822	3.9 × 5 mm	186007826
CSH Phenyl-Hexyl	2.1 × 5 mm *XP*	186007839	2.1 × 5 mm	186007830	2.1 × 5 mm	186007836
	3.9 × 5 mm *XP*	186007841	3.9 × 5 mm	186007832	3.9 × 5 mm	186007838
HSS C_{18}	2.1 × 5 mm *XP*	186007857	2.1 × 5 mm	186007851	2.1 × 5 mm	186007854
	3.9 × 5 mm *XP*	186007859	3.9 × 5 mm	186007853	3.9 × 5 mm	186007856
HSS C_{18} SB	2.1 × 5 mm *XP*	186007848	2.1 × 5 mm	186007842	2.1 × 5 mm	186007845
	3.9 × 5 mm *XP*	186007850	3.9 × 5 mm	186007844	3.9 × 5 mm	186007847
HSS T3	2.1 × 5 mm *XP*	186007884	2.1 × 5 mm	186007878	2.1 × 5 mm	186007881
	3.9 × 5 mm *XP*	186007886	3.9 × 5 mm	186007880	3.9 × 5 mm	186007883
HSS PFP	2.1 × 5 mm *XP*	186007875	2.1 × 5 mm	186007869	2.1 × 5 mm	186007872
	3.9 × 5 mm *XP*	186007877	3.9 × 5 mm	186007871	3.9 × 5 mm	186007874
HSS CN	2.1 × 5 mm *XP*	186007866	2.1 × 5 mm	186007860	2.1 × 5 mm	186007863
	3.9 × 5 mm *XP*	186007868	3.9 × 5 mm	186007862	3.9 × 5 mm	186007865

Universal VanGuard Cartridge Holder

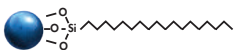
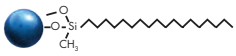
Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

Atlantis Columns

For polar compounds, Atlantis™ HPLC Columns provide exceptional performance, versatility, and retention when operating under reversed-phase conditions. The balanced retention of Atlantis Columns affords the separation of polar and non-polar analytes while providing:

- Compatibility with 100% aqueous mobile phases
- Polar-compound retention without ion-pairing reagents
- Long column life when used with mobile phases of low pH

Column Characteristics

	T3, 100 Å	dC_{18}, 100 Å	HILIC Silica, 100 Å
	HPLC: 3, 5, 10 µm	HPLC: 3, 5, 10 µm	HPLC: 3, 5 µm
Particle/Ligand			
Ligand Density*	1.6 µmol/m²	1.6 µmol/m²	N/A
Carbon Load*	14%	12%	N/A
Endcapped	Yes	Yes	No
USP Class No.	L1	L1	L3
pH Range	2–8	3–7	1–5
Temperature Limits	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C	Low pH = 45 ˚C, High pH = 45 ˚C
Surface Area*	330 m²/g	330 m²/g	330 m²/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**HILIC QC Reference Material** p/n: 186007226
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**HILIC QC Reference Material** p/n: 186007226

*Expected or approximate value.

SelectScience® TRUSTED REVIEWS

APPLICATION AREA: Analyze Metabolites

"By using this column we can estimate seven compounds in a single injection."

REVIEWER: Suresh Babu Alaparthi

ORGANIZATION: West Virginia State University

Atlantis Columns

T3

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
1.0 × 50 mm	186003713	2.1 × 30 mm	186003733
1.0 × 150 mm	186003714	2.1 × 50 mm	186003734
2.1 × 20 mm /S	186003715	2.1 × 100 mm	186003735
2.1 × 30 mm	186003716	2.1 × 150 mm	186003736
2.1 × 50 mm	186003717	3.0 × 50 mm	186003738
2.1 × 75 mm	186005652	3.0 × 100 mm	186003739
2.1 × 100 mm	186003718	3.0 × 150 mm	186003740
2.1 × 150 mm	186003719	3.0 × 250 mm	186003741
3.0 × 50 mm	186003721	4.6 × 50 mm	186003744
3.0 × 75 mm	186005653	4.6 × 75 mm	186003745
3.0 × 100 mm	186003722	4.6 × 100 mm	186003746
3.0 × 150 mm	186003723	4.6 × 150 mm	186003747
4.6 × 50 mm	186003726	4.6 × 250 mm	186003748
4.6 × 75 mm	186003727		
4.6 × 100 mm	186003728		
4.6 × 150 mm	186003729		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186003695[1]	10 × 10 mm	Guard Cartridge	186003706[1]
10 × 50 mm	OBD Column	186008202	10 × 150 mm	OBD Column	186008206
10 × 100 mm	OBD Column	186008203	10 × 250 mm	OBD Column	186008207
10 × 150 mm	OBD Column	186008204	19 × 10 mm	Guard Cartridge	186003710[2]
10 × 250 mm	OBD Column	186008205	19 × 50 mm	OBD Column	186003707
19 × 10 mm	Guard Cartridge	186003699[2]	19 × 150 mm	OBD Column	186003708
19 × 50 mm	OBD Column	186003696	19 × 250 mm	OBD Column	186003709
19 × 100 mm	OBD Column	186003697	30 × 10 mm	Guard Cartridge	186006878[3]
19 × 150 mm	OBD Column	186003698	30 × 75 mm	OBD Column	186004712
19 × 250 mm	OBD Column	186004026	30 × 150 mm	OBD Column	186003711
30 × 10 mm	Guard Cartridge	186006879[3]	30 × 250 mm	OBD Column	186003712
30 × 50 mm	OBD Column	186003700	50 × 50 mm	OBD Column	186004083
30 × 75 mm	OBD Column	186003701	50 × 100 mm	OBD Column	186004084
30 × 100 mm	OBD Column	186003702	50 × 150 mm	OBD Column	186004085
30 × 150 mm	OBD Column	186003703	50 × 250 mm	OBD Column	186004086
50 × 50 mm	OBD Column	186004080			
50 × 100 mm	OBD Column	186004081			
50 × 150 mm	OBD Column	186004082			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

dC_{18}

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
2.1 × 30 mm	186001287	2.1 × 50 mm	186001293
2.1 × 50 mm	186001291	2.1 × 100 mm	186001297
2.1 × 100 mm	186001295	2.1 × 150 mm	186001301
2.1 × 150 mm	186001299	3.0 × 100 mm	186001305
3.0 × 50 mm	186001389	3.0 × 150 mm	186001309
3.0 × 100 mm	186001303	3.0 × 250 mm	186001311
3.0 × 150 mm	186001307	3.9 × 150 mm	186001319
3.9 × 100 mm	186001393	4.6 × 50 mm	186001331
3.9 × 150 mm	186001317	4.6 × 75 mm	186001335
4.6 × 50 mm	186001329	4.6 × 100 mm	186001340
4.6 × 75 mm	186001333	4.6 × 150 mm	186001344
4.6 × 100 mm	186001337	4.6 × 250 mm	186001346
4.6 × 150 mm	186001342		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	**Type**	**P/N (1/pk)**	**Dimension**	**Type**	**P/N (1/pk)**
10 × 10 mm	Guard Cartridge	186002300[1]	10 × 10 mm	Guard Cartridge	186002452[1]
10 × 50 mm	OBD Column	186008146	10 × 150 mm	OBD Column	186008149
10 × 100 mm	OBD Column	186008148	10 × 250 mm	OBD Column	186008151
19 × 10 mm	Guard Cartridge	186001361[2]	19 × 10 mm	Guard Cartridge	186001363[2]
19 × 50 mm	OBD Column	186001365	19 × 150 mm	OBD Column	186001369
19 × 100 mm	OBD Column	186001367	19 × 250 mm	OBD Column	186001371
19 × 150 mm	OBD Column	186002800	30 × 10 mm	Guard Cartridge	186006875[3]
19 × 250 mm	OBD Column	186004030	30 × 250 mm	OBD Column	186002418
30 × 10 mm	Guard Cartridge	186006876[3]			
30 × 50 mm	OBD Column	186001373			
30 × 75 mm	OBD Column	186002455			
30 × 150 mm	OBD Column	186002801			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

Atlantis Columns *Continued*

HILIC Silica

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
2.1 × 15 mm Direct Connect	186002007	2.1 × 50 mm	186002012
2.1 × 30 mm	186002009	2.1 × 100 mm	186002014
2.1 × 50 mm	186002011	2.1 × 150 mm	186002016
2.1 × 100 mm	186002013	3.0 × 50 mm	186002018
2.1 × 150 mm	186002015	4.6 × 50 mm	186002028
3.0 × 50 mm	186002017	4.6 × 100 mm	186002030
3.0 × 100 mm	186002019	4.6 × 150 mm	186002032
4.6 × 50 mm	186002027	4.6 × 250 mm	186002033
4.6 × 100 mm	186002029		
4.6 × 150 mm	186002031		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	**Type**	**P/N (1/pk)**	**Dimension**	**Type**	**P/N (1/pk)**
19 × 10 mm	Guard Cartridge	186003956[2]	10 × 10 mm	Guard Cartridge	186002452[1]
19 × 50 mm	OBD Column	186003957	10 × 150 mm	OBD Column	186008149
19 × 100 mm	OBD Column	186003958	10 × 250 mm	OBD Column	186008151
19 × 150 mm	OBD Column	186003959	19 × 10 mm	Guard Cartridge	186001363[2]
30 × 10 mm	Guard Cartridge	186006877[3]	19 × 150 mm	OBD Column	186001369
30 × 50 mm	OBD Column	186003960	19 × 250 mm	OBD Column	186001371
30 × 100 mm	OBD Column	186003961	30 × 10 mm	Guard Cartridge	186006875[3]
30 × 150 mm	OBD Column	186003962	30 × 250 mm	OBD Column	186002418

[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

Atlantis Columns Method Validation Kits*

	Particle Size: 3 µm		Particle Size: 5 µm	
	Dimension	**P/N (3/pk)**	**Dimension**	**P/N (3/pk)**
T3	4.6 × 150 mm	186003751	4.6 × 150 mm	186003754
			4.6 × 250 mm	186003755
HILIC Silica	4.6 × 150 mm	186002315	4.6 × 150 mm	186002314
			4.6 × 250 mm	186002316

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

Atlantis VanGuard Cartridges

	Particle Size: 3 µm		Particle Size: 5 µm	
	Dimension	**P/N (3/pk)**	**Dimension**	**P/N (3/pk)**
T3	2.1 × 5 mm	186007674	2.1 × 5 mm	186007678
	3.9 × 5 mm	186007676	3.9 × 5 mm	186007680
dC_{18}	2.1 × 5 mm	186007658	2.1 × 5 mm	186007662
	3.9 × 5 mm	186007660	3.9 × 5 mm	186007664
HILIC Silica	2.1 × 5 mm	186007666	2.1 × 5 mm	186007670
	3.9 × 5 mm	186007668	3.9 × 5 mm	186007672

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

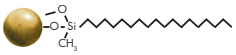
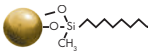
SunFire Columns

SunFire Columns set the standard for state-of-the-art bonded C_{18} and C_8 silica HPLC columns. Benefiting from years of research and product development, SunFire Columns deliver industry-leading levels of chromatographic performance, representing the best in particle and bonding expertise.

SunFire Columns offer:

- Excellent low-pH stability
- High chromatographic efficiency
- Superior peak shapes for charged analyte species

Column Characteristics

	C_{18}, 100 Å	C_8, 100 Å	Silica, 100 Å
	HPLC: 2.5, 3.5, 5, 10 µm	**HPLC: 2.5, 3.5, 5, 10 µm**	**HPLC: 5, 10 µm**
Particle/Ligand			
Ligand Density*	3.5 µmol/m²	3.5 µmol/m²	N/A
Carbon Load*	16%	12%	N/A
Endcapped	Yes	Yes	No
USP Class No.	L1	L7	L3
pH Range	2–8	2–8	2–8
Temperature Limits	Low pH = 50 °C, High pH = 40 °C	Low pH = 40 °C, High pH = 40 °C	Low pH =55 °C, High pH = 45 °C
Surface Area*	340 m²/g	340 m²/g	340 m²/g
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	–
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363 **HILIC QC Reference Material** p/n: 186007226	–

*Expected or approximate value.

SunFire 2.5 µm Columns can be found on page 150.

Ordering Information

SunFire Columns

C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm	186003399	2.1 × 50 mm	186002533	2.1 × 50 mm	186002539
2.1 × 50 mm	186003401	2.1 × 100 mm	186002534	2.1 × 100 mm	186002540
2.1 × 75 mm	186005634	2.1 × 150 mm	186002535	2.1 × 150 mm	186002541
3.0 × 30 mm	186003407	3.0 × 50 mm	186002542	3.0 × 50 mm	186002545
3.0 × 50 mm	186003409	3.0 × 100 mm	186002543	3.0 × 100 mm	186002546
3.0 × 75 mm	186005636	3.0 × 150 mm	186002544	3.0 × 150 mm	186002547
4.6 × 50 mm	186003417	4.6 × 20 mm *IS*	186002549	3.0 × 250 mm	186002548
		4.6 × 50 mm	186002551	4.6 × 30 mm	186002556
		4.6 × 75 mm	186002552	4.6 × 50 mm	186002557
		4.6 × 100 mm	186002553	4.6 × 100 mm	186002558
		4.6 × 150 mm	186002554	4.6 × 150 mm	186002559
				4.6 × 250 mm	186002560

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002565[1]	10 × 10 mm	Guard Cartridge	186002663[1]
10 × 50 mm	OBD Column	186008152	10 × 50 mm	OBD Column	186008208
10 × 100 mm	OBD Column	186008153	10 × 150 mm	OBD Column	186008156
10 × 150 mm	OBD Column	186008154	10 × 250 mm	OBD Column	186008157
10 × 250 mm	OBD Column	186008155	19 × 10 mm	Guard Cartridge	186002666[2]
19 × 10 mm	Guard Cartridge	186002569[2]	19 × 50 mm	OBD Column	186002667
19 × 50 mm	OBD Column	186002566	19 × 150 mm	OBD Column	186002668
19 × 100 mm	OBD Column	186002567	19 × 250 mm	OBD Column	186002669
19 × 150 mm	OBD Column	186002568	30 × 10 mm	Guard Cartridge	186006884[3]
19 × 250 mm	OBD Column	186004027	30 × 50 mm	OBD Column	186003854
30 × 10 mm	Guard Cartridge	186006885[3]	30 × 100 mm	OBD Column	186003971
30 × 50 mm	OBD Column	186002570	30 × 150 mm	OBD Column	186002670
30 × 75 mm	OBD Column	186002571	30 × 250 mm	OBD Column	186002671
30 × 100 mm	OBD Column	186002572	50 × 50 mm	OBD Column	186002871
30 × 150 mm	OBD Column	186002797	50 × 100 mm	OBD Column	186003972
30 × 250 mm	OBD Column	186003969	50 × 150 mm	OBD Column	186002672
50 × 50 mm	OBD Column	186002867	50 × 250 mm	OBD Column	186002673
50 × 100 mm	OBD Column	186002869			
50 × 150 mm	OBD Column	186003941			
50 × 250 mm	OBD Column	186003970			

*Recommended maximum pressure of 6000 psi (400 bar).
[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

C_8

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
3.0 × 50 mm	186003410	2.1 × 50 mm	186002710	2.1 × 50 mm	186002715
		2.1 × 100 mm	186002711	2.1 × 100 mm	186002716
		2.1 × 150 mm	186002712	2.1 × 150 mm	186002717
		3.0 × 50 mm	186002719	3.0 × 50 mm	186002723
		3.0 × 100 mm	186002720	3.0 × 100 mm	186002724
		3.0 × 150 mm	186002721	3.0 × 150 mm	186002725
		4.6 × 50 mm	186002729	4.6 × 30 mm	186002734
		4.6 × 75 mm	186002730	4.6 × 50 mm	186002735
		4.6 × 100 mm	186002731	4.6 × 100 mm	186002736
		4.6 × 150 mm	186002732	4.6 × 150 mm	186002737
				4.6 × 250 mm	186002738

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002750[1]	10 × 10 mm	Guard Cartridge	186002758[1]
10 × 50 mm	OBD Column	186008158	10 × 50 mm	OBD Column	186008209
10 × 100 mm	OBD Column	186008159	10 × 150 mm	OBD Column	186008162
10 × 150 mm	OBD Column	186008160	10 × 250 mm	OBD Column	186008163
10 × 250 mm	OBD Column	186008161	19 × 10 mm	Guard Cartridge	186002761[2]
19 × 10 mm	Guard Cartridge	186002754[2]	19 × 150 mm	OBD Column	186002763
19 × 50 mm	OBD Column	186002751	19 × 250 mm	OBD Column	186002764
19 × 100 mm	OBD Column	186002752	30 × 10 mm	Guard Cartridge	186006886[3]
19 × 150 mm	OBD Column	186002753	30 × 50 mm	OBD Column	186003853
19 × 250 mm	OBD Column	186004028	30 × 150 mm	OBD Column	186002765
30 × 10 mm	Guard Cartridge	186006887[3]	30 × 250 mm	OBD Column	186002766
30 × 50 mm	OBD Column	186002755	50 × 50 mm	OBD Column	186002872
30 × 75 mm	OBD Column	186002756	50 × 150 mm	OBD Column	186002767
30 × 100 mm	OBD Column	186002757	50 × 250 mm	OBD Column	186002768
30 × 150 mm	OBD Column	186002795			
50 × 50 mm	OBD Column	186002868			
50 × 100 mm	OBD Column	186002870			

*Recommended maximum pressure of 6000 psi (400 bar).
[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

SunFire Columns *Continued*

Silica

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	186003453	4.6 × 150 mm	186003467
4.6 × 250 mm	186003454	4.6 × 250 mm	186003468

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186003429[1]	10 × 10 mm	Guard Cartridge	186003441[1]
10 × 50 mm	OBD Column	186008180	10 × 150 mm	OBD Column	186008184
10 × 100 mm	OBD Column	186008181	10 × 250 mm	OBD Column	186008185
10 × 150 mm	OBD Column	186008182	19 × 10 mm	Guard Cartridge	186003444[2]
10 × 250 mm	OBD Column	186008183	19 × 50 mm	OBD Column	186003445
19 × 10 mm	Guard Cartridge	186003434[2]	19 × 150 mm	OBD Column	186003446
19 × 50 mm	OBD Column	186003431	19 × 250 mm	OBD Column	186003447
19 × 100 mm	OBD Column	186003432	30 × 10 mm	Guard Cartridge	186006888[3]
19 × 150 mm	OBD Column	186003433	30 × 50 mm	OBD Column	186003855
19 × 250 mm	OBD Column	186004029	30 × 150 mm	OBD Column	186003448
30 × 10 mm	Guard Cartridge	186006889[3]	30 × 250 mm	OBD Column	186003449
30 × 50 mm	OBD Column	186003435	50 × 50 mm	OBD Column	186003450
30 × 75 mm	OBD Column	186003436	50 × 150 mm	OBD Column	186003451
30 × 100 mm	OBD Column	186003437	50 × 250 mm	OBD Column	186003452
30 × 150 mm	OBD Column	186003438			
50 × 50 mm	OBD Column	186003439			
50 × 100 mm	OBD Column	186003440			

*Recommended maximum pressure of 6000 psi (400 bar).
[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

SunFire Preparative Scouting Columns

C_{18}

PREPARATIVE COLUMNS

Particle Size: 10 µm	
Dimension	P/N (1/pk)
4.6 × 150 mm	186003390
4.6 × 250 mm	186003391

Silica

Particle Size: 5 µm		Particle Size: 10 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	186003453	4.6 × 150 mm	186003467
4.6 × 250 mm	186003454	4.6 × 250 mm	186003468

SunFire Columns Method Validation Kits*

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
C_{18}	4.6 × 100 mm	186002675	4.6 × 150 mm	186002679
	4.6 × 150 mm	186002676	4.6 × 250 mm	186002680
C_8	4.6 × 100 mm	186002740	4.6 × 150 mm	186002744
	4.6 × 150 mm	186002741	4.6 × 250 mm	186002745

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

SunFire VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
C_{18}	2.1 × 5 mm	186007691	2.1 × 5 mm	186007694	2.1 × 5 mm	186007697
	3.9 × 5 mm	186007693	3.9 × 5 mm	186007696	3.9 × 5 mm	186007699
C_8	2.1 × 5 mm	186007700	2.1 × 5 mm	186007703	2.1 × 5 mm	186007706
	3.9 × 5 mm	186007702	3.9 × 5 mm	186007705	3.9 × 5 mm	186007708

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

APPLICATION AREA: Trap Peptides After Pepsin Digestion, Before Analytical Column

"Very easy-to-use, plug-and-play type of guard, we use it (VanGuard column) to trap peptides after on-column pepsin digestion before separation on an analytical column. The guard also serves as a tool to desalt prior to mass spectrometric analysis. Very reliable and reproducible results. Great value for the money!"

REVIEWER: George Bou-Assaf

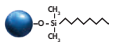
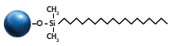
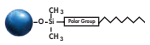
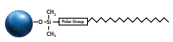
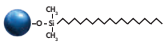
ORGANIZATION: Biogen

Symmetry Columns

Symmetry™ Columns exceed the standards for HPLC column performance. To ensure their optimum performance, they are packed with high-purity silica using stringently controlled manufacturing processes. No other silica-based LC column brand can match the column-to-column and batch-to-batch reproducibility of Symmetry Columns.

- Symmetry C_{18} and C_8 Columns deliver maximum reproducibility
- SymmetryShield RP18 and RP8 Columns provide superior peak shape
- Symmetry300 C_{18} and C_4 Columns offer high recoveries of peptides and proteins

Column Characteristics

	Symmetry C_8 and SymmetryPrep C_8	Symmetry C_{18} and SymmetryPrep C_{18}	SymmetryShield RP8	SymmetryShield RP18	Symmetry300 C_4	Symmetry300 C_{18}
	HPLC: 3.5, 5, 7 µm	HPLC: 3.5, 5, 7 µm	HPLC: 3.5, 5, 7 µm	HPLC: 3.5, 5, 7 µm	HPLC: 3.5, 5 µm	HPLC: 3.5, 5 µm
Particle/Ligand						
Carbon Load*	12%	19%	15%	17%	2.8%	8.5%
Endcapped	Yes	Yes	Yes	Yes	Yes	Yes
USP Class No.	L7	L1	L1	L1	L26	L1
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**MassPREP Protein Standard Mix** p/n: 186004900	**Cytochrome *c* Digestion Standard** p/n: 186006371
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**MassPREP Protein Standard Mix** p/n: 186004900	**Peptide Retention Standard** p/n: 186006555

*Expected or approximate value.

Symmetry, SymmetryShield, and Symmetry300 Columns

Symmetry C_{18}

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm	WAT058973	2.1 × 50 mm	186000206
2.1 × 50 mm	WAT200650	2.1 × 100 mm	186002608
2.1 × 100 mm	WAT058965	2.1 × 150 mm	WAT056975
2.1 × 150 mm	WAT106005	3.0 × 150 mm	WAT054200
3.0 × 50 mm	186002612	3.0 × 250 mm	186000690
3.0 × 100 mm	186000696	3.9 × 20 mm *IS*	186002086
3.0 × 150 mm	186000695	3.9 × 150 mm	WAT046980
3.9 × 20 mm *IS*	186002082	4.6 × 20 mm *IS*	186002094
4.6 × 30 mm	186000271	4.6 × 50 mm	186000207
4.6 × 50 mm	WAT200625	4.6 × 100 mm	186002616
4.6 × 75 mm	WAT066224	4.6 × 150 mm	WAT045905
4.6 × 100 mm	WAT066220	4.6 × 250 mm	WAT054275
4.6 × 150 mm	WAT200632		
4.6 × 250 mm	186005794		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 7 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186000711[5]	7.8 × 10 mm	Guard Cartridge	186000713[5]
7.8 × 50 mm	Column	186000208	7.8 × 150 mm	Column	WAT066288
7.8 × 100 mm	Column	186000209	7.8 × 300 mm	Column	WAT066235
19 × 10 mm	Guard Cartridge	186000715[2]	19 × 10 mm	Guard Cartridge	186000717[2]
19 × 50 mm	Column	186000210	19 × 150 mm	Column	WAT066240
19 × 100 mm	Column	186000211	19 × 300 mm	Column	WAT066245
30 × 100 mm	Column	186000236			

[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[5]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

Symmetry C_8

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm	WAT200624	2.1 × 100 mm	186002609
2.1 × 100 mm	WAT058961	2.1 × 150 mm	WAT056955
2.1 × 150 mm	WAT106011	3.0 × 150 mm	WAT054230
3.0 × 100 mm	186000698	3.0 × 250 mm	186000691
3.0 × 150 mm	186000697	3.9 × 20 mm *IS*	186002087
4.6 × 30 mm	186000270	3.9 × 150 mm	WAT046970
4.6 × 50 mm	WAT200620	4.6 × 50 mm	186000213
4.6 × 75 mm	WAT066200	4.6 × 100 mm	186002617
4.6 × 100 mm	WAT066204	4.6 × 150 mm	WAT045995
4.6 × 150 mm	WAT200630	4.6 × 250 mm	WAT054270

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 7 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186000712[5]	7.8 × 10 mm	Guard Cartridge	186000714[5]
7.8 × 50 mm	Column	186000214	7.8 × 150 mm	Column	WAT066285
7.8 × 100 mm	Column	186000215	7.8 × 300 mm	Column	WAT066225
19 × 100 mm	Column	186000229	19 × 10 mm	Guard Cartridge	186000718[2]
30 × 50 mm	Column	186000237	19 × 150 mm	Column	WAT066228
30 × 100 mm	Column	186000238	19 × 300 mm	Column	WAT066230
30 × 100 mm	Column	186000236			

Symmetry Shield RP18

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm	186000172	2.1 × 50 mm	186000217
2.1 × 100 mm	186000173	2.1 × 100 mm	186000998
2.1 × 150 mm	186000174	2.1 × 150 mm	186000111
3.0 × 100 mm	186000700	3.0 × 150 mm	186000692
3.0 × 150 mm	186000699	3.0 × 250 mm	186000693
3.9 × 20 mm *IS*	186002084	3.9 × 150 mm	186000108
4.6 × 50 mm	186000177	4.6 × 50 mm	186000218
4.6 × 75 mm	186000178	4.6 × 100 mm	186002618
4.6 × 100 mm	186000179	4.6 × 150 mm	186000109
4.6 × 150 mm	186000180	4.6 × 250 mm	186000112

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 7 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
19 × 10 mm	Guard Cartridge	186001835[2]	19 × 150 mm	Column	186001839
19 × 50 mm	Column	186001836	19 × 300 mm	Column	186001840
19 × 100 mm	Column	186001837			
19 × 150 mm	Column	186001838			

[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[5]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

Symmetry Shield RP8

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm	WAT094257	2.1 × 150 mm	WAT094245
2.1 × 100 mm	WAT058969	3.0 × 150 mm	WAT094243
2.1 × 150 mm	WAT106008	3.9 × 20 mm *IS*	186002089
4.6 × 50 mm	WAT094260	3.9 × 150 mm	WAT200655
4.6 × 75 mm	WAT094263	4.6 × 50 mm	186000224
4.6 × 100 mm	WAT094266	4.6 × 100 mm	186002619
4.6 × 150 mm	WAT094269	4.6 × 150 mm	WAT200662
		4.6 × 250 mm	WAT200670

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 7 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
19 × 10 mm	Guard Cartridge	186001841[2]	19 × 150 mm	Column	186001845
19 × 50 mm	Column	186001842	19 × 300 mm	Column	186001846
19 × 100 mm	Column	186001843			
19 × 150 mm	Column	186001844			

Symmetry300 C_{18}

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm	186000187	2.1 × 150 mm	WAT106172
2.1 × 100 mm	186000188	4.6 × 50 mm	WAT106209
2.1 × 150 mm	186000200	4.6 × 150 mm	WAT106157
4.6 × 50 mm	186000201	4.6 × 250 mm	WAT106151
4.6 × 75 mm	186000189		
4.6 × 100 mm	186000190		
4.6 × 150 mm	186000197		

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
19 × 10 mm	Guard Cartridge	186001847[2]
19 × 50 mm	Column	186001848
19 × 100 mm	Column	186001849
19 × 150 mm	Column	186001850

[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[5]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

Symmetry, SymmetryShield, and Symmetry300 Columns *Continued*

	ANALYTICAL COLUMNS			
	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
Symmetry300 C_4	2.1 × 50 mm	186000277	2.1 × 150 mm	186000285
	2.1 × 100 mm	186000278	3.9 × 150 mm	186000286
	2.1 × 150 mm	186000279	4.6 × 50 mm	186000287
	4.6 × 50 mm	186000280	4.6 × 150 mm	186000288
	4.6 × 75 mm	186000281	4.6 × 250 mm	186000289
	4.6 × 100 mm	186000282		
	4.6 × 150 mm	186000283		

Symmetry, SymmetryShield, and Symmetry300 Method Validation Kits*

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
Symmetry C_{18}	4.6 × 150 mm	WAT094240	3.9 × 150 mm	WAT047210
			4.6 × 150 mm	WAT054448
			4.6 × 250 mm	WAT054450
Symmetry C_8	4.6 × 150 mm	WAT094237	3.9 × 150 mm	WAT046955
			4.6 × 150 mm	WAT054435
			4.6 × 250 mm	WAT054438
SymmetryShield RP18	4.6 × 150 mm	186000181	4.6 × 150 mm	186000103
			4.6 × 250 mm	186000102
SymmetryShield RP8	4.6 × 150 mm	WAT094278	4.6 × 250 mm	WAT210591
Symmetry300 C_{18}	4.6 × 150 mm	186000195	3.9 × 150 mm	WAT106187
			4.6 × 150 mm	WAT106190
			4.6 × 250 mm	WAT106184
Symmetry300 C_4	4.6 × 150 mm	186000291	3.9 × 150 mm	186000293
			4.6 × 150 mm	186000294
			4.6 × 250 mm	186000295

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

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

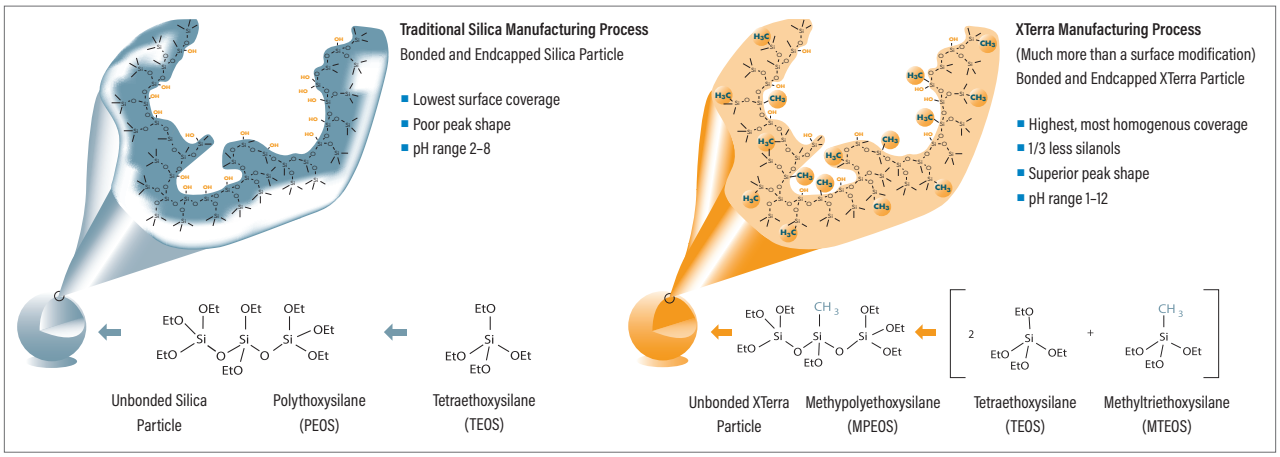
Symmetry VanGuard Cartridges

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
Symmetry C_{18}	2.1 × 5 mm	186007725	2.1 × 5 mm	186007729
	3.9 × 5 mm	186007727	3.9 × 5 mm	186007731
Symmetry C_8	2.1 × 5 mm	186007733	2.1 × 5 mm	186007737
	3.9 × 5 mm	186007735	3.9 × 5 mm	186007739
SymmetryShield RP18	2.1 × 5 mm	186007749	2.1 × 5 mm	186007753
	3.9 × 5 mm	186007751	3.9 × 5 mm	186007755
SymmetryShield RP8	2.1 × 5 mm	186007741	2.1 × 5 mm	186007745
	3.9 × 5 mm	186007743	3.9 × 5 mm	186007747
Symmetry300 C_{18}	2.1 × 5 mm	186007709	2.1 × 5 mm	186007713
	3.9 × 5 mm	186007711	3.9 × 5 mm	186007715
Symmetry300 C_4	2.1 × 5 mm	186007717	2.1 × 5 mm	186007721
	3.9 × 5 mm	186007719	3.9 × 5 mm	186007723

XTerra Columns

XTerra MS, Shield RP, and Phenyl Columns combine the best properties of silica- and polymeric-bonded phases with patented Hybrid Particle Technology (HPT), which replaces one out of every three silanol groups with a methyl group during particle synthesis. HPT overcomes the limitations of silica-based materials while maintaining its best attributes for mechanical strength, chemical resistance, and easy scale up from analytical to preparative chromatography.

Traditional Silica vs. XTerra Manufacturing Process



Column Characteristics

	MS C_{18}, 125 Å	Shield RP18, 125 Å	MS C_8, 125 Å	Shield RP8, 125 Å	Phenyl, 125 Å
	HPLC: 3.5, 5 µm	HPLC: 3.5, 5 µm	HPLC: 3.5, 5 µm	HPLC: 3.5, 5 µm	HPLC: 3.5, 5 µm
Particle/Ligand					
Carbon Load*	15.5%	15%	12%	13.5%	12%
Endcapped	Yes	Yes	Yes	Yes	Yes
USP Class No.	L1	L1	L7	L7	L11
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363

*Expected or approximate value.

For XTerra 2.5 µm Columns, please refer to page 155.

XTerra Columns

MS C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm	186000592	2.1 × 30 mm	186000398	2.1 × 20 mm *IS*	186001979
4.6 × 20 mm *IS*	186001889	2.1 × 50 mm	186000400	2.1 × 50 mm	186000446
4.6 × 30 mm	186000600	2.1 × 100 mm	186000404	2.1 × 100 mm	186000450
4.6 × 50 mm	186000602	2.1 × 150 mm	186000408	2.1 × 150 mm	186000454
4.6 × 75 mm	186000981	3.0 × 50 mm	186000414	2.1 × 250 mm	186000458
		3.0 × 100 mm	186000418	3.0 × 50 mm	186000462
		3.0 × 150 mm	186000422	3.0 × 100 mm	186000466
		3.9 × 100 mm	186000426	3.0 × 150 mm	186000470
		4.6 × 30 mm	186000430	3.0 × 250 mm	186000474
		4.6 × 50 mm	186000432	3.9 × 150 mm	186000478
		4.6 × 100 mm	186000436	4.6 × 50 mm	186000482
		4.6 × 150 mm	186000440	4.6 × 100 mm	186000486
		4.6 × 250 mm	186001470	4.6 × 150 mm	186000490
				4.6 × 250 mm	186000494

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186001168[5]	7.8 × 10 mm	Guard Cartridge	186001172[5]
7.8 × 50 mm	Column	186001152	7.8 × 150 mm	Column	186001160
7.8 × 100 mm	Column	186001156	7.8 × 300 mm	Column	186001164
7.8 × 150 mm	Column	186001475	10 × 10 mm	Guard Cartridge	186001002[1]
10 × 10 mm	Guard Cartridge	186001001[1]	10 × 150 mm	OBD Column	186008129
10 × 50 mm	OBD Column	186008103	10 × 250 mm	OBD Column	186008133
10 × 100 mm	OBD Column	186008107	10 × 300 mm	OBD Column	186008137
10 × 150 mm	OBD Column	186008141	19 × 10 mm	Guard Cartridge	186001034[2]
19 × 10 mm	Guard Cartridge	186001104[2]	19 × 50 mm	OBD Column	186002254
19 × 50 mm	OBD Column	186001930	19 × 150 mm	OBD Column	186002255
19 × 100 mm	OBD Column	186001934	19 × 250 mm	OBD Column	186002259
19 × 150 mm	OBD Column	186002379	19 × 300 mm	OBD Column	186002263
30 × 10 mm	Guard Cartridge	186006903[3]	30 × 10 mm	Guard Cartridge	186006902[3]
30 × 50 mm	OBD Column	186001938	30 × 150 mm	OBD Column	186002267
30 × 100 mm	OBD Column	186001942	30 × 250 mm	OBD Column	186002271
50 × 50 mm	OBD Column	186002218	30 × 300 mm	OBD Column	186002275
50 × 100 mm	OBD Column	186002222	50 × 50 mm	OBD Column	186002279
			50 × 150 mm	OBD Column	186002843
			50 × 250 mm	OBD Column	186002847

*Recommended maximum pressure of 6000 psi (400 bar).
[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.
[5]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

MS C_8

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 50 mm	186000603	2.1 × 50 mm	186000401	2.1 × 50 mm	186000447
		2.1 × 100 mm	186000405	2.1 × 100 mm	186000451
		2.1 × 150 mm	186000409	2.1 × 150 mm	186000455
		3.9 × 100 mm	186000427	2.1 × 250 mm	186000459
		4.6 × 50 mm	186000433	3.9 × 150 mm	186000479
		4.6 × 100 mm	186000437	4.6 × 50 mm	186000483
		4.6 × 150 mm	186000441	4.6 × 100 mm	186000487
		4.6 × 250 mm	186001471	4.6 × 150 mm	186000491
				4.6 × 250 mm	186000495

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186001169[5]	7.8 × 10 mm	Guard Cartridge	186001173[5]
7.8 × 50 mm	Column	186001153	7.8 × 150 mm	Column	186001161
7.8 × 100 mm	Column	186001157	7.8 × 300 mm	Column	186001165
7.8 × 150 mm	Column	186001476	10 × 150 mm	OBD Column	186008130
10 × 50 mm	OBD Column	186008104	10 × 250 mm	OBD Column	186008134
10 × 150 mm	OBD Column	186008142	10 × 300 mm	OBD Column	186008138
19 × 10 mm	Guard Cartridge	186001105[2]	19 × 10 mm	Guard Cartridge	186001035[2]
19 × 50 mm	OBD Column	186001931	19 × 150 mm	OBD Column	186002256
19 × 100 mm	OBD Column	186001935	19 × 250 mm	OBD Column	186002260
19 × 150 mm	OBD Column	186002380	19 × 300 mm	OBD Column	186002264
30 × 10 mm	Guard Cartridge	186006904[3]	30 × 150 mm	OBD Column	186002268
30 × 75 mm	OBD Column	186002388	30 × 250 mm	OBD Column	186002272
30 × 100 mm	OBD Column	186001943	30 × 300 mm	OBD Column	186002276
50 × 50 mm	OBD Column	186002219	50 × 50 mm	OBD Column	186002280
50 × 100 mm	OBD Column	186002223	50 × 150 mm	OBD Column	186002844

*Recommended maximum pressure of 6000 psi (400 bar).
[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.
[5] Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

Shield RP18

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
2.1 × 20 mm *IS*	186001925	2.1 × 50 mm	186000448
2.1 × 50 mm	186000402	2.1 × 100 mm	186000452
2.1 × 100 mm	186000406	2.1 × 150 mm	186000456
2.1 × 150 mm	186000410	2.1 × 250 mm	186000460
3.0 × 50 mm	186000416	3.0 × 50 mm	186000464
3.0 × 100 mm	186000420	3.0 × 100 mm	186000468
3.0 × 150 mm	186000424	3.0 × 150 mm	186000472
3.9 × 100 mm	186000428	3.0 × 250 mm	186000476
4.6 × 50 mm	186000434	3.9 × 150 mm	186000480
4.6 × 100 mm	186000438	4.6 × 50 mm	186000484
4.6 × 150 mm	186000442	4.6 × 100 mm	186000488
4.6 × 250 mm	186001472	4.6 × 150 mm	186000492
		4.6 × 250 mm	186000496

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	**Type**	**P/N (1/pk)**	**Dimension**	**Type**	**P/N (1/pk)**
7.8 × 10 mm	Guard Cartridge	186001170[5]	7.8 × 10 mm	Guard Cartridge	186001174[5]
7.8 × 50 mm	Column	186001154	7.8 × 150 mm	Column	186001162
7.8 × 100 mm	Column	186001158	7.8 × 300 mm	Column	186001166
7.8 × 150 mm	Column	186001477	10 × 10 mm	Guard Cartridge	186001007[1]
10 × 10 mm	Guard Cartridge	186001006[1]	10 × 150 mm	OBD Column	186008131
10 × 50 mm	OBD Column	186008105	10 × 250 mm	OBD Column	186008135
10 × 100 mm	OBD Column	186008128	10 × 300 mm	OBD Column	186008139
10 × 150 mm	OBD Column	186008143	19 × 10 mm	Guard Cartridge	186001036[2]
19 × 10 mm	Guard Cartridge	186001106[2]	19 × 150 mm	OBD Column	186002257
19 × 50 mm	OBD Column	186001932	19 × 250 mm	OBD Column	186002261
19 × 100 mm	OBD Column	186001936	19 × 300 mm	OBD Column	186002265
19 × 150 mm	OBD Column	186002381	30 × 10 mm	Guard Cartridge	186006905[3]
30 × 10 mm	Guard Cartridge	186006906[3]	30 × 150 mm	OBD Column	186002269
30 × 50 mm	OBD Column	186001940	30 × 250 mm	OBD Column	186002273
30 × 75 mm	OBD Column	186002389	30 × 300 mm	OBD Column	186002277
30 × 100 mm	OBD Column	186001944	50 × 50 mm	OBD Column	186002281
50 × 50 mm	OBD Column	186002220	50 × 250 mm	OBD Column	186002849
50 × 100 mm	OBD Column	186002224			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.
[5] Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

Shield RP8

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
3.0 × 50 mm	186000417	2.1 × 150 mm	186000457
3.0 × 100 mm	186000421	3.0 × 100 mm	186000469
3.0 × 150 mm	186000425	3.0 × 150 mm	186000473
3.9 × 100 mm	186000429	3.9 × 150 mm	186000481
4.6 × 50 mm	186000435	4.6 × 50 mm	186000485
4.6 × 100 mm	186000439	4.6 × 100 mm	186000489
4.6 × 150 mm	186000443	4.6 × 150 mm	186000493
4.6 × 250 mm	186001473	4.6 × 250 mm	186000497

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186001171[5]	7.8 × 10 mm	Guard Cartridge	186001175[5]
7.8 × 50 mm	Column	186001155	7.8 × 150 mm	Column	186001163
7.8 × 100 mm	Column	186001159	7.8 × 300 mm	Column	186001167
7.8 × 150 mm	Column	186001478	10 × 10 mm	Guard Cartridge	186001009[1]
10 × 10 mm	Guard Cartridge	186001008[1]	10 × 150 mm	OBD Column	186008132
10 × 50 mm	OBD Column	186008106	10 × 250 mm	OBD Column	186008136
10 × 150 mm	OBD Column	186008144	10 × 300 mm	OBD Column	186008140
19 × 10 mm	Guard Cartridge	186001107[2]	19 × 10 mm	Guard Cartridge	186001037[2]
19 × 100 mm	OBD Column	186001937	19 × 150 mm	OBD Column	186002258
19 × 150 mm	OBD Column	186002382	19 × 250 mm	OBD Column	186002262
30 × 50 mm	OBD Column	186001941	19 × 300 mm	OBD Column	186002266
30 × 75 mm	OBD Column	186002390	30 × 150 mm	OBD Column	186002270
30 × 100 mm	OBD Column	186001945	30 × 250 mm	OBD Column	186002274
50 × 50 mm	OBD Column	186002221	30 × 300 mm	OBD Column	186002278
50 × 100 mm	OBD Column	186002225	50 × 50 mm	OBD Column	186002282
			50 × 150 mm	OBD Column	186002846
			50 × 250 mm	OBD Column	186002850

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[5] Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

XTerra Columns *Continued*

	ANALYTICAL COLUMNS			
	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
Phenyl	2.1 × 50 mm	186001179	3.9 × 150 mm	186001184
	2.1 × 100 mm	186001180	4.6 × 50 mm	186001144
	2.1 × 150 mm	186001181	4.6 × 100 mm	186001145
	3.0 × 100 mm	186001142	4.6 × 150 mm	186001146
	3.0 × 150 mm	186001143	4.6 × 250 mm	186001147
	3.9 × 150 mm	186001178		
	4.6 × 50 mm	186001138		
	4.6 × 100 mm	186001139		
	4.6 × 150 mm	186001140		
	4.6 × 250 mm	186001474		

XTerra Columns Method Validation Kits*

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
MS C_{18}	4.6 × 150 mm	186000826	4.6 × 150 mm	186000829
			4.6 × 250 mm	186000830
Shield RP18	4.6 × 150 mm	186000861	4.6 × 150 mm	186000862
			4.6 × 250 mm	186000863

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

XTerra VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
MS C_{18}	2.1 × 5 mm	186007887	2.1 × 5 mm	186007892	2.1 × 5 mm	186007896
	3.9 × 5 mm	186007889	3.9 × 5 mm	186007894	3.9 × 5 mm	186007899
MS C_8	2.1 × 5 mm	186007901	2.1 × 5 mm	186007905	2.1 × 5 mm	186007909
	3.9 × 5 mm	186007903	3.9 × 5 mm	186007735	3.9 × 5 mm	186007739
Shield RP18			2.1 × 5 mm	186007929	2.1 × 5 mm	186007933
			3.9 × 5 mm	186007931	3.9 × 5 mm	186007935
Shield RP8			2.1 × 5 mm	186007941	3.9 × 5 mm	186007947
			3.9 × 5 mm	186007943		
Phenyl			2.1 × 5 mm	186007917	2.1 × 5 mm	186007921
			3.9 × 5 mm	186007919	3.9 × 5 mm	186007923

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

Spherisorb Columns

Waters Spherisorb™ Columns are available in a wide range of particle sizes (3, 5, and 10 µm) and bonded phases. Their high quality bonded phases afford many different and unique separation selectivities. Analytical columns are supplied with industry-standard, Parker-style, column end fittings.

Column Characteristics

	ODS2 (C_{18}), 80 Å	ODS1 (C_{18}), 80 Å	ODSB (C_{18}), 80 Å	C_8, 80 Å	C_6, 80 Å	C_1, 80 Å
	HPLC: 3, 5, 10 µm	HPLC: 3, 5, 10 µm	HPLC: 5 µm	HPLC: 3, 5, 10 µm	HPLC: 3, 5, 10 µm	HPLC: 3, 5, 10 µm
Ligand Density*	3.0 µmol/m^2	1.5 µmol/m^2	3.0 µmol/m^2	3.1 µmol/m^2	3.4 µmol/m^2	3.0 µmol/m^2
Carbon Load*	11.5%	6.2%	11.5%	5.8%	4.7%	2.2%
Endcapped	Yes	No	No	Yes	Yes	No
USP Class No.	L1	L1	L1	L7	L15	L13
Surface Area*	220 m^2/g	220 m^2/g	220 m^2/g	220 m^2/g	220 m^2/g	220 m^2/g

*Expected or approximate value.

	NH_2 (Amino), 80 Å	Phenyl, 80 Å	CN (Nitrile), 80 Å	OD/CN, 80 Å	W (Silica), 80 Å	SCX, 80 Å	SAX, 80 Å
	HPLC: 3, 5, 10 µm	HPLC: 3, 5, 10 µm	HPLC: 3, 5, 10 µm	HPLC: 5 µm	HPLC: 3, 5, 10 µm	HPLC: 5, 10 µm	HPLC: 5, 10 µm
Ligand Density*	2.6 µmol/m^2	1.7 µmol/m^2	3.3 µmol/m^2	1.2 µmol/m^2	—	—	—
Carbon Load*	1.9%	2.5%	3.1%	5%	N/A	4%	4%
Endcapped	No	No	No	Yes	No	No	No
USP Class No.	L8	L11	L10	—	L3	L9	L14
Surface Area*	220 m^2/g	220 m^2/g	220 m^2/g	220 m^2/g	220 m^2/g	220 m^2/g	220 m^2/g

*Expected or approximate value.

For Spherisorb Preparative Columns, please refer to page 278.

Ordering Information

Spherisorb Columns

ODS1

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.0 × 100 mm	PSS833422	4.0 × 125 mm	PSS845541
4.6 × 50 mm	PSS833411	4.0 × 250 mm	PSS845542
4.6 × 100 mm	PSS833412	4.6 × 100 mm	PSS830612
4.6 × 150 mm	PSS833413	4.6 × 150 mm	PSS830613
		4.6 × 250 mm	PSS830615

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008284	10 × 250 mm	OBD Column	186008285
19 × 250 mm	OBD Column	186008846	19 × 250 mm	OBD Column	186008857

ODS2

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 50 mm	PSS832111	4.0 × 125 mm	PSS845543
4.6 × 100 mm	PSS832112	4.0 × 250 mm	PSS845277
4.6 × 150 mm	PSS832113	4.6 × 50 mm	PSS831911
		4.6 × 100 mm	PSS831912
		4.6 × 150 mm	PSS831913
		4.6 × 250 mm	PSS831915

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008292	10 × 250 mm	OBD Column	186008294
19 × 250 mm	OBD Column	186008847	19 × 250 mm	OBD Column	186008858

C_8

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 50 mm	PSS832211	4.0 × 125 mm	PSS845280
4.6 × 100 mm	PSS832212	4.0 × 250 mm	PSS845281
4.6 × 150 mm	PSS832213	4.6 × 100 mm	PSS831812
		4.6 × 150 mm	PSS831813
		4.6 × 250 mm	PSS831815

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008291	10 × 250 mm	OBD Column	186008297
19 × 250 mm	OBD Column	186008848	19 × 250 mm	OBD Column	186008859

C_6

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	PSS833113	4.0 × 125 mm	PSS845284
		4.6 × 100 mm	PSS831012
		4.6 × 250 mm	PSS831015

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008288	19 × 250 mm	OBD Column	186008860
19 × 250 mm	OBD Column	186008849			

C_1

ANALYTICAL COLUMNS

Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.6 × 100 mm	PSS832612
4.6 × 150 mm	PSS832613
4.6 × 250 mm	PSS832615

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008295	19 × 250 mm	OBD Column	186008861
19 × 250 mm	OBD Column	186008850			

NH_2

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.0 × 100 mm	PSS832322	4.0 × 250 mm	PSS845301
4.6 × 50 mm	PSS832311	4.6 × 150 mm	PSS831113
4.6 × 100 mm	PSS832312	4.6 × 250 mm	PSS831115
4.6 × 150 mm	PSS832313		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008289	10 × 250 mm	OBD Column	186008299
19 × 250 mm	OBD Column	186008853	19 × 250 mm	OBD Column	186008864

Phenyl

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	PSS833713	4.0 × 250 mm	PSS845293
		4.6 × 250 mm	PSS830815

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008286	10 × 250 mm	OBD Column	186008300
19 × 250 mm	OBD Column	186008854	19 × 250 mm	OBD Column	186008865

CN Normal Phase

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	PSS832413	4.0 × 250 mm	PSS845297
		4.6 × 100 mm	PSS830912
		4.6 × 150 mm	PSS830913
		4.6 × 250 mm	PSS830915

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008287	10 × 250 mm	OBD Column	186008298
19 × 250 mm	OBD Column	186008852	19 × 250 mm	OBD Column	186008863

CN Reversed Phase

ANALYTICAL COLUMNS

Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.6 × 150 mm	PSS830908
4.6 × 250 mm	PSS830909

Silica

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	PSS832013	2.0 × 250 mm	PSS830125
		4.0 × 250 mm	PSS845540
		4.6 × 250 mm	PSS830115

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008281	10 × 250 mm	OBD Column	186008282
19 × 250 mm	OBD Column	186008851	19 × 250 mm	OBD Column	186008862

Spherisorb Columns *Continued*

SAX

ANALYTICAL COLUMNS	
Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.0 × 250 mm	PSS845305
4.6 × 50 mm	PSS832711
4.6 × 150 mm	PSS832713
4.6 × 250 mm	PSS832715

PREPARATIVE COLUMNS					
Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008296	10 × 250 mm	OBD Column	186008301
19 × 250 mm	OBD Column	186008855	19 × 250 mm	OBD Column	186008866

SCX

ANALYTICAL COLUMNS	
Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.0 × 250 mm	PSS845309
4.6 × 50 mm	PSS837511
4.6 × 100 mm	PSS837512
4.6 × 150 mm	PSS837513
4.6 × 250 mm	PSS837515

PREPARATIVE COLUMNS					
Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008302	10 × 250 mm	OBD Column	186008303
19 × 250 mm	OBD Column	186008856	19 × 250 mm	OBD Column	186008867

OD/CN

ANALYTICAL COLUMNS	
Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.6 × 150 mm	PSS837813
4.6 × 250 mm	PSS837815

Nova-Pak Columns

The bonded phases of Nova-Pak™ Columns, available in 4 and 6 µm particle sizes, offer high resolution and fast, efficient chromatography. When used with relatively short column lengths, the smaller particles reduce solvent consumption while retaining their ability to resolve complex mixtures. Steel analytical columns packed with 4 µm particles are available in 75, 150, and 300 mm lengths. Packed with high efficiency 6 µm particles, semi-preparative Prep Nova-Pak HR Columns provide an unparalleled range of separation possibilities. Their faster separations produce concentrated fractions, and they require less solvent, significantly reducing costs.

Column Characteristics

	C_{8}, 60 Å	C_{18}, 60 Å	Phenyl, 60 Å	CN, 60 Å	Silica, 60 Å
	HPLC: 4 µm	HPLC: 4, 6 µm	HPLC: 4 µm	HPLC: 4 µm	HPLC: 4, 6 µm
Carbon Load*	4%	7%	5%	2%	N/A
Endcapped	Yes	Yes	Yes	Yes	No
USP Class No.	L7	L1	L11	L10	L3
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	**Neutrals QC Reference Material** p/n: 186006360	—	—
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	**Reversed-Phase QC Reference Material** p/n: 186006363	—	—

*Expected or approximate value.

Ordering Information

Nova-Pak Columns

Nova-Pak C_{18}

ANALYTICAL COLUMNS	
Particle Size: 4 µm	
Dimension	P/N (1/pk)
2.1 × 150 mm	WAT023655
3.9 × 75 mm	WAT011670
3.9 × 150 mm	WAT086344
3.9 × 300 mm	WAT011695
4.6 × 150 mm	WAT044375

PREPARATIVE COLUMNS	
Particle Size: 6 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT038500
7.8 × 300 mm	WAT025820
19 × 300 mm	WAT025822

Nova-Pak C_{8}

ANALYTICAL COLUMNS	
Particle Size: 4 µm	
3.9 × 75 mm	WAT035877
3.9 × 150 mm	WAT035876

Nova-Pak Phenyl

ANALYTICAL COLUMNS	
Particle Size: 4 µm	
Dimension	P/N (1/pk)
2.1 × 150 mm	WAT052740
3.9 × 75 mm	WAT011675
3.9 × 150 mm	WAT010656

Nova-Pak CN-HP

3.9 × 75 mm	WAT010270
3.9 × 150 mm	WAT044245
3.9 × 300 mm	WAT056920

Nova-Pak Silica

2.1 × 150 mm	WAT052745
3.9 × 150 mm	WAT010025

PREPARATIVE COLUMNS	
Particle Size: 6 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT038501
7.8 × 300 mm	WAT025821
19 × 300 mm	WAT025823

For Nova-Pak Preparative Columns, please refer to page 282.

Resolve Columns

The non-endcapped Resolve Packing is significantly different compared to other Waters packing materials. The change in chromatographic behavior is most commonly noticed with polar compounds, which are typically more retained. For alkaline compounds, ion-pairing reagents are added to the mobile phase to reduce excessive tailing.

Ordering Information

Resolve Columns

C_{18}	Particle Size: 5 µm	
	Dimension	P/N (1/pk)
	3.9 × 150 mm	WAT085711
	3.9 × 300 mm	WAT011740

Column Characteristics

	$C_{8'}$ 90 Å	$C_{18'}$ 90 Å	Silica, 90 Å	CN, 90 Å
	HPLC: 5, 10 µm	HPLC: 5, 10 µm	HPLC:5, 10 µm	HPLC: 10 µm
Carbon Load*	5%	10%	10%	3%
Endcapped	No	No	No	No
USP Class No.	L7	L1	L3	L10
Performance Standards	Neutrals QC Reference Material p/n: 186006360	Neutrals QC Reference Material p/n: 186006360	–	–
Application Standards	Reversed-Phase QC Reference Material p/n: 186006363	Reversed-Phase QC Reference Material p/n: 186006363	–	–

*Expected or approximate value.

For Resolve Radial Compression Columns and PrepPak™ Cartridges, please refer to page 290.

Delta-Pak Columns

Delta-Pak Columns are ideal for separating and isolating peptides, proteins, and natural products. Optimized for large molecule separations and available in two pore sizes, they provide consistent and predictable scaling from milligram quantities to gram quantities between column formats.

Column Characteristics

	$C_{18'}$ 100 Å	$C_{18'}$ 300 Å	$C_{4'}$ 100 Å	$C_{4'}$ 300 Å
	HPLC: 5, 15 µm	HPLC: 5, 15 µm	HPLC: 5, 15 µm	HPLC: 5, 15 µm
Carbon Load*	17%	7%	7%	3%
Endcapped	Yes	Yes	Yes	Yes
USP Class No.	L1	L1	L26	L26
Performance Standards	Neutrals QC Reference Material p/n: 186006360	Neutrals QC Reference Material p/n: 186006360	MassPREP Protein Standard Mix p/n: 186004900	MassPREP Protein Standard Mix p/n: 186004900
Application Standards	Reversed-Phase QC Reference Material p/n: 186006363	Reversed-Phase QC Reference Material p/n: 186006363	MassPREP Protein Standard Mix p/n: 186004900	MassPREP Protein Standard Mix p/n: 186004900

*Expected or approximate value.

For Delta-Pak Preparative Columns, please refer to page 284.

Ordering Information

Delta-Pak Columns

Delta-Pak C_{18}, 300 Å

ANALYTICAL COLUMNS	
Particle Size: 5 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT011793

PREPARATIVE COLUMNS	
Particle Size: 15 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT011802
7.8 × 300 mm	WAT011803
19 × 300 mm	WAT011804
30 × 300 mm	WAT011805

Delta-Pak C_4, 300 Å

ANALYTICAL COLUMNS	
Particle Size: 5 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT011794

PREPARATIVE COLUMNS	
Particle Size: 15 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT011812
7.8 × 300 mm	WAT011813
19 × 300 mm	WAT011814
30 × 300 mm	WAT011815

Delta-Pak C_{18}, 100 Å

PREPARATIVE COLUMNS	
Particle Size: 15 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT011797
7.8 × 300 mm	WAT011798
19 × 300 mm	WAT011799
30 × 300 mm	WAT011800
50 × 300 mm	WAT011801

Delta-Pak C_4, 100 Å

PREPARATIVE COLUMNS	
Particle Size: 15 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT011807
7.8 × 300 mm	WAT011808
19 × 300 mm	WAT011809
30 × 300 mm	WAT011810

µBondapak/Bondapak Columns

Waters makes the only column that contains the µBondapak™ C_{18} packing material. Other column manufacturers claim their products exhibit "µBondapak-like" selectivity. Yet none of them have ever passed Waters' stringent QC batch tests. Since 1973, µBondapak and Bondapak™ packing materials demonstrate year-to-year reproducibility, which is why µBondapak remains among the most frequently referenced column brands.

Column Characteristics

	C_{18}, 125 Å	CN, 125 Å	NH_2, 125 Å	Phenyl, 125 Å
	HPLC: 10 µm	HPLC: 10 µm	HPLC: 10 µm	HPLC: 10 µm
Carbon Load*	10%	6%	3.5%	8%
Endcapped	Yes	Yes	No	Yes
USP Class No.	L1	L1	L8	L11
Performance Standards	**Neutrals QC Reference Material** p/n: 186006360	—	—	**Neutrals QC Reference Material** p/n: 186006360
Application Standards	**Reversed-Phase QC Reference Material** p/n: 186006363	—	—	**Reversed-Phase QC Reference Material** p/n: 186006363

*Expected or approximate value.

µBondapak/Bondapak

C_{18}, 125 Å

ANALYTICAL COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086684
3.9 × 300 mm	WAT027324
4.6 × 150 mm	WAT044370
4.6 × 300 mm	186000925

PREPARATIVE COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086684
3.9 × 300 mm	WAT027324
4.6 × 150 mm	WAT044370
4.6 × 300 mm	186000925
7.8 × 300 mm	WAT084176
19 × 150 mm	WAT088500
19 × 300 mm	WAT025828

Particle Size: 15–20 µm

3.9 × 150 mm	WAT025875
7.8 × 300 mm	WAT025832
19 × 300 mm	WAT025834

CN, 125 Å

ANALYTICAL COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086688
3.9 × 300 mm	WAT084042

PREPARATIVE COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086688
3.9 × 300 mm	WAT084042
7.8 × 300 mm	WAT084177

NH_2, 125 Å

ANALYTICAL COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 300 mm	WAT084040

PREPARATIVE COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 300 mm	WAT084040
7.8 × 300 mm	WAT084178

Phenyl, 125 Å

ANALYTICAL COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086680
3.9 × 300 mm	WAT027198

PREPARATIVE COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086680
3.9 × 300 mm	WAT027198
7.8 × 300 mm	WAT084179

For µBondapak/Bondapak and µPorasil/Porasil Preparative Columns, please refer to page 282.

µPorasil/Porasil Columns

µPorasil and Porasil particles were one of the first commercially available, fully porous packing materials used for LC separations. In contrast to the reversed-phase separation ability of µBondapak C_{18}, the non-bonded, silica-based material in µPorasil Columns was produced to provide normal-phase separations for a wide array of sample types.

Column Characteristics

	HPLC: 10, 15–20 µm
	Silica, 125 Å
Carbon Load*	N/A
Endcapped	No
USP Class No.	L3

*Expected or approximate value.

Ordering Information

µPorasil/Porasil

µPorasil, 125 Å

ANALYTICAL COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 300 mm	WAT027477

PREPARATIVE COLUMNS

Particle Size: 10 µm

Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086692
3.9 × 300 mm	WAT027477
7.8 × 300 mm	WAT084175
19 × 150 mm	WAT091648
19 × 300 mm	WAT025829

Porasil, 125 Å

PREPARATIVE COLUMNS

Particle Size: 15–20 µm

Dimension	P/N (1/pk)
3.9 × 300 mm	WAT025874
19 × 300 mm	WAT025835

Shodex RSpak Polymer Reversed-Phase Columns

Shodex RSpak Columns are packed with porous polymeric particles that remain stable in a pH range of 2–12. Similar to conventional polymer-based materials, the DS-613 sorbent works well with samples that are more hydrophobic than hydrophilic, and which, consequently, require relatively high concentrations of organic modifiers. DE-613 columns, with a polymethacrylate packing, are more hydrophilic than hydrophobic, and work well with mobile phases containing relatively high concentrations of water. The least hydrophobic sorbent is used for the DE-613 columns.

For weakly cationic species, the DC-613 column is a cation exchanger with unique selectivity (mixed-mode, ion-exchange, and reversed-phase partition chromatography).

Ordering Information

Shodex RSpak D Series Columns

Description	Base Polymer	Functional Group	Dimension	P/N (1/pk)
DS-613	Polystyrene	None	6 × 150 mm	WAT034220
DE-613	Polymethacrylate	None	6 × 150 mm	WAT034221
DC-613	Polystyrene	Sulfonated	6 × 150 mm	WAT034223
DS-G Pre-column	—	—	4.6 × 10 mm	WAT034224
DE-G Pre-column	—	—	4.6 × 10 mm	WAT034225
DC-G Pre-column	—	—	4.6 × 10 mm	WAT034227

Application-Specific Columns

SUGAR AND CARBOHYDRATE ANALYSIS

High-Performance Carbohydrate Analysis Cartridge Column, p/n: WAT044355

Waters High-Performance Carbohydrate Cartridge Column, with reusable end-fittings, is packed with a 4 µm, spherical silica. This column was developed to separate five monosaccharides and disaccharides with baseline resolution in less than 12 minutes. The 4.6 mm I.D. × 250 mm High-Performance Carbohydrate Cartridge Column offers optimal speed, resolution, and longevity. The pre-packed, disposable cartridge column requires reusable end fittings, which are available separately.

Carbohydrate Analysis Column, p/n: WAT084038

The Carbohydrate Analysis Column uses a covalently bonded amino packing on a silica substrate. It is best suited for low-molecular-weight sugars such as mono-, di-, and tri-saccharides.

Sugar Pak I Column, p/n: WAT085188

The Sugar Pak I Column separates monosaccharides and sugar alcohols via a strong cation-exchange mechanism. The resin is based on a sulfonated styrene-divinylbenzene polymer that provides pH stability by means of a calcium counter ion.

Waters offers a range of columns for the analysis of sugars, carbohydrates, organic acids, and alcohols. Refer to the following tables for ordering information.

Typical Applications for Sugar and Carbohydrate Columns

Cartridge/ Column	Carbohydrate Analysis Column	SAM I Reagent with Silica Cartridge	Sugar-Pak I, SC-1011, SP-0810	SH-1011, IC-Pak Ion-Exclusion Fast Fruit Juice	Dextro-Pak	KS-800 series
Mode	Partition	Partition	Ion exchange/ size exclusion	Ion exchange/ size exclusion	Reversed phase	Size exclusion
Eluent	65–85% acetonitrile/water ambient to 70 ˚C	70–80% acetonitrile/water 0.1% SAM I ambient	Water 75–95 ˚C	0.01 N phosphoric acid 50–60 ˚C	Water ambient	—
Application	Mono-, di- and tri-saccharides up to DP 8 sugars and sugar alcohols	Mono-, di- and tri-saccharides	Mono-, di-, oligosaccharides and sugar alcohols	Sugar acids, sugar alcohols, organic acids	Hydrolysed syrups, derivatized sugars	Mono- through oligosaccharides such as syrups
Elution Order	Smallest elute first	Smallest elute first	Largest elute first	Largest and most acidic elute first	Smallest elute first	Largest elute first

Guide to Shodex Sugar Columns

S	C	18	2	1
Type of Column	Cation	% Cross Linkage	Pore Size	0 - Gel Type
S = sugar	H = H^+	—	1 = 20 Å	1 - Semimacropore gel
	C = Ca^{2+}	—	2 = 50 Å	2 - Permanent pore gel
	P = Pb^{2+}	—	3 = 100 Å	
	Z = Zn^{2+}	—	4 = 500 Å	
	—	—	5 = 1000 Å	
Example:				
S	C	10	1	1
Sugar column	Ca^{2+}	10% cross linkage	20 Å	Semimacropore gel

Ordering Information

SAM I Reagent Column

Description	Dimension	P/N (1/pk)
SAM I Reagent	7.8 × 300 mm	WAT010873

Columns for Alcohols and Carbohydrates

Description	Dimension	Particle Size	Qty.	P/N
Carbohydrate Analysis Column	3.0 × 300 mm	10 µm	1/pk	WAT084038
Dextro-Pak Cartridge Column	8.0 × 100 mm	—	1/pk	WAT085650
High-Performance Carbohydrate Sentry Guard Column	3.9 × 20 mm	4 µm	2/pk	WAT046895[1]
SC-1011 Column	8.0 × 300 mm	7 µm	1/pk	WAT034238
SC-1011P Pre-column	6.0 × 50 mm	7 µm	1/pk	WAT034244
SH-1011	8.0 × 300 mm	7 µm	1/pk	WAT034236
SH-1011P Pre-column	6.0 × 50 mm	7 µm	1/pk	WAT034243
SP-0810 Column	8.0 × 300 mm	8 µm	1/pk	WAT036954
SP-0810P Pre-column	6.0 × 50 mm	8 µm	1/pk	WAT034245
Sugar-Pak 1 Column	6.5 × 300 mm	10 µm	1/pk	WAT085188
Sugar-Pak 1 Guard-Pak Inserts	—	—	10/pk	WAT015209[2]
Shodex KS-801	—	7 µm	1/pk	WAT034276

[1] Requires Sentry Guard Holder, p/n: WAT046905.
[2] Requires Guard-Pak Holder, p/n: WAT088141.

High-Performance Carbohydrate Analysis Cartridge Column

Description	Dimension	P/N (1/pk)
High-Performance Carbohydrate Cartridge Column (requires end-fittings)	4.6 × 250 mm	WAT044355
Sentry Integrated Guard Holder (for Waters cartridge columns)	—	WAT046905

FERMENTATION ANALYSIS, ORGANIC ACIDS, ALCOHOLS, AND CARBOHYDRATES

The ion-exclusion mode is ideally suited for the separation of monosaccharides, organic acids, or sugar acids. The column packings are sulfonated styrene divinylbenzene resins in the hydrogen form (IC-Pak Ion-Exclusion or SH-1011), and the mobile phase is a dilute acid such as 0.01 N phosphoric acid using column temperatures of 50–60 °C.

In this mode, the Fast Juice column can effectively separate glycerol, acetic acid, and ethanol in grape or other fruit juice. The column can also analyze the degree of microbial defect, the extent of natural fermentation in grapes, and the amount of sulfite in various foods and beverages. The IC-Pak Ion-exclusion Column can separate a wide range of organic acids while the Shodex SH Column separates acids as well as larger carbohydrates.

The analysis of alcohols and organic acids is important, for they typically help determine the flavor characteristics of beverages such as wine, beer, and some distilled spirits. The presence of alcohols in fruit juices can indicate product deterioration. The Shodex KC-811 Column, which provides ion-exchange and reversed-phase chromatography modes, is packed with a sulfonated, rigid, styrene-divinylbenzene copolymer. With high efficiency, this packing separates low-molecular-weight organic acids and water-soluble organics such as alcohols, aldehydes, and nitriles. The column provides ion-exclusion and reversed-phase mode of chromatography. Typical mobile phases, run at 1 mL/min at 45–80 °C, are composed of aqueous solutions containing 1% phosphoric acid, acetic acid, or perchloric acid.

Shodex KC-811 Column Retention Chart for Organic Acids

Sample	Retention Time	Sample	Retention Time
Oxalic Acid	5.20	ß- Hydroxy-propionic Acid	8.60
Maleic Acid	5.80	D-Glucuronic Acid	8.65
a-Ketoglutaric Acid	5.90	Fumaric Acid	8.95
Citric Acid	6.20	Formic Acid	9.20
Tartaric Acid	6.55	Acetic Acid	9.80
Pyruvic Acid	6.65	Adipic Acid	9.80
trans-Aconitic Acid	6.95	Levulinic Acid	10.00
Glyoxylic Acid	7.00	Mesaconic Acid	10.40
Malic Acid	7.05	Pyroglutamic Acid	10.70
Malonic Acid	7.07	Propionic Acid	11.25
Citraconic Acid	7.20	Acrylic Acid	11.60
Succinic Acid	8.00	Pivalic Acid	14.05
Glycolic Acid	8.40	Methacrylic Acid	14.10
Itaconic	8.50	trans-Crotonic Acid	15.65
Lactic Acid	8.60		

Eluent: Water with 0.1% phosphoric acid, Temperature: 60 ˚C, Flow rate: 1 mL/min.

Ordering Information

Columns for Fermentation Analysis, Organic Acids, Alcohols, and Carbohydrates

Description	Dimension	Qty.	P/N
Fast Fruit Juice Analysis	8.0 × 100 mm	1/pk	WAT010639
Fast Fruit Juice Guard-Pak Inserts	—	10/pk	WAT015207[1]
IC-Pak Ion-Exclusion	7.8 × 300 mm	1/pk	WAT010290
SC-1011 Column	8.0 × 300 mm	1/pk	WAT034238
SC-1011P Pre-column	6.0 × 50 mm	1/pk	WAT034244
KC-811	8.0 × 300 mm	1/pk	WAT034298
KC-811 Pre-column	6.0 × 50 mm	1/pk	WAT035501

[1]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

FREE FATTY ACID ANALYSIS

The Waters Free Fatty Acid HP Column uses a phenyl-bonded packing and a simple isocratic elution method to separate free fatty acids on the basis of carbon-chain length and degree of saturation. The short column dimension (3.9 × 150 mm) significantly reduces analysis time and increases sensitivity.

Column performance is based on:

- Straight chain saturated acids, which elute in order of increasing carbon number
- Unsaturated acids which elute before the analogous saturated compound
- Carbon number and chain configuration: the greater the unsaturation, the earlier the elution

Ordering Information

Free Fatty Acid HP Column

Free Fatty Acid HP	Particle Size: 4 µm	
	Dimension	P/N (1/pk)
	3.9 × 150 mm	WAT011690

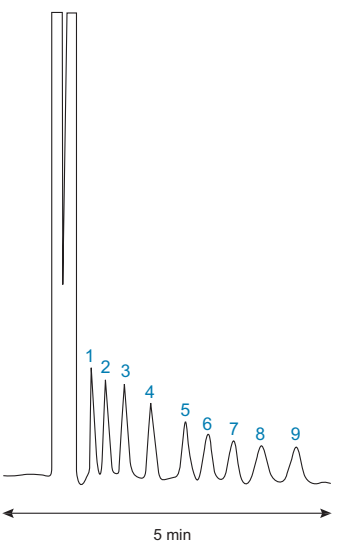
Fatty Acid Standards

Conditions

Column: Free Fatty Acid HP, 4 µm, 3.9 × 150 mm
Part number: WAT011690
Mobile phase: Acetonitrile: THF: water 45:20:35
Flow rate: 1.5 mL/min
Detection: RI

Compounds

1. Capric acid
2. Lauric acid
3. Myristic acid
4. Palmitic acid
5. Stearic acid
6. Nonadecanoic acid
7. Arachidic acid
8. Heneicosanoic acid
9. Behenic acid



POLYAROMATIC HYDROCARBON ANALYSIS

Waters PAH Columns are optimized for the HPLC analysis of polyaromatic hydrocarbons to achieve baseline resolution for 16 target analytes in fewer than 25 minutes. These columns are available in seven dimensions (including a capillary format) and two particle sizes. A complete certificate of analysis accompanies each, backed by world-class ISO 9002-registered documentation.

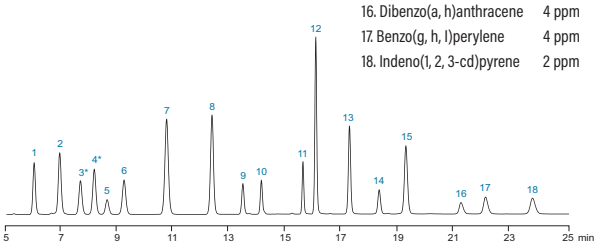
PAH Analysis According to Florida Administrative Code 17.700

Conditions

Column: Waters PAH C_{18}, 5 µm, 4.6 × 250 mm
Column temp.: 27 °C
Part number: 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

Compounds

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



Ordering Information

PAH Columns

C_{18}	Particle Size: 3 µm		Particle Size: 5 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
	4.6 × 50 mm	186001260	2.1 × 150 mm	186001261
			2.1 × 250 mm	186001262
			3.0 × 250 mm	186001263
			4.6 × 150 mm	186001264
			4.6 × 250 mm	186001265

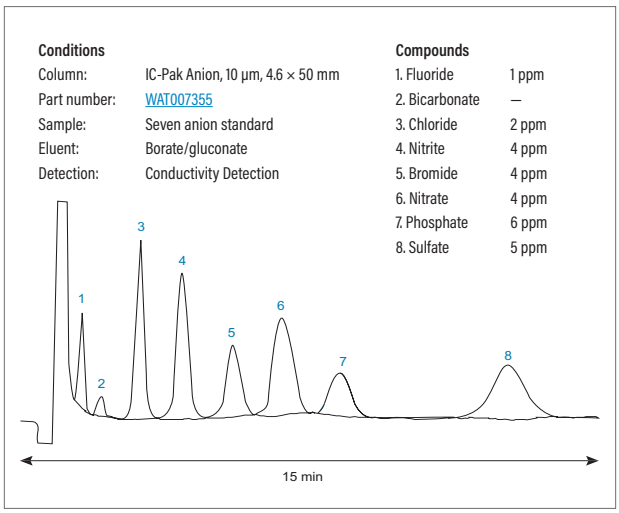
ION ANALYSIS

Waters IC-Pak resin-based columns separate a full range of ions from complex sample matrices. They offer an exceptional linear loading range, from less than 1.0 ppb to greater than 400 ppm, without dilution and without pH limitations on eluent or sample.

Recommended IC-Pak Columns:

- IC-Pak Anion Columns, for analysis of inorganic anions
- IC-Pak Ion-exclusion Columns, for weak acid anions and organic acids
- IC-Pak Cation Columns, sulfonated styrene-divinylbenzene based resin, for monovalent and divalent cation analysis
- IC-Pak C M/D Columns

IC-Pak Anion Column



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.

Ordering Information

IC-Pak Anion, Cation and Ion-Exclusion Columns

Description	Dimension	Qty.	P/N
IC-Pak Anion	4.6 × 50 mm	1/pk	WAT007355
IC-Pak Anion HR	4.6 × 75 mm	1/pk	WAT026765
IC-Pak Anion HC	4.6 × 150 mm	1/pk	WAT026770
IC-Pak Anion Guard-Pak Kit (Guard-Pak Holder and 5 inserts)	—	1/pk	WAT007357
IC-Pak Anion Concentrator Inserts	—	5/pk	WAT007358[9]
IC-Pak Anion Guard-Pak Inserts	—	5/pk	WAT010551[9]
IC-Pak C M/D Column	3.9 × 150 mm	1/pk	WAT036570
IC-Pak C M/D Guard-Pak Inserts	—	10/pk	WAT044250[9]
IC-Pak Cation Column	4.6 × 50 mm	1/pk	WAT007354
IC-Pak Cation Guard Column	4.6 × 50 mm	1/pk	WAT007356[9]
IC-Pak Cation Concentrator Inserts	—	5/pk	WAT010565

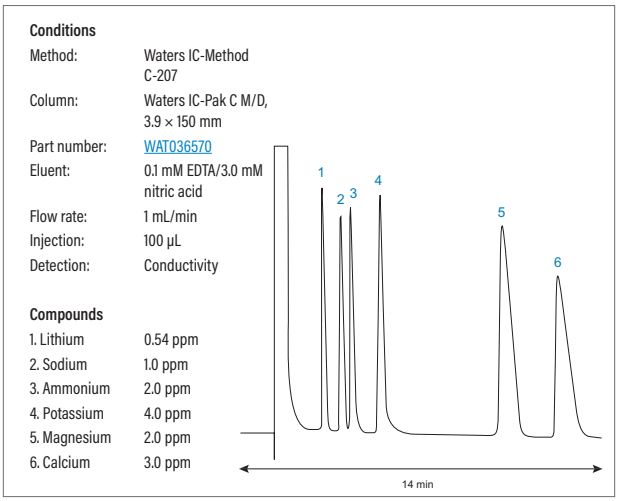
[9]Requires Guard-Pak Holder, p/n: WAT088141.

Ion-Exclusion Columns

Description	Dimension	Qty.	P/N
IC-Pak Ion-Exclusion Column	7.8 × 150 mm	1/pk	WAT010295
IC-Pak Ion-Exclusion Column	7.8 × 300 mm	1/pk	WAT010290
IC-Pak Ion-Exclusion Guard-Pak Inserts	—	10/pk	WAT020770[9]

[9]Requires Guard-Pak Holder, p/n: WAT088141.

IC-Pak C M/D Cation Column



PRIMERS

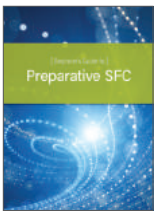
Waters is committed to education and training. Learn from the best! Our expanding series of easy-to-read, well-illustrated, high-quality primers are written by experts; and introduce, inform, and explain the latest technologies in analytical science.

The Quest for Ultra Performance in Liquid Chromatography: Origins of UPLC Technology

From the dawn of LC to the present day, drawn almost entirely from original sources and first-person accounts, this text reviews the first century of LC, showing how early the concepts of ultra performance were recognized and how many decades it took to reduce them to practice. An extensive glossary is included.

Paperback, 54 pages, ISBN: 978-1-879732-05-6

The Quest for Ultra Performance in Liquid Chromatography Part No. 715002098

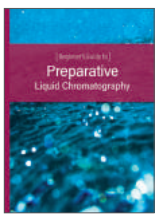


Beginner's Guide to Preparative SFC

Preparative chromatography continues to be an important purification tool in pharmaceutical, fine chemical, natural product, and other laboratory workflows. Over the past several years many laboratories have begun to include Supercritical Fluid Chromatography (SFC) as part of their purification strategies. In an effort to help scientists better understand this technology, this primer, introduces users to Supercritical Fluid Chromatography, describes the enabling technologies, workflows, practical tips and techniques, method development, analytical to preparative scaling, and shows several practical examples.

Paperback, 84 pages, ISBN: 978-1-879-73209-4

Beginner's Guide to Preparative Chromatography Part No. 715005427

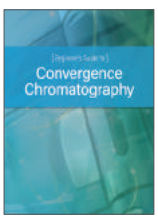


Beginner's Guide to Preparative Liquid Chromatography

This primer provides both the novice as well as the experienced chromatographer a solid base of information along with many practical tips and techniques for successful purification chromatography.

Paperback, 74 pages, ISBN: 978-1-879-73210-0

Beginner's Guide to Preparative Liquid Chromatography Part No. 715005428

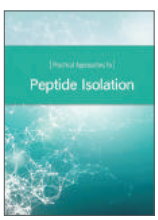


Beginner's Guide to Convergence Chromatography

This primer describes the fundamentals of convergence chromatography and reviews some of the many applications that make UPC² an essential separation technique for modern laboratory analysis.

Paperback, 64 pages, ISBN: 978-0-615-98496-4

Beginner's Guide to Convergence Chromatography Part No. 715004472

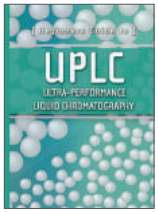


Practical Approaches to Peptide Isolation

This primer discusses the peptide isolation workflow, method development considerations including column selection, choice of mobile-phase modifier, the use of temperature, and gradient optimization, along with other relevant topics. The use of mass-directed isolation which makes the purification process easier with less ambiguous discrimination between the target peptide and the contaminants is also discussed.

Paperback, 84 pages, ISBN: 978-1-879-73211-7

Beginner's Guide to Size-Exclusion Chromatography Part No. 715005429



Beginner's Guide to UPLC (Ultra-Performance Liquid Chromatography)

Success is assured once new, experienced, and potential UPLC users learn from this volume on the 'why' and the 'how' of UPLC Technology principles. Scientists will gain the confidence to apply this knowledge in ways that enhance analytical productivity, streamline workflow, and advance scientific progress within their organizations.

Paperback, 52 pages, ISBN: 978-1-879732-07-0

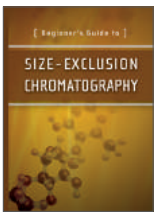
Beginner's Guide to UPLC (Ultra-Performance Liquid Chromatography) Part No. 715002099

Comprehensive Guide to HILIC (Hydrophilic Interaction Chromatography)

This technology primer is designed to provide the reader with the basic INSIGHT of how to be successful with hydrophilic interaction chromatography by understanding how the technique works, the parameters that impact retention and selectivity, as well as the practical considerations necessary to successfully implement HILIC within a chromatographic strategy.

Paperback, 72 pages, ISBN: 978-1-879732-08-7

Comprehensive Guide to HILIC (Hydrophilic Interaction Chromatography) Part No. 715002531

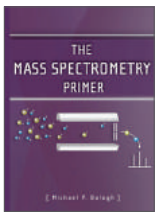


Beginner's Guide to Size-Exclusion Chromatography

Learn the basic concepts of SEC, good operating practices, and discusses some examples that address the capability of SEC separations.

Paperback, 64 pages, ISBN: 978-1-4675-9372-4

Beginner's Guide to Size-Exclusion Chromatography Part No. 715004398

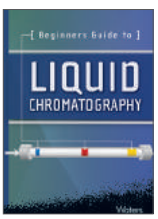


The Mass Spectrometry Primer

A wide range of topics related to a broad spectrum of mass spectrometric techniques is covered in this volume. In it, many frequently asked questions about the principles and practice of MS are answered. An extensive glossary explains MS terminology, and the benefits of coupling MS with chromatography are amply described.

Paperback, 80 pages, ISBN: 978-1-879732-04-1

The Mass Spectrometry Primer Part No. 715001940



Beginner's Guide to Liquid Chromatography

Offering an uncomplicated introduction to the technology of liquid chromatography (LC), with a focus on HPLC, this basic book uses clear language, colorful diagrams, and a full glossary to acquaint readers with basic concepts and terminology. This primer is suitable for younger science students as well as professionals new to LC.

Paperback, 52 pages, ISBN: 978-1-879732-02-5

Beginner's Guide to Liquid Chromatography Part No. 715001531

Beginner's Guide to SPE (Solid-Phase Extraction)

Through the extensive use of diagrams and clearly explained text, readers will understand how the power and usefulness of solid-phase extraction can help solve routine or complex sample preparation challenges. The book covers many topics including SPE device formats, sorbent considerations, mobile phase selection, and troubleshooting. The Beginner's Guide to SPE is a must read for anyone starting out in analytical chromatography or seasoned chemists looking to add solid-phase extraction to their skill set.

Paperback, 212 pages, ISBN: 978-1-467539-20-3

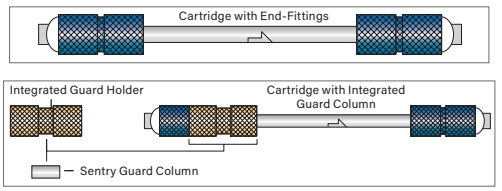
Beginner's Guide to SPE (Solid-Phase Extraction) Part No. 715003405

Cartridge Columns, Fittings, and Accessories

CARTRIDGE COLUMNS

Ordering Information

Cartridge Columns



Applicable Column Dimension	Cartridge End Fitting P/N (1/pk)
2.1 × 50 mm, 2.1 × 100 mm, 2.1 × 150 mm, 2.1 × 250 mm	700000117
3.0 × 50 mm, 3.0 × 100 mm, 3.0 × 150 mm, 3.0 × 250 mm	WAT037525
3.9 × 50 mm, 3.9 × 100 mm, 3.9 × 150 mm, 3.9 × 250 mm	WAT037525
4.6 × 50 mm, 4.6 × 100 mm, 4.6 × 150 mm, 4.6 × 250 mm	WAT037525

Cartridge Columns

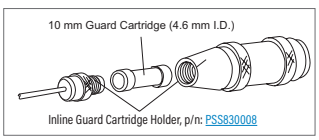
Description	Dimension	Particle Size	P/N (1/pk)
High-Performance Carbohydrate Cartridge Column (requires end fittings)	4.6 × 250 mm	4 µm	WAT044355
µBondapak/Bondapak Cartridge Columns	4.6 × 250 mm	10 µm	WAT052860

SPHERISORB CARTRIDGE AND GUARD COLUMNS

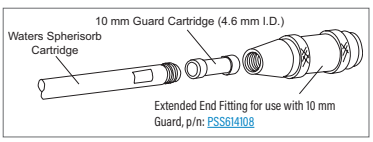
Ordering Information

1. 30 mm Stand Alone Guard/Column shown with end fittings (end fittings not included)
2. Guard holder end fitting for use with 10 mm Integral Guard, p/n: PSS614108
3. 10 mm Integral Guard Column
4. Column Coupler, p/n: PSS614102 (for use with cartridge columns only)

In-line Guard Cartridge Holder



Extended End Fitting for Use with 10 mm Guard Cartridges



Description	Qty.	P/N
Removable Column End Fitting	2/pk	PSS614100
Frit Assembly (2 µm)	5/pk	PSS614103
Frit Assembly (0.5 µm)	5/pk	PSS614104
Column Coupler	2/pk	PSS614102
Extended End Fitting for use with 10 mm Integral Guard	1/pk	PSS614108
Nylon Column Plugs for storage of Complete Column	1/pk	WAT015674
Nylon Column Caps for storage of Replacement Cartridge Column	10/pk	PSS614113
Inline 10 mm Guard Cartridge Holder Kit for use with above items	—	PSS830008

Waters Spherisorb Guard Columns

Waters Spherisorb Guard columns provide cost-effective column protection for all Waters Spherisorb Analytical Columns.

Waters Spherisorb Guard Cartridges*

Dimension	Type	Particle Size	Qty.	ODS1	ODS2	C_8	C_6	C_1	NH_2
10 × 4.6 mm	Guard	5 µm	3/pk	PSS830073	PSS830053	PSS830074	PSS830075	PSS830076	PSS830079
30 × 4.6 mm	Guard	5 µm	3/pk	—	PSS839458	—	—	—	PSS839478

Dimension	Type	Particle Size	Qty.	CN Normal Phase	W Silica	SAX	SCX
10 × 4.6 mm	Guard	5 µm	3/pk	PSS830077	PSS830051	PSS830055	PSS830057
30 × 4.6 mm	Guard	5 µm	3/pk	PSS839476	PSS839451	PSS839465	PSS839471

*Requires In-line Guard Cartridge Holder, p/n: PSS830008.

VANGUARD PRE-COLUMNS AND CARTRIDGES

Using a guard column extends the life of analytical columns without compromising chromatographic performance. Waters offers VanGuard™ Column Protection products in multiple particle sizes and stationary phases, making them ideally suited for the physical and chemical protection of all analytical columns.

Vanguard Columns offer:

- Minimal chromatographic effects and optimized performance
- Superior protection for UPLC, UHPLC, and HPLC columns with particle sizes between 5–16 µm
- Compatible operating pressures up to 18,000 psi (1240 bar)

Selection Guide

VanGuard Column Protection Cartridge/Pre-column selection based on analytical column I.D.			
Column I.D.	**Particle Size**	**Format**	**Dimension**
2.1 mm	<2 µm	Pre-column	2.1 × 5 mm
2.1 mm	>2 µm	Cartridge Column	2.1 × 5 mm
3.0 mm	>2 µm	Cartridge Column	2.1 × 5 mm
3.9 mm	>2 µm	Cartridge Column	3.9 × 5 mm
4.6 mm	>2 µm	Cartridge Column	3.9 × 5 mm

Ordering Information

Recommended VanGuard Cartridge

		2.1 and 3.0 mm I.D.	3.9 and 4.6 mm I.D.
Brand	**Particle Size**	**Analytical Columns**	
Atlantis	3, 5 µm	2.1 × 5 mm	3.9 × 5 mm
CORTECS	2.7 µm	2.1 × 5 mm	3.9 × 5 mm
SunFire	2.5, 3.5, 5 µm	2.1 × 5 mm	3.9 × 5 mm
Symmetry	3.5, 5 µm	2.1 × 5 mm	3.9 × 5 mm
XBridge	2.5, 3.5, 5 µm	2.1 × 5 mm	3.9 × 5 mm
XSelect CSH	2.5, 3.5, 5 µm	2.1 × 5 mm	3.9 × 5 mm
XSelect HSS	2.5, 3.5, 5 µm	2.1 × 5 mm	3.9 × 5 mm
XTerra	2.5, 3.5, 5 µm	2.1 × 5 mm	3.9 × 5 mm

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

VanGuard Pre-columns (Guard Columns)

Chemistry	Particle Size	Dimension	P/N (3/pk)
BEH C_{18}	1.7 µm	2.1 × 5 mm	186003975
BEH Shield RP18	1.7 µm	2.1 × 5 mm	186003977
BEH C_8	1.7 µm	2.1 × 5 mm	186003978
BEH Phenyl	1.7 µm	2.1 × 5 mm	186003979
BEH HILIC	1.7 µm	2.1 × 5 mm	186003980
BEH Amide	1.7 µm	2.1 × 5 mm	186004799
CORTECS C_{18}+	1.6 µm	2.1 × 5 mm	186007125
CORTECS C_{18}	1.6 µm	2.1 × 5 mm	186007123
CORTECS HILIC	1.6 µm	2.1 × 5 mm	186007124
CORTECS Shield RP18	1.6 µm	2.1 × 5 mm	186008713
CORTECS C_8	1.6 µm	2.1 × 5 mm	186008423
CORTECS Phenyl	1.6 µm	2.1 × 5 mm	186008420
CORTECS T3	1.6 µm	2.1 × 5 mm	186008508
CSH C_{18}	1.7 µm	2.1 × 5 mm	186005303
CSH Fluoro-Phenyl	1.7 µm	2.1 × 5 mm	186005358
CSH Phenyl-Hexyl	1.7 µm	2.1 × 5 mm	186005413
HSS C_{18}	1.8 µm	2.1 × 5 mm	186003981
HSS C_{18} SB	1.8 µm	2.1 × 5 mm	186004136
HSS T3	1.8 µm	2.1 × 5 mm	186003976
HSS PFP	1.8 µm	2.1 × 5 mm	186005974
HSS Cyano	1.8 µm	2.1 × 5 mm	186005995

Atlantis VanGuard Cartridges

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	**P/N (3/pk)**	**Dimension**	**P/N (3/pk)**
T3	2.1 × 5 mm	186007674	2.1 × 5 mm	186007678
	3.9 × 5 mm	186007676	3.9 × 5 mm	186007680
dC_{18}	2.1 × 5 mm	186007658	2.1 × 5 mm	186007662
	3.9 × 5 mm	186007660	3.9 × 5 mm	186007664
HILIC Silica	2.1 × 5 mm	186007666	2.1 × 5 mm	186007670
	3.9 × 5 mm	186007668	3.9 × 5 mm	186007672

SunFire VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	**P/N (3/pk)**	**Dimension**	**P/N (3/pk)**	**Dimension**	**P/N (3/pk)**
C_{18}	2.1 × 5 mm	186007691	2.1 × 5 mm	186007694	2.1 × 5 mm	186007697
	3.9 × 5 mm	186007693	3.9 × 5 mm	186007696	3.9 × 5 mm	186007699
C_8	2.1 × 5 mm	186007700	2.1 × 5 mm	186007703	2.1 × 5 mm	186007706
	3.9 × 5 mm	186007702	3.9 × 5 mm	186007705	3.9 × 5 mm	186007708

For SunFire Analytical Columns, please refer to pages 150 and 191.

Symmetry VanGuard Cartridges

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
Symmetry C_{18}	2.1 × 5 mm	186007725	2.1 × 5 mm	186007729
	3.9 × 5 mm	186007727	3.9 × 5 mm	186007731
Symmetry C_8	2.1 × 5 mm	186007733	2.1 × 5 mm	186007737
	3.9 × 5 mm	186007735	3.9 × 5 mm	186007739
SymmetryShield RP18	2.1 × 5 mm	186007749	2.1 × 5 mm	186007753
	3.9 × 5 mm	186007751	3.9 × 5 mm	186007755
SymmetryShield RP8	2.1 × 5 mm	186007741	2.1 × 5 mm	186007745
	3.9 × 5 mm	186007743	3.9 × 5 mm	186007747
Symmetry300 C_{18}	2.1 × 5 mm	186007709	2.1 × 5 mm	186007713
	3.9 × 5 mm	186007711	3.9 × 5 mm	186007715
Symmetry300 C_4	2.1 × 5 mm	186007717	2.1 × 5 mm	186007721
	3.9 × 5 mm	186007719	3.9 × 5 mm	186007723

For Symmetry Analytical Columns, please refer to PAGE 197.

XBridge VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
BEH C_{18}	2.1 × 5 mm	186007772	2.1 × 5 mm	186007766	2.1 × 5 mm	186007769
	3.9 × 5 mm	186007774	3.9 × 5 mm	186007768	3.9 × 5 mm	186007771
BEH C_8	2.1 × 5 mm	186007781	2.1 × 5 mm	186007775	2.1 × 5 mm	186007778
	3.9 × 5 mm	186007783	3.9 × 5 mm	186007777	3.9 × 5 mm	186007780
BEH Shield RP18	2.1 × 5 mm	186007808	2.1 × 5 mm	186007802	2.1 × 5 mm	186007805
	3.9 × 5 mm	186007810	3.9 × 5 mm	186007804	3.9 × 5 mm	186007807
Phenyl	2.1 × 5 mm	186007799	2.1 × 5 mm	186007793	2.1 × 5 mm	186007796
	3.9 × 5 mm	186007801	3.9 × 5 mm	186007795	3.9 × 5 mm	186007798
HILIC	2.1 × 5 mm	186007790	2.1 × 5 mm	186007784	2.1 × 5 mm	186007787
	3.9 × 5 mm	186007792	3.9 × 5 mm	186007786	3.9 × 5 mm	186007789
Amide	2.1 × 5 mm	186007763	2.1 × 5 mm	186007757	2.1 × 5 mm	186007760
	3.9 × 5 mm	186007765	3.9 × 5 mm	186007759	3.9 × 5 mm	186007762

For XBridge Analytical Columns, please refer to pages 124 and 161.

XSelect VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 5 mm ***XP***	186007817	2.1 × 5 mm	186007811	2.1 × 5 mm	186007814
	3.9 × 5 mm ***XP***	186007819	3.9 × 5 mm	186007813	3.9 × 5 mm	186007816
CSH Fluoro-Phenyl	2.1 × 5 mm ***XP***	186007827	2.1 × 5 mm	186007820	2.1 × 5 mm	186007824
	3.9 × 5 mm ***XP***	186007829	3.9 × 5 mm	186007822	3.9 × 5 mm	186007826
CSH Phenyl-Hexyl	2.1 × 5 mm ***XP***	186007839	2.1 × 5 mm	186007830	2.1 × 5 mm	186007836
	3.9 × 5 mm ***XP***	186007841	3.9 × 5 mm	186007832	3.9 × 5 mm	186007838
HSS C_{18}	2.1 × 5 mm	186007857	2.1 × 5 mm	186007851	2.1 × 5 mm	186007854
	3.9 × 5 mm	186007859	3.9 × 5 mm	186007853	3.9 × 5 mm	186007856
HSS C_{18} SB	2.1 × 5 mm	186007848	2.1 × 5 mm	186007842	2.1 × 5 mm	186007845
	3.9 × 5 mm	186007850	3.9 × 5 mm	186007844	3.9 × 5 mm	186007847
HSS T3	2.1 × 5 mm	186007884	2.1 × 5 mm	186007878	2.1 × 5 mm	186007881
	3.9 × 5 mm	186007886	3.9 × 5 mm	186007880	3.9 × 5 mm	186007883
HSS PFP	2.1 × 5 mm	186007875	2.1 × 5 mm	186007869	2.1 × 5 mm	186007872
	3.9 × 5 mm	186007877	3.9 × 5 mm	186007871	3.9 × 5 mm	186007874
HSS CN	2.1 × 5 mm	186007866	2.1 × 5 mm	186007860	2.1 × 5 mm	186007863
	3.9 × 5 mm	186007868	3.9 × 5 mm	186007862	3.9 × 5 mm	186007865

For XSelect Analytical Columns, please refer to pages 137 and 176.

XTerra VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
MS C_{18}	2.1 × 5 mm	186007887	2.1 × 5 mm	186007892	2.1 × 5 mm	186007896
	3.9 × 5 mm	186007889	3.9 × 5 mm	186007894	3.9 × 5 mm	186007899
MS C_8	2.1 × 5 mm	186007901	2.1 × 5 mm	186007905	2.1 × 5 mm	186007909
	3.9 × 5 mm	186007903	3.9 × 5 mm	186007907	3.9 × 5 mm	186007911
Shield RP18			2.1 × 5 mm	186007929	2.1 × 5 mm	186007933
			3.9 × 5 mm	186007931	3.9 × 5 mm	186007935
Shield RP8			2.1 × 5 mm	186007941	3.9 × 5 mm	186007947
			3.9 × 5 mm	186007943		
Phenyl			2.1 × 5 mm	186007917	2.1 × 5 mm	186007921
			3.9 × 5 mm	186007919	3.9 × 5 mm	186007923

For XTerra Analytical Columns, please refer to pages 155 and 201.

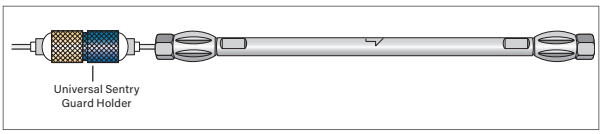
SENTRY GUARD CARTRIDGES

Waters Sentry Guard Cartridges are widely used as a cost-effective way to prolong HPLC column life by reducing particulate matter and chemical contaminants. Two holder designs are offered, one for use as an integrated part of the Waters Cartridge Column with reusable end fittings, the other for use with any HPLC column. Both designs allow the replacement of Sentry Guard Cartridges without tools.

Ordering Information

Waters Cartridge and Guard Column Guide

Guard Columns Universal Sentry Guard Holder Kits



Dimension	P/N (1/pk)
2.1 × 10 mm	WAT097958
2.1 × 20 mm	186000262
3.0 × 20 mm	WAT046910
3.9 × 20 mm	WAT046910
4.6 × 20 mm	WAT046910

Sentry Guard Holders and Replacement Parts*

Description	P/N (1/pk)
Integrated Guard Holder (for Waters Cartridge Columns)	WAT046905
Replacement Parts	
O-ring Kit for Sentry 2.1 mm Guard Holder, 2/pk	WAT097954
O-Ring Kit for Sentry 3.0, 3.9, 4.6 mm Guard Holder, 2/pk	WAT023401
Rigid Connector for Sentry 2.1 mm Guard Holder	WAT022681

*50 mm and 75 mm long Cartridge Columns must use the Universal Guard Holder.

µBondapak/Bondapak Sentry Guard Cartridges

	Particle Size: 10 µm	
	Dimension	P/N (2/pk)
C_{18}	3.9 × 20 mm	WAT044480[2]
CN	3.9 × 20 mm	WAT046855[2]
NH_2	3.9 × 20 mm	WAT046865[2]
Phenyl	3.9 × 20 mm	WAT046850[2]

[2]Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

µPorasil/Porasil Sentry Guard Cartridges

	Particle Size: 10 µm	
	Dimension	P/N (2/pk)
µPorasil	3.9 × 20 mm	WAT046860[1]

[1]Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.

Delta-Pak Sentry Guard Cartridges

	Particle Size: 5 µm	
	Dimension	P/N (2/pk)
C_4, 100 Å	3.9 × 20 mm	WAT046875[2]
C_4, 300 Å	3.9 × 20 mm	WAT046885[2]
C_{18}, 100 Å	3.9 × 20 mm	WAT046880[2]
C_{18}, 300 Å	3.9 × 20 mm	WAT046890[2]

[2] Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

Nova-Pak Sentry Guard Cartridges

	Particle Size: 4 µm	
	Dimension	P/N (2/pk)
C_8	3.9 × 20 mm	WAT046830[2]
C_{18}	3.9 × 20 mm	WAT044380[2]
CN-HP	3.9 × 20 mm	WAT046840[2]
Phenyl	3.9 × 20 mm	WAT046835[2]
Silica	3.9 × 20 mm	WAT046845[2]

[2] Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

Resolve Sentry Guard Cartridges

	Particle Size: 5 µm	
	Dimension	P/N (2/pk)
C_{18}	3.9 × 20 mm	WAT046915[1]

[1]Requires 3.9 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

Atlantis Sentry Guard Cartridges

	Particle Size: 3 µm		Particle Size: 5 µm	
	Dimension	P/N (2/pk)	Dimension	P/N (2/pk)
T3	2.1 × 10 mm	186003756[1]	4.6 × 20 mm	186003761[2]
	4.6 × 20 mm	186003758[2]		
dC_{18}	2.1 × 10 mm	186001377[1]	4.6 × 20 mm	186001323[2]
	4.6 × 20 mm	186001321[2]		
HILIC Silica	2.1 × 10 mm	186002005[1]		

[1]Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.
[2]Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

SunFire Sentry Guard Cartridges

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (2/pk)	Dimension	P/N (2/pk)
C_8	2.1 × 10 mm	186002708[1]	2.1 × 10 mm	186002713[1]
	3.0 × 20 mm	186002718[2]	3.0 × 20 mm	186002722[2]
	4.6 × 20 mm	186002727[2]	4.6 × 20 mm	186002733[2]
C_{18}	2.1 × 10 mm	186002530[1]	2.1 × 10 mm	186002536[1]
	3.0 × 20 mm	186002681[2]	3.0 × 20 mm	186002683[2]
	4.6 × 20 mm	186002682[2]	4.6 × 20 mm	186002684[2]

[1] Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.
[2] Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

Symmetry, SymmetryShield, and Symmetry300 Sentry Guard Cartridges

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (2/pk)	Dimension	P/N (2/pk)
Symmetry C_8	2.1 × 10 mm	WAT106128[1]	3.9 × 20 mm	WAT054250[2]
Symmetry C_{18}	2.1 × 10 mm	WAT106127[1]	3.9 × 20 mm	WAT054225[2]
SymmetryShield RP8	2.1 × 10 mm	WAT106129[1]	3.9 × 20 mm	WAT200675[2]
SymmetryShield RP18	2.1 × 10 mm	186000169[1]	3.9 × 20 mm	186000107[2]
	3.9 × 20 mm	186000701[2]		
Symmetry300 C_4	2.1 × 10 mm	186000275[1]	3.9 × 20 mm	186000284[2]
Symmetry300 C_{18}	2.1 × 10 mm	186000198[1]	3.9 × 20 mm	WAT106166[2]

[1]Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.
[2]Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

XBridge Sentry Guard Cartridges

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (2/pk)	Dimension	P/N (2/pk)
BEH C_8	3.0 × 20 mm	186003078[2]	2.1 × 10 mm	186003080[1]
	4.6 × 20 mm	186003079[2]	3.0 × 20 mm	186003081[2]
			4.6 × 20 mm	186003082[2]
BEH C_{18}	3.0 × 20 mm	186003060[2]	2.1 × 10 mm	186003062[1]
	4.6 × 20 mm	186003061[2]	3.0 × 20 mm	186003063[2]
			4.6 × 20 mm	186003064[2]
BEH Shield RP18	3.0 × 20 mm	186003069[2]	2.1 × 10 mm	186003071[1]
	4.6 × 20 mm	186003070[2]	3.0 × 20 mm	186003072[2]
			4.6 × 20 mm	186003073[2]

[1]Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.
[2]Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

XSelect Sentry Guard Cartridges

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (2/pk)	Dimension	P/N (2/pk)
CSH C_{18}	2.1 × 10 mm	186005252[1]	4.6 × 20 mm	186005285[2]
	3.0 × 20 mm	186005258[2]		
	4.6 × 20 mm	186005264[2]		
HSS T3	2.1 × 10 mm	186006470[1]	4.6 × 20 mm	186004792[2]
	3.0 × 20 mm	186004782[2]		
	4.6 × 20 mm	186004787[2]		

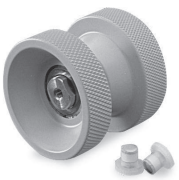
[1]Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.
[2]Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

XTerra Sentry Guard Cartridges

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (2/pk)	Dimension	P/N (2/pk)
MS C_{18}	3.9 × 20 mm	186000644	2.1 × 20 mm	186000652[3]
	4.6 × 10 mm	186001927	3.0 × 20 mm	186000656[2]
			3.9 × 20 mm	186000660[2]
			4.6 × 10 mm	186001920[4]
MS C_8	—	—	3.9 × 20 mm	186000661[2]
RP18	3.9 × 20 mm	186000646[2]	2.1 × 20 mm	186000654[3]
			3.0 × 20 mm	186000658
			3.9 × 20 mm	186000662[2]

[2]Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.
[3]Requires Cartridge Column Holder, p/n: 186000262.
[4]Requires In-line Guard Cartridge Holder, p/n: PSS830008.

GUARD-PAK HOLDER AND INSERTS



Waters Guard-Pak Holder is a compact, stand-alone housing for our unique disposable Guard-Pak Inserts. Installed In-line with your HPLC system immediately before the analytical column, the Guard-Pak Holder and inserts protect analytical LC columns against the gradual accumulation of particulates and chemical contaminants originating from the sample.

Ordering Information

Guard-Pak Holder

Description	P/N (1/pk)
Guard-Pak Holder	WAT088141
Guard-Pak Holder Connector	WAT080046
In-line Filters, 5/pk	WAT032472

Guard-Pak Inserts

Description	Particle Size	P/N (10/pk)
Bondapak C_{18}, 125 Å	10 µm	WAT088070[1]
Bondapak NH_2, 125 Å	10 µm	WAT026760[1]
Bondapak Phenyl, 125 Å	10 µm	WAT026745[1]
C_8, 60 Å	4 µm	WAT035880[1]
Nova-Pak C_{18}, 60 Å	4 µm	WAT015220[1]
Resolve C_{18}, 90 Å	10 µm	WAT085824[1]

[1]Requires Guard-Pak Holder, p/n: WAT088141.

≥5 µm Preparative HPLC Columns

Contents

≥5 µm Preparative HPLC Columns

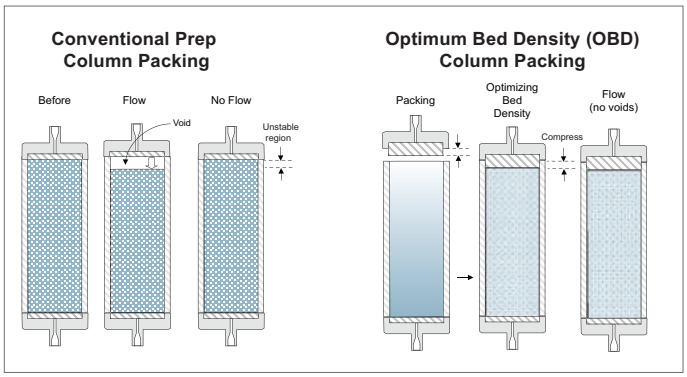
From Productivity Comes Predictability

Why struggle with inconsistencies in column-to-column performance, unpredictable column lifetimes, lost samples, repeat purification runs, and poor scalability from small- to large-volume columns?

Increase your productivity through higher recoveries and longer column lifetimes. With Optimum Bed Density (OBD) Preparative Columns, you can:

- Achieve fast, efficient, lab-scale separations, for greater throughput
- Directly scale from UPLC, UHPLC, or HPLC screening to lab-scale purification
- Select robust chromatographic particles designed for purification

The OBD Column Design

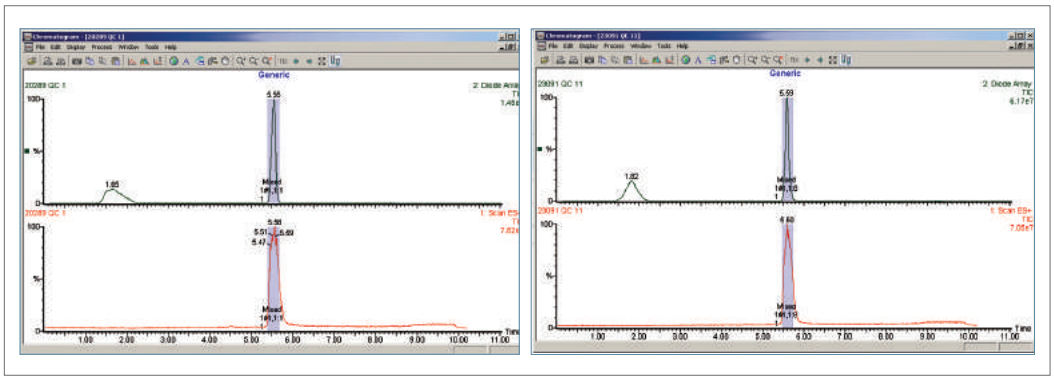


The OBD Preparative Column design and packing process results in predictable, uniform density profiles throughout the column. During the final capping process, our established procedures do not over compress or disrupt in any non-uniform way, eliminating the potential for voids.

COLUMN STABILITY AND RELIABILITY—LONG, PREDICTABLE LIFETIMES

The demand for rapid, high-purity, compound isolation assumes confidence in the integrity and stability of preparative columns. Complex, sparingly-soluble starting materials are often dissolved in strong solvents, such as DMSO. The combination of poor solubility and pressure shocks associated with large injection volumes of pure organic solvent are the primary contributors to early column failure and chromatographic bed collapse. The OBD design exhibits exceptional resistance to mechanical chromatographic bed failure and delivers consistent column-to-column performance, reducing cost by extending lifetimes.

Data From a High-Throughput Drug Discovery Laboratory



Data from a high-throughput drug discovery laboratory shows excellent peak shape after 7000 injections on an XBridge BEH C_{18} OBD Prep Column, 130 Å, 5 µm, 19 × 50 mm.

HOW TO CHOOSE THE RIGHT OBD PREPARATIVE COLUMN

STEP 1

Once the analytical separation has been optimized, a loading study on the analytical column is performed to determine the capacity of the particular packing material. The large-scale separation should be identical to the small-scale separation, therefore the maximum sample load will be dependent upon the complexity of the analytical separation.

STEP 2

Determine how much mass you need to purify or isolate.

STEP 3

Use these simple equations to determine the required column size for purification.

Note: Preparative HPLC system maximum flow rate and backpressure need to be considered and can limit column size.

Scale-Up Factor

$$\text{Scale-up factor} = \frac{(\text{Diameter preparative})^2 \times \text{Length preparative}}{(\text{Diameter analytical})^2 \times \text{Length analytical}}$$

Example: Scaling up from a 4.6 × 150 mm column to a 19 × 150 mm column:

$$\text{Scale-up factor} = \frac{(19)^2 \times 150}{(4.6)^2 \times 150} = 17.1$$

Applying the scale-up factor, you can predict that an approximate range of 17 to 135 mg of sample could be applied to the larger (19 × 150 mm) column (packed with the same material as the analytical column). This range is based on an analytical column (4.6 mm I.D.) mass load of 1 to 8 mg.

Flow Rate

$$\text{Flow rate (prep)} = \text{Flow rate (analytical)} \times \frac{(\text{Diameter preparative})^2}{(\text{Diameter analytical})^2} \times \frac{\text{Particle size (analytical)}}{\text{Particle size (preparative)}}$$

The calculated flow rate may be used for the larger column to ensure the same linear velocity of the mobile phases as used in the analytical run. However, reasonable rates are based on column diameters. Systems will be limited by increasing backpressure with increasing column length and decreasing particle size.

Gradient Duration (GD)

$$\text{GD (prep)} = \frac{(\text{GD analytical}) \times (\text{Length preparative})}{(\text{Length analytical})} \times \frac{(\text{Diameter preparative})^2}{(\text{Diameter analytical})^2} \times \frac{(\text{Flow rate analytical})}{(\text{Flow rate preparative})}$$

MASS LOADING

Many factors affect the mass capacity of preparative columns. The listed capacities represent an "average" estimate of the total amount of mass per injection to be loaded on to the column.

Capacity is:

- Higher for strongly retained material
- Higher for simple mixtures
- Lower where higher resolution is required
- Very strongly dependent on loading conditions
  - Limited by loading volume
  - Limited by diluent solvent strength

Approximate Mass Loading Capacities (mg) for OBD Preparative Columns (Gradient Mode)

	Diameter (mm)				
Length (mm)	**4.6**	**10**	**19**	**30**	**50**
50	3 mg	15 mg	45 mg	110 mg	310 mg
75	–	–	–	165 mg	–
100	5 mg	25 mg	90 mg	225 mg	620 mg
150	8 mg	40 mg	135 mg	335 mg	930 mg
250	13 mg	60 mg	225 mg	560 mg	1550 mg
Reasonable flow rate (mL/min)	1.4	6.6	24	60	164
Reasonable injection volume (µL)	20	100	350	880	2450

Reasonable flow rates are based on column diameter. Systems will be limited by increasing backpressure with increasing column length and decreasing particle size.

Reasonable injection volumes are based on column diameter at a length of 50 mm with relatively strong solvents. Increased length is compatible with larger injections, but not proportionately so. Weaker solvents significantly increase injection volume.

Mass loading capacities for peptides and purifications depend strongly on the sequence and may be estimated at 5–20% of listed values.

Waters OBD Preparative Columns Calculator

This convenient online scale-up tool provides:

- Mass load scaling
- Gradient scaling with appropriate flow rate scale-up and predicting volume consumption
- Calculations for split flow ratios for those using mass spectrometer driven chromatography
- Focused gradient UPLC, UHPLC, or analytical HPLC to preparative-scale method transfer

To try this tool, visit www.waters.com/prepcalculator

XBridge OBD Preparative Columns

THE BENCHMARK FOR RUGGEDNESS AND LONGEVITY IN LC METHODS

XBridge HPLC Columns include 10 general and application-specific sorbents that cover a wide range of particles sizes for analytical and preparative HPLC applications. With these versatile columns, you can use mobile phases in a wide pH range to quickly develop robust methods. In doing so, you benefit from high pH and temperature stability, for increased mass loading of basic compounds.

XBridge OBD Preparative Columns offer:

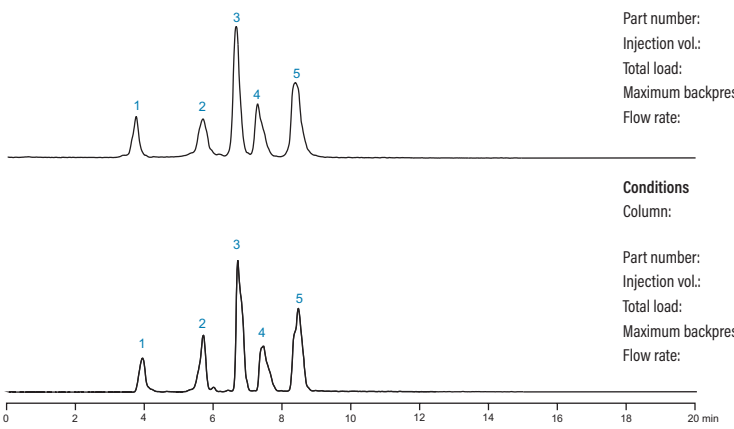
- BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl, BEH HILIC, and BEH Amide column chemistries
- Improved pH stability and increased column lifetimes
- Proven mechanical stability of OBD Column Technology
- Wide range of selectivity for both reversed-phase LC and HILIC separations
- Scalability from analytical to preparative applications

Columns for biomolecule purifications:

- XBridge Peptide BEH C_{18}, 130 Å and 300 Å Preparative Columns are QC tested for demanding peptide applications
- XBridge Protein BEH C_4, 300 Å Preparative Columns are QC tested for protein applications
- XBridge Oligonucleotide BEH C_{18}, 130 Å, 2.5 µm Preparative Columns are QC tested for excellent resolution of oligonucleotides

Maximum Efficiency/30% Lower Backpressure

Conditions		Compounds	
Mobile phase A:	0.1% DEA in water	1. Labetalol	50 mg/mL
Mobile phase B:	0.1% DEA in acetonitrile	2. Quinine	50 mg/mL
Sample conc.:	300 mg/mL in DMSO	3. Diltiazem	50 mg/mL
System:	AutoPurification	4. Verapamil	100 mg/mL
UV detection:	260 nm	5. Amitriptyline	50 mg/mL



Conditions		Gradient:	Time (min)	Profile %A	Profile %B
Column:	XTerra MS C_{18} OBD Prep, 5 µm, 19 × 50 mm		0.00	95	5
Part number:	186001930		1.79	95	5
Injection vol.:	660 µL		6.79	5	95
Total load:	198 mg		7.79	5	95
Maximum backpressure:	1000 psi				
Flow rate:	23.8 mL/min				

Conditions		Gradient:	Time (min)	Profile %A	Profile %B
Column:	XBridge BEH C_{18} OBD Prep, 5 µm, 19 × 50 mm		0.00	95	5
Part number:	186002977		1.79	95	5
Injection vol.:	660 µL		6.79	5	95
Total load:	198 mg		7.79	5	95
Maximum backpressure:	700 psi				
Flow rate:	23.8 mL/min				

XBridge OBD Preparative Columns deliver the same high loading capacity and reliability expected of our XTerra preparative products, with a significantly reduced column backpressure.

For more information on XBridge HPLC Columns, refer to page 124 for 2.5 µm and page 161 for 3–5 µm column offerings.

XBridge Columns

BEH C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006028	176002546	2.1 × 20 mm *IS*	186003019	2.1 × 20 mm *IS*	186003107
2.1 × 50 mm *XP*	186006029	176002547	2.1 × 30 mm	186003020	2.1 × 30 mm	186003129
2.1 × 75 mm *XP*	186006030	176002548	2.1 × 50 mm	186003021	2.1 × 50 mm	186003108
2.1 × 100 mm *XP*	186006031	176002549	2.1 × 100 mm	186003022	2.1 × 100 mm	186003109
2.1 × 150 mm *XP*	186006709	176002879	2.1 × 150 mm	186003023	2.1 × 150 mm	186003110
3.0 × 30 mm *XP*	186006032	176002550	3.0 × 30 mm	186003025	3.0 × 30 mm	186003111
3.0 × 50 mm *XP*	186006033	176002551	3.0 × 50 mm	186003026	3.0 × 50 mm	186003131
3.0 × 75 mm *XP*	186006034	176002552	3.0 × 100 mm	186003027	3.0 × 100 mm	186003132
3.0 × 100 mm *XP*	186006035	176002553	3.0 × 150 mm	186003028	3.0 × 150 mm	186003112
3.0 × 150 mm *XP*	186006710	176002880	4.6 × 30 mm	186003030	3.0 × 250 mm	186003133
4.6 × 30 mm *XP*	186006036	—	4.6 × 50 mm	186003031	4.6 × 30 mm	186003135
4.6 × 50 mm *XP*	186006037	—	4.6 × 75 mm	186003032	4.6 × 50 mm	186003113
4.6 × 75 mm *XP*	186006038	—	4.6 × 100 mm	186003033	4.6 × 75 mm	186003114
4.6 × 100 mm *XP*	186006039	—	4.6 × 150 mm	186003034	4.6 × 100 mm	186003115
4.6 × 150 mm *XP*	186006711	—	4.6 × 250 mm	186003943	4.6 × 150 mm	186003116
					4.6 × 250 mm	186003117

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002972[1]	10 × 10 mm	Guard Cartridge	186003889[1]
10 × 50 mm	OBD Column	186008164	19 × 10 mm	Guard Cartridge	186003892[2]
10 × 100 mm	OBD Column	186008165	30 × 10 mm	Guard Cartridge	186006892[3]
10 × 150 mm	OBD Column	186008166	10 × 150 mm	OBD Column	186008210
10 × 250 mm	OBD Column	186008167	10 × 250 mm	OBD Column	186008211
19 × 10 mm	Guard Cartridge	186002975[2]	19 × 50 mm	OBD Column	186003893
19 × 50 mm	OBD Column	186002977	19 × 100 mm	OBD Column	186003901
19 × 100 mm	OBD Column	186002978	19 × 150 mm	OBD Column	186003894
19 × 150 mm	OBD Column	186002979	19 × 250 mm	OBD Column	186003895
19 × 250 mm	OBD Column	186004021	30 × 75 mm	OBD Column	186004711
30 × 10 mm	Guard Cartridge	186006893[3]	30 × 100 mm	OBD Column	186003930
30 × 50 mm	OBD Column	186002980	30 × 150 mm	OBD Column	186003896
30 × 75 mm	OBD Column	186002981	30 × 250 mm	OBD Column	186003897
30 × 100 mm	OBD Column	186002982	50 × 50 mm	OBD Column	186003898
30 × 150 mm	OBD Column	186003284	50 × 100 mm	OBD Column	186003902
30 × 250 mm	OBD Column	186004025	50 × 150 mm	OBD Column	186003899
50 × 50 mm	OBD Column	186003933	50 × 250 mm	OBD Column	186003900
50 × 100 mm	OBD Column	186003937			
50 × 150 mm	OBD Column	186003929			
50 × 250 mm	OBD Column	186004107			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH C_8

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006040	176002554	2.1 × 30 mm	186003046	2.1 × 30 mm	186003187
2.1 × 50 mm *XP*	186006041	176002555	2.1 × 50 mm	186003047	2.1 × 50 mm	186003011
2.1 × 75 mm *XP*	186006042	176002556	2.1 × 100 mm	186003048	2.1 × 100 mm	186003012
2.1 × 100 mm *XP*	186006043	176002557	2.1 × 150 mm	186003049	2.1 × 150 mm	186003013
2.1 × 150 mm *XP*	186006712	176002881	3.0 × 30 mm	186003182	3.0 × 30 mm	186003189
3.0 × 30 mm *XP*	186006044	176002558	3.0 × 50 mm	186003050	3.0 × 50 mm	186003190
3.0 × 50 mm *XP*	186006045	176002559	3.0 × 100 mm	186003051	3.0 × 100 mm	186003191
3.0 × 75 mm *XP*	186006046	176002560	3.0 × 150 mm	186003052	3.0 × 150 mm	186003014
3.0 × 100 mm *XP*	186006047	176002561	4.6 × 30 mm	186003184	3.0 × 250 mm	186003192
3.0 × 150 mm *XP*	186006713	176002882	4.6 × 50 mm	186003053	4.6 × 30 mm	186003194
4.6 × 30 mm *XP*	186006048	—	4.6 × 75 mm	186003185	4.6 × 50 mm	186003015
4.6 × 50 mm *XP*	186006049	—	4.6 × 100 mm	186003054	4.6 × 75 mm	186003195
4.6 × 75 mm *XP*	186006050	—	4.6 × 150 mm	186003055	4.6 × 100 mm	186003016
4.6 × 100 mm *XP*	186006051	—	4.6 × 250 mm	186003963	4.6 × 150 mm	186003017
4.6 × 150 mm *XP*	186006714	—			4.6 × 250 mm	186003018

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002991[1]	10 × 10 mm	Guard Cartridge	186004003[1]
10 × 50 mm	OBD Column	186008172	19 × 10 mm	Guard Cartridge	186004006[2]
10 × 100 mm	OBD Column	186008173	30 × 10 mm	Guard Cartridge	186006894[3]
10 × 150 mm	OBD Column	186008174	10 × 150 mm	OBD Column	186008215
10 × 250 mm	OBD Column	186008175	10 × 250 mm	OBD Column	186008216
19 × 10 mm	Guard Cartridge	186002992[2]	19 × 50 mm	OBD Column	186004007
19 × 50 mm	OBD Column	186002993	19 × 100 mm	OBD Column	186004008
19 × 100 mm	OBD Column	186002994	19 × 150 mm	OBD Column	186004009
19 × 150 mm	OBD Column	186002995	19 × 250 mm	OBD Column	186004010
19 × 250 mm	OBD Column	186004023	30 × 150 mm	OBD Column	186004011
30 × 10 mm	Guard Cartridge	186006895[3]	30 × 250 mm	OBD Column	186004012
30 × 50 mm	OBD Column	186002996	50 × 50 mm	OBD Column	186004013
30 × 75 mm	OBD Column	186003269	50 × 100 mm	OBD Column	186004014
30 × 100 mm	OBD Column	186002997	50 × 150 mm	OBD Column	186004015
30 × 150 mm	OBD Column	186003083	50 × 250 mm	OBD Column	186004016
50 × 50 mm	OBD Column	186003934			
50 × 100 mm	OBD Column	186003938			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH Shield RP18

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006052	176002562	2.1 × 30 mm	186003035	2.1 × 30 mm	186003157
2.1 × 50 mm *XP*	186006053	176002563	2.1 × 50 mm	186003036	2.1 × 50 mm	186002999
2.1 × 75 mm *XP*	186006054	176002564	2.1 × 100 mm	186003037	2.1 × 100 mm	186003002
2.1 × 100 mm *XP*	186006055	176002565	2.1 × 150 mm	186003038	2.1 × 150 mm	186003003
2.1 × 150 mm *XP*	186006715	176002883	3.0 × 30 mm	186003153	3.0 × 50 mm	186003160
3.0 × 20 mm *IS**	186003140	—	3.0 × 50 mm	186003039	3.0 × 100 mm	186003004
3.0 × 30 mm *XP*	186006056	176002566	3.0 × 100 mm	186003040	3.0 × 150 mm	186003005
3.0 × 50 mm *XP*	186006057	176002567	3.0 × 150 mm	186003041	3.0 × 250 mm	186003161
3.0 × 75 mm *XP*	186006058	176002568	4.6 × 30 mm	186003155	4.6 × 50 mm	186003006
3.0 × 100 mm *XP*	186006059	176002569	4.6 × 50 mm	186003042	4.6 × 75 mm	186003007
3.0 × 150 mm *XP*	186006716	176002884	4.6 × 75 mm	186003043	4.6 × 100 mm	186003008
4.6 × 20 mm *IS**	186003144	—	4.6 × 100 mm	186003044	4.6 × 150 mm	186003009
4.6 × 30 mm *XP*	186006060	—	4.6 × 150 mm	186003045	4.6 × 250 mm	186003010
4.6 × 50 mm *XP*	186006061	—	4.6 × 250 mm	186003964		
4.6 × 75 mm *XP*	186006062	—				
4.6 × 100 mm *XP*	186006063	—				
4.6 × 150 mm *XP*	186006717	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002983[1]	10 × 10 mm	Guard Cartridge	186003988[1]
10 × 50 mm	OBD Column	186008168	19 × 10 mm	Guard Cartridge	186003991[2]
10 × 100 mm	OBD Column	186008169	30 × 10 mm	Guard Cartridge	186006897[3]
10 × 150 mm	OBD Column	186008170	10 × 150 mm	OBD Column	186008213
10 × 250 mm	OBD Column	186008171	10 × 250 mm	OBD Column	186008214
19 × 10 mm	Guard Cartridge	186002984[2]	19 × 50 mm	OBD Column	186003992
19 × 50 mm	OBD Column	186002985	19 × 100 mm	OBD Column	186003993
19 × 100 mm	OBD Column	186002986	19 × 150 mm	OBD Column	186003994
19 × 150 mm	OBD Column	186002987	19 × 250 mm	OBD Column	186003995
19 × 250 mm	OBD Column	186004022	30 × 150 mm	OBD Column	186003996
30 × 10 mm	Guard Cartridge	186006898[3]	30 × 250 mm	OBD Column	186003997
30 × 50 mm	OBD Column	186002988	50 × 50 mm	OBD Column	186003998
30 × 75 mm	OBD Column	186003262	50 × 100 mm	OBD Column	186003999
30 × 100 mm	OBD Column	186002989	50 × 150 mm	OBD Column	186004001
30 × 150 mm	OBD Column	186002990	50 × 250 mm	OBD Column	186004002
50 × 50 mm	OBD Column	186003935			
50 × 100 mm	OBD Column	186003939			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH Phenyl

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006064	176002570	2.1 × 30 mm	186003321	2.1 × 50 mm	186003338
2.1 × 50 mm *XP*	186006065	176002571	2.1 × 50 mm	186003322	2.1 × 100 mm	186003339
2.1 × 75 mm *XP*	186006066	176002572	2.1 × 100 mm	186003323	2.1 × 150 mm	186003340
2.1 × 100 mm *XP*	186006067	176002573	2.1 × 150 mm	186003324	3.0 × 50 mm	186003343
2.1 × 150 mm *XP*	186006718	176002885	3.0 × 50 mm	186003327	3.0 × 100 mm	186003344
3.0 × 30 mm *XP*	186006068	176002574	3.0 × 100 mm	186003328	3.0 × 150 mm	186003345
3.0 × 50 mm *XP*	186006069	176002575	3.0 × 150 mm	186003329	3.0 × 250 mm	186003346
3.0 × 75 mm *XP*	186006070	176002576	4.6 × 30 mm	186003331	4.6 × 50 mm	186003349
3.0 × 100 mm *XP*	186006071	176002577	4.6 × 50 mm	186003332	4.6 × 75 mm	186003350
3.0 × 150 mm *XP*	186006719	176002886	4.6 × 75 mm	186003333	4.6 × 100 mm	186003351
4.6 × 30 mm *XP*	186006072	—	4.6 × 100 mm	186003334	4.6 × 150 mm	186003352
4.6 × 50 mm *XP*	186006073	—	4.6 × 150 mm	186003335	4.6 × 250 mm	186003353
4.6 × 75 mm *XP*	186006074	—	4.6 × 250 mm	186003965		
4.6 × 100 mm *XP*	186006075	—				
4.6 × 150 mm *XP*	186006720	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186003354[1]
10 × 50 mm	OBD Column	186008176
10 × 100 mm	OBD Column	186008177
10 × 150 mm	OBD Column	186008178
10 × 250 mm	OBD Column	186008179
19 × 10 mm	Guard Cartridge	186003355[2]
19 × 50 mm	OBD Column	186003356
19 × 100 mm	OBD Column	186003357
19 × 150 mm	OBD Column	186003358
19 × 250 mm	OBD Column	186004024
30 × 10 mm	Guard Cartridge	186006891[3]
30 × 50 mm	OBD Column	186003277
30 × 75 mm	OBD Column	186003278
30 × 100 mm	OBD Column	186003279
30 × 150 mm	OBD Column	186003276
50 × 50 mm	OBD Column	186003936
50 × 100 mm	OBD Column	186003940

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH HILIC

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006076	176002578	2.1 × 50 mm	186004432	2.1 × 50 mm	186004444
2.1 × 50 mm *XP*	186006077	176002579	2.1 × 100 mm	186004433	2.1 × 100 mm	186004445
2.1 × 75 mm *XP*	186006078	176002580	2.1 × 150 mm	186004434	2.1 × 150 mm	186004446
2.1 × 100 mm *XP*	186006079	176002581	3.0 × 100 mm	186004436	3.0 × 100 mm	186004448
2.1 × 150 mm *XP*	186006721	176002887	4.6 × 50 mm	186004439	4.6 × 50 mm	186004451
3.0 × 30 mm *XP*	186006080	176002582	4.6 × 100 mm	186004440	4.6 × 100 mm	186004452
3.0 × 50 mm *XP*	186006081	176002583	4.6 × 150 mm	186004441	4.6 × 150 mm	186004453
3.0 × 75 mm *XP*	186006082	176002584			4.6 × 250 mm	186004454
3.0 × 100 mm *XP*	186006083	176002585				
3.0 × 150 mm *XP*	186006722	176002888				
4.6 × 30 mm *XP*	186006084	—				
4.6 × 50 mm *XP*	186006085	—				
4.6 × 75 mm *XP*	186006086	—				
4.6 × 100 mm *XP*	186006087	—				
4.6 × 150 mm *XP*	186006723	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004720[1]
10 × 50 mm	OBD Column	186008217
10 × 100 mm	OBD Column	186008218
19 × 10 mm	Guard Cartridge	186004723[2]
19 × 50 mm	OBD Column	186004724
19 × 100 mm	OBD Column	186004725
19 × 150 mm	OBD Column	186004726
19 × 250 mm	OBD Column	186004730
30 × 10 mm	Guard Cartridge	186006896[3]
30 × 50 mm	OBD Column	186004727
30 × 100 mm	OBD Column	186004728
30 × 150 mm	OBD Column	186004729
30 × 250 mm	OBD Column	186004731
50 × 50 mm	OBD Column	186004732
50 × 100 mm	OBD Column	186004733
50 × 150 mm	OBD Column	186004734
50 × 250 mm	OBD Column	186004735

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

BEH Amide

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006088	176002586	2.1 × 30 mm	186004858	2.1 × 30 mm	186006587
2.1 × 50 mm *XP*	186006089	176002587	2.1 × 50 mm	186004859	2.1 × 50 mm	186006588
2.1 × 75 mm *XP*	186006090	176002588	2.1 × 100 mm	186004860	2.1 × 100 mm	186006589
2.1 × 100 mm *XP*	186006091	176002589	2.1 × 150 mm	186004861	2.1 × 150 mm	186006590
2.1 × 150 mm *XP*	186006724	176002889	3.0 × 50 mm	186004863	3.0 × 50 mm	186006591
3.0 × 30 mm *XP*	186006092	176002590	3.0 × 100 mm	186004864	3.0 × 100 mm	186006592
3.0 × 50 mm *XP*	186006093	176002591	4.6 × 50 mm	186004867	4.6 × 50 mm	186006593
3.0 × 75 mm *XP*	186006094	176002592	4.6 × 100 mm	186004868	4.6 × 100 mm	186006594
3.0 × 100 mm *XP*	186006095	176002593	4.6 × 150 mm	186004869	4.6 × 150 mm	186006595
3.0 × 150 mm *XP*	186006725	176002890	4.6 × 250 mm	186004870	4.6 × 250 mm	186006596
4.6 × 30 mm *XP*	186006096	—				
4.6 × 50 mm *XP*	186006097	—				
4.6 × 75 mm *XP*	186006098	—				
4.6 × 100 mm *XP*	186006099	—				
4.6 × 150 mm *XP*	186006726	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186006597[1]
10 × 50 mm	OBD Column	186008260
10 × 100 mm	OBD Column	186008261
10 × 150 mm	OBD Column	186008262
10 × 250 mm	OBD Column	186008263
19 × 10 mm	Guard Cartridge	186006598[2]
19 × 50 mm	OBD Column	186006603
19 × 100 mm	OBD Column	186006604
19 × 150 mm	OBD Column	186006605
19 × 250 mm	OBD Column	186006606
30 × 10 mm	Guard Cartridge	186006890[3]
30 × 50 mm	OBD Column	186006607
30 × 75 mm	OBD Column	186006608
30 × 100 mm	OBD Column	186006609
30 × 150 mm	OBD Column	186006610
30 × 250 mm	OBD Column	186006611

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

Glycan BEH Amide, 130 Å

ANALYTICAL COLUMNS

Particle Size: 2.5 µm		Particle Size: 3.5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm *XP*	186007263	2.1 × 50 mm	186007502
2.1 × 100 mm *XP*	186007264	2.1 × 100 mm	186007503
2.1 × 150 mm *XP*	186007265	2.1 × 150 mm	186007504
3.0 × 30 mm *XP*	186008038	4.6 × 50 mm	186007273
3.0 × 75 mm *XP*	186008039	4.6 × 100 mm	186007274
3.0 × 150 mm *XP*	186008040	4.6 × 150 mm	186007275
4.6 × 50 mm *XP*	186007268	4.6 × 250 mm	186007276
4.6 × 100 mm *XP*	186007269		
4.6 × 150 mm *XP*	186007270		

Peptide BEH C_{18}, 130 Å

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
1.0 × 50 mm	186003560	1.0 × 50 mm	186003571
1.0 × 100 mm	186003561	1.0 × 100 mm	186003572
1.0 × 150 mm	186003562	1.0 × 150 mm	186003573
2.1 × 50 mm	186003563	2.1 × 50 mm	186003574
2.1 × 100 mm	186003564	2.1 × 100 mm	186003575
2.1 × 150 mm	186003565	2.1 × 150 mm	186003576
2.1 × 250 mm	186003566	2.1 × 250 mm	186003577
4.6 × 50 mm	186003567	4.6 × 50 mm	186003578
4.6 × 100 mm	186003568	4.6 × 100 mm	186003579
4.6 × 150 mm	186003569	4.6 × 150 mm	186003580
4.6 × 250 mm	186003570	4.6 × 250 mm	186003581

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004469[1]	4.6 × 50 mm	OBD Column	186003648
10 × 50 mm	OBD Column	186008186	4.6 × 100 mm	OBD Column	186003649
10 × 100 mm	OBD Column	186008187	4.6 × 150 mm	OBD Column	186003650
10 × 150 mm	OBD Column	186008188	4.6 × 250 mm	OBD Column	186003651
10 × 250 mm	OBD Column	186008189	10 × 10 mm	Guard Cartridge	186004465[1]
19 × 10 mm	Guard Cartridge	186004468[2]	10 × 50 mm	OBD Column	186008194
19 × 50 mm	OBD Column	186003586	10 × 100 mm	OBD Column	186008195
19 × 100 mm	OBD Column	186003587	10 × 150 mm	OBD Column	186008196
19 × 150 mm	OBD Column	186003945	10 × 250 mm	OBD Column	186008197
			19 × 10 mm	Guard Cartridge	186004464[2]
			19 × 50 mm	OBD Column	186003656
			19 × 150 mm	OBD Column	186003657
			19 × 250 mm	OBD Column	186003658
			30 × 50 mm	OBD Column	186003659
			30 × 100 mm	OBD Column	186003660
			30 × 150 mm	OBD Column	186003661
			30 × 250 mm	OBD Column	186003662

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

APPLICATION AREA: Analyze Natural Product Secondary Metabolites from Bacterial Extracts

"For the purpose of our application (natural products metabolites dereliction and isolation) the XBridge OBD prep column showed reproducible results from batch-to-batch runs as well as reliable comparison with the analytical run of the same sample so it is a very reliable and easy to use column."

REVIEWER: Arlene Sy-Cordero

ORGANIZATION: Lodo Therapeutics

Peptide BEH C_{18}, 300 Å

ANALYTICAL COLUMNS

Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006028	1.0 × 50 mm	186003604	1.0 × 50 mm	186003615
2.1 × 50 mm *XP*	186006029	1.0 × 100 mm	186003605	1.0 × 100 mm	186003616
2.1 × 75 mm *XP*	186006030	1.0 × 150 mm	186003606	1.0 × 150 mm	186003617
2.1 × 100 mm *XP*	186006031	2.1 × 50 mm	186003607	2.1 × 50 mm	186003618
2.1 × 150 mm *XP*	186006709	2.1 × 100 mm	186003608	2.1 × 100 mm	186003619
3.0 × 30 mm *XP*	186006032	2.1 × 150 mm	186003609	2.1 × 150 mm	186003620
3.0 × 50 mm *XP*	186006033	2.1 × 250 mm	186003610	2.1 × 250 mm	186003621
3.0 × 75 mm *XP*	186006034	4.6 × 50 mm	186003611	4.6 × 50 mm	186003622
3.0 × 100 mm *XP*	186006035	4.6 × 100 mm	186003612	4.6 × 100 mm	186003623
3.0 × 150 mm *XP*	186006710	4.6 × 150 mm	186003613	4.6 × 150 mm	186003624
4.6 × 30 mm *XP*	186006036	4.6 × 250 mm	186003614	4.6 × 250 mm	186003625
4.6 × 50 mm *XP*	186006037				
4.6 × 75 mm *XP*	186006038				
4.6 × 100 mm *XP*	186006039				
4.6 × 150 mm *XP*	186006711				

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004471[1]	4.6 × 50 mm	OBD Column	186003663
10 × 50 mm	OBD Column	186008190	4.6 × 100 mm	OBD Column	186003664
10 × 100 mm	OBD Column	186008191	4.6 × 150 mm	OBD Column	186003665
10 × 150 mm	OBD Column	186008192	4.6 × 250 mm	OBD Column	186003666
10 × 250 mm	OBD Column	186008193	10 × 10 mm	Guard Cartridge	186004467[1]
19 × 10 mm	Guard Cartridge	186004470[2]	10 × 50 mm	OBD Column	186008198
19 × 50 mm	OBD Column	186003630	10 × 100 mm	OBD Column	186008199
19 × 100 mm	OBD Column	186003631	10 × 150 mm	OBD Column	186008200
19 × 150 mm	OBD Column	186003946	10 × 250 mm	OBD Column	186008201
			19 × 10 mm	Guard Cartridge	186004466[2]
			19 × 50 mm	OBD Column	186003671
			19 × 150 mm	OBD Column	186003672
			19 × 250 mm	OBD Column	186003673
			30 × 10 mm	Guard Cartridge	186006882[3]
			30 × 50 mm	OBD Column	186003674
			30 × 100 mm	OBD Column	186003675
			30 × 150 mm	OBD Column	186003676
			30 × 250 mm	OBD Column	186003677

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Cartridge Holder, p/n: 186006912.

Protein BEH C_4, 300 Å

ANALYTICAL COLUMNS		PREPARATIVE COLUMNS					
Particle Size: 3.5 µm		Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	P/N (1/pk)	Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
2.1 × 50 mm	186004498	10 × 10 mm	Guard Cartridge	186007305[1]	10 × 10 mm	Guard Cartridge	186007325[1]
2.1 × 100 mm	186004499	10 × 50 mm	OBD Column	186008272	10 × 50 mm	OBD Column	186008276
2.1 × 150 mm	186004500	10 × 100 mm	OBD Column	186008273	10 × 100 mm	OBD Column	186008277
2.1 × 250 mm	186004501	10 × 150 mm	OBD Column	186008274	10 × 150 mm	OBD Column	186008278
4.6 × 50 mm	186004502	10 × 250 mm	OBD Column	186008275	10 × 250 mm	OBD Column	186008279
4.6 × 100 mm	186004503	19 × 10 mm	Guard Cartridge	186007310[2]	19 × 10 mm	Guard Cartridge	186007330[2]
4.6 × 150 mm	186004504	19 × 50 mm	OBD Column	186007311	19 × 50 mm	OBD Column	186007331
4.6 × 250 mm	186004505	19 × 100 mm	OBD Column	186007312	19 × 100 mm	OBD Column	186007332
		19 × 150 mm	OBD Column	186007313	19 × 150 mm	OBD Column	186007333
		19 × 250 mm	OBD Column	186007314	19 × 250 mm	OBD Column	186007334
		30 × 10 mm	Guard Cartridge	186007315[3]	30 × 10 mm	Guard Cartridge	186007335[3]
		30 × 50 mm	OBD Column	186007316	30 × 50 mm	OBD Column	186007336
		30 × 75 mm	OBD Column	186007317	30 × 75 mm	OBD Column	186007337
		30 × 100 mm	OBD Column	186007318	30 × 100 mm	OBD Column	186007338
		30 × 150 mm	OBD Column	186007319	30 × 150 mm	OBD Column	186007339
		30 × 250 mm	OBD Column	186007320	30 × 250 mm	OBD Column	186007340

Oligonucleotide BEH C_{18}, 130 Å

PREPARATIVE COLUMNS		
Particle Size: 2.5 µm		
Dimension	Type	P/N (1/pk)
10 × 50 mm	OBD Column	186008212

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

APPLICATION AREA: Small Molecule Purification

"These are excellent columns. They come in a variety of sizes to meet every need, we use mostly the 19 × 100 mm. These columns are great and meet our routine purification needs and give excellent efficiency and resolution for those more challenging ones. We find that the columns are very robust, ours can last years and many injections, in some cases, a good flush is all that is needed to get them back to optimal. Highly recommended."

REVIEWER: Romulo Romero
ORGANIZATION: AstraZeneca

XBridge Columns Method Validation Kits*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
BEH C_{18}	2.1 × 50 mm *XP*	186006197	2.1 × 100 mm	186003766	2.1 × 150 mm	186003771
	2.1 × 100 mm *XP*	186006198	3.0 × 100 mm	186003767	3.0 × 100 mm	186003772
	2.1 × 150 mm *XP*	186006757	3.0 × 150 mm	186003768	3.0 × 150 mm	186003773
	3.0 × 50 mm *XP*	186006199	4.6 × 100 mm	186003769	4.6 × 100 mm	186003774
	3.0 × 100 mm *XP*	186006200	4.6 × 150 mm	186003770	4.6 × 150 mm	186003775
	3.0 × 150 mm *XP*	186006758			4.6 × 250 mm	186003776
	4.6 × 50 mm *XP*	186006201				
	4.6 × 100 mm *XP*	186006202				
	4.6 × 150 mm *XP*	186006759				
BEH C_8	2.1 × 50 mm *XP*	186006203	2.1 × 100 mm	186003777	2.1 × 150 mm	186003782
	2.1 × 100 mm *XP*	186006204	3.0 × 100 mm	186003778	3.0 × 100 mm	186003783
	2.1 × 150 mm *XP*	186006760	3.0 × 150 mm	186003779	3.0 × 150 mm	186003784
	3.0 × 50 mm *XP*	186006205	4.6 × 100 mm	186003780	4.6 × 100 mm	186003785
	3.0 × 100 mm *XP*	186006206	4.6 × 150 mm	186003781	4.6 × 150 mm	186003786
	3.0 × 150 mm *XP*	186006761			4.6 × 250 mm	186003787
	4.6 × 50 mm *XP*	186006207				
	4.6 × 100 mm *XP*	186006208				
	4.6 × 150 mm *XP*	186006762				
BEH Shield RP18	2.1 × 50 mm *XP*	186006209	2.1 × 100 mm	186003788	2.1 × 150 mm	186003793
	2.1 × 100 mm *XP*	186006210	3.0 × 100 mm	186003789	3.0 × 100 mm	186003794
	2.1 × 150 mm *XP*	186006763	3.0 × 150 mm	186003790	3.0 × 150 mm	186003795
	3.0 × 50 mm *XP*	186006211	4.6 × 100 mm	186003791	4.6 × 100 mm	186003796
	3.0 × 100 mm *XP*	186006212	4.6 × 150 mm	186003792	4.6 × 150 mm	186003797
	3.0 × 150 mm *XP*	186006774			4.6 × 250 mm	186003798
	4.6 × 50 mm *XP*	186006213				
	4.6 × 100 mm *XP*	186006214				
	4.6 × 150 mm *XP*	186006775				
BEH Phenyl	2.1 × 50 mm *XP*	186006215	2.1 × 100 mm	186003799	2.1 × 150 mm	186003804
	2.1 × 100 mm *XP*	186006216	3.0 × 100 mm	186003800	3.0 × 100 mm	186003805
	2.1 × 150 mm *XP*	186006776	3.0 × 150 mm	186003801	3.0 × 150 mm	186003806
	3.0 × 50 mm *XP*	186006217	4.6 × 100 mm	186003802	4.6 × 100 mm	186003807
	3.0 × 100 mm *XP*	186006218	4.6 × 150 mm	186003803	4.6 × 150 mm	186003808
	3.0 × 150 mm *XP*	186006777			4.6 × 250 mm	186003809
	4.6 × 50 mm *XP*	186006219				
	4.6 × 100 mm *XP*	186006220				
	4.6 × 150 mm *XP*	186006778				
Oligonucleotide BEH C_{18}, 130 Å	4.6 × 50 mm	186004906				

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

XBridge Columns Method Validation Kits* *Continued*

	Particle Size: 2.5 µm	
	Dimension	**P/N (3/pk)**
HILIC	2.1 × 50 mm ***XP***	186006221
	2.1 × 100 mm ***XP***	186006222
	2.1 × 150 mm ***XP***	186006779
	3.0 × 50 mm ***XP***	186006223
	3.0 × 100 mm ***XP***	186006224
	3.0 × 150 mm ***XP***	186006780
	4.6 × 50 mm ***XP***	186006225
	4.6 × 100 mm ***XP***	186006226
	4.6 × 150 mm ***XP***	186006781
Amide	2.1 × 50 mm ***XP***	186006227
	2.1 × 100 mm ***XP***	186006228
	2.1 × 150 mm ***XP***	186006782
	3.0 × 50 mm ***XP***	186006229
	3.0 × 100 mm ***XP***	186006230
	3.0 × 150 mm ***XP***	186006783
	4.6 × 50 mm ***XP***	186006231
	4.6 × 100 mm ***XP***	186006232
	4.6 × 150 mm ***XP***	186006784
Glycan BEH Amide, 130 Å	2.1 × 150 mm ***XP***	186007266
	4.6 × 150 mm ***XP***	186007271

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

APPLICATION AREA: Purification of Small Molecules and Peptides

"XBridge columns are easy to install and basic method development gives high resolution. They are robust, long-lasting and easily cleaned. Even when sample is highly concentrated, and material is overloaded, column resolution remains high."

REVIEWER: Daniel Sheik

ORGANIZATION: Purdue Institute for Drug Discovery

XBridge VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
BEH C_{18}	2.1 × 5 mm ***XP***	186007772	2.1 × 5 mm	186007766	2.1 × 5 mm	186007769
	3.9 × 5 mm ***XP***	186007774	3.9 × 5 mm	186007768	3.9 × 5 mm	186007771
BEH C_8	2.1 × 5 mm ***XP***	186007781	2.1 × 5 mm	186007775	2.1 × 5 mm	186007778
	3.9 × 5 mm ***XP***	186007783	3.9 × 5 mm	186007777	3.9 × 5 mm	186007780
BEH Shield RP18	2.1 × 5 mm ***XP***	186007808	2.1 × 5 mm	186007802	2.1 × 5 mm	186007805
	3.9 × 5 mm ***XP***	186007810	3.9 × 5 mm	186007804	3.9 × 5 mm	186007807
BEH Phenyl	2.1 × 5 mm ***XP***	186007799	2.1 × 5 mm	186007793	2.1 × 5 mm	186007796
	3.9 × 5 mm ***XP***	186007801	3.9 × 5 mm	186007795	3.9 × 5 mm	186007798
BEH HILIC	2.1 × 5 mm ***XP***	186007790	2.1 × 5 mm	186007784	2.1 × 5 mm	186007787
	3.9 × 5 mm ***XP***	186007792	3.9 × 5 mm	186007786	3.9 × 5 mm	186007789
BEH Amide	2.1 × 5 mm ***XP***	186007763	2.1 × 5 mm	186007757	2.1 × 5 mm	186007760
	3.9 × 5 mm ***XP***	186007765	3.9 × 5 mm	186007759	3.9 × 5 mm	186007762

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

APPLICATION AREA: Preparative LC Fraction Collection

"Waters application specialists help us to select the correct dimension of the (XBridge) column based on our application. On the receipt of the column, the application specialist was on site and helped us install and share his experience working with prep column. I am using this column almost every day and made more than 2000 injections with 10 mg/mL sample concentration and still, it works well for my application. I highly recommend this column and I am very happy with Waters products, their after sale support. The one thing that makes stand above all is their 90 days guarantee."

REVIEWER: Jignesh Desai

ORGANIZATION: Alvogen

XSelect OBD Preparative Columns

VERSATILITY AND SELECTIVITY

XSelect HPLC Columns offer the opportunity to scale from analytical to preparative applications, taking advantage of alternative selectivity through different column chemistries and methods specifying different pH scales.

XSelect OBD Preparative Columns are:

- Available as CSH C_{18}, CSH Fluoro-Phenyl, CSH Phenyl-Hexyl, HSS C_{18}, HSS C_{18} SB, and HSS T3 column chemistries
- Designed for selectivity, improving the separation of closely eluting peaks
- Intended for isolation and purification, improving throughput with high-mass loading
- Ideal for rapid method development, reducing the time and cost required to develop screening methods

Columns for peptide purifications:

- Improve peak shape and mass loading using the QC-tested XSelect Peptide CSH C_{18} Columns

Columns Designed for Isolation and Purification

LC Conditions

Columns:	ACQUITY UPLC CSH C_{18}, 1.7 µm, 2.1 × 50 mm
Part number:	186005296
Mobile phase A:	0.1% formic acid in water
Mobile phase B:	0.1% formic acid in acetonitrile

Gradient:

Time (min)	Flow (mL/min)	Profile %A	%B	Curve
Initial	0.9	95	5	Initial
2.00	0.9	5	95	6
2.50	0.9	5	95	6
2.51	0.9	95	5	6
3.50	0.9	95	5	6

Injection vol.:	1 µL
Sample conc.:	800 µg/mL for crude mix
Sample diluent:	50/50 methanol/water
Column temp.:	40 °C
Weak needle wash:	95/5 water/acetonitrile
Strong needle wash:	95/5 acetonitrile/water
UV detection:	220 nm
Sampling rate:	20 points/sec
Filter time constant:	0.1 sec
System:	ACQUITY UPLC with ACQUITY UPLC PDA Detector

Preparative Conditions

Column:	XSelect CSH C_{18} OBD Prep, 5 µm, 19 × 100 mm
Part number:	186005421
Mobile phase A:	0.1% formic acid in water
Mobile phase B:	0.1% formic acid in acetonitrile

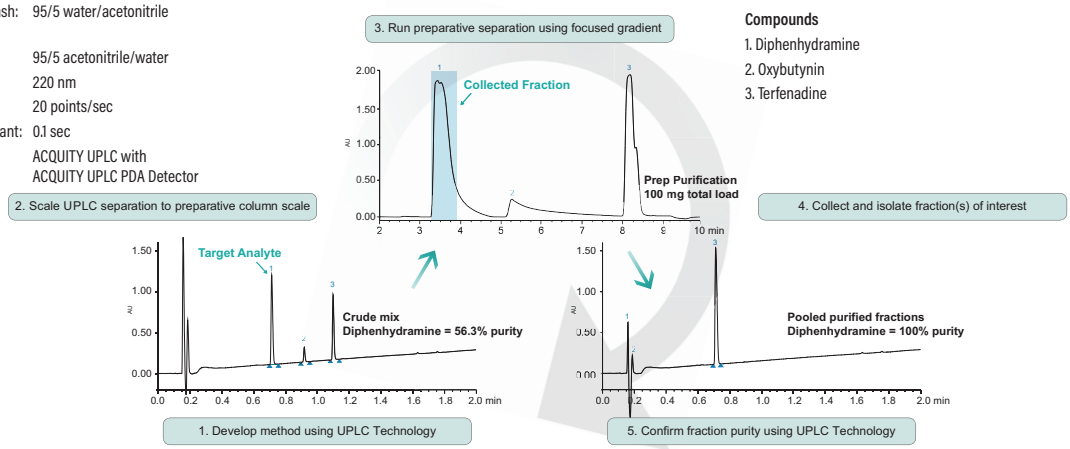
Gradient:

Time (min)	Flow (mL/min)	Profile %A	%B	Curve
1.21	25	95	5	Initial
1.71	25	95	5	6
7.02	25	78.8	21.2	6
7.21	25	70.8	29.2	6
8.21	25	5	95	6
8.31	25	95	5	6
13.21	25	95	5	6

Injection vol.:	1.25 mL
Sample conc.:	80 mg/mL for crude mix
Diphenhydramine:	40 mg/mL
Oxybutynin:	16 mg/mL
Terfenadine :	24 mg/mL
Sample diluent:	DMSO
Column temp.:	40 °C
Weak needle wash:	95/5 water/methanol
Strong needle wash:	95/5 methanol/water
UV detection:	220 nm
Sampling rate:	1 point/sec
Filter time constant:	1 sec
System:	Waters 2525 Binary Gradient Module, 2767 Sample Manager, Column Fluidics Organizer, 2996 Photodiode Array Detector, ZQ Mass Spectrometer

Compounds

1. Diphenhydramine
2. Oxybutynin
3. Terfenadine



Using CSH Technology throughout the entire process, methods can be developed quickly with ACQUITY UPLC CSH Columns and UPLC Technology and then transferred to preparative-scale XSelect OBD Preparative Columns for isolation and purification. The purity of the isolated fraction(s) can then be measured/confirmed using ACQUITY UPLC CSH Columns and UPLC Technology.

Ordering Information

XSelect Columns

CSH C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm ***XP***	186006100	176002594	1.0 × 50 mm	186005249	2.1 × 50 mm	186005274
2.1 × 50 mm ***XP***	186006101	176002595	1.0 × 150 mm	186005251	2.1 × 100 mm	186005275
2.1 × 75 mm ***XP***	186006102	176002596	2.1 × 30 mm	186005254	2.1 × 150 mm	186005276
2.1 × 100 mm ***XP***	186006103	176002597	2.1 × 50 mm	186005255	3.0 × 30 mm	186005279
2.1 × 150 mm ***XP***	186006727	176002891	2.1 × 75 mm	186005644	3.0 × 50 mm	186005280
3.0 × 30 mm ***XP***	186006104	176002598	2.1 × 100 mm	186005256	3.0 × 100 mm	186005281
3.0 × 50 mm ***XP***	186006105	176002599	2.1 × 150 mm	186005257	3.0 × 150 mm	186005282
3.0 × 75 mm ***XP***	186006106	176002600	3.0 × 30 mm	186005260	3.0 × 250 mm	186005283
3.0 × 100 mm ***XP***	186006107	176002601	3.0 × 50 mm	186005261	4.6 × 50 mm	186005287
3.0 × 150 mm ***XP***	186006728	176002892	3.0 × 75 mm	186005647	4.6 × 100 mm	186005289
4.6 × 30 mm ***XP***	186006108	—	3.0 × 100 mm	186005262	4.6 × 150 mm	186005290
4.6 × 50 mm ***XP***	186006109	—	3.0 × 150 mm	186005263	4.6 × 250 mm	186005291
4.6 × 75 mm ***XP***	186006110	—	4.6 × 50 mm	186005267		
4.6 × 100 mm ***XP***	186006111	—	4.6 × 75 mm	186005268		
4.6 × 150 mm ***XP***	186006729	—	4.6 × 100 mm	186005269		
			4.6 × 150 mm	186005270		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186005491[1]	Guard Cartridge	10 × 10 mm	186007285
10 × 50 mm	OBD Column	186008236	OBD Column	10 × 50 mm	186008268
10 × 100 mm	OBD Column	186008237	OBD Column	10 × 100 mm	186008269
10 × 150 mm	OBD Column	186008238	OBD Column	10 × 150 mm	186008270
10 × 250 mm	OBD Column	186008239	OBD Column	10 × 250 mm	186008271
19 × 10 mm	Guard Cartridge	186005418[2]	Guard Cartridge	19 × 10 mm	186007290
19 × 50 mm	OBD Column	186005420	OBD Column	19 × 50 mm	186007291
19 × 100 mm	OBD Column	186005421	OBD Column	19 × 100 mm	186007292
19 × 150 mm	OBD Column	186005422	OBD Column	19 × 150 mm	186007293
19 × 250 mm	OBD Column	186005492	OBD Column	19 × 250 mm	186007294
30 × 10 mm	Guard Cartridge	186006899[3]	Guard Cartridge	30 × 10 mm	186007295
30 × 50 mm	OBD Column	186005423	OBD Column	30 × 50 mm	186007296
30 × 75 mm	OBD Column	186005424	OBD Column	30 × 75 mm	186007297
30 × 100 mm	OBD Column	186005425	OBD Column	30 × 100 mm	186007298
30 × 150 mm	OBD Column	186005426	OBD Column	30 × 150 mm	186007299
30 × 250 mm	OBD Column	186005493	OBD Column	30 × 250 mm	186007300
50 × 50 mm	OBD Column	186005494	OBD Column	50 × 50 mm	186007301
50 × 100 mm	OBD Column	186005495	OBD Column	50 × 100 mm	186007302
50 × 150 mm	OBD Column	186005496	OBD Column	50 × 150 mm	186007303
50 × 250 mm	OBD Column	186005497	OBD Column	50 × 250 mm	186007304

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

CSH Fluoro-Phenyl

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006112	176002602	2.1 × 50 mm	186005310	2.1 × 50 mm	186005329
2.1 × 50 mm *XP*	186006113	176002603	2.1 × 75 mm	186005646	2.1 × 100 mm	186005330
2.1 × 75 mm *XP*	186006114	176002604	2.1 × 100 mm	186005311	2.1 × 150 mm	186005331
2.1 × 100 mm *XP*	186006115	176002605	2.1 × 150 mm	186005312	3.0 × 50 mm	186005335
2.1 × 150 mm *XP*	186006730	176002893	3.0 × 50 mm	186005316	3.0 × 100 mm	186005336
3.0 × 30 mm *XP*	186006116	176002606	3.0 × 75 mm	186005649	3.0 × 150 mm	186005337
3.0 × 50 mm *XP*	186006117	176002607	3.0 × 100 mm	186005317	3.0 × 250 mm	186005338
3.0 × 75 mm *XP*	186006118	176002608	3.0 × 150 mm	186005318	4.6 × 50 mm	186005342
3.0 × 100 mm *XP*	186006119	176002609	4.6 × 50 mm	186005322	4.6 × 75 mm	186005343
3.0 × 150 mm *XP*	186006731	176002894	4.6 × 75 mm	186005323	4.6 × 100 mm	186005344
4.6 × 30 mm *XP*	186006120	—	4.6 × 100 mm	186005324	4.6 × 150 mm	186005345
4.6 × 50 mm *XP*	186006121	—	4.6 × 150 mm	186005325	4.6 × 250 mm	186005346
4.6 × 75 mm *XP*	186006122	—				
4.6 × 100 mm *XP*	186006123	—				
4.6 × 150 mm *XP*	186006732	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186005498[1]
10 × 50 mm	OBD Column	186008240
10 × 100 mm	OBD Column	186008241
10 × 150 mm	OBD Column	186008242
10 × 250 mm	OBD Column	186008243
19 × 10 mm	Guard Cartridge	186005431[2]
19 × 50 mm	OBD Column	186005433
19 × 100 mm	OBD Column	186005434
19 × 150 mm	OBD Column	186005435
19 × 250 mm	OBD Column	186005499
30 × 10 mm	Guard Cartridge	186006900[3]
30 × 50 mm	OBD Column	186005436
30 × 75 mm	OBD Column	186005437
30 × 100 mm	OBD Column	186005438
30 × 150 mm	OBD Column	186005439
30 × 250 mm	OBD Column	186005500
50 × 50 mm	OBD Column	186005501
50 × 100 mm	OBD Column	186005502
50 × 150 mm	OBD Column	186005503
50 × 250 mm	OBD Column	186005504

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

CSH Phenyl-Hexyl

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006124	176002610	2.1 × 50 mm	186005365	2.1 × 50 mm	186005384
2.1 × 50 mm *XP*	186006125	176002611	2.1 × 75 mm	186005645	2.1 × 100 mm	186005385
2.1 × 75 mm *XP*	186006126	176002612	2.1 × 100 mm	186005366	2.1 × 150 mm	186005386
2.1 × 100 mm *XP*	186006127	176002613	2.1 × 150 mm	186005367	3.0 × 50 mm	186005390
2.1 × 150 mm *XP*	186006733	176002895	3.0 × 50 mm	186005371	3.0 × 100 mm	186005391
3.0 × 30 mm *XP*	186006128	176002614	3.0 × 75 mm	186005648	3.0 × 150 mm	186005392
3.0 × 50 mm *XP*	186006129	176002615	3.0 × 100 mm	186005372	3.0 × 250 mm	186005393
3.0 × 75 mm *XP*	186006130	176002616	3.0 × 150 mm	186005373	4.6 × 50 mm	186005397
3.0 × 100 mm *XP*	186006131	176002617	4.6 × 50 mm	186005377	4.6 × 75 mm	186005398
3.0 × 150 mm *XP*	186006734	176002896	4.6 × 75 mm	186005378	4.6 × 100 mm	186005399
4.6 × 30 mm *XP*	186006132	—	4.6 × 100 mm	186005379	4.6 × 150 mm	186005400
4.6 × 50 mm *XP*	186006133	—	4.6 × 150 mm	186005380	4.6 × 250 mm	186005401
4.6 × 75 mm *XP*	186006134	—				
4.6 × 100 mm *XP*	186006135	—				
4.6 × 150 mm *XP*	186006735	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186005505[1]
10 × 50 mm	OBD Column	186008244
10 × 100 mm	OBD Column	186008245
10 × 150 mm	OBD Column	186008246
10 × 250 mm	OBD Column	186008247
19 × 10 mm	Guard Cartridge	186005444[2]
19 × 50 mm	OBD Column	186005446
19 × 100 mm	OBD Column	186005447
19 × 150 mm	OBD Column	186005448
19 × 250 mm	OBD Column	186005506
30 × 10 mm	Guard Cartridge	186006901[3]
30 × 50 mm	OBD Column	186005520
30 × 75 mm	OBD Column	186005450
30 × 100 mm	OBD Column	186005451
30 × 150 mm	OBD Column	186005452
30 × 250 mm	OBD Column	186005507
50 × 50 mm	OBD Column	186005508
50 × 100 mm	OBD Column	186005509
50 × 150 mm	OBD Column	186005510
50 × 250 mm	OBD Column	186005511

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

HSS C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm ***XP***	186006136	176002618	2.1 × 30 mm	186006380	2.1 × 50 mm	186006391
2.1 × 50 mm ***XP***	186006137	176002619	2.1 × 50 mm	186006381	2.1 × 100 mm	186006392
2.1 × 75 mm ***XP***	186006138	176002620	2.1 × 75 mm	186006382	2.1 × 150 mm	186006393
2.1 × 100 mm ***XP***	186006139	176002621	2.1 × 100 mm	186006383	3.0 × 50 mm	186006396
2.1 × 150 mm ***XP***	186006736	176002897	2.1 × 150 mm	186006384	3.0 × 100 mm	186006397
3.0 × 30 mm ***XP***	186006140	176002622	3.0 × 30 mm	186004765	3.0 × 150 mm	186006398
3.0 × 50 mm ***XP***	186006141	176002623	3.0 × 50 mm	186004766	3.0 × 250 mm	186006399
3.0 × 75 mm ***XP***	186006142	176002624	3.0 × 75 mm	186005642	4.6 × 50 mm	186004852
3.0 × 100 mm ***XP***	186006143	176002625	3.0 × 100 mm	186004762	4.6 × 75 mm	186006402
3.0 × 150 mm ***XP***	186006737	176002898	3.0 × 150 mm	186004763	4.6 × 100 mm	186006403
4.6 × 30 mm ***XP***	186006144	—	4.6 × 50 mm	186004772	4.6 × 150 mm	186004773
4.6 × 50 mm ***XP***	186006145	—	4.6 × 75 mm	186006387	4.6 × 250 mm	186004775
4.6 × 75 mm ***XP***	186006146	—	4.6 × 100 mm	186004767		
4.6 × 100 mm ***XP***	186006147	—	4.6 × 150 mm	186004768		
4.6 × 150 mm ***XP***	186006738	—	4.6 × 250 mm	186004770		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004776[1]	10 × 100 mm	OBD Column	186008223
10 × 50 mm	OBD Column	186008222	10 × 150 mm	OBD Column	186008224

HSS C_{18} SB

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm ***XP***	186006160	176002634	2.1 × 50 mm	186006422	2.1 × 50 mm	186006432
2.1 × 50 mm ***XP***	186006161	176002635	2.1 × 75 mm	186006423	2.1 × 100 mm	186006433
2.1 × 75 mm ***XP***	186006162	176002636	2.1 × 100 mm	186006424	2.1 × 150 mm	186006434
2.1 × 100 mm ***XP***	186006163	176002637	2.1 × 150 mm	186006425	3.0 × 50 mm	186006437
2.1 × 150 mm ***XP***	186006742	176002901	3.0 × 50 mm	186004747	3.0 × 100 mm	186006438
3.0 × 30 mm ***XP***	186006164	176002638	3.0 × 75 mm	186005643	3.0 × 150 mm	186006439
3.0 × 50 mm ***XP***	186006165	176002639	3.0 × 100 mm	186004743	3.0 × 250 mm	186006440
3.0 × 75 mm ***XP***	186006166	176002640	3.0 × 150 mm	186004744	4.6 × 50 mm	186004757
3.0 × 100 mm ***XP***	186006167	176002641	4.6 × 50 mm	186004753	4.6 × 75 mm	186006443
3.0 × 150 mm ***XP***	186006743	176002902	4.6 × 75 mm	186006428	4.6 × 100 mm	186006444
4.6 × 30 mm ***XP***	186006168	—	4.6 × 100 mm	186004748	4.6 × 150 mm	186004754
4.6 × 50 mm ***XP***	186006169	—	4.6 × 150 mm	186004749	4.6 × 250 mm	186004756
4.6 × 75 mm ***XP***	186006170	—	4.6 × 250 mm	186004751		
4.6 × 100 mm ***XP***	186006171	—				
4.6 × 150 mm ***XP***	186006744	—				

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004758[1]	10 × 100 mm	OBD Column	186008220
10 × 50 mm	OBD Column	186008219	10 × 150 mm	OBD Column	186008221

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

HSS T3

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006148	176002626	1.0 × 100 mm	186006459	2.1 × 50 mm	186006473
2.1 × 50 mm *XP*	186006149	176002627	1.0 × 150 mm	186006460	2.1 × 100 mm	186006474
2.1 × 75 mm *XP*	186006150	176002628	2.1 × 30 mm	186006462	2.1 × 150 mm	186006475
2.1 × 100 mm *XP*	186006151	176002629	2.1 × 50 mm	186006463	3.0 × 50 mm	186006478
2.1 × 150 mm *XP*	186006739	176002899	2.1 × 75 mm	186006464	3.0 × 100 mm	186006479
3.0 × 30 mm *XP*	186006152	176002630	2.1 × 100 mm	186006465	3.0 × 150 mm	186006480
3.0 × 50 mm *XP*	186006153	176002631	2.1 × 150 mm	186006466	3.0 × 250 mm	186006481
3.0 × 75 mm *XP*	186006154	176002632	3.0 × 30 mm	186004783	4.6 × 50 mm	186004794
3.0 × 100 mm *XP*	186006155	176002633	3.0 × 50 mm	186004784	4.6 × 75 mm	186006484
3.0 × 150 mm *XP*	186006740	176002900	3.0 × 75 mm	186005641	4.6 × 100 mm	186006485
4.6 × 30 mm *XP*	186006156	—	3.0 × 100 mm	186004780	4.6 × 150 mm	186004791
4.6 × 50 mm *XP*	186006157	—	3.0 × 150 mm	186004781	4.6 × 250 mm	186004793
4.6 × 75 mm *XP*	186006158	—	4.6 × 50 mm	186004790		
4.6 × 100 mm *XP*	186006159	—	4.6 × 75 mm	186006469		
4.6 × 150 mm *XP*	186006741	—	4.6 × 100 mm	186004785		
			4.6 × 150 mm	186004786		
			4.6 × 250 mm	186004788		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186004795[1]	10 × 150 mm	OBD Column	186008227
10 × 50 mm	OBD Column	186008225	10 × 250 mm	OBD Column	186008280
10 × 100 mm	OBD Column	186008226			

HSS PFP

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm *XP*	186006172	176002642	2.1 × 50 mm	186005847	2.1 × 50 mm	186005869
2.1 × 50 mm *XP*	186006173	176002643	2.1 × 75 mm	186005848	2.1 × 100 mm	186005871
2.1 × 75 mm *XP*	186006174	176002644	2.1 × 100 mm	186005849	2.1 × 150 mm	186005872
2.1 × 100 mm *XP*	186006175	176002645	2.1 × 150 mm	186005850	3.0 × 50 mm	186005875
2.1 × 150 mm *XP*	186006745	176002903	3.0 × 30 mm	186005852	3.0 × 100 mm	186005877
3.0 × 30 mm *XP*	186006176	176002646	3.0 × 50 mm	186005853	3.0 × 150 mm	186005878
3.0 × 50 mm *XP*	186006177	176002647	3.0 × 75 mm	186005854	3.0 × 250 mm	186005879
3.0 × 75 mm *XP*	186006178	176002648	3.0 × 100 mm	186005855	4.6 × 50 mm	186005882
3.0 × 100 mm *XP*	186006179	176002649	3.0 × 150 mm	186005856	4.6 × 75 mm	186005883
3.0 × 150 mm *XP*	186006746	176002904	4.6 × 50 mm	186005859	4.6 × 100 mm	186005884
4.6 × 30 mm *XP*	186006180	—	4.6 × 75 mm	186005860	4.6 × 150 mm	186005885
4.6 × 50 mm *XP*	186006181	—	4.6 × 100 mm	186005861	4.6 × 250 mm	186005886
4.6 × 75 mm *XP*	186006182	—	4.6 × 150 mm	186005862		
4.6 × 100 mm *XP*	186006183	—	4.6 × 250 mm	186005863		
4.6 × 150 mm *XP*	186006747	—				

[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

HSS CN

ANALYTICAL COLUMNS

Particle Size: 2.5 µm			Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	P/N (3/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm ***XP***	186006184	176002650	2.1 × 50 mm	186005907	2.1 × 50 mm	186005929
2.1 × 50 mm ***XP***	186006185	176002651	2.1 × 75 mm	186005908	2.1 × 100 mm	186005931
2.1 × 75 mm ***XP***	186006186	176002652	2.1 × 100 mm	186005909	2.1 × 150 mm	186005932
2.1 × 100 mm ***XP***	186006187	176002653	2.1 × 150 mm	186005910	3.0 × 50 mm	186005935
2.1 × 150 mm ***XP***	186006748	176002905	3.0 × 50 mm	186005913	3.0 × 100 mm	186005937
3.0 × 30 mm ***XP***	186006188	176002654	3.0 × 75 mm	186005914	3.0 × 150 mm	186005938
3.0 × 50 mm ***XP***	186006189	176002655	3.0 × 100 mm	186005915	3.0 × 250 mm	186005939
3.0 × 75 mm ***XP***	186006190	176002656	3.0 × 150 mm	186005916	4.6 × 50 mm	186005942
3.0 × 100 mm ***XP***	186006191	176002657	4.6 × 50 mm	186005919	4.6 × 75 mm	186005943
3.0 × 150 mm ***XP***	186006749	176002906	4.6 × 75 mm	186005920	4.6 × 100 mm	186005944
4.6 × 30 mm ***XP***	186006192	—	4.6 × 100 mm	186005921	4.6 × 150 mm	186005945
4.6 × 50 mm ***XP***	186006193	—	4.6 × 150 mm	186005922	4.6 × 250 mm	186005946
4.6 × 75 mm ***XP***	186006194	—	4.6 × 250 mm	186005923		
4.6 × 100 mm ***XP***	186006195	—				
4.6 × 150 mm ***XP***	186006750	—				

Peptide CSH C_{18}, 130 Å

ANALYTICAL COLUMNS

Particle Size: 2.5 µm		Particle Size: 3.5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm ***XP***	186006941	2.1 × 50 mm	186006950
2.1 × 100 mm ***XP***	186006942	2.1 × 100 mm	186006951
2.1 × 150 mm ***XP***	186006943	2.1 × 150 mm	186006952
4.6 × 50 mm ***XP***	186006946	4.6 × 50 mm	186006955
4.6 × 100 mm ***XP***	186006947	4.6 × 100 mm	186006956
4.6 × 150 mm ***XP***	186007038	4.6 × 150 mm	186006957

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
4.6 × 50 mm	Column	186007076[4]	19 × 250 mm	OBD Column	186007031
4.6 × 100 mm	Column	186007077[4]	30 × 50 mm	OBD Column	186007026
4.6 × 150 mm	Column	186007078[4]	30 × 100 mm	OBD Column	186007025
10 × 10 mm	Guard	186007015[1]	30 × 150 mm	OBD Column	186007023
10 × 50 mm	OBD Column	186008264	30 × 250 mm	OBD Column	186007024
10 × 100 mm	OBD Column	186008265	50 × 50 mm	OBD Column	186007030
10 × 150 mm	OBD Column	186008266	50 × 100 mm	OBD Column	186007027
10 × 250 mm	OBD Column	186008267	50 × 150 mm	OBD Column	186007028
19 × 10 mm	Guard	186007019[3]	50 × 250 mm	OBD Column	186007029
19 × 50 mm	OBD Column	186007022			
19 × 100 mm	OBD Column	186007020			
19 × 150 mm	OBD Column	186007021			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[3] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[4] For use in developing lab-scale preparative chromatography.

XSelect Columns Method Validation Kits*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 50 mm *XP*	186006233	2.1 × 100 mm	186005538	2.1 × 150 mm	186005543
	2.1 × 100 mm *XP*	186006234	3.0 × 100 mm	186005539	3.0 × 100 mm	186005544
	2.1 × 150 mm *XP*	186006785	3.0 × 150 mm	186005540	3.0 × 150 mm	186005545
	3.0 × 50 mm *XP*	186006235	4.6 × 100 mm	186005541	4.6 × 100 mm	186005546
	3.0 × 100 mm *XP*	186006236	4.6 × 150 mm	186005542	4.6 × 150 mm	186005547
	3.0 × 150 mm *XP*	186006786			4.6 × 250 mm	186005548
	4.6 × 50 mm *XP*	186006237				
	4.6 × 100 mm *XP*	186006238				
	4.6 × 150 mm *XP*	186006787				
CSH Fluoro-Phenyl	2.1 × 50 mm *XP*	186006239	2.1 × 100 mm	186005549	2.1 × 150 mm	186005554
	2.1 × 100 mm *XP*	186006240	3.0 × 100 mm	186005550	3.0 × 100 mm	186005555
	2.1 × 150 mm *XP*	186006788	3.0 × 150 mm	186005551	3.0 × 150 mm	186005556
	3.0 × 50 mm *XP*	186006241	4.6 × 100 mm	186005552	4.6 × 100 mm	186005557
	3.0 × 100 mm *XP*	186006242	4.6 × 150 mm	186005553	4.6 × 150 mm	186005558
	3.0 × 150 mm *XP*	186006789			4.6 × 250 mm	186005559
	4.6 × 50 mm *XP*	186006243				
	4.6 × 100 mm *XP*	186006244				
	4.6 × 150 mm *XP*	186006790				
CSH Phenyl-Hexyl	2.1 × 50 mm *XP*	186006245	2.1 × 100 mm	186005560	2.1 × 150 mm	186005565
	2.1 × 100 mm *XP*	186006246	3.0 × 100 mm	186005561	3.0 × 100 mm	186005566
	2.1 × 150 mm *XP*	186006791	3.0 × 150 mm	186005562	3.0 × 150 mm	186005567
	3.0 × 50 mm *XP*	186006247	4.6 × 100 mm	186005563	4.6 × 100 mm	186005568
	3.0 × 100 mm *XP*	186006248	4.6 × 150 mm	186005564	4.6 × 150 mm	186005569
	3.0 × 150 mm *XP*	186006792			4.6 × 250 mm	186005570
	4.6 × 50 mm *XP*	186006249				
	4.6 × 100 mm *XP*	186006250				
	4.6 × 150 mm *XP*	186006793				

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

APPLICATION AREA: Peptide Purification from Biological Samples

"The Waters XSelect line of columns are easily some of the best columns I have used for separations of peptides. The columns give reproducible results, can be effectively used under a wide range of conditions, and effectively separate almost everything I've attempted. The service by Waters and by the sales team was also top notch - they worked with me efficiently and were helpful in finding me the best column for my application. Thanks, Waters!"

REVIEWER: James Checco

ORGANIZATION: University of Illinois at Urbana-Champaign

XSelect Columns Method Validation Kits* *Continued*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
HSS C_{18}	2.1 × 50 mm *XP*	186006251	2.1 × 100 mm	186006406	2.1 × 150 mm	186006411
	2.1 × 100 mm *XP*	186006252	3.0 × 100 mm	186006407	3.0 × 100 mm	186006412
	2.1 × 150 mm *XP*	186006794	3.0 × 150 mm	186006408	3.0 × 150 mm	186006413
	3.0 × 50 mm *XP*	186006253	4.6 × 100 mm	186006409	4.6 × 100 mm	186006414
	3.0 × 100 mm *XP*	186006254	4.6 × 150 mm	186006410	4.6 × 150 mm	186006415
	3.0 × 150 mm *XP*	186006795			4.6 × 250 mm	186006416
	4.6 × 50 mm *XP*	186006255				
	4.6 × 100 mm *XP*	186006256				
	4.6 × 150 mm *XP*	186006796				
HSS C_{18} SB	2.1 × 50 mm *XP*	186006263	2.1 × 100 mm	186006447	2.1 × 150 mm	186006452
	2.1 × 100 mm *XP*	186006264	3.0 × 100 mm	186006448	3.0 × 100 mm	186006453
	2.1 × 150 mm *XP*	186006800	3.0 × 150 mm	186006449	3.0 × 150 mm	186006454
	3.0 × 50 mm *XP*	186006265	4.6 × 100 mm	186006450	4.6 × 100 mm	186006455
	3.0 × 100 mm *XP*	186006266	4.6 × 150 mm	186006451	4.6 × 150 mm	186006456
	3.0 × 150 mm *XP*	186006801			4.6 × 250 mm	186006457
	4.6 × 50 mm *XP*	186006267				
	4.6 × 100 mm *XP*	186006268				
	4.6 × 150 mm *XP*	186006802				
HSS T3	2.1 × 50 mm *XP*	186006257	2.1 × 100 mm	186006488	2.1 × 150 mm	186006493
	2.1 × 100 mm *XP*	186006258	3.0 × 100 mm	186006489	3.0 × 100 mm	186006494
	2.1 × 150 mm *XP*	186006797	3.0 × 150 mm	186006490	3.0 × 150 mm	186006495
	3.0 × 50 mm *XP*	186006259	4.6 × 100 mm	186006491	4.6 × 100 mm	186006496
	3.0 × 100 mm *XP*	186006260	4.6 × 150 mm	186006492	4.6 × 150 mm	186006497
	3.0 × 150 mm *XP*	186006798			4.6 × 250 mm	186006498
	4.6 × 50 mm *XP*	186006261				
	4.6 × 100 mm *XP*	186006262				
	4.6 × 150 mm *XP*	186006799				
HSS PFP	2.1 × 50 mm *XP*	186006815	2.1 × 100 mm	186005890	2.1 × 150 mm	186005895
	2.1 × 100 mm *XP*	186006816	3.0 × 100 mm	186005891	3.0 × 100 mm	186005896
	2.1 × 150 mm *XP*	186006803	3.0 × 150 mm	186005892	3.0 × 150 mm	186005897
	3.0 × 50 mm *XP*	186006817	4.6 × 100 mm	186005893	4.6 × 100 mm	186005898
	3.0 × 100 mm *XP*	186006818	4.6 × 150 mm	186005894	4.6 × 150 mm	186005899
	3.0 × 150 mm *XP*	186006804			4.6 × 250 mm	186005900
	4.6 × 50 mm *XP*	186006273				
	4.6 × 100 mm *XP*	186006274				
	4.6 × 150 mm *XP*	186006805				
Peptide CSH C_{18}	2.1 × 100 mm *XP*	186006945	2.1 × 100 mm	186006953		
	4.6 × 100 mm *XP*	186006966	4.6 × 100 mm	186006959		

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

XSelect Columns Method Validation Kits* *Continued*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
HSS CN	2.1 × 50 mm *XP*	186006275	2.1 × 100 mm	186005950	2.1 × 150 mm	186005955
	2.1 × 100 mm *XP*	186006276	3.0 × 100 mm	186005951	3.0 × 100 mm	186005956
	2.1 × 150 mm *XP*	186006806	3.0 × 150 mm	186005952	3.0 × 150 mm	186005957
	3.0 × 50 mm *XP*	186006277	4.6 × 100 mm	186005953	4.6 × 100 mm	186005958
	3.0 × 100 mm *XP*	186006278	4.6 × 150 mm	186005954	4.6 × 150 mm	186005959
	3.0 × 150 mm *XP*	186006807			4.6 × 250 mm	186005960
	4.6 × 50 mm *XP*	186006279				
	4.6 × 100 mm *XP*	186006280				
	4.6 × 150 mm *XP*	186006808				

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

XSelect VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
CSH C_{18}	2.1 × 5 mm *XP*	186007817	2.1 × 5 mm	186007811	2.1 × 5 mm	186007814
	3.9 × 5 mm *XP*	186007819	3.9 × 5 mm	186007813	3.9 × 5 mm	186007816
CSH Fluoro-Phenyl	2.1 × 5 mm *XP*	186007827	2.1 × 5 mm	186007820	2.1 × 5 mm	186007824
	3.9 × 5 mm *XP*	186007829	3.9 × 5 mm	186007822	3.9 × 5 mm	186007826
CSH Phenyl-Hexyl	2.1 × 5 mm *XP*	186007839	2.1 × 5 mm	186007830	2.1 × 5 mm	186007836
	3.9 × 5 mm *XP*	186007841	3.9 × 5 mm	186007832	3.9 × 5 mm	186007838
HSS C_{18}	2.1 × 5 mm *XP*	186007857	2.1 × 5 mm	186007851	2.1 × 5 mm	186007854
	3.9 × 5 mm *XP*	186007859	3.9 × 5 mm	186007853	3.9 × 5 mm	186007856
HSS C_{18} SB	2.1 × 5 mm *XP*	186007848	2.1 × 5 mm	186007842	2.1 × 5 mm	186007845
	3.9 × 5 mm *XP*	186007850	3.9 × 5 mm	186007844	3.9 × 5 mm	186007847
HSS T3	2.1 × 5 mm *XP*	186007884	2.1 × 5 mm	186007878	2.1 × 5 mm	186007881
	3.9 × 5 mm *XP*	186007886	3.9 × 5 mm	186007880	3.9 × 5 mm	186007883
HSS PFP	2.1 × 5 mm *XP*	186007875	2.1 × 5 mm	186007869	2.1 × 5 mm	186007872
	3.9 × 5 mm *XP*	186007877	3.9 × 5 mm	186007871	3.9 × 5 mm	186007874
HSS CN	2.1 × 5 mm *XP*	186007866	2.1 × 5 mm	186007860	2.1 × 5 mm	186007863
	3.9 × 5 mm *XP*	186007868	3.9 × 5 mm	186007862	3.9 × 5 mm	186007865

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

SunFire OBD Preparative Columns

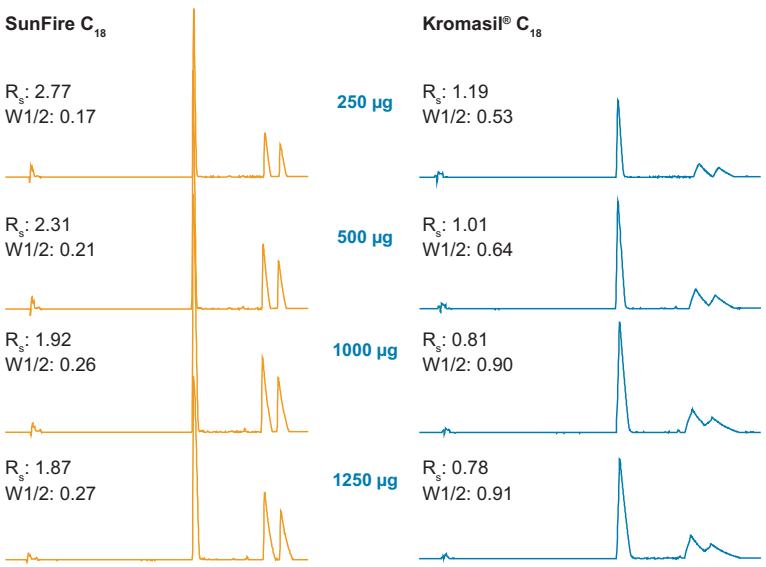
HIGH-MASS LOADING

SunFire C_{18}, C_8, and Silica Columns provide significant mass-loading capacity. The OBD design ensures the column's excellent performance, scalability, and serviceable life.

SunFire OBD Preparative Columns offer:

- Easy scale-up from analytical to preparative chromatography
- High-mass loading
- Low-pH stability
- Excellent column life and stability
- Superior peak shapes

High Mass Loading of SunFire Sorbents Enables the Use of Smaller Preparative Column Dimensions



Conditions

Column:	SunFire C_{18}, 5 µm, 4.6 × 150 mm
Part number:	186002559
Mobile phase A:	0.1% TFA in water
Mobile phase B:	0.1% TFA in acetonitrile
Gradient:	15 min linear gradient from 20% B to 85% B, 2 min initial holding time
Flow rate:	1 mL/min
Injection vol.:	10 µL
UV detection:	254 nm
System:	Alliance HT 2795

Compounds

1. Ketoconazole
2. Econazole
3. Miconazole

Sample Concentration: As indicated in the table, dissolved in DMSO

Analyte	mg/mL	mg/mL	mg/mL	mg/mL
Ketoconazole	25	20	10	5
Econazole	50	40	20	10
Miconazole	50	40	20	10
Total Concentration	125	100	50	25

For more information on SunFire Columns, refer to page 150 for 2.5 µm and page 191 for 3–5 µm column offerings.

Ordering Information

SunFire Columns

C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm	186003399	2.1 × 50 mm	186002533	2.1 × 50 mm	186002539
2.1 × 50 mm	186003401	2.1 × 100 mm	186002534	2.1 × 100 mm	186002540
2.1 × 75 mm	186005634	2.1 × 150 mm	186002535	2.1 × 150 mm	186002541
3.0 × 30 mm	186003407	3.0 × 50 mm	186002542	3.0 × 50 mm	186002545
3.0 × 50 mm	186003409	3.0 × 100 mm	186002543	3.0 × 100 mm	186002546
3.0 × 75 mm	186005636	3.0 × 150 mm	186002544	3.0 × 150 mm	186002547
4.6 × 50 mm	186003417	4.6 × 20 mm *IS*	186002549	3.0 × 250 mm	186002548
		4.6 × 50 mm	186002551	4.6 × 30 mm	186002556
		4.6 × 75 mm	186002552	4.6 × 50 mm	186002557
		4.6 × 100 mm	186002553	4.6 × 100 mm	186002558
		4.6 × 150 mm	186002554	4.6 × 150 mm	186002559
				4.6 × 250 mm	186002560

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002565[1]	10 × 10 mm	Guard Cartridge	186002663[1]
10 × 50 mm	OBD Column	186008152	10 × 50 mm	OBD Column	186008208
10 × 100 mm	OBD Column	186008153	10 × 150 mm	OBD Column	186008156
10 × 150 mm	OBD Column	186008154	10 × 250 mm	OBD Column	186008157
10 × 250 mm	OBD Column	186008155	19 × 10 mm	Guard Cartridge	186002666[2]
19 × 10 mm	Guard Cartridge	186002569[2]	19 × 50 mm	OBD Column	186002667
19 × 50 mm	OBD Column	186002566	19 × 150 mm	OBD Column	186002668
19 × 100 mm	OBD Column	186002567	19 × 250 mm	OBD Column	186002669
19 × 150 mm	OBD Column	186002568	30 × 10 mm	Guard Cartridge	186006884[3]
19 × 250 mm	OBD Column	186004027	30 × 50 mm	OBD Column	186003854
30 × 10 mm	Guard Cartridge	186006885[3]	30 × 100 mm	OBD Column	186003971
30 × 50 mm	OBD Column	186002570	30 × 150 mm	OBD Column	186002670
30 × 75 mm	OBD Column	186002571	30 × 250 mm	OBD Column	186002671
30 × 100 mm	OBD Column	186002572	50 × 50 mm	OBD Column	186002871
30 × 150 mm	OBD Column	186002797	50 × 100 mm	OBD Column	186003972
30 × 250 mm	OBD Column	186003969	50 × 150 mm	OBD Column	186002672
50 × 50 mm	OBD Column	186002867	50 × 250 mm	OBD Column	186002673
50 × 100 mm	OBD Column	186002869			
50 × 150 mm	OBD Column	186003941			
50 × 250 mm	OBD Column	186003970			

*Recommended maximum pressure of 6000 psi (400 bar).
[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

C_8

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
3.0 × 50 mm	186003410	2.1 × 50 mm	186002710	2.1 × 50 mm	186002715
		2.1 × 100 mm	186002711	2.1 × 100 mm	186002716
		2.1 × 150 mm	186002712	2.1 × 150 mm	186002717
		3.0 × 50 mm	186002719	3.0 × 50 mm	186002723
		3.0 × 100 mm	186002720	3.0 × 100 mm	186002724
		3.0 × 150 mm	186002721	3.0 × 150 mm	186002725
		4.6 × 50 mm	186002729	4.6 × 30 mm	186002734
		4.6 × 75 mm	186002730	4.6 × 50 mm	186002735
		4.6 × 100 mm	186002731	4.6 × 100 mm	186002736
		4.6 × 150 mm	186002732	4.6 × 150 mm	186002737
				4.6 × 250 mm	186002738

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186002750[1]	10 × 10 mm	Guard Cartridge	186002758[1]
10 × 50 mm	OBD Column	186008158	10 × 50 mm	OBD Column	186008209
10 × 100 mm	OBD Column	186008159	10 × 150 mm	OBD Column	186008162
10 × 150 mm	OBD Column	186008160	10 × 250 mm	OBD Column	186008163
10 × 250 mm	OBD Column	186008161	19 × 10 mm	Guard Cartridge	186002761[2]
19 × 10 mm	Guard Cartridge	186002754[2]	19 × 150 mm	OBD Column	186002763
19 × 50 mm	OBD Column	186002751	19 × 250 mm	OBD Column	186002764
19 × 100 mm	OBD Column	186002752	30 × 10 mm	Guard Cartridge	186006886[3]
19 × 150 mm	OBD Column	186002753	30 × 50 mm	OBD Column	186003853
19 × 250 mm	OBD Column	186004028	30 × 150 mm	OBD Column	186002765
30 × 10 mm	Guard Cartridge	186006887[3]	30 × 250 mm	OBD Column	186002766
30 × 50 mm	OBD Column	186002755	50 × 50 mm	OBD Column	186002872
30 × 75 mm	OBD Column	186002756	50 × 150 mm	OBD Column	186002767
30 × 100 mm	OBD Column	186002757	50 × 250 mm	OBD Column	186002768
30 × 150 mm	OBD Column	186002795			
50 × 50 mm	OBD Column	186002868			
50 × 100 mm	OBD Column	186002870			

*Recommended maximum pressure of 6000 psi (400 bar).
[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

SunFire Columns *Continued*

Silica

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	186003453	4.6 × 150 mm	186003467
4.6 × 250 mm	186003454	4.6 × 250 mm	186003468

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186003429[1]	10 × 10 mm	Guard Cartridge	186003441[1]
10 × 50 mm	OBD Column	186008180	10 × 150 mm	OBD Column	186008184
10 × 100 mm	OBD Column	186008181	10 × 250 mm	OBD Column	186008185
10 × 150 mm	OBD Column	186008182	19 × 10 mm	Guard Cartridge	186003444[2]
10 × 250 mm	OBD Column	186008183	19 × 50 mm	OBD Column	186003445
19 × 10 mm	Guard Cartridge	186003434[2]	19 × 150 mm	OBD Column	186003446
19 × 50 mm	OBD Column	186003431	19 × 250 mm	OBD Column	186003447
19 × 100 mm	OBD Column	186003432	30 × 10 mm	Guard Cartridge	186006888[3]
19 × 150 mm	OBD Column	186003433	30 × 50 mm	OBD Column	186003855
19 × 250 mm	OBD Column	186004029	30 × 150 mm	OBD Column	186003448
30 × 10 mm	Guard Cartridge	186006889[3]	30 × 250 mm	OBD Column	186003449
30 × 50 mm	OBD Column	186003435	50 × 50 mm	OBD Column	186003450
30 × 75 mm	OBD Column	186003436	50 × 150 mm	OBD Column	186003451
30 × 100 mm	OBD Column	186003437	50 × 250 mm	OBD Column	186003452
30 × 150 mm	OBD Column	186003438			
50 × 50 mm	OBD Column	186003439			
50 × 100 mm	OBD Column	186003440			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

SunFire Preparative Scouting Columns

C_{18}

PREPARATIVE COLUMNS

Particle Size: 10 µm	
Dimension	P/N (1/pk)
4.6 × 150 mm	186003390
4.6 × 250 mm	186003391

Silica

Particle Size: 5 µm		Particle Size: 10 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	186003453	4.6 × 150 mm	186003467
4.6 × 250 mm	186003454	4.6 × 250 mm	186003468

SunFire Columns Method Validation Kits*

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
C_{18}	4.6 × 100 mm	186002675	4.6 × 150 mm	186002679
	4.6 × 150 mm	186002676	4.6 × 250 mm	186002680
C_8	4.6 × 100 mm	186002740	4.6 × 150 mm	186002744
	4.6 × 150 mm	186002741	4.6 × 250 mm	186002745

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

SunFire VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
C_{18}	2.1 × 5 mm	186007691	2.1 × 5 mm	186007694	2.1 × 5 mm	186007697
	3.9 × 5 mm	186007693	3.9 × 5 mm	186007696	3.9 × 5 mm	186007699
C_8	2.1 × 5 mm	186007700	2.1 × 5 mm	186007703	2.1 × 5 mm	186007706
	3.9 × 5 mm	186007702	3.9 × 5 mm	186007705	3.9 × 5 mm	186007708

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

APPLICATION AREA: Small Molecule Prep-Scale Purification with Fraction Collector

"The SunFire OBD C_{18} prep-LC column made transitioning from my analytical method to a focused-gradient prep scale method fast and easy. Product gave reproducible results which was critical for impurity isolation and identification."

REVIEWER: Doug Vaughan

ORGANIZATION: BioVectra Inc.

Atlantis OBD Preparative Columns

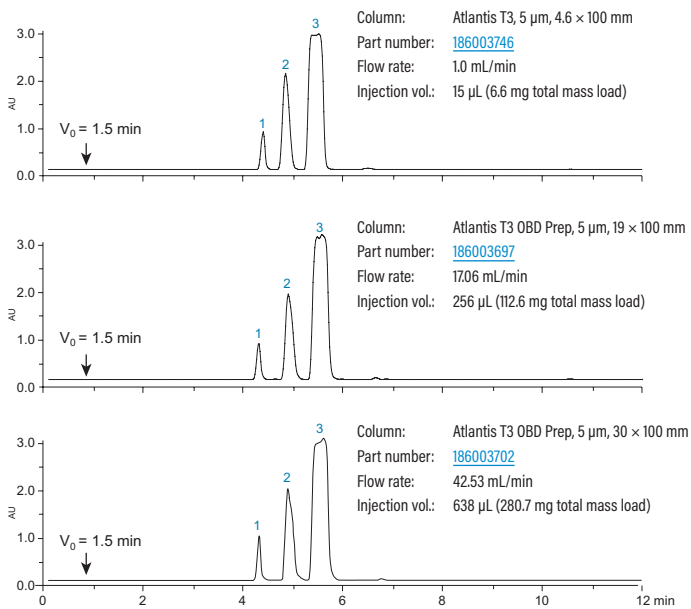
RETENTION OF POLAR COMPOUNDS

Atlantis HPLC Columns provide balanced retention for broad analyte mixtures and exceptional performance, versatility, and retention for polar compounds.

Atlantis OBD Preparative Columns offer:

- T3, HILIC, and dC_{18} column chemistries
- Compatibility with 100% aqueous mobile phases
- Long column life when used with mobile phases of low pH
- Polar-compound retention without ion-pairing reagents

Beta Blockers



Column: Atlantis T3, 5 µm, 4.6 × 100 mm
Part number: 186003746
Flow rate: 1.0 mL/min
Injection vol.: 15 µL (6.6 mg total mass load)

Column: Atlantis T3 OBD Prep, 5 µm, 19 × 100 mm
Part number: 186003697
Flow rate: 17.06 mL/min
Injection vol.: 256 µL (112.6 mg total mass load)

Column: Atlantis T3 OBD Prep, 5 µm, 30 × 100 mm
Part number: 186003702
Flow rate: 42.53 mL/min
Injection vol.: 638 µL (280.7 mg total mass load)

Compounds

1. Atenolol	40 mg/mL in DMSO
2. Metoprolol	200 mg/mL in DMSO
3. Propranolol	200 mg/mL in DMSO

Conditions

Mobile phase A:	0.1% formic acid in water
Mobile phase B:	0.1% formic acid in acetonitrile
UV detection:	280 nm
System:	2525 Binary Gradient Module, 2767 Sample Manager, 2996 PDA (AutoPurification flow cell)
Temp.:	Ambient

Analytical Gradient Table

Gradient:	Time (min)	Profile %A	%B
	0.0	100	0
	1.0	100	0
	2.0	82	18
	6.0	28	72
	8.0	28	72
	8.1	0	100
	10.0	0	100
	10.1	100	0
	15.0	100	0

Preparative Gradient Table

Gradient:	Time (min)	Profile %A	%B
	0.0	100	0
	2.0	100	0
	3.0	82	18
	7.0	28	72
	9.0	28	72
	9.1	0	100
	11.0	0	100
	11.1	100	0
	16.0	100	0

For more information on Atlantis Analytical Columns, refer to page 187.

Atlantis Columns

T3

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
1.0 × 50 mm	186003713	2.1 × 30 mm	186003733
1.0 × 150 mm	186003714	2.1 × 50 mm	186003734
2.1 × 20 mm *IS*	186003715	2.1 × 100 mm	186003735
2.1 × 30 mm	186003716	2.1 × 150 mm	186003736
2.1 × 50 mm	186003717	3.0 × 50 mm	186003738
2.1 × 75 mm	186005652	3.0 × 100 mm	186003739
2.1 × 100 mm	186003718	3.0 × 150 mm	186003740
2.1 × 150 mm	186003719	3.0 × 250 mm	186003741
3.0 × 50 mm	186003721	4.6 × 50 mm	186003744
3.0 × 75 mm	186005653	4.6 × 75 mm	186003745
3.0 × 100 mm	186003722	4.6 × 100 mm	186003746
3.0 × 150 mm	186003723	4.6 × 150 mm	186003747
4.6 × 50 mm	186003726	4.6 × 250 mm	186003748
4.6 × 75 mm	186003727		
4.6 × 100 mm	186003728		
4.6 × 150 mm	186003729		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 10 mm	Guard Cartridge	186003695[1]	10 × 10 mm	Guard Cartridge	186003706[1]
10 × 50 mm	OBD Column	186008202	10 × 150 mm	OBD Column	186008206
10 × 100 mm	OBD Column	186008203	10 × 250 mm	OBD Column	186008207
10 × 150 mm	OBD Column	186008204	19 × 10 mm	Guard Cartridge	186003710[2]
10 × 250 mm	OBD Column	186008205	19 × 50 mm	OBD Column	186003707
19 × 10 mm	Guard Cartridge	186003699[2]	19 × 150 mm	OBD Column	186003708
19 × 50 mm	OBD Column	186003696	19 × 250 mm	OBD Column	186003709
19 × 100 mm	OBD Column	186003697	30 × 10 mm	Guard Cartridge	186006878[3]
19 × 150 mm	OBD Column	186003698	30 × 75 mm	OBD Column	186004712
19 × 250 mm	OBD Column	186004026	30 × 150 mm	OBD Column	186003711
30 × 10 mm	Guard Cartridge	186006879[3]	30 × 250 mm	OBD Column	186003712
30 × 50 mm	OBD Column	186003700	50 × 50 mm	OBD Column	186004083
30 × 75 mm	OBD Column	186003701	50 × 100 mm	OBD Column	186004084
30 × 100 mm	OBD Column	186003702	50 × 150 mm	OBD Column	186004085
30 × 150 mm	OBD Column	186003703	50 × 250 mm	OBD Column	186004086
50 × 50 mm	OBD Column	186004080			
50 × 100 mm	OBD Column	186004081			
50 × 150 mm	OBD Column	186004082			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

dC$_{18}$

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
2.1 × 30 mm	186001287	2.1 × 50 mm	186001293
2.1 × 50 mm	186001291	2.1 × 100 mm	186001297
2.1 × 100 mm	186001295	2.1 × 150 mm	186001301
2.1 × 150 mm	186001299	3.0 × 100 mm	186001305
3.0 × 50 mm	186001389	3.0 × 150 mm	186001309
3.0 × 100 mm	186001303	3.0 × 250 mm	186001311
3.0 × 150 mm	186001307	3.9 × 150 mm	186001319
3.9 × 100 mm	186001393	4.6 × 50 mm	186001331
3.9 × 150 mm	186001317	4.6 × 75 mm	186001335
4.6 × 50 mm	186001329	4.6 × 100 mm	186001340
4.6 × 75 mm	186001333	4.6 × 150 mm	186001344
4.6 × 100 mm	186001337	4.6 × 250 mm	186001346
4.6 × 150 mm	186001342		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	**Type**	**P/N (1/pk)**	**Dimension**	**Type**	**P/N (1/pk)**
10 × 10 mm	Guard Cartridge	186002300[1]	10 × 10 mm	Guard Cartridge	186002452[1]
10 × 50 mm	OBD Column	186008146	10 × 150 mm	OBD Column	186008149
10 × 100 mm	OBD Column	186008148	10 × 250 mm	OBD Column	186008151
19 × 10 mm	Guard Cartridge	186001361[2]	19 × 10 mm	Guard Cartridge	186001363[2]
19 × 50 mm	OBD Column	186001365	19 × 150 mm	OBD Column	186001369
19 × 100 mm	OBD Column	186001367	19 × 250 mm	OBD Column	186001371
19 × 150 mm	OBD Column	186002800	30 × 10 mm	Guard Cartridge	186006875[3]
19 × 250 mm	OBD Column	186004030	30 × 250 mm	OBD Column	186002418
30 × 10 mm	Guard Cartridge	186006876[3]			
30 × 50 mm	OBD Column	186001373			
30 × 75 mm	OBD Column	186002455			
30 × 150 mm	OBD Column	186002801			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

Atlantis Columns *Continued*

HILIC Silica

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 15 mm Direct Connect	186002007	2.1 × 50 mm	186002012
2.1 × 30 mm	186002009	2.1 × 100 mm	186002014
2.1 × 50 mm	186002011	2.1 × 150 mm	186002016
2.1 × 100 mm	186002013	3.0 × 50 mm	186002018
2.1 × 150 mm	186002015	4.6 × 50 mm	186002028
3.0 × 50 mm	186002017	4.6 × 100 mm	186002030
3.0 × 100 mm	186002019	4.6 × 150 mm	186002032
4.6 × 50 mm	186002027	4.6 × 250 mm	186002033
4.6 × 100 mm	186002029		
4.6 × 150 mm	186002031		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
19 × 10 mm	Guard Cartridge	186003956[2]	10 × 10 mm	Guard Cartridge	186002452[1]
19 × 50 mm	OBD Column	186003957	10 × 150 mm	OBD Column	186008149
19 × 100 mm	OBD Column	186003958	10 × 250 mm	OBD Column	186008151
19 × 150 mm	OBD Column	186003959	19 × 10 mm	Guard Cartridge	186001363[2]
30 × 10 mm	Guard Cartridge	186006877[3]	19 × 150 mm	OBD Column	186001369
30 × 50 mm	OBD Column	186003960	19 × 250 mm	OBD Column	186001371
30 × 100 mm	OBD Column	186003961	30 × 10 mm	Guard Cartridge	186006875[3]
30 × 150 mm	OBD Column	186003962	30 × 250 mm	OBD Column	186002418

[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

Atlantis Columns Method Validation Kits*

	Particle Size: 3 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
T3	4.6 × 150 mm	186003751	4.6 × 150 mm	186003754
			4.6 × 250 mm	186003755
HILIC Silica	4.6 × 150 mm	186002315	4.6 × 150 mm	186002314
			4.6 × 250 mm	186002316

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

Atlantis VanGuard Cartridges

	Particle Size: 3 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
T3	2.1 × 5 mm	186007674	2.1 × 5 mm	186007678
	3.9 × 5 mm	186007676	3.9 × 5 mm	186007680
dC_{18}	2.1 × 5 mm	186007658	2.1 × 5 mm	186007662
	3.9 × 5 mm	186007660	3.9 × 5 mm	186007664
HILIC Silica	2.1 × 5 mm	186007666	2.1 × 5 mm	186007670
	3.9 × 5 mm	186007668	3.9 × 5 mm	186007672

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

XTerra OBD Preparative Columns

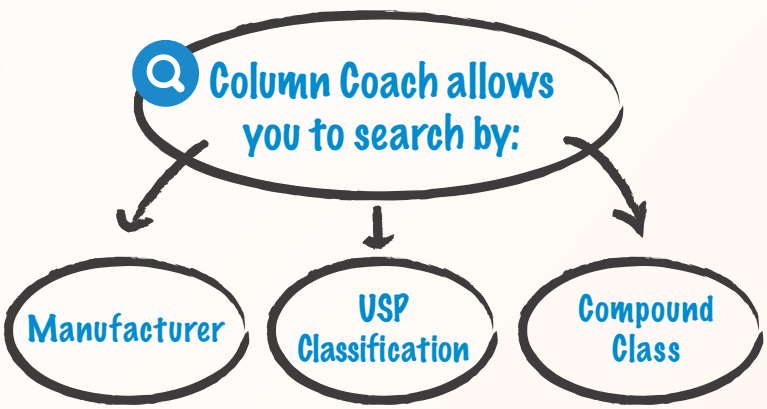
XTerra HPLC Columns offer a rugged material of high mechanical strength and high efficiency. They provide excellent peak shape for bases and easy scale-up from analytical to preparative chromatography.

XTerra OBD Preparative Columns offer:

- MS C_{18}, MS C_8, Shield RP18, and Shield RP8 column chemistries
- High mechanical strength
- Excellent chemical stability for both low- and high-pH purifications
- Excellent peak shape for bases

Looking to find an alternative column recommendation?

Ask the Column Coach.



Get the answers at waters.com/ColumnCoach

XTerra Columns

MS C_{18}

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm	186000592	2.1 × 30 mm	186000398	2.1 × 20 mm *IS*	186001979
4.6 × 20 mm *IS*	186001889	2.1 × 50 mm	186000400	2.1 × 50 mm	186000446
4.6 × 30 mm	186000600	2.1 × 100 mm	186000404	2.1 × 100 mm	186000450
4.6 × 50 mm	186000602	2.1 × 150 mm	186000408	2.1 × 150 mm	186000454
4.6 × 75 mm	186000981	3.0 × 50 mm	186000414	2.1 × 250 mm	186000458
		3.0 × 100 mm	186000418	3.0 × 50 mm	186000462
		3.0 × 150 mm	186000422	3.0 × 100 mm	186000466
		3.9 × 100 mm	186000426	3.0 × 150 mm	186000470
		4.6 × 30 mm	186000430	3.0 × 250 mm	186000474
		4.6 × 50 mm	186000432	3.9 × 150 mm	186000478
		4.6 × 100 mm	186000436	4.6 × 50 mm	186000482
		4.6 × 150 mm	186000440	4.6 × 100 mm	186000486
		4.6 × 250 mm	186001470	4.6 × 150 mm	186000490
				4.6 × 250 mm	186000494

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186001168[5]	7.8 × 10 mm	Guard Cartridge	186001172[5]
7.8 × 50 mm	Column	186001152	7.8 × 150 mm	Column	186001160
7.8 × 100 mm	Column	186001156	7.8 × 300 mm	Column	186001164
7.8 × 150 mm	Column	186001475	10 × 10 mm	Guard Cartridge	186001002[1]
10 × 10 mm	Guard Cartridge	186001001[1]	10 × 150 mm	OBD Column	186008129
10 × 50 mm	OBD Column	186008103	10 × 250 mm	OBD Column	186008133
10 × 100 mm	OBD Column	186008107	10 × 300 mm	OBD Column	186008137
10 × 150 mm	OBD Column	186008141	19 × 10 mm	Guard Cartridge	186001034[2]
19 × 10 mm	Guard Cartridge	186001104[2]	19 × 50 mm	OBD Column	186002254
19 × 50 mm	OBD Column	186001930	19 × 150 mm	OBD Column	186002255
19 × 100 mm	OBD Column	186001934	19 × 250 mm	OBD Column	186002259
19 × 150 mm	OBD Column	186002379	19 × 300 mm	OBD Column	186002263
30 × 10 mm	Guard Cartridge	186006903[3]	30 × 10 mm	Guard Cartridge	186006902[3]
30 × 50 mm	OBD Column	186001938	30 × 150 mm	OBD Column	186002267
30 × 100 mm	OBD Column	186001942	30 × 250 mm	OBD Column	186002271
50 × 50 mm	OBD Column	186002218	30 × 300 mm	OBD Column	186002275
50 × 100 mm	OBD Column	186002222	50 × 50 mm	OBD Column	186002279
			50 × 150 mm	OBD Column	186002843
			50 × 250 mm	OBD Column	186002847

*Recommended maximum pressure of 6000 psi (400 bar).
[1]Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3]Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.
[5]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

For more information on XTerra Columns, refer to page 155 for 2.5 µm and page 201 for 3–5 µm column offerings.

MS C_8

ANALYTICAL COLUMNS

Particle Size: 2.5 µm*		Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 50 mm	186000603	2.1 × 50 mm	186000401	2.1 × 50 mm	186000447
		2.1 × 100 mm	186000405	2.1 × 100 mm	186000451
		2.1 × 150 mm	186000409	2.1 × 150 mm	186000455
		3.9 × 100 mm	186000427	2.1 × 250 mm	186000459
		4.6 × 50 mm	186000433	3.9 × 150 mm	186000479
		4.6 × 100 mm	186000437	4.6 × 50 mm	186000483
		4.6 × 150 mm	186000441	4.6 × 100 mm	186000487
		4.6 × 250 mm	186001471	4.6 × 150 mm	186000491
				4.6 × 250 mm	186000495

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186001169[5]	7.8 × 10 mm	Guard Cartridge	186001173[5]
7.8 × 50 mm	Column	186001153	7.8 × 150 mm	Column	186001161
7.8 × 100 mm	Column	186001157	7.8 × 300 mm	Column	186001165
7.8 × 150 mm	Column	186001476	10 × 150 mm	OBD Column	186008130
10 × 50 mm	OBD Column	186008104	10 × 250 mm	OBD Column	186008134
10 × 150 mm	OBD Column	186008142	10 × 300 mm	OBD Column	186008138
19 × 10 mm	Guard Cartridge	186001105[2]	19 × 10 mm	Guard Cartridge	186001035[2]
19 × 50 mm	OBD Column	186001931	19 × 150 mm	OBD Column	186002256
19 × 100 mm	OBD Column	186001935	19 × 250 mm	OBD Column	186002260
19 × 150 mm	OBD Column	186002380	19 × 300 mm	OBD Column	186002264
30 × 10 mm	Guard Cartridge	186006904[3]	30 × 150 mm	OBD Column	186002268
30 × 75 mm	OBD Column	186002388	30 × 250 mm	OBD Column	186002272
30 × 100 mm	OBD Column	186001943	30 × 300 mm	OBD Column	186002276
50 × 50 mm	OBD Column	186002219	50 × 50 mm	OBD Column	186002280
50 × 100 mm	OBD Column	186002223	50 × 150 mm	OBD Column	186002844

*Recommended maximum pressure of 6000 psi (400 bar).
[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.
[5] Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

Shield RP18

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
2.1 × 20 mm *IS*	186001925	2.1 × 50 mm	186000448
2.1 × 50 mm	186000402	2.1 × 100 mm	186000452
2.1 × 100 mm	186000406	2.1 × 150 mm	186000456
2.1 × 150 mm	186000410	2.1 × 250 mm	186000460
3.0 × 50 mm	186000416	3.0 × 50 mm	186000464
3.0 × 100 mm	186000420	3.0 × 100 mm	186000468
3.0 × 150 mm	186000424	3.0 × 150 mm	186000472
3.9 × 100 mm	186000428	3.0 × 250 mm	186000476
4.6 × 50 mm	186000434	3.9 × 150 mm	186000480
4.6 × 100 mm	186000438	4.6 × 50 mm	186000484
4.6 × 150 mm	186000442	4.6 × 100 mm	186000488
4.6 × 250 mm	186001472	4.6 × 150 mm	186000492
		4.6 × 250 mm	186000496

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	**Type**	**P/N (1/pk)**	**Dimension**	**Type**	**P/N (1/pk)**
7.8 × 10 mm	Guard Cartridge	186001170[5]	7.8 × 10 mm	Guard Cartridge	186001174[5]
7.8 × 50 mm	Column	186001154	7.8 × 150 mm	Column	186001162
7.8 × 100 mm	Column	186001158	7.8 × 300 mm	Column	186001166
7.8 × 150 mm	Column	186001477	10 × 10 mm	Guard Cartridge	186001007[1]
10 × 10 mm	Guard Cartridge	186001006[1]	10 × 150 mm	OBD Column	186008131
10 × 50 mm	OBD Column	186008105	10 × 250 mm	OBD Column	186008135
10 × 100 mm	OBD Column	186008128	10 × 300 mm	OBD Column	186008139
10 × 150 mm	OBD Column	186008143	19 × 10 mm	Guard Cartridge	186001036[2]
19 × 10 mm	Guard Cartridge	186001106[2]	19 × 150 mm	OBD Column	186002257
19 × 50 mm	OBD Column	186001932	19 × 250 mm	OBD Column	186002261
19 × 100 mm	OBD Column	186001936	19 × 300 mm	OBD Column	186002265
19 × 150 mm	OBD Column	186002381	30 × 10 mm	Guard Cartridge	186006905[3]
30 × 10 mm	Guard Cartridge	186006906[3]	30 × 150 mm	OBD Column	186002269
30 × 50 mm	OBD Column	186001940	30 × 250 mm	OBD Column	186002273
30 × 75 mm	OBD Column	186002389	30 × 300 mm	OBD Column	186002277
30 × 100 mm	OBD Column	186001944	50 × 50 mm	OBD Column	186002281
50 × 50 mm	OBD Column	186002220	50 × 250 mm	OBD Column	186002849
50 × 100 mm	OBD Column	186002224			

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.
[5] Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

Shield RP8

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
3.0 × 50 mm	186000417	2.1 × 150 mm	186000457
3.0 × 100 mm	186000421	3.0 × 100 mm	186000469
3.0 × 150 mm	186000425	3.0 × 150 mm	186000473
3.9 × 100 mm	186000429	3.9 × 150 mm	186000481
4.6 × 50 mm	186000435	4.6 × 50 mm	186000485
4.6 × 100 mm	186000439	4.6 × 100 mm	186000489
4.6 × 150 mm	186000443	4.6 × 150 mm	186000493
4.6 × 250 mm	186001473	4.6 × 250 mm	186000497

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186001171[5]	7.8 × 10 mm	Guard Cartridge	186001175[5]
7.8 × 50 mm	Column	186001155	7.8 × 150 mm	Column	186001163
7.8 × 100 mm	Column	186001159	7.8 × 300 mm	Column	186001167
7.8 × 150 mm	Column	186001478	10 × 10 mm	Guard Cartridge	186001009[1]
10 × 10 mm	Guard Cartridge	186001008[1]	10 × 150 mm	OBD Column	186008132
10 × 50 mm	OBD Column	186008106	10 × 250 mm	OBD Column	186008136
10 × 150 mm	OBD Column	186008144	10 × 300 mm	OBD Column	186008140
19 × 10 mm	Guard Cartridge	186001107[2]	19 × 10 mm	Guard Cartridge	186001037[2]
19 × 100 mm	OBD Column	186001937	19 × 150 mm	OBD Column	186002258
19 × 150 mm	OBD Column	186002382	19 × 250 mm	OBD Column	186002262
30 × 50 mm	OBD Column	186001941	19 × 300 mm	OBD Column	186002266
30 × 75 mm	OBD Column	186002390	30 × 150 mm	OBD Column	186002270
30 × 100 mm	OBD Column	186001945	30 × 250 mm	OBD Column	186002274
50 × 50 mm	OBD Column	186002221	30 × 300 mm	OBD Column	186002278
50 × 100 mm	OBD Column	186002225	50 × 50 mm	OBD Column	186002282
			50 × 150 mm	OBD Column	186002846
			50 × 250 mm	OBD Column	186002850

[1] Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[5] Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

XTerra Columns *Continued*

	ANALYTICAL COLUMNS			
	Particle Size: 3.5 µm		Particle Size: 5 µm	
Phenyl	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
	2.1 × 50 mm	186001179	3.9 × 150 mm	186001184
	2.1 × 100 mm	186001180	4.6 × 50 mm	186001144
	2.1 × 150 mm	186001181	4.6 × 100 mm	186001145
	3.0 × 100 mm	186001142	4.6 × 150 mm	186001146
	3.0 × 150 mm	186001143	4.6 × 250 mm	186001147
	3.9 × 150 mm	186001178		
	4.6 × 50 mm	186001138		
	4.6 × 100 mm	186001139		
	4.6 × 150 mm	186001140		
	4.6 × 250 mm	186001474		

XTerra Columns Method Validation Kits*

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
MS C_{18}	4.6 × 150 mm	186000826	4.6 × 150 mm	186000829
			4.6 × 250 mm	186000830
Shield RP18	4.6 × 150 mm	186000861	4.6 × 150 mm	186000862
			4.6 × 250 mm	186000863

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

XTerra VanGuard Cartridges

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
MS C_{18}	2.1 × 5 mm	186007887	2.1 × 5 mm	186007892	2.1 × 5 mm	186007896
	3.9 × 5 mm	186007889	3.9 × 5 mm	186007894	3.9 × 5 mm	186007899
MS C_8	2.1 × 5 mm	186007901	2.1 × 5 mm	186007905	2.1 × 5 mm	186007909
	3.9 × 5 mm	186007903	3.9 × 5 mm	186007735	3.9 × 5 mm	186007739
Shield RP18			2.1 × 5 mm	186007929	2.1 × 5 mm	186007933
			3.9 × 5 mm	186007931	3.9 × 5 mm	186007935
Shield RP8			2.1 × 5 mm	186007941	3.9 × 5 mm	186007947
			3.9 × 5 mm	186007943		
Phenyl			2.1 × 5 mm	186007917	2.1 × 5 mm	186007921
			3.9 × 5 mm	186007919	3.9 × 5 mm	186007923

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

Symmetry Preparative Columns

Symmetry Columns provide a high standard of reproducibility and total confidence in the long-term compliance of your HPLC methods. The SymmetryPrep family includes SymmetryPrep (C_{18} and C_8), SymmetryShield (RP18 and RP8), and Symmetry300 (C_{18}) Columns.

Symmetry Preparative Columns offer:

- High capacity
- High efficiency
- The ability to scale-up methods from Symmetry analytical columns with particles of 3.5 and 5 µm

Ordering Information

Symmetry, SymmetryShield, and Symmetry300 Columns

Symmetry C_{18}

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 30 mm	WAT058973	2.1 × 50 mm	186000206
2.1 × 50 mm	WAT200650	2.1 × 100 mm	186002608
2.1 × 100 mm	WAT058965	2.1 × 150 mm	WAT056975
2.1 × 150 mm	WAT106005	3.0 × 150 mm	WAT054200
3.0 × 50 mm	186002612	3.0 × 250 mm	186000690
3.0 × 100 mm	186000696	3.9 × 20 mm *IS*	186002086
3.0 × 150 mm	186000695	3.9 × 150 mm	WAT046980
3.9 × 20 mm *IS*	186002082	4.6 × 20 mm *IS*	186002094
4.6 × 30 mm	186000271	4.6 × 50 mm	186000207
4.6 × 50 mm	WAT200625	4.6 × 100 mm	186002616
4.6 × 75 mm	WAT066224	4.6 × 150 mm	WAT045905
4.6 × 100 mm	WAT066220	4.6 × 250 mm	WAT054275
4.6 × 150 mm	WAT200632		
4.6 × 250 mm	186005794		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 7 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186000711[5]	7.8 × 10 mm	Guard Cartridge	186000713[5]
7.8 × 50 mm	Column	186000208	7.8 × 150 mm	Column	WAT066288
7.8 × 100 mm	Column	186000209	7.8 × 300 mm	Column	WAT066235
19 × 10 mm	Guard Cartridge	186000715[2]	19 × 10 mm	Guard Cartridge	186000717[2]
19 × 50 mm	Column	186000210	19 × 150 mm	Column	WAT066240
19 × 100 mm	Column	186000211	19 × 300 mm	Column	WAT066245
30 × 100 mm	Column	186000236			

[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[5]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

For more information on Symmetry Analytical Columns, refer to page 196.

Symmetry C_8

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm	WAT200624	2.1 × 100 mm	186002609
2.1 × 100 mm	WAT058961	2.1 × 150 mm	WAT056955
2.1 × 150 mm	WAT106011	3.0 × 150 mm	WAT054230
3.0 × 100 mm	186000698	3.0 × 250 mm	186000691
3.0 × 150 mm	186000697	3.9 × 20 mm *IS*	186002087
4.6 × 30 mm	186000270	3.9 × 150 mm	WAT046970
4.6 × 50 mm	WAT200620	4.6 × 50 mm	186000213
4.6 × 75 mm	WAT066200	4.6 × 100 mm	186002617
4.6 × 100 mm	WAT066204	4.6 × 150 mm	WAT045995
4.6 × 150 mm	WAT200630	4.6 × 250 mm	WAT054270

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 7 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
7.8 × 10 mm	Guard Cartridge	186000712[5]	7.8 × 10 mm	Guard Cartridge	186000714[5]
7.8 × 50 mm	Column	186000214	7.8 × 150 mm	Column	WAT066285
7.8 × 100 mm	Column	186000215	7.8 × 300 mm	Column	WAT066225
19 × 100 mm	Column	186000229	19 × 10 mm	Guard Cartridge	186000718[2]
30 × 50 mm	Column	186000237	19 × 150 mm	Column	WAT066228
30 × 100 mm	Column	186000238	19 × 300 mm	Column	WAT066230
30 × 100 mm	Column	186000236			

Symmetry Shield RP18

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm	186000172	2.1 × 50 mm	186000217
2.1 × 100 mm	186000173	2.1 × 100 mm	186000998
2.1 × 150 mm	186000174	2.1 × 150 mm	186000111
3.0 × 100 mm	186000700	3.0 × 150 mm	186000692
3.0 × 150 mm	186000699	3.0 × 250 mm	186000693
3.9 × 20 mm *IS*	186002084	3.9 × 150 mm	186000108
4.6 × 50 mm	186000177	4.6 × 50 mm	186000218
4.6 × 75 mm	186000178	4.6 × 100 mm	186002618
4.6 × 100 mm	186000179	4.6 × 150 mm	186000109
4.6 × 150 mm	186000180	4.6 × 250 mm	186000112

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 7 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
19 × 10 mm	Guard Cartridge	186001835[2]	19 × 150 mm	Column	186001839
19 × 50 mm	Column	186001836	19 × 300 mm	Column	186001840
19 × 100 mm	Column	186001837			
19 × 150 mm	Column	186001838			

[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[5]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

Symmetry Shield RP8

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm	WAT094257	2.1 × 150 mm	WAT094245
2.1 × 100 mm	WAT058969	3.0 × 150 mm	WAT094243
2.1 × 150 mm	WAT106008	3.9 × 20 mm /S	186002089
4.6 × 50 mm	WAT094260	3.9 × 150 mm	WAT200655
4.6 × 75 mm	WAT094263	4.6 × 50 mm	186000224
4.6 × 100 mm	WAT094266	4.6 × 100 mm	186002619
4.6 × 150 mm	WAT094269	4.6 × 150 mm	WAT200662
		4.6 × 250 mm	WAT200670

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 7 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
19 × 10 mm	Guard Cartridge	186001841[2]	19 × 150 mm	Column	186001845
19 × 50 mm	Column	186001842	19 × 300 mm	Column	186001846
19 × 100 mm	Column	186001843			
19 × 150 mm	Column	186001844			

Symmetry300 C_{18}

ANALYTICAL COLUMNS

Particle Size: 3.5 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.1 × 50 mm	186000187	2.1 × 150 mm	WAT106172
2.1 × 100 mm	186000188	4.6 × 50 mm	WAT106209
2.1 × 150 mm	186000200	4.6 × 150 mm	WAT106157
4.6 × 50 mm	186000201	4.6 × 250 mm	WAT106151
4.6 × 75 mm	186000189		
4.6 × 100 mm	186000190		
4.6 × 150 mm	186000197		

PREPARATIVE COLUMNS

Particle Size: 5 µm		
Dimension	Type	P/N (1/pk)
19 × 10 mm	Guard Cartridge	186001847[2]
19 × 50 mm	Column	186001848
19 × 100 mm	Column	186001849
19 × 150 mm	Column	186001850

[2]Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[5]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

Symmetry, SymmetryShield, and Symmetry300 Columns *Continued*

	ANALYTICAL COLUMNS			
	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
Symmetry300 C_4	2.1 × 50 mm	186000277	2.1 × 150 mm	186000285
	2.1 × 100 mm	186000278	3.9 × 150 mm	186000286
	2.1 × 150 mm	186000279	4.6 × 50 mm	186000287
	4.6 × 50 mm	186000280	4.6 × 150 mm	186000288
	4.6 × 75 mm	186000281	4.6 × 250 mm	186000289
	4.6 × 100 mm	186000282		
	4.6 × 150 mm	186000283		

Symmetry, SymmetryShield, and Symmetry300 Method Validation Kits*

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
Symmetry C_{18}	4.6 × 150 mm	WAT094240	3.9 × 150 mm	WAT047210
			4.6 × 150 mm	WAT054448
			4.6 × 250 mm	WAT054450
Symmetry C_8	4.6 × 150 mm	WAT094237	3.9 × 150 mm	WAT046955
			4.6 × 150 mm	WAT054435
			4.6 × 250 mm	WAT054438
SymmetryShield RP18	4.6 × 150 mm	186000181	4.6 × 150 mm	186000103
			4.6 × 250 mm	186000102
SymmetryShield RP8	4.6 × 150 mm	WAT094278	4.6 × 250 mm	WAT210591
Symmetry300 C_{18}	4.6 × 150 mm	186000195	3.9 × 150 mm	WAT106187
			4.6 × 150 mm	WAT106190
			4.6 × 250 mm	WAT106184
Symmetry300 C_4	4.6 × 150 mm	186000291	3.9 × 150 mm	186000293
			4.6 × 150 mm	186000294
			4.6 × 250 mm	186000295

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

Universal VanGuard Cartridge Holder

Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

Symmetry VanGuard Cartridges

	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N (3/pk)	Dimension	P/N (3/pk)
Symmetry C_{18}	2.1 × 5 mm	186007725	2.1 × 5 mm	186007729
	3.9 × 5 mm	186007727	3.9 × 5 mm	186007731
Symmetry C_8	2.1 × 5 mm	186007733	2.1 × 5 mm	186007737
	3.9 × 5 mm	186007735	3.9 × 5 mm	186007739
SymmetryShield RP18	2.1 × 5 mm	186007749	2.1 × 5 mm	186007753
	3.9 × 5 mm	186007751	3.9 × 5 mm	186007755
SymmetryShield RP8	2.1 × 5 mm	186007741	2.1 × 5 mm	186007745
	3.9 × 5 mm	186007743	3.9 × 5 mm	186007747
Symmetry300 C_{18}	2.1 × 5 mm	186007709	2.1 × 5 mm	186007713
	3.9 × 5 mm	186007711	3.9 × 5 mm	186007715
Symmetry300 C_4	2.1 × 5 mm	186007717	2.1 × 5 mm	186007721
	3.9 × 5 mm	186007719	3.9 × 5 mm	186007723

Spherisorb Preparative Columns

Spherisorb Columns are frequently referenced in scientific literature. To date, more than 2000 published abstracts acknowledge the use of Spherisorb Columns. These articles provide a tremendous range of validated methods and applications of significant use in method development.

Ordering Information

Spherisorb Columns

ODS1

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.0 × 100 mm	PSS833422	4.0 × 125 mm	PSS845541
4.6 × 50 mm	PSS833411	4.0 × 250 mm	PSS845542
4.6 × 100 mm	PSS833412	4.6 × 100 mm	PSS830612
4.6 × 150 mm	PSS833413	4.6 × 150 mm	PSS830613
		4.6 × 250 mm	PSS830615

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008284	10 × 250 mm	OBD Column	186008285
19 × 250 mm	OBD Column	186008846	19 × 250 mm	OBD Column	186008857

ODS2

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 50 mm	PSS832111	4.0 × 125 mm	PSS845543
4.6 × 100 mm	PSS832112	4.0 × 250 mm	PSS845277
4.6 × 150 mm	PSS832113	4.6 × 50 mm	PSS831911
		4.6 × 100 mm	PSS831912
		4.6 × 150 mm	PSS831913
		4.6 × 250 mm	PSS831915

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008292	10 × 250 mm	OBD Column	186008294
19 × 250 mm	OBD Column	186008847	19 × 250 mm	OBD Column	186008858

For more information on Spherisorb Columns, refer to page 207.

C_8

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 50 mm	PSS832211	4.0 × 125 mm	PSS845280
4.6 × 100 mm	PSS832212	4.0 × 250 mm	PSS845281
4.6 × 150 mm	PSS832213	4.6 × 100 mm	PSS831812
		4.6 × 150 mm	PSS831813
		4.6 × 250 mm	PSS831815

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008291	10 × 250 mm	OBD Column	186008297
19 × 250 mm	OBD Column	186008848	19 × 250 mm	OBD Column	186008859

C_6

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	PSS833113	4.0 × 125 mm	PSS845284
		4.6 × 100 mm	PSS831012
		4.6 × 250 mm	PSS831015

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008288	19 × 250 mm	OBD Column	186008860
19 × 250 mm	OBD Column	186008849			

C_1

ANALYTICAL COLUMNS

Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.6 × 100 mm	PSS832612
4.6 × 150 mm	PSS832613
4.6 × 250 mm	PSS832615

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008295	19 × 250 mm	OBD Column	186008861
19 × 250 mm	OBD Column	186008850			

NH_2

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
2.0 × 100 mm	PSS832322	4.0 × 250 mm	PSS845301
4.6 × 50 mm	PSS832311	4.6 × 150 mm	PSS831113
4.6 × 100 mm	PSS832312	4.6 × 250 mm	PSS831115
4.6 × 150 mm	PSS832313		

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008289	10 × 250 mm	OBD Column	186008299
19 × 250 mm	OBD Column	186008853	19 × 250 mm	OBD Column	186008864

Phenyl

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	PSS833713	4.0 × 250 mm	PSS845293
		4.6 × 250 mm	PSS830815

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008286	10 × 250 mm	OBD Column	186008300
19 × 250 mm	OBD Column	186008854	19 × 250 mm	OBD Column	186008865

CN Normal Phase

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	PSS832413	4.0 × 250 mm	PSS845297
		4.6 × 100 mm	PSS830912
		4.6 × 150 mm	PSS830913
		4.6 × 250 mm	PSS830915

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008287	10 × 250 mm	OBD Column	186008298
19 × 250 mm	OBD Column	186008852	19 × 250 mm	OBD Column	186008863

CN Reversed Phase

ANALYTICAL COLUMNS

Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.6 × 150 mm	PSS830908
4.6 × 250 mm	PSS830909

Silica

ANALYTICAL COLUMNS

Particle Size: 3 µm		Particle Size: 5 µm	
Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
4.6 × 150 mm	PSS832013	2.0 × 250 mm	PSS830125
		4.0 × 250 mm	PSS845540
		4.6 × 250 mm	PSS830115

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008281	10 × 250 mm	OBD Column	186008282
19 × 250 mm	OBD Column	186008851	19 × 250 mm	OBD Column	186008862

SAX

ANALYTICAL COLUMNS

Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.0 × 250 mm	PSS845305
4.6 × 50 mm	PSS832711
4.6 × 150 mm	PSS832713
4.6 × 250 mm	PSS832715

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008296	10 × 250 mm	OBD Column	186008301
19 × 250 mm	OBD Column	186008855	19 × 250 mm	OBD Column	186008866

SCX

ANALYTICAL COLUMNS

Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.0 × 250 mm	PSS845309
4.6 × 50 mm	PSS837511
4.6 × 100 mm	PSS837512
4.6 × 150 mm	PSS837513
4.6 × 250 mm	PSS837515

PREPARATIVE COLUMNS

Particle Size: 5 µm			Particle Size: 10 µm		
Dimension	Type	P/N (1/pk)	Dimension	Type	P/N (1/pk)
10 × 250 mm	OBD Column	186008302	10 × 250 mm	OBD Column	186008303
19 × 250 mm	OBD Column	186008856	19 × 250 mm	OBD Column	186008867

OD/CN

ANALYTICAL COLUMNS

Particle Size: 5 µm	
Dimension	P/N (1/pk)
4.6 × 150 mm	PSS837813
4.6 × 250 mm	PSS837815

For µBondapak/Bondapak and µPorasil/Porasil Analytical Columns, please refer to page 214.

Nova-Pak Preparative Columns

Nova-Pak HR, 6 µm, ultra-high-efficiency packing materials are available as shorter columns to facilitate separations - making it faster, lowering solvent consumption, and producing fractions of greater concentration. The preparative Nova-Pak HR material provides the same selectivity and retention characteristics as the analytical Nova-Pak 4 µm material. The Nova-Pak HR packing materials for preparative use are ideal for separating a wide range of compounds such as organic synthesis intermediates or natural products.

Ordering Information

Nova-Pak Columns

Nova-Pak C_{18}

ANALYTICAL COLUMNS	
Particle Size: 4 µm	
Dimension	P/N (1/pk)
2.1 × 150 mm	WAT023655
3.9 × 75 mm	WAT011670
3.9 × 150 mm	WAT086344
3.9 × 300 mm	WAT011695
4.6 × 150 mm	WAT044375

PREPARATIVE COLUMNS	
Particle Size: 6 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT038500
7.8 × 300 mm	WAT025820
19 × 300 mm	WAT025822

Nova-Pak C_8

3.9 × 75 mm	WAT035877
3.9 × 150 mm	WAT035876

Nova-Pak Phenyl

ANALYTICAL COLUMNS	
Particle Size: 4 µm	
Dimension	P/N (1/pk)
2.1 × 150 mm	WAT052740
3.9 × 75 mm	WAT011675
3.9 × 150 mm	WAT010656

Nova-Pak CN-HP

3.9 × 75 mm	WAT010270
3.9 × 150 mm	WAT044245
3.9 × 300 mm	WAT056920

Nova-Pak Silica

2.1 × 150 mm	WAT052745
3.9 × 150 mm	WAT010025

PREPARATIVE COLUMNS	
Particle Size: 6 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT038501
7.8 × 300 mm	WAT025821
19 × 300 mm	WAT025823

µBondapak/Bondapak and µPorasil/Porasil Columns

The popular µBondapak C_{18} chemistry and µPorasil silica packing materials are offered in 10 µm particle size. Bondapak and Porasil are available in two particle sizes, 15–20 µm and 37–55 µm, providing easy transfer of chromatography methods and the means to optimize resolution, throughput, and cost. Existing 10 µm µBondapak or µPorasil chromatography can serve as a starting point for scale-up separations.

The preparative Bondapak HC_{18} HA (high carbon load, high activity silica) is a highly carbon-loaded packing that differs in selectivity from that of the standard Bondapak packing materials. The higher carbon load on the silica surface typically results in a higher loading capability. Bondapak HC_{18} HA is available in the 37–55 µm particle size.

The Porasil Silica family of packing materials provides a cost-effective means for scaling up to preparative processes. µPorasil 10 µm, Porasil 15-20 µm, and Porasil 37-55 µm can be scaled up to Prep Silica 55-105 µm columns.

For more information on Nova-Pak Columns, refer to page 212.

Ordering Information

µBondapak/Bondapak

C_{18}, 125 Å

ANALYTICAL COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086684
3.9 × 300 mm	WAT027324
4.6 × 150 mm	WAT044370
4.6 × 300 mm	186000925

PREPARATIVE COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086684
3.9 × 300 mm	WAT027324
4.6 × 150 mm	WAT044370
4.6 × 300 mm	186000925
7.8 × 300 mm	WAT084176
19 × 150 mm	WAT088500
19 × 300 mm	WAT025828
Particle Size: 15–20 µm	
3.9 × 150 mm	WAT025875
7.8 × 300 mm	WAT025832
19 × 300 mm	WAT025834

CN, 125 Å

ANALYTICAL COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086688
3.9 × 300 mm	WAT084042

PREPARATIVE COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086688
3.9 × 300 mm	WAT084042
7.8 × 300 mm	WAT084177

NH_2, 125 Å

ANALYTICAL COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT084040

PREPARATIVE COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT084040
7.8 × 300 mm	WAT084178

Phenyl, 125 Å

ANALYTICAL COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086680
3.9 × 300 mm	WAT027198

PREPARATIVE COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086680
3.9 × 300 mm	WAT027198
7.8 × 300 mm	WAT084179

µPorasil/Porasil

µPorasil, 125 Å

ANALYTICAL COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT027477

PREPARATIVE COLUMNS	
Particle Size: 10 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT086692
3.9 × 300 mm	WAT027477
7.8 × 300 mm	WAT084175
19 × 150 mm	WAT091648
19 × 300 mm	WAT025829

Porasil, 125 Å

PREPARATIVE COLUMNS	
Particle Size: 15–20 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT025874
19 × 300 mm	WAT025835

i For µBondapak/Bondapak and µPorasil/Porasil Preparative Columns, please refer to page 214.

Delta-Pak Preparative Columns

Delta-Pak packing materials are ideal for separating peptides, proteins, and natural products. Isolating and purifying a peptide is usually a multi-step procedure in which fractions from a first run are re-chromatographed on the same preparative column to obtain pure product. Delta-Pak packing materials are based on a highly stable, bonded, end-capped 5 and 15 µm packing. The 5 µm packing is available in analytical-scale dimensions for preliminary preparative chromatographic studies, peptide mapping, and fraction-purity assays. The chemistry characteristics of the packing materials are independent of the particle size.

Ordering Information

Delta-Pak Columns

Delta-Pak C_{18}, 300 Å

ANALYTICAL COLUMNS	
Particle Size: 5 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT011793

PREPARATIVE COLUMNS	
Particle Size: 15 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT011802
7.8 × 300 mm	WAT011803
19 × 300 mm	WAT011804
30 × 300 mm	WAT011805

Delta-Pak C_4, 300 Å

ANALYTICAL COLUMNS	
Particle Size: 5 µm	
Dimension	P/N (1/pk)
3.9 × 150 mm	WAT011794

PREPARATIVE COLUMNS	
Particle Size: 15 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT011812
7.8 × 300 mm	WAT011813
19 × 300 mm	WAT011814
30 × 300 mm	WAT011815

Delta-Pak C_{18}, 100 Å

PREPARATIVE COLUMNS	
Particle Size: 15 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT011797
7.8 × 300 mm	WAT011798
19 × 300 mm	WAT011799
30 × 300 mm	WAT011800
50 × 300 mm	WAT011801

Delta-Pak C_4, 100 Å

PREPARATIVE COLUMNS	
Particle Size: 15 µm	
Dimension	P/N (1/pk)
3.9 × 300 mm	WAT011807
7.8 × 300 mm	WAT011808
19 × 300 mm	WAT011809
30 × 300 mm	WAT011810

Preparative Guard Cartridge Holders

Ordering Information

Purification and Isolation Cartridge Holders

Description	P/N
7.8 × 10 mm Cartridge Holder	186000708
10 × 10 mm Cartridge Holder	289000779
19 × 10 mm Cartridge Holder	186000709
30 × 10 mm Prep Guard Holder	186006912
Replacement O-ring 7.8 mm, 2/pk	700001019
Replacement O-ring 10 mm, 2/pk	700001436
Replacement O-ring 19 mm, 2/pk	700001020
Replacement O-ring 30 mm, 2/pk	186007012

19 × 10 mm Prep Guard Holder and Cartridge

30 × 10 mm Prep Guard Holder and Cartridge

For more information on Delta-Pak Columns, refer to page 213.

Preparative Standards

HOW DO YOU KNOW YOUR CHROMATOGRAPHIC SYSTEM IS IN PROPER WORKING ORDER?

Quality Control Reference Materials (QC Reference Materials) contain mixtures of standards specifically chosen to provide an easy and reliable way to monitor the performance of any chromatographic system. Using a QC Reference Material, you can be assured that your column and system are ready to analyze your samples. Regular use of QC Reference Materials also provides an opportunity to benchmark your chromatographic systems and trend performance over time, making it easier to proactively identify problems and resolve them faster.

Literature References

Title	Literature Code
Quality Control Reference Material and Benchmarking Instrument Performance white paper	720004535EN
Troubleshooting Common System Problems Using Waters Neutrals Quality Control Reference Material application note	720004635EN

Chromatographic analyses are inherently complex. Variables such as mobile-phase composition, column type, and detection method influence their outcome. Waters has formulated specific QC Reference Material mixtures that account for these variables while testing the performance of chromatographic columns and systems.

Ordering Information

Quality Control Reference Materials

Product Name	Intended Use	Chromatographic Mode	Systems	Contents	P/N
Preparative Chromatography Mix Standard	Provides chromatographic performance information inclusive of mobile-phase pH using one void marker, one acidic, one basic, and one neutral probes.	Reversed-phase	All Purification Systems	**5 mg/mL each:** Diclofenac sodium salt, diphenhydramine hydrochloride, flavone in a 1 mL solution of DMSO. Store at room temperature.	186006703
AutoPurification System Standard	Tests the performance of fraction collectors, both UV and MS directed, using three dyes.	Reversed-phase	All Purification Systems with Fraction Collectors	**3 ampoules of test mix containing:** 2500 µg/mL thionin, 3000 µg/mL thioflavin, 2500 µg/mL crystal violet in a 10 mL solution of 25/75 water/methanol. Store at room temperature.	716000765

For details about standards specific to calibration, qualification, and the tuning of instruments (as well as a more comprehensive listing of standards and reagents), consult the Analytical Standards and Reagents e-Catalog at asr.waters.com.

Preparative Bulk Material

Waters offers various kinds of bulk packing materials for lab-to-process-scale purifications. All are manufactured in accordance with our ISO 9001-certified manufacturing processes and cGMP (current Good Manufacturing Practices) guidelines, ensuring long-term reproducible material.

Bulk materials are available packaged in quantities of 100 g to 5 kg. For larger quantity purchases, inquire about pricing and availability.

Ordering Information

Reversed-Phase Bulk Packings

	Particle Size: 10 µm	
	Qty.	P/N
XBridge BEH C_{18}, 130 Å	1 kg	186008658
SunFire C_{18}, 100 Å	1 kg	186007650
	Particle Size: 15–20 µm	
Bondapak C_{18}, 125 Å	100 g	WAT020739
	1 kg	WAT020740
	5 kg	WAT020741
	Particle Size: 37–55 µm	
	100 g	WAT030632
	1 kg	WAT030633
	5 kg	WAT030634
	Particle Size: 37–55 µm	
Bondapak HC_{18} HA, 125 Å	100 g	WAT035672
	1 kg	WAT035674
	5 kg	WAT035676
	Particle Size: 55–105 µm	
Prep C_{18}, 125 Å	100 g	WAT020594
	1 kg	WAT010001
	5 kg	WAT020595
	25 kg	WAT020596

Normal-Phase Bulk Packings

	Particle Size: 10 µm	
	Qty.	P/N
µPorasil Silica, 125 Å	5 kg	186005791
	Particle Size: 15–20 µm	
Porasil Silica, 125 Å	100 g	WAT020731
	1 kg	WAT020732
	5 kg	WAT020733
	25 kg	WAT020734
	Particle Size: 37–55 µm	
	100 g	WAT020721
	1 kg	WAT020722
	5 kg	WAT020723
	25 kg	WAT020724
	Particle Size: 55–105 µm	
Prep Silica, 125 Å	100 g	WAT020587
	1 kg	WAT010004
	5 kg	WAT020588
	25 kg	WAT020589

Gas Chromatography Packings

Versatile PoraPak gas chromatography column packing materials simplify the analysis of many complex compounds, from atmospheric gases to organics. Consisting of polymer beads, these unique packings are chemically and physically stable. Consistent particle size, porosity, and surface area ensure analytical reproducibility. The columns also provide unequaled separation capability with high resolution and low, constant retention volumes.

VERSATILITY FOR SPECIALTY APPLICATIONS

To optimize separation of even the most complex matrices, PoraPak packing materials offer several physical and chemical variations.

Special characteristics of Waters' unique GC packings include:

- Fast analysis, with compounds eluting in distinctive bands with no tailing
- The ability to sustain elevated temperatures, permitting temperature programming without adverse effects to retention, reproducibility, and column life
- The ability to accommodate large sample loads required for preparative and trace analysis while maintaining characteristically high column efficiency

Ordering Information

GC PoraPak Porous Polymer Packing

Type	Polarity	Surface Area (m^2/g)	Density (g/cm^3)	Single Temp. Program	Particle Size Mesh	Qty.	P/N
P	Nonpolar	100–200	0.26	250 ˚C	50–80	20 g	WAT027053
					80–100	20 g	WAT027054
					100–120	20 g	WAT027055
PS	Nonpolar	100–200	0.26	250 ˚C	50–80	20 g	WAT027083
					80–100	20 g	WAT027084
					100–120	20 g	WAT027085
Q	Slightly nonpolar to moderate	500–600	0.34	250 ˚C	50–80	26 g	WAT027059
					80–100	26 g	WAT027060
					100–120	26 g	WAT027061
QS	Slightly nonpolar to moderate	500–600	0.34	250 ˚C	50–80	26 g	WAT027089
					80–100	26 g	WAT027090
					100–120	26 g	WAT027091
R	Moderate polar monomer: vinyl pyrrolidone	450–600	0.32	250 ˚C	50–80	24 g	WAT027065
					80–100	24 g	WAT027066
					100–120	24 g	WAT027067
S	Moderate polar monomer: vinyl pyridine	300–450	0.35	250 ˚C	50–80	26 g	WAT027071
					80–100	26 g	WAT027072
					100–120	26 g	WAT027073
N	Polar monomer: vinyl pyrrolidone	250–350	0.41	190 ˚C	50–80	29 g	WAT027047
					80–100	29 g	WAT027048
					100–120	29 g	WAT027049
T	Highly polar monomer: ethyleneglycol dimethacrylate	225–350	0.39	190 ˚C	50–80	31 g	WAT027077
					80–100	31 g	WAT027078
					100–120	31 g	WAT027079

Radial Compression Module Products

We carry a complete inventory of accessories and spare parts for Waters' patented radial compression modules for use with the 5 mm and 8 mm I.D. Radial-Pak Column segments, the 25 mm and 40 mm I.D. PrepLC Column segments, and the 47 mm I.D. PrepPak Cartridges.

Ordering Information

8 × 100 Cartridge Holder (p/n: WAT082887) for 8 × 100 mm and 5 × 100 mm Radial-Pak Column Segments.

8 × 100 Cartridge Holder, Parts, and Accessories

Description	P/N
8 × 100 Cartridge Holder	WAT082887
8 × 100 Extension Kit (Includes one Extension Tube, Union, O-Rings)	WAT038846
Column Segment Union	WAT038849
O-Ring for Extension Tube	WAT038851
Connector Tubing Assembly (Non Metallic)	WAT088919
Connector Assembly (Stainless Steel)	WAT082892
Washer for Connectors, 10/pk	WAT005147
Pressure Relief Plug	WAT088027
Check Valve	WAT082888
O-Ring (Large) for Connector, 10/pk	WAT005130
O-Ring (Small) for Connector (Normal Phase), 4/pk	WAT015797
O-Ring (Small) for Connector (Reversed Phase), 10/pk	WAT005129
O-Ring for Filling Port, 10/pk	WAT005129
O-Ring for Pressure Piston	WAT088494
Gripper Ring Replacement Kit (Includes 10 Gripper Rings, 20 Washers, 10 Ferrules, and Tool)	WAT021908

*All column segments and cartridges require the appropriate holder/module.

(p/n: WAT015814)

PrepLC 25 mm Module, Parts, and Accessories

Description	P/N
PrepLC 25 mm Module	WAT015814
PrepLC 25 mm Extension Kit (Includes one Extension Tube, Union, O-Rings)	WAT022180
Extension Tube	WAT019311
O-Ring for Extension Tube	WAT015831
O-Ring (Large) for Connector	WAT015833
O-Ring (Small) for Connector (Normal Phase)	WAT015848
O-Ring (Small) for Connector (Reversed Phase)	WAT015834
O-Ring for Filling Port, 10/pk	WAT005129
O-Ring for Pressure Piston	WAT015854
Union Coupling Assembly	WAT015860
Union, 1/8" to 1/16" Tubing, 5/pk	WAT005137

*All column segments and cartridges require the appropriate holder/module.

PrepLC Assemblies

Description	P/N
PrepLC 40 mm Assembly (Includes PrepLC Universal Base and PrepLC 40 mm Chamber)	WAT022441
PrepLC Universal Base	WAT027577
PrepLC 40 mm Chamber (Includes O-Rings, Spacer, and Union)	WAT027578
PrepLC 40 mm Extension Kit (Includes Extension Tube, Union, and O-Rings)	WAT022365
PrepLC 25 mm Chamber (Includes O-Rings, Spacer, and Union)	WAT033994
PrepLC 25 mm Extension Kit (Includes one Extension Tube, Union, and O-Rings)	WAT022180
PrepLC Scale-Up Kit with Capability for 40 mm or 25 × 300 mm Length Includes: One - PrepLC Universal Base Two - PrepLC Chambers (One each of 40 mm and 25 mm) Two - PrepLC 25 mm Extension Kits Two - PrepLC 40 mm Extension Kits	WAT022440

PrepLC Assembly 40 × 100 mm

PrepLC Assembly 25 × 100 mm

(p/n: WAT022440)

PrepLC Spare Parts

Description	P/N
PrepLC Universal Base Spare Parts	
O-Ring Removal Tool	WAT082853
O-Ring for Pressure Piston	WAT022281
O-Ring for Filling Port	WAT005129
Filling Port Plug	WAT027509
Ferrules and Compression Fittings (Stainless Steel), 5/pk	WAT025604

PrepLC 40 mm Chamber Spare Parts	
Column Segment Union	WAT033996
Cartridge Spacer	WAT033997
O-Ring, Base Plate (Small)	WAT022453
O-Ring, Base Plate (Large)	WAT022454
O-Ring, Chamber Top	WAT022280
O-Ring (Normal Phase) Cartridge, Top and Bottom, Spacers, and Unions	WAT027519
O-Ring (Reversed Phase) Cartridge, Top and Bottom, Spacers, and Unions	WAT027518
O-Ring (Reversed Phase) Chamber, Bottom	WAT022283
O-Ring (Reversed Phase) Inner Connector, Top and Bottom	WAT015835
O-Ring, Extension Tube	WAT022454

PrepLC 25 mm Chamber Spare Parts	
Column Segment Union	WAT015860
Segment Spacer	WAT015859
O-Ring, Base Plate (Small)	WAT022276
O-Ring, Base Plate (Large)	WAT015831
O-Ring, Chamber Top	WAT015833
O-Ring (Normal Phase) Cartridge Top and Bottom, Spacers, and Unions	WAT015848
O-Ring (Reversed Phase) Cartridge, Top and Bottom, Spacers, and Union	WAT015834
O-Ring (Reversed Phase) Chamber Bottom	WAT022282
O-Ring (Reversed Phase) Inner Connector, Top and Bottom	WAT015835
Tubing Fluid Path Kit* (PEEK) (Includes Inner Connectors, Tubing, Ferrules, and Compression Screws)	WAT022400

*For applications where a metal-free flow path is needed.

PrepPak Cartridges*

	Dimension	P/N
Particle Size: 15–20 µm		
Bondapak C_{18}, 125 Å	47 × 300 mm	WAT091784
Bondapak C_{18}, 300 Å	47 × 300 mm	WAT038571
Particle Size: 37–55 µm		
Bondapak HC_{18} HA, 125 Å	47 × 300 mm	WAT038570
Particle Size: 55–105 µm		
Bondapak NH_2, 125 Å	47 × 300 mm	WAT091631
Particle Size: 15 µm		
Delta-Pak C_{18}, 100 Å	47 × 300 mm	WAT015401
Delta-Pak C_{18}, 300 Å	47 × 300 mm	WAT010988
Particle Size: 15 µm		
Delta-Pak C_4, 100 Å	47 × 300 mm	WAT011633
Delta-Pak C_4, 300 Å	47 × 300 mm	WAT011669
Particle Size: 55–105 µm		
Prep C_{18}, 125 Å	47 × 300 mm	WAT025876
Particle Size: 37–55 µm		
Porasil Silica, 125 Å (1/pk)	47 × 300 mm	WAT025853
Particle Size: 37–55 µm		
Porasil Silica, 125 Å (10/pk)	47 × 300 mm	WAT025877
PrepPak 1000 Module for 47 × 300 mm PrepPak Cartridges		WAT089592

*All column segments and cartridges require the appropriate holder/module, see page 288.

Delta-Pak Radial Compression Column Segments and PrepPak Cartridges*

	Dimension	Type	P/N
Particle Size: 15 µm			
Delta-Pak C_{18}, 100 Å	8 × 100 mm	Column	WAT025846
	25 × 10 mm	Guard, 2/pk	WAT038520
	25 × 100 mm	Column	WAT038506
	40 × 10 mm	Guard, 2/pk	WAT037842
	40 × 100 mm	Column	WAT037688
Delta-Pak C_{18}, 300 Å	8 × 100 mm	Column	WAT025845
	25 × 10 mm	Guard, 2/pk	WAT038522
	25 × 100 mm	Column	WAT038507
	40 × 10 mm	Guard, 2/pk	WAT037845
	40 × 100 mm	Column	WAT037692
Delta-Pak C_4, 100 Å	8 × 100 mm	Column	WAT025848
	25 × 10 mm	Guard, 2/pk	WAT038524
	25 × 100 mm	Column	WAT038508
	40 × 100 mm	Column	WAT037696
Delta-Pak C_4, 300 Å	25 × 100 mm	Column	WAT038509
	25 × 10 mm	Guard, 2/pk	WAT038526
	40 × 10 mm	Guard, 2/pk	WAT037851
	40 × 100 mm	Column	WAT037700

*All column segments and cartridges require the appropriate holder/module, see page 288.

Resolve Radial Compression Column Segments and PrepPak Cartridges*

	Dimension	P/N
Particle Size: 5 µm		
C_{18}, 90 Å	8 × 100 mm	WAT084624[1]
Particle Size: 10 µm		
	5 × 100 mm	WAT084620
	8 × 100 mm	WAT084720
Particle Size: 10 µm		
C_8, 90 Å	5 × 100 mm	WAT085672
	8 × 100 mm	WAT085670

[1]Requires 8 × 100 Cartridge Holder, p/n: WAT082887.

	Dimension	P/N
Particle Size: 5 µm		
Silica, 90 Å	8 × 100 mm	WAT084634
Particle Size: 10 µm		
	5 × 100 mm	WAT084630
	8 × 100 mm	WAT084730
Particle Size: 10 µm		
CN, 90 Å	5 × 100 mm	WAT084626
	8 × 100 mm	WAT084636

Nova-Pak and Prep Nova-Pak Radial Compression Column Segments and PrepPak Cartridges

Nova-Pak Radial-Pak Column Segments*	Particle Size: 4 µm	
	Dimension	P/N
C_{18}, 60 Å	5 × 100 mm	WAT080100
	8 × 100 mm	WAT086342
C_8, 60 Å	5 × 100 mm	WAT035890
	8 × 100 mm	WAT035884
Phenyl, 60 Å	5 × 100 mm	WAT010657
	8 × 100 mm	WAT010658
CN HP, 60 Å	5 × 100 mm	WAT010224
	8 × 100 mm	WAT010223
Silica, 60 Å	5 × 100 mm	WAT010986
	8 × 100 mm	WAT010987

*Requires 8 × 100 mm Cartridge Holder, p/n: WAT082887.

Prep Nova-Pak HR Radial-Pak Column Segments	Particle Size: 6 µm	
C_{18}, 60 Å	8 × 100 mm	WAT025843
Silica, 60 Å	8 × 100 mm	WAT025844

Prep Nova-Pak HR PrepLC 25 mm Column Segments	Particle Size: 6 µm	
C_{18}, 60 Å	25 × 100 mm	WAT038510
Silica, 60 Å	25 × 100 mm	WAT038511

Prep Nova-Pak HR 25 × 10 Guard-Pak Inserts, 2/pk	Particle Size: 6 µm	
C_{18}, 60 Å	25 × 10 mm	WAT038528
Silica, 60 Å	25 × 10 mm	WAT038530

Prep Nova-Pak HR PrepLC 40 mm Column Segments	Particle Size: 6 µm	
C_{18}, 60 Å	40 × 100 mm	WAT037704

Prep Nova-Pak HR 40 × 10 Guard-Pak Inserts, 2/pk	Particle Size: 6 µm	
C_{18}, 60 Å	40 × 10 mm	WAT037854
Silica, 60 Å	40 × 10 mm	WAT037857

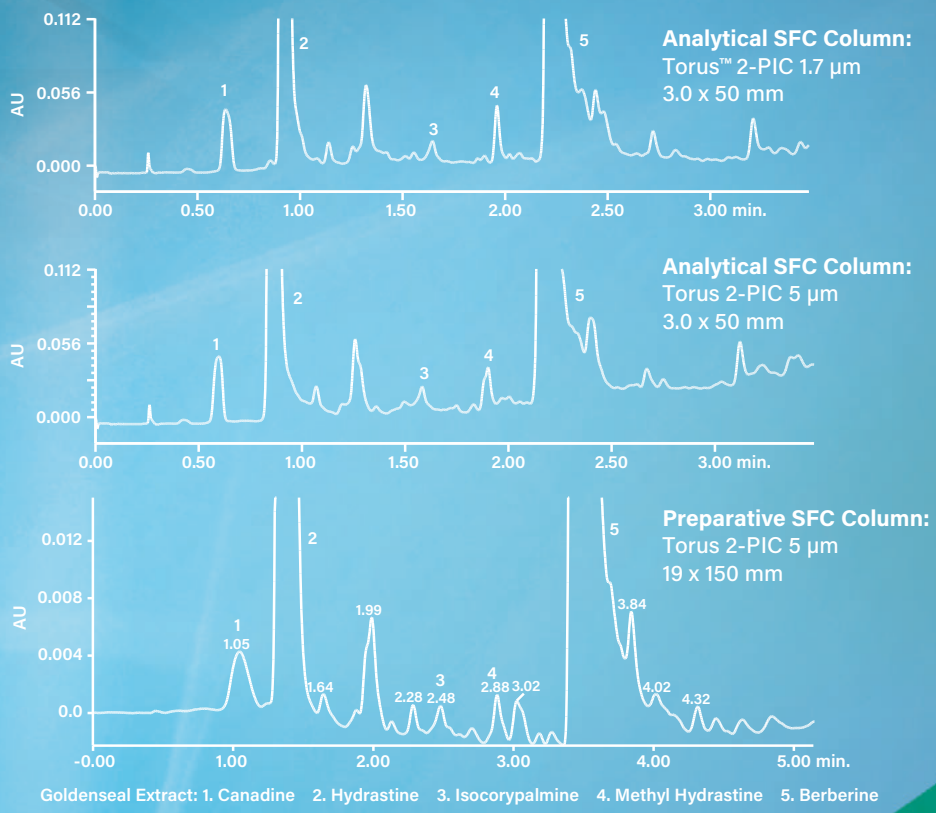
Scale SFC from Analytical to Preparative with Torus Columns

NEW ACHIRAL SFC COLUMNS

- Access the power of normal-phase chromatography with the ease and reliability of reversed-phase chromatography
- Rugged SFC Preparative Columns for exceptional column lifetimes
- Unequaled speed and unparalleled confidence

Torus Columns are available in four scalable chemistries:

- Torus 2-PIC™ 1.7 µm → Torus 2-PIC 5 µm
- Torus DEA 1.7 µm → Torus DEA 5 µm
- Torus DIOL 1.7 µm → Torus DIOL 5 µm
- Torus 1-AA 1.7 µm → Torus 1-AA 5 µm



Torus™

SFC

See page 296 for more information.

SFC Analytical and Preparative Columns

SFC Analytical and Preparative Columns

Contents

SFC Analytical and Preparative Columns

Torus, Trefoil, and Viridis Columns for Achiral and Chiral SFC Separations

The Torus, Trefoil,™ and Viridis™ Column Chemistries, combined with Waters SFC Instrumentation, will enable separation scientists to better access the power of normal-phase chromatography with the ease and reliability of reversed-phase chromatography. These achiral and chiral SFC column chemistries provide the ability to handle achiral and chiral separations with unequaled speed and unparalleled confidence.

Column Characteristics

Column	Particle Shape	Particle Size	Pore Volume	Pore Size	Surface Area	Carbon Load	Chemistry
Torus Analytical & Preparative Achiral SFC Columns							
Torus 2-PIC	Spherical	1.7, 5 µm	0.7 cc/g	130 Å	185 m^2/g	–	2-Picolylamine
Torus DEA	Spherical	1.7, 5 µm	0.7 cc/g	130 Å	185 m^2/g	–	Diethylamine
Torus DIOL	Spherical	1.7, 5 µm	0.7 cc/g	130 Å	185 m^2/g	–	High density diol
Torus 1-AA	Spherical	1.7, 5 µm	0.7 cc/g	130 Å	185 m^2/g	–	1-Aminoanthracene
Trefoil Analytical Chiral SFC Column							
Trefoil AMY1	Spherical	2.5 µm	–	–	–	–	Amylose tris-(3, 5-dimethylphenylcarbamate)
Trefoil CEL1	Spherical	2.5 µm	–	–	–	–	Cellulose tris-(3, 5-dimethylphenylcarbamate)
Trefoil CEL2	Spherical	2.5 µm	–	–	–	–	Cellulose tris-(3-chloro-4-methylphenylcarbamate)
Viridis Analytical & Preparative Achiral SFC Columns							
Viridis BEH	Spherical	1.7, 3.5, 5 µm	0.7 cc/g	130 Å	185 m^2/g	N/A	Unbonded
Viridis BEH 2-EP	Spherical	1.7, 3.5, 5 µm	0.7 cc/g	130 Å	185 m^2/g	9%	2-Ethylpyridine
Viridis CSH Fluoro-Phenyl	Spherical	1.7, 3.5, 5 µm	0.7 cc/g	130 Å	185 m^2/g	10%	CSH fluoro-phenyl
Viridis HSS C_{18} SB	Spherical	1.8, 3.5 µm	0.7 cc/g	100 Å	230 m^2/g	8.5%	C_{18}
Viridis Silica	Spherical	5 µm	0.9 cc/g	100 Å	340 m^2/g	N/A	Unbonded
Viridis Silica 2-EP	Spherical	5 µm	0.9 cc/g	100 Å	340 m^2/g	8%	2-Ethylpyridine

The use of compressed liquid CO_2 as the primary mobile phase in convergence chromatography unleashes the powerful orthogonal capability of normal-phase separations. Gradient separations performed across the widest polarity range bring the full detection capabilities of mass spectrometry into everyday use as a mainstream technique. You can now separate most compounds and mixtures soluble in organic solvents and, in addition, separate structural analogs, isomers, and enantiomeric and diastereomeric mixtures—all of which are notoriously difficult to separate by other means.

Torus Columns for Achiral SFC Separations

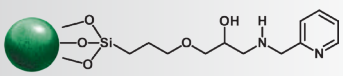
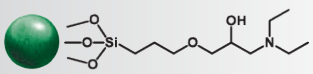
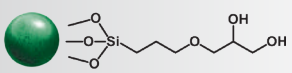
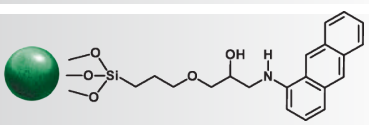
Torus™

Torus Columns offer:

- Excellent peak shapes
- A wide range of unique selectivities with unique ligands
- Highest efficiency and QC-ready robustness
- Waters OBD Technology

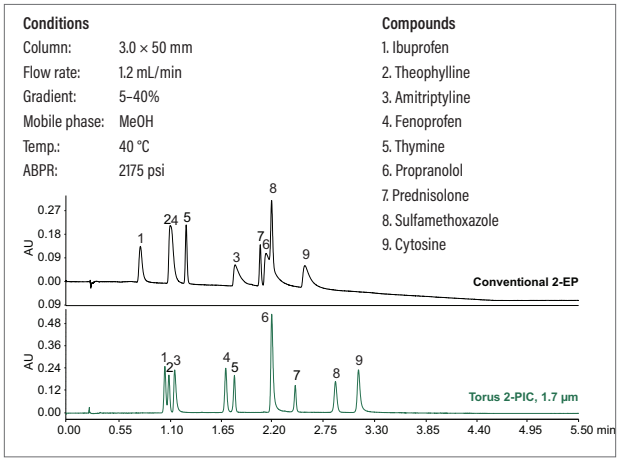
Torus Columns are designed for achiral SFC separations, offer a wide range of selectivity, excellent peak shape, and are suited for method transfer and method scale-up. Torus Columns are offered in 1.7 and 5 µm chemistries in both analytical and preparative column formats.

The Torus Phases are based on patent-pending two-stage functionalization of ethylene bridged hybrid (BEH) particles. The initial bonding provides a hydrophilic surface that controls the retention characteristics of the sorbent, and is responsible for minimizing unwanted surface interactions, which lead to retention and selectivity changes over time. The second step of the functionalization is responsible for the individual selectivity and peak shape characteristics of each of the Torus Chemistries. The results of these steps are a series of stationary phases with broad ranging selectivities, which maintain robust chromatographic performance over the lifetime of the column.

Torus 2-PIC, 1.7 and 5 µm Columns 2-Picolylamine	
Torus DEA, 1.7 and 5 µm Columns Diethylamine	
Torus DIOL, 1.7 and 5 µm Columns High Density Diol	
Torus 1-AA, 1.7 and 5 µm Columns 1-Aminoanthracene	

TORUS 2-PIC (2-PICOLYLAMINE)

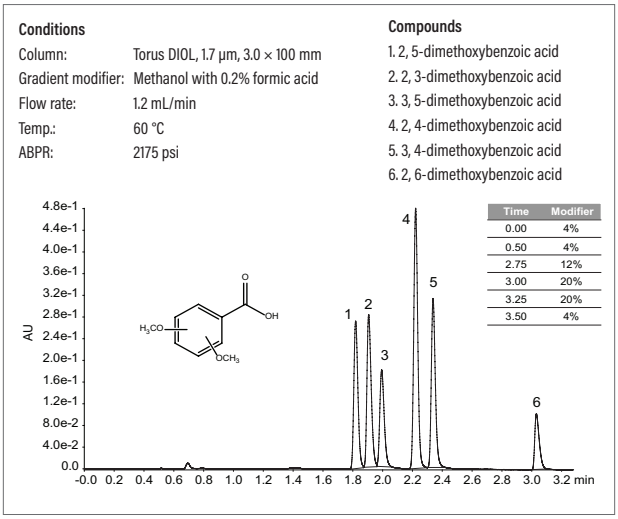
Torus 2-PIC Columns were designed for general use and are the first choice for a wide range of applications with acidic and basic compounds. The Torus 2-PIC phase demonstrates enhanced performance compared to conventional 2-ethylpyridine (2-EP), displaying improved peak shape, added retention, and novel selectivity.



Torus 2-PIC has excellent peak shape characteristics for wide ranges of acidic and basic compounds.

TORUS DIOL (HIGH-DENSITY DIOL)

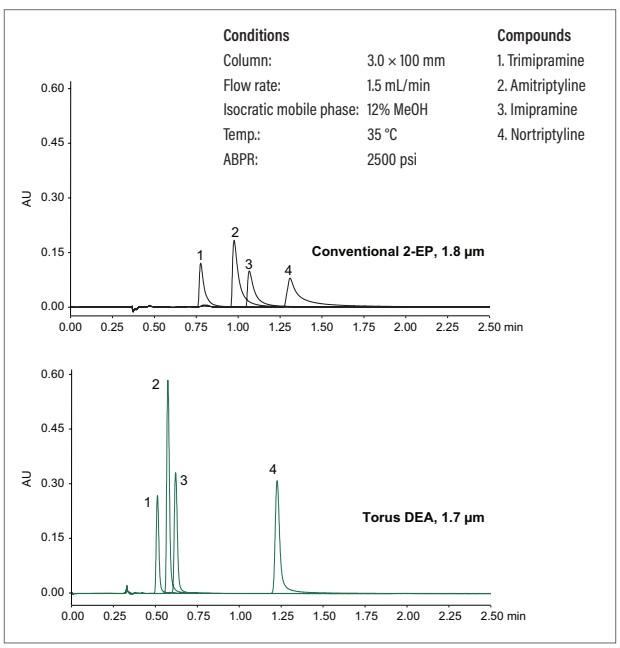
Torus DIOL Columns were developed to provide additional selectivity choices. High-density diol surface bonding offers chromatography performance similar to that of traditional, unbonded silica phases, and adds overall method robustness when utilized with additives.



Torus DIOL Columns show good peak shapes for acidic compounds, as demonstrated by the separation of six isomeric forms of dimethoxybenzoic acid.

TORUS DEA (DIETHYLAMINE)

Torus DEA Columns are designed to be orthogonal to the Torus 2-PIC phase. Designed to provide superior peak shape for very strong bases, these columns provide a complementary selectivity to the 2-PIC stationary phase.



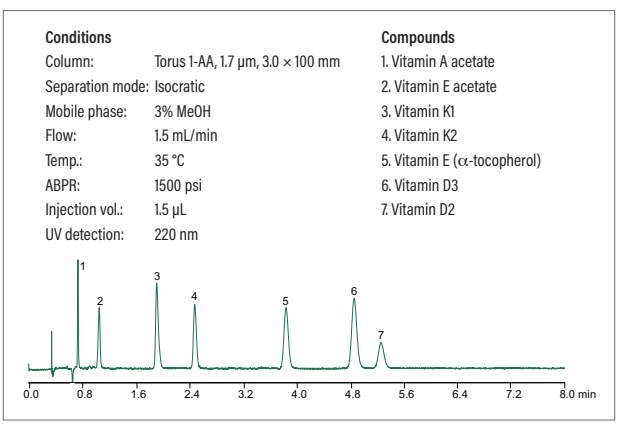
Torus DEA exhibits excellent peak shape for strong basic compounds when compared to a silica 2-EP column.

TORUS 1-AA (1-AMINOANTHRACENE)

Torus 1-AA Columns are designed to be the superior choice for separating neutral compounds such as polar and non-polar steroids, and hydrophobic compounds such as lipids and fat-soluble vitamins. This chemistry also provides an orthogonal selectivity to the 2-PIC phase, making it very useful in method development.

Torus 1-AA Columns are best used for:

- Hydrophobic (lipophilic) compounds
- Free fatty acids
- Fat-soluble vitamins
- Lipids
- Natural products
- Steroids



Torus 1-AA Column shows good peak shape and resolution of fat-soluble vitamins.

Torus Columns for Achiral Method Development

For method development, it is crucial to have a series of columns that have significantly differing selectivities and good retentivity. The Torus Chemistries were specifically chosen to provide a breadth of selectivities for acids, bases, and neutral analytes. For more information on achiral SFC method development, visit **www.waters.com/torus** and view the webcast titled "Torus Columns for Achiral Method Development".

Visit www.waters.com/torus

Ordering Information

Torus Analytical Columns

Dimension	Particle Size: 1.7 µm			
	P/N	P/N	P/N	P/N
	2-PIC	DEA	DIOL	1-AA
VanGuard Pre-column, 2.1 × 5 mm, 3/pk	186007604	186007622	186007613	186007631
2.1 × 50 mm	186007596	186007614	186007605	186007623
2.1 × 75 mm	186007597	186007615	186007606	186007624
2.1 × 100 mm	186007598	186007616	186007607	186007625
2.1 × 150 mm	186007599	186007617	186007608	186007626
3.0 × 50 mm	186007600	186007618	186007609	186007627
3.0 × 75 mm	186007601	186007619	186007610	186007628
3.0 × 100 mm	186007602	186007620	186007611	186007629
3.0 × 150 mm	186007603	186007621	186007612	186007630

Dimension	Particle Size: 5 µm			
	P/N	P/N	P/N	P/N
2.1 × 150 mm	186008543	186008563	186008554	186008572
3.0 × 50 mm	186008544	186008564	186008555	186008573
3.0 × 100 mm	186008545	186008565	186008556	186008574
3.0 × 150 mm	186008546	186008566	186008557	186008575
3.0 × 250 mm	186008549	186008567	186008558	186008576
4.6 × 50 mm	186008550	186008568	186008559	186008577
4.6 × 100 mm	186008551	186008569	186008560	186008578
4.6 × 150 mm	186008552	186008570	186008561	186008579
4.6 × 250 mm	186008553	186008571	186008562	186008580

Torus Column Method Development Kits

Dimension	Particle Size: 1.7 µm
	P/N
Torus Column Screening Kit, 2.1 × 50 mm (2-PIC, DEA, DIOL, 1-AA), 4/pk	176003579
Torus Column Method Development Kit, 3.0 × 100 mm (2-PIC, DEA, DIOL, 1-AA), 4/pk	176003580

Torus Preparative Achiral SFC Columns

Combining state-of-the-art media manufacturing with industry-leading column technology, Torus Achiral Columns impart a new level of robustness to laboratory-scale purification.

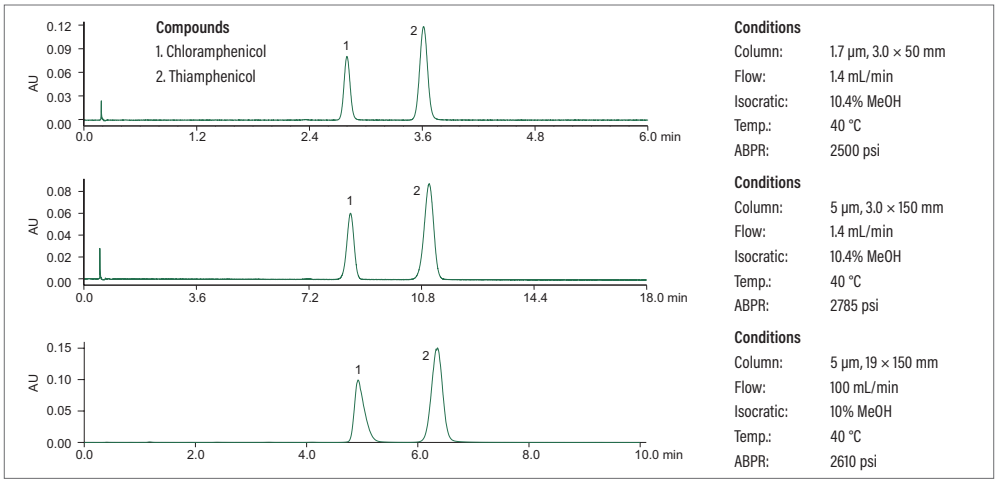
You can base a scale up of screening methods on any of the four Torus analytical column chemistries to perform 5 µm Torus Preparative SFC Separations.

Torus 2-PIC 1.7 µm Columns → Torus 2-PIC 5 µm Preparative Columns

Torus DEA 1.7 µm Columns → Torus DEA 5 µm Preparative Columns

Torus DIOL 1.7 µm Columns → Torus DIOL 5 µm Preparative Columns

Torus 1-AA 1.7 µm Columns → Torus 1-AA 5 µm Preparative Columns



Scale up of an analytical method from a Torus 2-PIC, 1.7 µm Column of two closely related antibiotics, chloramphenicol and thiamphenicol, to a Torus 2-PIC, 5 µm, Preparative Column.

Ordering Information

Torus OBD Preparative Columns

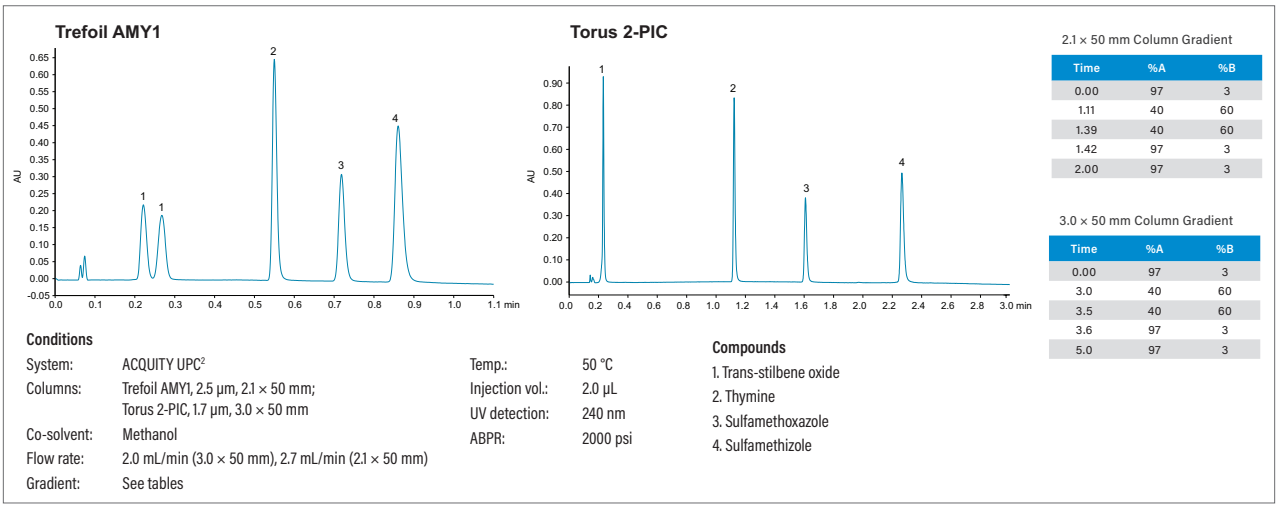
Dimension	Particle Size: 5 µm			
	P/N	P/N	P/N	P/N
	2-PIC	DIOL	DEA	AA
OBD 10 × 50 mm	186008581	186008598	186008615	186008632
OBD 10 × 100 mm	186008582	186008599	186008616	186008633
OBD 10 × 150 mm	186008583	186008600	186008617	186008634
OBD 10 × 250 mm	186008584	186008601	186008618	186008635
19 × 10 mm Guard Cartridge*	186008741	186008742	186008743	186008744
OBD 19 × 50 mm	186008585	186008602	186008619	186008636
OBD 19 × 100 mm	186008586	186008603	186008620	186008637
OBD 19 × 150 mm	186008587	186008604	186008621	186008638
OBD 19 × 250 mm	186008588	186008605	186008622	186008639
30 × 10 mm Guard Cartridge**	186008650	186008651	186008652	186008653
OBD 30 × 50 mm	186008589	186008606	186008623	186008640
OBD 30 × 75 mm	186008590	186008607	186008624	186008641
OBD 30 × 100 mm	186008591	186008608	186008625	186008642
OBD 30 × 150 mm	186008592	186008609	186008626	186008643
OBD 30 × 250 mm	186008593	186008610	186008627	186008644
OBD 50 × 50 mm	186008594	186008611	186008628	186008645
OBD 50 × 100 mm	186008595	186008612	186008629	186008646
OBD 50 × 150 mm	186008596	186008613	186008630	186008648
OBD 50 × 250 mm	186008597	186008614	186008631	186008649

* Requires 19 mm I.D. Prep Guard Holder, p/n: 186008745.
** Requires 30 mm I.D. Prep Guard Holder, p/n: 186006912.

ACQUITY UPC^2 System: Quality Control Reference Materials

The Quality Control Reference Materials (QC Reference Materials) for the ACQUITY UPC^2™ System provide a simple, reliable way to monitor a system's performance. Prepared for use with Trefoil and Torus Columns, this four-component mixture is optimized to ensure these key aspects of performance:

- The efficacy of chiral separation (by means of a chiral compound included in the mixture)
- The performance of mass spectrometry (by means of an ionizing compound included in the mixture)
- The well-separated nature of compounds in a wide elution range
- The detectability of all compounds by UV



Conditions

System:	ACQUITY UPC^2
Columns:	Trefoil AMY1, 2.5 µm, 2.1 × 50 mm; Torus 2-PIC, 1.7 µm, 3.0 × 50 mm
Co-solvent:	Methanol
Flow rate:	2.0 mL/min (3.0 × 50 mm), 2.7 mL/min (2.1 × 50 mm)
Gradient:	See tables
Temp.:	50 °C
Injection vol.:	2.0 µL
UV detection:	240 nm
ABPR:	2000 psi

Compounds

1. Trans-stilbene oxide
2. Thymine
3. Sulfamethoxazole
4. Sulfamethizole

2.1 × 50 mm Column Gradient

Time	%A	%B
0.00	97	3
1.11	40	60
1.39	40	60
1.42	97	3
2.00	97	3

3.0 × 50 mm Column Gradient

Time	%A	%B
0.00	97	3
3.0	40	60
3.5	40	60
3.6	97	3
5.0	97	3

Single QC Reference Material for Trefoil and Torus Columns on an ACQUITY UPC^2 System.

HOW DO YOU KNOW YOUR CHROMATOGRAPHIC SYSTEM IS OPERATING PROPERLY?

QC Reference Materials contain mixtures of standards chosen to provide an easy and reliable way to monitor the performance of any chromatographic system. They assure you that your column and system are ready to analyze samples. Regular use of QC Reference Materials also provides an opportunity to benchmark chromatographic systems and note their performance over time, making it easier to proactively identify problems and correct them sooner.

Ordering Information

Quality Control Reference Materials

Product Name	Intended Use	Chromatographic Mode	System	Contents	P/N
UPC² QC Reference Material	Provides chromatographic performance information inclusive of mobile-phase pH for both chiral and achiral modes.	Convergence Chromatography, SFC ▪ chiral ▪ achiral	ACQUITY UPC²	1. 0.50 mg/mL (+/-) trans-stilbene oxide 2. 0.50 mg/mL thymine 3. 0.50 mg/mL sulfamethoxazole 4. 0.50 mg/mL sulfamethizole In a 1 mL solution of 75:25 ACN:MeOH Store refrigerated 2–5 °C	186007950

Standards for SFC and ACQUITY UPC² Systems

Description	P/N
Waters Prep 15/30 SFC System Test Mix and Internal Standard	700005675
Waters Prep 100 SFC System Test Mix and Internal Standard	700005674

Standards for ACQUITY UPC² Systems

Description	Contents	P/N
UPC² Standard Mix	2 mg/mL each: 3-benzoylpyridine, cortisone, 4-nitroaniline, 4, 4′-biphenol in methanol, 1 mL	186006372
UPC² Gradient Standard	1 mg/mL coumarin, 1 mg/mL flavone, 2 mg/mL caffeine, 1 mg/mL thymine, 2 mg/mL prednisone in 2-propanol, 1 mL	186006551
UPC² Caffeine Standard	1.0 mg/mL caffeine in 2-propanol, 2 mL	186006614
UPC² Standards Kit	1.0 mg/mL caffeine in 2-propanol, 2 mL 1 mg/mL coumarin, 1 mg/mL flavone, 2 mg/mL caffeine, 1 mg/mL thymine, 2 mg/mL prednisone in 2-propanol, 1 mL	176002811
UPC² Flavone Standard	1 mg/mL in 2-propanol, 2 mL	186006523
UPC² Flurbiprofen Standard	1 mg/mL in 2-propanol, 2 mL	186006524
UPC² Ibuprofen Standard	1 mg/mL in 2-propanol, 2 mL	186006521
UPC² Ketoprofen Standard	1 mg/mL in 2-propanol, 2 mL	186006522

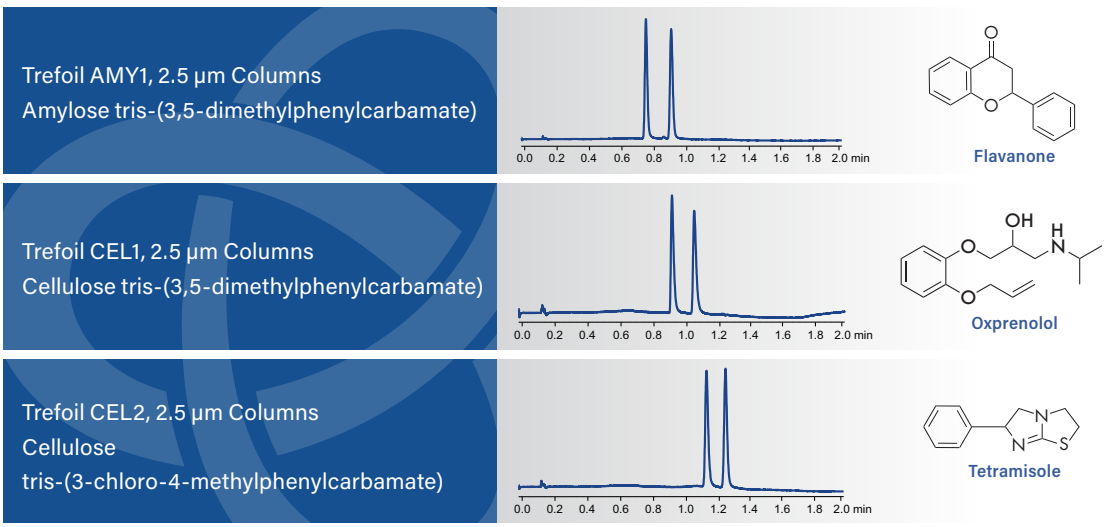
Trefoil Columns for Chiral SFC Separations

Trefoil™

Trefoil Columns offer:

- Optimized particle size, column dimensions, and flow rates for the ACQUITY UPC² System
- The full advantage of mass-spectrometry detection
- Faster results when following method-development protocols
- High quality, consistent, and reproducible columns

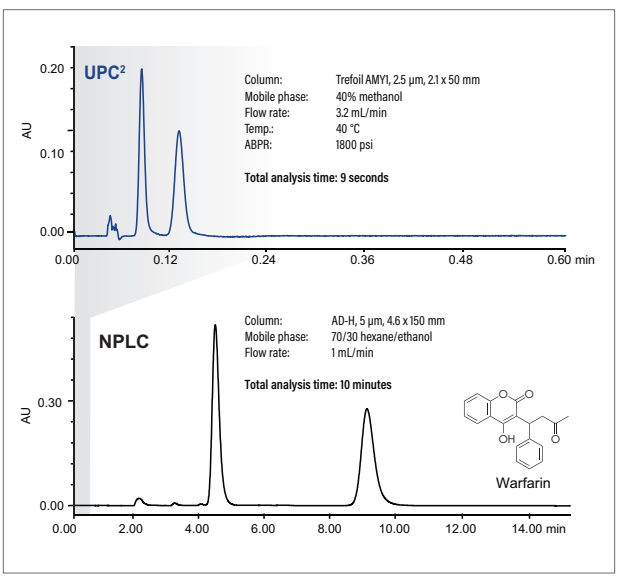
Trefoil modified polysaccharide-based stationary phases provide broad spectrum chiral selectivity. Trefoil AMY1, Trefoil CEL1, and Trefoil CEL2 Column Chemistries are complementary to each other and independently offer different retention characteristics for separating chiral compounds. Selectivity can be further enhanced by blends of modifiers and additives that most favorably modulate chiral recognition. These columns are designed to separate enantiomers and their stereoisomers, metabolites, degradants, and impurities with greater resolution and speed.



Chiral separations were all run using the two-minute screening method.

TRANSFER NORMAL-PHASE METHODS TO CONVERGENCE CHIRAL METHODS

Legacy normal-phase chiral methods can be easily transferred to the ACQUITY UPC² System using Trefoil Columns. Many of these old methods have undesirable characteristics such as long run times and often use chlorinated solvents in combination with THF or hexane which are costly to purchase and dispose. With simple redevelopment, new, cost-effective methods can be obtained using inexpensive and non-toxic compressed liquid CO_2 as the primary mobile phase and can be coupled to mass spectrometers for greater information.

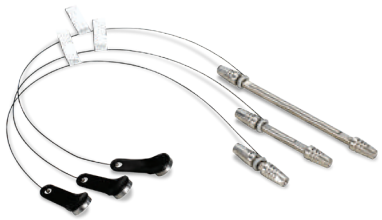


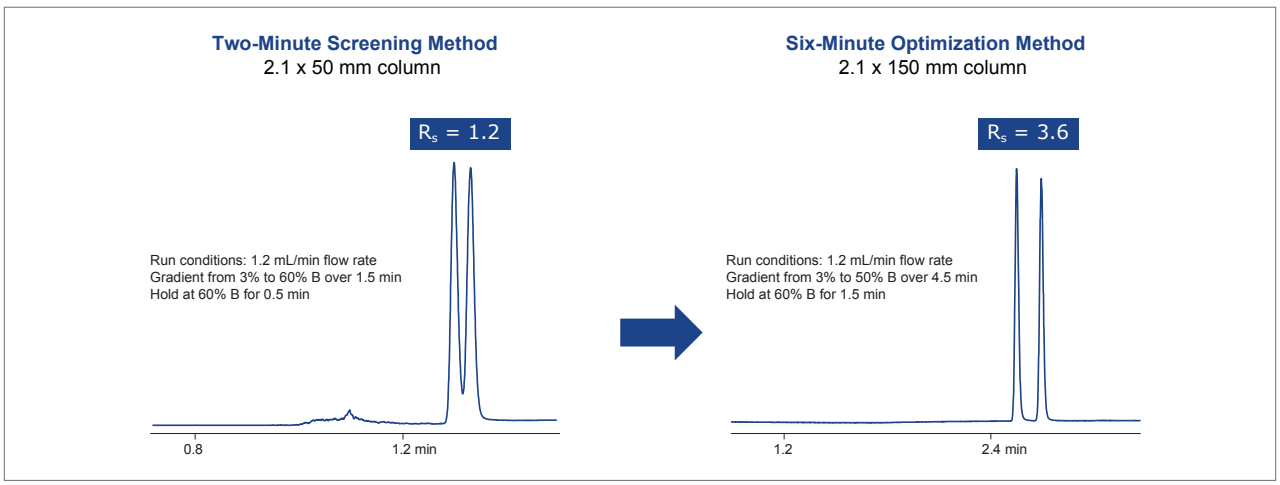
ACQUITY UPC² System with Trefoil Columns can be more than 30 times faster, use 75 times less solvent per run, and cost 100 times less per analysis.

DID YOU KNOW...

CHIRAL METHODS USING TREFOIL COLUMNS

Faster method development is possible when taking advantage of the dependable, high performance, low dispersion analytical ACQUITY UPC² System when used together with the Trefoil chiral stationary phases. Using short, narrow-bore columns with a small number of well selected co-solvents and mass spectrometry compatible additives enables this holistic combination to achieve routine gradient screening runs in two minutes. To view a webcast on the Trefoil Columns Method Development Strategy, please visit **www.waters.com/trefoil**





An example of the increased resolution expected when you transition from the two-minute screening method to the six-minute optimization method.

Ordering Information

Trefoil Columns

Dimension	Particle Size: 2.5 µm		
	P/N	P/N	P/N
	Trefoil AMY1	Trefoil CEL1	Trefoil CEL2
2.1 × 50 mm	186007457	186007461	186007654
2.1 × 150 mm	186007458	186007462	186007655
3.0 × 50 mm	186007459	186007463	186007656
3.0 × 150 mm	186007460	186007464	186007657

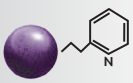
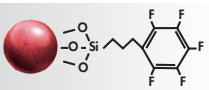
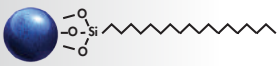
Trefoil Column Method Development Kits

Description	Particle Size: 2.5 µm
	P/N
Trefoil Column Screening Kit, 2.1 × 50 mm (AMY1, CEL1, CEL2), 3/pk	176003577
Trefoil Column Optimization Kit, 3.0 × 150 mm (AMY1, CEL1, CEL2), 3/pk	176003578

Viridis Columns

VIRIDIS HYBRID AND HSS SFC COLUMNS

Viridis Columns offer an added range of achiral SFC selectivities. These columns are based on the patented Ethylene Bridged Hybrid (BEH) particle technology, Charged Surface Hybrid (CSH) particle technology, and High-Strength Silica (HSS) particle technology. The reduction and control of surface silanol activity on Viridis particles delivers, under SFC conditions, excellent peak shapes—even for well-retained basic achiral compounds.

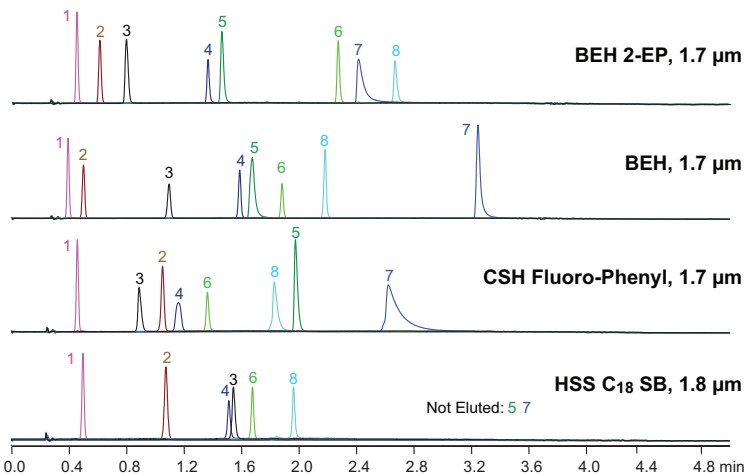
Viridis BEH 2-EP, 1.7, 3.5, and 5 µm Columns	
Viridis BEH, 1.7, 3.5, and 5 µm Columns	
Viridis CSH Fluoro-Phenyl, 1.7, 3.5, and 5 µm Columns	
Viridis HSS C_{18} SB, 1.7 and 3.5 µm Columns	

Conditions

Column:	3.0 × 50 mm
Gradient	
Mobile phase:	5–40% MeOH in 4 min
Flow:	1.2 mL/min
ABPR:	2175 psi (150 bar)
Temp.:	40 °C

Compounds

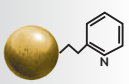
1. Coumarin
2. Flavone
3. Caffeine
4. Thymine
5. Papaverine
6. Sulfamethoxazole
7. Cytosine
8. Sulfamethizole



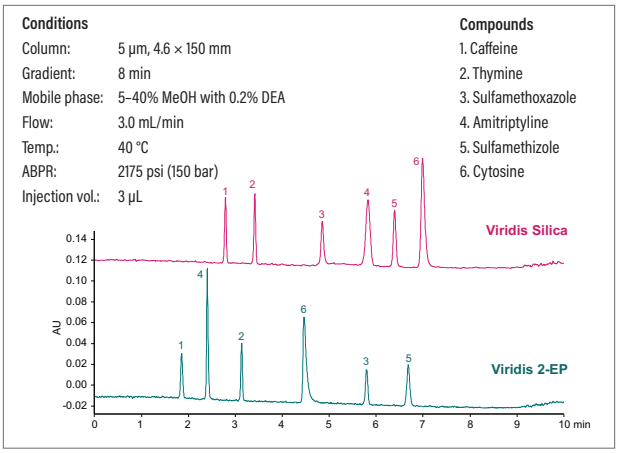
Viridis Analytical Columns provide multiple selectivities.

VIRIDIS SILICA-BASED SFC COLUMNS

Based on Waters long history of chromatographic silica production, the Viridis Silica Columns are designed to be highly reproducible and predictable based on tight product specifications and very low metal content. They are available for both analytical screening and in preparative column dimensions for purification. Separation methods can be optimized and scaled up to Viridis Preparative OBD Columns.

Viridis Silica 2-EP, 5 µm Columns	
Viridis Silica, 5 µm Columns	

Widely used in achiral SFC separations, exhibiting good retention, peak shape, and selectivity properties both with and without the use of additives.



Viridis SFC Preparative Columns.

Ordering Information

Viridis BEH, CSH, and HSS 1.7 and 1.8 µm Columns

Dimension	Particle Size: 1.7 µm			Particle Size: 1.8 µm
	P/N	P/N	P/N	P/N
	BEH 2-EP	BEH	CSH Fluoro-Phenyl	HSS C_{18} SB
2.1 × 50 mm	186006576	186006558	186006567	186006617
2.1 × 75 mm	186006577	186006559	186006568	186006618
2.1 × 100 mm	186006578	186006560	186006569	186006619
2.1 × 150 mm	186006579	186006561	186006570	186006620
3.0 × 50 mm	186006580	186006562	186006571	186006621
3.0 × 75 mm	186006581	186006563	186006572	186006622
3.0 × 100 mm	186006582	186006564	186006573	186006623
3.0 × 150 mm	186006688	186006686	186006687	186006685
VanGuard Pre-column, 2.1 × 5 mm, 3/pk	186006575	186006557	186006566	186006616

Viridis BEH, CSH, and HSS 3.5 µm Columns

Dimension	Particle Size: 3.5 µm			
	P/N	P/N	P/N	P/N
	BEH 2-EP	BEH	CSH Fluoro-Phenyl	HSS C_{18} SB
2.1 × 50 mm	186006652	186006634	186006643	186006625
2.1 × 75 mm	186006653	186006635	186006644	186006626
2.1 × 100 mm	186006654	186006636	186006645	186006627
2.1 × 150 mm	186006655	186006637	186006646	186006628
3.0 × 50 mm	186006656	186006638	186006647	186006629
3.0 × 75 mm	186006657	186006639	186006648	186006630
3.0 × 100 mm	186006658	186006640	186006649	186006631
3.0 × 150 mm	186006659	186006641	186006650	186006632
VanGuard Pre-column, 2.1 × 5 mm, 3/pk	186006651	186006633	186006642	186006624

Viridis 5 µm Analytical SFC Columns

Dimension	Particle Size: 5 µm				
	P/N	P/N	P/N	P/N	P/N
	BEH 2-EP	BEH	CSH Fluoro-Phenyl	Silica 2-EP	Silica
2.1 × 150 mm	186006545	186006544	186006543	186006542	186006541
3.0 × 50 mm	186005750	186005719	186005688	186005800	186005804
3.0 × 100 mm	186005751	186005720	186005689	186005801	186005805
3.0 × 150 mm	186005752	186005721	186005690	186005802	186005806
3.0 × 250 mm	186005753	186005722	186005691	186005803	186005807
4.6 × 50 mm	186005754	186005723	186005692	186004935	186004908
4.6 × 100 mm	186005755	186005724	186005693	186004936	186004909
4.6 × 150 mm	186005756	186005725	186005694	186004937	186004910
4.6 × 250 mm	186005757	186005726	186005695	186004938	186004911

Viridis 5 µm Preparative SFC Columns

Dimension	Particle Size: 5 µm				
	P/N	P/N	P/N	P/N	P/N
	BEH 2-EP	BEH	CSH Fluoro-Phenyl	Silica 2-EP	Silica
OBD 10 × 50 mm	186008256	186008252	186008248	186008232	186008228
OBD 10 × 100 mm	186008257	186008253	186008249	186008233	186008229
OBD 10 × 150 mm	186008258	186008254	186008250	186008234	186008230
OBD 10 × 250 mm	186008259	186008255	186008251	186008235	186008231
OBD 19 × 50 mm	186005762	186005731	186005700	186004943	186004916
OBD 19 × 100 mm	186005763	186005732	186005701	186004944	186004917
OBD 19 × 150 mm	186005764	186005733	186005702	186004945	186004918
OBD 19 × 250 mm	186005765	186005734	186005703	186004946	186004919
30 × 10 mm Guard Cartridge*	186006909	186006910	186006911	186006908	186006907
OBD 30 × 50 mm	186005766	186005735	186005704	186004947	186004920
OBD 30 × 75 mm	186005767	186005736	186005705	186004948	186004921
OBD 30 × 100 mm	186005768	186005737	186005706	186004949	186004922
OBD 30 × 150 mm	186005769	186005738	186005707	186004950	186004923
OBD 30 × 250 mm	186005770	186005739	186005708	186004951	186004924
OBD 50 × 50 mm	186005771	186005740	186005709	186004952	186004925
OBD 50 × 100 mm	186005772	186005741	186005710	186004953	186004926
OBD 50 × 150 mm	186005773	186005742	186005711	186004954	186004927
OBD 50 × 250 mm	186005774	186005743	186005712	186004955	186004928

*Requires 30 mm I.D. Prep Guard Holder, p/n: 186006912.

Viridis Method Development Kits

Description	P/N
Viridis Method Development Kit, 3.0 × 100 mm (BEH 2-EP, BEH, CSH Fluoro-Phenyl, HSS C_{18} SB), 4/pk	176003050
Viridis Column Screening Kit, 2.1 × 50 mm (BEH 2-EP, BEH, CSH Fluoro-Phenyl, HSS C_{18} SB), 4/pk	176003091

Quality Control Reference Materials

Product Name	Intended Use	Chromatographic Mode	System	Contents	P/N
UPC² QC Reference Material	Provides chromatographic performance information inclusive of mobile-phase pH for both chiral and achiral modes	Convergence Chromatography, SFC ▪ chiral ▪ achiral	ACQUITY UPC²	1. 0.50 mg/mL (+/-) trans-stilbene oxide 2. 0.50 mg/mL thymine 3. 0.50 mg/mL sulfamethoxazole 4. 0.50 mg/mL sulfamethizole In a 1 mL solution of 75:25 ACN:MeOH Store refrigerated 2–5 °C	186007950

Standards

Description	Contents	P/N
Waters Prep 15/30 SFC System Test Mix and Internal Standard		700005675
Waters Prep 100 SFC System Test Mix and Internal Standard		700005674
UPC² Standard Mix	2 mg/mL each: 3-benzoylpyridine, cortisone, 4-nitroaniline, 4, 4′-biphenol in methanol, 1 mL	186006372
UPC² Gradient Standard	1 mg/mL coumarin, 1 mg/mL flavone, 2 mg/mL caffeine, 1 mg/mL thymine, 2 mg/mL prednisone in 2-propanol, 1 mL	186006551
UPC² Caffeine Standard	1 mg/mL caffeine in 2-propanol, 2 mL	186006614
UPC² Standards Kit	1 mg/mL caffeine in 2-propanol, 2 mL 1 mg/mL coumarin, 1 mg/mL flavone, 2 mg/mL caffeine, 1 mg/mL thymine, 2 mg/mL prednisone in 2-propanol, 1 mL	176002811
UPC² Flavone Standard	1 mg/mL in 2-propanol, 2 mL	186006523
UPC² Flurbiprofen Standard	1 mg/mL in 2-propanol, 2 mL	186006524
UPC² Ibuprofen Standard	1 mg/mL in 2-propanol, 2 mL	186006521
UPC² Ketoprofen Standard	1 mg/mL in 2-propanol, 2 mL	186006522

Biomolecule Purification, Characterization, and Analysis

Biomolecule Purification, Characterization, and Analysis

Contents

Biomolecule Purification, Characterization, and Analysis

Innovative Technologies from the Leader in Separation Science and Analytical Biochemistry

Advances in the areas of genomics, proteomics, metabolomics, and molecular and system biology continue to revolutionize the diagnosis and treatment of diseases and increase our fundamental understanding of biological processes.

As a leading analytical supplier of instrumentation, software, service and support, and chemistry products, Waters is uniquely positioned to provide researchers the tools, technologies, and integrated solutions desired to tackle the formidable challenges involving various biomolecules. Beginning with a keen understanding of today's biomolecule-related challenges, Waters scientists and engineers continuously seek purposeful innovations that help deliver impactful solutions in applications ranging from proteomics and biomarker discovery through the commercialization of advanced biopharmaceuticals. We continue to develop new, innovative columns and sample preparation consumables that support the HPLC, UHPLC, UPLC, and LC-MS analyses of peptides, oligonucleotides, proteins, amino acids, and glycans.

Waters comprehensive chemistry and consumables family includes:

- Peptide columns for nano, capillary, analytical, and preparative peptide applications
- Protein size-exclusion, ion-exchange, hydrophobic-interaction, hydrophilic-interaction, and reversed-phase columns for analytical HPLC, UHPLC, UPLC, and lab-scale purification applications
- AccQ•Tag™ Ultra Chemistry specific for Waters UPLC Amino Acid Analysis Solution, as well as Pico•Tag™ and AccQ•Tag for HPLC-based amino acid analyses
- Oligonucleotide columns for synthetic oligonucleotide and DNA/RNA fragment isolations and analyses
- GlycoWorks™ *Rapi*Fluor-MS™ sample preparation kits and standards, and Waters Glycan Columns for the analysis of released glycans
- ACQUITY UPLC Glycoprotein BEH Amide, 300 Å Column for the analyses of intact glycoproteins, glycoprotein fragments, and glycopeptides
- Analytical Standards and Reagents consumables and kits for MS and LC-MS applications of peptides, proteins, and other biomolecules

In addition, our ACQUITY UPLC Protein BEH SEC, 125 Å, 200 Å, and 450 Å guards, columns, and quality controlled protein/peptide standards, as well as our ACQUITY UPLC Glycoprotein BEH Amide, 300 Å offering, were developed for use on ACQUITY UPLC Systems to help obtain accurate, precise, and highly resolving quantitative analysis of therapeutic proteins such as mAbs.

Designed and QC tested with relevant biomolecules to help ensure column-to-column consistency.

Bioseparations Columns

www.waters.com/biosep

Bioseparations Analytical Standards and Reagents

www.waters.com/biostds

Amino Acid Analysis

AccQ•Tag™ Ultra
UPLC® Amino Acid Analysis

Amino acids are the constituents of proteins and are the intermediates in many metabolic pathways. Qualitative and quantitative Amino Acid Analysis (AAA) is used to determine the concentration of proteins, identify proteins, and detect structural variants. Amino acid composition is a critical component of the nutritional value of foods and feeds. The same analytical tools are used to monitor cell culture and fermentation processes. AAA is also used as a clinical diagnostic tool for assessing inborn errors of metabolism and nutritional status.

The accurate identification and quantification of amino acids in biological research and in the development and commercialization of food, beverage, and biotherapeutic products is challenging. This set of analytes covers a wide range of chemical properties (e.g., acidic, basic, neutral), yet resolution of individual pairs having only minor structural differences is required. Analysis is further complicated by the absence of common chromophores, necessitating use of a derivatization chemistry to enable analyte detection.

Reversed-phase chromatography provides good selectivity for separating amino acids. The most common approach to reversed-phase AAA includes pre-column derivatization. The derivatized amino acids retain better on the reversed-phase column and can be more easily separated. Most common derivatization reagents react with the amines. Some reagents react only with primary amines, but the most useful ones also react with secondary amines such that proline and hydroxyproline are also measured. In addition to improving chromatography, derivatization can make the amino acids readily detectable by UV absorbance or fluorescence.

For more than 50 years, Waters has provided reversed-phase chromatographic solutions that have successfully addressed a variety of organic compound analytical needs, including amino acid analysis. Hundreds of published papers have positively testified to the successful application of one of Waters pre-column amino acid derivatization chemistries that are used prior to the reversed-phase separation with on-line detection of resolved peaks using either UV absorbance or fluorescence. Waters offers three distinct methods that utilize pre-column derivatization and reversed-phase chromatography for accurate identification and quantitation of free or bound amino acids: Pico•Tag, AccQ•Tag, and AccQ•Tag Ultra.

Pico•Tag Method	AccQ•Tag Method	AccQ•Tag Ultra Chemistry Package
1980's	1990's	2006
▪ Designed for use with HPLC systems ▪ Applicable to any sample including protein hydrolysates, physiologic fluids, feeds, foods, and pharmaceutical preparations ▪ Based on the coupling reaction of the well known Edman Degradation, the reaction of phenylisothiocyanate (PITC) with both primary and secondary amino acids to form phenylthiocarbamyl (PTC) derivatives ▪ QC tested for use on HPLC with UV detection	▪ Designed for use with HPLC systems ▪ Suitable for protein and peptide identification and quantitation, monitoring cell culture media and nutritional content of food and feed ▪ Based on AccQ•Tag derivatization of primary and secondary amino acids in aqueous conditions ▪ QC tested for use on HPLC with fluorescence detection	▪ Designed specifically for use with the UPLC Amino Acid Analysis Solution ▪ AccQ•Tag Ultra Chemistry Package is part of a complete solution that includes instrument, software, and support for amino acid analysis of protein hydrolysates, cell culture media, foods, and feeds ▪ Based on AccQ•Tag derivatization of primary and secondary amino acids in aqueous conditions ▪ Reagents, columns, and eluents QC tested with an amino acid separation

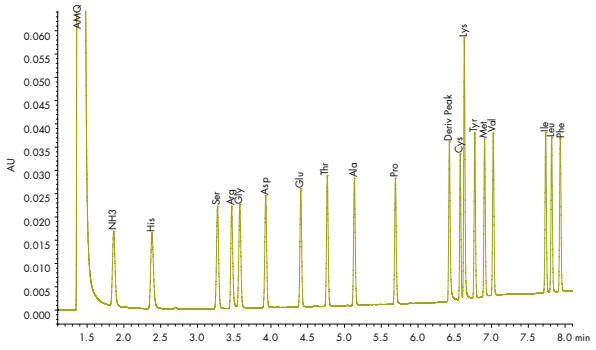
ACCURATE AMINO ACID ANALYSES FROM VARIED SAMPLE MATRICES

The UPLC Amino Acid Analysis Solution includes two complete methods using the same instrumentation and chemistries. The first is suitable for the amino acids derived from protein hydrolysates. The second is suitable for the larger number of free amino acids found in process samples such as cell culture or fermentation broths. The methods differ in the dilution of the AccQ•Tag Ultra Eluent A and the separation column temperature. There are no user adjustments of pH or modifications of composition for either Eluent A or Eluent B.

Hydrolysate Standard 10 pmol/µL

Conditions

Sample:	10 pmol Hydrolysate Standard
Column:	AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 100 mm (p/n: 186003837)
Temp.:	55 °C
Eluent A:	AccQ•Tag Ultra Eluent A – 1:20 Dilution
Eluent B:	AccQ•Tag Ultra Eluent B
Flow rate:	0.7 mL/min
Gradient:	UPLC Amino Acid Analysis Solution Hydrolysate Gradient (provided in the UPLC Amino Acid Analysis Solution System Guide)
UV detection:	260 nm

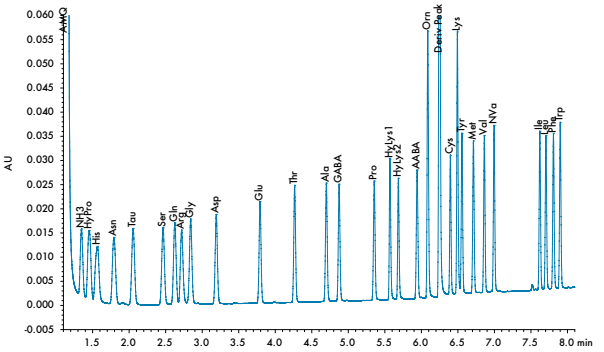


Separation of standard amino acids using the UPLC Amino Acid Analysis Solution Hydrolysate Method.

Cell Culture Standard 10 pmol/µL

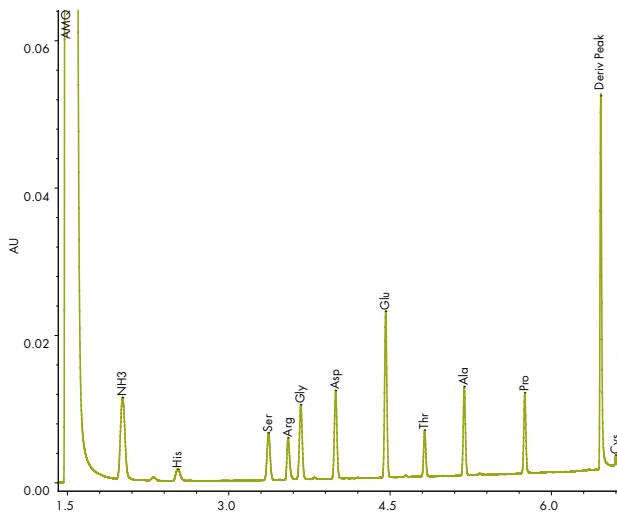
Conditions

Sample:	10 pmol Cell Culture Standard
Column:	AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 100 mm (p/n: 186003837)
Temp.:	60 °C
Eluent A:	AccQ•Tag Ultra Eluent A – 1:10 Dilution
Eluent B:	AccQ•Tag Ultra Eluent B
Flow rate:	0.7 mL/min
Gradient:	UPLC Amino Acid Analysis Solution Cell Culture Gradient (provided in the UPLC Amino Acid Analysis Solution System Guide)
UV detection:	260 nm



Separation of the larger set of standard amino acids using the UPLC Amino Acid Analysis Solution Cell Culture Method. No modification of the mobile phase pH or composition is required.

Amino Acid Analysis of Hydrolyzed Poultry Diet

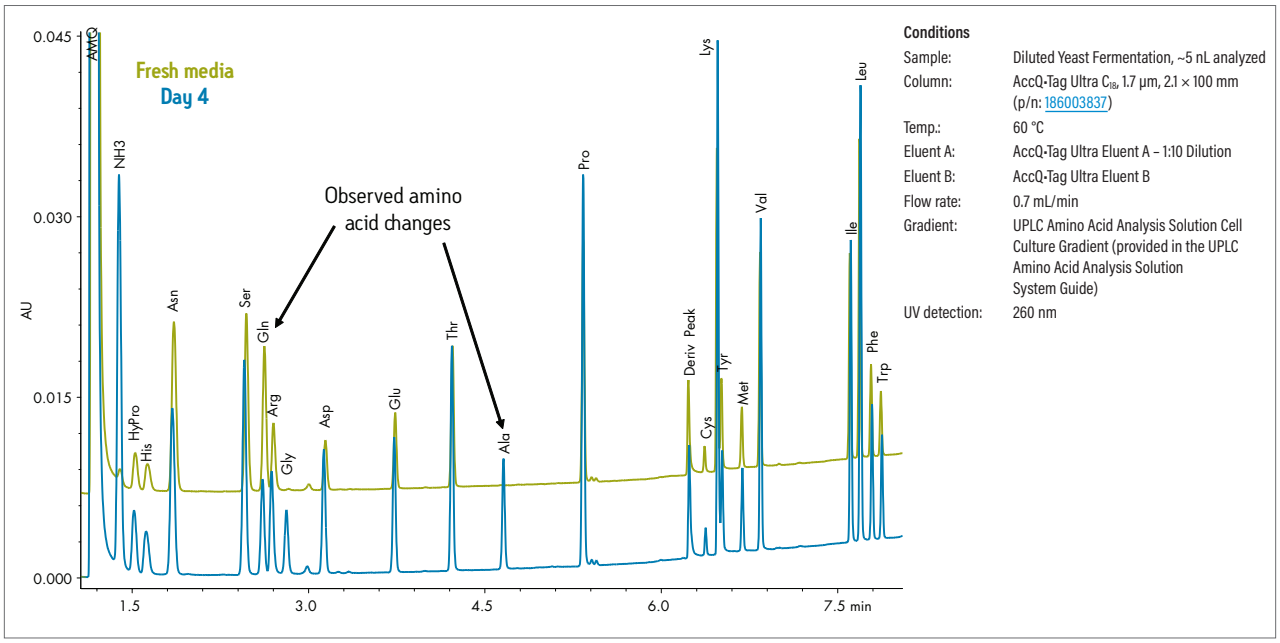


Conditions

Sample:	Acid Hydrolysate of Poultry Diet, ~6 ng
Column:	AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 100 mm (p/n: 186003837)
Temp.:	55 °C
Eluent A:	AccQ•Tag Ultra Eluent A – 1:20 Dilution
Eluent B:	AccQ•Tag Ultra Eluent B
Flow rate:	0.7 mL/min
Gradient:	UPLC Amino Acid Analysis Solution Hydrolysate Gradient (provided in the UPLC Amino Acid Analysis Solution System Guide)
UV detection:	260 nm

The 75 replicate analyses of a poultry diet mixed feed gives reproducible measurements of the weight percentage of the growth-limiting amino acids, typically 1% or better. The high sensitivity of the method ensures that only a very small aliquot of sample is required, thereby minimizing interferences.

Amino Acid Analysis of Cell Culture Media



Amino acid levels in a growing cell culture change over a relatively short period shown here as a decrease in glutamine accompanied by an increase in alanine. The supplied methods were used without modification and no sample prep beyond dilution was required.

UPLC: AccQ•Tag ULTRA AMINO ACID ANALYSIS SOLUTION

Waters' UPLC Amino Acid Analysis Application Solution is the product of over 25 years of experience in amino acid analysis, highlighted by the development and industry-wide acceptance of the innovative and proven Pico•Tag and AccQ•Tag chemistries. The UPLC Amino Acid Analysis Solution is holistically designed to offer a total application solution that is optimized for accurate, reliable, and reproducible analysis of amino acids. The solution leverages Waters experience in separation science, derivatization chemistries, and information management to ensure accurate and precise qualitative and quantitative results. Our solution also provides performance-qualified methodologies that are designed to be rugged and reliable, assuring reproducible results day-to-day, instrument-to-instrument, lab-to-lab, around the world—with the expert support that scientists have come to expect from Waters. Users can feel confident with assured performance in the areas of protein characterization, cell culture monitoring, and nutritional analysis of foods and feeds.

The UPLC Amino Acid Analysis Solution consists of:

- ACQUITY UPLC (binary), ACQUITY UPLC H-Class (quaternary), or ACQUITY UPLC H-Class Bio (quaternary) System with a tunable UV detector for enhanced chromatographic resolution and maximum-sensitivity detection
- AccQ•Tag Ultra derivatization chemistries including quality-controlled columns, reagents, and eluents
- Empower™ 2 pre-configured projects, methods, and report templates
- Installation and application training and support
- Application-specific performance qualification
- Connections INSIGHT™ ISDP instrument diagnostics to ensure continuous, consistent, and reliable operation
- Standards and kits to validate and troubleshoot

AccQ•Tag Ultra Chemistry

The AccQ•Tag Ultra chemistry is an integral component of the UPLC Amino Acid Analysis Application Solution. This application solution is an integrated combination of instrumentation, derivatization chemistry, separation column and eluents, methods and software. Analysts are assured of accurate and precise amino acid analyses with the complete application solution. The use of the AccQ•Tag Ultra chemistry without the rest of the application solution is not supported as an Amino Acid Analysis method.

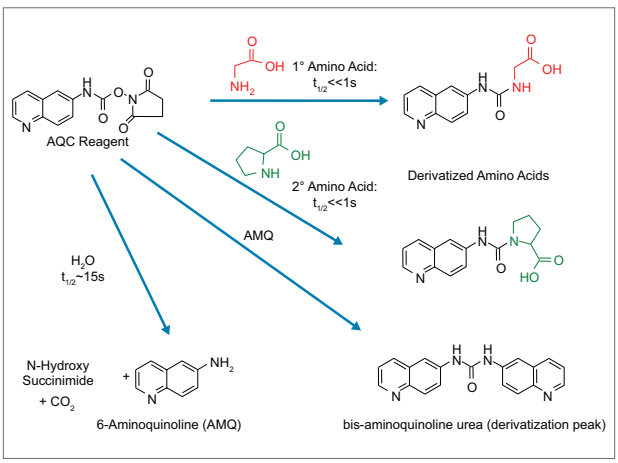
AccQ•Tag Ultra chemistry is different from the AccQ•Tag HPLC method described later in this chapter. Although the components of the two derivatization kits are the same, the QC tests are based on the specific separation and detection protocols. Both methods begin with the same derivatization chemistry but differ in all the other details such that components cannot be interchanged. Most importantly, the AccQ•Tag Ultra column has completely different chemistry from the AccQ•Tag Column. The AccQ•Tag Ultra Column leverages Waters 1.7 µm hybrid-silica BEH Technology particles that deliver the excellent column efficiency and resolution. The column also includes eCord™ Intelligent Chip Technology that is permanently attached to the column to easily track its history. The mobile phases in the AccQ•Tag Ultra chemistry are different from those used for the AccQ•Tag HPLC method, each being optimized for the specific column and detection technique.

Compared to traditional HPLC methods, the UPLC Amino Acid Analysis Solution results in peaks that are much sharper and better resolved. This improved resolution results in a rugged method where there is no ambiguity in peak identification and it simplifies quantitation. The better resolution provides a precise, reliable method. The dramatically higher throughput (3 to 5 times faster) with UPLC Technology enables users to make more informed decisions faster and to perform more analyses per day.

AccQ•Tag Derivatization Reaction

- Utilizes AccQ•Tag Ultra Reagent Powder
  - 6-aminoquinolyl-N-hydroxysuccinimidyl carbamate (AQC)
  - US Patent #5,296,599 and European Patent #EP 0 533 200 B1
- AQC reacts rapidly with both primary and secondary amines
- Excess reagent reacts more slowly with water to form 6-aminoquinoline (AMQ)
- AMQ reacts slowly with excess AQC reagent to form a bisurea
- Derivatized amino acids are separated chromatographically from the byproducts
- Requires no vacuum drying, sample prep, or extraction

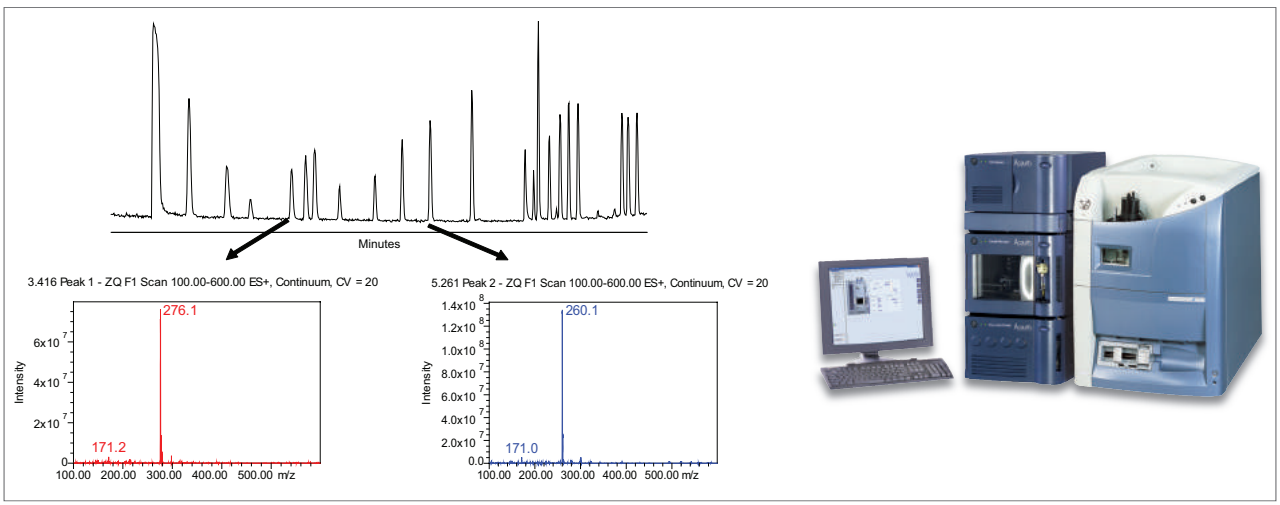
Chemistry of the AccQ•Tag Derivatization Reaction



MS Compatible

The UPLC Amino Acid Analysis Application Solution is directly compatible with electrospray mass spectrometry. No adjustment is required to have an MS TIC that exactly matches the UV trace. MS is extremely useful for any samples that may have an extra, unknown, or unexpected peak, since the identification of amino acids can be confirmed by their molecular weight. Although MS is not required for routine peak identification and does not provide additional useful sensitivity, the use of MS-compatible mobile phases makes using MS detection simple.

Direct Flow into Source at 700 µL/min



The UPLC Amino Acid Analysis Application Solution is directly compatible with electrospray mass spectrometry.

Amino Acid Analysis Standard

This standard contains (10) 1 mL ampules of unlabeled amino acid standards to benchmark and troubleshoot the AccQ•Tag Ultra, AccQ•Tag, or Pico•Tag methods.

Ordering Information

Amino Acid Standard

Description	P/N
Amino Acid Standard (AccQ•Tag, Pico•Tag, AccQ•Tag Ultra)	WAT088122

AccQ•Tag Ultra Amino Acid Analysis Kits and Accessories

Description	Qty.	P/N
ACQUITY UPLC AAA Application Kit		176001279
This Kit is intended to enable existing ACQUITY UPLC Systems for AAA applications.		
Kit contains:		
Amino acid standard, hydrolysate	10 × 1 mL	
Sample tubes	4 × 72/pk	
Total recovery vials with caps	3 × 100/pk	
Column stabilizer kit, 150 mm		
AccQ•Tag Ultra Derivatization Kit		
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 100 mm Column		
AccQ•Tag Ultra Eluent A, concentrate	950 mL	
AccQ•Tag Ultra Eluent B	950 mL	
Tube inlet .0025 I.D. PEEK nut PDA assembly		
2 µL Sample loop		
Column In-line filter kit		
UPLC AAA solution information set		
UPLC AAA application solution startup tests		
Cert. AAA application and familiarization		
UPLC AAA H-Class Applications Kit		176002983
This kit is intended to enable existing ACQUITY UPLC H-Class Systems for AAA applications.		
Kit contains:		
AccQ•Tag Ultra Derivatization Kit, 250 analyses		
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 100 mm Column		
AccQ•Tag Ultra Eluent A, concentrate	950 mL	
AccQ•Tag Ultra Eluent B	950 mL	
Amino acid standard, hydrolysate	10 × 1 mL	
Total recovery vials	3 × 100/pk	
Tube inlet 0.0025 I.D. PEEK nut PDA assembly		
Column In-line filter kit		
UPLC AAA H-Class solution information set		
AAA application and familiarization service		

Description	Qty.	P/N
AccQ•Tag Ultra Chemistry Kit		176001235
The refill kit is intended to recharge the AccQ•Tag Ultra chemistries that are part of the application kit. This kit should be purchased by those that have already purchased the AccQ•Tag Ultra Application Solution. This kit is applicable to both ACQUITY UPLC and ACQUITY UPLC H-Class AAA Application Solutions, and should not be purchased as part of an initial system.		
Kit contains:		
AccQ•Tag Ultra Derivatization Kit, 250 analyses		
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 100 mm Column		
AccQ•Tag Ultra Eluent A, concentrate	950 mL	
AccQ•Tag Ultra Eluent B	950 mL	
Amino acid standard, hydrolysate	10 × 1 mL	
Sample tubes	4 × 72/pk	
Total recovery vials with caps	3 × 100/pk	
AccQ•Tag Ultra Derivatization Kit, 250 Analyses		186003836
AccQ•Tag Ultra Borate Buffer	5 × 6 mL	
AccQ•Tag Ultra Derivatization Reagent Powder	5 × 3 mg	
AccQ•Tag Ultra Reagent Diluent	5 × 4 mL	
Amino Acid Standard, Hydrolysate	10 × 1 mL	WAT088122
A standard mixture containing 18 amino acids (17 hydrolysate amino acids each at 2.5 mM and cystine at 1.25 mM)		
Sample Tubes	4 × 72/pk	WAT007571
Total Recovery Vials with Caps	3 × 100/pk	186000384C
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 100 mm Column		186003837
AccQ•Tag Ultra Eluent A, concentrate	950 mL	186003838
AccQ•Tag Ultra Eluent B	950 mL	186003839

HPLC: AccQ•Tag AMINO ACID ANALYSIS SOLUTION

The HPLC AccQ•Tag Method utilizes the same pre-column derivatization step as the AccQ•Tag Ultra Method. The AccQ•Fluor™ Reagent, 6-aminoquinolyl-N-hydroxysuccinimidyl carbamate (AQC), derivatizes primary and secondary amines in a simple, single-step reaction to yield highly stable, fluorescent adducts. We offer the AccQ•Tag Method as a system package consisting of pre-packaged reagents and extensive documentation.

The AccQ•Tag chemistry package contains the items you need for up to 250 analyses of protein and peptide hydrolysate amino acids.

AccQ•Tag Derivatization Kit

The AccQ•Tag Derivatization Kit contains five sets of the derivatizing reagents. Each set of reagents includes one vial each of:

- AccQ•Fluor Borate Buffer – The buffer is added to the samples to ensure the optimum pH for derivatization.
- AccQ•Fluor Reagent Powder – The reagent powder is the 6-aminoquinolyl-N-hydroxysuccinimidyl carbamate (AQC) derivatizing reagent. It is shipped dry for maximum stability.
- AccQ•Fluor Reagent Diluent – This diluent, acetonitrile, is used reconstitute the reagent for derivatization.

AccQ•Tag Amino Acid Analysis Column

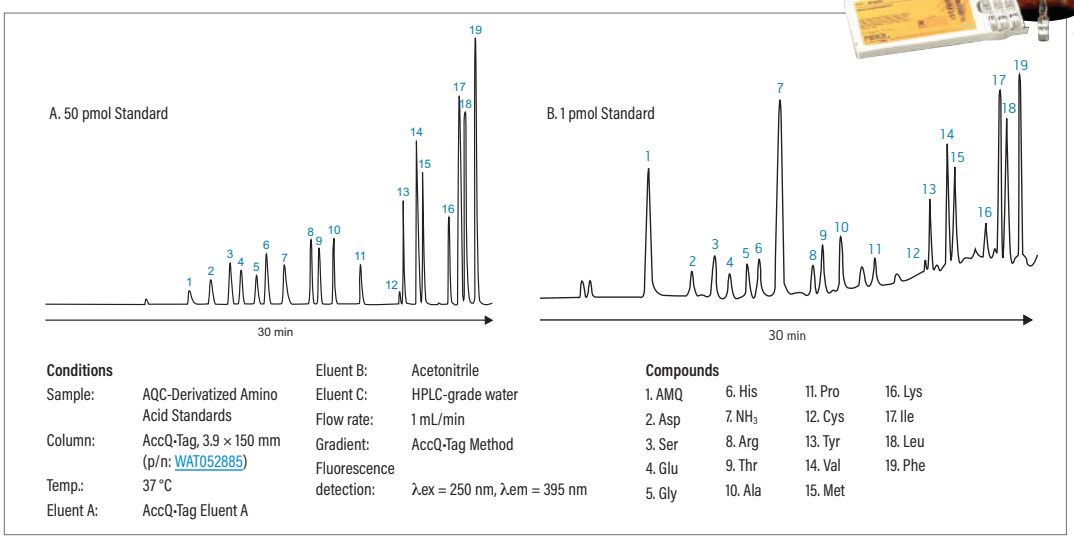
The AccQ•Tag Column is a high-efficiency HPLC column specifically certified for use with the AccQ•Tag Method. This column separates the amino acid derivatives produced by the AccQ•Fluor derivatization reaction.

Ordering Information

AccQ•Tag Amino Acid Analysis Kits and Accessories for HPLC and UHPLC AAA Analysis

Description	Qty.	P/N
AccQ•Tag Chemistry Kit		WAT052875
Kit is for up to 250 analyses and contains:		
AccQ•Fluor Reagent 1	5 × 6 mL	
AccQ•Fluor Reagent 2A	5 × 3 mg	
AccQ•Fluor Reagent 2B	5 × 3 mL	
AccQ•Tag Column, 3.9 × 150 mm		
AccQ•Tag Eluent A, concentrate	2 × 1 L	
Sample tubes	4 × 72/pk	
Amino acid standard, hydrolysate	10 × 1 mL	
AccQ•Tag User Guide		
Amino Acid Standard, Hydrolysate	10 × 1 mL	WAT088122
A standard mixture containing 18 amino acids (17 hydrolysate amino acids each at 2.5 mM and cystine at 1.25 mM).		
AccQ•Tag Eluent A	1 L	WAT052890
Concentrate		
AccQ•Tag Eluent B	1 L	WAT052895
AccQ•Fluor Reagent Kit		WAT052880
Kit contains:		
AccQ•Fluor Reagent 1	5 × 6 mL	
AccQ•Fluor Reagent 2A	5 × 3 mg	
AccQ•Fluor Reagent 2B	5 × 4 mL	
The components of this kit are not available separately		
AccQ•Tag Column, 3.9 × 150 mm		WAT052885
AccQ•Tag User Guide		WAT052874

AccQ•Tag Analysis of Hydrolysate Amino Acids



Conditions

Sample:	AQC-Derivatized Amino Acid Standards
Column:	AccQ•Tag, 3.9 × 150 mm (p/n: WAT052885)
Temp.:	37 °C
Eluent A:	AccQ•Tag Eluent A
Eluent B:	Acetonitrile
Eluent C:	HPLC-grade water
Flow rate:	1 mL/min
Gradient:	AccQ•Tag Method
Fluorescence detection:	λex = 250 nm, λem = 395 nm

Compounds

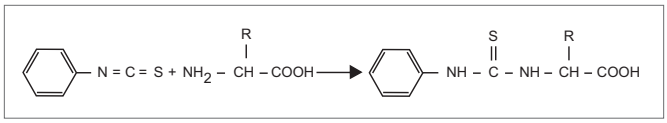
1. AMQ	6. His	11. Pro	16. Lys
2. Asp	7. NH_3	12. Cys	17. Ile
3. Ser	8. Arg	13. Tyr	18. Leu
4. Glu	9. Thr	14. Val	19. Phe
5. Gly	10. Ala	15. Met	

Application of the AccQ•Tag Method to the analysis of hydrolysate amino acids is illustrated. The high purity reagents provided in the AccQ•Tag chemistry package enable high sensitivity analysis by minimizing background amino acid content. AMQ (6-aminoquinoline).

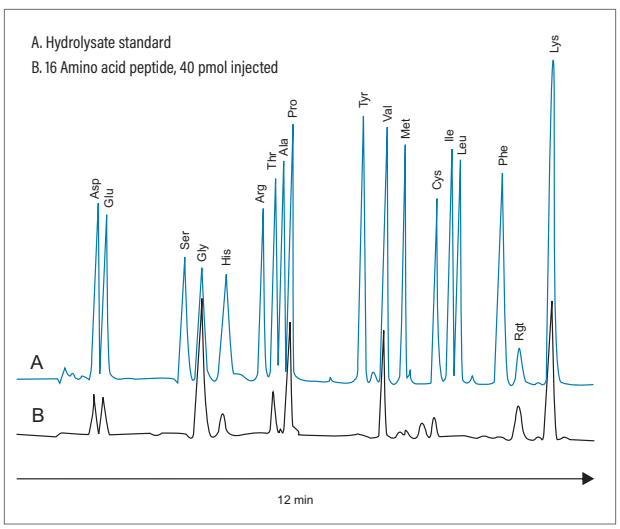
HPLC: Pico•Tag METHOD

Waters Pico•Tag Method is a widely-used technique for HPLC amino acid analysis. This method is applicable to any sample including protein hydrolysates, physiologic fluids, feeds, foods, and pharmaceutical preparations. Pre-column derivatization relies on the coupling reaction of the well-known Edman Degradation, the reaction of phenylisothiocyanate (PITC) with both primary and secondary amino acids to form phenylthiocarbamyl (PTC) derivatives. The PTC-amino acid adducts are stable and easily separated by reversed-phase HPLC. A single product is formed for each amino acid. Most reaction by-products and all derivatization reagents are volatile, so they may be removed from the sample by vacuum drying.

Pico•Tag Derivatization Reaction

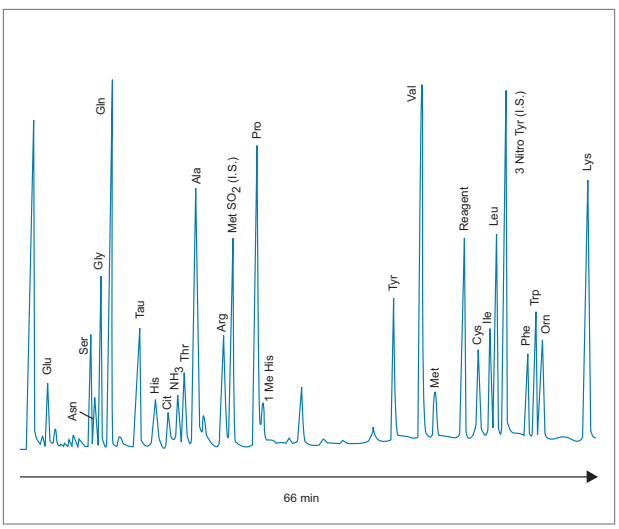


Peptide Hydrolysate Amino Acid Analysis Using the Pico•Tag Method



This 12-minute analysis using Waters Pico•Tag Amino Acid Analysis Method provides identification and accurate quantitation of the amino acid composition.

Plasma Amino Acid Profile Using the Pico•Tag Method



Reproducible and reliable plasma amino acid profiles are obtained in 66 minutes using Waters Pico•Tag Method. In this analysis, 100 µL plasma was diluted with an internal standard, deproteinized by centrifugal ultrafiltration, and derivatized. The methionine sulfone (internal standard) peak represents 25 picomoles. Courtesy of A.S. Feste, R.W. Drummond, and S.J. Dudrich, Nutritional Support Service, St. Luke Episcopal Hospital, Houston, Texas.

Ordering Information

Pico•Tag Amino Acid Analysis of Physiologic Amino Acids

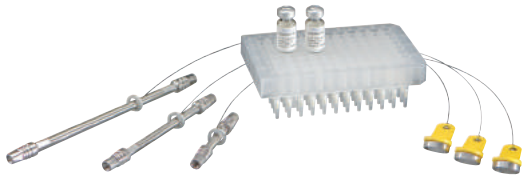
Description	Qty.	P/N
Chemistry Package for Amino Acid Analysis of Physiologic Amino Acids		WAT091681
Kit contains: Free Amino Acid Analysis Column, 3.9 × 300 mm		
Pico•Tag Reagent Kit		
Pico•Tag Eluent 1	4 × 1 L	
Pico•Tag Eluent 2	4 × 1 L	
Pico•Tag Diluent	100 mL	
Manual, column heater inserts, and sample tubes		
Pico•Tag Reagent Kit (PITC, TEA, and standards A/N and B)		WAT010947
Amino Acid Analysis Column, 3.9 × 300 mm		WAT010950
Pico•Tag Eluent 1	4 × 1 L	WAT010960
Pico•Tag Eluent 2	4 × 1 L	WAT010965
Pico•Tag Diluent	100 mL	WAT088119
Pico•Tag Eluent 2	1 L	WAT010985

Pico•Tag Amino Acid Analysis for Protein Hydrolysates

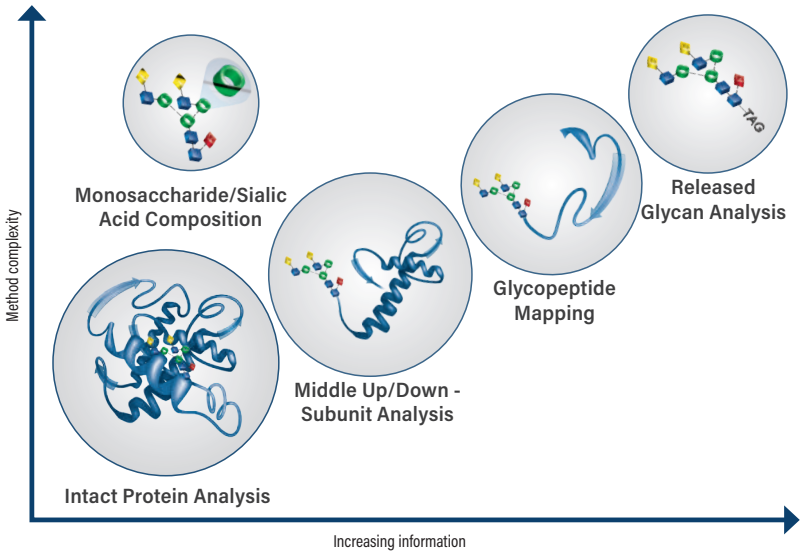
Description	Qty.	P/N
Chemistry Package for Amino Acid Analysis of Protein Hydrolysates		WAT007360
Kit contains: Pico•Tag Column, 3.9 × 150 mm		
Pico•Tag Reagent Kit (includes PITC, TEA, and standards)		
Pico•Tag Eluent A	4 × 1 L	
Pico•Tag Eluent B	4 × 1 L	
Pico•Tag Diluent	100 mL	
Manual, column heater inserts, and sample tubes		
Pico•Tag Column, 3.9 × 150 mm		WAT088131
Pico•Tag Reagent Kit (PITC, TEA, and standards)		WAT088123
Pico•Tag Eluent A	4 × 1 L	WAT088108
Pico•Tag Eluent B	4 × 1 L	WAT088112
Pico•Tag Diluent	100 mL	WAT088119
Pico•Tag Eluent B	1 L	WAT010983

Glycan and Glycoprotein Analysis

More than two thirds of recombinant biopharmaceutical products on the market are glycoproteins, and nearly every stage of their manufacture is carefully monitored and regulated to ensure consistency in quality, safety, and effectiveness. Consequently, international regulatory agencies require use of state-of-the-art glycan analyses methods to help ensure the successful development and commercialization of effective and safe glycosylated biotherapeutics. To address this need, Waters offers a variety of robust, reproducible, complementary, information-rich analytical methods for this application.



CONSOLIDATING COMPLEMENTARY TECHNIQUES TO STREAMLINE GLYCAN ANALYSIS



For analyzing all structural levels of glycoproteins, we offer complete approaches according to workflow:

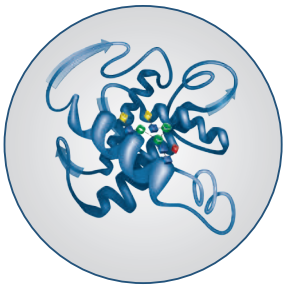
- Intact glycoprotein profiling (e.g., glycan occupancy determination)
- Middle up/down - subunit analysis
- Glycopeptide mapping
- Released and labeled glycan analysis
- Monosaccharide/sialic acid composition

Glycoprotein and Glycopeptide Analysis

Intact glycoprotein profiling, subunit analysis, and glycopeptide mapping are means of characterizing protein glycosylation and are valuable orthogonal methods that provide accurate mass confirmation, glycan identification, and elucidate sites of glycan occupancy. Waters ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Column is a powerful, single column chemistry that can run multiple complimentary, glycoprotein analyses methods.

- Optimized, large-pore, HILIC stationary phase for resolving the glycoforms of intact and digested glycoproteins
- Unprecedented separation selectivity and orthogonality to reversed phase
- High resolution glycopeptide mapping without limitations due to peptide/glycan size or composition
- Improved resolution in separations of large, released N-glycans (EPO, Factor IX)

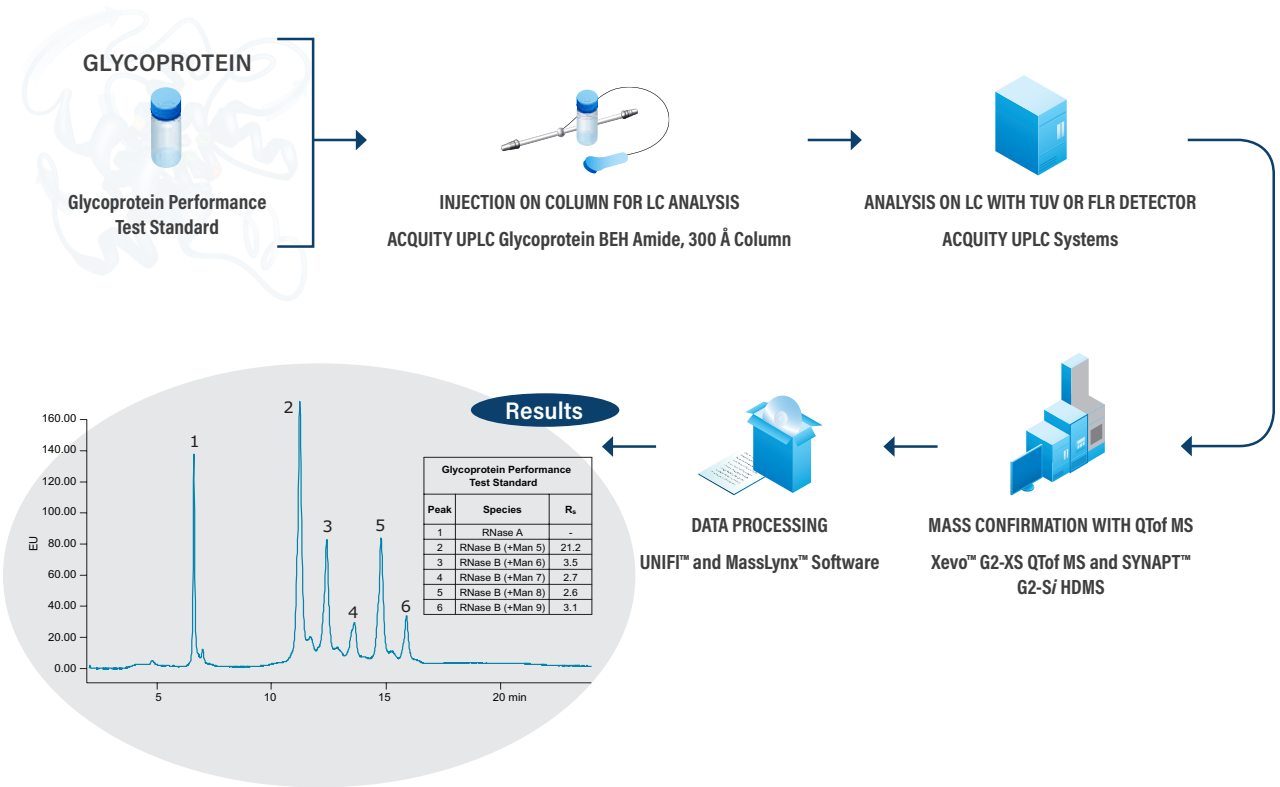
INTACT GLYCOPROTEIN ANALYSIS



Waters ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Column separates individual intact protein glycoforms as well as delivers information about glycan occupancy. Using elevated 80 ˚C column temperature, TFA ion pairing, and an HFIP mobile-phase additive, one is able to successfully enhance the solubility of 150,000 Dalton, Intact IgGs for this HILIC-based separation that uses an initial high organic solvent concentration. The figure on the next page shows the HILIC fluorescence chromatograms resulting from a separation of a native Intact mAb Mass Check Standard (a murine IgG1 mAb) and its partially as well as completely deglycosylated isoforms.

- Measure glycan occupancy of an intact therapeutic mAb
- Relative abundance of aglycosylated forms (-2 and -1 N glycans moetites) can be monitored by fluorescence
- Wide-pore phase facilitates the development of previously unimagined separations that includes an orthogonal separation of mAb fragments compared to well-established, reversed-phase chromatography

Intact Protein Analysis Workflow



ACQUITY UPLC Glycan vs. Glycoprotein BEH Amide Analyses of Intact mAb vs. Partially- and Fully-Deglycosylated Species

LC Conditions

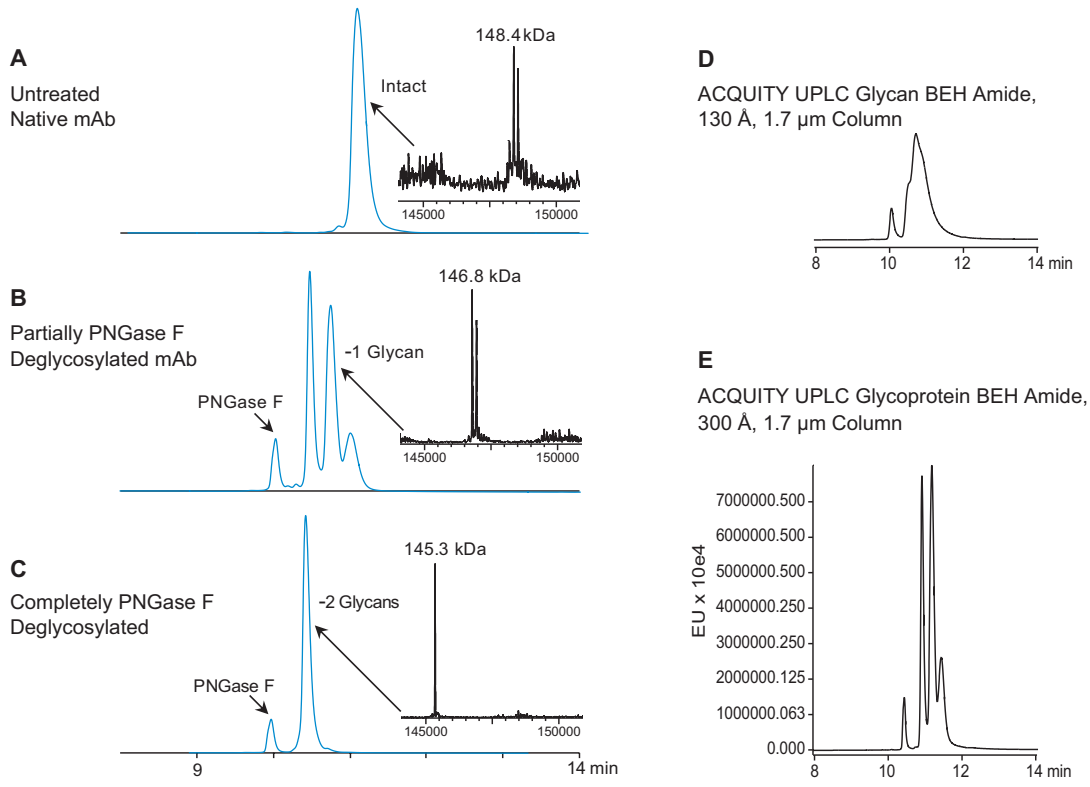
System:	ACQUITY UPLC H-Class Bio
Columns:	ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 100 mm (p/n: 176003701) that contains Glycoprotein Performance Test Standard (p/n: 186008010) ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 150 mm (p/n: 186004742)
Mobile phase A:	0.1% TFA, 0.3% HFIP in water
Mobile phase B:	0.1% TFA, 0.3% HFIP in acetonitrile
Column temp.:	80 °C
Flow rate:	0.2 mL/min
Injection vol.:	≤1 µL (aqueous diluents)

Gradient:

Time	%A	%B	Curve
0.0	20	80	6
10.0	50	50	6
11.0	100	0	6
14.0	100	0	6
15.0	20	80	6
25.0	20	80	6

MS Conditions

System:	Xevo G2 QTof
Ionization mode:	ESI+
Analyzer mode:	Resolution (~20 K)
Capillary voltage:	3.0 kV
Cone voltage:	45 V
Source temp.:	150 °C
Desolvation temp.:	350 °C



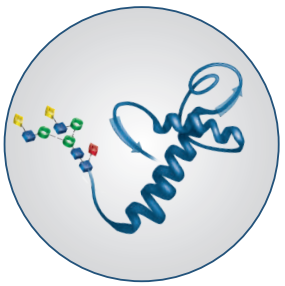
Glycoprotein BEH Amide, 300 Å, 1.7 µm Column analyses of Waters mAb Mass Check Standard showing native (A), partially deglycosylated (B), and completely deglycosylated (C) samples. Also showing HILIC fluorescence profiles of partially deglycosylated Intact mAb Mass Check Standard using two ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 150 mm Columns in series (D) versus two ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 150 mm Columns in series (E).

Ordering Information

ACQUITY UPLC Glycoprotein BEH Amide Columns, Kits, and Standards

Description	P/N
ACQUITY UPLC Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 50 mm, 1/pk with Standard	176003700
ACQUITY UPLC Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 100 mm, 1/pk with Standard	176003701
ACQUITY UPLC Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 150 mm, 1/pk with Standard	176003702
ACQUITY UPLC Glycoprotein BEH Amide VanGuard Pre-Column, 300 Å, 1.7 µm, 2.1 × 5 mm, 3/pk with Standard	176003699
ACQUITY UPLC Glycoprotein BEH Amide Method Validation Kit, 300 Å, 1.7 µm, 2.1 × 100 mm, 3/pk with Standard	176003703
Glycoprotein Performance Test Standard	186008010
Intact mAb Mass Check Standard	186006552

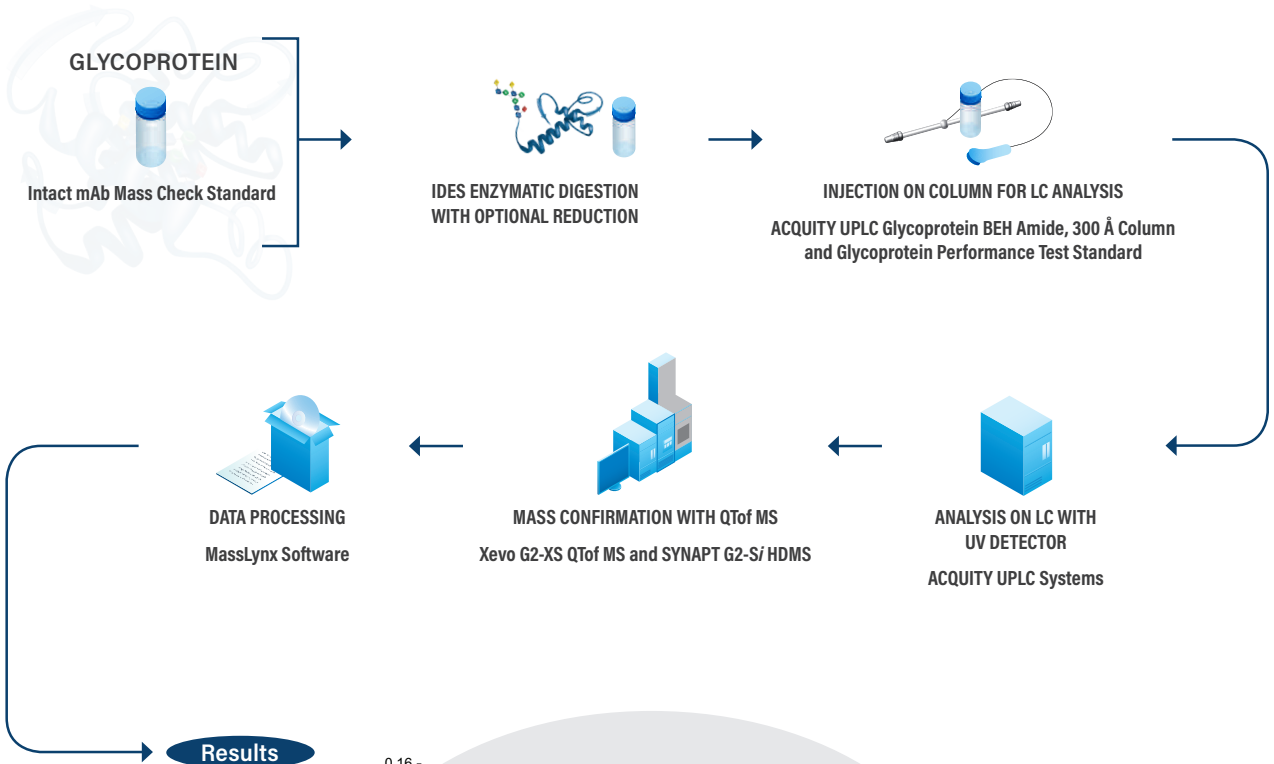
GLYCOPROTEIN SUBUNIT ANALYSIS

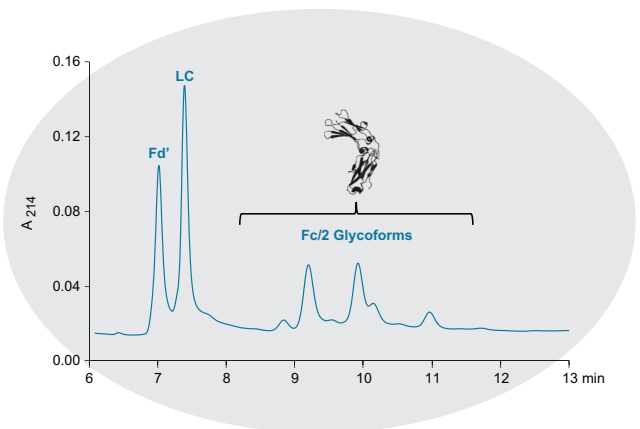


Reversed-phase chromatography is a well-established and commonly used technique to analyze intact protein of protein subunits generated from digestions with enzymes such as FabRICATOR (IdeS protease) that generates a site cleavage at the hinge region of a monoclonal antibody generating Fc and F(ab')2 fragments (www.genovis.com).

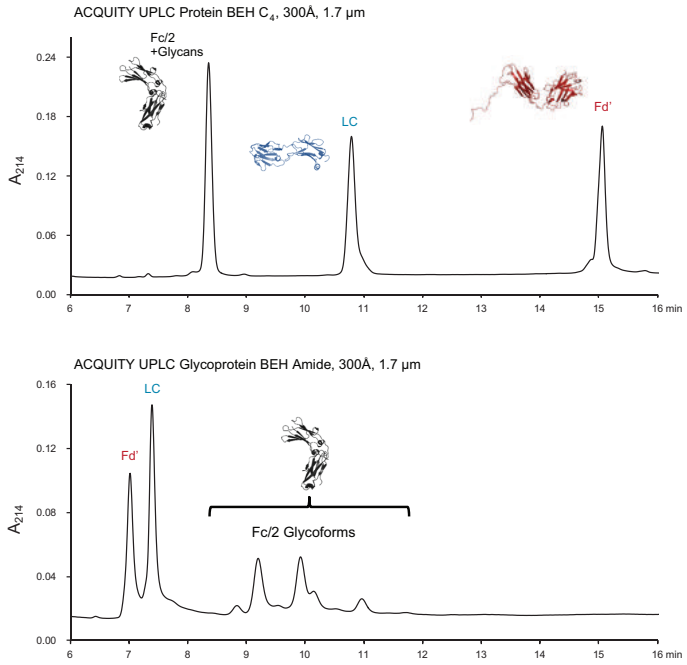
- Provides orthogonal and complementary results, compared to C_4-based reversed-phase separations for glycoprotein subunits

Subunit Analysis Workflow





HILIC Amide Offers an Orthogonal, Complementary, and Information-Rich Approach to IgG Subunit Analyses



LC Conditions

System:	ACQUITY UPLC H-Class Bio, Xevo G2 QTof, 500-4000 *m/z*, 2 Hz
Sample:	1 µg of IdeS digested mAb
Injection:	0.67 µL
Mobile phase A:	HPLC-grade water with 0.1% TFA,
Mobile phase B:	HPLC acetonitrile with 0.1% TFA
Flow rate:	0.2 mL/min

Reversed-Phase C_4 (top)

Column:	ACQUITY UPLC Protein BEH C_4, 300 Å, 1.7 µm, 2.1 × 100 mm (p/n: 186004496)
Temp.:	80 °C
Gradient:	5%-33% acetonitrile in 1 min, then 33 to 40% acetonitrile in 20 min

HILIC Amide (bottom)

Column:	ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 100 mm Column Kit (p/n: 176003701) that contains Glycoprotein Performance Test Standard (p/n: 186008010)
Temp.:	80 °C
Gradient:	20% to 30% water in 1 min, then 30% to 37% water in 20 min

Trastuzumab subunit separations. Top: 1 µg of reduced IdeS digest separated using an ACQUITY UPLC Protein BEH C_4, 300 Å, 1.7 µm Column (0.7 µL aqueous injection). Bottom: 1 µg of reduced IdeS digest separated using an ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Column (0.7 µL aqueous injection).

Ordering Information

ACQUITY UPLC Glycoprotein BEH Amide Columns, Kits, and Standards

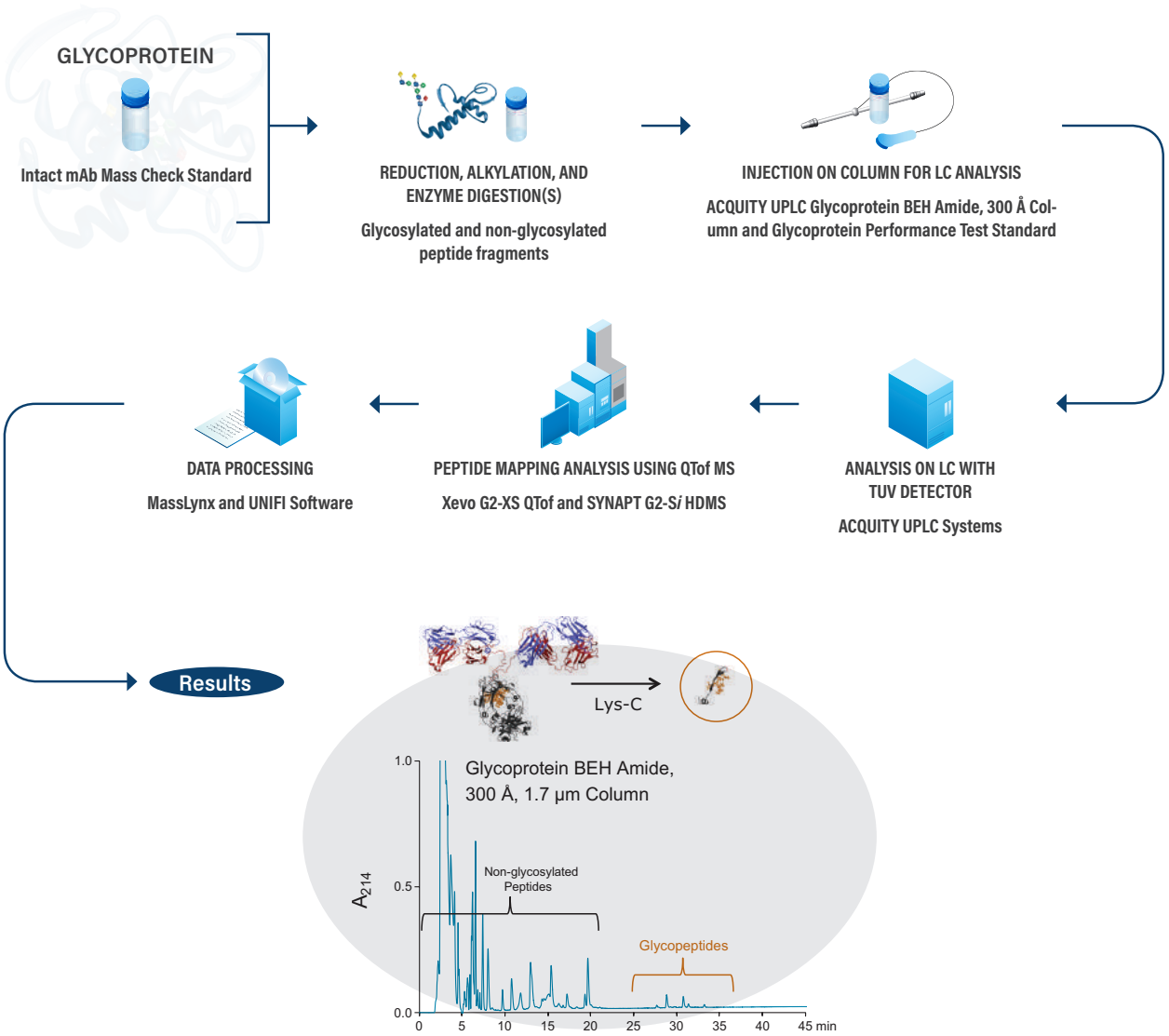
Description	P/N
ACQUITY UPLC Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 50 mm, 1/pk with Standard	176003700
ACQUITY UPLC Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 100 mm, 1/pk with Standard	176003701
ACQUITY UPLC Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 150 mm, 1/pk with Standard	176003702
ACQUITY UPLC Glycoprotein BEH Amide VanGuard Pre-Column, 300 Å, 1.7 µm, 2.1 × 5 mm, 3/pk with Standard	176003699
ACQUITY UPLC Glycoprotein BEH Amide Method Validation Kit, 300 Å, 1.7 µm, 2.1 × 100 mm, 3/pk with Standard	176003703
Glycoprotein Performance Test Standard	186008010
Intact mAb Mass Check Standard	186006552

GLYCOPEPTIDE ANALYSIS

While reversed-phase, UPLC-based separations can resolve glycosylated peptides into their glycoforms, the complete resolution of glycopeptide micro-heterogeneity (same peptide sequence, various glycoforms) remains difficult. This is because retention in RP-LC is mainly due to peptide hydrophobicity, and is less affected by the presence of hydrophilic glycans. The separation is further complicated by the presence of non-glycosylated peptides in the sample that often elute in the vicinity of the glycopeptides of interest. HILIC-based glycopeptide separation provides the following benefits:

- Effectively generate data related to glycan heterogeneity and site occupancy of a trypsin digest N-linked glycoprotein
- Useful for the characterization of O-linked glycans because of the lack of specific and efficient enzymes for their release and characterization of O-linked glycoproteins

Glycopeptide Mapping Workflow



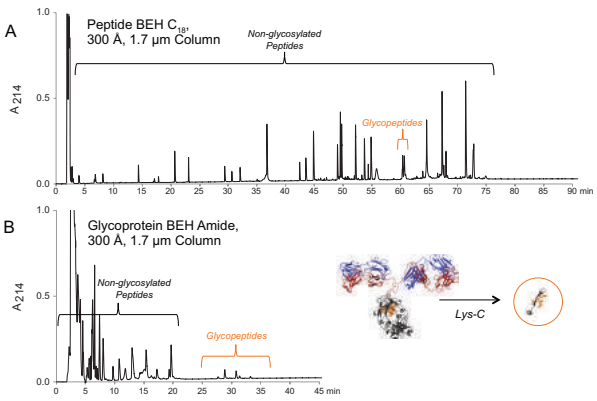
Reversed-Phase vs. HILIC-Based Analyses of a Lys-C Digest of Trastuzumab

LC Conditions

System:	ACQUITY UPLC H-Class Bio
Sample temp.:	10 °C
Vials:	Polypropylene 12 × 32 mm Screw Neck, 300 µL volume (p/n: 186002640)

Reversed-Phase LC

Column:	ACQUITY UPLC Peptide BEH C_{18}, 300 Å, 1.7 µm, 2.1 × 150 mm (p/n: 186003687)
Column temp.:	60 °C
Injection vol.:	24.2 µL (aqueous digest)



Flow rate:	0.2 mL/min			
Mobile phase A:	0.1% (v/v) TFA, water			
Mobile phase B:	0.1% (v/v) TFA, acetonitrile			
Gradient:	Time	%A	%B	Curve
	0.0	98.0	2.0	6
	96.0	50.0	50.0	6

HILIC LC

Column:	ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 150 mm Column Kit (p/n: 176003702) that contains Glycoprotein Performance Test Standard (p/n: 186008010)
Column temp.:	30 °C
Injection volume:	100–250 µL (aqueous digests were diluted with 4 parts acetonitrile and 0.1 part dimethylsulfoxide to obtain a miscible, HILIC-compatible diluent
Flow rate:	0.2 mL/min
Mobile phase A:	0.1% (v/v) TFA, water
Mobile phase B:	0.1% (v/v) TFA, acetonitrile

Gradient:	Time	%A	%B	Curve
	0.0	20.0	80.0	6
	60.0	50.0	50.0	6

MS Conditions

System:	SYNAPT G2-S HDMS	Source temp.:	120 °C
Ionization mode:	ESI+	Desolvation temp.:	350 °C
Analyzer mode:	Resolution (~20 K)	Desolvation gas flow:	800 L/hr
Capillary voltage:	3.0 kV	Acquisition:	50–2500 *m/z*, 0.1 sec scan rate
Cone voltage:	25 V	Data management:	MassLynx Software v4.1/UNIFI v1.7

A traditional reversed-phase separation of the Lys-C digest using an ACQUITY UPLC Peptide BEH C_{18}, 300 Å, 1.7 µm, 2.1 × 150 mm Column (top) vs. a HILIC separation of the Lys-C digest using an ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 150 mm Column (bottom). In each analysis, 9.2 µg of the Lys-C digest was separated using the same gradient slope and injecting sample from a diluent comprised of either approximately 0.2% TFA in 80:20 acetonitrile/water (HILIC) or 100% water (reversed phase).

For more information, reference application note 720005409EN.

Two Parallel Strategies for Glycoprotein Analyses: Glycopeptide Mapping vs. Released Glycan Analysis

LC Conditions (left)

System:	ACQUITY UPLC H-Class Bio
Sample temp.:	10 °C
Vials:	Polypropylene 12 × 32 mm Screw Neck, 300 µL volume (p/n: 186002640)
Column:	ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 150 mm Column Kit (p/n: 176003702) that contains Glycoprotein Performance Test Standard (p/n: 186008010)
Column temp.:	60 °C
Injection:	Analyses were performed of 9.2 µg of Lys-C/tryptic digest in a sample diluent of approximately 0.2% TFA in 80:20 acetonitrile/water
Flow rate:	0.2 mL/min
Mobile phase A:	0.1% (v/v) TFA, water
Mobile phase B:	0.1% (v/v) TFA, acetonitrile

Gradient:	Time	%A	%B	Curve
	0.0	20.0	80.0	6
	60.0	50.0	50.0	6

MS Conditions

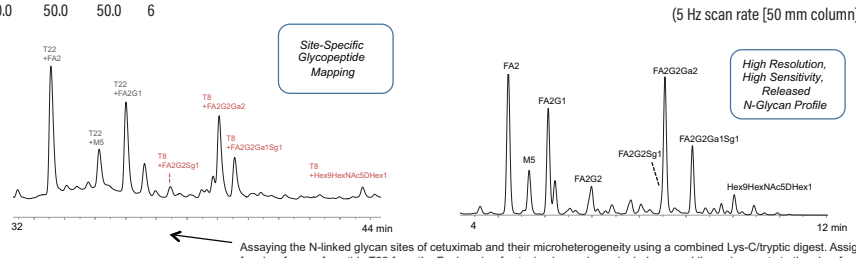
System:	SYNAPT G2-S*i* HDMS
Ionization mode:	ESI+
Analyzer mode:	Resolution (~20 K)
Capillary voltage:	3.0 kV
Cone voltage:	25 V
Source temp.:	120 °C
Desolvation temp.:	350 °C
Desolvation gas flow:	800 L/hr
Acquisition:	50–2500 *m/z*, 0.1 sec scan rate
Data management:	MassLynx Software (v4.1)/UNIFI v1.7

LC Conditions (right)

System:	ACQUITY UPLC H-Class Bio
Sample temp.:	10 °C
Vials:	Polypropylene 12 × 32 mm Screw Neck, 300 µL volume (p/n: 186002640)
Column:	ACQUITY UPLC Glycan BEH Amide 130 Å, 1.7 µm, 2.1 × 50 mm (p/n: 186004740)
Column temp.:	60 °C
Injection volume:	10 µL (DMF/acetonitrile diluted sample)
Mobile phase A:	50 mM ammonium formate, pH 4.4 LC-MS grade; from a 100x concentrate (p/n: 186007081)
Mobile phase B:	Acetonitrile (LC-MS grade)

Gradient:	Time (min)	Flow Rate (mL/min)	%A	%B	Curve
	0.0	0.4	25	75	6
	11.7	0.4	46	54	6
	12.2	0.2	100	0	6

Fluorescence detection: Ex 265/Em 425 nm (*Rapi*Fluor-MS) (5 Hz scan rate [50 mm column], Gain = 1)

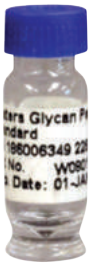


Assaying the N-linked glycan sites of cetuximab and their microheterogeneity using a combined Lys-C/tryptic digest. Assignments for glycoforms of peptide T22 from the Fc domain of cetuximab are shown in dark gray, while assignments to the glycoforms of peptide T8 from the Fab domain are shown in red. Analyses were performed on 9.2 µg of Lys-C/tryptic digest using an ACQUITY UPLC Glycoprotein BEH Amide, 300Å, 1.7 µm, 2.1 x 150 mm Column and a sample diluent of approximately 0.2% TFA in 80:20 acetonitrile/water. For more information, reference application note 720005409EN.

HILIC Profiling of cetuximab glycosylation. HILIC-fluorescence chromatograms of RapiFluor-MS labeled N-glycans from cetuximab obtained using an ACQUITY UPLC Glycan BEH Amide, 300 Å, 1.7 µm, 2.1 × 50 mm Column. Mass spectral data supporting the assignments of the RapiFluor-MS labeled N-glycans are provided.

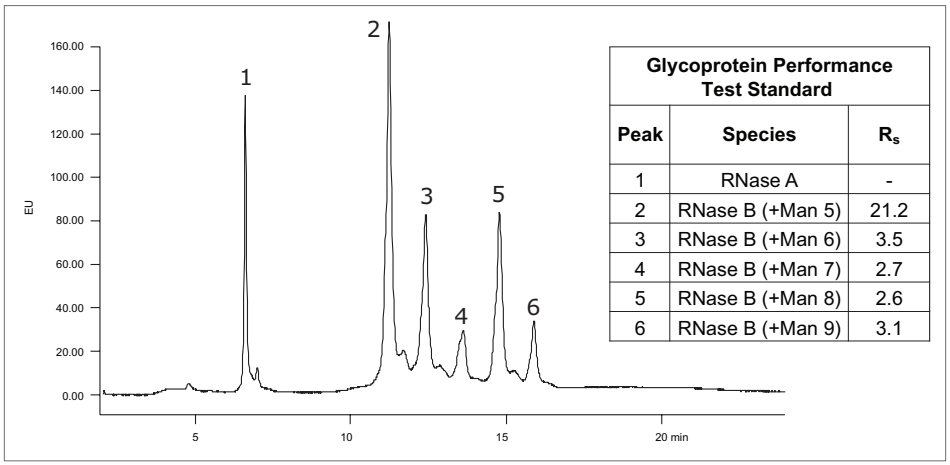
For more information, reference application note 720005385EN.

GLYCOPROTEIN PERFORMANCE TEST STANDARD



Benchmarking, Method Development, and Troubleshooting

Glycoprotein Performance Test Standard is a mix of ribonuclease B from bovine pancreas at 90 µg/vial with ribonuclease A from bovine pancreas at 10 µg/vial used to quality control the ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Column, and is recommended to be used on a regular basis for benchmarking and monitoring column and system performance and lifetime.



Glycoprotein Performance Test Standard		
Peak	**Species**	**R_s**
1	RNase A	-
2	RNase B (+Man 5)	21.2
3	RNase B (+Man 6)	3.5
4	RNase B (+Man 7)	2.7
5	RNase B (+Man 8)	2.6
6	RNase B (+Man 9)	3.1

Separation of the Glycoprotein Performance Test Standard (RNase A + RNase B glycoforms) using an ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 150 mm Column. Fluorescence detection at Ex 280 nm and Em 320 nm and a column temperature of 45 ˚C were employed in this example.

Ordering Information

ACQUITY UPLC Glycoprotein BEH Amide Columns, Kits, and Standards

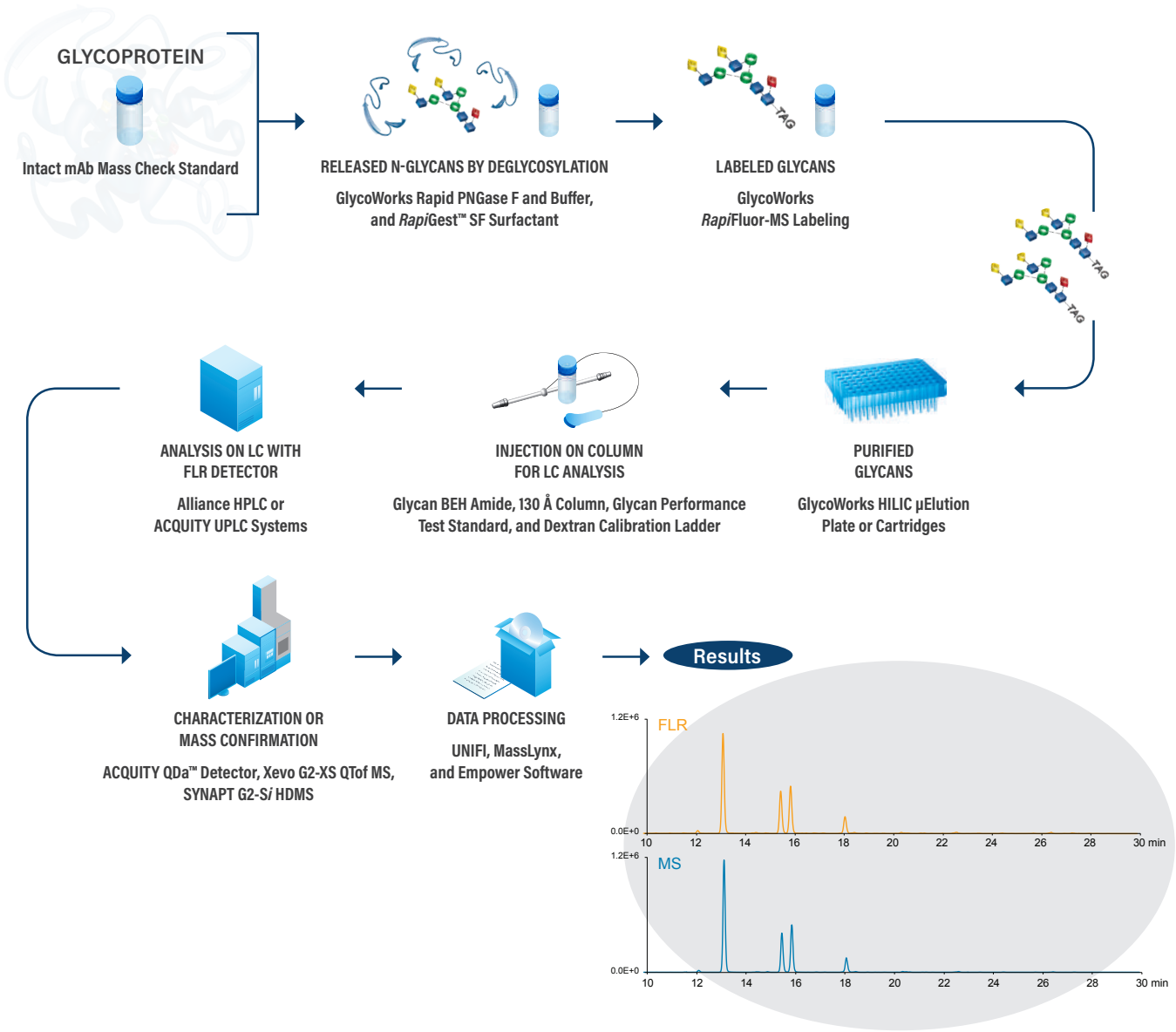
Description	P/N
ACQUITY UPLC Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 50 mm, 1/pk with Standard	176003700
ACQUITY UPLC Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 100 mm, 1/pk with Standard	176003701
ACQUITY UPLC Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 150 mm, 1/pk with Standard	176003702
ACQUITY UPLC Glycoprotein BEH Amide VanGuard Pre-column, 300 Å, 1.7 µm, 2.1 × 5 mm, 3/pk with Standard	176003699
ACQUITY UPLC Glycoprotein BEH Amide Method Validation Kit, 300 Å, 1.7 µm, 2.1 × 100 mm, 3/pk with Standard	176003703
Glycoprotein Performance Test Standard	186008010
Intact mAb Mass Check Standard	186006552

RELEASED N-GLYCAN ANALYSIS

Waters GlycoWorks Sample Preparation Kits and Standards, along with the ACQUITY UPLC and HPLC Glycan BEH Amide Columns, were designed cohesively to provide a seamless and efficient workflow from bench to analysis.

- Fast and simplified sample preparation with the GlycoWorks *Rapi*Fluor-MS N-Glycan Kit
- High resolving power due to the small particle size (1.7 µm) of the fully porous material
- Reproducible column-to-column performance due to the chemical and mechanical stability of the Waters ethylene bridged hybrid (BEH) particle and ligand binding technology
- Scale-up and transferability possible with UPLC and HPLC versions

Released N-Glycan Workflow

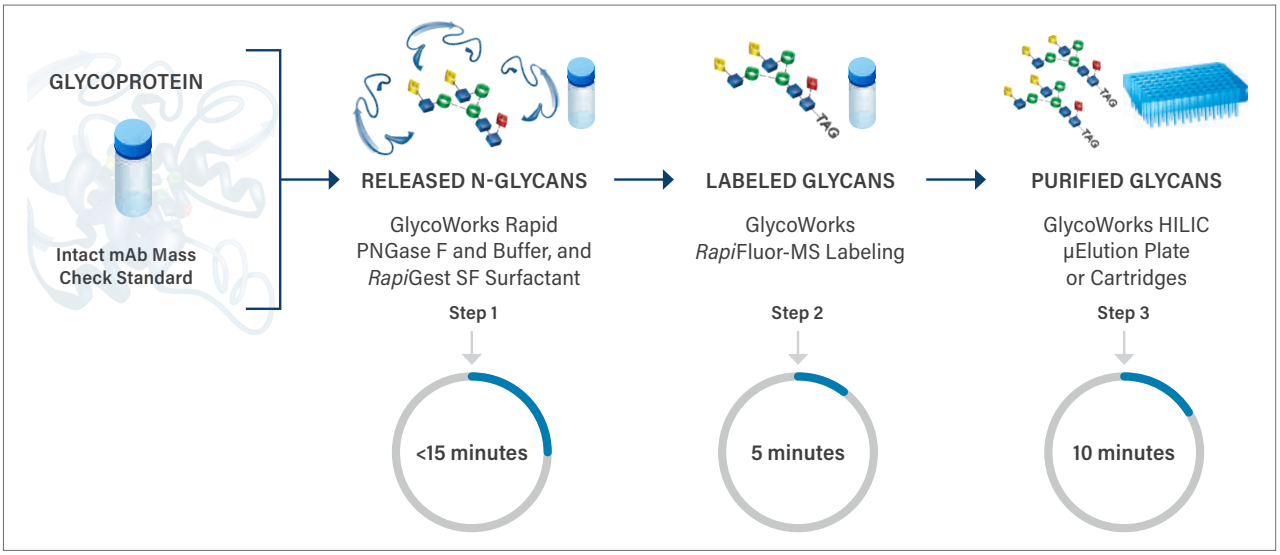


GLYCOWORKS *RAPI*FLUOR-MS RELEASED N-GLYCANS SAMPLE PREPARATION

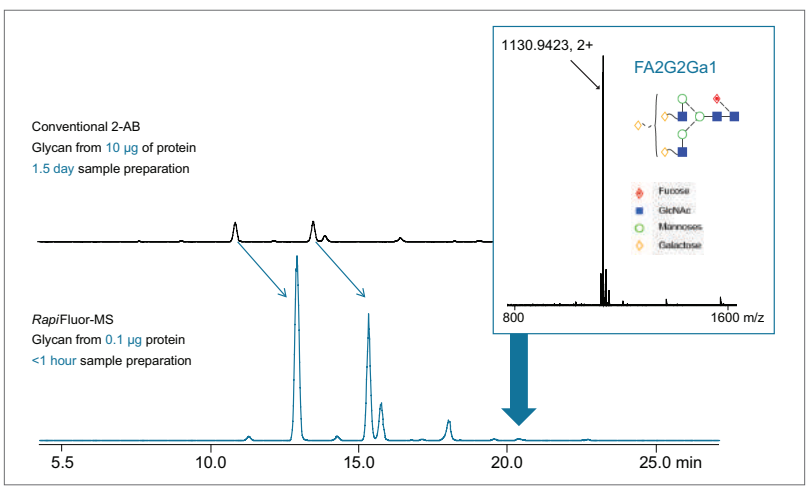
Waters GlycoWorks Consumables offer a more convenient, comprehensive, and effective sample-preparation solution for glycan analysis.

- The GlycoWorks *Rapi*Fluor-MS N-Glycan Kit ensures easy, quick preparation of released-labeled, N-glycan samples
- Streamlined protocols minimize errors and sample loss
- Greatly improved FLR and MS signal intensities help easily identify low-abundance N-linked glycans
- Complete modules for processing 96 samples with flexibility of processing between 8, 24, and 48 samples at a time depending on laboratory demands with automation scripts available
- Support easy training of analysts and the transferring of methods throughout an organization

Three Steps, as little as 30 minutes



Glycan Characterization by UPLC FLR with Xevo G2-XS QTof Mass Spectrometer



Un-ionized form of acids and bases give most retention. Retention of neutral analytes not affected by pH.

Learn more about Waters latest Glycan Solutions.

Visit **waters.com/glycans**

GlycoWorks *Rapi*Fluor-MS Released N-Glycan Sample Preparation Kits

Description	P/N
GlycoWorks *Rapi*Fluor-MS N-Glycan Starter Kit—96 Sample Kit contains: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module, ACQUITY UPLC Glycan BEH Amide, 1.7 µm, 2.1 × 150 Column, Ammonium Formate Solution – Glycan Analysis	176003635
GlycoWorks *Rapi*Fluor-MS N-Glycan Kit—96 Sample Kit contains: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module	176003606
GlycoWorks *Rapi*Fluor-MS N-Glycan Starter Kit—24 sample Kit contains: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module, ACQUITY UPLC Glycan BEH Amide, 1.7 µm, 2.1 × 150 mm Column, Ammonium Formate Solution – Glycan Analysis	176003712
GlycoWorks *Rapi*Fluor-MS N-Glycan Kit—24 sample Kit contains: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module	176003713
GlycoWorks *Rapi*Fluor-MS N-Glycan Refill Kit—24 sample Kit contains one of each: GlycoWorks Deglycosylation Module and the GlycoWorks Labeling Module	176003714
GlycoWorks Rapid Deglycosylation 1 × 24 Kit contains: one vial of GlycoWorks Rapid PNGaseF Enzyme and Buffer; and, one vial of 10-mg *Rapi*Gest SF Surfactant	186008939
GlycoWorks Rapid Deglycosylation 3 × 8	186008841
GlycoWorks Rapid Deglycosylation Kit 2 × 48	186004579

GlycoWorks *Rapi*Fluor-MS N-Glycan Automation Kits

Description	P/N
GlycoWorks *Rapi*Fluor-MS N-Glycan Script Starter Kit – Automation Kit contains: GlycoWorks Automation Script Pack-CD; Intact mAb Mass Check Standard (unlabeled); *Rapi*Fluor-MS Intact mAb Mass Check Standard (deglycosylated, labeled, and purified); GlycoWorks Rapid Deglycosylation Kit – 2 × 48; GlycoWorks *Rapi*Fluor-MS Labeling Module – Automation; GlycoWorks HILIC µElution Plate; GlycoWorks SPE Reagents – Automation; GlycoWorks Sample Collection Module – Automation; ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 150 mm Column; Mobile phase concentrate: ammonium formate	176004151
GlycoWorks *Rapi*Fluor-MS N-Glycan Starter Kit – Automation Kit contains: Intact mAb Mass Check Standard (unlabeled); *Rapi*Fluor-MS Intact mAb Mass Check Standard (deglycosylated, labeled, and purified); GlycoWorks Rapid Deglycosylation Kit – 2 × 48; GlycoWorks *Rapi*Fluor-MS Labeling Module – Automation; GlycoWorks HILIC µElution Plate; GlycoWorks SPE Reagents – Automation; GlycoWorks Sample Collection Module – Automation; ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 150 mm Column; Mobile phase concentrate: ammonium formate	176004152
GlycoWorks *Rapi*Fluor-MS N-Glycan Kit - Automation Kit contains: GlycoWorks Rapid Deglycosylation Kit – 2 × 48, GlycoWorks *Rapi*Fluor-MS Labeling Module – Automation, GlycoWorks HILIC µElution Plate, GlycoWorks SPE Reagents – Automation and GlycoWorks Sample Collection Module – Automation	176004153
GlycoWorks *Rapi*Fluor-MS N-Glycan Basic Kit - Automation Kit contains: GlycoWorks Rapid Deglycosylation Kit – 2 × 48, GlycoWorks *Rapi*Fluor-MS Labeling Module – Automation, GlycoWorks HILIC µElution Plate, and GlycoWorks SPE Reagents – Automation	176004154

*Rapi*Fluor-MS Released N-Glycan Standards and Accessories

Description	P/N
*Rapi*Fluor-MS Dextran Calibration Ladder 50 µg/vial	186007982
*Rapi*Fluor-MS Glycan Performance Test Standard 400 pmol total/vial	186007983
*Rapi*Fluor-MS High Mannose Standard	186008317
*Rapi*Fluor-MS Intact mAb Standard	186008843
*Rapi*Fluor-MS Quantitative Glycan Standard	186008791
*Rapi*Fluor-MS Sialylated Glycan Performance Test Standard	186008660
Intact mAb Mass Check Standard*	186006552
Ammonium Formate Solution – Glycan Analysis 5000 mM	186007081
GlycoWorks Rapid Buffer—5 mL	186008100

* Controls Standard included in kit.
** Essential for kit use.

Description	P/N
*Rapi*Gest SF 3 mg vial	186008090
*Rapi*Gest SF 10 mg vial	186002123
96-Well Plate Extraction Manifold	186001831
Vacuum Manifold Shims,** 3/set	186007986
Positive Pressure Manifold Spacer for the GlycoWorks *Rapi*Fluor-MS N-Glycan Kit,* 1/pk	186007987
Vacuum Pump 220 v/240 v 50 Hz	725000604
Positive Pressure Manifold	186006961
Modular Heat Block for 1 mL tubes/96 wells	186007985
ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 150 mm Column	186004742

GLYCAN PERFORMANCE TEST STANDARDS AND DEXTRAN CALIBRATION LADDERS

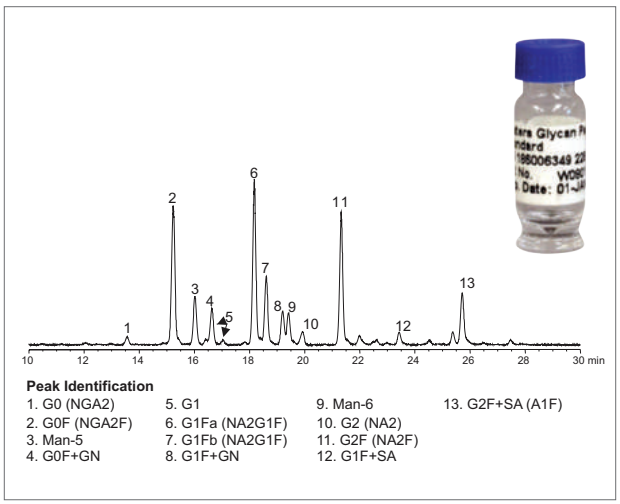
Benchmarking, Method Development, and Troubleshooting

Glycan Performance Test Standards

The Glycan 2-AB Performance Test Standard is Human-like IgG spiked with Man-5 and Man-6 and is QC verified to contain the components needed to benchmark and evaluate ACQUITY UPLC Glycan BEH Amide Columns containing 1.7 µm particles and the XBridge Glycan BEH Amide Columns that contain either 2.5 µm or 3.5 µm particles. It is also valuable to use as an additional 2-AB labeled control to assess digestion and labeling reaction efficiencies. Also offered in the *Rapi*Fluor-MS label.

Dextran Calibration Ladders

The Dextran Calibration Ladders allow the user to tie together the entire GlycoWorks Sample Preparation Solution seamlessly to the Waters ACQUITY UPLC System and GlycoBase Database Search. Using these labeled standards allows the user to calibrate their system based on GU units, and have confidence in results. Available in 2-AB, 2-AA, and the *Rapi*Fluor-MS labels.



2-AB Glycan Performance Test Standard, FLR Trace.

Ordering Information

ACQUITY UPLC Glycan BEH Amide Columns and Method Validation Kits

Description	P/N
ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 50 mm Column	186004740
ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 100 mm Column	186004741
ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 5 mm VanGuard Column, 3/pk	186004739
ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 100 mm Column Method Validation Kit[1]	186004907
ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 x150 mm Column	186004742

Note: ACQUITY UPLC Glycan BEH Amide, 1.7 µm Columns are designed for use with the ACQUITY UPLC System. The benefits of the small particle packing in ACQUITY UPLC Glycan BEH Amide, 1.7 µm Columns are only realized with the low system volume and low detector dispersion of an ACQUITY UPLC System.
[1]Three columns from three different batches of BEH Amide, 130 Å material.

XBridge Glycan BEH Amide HPLC and UHPLC Columns and Method Validation Kits

Description	P/N
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 2.1 × 5 mm VanGuard Column, 3/pk	186007262
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 2.1 × 50 mm ***XP*** Column	186007263
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 2.1 × 100 mm ***XP*** Column	186007264
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 2.1 × 150 mm ***XP*** Column	186007265
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 2.1 × 150 mm ***XP*** Column Method Validation Kit[1]	186007266
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 3.0 × 30 mm ***XP*** Column	186008038
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 3.0 × 75 mm ***XP*** Column	186008039
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 3.0 × 150 mm ***XP*** Column	186008040
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 4.6 × 20 mm Guard Column, 2/pk[3]	186007267
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 4.6 × 50 mm ***XP*** Column	186007268
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 4.6 × 100 mm ***XP*** Column	186007269
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 4.6 × 150 mm ***XP*** Column	186007270
XBridge Glycan BEH Amide, 130 Å, 2.5 µm, 4.6 × 150 mm ***XP*** Column Method Validation Kit[1]	186007271
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 2.1 × 10 mm Sentry Guard Cartridge, 2/pk[2]	186007505
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 2.1 × 50 mm Column	186007502
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 2.1 × 100 mm Column	186007503
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 2.1 × 150 mm Column	186007504
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 4.6 × 20 mm Sentry Guard Cartridge, 2/pk[3]	186007272
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 4.6 × 50 mm Column	186007273
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 4.6 × 100 mm Column	186007274
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 4.6 × 150 mm Column	186007275
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 4.6 × 150 mm Column Method Validation Kit[1]	186007277
XBridge Glycan BEH Amide, 130 Å, 3.5 µm, 4.6 × 250 mm Column	186007276

[1] Three columns from three different batches of BEH Amide, 130 Å material.
[2] Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.
[3] Requires 4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

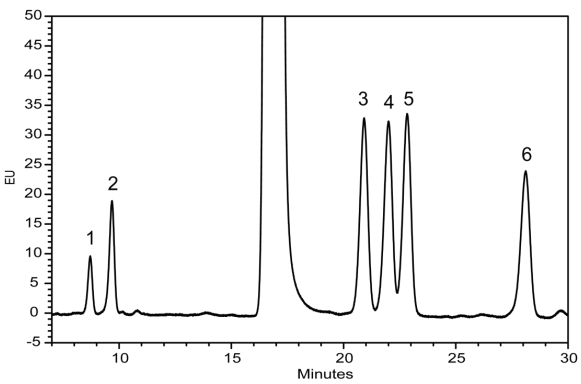
Reductive Amination Glycan Sample Preparation Kits and Standards

Description	P/N
GlycoWorks Reductive Amination High-Throughput Prep Kit	176003090
GlycoWorks HILIC µElution 96-Well Plate	186002780
*Rapi*Gest SF 1 mg Vial	186001860
GlycoWorks Control Standard, 100 µg Vial	186007033
GlycoWorks Reagent Kit	186007034
Manifold Waste Tray	600001282
GlycoWorks Reductive Amination Single-Use Prep Kit	176003119
GlycoWorks HILIC 1 cc Cartridge (10/pk)	186007080
*Rapi*Gest SF 1 mg Vial	186001860
GlycoWorks Control Standard, 100 µg Vial	186007033
GlycoWorks Reagent Kit	186007034
2-AB Glycan Performance Test Standard The Glycan Performance Test Standard is a 2-AB labeled human IgG-like standard that is QC verified to contain the components needed to benchmark and evaluate ACQUITY UPLC Glycan BEH , 1.7 µm Columns.	186006349
2-AB Dextran Calibration Ladder The 2-AB labeled, Dextran Calibration Ladder is used to calibrate the HILIC column from retention time to GU values. This calibration ladder provides good peak shape and reliable identification from 2 to 30 glucose units.	186006841
2-AA Dextran Calibration Ladder The 2-AA labeled, Dextran Calibration Ladder is used to calibrate the HILIC column from retention time to GU values. This calibration ladder provides good peak shape and reliable identification from 2 to 30 glucose units.	186007279
GlycoWorks HILIC 1 cc Cartridge, 20/pk	186007080
GlycoWorks HILIC 1 cc Flangeless Cartridge	186007239
GlycoWorks HILIC µElution Plate	186002780
GlycoWorks Reagent Kit	186007034
GlycoWorks SPE Reagents	186007992
Ammonium Formate Solution – Glycan Analysis	186007081

Monosaccharide Analyses

Apart from charged sialic acid species, the primary monosaccharides found in N-linked and O-linked glycans are the neutral monosaccharides N-acetylglucosamine (GlcNAc), N-acetylgalactosamine (GalNAc), galactose (Gal), glucose (Glc), mannose (Man), and fucose (Fuc). Analyses of non-charged monosaccharides frequently begins by acid hydrolysis of the glycan by incubation with trifluoroacetic acid or hydrochloric acid. Usually, a three-hour incubation at 100 °C with 2 M trifluoroacetic acid releases all of the monosaccharides; however, during hydrolysis, the N-acetyl groups on GlcNAc and GalNAc are hydrolyzed to glucosamine (GlcN) and galactosamine (GalN). Following hydrolysis, the released monosaccharides are derivatized using 2-aminobenzoic acid (2-AA), as detailed in the Waters application note "Future Proofing the Biopharmaceutical QC Laboratory: Chromatographic Scaling of HPLC Monosaccharide Analyses Using the ACQUITY UPLC H-Class Bio System" (p/n: 720005255EN). As the application note explains, this method can reliably generate sensitive, high resolution, and quantitative monosaccharide analyses independent of a laboratory's available LC instrumentation.

HPLC-Based Analyses of 2-AA Labeled Monosaccharides from Acid Hydrolyzed Bovine Fetuin



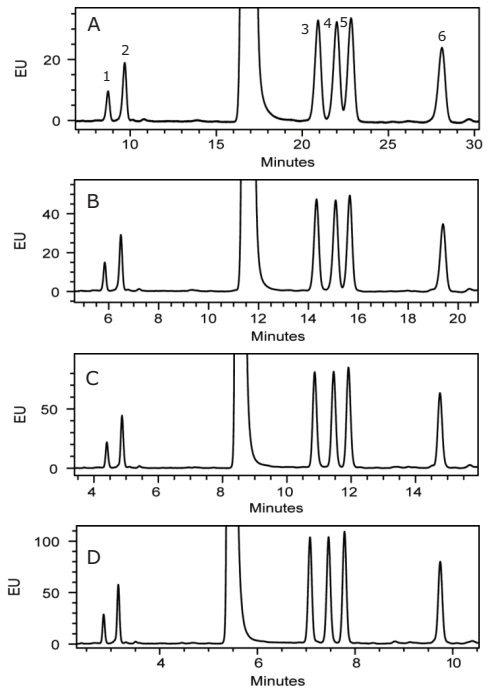
LC Conditions

System:	ACQUITY UPLC H-Class
Sample:	Acid Hydrolyzed Bovine Fetuin followed by 2-AA derivatization
Injection:	4.8 µL
Column:	XBridge BEH C_{18}, 130 Å, 5 µm, 4.6 × 100 mm (p/n: 186003115)
Mobile phase A:	0.2% N-butylamine, 0.5% phosphoric acid, and 1% THF in water
Mobile phase B:	Acetonitrile with 0.1% trifluoroacetic acid
Flow rate:	0.48 mL/min
Gradient:	See table
Excitation wavelength:	360 nm
Emission wavelength:	425 nm
Column temp.:	30 °C

Measurement	Particle Size (µm)			
	5	3.5	2.5	1.7
Column I.D. (mm)	4.6	4.6	2.1	2.1
Column Length (mm)	100	100	100	100
Average W1/2h	0.349	0.189	0.125	0.076
T_0	20.00	9.99	14.02	6.80
P_c	58	75	81	90
GlcNAc	8.71	5.84	4.40	2.85
GalNAc	9.69	6.49	4.87	3.15
Gal	20.92	14.32	10.87	7.08
Man	22.01	15.09	11.46	7.46
Glc	22.83	15.66	11.92	7.78
Fuc	28.12	19.39	14.76	9.74
GlcNAc	3.65	3.83	3.69	3.67
GalNAc	8.26	8.52	8.23	8.31
Gal	22.17	22.48	22.45	22.06
Man	23.04	23.07	23.05	22.72
Glc	23.76	23.89	23.88	23.61
Fuc	19.11	18.21	18.71	19.62
Rs				
GlcNAc, GalNAc	1.12	1.13	1.13	1.15
GalNAc, Gal	2.26	2.38	2.47	2.67
Gal, Man	1.05	1.06	1.06	1.06
Man, Glc	1.04	1.04	1.04	1.05
Glc, Fuc	1.24	1.25	1.26	1.28
GlcNAc, GalNAc	2.52	3.10	3.16	3.32
GalNAc, Gal	21.05	27.12	30.69	33.25
Gal, Man	1.62	2.10	2.48	2.62
Man, Glc	1.20	1.53	1.90	2.23
Glc, Fuc	7.34	9.59	11.41	12.78

HPLC analysis of monosaccharides. A separation performed with a Waters XBridge BEH C_{18}, 130 Å, 5 µm Column as detailed in Waters Applications Note: 720005255EN. Monosaccharides are identified as follows: (1) N-acetylglucosamine (GlcNAc), (2) N-acetylgalactosamine (GalNAc), (3) Galactose (Gal), (4) Mannose (Man), (5) Glucose (Glc), and (6) Fucose (Fuc).

Effect of Particle Size on the Analyses of 2-AA Labeled Monosaccharides from Acid Hydrolyzed Bovine Fetuin



LC Conditions

System:	ACQUITY UPLC H-Class
Sample:	Acid Hydrolyzed Bovine Fetuin followed by 2-AA derivitization
Injection:	4.8 µL on 4.6 mm I.D. column, 2.1 µL on 2.1 mm I.D. columns
Columns:	XBridge BEH C_{18}, 130 Å, 5 µm, 4.6 × 100 mm (p/n: 186003115) XBridge BEH C_{18}, 130 Å, 3.5 µm, 2.1 × 100 mm (p/n: 186003033) XBridge BEH C_{18}, 130 Å, 2.5 µm ***XP***, 2.1 × 100 mm (p/n: 186006031) ACQUITY UPLC BEH C_{18}, 130 Å, 1.7 µm, 2.1 × 100 mm (p/n: 186002352)
Mobile phase A:	0.2% N-butylamine,0.5% phosphoric acid, and 1% THF in water
Mobile phase B:	Acetonitrile with 0.1% trifluoroacetic acid
Gradient:	See table
Flow rate:	See table
Excitation wavelength:	360 nm
Emission wavelength:	425 nm
Column temp.:	30 °C

Method Details (flow rate and time)

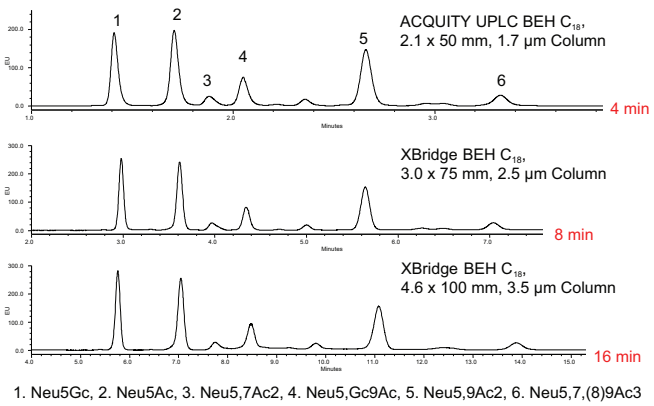
		5 µm		3.5 µm		2.5 µm		1.7 µm	
Step	%B[1]	Flow (mL min-1)	Time (min)	Flow (mL min-1)	Time (min)	Flow (mL min-1)	Time (min)	Flow (mL min-1)	Time (min)
1	7	0.480	0.00	0.685	0.00	0.200	0.00	0.294	0.00
2	7	0.480	7.78	0.685	5.45	0.200	3.89	0.294	2.64
3	17	0.480	27.78	0.685	19.47	0.200	13.88	0.294	9.44
4	100	0.480	28.89	0.685	20.24	0.200	14.43	0.294	9.82
5	100	0.480	40.00	0.685	28.03	0.200	19.99	0.294	13.60
6	7	0.480	41.11	0.685	28.81	0.200	20.54	0.294	13.97
7	7	0.480	50.00	0.685	35.04	0.200	24.98	0.294	17.00

Geometric scaling of a monosaccharide separation on XBridge BEH C_{18}, 130 Å, (A) 5 µm particle, (B) 3.5 µm particle, (C) 2.5 µm particle, and (D) 1.7 µm particle noting higher throughput and improved component Rs via use of 1.7 µm particle technology.

Sialic Acid Analyses

A diverse range of sialic acids are found in nature, but the two major sialic acids species found on N- and O-linked glycans contained in biopharmaceuticals are N-acetyl-neuraminic acid (Neu5Ac) and N-glycolyl-neuraminic acid (Neu5Gc). Since sialylation can enhance serum half-life as well as affect biological activity, it is important to accurately monitor both the quantitative levels and types of sialic acids during all stages of the product life cycle. Many LC-based methods begin with the release of the targeted sialic acids under milder acid hydrolysis conditions (e.g., 2 M acetic acid for two hours at 80 °C). The released sialic acids can be then derivatized with 1, 2-diamino-4, 5-methylenedioxybenzene-2HCl (DMB) dye. Of particular importance is the fact that DMB- labeled sialic acids are light sensitive and liable to degradation and should be analyzed within 24 hours of labeling. This can become a significant problem if a large number of samples need to be analyzed using traditional HPLC-based techniques that can take more than 30 minutes per sample analysis.

UPLC vs. HPLC-Based Analyses of DMB-Labeled, Sialic Acid Test Mix



1. Neu5Gc, 2. Neu5Ac, 3. Neu5,7Ac2, 4. Neu5,Gc9Ac, 5. Neu5,9Ac2, 6. Neu5,7,(8)9Ac3

LC Conditions

System:	ACQUITY UPLC		
Mobile phase:	Acetonitrile:methanol:water (9:7:84)		
Detection:	Fluorescence : λex = 373, λem = 448		
Sample:	Prozyme GLYKO sialic acid reference panel		
Wash solvents:	Acetonitrile:methanol:water (9:7:84)		
Columns:	ACQUITY UPLC, BEH C_{18}, 1.7 µm	XBridge BEH C_{18}, 2.5 µm	XBridge C_{18}, 3.5 µm
Configuration:	2.1 × 50 mm	3.0 × 75 mm	4.6 × 100 mm
Flow rate:	0.18	0.26	0.43
Loop size:	2 µL	2 µL	10 µL
Injection vol.:	0.7 µL	2.0 µL	6.7 µL
Run time:	6.0 min	12.5 min	24.0 min

Note: The higher throughput and improved component resolution associate with the 1.7 µm particle technology.

Geometric scaling of DMB-labeled sialic acid standards on XBridge BEH C_{18}, 130 Å, 3.5 µm particle (bottom), 2.5 µm particle (middle), and ACQUITY UPLC BEH C_{18}, 130 Å, 1.7 µm particle (top).

Ordering Information

ACQUITY UPLC BEH C_{18}, 130 Å and XBridge BEH C_{18}, 130 Å HPLC and UHPLC Columns

	Particle Size: 1.7 µm	
ACQUITY UPLC BEH C_{18}, 130 Å	**Dimension**	**P/N (1/pk)**
	2.1 × 50 mm	186002350
	2.1 × 100 mm	186002352
	2.1 × 150 mm	186004742
XBridge BEH C_{18}, 130 Å, *XP*	**Particle Size: 2.5 µm**	
	2.1 × 100 mm	186006031
	3 × 100 mm	186006035
	3 × 150 mm	186006710
XBridge BEH C_{18}, 130 Å	**Particle Size: 3.5 µm**	
	2.1 × 100 mm	186003033
	Particle Size: 5 µm	
	4.6 × 100 mm	186003115

Oligonucleotide Analysis

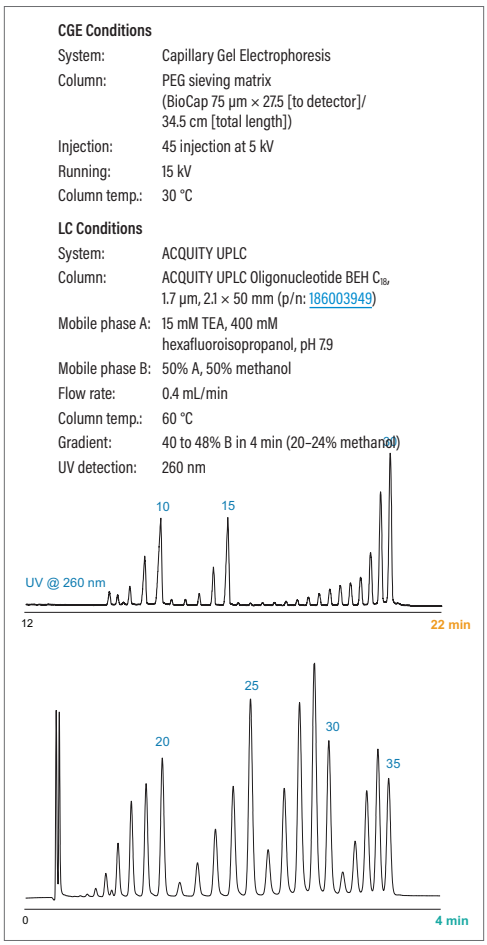
Waters Oligonucleotide Columns contain second-generation hybrid silica BEH Technology particles functionalized with C_{18}. The separation of detritylated synthetic oligonucleotide samples is based on the well-established method of ion-pair, reversed-phase chromatography. The availability of 1.7 µm UPLC particles or 2.5 µm HPLC particles in various column dimensions provides flexibility to meet various lab-scale isolation or analysis needs, and delivers exceptional sample resolution and superior column life. In addition, Waters manufacturing and quality control testing procedures help ensure consistent batch-to-batch and column-to-column performance regardless of application demands.

- Separation efficiencies equivalent to or exceeding those of PAGE, CGE, or ion-exchange HPLC methods
- The ability to distinguish/separate failure sequences from detritylated full-length products
- Column scalability for laboratory-scale isolation needs
- Exceptional column life for reduced cost per analysis
- QC tested with MassPREP Oligonucleotide Standard (p/n: 186004135) to help ensure performance consistency

EXCEPTIONAL RESOLUTION OF OLIGONUCLEOTIDE MIXTURES

ACQUITY UPLC Oligonucleotide C_{18}, 1.7 µm (designed for use with an ACQUITY UPLC System) and XBridge Oligonucleotide C_{18}, 2.5 µm Columns are well suited for the analysis of detritylated oligonucleotides using ion-pair, reversed-phase chromatography. As indicated (see figure on right), separations are comparable to those obtained by capillary gel electrophoresis (CGE) in terms of component resolution, yet analysis times are significantly decreased using Waters UPLC Technology. The ability to resolve large oligonucleotide sequences (e.g., N from N-1) is possible due to the enhanced resolving power obtained using sub-3-µm, BEH Technology particles. In addition, quantitation with molecular weight characterization of the separated target oligonucleotide product from failure sequences is possible using Waters Oligonucleotide Columns with hyphenated-mass spectrometry methods and MS-friendly eluents.

Separation of Detritylated Oligodeoxythymidine Ladders by Capillary Gel Electrophoresis (CGE) vs. Ion-Pair, Reversed-Phase Chromatography



Ordering Information

ACQUITY UPLC Oligonucleotide BEH C_{18} Columns and Method Validation Kits

BEH C_{18}, 130 Å*	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186003949
	2.1 × 100 mm	186003950
	2.1 × 150 mm	186005516
BEH C_{18}, 130 Å Method Validation Kit**	2.1x 100 mm	186004898

* For use on Waters ACQUITY UPLC Systems.
** Three Columns from three different batches of material.

XBridge Oligonucleotide BEH C_{18} HPLC and UHPLC Columns and Method Validation Kits

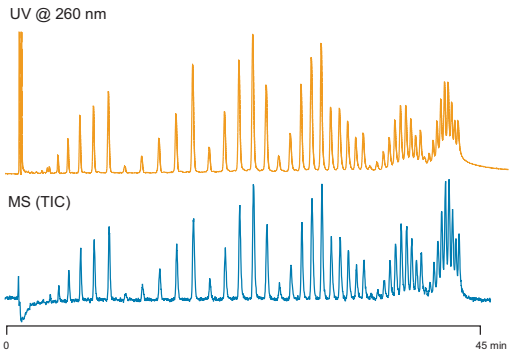
BEH C_{18}, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 50 mm	186003952
	4.6 × 50 mm	186003953
BEH C_{18}, 130 Å OBD Prep	10 × 50 mm	186008212
	19 × 50 mm	186008962
	30 × 50 mm	186008963
	50 × 50 mm	186008964
BEH C_{18}, 130 Å Method Validation Kit**	4.6 × 50 mm	186004906

** Three Columns from three different batches of material.

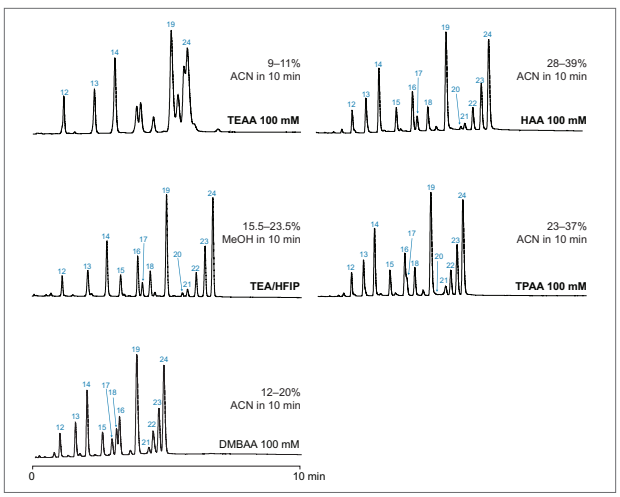
Separation of a 15–60 mer Detritylated Oligodeoxythymidine Ladder

LC Conditions

System:	ACQUITY UPLC with PDA and Q-Tof micro MS	Flow rate:	0.1 mL/min
Column:	ACQUITY UPLC Oligonucleotide BEH C_{18}, , 130 Å, 1.7 µm, 2.1 × 50 mm (p/n: 186003949)	Column temp.:	60 °C
Mobile phase A:	15 mM TEA–400 mM hexafluoroisopropanol	Gradient:	19 to 26.5.5% B in 60 min
Mobile phase B:	Methanol	UV detection:	260 nm 10 scans per second MS: 1 scan per second, 0.1 sec interscan



Impact of Different Ion-Pairing Agents on Varying Oligonucleotide Sequence Separations



Improved oligonucleotides separations can be achieved using alternative IP agents compared to use of traditional TEAA.

UPLC-MS Analysis of Interfering RNA Oligonucleotides

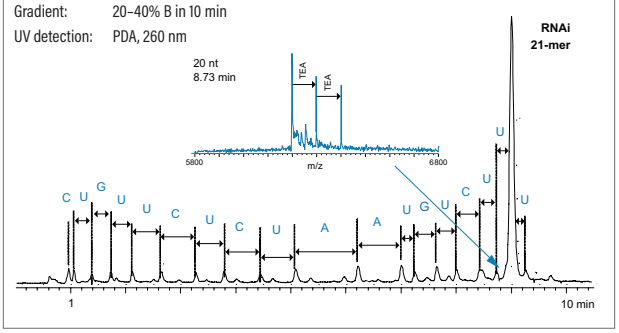
Discovery of the RNA interference (RNAi) mechanism now broadly used for silencing of target gene expression has prompted a need for the analysis of small interfering RNAs (siRNA) molecules. To satisfy the need for a robust, fast, and sensitive analysis of 20–25 nucleotides of small interfering RNA (siRNA), a UPLC-MS method has been developed utilizing UPLC Oligonucleotide Columns and SYNAPT HDMS™ Mass Spectrometer.

The acquisition of the accurate masses allowed for an assignment of the peaks of 5′-truncated oligomers (failed sequences generated during oligonucleotide synthesis), as well as some other impurities. The mass of each peak in the MS chromatogram was deconvoluted using MaxEnt 1 Software. The tentative 5′-end failure products are assigned in the below figure. Nearly the entire sequence of the parent oligonucleotide was elucidated. MS analysis also revealed a presence of an extra uridine mononucleotide added to the target 21-mer RNAi sequence.

LC-MS Analysis of RNA (21 mer)

LC Conditions

System:	ACQUITY UPLC	TIC MS:	SYNAPT MS
Column:	ACQUITY UPLC Oligonucleotide BEH C_{18}, 130 Å, 1.7 µm, 2.1 × 50 mm (p/n: 186003949)	Capillary:	2000 V
Column temp.:	60 °C	Sample cone:	35 V
Sample injected:	2.5 µL (100 pmol of 21 nt RNAi)	Extraction cone:	3 V
Flow rate:	0.2 mL/min	Desolvation temp.:	200 °C
Mobile phase A:	15 mM TEA. 400 mM roisopropanol	Source temp.:	120 °C
Mobile phase B:	50% A, 50% methanol	Cone gas flow:	50 L/hr
Gradient:	20–40% B in 10 min	Desolvation gas flow:	600 L/hr
UV detection:	PDA, 260 nm		



Outstanding Column Life

Waters Oligonucleotide Columns packed with BEH Technology particles have shown remarkable column longevity, under these demanding separation conditions, while maintaining outstanding separation performance. By comparison, significantly reduced column life results when traditional silica-based columns are used under these same demanding separation conditions.

Scalable DNA and RNAi Separations with Good Product Recovery

XBridge Oligonucleotide BEH C_{18}, 130 Å Columns are the preferred offering for detritylated oligonucleotide purifications due to the availability of column sizes designed to meet lab-scale isolation requirements. The choice of XBridge Oligonucleotide C_{18} Column dimension and operating flow rate depends primarily on the scale of the synthesis reaction mixture. For example, a 4.6 × 50 mm column containing XBridge Oligonucleotide BEH C_{18}, 130 Å, 2.5 µm material is an excellent selection when oligonucleotide mass loads are less than or equal to 0.2 µmol. Selection of the appropriate column size for the amount of oligonucleotide sample loaded is recommended to maximize component resolution and recovery of the target product from non-desired failure sequences.

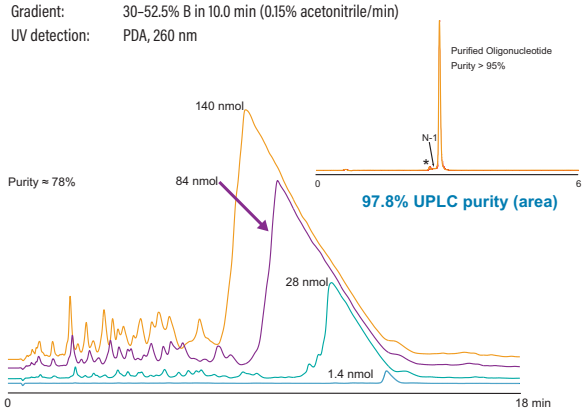
For researchers involved in gene silencing it is often necessary to work with RNA of high purity. Crude synthetic oligonucleotides used for gene knockout are typically purified. The figure below illustrates a lab-scale purification of 21 mer RNA at various column loads. Using an Oligonucleotide column chemistry and an Alliance System, large quantities of crude single stranded RNA can be successfully purified yielding material of high purity, approximately 95%, with an estimated yield of 55% based on collected peak area to the total peak area of the sample.

In addition, XBridge Oligonucleotide Columns are well suited for the analysis and purification of siRNA. As shown in the figure below, siRNA is well resolved from single stranded RNA and truncated duplexes.

Purification of Single Stranded RNA

LC Conditions

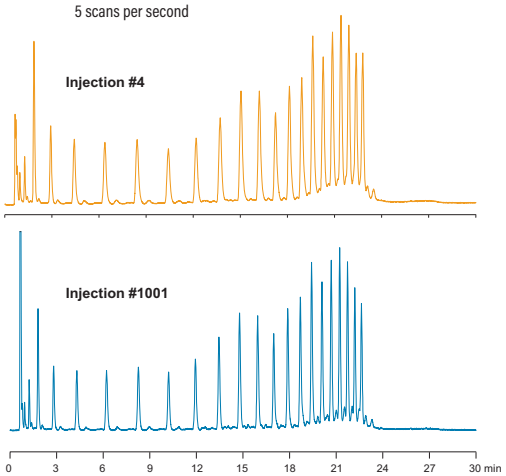
System:	Alliance HPLC
Column:	XBridge Oligonucleotide BEH C_{18}, 130 Å, 2.5 µm, 4.6 × 50 mm (p/n: 186003953)
Column temp.:	60 °C
Flow rate:	1.0 mL/min
Mobile phase A:	0.1 M triethylammonium acetate, pH 7.5
Mobile phase B:	20% acetonitrile in A
Gradient:	30–52.5% B in 10.0 min (0.15% acetonitrile/min)
UV detection:	PDA, 260 nm



Separation of 5–25 mer Detritylated Oligodeoxythymidine Ladder

LC Conditions

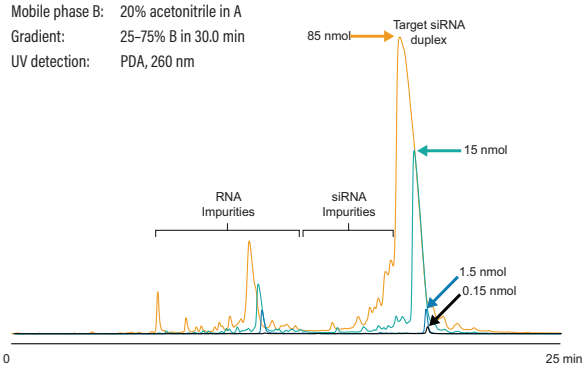
System:	Alliance HPLC with PDA
Column:	XBridge Oligonucleotide BEH C_{18}, 130 Å, 2.5 µm, 2.1 × 50 mm (p/n: 186003952)
Mobile phase A:	10% methanol/90% (385 mM Hexafluoroisopropanol + 14.3 mM TEA)
Mobile phase B:	25% methanol/75% (385 mM Hexafluoroisopropanol + 14.3 mM TEA)
Column temp.:	60 °C
Gradient:	0–100% B in 30 min (10–25% methanol)
Flow rate:	1.0 mL/min
UV detection:	260 nm
	5 scans per second



Purification of siRNA Duplex from Impurities

LC Conditions

System:	Alliance HPLC
Column:	XBridge Oligonucleotide BEH C_{18}, 130 Å, 2.5 µm, 4.6 × 50 mm (p/n: 186003953)
Column temp.:	20 °C
Flow rate:	1.0 mL/min
Mobile phase A:	0.1 M triethylammonium acetate, pH 7.0
Mobile phase B:	20% acetonitrile in A
Gradient:	25–75% B in 30.0 min
UV detection:	PDA, 260 nm



Dimension	Approx Mass Load**	Yield***	Flow Rate
2.1 × 50 mm	0.04 µmol	0.2 mg	0.2 mL/min
4.6 × 50 mm	0.20 µmol	1.0 mg	1.0 mL/min
10 × 50 mm	1.00 µmol	4.5 mg	4.5 mL/min
19 × 50 mm*	4.00 µmol	16.0 mg	16.0 mL/min
30 × 50 mm*	9.00 µmol	40.0 mg	40.0 mL/min
50 × 50 mm*	25.00 µmol	110.0 mg	110.0 mL/min

* Oligonucleotide custom column.
** Values are only approximates and vary depending on oligonucleotide length, base composition, and "heart-cutting" fraction collection method used.
*** Estimated for average oligonucleotide MW and synthesis yield.

COLUMNS FOR LARGE DNA/RNA SPECIES

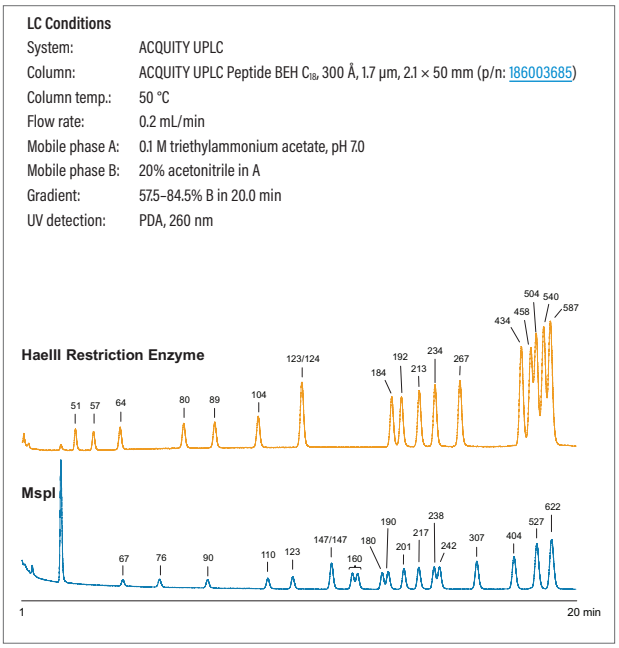
In general, molecular biology methods for manipulation of DNA rely on restriction enzymes, polymerase-chain reaction (PCR), and sequencing techniques. Using these methods, genomic DNA is typically converted into shorter double stranded (ds)DNA sequences, typically 100–1000 base pairs (bp) in length. The shorter dsDNA molecules are often analyzed or isolated by methods such as slab gel or capillary electrophoresis. Use of Waters ACQUITY UPLC BEH C_{18}, 300 Å Reversed-Phase or Gen-Pak FAX Anion-Exchange Columns offer alternatives to more traditional electrophoretic methods and are particularly well suited for various analytical and small-scale purification applications.

Ordering Information

ACQUITY UPLC BEH C_{18}, 300 Å Columns for DNA/RNA Fragments

BEH C_{18}, 300 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186003685

Separation of Duplex DNA Fragments: HaeIII and MspI Restriction Enzyme Digests of pBR322 Plasmid

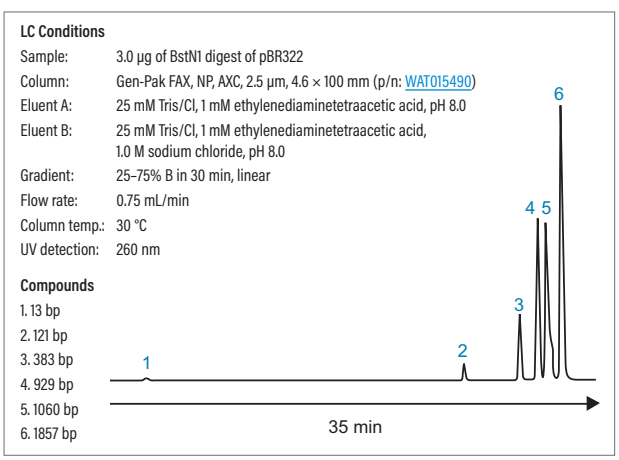


ANION-EXCHANGE HPLC OF NUCLEIC ACIDS

Gen-Pak FAX Anion-Exchange Columns

Waters Gen-Pak FAX Columns offer the highest resolution available for anion-exchange HPLC of nucleic acids. The Gen-Pak FAX Column contains a weak anion exchanger based on DEAE functionalized non-porous resin. It contains 2.5 µm particles and is well suited for analytical and micro-preparative applications.

Separation of DNA Restriction Fragments

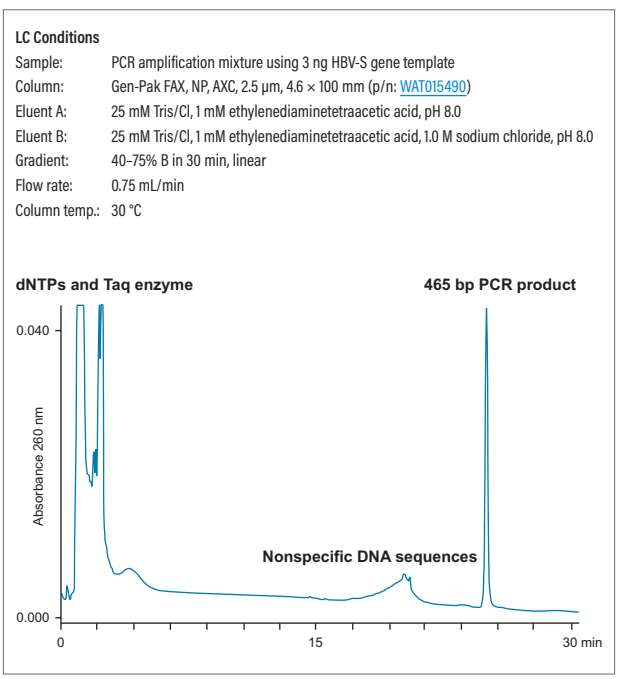


Ordering Information

Gen-Pak FAX HPLC Column

Description	Dimension	P/N
Gen-Pak FAX Column	4.6 × 100 mm	WAT015490
Gen-Pak FAX Replacement Inlet Filter	—	WAT015715

Chromatography of a PCR Amplification Mixture Generated using 3 ng and 1 fg of HBV S-Gene Template



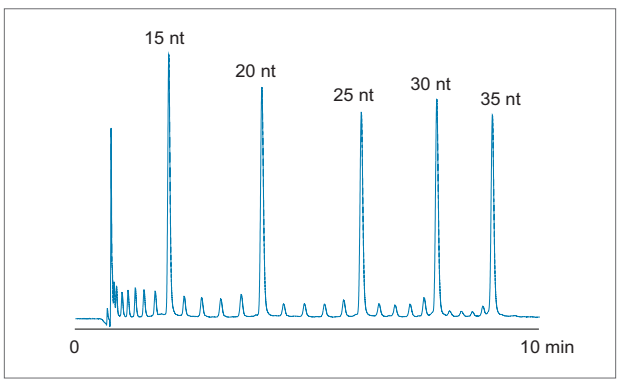
MassPREP OLIGONUCLEOTIDE STANDARD

Benchmarking, Method Development, and Troubleshooting

- Contains a carefully defined mixture of synthesized oligodeoxythymidine fragments
- Useful in testing and confirming HPLC/UPLC, LC-MS, and column performance for oligonucleotide applications
- Each is QC tested and shipped with a certificate of analysis

The pre-packaged MassPREP Oligonucleotide Standard is designed for verification of HPLC/UPLC instrument and column performance for analysis of synthetic oligonucleotides. Approximate equimolar amounts of 15, 20, 25, 30, and 35 nucleotide (nt) long oligodeoxythymidines are lyophilized and packaged in 1.5 mL LC vials. These vials are vacuum-sealed in foil pouches to reduce degradation that can occur by excessive exposure to light and air. Approximately 1 nmole of each oligonucleotide is present in the vial.

Separation of MassPREP Oligonucleotide Standard on ACQUITY UPLC Oligonucleotide C_{18}, 130 Å, 1.7 µm Column



Waters ACQUITY UPLC analysis of MassPREP Oligonucleotide Standard on an ACQUITY UPLC Oligonucleotide C_{18}, 130 Å, 1.7 µm Column. The main components are labeled. Small peaks eluting between labeled oligonucleotides are N-1, N-2, etc. failure sequences generated during the oligonucleotide syntheses. The ACQUITY UPLC System is equipped with 50 µL standard mixer and PDA detector (260 nm).

Ordering Information

MassPREP Oligonucleotide Standard

Description	Qty.	P/N
MassPREP Oligonucleotide Standard	1/pk	186004135

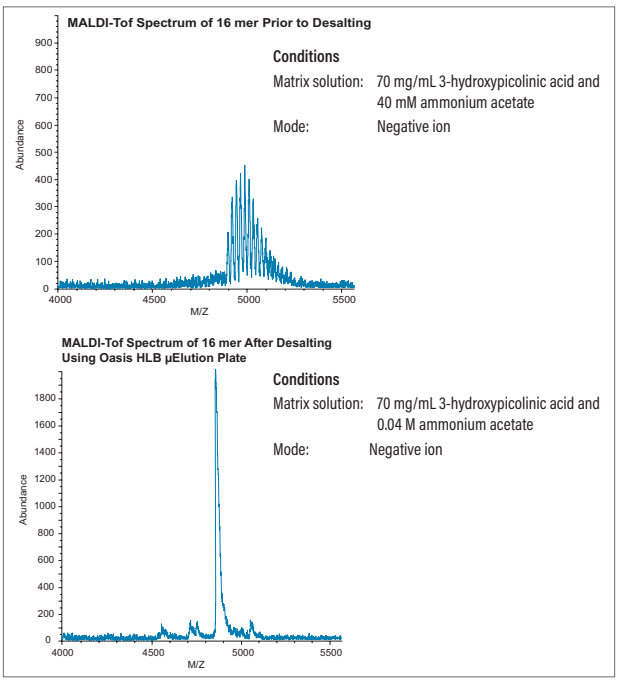
OLIGONUCLEOTIDE DESALTING BY SOLID-PHASE EXTRACTION

Oasis µElution Plates

- Removes salt prior to MS analysis
- Low elution volumes
- High sensitivity
- Sample concentrating
- High throughput

Desalting of synthetic oligonucleotides is essential for MS analysis (QC, genotyping applications and SNP analysis). Waters Oasis µElution Plate is an excellent choice for high-throughput analysis with minimal amount of sample. The Oasis µElution Plate combines patented plate design, proven chemistries, and generic protocols enabling elution volumes as low as 25 µL. You can perform SPE cleanup and concentration of very small sample volumes. The Oasis Hydrophilic-Lipophilic-Balanced (HLB) Sample Extraction Products incorporate a patented copolymer made from a balanced ratio of two monomers; the lipophilic divinylbenzene and the hydrophilic N-vinylpyrolodone that is ideally suited for this application.

Effective Use of Oasis HLB for Oligonucleotide Desalting Prior to MALDI-Tof MS



Ordering Information

Oasis HLB µElution Plate (for Oligonucleotides)

Description	P/N
Oasis HLB µElution Plate (for Oligonucleotides)	186001828BA

Peptide Analysis

The desired separation, accurate quantitation, and identification of peptides ranging from proteomics investigations to biotherapeutics mAb characterization is challenging. To be successful, scientists acknowledge the importance of separation synergies that occur when a defined column, instrument, and method are assembled to address specific application needs.

Reversed-phase (RP) chromatography has become the separation mode of choice for many of these challenging applications. It offers relatively high resolving power and provides outstanding quantitative (UV) and qualitative (ESI-MS) information. In RP-based peptide separations, the size of the peptide as well as the hydrophobicity of the amino-acid side chains determine the elution order. Consequently, small, less hydrophobic peptide sequences elute first using a gradient of increasing organic solvent concentration.

A WIDE RANGE OF CHEMISTRIES FOR REVERSED-PHASE PEPTIDE SEPARATIONS

A peptide column needs to adapt to a wide range of peptides: hydrophobic, hydrophilic, small, and large. See the options below to choose the right column for your analysis.

Hybrid Particles

BEH Technology™

BEH (Ethylene-Bridged Hybrid)

Trifunctional C_{18} ligand, fully end-capped, and bonded to the Ethylene-Bridged Hybrid (BEH) particles.

- Ideally suited for separation of a wide range of peptides: large and small, acidic and basic, hydrophilic and hydrophobic
- Stable across a wide pH range (pH 1–11) so neutral or alkaline pH eluents can be used to alter peptide separation selectivities
- High temperature stability (up to 80 °C) expands method development capabilities
- Outstanding peak capacity and superior peak shape in trifluoroacetic acid (TFA) or formic acid (FA) ion pair eluents when compared to use of 100% silica based C_{18} columns
- Two pore sizes (130 Å and 300 Å) provide different separation selectivities for a wide range of peptides and small proteins

CSH™ Technology

CSH (Charged Surface Hybrid)

Trifunctional C_{18} ligand, fully end-capped, bonded to Charged Surface Hybrid (CSH) particles.

- Outstanding peak capacities with formic acid for LC-MS based applications
- Excellent performance with TFA for optical based applications
- Accepts greater peptide mass loads than many competitive technologies for detection of low-level impurities
- Offers unique selectivity when compared to Waters Peptide BEH C_{18} Columns
- Optimal for separations from pH 1–5
- The 130 Å pore size is best suited for compounds less than 10,000 Daltons

Silica Particles

HSS HIGH STRENGTH SILICA

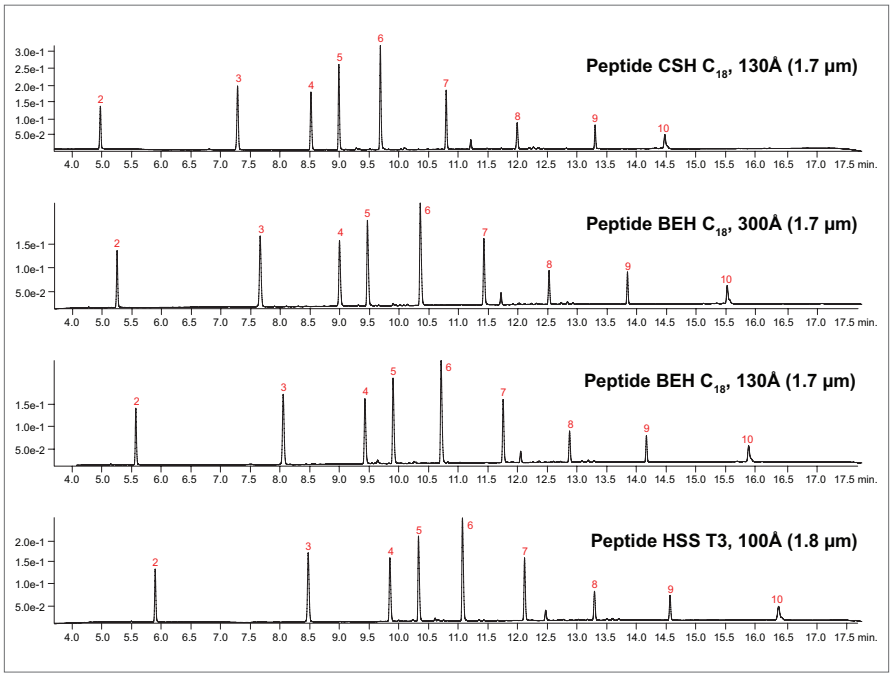
HSS (High Strength Silica)

Trifunctional C_{18} ligand, fully end-capped, bonded to High Strength Silica (HSS) particles.

- Viable option when either the hybrid-based, Peptide BEH C_{18} or Peptide CSH C_{18} do not meet a specific peptide application need
- Ideal choice for the separation of small, hydrophilic peptides since retentivity is greater than that obtained using Waters hybrid-based peptide separation columns

Three Outstanding Peptide Column Chemistries that Address Varied Peptide Separations

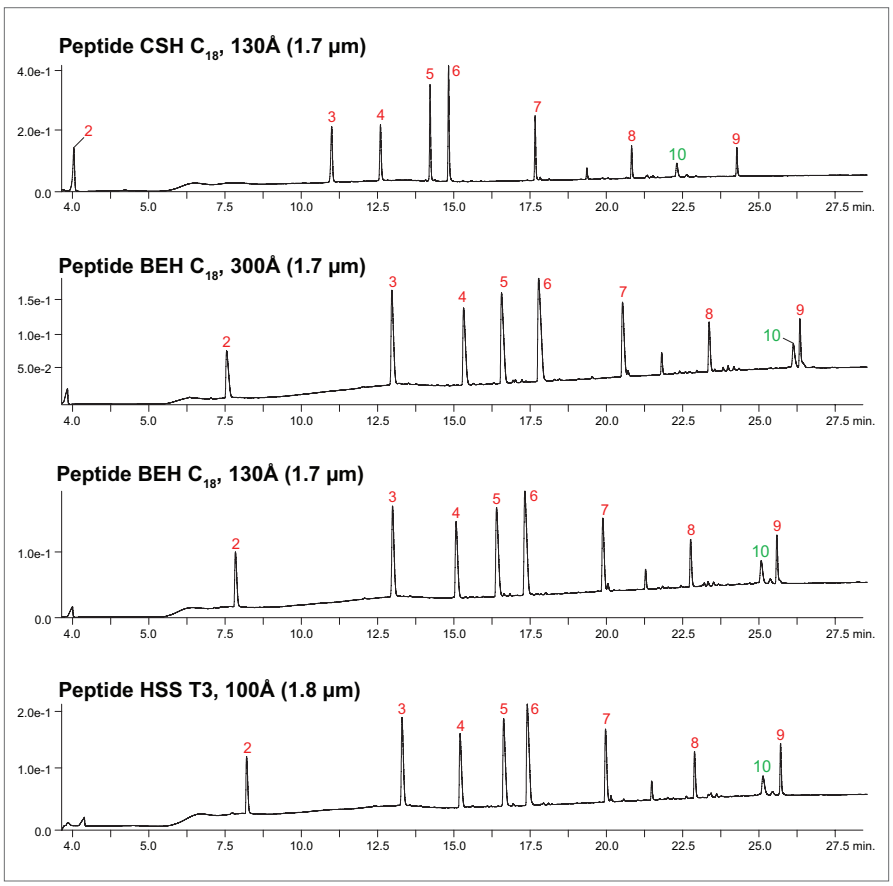
Separation of Peptide Standards Using 0.1% TFA Ion Pairing on Waters Peptide Separation Columns



Peptides contained in Waters MassPREP Peptide Standard Mixture, p/n: 186002337, were separated on 2.1 × 150 mm columns containing Waters Peptide CSH C_{18} 130 Å (1.7 µm), Peptide BEH C_{18} 300 Å (1.7 µm), Peptide BEH C_{18} 130 Å (1.7 µm), or Peptide HSS T3 100 Å (1.8 µm) UPLC-based particles on a Waters ACQUITY UPLC H-Class Bio System using a gradient of increasing acetonitrile concentration with 0.1% TFA ion-pairing. Flow at 0.4 mL/min.

The MassPREP Peptide Standard Mixture contains allantoin (a void volume marker) and nine carefully selected peptides with a broad range of polarities and isoelectric points. 1 = Allantoin 158 Da (not shown in figure since elutes at column void volume), 2 = RASG-1: 1, 000 Da, 3 = Angiotensin frag.1–7: 898 Da 4 = Bradykinin: 1060 Da, 5 = Angiotensin II: 1046 Da, 6 = Angiotensin I: 1296 Da, 7 = Renin: 1758 Da, 8 = Enolase T35: 1872 Da, 9 = Enolase T37: 2827 Da, 10 = Melittin: 2846)

Separation of Peptide Standards Using 0.1% FA Ion Pairing on Waters Peptide Separation Columns



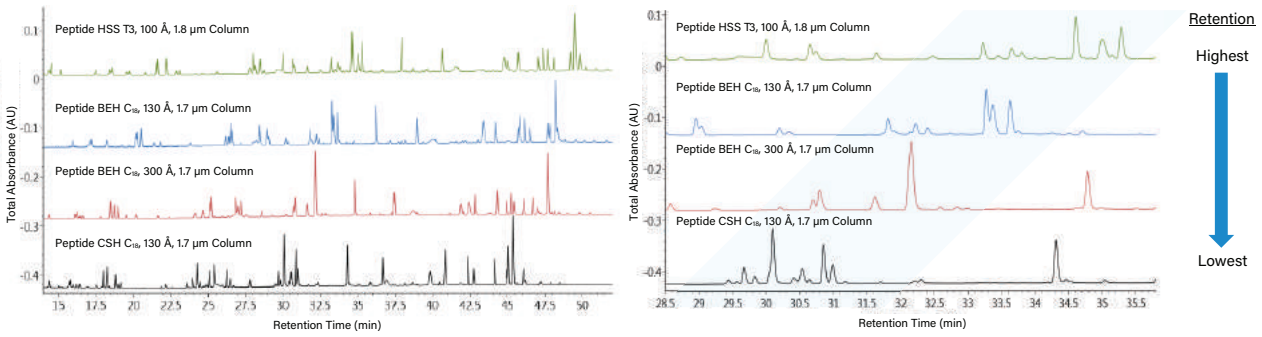
Peptides contained in Waters MassPREP Peptide Standard Mixture, p/n: 186002337, were separated on 2.1 × 150 mm columns containing Waters Peptide CSH C_{18} 130 Å (1.7 µm), Peptide BEH C_{18} 300 Å (1.7 µm), Peptide BEH C_{18} 130 Å (1.7 µm), or Peptide HSS T3, 100 Å (1.8 µm) UPLC-based particles on a Waters ACQUITY UPLC H-Class Bio System using a gradient of increasing acetonitrile concentration with 0.1% FA ion-pairing. Flow at 0.2 mL/min.

Sample as above.

Note: Different peptide separation selectivities and comparative retention time differences among the tested columns.

Elution order of peaks 9 and 10 switch when run in 0.1 FA vs. 0.1% TFA.

Separation of Tryptic Digest of Reduced Alkylated National Institute of Standards and Technology's mAb on Waters Peptide Separation Columns



LC system:	ACQUITY UPLC H-Class Bio	Eluent A:	Water with 0.1% TFA
Sample:	Tryptic Digest of NIST mAb reference material	Eluent B:	Acetonitrile with 0.1% TFA
		Gradient:	0.5% - 50% B in 60 min, linear
Columns:	2.1 x 150 mm	Flow rate:	0.20 mL/min
		Column temp.:	60 °C

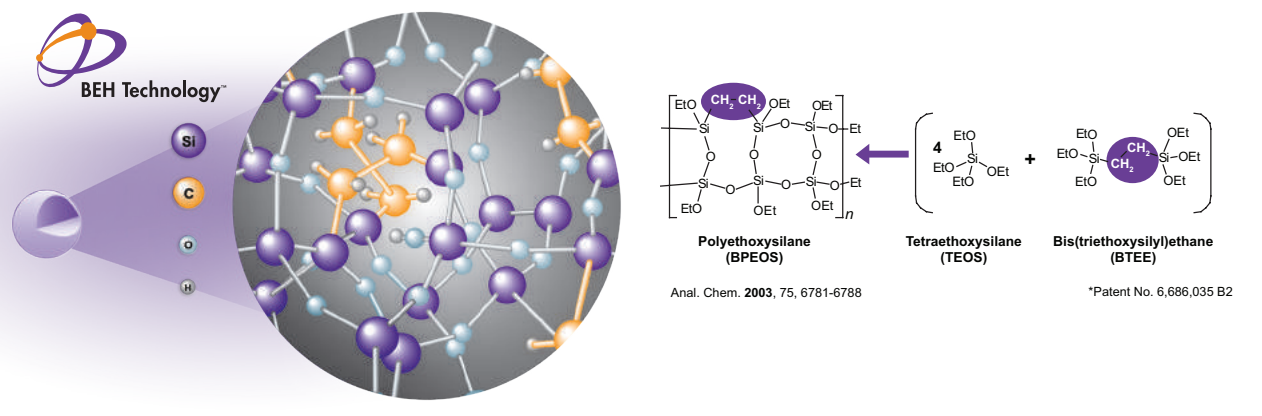
Waters UPLC (shown) and HPLC-based Peptide Separation Columns deliver different peptide selectivities and high peak capacities for the separation of complex peptide mixtures. In addition, each batch of material is specifically QC tested and qualified with a tryptic digest of cytochrome c to help ensure column-to-column consistency when used in validated methods.

PEPTIDE BEH C_{18}, 130 Å AND 300 Å COLUMNS

Hybrid-Based Particles for Reversed-Phase Peptide Separations

In 1999, Waters first demonstrated how organic/inorganic Hybrid Particle Technology columns successfully addressed limitations (e.g., pH stability) that exist using 100% silica-based, reversed-phase columns for biocompound separations. In 2009, we advanced LC-based peptide separation capabilities by commercializing our Peptide BEH C_{18}, 130 Å, and BEH C_{18}, 300 Å HPLC- and UPLC-based columns both based on the second-generation BEH particles. In addition, we added an additional quality control test using a tryptic digest of cytochrome *c* to help ensure consistent column-to-column performance. To date, hundreds of referenced journal citations provide data that support the effective use of this column chemistry for a variety of separations in various diverse application areas.

The BEH Particle: First Key Chemistry Enabler of Waters UPLC Technology

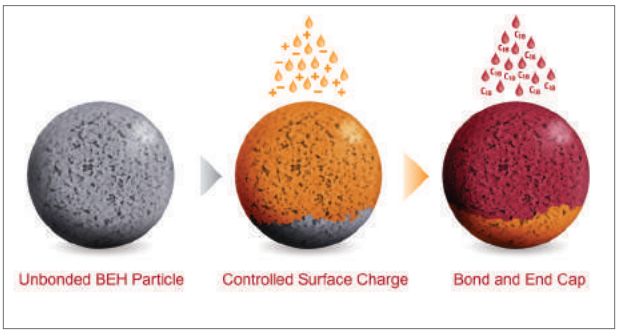


Ethylene Bridged Hybrid (BEH) Technology synthesis creates particles that ensure extreme column performance and long column lifetime under harsh operating conditions.

CSH Technology Particles for Peptide Separations

Waters innovative Peptide CSH C_{18}, 130 Å offerings expands on the already successful and well-recognized Peptide BEH C_{18}, 130 Å and BEH C_{18}, 300 Å columns. Based on comparative peptide separations, Peptide CSH C_{18}, 130 Å Columns exhibit improved load ability, greater peak capacities, and unique selectivity compared to Peptide BEH C_{18}, 130 Å. Its performance is also significantly less dependent on TFA ion pairing, making it ideal for MS applications where high sensitivity is desired. The use of the well-controlled, charged surface hybrid properties of Peptide CSH C_{18}, 130 Å holds significant promise for facilitating either challenging LC and/or LC-MS peptide separations.

The CSH Particle: Expands Upon BEH Technology



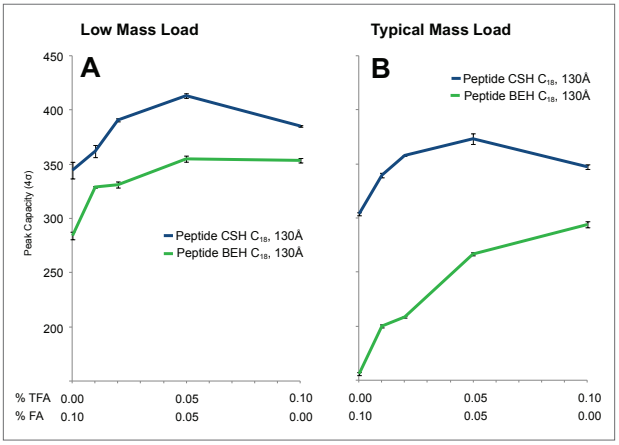
Charged Surface Hybrid (CSH) Technology improves selectivity and offers the highest possible performance for basic compounds in the acidic, low-ionic strength mobile phases commonly used in LC-MS laboratories.

PEPTIDE CSH C_{18}, 130 Å COLUMNS

Charged Surface Hybrid Particles Deliver Superior Peptide Separations in LC and LC-MS Applications

Waters patented synthesis process for its Charged Surface Hybrid (CSH) Technology particles imparts a low-level, positive charge to the surface of each particle. For that reason, when using our Peptide CSH C_{18}, 130 Å Columns, you must ensure a mobile-phase pH of less than 5 to enable peptide/CSH surface-charge interactions. CSH Technology allows the columns to be successfully used with standard eluents containing trifluoroacetic acid or a weaker acid modifier, such as formic acid. You do not need to compromise between selecting a reversed-phase eluent that delivers sharp, symmetrically separated peaks (e.g., 0.1% trifluoroacetic acid) and one that minimizes reduction of MS signal (e.g., 0.1% formic acid). Additionally, the ability of the CSH C_{18}, 130 Å column chemistry to accept greater peptide mass loads than many other columns enhances the ability to detect potentially important low-level constituents of the major components of interest.

Comparative Averaged Peptide Peak Capacities on Peptide CSH C_{18}, 130 Å vs. Peptide BEH C_{18}, 130 Å Based Columns (2.1 × 150 mm) at Two Peptide Mass Loads and Differing Concentrations of Formic Acid and Trifluoroacetic Acid



Effect of column mass load on separated peptide peak capacity in formic acid, trifluoroacetic acid, and eluent blends of formic acid and trifluoroacetic acid. (A) approximate sample load of 0.06 µg peptide mixture. (B) approx. 0.6 µg peptide mixture. Values were derived from two replicates. Waters MassPREP Peptide Standard Mixture (p/n: 186002337) was used in the study.

Excellent Mass Loading of Complex Peptide Samples

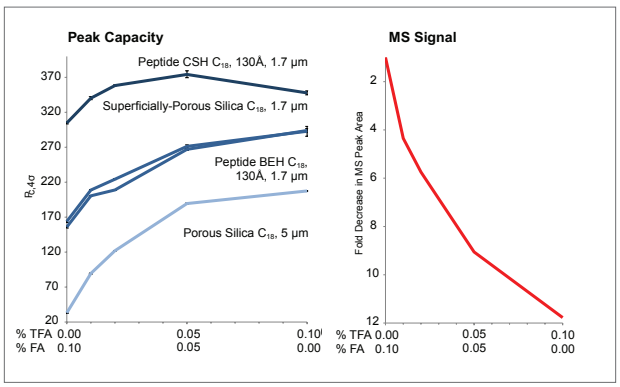
One of the inherent performance advantages of our CSH Technology is improved sample-mass loadability, the quantity of analyte that you can load onto a column before peak shape deteriorates. At typical mass loads, Peptide CSH C_{18}, 130 Å delivers a remarkably better performance than many existing C_{18} offerings. When loading 10× less sample, the difference in performance was less pronounced. Improved peptide-mass loadability is an excellent column asset for challenging separations, particularly for those that involve mixtures that comprise species present at vastly different concentrations.

A need persists for columns compatible with LC instrumentation. We recommend the use of low-dispersion LC instrumentation to extract full performance from a well-packed column containing 1.7 µm particles. Waters' e***X***tended ***P***erformance (***XP***) Columns packed with 2.5 µm ***XP*** particles improves the productivity of existing HPLC instrumentation. You can scale high peak capacity peptide separations performed using a Peptide CSH C_{18}, 130 Å, 1.7 µm Column to a Peptide CSH C_{18}, 130 Å, 2.5 µm ***XP*** Column simply by altering flow rate and gradient time. You can readily employ CSH Technology for high peak capacity peptide separations using either HPLC, UHPLC, or UPLC instrumentation.

Superior Performance in Eluents Containing Formic Acid or Trifluoroacetic Acid

Waters' Peptide CSH C_{18}, 130 Å particles contain a low and carefully defined concentration of positive charges that yield comparatively excellent peak shape for peptide separations that rely on mobile phases that contain formic acid or trifluoroacetic acid . The fact that the performance of a Peptide CSH C_{18}, 130 Å Column exhibits little dependence on strong ion-pairing agents makes it ideal for LC or LC-MS applications.

Comparative Averaged Peptide Peak Capacities on Selected Reversed-Phase Columns with Differing Concentrations of Formic Acid and Trifluoroacetic Acid



Effect of trifluoroacetic acid on peak capacity and MS signal. (A) Peak capacity as a function of acid modifier. Values were derived from two replicates. (B) Fold decrease in MS peak area as a function of acid modifier. Waters MassPREP Peptide Standard Mixture (p/n: 186002337) was used in study.

PEPTIDE HSS T3 COLUMNS

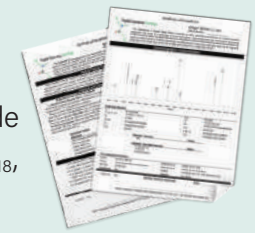
High pore volume HPLC particles do not possess the mechanical stability necessary to withstand the high pressures inherent in UPLC separations. Waters' material scientists addressed this challenge by developing a silica particle designed for high mechanical stability with the appropriate morphology to provide long UPLC column lifetimes and high UPLC efficiencies at high pressures. The 1.8 µm High Strength Silica (HSS) particle is the first and only 100% silica particle designed, tested, and intended for use in applications up to 15,000 psi (1034 bar).

The HSS particle technology is available in ACQUITY UPLC Peptide HSS T3, 100 Å, 1.8 µm as well as XSelect Peptide HSS T3, 100 Å, ***XP*** 2.5 µm and 5 µm for UHPLC and HPLC-based separations for seamless transfer between UPLC and HPLC/UHPLC instrument platforms.

Simplifying Column Choice for Peptide Purifications

Our peptide columns are versatile. Often, a single C_{18}-based chemistry can separate a wide range of peptides, requiring little time and expense to obtain satisfactory results. We offer peptide packings in many particle sizes and column dimensions. (See the "Peptide Preparative Column Selection Guide" below.)

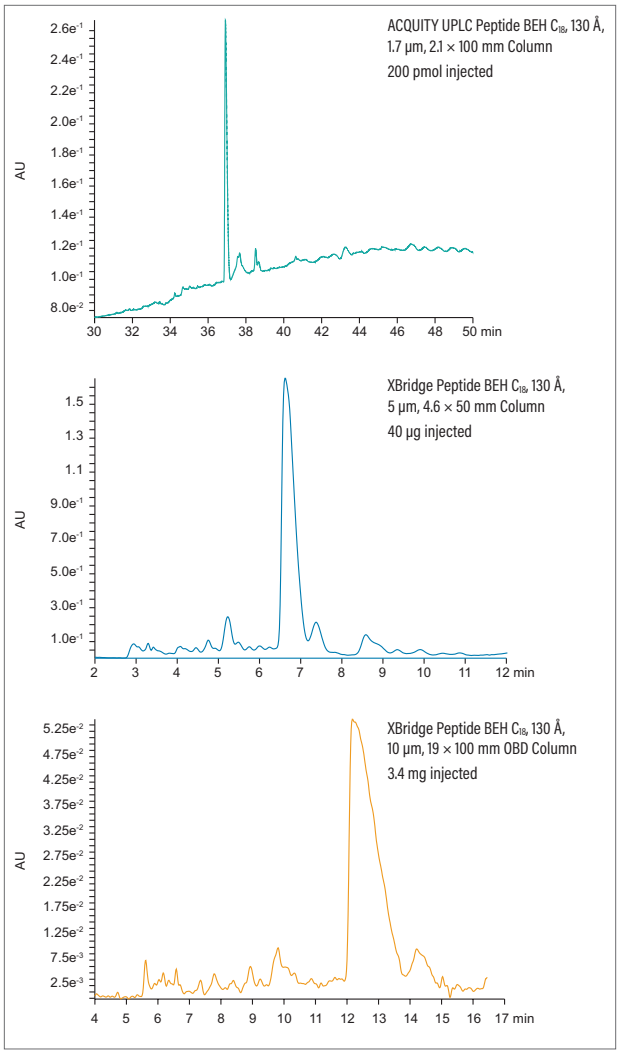
Increased Assurance with Waters Peptide Columns



Waters rigorously tests each batch of our synthesized Peptide BEH C_{18}, 130 Å; Peptide BEH C_{18}, 300 Å; Peptide CSH C_{18}, 130 Å; and Peptide HSS T3, 100 Å particles used in our manufactured columns. To pass, each batch of material must satisfactorily separate a complex protein digest using a gradient separation with well-defined pass/fail criteria. In addition, each and every manufactured column is tested and must exceed established packed column efficiency values before accepted for customer purchase. In combination, these tests (results available in Certificate of Analysis documentation) help ensure consistent batch-to-batch and column-to-column performance.

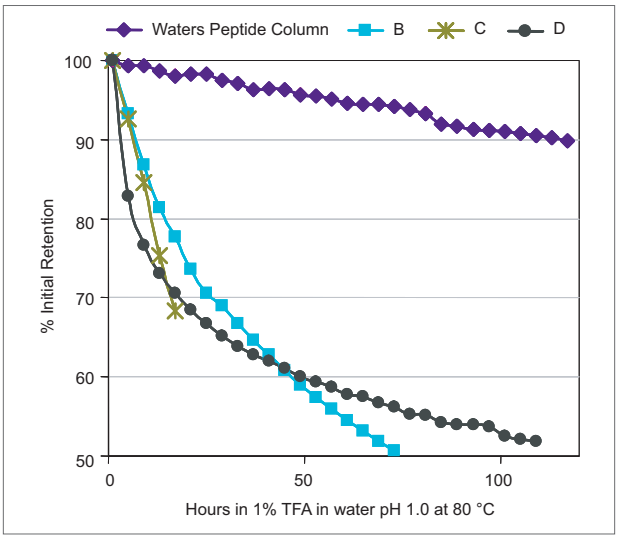
Certificate of analysis information includes a labeled chromatogram of the gradient separation of a tryptic digest of bovine cytochrome *c* (p/n: 186006371) using eluents that contain 0.1% formic acid. You can purchase the same protein digest test mixture to ensure the proper performance of your Peptide CSH C_{18}, 130 Å Column.

Separation of 13 Residue Peptides at Various Sample Loads



Offered in many particle sizes and column configurations, our peptide columns are well-suited for various laboratory-scale purification needs.

Long-Term Stability



We tested several peptide columns to observe how they performed when injections were repeated, comparing them with the performance columns B, C, and D made by other manufactures. (Retention was monitored to determine column lifetime.)

Peptide Preparative Column Selection Guide

OBD Prep Columns, 5 and 10 µm 130 Å and 300 Å				
I.D. (mm)	Length (mm)	µmol of a Single Peptide	Weight of a Single Peptide (mg)	Typical Flow Rate (mL/min)
10	50	0.25–5	0.5–10	4.5–9
10	100	0.25–5	0.5–10	4.5–9
10	150	0.25–5	0.5–10	4.5–9
10	250	0.25–5	0.5–10	4.5–9
19	50	1–18	2.0–36	16–32
19	100	1–18	2.0–36	16–32
19	150	1–18	2.0–36	16–32
19	250	1–18	2.0–36	16–32

OBD Prep Columns, 10 µm 130 Å and 300 Å				
I.D. (mm)	Length (mm)	µmol of a Single Peptide	Weight of a Single Peptide (mg)	Typical Flow Rate (mL/min)
30	50	2.5–25	5–100	40–80
30	100	2.5–25	5–100	40–80
30	150	2.5–25	5–100	40–80
30	250	2.5–25	5–100	40–80

Peptide Packing Material in OBD Columns for Maximum Chemical and Physical Stability

When columns fail, they do so both physically and chemically. For columns used with low-pH mobile phases, the usual cause of abbreviated column life is hydrolysis of the bonded phase, which manifests itself as significant changes in peptide retention. Our BEH Technology Columns incorporate proprietary procedures for bonding and end-capping that yield stable bonded phases. In low-pH stability tests, BEH C_{18} columns showed only minimal retention loss. Our patented Optimum Bed Density (OBD) Technology, developed to create packed beds that are the most stable of any available, regardless of manufacturer, ensures the physical stability of these columns. Visit www.waters.com/obd for details about OBD Technology.

Ordering Information

ACQUITY UPLC Peptide BEH C_{18} Guards and Columns

BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 5 mm	186003975*
	2.1 × 50 mm	186003554
	2.1 × 100 mm	186003555
	2.1 × 150 mm	186003556

BEH C_{18}, 300 Å	Particle Size: 1.7 µm	
	1.0 × 50 mm	186005592
	1.0 × 100 mm	186005593
	1.0 × 150 mm	186005594
	2.1 × 5 mm	186004629*
	2.1 × 50 mm	186003685
	2.1 × 100 mm	186003686
	2.1 × 150 mm	186003687

*VanGuard Pre-column, 3/pk.

ACQUITY UPLC Peptide BEH C_{18} Method Validation Kits*

BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 100 mm	186004896
	2.1 × 150 mm	186006516

BEH C_{18}, 300 Å	Particle Size: 1.7 µm	
	2.1 × 100 mm	186004897
	2.1 × 150 mm	186006517

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

XBridge Peptide BEH C_{18} Method Validation Kits*

BEH C_{18}, 130 Å	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N	Dimension	P/N	Dimension	P/N
	2.1 × 150 mm	186009002	4.6 × 100 mm	186004904	4.6 × 100 mm	186005463
	3 × 150 mm	186009003				
	4.6 × 150 mm	186009004				

BEH C_{18}, 300 Å	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
	2.1 × 150 mm	186009079	4. × 100 mm	186004905	4.6 × 100 mm	186005464
	3 × 150 mm	186009080				
	4.6 × 150 mm	186009081				

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

XBridge Peptide BEH C_{18} VanGuard Cartridges, 3/pk

BEH C_{18}, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 5 mm	186008988
	3.9 × 5 mm	186008989

BEH C_{18}, 300 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009077
	3.9 × 5 mm	186009078

XBridge Peptide BEH C_{18} Guards and Columns

BEH C_{18}, 130 Å

Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm		Particle Size: 10 µm	
Dimension	P/N	Dimension	P/N	Dimension	P/N	Dimension	P/N
2.1 × 50 mm	186008979	1.0 × 50 mm	186003560	1.0 × 50 mm	186003571	4.6 × 50 mm	186003648
2.1 × 100 mm	186008980	1.0 × 100 mm	186003561	1.0 × 100 mm	186003572	4.6 × 100 mm	186003649
2.1 × 150 mm	186008981	1.0 × 150 mm	186003562	1.0 × 150 mm	186003573	4.6 × 150 mm	186003650
3 × 50 mm	186008982	2.1 × 50 mm	186003563	2.1 × 50 mm	186003574	4.6 × 250 mm	186003651
3 × 100 mm	186008983	2.1 × 100 mm	186003564	2.1 × 100 mm	186003575	10 × 10 mm	186004465*,1
3 × 150 mm	186008984	2.1 × 150 mm	186003565	2.1 × 150 mm	186003576	10 × 50 mm	186008194
4.6 × 50 mm	186008985	2.1 × 250 mm	186003566	2.1 × 250 mm	186003577	10 × 100 mm	186008195
4.6 × 100 mm	186008986	4.6 × 50 mm	186003567	4.6 × 50 mm	186003578	10 × 150 mm	186008196
4.6 × 150 mm	186008987	4.6 × 100 mm	186003568	4.6 × 100 mm	186003579	10 × 250 mm	186008197
		4.6 × 150 mm	186003569	4.6 × 150 mm	186003580	19 × 10 mm	186004464*,2
		4.6 × 250 mm	186003570	4.6 × 250 mm	186003581	19 × 50 mm	186003656
				10 × 10 mm	186004469*,1	19 × 150 mm	186003657
				10 × 50 mm	186008186	19 × 250 mm	186003658
				10 × 100 mm	186008187	30 × 10 mm	186006880*,3
				10 × 150 mm	186008188	30 × 50 mm	186003659
				10 × 250 mm	186008189	30 × 100 mm	186003660
				19 × 10 mm	186004468*,2	30 × 150 mm	186003661
				19 × 50 mm	186003586	30 × 250 mm	186003662
				19 × 100 mm	186003587		
				19 × 150 mm	186003945		

BEH C_{18}, 300 Å

Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm		Particle Size: 10 µm	
2.1 × 5 mm	186009077	1.0 × 50 mm	186003604	1.0 × 50 mm	186003615	4.6 × 50 mm	186003663
2.1 × 50 mm	186009068	1.0 × 100 mm	186003605	1.0 × 100 mm	186003616	4.6 × 100 mm	186003664
2.1 × 100 mm	186009069	1.0 × 150 mm	186003606	1.0 × 150 mm	186003617	4.6 × 150 mm	186003665
2.1 × 150 mm	186009070	2.1 × 50 mm	186003607	2.1 × 50 mm	186003618	4.6 × 250 mm	186003666
3.0 × 50 mm	186009071	2.1 × 100 mm	186003608	2.1 × 100 mm	186003619	10 × 10 mm	186004467*,1
3.0 × 100 mm	186009072	2.1 × 150 mm	186003609	2.1 × 150 mm	186003620	10 × 50 mm	186008198
3.0 × 150 mm	186009073	2.1 × 250 mm	186003610	2.1 × 250 mm	186003621	10 × 100 mm	186008199
4.6 × 50 mm	186009074	4.6 × 50 mm	186003611	4.6 × 50 mm	186003622	10 × 150 mm	186008200
4.6 × 100 mm	186009075	4.6 × 100 mm	186003612	4.6 × 100 mm	186003623	10 × 250 mm	186008201
4.6 × 150 mm	186009076	4.6 × 150 mm	186003613	4.6 × 150 mm	186003624	19 × 10 mm	186004466*,2
		4.6 × 250 mm	186003614	4.6 × 250 mm	186003625	19 × 50 mm	186003671
				10 × 10 mm	186004471*,1	19 × 150 mm	186003672
				10 × 50 mm	186008190	19 × 250 mm	186003673
				10 × 100 mm	186008191	30 × 50 mm	186003674
				10 × 150 mm	186008192	30 × 100 mm	186003675
				10 × 250 mm	186008193	30 × 150 mm	186003676
				19 × 10 mm	186004470*,2	30 × 250 mm	186003677
				19 × 50 mm	186003630	30 × 10 mm	186006882*,3
				19 × 100 mm	186003631		
				19 × 150 mm	186003946		

*Guard Cartridge.
[1] Requires 10 × 10 mm Prep Guard Holder, p/n: 289000779.
[2] Requires 19 × 10 mm Prep Guard Holder, p/n: 186000709.
[3] Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

ACQUITY UPLC Peptide CSH C_{18} Columns and Kits

CSH C_{18}, 130 Å	Particle Size: 1.7 µm		
	Dimension	Column P/N	Kit P/N[1]
	1.0 × 50 mm	186006933	176003061
	1.0 × 100 mm	186006934	176003062
	1.0 × 150 mm	186006935	176003063
	2.1 × 50 mm	186006936	176003064
	2.1 × 100 mm	186006937	176003065
	2.1 × 150 mm	186006938	176003066

[1] Kit contains Peptide CSH C_{18}, 130 Å Column plus one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.

ACQUITY UPLC Peptide CSH C_{18} VanGuard Pre-Column, 3/pk

CSH C_{18}, 130 Å	Particle Size: 1.7 µm		
	Dimension	Column P/N	Kit P/N[1]
	2.1 × 5 mm	186006939	176003067

[1] Kit contains Peptide CSH C_{18}, 130 Å Column plus one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.

ACQUITY UPLC Peptide CSH C_{18} Method Validation Kits*

CSH C_{18}, 130 Å	Particle Size: 1.7 µm		
	Dimension	Column P/N	Kit P/N[1]
	2.1 × 150 mm	186006940	176003068

*Kit contains 3 columns, each from a different batch.
[1] Kit contains Peptide CSH C_{18}, 130 Å Column plus one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.

XSelect Peptide CSH C_{18} Guards, Columns, and Kits

CSH, C_{18}, 130 Å	Particle Size: 2.5 µm			Particle Size: 3.5 µm			Particle Size: 5 µm	
	Dimension	Column P/N	Kit P/N[1]	Dimension	Column P/N	Kit P/N[1]	Dimension	Column P/N (1/pk)
	2.1 × 50 mm ***XP***	186006941	176003069	2.1 × 10 mm[2,4]	186006954	176003081	4.6 × 50 mm	186007076
	2.1 × 100 mm ***XP***	186006942	176003070	2.1 × 50 mm	186006950	176003077	4.6 × 100 mm	186007077
	2.1 × 150 mm ***XP***	186006943	176003071	2.1 × 100 mm	186006951	176003078	4.6 × 150 mm	186007078
	4.6 × 50 mm ***XP***	186006946	176003074	2.1 × 150 mm	186006952	176003079	10 × 10 mm*	186007015
	4.6 × 100 mm ***XP***	186006947	176003075	4.6 × 20 mm[3,4]	186006958	176003085	10 × 50 mm*	186008264
	4.6 × 150 mm ***XP***	186007038	176003093	4.6 × 50 mm	186006955	176003082	10 × 100 mm*	186008265
				4.6 × 100 mm	186006956	176003083	10 × 150 mm*	186008266
				4.6 × 150 mm	186006957	176003084	10 × 250 mm*	186008267
							19 × 10 mm*	186007019**
							19 × 50 mm*	186007022
							19 × 100 mm*	186007020
							19 × 150 mm*	186007021
							19 × 250 mm*	186007031
							30 × 50 mm*	186007026
							30 × 100 mm*	186007025
							30 × 150 mm*	186007023
							30 × 250 mm*	186007024
							50 × 50 mm*	186007030
							50 × 100 mm*	186007027
							50 × 150 mm*	186007028
							50 × 250 mm*	186007029

* OBD Column.
** Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.
[1] Kit contains Peptide CSH C_{18}, 130 Å Column plus one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.
[2] Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.
[3] Requires 4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.
[4] 2/pk.

XSelect Peptide CSH C_{18} Columns and Method Validation Kits*

CSH C_{18}, 130 Å	Particle Size: 2.5 µm			Particle Size: 3.5 µm		
	Dimension	Column P/N	Kit P/N[1]	Dimension	Column P/N	Kit P/N[1]
	2.1 × 100 mm	186006945	176003073	2.1 × 100 mm	186006953	176003080
	4.6 × 100 mm	186006966	176003076	4.6 × 100 mm	186006959	176003086

*Each Method Validation Kit contains three columns, each from a different batch.
[1] Kit includes three Peptide CSH C_{18}, 130 Å columns, each from a different batch; and three vials of Cytochrome *c* Digestion Standard, p/n: 186006371.

XSelect Peptide CSH C_{18} VanGuard Cartridges,* 3/pk

CSH, C_{18}, 130 Å	Particle Size: 2.5 µm		
	Dimension	Column P/N	Kit P/N[1]
	2.1 × 5 mm	186006944	176003072

*Requires VanGuard Cartridge Universal Holder, p/n: 186007949.
[1] Kit includes three Peptide CSH C_{18}, 130 Å Guard Columns and one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.

Purification and Isolation Cartridge Holders and Replacement O-rings

Description	Qty.	P/N
10 × 10 mm Cartridge Holder	1/pk	289000779
19 × 10 mm Cartridge Holder	1/pk	186000709
Replacement O-ring 7.8 mm	2/pk	700001019
Replacement O-ring 10 mm	2/pk	700001436

ACQUITY UPLC Peptide HSS T3 Columns and Kits

HSS T3, 100 Å	Particle Size: 1.8 µm		
	Dimension	Column P/N	Kit P/N[1]
	1.0 × 50 mm	186008751	176003992
	1.0 × 100 mm	186008752	176003993
	1.0 × 150 mm	186008753	176003994
	2.1 × 50 mm	186008754	176003995
	2.1 × 100 mm	186008755	176003996
	2.1 × 150 mm	186008756	176003997

[1] Kit includes Peptide HSS T3 Column plus one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.

ACQUITY UPLC Peptide HSS T3 VanGuard Pre-Column, 3/pk

HSS T3, 100 Å	Particle Size: 1.8 µm	
	Dimension	P/N
	2.1 × 5 mm	186008757

ACQUITY UPLC Peptide HSS T3 Method Validation Kits*

HSS T3, 100 Å	Particle Size: 1.8 µm	
	Dimension	P/N
	2.1 × 150 mm	186008782

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

XSelect Peptide HSS T3 Columns

HSS T3, 100 Å	Particle Size: 2.5 µm			Particle Size: 5 µm		
	Dimension	Column P/N	Kit P/N[1]	Dimension	Column P/N	Kit P/N[1]
	2.1 × 50 mm	186008758	176003998	2.1 × 100 mm	186008775	176004017
	2.1 × 100 mm	186008759	176003999	2.1 × 150 mm	186008776	176004018
	2.1 × 150 mm	186008760	176004006	4.6 × 100 mm	186008779	176004020
	4.6 × 50 mm	186008762	176004007	4.6 × 150 mm	186008780	176004021
	4.6 × 100 mm	186008763	176004008			
	4.6 × 150 mm	186008764	176004009			

[1] Kit includes Peptide HSS T3 Column plus one vial of Cytochrome *c* Digestion Standard, p/n: 186006371.

XSelect Peptide HSS T3 VanGuard Cartridges, 3/pk*

HSS T3, 100 Å	Particle Size: 2.5 µm		Particle Size: 5 µm	
	Dimension	P/N	Dimension	P/N
	2.1 × 5 mm	186008761	2.1 × 5 mm	186008777
	3.9 × 5 mm	186008765	3.9 × 5 mm	186008781

*Requires a VanGuard Cartridge Universal Holder, p/n: 186007949.

XSelect Peptide HSS T3 Method Validation Kits*

HSS T3, 100 Å	Particle Size: 2.5 µm		Particle Size: 5 µm	
	Dimension	P/N	Dimension	P/N
	2.1 × 150 mm	186008783	2.1 × 150 mm	186008787
	4.6 × 150 mm	186008784	4.6 × 150 mm	186008788

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

CATION-EXCHANGE PEPTIDE AND POLYPEPTIDE SEPARATIONS

For most analytical and preparative peptide separations, cation-exchange chromatography is used mainly when alternative selectivity is required. In some large-scale purifications, cation exchange can take on a more central role. In these cases, cation exchange is frequently used as the first step in the separation, followed by a secondary purification step using reversed-phase methods.

Waters offers BioSuite packings for cation-exchange separations. These packings are useful both for analytical and preparative work. They are based on rigid, hydrophilic polymethacrylate particles with large 1,000 Å pores. The naturally hydrophilic polymer reduces non-specific adsorption, resulting in better recovery of peptide/polypeptide mass and bioactivity. These packings are stable in the pH range of 2–12.

Protein-Pak SP HR 8 and 15 µm packing material is available in pre-packed glass columns.

THERAPEUTIC PEPTIDE METHOD DEVELOPMENT KIT

The Therapeutic Peptide Method Development Kit was developed to simplify the process of sample preparation and LC method development for the analysis of therapeutic peptides in plasma. The kit contains an Oasis Peptide µElution Method Development Plate, a Peptide BEH C_{18}, 300 Å reversed-phase column, and the detailed screening protocol which was used to generate the data shown in this publication.

In addition, a comprehensive method development training seminar has been created which describes all aspects of the method development process from the MS conditions to the final validation of a method for the extraction of the therapeutic peptide desmopressin from human plasma.

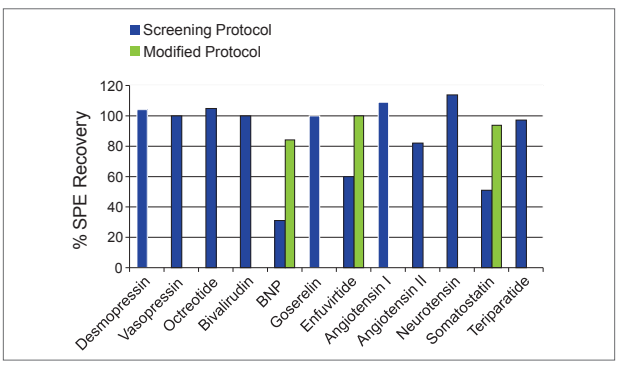
Although big progress has been made in sample pretreatment over the last years, there are still considerable limitations when it comes to overcoming complexity and dynamic range problems associated with peptide analyses from biological matrices. We focus on techniques which can be employed prior to liquid chromatography coupled to mass spectrometry for peptide detection and identification.

The peptide columns are specifically QC tested with a cytochrome *c* tryptic digest that helps ensure batch-to-batch consistency in validated methods ideally suited for separating a wide range of large and small, acidic and basic, hydrophilic and hydrophobic peptides.

The complexity of samples still far exceeds the capacity of currently available analytical systems, and specific sample preparation remains a crucial part of the analysis in a whole.

For more information, visit www.waters.com/pepkit or contact your local Waters sales office.

High Recovery of Peptides



The innovative Oasis µElution Plate allows for up to a 15x sample concentration, increasing the possibility of reaching the required sensitivity levels for bioanalytical assays. The low (25 µL) elution volume eliminates the need for evaporation and reconstitution significantly reducing the potential analyte loss due to absorption to the walls of the collection plate and/or chemical instability.

Ordering Information

Therapeutic Peptide Method Development Kits

Description	Qty/Box	P/N
UPLC Therapeutic Peptide Method Development Kit		176001835
Oasis µElution Method Development Plate	1	186004713
ACQUITY UPLC Peptide BEH C_{18}, 300 Å, 1.7 µm, 2.1 × 50 mm Column	1	186003685
96-Well 1 mL Collection Plate and Cap Mat	3	600001043
HPLC Peptide Therapeutic Peptide Method Development Kit		176001836
Oasis µElution Method Development Plate	1	186004713
XBridge Peptide BEH C_{18}, 300 Å, 3.5 µm, 2.1 × 50 mm Column	1	186003607
96-Well 1 mL Collection Plate and Cap Mat	3	600001043

Additional Products (Not Included in Kits)		
Oasis MAX 96-Well µElution Plate	1	186001829
Oasis WCX 96-Well µElution Plate	1	186002499
96-Well 1 mL Collection Plate	50	186002481
Cap Mats for 1 mL Collection Plate	50	186002483
Disposable Reservoir Tray	25	WAT058942
Extraction Manifold for 96-Well Plates	1	186001831
Vacuum Box Gasket Kit (contains foam top gaskets and orange O-rings)	2	186003522
SPE Vacuum Pump 115 V, 60 Hz	1	725000417
SPE Vacuum Pump 240 V, 50 Hz	1	725000604

BIOSUITE HPLC AND UHPLC PEPTIDE ANALYSIS COLUMNS

- Two HPLC and UHPLC column chemistries that provide alternative chemistries for peptide separations
- Designed for maximum resolution of complex digests
- Available in various configurations for LC or LC-MS applications
- Excellent batch-to-batch reproducibility for consistent results
- Uniquely QC tested specifically for peptide mapping using Waters MassPREP Cytochrome *c* Digestion Standard

BioSuite Peptide Analysis Series

BioSuite PA Series consists of two Waters premier reversed-phase column chemistries specifically optimized for peptide mapping from simple to complicated digests.

BioSuite C_{18}, 3 µm PA-A

BioSuite C_{18}, 3 µm PA-A is a 100 Å, difunctional bonded, low ligand density, silica-based column.

- Specifically designed for excellent retention of polar peptides
- Ideal choice for LC-MS applications using formic acid (FA) that minimizes ion-suppression
- Excellent performance for traditional HPLC separations using low TFA concentrations (e.g., 0.025% TFA)

BioSuite C_{18}, 3.5 µm PA-B

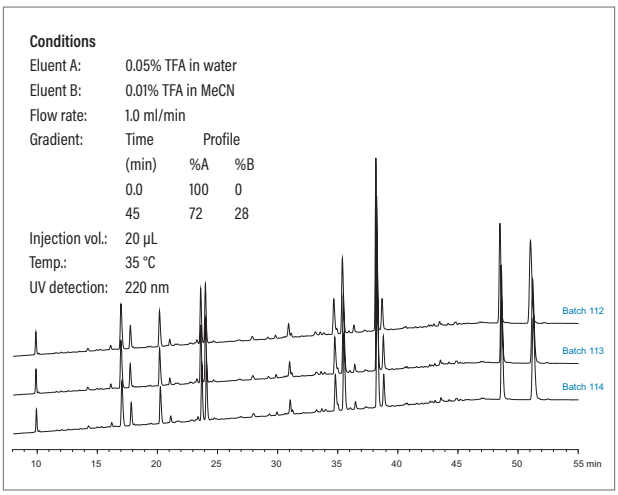
BioSuite C_{18}, 3.5 µm PA-B is a 300 Å, high-ligand density, monofunctional, silica-based column.

- Outstanding performance when separating complex digests containing hydrophilic, hydrophobic, and basic peptides
- Superior peak shape and capacity for peptide separations using TFA containing eluents (e.g., 0.1% TFA)
- Good choice for the separation of larger peptide fragments generated by some endoproteases (e.g., Lys-C)

Consistent Results Due to Superior Batch-to-Batch Reproducibility

Waters' batch-release protocol includes a tryptic map of cytochrome *c* (using Waters MassPREP Cytochrome *c* Digestion Standard [p/n: 186006371]) which is used to test for reproducibility to retention times and resolution. The three test chromatograms below show the results of the protein digest test for different batches of PA-B material.

Cytochrome *c* Tryptic Map QC Test



Waters BioSuite C_{18} PA-A and PA-B Columns are QC tested with tryptic digest of cytochrome c (p/n: 186006371) to help ensure batch-to-batch and column-to-column performance consistency.

Ordering Information

BioSuite Peptide Analysis HPLC and UHPLC Columns

BioSuite C_{18}	Inner Diameter	Length	3 µm PA-A	3.5 µm PA-B
			P/N	P/N
	2.1 mm	50 mm	186002425	186002433
	2.1 mm	100 mm	186002426	186002434
	2.1 mm	150 mm	186002427	186002435
	2.1 mm	250 mm	186002428	186002436
	4.6 mm	50 mm	186002429	186002437
	4.6 mm	100 mm	186002430	186002438
	4.6 mm	150 mm	186002431	186002439
	4.6 mm	250 mm	186002432	186002440

CYTOCHROME *c* DIGESTION STANDARD

Benchmarking, Method Development, and Troubleshooting

The Cytochrome *c* Digestion Standard was prepared by digesting Bovine Heart Cytochrome *c* (Uniprot #P62894) with sequencing grade trypsin. This standard is recommended for benchmarking system performance and is also used for column QC.

Ordering Information

Cytochrome *c* Digestion Standard

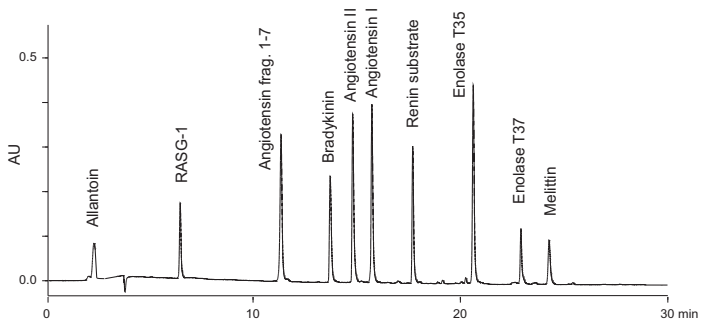
Description	P/N
Cytochrome *c* Digestion Standard	186006371

MassPREP PEPTIDE STANDARD

Benchmarking, Method Development, and Troubleshooting

The MassPREP Peptide Standard Mixture contains a void volume (VO) column marker and nine carefully selected peptides with a broad range of polarities and isoelectric points. The MassPREP Standard is useful to test LC columns and systems dedicated to peptide separations.

Baseline HPLC Resolution of Nine Peptides Contained in MassPREP Standard Mixture



Component Name	Molecular Weight* (g/mol)	pK_a	Peptide Sequence
Allantoin (V0 marker)	158.0440	–	–
RASG-1	1000.4938	9.34	RGDSPASSKP
Angiotensin frag.1–7	898.4661	7.35	DRVYIHP
Bradykinin	1059.5613	12.00	RPPGFSPFR
Angiotensin II	1045.5345	7.35	DRVYIHPF
Angiotensin I	1295.6775	7.51	DRVYIHPFHL
Renin substrate	1757.9253	7.61	DRVYIHPFHLLVYS
Enolase T35	1871.9604	7.34	WLTGPQLADLYHSLMK
Enolase T37	2827.2806	3.97	YPIVSIEDPFAEDDWEAWSHFFK
Melittin	2845.7381	12.06	GIGAVLKVLTTGLPALISWIKRKRQQ

Peptide Analysis on a BioSuite C_{18}, 3 µm, 2.1 × 150 mm Column; Eluent A: 0.02% TFA in water, Eluent B: 0.016% TFA in acetonitrile. Gradient: 0–50% B in 30 minutes. Flow: 0.20 mL/min. Temp: 40 °C.
* Monoisotopic molecular weight.

Waters offers a variety of carefully formulated and QC-tested peptide standards to help chromatographers confirm the performance of their column and LC system prior to analyses of potentially highly valued samples.

Ordering Information

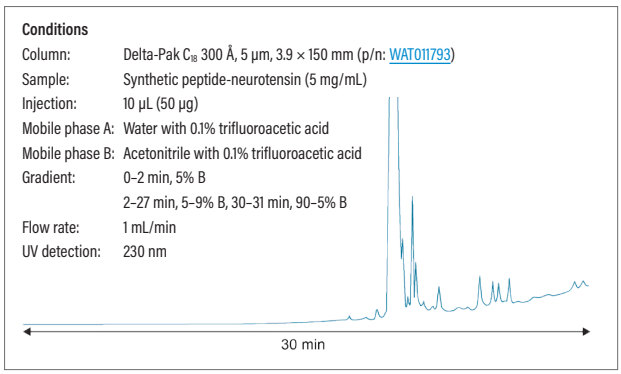
MassPREP Peptide Standards

Description	Volume	P/N
MassPREP Peptide Mixture One vial with approximately 1 nmol of each: Allantoin (Vo Marker); RASG-1, angiotensin frag. 1–7, bradykinin; angiotensin II; angiotensin I, renin substrate, enolase T35, enolase T37, melittin. The peptide standard is useful to test LC columns and systems dedicated to peptide separations.	Solid	186002337
MassPREP Peptide Mixture, 5/pk Each vial contains approximately 1 nmol of each: Allantoin (Vo Marker); RASG-1, angiotensin frag. 1–7, bradykinin, angiotensin II, angiotensin I, renin substrate, enolase T35, enolase T37, melittin. The peptide standard is useful to test LC columns and systems dedicated to peptide separations.	Solid	186002338

DELTA-PAK HPLC AND UHPLC COLUMNS

Delta-Pak packings, ideal for the separation of peptides, proteins, and natural products, are based on a highly stable, bonded, endcapped 5 or 15 µm spherical silica. Delta-Pak is available in two different pore size materials (100 Å and 300 Å) with a C_{18} or C_4 bonded phase.

Synthetic Peptide Separation on Delta-Pak C_{18} HPLC Column



Waters Delta-Pak C_{18}, 300 Å Columns (available in 5 and 15 µm particle sizes) are well suited for the analysis and lab-scale isolation of synthetic peptide mixtures.

For more information, visit waters.com/biosep

Ordering Information

Delta-Pak Analytical HPLC and UHPLC Columns and Guards

	Particle Size: 5 µm		
Delta-Pak C_{18}, 100 Å	**Dimension**	**Type**	**P/N**
	3.9 × 20 mm	Guard, 2/pk	WAT046880[1]
	3.9 × 20 mm	Guard, 10/pk	WAT036870[1]
	3.9 × 150 mm	Column	WAT011795
Delta-Pak C_{18}, 300 Å	2.1 × 150 mm	Column	WAT023650
	3.9 × 20 mm	Guard, 2/pk	WAT046890[1]
	3.9 × 150 mm	Cartridge, 10/pk	WAT036875[2]
	3.9 × 150 mm	Column	WAT011793
Delta-Pak C_4, 100 Å	3.9 × 20 mm	Guard, 2/pk	WAT046875[1]
	3.9 × 150 mm	Column	WAT011796
Delta-Pak C_4, 300 Å	3.9 × 20 mm	Guard, 2/pk	WAT046885[1]
	3.9 × 150 mm	Cartridge, 10/pk	WAT036865[2]
	3.9 × 150 mm	Column	WAT011794
Guard-Pak Holder			WAT088141
Guard-Pak In-line Filters, 5/pk			WAT032472

[1] Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.
[2] Requires Guard-Pak Holder, p/n: WAT088141.

Delta-Pak Radial Compression Preparative HPLC and UHPLC Column Segments and PrepPak Cartridges*

	Particle Size: 15 µm		
Delta-Pak C_{18}, 100 Å	**Dimension**	**Type**	**P/N**
	8 × 100 mm	Column	WAT025846
	25 × 10 mm	Guard, 2/pk	WAT038520
	25 × 100 mm	Column	WAT038506
	40 × 10 mm	Guard, 2/pk	WAT037842
	40 × 100 mm	Column	WAT037688
Delta-Pak C_{18}, 300 Å	8 × 100 mm	Column	WAT025845
	25 × 10 mm	Guard, 2/pk	WAT038522
	25 × 100 mm	Column	WAT038507
	40 × 10 mm	Guard, 2/pk	WAT037845
	40 × 100 mm	Column	WAT037692
Delta-Pak C_4, 100 Å	8 × 100 mm	Column	WAT025848
	25 × 10 mm	Guard, 2/pk	WAT038524
	25 × 100 mm	Column	WAT038508
	40 × 10 mm	Guard, 2/pk	WAT037696
Delta-Pak C_4, 300 Å	25 × 10 mm	Guard, 2/pk	WAT038526
	25 × 100 mm	Column	WAT038509
	40 × 10 mm	Guard, 2/pk	WAT037851
	40 × 100 mm	Column	WAT037700

*All column segments and cartridges require the appropriate holder/module.

Delta-Pak Preparative HPLC and UHPLC Guard Columns

	Particle Size: 15 µm		
Delta-Pak C_{18}, 100 Å	**Dimension**	**Type**	**P/N**
	3.9 × 300 mm	Column	WAT011797
	7.8 × 300 mm	Column	WAT011798
	19 × 300 mm	Column	WAT011799
	30 × 300 mm	Column	WAT011800
	50 × 300 mm	Column	WAT011801
Delta-Pak C_{18}, 300 Å	3.9 × 300 mm	Column	WAT011802
	7.8 × 300 mm	Column	WAT011803
	19 × 300 mm	Column	WAT011804
	30 × 300 mm	Column	WAT011805
Delta-Pak C_4, 100 Å	3.9 × 300 mm	Column	WAT011807
	7.8 × 300 mm	Column	WAT011808
	19 × 300 mm	Column	WAT011809
	30 × 300 mm	Column	WAT011810
Delta-Pak C_4, 300 Å	3.9 × 300 mm	Column	WAT011812
	7.8 × 300 mm	Column	WAT011813
	19 × 300 mm	Column	WAT011814
	30 × 300 mm	Column	WAT011815

SYMMETRY HPLC AND UHPLC COLUMNS

Waters Symmetry reversed-phase, silica-based particles are synthesized using ultrapure organic reagents, resulting in high purity material with very low silanol activity. When combined with the high surface coverage of the bonded phase, outstanding peptide separations and recoveries are possible.

- Superior manufacturing control for consistent batch-to-batch and column-to-column results
- 100 Å and 300 Å pore size offerings for small or larger size peptides
- SymmetryShield Column chemistry offers complementary selectivity to Symmetry Column offerings
- SymmetryPrep Columns provide direct scale up while maintaining resolution

Symmetry300 Columns: The First Columns Specifically Engineered for the Discovery and Development of New Biopharmaceuticals

Symmetry300 Columns are 300 Å reversed-phase columns specifically designed to provide maximum batch-to-batch and column-to-column performance consistency and recovery of protein and peptide applications.

Symmetry300 Columns are offered in two particle sizes (3.5 µm and 5 µm) and in two chemistries (C_4 for large peptides and proteins, and C_{18} for smaller peptides) to address various needs.

Ordering Information

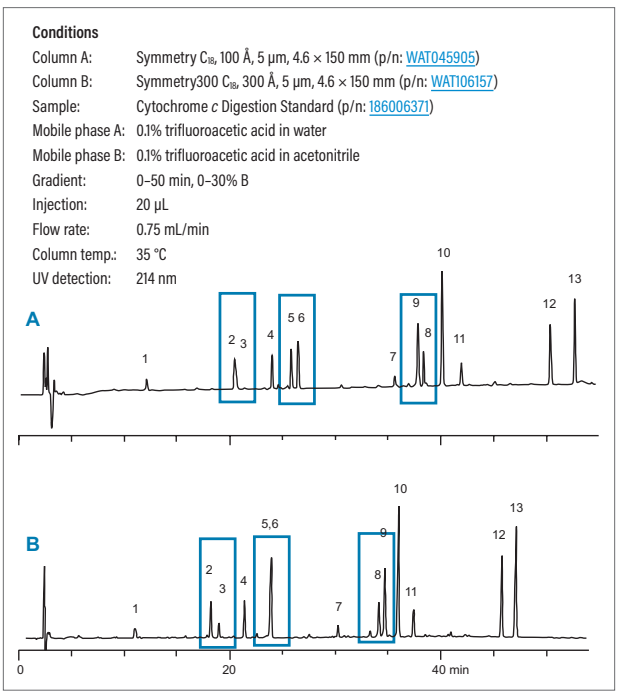
Symmetry300 HPLC and UHPLC Columns

	Particle Size: 3.5 µm		Particle Size: 5 µm	
C_{18}	Dimension	P/N	Dimension	P/N
	1.0 × 150 mm	186000185	2.1 × 150 mm	WAT106172
	2.1 × 50 mm	186000187	3.9 × 150 mm	WAT106154
	2.1 × 100 mm	186000188	4.6 × 50 mm	WAT106209
	2.1 × 150 mm	186000200	4.6 × 150 mm	WAT106157
	4.6 × 50 mm	186000201	4.6 × 250 mm	WAT106151
	4.6 × 75 mm	186000189	19 × 10 mm	186001847
	4.6 × 100 mm	186000190	19 × 50 mm	186001848
	4.6 × 150 mm	186000197	19 × 100 mm	186001849
C_4	2.1 × 150 mm	186000276	2.1 × 150 mm	186000285
	3.9 × 150 mm	186000277	3.9 × 150 mm	186000286
	4.6 × 50 mm	186000278	4.6 × 50 mm	186000287
	4.6 × 150 mm	186000279	4.6 × 150 mm	186000288
	4.6 × 250 mm	186000280	4.6 × 250 mm	186000289
	19 × 10 mm	186000281		
	19 × 50 mm	186000282		
	19 × 100 mm	186000283		

High Recoveries of Peptides and Proteins

The heart of the column is high purity-based deactivated silica. Waters dedicated chromatography chemistry manufacturing plant operates under the stringent standards of cGMP and ISO 9001. The silica used in the manufacture of our Symmetry300 Columns is synthesized using ultrapure organic reagents that yields high purity particles with very low silanol activity. These particles when combined with innovative ligand (i.e., C_4 and C_{18}) bonding techniques helps produce reversed-phase columns with minimal non-desired secondary interactions between bound ligand and biomolecules.

Pore Size Effects on Peptide Selectivity: Comparative Results on Symmetry 100 Å vs. Symmetry300 Columns



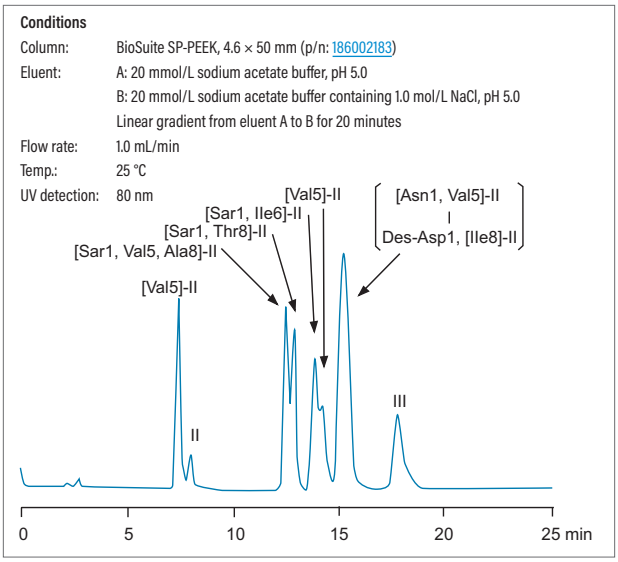
Waters' Symmetry-based C_{18} Column consists of a 100% porous silica particle containing a C_{18} ligand and endcapping to minimize undesired secondary interactions between the peptide analytes and column chemistry. As indicated by the gradient separation of a cytochrome c tryptic digest, different separation selectivities are obtained on the 100 Å column vs. the 300 Å pore size materials, with Symmetry300 C_{18} being preferred for separation on compounds greater than approximately 10,000 Dalton.

The key to a successful separation is the selection of a column that gives the highest chemistry resolution with maximum peak capacity and recovery.

BIOSUITE CATION-EXCHANGE HPLC COLUMNS

BioSuite SP NP, SP-PEEK, and SP cation-exchange chemistries (CXC) consists of the "strong" sulfopropyl ligand bonded to a pH stable (i.e., pH 2–12), methacrylic ester-based polymeric resin. The availability of different pore and particle size materials provides chromatographers with the flexibility required to isolate and or characterize peptides based upon minor charge differences. Non-porous (NP) and porous IEX Columns are also available to meet various separations requirements. Speed and superior chromatographic resolution are possible using the non-porous IEX offerings, while porous BioSuite offerings are available for applications requiring greater peptide binding capacity. In addition, BioSuite SP material is offered in PEEK hardware as well as in 21.5 mm I.D. stainless steel "lab-scale" preparative column dimensions.

Separation of Angiotensins on BioSuite SP-PEEK Cation-Exchange HPLC Column



Waters BioSuite SP-PEEK Cation-Exchange Column is well suited for the HPLC or UHPLC analyses of a complex peptide mixture using a gradient of increasing salt concentration.

Ordering Information

BioSuite Cation-Exchange HPLC Columns

Description	Matrix	Pore Size	Exclusion Limit (Daltons) against Polyethylene Glycol	Inner Diameter	Length	Column Volume (mL)	# Approx Protein Binding Capacity Per Pre-Packed Column	P/N
BioSuite SP-PEEK, 7 µm CXC	Polymer	1300 Å	>4,000,000	4.6 mm	50 mm	0.83	58 mg*	186002182
BioSuite SP, 2.5 µm NP CXC	Polymer	N/A	500	4.6 mm	35 mm	0.58	2.9 mg**	186002183
BioSuite SP, 10 µm CXC	Polymer	1000 Å	1,000,000	7.5 mm	75 mm	3.31	132 mg**	186002184
BioSuite SP, 13 µm CXC	Polymer	1000 Å	1,000,000	21.5 mm	150 mm	54.45	2178 mg**	186002185

For best resolution of complex samples, do not exceed 20% of the column's protein binding capacity.
* Data generated with gamma globulin.
** Data generated with hemoglobin.

BioResolve SCX mAb Columns

BioResolve SCX mAb Columns for the LC analysis of mAb charge variants as well as other biopharmaceutical therapeutics.

waters.com/bioresolve

ADDITIONAL PEPTIDE CONSUMABLES

MassPREP Protein Digestion Standards

The MassPREP Protein Digestion Standards are prepared under strict quality control procedures and contain no undigested standard proteins, trypsin, or other hydrophilic components. Test results from each batch of digestion standards are provided on an available Certificate of Analysis report.

Ordering Information

MassPREP Digestion Standards

Description	Volume	P/N
Yeast enolase	Solid	186002325
Phosphorylase b	Solid	186002326
Bovine hemoglobin	Solid	186002327
Yeast alcohol dehydrogenase (ADH)	Solid	186002328
Bovine serum albumin (BSA)	Solid	186002329
Cytochrome *c*		186006371
MassPREP Digestion Standard Kit contains (1) of 186002325, 186002326, 186002327, 186002328, 186002329		186002330

NIST Digestion Standards

A line of standards based off the NIST Reference Material 8671 (NIST mAb), a humanized IgG1k expressed from a murine cell line.

Ordering Information

NIST Digestion Standards

Description	P/N
mAb Tryptic Digestion Standard	186009126
mAb Subunit Standard	186008927

Note: mAb Charge Variant Standard (p/n: 186009065) is also available and it is based on the same NIST mAb Reference Material 8671.

Quantitative Peptide Standards

Sets of standards specifically designed, formulated, and quality controlled for quantitative peptide analysis.

- Quantitative peptide retention standard
- Hi3 Phos B and *E. coli* standards
- SILAC Hi3 Phos B and *E. coli* standards

Ordering Information

Quantitative Peptide Analysis Standards

Description	P/N
Hi3 Phosphorylase B Standard The Hi3 Phos B standard is primarily intended for use with the Hi3 quantification method for MS^E proteomics data processed with ProteinLynx Global SERVER for samples of microbial origin. It may also be used in the evaluation and benchmarking of proteomic LC-MS systems comprised of nanoACQUITY UPLC and SYNAPT and Xevo time-of-flight mass spectrometers. The Hi3 Phos B standard is intended for samples of microbial origin. It is a quantitative standard comprised of the top six ionizing peptides in the rabbit phosphorylase B protein. Recommended at -20 °C.	186006011
Hi3 *E. coli* Standard The Hi3 *E. coli* standard is primarily intended for use with the Hi3 quantification method for MS^E proteomics data processed with ProteinLynx Global Server for samples of microbial origin. It may also be used in the evaluation and benchmarking of proteomic LC-MS systems comprised of nanoACQUITY UPLC and SYNAPT and Xevo time-of-flight mass spectrometers. The Hi3 *E. coli* standard is intended for samples of animal origin. It is a quantitative standard comprised of the top six ionizing peptides in the *E. coli* ClpB protein.	186006012
SILAC Hi3 Phos B Standard The SILAC Hi3 Phos B standard is formulated from the same specialized set of the top six ionizing peptides of the rabbit phosphorylase B protein that is contained in the non-labeled counterpart: Hi3 Phos B standard (p/n: 186006011). The main difference is that this standard is produced to have a heavy labeled reference on the lysine (K) or arginine (R) end of the peptide.	186007083
SILAC Hi3 *E. coli* Standard The SILAC Hi3 *E. coli* standard is formulated from the same specialized set of the top six ionizing peptides of the *E. coli* ClpB protein that is contained in the non-labeled counterpart: Hi3 *E. coli* standard (p/n: 186006012). The main difference is that this standard is produced to have a heavy labeled reference on the lysine (K) or arginine (R) end of the peptide.	186007084
Quantitative Peptide Retention Standard The Quantitative Peptide Retention Standard is a quantitative standard that is useful during the calibration, development, and troubleshooting of chromatographic separations ensuring confidence in results. This standard is rigorously QC tested for purity and quantitative formulation and is specifically designed with the following features: ■ Peak retention for chromatographic reproducibility ■ UV absorptivity for signal reproducibility ■ Low- to high-mass range for MS ■ Water solubility ■ Tryptic-like peptides for peptide mapping studies	186006555

MassPREP Phosphopeptide Standards

The MassPREP Phosphopeptide Standards give you greater control over sample preparation, with the option to use pure peptides or to define phosphopeptides to unmodified peptide ratios.

Ordering Information

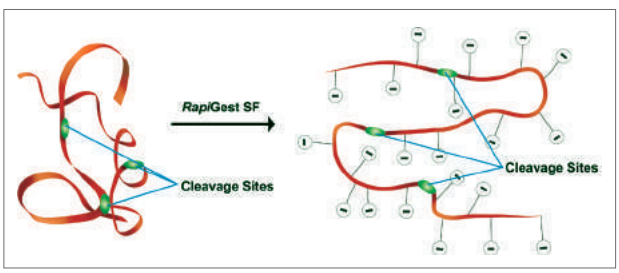
MassPREP Phosphopeptide Standards

Description	Volume	P/N
MassPREP Phosphopeptide Standard Enolase	Solid	186003285
Four yeast enolase derived phosphorylated peptides: T18 1P, T19 1P, T43 1P, T43 2P. Used to optimize phosphopeptide detection in LC-MS, LC/UV, and MALDI-MS.		
MassPREP Enolase Digest with Phosphopeptides Mix	Solid	186003286
Yeast enolase spiked with four yeast enolase derived phosphorylated peptides: T18 1P, T19 1P, T43 1P, T43 2P. A more complex mixture used to optimize and troubleshoot phosphopeptide detection in LC-MS, LC/UV, and MALDI-MS.		
MassPREP Phosphopeptide Sample Kit—Enolase		186003287
Kit allows one to mix and optimize a complex standard per specific applications. Kit contains two vials:		
MassPREP enolase digestion standard	Solid	186002325
MassPREP phosphopeptide standard enolase	Solid	186003285
MassPREP Enhancer (5 vials)	Solid	186003863
Five 500 mg MassPREP Enhancer. A component in the MassPREP Phosphopeptide Enrichment Kit.		186003864
MassPREP Phosphopeptide Enrichment Kit		186003864
MassPREP phosphopeptide enrichment µElution plate	Solid	186003820
MassPREP enhancer	Solid	186003863
MassPREP enolase digest with phosphopeptides mix		186003286

*Rapi*Gest SF Protein Digestion Surfactant

*Rapi*Gest SF (surfactant) radically enhances protein enzymatic digestions in terms of speed and percent recovery. *Rapi*Gest SF is a patented anionic surfactant that accelerates the production of peptides generated by proteases, such as trypsin, Asp-N, Glu-C, and Lys-C. Many hydrophobic proteins are resistant to proteolysis because their cleavage sites are inaccessible to endoproteases. *Rapi*Gest SF, a mild denaturant, helps solubilize and unfold proteins making them more amenable to cleavage without denaturing or inhibiting common proteolytic enzymes.

How *Rapi*Gest SF Works



Ordering Information

*Rapi*Gest SF Surfactant

Description	P/N
*Rapi*Gest SF 1 mg vial	186001860
*Rapi*Gest SF 1 mg vial (5/pk)	186001861
*Rapi*Gest SF 3 mg vial	186008090
*Rapi*Gest SF 10 mg vial	186002123
*Rapi*Gest SF 50 mg vial	186002122

NO MATTER YOUR LC SYSTEM, WE HAVE A COLUMN FOR YOU.

ALLIANCE HPLC

Dispersion: >40 µL

Columns: ≥4.6 mm I.D., ≥3.5 µm particles

Recommended column: 4.6 mm I.D., 5 µm particles

Typical operating pressure: <5000 psi

waters.com/Alliance

ACQUITY Arc
ACQUITY Arc Bio

Dispersion: 20-30 µL

Columns: ≥3.0 mm I.D., ≥2.5 µm particles

Recommended column: 3.0 mm I.D., 2.5 µm particles

Typical operating pressure: <9500 psi

waters.com/Arc

ACQUITY UPLC H-Class PLUS
ACQUITY UPLC H-Class PLUS Bio

Dispersion: <20 µL

Columns: ≥2.1 mm I.D., ≥1.6 µm particles

Recommended column: 2.1 mm I.D., 1.7 µm particles

Typical operating pressure: <15,000 psi

waters.com/HClassBio

Waters

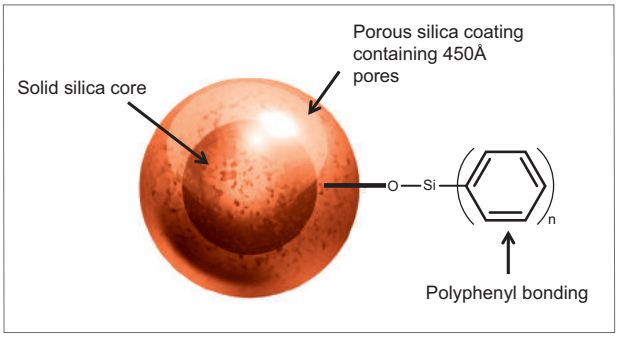
THE SCIENCE OF WHAT'S POSSIBLE.™

Protein Analysis

The development and successful commercialization of protein-based biopharmaceuticals and diagnostic reagents frequently depends on the ability to adequately characterize these complex biomolecules. Waters' columns and methods can help solve your protein separation and characterization challenges. Waters technology utilizes:

- Reversed-phase
- Hydrophilic-interaction for ADCs
- HILIC for large molecules
- SEC for aggregate analysis
- Ion-exchange and charge variant

These orthogonal separation techniques help provide the critical characterization data and isolated material required to produce the next-generation drugs.



A schematic representing the particle and bonded phase of a BioResolve RP mAb Polyphenyl, 450 Å, 2.7 µm Column.

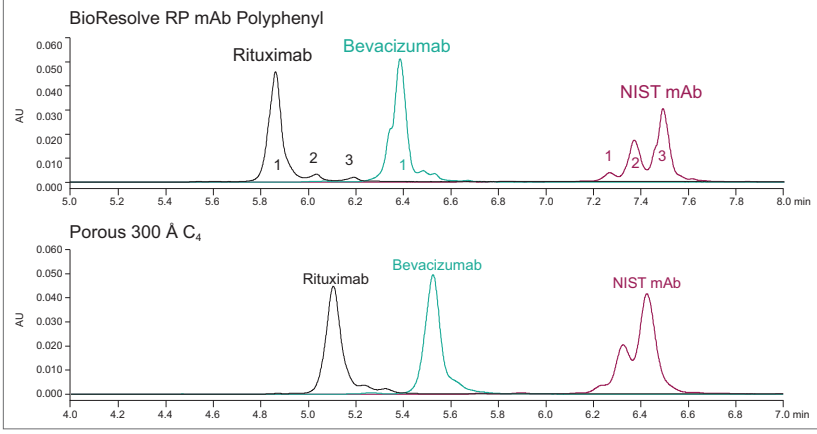
INTACT PROTEIN AND mAb SUBUNIT ANALYSIS

BioResolve RP mAb Polyphenyl Columns

Advances in the LC-MS analysis of biotherapeutic proteins have enabled the analysis at the intact protein and protein subunit level compared to use of peptide mapping protocols. The BioResolve™ RP mAb Columns and VanGuard Cartridges were purposely designed for high quality LC or LC-MS analyses of intact monoclonal antibodies (mAbs), mAb subunits, and antibody drug conjugates (ADCs) using reversed-phase chromatography. This capability was made possible using silica-based, solid core particles containing a well-defined, 450 Å pore coating and polyphenyl ligand bonding.

- Improved resolution for increased quantitation accuracy
- Less injection-to-injection carryover for increased confidence
- Lessened dependence on temperature for minimizing protein degradation
- Amenability to HPLC, UHPLC, and UPLC for use across different laboratories
- LC-MS compatibility and lessened ion pairing dependence for higher quality MS data
- Batch-to-batch consistency ensured by QC testing with the mAb Subunit Standard

Improved Separation Selectivity, Increased Quantitation Accuracy and Enhanced MS Data

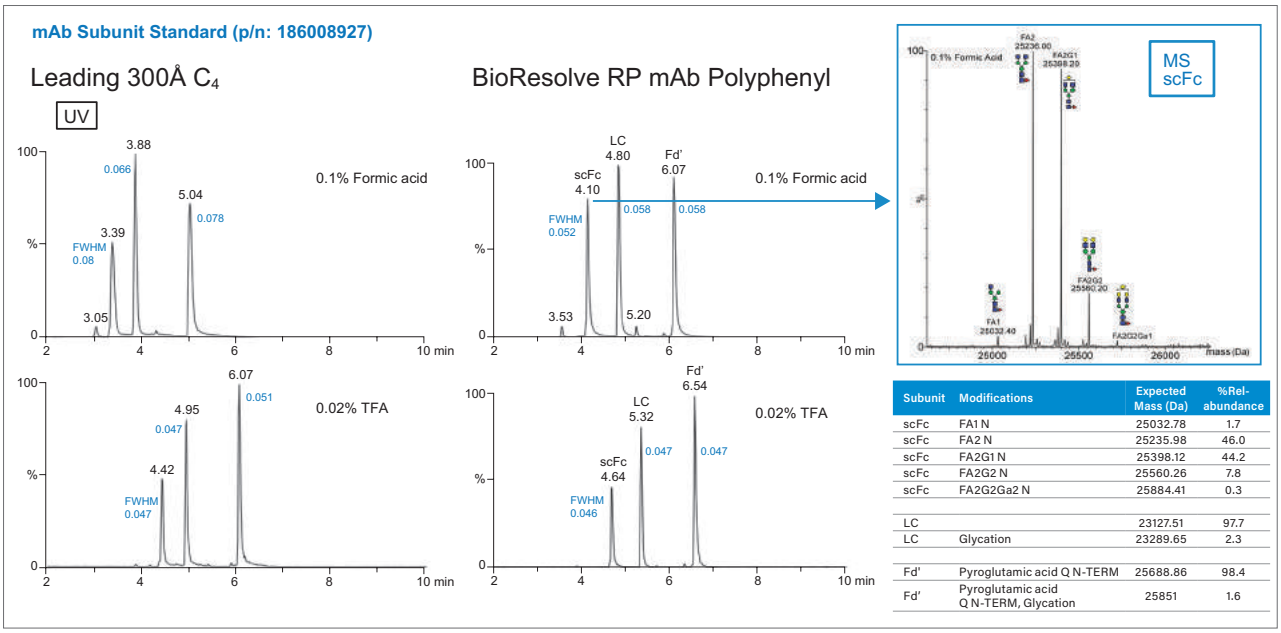


mAb	Peak	Mass (Da)	
Rituximab	1	147,243	Rituximab
	2	147,246	*
	3	147,244	*
Bevacizumab	1	149,202	Bevacizumab
	2	149,191	Sequence variance
	3		*
NIST mAb	1	148,234 (low intensity)	Oxidation
	2	148,220	Oxidation
	3	148,204	NIST mAb
	4	148,205 (low intensity)	*

*Potential deamidation or conformational variant.

Overlay of reversed-phase gradient separation of three different antibodies. The BioResolve RP mAb Polyphenyl Column provides the highest resolution as compared to a leading C_4, 300 Å column in these LC-MS analyses. Masses and potential minor peak identifications are shown in the table. Note: The tentative identifications shown were determined solely on the mass differences against the main peak. Additional testing (e.g., MS- MS) is required to confirm identifies.

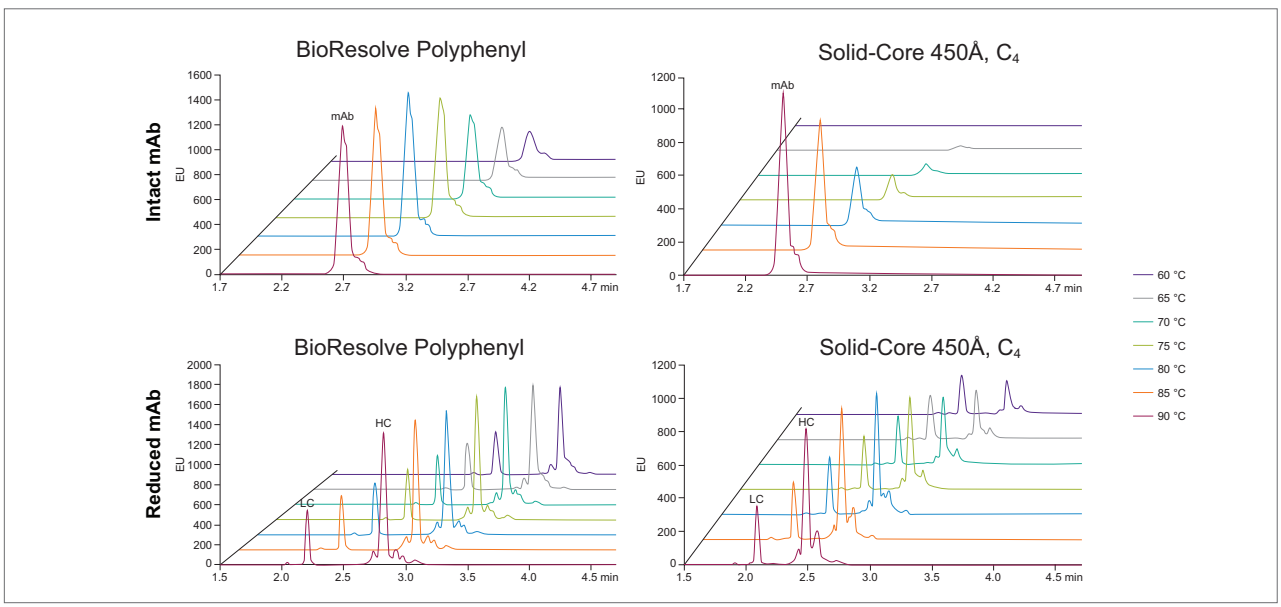
High-Quality MS Data without Adverse Peak Tailing



Subunit	Modifications	Expected Mass (Da)	%Rel-abundance
scFc	FA1 N	25032.78	1.7
scFc	FA2 N	25235.98	46.0
scFc	FA2G1 N	25398.12	44.2
scFc	FA2G2 N	25560.26	7.8
scFc	FA2G2Ga2 N	25884.41	0.3
LC		23127.51	97.7
LC	Glycation	23289.65	2.3
Fd'	Pyroglutamic acid Q N-TERM	25688.86	98.4
Fd'	Pyroglutamic acid Q N-TERM, Glycation	25851	1.6

The ability to obtain acceptable reversed-phase separations in MS-compatible eluents (e.g., 0.1% FA or 0.02% TFA) is an important performance criteria when selecting an appropriate column for these applications. Different than several tested columns (complete data not shown), acceptable LC-MS gradient separations can be achieved with the BioResolve RP mAb Polyphenyl Column using various mobile phases.

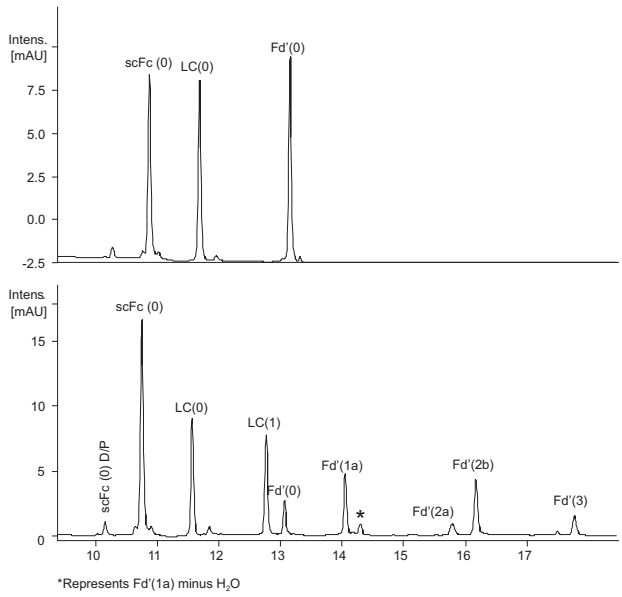
Native mAb (top) vs. Reduced Panitumumab (bottom) Recoveries at Different Gradient Separation Temperatures



The ability to recover proteins from reversed-phase gradient separations can be affected by the separation temperature. While higher temperatures are frequently required to obtain acceptable recoveries, these same on-column high temperatures can cause sample degradation and potential misinformation. Compared to several tested columns (complete data not shown), acceptable gradient separations are possible using lower temperatures on the BioResolve RP mAb Polyphenyl Column.

Bobály, B.; Lauber, M.; Beck, A.; Guillarme, D.; Fekete, S. Utility of a high coverage phenyl-bonding and wide-pore superficially porous particle for the analysis of monoclonal antibodies and related products. J. Chromatogr. A, submitted.

Outstanding Component Resolution and Recovery from IdeS Digested Unconjugated mAbs versus Conjugated (ADC) Species



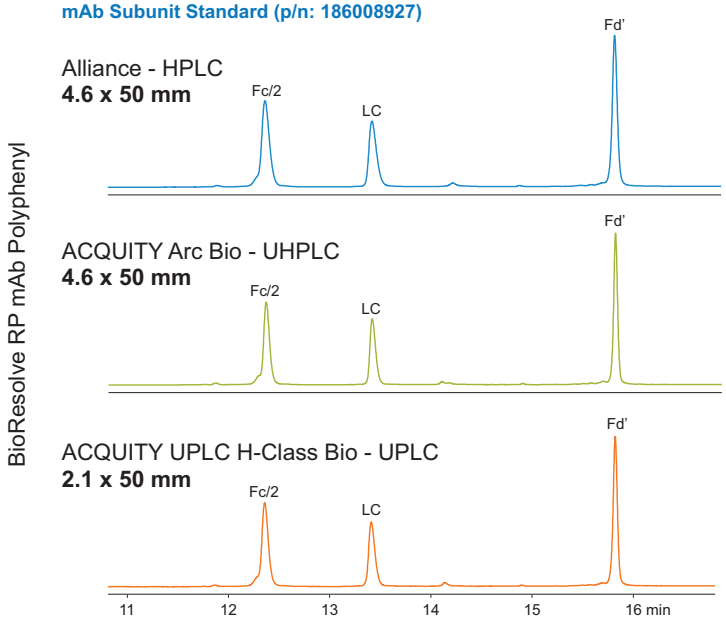
Relative Peak Area of Subunits for mAb and ADC

Isoforms	mAb Relative % Peak Area	mAb Total % Subunit	ADC Relative % Peak Area	ADC % Subunit
Fd' (0)	35.9		5.8	
Fd' (3)	n/a		4.1	
Fd' (2b)	n/a		11.4	
Fd' (2a)	n/a	35.9	3.5	37.4
Fd' (1a) minus water*	n/a		2.8	
Fd' (1a)	n/a		9.8	
L Chain (0)	31.0	31.0	12.6	29.1
L Chain (1)	n/a		16.6	
scFc (0)	33.1	33.1	33.5	33.5

A comparison of an unconjugated mAb versus an antibody drug conjugate showing full recovery of the Fd', LC, and Fc subunits/domains (with and without conjugation). Similar peak areas are recovered from scFc, LC, and Fd' in the ADC vs. the mAb.

Smith, J.; Friese, O.; Rouse, J.; Lauber, M.; Nguyen, J.; Jayaraman, P. High Resolution Chromatography – Mass Spectrometry with a Novel Phenyl RPLC Column for Heightened Characterization of Hydrophobic Monoclonal Antibodies and Antibody Drug Conjugates. WCBP, Washington, DC, January 30-February 1, 2018.

Separations on HPLC and UPLC Systems Using BioResolve RP mAb Polyphenyl, 450 Å, 2.7 µm Columns



Peak Area (%): Comparable profiles

	Fc/2 (%)	LC (%)	Fd'
Alliance	34.52	24.43	41.05
ACQUITY Arc Bio	34.23	24.47	41.30
ACQUITY UPLC H-Class Bio	34.50	24.31	41.19

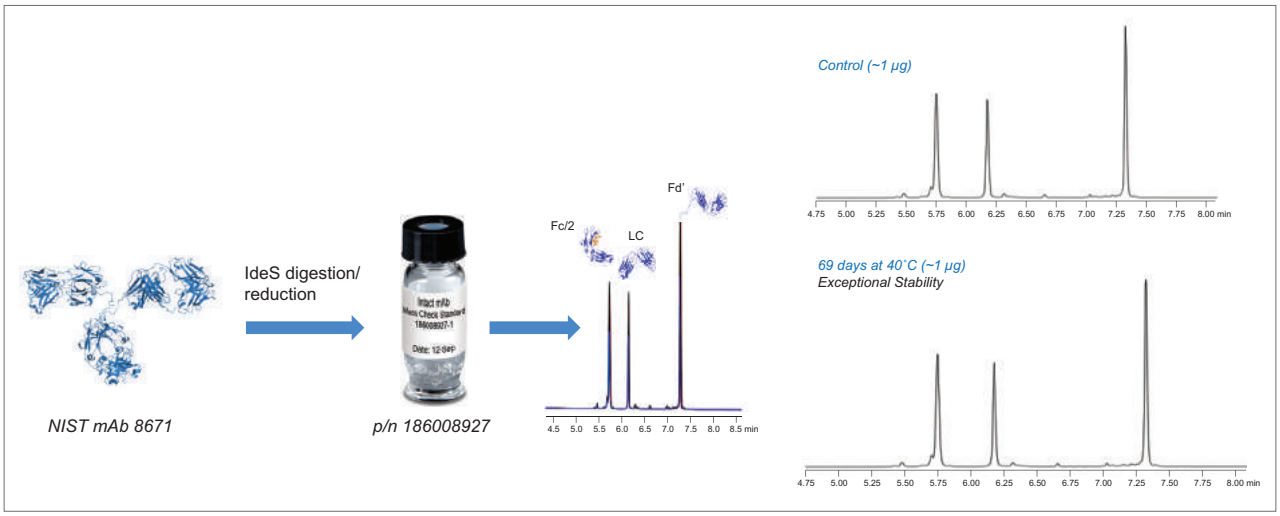
It is possible to use a column containing the exact same material while developing a method during discovery, working through product development, and implementing QC manufacturing controls. This capability can be attributed to the solid-core particle design and innovative polyphenyl ligand bonding of the BioResolve RP mAb Polyphenyl Column. Method transfer concerns can therefore be minimized.

mAb Subunit Standard

Benchmarking, Method Development, and Troubleshooting

Waters mAb Subunit Standard can be used in the benchmarking of LC and LC-MS techniques, proficiency testing among different instruments and laboratories, and system suitability. This standard is a filtered and stabilized formulation of reduced, IdeS-digested NIST Reference Material 8671 (NIST mAb), a humanized IgG1κ expressed from a murine cell line.

- 25 µg of reduced, IdeS-digested NIST Reference Material 8671
- Desalted, stabilized with excipients, and lyophilized
- Excellent stability
- Used to QC each batch on BioResolve RP mAb Polyphenyl Column



SelectScience TRUSTED REVIEWS

APPLICATION AREA: Nanobodies

"We purchased this column to characterize our nanobodies which have a molecular weight of around 14 KDa and it worked really well. Even without expecting it when analyzing them by UPLC-MS with the BioResolve column we were able to distinguish two separate peaks corresponding to the wild type nanobody and an N-terminal pyroglutamat form of it which only differs on 17 units of mass. With that we can say that this column has a really good resolution and is able to distinguish between two close species which may be really useful when working with antibody's modifications."

REVIEWER: Sonia Ciudad Fernández

ORGANIZATION: IECB

Ordering Information

BioResolve RP mAb Polyphenyl Columns, Cartridges, Method Validation Kits*, and Standards

BioResolve RP mAb Polyphenyl Column, 450 Å	Particle Size: 2.7 µm		
	Dimension	P/N (1/pk)	P/N (1/pk with Intact mAb and mAb Subunit Stds)
	1.0 × 50 mm	186009015	–
	1.0 × 100 mm	186009016	–
	1.0 × 150 mm	186009017	–
	2.1 × 50 mm	186008944	176004156
	2.1 × 100 mm	186008945	176004157
	2.1 × 150 mm	186008946	176004158
	3.0 × 50 mm	186008948	–
	3.0 × 100 mm	186008949	–
	3.0 × 150 mm	186008950	–
	4.6 × 50 mm	186008953	176004167
	4.6 × 100 mm	186008954	176004168
	4.6 × 150 mm	186008955	176004169

BioResolve RP mAb Polyphenyl VanGuard Cartridge, 450 Å	Dimension	P/N (3/pk)	P/N (3/pk with VanGuard Holder)
	2.1 × 5 mm	186008943	176004212
	3.9 × 5 mm	186008947	176004161

BioResolve RP mAb Polyphenyl Method Validation Kit, 450 Å	Dimension	P/N (3/pk)	P/N (3/pk with Intact mAb and mAb Subunit Stds)
	1.0 × 100 mm	186009018	–
	1.0 × 150 mm	186009019	–
	2.1 × 100 mm	186008956	176004159
	2.1 × 150 mm	186008957	176004160
	3.0 × 100 mm	186008958	–
	3.0 × 150 mm	186008959	–
	4.6 × 100 mm	186008960	176004170
	4.6 × 150 mm	186008961	176004171

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

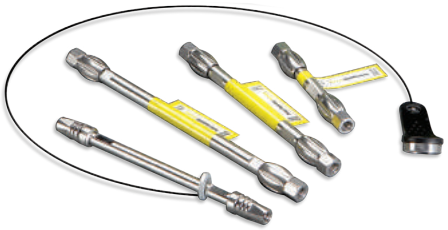
Standards

Description	P/N
Humanized mAb Standard, 1 vial	186009125
Intact mAb Mass Check Standard, 1 vial	186006552
mAb Subunit Standard, 1 vial	186008927

VanGuard Cartridge Universal Holder

Description	P/N
VanGuard Cartridge Universal Holder, 1/pk	186007949

Protein BEH C_4, 300 Å Columns



The analysis and characterization of protein samples requires the detection of small chemical differences between large molecules. Most often these analyses have employed an array of analytical techniques, each sensitive to a different property of the protein. Reversed-phase HPLC has not been fully exploited in these tests because the separation of proteins often yields relatively broad and asymmetrical peaks with poor recovery and significant carryover. Waters reversed-phase, ethylene-bridged hybrid (BEH Technology) Protein Separation Technology Columns are specifically designed for the high-resolution analysis of proteins.

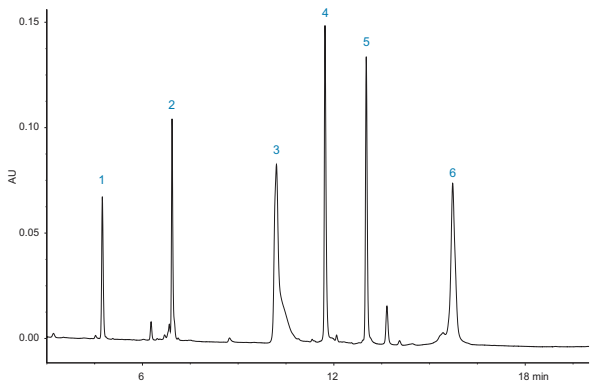
Waters family of Protein BEH C_4, 300 Å Columns for protein separations:

- Separates proteins of various sizes, hydrophobicities, and isoelectric points
- Tolerates extreme pH and temperature
- HPLC/UHPLC (3.5 µm) and UPLC (1.7 µm) column to address instrumentation and application needs
- Preparative columns available in 5- and 10-µm particle offerings
- Quality-control tested with MassPREP Protein Standard Mix (p/n: 186004900)

C_4, 300 Å Columns Developed for Protein Chromatography

Conditions	
Column:	XBridge Protein BEH C_4, 300 Å, 3.5 µm, 2.1 × 50 mm (p/n: 186004498)
Sample:	MassPREP Protein Standard, 0.1% TFA in 5% acetonitrile (p/n: 186004900)
Mobile phase A:	0.1% trifluoroacetic acid in water
Mobile phase B:	0.075% trifluoroacetic acid in 71.4% acetonitrile
Flow rate:	0.2 mL/min
Gradient:	28–100% B in 25 min
Column temp.:	40 °C
Injection:	5 µL
UV detection:	220 nm

Compounds	
1. Ribonuclease A	0.04 mg/mL
2. Cytochrome *c*	0.06 mg/mL
3. Bovine serum albumin	0.20 mg/mL
4. Myoglobin	0.13 mg/mL
5. Enolase	0.22 mg/mL
6. Phosphorylase b	0.59 mg/mL

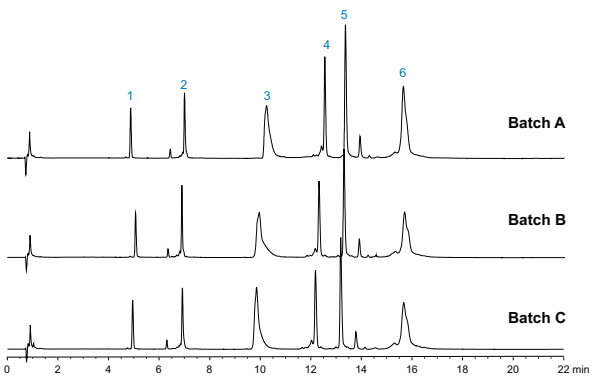


Protein BEH C_4, 300 Å columns can be used with proteins that have a wide range of properties. This protein mix was chosen to represent a range of isoelectric points, molecular weights, and hydrophobicities.

Batch-to-Batch Reproducibility

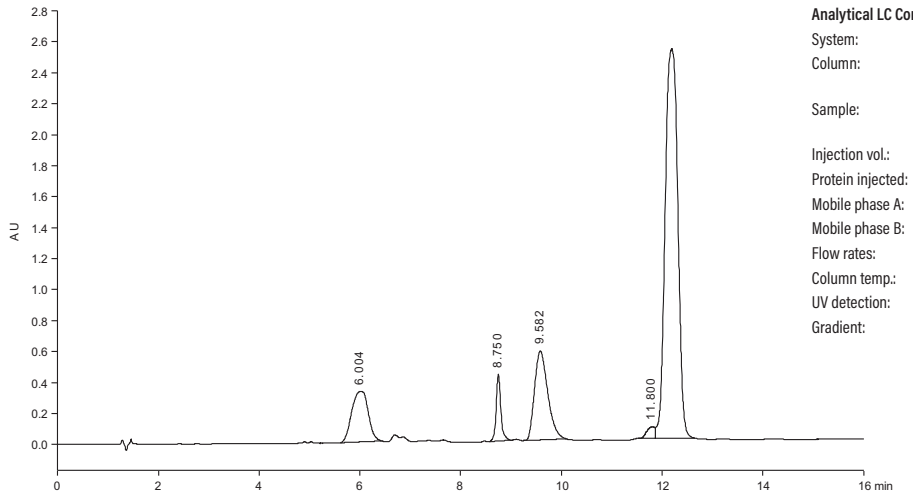
Conditions	
Column:	ACQUITY UPLC Protein BEH C_4, 300 Å, 1.7 µm, 2.1 × 50 mm (p/n: 186004495)
Sample:	MassPREP Protein Standard, 0.1% TFA in 5% acetonitrile (p/n: 186004900)
Eluent A:	0.1% trifluoroacetic acid in 100% HPLC grade water
Eluent B:	0.075% trifluoroacetic acid in 71.4% acetonitrile
Flow rate:	0.2 mL/min
Gradient:	28–100% B in 25 min
Column temp.:	40 °C
UV detection:	220 nm

Compounds
1. Ribonuclease
2. Cytochrome *c*
3. BSA
4. Myoglobin
5. Enolase
6. Phosphorylase b



Waters MassPREP Protein Standard Mix is used to critically QC test the ACQUITY UPLC Protein BEH C_4, 300 Å Columns to help ensure consistent batch-to-batch and column-to-column performance.

Optimized Analytical Scale Separation on XBridge Protein BEH C_4, 300 Å, 3.5 µm, 4.6 × 150 mm Column



Analytical LC Conditions

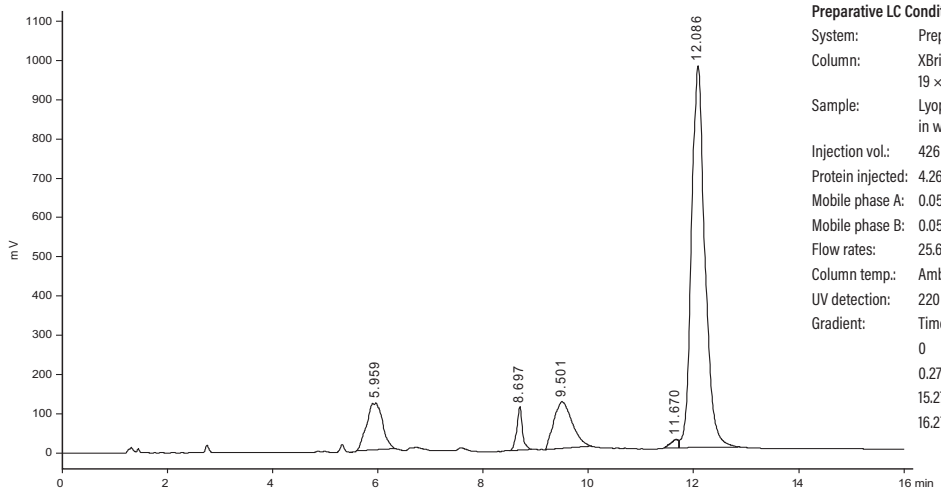
System:	Alliance
Column:	XBridge Protein BEH C_4, 300 Å, 3.5 µm, 4.6 × 150 mm (p/n: 186004504)
Sample:	Lyophilized chicken egg white, 10 mg/mL in 0.05% TFA in water
Injection vol.:	25 µL
Protein injected:	0.25 mg
Mobile phase A:	0.05% TFA in water
Mobile phase B:	0.05% TFA in acetonitrile
Flow rates:	1.5 mL/min
Column temp.:	Ambient
UV detection:	220 nm

Gradient:

Time	%A	%B
0	90	10
15	40	60
16	90	10

Analytical scale separation of 250 µg chicken egg white proteins on XBridge Protein BEH C_4, 300 Å, 3.5 µm, 4.6 × 150 mm Column.

Successful Scaled Preparative Separation on XBridge Protein BEH C_4, OBD Prep, 300 Å, 5 µm, 19 × 150 mm Column



Preparative LC Conditions

System:	Prep 150 LC
Column:	XBridge Protein BEH C_4 OBD Prep, 300 Å, 5 µm, 19 × 150 mm (p/n: 186007313)
Sample:	Lyophilized chicken egg white, 10 mg/mL in 0.05% TFA in water
Injection vol.:	426 µL
Protein injected:	4.26 mg
Mobile phase A:	0.05% TFA in water
Mobile phase B:	0.05% TFA in acetonitrile
Flow rates:	25.6 mL/min
Column temp.:	Ambient
UV detection:	220 nm

Gradient:

Time	%A	%B
0	90	10
0.27	90	10
15.27	40	60
16.27	90	10

Effective method development and scaling of the 250 µm analytical scale separation to the preparative BEH C_4, 300 Å, 5 µm, 19 × 150 mm column results in chromatography showing an almost identical separation pattern.

MassPREP Protein Standard Mix

Benchmarking, Method Development, and Troubleshooting

The MassPREP Protein Standard Mix consists of carefully chosen proteins encompassing a wide range of properties. These mixtures contain proteins that vary in isoelectric points, molecular weights, and hydrophobicities. These characteristics provide the user with an attractive intact protein validation mixture that can be used for a variety of applications. In particular, it is used as a benchmarking standard for ACQUITY UPLC Protein BEH C_4, 300 Å Columns.

MassPREP Protein Standard Mix		
Protein Sample	**Molecular Weight (MW)**	**Isoelectric Point (pI)**
Ribonuclease A, bovine pancreas	13.7 k	9.6
Cytochrome *c*, horse heart, 96%	12.4 k	10.25
Albumin, bovine serum, 96–99%	66.4 k	5.8
Myoglobin, horse heart >90%	16.7 k	6.53
Enolase from baker's yeast (S. cerevisiae)	46.7 k	6.53
Phosphorylase b, rabbit muscle	97.0 k	7.18

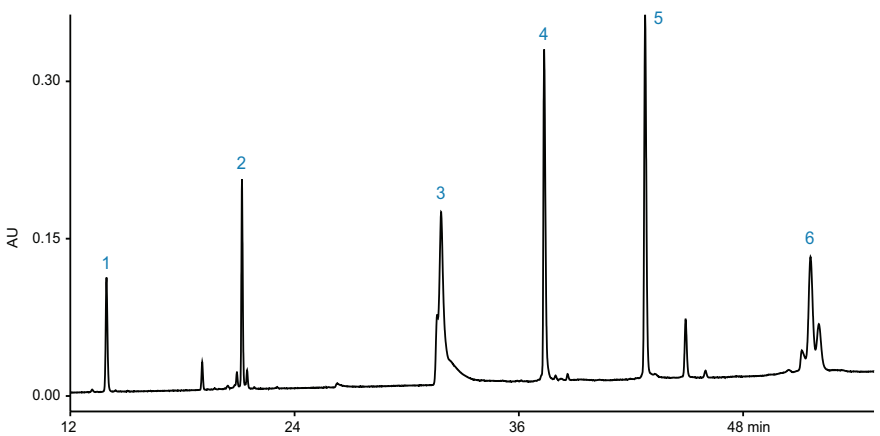
MassPREP Protein Standard Mix on an ACQUITY UPLC Protein BEH C_4, 1.7 µm, 2.1 × 150 mm Column

Conditions

Column:	ACQUITY UPLC Protein BEH C_4, 300 Å, 1.7 µm, 2.1 × 150 mm (p/n: 186004497)
Mobile phase A:	0.1% TFA in water
Mobile phase B:	0.1% TFA in 100% acetonitrile
Flow rate:	0.2 mL/min
Gradient:	20–55% B in 60 min
Column temp.:	40 °C
Injection:	3.3 µL
UV detection:	220 nm
Sample:	MassPREP Protein Standard mixture prepared in 0.1% TFA in 5% acetonitrile

Compounds

1. Ribonuclease A (0.04 mg/mL)
2. Cytochrome *c* (0.06 mg/mL)
3. Bovine serum albumin (0.20 mg/mL)
4. Myoglobin (0.13 mg/mL)
5. Enolase (0.22 mg/mL)
6. Phosphorylase b (0.59 mg/mL)



Use of Waters' carefully formulated and QC tested MassPREP Protein Standard Mix can help chromatographers confirm adequate performance of their reversed-phase column and LC system prior to the analyses of potentially highly valued samples.

MassPREP Protein Standard Mixture Certificate of Analysis

Waters' Analytical Standards and Reagents come with a Certificate of Analysis that contains relevant, lot-specific information. Many times a chromatogram is attached using data acquired the same way a customer would use the standard.

Ordering Information

Protein Standards

Description	P/N
MassPREP Protein Standard Mix	186004900
Intact mAb Mass Check Standard	186006552

ACQUITY UPLC Protein BEH C_4, 300 Å Columns and Method Validation Kits

Protein BEH C_4, 300 Å

Particle Size: 1.7 µm	
Dimension	P/N
1.0 × 50 mm	186005589
1.0 × 100 mm	186005590
1.0 × 150 mm	186005591
2.1 × 50 mm	186004495
2.1 × 100 mm	186004496
2.1 × 150 mm	186004497

Protein BEH C_4, 300 Å VanGuard Pre-Column, 3/pk

Particle Size: 1.7 µm	
Dimension	P/N
2.1 × 5 mm	186004623

Protein BEH C_4, 300 Å Method Validation Kit*

Particle Size: 1.7 µm	
2.1 × 100 mm	186004899
2.1 × 150 mm	186006549

XBridge Protein BEH HPLC and UHPLC Columns and Method Validation Kits

Protein BEH C_4, 300 Å

Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm		Particle Size: 10 µm	
Dimension	P/N	Dimension	P/N	Dimension	P/N	Dimension	P/N
2.1 × 50 mm	186009127	2.1 × 10 mm Guard Cartridge	186007230[1]	10 × 10 mm Guard Cartridge	186007305[3]	10 × 10 mm Guard Cartridge	186007325[3]
2.1 × 100 mm	186009128	2.1 × 50 mm	186004498	10 × 50 mm	186008272	10 × 50 mm	186008276
2.1 × 150 mm	186009129	2.1 × 100 mm	186004499	10 × 100 mm	186008273	10 × 100 mm	186008277
3 × 50 mm	186009132	2.1 × 150 mm	186004500	10 × 150 mm	186008274	10 × 150 mm	186008278
3 × 100 mm	186009133	2.1 × 250 mm	186004501	10 × 250 mm	186008275	10 × 250 mm	186008279
3 × 150 mm	186009134	4.6 × 20 mm Guard Cartridge	186007235[2]	19 × 10 mm Guard Cartridge	186007310[4]	19 × 10 mm Guard Cartridge	186007330[4]
4.6 × 50 mm	186009136	4.6 × 50 mm	186004502	19 × 50 mm	186007311	19 × 50 mm	186007331
4.6 × 100 mm	186009137	4.6 × 100 mm (MVK)*	186005465	19 × 100 mm	186007312	19 × 100 mm	186007332
4.6 × 150 mm	186009138	4.6 × 100 mm	186004503	19 × 150 mm	186007313	19 × 150 mm	186007333
		4.6 × 150 mm	186004504	19 × 250 mm	186007314	19 × 250 mm	186007334
		4.6 × 250 mm	186004505	30 × 10 mm Guard Cartridge	186007315[5]	30 × 10 mm Guard Cartridge	186007335[5]
				30 × 50 mm	186007316	30 × 50 mm	186007336
				30 × 75 mm	186007317	30 × 75 mm	186007337
				30 × 100 mm	186007318	30 × 100 mm	186007338
				30 × 150 mm	186007319	30 × 150 mm	186007339
				30 × 250 mm	186007320		

Protein BEH C_4, 300 Å VanGuard Pre-column, 3/pk**

2.1 × 5 mm	186009131
3.9 × 5 mm	186009140

Protein BEH C_4, 300 Å Method Validation Kit*

2.1 × 5 mm	186009131
3 × 150 mm	186009135
4.6 × 150 mm	186009139

*Three columns from three different batches of material.
** Requires VanGuard Cartridge Universal Holder, p/n: 186007949
[1]Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n WAT097958.
[2]Requires 4.6 × 20 mm Universal Sentry Guard Holder, p/n WAT046910.
[3]Requires 10 × 10 mm Cartridge Holder, p/n 289000779.
[4]Requires 19 × 10 mm Cartridge Holder, p/n 186000709.
[5]Requires 30 × 10 mm Prep Guard Holder, p/n 186006912.

Protein-Pak Hi Res HIC Columns and HIC Protein Standard

Protein-Pak Hi Res HIC (Hydrophobic Interaction Chromatography) columns contain non-porous, polymethacrylate-based particles (2.5 µm) functionalized with a butyl-ligand coating and are well suited for the characterization of proteins and biotherapeutics including monoclonal antibodies (mAb) and antibody drug conjugates (ADC).

While reversed-phase chromatography is a frequently used bioanalytical technique, HIC offers attractive orthogonal separation advantages. In reversed-phase LC, proteins are retained by hydrophobic interaction with alkyl groups (e.g., C_{18}) on the packing material. However, the butyl-ligand density on Waters Protein-Pak Hi Res HIC Column is comparatively less resulting in fewer protein-ligand hydrophobic interactions. Consequently, HIC-based elution is possible using gradients of decreasing salt concentration at physiological pH values. Use of denaturing organic solvent eluents (e.g., acetonitrile in 0.1% TFA) thus allowing biotherapeutics (e.g., acid labile, cysteine-linked ADCs) to be analyzed in non-denaturing conditions.

In addition, Waters has developed HIC Protein Standard Test Mix designed for user verification of HPLC/UPLC instrument and Protein-Pak Hi Res HIC Column performance prior to sample analyses. This intact protein validation mix, when used on a regular basis, helps monitor system and column performance and is also highly valuable in method development and/or troubleshooting. The standard contains a carefully chosen set of six proteins that provide good chromatographic representation using a gradient of decreasing salt concentration.

- Ideally suited for hydrophobic-based separations for protein characterization using non-denaturing conditions
- Use of non-porous particles help deliver fast, efficient separations to address high-throughput needs
- Shipped with Waters HIC Protein Test Standard to help test for acceptable instrument and HIC column performance
- Successfully used for the analysis of cysteine-based, antibody drug conjugates

Ordering Information

Protein-Pak Hi Res HIC Columns and HIC Protein Standards

Description	Dimension	P/N
Protein-Pak Hi Res HIC, 2.5 µm Column and HIC Protein Standard	4.6 × 35 mm	176003575
Protein-Pak Hi Res HIC, 2.5 µm Column and HIC Protein Standard	4.6 × 100 mm	176003576
HIC Protein Test Standard	–	186007953

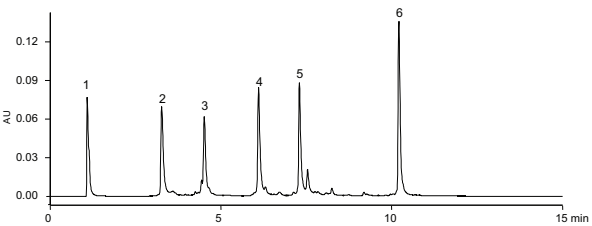
Protein-Pak Hi Res HIC Column and HIC Protein Standard

Conditions

Sample:	HIC Protein Standard Test Mix (p/n: 186007953) dissolved in 100 µL 50% A/50% B 2 µL injected
Column:	Protein-Pak Hi Res HIC, 2.5 µm, 4.6 × 100 mm (p/n: 176003576)
Flow rate:	0.6 mL/min
Mobile phase A:	2 M $(NH_4)_2SO_4$ in 50 mM NaH_2PO_4/NaH_2PO_4, pH 6.9
Mobile phase B:	50 mM NaH_2PO_4/NaH_2PO_4, pH 6.9
Gradient:	0–100% B in 15 min
UV detection:	220 nm
Temp.:	30 °C

Compounds

1. Cytochrome *c*
2. Myoglobin
3. Ribonuclease A
4. Lysozyme
5. Enolase
6. Alpha-chymotrypsinogen A

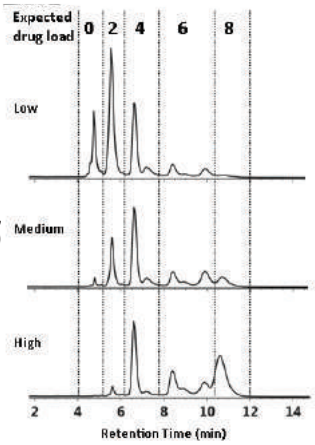


Using a gradient of decreasing salt concentration and on-denaturing eluents, Waters Protein-Pak Hi Res HIC Column is well suited for the separation of proteins of various molecular weights and hydrophobic interactions.

Separation of ADC Samples on Protein-Pak Hi Res HIC Column

Conditions

Sample:	Cysteine-conjugated ADCs were obtained by a collaborator at a concentration of 10 mg/mL in formulation buffer. Samples were prepared for analysis at a concentration of 2 mg/mL in 1 M ammonium sulfate ($(NH_4)_2SO_4$) 10 µL injected
Column:	Protein-Pak Hi Res HIC, 2.5 µm, 4.6 × 100 mm (p/n: 176003576)
Flow rate:	0.7 mL/min
Mobile phase A:	2.5 M $(NH_4)_2SO_4$ 125 mM phosphate buffer, pH 6.7 and 5% isopropanol
Mobile phase B:	125 mM phosphate buffer, pH 6.7 and 5% isopropanol
Gradient:	0–50% B in 10 min. Hold at 50% B for 5 min.
UV detection:	280 nm
Temp.:	30 °C



Monitoring drug load variability. Three batches of cysteine-linked ADCs were synthesized, each with a different level of drug conjugation (low, medium, high) and separated using hydrophobic interaction chromatography. The drug load distribution shifted from low-to-high corresponding to an increase in the load of the hydrophobic drug.

BioSuite Hydrophobic-Interaction Chromatography (HIC) HPLC Columns

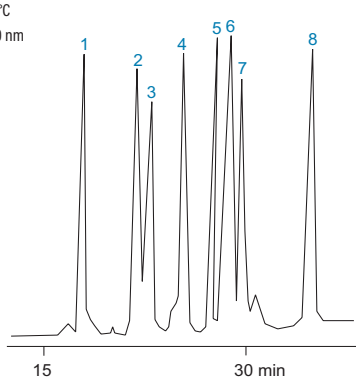
The separation of proteins and peptides based upon hydrophobic characteristics is a powerful chromatographic technique. However, some proteins denature at elevated organic solvent concentrations making reversed-phase chromatography (RPC) difficult. BioSuite Phenyl Hydrophobic-interaction Chromatography (HIC) provides a viable separation alternative to RPC. HIC is characterized by the adsorption of compounds to a weakly hydrophobic surface at high salt concentrations, followed by elution with a decreasing salt gradient. HIC combines the non-denaturing characteristics of salt precipitation with the precision of HPLC to yield excellent separation of biologically active material. BioSuite Phenyl, 1000 Å, 10 µm HIC column media consists of a phenyl group bonded to a methacrylic ester-based polymeric resin.

The large 1000 Å pore size accommodates proteins up to 5,000,000 Daltons. A 21.5 × 150 mm column is also available for "lab scale" isolations.

Hydrophobic Proteins are Well Resolved by Reversed-Phase Chromatography on BioSuite pPhenyl RP Column

Conditions

Sample:	Ribonuclease (Peak 1), bovine insulin, (Peak 2), cytochrome *c* (Peak 3), lysozyme (Peak 4), transferrin (Peak 5), bovine serum albumin (Peak 6), myoglobin (Peak 7), ovalbumin (Peak 8)
Column:	BioSuite Phenyl, 1000 Å, 10 µm, 4.6 × 75 mm (p/n: 186002157)
Eluent A:	HPLC-grade water with 0.05% trifluoroacetic acid
Eluent B:	Acetonitrile with 0.05% trifluoroacetic acid
Flow rate:	1.0 mL/min
Gradient:	Linear gradient from 5 to 80% B in 60 min
Column temp.:	25 °C
UV detection:	220 nm

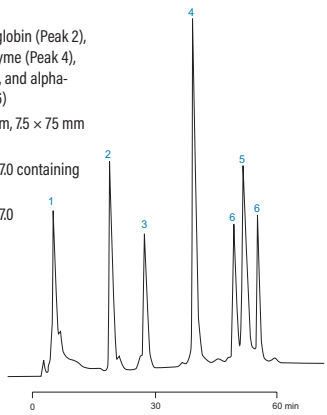


The BioSuite pPhenyl, 1000 Å RPC Columns have a higher ligand density compared to the BioSuite Phenyl, 1000 Å HIC Columns and are not recommended for hydrophobic-interaction separations.

Hydrophobic-Interaction Chromatography on BioSuite Phenyl HIC Column is an Excellent Alternative to Reversed-Phase Methods

Conditions

Sample:	Cytochrome *c* (Peak 1), myoglobin (Peak 2), ribonuclease (Peak 3), lysozyme (Peak 4), alphachymotrypsin (Peak 5), and alpha-chymotrypsinogen A (Peak 6)
Column:	BioSuite Phenyl, 1000 Å, 10 µm, 7.5 × 75 mm (p/n: 186002159)
Eluent A:	0.1 M sodium phosphate, pH 7.0 containing 2.0 M ammonium sulfate
Eluent B:	0.1 M sodium phosphate, pH 7.0
Flow rate:	1.0 mL/min
Gradient:	Linear gradient from 0 to 100% B in 60 min
Column temp.:	25 °C
UV detection:	280 nm

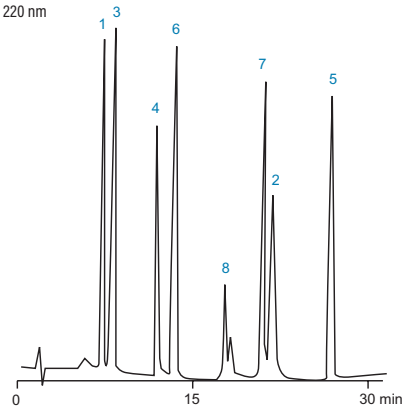


The BioSuite Phenyl, 1000 Å HIC Columns have a lower ligand density compared to the BioSuite pPhenyl, 1000 Å RPC Columns and are not recommended for reversed-phase separations.

Reversed-Phase Chromatography at Elevated pH on BioSuite pC_{18} RP Column Possible on Polymer Based Material

Conditions

Sample:	Met-enkephalin (Peak 1), bradykinin (Peak 2), leu-enkephalin (Peak 3), neurotensin (Peak 4), bombesin (Peak 5), angiotensin I (Peak 6), somatostatin (Peak 7), insulin (Peak 8)
Column:	BioSuite C_{18}, 500 Å, 7 µm, 4.6 × 150 mm (p/n: 186002154)
Eluent A:	0.2 M ammonium hydroxide, pH 10.8
Eluent B:	0.2 M ammonium hydroxide, pH 10.8 (20%)/acetonitrile (80%)
Flow rate:	1.0 mL/min
Gradient:	Linear gradient from 0 to 80% B in 50 min
Column temp.:	25 °C
UV detection:	220 nm



Use of "pH stable" methacrylate-based particles contained in Waters BioSuite pC_{18} Reversed-Phase Columns allow scientists to change separation selectivity by using a pH not possible with 100% silica-based C_{18} columns.

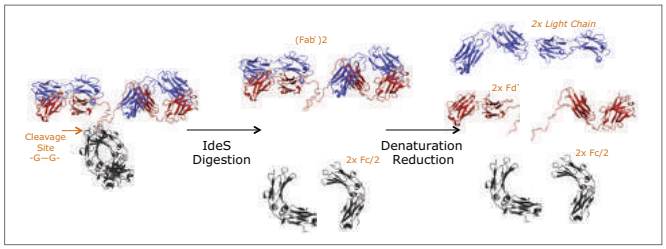
Ordering Information

Hydrophobic-Interaction HPLC and UHPLC Column

Description	Dimension	P/N
Protein HIC PH-814 Steel Column	8 × 75 mm	WAT035520

ACQUITY UPLC Glycoprotein BEH Amide, 300 Å Columns

HILIC for Large Molecules

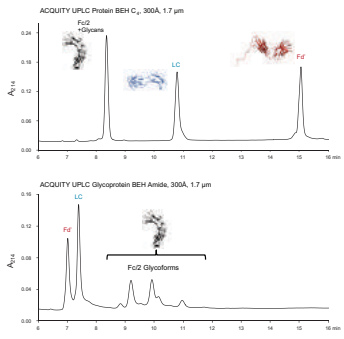


IdeS digestion and reduction scheme for preparing IgG LC, Fd', and Fc/2 subunits.

In what is commonly referred to as a middle-up or middle-down analysis, native mAbs can be proteolyzed into subunits to facilitate characterization. One increasingly popular way to produce subunit digests of mAbs is via the IdeS protease (Immunoglobulin Degrading Enzyme of S. pyogenes). IdeS cleaves with high fidelity at a conserved sequence motif in the hinge region of humanized mAbs to cleanly produce, upon reduction, three 25 kDa mAb fragments that are amenable to mass spectrometry and useful for localizing different attributes of therapeutic mAbs (below).

IdeS digestion combined with reversed-phase (RP) chromatography on Waters ACQUITY UPLC Protein BEH C_4, 300 Å Column has been successfully used as a simple identity test for mAbs and fusion proteins, because IdeS produced subunits from different drug products will exhibit diagnostic RP retention times. However, it should be kept in mind that many IgG modifications more strongly elicit changes in the hydrophilicity of a mAb along with its capacity for hydrogen bonding.

Compared to the reversed-phase separation of glycoprotein subunits, HILIC-based chromatography on Waters ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Columns offers additional information related to a mAb digest as shown in the figures below.



Gradient used for reversed-phase (RP) separations of trastuzumab subunits:

Time	%A	%B	Curve
0.0	95.0	5.0	6
1.0	66.7	33.3	6
21.0	59.7	40.3	6
22.0	20.0	80.0	6
24.0	20.0	80.0	6
25.0	95.0	5.0	6
35.0	95.0	5.0	6

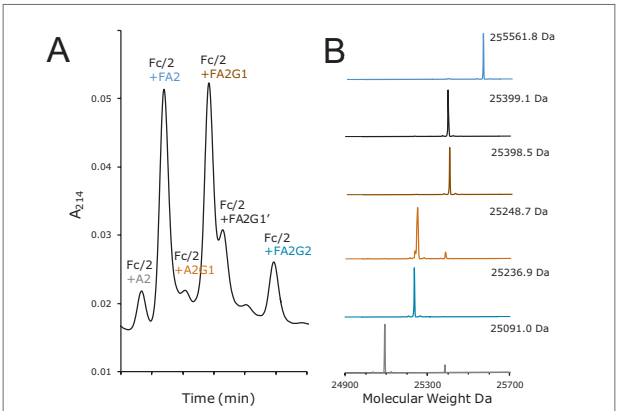
Gradient used for HILIC separations of IgG subunits:

Time	%A	%B	Curve
0	20.0	80.0	6
1	30.0	70.0	6
21	37.0	63.0	6
22	100.0	0.0	6
24	100.0	0.0	6
25	20.0	80.0	6
35	20.0	80.0	6

LC Conditions

System:	ACQUITY UPLC H-Class Bio
Columns	Top: ACQUITY UPLC Protein BEH C_4, 300 Å, 1.7 µm, 2.1 × 150 mm (p/n: 186004497) Bottom: ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 150 mm Column Kit (p/n: 176003702) that contains Glycoprotein Performance Test Standard (p/n: 186008010)
Sample temp.:	5 °C
Column temp.:	45 °C
Flow rate:	0.2 mL/min
Mobile phase A:	0.1% (v/v) TFA, water
Mobile phase B:	0.1% (v/v) TFA, acetonitrile
Injection vol.:	≤1.2 µL (aqueous diluents)

Trastuzumab subunit separations. (A) 1 µg of reduced, IdeS digested separated using an ACQUITY UPLC Protein BEH C_4, 300 Å, 1.7 µm Column (0.7 µL aqueous injection). (B) 1 µg of reduced, IdeS digested separated using an ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Column (0.7 µL aqueous injection).



C

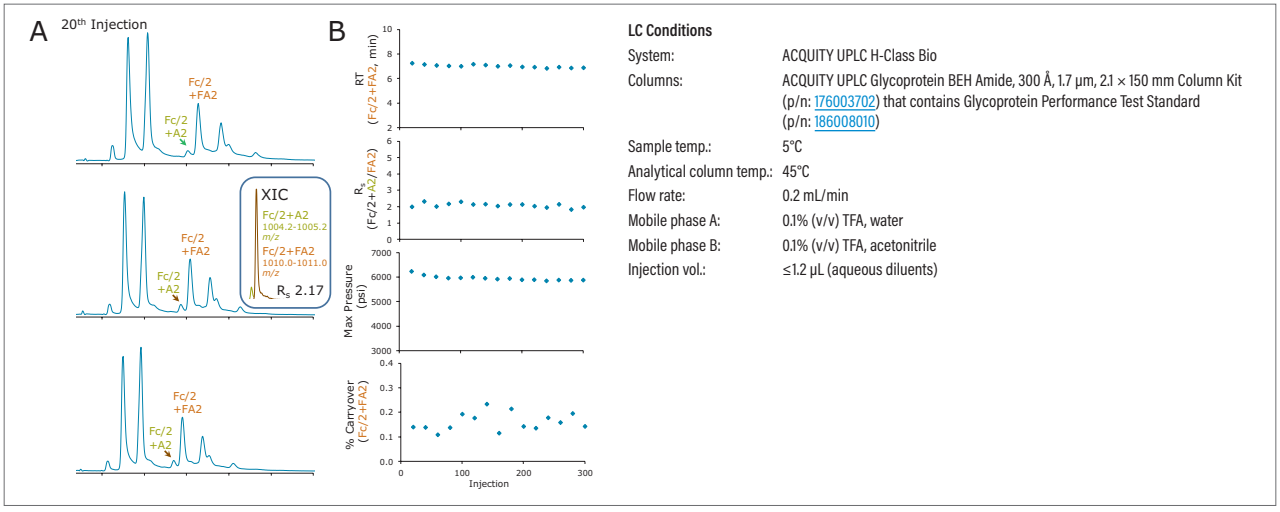
Species	MW_{Avg} Theoretical (Da)	MW_{Avg} Observed (Da)
Fd'	25383.6	25383.3
LC	23443.1	23443.1
Fc/2+A2	25090.2	25091.0
Fc/2+FA2	25236.3	25236.9
Fc/2+A2G1	25252.3	25248.7
Fc/2+FA2G1	25398.5	25398.5
Fc/2+FA2G1'	25398.5	25399.1
Fc/2+FA2G2	25560.6	25561.8

Profiling trastuzumab Fc/2 subunit glycoforms. (A) Retention window corresponding to the glycoform separation space. (B) Deconvoluted ESI mass spectra for the HILIC chromatographic peaks. Chromatographic peaks are labeled with the same color as their corresponding mass spectra. (C) Molecular weights for the observed trastuzumab subunits.

Lifetime Testing of ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Columns for Profiling IgG Subunit Glycoforms

The ability of Waters BEH Amide, 300 Å, 1.7 µm Column to robustly deliver separations over time is shown below by data collected from a series 300 sequential injections of a reduced, IdeS digested trastuzumab sample.

This was a potentially challenging use scenario given that the reduced, IdeS digested mAb sample contains both high concentrations of guanidine denaturant and TCEP reducing agent. Total ion chromatograms corresponding to the 20th, 180th, and 300th injections of this experiment are displayed. In these analyses, particular attention was paid to the half-height resolution of the Fc/2+A2 and Fc/2+FA2 species, which was assessed every 20th separation using extracted ion chromatograms (XICs). In this testing, several additional chromatographic parameters were also monitored, including the retention time of the Fc/2+FA2 species, the maximum system pressure observed during the chromatographic run, and the percent (%) carryover of the most abundant glycoform, the Fc/2+FA2 species. Plots of these parameters underscore the consistency of the subunit separation across the lifetime of the column.

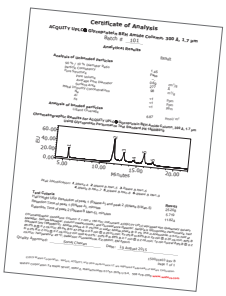


LC Conditions

System:	ACQUITY UPLC H-Class Bio
Columns:	ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 150 mm Column Kit (p/n: 176003702) that contains Glycoprotein Performance Test Standard (p/n: 186008010)
Sample temp.:	5°C
Analytical column temp.:	45°C
Flow rate:	0.2 mL/min
Mobile phase A:	0.1% (v/v) TFA, water
Mobile phase B:	0.1% (v/v) TFA, acetonitrile
Injection vol.:	≤1.2 µL (aqueous diluents)

Lifetime testing of an ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm, 2.1 × 150 mm Column for sequential injections of reduced, IdeS digested trastuzumab. (A) Total ion chromatograms (TICs) from the 20th, 180th, and 300th injections. Example extracted ion chromatograms (XICs) for Fc/2+A2 and Fc/2+FA2 that were used to measure resolution. (B) Chromatographic parameters observed across the 300 injection lifetime test. Each panel shows results for each 20th injection, including retention time (RT) of the FA2 glycoform, Rs between A2 and FA2 glycoforms, maximum pressure across the run, and % carryover as measured by a repeat gradient and XICs.

ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Column Consistency



To help ensure batch-to-batch and column-to-column consistency in validated methods, each batch of material selected for use in the ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Column offering is specifically QC tested with Waters Glycoprotein Performance Test Standard (p/n 186008010). This same standard is shipped (at no additional cost) with each column to help benchmark method development and/or troubleshoot use of this column and instrumentation.

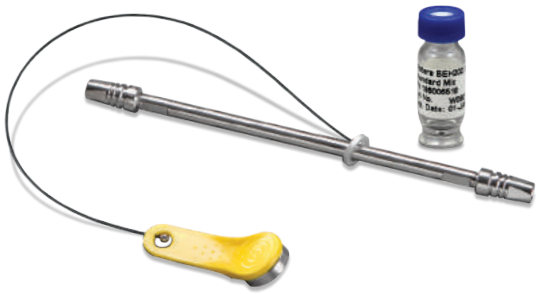
Ordering Information

ACQUITY UPLC Glycoprotein BEH Amide, 300 Å Columns and Standards

BEH Amide, 300 Å	Particle Size: 1.7 µm		
	Dimension	Qty.	P/N
	2.1 × 5 mm	3/pk with standard	176003699
	2.1 × 50 mm	1/pk with standard	176003700
	2.1 × 100 mm	1/pk with standard	176003701
	2.1 × 150 mm	1/pk with standard	176003702
	2.1 × 100 (MVK)	3/pk with standard	176003703
Glycoprotein Performance Test Standard			186008010

AGGREGATE ANALYSIS

ACQUITY UPLC Technology allows analytical chemists to reach far beyond conventional LC separations and has proven itself to be a major asset in increasing the productivity of laboratories around the world. The latest addition to this application-driven portfolio is the ACQUITY UPLC SEC System Solution, enabled by the unique ethylene-bridged-hybrid (BEH) Diol-coated particle technology.



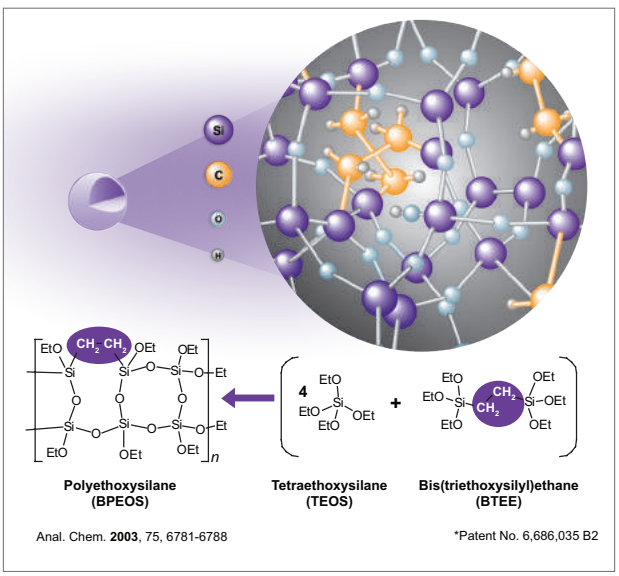
- Determines aggregation levels in therapeutic monoclonal antibodies up to 10x faster than traditional HPLC-based size-exclusion chromatography (SEC)
- Fully optimized column chemistry significantly reduces the requirement for high salt concentration mobile phases
- QC tested with BEH protein standards, ensuring unmatched batch-to-batch consistency and increased confidence in validated methods
- Waters Protein Standard Mixes are available for the 125 Å, 200 Å, and 450 Å SEC columns for additional validation (p/n: 186006519,186006518, and 186006842, respectively)

BEH Technology

In 1999, Waters launched the family of XTerra HPLC columns featuring patented, first-generation hybrid-particle technology (HPT). HPT enabled XTerra Columns to become one of the most successful column products in the history of Waters. In HPT, the best properties of inorganic (silica) and organic (polymeric) packings are combined to produce a material that has superior mechanical strength, efficiency, high-pH stability, and peak shape for basic compounds.

The first-generation methyl-hybrid particles of XTerra Columns did not possess the mechanical strength or efficiency necessary to fully realize the potential speed, sensitivity, and resolution capabilities of UPLC Technology. Therefore, a new pressure-tolerant particle needed to be created. This second-generation hybrid material utilizes an ethylene-bridged hybrid (BEH) structure. Compared to the first-generation methyl-hybrid particle of XTerra Columns, the BEH particle of ACQUITY UPLC BEH Columns exhibits improved efficiency, strength and pH range. BEH Technology is a key enabler of the speed, sensitivity, and resolution of both small and large molecule UPLC separations.

The BEH Particle: One of the Key Enablers of UPLC Technology

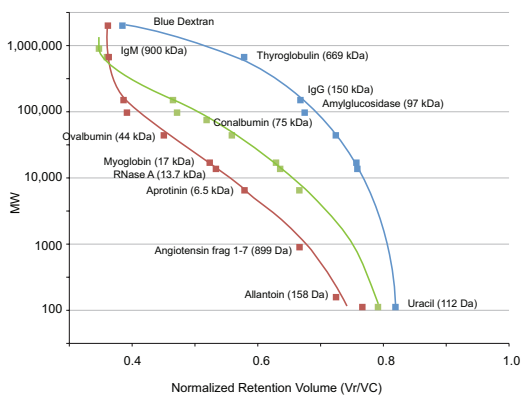


Ethylene Bridged Hybrid (BEH) Technology synthesis creates particles that ensure extreme column performance and long column lifetime under harsh operating conditions.

ACQUITY UPLC Technology

Waters ACQUITY UPLC Technology allows analytical chemists to reach far beyond conventional LC separations and is proven to be a valuable asset that improves the quality of collected data while increasing sample throughput and productivity. Biotherapeutics and biosimilars manufacturers can now choose the most appropriate UPLC-based, Protein BEH SEC Columns (i.e., 125 Å, 200 Å, and 450 Å pore size) to satisfy their application requirements based on this separation technology.

Calibration Curves on ACQUITY UPLC Protein BEH SEC, 125 Å, 200 Å, and 450 Å Columns



ACQUITY UPLC Protein BEH SEC, 125Å, 1.7 µm: 1K–80K Daltons

ACQUITY UPLC Protein BEH SEC, 200Å, 1.7 µm: 10K–450K Daltons

ACQUITY UPLC Protein BEH SEC, 450Å, 2.5 µm: 100K–1500K Daltons

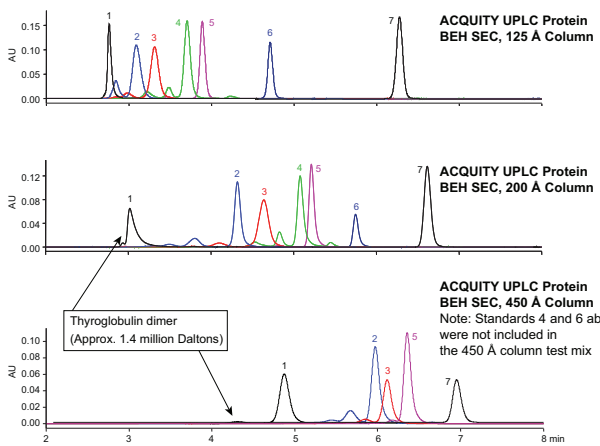
Protein standards
Temp.: 30 °C
Mobile phase: 100 mM sodium phosphate, pH=6.8

Size exclusion chromatography (SEC) separates compounds primarily based on their relative size in solution. Calibration curves on UPLC-based SEC columns of different pore size, using defined protein and peptides of known molecular weight, help chromatographers select the most appropriate SEC column for their specific application.

Separation of Protein and Peptide Standards on ACQUITY UPLC Protein BEH SEC, 125 Å, 200 Å, and 450 Å Columns

Compounds

1. Thyroglobulin	(670 K)	5. Myoglobin	(17 K)
2. BSA	(66 K)	6. Angiotensin frag 1–7	(899)
3. Ovalbumin	(44 K)	7. Uracil	(112)
4. Carbonic anhydrase	(29 K)		



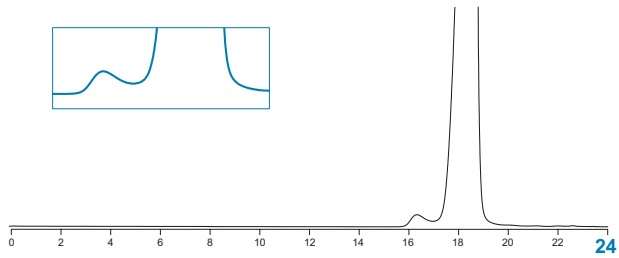
Columns	ACQUITY UPLC Protein BEH SEC, 125 Å, 1.7 µm; ACQUITY UPLC Protein BEH SEC, 200 Å, 1.7 µm	ACQUITY UPLC Protein BEH SEC, 450 Å, 2.5 µm
Column configuration	4.6 × 150 mm	
Mobile phase	100 mM sodium phosphate buffer, pH 6.8	
Weak needle wash	100% Milli-Q Water	
Strong needle wash	100% Milli-Q Water	
Seal wash	90/10 water/methanol	
Samples: Diluted in mobile phase	Thyroglobulin 0.3 mg/mL, BSA 0.3 mg/mL, Ovalbumin 0.3 mg/mL, Carbonic anhydrase 0.3 mg/mL, Myoglobin 0.3 mg/mL, Angiotensin frag. 1–7 0.1 mg/mL, Uracil 0.1 mg/mL	Thyroglobulin 3 mg/mL, BSA 5 mg/mL, Ovalbumin 3 mg/mL, Myoglobin 2 mg/mL, Uracil 0.1 mg/mL
Injection vol.	2 µL, full loop	
Flow rate	0.3 mL/min	
Column temp.	Ambient	
UV detection	220 nm	280 nm

Waters offers a family of BEH-based, diol-coated SEC columns of different pore size to satisfactorily address the molecular weight range of analytes to be separated.

SEC Analysis of Insulin

Size-exclusion chromatography (SEC) is the USP and EP standard method for the analysis of covalent HMW insulin in therapeutic preparations. Compared to use of traditional HPLC-based SEC methods, significant improvement in insulin component resolution, while reducing analysis time and mobile-phase consumption, is obtained using a Waters Protein BEH SEC, 125 Å, 1.7 µm Column with Waters' UltraPerformance LC™ (UPLC) Instrumentation (shown below).

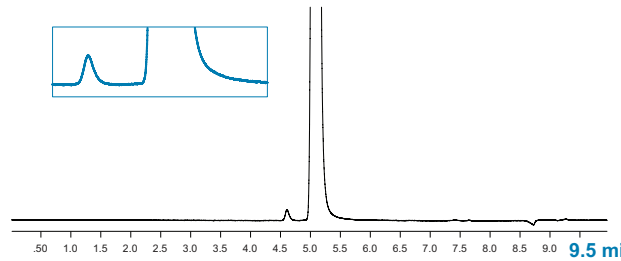
Insulin Analyses by Traditional HPLC-SEC vs. UPLC-SEC



LC Conditions

Column:	Insulin HMWP SEC, 125 Å, 10 µm, 7.8 × 300 mm (p/n: WAT201549)
Sample:	Insulin, human recombinant (Sigma I-2643) (4 mg/mL)
Injection:	100 µL
Eluent:	L-arginine (1 gm/liter)/acetic acid/acetonitrile (65/15/20, v/v/v)
Flow:	0.5 mL/min (isocratic)
UV detection:	276 nm

Alliance HPLC System



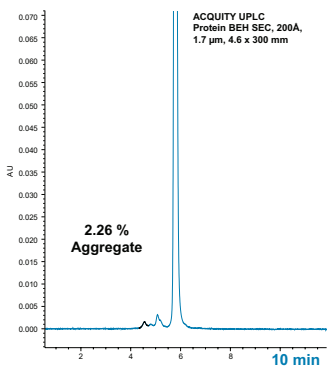
LC Conditions

Column:	ACQUITY UPLC Protein BEH SEC, 125 Å, 1.7 µm, 4.6 × 300 mm (p/n: 186006506)
Sample:	Insulin, human recombinant (Sigma I-2643) (4 mg/mL)
Injection:	5 µL
Eluent:	L-arginine (1 gm/liter)/acetic acid/acetonitrile (65/15/20, v/v/v)
Flow:	0.4 mL/min (isocratic)
UV detection:	276 nm

ACQUITY UPLC System

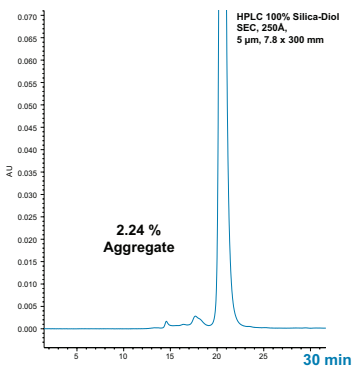
Compared to use of traditional HPLC-based SEC technology for the analysis of earlier eluting insulin aggregates from desired monomer species, Waters ACQUITY UPLC BEH SEC Technology delivers benefits of improved component resolution and in less time.

Comparative UPLC-Based SEC Benefits vs. Use of Traditional HPLC SEC for Biotherapeutic Characterization



LC Conditions

Column:	ACQUITY UPLC Protein BEH SEC, 200 Å, 1.7 µm, 4.6 × 300 mm (p/n: 186005226)
Sample:	Humanized IgG monoclonal antibody, 3 mg/mL in eluent
UPLC system:	ACQUITY UPLC with tunable UV detector
Eluent:	25 mM sodium phosphate, pH 6.8 with 0.15 M sodium chloride
Flow rate:	0.4 mL/min
Injection:	5 µL
UV detection:	280 nm



LC Conditions

Column:	Traditional 100% silica-based/diol coated SEC, 250 Å, 5 µm, 7.8 × 300 mm
Sample:	Humanized IgG monoclonal antibody, 3 mg/mL in eluent
HPLC system:	Waters Model 2796 HPLC with Model 2487 Dual λ Absorbance Detector
Eluent:	25 mM sodium phosphate, pH 6.8 with 0.15 M sodium chloride
Flow rate:	0.4 mL/min
Injection:	20 µL
UV detection:	280 nm

Compared to use of traditional HPLC-based SEC technology, Waters ACQUITY UPLC BEH SEC Technology delivers benefits of the comparable determination on mAb aggregate vs. monomer (i.e., less time, higher sample throughput).

Insulin HMWP HPLC Columns

The Waters Insulin HMWP Column is specifically designed for use in the manufacture and quality control of insulin products. This column is tested for performance in the analysis of impurities with molecular masses greater than those of insulin.

Ordering Information

Insulin HMWP SEC HPLC Columns

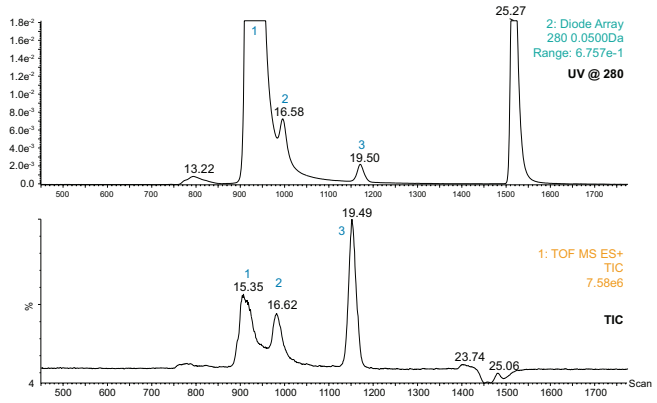
Description	Dimension	P/N
Insulin HMWP Column	7.8 × 300 mm	WAT201549
Protein-Pak 125 Sentry Guard Column, 2/pk (requires holder)	3.9 × 20 mm	186000926
Sentry Universal Guard Column Holder	—	WAT046910

Tested to perform in the method published in PharmaEuropa Vol. 8, No 3, September 1996.

LC-MS Analyses Using SEC and Volatile Eluents

Size-exclusion chromatography (SEC), under non-denaturing conditions, is a standard method for testing biomolecules and their aggregates. MALS and AUC are established detectors but cannot provide exact mass for unknown species with a sufficient accuracy. The presence of an unexpected peak requires further investigation and/or confirmation of molecular weight, and SE-UPLC-MS under aqueous, non-denaturing conditions can provide valuable information that would more rapidly solve an organization's issues with characterization or quality.

LC-MS Analysis of Humanized Monoclonal Antibody on Protein BEH SEC, 200 Å, 1.7 µm



LC Conditions

System:	ACQUITY UPLC H-Class Bio with PDA detector
Column:	ACQUITY UPLC Protein BEH SEC, 200 Å, 1.7 µm, 4.6 × 300 mm (p/n: 186005226)
Column temp.:	30 °C
Sample temp.:	4 °C
Injection vol.:	2 µL
Flow rate:	0.15 mL/min
Mobile phase:	100 mM ammonium formate and 25 mM sodium phosphate, 150 mM sodium chloride, pH 6.8
Additive:	Acetonitrile, 0.8% formic acid, at 0.2 mL/min

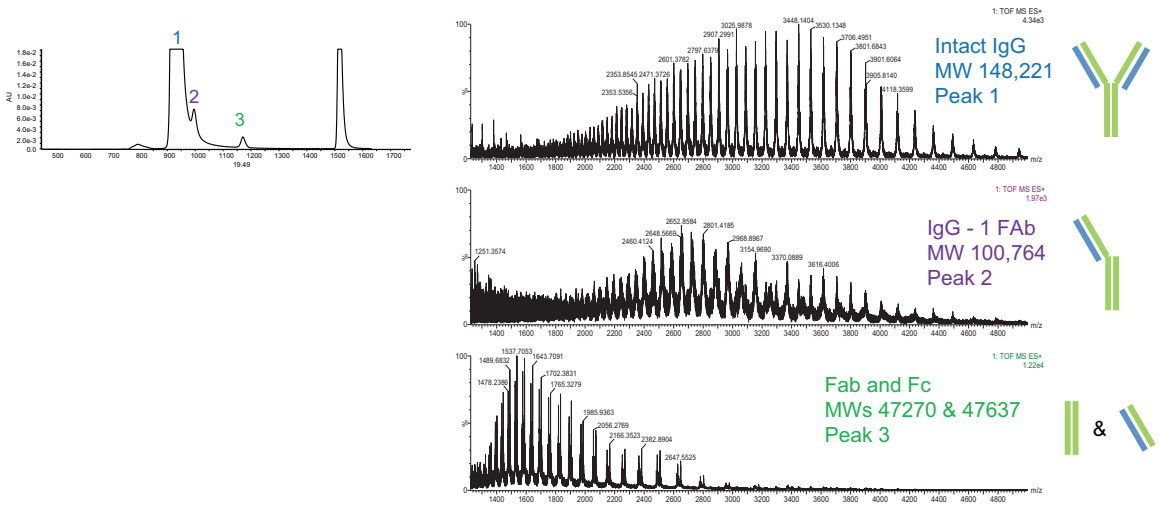
External pump: Waters 515 HPLC

MS Conditions

System:	Xevo G2 QTof
Ionization mode:	ESI+
Analyzer mode:	Sensitivity
Acquisition range:	500–5000
Capillary voltage:	3.00 kV
Cone voltage:	40.0 V
Source temp.:	150 °C
Desolvation temp.:	450 °C
Cone gas flow:	0.0 L/Hr
Desolvation gas flow:	800.0 L/Hr
Calibration:	NaI 2 µg/µL from 1000–4000 *m/z*

An intact biotherapeutic mAb, which was past expiry, was analyzed by using MS-friendly, non-denaturing conditions. In the UV chromatogram, not only are the mAb aggregate and monomer observed, but a low molecular weight (LMW) peak eluting after the intact mAb is partially resolved as well. In addition to these peaks, the UV chromatogram reveals two other LMW species.

Intact mAb Extracted and Deconvoluted Mass Spectra



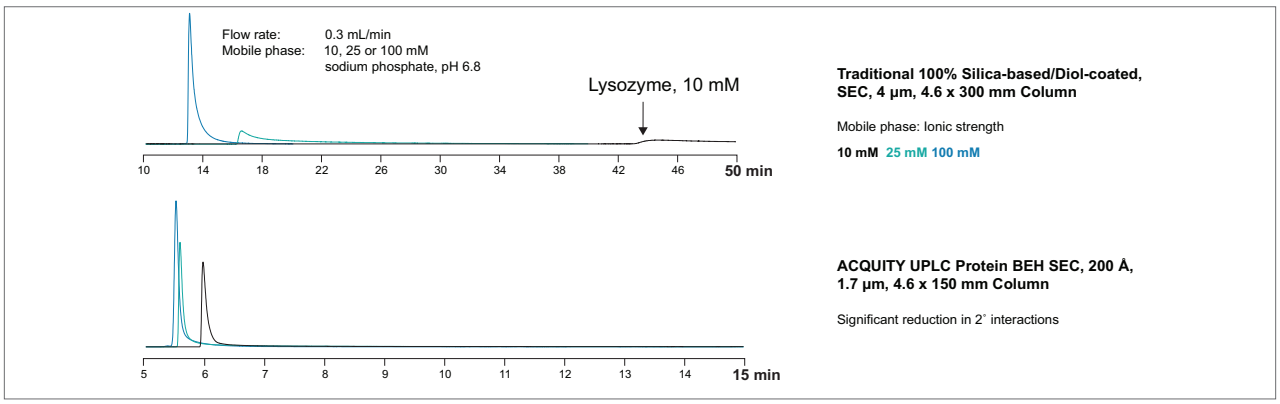
Deconvoluted molecular weight determined using MaxEnt1

Shown are the raw MS spectra for the peaks shown in the chromatogram to the left. The calculated masses, using MaxEnt1 Software, were consistent with the structures shown.

Reduced Requirement for High Salt Concentration Mobile Phases

With conventional silica-based SEC Column chemistries, undesirable secondary ionic interactions between the silica surface and basic proteins can result in long retention times and excessive peak tailing. Traditionally, the solution to this issue is the inclusion of high concentrations of a salt to compete for the charged sites on the surface of the silica. The unique surface chemistry of the ACQUITY UPLC Protein BEH SEC, 200 Å Column significantly reduces these secondary interactions, resulting in the ability to use less-aggressive-mobile-phase salt concentrations.

Effect of Eluent Ionic Strength on the SEC Analysis of the Basic Protein Lysozyme on 100% Silica vs. BEH SEC Particles



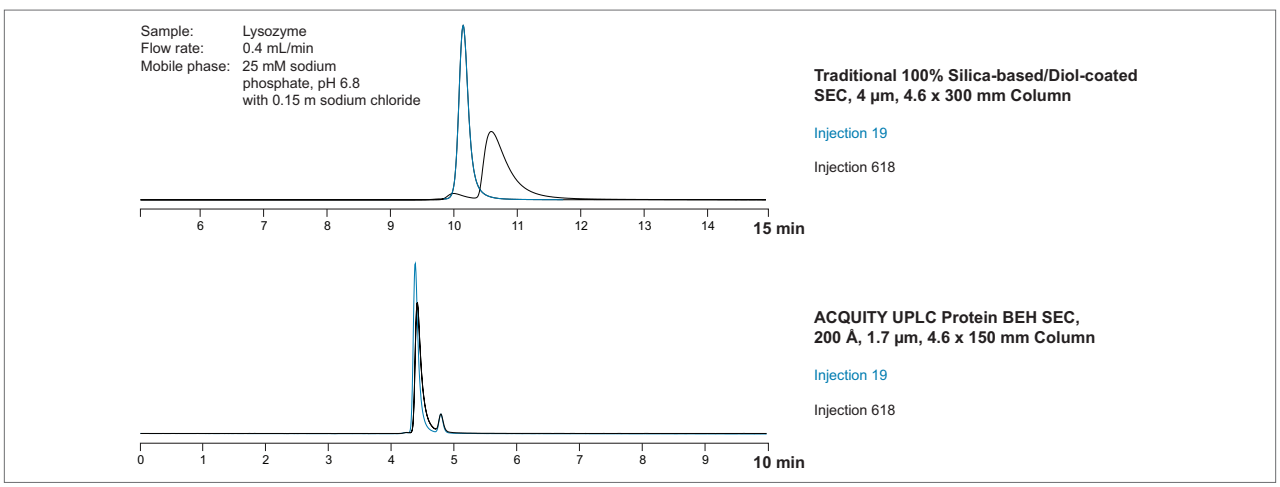
Conventional silica-based columns for SEC can exhibit significant secondary interactions, especially for basic proteins like lysozyme. In this example, a lower concentration of sodium phosphate (10 mM) causes lysozyme to be barely detectable. However, these non-desired secondary interactions are significantly reduced on the ACQUITY UPLC Protein BEH SEC, 200 Å, 1.7 µm Column, as is shown with the same lysozyme analysis on the conventional silica-based SEC column. On the ACQUITY UPLC Protein BEH SEC Column, the peak shape is drastically improved with 10 mM salt, thereby eliminating the need to use high salt concentrations. This can lead to increased column and instrument lifetime.

A New Level of Column Stability for Size-Exclusion Chromatography

BEH particle technology is well established for chromatography of synthetic oligonucleotides, amino acids, peptides, proteins, and labeled glycans with stability and performance attributes not found with traditional, 100% silica-based particles.

The combination of the BEH base particle and the patent-pending, innovative, diol-bonding process results in column stability, performance, and lifetime not typical in traditional, size-exclusion chromatographic columns.

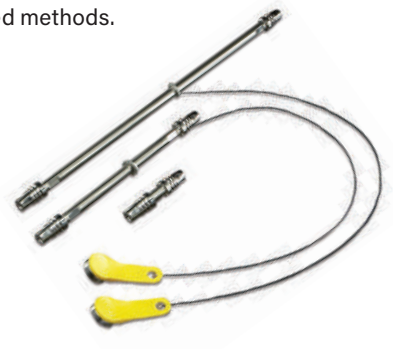
ACQUITY UPLC Protein BEH SEC, 200 Å Particle and Diol Bonding Technology Provides a Stable Chemistry with Outstanding Column Life



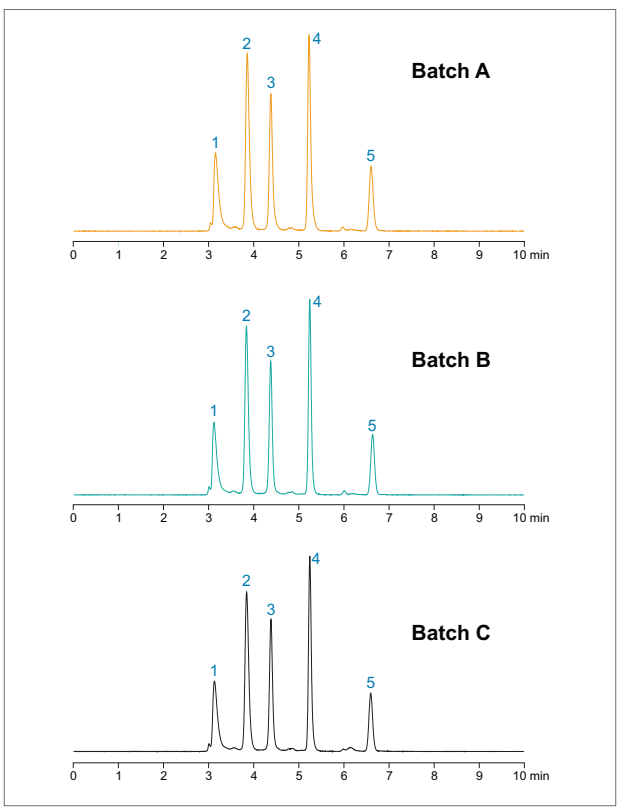
This example compares the lifetime of the conventional SEC column to the ACQUITY UPLC Protein BEH SEC, 200 Å, 1.7 µm Column for lysozyme. The conventional SEC column not only shows a severe deterioration in peak shape, but also a difference in the retention that appears with increasing injections. This indicates that the conventional column is undergoing a chemical change that is not seen with the ACQUITY UPLC Protein BEH SEC Column. The ACQUITY UPLC Protein BEH SEC Column is stable, both mechanically and chemically, even for very basic proteins that are sensitive to small changes in the column over time.

Stringent Manufacturing Quality Assurance Delivers Confidence in Results

All Waters ACQUITY UPLC Columns chemistries are synthesized in state-of-the-art ISO-certified manufacturing facilities from high-quality raw materials, and are extensively QC tested throughout the synthetic process. In addition, each batch of Protein BEH SEC, 200 Å, 1.7 µm material is specifically tested with relevant proteins to help ensure unmatched batch-to-batch consistency for supreme confidence in validated methods.



Waters ISO 2001 Manufacturing and Testing Processes Help Ensure Outstanding ACQUITY UPLC Protein BEH SEC, 200 Å, 1.7 µm Batch-to-Batch Reproducibility



Waters BEH Protein Standards (125 Å, 200 Å, and 450 Å formulated mixtures) are used to critically QC test our Protein BEH SEC columns to help ensure consistent batch-to-batch and column-to-column performance.

Ordering Information

ACQUITY UPLC Protein BEH SEC Columns and Guard Kits

			Particle Size: 1.7 µm	Particle Size: 2.5 µm
BEH SEC, 125 Å	**Dimension**	**Configuration**	**P/N**	**P/N**
	4.6 × 150 mm	Column and Standard	176003906	–
	4.6 × 150 mm	Column	186006505	–
	4.6 × 300 mm	Column and Standard	176003907	–
	4.6 × 300 mm	Column	186006506	–
	4.6 × 30 mm	Guard Kit[1]	186006504	–
BEH SEC, 200 Å	2.1 × 150 mm	Column	186008471	–
	4.6 × 50 mm	Column	186009082	–
	4.6 × 150 mm	Column and Standard	176003904	–
	4.6 × 150 mm	Column	186005225	–
	4.6 × 300 mm	Column and Standard	176003905	–
	4.6 × 300 mm	Column	186005226	–
	4.6 × 30 mm	Guard Kit[1]	186005793	–
BEH SEC, 450 Å	4.6 × 150 mm	Column and Standard	–	176002996
	4.6 × 150 mm	Column	–	186006851
	4.6 × 300 mm	Column and Standard	–	176002997
	4.6 × 300 mm	Column	–	186006852
	4.6 × 30 mm	Guard Kit[1]	–	186006850

1) Size-exclusion chromatography may require modifications to an existing ACQUITY UPLC System. Please reference "Size-Exclusion and Ion-Exchange Chromatography of Proteins using the ACQUITY UPLC System" (p/n: 715002147) or "Size Exclusion and Ion-Exchange Chromatography of Proteins using the ACQUITY UPLC H-Class System" (p/n: 715002909) for specific recommendations.
2) To connect two UPLC SEC Columns together in series, we recommend using a Waters Sample Loop (p/n: 430001516).
[1] All Guard Kits contain a straight piece of 0.005" × 1.75" tubing and end fittings (p/n: WAT022681) to connect the guard column to the analytical SEC column.

Tubing Options for ACQUITY UPLC Protein BEH SEC Columns

Description	P/N
ELSD Outlet Tubing (0.004" I.D. × 6" length)	430001562
0.005 × 1.75" SEC UPLC Connection Tubing, 2/pk	186006613

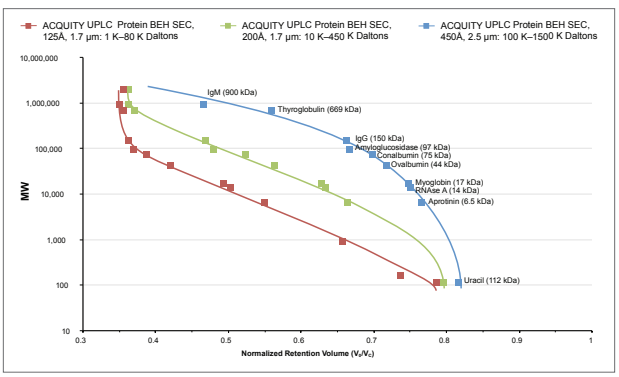
XBridge Protein BEH SEC, 125 Å, 200 Å, and 450 Å Columns and Protein Standard Test Mixtures

Waters series of XBridge Protein BEH SEC, 125 Å, 200 Å, or 450 Å, 2.5 and 3.5 µm Columns were developed to complement our existing line of UPLC-based SEC offerings for use where traditional HPLC-based instrumentation and methods are employed for peptide or protein size-exclusion chromatography (SEC). These HPLC- and UHPLC-based, SEC chemistries are based on the same Waters Ethylene Bridged Hybrid (BEH)-based particle technology and diol-bonded surface coating as used in our successful line of UPLC-based SEC columns. This process offers chromatographers the option and ability to easily transfer methods based on laboratory instrumentation and component resolution or sample throughput needs.

All of Waters BEH-based SEC columns are manufactured in a cGMP, ISO 9001 certified plant using stringent manufacturing protocols and ultra-pure reagents. Each batch of manufactured material undergoes a series of standard QC measurements (e.g., particle and pore size distribution) followed by an application-specific test using appropriate peptide and protein test mixtures. A packed column efficiency test is then performed on every batch approved, packed SEC column to further help ensure reproducible batch-to-batch and column-to-column performance for use in research or in a demanding validated method.

- Outstanding resolution of peptide and protein mixtures (from 1–1,000,000 K) obtained on high-efficient packed columns containing 3.5 µm particles or 125 Å, 200 Å, or 450 Å pores
- Compared to SEC columns containing 100% silica particles, Waters BEH-based SEC columns are stable at pH values greater than 7 and exhibit less non-desired, secondary ionic interactions between the SEC particle and peptide/protein
- Each column is shipped with Waters SEC Protein Standard Mix to help users establish or confirm acceptable instrument and column performance
- HPLC- and UHPLC-based columns complement existing UPLC-based SEC Columns to assist in method transfer based on users' application and throughput needs

Calibration Curves on XBridge Protein BEH SEC, 125 Å, 200 Å, and 450 Å Columns



Size-exclusion chromatography (SEC) separates compounds primarily based on their relative size in solution. Calibration curves on Waters HPLC-based, SEC Columns of different pore size, using defined protein and peptides of known molecular weight, help chromatographers select the most appropriate SEC column for their specific application.

BEH SEC Protein Standards

Benchmarking, Method Development, and Troubleshooting

The BEH SEC Protein Standards are specifically designed to help aid in the benchmarking of each set of columns. Each standard contains carefully chosen proteins unique to that chemistry, which has been worked out meticulously over time. These standards are used to QC the respective HPLC or UPLC columns which makes them an ideal choice for benchmarking a new column while also providing the capability to run the samples over time to monitor column performance.

Offers standards for:

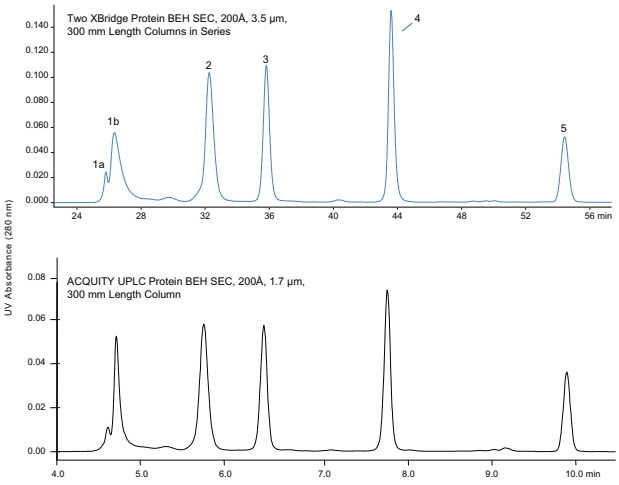
- ACQUITY UPLC and XBridge Protein BEH SEC, 125 Å
- ACQUITY UPLC and XBridge Protein BEH SEC, 200 Å
- ACQUITY UPLC and XBridge Protein BEH SEC, 450 Å

Ordering Information

ACQUITY UPLC BEH SEC Protein Standards

Description	P/N
BEH125 SEC Protein Standard Mix	186006519
BEH200 SEC Protein Standard Mix	186006518
BEH450 SEC Protein Standard Mix	186006842

Scalable SEC Separations Using UPLC- vs. HPLC-Based SEC



Sample: BEH200 SEC Protein Standard Mix (p/n: 186006518)
Flow rate: 0.42 mL/min on 4.6 mm column
0.30 mL/min on 7.8 mm column
Mobile phase: 100 mM sodium phosphate, pH 6.8

Alliance HPLC System

Compounds

1a. Thyroglobulin dimer (1.3 MDa)
1b. Thyroglobulin (669 kDa)
2. IgG (150 kDa)
3. BSA (67 kDa)
4. Myoglobin (14 kDa)
5. Uracil (112 Da)

ACQUITY UPLC H-Class Bio System

Comparison of separations of Waters BEH200 SEC Protein Standard Mix (p/n: 186006518) on two XBridge Protein BEH SEC, 200 Å, 3.5 µm, 7.8 × 200 mm HPLC Columns run in series using an Alliance HPLC (top panel) and on an ACQUITY UPLC Protein BEH SEC, 200 Å, 1.7 µm , 4.6 × 300 mm Column using an ACQUITY UPLC H-Class Bio System (bottom panel). The flow rates were scaled based on particle diameter and column I.D. to 0.42 mL/minute for the two HPLC columns run in series, and 0.3 mL/minute for the UPLC column. Sample loads were also adjusted for column volume.

Ordering Information

XBridge Protein BEH SEC HPLC and UHPLC Columns

Description	Dimension	Configuration	P/N	Dimension	Configuration	P/N
	Particle Size: 2.5 µm			Particle Size: 3.5 µm		
BEH SEC, 125 Å Column with BEH125 SEC Protein Standard Mix	4.6 × 30 mm	Guard Kit[1]	176004331	7.8 × 30 mm	Guard Kit[1]	176003591
	4.6 × 150 mm	Column	176004332	7.8 × 150 mm	Column	176003592
	4.6 × 300 mm	Column	176004333	7.8 × 300 mm	Column	176003593
	7.8 × 30 mm	Guard Kit[1]	176004322			
	7.8 × 150 mm	Column	176004323			
	7.8 × 300 mm	Column	176004324			
BEH SEC, 200 Å Column with BEH200 SEC Protein Standard Mix	4.6 × 30 mm	Guard Kit[1]	176004334	7.8 × 30 mm	Guard Kit[1]	176003594
	4.6 × 150 mm	Column	176004335	7.8 × 150 mm	Column	176003595
	4.6 × 300 mm	Column	176004336	7.8 × 300 mm	Column	176003596
	7.8 × 30 mm	Guard Kit[1]	176004325			
	7.8 × 150 mm	Column	176004326			
	7.8 × 300 mm	Column	176004327			
BEH SEC, 450 Å Column with BEH450 SEC Protein Standard Mix	4.6 × 30 mm	Guard Kit[1]	176004337	7.8 × 30 mm	Guard Kit[1]	176003597
	4.6 × 150 mm	Column	176004338	7.8 × 150 mm	Column	176003598
	4.6 × 300 mm	Column	176004339	7.8 × 300 mm	Column	176003599

Note: To connect two HPLC/UHPLC SEC columns together in series, we recommend using a Waters Sample Loop, p/n: 430001516.
[1] All Guard Kits contain a straight piece of 0.005" × 1.75" tubing and end fittings (p/n: WAT022681) to connect the guard column to the analytical SEC column.

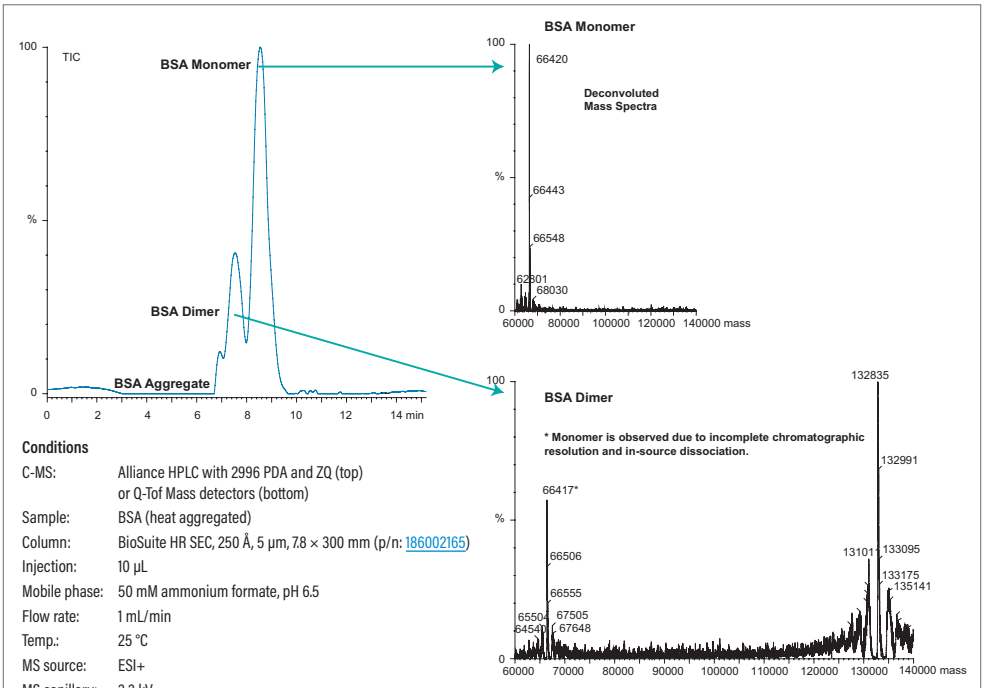
Tubing Options for XBridge Protein BEH SEC Columns

Description	P/N
Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

BioSuite Size-Exclusion (SEC) HPLC Columns

BioSuite ultra-high resolution (UHR), high resolution (HR), and standard size-exclusion column packings use a rigid yet "wettable" silica-based media that is stable from pH 2.5–7.5. As indicated in the calibration curve tables, the exclusion limits of BioSuite SEC packings are determined by the particle and pore size of the silica-based material. Particle size of the SEC packing media as well as column length are important parameters that determine separation efficiency. BioSuite 4 µm particle size, UHR Columns provide maximum separation efficiency, followed by BioSuite HR Columns and BioSuite Standard SEC Columns. To maximize column life of analytical (i.e., 4.6 mm or 7.8 mm I.D.) or preparative (i.e., 21.5 mm I.D.) SEC Columns, use of BioSuite Guard Columns is recommended.

LC-MS Analysis of BSA Aggregation Using BioSuite 250, HR 5 µm SEC Column

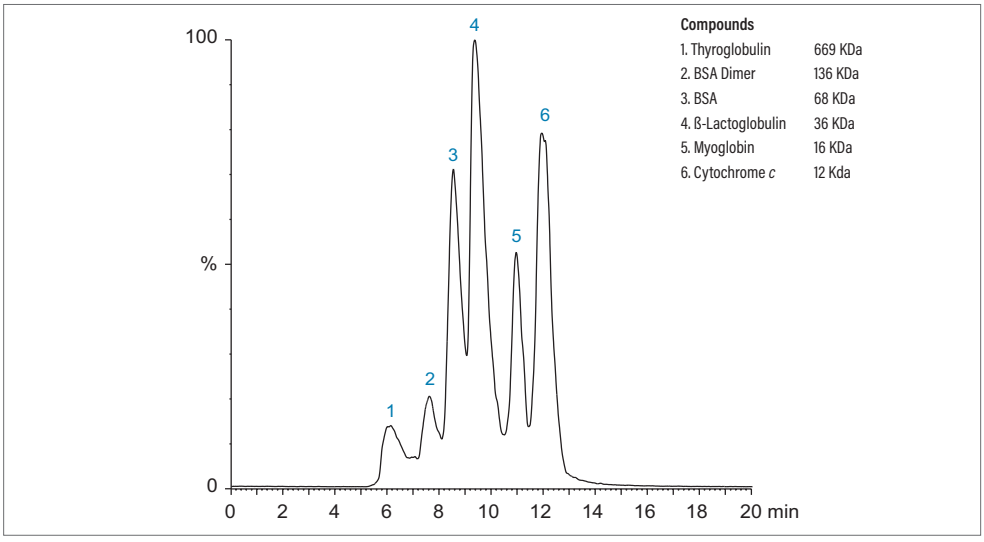


Conditions

C-MS:	Alliance HPLC with 2996 PDA and ZQ (top) or Q-Tof Mass detectors (bottom)
Sample:	BSA (heat aggregated)
Column:	BioSuite HR SEC, 250 Å, 5 µm, 7.8 × 300 mm (p/n: 186002165)
Injection:	10 µL
Mobile phase:	50 mM ammonium formate, pH 6.5
Flow rate:	1 mL/min
Temp.:	25 °C
MS source:	ESI+
MS capillary:	3.3 kV
MS cone:	30 V
Mass range:	400–3000 *m/z*

SEC is an effective technique to separate and quantitate higher molecular weight protein aggregates from lower molecular weight monomers using optical detection. Use of MS-compatible SEC eluents provides an additional dimension of useful data by providing real time mass data of the separated protein components.

LC-MS Analysis of Protein Standards Using BioSuite 250, 5 µm High Resolution (HR) SEC Column (LC-MS conditions as above)

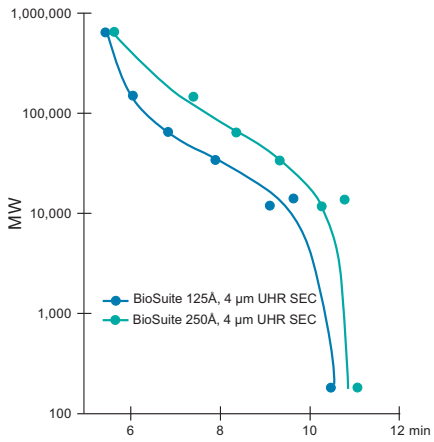


Compounds

1. Thyroglobulin	669 KDa
2. BSA Dimer	136 KDa
3. BSA	68 KDa
4. ß-Lactoglobulin	36 KDa
5. Myoglobin	16 KDa
6. Cytochrome *c*	12 Kda

BioSuite SEC Reference: SEC-MS Analysis of Aggregates in Protein Mixtures. Application Book Supplement of LC/GC Europe. Sept. 2003. (Waters Literature Reference: 720000743EN)

Protein Calibration Curves for BioSuite Ultra-High Resolution (UHR) SEC Columns



Conditions

Sample: Thyroglobulin (670,000 Da), gamma globulin (155,000 Da), bovine serum albumin (66,330 Da), beta lactoglobulin (18,400 Da), lysozyme (14,300 Da), cytochrome *c* (12,400 Da), triglycine (189 Da)

Columns: BioSuite UHR SEC, 250 Å, 4 µm, 4.6 × 300 mm (p/n: 186002162)
BioSuite SEC, 125 Å, 4 µm, 4.6 × 300 mm (p/n: 186002161)

Eluent: 0.15 M sodium phosphate, pH 6.8

Flow rate: 0.35 mL/min

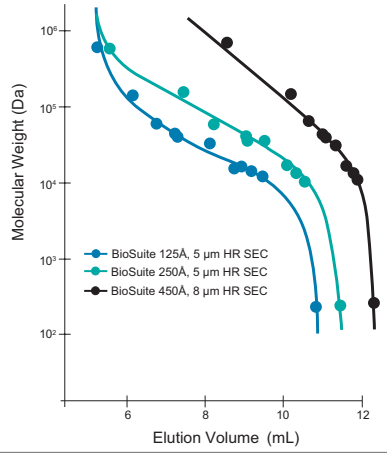
Column temp.: 25 °C

UV detection: 220 nm

Column	Globular Protein MW Range	Branched Dextrans	Linear PEG/PEO
BioSuite 125 Å	5000–150,000	1000–30,000	500–15,000
BioSuite 250 Å	10,000–500,000	2000–70,000	1000–35,000

Note: Operating flow rates for BioSuite Ultra-High Resolution (UHR) SEC Columns (4.6 mm) are from 0.1–0.4 mL/min. Use of an HPLC system (e.g. Waters Alliance HPLC System) capable of operating at these flow rates is essential for optimal UHR SEC Column performance.

Protein Calibration Curves for BioSuite High Resolution (HR) SEC Columns



Conditions

Sample: Thyroglobulin (MW 670,000 Da), IgG (MW 156,000 Da), BSA (66,330 Da), ovalbumin (MW 43,000 Da), peroxidase (40,200 Da), beta lactoglobulin (MW 18,400 Da), myoglobin (MW 16,900 Da), ribonuclease A (MW 13,700 Da), cytochrome *c* (12,400 Da), glycine tetramer (246 Da)

Columns: BioSuite HR SEC, 450 Å, 8 µm, 7.8 × 300 mm (p/n: 186002166)
BioSuite HR SEC, 250 Å, 5 µm, 7.8 × 300 mm (p/n: 186002165)
BioSuite SEC, 125 Å, 5 µm, 7.8 × 300 mm (p/n: 186002164)

Eluent: 0.1 M sodium phosphate, pH 7.0 containing 0.3 M sodium chloride

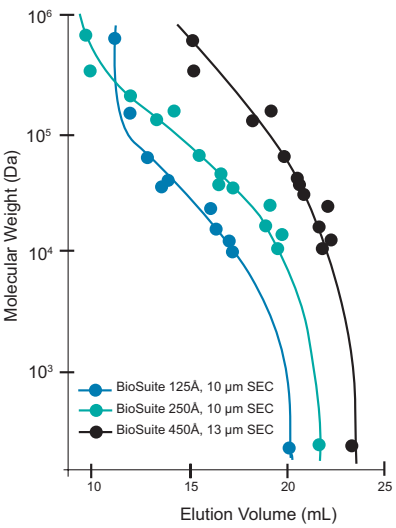
Flow rate: 1.0 mL/min

Column temp.: 25 °C

UV detection: 220 nm

Column	Globular Protein MW Range	Branched Dextrans	Linear PEG/PEO
BioSuite 125 Å	5000–150,000	1000–30,000	500–15,000
BioSuite 250 Å	10,000–500,000	2000–70,000	1000–35,000
BioSuite 450 Å	20,000–1,000,000	4000–500,000	2000–250,000

Protein Calibration Curves for BioSuite Standard SEC Columns



Conditions

Sample: Thyroglobulin (MW 670,000 Da), IgG (MW 156,000 Da), BSA (66,330 Da), ovalbumin (MW 43,000 Da), peroxidase (40,200 Da), beta lactoglobulin (MW18,400 Da), myoglobin (MW 16,900 Da), ribonuclease A (MW 13,700 Da), cytochrome *c* (12,400 Da), glycine tetramer (246 Da)

Columns: BioSuite SEC, 450 Å, 13 µm, 7.5 × 300 mm (p/n: 186002172)
BioSuite SEC, 250 Å, 13 µm, 7.5 × 300 mm (p/n: 186002170)
BioSuite SEC, 125 Å, 10 µm, 7.5 × 300 mm (p/n: 186002168)

Eluent: 0.1 M sodium phosphate, pH 7.0 containing 0.3 M sodium chloride

Flow rate: 1.0 mL/min

Column temp.: 25 °C

UV detection: 220 nm

Column	Globular Protein MW Range	Branched Dextrans	Linear PEG/PEO
BioSuite 125 Å	5000–150,000	1000–30,000	500–15,000
BioSuite 250 Å	10,000–500,000	2000–70,000	1000–35,000
BioSuite 450 Å	20,000–1,000,000	4000–500,000	2000–250,000

BioSuite 4.6 mm, 7.8 mm, and 7.5 mm analytical and 21.5 mm preparative columns are available.

Ordering Information

BioSuite SEC HPLC and UHPLC Columns

Description	Matrix	Diameter Width	Diameter Length	Column Volume	Suggested Volume Load for Maximum Multicomponent Resolution*	Multicomponent Resolution**	P/N
BioSuite 125 Å, 4 µm UHR SEC	Silica	4.6 mm	300 mm	4.98 mL	Less than 8 mg/mL	Less than 40 µL	186002161
BioSuite 250 Å, 4 µm UHR SEC	Silica	4.6 mm	300 mm	4.98 mL	Less than 8 mg/mL	Less than 80 µL	186002162
BioSuite UHR Guard SEC	Silica	4.6 mm	35 mm	—	—	—	186002163
BioSuite 125 Å, 5 µm HR SEC	Silica	7.8 mm	300 mm	14.33 mL	Less than 8 mg/mL	Less than 200 µL	186002164
BioSuite 250 Å, 5 µm HR SEC	Silica	7.8 mm	300 mm	14.33 mL	Less than 8 mg/mL	Less than 200 µL	186002165
BioSuite 450 Å, 8 µm HR SEC	Silica	7.8 mm	300 mm	14.33 mL	Less than 8 mg/mL	Less than 200 µL	186002166
BioSuite HR Guard SEC	Silica	6 mm	40 mm	—	—	—	186002167
BioSuite 125 Å, 10 µm SEC	Silica	7.5 mm	300 mm	13.25 mL	Less than 8 mg/mL	Less than 200 µL	186002168
BioSuite 125 Å, 13 µm SEC	Silica	21.5 mm	300 mm	108.9 mL	Less than 8 mg/mL	Less than 1.6 mL	186002169
BioSuite 250 Å, 10 µm SEC	Silica	7.5 mm	300 mm	13.25 mL	Less than 8 mg/mL	Less than 200 µL	186002170
BioSuite 250 Å, 13 µm SEC	Silica	21.5 mm	300 mm	108.9 mL	Less than 8 mg/mL	Less than 1.6 mL	186002171
BioSuite 450 Å, 13 µm SEC	Silica	7.5 mm	300 mm	13.25 mL	Less than 8 mg/mL	Less than 200 µL	186002172
BioSuite 450 Å, 17 µm SEC	Silica	21.5 mm	300 mm	108.9 mL	Less than 8 mg/mL	Less than 1.6 mL	186002173
BioSuite Guard SEC	Silica	7.5 mm	75 mm	—	—	—	186002174
BioSuite Guard SEC	Silica	21.5 mm	75 mm	—	—	—	186002175

* Using a BSA protein standard in a 50 mM phosphate buffer containing salt (either 0.1 M NaCl or 0.1 M Na_2SO_4) eluent. Useful protein mass loads will vary depending upon separation eluent, complexity of sample, and type of proteins contained in mixture. In general, maximum component resolution is obtained by injecting the smallest possible volume of a dilute protein solution.

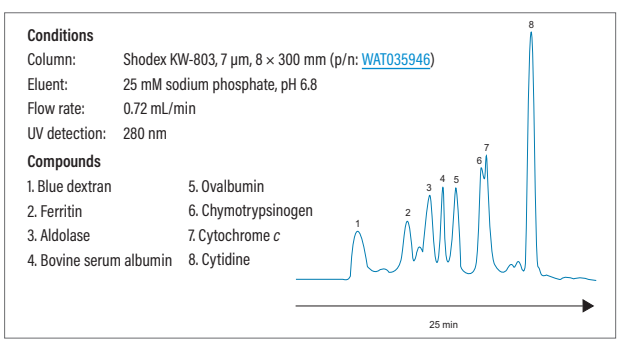
** Operating flow rates for BioSuite Ultra-High Resolution (UHR) SEC Columns (4.6 mm I.D.) are from 0.1–0.4 mL/min. Use of an HPLC system (e.g., Waters Alliance HPLC System) capable of operating at these flows is essential for optimal UHR SEC Column performance.

Protein-Pak and Shodex Size-Exclusion HPLC Columns

Waters offers two families of packings for size-exclusion chromatography. Protein-Pak packings are based on a 10 µm, diol-bonded silica and are available in a selection of pore sizes and column configurations. In addition, Waters offers a series of Shodex 7 µm, high-resolution, gel filtration packings.

The Protein-Pak Size-exclusion Columns can be expected to resolve proteins that differ in molecular weight by a factor of two and to distinguish proteins differing by as little as 15% in molecular weight. The degree of resolution is more dependent on the sample mass and volume than the interaction between the sample and the stationary phase. Ideally, there should be no interaction between the stationary phase and the sample molecules. Secondary interactions are most often ionic and can, therefore, be reduced by increasing the ionic strength of the mobile phase. Typical, salt concentrations range to 0.2–0.5 M NaCl. It may also be useful in some cases to consider adding 10–20% methanol to eliminate hydrophobic and other hydrogen-bonding interactions.

Standard Protein Mix on KW-803 Column



This gel-filtration separation of protein standards demonstrates the ability to separate proteins in a wide range of molecular weights in minutes for high sensitivity analysis or protein isolation up to the milligram scale.

Ordering Information

Protein-Pak SEC HPLC Columns and Guards

Steel Column	Dimension	MW Range	P/N
Protein-Pak 60	7.8 × 300 mm	1000–20,000	WAT085250
Protein-Pak 60	19 × 300 mm	1000–20,000	WAT025830
Protein-Pak 125	7.8 × 300 mm	2000–80,000	WAT084601
Protein-Pak 125	19 × 300 mm	2000–80,000	WAT025831
Protein-Pak 300SW	7.5 × 300 mm	10,000–300,000	WAT080013
Protein-Pak 125 Sentry Guard Column, 3.9 × 20 mm, 2/pk (requires holder)			186000926
Sentry Universal Guard Column Holder			WAT046910

Glass Column	Dimension	MW Range	P/N
Protein-Pak 200SW	8 × 300 mm	500–60,000	WAT011786
Protein-Pak 300SW	8 × 300 mm	10,000–300,000	WAT011787

Shodex Size-Exclusion and Anion-Exchange HPLC and UHPLC Columns

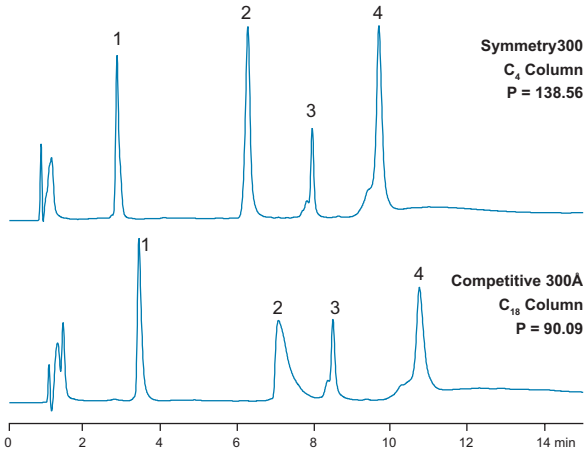
Description	Particle Size	Dimension	MW Range	P/N
Protein KW-802.5	7 µm	8 × 300 mm	100–50,000	WAT035943
Protein KW-803	7 µm	8 × 300 mm	100–150,000	WAT035946
Protein KW-804	7 µm	8 × 300 mm	500–600,000	WAT036613

Symmetry300 C_4 HPLC and UHPLC Columns

Compared to our Protein BEH C_4, 300 Å offerings, Symmetry300 C_4 particles are 100% silica-based and are synthesized using ultrapure organic reagents resulting in high-purity material with very low silanol activity for outstanding peptide and protein separations and recoveries.

- 300 Å pore for peptide and protein applications
- Fully endcapped to minimize undesired secondary interactions
- Alternative separation selectivity compared to Waters BEH C_4, 300 Å hybrid material
- QC tested with peptide samples to help ensure excellent batch-to-batch consistency

Protein: Symmetry300 C_4 vs. Competitors



Conditions

Mobile phase A:	0.1% trifluoroacetic acid in water
Mobile phase B:	0.08% trifluoroacetic acid in acetonitrile
Flow rate:	0.75 mL/min
Gradient:	Time (min) / %A / %B: 0.00 / 80 / 20; 15.00 / 35 / 65
Injection vol.:	20 µL
Column temp.:	40 °C
UV detection:	220 nm
System:	Alliance 2790, 996 PDA

Compounds

1. RNAse
2. BSA
3. B-Lactoglobulin
4. Ovalbumin

Compared to many competitive 100% silica-based C_{18} columns, Waters proprietary bonding and end-capping technologies help deliver improved peak shape with less undesired tailing.

Ordering Information

Symmetry300 HPLC and UHPLC Columns

C_4	Particle Size: 3.5 µm		Particle Size: 5 µm	
	Dimension	P/N	Dimension	P/N
	2.1 × 150 mm	186000276	2.1 × 150 mm	186000285
	3.9 × 150 mm	186000277	3.9 × 150 mm	186000286
	4.6 × 50 mm	186000278	4.6 × 50 mm	186000287
	4.6 × 150 mm	186000279	4.6 × 150 mm	186000288
	4.6 × 250 mm	186000280	4.6 × 250 mm	186000289
	19 × 10 mm	186000281		
	19 × 50 mm	186000282		
	19 × 100 mm	186000283		

CHARGE VARIANT AND ION-EXCHANGE ANALYSIS

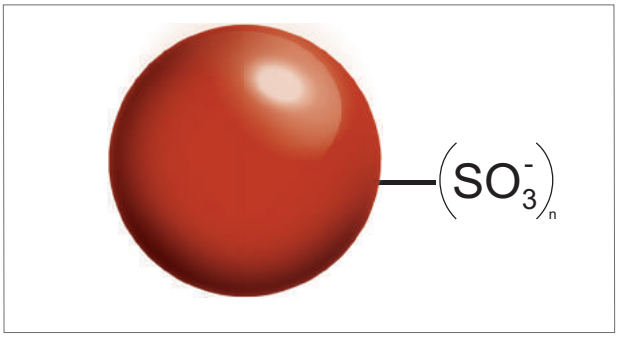
Ion-Exchange (IEX) separations are most commonly performed using gradients of increasing salt, changing pH, or simultaneous salt increases and pH changes with less charged protein species eluting prior to more highly charged molecules. Based on protein type and separation pH, either an anion or cation exchanger is selected for the separation. In addition, gradient duration, buffer composition and pH, flow rate, as well as separation temperature all play an important part in obtaining needed protein separations.

BioResolve SCX mAb Columns

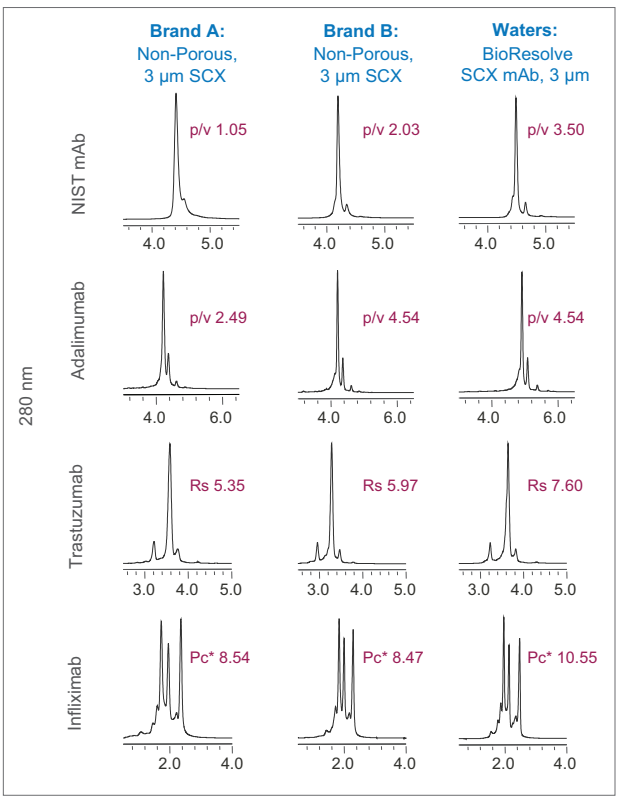
Charge variant profiling is one of several important characterization techniques performed on monoclonal antibody biotherapeutics. To help ensure that reliable results are obtained in these types of analyses, Waters developed corrosion–resistant columns containing BioResolve SCX mAb, non-porous, polymer-based particles grafted with a rigorously-optimized, multi-component network of negatively charged sulfonic acid ligands. This innovative column technology delivers high-resolution, charged-based separations of mAbs in both LC and LC-MS applications using both salt and pH gradient elution.

Benefits include:

- Strong-cation exchanger based on non-porous (NP) polymeric particles that deliver high mechanical strength and chemical tolerance for LC or LC-MS charge based separations
- Developed through extensive prototyping and comprehensive testing with a wide range of mAbs and separations based on both salt and pH-gradient chromatography
- Based on a non-porous, 3 µm particle for optimal diffusion kinetics; high pressure capability; and amenability to HPLC, UHPLC, and UPLC systems
- Quality-control tested with the mAb Charge Variant Standard (derived from NIST mAb Reference Material 8671) to help ensure batch-to-batch column consistency

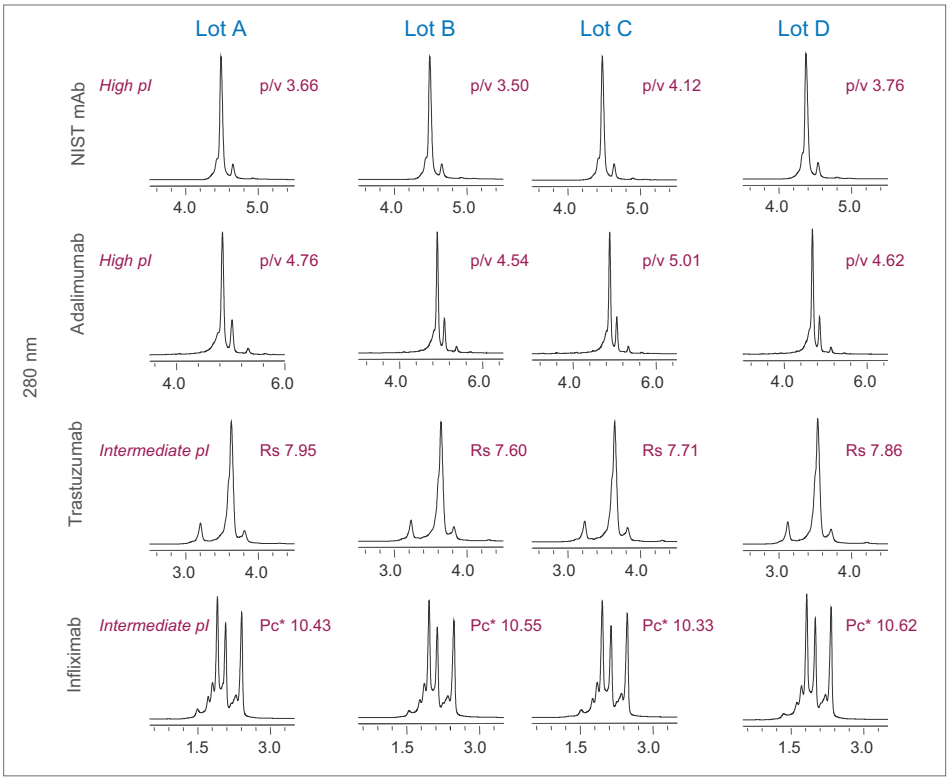


LC Analysis of Monoclonal Antibodies - BioResolve SCX mAb Column vs. Commercially Available, Non-Porous, Cation-Exchange Columns



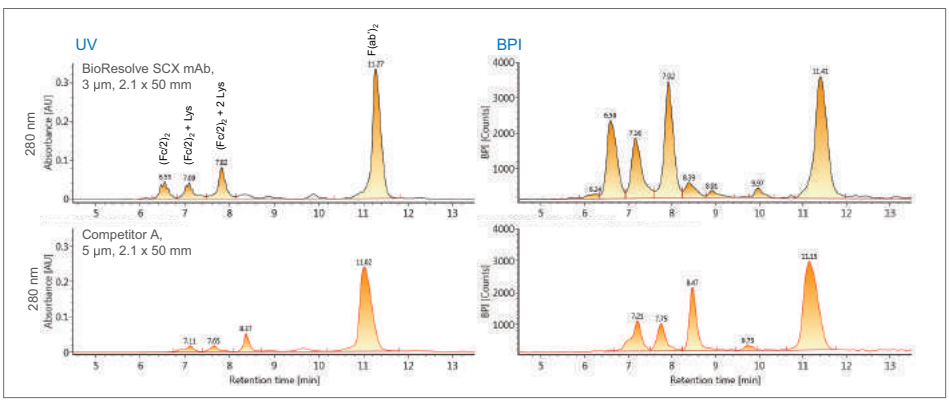
Comparative peak valley (P/V) ratios, component resolution (Rs), and measured peak capacities of four biotherapeutic antibodies separated on Waters vs. commercially available, cation-exchange columns noting higher quality data obtained on a BioResolve SCX mAb, 3 µm Column. All separations were performed at 30 ˚C on an ACQUITY UPLC H-Class Bio System at the same linear velocity (i.e., 0.72 mL/min for 4.6 × 50 mm and 0.54 mL/min for 4 × 50 mm columns) with appropriately scaled injection volumes using a 10 min linear gradient from 10 mm to 200 mM NaCl contained in 20 mM MES, pH 7 buffer.

Outstanding Batch-to-Batch Reproducibility of BioResolve SCX mAb Cation-Exchange Columns in the Analysis of Four mAbs



Comparative peak valley (P/V) ratios, component resolutions (Rs), and measured peak capacities of four monoclonal antibodies on four different manufactured batches of BioResolve SCX mAb, 3 µm, 4.6 × 50 mm Columns. All separations were performed at 30 ˚C on an ACQUITY UPLC H-Class Bio System at 0.72 mL/min using a 10 min linear gradient from 10 mm to 200 mM NaCl contained in 20 mM MES, pH 7 buffer.

LC-MS Analysis of IdeS Digested Infliximab on a BioResolve SCX mAb Column vs. an Alternative Commercially Available, Non-Porous, Cation-Exchange Column



Higher resolution and higher recovery separations using volatile, MS-compatible mobile phases and a BioResolve SCX mAb, 3 µm, 2.1 × 50 mm Column. Separations were performed at 30 ˚C on an ACQUITY UPLC I-Class System at 0.11 mL/min using an 18.3 min linear gradient from 15-50% buffer B (buffer A: 50 mM ammonium formate, pH 3.9 and buffer B: 500 mM ammonium acetate, pH 7.4).

mAb Charge Variant Standard

The mAb Charge Variant Standard is a proficiency and suitability standard used to confirm and monitor column and instrument performance. This standard is formulated as a filtered and stabilized mixture of a void marker (tryptophan), conalbumin from chicken egg white, and NIST Reference Material 8671 (NIST mAb, a humanized IgG1κ expressed from a murine cell line). Every vial contains approximately 0.5 µg of tryptophan, 200 µg of conalbumin, and 100 µg of NIST mAb. Shown on the right is a pH-gradient chromatogram example of the mAb Charge Variant Standard as obtained with BioResolve CX pH Concentrates.

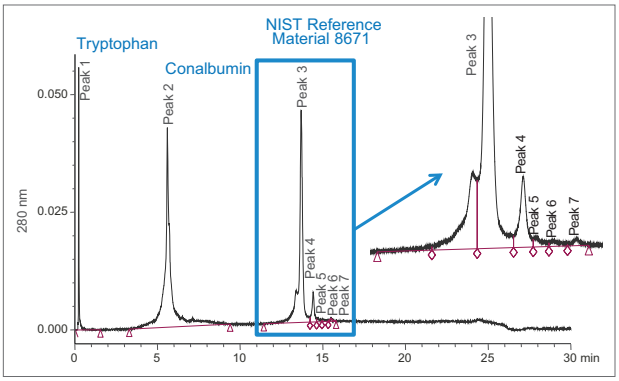
VanGuard FIT Cartridge

The injection of column fouling excipients (e.g., polysorbate) and particles (e.g., insoluble sample or microbes) is known to cause the premature failure of columns. Careful sample and eluent preparation helps address this concern. Yet experienced chromatographers recognize the value of using a guard column, containing the same material as the analytical column, to further help ensure maximum column life. Traditional guard columns help protect the analytical column. However, they are relatively expensive and introduce compromising levels of additional dispersion.

To address these shortcomings, Waters has enhanced the value of the existing VanGuard Technology by introducing the novel VanGuard Fully Integrated Technology (FIT) Cartridge - a, simplified guard column design that maximizes column life without degrading biomolecule component resolution. Based on customer preference, the BioResolve SCX mAb Column can be purchased with or without a VanGuard FIT Cartridge.[1, 2]

[1] The VanGuard FIT Cartridge contains the same BioResolve SCX mAb, 3 µm material as used in an analytical BioResolve SCX mAb Column.
[2] Replacement BioResolve SCX mAb, 3 µm VanGuard FIT Cartridges cannot be used on columns that lack the VanGuard FIT Cartridge option.

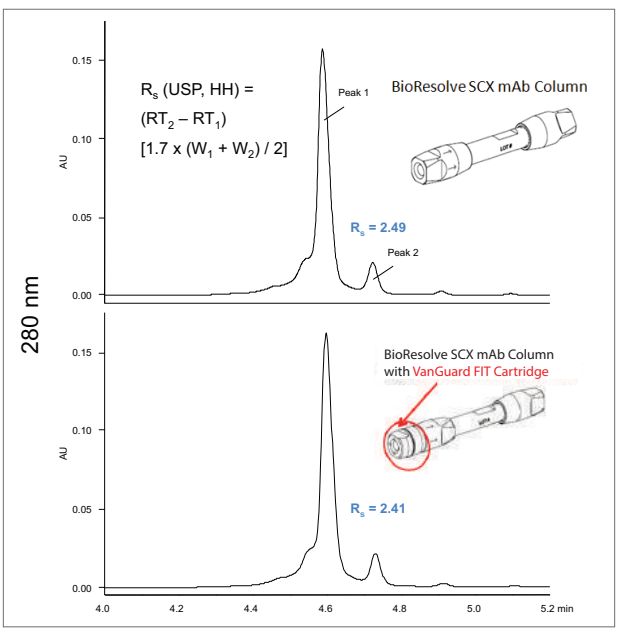
Separation of Waters mAb Charge Variant Standard on a BioResolve SCX mAb, 3 µm Column



Separation of the mAb Charge Variant Standard on a BioResolve SCX mAb, 3 µm, 4.6 × 50 mm Column with a VanGuard FIT Cartridge showing excellent resolution of various mAb charge variant species. Separation was performed on an ACQUITY UPLC H-Class System at 30 °C and at 1.44 mL/min using a 24 min linear gradient from pH 5 to 10.2.

*The interpretation of charge variants was extrapolated from BioDrugs, 2016, 30, 321–338.

No Compromise Column Protection and Extended Lifetimes with VanGuard FIT Enhancement



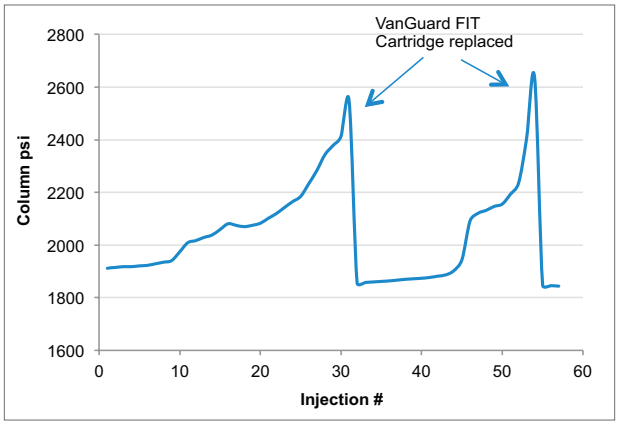
Separation of NIST mAb Reference Material 8671 (12.5 µg injected) on a BioResolve SCX mAb, 3 µm, 4.6 × 50 mm Column with and without an Integrated VanGuard FIT Cartridge. All separations were performed on an ACQUITY UPLC H-Class Bio System at 0.96 mL/min using a 7.5 min linear gradient from 10 mm to 200 mM NaCl contained in 20 mM MES, pH 6 buffer.

When chromatography degrades from unintentional fouling (e.g., injections of particulates originating from a sample, LC system, and/or mobile phase), the VanGuard FIT Cartridge can be easily changed with available replacements to restore column performance and extend the life of the analytical column.

BioResolve CX pH Buffers

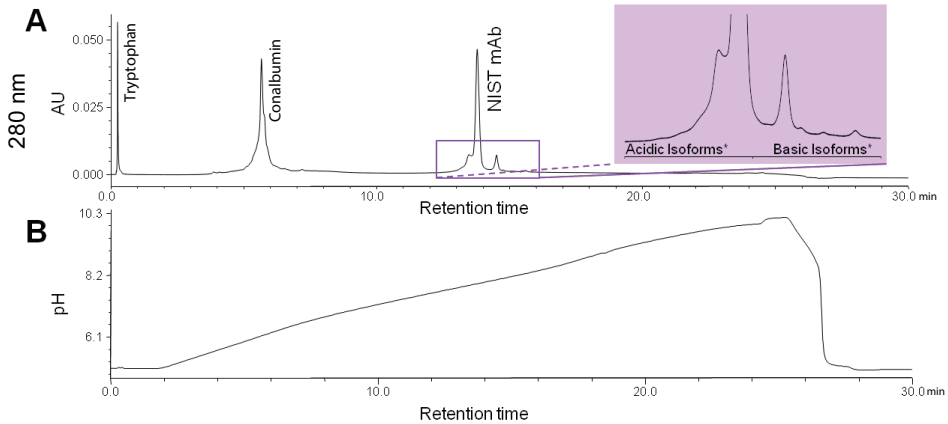
While ion-exchange chromatography using a gradient of increasing salt concentration is commonly used for charge variant profiling of mAb-based therapeutics, it often requires the optimization of methods for each individual sample. By comparison, use of a more universal pH gradient offers the potential of being applicable to many different samples. The BioResolve CX pH Concentrates facilitate obtaining high-resolution separations with BioResolve SCX mAb, 3 µm Columns. Together, the two technologies provide a robust and simple-to-use pH gradient based method for charge variant analysis of different mAb species. Each set of the carefully formulated concentrates was designed so users can quickly prepare mobile phases of controlled pH and ionic strength to yield robust cation-exchange separations. Each concentrate is accurately packaged as a 100 mL volume of a 10x concentrated solution that can be prepared into 1 L of mobile phase by means of a simple 10-fold aqueous dilution. The resulting buffers can be used in a universally applicable binary gradient separation method that runs from pH 5.0 to 10.2.

Extension of BioResolve SCX mAb Column by Replacement of VanGuard Fit Cartridge on Particulate Fouled Column



Repeated 5 µL injections of 20 mM sodium phosphate, pH 6.8 containing 0.1 µm latex particles onto a BioResolve SCX mAb, 3 µm, 4.6 × 50 mm Column with VanGuard FIT. Testing was performed on an ACQUITY UPLC H-Class System at 0.50 mL/min using 20 mM sodium phosphate, pH 6.8 with injections made every 5 min noting pressure increases that were reduced when the existing VanGuard FIT Cartridge was replaced with a new one at injections #30 and #54. Note: 0.1 µm latex particles were selected due to their size being similar to bacterial cells (0.2 to 10 µm) that are a potential source of column fouling if present in eluents that lack bacteriostatic agents.

Separation of mAb Charge Variant Standard on a BioResolve SCX mAb, 3 µm Column Using a Turn-Key pH Gradient Generated Using BioResolve CX pH Concentrates



Representative ion-exchange chromatogram (A) and pH trace (B) for a separation of the mAb Charge Variant Standard (p/n: 186009065) on a BioResolve SCX mAb, 3 µm, 4.6 × 50 mm Column. The data was obtained at 30 ˚C on an ACQUITY UPLC H-Class Bio System using a 24 min linear pH gradient from pH 5.0 to 10.2 at a flow rate of 1.44 mL/min. Note: the pH trace was obtained with GE Healthcare Life Sciences Monitor pH/C-900.

Ordering Information

BioResolve SCX mAb Columns, Method Validation Kits, Cartridges, and Standards

Column	Particle Size: 3 µm		
	Dimension	P/N (1/pk) with VanGuard FIT and mAb Charge Variant Standard	P/N (1/pk) with mAb Charge Variant Standard
	2.1 × 50 mm	176004341	176004342
	2.1 × 100 mm	176004343	176004344
	4.6 × 50 mm	176004346	176004347
	4.6 × 100 mm	176004348	176004349

Method Validation Kit*	Particle Size: 3 µm		
	Dimension	P/N (3/pk) with VanGuard FIT and mAb Charge Variant Standard	P/N (3/pk) with mAb Charge Variant Standard
	2.1 × 100 mm	176004345	–
	4.6 × 100 mm	–	176004350

Description	P/N
BioResolve SCX mAb VanGuard FIT Cartridge, 3 µm, 3.9 × 5 mm, 3/pk**	186009062
BioResolve SCX mAb VanGuard FIT Replacement Cartridge, 3 µm, 2.1 × 5 mm, 3/pk**	186009061
mAb Charge Variant Standard	186009065
BioResolve CX pH Concentrate A, pH 5 (100 mL bottle of 10X concentrate)	186009063
BioResolve CX pH Concentrate B, pH 10.2 (100 mL bottle of 10X concentrate)	186009064
BioResolve CX pH Concentrate Kit	176004340
Certified LDPE Container, 1000 mL (2/pk)	186009110

* Method Validation Kit (MVK) contains three columns from three different batches.
** VanGuard FIT Replacement Cartridges can ONLY be used on BioResolve SCX mAb Columns that have VanGuard FIT component.

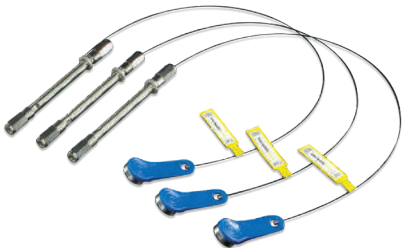
BioResolve SCX mAb Startup Kits

Description	P/N
BioResolve SCX mAb, 3 µm, 2.1 × 50 mm Column w/ VanGuard FIT Cartridge; mAb Charge Variant Standard; BioResolve SCX pH Concentrates; and two Certified LDPE Containers	176004351
BioResolve SCX mAb, 3 µm, 2.1 × 50 mm Column; mAb Charge Variant Standard; BioResolve SCX pH Concentrates; and two Certified LDPE Containers	176004355
BioResolve SCX mAb, 3 µm, 2.1 × 100 mm Column w/VanGuard FIT Cartridge; mAb Charge Variant Standard; BioResolve SCX pH Concentrates; and two Certified LDPE Containers	176004352
BioResolve SCX mAb, 3 µm, 2.1 × 100 mm Column; mAb Charge Variant Standard; BioResolve SCX pH Concentrates; and two Certified LDPE Containers	176004356
BioResolve SCX mAb, 3 µm, 4.6 × 50 mm Column w/ VanGuard FIT Cartridge; mAb Charge Variant Standard; BioResolve SCX pH Concentrates; and two Certified LDPE Containers	176004353
BioResolve SCX mAb 3 µm, 4.6 × 50 mm Column; mAb Charge Variant Standard; BioResolve SCX pH Concentrates; and two Certified LDPE Containers	176004357
BioResolve SCX mAb, 3 µm, 4.6 × 100 mm Colum w/ VanGuard FIT Cartridge; mAb Charge Variant Standard; BioResolve SCX pH Concentrates; and two Certified LDPE Containers	176004354
BioResolve SCX mAb 3 µm, 4.6 × 100 mm Column; mAb Charge Variant Standard; BioResolve SCX pH Concentrates; and two Certified LDPE Containers	176004358

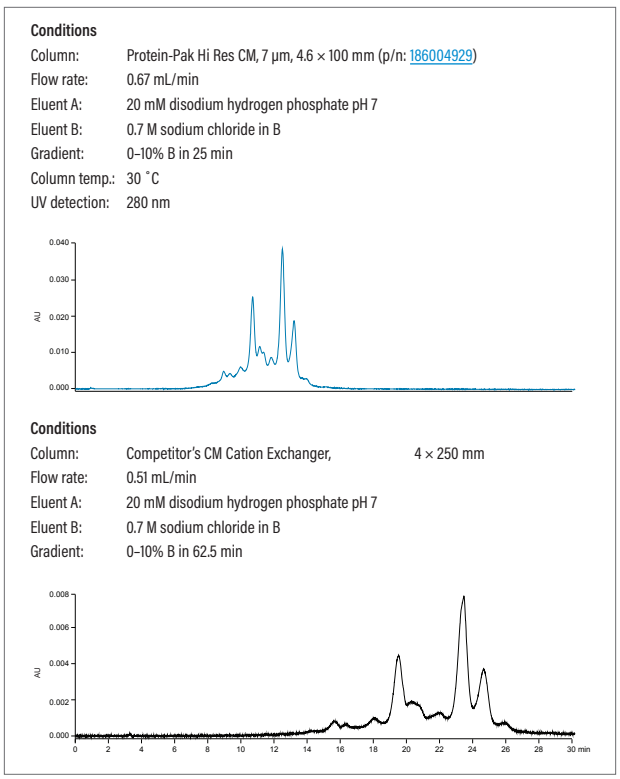
Protein-Pak Hi Res Ion-Exchange (IEX) Columns for ACQUITY UPLC Applications

Protein-Pak Hi Res Ion-Exchange (IEX) Columns were developed to assist in the characterization of recombinant proteins, monoclonal antibodies, and other biological compounds. The non-porous, high compound binding capacity of these particles yields outstanding resolution of charged species in less time compared to use of many traditional porous IEX offerings. In addition, quality control testing with defined protein standards helps ensure consistent batch-to-batch performance.

- Designed for the characterization of protein charge variants and other biocompounds
- Two cation-exchangers (carboxymethyl and sulfopropyl) and one anion exchanger (quaternary ammonium) that address selectivity needs
- Non-porous, high-capacity stationary phases deliver fast separations that address high-throughput needs
- QC tested with protein standards to ensure batch-to- batch consistency
- eCord enabled to help monitor column use on ACQUITY UPLC Systems

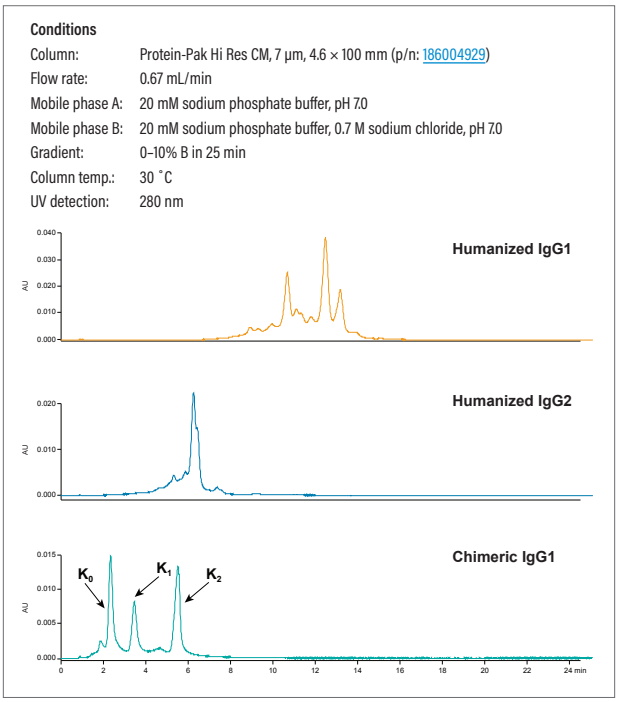


Resolved Monoclonal Antibody (mAb) Isoform Separation



Cation-exchange chromatography is a useful tool for the characterization and quantitation of mAb or recombinant protein variants. Use of Waters Protein-Pak Hi Res CM Column on an ACQUITY UPLC System increases sample throughput while maintaining resolution between intended product and undesired variants.

Protein-Pak Hi Res CM Analysis of Three mAbs Containing Different Levels of Variants



Sequence, production, storage, and shipping conditions influence the degree of variants contained in a biotherapeutic protein. Waters Protein-Pak Hi Res CM Column can successfully resolve variations that may involve as little as a single amino acid change (K0 = No terminal lysines, K1 = One terminal lysine, and K2 = Two terminal lysines).

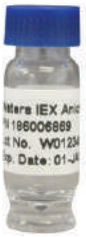
Ordering Information

Protein-Pak Hi Res UPLC Columns

Description	Particle Size	Dimension	P/N (1/pk)
Protein-Pak Hi Res CM	7 µm	4.6 × 100 mm	186004929
Protein-Pak Hi Res SP	7 µm	4.6 × 100 mm	186004930
Protein-Pak Hi Res Q	5 µm	4.6 × 100 mm	186004931

Note: Only when Protein-Pak Hi Res IEX Columns are combined with the ACQUITY UPLC System are the full performance benefits realized. See Waters service notes, p/n: 715002147A for ACQUITY UPLC System configuration guidelines for ion-exchange chromatography.

Ion-Exchange Standards



Benchmarking, Method Development, and Troubleshooting

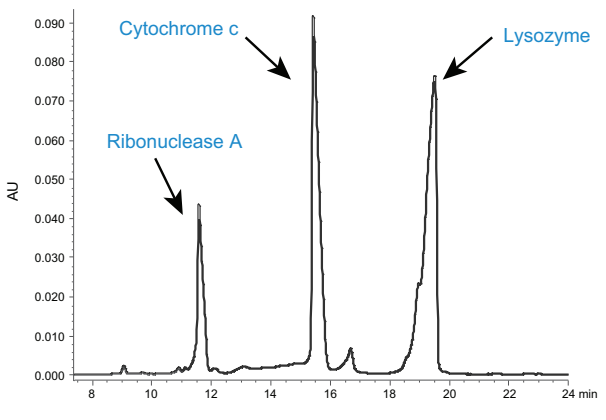
Ion-Exchange Standards are sets of standards that allow the user to benchmark anion- or cation-exchange columns on a regular basis in order to have confidence in results as well as providing a troubleshooting tool for any issues that may arise.

- IEX Anion Test Standard
- IEX Cation Test Standard

Protein-Pak Hi Res CM Column using the IEX Cation Test Standard

Conditions

Column:	Protein-Pak Hi Res CM, 4.6 × 100 mm (p/n: 186004929)
Injection vol.:	10.0 µL
Flow rate:	1 mL/min
Mobile phase A:	20 mM sodium phosphate buffer, pH 6.6
Mobile phase B:	20 mM sodium phosphate buffer, 0.5 M NaCl, pH 6.6
Temp.:	30 °C
UV detection:	280 nm
Gradient:	0 to 60% B in 34 min



Waters offers a variety of carefully formulated and QC-tested anion-exchange and cation-exchange protein standards to help chromatographers confirm adequate performance of their IEX column and LC system prior to the analyses of potentially highly valued samples.

Ordering Information

IEX Standards

Description	P/N (1/pk)
IEX Anion Test Standard	186006869
IEX Cation Test Standard	186006870

Application of Waters UPLC Technology for Biotherapeutic Characterization

ACQUITY UPLC allows analytical chemists to reach far beyond conventional LC separations and has proven itself to be an asset to laboratories around the world. UPLC sets new standards in resolution, sensitivity, and throughput by being the first holistically-designed system that maximizes for rapid, high-resolution analyses. It has fueled hundreds of peer-reviewed papers, helps laboratories conserve resources, and has served the needs of regulatory agencies around the globe. ACQUITY UPLC simultaneously makes your laboratory more sustainable and more efficient.

Manufacturing Consistency for Enhanced Assurance

The ability to obtain the same high-quality separations regardless of column lot is of critical importance to the successful development and commercialization of biotherapeutics. Each batch of Protein-Pak Hi Res IEX material is tested with a relevant mixture of protein standards to help ensure consistent column-to-column performance.

ACQUITY UPLC Technology for biotherapeutic characterization.

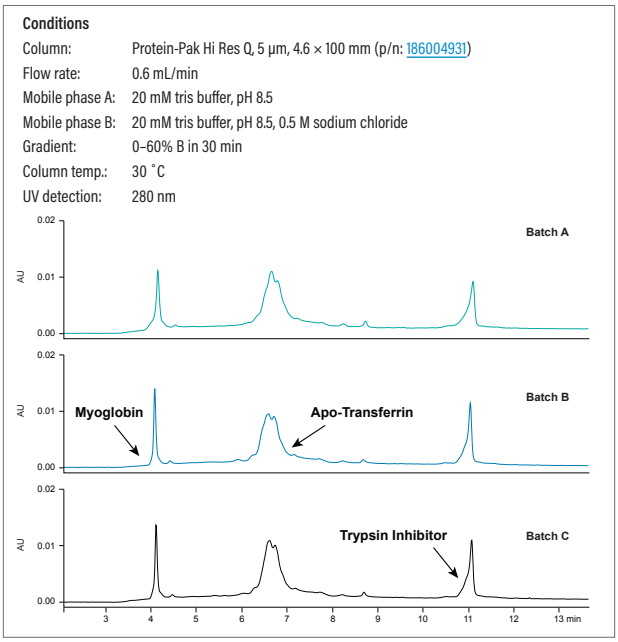
Novel IEX Particles Ideal for Biomolecule Characterizations

Protein-Pak Hi Res IEX Columns contain non-porous, pH tolerant, hydrophilic particles whose surface consists of a multi-layered network of either anion (5 µm) or cation (7 µm) exchange groups. This innovative particle and bonding chemistry produces particles with greater protein loading capacities than found on many traditional mono-disperse, non-porous resins. This translates into columns that can resolve complex mixtures of biomolecules in comparatively short times compared to use of alternative porous or non-porous IEX Column offerings.

Column	Protein-Pak Hi Res Q	Protein-Pak Hi Res CM	Protein-Pak Hi Res SP
Ion Exchange	**Strong Anion**	**Weak Cation**	**Strong Cation**
Functional group	Quaternary ammonium	Carboxymethyl	Sulfopropyl
Matrix	Hydrophilic polymer	Hydrophilic polymer	Hydrophilic polymer
Particle size	5 µm	7 µm	7 µm
Pore size	Non porous	Non porous	Non porous
I.D. × L	4.6 × 100 mm	4.6 × 100 mm	4.6 × 100 mm
Counter ion	Cl-	Na+	Na+
pH range	3–10	3–10	3–10
Temperature	10–60 °C	10–60 °C	10–60 °C
pK_a	10.5	4.9	2.3
Flow rates	0.3–0.6 mL/min	0.5–1.4 mL/min	0.5–1.4 mL/min
Approximate protein binding capacity in mgs per column (i.e., BSA for Hi Res Q column, lysozyme for Hi Res CM and Hi Res SP columns)*	58	33	25

* For optimal resolution of complex samples, do not exceed 20% of the column's protein binding capacity.

Protein-Pak Hi Res IEX Column Batch-to-Batch Reproducibility

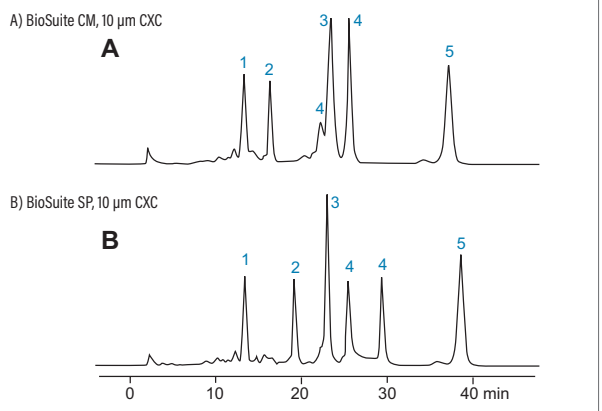


Each batch of Protein-Pak Hi Res SP, CM, and Q Column packing material is chromatography tested using a relevant protein standard mixture to help ensure consistent and predictable performance.

BioSuite Ion-Exchange HPLC Columns

BioSuite Ion-Exchange (IEX) Column offerings include strong and weak cation (CXC) and anion exchangers (AXC) bonded to a pH stable (i.e., pH 2–12), methacrylic ester-based polymeric resin. The availability of four separation chemistries provides chromatographers with the flexibility required to develop methods that separate proteins or peptides based upon minor charge differences. Non-porous (NP) and porous IEX columns are also available. Speed and superior chromatographic resolution are possible using the NP IEX offerings. Waters' porous ion exchangers are available for applications requiring greater protein or peptide binding capacity. In addition, selected BioSuite Ion-Exchange Columns are offered in PEEK hardware as well as in 21.5 mm I.D. preparative column sizes.

Protein Selectivity Differences Observed by Ion-Exchange Chromatography on BioSuite CM (Weak-Cation Exchange) vs. SP (Strong-Cation Exchange) Columns

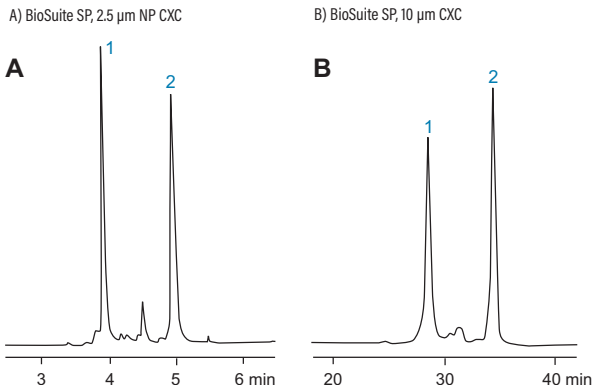


Conditions

Sample:	Trypsinogen (Peak 1), ribonuclease (Peak 2), alpha-chymotrypsinogen A (Peak 3), cytochrome *c* (Peak 4), and lysozyme (Peak 5)
Columns:	A: BioSuite CM, CXC, 10 µm, 7.5 × 75 mm (p/n: 186002186)
	B: BioSuite SP, CXC, 10 µm, 7.5 × 75 mm, (p/n: 186002184)
Eluent A:	20 mM sodium phosphate, pH 7.0
Eluent B:	20 mM sodium phosphate, pH 7.0 containing 0.5 M sodium chloride
Flow rate:	1.0 mL/min
Gradient:	Linear gradient from 0 to 100% B in 60 min
Column temp.:	25 °C
UV detection:	280 nm

BioSuite strong (SP) and weak (CM) cation-exchange columns deliver different separation selectivities useful when developing a method to adequately separate a complex biocompound mixture.

Enhanced Compound Resolution by Ion-Exchange Chromatography on BioSuite SP Non-Porous (NP) vs. Porous CXC Columns



Conditions

Sample:	Alpha-chymotrypsinogen A (Peak 1) and ribonuclease (Peak 2)
Columns:	A: BioSuite, NP CXC, 2.5 µm, 4.6 × 35 mm (p/n:186002183)
	B: BioSuite SP, CXC, 10 µm, 7.5 × 75 mm (p/n:186002184)
Eluent A:	20 mM MES [2(N-morpholino)ethanesulfonic acid], pH 6.0
Eluent B:	20 mM MES, pH 6.0 containing 0.5 M sodium chloride
Flow rate:	A: 1.5 mL/min
	B: 1.0 mL/min
Gradient:	A: Linear gradient from 0 to 100% B in 10 min
	B: Linear gradient from 0 to 100% B in 60 min
Column temp.:	25 °C
UV detection:	280 nm

Use of 2.5 µm, superficially-porous particles, contained in the BioSuite SP NP Columns, can deliver improved peptide component resolution and in less time (left figure) compared to the use of a BioSuite SP, CXC column that contains 10 µm, fully-porous particles (right figure).

Ordering Information

BioSuite pC_{18} and pPhenyl HPLC and UHPLC Columns

Description	Matrix	Dimension	P/N (1/pk)
BioSuite pC_{18}, 2.5 µm NP RPC	Polymer	4.6 × 35 mm	186002152
BioSuite pC_{18}, 500, 7 µm RPC	Polymer	2.0 × 150 mm	186002153
BioSuite pC_{18}, 500, 7 µm RPC	Polymer	4.6 × 150 mm	186002154
BioSuite pC_{18}, 500, 13 µm RPC	Polymer	21.5 × 150 mm	186002155
BioSuite pPhenyl, 1000, 10 µm RPC	Polymer	2.0 × 75 mm	186002156
BioSuite pPhenyl, 1000, 10 µm RPC	Polymer	4.6 × 75 mm	186002157
BioSuite pPhenyl, 1000, 13 µm RPC	Polymer	21.5 × 150 mm	186002158

BioSuite IEX HPLC Columns

Description	Matrix	Pore Size	Exclusion Limit (Daltons) Against Polyethylene Glycol	Dimension	Column Volume (mL)	# Approx Protein Binding Capacity Per Pre-Packed Column	P/N
BioSuite Q-PEEK, 10 µm AXC	Polymer	4000 Å	>5,000,000	4.6 × 50 mm	0.83	58 mg[1]	186002176
BioSuite SP-PEEK, 7 µm CXC	Polymer	1300 Å	>4,000,000	4.6 × 50 mm	0.83	58 mg[2]	186002182
BioSuite DEAE, 2.5 µm NP AXC	Polymer	n/a	500	4.6 × 35 mm	0.58	2.9 mg[1]	186002179
BioSuite SP, 2.5 µm NP CXC	Polymer	n/a	500	4.6 × 35 mm	0.58	2.9 mg[3]	186002183
BioSuite Q, 10 µm AXC	Polymer	1000 Å	1,000,000	7.5 × 75 mm	3.31	331 mg[1]	186002177
BioSuite Q, 13 µm AXC	Polymer	1000 Å	1,000,000	21.5 × 150 mm	54.45	5445 mg[1]	186002178
BioSuite DEAE, 10 µm AXC	Polymer	1000 Å	1,000,000	7.5 × 75 mm	3.31	99 mg[1]	186002180
BioSuite DEAE, 13 µm AXC	Polymer	1000 Å	1,000,000	21.5 × 150 mm	54.45	1633 mg[1]	186002181
BioSuite SP, 10 µm CXC	Polymer	1000 Å	1,000,000	7.5 × 75 mm	3.31	132 mg[3]	186002184
BioSuite SP, 13 µm CXC	Polymer	1000 Å	1,000,000	21.5 × 150 mm	54.45	2178 mg[3]	186002185
BioSuite CM, 10 µm CXC	Polymer	1000 Å	1,000,000	7.5 × 75 mm	3.31	149 mg[3]	186002186
BioSuite CM, 13 µm CXC	Polymer	1000 Å	1,000,000	21.5 × 150 mm	54.45	2450 mg[3]	186002187

[1] Data generated with BSA.
[2] Data generated with gamma globulin.
[3] Data generated with hemoglobin.
Note: For best resolution of complex samples, do not exceed 20% of the column's protein binding capacity.

Protein-Pak PW Series Columns

Waters also offers a line of 10 µm polymer-based ion-exchangers pre-packed in steel or glass columns. The Protein-Pak 5PW Columns are available as DEAE and SP ion exchangers. These columns can be used on HPLC and FPLC systems in both analytical and preparative configurations.

Approximate Protein Binding Capacity per Pre-Packed Column				
	Protein-Pak HR Packing			
Dimension	Q	DEAE	SP	CM
5 × 50 mm	60 mg	40 mg	40 mg	25 mg
5 × 100 mm	130 mg	150 mg	80 mg	45 mg
10 × 100 mm	500 mg	300 mg	300 mg	180 mg

Ordering Information

Protein-Pak PW HPLC Column Series

Description	Dimension	P/N
Polymeric Weak Anion-Exchanger	7.5 × 75 mm	WAT088044
Protein-Pak DEAE 5PW Glass Column	8 × 75 mm	WAT011783
Protein-Pak DEAE 5PW Steel Column	21.5 × 150 mm	WAT010640
Polymeric Strong Cation Exchanger	7.5 × 75 mm	WAT088043
Protein-Pak SP 5PW Glass Column	8 × 75 mm	WAT011784

Protein-Pak High Resolution (HR) Ion-Exchange Glass Columns

Waters Protein-Pak HR packing materials are based on rigid, hydrophilic, polymethacrylate particles with large 1000 Å pores. The naturally hydrophilic polymer reduces non-specific adsorption, resulting in quantitative recovery of protein mass and bioactivity. These packings are compatible with buffers in the pH range 2–12, and will withstand exposure to caustic solutions, such as 0.1–1.0 M sodium hydroxide and acetic solutions, such as 20% acetic acid, for cleaning purposes.

The Protein-Pak HR 8 µm and 15 µm packing materials are available pre-packed in Waters Advanced Purification (AP) Glass Columns in a choice of 5 mm I.D. (mini-column) or 10 mm I.D. by 100 mm in length. The 5 mm I.D. column is also available in a 50 mm length. These columns are compatible with any HPLC and FPLC system with the use of an adapter kit.

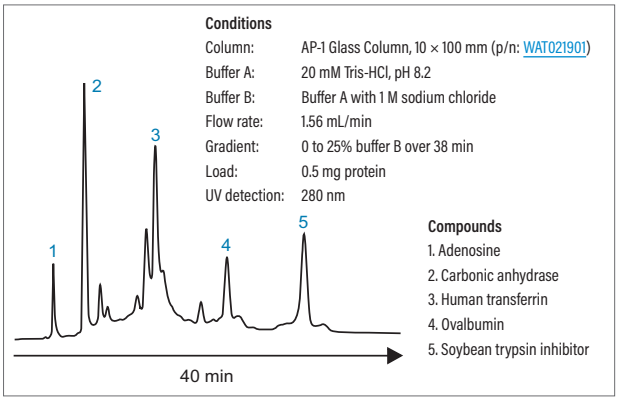
Protein-Pak HR ion exchangers are available with a Q functional group, a strong anion exchanger; DEAE, a weak anion exchanger; SP, a strong cation exchanger; and CM, a weak cation exchanger. The principal difference between a weak and strong ion exchanger does not lie in the protein binding capacity, but in the pH range of operation. Weak ion exchangers tend to have a more restricted useful pH range of operation.

Properties of Protein-Pak HR Columns

	Protein-Pak Q HR1	Protein-Pak DEAE HR2	Protein-Pak CM HR3	Protein-Pak SP HR4
Type of material	Polymer	Polymer	Polymer	Polymer
Protein binding capacity	60 mg/mL	40 mg/mL	25 mg/mL	40 mg/mL
Ion-exchange capacity	200 µeq/mL	250 µeq/mL	175 µeq/mL	225 µeq/mL
Nominal pK	11.7	9.0	5.7	2.2
Typical protein recovery	>95%	>95%	>95%	>95%
Typical recovery of biological activity	>90%	>90%	>90%	>90%
pH stability	2–12	2–12	2–12	2–12

1. For best resolution do not exceed 20% of the protein binding capacity.
2. Bovine serum albumin in 20 mM Tris/Cl pH 8.2 was used to measure protein binding capacity of Protein-Pak Q and DEAE HR.
3. Cytochrome *c* in 25 mM MES pH 5.0 was used to measure protein binding capacity of Protein-Pak SP and CM HR.
4. Same conditions as CM. Protein binding capacity of Protein-Pak SP 40 HR is 20 mg/mL.

Protein Resolution on Protein-Pak DEAE 15HR Anion-Exchange Column



Waters Advanced Purification (AP) Glass Columns, containing Protein-Pak DEAE 15 µm particles, are well suited for the analysis and/or lab-scale purification of various protein mixtures.

Ordering Information

Protein-Pak HR Ion-Exchange Glass Columns

Ion-Exchange Packing	Particle Size	Pore Size	Dimension	Particle Type	P/N
Protein-Pak Q 8HR	8 µm	1000 Å	5 × 50 mm	Polymeric strong anion exchanger	WAT039575
			5 × 100 mm		WAT039630
			10 × 100 mm		WAT035980
Protein-Pak Q 15HR	15 µm	1000 Å	5 × 50 mm	Polymeric strong anion exchanger	WAT039782
			10 × 100 mm		WAT037663
Protein-Pak DEAE 8HR	8 µm	1000 Å	5 × 50 mm	Polymeric weak anion exchanger	WAT039791
			5 × 100 mm		WAT039783
			10 × 100 mm		WAT035650
Protein-Pak DEAE 15HR	15 µm	1000 Å	5 × 50 mm	Polymeric weak anion exchanger	WAT039780
			5 × 100 mm		WAT039786
			10 × 100 mm		WAT038564
Protein-Pak SP 8HR	8 µm	1000 Å	5 × 50 mm	Polymeric strong cation exchanger	WAT039570
			5 × 100 mm		WAT039625
			10 × 100 mm		WAT035655
Protein-Pak SP 15HR	15 µm	1000 Å	10 × 100 mm	Polymeric strong cation exchanger	WAT038567
Protein-Pak CM 8HR	8 µm	1000 Å	5 × 50 mm	Polymeric weak cation exchanger	WAT039790
			5 × 100 mm		WAT039785
			10 × 100 mm		WAT035970
Protein-Pak CM 15HR	15 µm	1000 Å	5 × 50 mm	Polymeric weak cation exchanger	WAT039787

Advanced Purification (AP) Glass Columns

Waters AP series of glass columns are constructed of biocompatible glass and polymeric materials and can be easily used with silica, polymer, or soft gel packings. To optimize flow and ensure uniform sample distribution onto the packed bed, each column incorporates a distributor. A replaceable filter protects the packing from large particulate contaminants. Empty AP Glass Columns are available in a variety of sizes and utilize the same design to ensure predictable methods transfer among them. AP Glass Columns are compatible with both analytical and preparative HPLC and FPLC systems.

Ordering Information

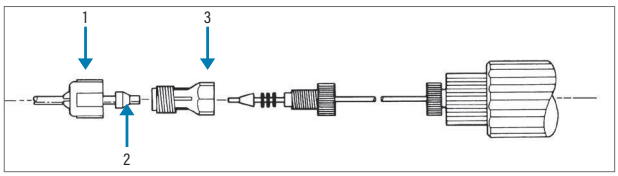
Advanced Purification (AP) Glass Columns

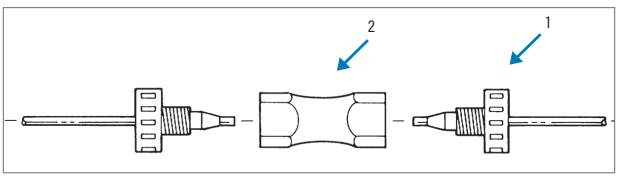
Dimension	Bed Volume (mL)	Flow Rate (mL/min)	Pressure Rating (psi/MPa)	P/N
5 × 50 mm	0.8–1.2	0–4	1500 psi/10 MPa	WAT064-01
5 × 100 mm	1.8–2.2	0–4	1500 psi/10 MPa	WAT064-02
10 × 100 mm	5–8	0–4	1500 psi/10 MPa	WAT021901
10 × 200 mm	13–16	0–4	1500 psi/10 MPa	WAT021902
10 × 300 mm	21–24	0–4	1500 psi/10 MPa	WAT021903
10 × 600 mm	45–48	0–4	1500 psi/10 MPa	WAT021906
20 × 100 mm	22–31	4–16	1000 psi/6.8 MPa	WAT027501
20 × 200 mm	53–62	4–16	1000 psi/6.8 MPa	WAT027502
20 × 300 mm	85–94	4–16	1000 psi/6.8 MPa	WAT027503
20 × 600 mm	179–188	4–16	1000 psi/6.8 MPa	WAT027506
50 × 100 mm	137–196	16–100	500 psi/3.4 MPa	WAT023321
50 × 200 mm	333–392	16–100	500 psi/3.4 MPa	WAT023332
50 × 300 mm	530–589	16–100	500 psi/3.4 MPa	WAT023323
50 × 600 mm	1118–1177	16–100	500 psi/3.4 MPa	WAT023326

Advanced Purification (AP) Glass Column Accessories and Spare Parts

Waters AP Glass Columns feature non-metallic construction and adjustable bed height with easy-to-use coarse and fine adjustments. The AP Glass Columns are available in a variety of dimensions.

Connection of an AP MiniColumn and an AP-1 Column to 1/8" OD Tubing





Ordering Information

AP MiniColumn

Description	Qty.	P/N
1. Collet and Nut Assembly (3/8–24)	10/pk	WAT005138
2. Ferrule 1/8" Tube	10/pk	WAT005136
3. Union 3/8–24 × 'Z' Fitting	5/pk	WAT005137

AP MiniColumn Accessories and Spare Parts

Description	Dimension	P/N
Glass Tube	5 × 50 mm	WAT038802
	5 × 100 mm	WAT038803
Column Jacket	5 × 50 mm	WAT038804
	5 × 100 mm	WAT038805
Filters, 10/pk	–	WAT038806
O-Rings, 13/pk (includes 10 inlet/outlet and 3 funnel)	–	WAT038807
Inlet Connector Assembly	–	WAT038800

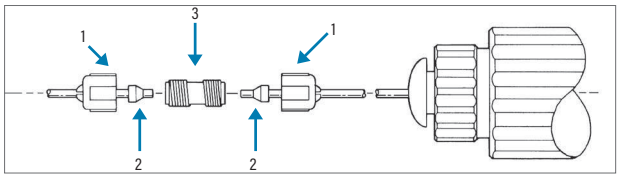
AP-1 Column

Description	Qty.	P/N
1 Compression Screw and Ferrule 'Z' Fitting, Plastic	1/pk	WAT082708
2 Union 'Z' Fitting, Plastic	1/pk	WAT082745

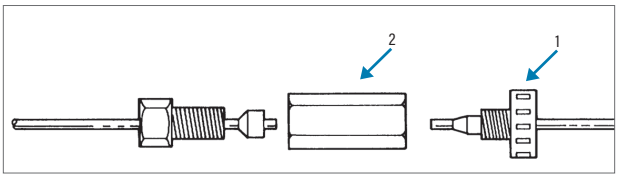
AP-1 Column Accessories and Spare Parts

Description	Dimension	P/N
Glass Tube	10 × 100 mm	WAT021992
	10 × 200 mm	WAT022033
	10 × 300 mm	WAT022034
	10 × 600 mm	WAT022035
Plastic Shield	10 × 100 mm	WAT021927
	10 × 200 mm	WAT021945
	10 × 300 mm	WAT021946
	10 × 600 mm	WAT021947
O-Rings, 5/pk	–	WAT021907
Filters, 10/pk	–	WAT021910
Replacement Tubing (Tefzel) (1/16 in. O.D. × 0.009 in. I.D. × 10 feet) (1.6 mm O.D. × 0.23 mm I.D. × 3 m)	–	WAT021950
Inlet Connector Assembly	–	WAT021904

Connection of an AP-2 and an AP-5 Column to 1/8" O.D. Tubing



Connection of Pharmacia Fitting to 1/16" O.D. Tubing



AP-2 Column

Description	Qty.	P/N
1. Collet and Nut Assembly (3/8–24)	10/pk	WAT005138
2. Ferrule 1/8" Tube	10/pk	WAT005136
3. Union 3/8–24 × 3/8–24	1/pk	WAT082734

AP-2 Column Accessories and Spare Parts

Description	Dimension	P/N
Glass Tube	20 × 100 mm	WAT019891
	20 × 200 mm	WAT019892
	20 × 300 mm	WAT019893
Plastic Shield	20 × 100 mm	WAT027542
	20 × 200 mm	WAT027543
	20 × 300 mm	WAT027544
O-Rings, 5/pk	—	WAT027528
Filters, 2/pk	—	WAT027530
Replacement Tubing (Tefzel) (1/8 in. O.D. × 0.040 in. I.D. × 10 feet) (3.2 mm O.D. × 1.02 mm I.D. × 3 m)	—	WAT023344
Inlet Connector Assembly	—	WAT027525
Distributors/Inserts, 5/pk	—	700004715

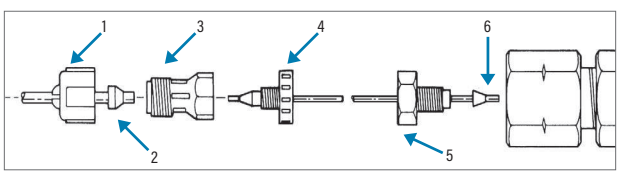
AP-5 Column

Description	Qty.	P/N
1. Compression Screw and Ferrule 'Z' Fitting, Plastic	1/pk	WAT082708
2. Union, Plastic	1/pk	WAT021951

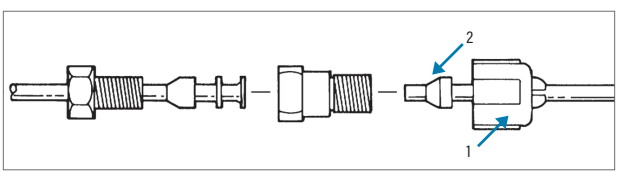
AP-5 Column Accessories and Spare Parts

Description	Dimension	P/N
Glass Tube	50 × 100 mm	WAT019876
	50 × 200 mm	WAT019877
	50 × 300 mm	WAT019878
Plastic Shield	50 × 100 mm	WAT023370
	50 × 200 mm	WAT023371
	50 × 300 mm	WAT023372
	50 × 600 mm	WAT023373
O-Rings, 5/pk	—	WAT023345
Filter, 2/pk	—	WAT023343
Replacement Tubing (Tefzel) 1/8 in. O.D. × 0.040 in. I.D. × 10 feet) (3.2 mm O.D. × 1.02 mm I.D. × 3 m)	—	WAT023344
Inlet Connector Assembly	—	WAT023349
Outlet Connector Assembly	—	WAT023348
Collet and Nut Assembly	—	WAT023346
Ferrule, 10/pk	—	WAT023347
Funnel Assembly	—	WAT023396

Connection of a Protein-Pak Steel Column to 1/16" and 1/8" O.D. Tubing



Connection of 1/8" or 1/16" Flanged Type Fitting to 1/8" O.D. Tubing



Protein-Pak Steel Column

Description	Qty.	P/N
1. Collet and Nut Assembly (3/8–24)	10/pk	WAT005138
2. Ferrule 1/8" Tube	10/pk	WAT005136
3. Union 3/8–24 × 'Z' Fitting	5/pk	WAT005137
4. Compression Screw and Ferrule 'Z' Fitting, Plastic	1/pk	WAT082708
5. Compression Screw 'Z' Fitting, Steel	10/pk	WAT005070
6. Ferrule 1/16" Steel	10/pk	WAT005063

Flanged Type Fitting

Description	Qty.	P/N
1. Collet and Nut Assembly (3/8–24)	10/pk	WAT005138
2. Ferrule 1/8" Tube	10/pk	WAT005136

AccellPlus Ion-Exchange Packings

Solid-Phase Extraction for Protein Sample Preparation

Waters AccellPlus ion-exchange packings are 40 µm, 300 Å polymer-coated, silica-based materials for both lab- and process-scale chromatography. AccellPlus, available as a QMA (strong anion exchanger) or CM (weak cation exchanger) is easy to pack and is excellent for the purification of proteins, enzymes, and immunoglobulins. The rigid silica-based packing material will withstand very high flow rates during cleaning and re-equilibration cycles. Normal flow rates are used during sample loading and elution to obtain the best possible resolution.

AccellPlus bulk material may be packed into our Advanced Purification (AP) Glass Columns.

[1]To estimate packed bed volume for a known amount of AccellPlus: **AccellPlus used (g) × 2 = packed bed volume (mL)**

AccellPlus Sep-Pak Cartridges

Sep-Pak Plus Cartridges packed with AccellPlus ion exchangers provide a rapid, economical means to clean up heavily contaminated samples that would damage a high resolution column. They can also be used to rapidly screen chromatographic conditions. These are also available in a variety of configurations.

Ordering Information

AccellPlus Sep-Pak Cartridges

Description	Ion-Exchange Type	P/N
AccellPlus CM	Weak Cation Exchanger	WAT020550
AccellPlus QMA	Strong Anion Exchanger	WAT020545
AccellPlus QMA Plus	Strong Anion Exchanger	186004540

AccellPlus PrepPak Cartridges (47 × 300 mm)

Economical, convenient preparative separations in the 500 mg to 10 g range. For a complete listing of Waters products for preparative chromatography, visit www.waters.com

Protein Binding Capacity of AccellPlus	
AccellPlus QMA* 200 mg BSA/g packing	**AccellPlus CM** 175 mg Cytochrome *c*/g packing**
* Bovine serum albumin in 20 mM Tris/Cl pH 7.0 was used to measure protein binding capacity of AccellPlus QMA.	
** Cytochrome *c* in 20 mM sodium phosphate pH 6.3 was used to measure protein binding capacity of AccellPlus CM.	
Note: For best resolution do not exceed 20% of the protein binding capacity.	

Ordering Information

AccellPlus PrepPak Cartridges (47 × 300 mm)

Description	Particle Size	Pore Size	P/N
AccellPlus CM*	40 µm	300 Å	WAT036545
PrepPak 1000 Module	—	—	WAT089592

* Requires PrepPak 1000 Module.

AccellPlus Ion-Exchange Bulk Packings

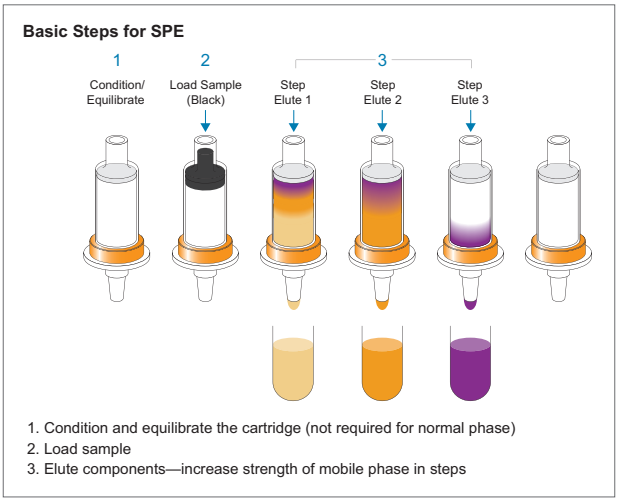
For all preparative isolations based on ionic interactions, particularly proteins, enzymes, and immunoglobulins.

Ion-Exchange Sample Preparation with Sep-Pak Cartridges

To perform ion-exchange sample preparation with Sep-Pak Cartridges, use a gradient of pH or ionic strength with Accell Plus CM, AccellPlus QMA or NH_2 as a sorbent.

- Condition the cartridge with six to ten hold-up volumes of de-ionized water or weak buffer
- Load the sample dissolved in a solution of deionized water or buffer
- Elute unwanted weakly bound components with a weak buffer
- Elute the first component of interest with a stronger buffer (change the pH or ionic strength)
- Elute other components of interest with progressively stronger buffers
- When you recover all of your components, discard the used cartridge in an appropriate manner

General Elution Protocol for Ion-Exchange Chromatography on Sep-Pak Cartridges (NH_2, AccellPlus QMA, AccellPlus CM)



1. Condition and equilibrate the cartridge (not required for normal phase)
2. Load sample
3. Elute components—increase strength of mobile phase in steps

Ordering Information

AccellPlus Ion-Exchange Bulk Packings

Description	Particle Size	Pore Size	Qty.	P/N
AccellPlus QMA	40 µm	300 Å	100 g	WAT010742
Anion Exchanger	—	—	500 g	WAT010741
AccellPlus CM	40 µm	300 Å	100 g	WAT010740
Cation Exchanger	—	—	500 g	WAT010739

Protein-Pak Affinity Columns

The Protein-Pak Affinity Epoxy-Activated packing consists of 40 µm, 500 Å pore size particles having a hydrophilic bonding layer with a glycidoxypropyl functionality resulting in a seven atom spacer arm. The epoxy-activated surface can immobilize a wide range of ligands via a covalent linkage with amino, hydroxyl or sulfhydryl groups using simple coupling procedures. For method screening or small scale separation, choose the convenience of pre-packed microcolumns. Larger-scale separations are easily achieved by packing bulk material in our Advanced Purification (AP) Glass Column.

To estimate packed bed volume for a known amount of Protein-Pak Affinity Epoxy-Activated packing:

Protein-Pak Affinity Epoxy-Activated used (g) × 2 = packed bed volume (mL)

Purification of Carbonic Anhydrase

Conditions

Ligand: Sulfanilamide, 180 µmol/g

Column: AP-1 Glass, 10 × 100 mm (p/n: WAT021992)

Buffer A: 100 mM tris sulfate with 200 mM sodium sulfate, pH 8.7

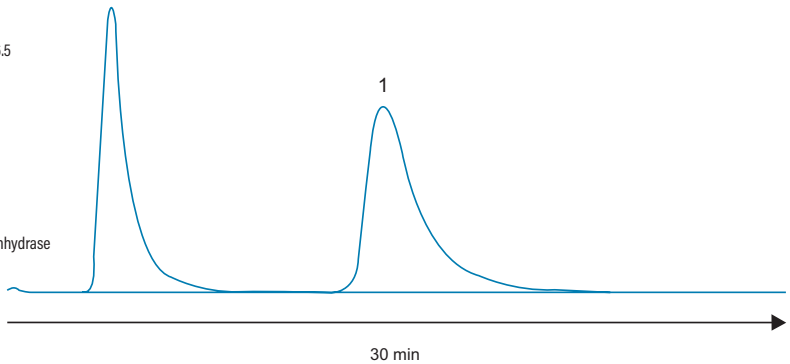
Buffer B: 200 mM potassium thiocyanate in 50 mM tris sulfate, pH 6.5

Gradient:

Time (min)	Profile %A	%B	Flow Rate (mL/min)
Initial	1	100	0
1	2	100	0
2	7	0	100
2	17	100	0 2

UV detection: 280 nm

Protein load: 24 mg of bovine hemolysate yielded 0.6 mg of carbonic anhydrase with a 100% recovery of esterase activity



Compound

1. Carbonic anhydrase

Waters Protein-Pak Affinity material can be successfully used to create an affinity resin as shown in the example of the affinity purification for the protein carbonic anhydrase.

Ordering Information

Protein-Pak Affinity Columns

Particle Packing	Particle Size	Pore Size	Qty.	P/N
Protein-Pak Affinity	40 µm	500 Å	25 g	WAT030653
Epoxy-Activated Packing	—	—	100 g	WAT030654
Protein-Pak Affinity Epoxy-Activated MicroColumn (500 mg of material in a 3 cc syringe barrel). Inquire for additional offerings.	40 µm	500 Å	10/box	WAT035955

BioSuite pC_{18} and pPhenyl Reversed-Phase Chromatography (RPC) HPLC Columns

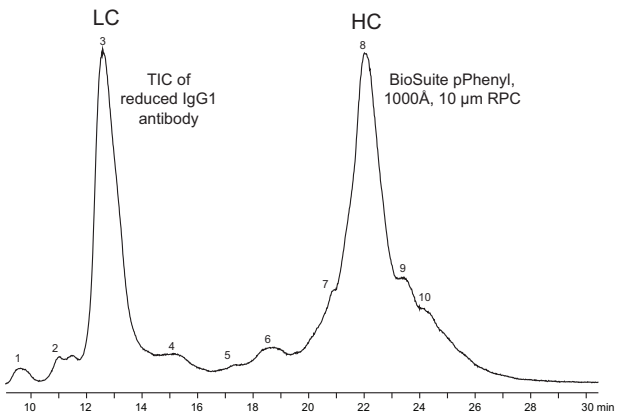
Reversed-phase chromatography (RPC) has become a widely accepted tool for the separation of proteins, peptides, synthetic oligonucleotides, and other biomolecules. For many applications, Symmetry and Symmetry300, Atlantis T3, or BEH 130 Å and BEH 300 Å Chemistries can be successfully used for the isolation and analyses of these biocompounds. However for some applications, the large pore size and high chemical stability of BioSuite phenyl C_{18} and pPhenyl resin-based packings may be preferred. BioSuite RPC Column offerings include a C_{18} (pC_{18}) and a phenyl (pPhenyl) chemistry bonded to a pH stable, methacrylic ester-based polymeric resin. The 500 Å pore size of the pC_{18} base matrix accommodates proteins up to 2,500,000 Daltons while the 1000 Å pore size of the pPhenyl base matrix accommodates proteins up to 5,000,000 Daltons.

The BioSuite pC_{18}, 2.5 µm, NP Column contains a non-porous chemistry that yields superior chromatographic resolution in less time compared to chromatography performed on the porous, pC_{18}, 500 Å, 7 µm RPC selection. Waters' porous, pC_{18}, 500 Å, 7 µm RPC Column is available for applications requiring greater binding capacity. The pC_{18} and pPhenyl RPC chemistries are available in 21.5 × 150 mm columns for "lab-scale" isolations while a 2.0 × 75 mm column is well suited for narrow-bore HPLC and LC-MS applications.

LC-MS Analysis of a Reduced Monoclonal IgG1 Antibody on a BioSuite pPhenyl RPC Column

Conditions

Sample:	Reduced monoclonal IgG1 antibody
Column:	BioSuite Phenyl, 1000 Å, 10 µm, 2.0 × 75 mm (p/n: 186002156)
Eluent A:	Water with 0.1% formic acid
Eluent B:	Acetonitrile with 0.1% formic acid
Flow rate:	0.2 ml/min
Gradient:	10% B for 6 min (waste), then 20–35% B in 30 min
Temp.:	80 °C
UV detection:	Waters LCT Premier ESI-Tof MS



The BioSuite pPhenyl, 1000 Å RPC Columns have a higher ligand density compared to the BioSuite Phenyl, 1000 Å HIC Columns and are not recommended for hydrophobic-interaction separations.

Ordering Information

BioSuite Hydrophobic-Interaction Chromatography HPLC and UHPLC Columns

Description	Matrix	Dimension	P/N
BioSuite Phenyl, 10 µm HIC	Polymer	7.5 × 75 mm	186002159
BioSuite Phenyl, 13 µm HIC	Polymer	21.5 × 150 mm	186002160

Size-Exclusion Chromatography Columns and Standards

Size-Exclusion Chromatography Columns and Standards

Contents

Size-Exclusion Chromatography Columns and Standards

For 60 years, Waters has continuously improved GPC (Gel Permeation Chromatography), and SEC (Size-Exclusion Chromatography), refining instrumentation, packing materials, and technology. Among the resultant innovations are size-exclusion techniques that expand beyond the original polymer analysis. These include applications for separating small and large molecules from interfering matrices such as those in foods, pharmaceutical preparations, and natural products.

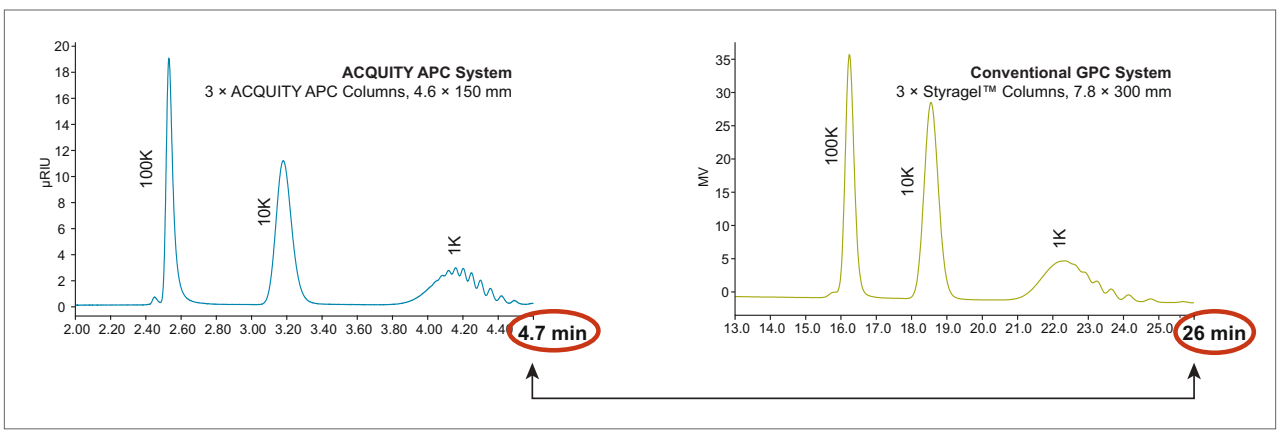
As a market leader and a primary manufacturer of chromatographic instrumentation and consumables, Waters will continue to influence the field of separation science, providing the highest quality products and expert applications support.

GPC Columns for Non-Aqueous Samples

The goals for a separation can range between maximum speed, for screening purposes, to maximum resolution, for quality control purposes. Each analysis type presents unique challenges. Waters' comprehensive line of GPC columns ensures that the column or column bank you select for an analysis will accommodate a particular temperature, solvent, and polymer type.

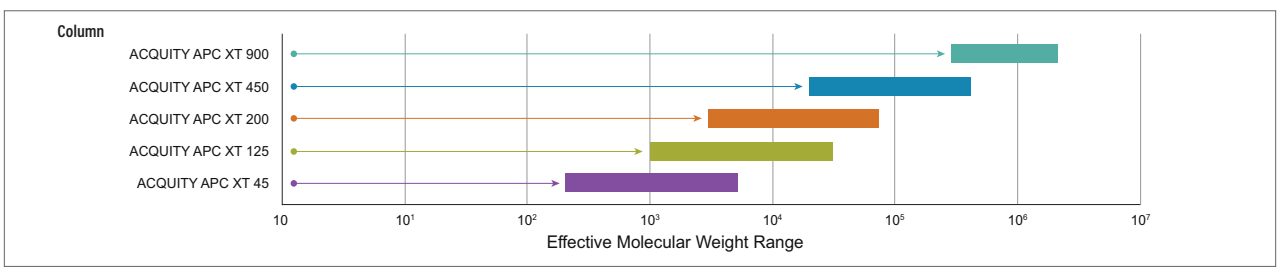
ACQUITY APC XT COLUMNS

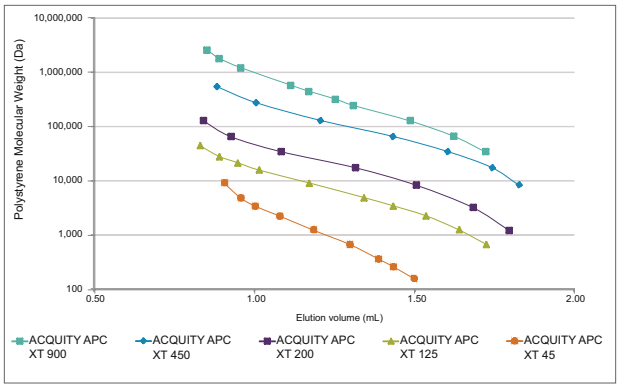
Using ACQUITY APC XT Columns, you can quantify and characterize polymer samples with accuracy and confidence while maximizing productivity. The high-performance chemistries contained in ACQUITY Advanced Polymer Chromatography (APC) Columns enable rapid and accurate chromatographic characterization of synthetic polymer and macromolecular species. The rigid hybrid particles used for ACQUITY APC XT Columns provide an unprecedented capability for rapid solvent switching, allowing you to use multiple conditions for the same column bank. This gives you the ability to quantify and characterize polymer samples with confidence and accuracy while maximizing productivity.



Compared with conventional columns, ACQUITY APC Columns provide faster analysis time and increase chromatographic resolution. Improving data quality enhances your ability to accurately characterize polymers and to do it with confidence. The conventional GPC separation was performed using three Styragel HR Columns (HR 0.5, HR 2, and HR 4E), all 7.8 × 300 mm. The same polystyrene sample was analyzed using a three column bank of 4.6 × 150 mm ACQUITY APC Columns (XT 45, XT 45, and XT 200). The separation used THF, and the flow rate was 1 mL/min.

ACQUITY APC XT Column Selection Guide





Polystyrene calibration curves for ACQUITY APC XT Columns.

Ordering Information

ACQUITY APC XT Columns

Pore Size	Effective MW Range*	Particle Size	P/N Column Length 30 mm	P/N Column Length 75 mm	P/N Column Length 150 mm
45 Å	200–5000	1.7 µm	186006992	186006993	186006995
125 Å	1000–30,000	2.5 µm	186006997	186006998	186007000
200 Å	3000–70,000	2.5 µm	186007002	186007003	186007005
450 Å	20,000–400,000	2.5 µm	186007007	186007008	186007010
900 Å	300,000–2,000,000	2.5 µm	186007252	186007253	186007254

All columns listed above are 4.6 mm I.D. and are shipped dry. Maximum operating temperature limit 90 °C.
*The calibration range is based on well-characterized polystyrene standards.

ACQUITY APC XT Columns are shipped dry, with acetal compression plugs at the assembly's ends. If you are storing the columns wet using a strong solvating solvent, consider fitting compression plugs made of stainless steel.

ACQUITY APC XT Fitting Compression Plug

Description	P/N
Stainless Steel Pin Plug, 1/16 in., High Pressure, 5/pk	700002747

Waters ACQUITY APC Column Selector

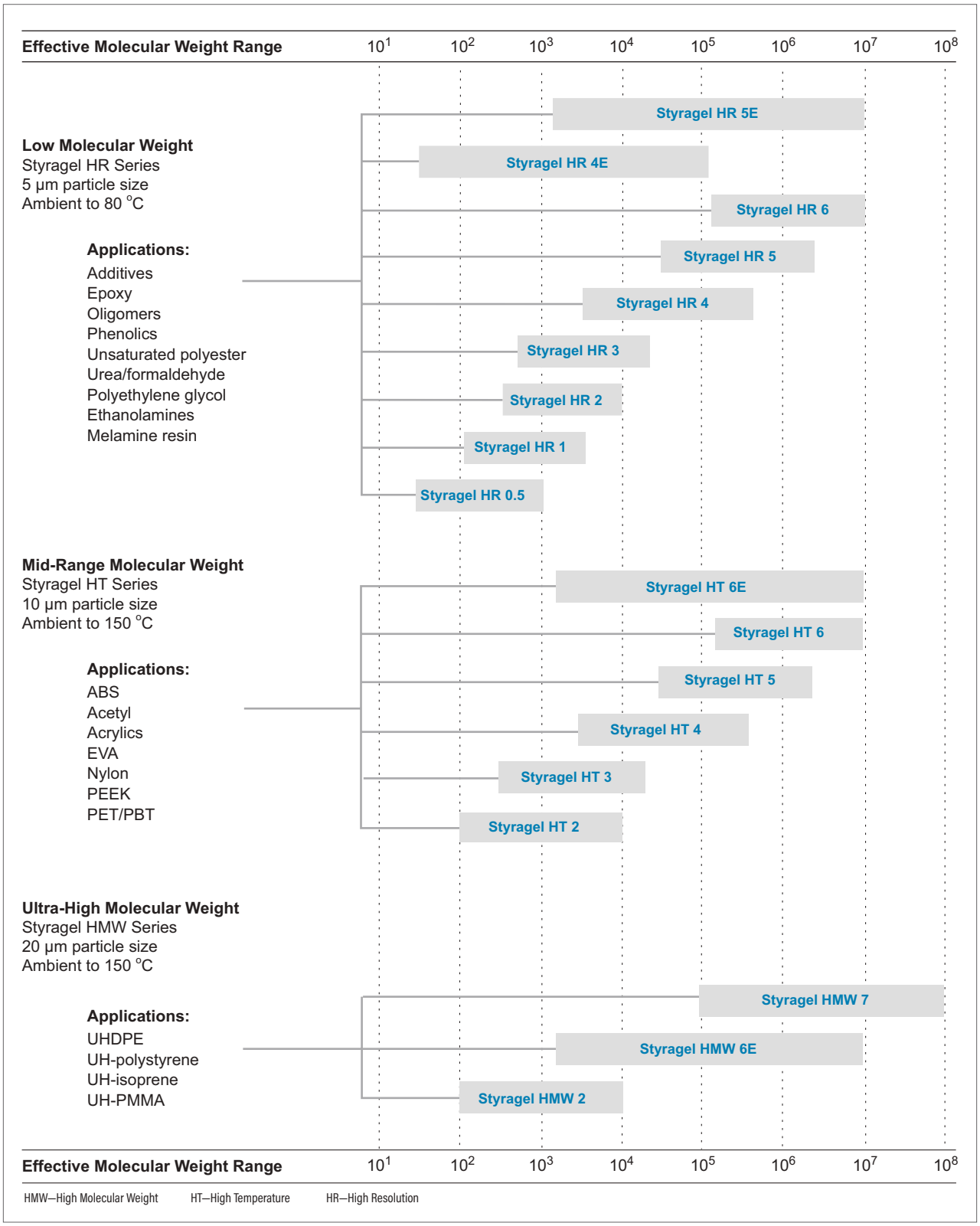
Easily find column and calibration kit recommendations that fit your polymer analysis requirements.

To try this tool, go to www.waters.com/apcselector

STYRAGEL COLUMNS SELECTION GUIDE

Waters offers a comprehensive selection of polymeric GPC columns. Select a column or column bank that is compatible with the temperature, solvent, and polymer type analyzed. Refer to the following charts to quickly compare the molecular weight ranges for the specified columns. By connecting two or more columns in series, you extend the effective molecular-weight range, which is necessary preparation for performing increasingly complex sample analyses.

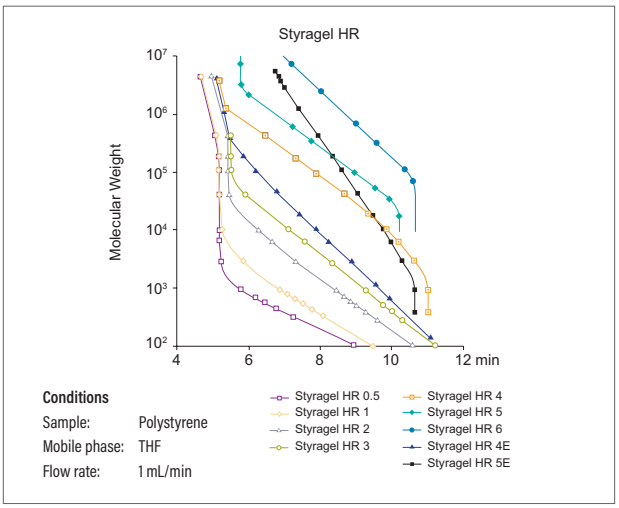
Selection Guide



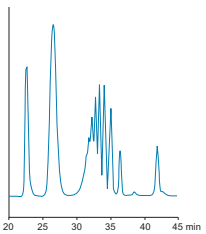
Styragel HR (High-Resolution) Columns

Designed especially for low-molecular-weight samples, Waters Styragel HR Columns are ideal for analyzing oligomers, epoxies, and polymer additives, where high resolution is critical. Packed with rigid 5 µm particles, these columns deliver unrivaled resolution and efficiency in the low-to-mid molecular-weight region.

Calibration Curves for the Waters Styragel HR Series of High-Resolution Columns

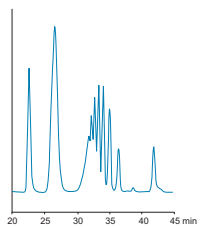


Styragel HR Columns for Unrivaled Resolution of Low-Molecular-Weight Samples



Conventional Styragel HR Columns, 7.8 × 300 mm

Column bank: Styragel HR 0.5, 1, 2, and 3
Part numbers: WAT044231, WAT044234, WAT044237, WAT044222
Mobile phase: THF
Column temp.: 35 °C
Flow rate: 1 mL/min
Sample: Polystyrene standards: 0.5 K, 5.05 K, 49.8 K



Solvent-Efficient Styragel HR Columns, 4.6 × 300 mm

Column bank: Styragel HR 0.5, 1, 2, and 3
Part numbers: WAT045835, WAT045850, WAT045865, WAT045880
Mobile phase: THF
Column temp.: 35 °C
Flow rate: 0.35 mL/min
Sample: Polystyrene standard mix 0.5 K, 5.05 K, 49.8 K

Ordering Information

Styragel HR Columns (7.8 × 300 mm)

		P/N	P/N	P/N
Description	**Effective MW Range**	**THF**	**DMF**	**Toluene**
Styragel HR 0.5, 50 Å	0–1000	WAT044231	WAT044232	WAT044230
Styragel HR 1, 100 Å	100–5000	WAT044234	WAT044235	WAT044233
Styragel HR 2, 500 Å	500–20,000	WAT044237	WAT044238	WAT044236
Styragel HR 3, 10^3 Å	500–30,000	WAT044222	WAT044223	WAT044221
Styragel HR 4, 10^4 Å	5000–600,000	WAT044225	WAT044226	WAT044224
Styragel HR 4E, mixed bed	50–100,000	WAT044240	WAT044241	WAT044239
Styragel HR 5, 10^5 Å	50,000–4,000,000	WAT054460	WAT054466	WAT054464
Styragel HR 5E, mixed bed	2000–4,000,000	WAT044228	WAT044229	WAT044227
Styragel HR 6, 10^6 Å	200,000–10,000,000	WAT054468	WAT054474	WAT054470
Styragel Guard Column, 4.6 × 30 mm	—	WAT054405	WAT054415	WAT054410

Styragel HR Columns (4.6 × 300 mm)*

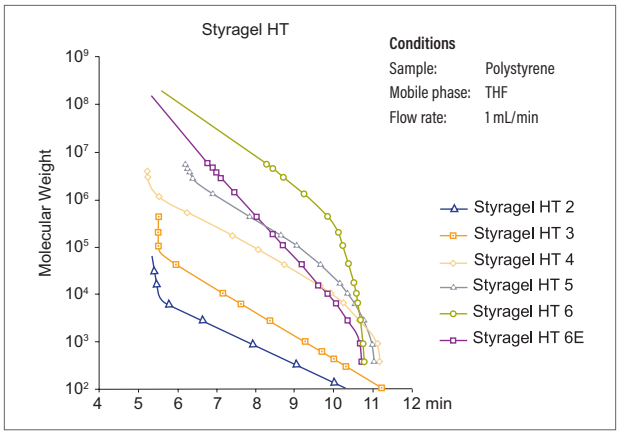
		P/N	P/N	P/N
Description	**Effective MW Range**	**THF**	**DMF**	**Toluene**
Styragel HR 0.5, 50 Å	0–1000	WAT045835	WAT045840	WAT045830
Styragel HR 1, 100 Å	100–5000	WAT045850	WAT045855	WAT045845
Styragel HR 2, 500 Å	500–20,000	WAT045865	WAT045870	WAT045860
Styragel HR 3, 10^3 Å	500–30,000	WAT045880	WAT045885	WAT045875
Styragel HR 4, 10^4 Å	5000–600,000	WAT045895	WAT045900	WAT045890
Styragel HR 4E, mixed bed	50–100,000	WAT045805	WAT045810	WAT045800
Styragel HR 5E, mixed bed	2000–4,000,000	WAT045820	WAT045825	WAT045815

*The same high performance as our conventional Styragel HMW Columns with the added advantage of reducing your solvent consumption by two-thirds.

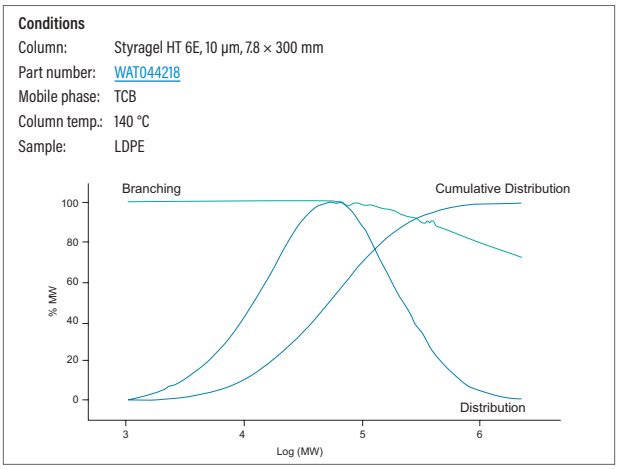
STYRAGEL HT (HIGH-TEMPERATURE) COLUMNS

You can use Styragel HT Columns with aggressive solvents at high temperatures without sacrificing resolution or column lifetime. Packed with rigid 10 µm particles, a typical plate count exceeds 10,000 plates per column. These columns are extremely durable because of a narrow, particle-size distribution that results in a stable column bed. Suitable for both ambient and high-temperature analysis, the Styragel HT Columns offer excellent resolution of polymers in the mid-to-high molecular-weight range.

Calibration Curves for the Waters Styragel HT Series of High-Temperature Columns



Styragel HT Columns Deliver Superior Performance—Even at High Temperatures



Ordering Information

Styragel HT Columns (7.8 × 300 mm)

		P/N	P/N	P/N
Description	**Effective MW Range**	**THF**	**DMF**	**Toluene**
Styragel HT 2, 500 Å	100–10,000	WAT054475	WAT054480	WAT054476
Styragel HT 3, 10^3 Å	500–30,000	WAT044207	WAT044208	WAT044206
Styragel HT 4, 10^4 Å	5000–600,000	WAT044210	WAT044211	WAT044209
Styragel HT 5, 10^5 Å	50,000–4,000,000	WAT044213	WAT044214	WAT044212
Styragel HT 6, 10^6 Å	200,000–10,000,000	WAT044216	WAT044217	WAT044215
Styragel HT 6E, mixed bed	5000–10,000,000	WAT044219	WAT044220	WAT044218
Styragel Guard Column, 4.6 × 30 mm	—	WAT054405	WAT054415	WAT054410

Styragel HT Columns (4.6 × 300 mm)*

		P/N	P/N	P/N
Description	**Effective MW Range**	**THF**	**DMF**	**Toluene**
Styragel HT 3, 10^3 Å	500–30,000	WAT045920	WAT045925	WAT045915
Styragel HT 4, 10^4 Å	5000–600,000	WAT045935	WAT045940	WAT045930
Styragel HT 5, 10^5 Å	50,000–4,000,000	WAT045950	WAT045955	WAT045945
Styragel HT 6, 10^6 Å	200,000–10,000,000	WAT045965	WAT045970	WAT045960
Styragel HT 6E, mixed bed	5000–10,000,000	WAT045980	WAT045985	WAT045975

*The same high performance as our conventional Styragel HT Columns with the added advantage of reducing your solvent consumption by two-thirds.

Styragel HMW (High-Molecular-Weight) Columns

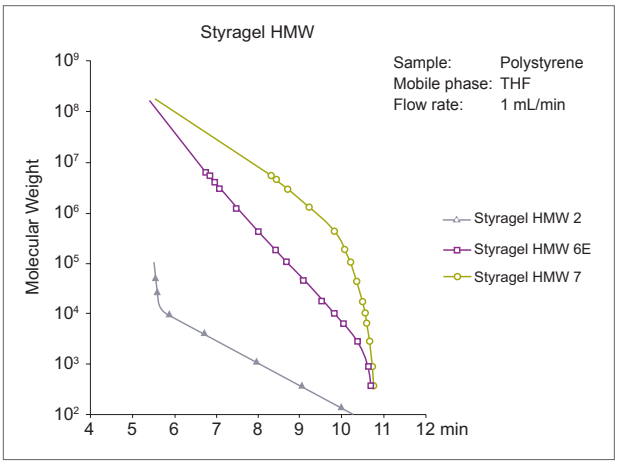
The Styragel HMW Columns are designed specifically to analyze polymers of ultra-high-molecular-weight, which are susceptible to shearing. Combining high-porosity, 10 µm frits and 20 µm particles, the Styragel HMW Columns minimize polymer shear effects. Usable at ambient or elevated temperatures, these state-of-the-art columns exhibit excellent lifetimes.

Ordering Information

Styragel HMW Columns (7.8 × 300 mm)

		P/N	P/N	P/N
Description	**Effective MW Range**	**THF**	**DMF**	**Toluene**
Styragel HMW 2, 500 Å	100–10,000	WAT054488	WAT054494	WAT054490
Styragel HMW 6E, mixed bed	5000–1 × 107	WAT044204	WAT044205	WAT044203
Styragel HMW 7, 10^7 Å	500,000–1 × 108	WAT044201	WAT044202	WAT044200
Styragel Guard Column, 4.6 × 30 mm	—	WAT054405	WAT054415	WAT054410

Calibration Curves for Waters Styragel HMW Series of High-Molecular-Weight Columns



Styragel HMW Columns (4.6 × 300 mm)*

		P/N	P/N	P/N
Description	**Effective MW Range**	**THF**	**DMF**	**Toluene**
Styragel HMW 6E, mixed bed	5000–1 × 107	WAT046820	WAT046825	WAT046815
Styragel HMW 7, 10^7 Å	500,000–1 × 108	WAT046805	WAT046810	WAT046800

System dead volume must be minimized for maximum column performance.
*The same high performance as our conventional Styragel HMW Columns with the added advantage of reducing your solvent consumption by two-thirds.

ULTRASTYRAGEL COLUMNS

Ultrastyragel Preparative Columns provide high-efficiency GPC separations for compound isolation and sample cleanup. Closely related to Styragel GPC Columns, the family of Ultrastyragel Columns provides a two- to three-fold increase in efficiency (plates/meter) that improves separation speed and reduces solvent consumption for preparative isolation. Separations that once required several smaller Styragel Columns can be performed on a single, more efficient, Ultrastyragel Preparative Column.

Ordering Information

Ultrastyragel Columns (19 × 300 mm)

		(mL/min)	P/N	P/N
Pore Size	**Effective MW Range**	**Flow Rate**	**Toluene**	**THF**
100 Å	50–1500	4–10	WAT025866	WAT025859
500 Å	100–10,000	4–10	WAT025867	WAT025860
10^3 Å	200–30,000	4–10	WAT025868	WAT025861
10^4 Å	5000–600,000	4–10	WAT025869	WAT025862
10^5 Å	50,000–4 M	4–10	WAT025870	WAT025863
10^6 Å	200,000–10 M	4–10	WAT025871	WAT025864
Linear	2000–4 M	4–10	WAT025872	WAT025865

Ultrastyragel Columns (7.8 × 300 mm)

		P/N	P/N
Pore Size	**Effective MW Range**	**Toluene**	**THF**
100 Å	50–1500	WAT085500	WAT010570
500 Å	100–10,000	WAT085501	WAT010571

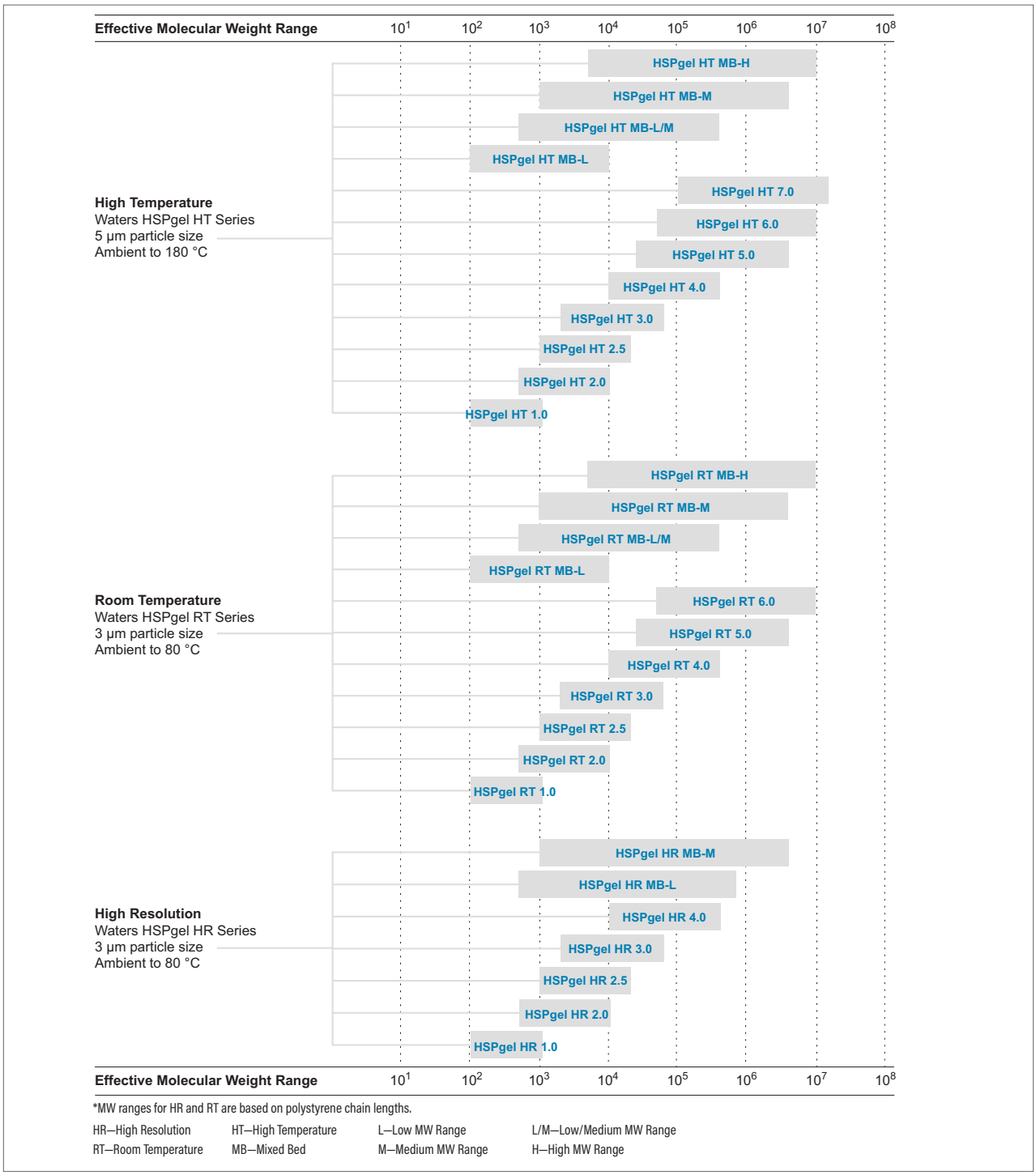
HSPgel COLUMNS

Designed for high-speed GPC analysis, the Waters HSPgel Column provides an accurate and precise determination of molecular weight, increased sample throughput, and greatly reduced solvent consumption and disposal.

Waters offers these 6.0 × 150 mm columns:

- HSPgel HR series, for high-resolution, room-temperature GPC
- HSPgel RT series, for routine room temperature GPC
- HSPgel HT series for high temperature GPC

HSPgel Columns Selection Guide*



*MW ranges for HR and RT are based on polystyrene chain lengths.

HR—High Resolution
RT—Room Temperature
HT—High Temperature
MB—Mixed Bed
L—Low MW Range
M—Medium MW Range
L/M—Low/Medium MW Range
H—High MW Range

HSPgel HR Column Series

The HSPgel HR columns are designed for high-resolution, room-temperature, organic polymer GPC. These columns are packed in THF and can be converted once to toluene, dichloromethane, or chloroform.

Ordering Information

HSPgel HR Columns in THF, 3 µm, 6.0 × 150 mm

Description	MW Range	P/N
HSPgel HR 1.0	100–1000	186001741
HSPgel HR 2.0	500–10,000	186001742
HSPgel HR 2.5	1000–20,000	186001743
HSPgel HR 3.0	2000–60,000	186001744
HSPgel HR 4.0	10,000–400,000	186001745
HSPgel HR MB-L	500–700,000	186001746
HSPgel HR MB-M	1000–4,000,000	186001747

HR—High Resolution, MB—Mixed Bed, L—Low MW Range, M—Medium MW Range.

HSPgel RT Column Series

The HSPgel RT columns are designed for the routine, room-temperature work of organic-polymer GPC. The columns, which are shipped packed in THF, can be converted multiple times, from THF to toluene, chloroform, dichloromethane, DMF, DMSO, etc.

Ordering Information

HSPgel RT Columns in THF, 3 µm, 6.0 × 150 mm

Description	MW Range	P/N
HSPgel RT 1.0	100–1000	186001749
HSPgel RT 2.0	500–10,000	186001750
HSPgel RT 2.5	1000–20,000	186001751
HSPgel RT 3.0	2000–60,000	186001752
HSPgel RT 4.0	10,000–400,000	186001753
HSPgel RT 5.0	25,000–4,000,000	186001754
HSPgel RT 6.0	50,000–10,000,000	186001755
HSPgel RT MB-L	100–10,000	186001757
HSPgel RT MB-L/M	500–400,000	186001758
HSPgel RT MB-M	1000–4,000,000	186001759
HSPgel RT MB-H	5000–10,000,000	186001760

RT—Room Temperature, MB—Mixed Bed, L—Low MW Range, M—Medium MW Range, L/M—Low/Medium MW Range, H—High MW Range.

HSPgel HT Column Series

The HSPgel HT columns are designed for organic GPC conducted at between room temperature and high temperature (180 °C). The columns are shipped packed in either THF or ODCB. The ODCB-packed column should be used for direct conversion to TCB. These columns can withstand multiple solvent switches.

Ordering Information

HSPgel HT Columns in THF, 5 µm, 6.0 × 150 mm

Description	MW Range	P/N
HSPgel HT 1.0	100–1000	186001761
HSPgel HT 2.0	500–10,000	186001762
HSPgel HT 2.5	1000–20,000	186001763
HSPgel HT 3.0	2000–60,000	186001764
HSPgel HT 4.0	10,000–400,000	186001765
HSPgel HT 5.0	25,000–4,000,000	186001766
HSPgel HT 6.0	50,000–10,000,000	186001767
HSPgel HT 7.0	100,000–15,000,000	186001768
HSPgel HT MB-L	100–1000	186001769
HSPgel HT MB-L/M	500–400,000	186001770
HSPgel HT MB-M	1000–4,000,000	186001771
HSPgel HT MB-H	5000–10,000,000	186001772

HT - High Temperature, MB - Mixed Bed, L - Low MW Range, M -Medium MW Range, L/M - Low/Medium MW Range, H - High MW Range.

HSPgel HT Columns in ODCB, 5 µm, 6.0 × 150 mm

Description	MW Range	P/N
HSPgel HT 1.0	100–1000	186001773
HSPgel HT 2.0	500–10,000	186001774
HSPgel HT 2.5	1000–20,000	186001775
HSPgel HT 3.0	2000–60,000	186001776
HSPgel HT 4.0	10,000–400,000	186001777
HSPgel HT 5.0	25,000–4,000,000	186001778
HSPgel HT 6.0	50,000–10,000,000	186001779
HSPgel HT 7.0	100,000–15,000,000	186001780
HSPgel HT MB-L	100–1000	186001781
HSPgel HT MB-L/M	500–400,000	186001782
HSPgel HT MB-M	1000–4,000,000	186001783
HSPgel HT MB-H	5000–10,000,000	186001784

HT - High Temperature, MB - Mixed Bed, L - Low MW Range, M -Medium MW Range, L/M - Low/Medium MW Range, H - High MW Range.

SHODEX COLUMNS

Waters is proud to distribute Shodex GPC Columns and accessories. For 30 years, Shodex GPC Columns have been used successfully by scientists worldwide. The following selection of highly-reproducible GPC columns contains styrene divinylbenzene resins.

K-800 Column Series (8 × 300 mm)

Ultra-high-efficiency columns designed for high-resolution performance, available in THF, DMF, or chloroform.

Ordering Information

Shodex GPC K-800 Columns in THF 5 µm, 8 × 300 mm

Description	Polystyrene Exclusion Limit	P/N
Shodex KF-801	1500	WAT030697
Shodex KF-802	5000	WAT030698
Shodex KF-802.5	20,000	WAT030699
Shodex KF-803	70,000	WAT034100
Shodex KF-804	400,000	WAT034101
Shodex KF-805	4,000,000	WAT034102
Shodex KF-807	200,000,000	WAT034104
Shodex KF-806M (linear)	40,000,000	WAT034105
Shodex KF-G Guard (5 µm, 4.6 × 10 mm)		WAT034106

Shodex GPC K-800 Columns in Chloroform, 5 µm, 8 × 300 mm

Description	Polystyrene Exclusion Limit	P/N
Shodex K-802.5	20,000	WAT034109
Shodex K-803	70,000	WAT034110
Shodex K-804	400,000	WAT034111
Shodex K-805	4,000,000	WAT034112
Shodex K-G Guard (5 µm, 4.6 × 10 mm)		WAT035524

Shodex GPC K-800 Columns in DMF, 5 µm, 8 × 300 mm

Description	Polystyrene Exclusion Limit	P/N
Shodex KD-801	2500	WAT034116
Shodex KD-802	5000	WAT034117
Shodex KD-802.5	20,000	WAT034118
Shodex KD-803	70,000	WAT034119
Shodex KD-804	400,000	WAT034120
Shodex KD-806	40,000,000	WAT034122
Shodex KD-807	200,000,000	WAT034123
Shodex KD-806 M (linear)	40,000,000	WAT034124
Shodex KD-G Guard (5 µm, 4.6 × 10 mm)		WAT034125

HFIP-800 Column Series

These columns have the same high efficiency as the K-series columns shipped in HFIP.

Ordering Information

Shodex GPC HFIP-800 Columns, 5 µm, 8 × 300 mm

Description	Polystyrene Exclusion Limit	P/N
Shodex HFIP-803	70,000	WAT035605
Shodex HFIP-806M (linear)	40,000,000	WAT035611
Shodex HFP-LG Guard (8 × 50 mm)	—	WAT035612

ENVIROGEL HIGH-RESOLUTION GPC CLEANUP COLUMNS

The Envirogel High-Efficiency GPC Cleanup Columns remove low volatility, high-molecular-weight interferences, such as lipids and natural resins, from environmental samples, as specified in EPA Method 3640A. In the past, the cleanup procedure for environmental samples was performed on low-efficiency GPC Columns based on packing particle diameters of 37–75 µm (200–400 mesh) Bio-Beads S-X resins. The high-efficiency Envirogel GPC Cleanup Columns increase the speed of this process, and simultaneously reduce solvent consumption. For optimum capacity and resolution, a 150 mm column is used in series with the 300 mm column. The use of both the 150 mm and 300 mm column provides maximum loading capacity, while the 300 mm column provides maximum throughput when used alone, plus reduced solvent consumption.

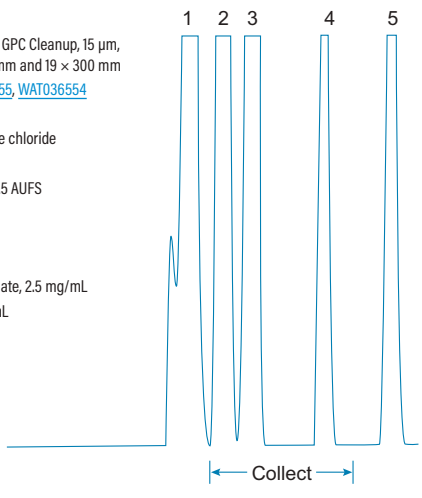
Column Optimization

Conditions

Column: Envirogel GPC Cleanup, 15 µm, 19 × 150 mm and 19 × 300 mm
Part numbers: WAT036555, WAT036554
Sample: 2000 µL
Solvent: Methylene chloride
Flow rate: 5 mL/min
UV detection: 254 nm, 1.5 AUFS

Compounds

1. Corn oil, 62.5 mg/mL
2. Bis(2-ethylhexyl) phthalate, 2.5 mg/mL
3. Methoxychlor, 0.5 mg/mL
4. Perylene, 0.05 mg/mL
5. Sulfur, 0.2 mg/mL



Ordering Information

Envirogel High-Resolution GPC Cleanup Columns

Description	Solvent	Dimension	P/N
Envirogel GPC Cleanup	Methylene chloride	19 × 150 mm	WAT036555
Envirogel GPC Cleanup	Cyclohexane/ethyl acetate	19 × 150 mm	186001915
Envirogel GPC Cleanup	Methylene chloride	19 × 300 mm	WAT036554
Envirogel GPC Cleanup	Cyclohexane/ethyl acetate	19 × 300 mm	186001916
Envirogel GPC Guard	Methylene chloride	4.6 × 30 mm	186001913
Envirogel GPC Guard	Cyclohexane/ethyl acetate	4.6 × 30 mm	186001914

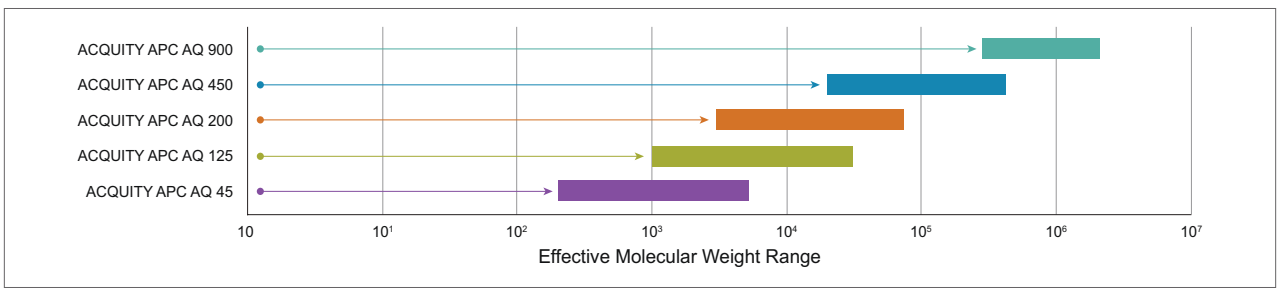
SEC Columns

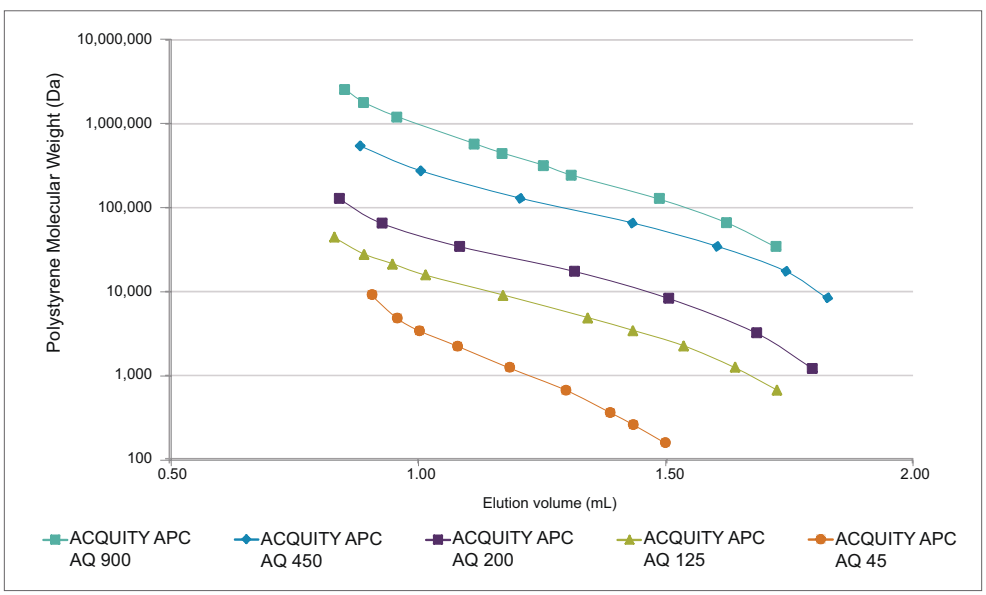
Size-exclusion chromatography (SEC) and gel-filtration chromatography (GFC) are synonymous terms for techniques used to separate macromolecules in aqueous environments according to their hydrodynamic volume. Waters SEC Columns efficiently separate cationic, anionic, and non-ionic macromolecules in many physical, chemical, and biological applications.

ACQUITY APC AQ COLUMNS

Designed for aqueous samples, ACQUITY APC AQ Columns are based on hybrid-polymer sub-3-µm particle technology. The advantages of this technology, detailed in the ACQUITY APC XT section on page 403, apply as well to the AQ columns.

ACQUITY APC AQ Column Selection Guide





Polystyrene calibration curves for ACQUITY APC AQ Columns.

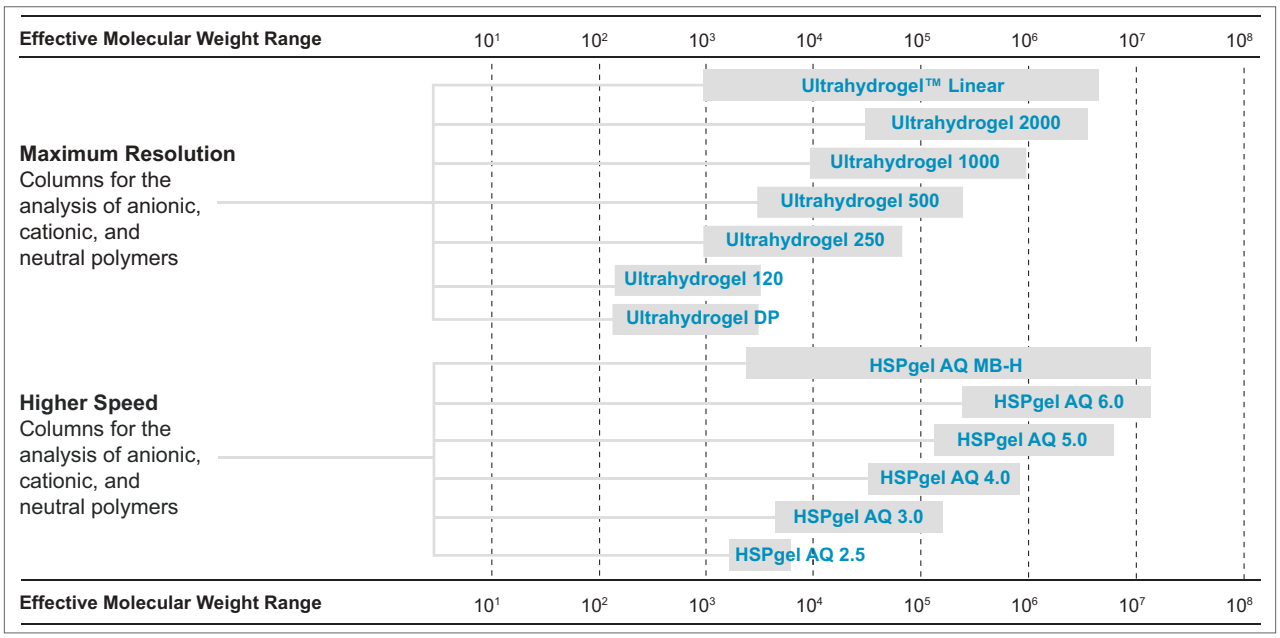
Ordering Information

ACQUITY APC AQ Columns

Pore Size	Effective MW Range*	Particle Size	P/N	P/N	P/N
			Column Length		
			30 mm	75 mm	150 mm
45 Å	200–5000	1.7 µm	186006972	186006973	186006975
125 Å	1000–30,000	2.5 µm	186006977	186006978	186006980
200 Å	3000–70,000	2.5 µm	186006982	186006983	186006985
450 Å	20,000–400,000	2.5 µm	186006987	186006988	186006990
900 Å	300,000–2,000,000	2.5 µm	186007249	186007250	186007251

*All columns are 4.6 mm I.D., maximum temperature limit is 45 °C, columns are shipped dry.

Aqueous SEC Column Selection Guide



This chart compares the molecular weight ranges for the specified columns. By connecting two or more columns in series, the effective molecular weight range can be extended to provide coverage for more complex sample analysis.

SelectScience TRUSTED REVIEWS

APPLICATION AREA: Analyzed Polymers

"These high quality SEC columns can be used for cationic or anionic polymers."

REVIEWER: Jang Shing Chiou

ORGANIZATION: Alcon Research Ltd.

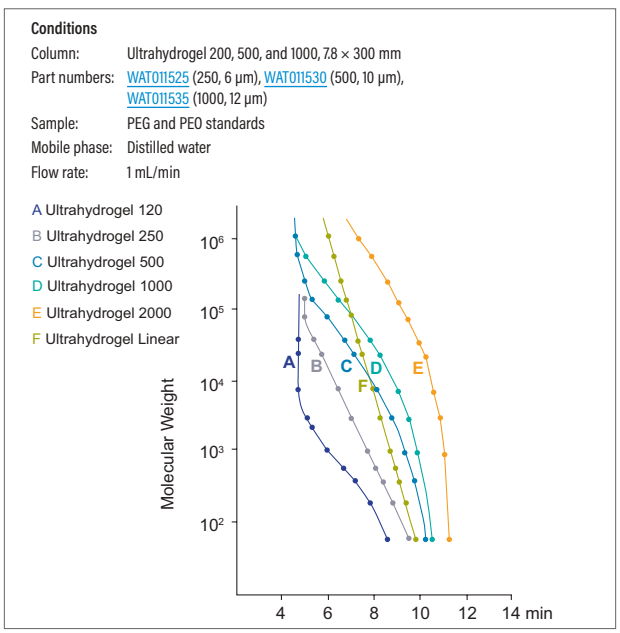
ULTRAHYDROGEL COLUMNS

Packed with hydroxylated, polymethacrylate-based gel, Waters Ultrahydrogel SEC Columns are ideal for analyzing aqueous-soluble samples such as oligomers, oligosaccharides, and polysaccharides. They are likewise well suited to analyze cationic, anionic, and amphoteric polymers.

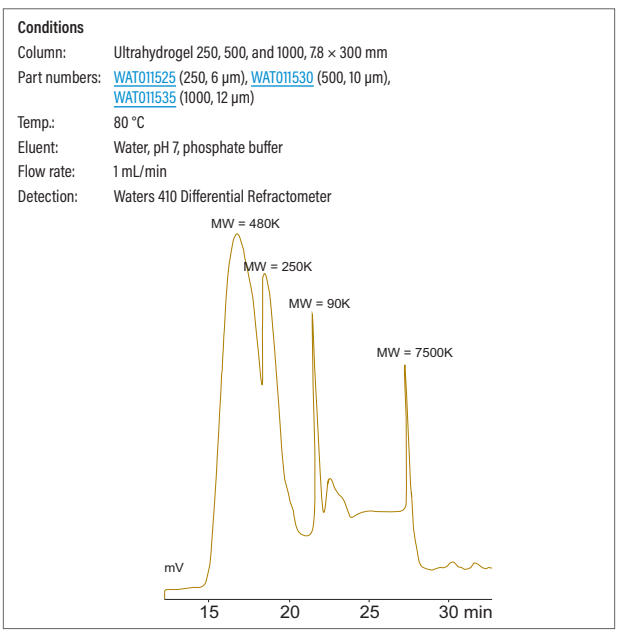
These 7.8 × 300 mm, high-resolution columns offer many advantages over conventional aqueous SEC columns:

- Wide-pH range (2–12)
- Compatibility with high concentrations of organic solvents, as much as 20% organic and 50% organic for mobile phases introduced by gradient
- Greater flexibility for the mobile phase
- Minimal non-size-exclusion effects

Ultrahydrogel Columns Calibration Curves



Gelatin Sample



Ordering Information

Ultrahydrogel Columns (7.8 × 300 mm)*

Description	Pore Size	Particle Size	Exclusion Limit	P/N
Ultrahydrogel 120	120 Å	6 µm	5000	WAT011520
Ultrahydrogel 250	250 Å	6 µm	80,000	WAT011525
Ultrahydrogel 500	500 Å	10 µm	400,000	WAT011530
Ultrahydrogel 1000	1000 Å	12 µm	1,000,000	WAT011535
Ultrahydrogel 2000	2000 Å	12 µm	7,000,000	WAT011540
Ultrahydrogel Linear	Blend	10 µm	7,000,000	WAT011545
Ultrahydrogel DP*	120 Å	6 µm	5000	WAT011550
Ultrahydrogel DNA	>2000 Å	10 µm	10,000,000	WAT011560
Ultrahydrogel Guard Column	N/A	6 µm	N/A	WAT011565
Ultrahydrogel Guard Column DP*	N/A	6 µm	N/A	WAT011570

*DP = Degree of Polymerization, choice of column when working with glucose oligomers.

HSPgel COLUMNS

Waters HSPgel SEC Columns are optimized for high-speed polymer analysis in aqueous solution. HSPgel Columns reduce solvent consumption, increase throughput, and provide accurate molecular-weight data for any room-temperature analysis. The column dimensions are 6.0 × 150 mm.

Ordering Information

HSPgel Columns for High-Speed SEC Analysis*

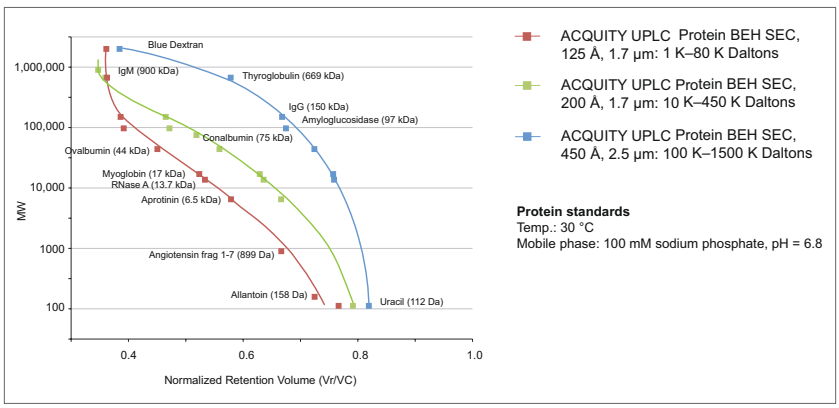
Description	MW Range	Solvent	Particle Size	P/N
HSPgel AQ 2.5	500–2000	Water	4 µm	186001785
HSPgel AQ 3.0	1000–60,000	Water	4 µm	186001786
HSPgel AQ 4.0	10,000–400,000	Water	6 µm	186001787
HSPgel AQ 5.0	50,000–4,000,000	Water	7 µm	186001788
HSPgel AQ 6.0	100,000–10,000,000	Water	9 µm	186001789
HSPgel AQ MB-H	500–10,000,000	Water	9 µm	186001790

*Exclusion limits for AQ series extrapolated from highest MW PEO standard (~900,000).

ACQUITY UPLC PROTEIN SEC COLUMNS

ACQUITY UPLC Protein SEC Columns are packed with ethylene-bridged hybrid (BEH), diol-coated particles. Manufacturers of biotherapeutics and biosimilars can choose the most effective pore size for their application: 125, 200, and 450 Å.

Calibration Curves on ACQUITY UPLC Protein BEH SEC, 125 Å, 200 Å, and 450 Å Columns



Ordering Information

ACQUITY UPLC Protein BEH SEC, 4.6 mm Column

Pore Size	MW Range	Particle Size	P/N	P/N	P/N	P/N	P/N
			Column Length				
			30 mm Guard	150 mm	300 mm	150 mm w/Standard	300 mm w/Standard
125 Å	1K - 80K Da	1.7 µm	186006504	186006505	186006506	176003906	176003907
200 Å	10K - 450K Da	1.7 µm	186005793	186005225	186005226	176003904	176003905
450 Å	100K - 1500k Da	2.5 µm	186006850	186006851	186006852	176002996	176002997
125 Å	1K - 80K Da	1.7 µm	—	186008471*	—	—	—
ELSD Outlet Tubing (0.004" I.D. × 6" length)							430001562
0.005 × 1.75" SEC UPLC Connection Tubing, 2/pk							186006613

*ACQUITY UPLC Protein BEH SEC, 2.1 × 150 mm Column.

SelectScience® TRUSTED REVIEWS

APPLICATION AREA: Size Characterisation of Proteins

"We use the BEH columns for all our SEC runs. They are UPLC compliant and take around six minutes a run. This means they work fantastically well for high throughput screening and at least for our application they last much longer than other columns - we get >1000 runs per column. The only complaint is that they are expensive, but you get what you pay for and the speed alone means we only need to run one UPLC for 5x the samples on a HPLC."

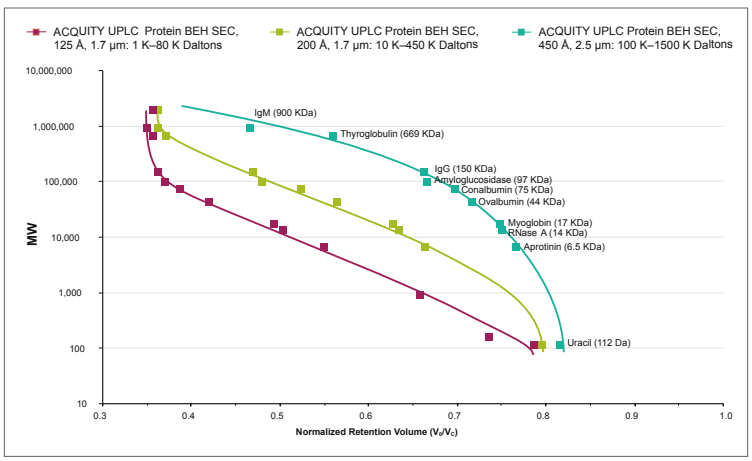
REVIEWER: Nikki Royle

ORGANIZATION: Small Biotech

XBRIDGE PROTEIN BEH SEC COLUMNS

XBridge Protein BEH SEC Columns are designed for use on HPLC and UHPLC instrumentation. The 3.5 µm columns are available in 125, 200, and 450 Å pore sizes using the same ethylene-bridged hybrid (BEH) particle technology and diol-bonded coating used in Waters' UPLC-based SEC columns. This allows you to transfer methods based on laboratory instrumentation and component resolution or sample throughput needs.

Calibration Curves on XBridge Protein BEH SEC, 125 Å, 200 Å, and 450 Å Columns



Ordering Information

XBridge Protein BEH SEC, 7.8 mm I.D. Columns*

Pore Size	Effective MW Range*	Particle Size	P/N Column Length 30 mm	P/N Column Length 150 mm	P/N Column Length 300 mm
125 Å	1K - 80K	3.5 µm	176003591	176003592	176003593
200 Å	10K - 450K	3.5 µm	176003594	176003595	176003596
450 Å	100K - 1500k	3.5 µm	176003597	176003598	176003599

Straight Connection Tubing and End-fittings for XBridge Protein BEH SEC Column	WAT022681
U-Bend Connection Tubing and End-fittings for XBridge Protein BEH SEC Column	WAT084080

SEC Protein Standards are matched to the pore size of the column.
*All columns and guards include standards mix.

PROTEIN-PAK SIZE-EXCLUSION HPLC COLUMNS

Protein-Pak packings are based on a 10 µm, diol-bonded silica and are available in a selection of pore sizes and column configurations.

The Protein-Pak Size-Exclusion Columns can be expected to resolve proteins that differ in molecular weight by a factor of two and to distinguish proteins differing by as little as 15% in molecular weight. The degree of resolution is more dependent on the sample mass and volume than the interaction between the sample and the stationary phase. Ideally, there should be no interaction between the stationary phase and the sample molecules. Secondary interactions are most often ionic and can, therefore, be reduced by increasing the ionic strength of thee mobile phase. Typical, salt concentrations range to 0.2–0.5 M NaCl. It may also be useful in some cases to consider adding 10–20% methanol to eliminate hydrophobic and other hydrogen-bonding interactions.

Ordering Information

Protein-Pak SEC HPLC Columns and Guards

Steel Column	Dimension	MW Range	P/N
Protein-Pak 60	7.8 × 300 mm	1000–20,000	WAT085250
Protein-Pak 60	19 × 300 mm	1000–20,000	WAT025830
Protein-Pak 125	7.8 × 300 mm	2000–80,000	WAT084601
Protein-Pak 125	19 × 300 mm	2000–80,000	WAT025831
Protein-Pak 300SW	7.5 × 300 mm	10,000–300,000	WAT080013
Protein-Pak 125 Sentry Guard Column, 3.9 × 20 mm, 2/pk (requires holder)			186000926
Sentry Universal Guard Column Holder			WAT046910

PROTEIN STANDARDS

Each standard contains proteins selected for ACQUITY UPLC and XBridge Protein BEH SEC Columns. Use these standards for purposes of quality control, to test an HPLC or UPLC column, and to monitor column performance over time.

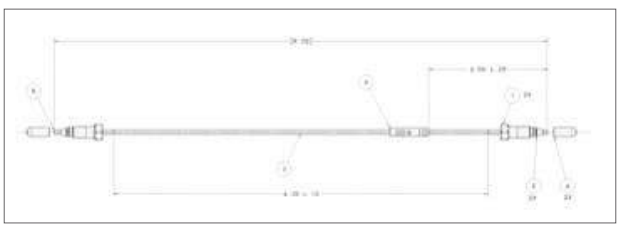
Ordering Information

BEH SEC Column Protein Standards

Description	P/N
BEH125 SEC Protein Standard Mix	186006519
A mix of four proteins: thyroglobulin, ovalbumin, ribonuclease A and uracil	
BEH200 SEC Protein Standard Mix	186006518
A mix of five proteins: thyroglobulin, IgG, BSA, myoglobin, uracil	
BEH450 SEC Protein Standard Mix	186006842
A mix of five proteins: thyroglobulin, IgG, BSA, myoglobin, uracil	

SEC COLUMN CONNECTORS AND CONNECTOR KITS

Connectors to attach BEH SEC columns in series and/or BEH SEC guards to BEH SEC columns.



Ordering Information

UPLC Column Connectors

Description	P/N
ACQUITY APC CM-S Column Connector, U, .004" I.D.*	700009535
ACQUITY APC CM-S Column Connector, Offset U, .004" I.D.*	700009534
ACQUITY APC CM-S Column Connector Tube, Long, .004" I.D.	700009560
ACQUITY APC CM-S Inline Column Connection, .005" I.D.	700009524
0.005 × 1.75 UPLC SEC Connection Tubing, 2/pk	186006613

* Ferrules are not staked on tubing upon receipt. The two-piece ferrule is permanently seated upon installation once the fitting is tightened into the column.

HPLC Column Connectors

Description	P/N
Column Joining Tube Assembly*	WAT084080
Rigid Connector Package*	WAT022681

*The ferrules are permanently seated to Waters' depth setting upon receipt.

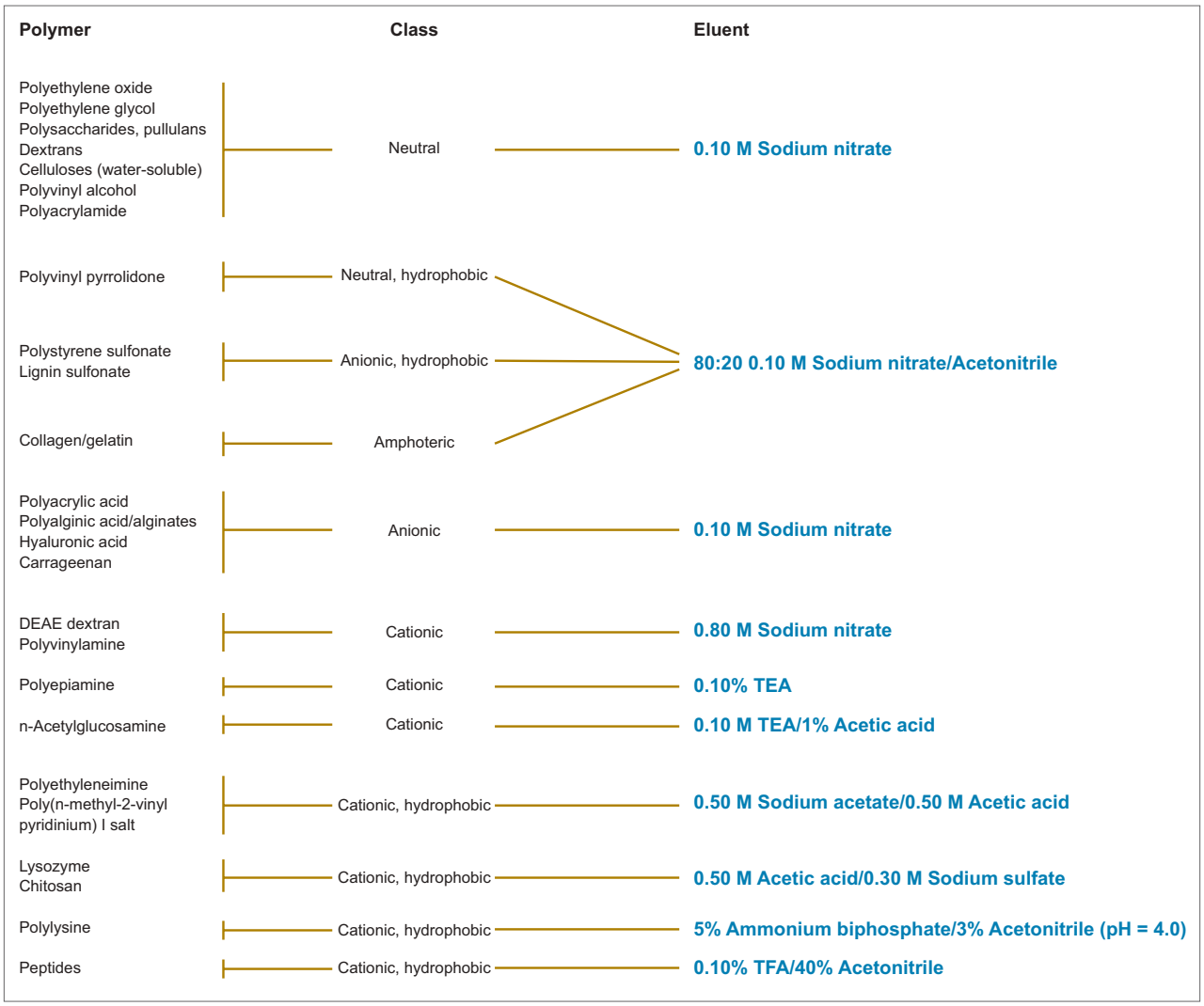
Connector Kits

Description	P/N
ACQUITY CM-S 4-Column Bank Connection Kit	205001172
Kit contains:	
Two ACQUITY APC CM-S Inline Column Connector, .005" I.D. (p/n: 700009524)	
Two ACQUITY APC CM-S Column Connector, U, .004" I.D. (p/n: 700009535)	
One ACQUITY APC CM-S Column Connector, Offset U, .004" I.D. (p/n: 700009534)	
ACQUITY CM-S 3-Column Bank Connection Kit	205001171
Kit contains:	
One ACQUITY APC CM-S Inline Column Connector, .005" I.D. (p/n: 700009524)	
Two ACQUITY APC CM-S Column Connector, U, .004" I.D. (p/n: 700009535)	
ACQUITY CM-S 2-Column Bank Connection Kit	205001169
Kit contains:	
One ACQUITY APC CM-S Inline Column Connector, .005" I.D. (p/n: 700009524)	
One ACQUITY APC CM-S Column Connector, U, .004" I.D. (p/n: 700009535)	

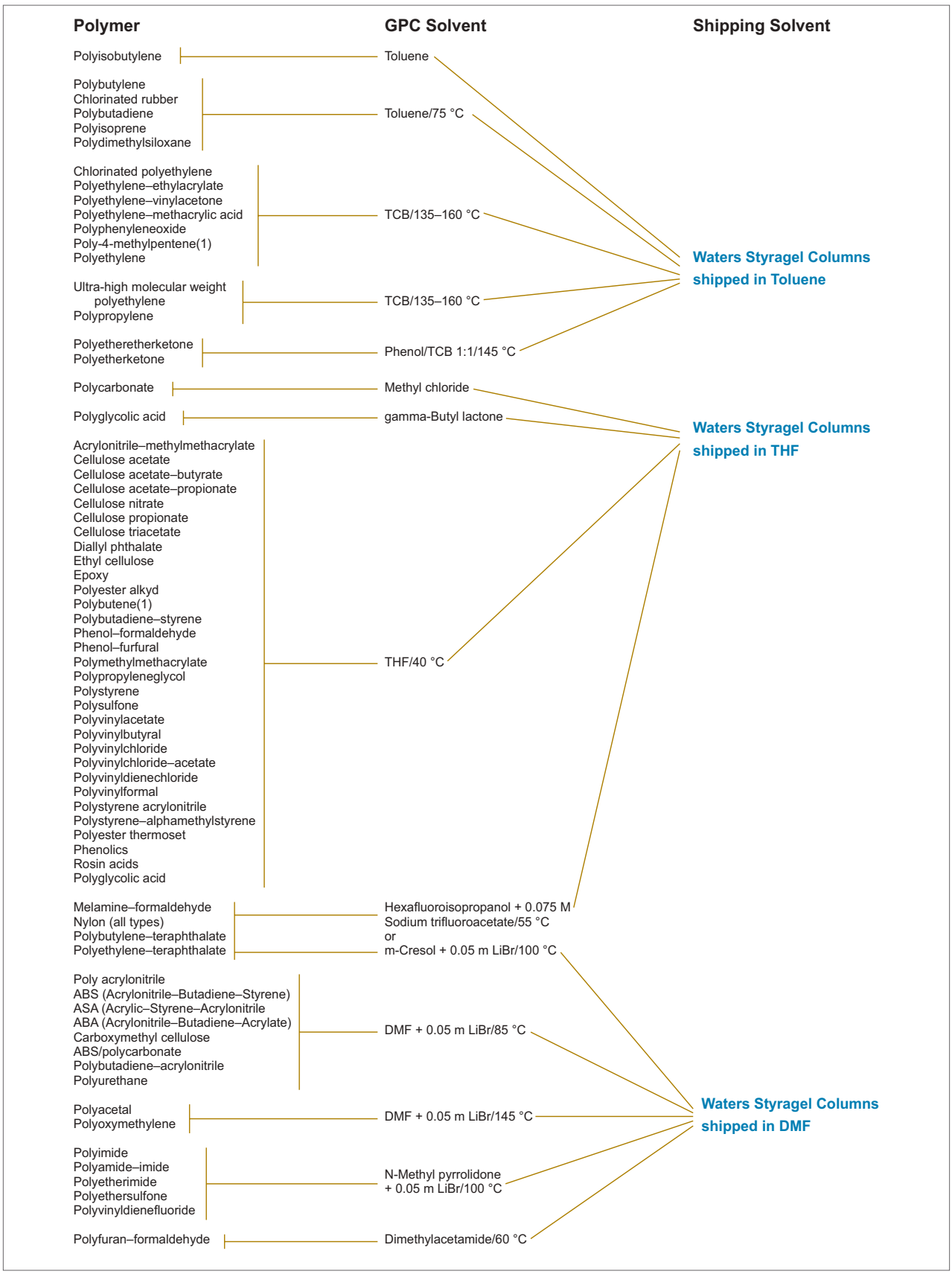
Solvent Guide

The following graphic is a guide for eluents.

Aqueous SEC Solvent Selection Guide



Non-Aqueous GPC Solvent Selection Guide

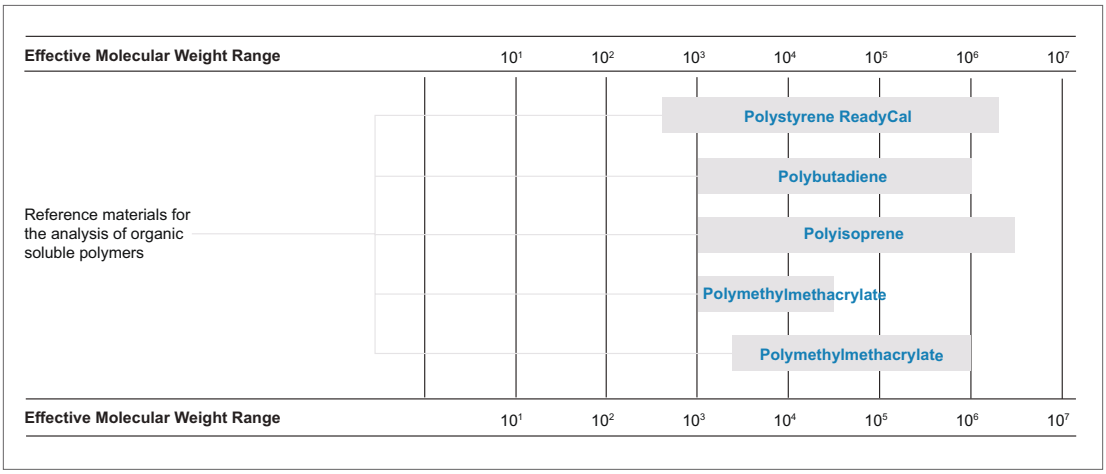


For more information on XBridge Protein BEH SEC Columns, refer to page 378.

Calibration Standards

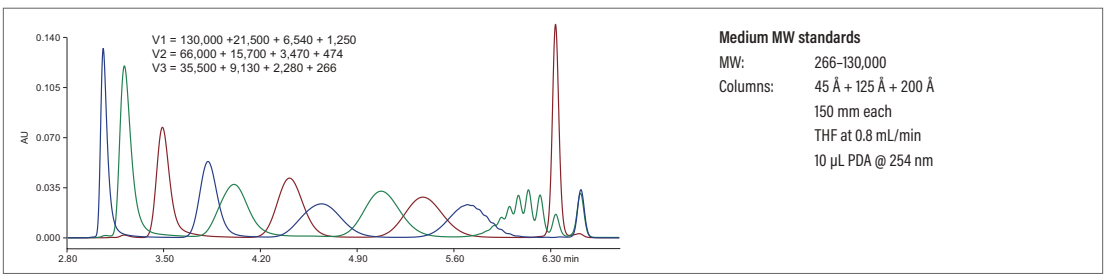
Waters offers a selection of well-characterized polymer standards for calibration. The offering includes kits as well as individual standards. The standards are available for aqueous and non-aqueous applications.

Non-Aqueous GPC Standards Guide



ACQUITY APC CALIBRATION STANDARDS

ACQUITY APC Calibration Standards match the molecular-weight range of the ACQUITY APC XT Columns. These kits eliminate the need to manually prepare custom calibration mixes because they provide the correct number of data points for the targeted molecular-weight range. In addition, they reduce, by 3–5 times, the ACQUITY APC System's calibration time. With reduced calibration time, calibrations can be carried out on a more frequent basis, increasing confidence in the accuracy of results.



The ACQUITY APC Calibration Standards are available in both polystyrene and polymethyl methacrylate, configured as low-, middle-, and high-molecular-weight calibration kits. Also available are method development kits, which include the full separation range of the three kits combined.

Ordering Information

ACQUITY APC Calibration Standards

Description	MW Range	P/N
ACQUITY APC Polystyrene Low MW Calibration Kit Three sets of 10 vials containing 1.5 mg each of the following: Vial 1: MW 15.5K, 4.71K, 1.25K Vial 2: MW 8.90K, 3.46K, 0.570K Vial 3: MW 6.67K, 2.25K, 0.266K	266–15,000	186007539
ACQUITY APC Polystyrene Middle MW Calibration Kit Three sets of 10 vials containing 1.5 mg each of the following: Vial 1: MW 125K, 21. 2K, 6.67K, 1.25K Vial 2: MW 62. 5K, 15.5K, 3.46K, 0.570K Vial 3: MW 35.4K, 8.90K, 2.25K, 0.266K	266–130,000	186007540
ACQUITY APC Polystyrene High MW Calibration Kit Three sets of 10 vials containing the following: Vial 1: 0.75 mg MW 1760K; and 1.5 mg 271K, 34. 0K, 3.46K Vial 2: 0.75 mg MW 1170K; and 1.5 mg 125K, 17. 3K, 0.570K Vial 3: 1.5 mg MW 554K, 62.5K, 8.9 0K, 0.26 6K	266–2,500,000	186007541
ACQUITY APC Polystyrene Method Development MW Calibration Kit Three vials containing the following: Vial 1: 0.75 mg Mp 1210K; and 1.5 mg 130K, 17.6K, 0.474K Vial 2: 0.75 mg Mp 1800K; and 1.5 mg 277K, 34.8K, 3.47K Vial 3: 1.5 mg Mp 552K, 66.0K, 9.13K, 0.266K Vial 4: 1.5 mg Mp 66.0K, 15.7K, 3.47K, 0.474K Vial 5: 1.5 mg Mp 130K, 21.5K, 6.54K, 1.25K Vial 6: 1.5 mg Mp 35.5K, 9.13K, 2.28K, 0.266K Vial 7: 1.5 mg Mp 15.7K, 4.92K, 1.25K Vial 8: 1.5 mg Mp 9.13K, 3.47K, 0.474K Vial 9: 1.5 mg Mp 6.54K, 2.28K, 0.266K Vial 10: 1.5 mg BHT	266–2,500,000	186007542
ACQUITY APC Polymethyl Methacrylate Low MW Calibration Kit Three sets of 10 vials containing 1.5 mg each of the following: Vials 1: MW 12.5K, 4.14K, 0.997K Vials 2: MW 9.59K, 3.15K, 0.573K Vials 3: MW 6.27K, 2.26K, 0.202K	202–12,000	186007543
ACQUITY APC Polymethyl Methacrylate Middle MW Calibration Kit Three sets of 10 vials containing 1.5 mg each of the following: Vials 1: MW 199K, 40.3K, 6.27K, 0.997K Vials 2: MW 107K, 23.2K, 4.14K, 0.573K Vials 3: MW 69.0K, 12.5K, 2.26K, 0.202K	202–200,000	186007544
ACQUITY APC Polymethyl Methacrylate High MW Calibration Kit Three sets of 10 vials containing the following: Vial 1: 0.75 mg MW 1430; and 1.5 mg MW 199K, 23.2K, 6.37K Vial 2: 1.5 mg MW 592K, 86.7K, 12.5K, 0.573K Vial 3: 1.5 mg MW 335K, 40.3K, 6.27K, 0.202K	202–1,600,000	186007545
ACQUITY APC Polymethyl Methacrylate Method Development MW Calibration Kit Three vials containing the following: Vial 1: 0.75 mg Mp 1600K; and 1.5 mg Mp 201K, 23.5K, 2.38K Vial 2: 1.5 mg Mp 608K, 88.5K, 12.6K, 0.602K Vial 3: 1.5 mg Mp 340K, 41.4K, 6.37K, 0.202K Vial 4: 1.5 mg Mp 108K, 23.5K, 4.23K, 0.602K Vial 5: 1.5 mg Mp 201K, 41.4K, 6.37K, 1.102K Vial 6: 1.5 mg Mp 71.8K, 12.6K, 2.38K, 0.202K Vial 7: 1.5 mg Mp 12.6K, 4.23K, 1.102K Vial 8: 1.5 mg Mp 9.68K, 3.21K, 0.602K Vial 9: 1.5 mg Mp 6.37K, 2.38K, 0.202K Vial 10: 1.5 mg BHT	202–1,600,000	186007546

**Values listed are approximate molecular weights.*

READYCAL STANDARDS

A ReadyCal Kit allows quick and accurate preparation of a multi-point calibration curve without the need to weigh chemicals. Each vial contains a polymer mix that spans a molecular-weight range, to provide baseline resolution of each component. Simply add solvent directly to the vial and mix.

Ordering Information

ReadyCal Standards

Description*	P/N
Polystyrene ReadyCal Standards 4 mL Kit A complete kit of ready-to-use polystyrene calibration standards. Kit contains 30 autosampler vials, 4 mL each, which contain four polystyrene standards per vial. There are three separate molecular weight ranges in each kit, ten units of each range. Range is from 400 to 2,000,000 Da.	WAT058930
Polystyrene ReadyCal Standards 2 mL Kit A complete kit of ready-to-use polystyrene calibration standards. Kit contains 30 autosampler vials, 2 mL each, which contain four polystyrene standards per vial. There are three separate molecular weight ranges in each kit, ten units of each range. Range is from 400 to 2,000,000 Da.	WAT058931

*Values listed are approximate molecular weights.

POLYMER-SPECIFIC CALIBRATION STANDARDS

Tailored specifically for different types of polymer analysis, these calibration standards provide a quick and reliable references to known molecular-weight ranges. Polymer type and MW ranges appear in the table.

Ordering Information

Polymer-Specific Calibration Standards

Description*	P/N
Polybutadiene Standards Kit 0.5 g/vial polybutadiene at each molecular weight: 1000, 3000, 7000, 10,000, 30,000, 70,000, 100,000, 300,000, 700,000, 1,000,000	WAT035709
Polyisoprene Standards Kit 0.5 g/vial polyisoprene at each molecular weight: 1000, 3000, 10,000, 30,000, 70,000, 100,000, 300,000, 500,000, 1,000,000, 3,000,000	WAT035708
Polymethylmethacrylate Low MW Standards Kit 0.5 g/vial polymethylmethacrylate at each molecular weight: 1000, 1700, 2500, 3500, 5000, 7000, 10,000, 13,000, 20,000, 30,000	WAT035707
Polymethylmethacrylate Mid MW Standards Kit 0.5 g/vial polymethylmethacrylate at each molecular weight: 2400, 9500, 31,000, 52,000, 100,000, 170,000, 270,000, 490,000, 730,000, 1,000,000	WAT035706
Polystyrene Low-Mid MW Standards Kit 10 g/vial polystyrene at each molecular weight: 400, 530, 950 5 g/vial polystyrene at each molecular weight: 2800, 6400, 10,000, 17,000, 43,000, 110,000, 180,000	WAT011588
Polystyrene Mid-High MW Standards Kit 5 g/vial polystyrene at each molecular weight: 430,000, 780,000 1 g/vial polystyrene at each molecular weight: 1,300,000, 2,800,000, 3,600,000, 4,300,000, 5,200,000, 6,200,000, 8,400,000, 20,000,000	WAT011610
Polystyrene Low MW Standards Kit 0.5 g/vial polystyrene at each molecular weight: 580, 950, 1200, 1800, 2470, 3770, 5100, 7600, 12,500, 17,000	WAT034208
Polystyrene Mid MW Standards Kit 0.5 g/vial polystyrene at each molecular weight: 1200, 3250, 10,200, 28,000, 68,000, 195,000, 490,000, 1,080,000, 1,750,000, 2,750,000	WAT034209
Polystyrene High MW Standards Kit 0.5 g/vial polystyrene at each molecular weight: 45,000, 1,270,000, 2,300,000, 3,260,000, 4,340,000, 8,000,000, 15,000,000	WAT034210

*Values listed are approximate molecular weights.

INDIVIDUAL MW STANDARDS

In many cases, a single calibration standard can verify the molecular weight of a sample-mixture component, making its identification simple and straightforward.

Ordering Information

Individual MW Standards

Description*	P/N
Polystyrene Standard 400 10 g/vial polystyrene, 400 MW	WAT011590
Polystyrene Standard 530 10 g/vial polystyrene, 530 MW	WAT011592
Polystyrene Standard 950 10 g/vial polystyrene, 950 MW	WAT011594
Polystyrene Standard 2800 5 g/vial polystyrene, 2800 MW	WAT011596
Polystyrene Standard 6400 5 g/vial polystyrene, 6400 MW	WAT011598
Polystyrene Standard 10,100 5 g/vial polystyrene, 10,100 MW	WAT011600
Polystyrene Standard 17,000 5 g/vial polystyrene, 17,000 MW	WAT011602
Polystyrene Standard 43,000 5 g/vial polystyrene, 43,000 MW	WAT011604
Polystyrene Standard 110,000 5 g/vial polystyrene, 110,000 MW	WAT011606
Polystyrene Standard 180,000 5 g/vial polystyrene, 180,000 MW	WAT011608

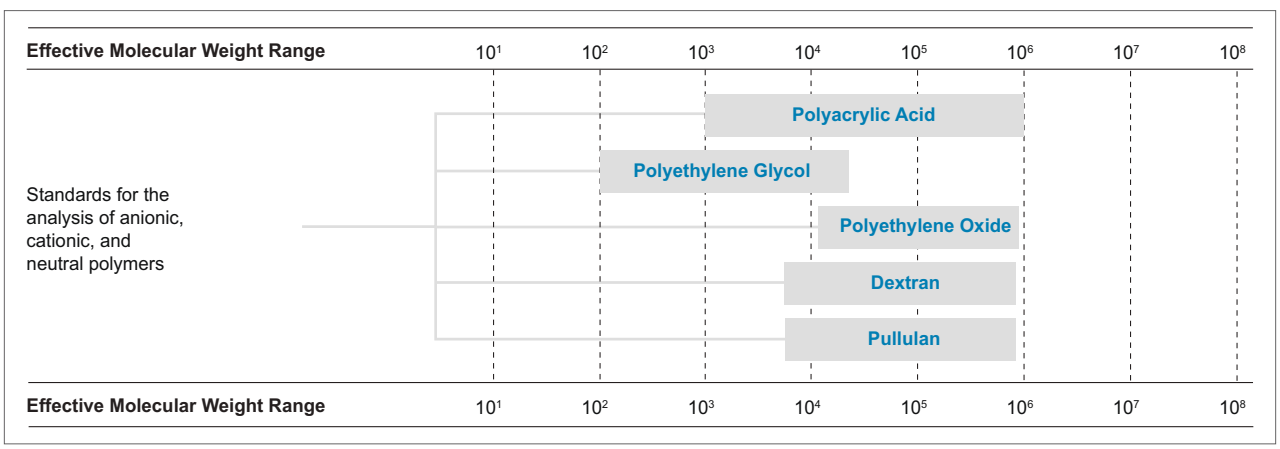
Description*	P/N
Polystyrene Standard 430,000 5 g/vial polystyrene, 430,000 MW	WAT011612
Polystyrene Standard 780,000 5 g/vial polystyrene, 780,000 MW	WAT011614
Polystyrene Standard 1,300,000 1 g/vial polystyrene, 1,300,000 MW	WAT011616
Polystyrene Standard 2,800,000 1 g/vial polystyrene, 2,800,000 MW	WAT011618
Polystyrene Standard 3,600,000 1 g/vial polystyrene, 3,600,000 MW	WAT011620
Polystyrene Standard 4,300,000 1 g/vial polystyrene, 4,300,000 MW	WAT011622
Polystyrene Standard 5,200,000 1 g/vial polystyrene, 5,200,000 MW	WAT011624
Polystyrene Standard 6,200,000 1 g/vial polystyrene, 6,200,000 MW	WAT011626
Polystyrene Standard 8,400,000 1 g/vial polystyrene, 8,400,000 MW	WAT011628
Polystyrene Standard 20,000,000 1 g/vial polystyrene, 20,000,000 MW	WAT011630

*Values listed are approximate molecular weights.

SEC CALIBRATION STANDARDS

Waters SEC Calibration Standards are precisely formulated to determine accurate molecular weight and conveniently packaged to minimize errors in SEC calibration methods. The fully traceable aqueous-based polymer kits simplify routine calibration procedures that improve workflow and increase productivity.

Aqueous SEC Standards Guide



This chart may be used to determine the appropriate component standard and corresponding molecular weight range.

Full-Range Calibration Standards

These standards kits provide an accurate calibration range for determining the molecular weight of common water-soluble polymers. The kits contain a series of well-characterized standards of a specified polymer type and include certificates that list component ranges and concentrations.

Ordering Information

Full-Range Calibration Standards for SEC

Description*	P/N
Polyacrylic Acid Standards Kit 250 mg/vial polyacrylic acid at each molecular weight: 1000, 3000, 7000, 15,000, 30,000, 70,000, 100,000, 300,000, 700,000, and 1,000,000	WAT035714
Polyethylene Glycol Standards Kit 1.0 g/vial polyethylene glycol at each molecular weight: 100, 200, 400, 600, 1000, 1500, 4300, 7000, 13,000, and 22,000	WAT035711
Polyethylene Oxide Kit 500 mg/vial polyethylene oxide at each molecular weight: 24,000, 40,000, 79,000, 160,000, 340,000, 570,000, and 850,000	WAT011572
Dextrans Standard 500 mg/vial dextrans at each molecular weight: 1000, 4400, 8500, 15,400, 30,000, 50,400, 87,000, and 225,000	WAT054392
Pullulan Kit 200 mg/vial pullulan at each molecular weight: 5000, 10,000, 20,000, 50,000, 100,000, 200,000, 400,000, and 800,000	WAT034207

*Values listed are approximate molecular weights.

Individual Calibration Standards

In many cases, a single calibration standard can verify the molecular weight of a sample-mixture component, making its identification simple and straightforward.

Ordering Information

Individual Calibration Standards for SEC

Description*	P/N
Polyethylene Oxide Standard 24,000	WAT011574
Polyethylene Oxide Standard 40,000	WAT011576
Polyethylene Oxide Standard 79,000	WAT011578
Polyethylene Oxide Standard 160,000	WAT011580
Polyethylene Oxide Standard 340,000	WAT011582
Polyethylene Oxide Standard 570,000	WAT011584
Polyethylene Oxide Standard 850,000	WAT011586

*Values listed are approximate molecular weights.

Nano- and Micro-Flow LC-MS

Nano- and Micro-Flow LC-MS

Contents

Nano- and Micro-Flow LC-MS

Our nano- and micro-flow LC Columns fully exploit the separation power of small, sub-2-µm particles to deliver superior chromatographic resolution.

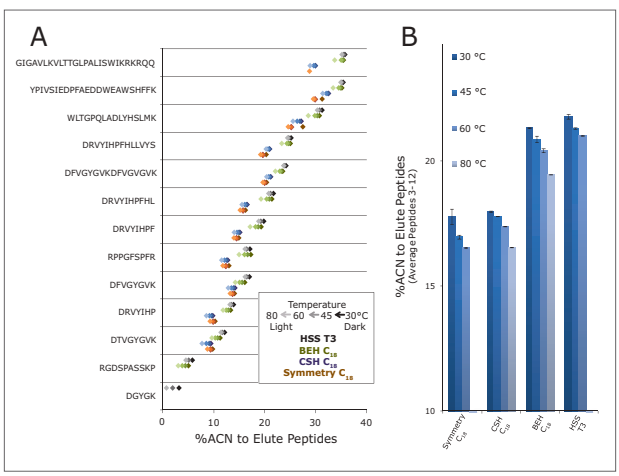
The selected stationary phases for nano-LC columns facilitate the efficiency and selectivity required for separations of complex peptide and protein separations as well as other sample-limited analyses.

Hybrid Particles			Silica-based Particles
			
BEH Technology™		CSH™ Technology	HSS HIGH STRENGTH SILICA
130 Å	300 Å	130 Å	100 Å
1.7 µm	1.7 µm	1.7 µm	1.8 µm
C_{18}	C_{18}, C_4	C_{18}	T3

Peptide Separation Technology stationary phases are specifically QC tested with tryptic digests of cytochrome *c* to ensure consistent performance for peptide separations.

Protein Separation Technology stationary phases are specifically designed for the high resolution analysis of proteins of various sizes, hydrophobicities, and isoelectric points. Particles are QC tested using a protein standard mix.

Trap Elute Peptide Separation



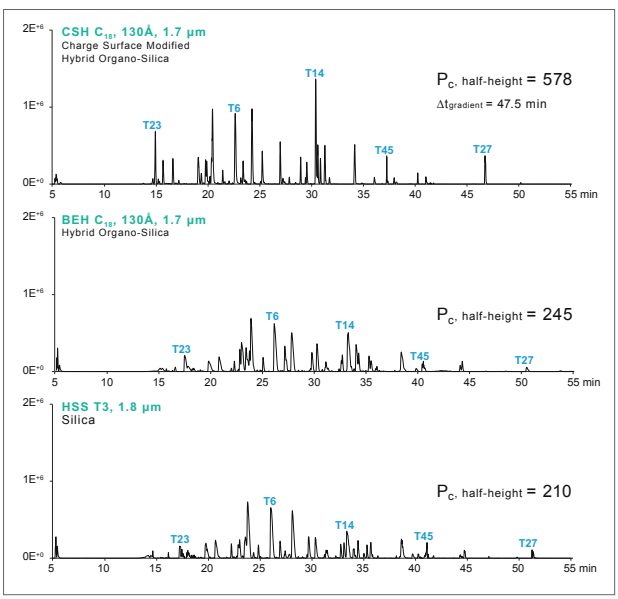
Peptide retentivity comparison of different stationary phases, including Symmetry Silica (the lower retention of Symmetry is used in trap-elute separations).

For more information on Waters Particle Technology, please refer to page 77.

In nano- and micro-flow LC-MS, analyzing large-volume samples using a single column can be impractical. In such cases, you can trap analytes at higher flow rates. It is preferable to perform online trapping of analytes at microscale flow rates and to subsequently elute and separate those analytes across an analytical column, wherein a significantly lower nanoscale flow rate is employed.

To be effective, the trapping column's retentivity must be lower than that of the analytical column. This relationship between trapping and analytical columns ensures refocusing of analytes on the analytical column after elution from the trap at the start of the gradient, delivering high peak capacity separations.

Peak Capacity and Retentivity



Comparison of a base peak ion chromatogram of MassPREP Enolase Digestion Standard, 1 µg, direct injection on a 75 µm (I.D.) column.

Nano- and micro-flow LC-MS is commonplace in areas of bio-separation such as peptide bioanalysis, intact antibody analysis, proteomics, lipidomics and metabolomics. This technique addresses limited sample availability and the need for high sensitivity and the requirement for low limits of detection or quantification.

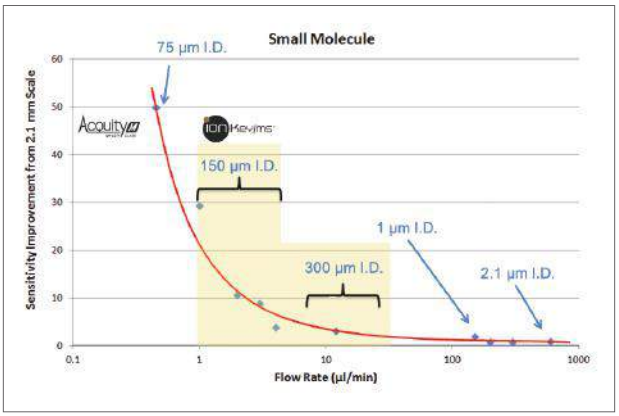
In micro-flow LC-MS, the inner diameter of the separation column, and thus the flow rate of the mobile phase can dramatically alter the sensitivity of the mass spectrometry as follows:

- By increasing sampling efficiency
- By increasing ionization efficiency
- By reducing matrix effects

Nano- LC-MS provides a higher sensitivity increase, compared with 2.1 mm UPLC Columns. Micro-flow separations, which use larger-diameter columns, increase sample throughput dramatically while continuing to deliver excellent sensitivity for many complex biomolecular analyses.

We offer solutions that satisfy the most demanding requirements for assays that rely on nano- and micro-flow LC-MS technology—solutions that ensure the assays' successful performance.

Gaining Sensitivity by Reducing Column Diameter and Flow Rate



Sensitivity enhancement for a series of small molecules relative to a 2.1 mm I.D. separation performed on an ACQUITY UPLC System. The volume and concentration of sample injected on each column format was identical.

Nano- and Micro-flow LC-MS Consumables

- Includes a 150 µm I.D. separation channel, for highest sensitivity, and a 300 µm I.D. channel, for high-throughput analysis
- Greatly simplified micro-flow LC-MS, with fitting-free connections
- The 150 µm I.D. iKey™ Separation Device demonstrates as much as 40 times the sensitivity of the 2.1 mm I.D. UPLC column
- The 300 µm I.D. iKey, during high-throughput UPLC-cycle times, delivers as much as six times the sensitivity of a 2.1 mm I.D. UPLC column
- Easy post-column addition of MS-modifier solvents

- nanoEase M/Z Columns with easy-to-use ZenFit™ Connection Technology
- Column inner diameters range from 75 to 300 µm
- Column lengths range from 50 to 250 mm
- Trapping columns range from 180 to 300 µm I.D.

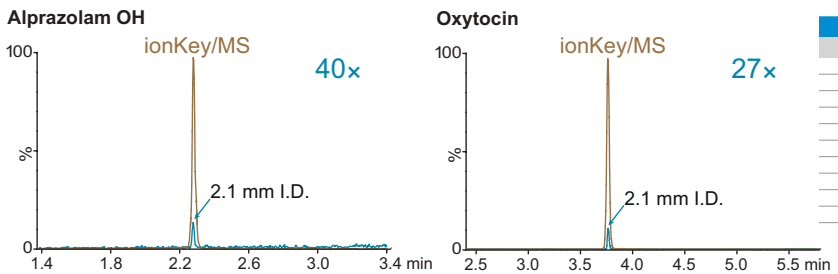
ionKey/MS

SIMPLIFIED MICRO-FLOW LC-MS WITH ENHANCED SENSITIVITY

The ionKey/MS System integrates the micro-flow UPLC separation into the source of the mass spectrometer. This delivers LC-MS system performance and sensitivity that cannot be achieved any other way. ionKey/MS Systems are enabled by the iKey Separation Device, which replaces the need for traditional fittings and columns and simplifies the user experience. The "plug and play" design of the iKey Separation Device eliminates operator variability common in traditional micro-flow LC-MS analyses.

The ionKey MS System with the ACQUITY UPLC M-Class System and Xevo TQ-S Mass Spectrometer.

150 µm I.D. iKey: Up to 40× Increase in Sensitivity Compared to 2.1 mm UPLC LC-MS Applications

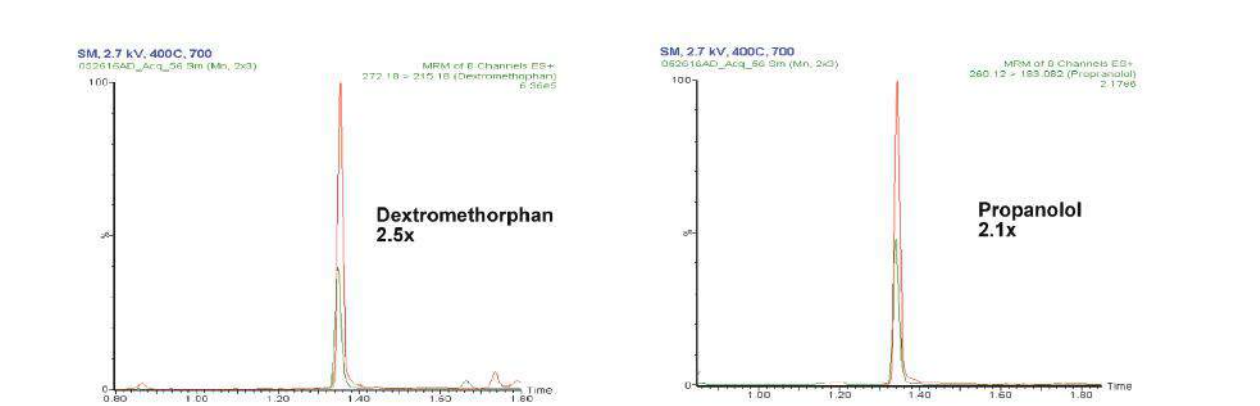


UPLC/MRM comparison of ionKey/MS relative to 2.1 mm I.D. chromatography

Compound Name	Relative Peak Area	Relative S/N
Small Molecule		
Lidocaine	3	3
Fluconazole	15	39
Propranolol	2	2
Alprazolam OH	14	40
Alprazolam	7	12
Nefazodone	3	6
Tolbutamide	5	6
Warfarin	2	4
Clopidogrel	2	2
Mean value	6	13

Sensitivity comparison between ionKey/MS™ and 2.1 mm I.D. chromatography; 1 µL injection of equal sample load on each.

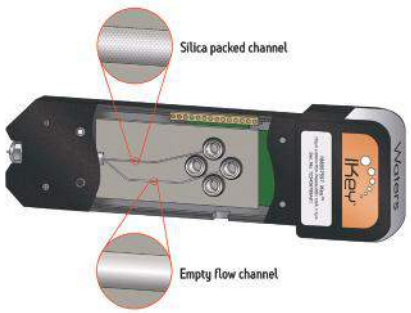
300 µm I.D. iKey HT: Increased LC-MS Sensitivity with UPLC Throughput



Sensitivity gains using (300 µm × 50 mm) iKey HT BEH C_{18} Separation Device (red) compared to (2.1 mm × 50 mm) UPLC BEH C_{18} Column (green) under identical injection volume and gradient conditions.

iKey Separation Device

In an ionKey/MS System, the iKey Separation Device contains the fluid connections, electronics, ESI interface, column heater, eCord, and chemistry needed to perform UPLC separations. As such, it replaces the need for traditional fittings and columns, simplifying the user experience. The "plug and play" design of the iKey eliminates user-dependent variation in results that often occurs in traditional micro-flow LC-MS analyses, regardless of users' skill level.

iKey Separation Device	iKey Separation Device with Post-Column Addition (PCA)
	
The major component of the ionKey/MS System, the iKey Separation Device performs sub-2-µm UPLC separations, resulting in highly sensitive, efficient, micro-flow LC-MS analyses. The iKey Separation device is available with two inner diameters: 150 µm I.D. which provides the highest level of sensitivity, and the 300 µm I.D. iKey HT for higher throughput separations.	The PCA iKey incorporates a separation channel as well as a post-column addition (PCA) channel. The design allows for mixing the mobile phase post separation with a desired solvent. Both effluents are merged and collected at the inlet of the emitter. Post-column addition of solvents can enhance the electrospray process and increase sensitivity without adversely affecting the separation.

Robust, Reproducible, and Reliable

1 user X 1 system X 1 iKey	Peptide from P00924, yeast enolase		5 users X 5 systems X 18 iKeys
	6.84 min	Retention time	6.69 min
	0.01 min	SD of retention time	0.11 min
	3.01 sec	Average peak width FWHM	2.72 sec
0.15% retention time RSD			**1.64%** retention time RSD
QC reproducibility for one iKey with over 500 injections of protein precipitated plasma.			*QC reproducibility across multiple users, ionKey/MS Systems, and iKeys.*

The iKey Separation Device is LC-MS tested to ensure consistent performance not only for a particular iKey but from one iKey to another. The device also exhibits robust performance—performance that achieves high-quality results, even after hundreds of injections.

Ordering Information

iKey Separation Devices

	Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)
BEH C_{18}, 130 Å	150 µm × 50 mm	186007256
	150 µm × 50 mm (PCA)	186007580
	150 µm × 100 mm	186007258
CSH C_{18}, 130 Å	150 µm × 50 mm	186007244
	150 µm × 100 mm	186007245
HSS T3, 100 Å	150 µm × 50 mm	186007260
	150 µm × 100 mm	186007261
	300 µm × 50 mm	186008727

iKey Peptide Separation Devices

	Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)
BEH C_{18}, 130 Å	150 µm × 50 mm	186006764
	150 µm × 50 mm (PCA)	186007557
	150 µm × 100 mm	186006766
CSH C_{18}, 130 Å	150 µm × 50 mm	186007257
	150 µm × 100 mm	186007259
BEH C_{18}, 300 Å	150 µm × 50 mm	186006969
	150 µm × 100 mm	186006970

iKey Protein Separation Devices

	Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)
BEH C_4, 300 Å	150 µm × 50 mm	186006765
	150 µm × 100 mm	186006968

iKey Utility Devices

	Dimension	P/N (1/pk)
iKey Infusion Device	85 µm × 50 mm	186007049
iKey Flow Injection Analysis Device	85 µm × 50 mm	186007051
iKey Diagnostic Device V3	n/a	186008450

For additional information, please go to www.waters.com/iKey

Nano- and Micro-Flow Columns and Trapping Columns

Waters Columns for nano-to-microscale LC-MS analyses are designed for low-dispersion nano-UPLC Systems. Our rigorous quality-control measures ensure that the columns achieve their full potential for sensitivity, resolution, and reproducibility for biomarker discovery and also for identifying and characterizing peptides and proteins.

SEPARATION COLUMNS

These columns enable nano- and microscale separations with MS detection under UPLC conditions at 15,000 psi. They take full advantage of the separation power of sub-2-µm particle technology. Columns between 75 and 300 µm I.D. provide chromatographic separations with flow rates between 200 nL/min and 100 µL/min, covering a 170-fold range of sample amounts. The varying characteristics of available particle technologies provide alternate selectivity, retentivity, and loadability, and thus the flexibility to achieve the most suitable separation for complex LC-MS analyses.

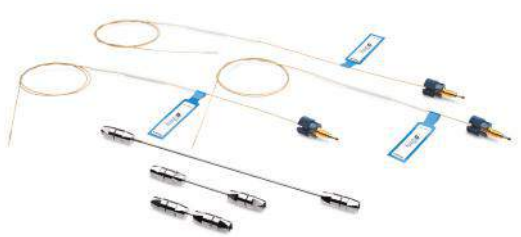
TRAPPING COLUMNS

Trapping columns are used to desalt and enrich the sample before eluting onto the analytical column for the final separation with MS detection. For fast loading of the trap column and to reduce the cycle time, trap columns are packed with larger 5 µm particles.

nanoEase M/Z Columns with ZenFit Connection Technology

Waters ZenFit Connection Technology introduces easy-to-use, re-usable, fingertight, liquid-line connectors to the family of nanoEase M/Z Columns. These columns are capable of withstanding pressures as high as 15,000 psi and eliminating dead volume, a frequent source of variability associated with regular fittings. ZenFit Connection Technology does not require user training or any further special attention.

*To use nanoEase M/Z Columns on the ACQUITY UPLC M-Class System, equip systems with the appropriate upgrade kit. The 300 µm I.D. ACQUITY UPLC M-Class Columns and Traps are compatible with ZenFit Connections.



Ordering Information

nanoEase M/Z Peptide Columns

	Particle Size: 1.7 µm	
	Dimension	**P/N (1/pk)**
BEH C_{18}, 130 Å	75 µm × 100 mm	186008792
	75 µm × 150 mm	186008793
	75 µm × 200 mm	186008794
	75 µm × 250 mm	186008795
	100 µm × 100 mm	186008796
	150 µm × 100 mm	186008797
BEH C_{18}, 300 Å	75 µm × 100 mm	186008798
	75 µm × 150 mm	186008799
	75 µm × 200 mm	186008800
	75 µm × 250 mm	186008801
	100 µm × 100 mm	186008802
	150 µm × 100 mm	186008803
CSH C_{18}, 130 Å	75 µm × 100 mm	186008807
	75 µm × 150 mm	186008808
	75 µm × 200 mm	186008809
	75 µm × 250 mm	186008810
	100 µm × 100 mm	186008811
	150 µm × 50 mm	186008812
	150 µm × 100 mm	186008813
	150 µm × 150 mm	186008814

nanoEase M/Z Protein Columns

	Dimension	**P/N (1/pk)**
	Particle Size: 1.7 µm	
BEH C_4, 300 Å	75 µm × 100 mm	186008804
	100 µm × 100 mm	186008805
	150 µm × 100 mm	186008806

nanoEase M/Z HSS Columns

	Dimension	**P/N (1/pk)**
	Particle Size: 1.8 µm	
HSS T3, 100 Å	75 µm × 100 mm	186008815
	75 µm × 150 mm	186008816
	75 µm × 200 mm	186008817
	75 µm × 250 mm	186008818
	100 µm × 100 mm	186008819
	150 µm × 100 mm	186008820

nanoEase M/Z Columns and ACQUITY UPLC M-Class Columns are preferred for use with the ACQUITY UPLC M-Class and nanoACQUITY UPLC Systems.

nanoEase M/Z Trap Columns*

	Particle Size: 5 µm	
	Dimension	P/N (1/pk)
Symmetry C_{18}, 100 Å	180 µm × 20 mm	186008821

*For 300 µm I.D. traps please refer to M-Class Trap Columns.

ACQUITY UPLC M-Class Columns

	Particle Size: 1.8 µm	
	Dimension	P/N (1/pk)
HSS T3, 100 Å	75 µm × 100 mm	186008006
	75 µm × 150 mm	186007473
	75 µm × 200 mm	186008007
	75 µm × 250 mm	186007474
	100 µm × 100 mm	186008008
	150 µm × 100 mm	186008009
	300 µm × 50 mm	186007559
	300 µm × 100 mm	186007560
	300 µm × 150 mm	186007472

ACQUITY UPLC M-Class Trap Columns

	Particle Size: 5 µm	
	Dimension	P/N (1/pk)
Symmetry C_{18}, 100 Å	180 µm × 20 mm	186007496[4]
	180 µm × 20 mm	186007497[5]
	180 µm × 20 mm	186007500[6]
	180 µm × 20 mm	186007592[7]
Symmetry C_{18}, 100 Å	300 µm × 25 mm	186007499[3]
	300 µm × 50 mm	186007498
Peptide BEH C_{18}, 130 Å	300 µm × 50 mm	186007471
BEH C_4, 300 Å	300 µm × 50 mm	186008470
HSS T3, 100 Å	300 µm × 50 mm	186008029

[3]Configuration HCP (2D).
[4]Configuration: 2G, V/M.
[5]Configuration: 2D, V/M.
[6]Configuration: 2G, V/V.
[7]Configuration: 2D, V/V.

ACQUITY UPLC M-Class Peptide Columns

	Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)
BEH C_{18}, 130 Å	75 µm × 100 mm	186007481
	75 µm × 150 mm	186007482
	75 µm × 200 mm	186007483
	75 µm × 250 mm	186007484
	100 µm × 100 mm	186007485
	150 µm × 100 mm	186007486
	300 µm × 50 mm	186007564
	300 µm × 100 mm	186007565
	300 µm × 150 mm	186007566
BEH C_{18}, 300 Å	75 µm × 100 mm	186007487
	75 µm × 150 mm	186007490
	75 µm × 200 mm	186007491
	75 µm × 250 mm	186007492
	100 µm × 100 mm	186007488
	150 µm × 100 mm	186007489
	300 µm × 50 mm	186007570
	300 µm × 100 mm	186007571
	300 µm × 150 mm	186007572
CSH C_{18}, 130 Å	75 µm × 100 mm	186007475
	75 µm × 150 mm	186007476
	75 µm × 200 mm	186007477
	75 µm × 250 mm	186007478
	100 µm × 100 mm	186007479
	150 µm × 50 mm	186007513
	150 µm × 100 mm	186007480
	150 µm × 150 mm	186007514
	300 µm × 50 mm	186007561
	300 µm × 100 mm	186007562
	300 µm × 150 mm	186007563

ACQUITY UPLC M-Class Protein Columns

	Particle Size: 1.7 µm	
	Dimension	P/N (1/pk)
BEH C_4, 300 Å	75 µm × 100 mm	186007493
	100 µm × 100 mm	186007494
	150 µm × 100 mm	186007495
	300 µm × 50 mm	186007567
	300 µm × 100 mm	186007568
	300 µm × 150 mm	186007569

ACQUITY UPLC M-Class with HDX Technology

ACQUITY UPLC M-Class System.

Hydrogen-deuterium exchange mass spectrometry (HDS-MS) is used to study a protein's structural dynamics and conformational changes, a component of understanding its higher-order structure. Information about protein conformation from an HDX MS study can serve to compare a control compound with an analyte by measuring the relative amount of deuteration uptake. HDX-MS can monitor domain interaction, localized-protein breathing, and folding or unfolding in the solution phase. The ACQUITY UPLC M-Class System can quantify small changes in protein conformation by extending its pressure range to effect a higher-efficiency separation. An integral part of the ACQUITY UPLC M-Class HDX System is the Waters Enzymate™ BEH Pepsin Column, which performs online protein digestion.

The technology offers these benefits:

- True UPLC separations for peptide and protein HDX
- Reproducible, robust, and rapid separations (nano-to-micro-scale at 0 °C and pressure to 15,000 psi)

ENZYMATE PEPSIN ONLINE DIGESTION COLUMN

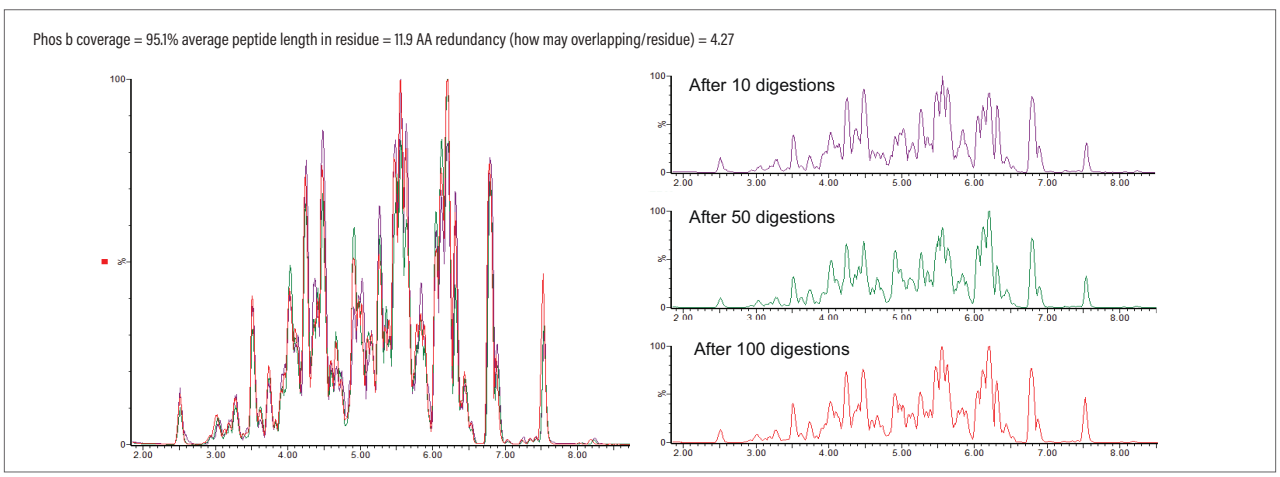
Enzymate Pepsin Online Digestion Column.

Waters Enzymate Pepsin Online Digestion Column digests intact proteins into peptides. The peptic peptides are then retained on a trapping column. Peptides eluting from the trapping column are refocused onto a sub-2-µm ACQUITY UPLC Column and then eluted into a high-resolution mass spectrometer.

Enzymate Pepsin Online Digestion Columns, an integral part of the ACQUITY UPLC M-Class HDX System, offer these benefits:

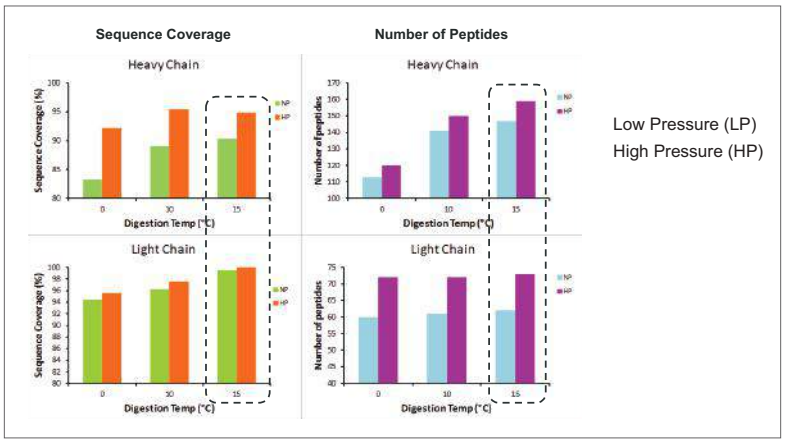
- Fast, reproducible, and efficient online protein digestion, typically within 30 seconds
- Shortened preparation time (overall) for protein samples
- Ability to optimize the efficiency of protein digestion by changing temperature, flow rate, or both

Overlay of Three Phos B Digestions within a 130-Injection HDX MS Study



Reproducible online pepsin digestions of phosphorylase b. A total of 130 digestions were performed using an Enzymate Pepsin Column. The 10th, 50th, and 100th digestions are shown. The sequence coverage is shown on the right.

Comparisons of Low- and High-Pressure Digestion Efficiencies



The Waters Enzymate BEH Pepsin Column was used for digestion of IgG2, at 1000 psi (NP), and 13,000 psi (HP). Results show high-pressure digestion increases protein-sequence coverage and spatial resolution of IgG2, compared with low-pressure digestion.

Ordering Information

Enzymate Pepsin Online Digestion Column

		Particle Size: 5 µm
Description	**Dimension**	**P/N (1/pk)**
Enzymate Pepsin Online Digestion Column	2.1 × 30 mm	186007233

LC-MS Accessories

TRUVIEW LCMS CERTIFIED VIALS

TruView LCMS Certified Vials include stringent dimensional tolerances plus UV and MS cleanliness testing. The additional product attribute of TruView Vials is low polar analyte adsorption. The vials are manufactured by a process that limits the concentration of free ions on the surface of glass; ionic sites can cause analyte adsorption. Waters TruView LCMS Certified Vials are tested for high recovery of analyte at 1 ng/mL concentration using UPLC-MS/MS (MRM) and yield little adsorption. These vials exhibit the lowest adsorption of autosampler vials in the market.

Ordering Information

TruView LCMS Certified Vials

Description	Clear Glass	Amber Glass	Max Recovery	Total Recovery	Amber Max Recovery
TruView LCMS Certified Vials, 100/pk with cap and pre-slit silicone/PTFE septa	186005666CV	186005661CV	186005662CV	186005663CV	186005670CV
TruView LCMS Certified Vials, 100/pk with cap and silicone/PTFE septa	186005660CV	186005667CV	186005668CV	186005669CV	186005664CV

WATERS CERTIFIED CONTAINERS

Waters Certified Containers are uniquely processed, treated, and certified in the same unique manner as our highly regarded low TOC vials.

Ultra-clean containers can be used on any LC system, including UPLC, LC/UV, and LC-MS, among others Manufactured to stringent standards, they prevent extraneous peaks and baseline noise stemming from high TOC. To help assist with contamination prevention and facilitate recommended care and use, each container carries the Waters certified mark for easy differentiation in operational use.

Ordering Information

Certified Containers

Description	P/N
Certified Container Kit Kit contains: four certified 1 L bottles, three certified 500 mL bottles, one clean container cap kit	186007088
Low Volume Certified Container Kit Kit contains: five certified 250 mL clear bottles, one certified 500 mL clear bottle, one clean container cap kit	186007278
Certified Container, 1 L	186007089
Certified Container, 500 mL	186007090
Clean Container Cap Kit	205000642

pH BUFFERS

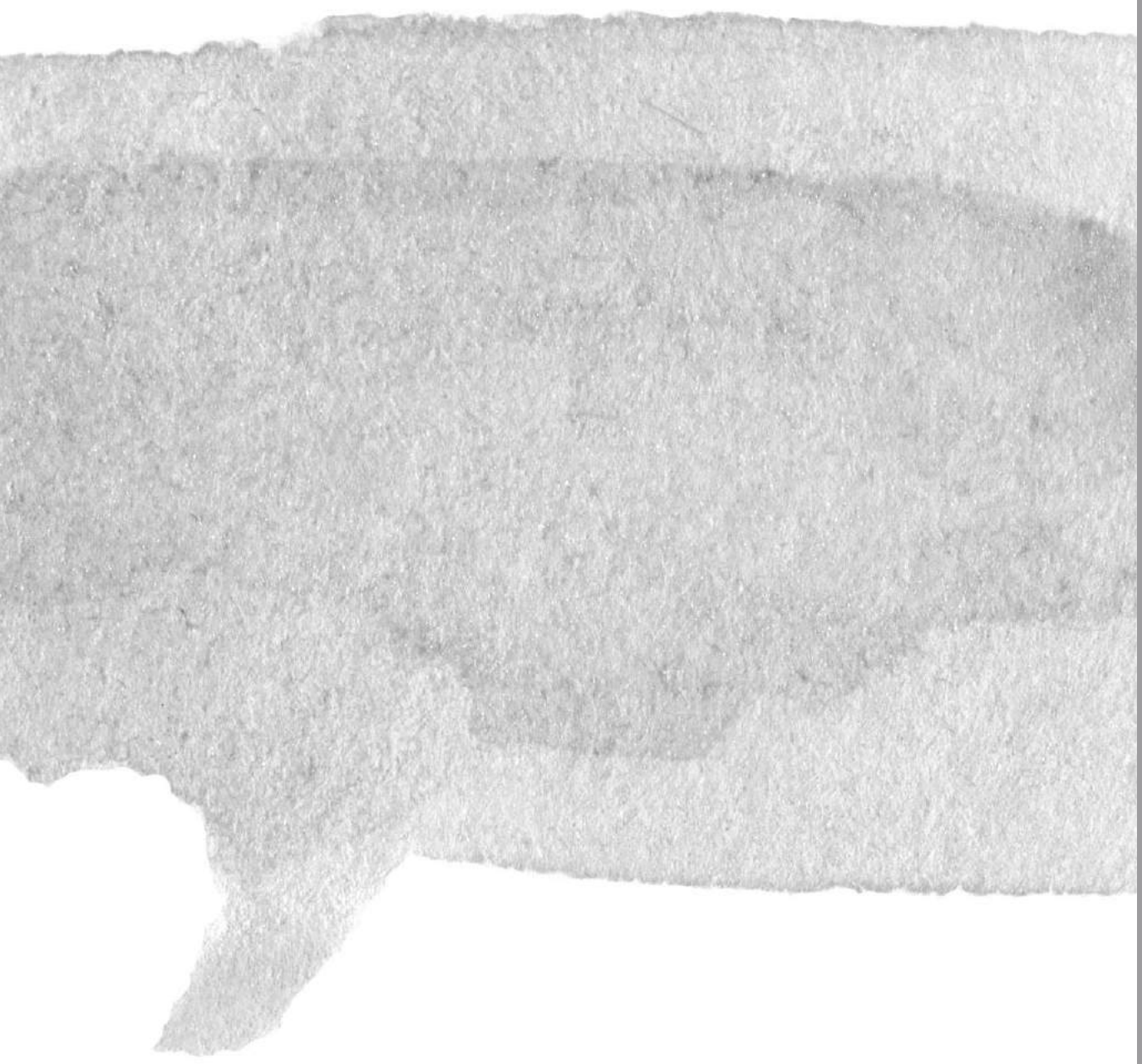
These pH Buffers are directly traceable to NIST SRMs, mercury free, guaranteed stable for at least one year after your receipt, and are supplied with a full certificate of analysis.

Ordering Information

pH Buffers

Description	Volume	P/N
pH 4 Liter pH 4 Buffer	1 L	129
pH 7 Liter pH 7 Buffer	1 L	133
pH 10 Liter pH 10 Buffer	1 L	137
pH 4 Pint pH 4 Buffer	1 pint	127
pH 7 Pint pH 7 Buffer	1 pint	131
pH 10 Pint pH 10 Buffer	1 pint	135

Application-Specific Columns and Kits, and Spare Parts



Contents

Application-Specific Columns and Kits, and Spare Parts

Application-Specific Columns

SUGAR AND CARBOHYDRATE ANALYSIS

High-Performance Carbohydrate Analysis Cartridge Column, p/n: WAT044355

Waters High-Performance Carbohydrate Cartridge Column, with reusable end-fittings, is packed with a 4 µm, spherical silica. This column was developed to separate five monosaccharides and disaccharides with baseline resolution in less than 12 minutes. The 4.6 mm I.D. × 250 mm High-Performance Carbohydrate Cartridge Column offers optimal speed, resolution, and longevity. The pre-packed, disposable cartridge column requires reusable end fittings, which are available separately.

Carbohydrate Analysis Column, p/n: WAT084038

The Carbohydrate Analysis Column uses a covalently bonded amino packing on a silica substrate. It is best suited for low-molecular-weight sugars such as mono-, di-, and tri-saccharides.

Sugar Pak I Column, p/n: WAT085188

The Sugar Pak I Column separates monosaccharides and sugar alcohols via a strong cation-exchange mechanism. The resin is based on a sulfonated styrene-divinylbenzene polymer that provides pH stability by means of a calcium counter ion.

Waters offers a range of columns for the analysis of sugars, carbohydrates, organic acids, and alcohols. Refer to the following tables for ordering information.

Typical Applications for Sugar and Carbohydrate Columns

Cartridge/ Column	Carbohydrate Analysis Column	SAM I Reagent with Silica Cartridge	Sugar-Pak I, SC-1011, SP-0810	SH-1011, IC-Pak Ion-Exclusion Fast Fruit Juice	Dextro-Pak	KS-800 series
Mode	Partition	Partition	Ion exchange/ size exclusion	Ion exchange/ size exclusion	Reversed phase	Size exclusion
Eluent	65–85% acetonitrile/ water ambient to 70 ˚C	70–80% acetonitrile/water 0.1% SAM I ambient	Water 75–95 ˚C	0.01 N phosphoric acid 50–60 ˚C	Water ambient	—
Application	Mono-, di- and tri-saccharides up to DP 8 sugars and sugar alcohols	Mono-, di- and tri-saccharides	Mono-, di-, oligosaccharides and sugar alcohols	Sugar acids, sugar alcohols, organic acids	Hydrolysed syrups, derivatized sugars	Mono- through oligosaccharides such as syrups
Elution Order	Smallest elute first	Smallest elute first	Largest elute first	Largest and most acidic elute first	Smallest elute first	Largest elute first

Guide to Shodex Sugar Columns

S	C	18	2	1
Type of Column	Cation	% Cross Linkage	Pore Size	0 - Gel Type
S = sugar	H = H^+	—	1 = 20 Å	1 - Semimacropore gel
	C = Ca^{2+}	—	2 = 50 Å	2 - Permanent pore gel
	P = Pb^{2+}	—	3 = 100 Å	
	Z = Zn^{2+}	—	4 = 500 Å	
	—	—	5 = 1000 Å	
Example:				
S	C	10	1	1
Sugar column	Ca^{2+}	10% cross linkage	20 Å	Semimacropore gel

Ordering Information

SAM I Reagent Column

Description	Dimension	Qty.	P/N
SAM I Reagent	7.8 × 300 mm	1/pk	WAT010873

Columns for Alcohols and Carbohydrates

Description	Dimension	Particle Size	Qty.	P/N
Carbohydrate Analysis Column	3.0 × 300 mm	10 µm	1/pk	WAT084038
Dextro-Pak Cartridge Column	8.0 × 100 mm	—	1/pk	WAT085650
High-Performance Carbohydrate Sentry Guard Column	3.9 × 20 mm	4 µm	2/pk	WAT046895[1]
SC-1011 Column	8.0 × 300 mm	7 µm	1/pk	WAT034238
SC-1011P Pre-column	6.0 × 50 mm	7 µm	1/pk	WAT034244
SH-1011	8.0 × 300 mm	7 µm	1/pk	WAT034236
SH-1011P Pre-column	6.0 × 50 mm	7 µm	1/pk	WAT034243
SP-0810 Column	8.0 × 300 mm	8 µm	1/pk	WAT036954
SP-0810P Pre-column	6.0 × 50 mm	8 µm	1/pk	WAT034245
Sugar-Pak 1 Column	6.5 × 300 mm	10 µm	1/pk	WAT085188
Sugar-Pak 1 Guard-Pak Inserts	—	—	10/pk	WAT015209[2]
Shodex KS-801	—	7 µm	1/pk	WAT034276

[1] Requires Sentry Guard Holder, p/n: WAT046905.
[2] Requires Guard-Pak Holder, p/n: WAT088141.

High-Performance Carbohydrate Analysis Cartridge Column

Description	Dimension	P/N
High-Performance Carbohydrate Cartridge Column (requires end-fittings)	4.6 × 250 mm	WAT044355
Sentry Integrated Guard Holder (for Waters cartridge columns)	—	WAT046905

APPLICATION AREA: Small Molecule Scout to Prep

"These columns are a work-horse in our open access environment. We have found with regular flushing these column can last thousands of crude injections. I would highly recommend Waters BEH columns to other chromatographers."

REVIEWER: Philip Michaels

ORGANIZATION: Novartis

FERMENTATION ANALYSIS, ORGANIC ACIDS, ALCOHOLS, AND CARBOHYDRATES

The ion-exclusion mode is ideally suited for the separation of monosaccharides, organic acids, or sugar acids. The column packings are sulfonated styrene divinylbenzene resins in the hydrogen form (IC-Pak Ion-Exclusion or SH-1011), and the mobile phase is a dilute acid such as 0.01 N phosphoric acid using column temperatures of 50–60 °C.

In this mode, the Fast Juice column can effectively separate glycerol, acetic acid, and ethanol in grape or other fruit juice. The column can also analyze the degree of microbial defect, the extent of natural fermentation in grapes, and the amount of sulfite in various foods and beverages. The IC-Pak Ion-exclusion Column can separate a wide range of organic acids while the Shodex SH Column separates acids as well as larger carbohydrates.

The analysis of alcohols and organic acids is important, for they typically help determine the flavor characteristics of beverages such as wine, beer, and some distilled spirits. The presence of alcohols in fruit juices can indicate product deterioration. The Shodex KC-811 Column, which provides ion-exchange and reversed-phase chromatography modes, is packed with a sulfonated, rigid, styrene-divinylbenzene copolymer. With high efficiency, this packing separates low-molecular-weight organic acids and water-soluble organics such as alcohols, aldehydes, and nitriles. The column provides ion-exclusion and reversed-phase mode of chromatography. Typical mobile phases, run at 1 mL/min at 45–80 °C, are composed of aqueous solutions containing 1% phosphoric acid, acetic acid, or perchloric acid.

Shodex KC-811 Column Retention Chart for Organic Acids

Sample	Retention Time	Sample	Retention Time
Oxalic Acid	5.20	ß- Hydroxy-propionic Acid	8.60
Maleic Acid	5.80	D-Glucuronic Acid	8.65
a-Ketoglutaric Acid	5.90	Fumaric Acid	8.95
Citric Acid	6.20	Formic Acid	9.20
Tartaric Acid	6.55	Acetic Acid	9.80
Pyruvic Acid	6.65	Adipic Acid	9.80
trans-Aconitic Acid	6.95	Levulinic Acid	10.00
Glyoxylic Acid	7.00	Mesaconic Acid	10.40
Malic Acid	7.05	Pyroglutamic Acid	10.70
Malonic Acid	7.07	Propionic Acid	11.25
Citraconic Acid	7.20	Acrylic Acid	11.60
Succinic Acid	8.00	Pivalic Acid	14.05
Glycolic Acid	8.40	Methacrylic Acid	14.10
Itaconic	8.50	trans-Crotonic Acid	15.65
Lactic Acid	8.60		

Eluent: Water with 0.1% phosphoric acid, Temperature: 60 ˚C, Flow rate: 1 mL/min.

Ordering Information

Columns for Fermentation Analysis, Organic Acids, Alcohols, and Carbohydrates

Description	Dimension	Qty.	P/N
Fast Fruit Juice Analysis	8.0 × 100 mm	1/pk	WAT010639
Fast Fruit Juice Guard-Pak Inserts	—	10/pk	WAT015207[1]
IC-Pak Ion-Exclusion	7.8 × 300 mm	1/pk	WAT010290
SC-1011 Column	8.0 × 300 mm	1/pk	WAT034238
SC-1011P Pre-column	6.0 × 50 mm	1/pk	WAT034244
KC-811	8.0 × 300 mm	1/pk	WAT034298
KC-811 Pre-column	6.0 × 50 mm	1/pk	WAT035501

[1]Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

FREE FATTY ACID ANALYSIS

The Waters Free Fatty Acid HP Column uses a phenyl-bonded packing and a simple isocratic elution method to separate free fatty acids on the basis of carbon-chain length and degree of saturation. The short column dimension (3.9 × 150 mm) significantly reduces analysis time and increases sensitivity.

Column performance is based on:

- Straight chain saturated acids, which elute in order of increasing carbon number
- Unsaturated acids which elute before the analogous saturated compound
- Carbon number and chain configuration: the greater the unsaturation, the earlier the elution

Ordering Information

Free Fatty Acid HP Column

Description	Dimension	Particle Size	Qty.	P/N
Free Fatty Acid HP	3.9 × 150 mm	4 µm	1/pk	WAT011690

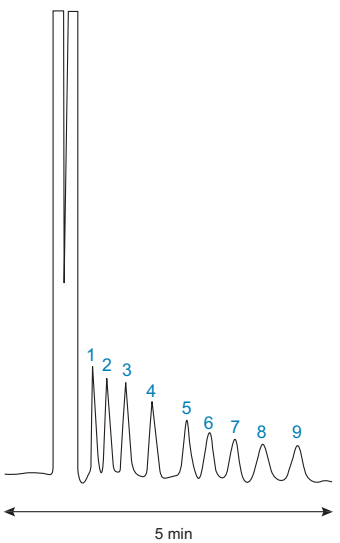
Fatty Acid Standards

Conditions

Column: Free Fatty Acid HP, 4 µm, 3.9 × 150 mm
Part number: WAT011690
Mobile phase: Acetonitrile: THF: water 45:20:35
Flow rate: 1.5 mL/min
Detection: RI

Compounds

1. Capric acid
2. Lauric acid
3. Myristic acid
4. Palmitic acid
5. Stearic acid
6. Nonadecanoic acid
7. Arachidic acid
8. Heneicosanoic acid
9. Behenic acid



POLYAROMATIC HYDROCARBON ANALYSIS

Waters PAH Columns are optimized for the HPLC analysis of polyaromatic hydrocarbons to achieve baseline resolution for 16 target analytes in fewer than 25 minutes. These columns are available in seven dimensions (including a capillary format) and two particle sizes. A complete certificate of analysis accompanies each, backed by world-class ISO 9002-registered documentation.

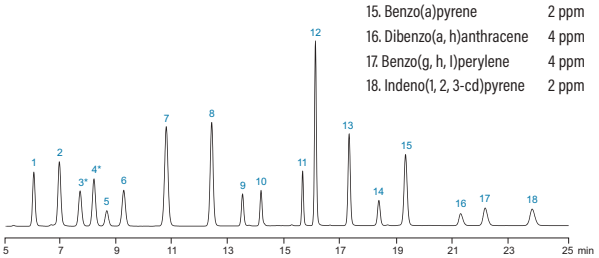
PAH Analysis According to Florida Administrative Code 17.700

Conditions

Column: Waters PAH C_{18}, 5 µm, 4.6 × 250 mm
Column temp.: 27 °C
Part number: 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

Compounds

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



Ordering Information

PAH Columns

	Particle Size: 3 µm		Particle Size: 5 µm	
	Dimension	P/N	Dimension	P/N
C_{18}	4.6 × 50 mm	186001260	2.1 × 150 mm	186001261
			2.1 × 250 mm	186001262
			3.0 × 250 mm	186001263
			4.6 × 150 mm	186001264
			4.6 × 250 mm	186001265

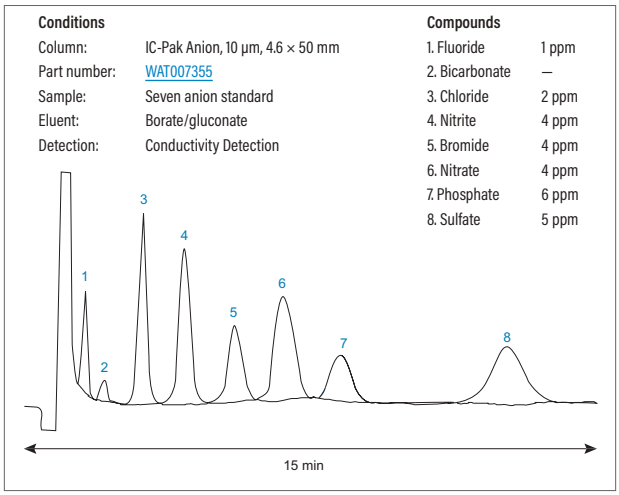
ION ANALYSIS

Waters IC-Pak resin-based columns separate a full range of ions from complex sample matrices. They offer an exceptional linear loading range, from less than 1.0 ppb to greater than 400 ppm, without dilution and without pH limitations on eluent or sample.

Recommended IC-Pak Columns:

- IC-Pak Anion Columns, for analysis of inorganic anions
- IC-Pak Ion-exclusion Columns, for weak acid anions and organic acids
- IC-Pak Cation Columns, sulfonated styrene-divinylbenzene based resin, for monovalent and divalent cation analysis
- IC-Pak C M/D Columns

IC-Pak Anion Column



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.

Ordering Information

IC-Pak Anion, Cation and Ion-Exclusion Columns

Description	Dimension	Qty.	P/N
IC-Pak Anion	4.6 × 50 mm	1/pk	WAT007355
IC-Pak Anion HR	4.6 × 75 mm	1/pk	WAT026765
IC-Pak Anion HC	4.6 × 150 mm	1/pk	WAT026770
IC-Pak Anion Guard-Pak Kit (Guard-Pak Holder and 5 inserts)	—	1/pk	WAT007357
IC-Pak Anion Concentrator Inserts	—	5/pk	WAT007358[9]
IC-Pak Anion Guard-Pak Inserts	—	5/pk	WAT010551[9]
IC-Pak C M/D Column	3.9 × 150 mm	1/pk	WAT036570
IC-Pak C M/D Guard-Pak Inserts	—	10/pk	WAT044250[9]
IC-Pak Cation Column	4.6 × 50 mm	1/pk	WAT007354
IC-Pak Cation Guard Column	4.6 × 50 mm	1/pk	WAT007356[9]

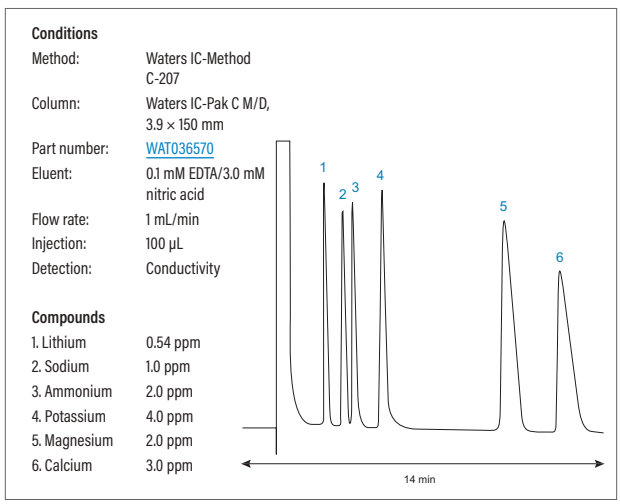
[9]Requires Guard-Pak Holder, p/n: WAT088141.

Ion-Exclusion Columns

Description	Dimension	Qty.	P/N
IC-Pak Ion-Exclusion Column	7.8 × 150 mm	1/pk	WAT010295
IC-Pak Ion-Exclusion Column	7.8 × 300 mm	1/pk	WAT010290
IC-Pak Ion-Exclusion Guard-Pak Inserts	—	10/pk	WAT020770[9]

[9]Requires Guard-Pak Holder, p/n: WAT088141.

IC-Pak C M/D Cation Column



Application-Specific Kits

ACQUITY UPLC BISPHENOL A COLUMN AND METHOD KITS

The ACQUITY UPLC Bisphenol A Column and Method Kits are fully compliant with ASTM Method D7574–09. Waters ACQUITY UPLC Solution provides optimum resolution and sensitivity for the analysis of Bisphenol A in water. The column kit includes the ACQUITY UPLC BEH C_{18} Column and ACQUITY UPLC Isolator Column. The Method Kit also includes Oasis HLB SPE Cartridges and LCMS Certified Vials.

Ordering Information

Description	P/N
ACQUITY Bisphenol A Column Kit	176001955
ACQUITY Bisphenol A Method Kit	186004932

ACQUITY UPLC PFC COLUMN KIT

Optimized for trace level detection of Perfluorinated Compounds (PFCs) with the ACQUITY UPLC System, this kit contains the ACQUITY UPLC BEH C_{18}, 1.7 µm, 2.1 × 50 mm Column, the ACQUITY UPLC PFC Isolator Column, and PFC reference standards.

Ordering Information

Description	P/N
ACQUITY PFC Column Kit	176001692

ACQUITY UPLC PFC ANALYSIS KIT

The ACQUITY UPLC PFC Analysis Kit includes Oasis SPE Cartridges, PFC calibration and reference standards, certified vials, ACQUITY UPLC Columns, and the necessary instrument components to optimize your instrument for trace level detection of PFCs.

Ordering Information

Description	P/N
ACQUITY PFC Analysis Kit	176001744

BEVERAGE ANALYSIS KIT

Waters Beverage Analysis Kit was specifically designed for the non-chemist such as onsite bottler quality control workers, to perform quick and accurate analysis of commonly used additives (acesulfame-K, saccharin, caffeine, benzoate, sorbate, and aspartame) in drink formulations. This comprehensive kit is simple and easy-to-use, and can be used in conjunction with a rapid LC method to ensure final product quality and improve manufacturing efficiency.

- Rapid analysis of six additives in soft drinks with minimal sample preparation
- Pre-formulated mobile phase, wash solvent, and standards
- Environmentally friendly solvents (ethanol based)
- Optimized methodology that is easy to follow
- Certificate of Analysis with uncertainty values and verification testing information
- Works with a variety of LC systems; results obtained in as little as 10 minutes by HPLC or seven minutes by UPLC

Ordering Information

Beverage Analysis Kits

Description	P/N
Beverage Analysis Kit Contains six standards: Four 100 mL bottles containing acesulfame-K, saccharin, caffeine, benzoate, and sorbate in solution; four bottles each with 50 mg aspartame in solid form; four 1 L bottles of mobile phase; four 1 L bottles of wash solvent; sufficient for one month of typical use	176002534
Beverage Analysis Five Standards Solution (acesulfame-K, saccharin, caffeine, benzoate, and sorbate), 100 mL	186006008
Beverage Analysis Standard Solid (aspartame), 50 mg	186006010
Beverage Analysis Mobile Phase Reagent (acetate buffer), 1 L	186006006
Beverage Analysis Wash Reagent (ethanol-based), 1 L	186006007
Low-Level Beverage Analysis Standards (50 mg/L caffeine and 50 mg/L acesulfame-K), for beverages with low caffeine content	186007231
High-Level Beverage Analysis Standards (250 mg/L caffeine and 250 mg/L acesulfame-K), for beverages with high caffeine content	186007232

CARBAMATE ANALYSIS KITS

Waters Carbamate Analysis Kits for environmental and food testing include the Waters Carbamate Column, Oasis HLB Cartridges, vials, and reference standards. When used in part with regulated methods, these proven kits simplify your analysis while increasing your confidence in the result.

Ordering Information

Carbamate Analysis Kits

Description	P/N
Carbamate Analysis Kit for Environmental Testing	176001740
Carbamate Analysis Kit for Food Testing	186004719

Carbamate Analysis Column for Pesticides

Description	Dimension	Qty.	P/N
Carbamate Analysis	3.9 × 150 mm	1/pk	WAT035577

EPA METHOD 1694 ANALYSIS KIT

Waters EPA Method 1694 Analysis Kit includes the XTerra MS C_{18} Column, Atlantis HILIC Column, and Oasis HLB Cartridges; all of which are specified in the EPA Method.

Ordering Information

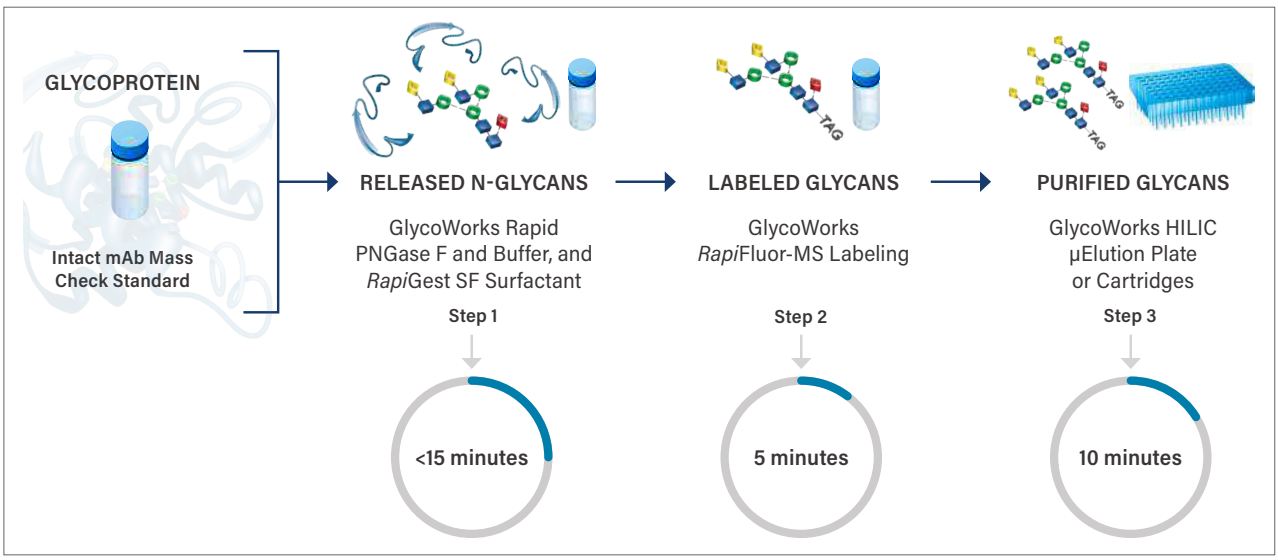
Description	P/N
EPA Method 1694 Analysis Kit	176001634
Sep-Pak Vac, 500 mg, PS2 (30/box)	WAT200601
Sep-Pak QMA Plus Carbonate, 46 mg (50/box)	186004540

GLYCOWORKS *RAPI*FLUOR-MS N-GLYCAN KITS

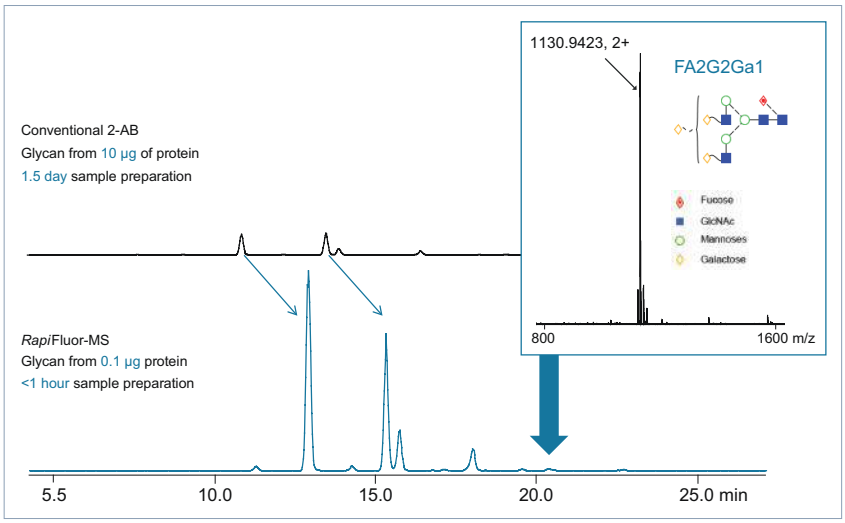
Waters GlycoWorks consumables offer a more convenient, comprehensive, and effective sample-preparation solution for glycan analysis.

- The GlycoWorks *Rapi*Fluor-MS N-Glycan Kit ensures easy, quick preparation of released-labeled, N-glycan samples
- Streamlined protocols minimize errors and sample loss
- Greatly improved FLR and MS signal intensities help easily identify low-abundance N-linked glycans
- Complete modules for processing 96 samples with flexibility of processing between 8, 24, and 48 samples at a time depending on laboratory demands with automation scripts available
- Support easy training of analysts and the transferring of methods throughout an organization

Three Steps, as little as 30 minutes



Glycan Characterization by UPLC FLR with Xevo G2-XS QTof Mass Spectrometer



Un-ionized form of acids and bases give most retention. Retention of neutral analytes not affected by pH.

Ordering Information

GlycoWorks *Rapi*Fluor-MS Released N-Glycan Sample Preparation Kits

Description	P/N
GlycoWorks *Rapi*Fluor-MS N-Glycan Starter Kit—96 Sample Kit contains: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module, ACQUITY UPLC Glycan BEH Amide, 1.7 µm, 2.1 × 150 Column, Ammonium Formate Solution – Glycan Analysis	176003635
GlycoWorks *Rapi*Fluor-MS N-Glycan Kit—96 Sample Kit contains: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module	176003606
GlycoWorks *Rapi*Fluor-MS N-Glycan Starter Kit—24 sample Kit contains: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module, ACQUITY UPLC Glycan BEH Amide, 1.7 µm, 2.1 × 150 mm Column, Ammonium Formate Solution – Glycan Analysis	176003712
GlycoWorks *Rapi*Fluor-MS N-Glycan Kit—24 sample Kit contains: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module	176003713
GlycoWorks *Rapi*Fluor-MS N-Glycan Refill Kit—24 sample Kit contains one of each: GlycoWorks Deglycosylation Module and the GlycoWorks Labeling Module	176003714
GlycoWorks Rapid Deglycosylation 1 × 24 Kit contains: one vial of GlycoWorks Rapid PNGaseF Enzyme and Buffer; and, one vial of 10-mg *Rapi*Gest SF Surfactant	176003839
GlycoWorks Rapid Deglycosylation 3 × 8	176008841
GlycoWorks Rapid Deglycosylation Kit 2 × 48	186004579

GlycoWorks *Rapi*Fluor-MS N-Glycan Automation Kits

Description	P/N
GlycoWorks *Rapi*Fluor-MS N-Glycan Script Starter Kit – Automation Kit contains: GlycoWorks Automation Script Pack-CD; Intact mAb Mass Check Standard (unlabeled); *Rapi*Fluor-MS Intact mAb Mass Check Standard (deglycosylated, labeled, and purified); GlycoWorks Rapid Deglycosylation Kit – 2 × 48; GlycoWorks *Rapi*Fluor-MS Labeling Module – Automation; GlycoWorks HILIC µElution Plate; GlycoWorks SPE Reagents – Automation; GlycoWorks Sample Collection Module – Automation; ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 150 mm Column; Mobile phase concentrate: ammonium formate	176004151
GlycoWorks *Rapi*Fluor-MS N-Glycan Starter Kit – Automation Kit contains: Intact mAb Mass Check Standard (unlabeled); *Rapi*Fluor-MS Intact mAb Mass Check Standard (deglycosylated, labeled, and purified); GlycoWorks Rapid Deglycosylation Kit – 2 × 48; GlycoWorks *Rapi*Fluor-MS Labeling Module – Automation; GlycoWorks HILIC µElution Plate; GlycoWorks SPE Reagents – Automation; GlycoWorks Sample Collection Module – Automation; ACQUITY UPLC Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 150 mm Column; Mobile phase concentrate: ammonium formate	176004152
GlycoWorks *Rapi*Fluor-MS N-Glycan Kit - Automation Kit contains: GlycoWorks Rapid Deglycosylation Kit – 2 × 48, GlycoWorks *Rapi*Fluor-MS Labeling Module – Automation, GlycoWorks HILIC µElution Plate, GlycoWorks SPE Reagents – Automation and GlycoWorks Sample Collection Module – Automation	176004153
GlycoWorks *Rapi*Fluor-MS N-Glycan Basic Kit - Automation Kit contains: GlycoWorks Rapid Deglycosylation Kit – 2 × 48, GlycoWorks *Rapi*Fluor-MS Labeling Module – Automation, GlycoWorks HILIC µElution Plate, and GlycoWorks SPE Reagents – Automation	176004154

PROTEINWORKS SAMPLE PREPARATION KITS FOR QUANTIFICATION

ProteinWorks™ Sample Preparation Kits, combined with robust and reliable LC-MS methods and instrumentation, allow discovery and early development laboratories to achieve standardized, reproducible, and sensitive protein quantification via the surrogate peptide approach.

- ProteinWorks eXpress Digest Kits simplify and accelerate protein digestion, streamlining and standardizing the traditionally complex pre-analytic workflow for LC/MS protein quantification via the surrogate peptide approach
- ProteinWorks µElution SPE Kit is designed for post-digestion clean-up, increasing assay sensitivity, and improving system robustness by removing excess digest reagents, phospholipids, and other plasma and serum components

Ordering Information

ProteinWorks Sample Preparation Kits

Description	P/N
96 Sample Kits	
ProteinWorks Auto-eXpress High 3 Digest Kit Suitable for high protein content samples (1.0–5.25 mg total protein) and contains: ProteinWorks High Digest Ambient Kit and ProteinWorks High Digest Trypsin Kit	176004079
ProteinWorks eXpress Digest Start-Up Kit Kit contains: eXpress Digest Kit, ProteinWorks µElution SPE Cleanup Kit, and a Murine mAb Standard	176003696
ProteinWorks Auto-eXpress Low 3 Digest Kit Suitable for high protein content samples (0.2–1.0 mg total protein) and contains: ProteinWorks Low Digest Ambient Kit and ProteinWorks Low Digest Trypsin Kit	176004077
ProteinWorks Auto-eXpress Low 5 Digest Kit Suitable for high protein content samples (0.2–1.0 mg total protein) and contains: ProteinWorks Low Digest Ambient Kit, ProteinWorks Low Digest Trypsin Kit, and ProteinWorks Reduction Alkylation Kit	176004078
ProteinWorks Auto-eXpress High 5 Digest Kit Suitable for high protein content samples (1.0–5.25 mg total protein) and contains: ProteinWorks High Digest Ambient Kit, ProteinWorks High Digest Trypsin Kit, and ProteinWorks Reduction Alkylation Kit	176004080
ProteinWorks eXpress Direct Digest Start-Up Kit Kit contains: eXpress Direct Digest Kit, ProteinWorks µElution SPE Cleanup Kit, and a Murine mAb Standard	176003695
ProteinWorks eXpress Direct Digest Kit Kit includes: Pre-Measured, Lot-Traceable Reagents; a Flexible 96-Tube Sample Collection Module; and Optimized Protocols	176003688
ProteinWorks eXpress Digest Kit Kit includes: Pre-measured, Lot-Traceable Reagents; a Flexible 96-tube Sample Collection Module, and Optimized Protocols	176003689
ProteinWorks µElution SPE Clean-up Kit Kit includes: Optimized SPE Protocol and Oasis µElution Technology	186008304

APPLICATION AREA: Pharmacokinetic Matricies

"The VanGuard column guards are an exceptional product. They've increased my column life from 8-10K analysis to over 18K, essentially doubling its life. The price is excellent, the customer service is also top notch. I also like to run a clean sample, I run SPE and along with my VanGuard pre-column, my instrument is protected from buildup and possible contaminants."

REVIEWER: Andrew Urdzela

ORGANIZATION: Crown Toxicology

THERAPEUTIC PEPTIDE METHOD DEVELOPMENT KITS

The Therapeutic Peptide Method Development Kit was developed to simplify the process of sample preparation and LC method development for the analysis of therapeutic peptides in plasma. The kit contains an Oasis Peptide µElution Method Development Plate, a Peptide BEH C_{18}, 300 Å reversed-phase column, and the detailed screening protocol which was used to generate the data shown in this publication.

In addition, a comprehensive method development training seminar has been created which describes all aspects of the method development process from the MS conditions to the final validation of a method for the extraction of the therapeutic peptide desmopressin from human plasma.

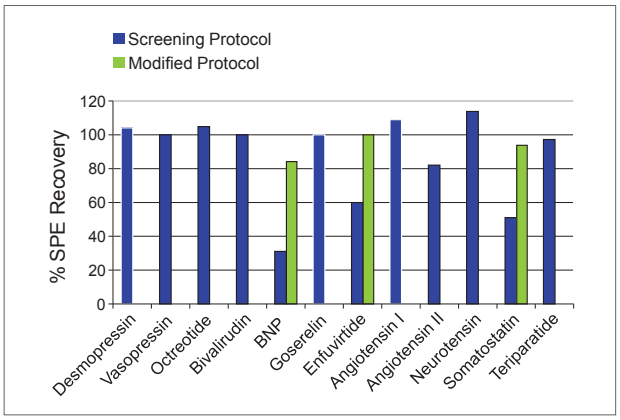
Although big progress has been made in sample pretreatment over the last years, there are still considerable limitations when it comes to overcoming complexity and dynamic range problems associated with peptide analyses from biological matrices. We focus on techniques which can be employed prior to liquid chromatography coupled to mass spectrometry for peptide detection and identification.

The peptide columns are specifically QC tested with a cytochrome *c* tryptic digest that helps ensure batch-to-batch consistency in validated methods ideally suited for separating a wide range of large and small, acidic and basic, hydrophilic and hydrophobic peptides.

The complexity of samples still far exceeds the capacity of currently available analytical systems, and specific sample preparation remains a crucial part of the analysis in a whole.

For more information, visit www.waters.com/pepkit or contact your local Waters sales office.

High Recovery of Peptides



The innovative Oasis µElution Plate allows for up to a 15x sample concentration, increasing the possibility of reaching the required sensitivity levels for bioanalytical assays. The low (25 µL) elution volume eliminates the need for evaporation and reconstitution significantly reducing the potential analyte loss due to absorption to the walls of the collection plate and/or chemical instability.

Ordering Information

Therapeutic Peptide Method Development Kits

Description	Qty/Box	P/N
UPLC Therapeutic Peptide Method Development Kit		176001835
Oasis µElution Method Development Plate	1	186004713
ACQUITY UPLC Peptide BEH C_{18}, 300 Å, 1.7 µm, 2.1 × 50 mm Column	1	186003685
96-Well 1 mL Collection Plate and Cap Mat	3	600001043
HPLC Peptide Therapeutic Peptide Method Development Kit		176001836
Oasis µElution Method Development Plate	1	186004713
XBridge Peptide BEH C_{18}, 300 Å, 3.5 µm, 2.1 × 50 mm Column	1	186003607
96-Well 1 mL Collection Plate and Cap Mat	3	600001043

Additional Products (Not Included in Kits)		
Oasis MAX 96-Well µElution Plate	1	186001829
Oasis WCX 96-Well µElution Plate	1	186002499
96-Well 1 mL Collection Plate	50	186002481
Cap Mats for 1 mL Collection Plate	50	186002483
Disposable Reservoir Tray	25	WAT058942
Extraction Manifold for 96-Well Plates	1	186001831
Vacuum Box Gasket Kit (contains foam top gaskets and orange O-rings)	2	186003522
SPE Vacuum Pump 115 V, 60 Hz	1	725000417
SPE Vacuum Pump 240 V, 50 Hz	1	725000418

For more information, visit www.waters.com/pepkit or contact your local Waters sales office.

Spare Parts

COLUMN AND CARTRIDGE FITTINGS

Ordering Information

ACQUITY UPLC Column In-line Filter Unit

Description	P/N
In-line Filter Holder and 6/pk 0.2 µm Stainless Steel Replacement Filters	205000343
Five 0.2 µm Stainless Steel Replacement Filters and End Nuts for 205000343	700002775

PEEK TUBING AND FITTINGS

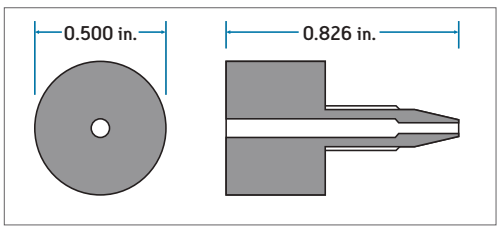
PEEK One-Piece Fingertight Fitting, 1/16-inch, 10–32 Thread

For the most demanding applications, we recommend the high-performance fingertight HPLC fitting. Nut and ferrule are made from a single piece of PEEK, which helps the fitting remain leak-tight at pressures as high as 6000 psi (420 bar). With the knurled head of the nut increased in diameter, to facilitate tightening without tools, it's nonetheless a genuine fingertight.

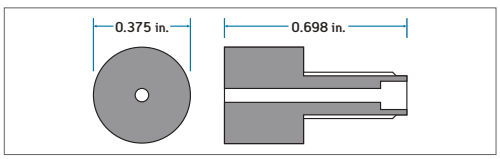
Ordering Information

Description	P/N
PEEK Fingertight One-piece Fitting	186008714

PEEK Fingertight One-Piece Fitting



PEEK Fingertight Two-Piece Nut



Rely on Genuine Waters Quality Parts

Waters knows how to run chromatography and LC-MS laboratories at peak performance. Our instruments, software, chemistries, and services provide you the tools for success.

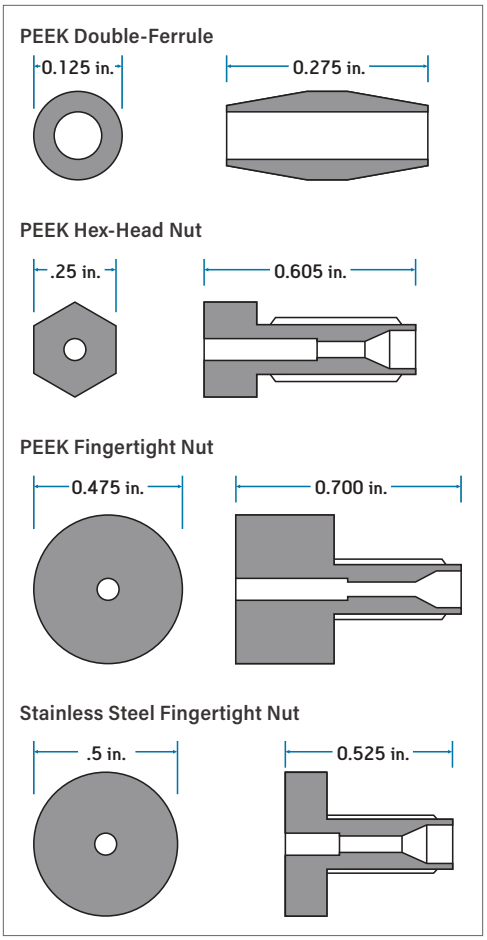
Only Waters Quality Parts™ are tested and certified for ensuring optimal performance of Waters systems. Fitting our component parts to your instruments instills confidence that they will operate in a dependable, invariable manner over time; that results will be accurate, precise, and reproducible; and that systems will remain compliant.

PEEK Fittings with Double Ferrules, 1/16-inch, 10–32 Thread

Double-ferrule fittings made of PEEK grip tubing in two places. The ferrules provide twice the holding power of single-ferrule fittings. They are ideal for use with PEEK and Tefzel tubing, which often slip when used with single-ferrule fittings. When used with stainless steel or titanium tubing, double-ferrule fittings grip tighter, creating a highly reliable connection that performs flawlessly at high pressures.

We offer both fingertight and hex-head nuts for use with double-ferrules. The fingertight version can be hand-tightened for operating pressures as high as 6000 psi. Use the hex-head version for connections that are difficult to reach or closely spaced.

These fittings fit virtually any female 1/16-inch fitting, including Parker, Swagelok, Waters, Valco, Rheodyne, UPChurch, etc.—all with 10–32 threads.



Ordering Information

Description	P/N
PEEK Double-ferrule	PSL613302
PEEK Hex-head Nut	PSL613324
PEEK Fingertight Nut	PSL613301
Stainless Steel Fingertight Nut	PSL613325

PTFE/ETFE Tubing and Fittings

O.D. Inches (mm)	I.D. Inches (mm)	Length/Material	P/N
0.125 (3.2)	0.062 (1.57)	25 ft. (7.6 m), PTFE	WAT026808
0.149 (3.8)	0.119 (30.0)	25 ft. (7.6 m), PTFE	WAT026809
0.250 (6.3)	0.190 (4.8)	10 ft. (3 m), PTFE	WAT026810
0.080 (2.0)	0.058 (1.5)	25 ft. (7.6 m), PTFE	WAT026974
0.178 (4.52)	0.148 (3.76)	25 ft. (7.6 m), PTFE	WAT051041
0.149 (3.8)	0.119 (30.0)	20 ft. (6 m), PTFE	WAT051052
0.125 (3.2)	0.020 (0.508)	10 ft. (3 m), PTFE	WAT088430
0.125 (3.2)	0.009 (0.228)	10 ft. (3 m), PTFE	WAT088431
0.125 (3.2)	0.040 (1.0)	10 ft. (3 m) , PTFE	WAT088432
0.062 (1.57)	0.009 (0.228)	36 in. (1 m), ETFE	WAT088561
0.062 (1.57)	0.040 (1.0)	36 in. (1 m), PTFE	WAT088563
PTFE Adapter, 0.125 (3.2) to 0.065 (1.6), 5/pk			WAT005137

Stainless Steel Tubing and Fittings

O.D. Inches (mm)	I.D. Inches (mm)	Length/Material	P/N
0.0625 (1.6)	0.005 (0.127)	10 ft. (3 m), SS	WAT241039
0.0625 (1.6)	0.020 (0.508)	10 ft. (3 m), SS	WAT026804
0.0625 (1.6)	0.030 (0.762)	10 ft. (3 m), SS	430000366
0.0625 (1.6)	0.040 (1.020)	10 ft. (3 m), SS	WAT026805
0.125 (3.2)	0.062 (1.57)	10 ft. (3 m), SS	WAT026806
0.125 (3.2)	0.093 (2.36)	10 ft. (3 m), SS	WAT026807
0.0625 (1.6)	0.009 (0.228)	10 ft. (3 m), SS	WAT026973
0.0625 in. O.D. Stainless Steel Tubing Cutter with 3 Blades			WAT022384
Replacement Blades for WAT022384, 3/pk			WAT022385

PEEK Tubing and Fittings

O.D. Inches (mm)	I.D. Inches (mm)	Length/Material	P/N
0.0625 (1.6)	0.005 (0.127)	5 ft. (1.5 m), PEEK	WAT022995
0.0625 (1.6)	0.010 (0.254)	5 ft. (1.5 m), PEEK	WAT022996
0.0625 (1.6)	0.015 (0.381)	5 ft. (1.5 m), PEEK	WAT022997
0.0625 (1.6)	0.020 (0.508)	5 ft. (1.5 m), PEEK	WAT022998
PEEK Tubing Cutter			WAT031795
PEEK Tubing and Fitting Kit			WAT022999
PEEK Union, 0.0625 in.			WAT026-04

Compression Screws and Ferrules

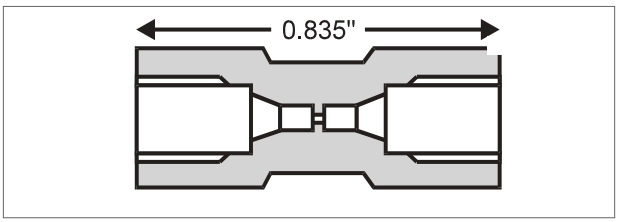
Description	P/N
Ferrule, 01, Stainless Steel, 10/pk	WAT005063
Compression Screw, 0.0625 in., 10/pk	WAT005070
Compression Fitting Plug, Stainless Steel, 5/pk	WAT005079
Rheodyne Ferrule, 10/pk	WAT007020
Ferrule, Stainless Steel	WAT022330
Ferrule, 1/16 in. O.D., PEEK	WAT021817
Compression Screw, Stainless Steel	WAT025313
Compression Fitting Plug, Stainless Steel	WAT025566
Compression Screws and Ferrules, 0.166 in., 5/pk	WAT025604
Compression Screws, 0.125 in., PEEK, 2/pk	WAT046-12
Compression Screw, Long, 1/16 in.	WAT021812
Compression Screw, Short, PEEK 1/16 in.	WAT021815
Extra Long Compression Screw, Stainless Steel, 10/pk	WAT060051
Finger Tight Poly Knob Used with Compression Screws Plus PEEK Ferrules	WAT021816
Tee, 0.0625 in. Compression Screw, Stainless Steel	WAT075215
Tubing Cap, Hex Stainless Steel	WAT084078
Union, 0.0625 in. Stainless Steel	WAT097332

PEEK Unions, Tees, and Crosses

Inert and biocompatible PEEK unions can withstand operating pressures as high as 6000 psi (420 bar). PEEK tees and crosses can withstand pressures as high as 10,000 psi (690 bar).

PEEK unions, tees, and crosses share these features:

- Connect any 1/16-inch tubing (PEEK, stainless steel, titanium, or Tefzel)
- Low dead volume
- 10–32 thread

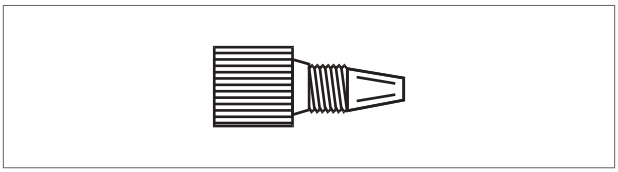


Ordering Information

Description	P/N
PEEK Union with 2 PEEK Fingertight Nuts and Double Ferrules 1/16 in.	PSL613312
PEEK Union without Nuts and Ferrules 1/16 in.	PSL613313
PEEK TEE with One-piece Fingertight Fitting	PSL613317
PEEK CROSS with One-piece Fingertight Fitting	PSL613319
PEEK TEE without Fittings	PSL613318
PEEK CROSS without Fittings	PSL613320
PEEK One-piece Fingertight Fitting	186008714

Handilok CTFE Fittings

Handilok fittings can replace, without the need for tools, conventional compression fittings used with 1/16-inch tubing. Compatible with all internal fittings with a 10–32 thread, these fittings meet rigid high-pressure requirements, withstanding pressures greater than 4000 psi (280 bar).



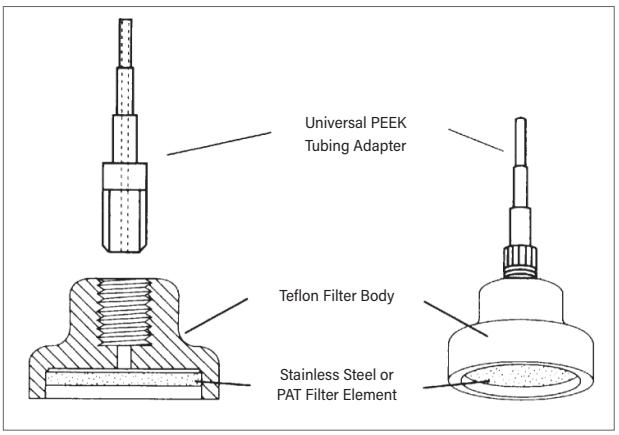
Ordering Information

Handilok Fittings	P/N
1/16 in. Fitting, 1/pk	PSL618021
1/16 in. Fitting, 10/pk	PSL618022

FILTERS

Last Drop Mobile Phase Filters

The Last Drop mobile-phase filter incorporates a flat filter element set parallel to the bottom of a reservoir. This design allows the filter to draw all but the last 2% of mobile phase from the reservoir without drawing air into the system. Last Drop filters are available with 316 L stainless steel or PAT (PEEK alloyed with Teflon) filter elements in inert Teflon housings. The top of the housing incorporates a PEEK tripod that fits into pump inlet lines with inner diameters of 1.5, 2.2, or 3.5 mm.

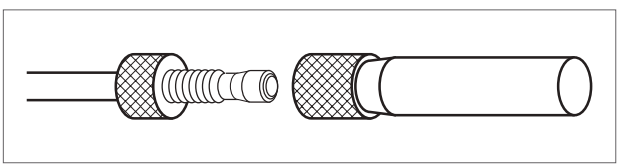


Ordering Information

Description	P/N
Filter with 2 µm Stainless Steel Filter	PSL901290

PEEK Biocompatible Mobile Phase Filter

The PEEK Biocompatible Mobile Phase Filter protects an HPLC pumping system against particulate matter in a mobile phase. Many macromolecules are fairly labile and require not only biocompatible chromatographs but also mobile-phase filters that are absolutely inert. These filters are designed from inert polymeric components, which effectively eliminate metal from the fluid path. With a porosity of 5 µm, all fittings (including the inlet tube) are composed of perfectly inert PEEK.



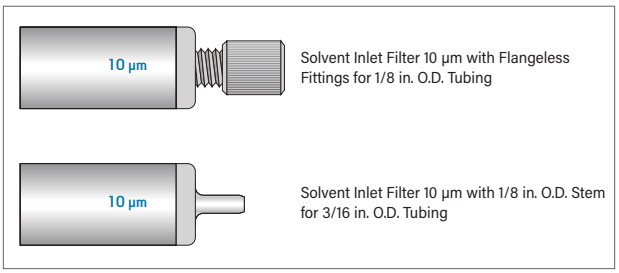
Ordering Information

Description	P/N
Biocompatible Mobile Phase Filter	PSL901282

Solvent Inlet Filters

It's good practice to always filter solvents, to avoid damaging the pump. Solvent inlet filters, with a porosity of 10 µm, provide the necessary pump protection, and their large surface area ensures long life without pump cavitation.

Filters should be changed periodically, depending on usage and mobile phase. Replacing the filter is easy; no tools are needed. The unique Plastictight male nut is screwed into the filter and tightened by hand. Finger tightening is sufficient; the Plastictight fitting holds without flanging.

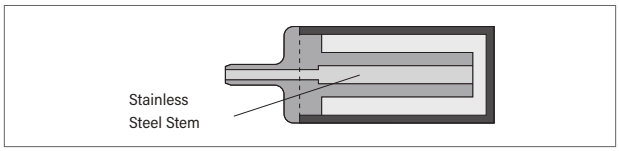


Ordering Information

Description	P/N
Solvent Inlet Filter Kits	
Assy, Solvent Filter	WAT025531
Plastictight Fitting with Teflon Tubing 1/16 in. I.D. × 1/8 in. O.D. × 3 ft.	PSL613602
Replacement Filter 10 µm, 5/pk	PSL613604
Solvent Inlet Filters for General Use	
Solvent Inlet Filter 10 µm with 1/16 in. O.D. Stem for 1/8 in. O.D. Tubing	PSL613570
Solvent Inlet Filter 10 µm with Flangeless Fittings for 1/8 in. O.D. Tubing	PSL613578
Solvent Inlet Filters for Preparative HPLC	
Solvent Inlet Filter 10 µm with 1/16 in. O.D. Stem for 1/8 in. O.D. Tubing	PSL613607
Solvent Inlet Filter 10 µm with Flangeless Fittings for 1/8 in. O.D. Tubing	PSL613608
Solvent Inlet Filters for Waters HPLC Systems	
Solvent Inlet Filter 10 µm with 1/8 in. O.D. Stem for 3/16 in. O.D. Tubing	PSL613609

Bottom-of-the-Bottle Solvent Filters

Our Bottom-of-the Bottle Solvent Filter is designed after the original Bottom-of-the-Bottle replaceable filters. This unique filter is fitted with a stainless steel stem on top, to accommodate 1/16-inch (I.D.) tubing. A lower stem, which goes directly into the filter, reaches to within 0.06 inches of the Bottom-of-the-Bottle filters. The 10 µm filter can easily accommodate flow rates as high as 10 mL/min.



Ordering Information

Description	P/N
Stainless Steel Filter Assembly	PSL613457

SelectScience® TRUSTED REVIEWS

APPLICATION AREA: Steroid Analysis

"The Oasis prime product line is an awesome solid phase extraction product line. The ease of use and the variety in the product line has made methods development a breeze. The micro elution plates have reduced the loss in evaporation steps that we had experienced in the past."

REVIEWER: Jermaine Ford

ORGANIZATION: US EPA

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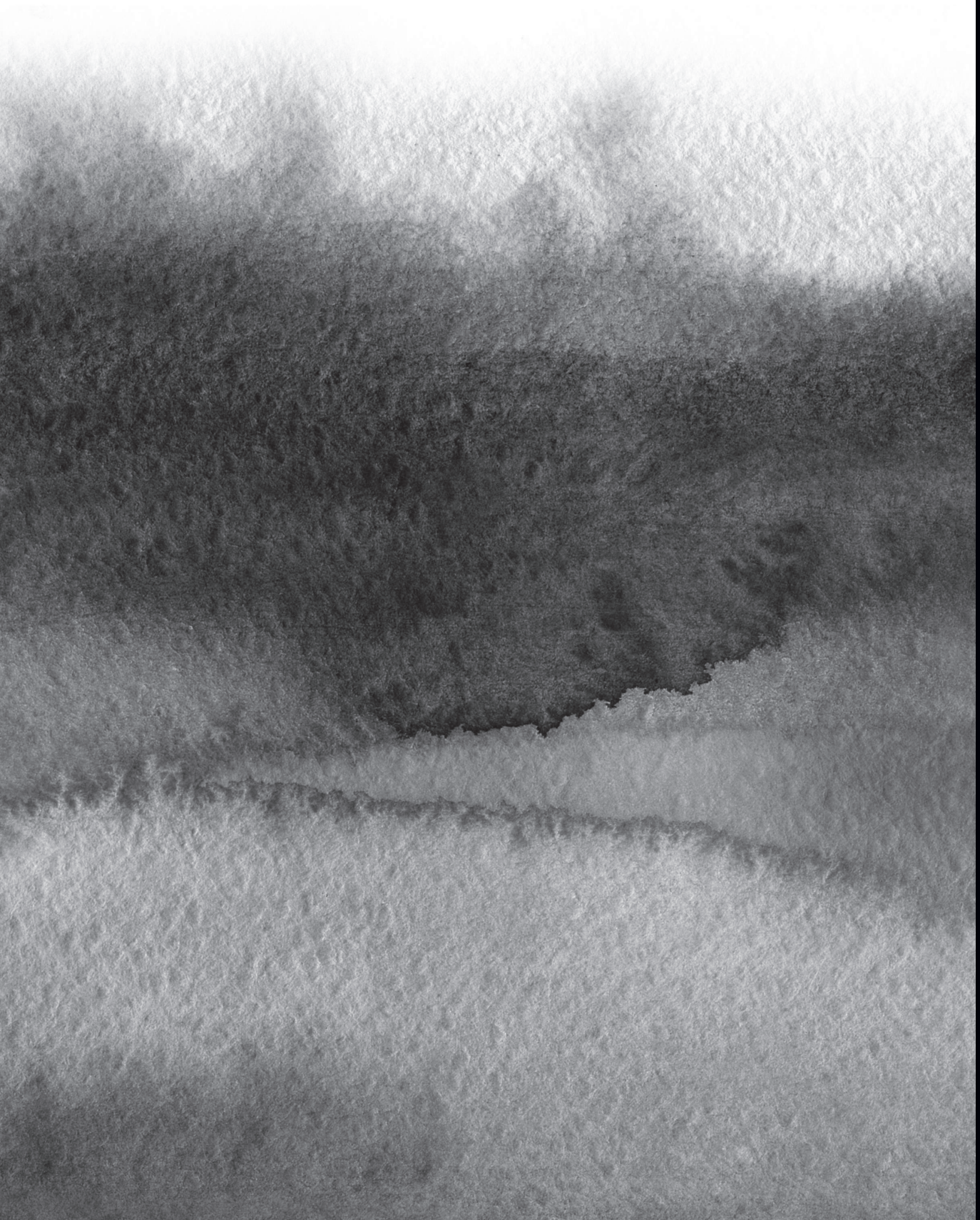

Contents

Alphabetical Index

A

B

C

Q

R

S

T

U

V

W

X

Part Number Index

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