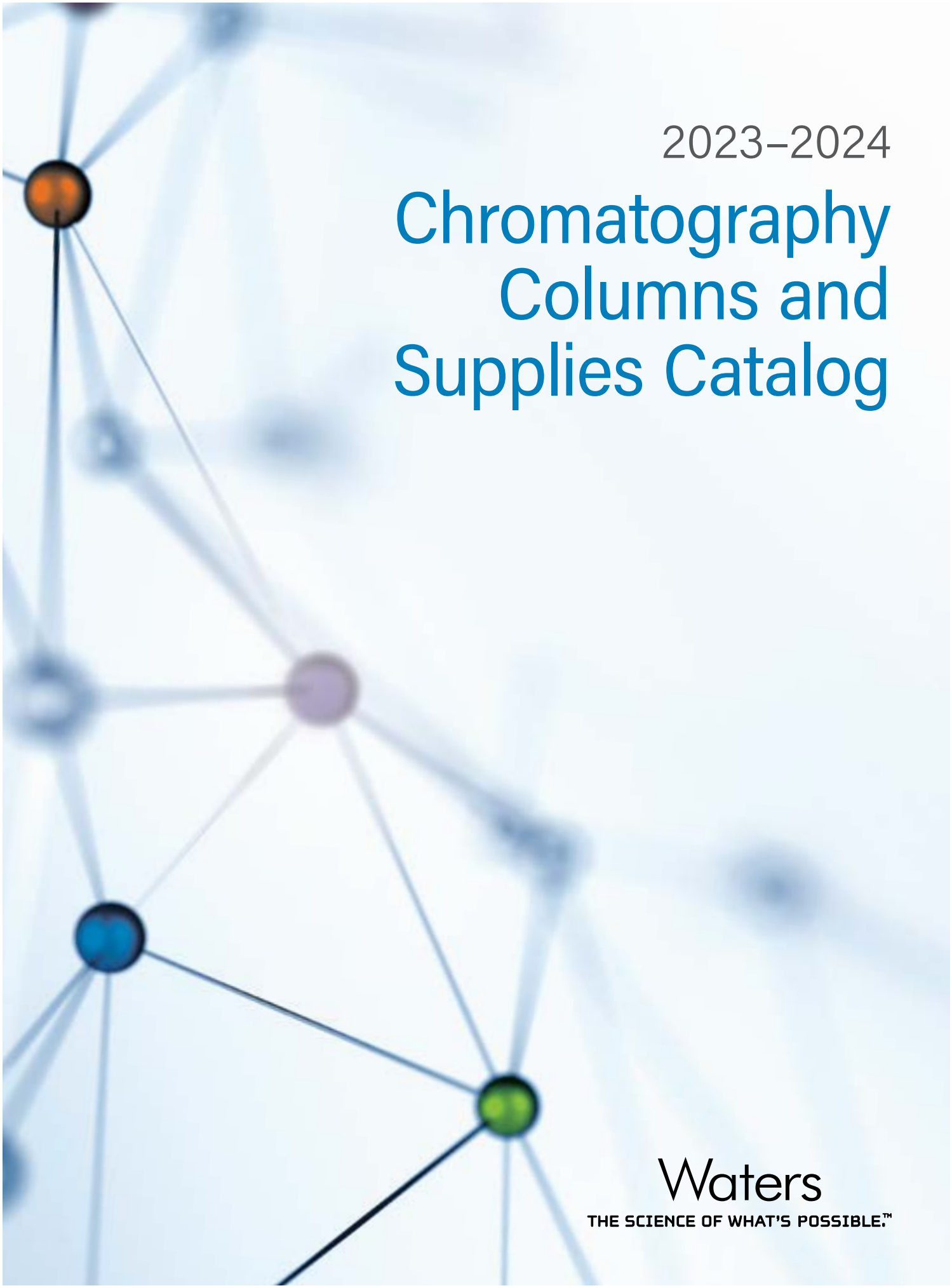


2023–2024

Chromatography Columns and Supplies Catalog

Waters

THE SCIENCE OF WHAT'S POSSIBLE.™

Table of Contents

04 Sample Preparation

51 Sample Vials and Accessories

83 How to Choose a Column

93 MaxPeak Premier Columns

105 Sub-2-µm UPLC Columns

129 2.x µm UHPLC Columns

179 ≥3 µm Analytical HPLC Columns

247 ≥5 µm Preparative HPLC Columns

309 SFC Analytical and Preparative Columns

323 Biomolecule Purification, Characterization, and Analysis

453 Size-Exclusion Chromatography Columns and Standards

481 Nano- and Micro-Flow LC-MS

493 Application-Specific Columns, Kits and Spare Parts

529 Waters Quality Parts and Supplies

585 Indices

457 Alphabetical Index

463 Part Number Index

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.

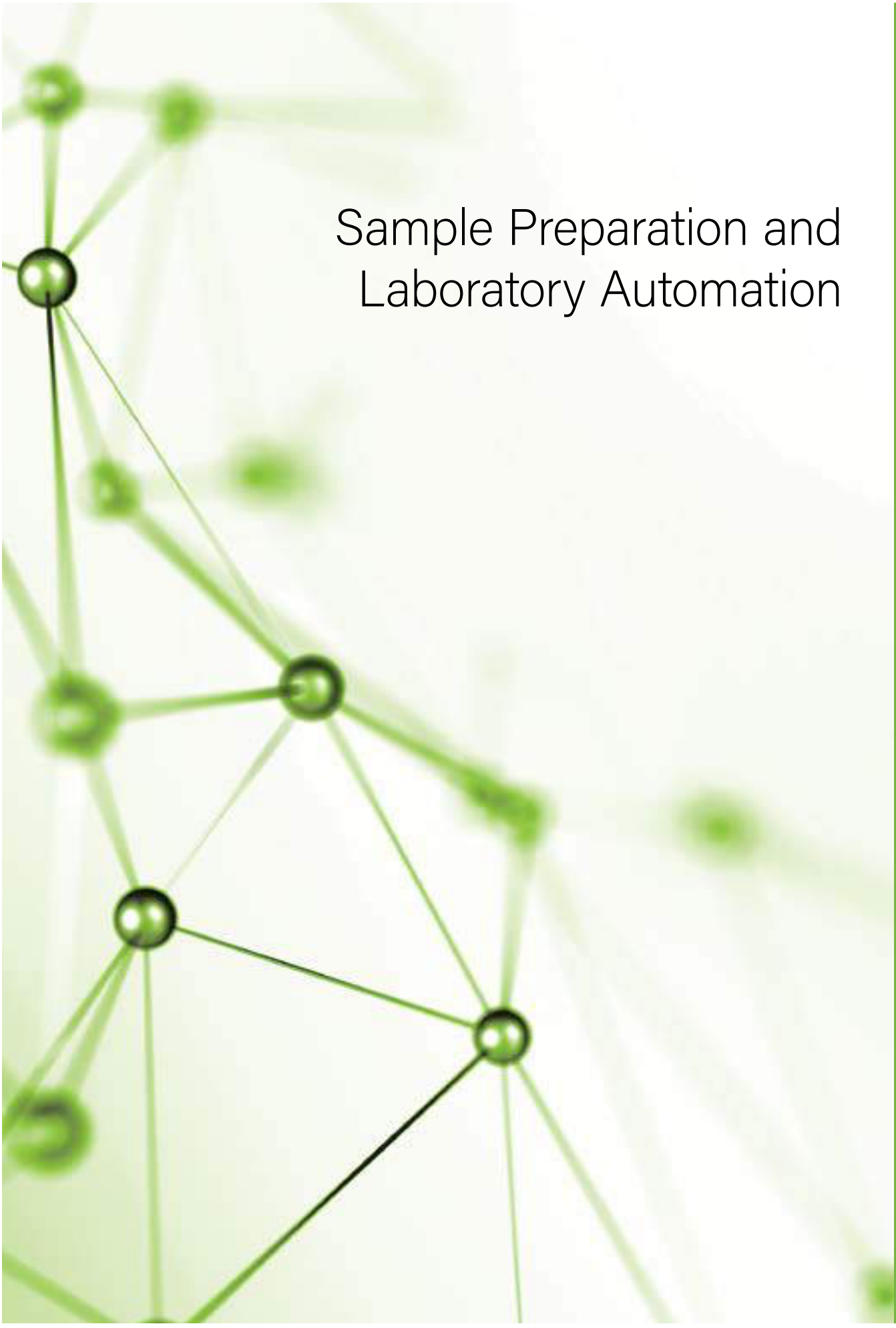
Dr. Udit Batra
President and Chief Executive Officer
Waters Corporation

Waters
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Eliminate Doubt in Your Chromatography with Quality Products, Robust Supply Chain, and Personalized Support

October 2022. 720007439, v01.



Sample Preparation and Laboratory Automation

Sample Preparation and Laboratory Automation

Sample Preparation and Laboratory Automation

Contents

Goals of Sample Preparation 5

Benefits of Solid-Phase Extraction 5

Selecting the Correct SPE Format 6

Oasis Solid-Phase Extraction (SPE) Products 8

- A Breakthrough in SPE 9
- Oasis PRiME HLB 12
- Oasis PRiME MCX 13
- Oasis MCX for Basic Compounds 14
- Oasis MAX for Acidic Compounds 15
- Oasis WCX for Strong Basic Compounds 15
- Oasis WAX for Strong Acidic Compounds 16
- Oasis Sorbent Selection Tools for Convenient Method Development 16
- XBridge OSM Cartridges 18
- SPE Columns for Waters UPLC with On-Line SPE Technology 18
- Oasis Glass Cartridges for PPT Detection Levels 18

Ostro Pass-Through Sample Preparation Product 19

Sep-Pak Solid-Phase Extraction (SPE) Products 20

- Anatomy of Sep-Pak Cartridges 26
- General Extraction Protocols for Sep-Pak Cartridges 27

Certified Sep-Pak Solid-Phase Extraction (SPE) Cartridges 31

- Certified Sep-Pak Sorbent Selection Guide 32

PoraPak Rxn Cartridges for Post-Synthesis Cleanup 34

Vacuum Manifold and Accessories 35

- Vacuum Manifold for Use with SPE Cartridges 35
- Sep-Pak Cartridge Connections Kit 36
- Sep-Pak Cartridge Accessories 36

DisQuE Sample Preparation Solutions for QuEChERS 37

- DisQuE Kitted Solutions 37
- DisQuE Extraction and Cleanup Tubes and Pouches 38

Waters/Pall Life Sciences Sample and Solvent Filtration Products 39

- Filter Design and Membrane Choices 40
- Solvent Filtration Apparatus 43

Liquid Handling Automations 44

- Andrew+ Pipetting Robot 44
- Pipette+ System 46
- OneLab+ Software 48

Sample Processing Devices and Accessories 49

- Otto SPEcialist 49

Sample Preparation

Goals of Sample Preparation

Successful sample preparation for most analytical techniques (HPLC, UPLC™, LC-MS, UV, GC, etc.) has three primary objectives. 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 make it easy to produce samples that are free of matrix interferences, leading to more robust and predicable analytical results. Based on simple, logical workflows that produce cleaner samples through targeted 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 ensure 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 and reproducible 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

Need more help getting started with solid phase extraction?

- Download our Oasis Reference Cards
- Download our Oasis Peptide Bioanalysis Reference Cards





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!"

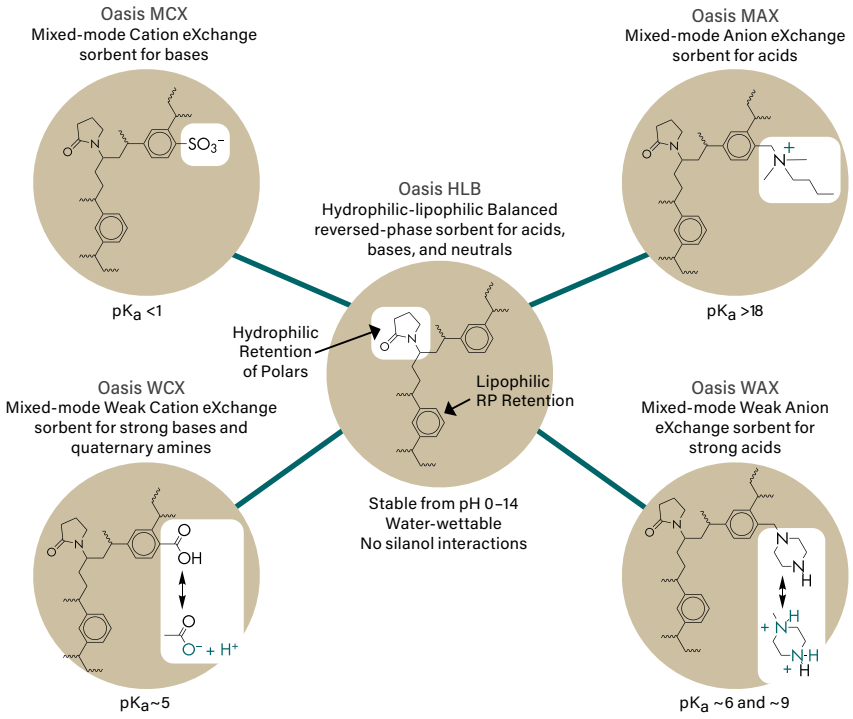
REVIEWER: David Patlak
ORGANIZATION: Vermont Forensic Laboratory

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 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.

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.

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. Oasis PRiME HLB and MCX have application patents pending.

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
Load sample	**Load sample**	**Oasis 2 × 4 Strategy: Only two protocols and four sorbents to analyze all types of compounds: acids, bases, and neutrals**
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			
For Weak Bases pK_a 2–10: Use Oasis MCX	For Strong Acids pK_a <1: Use Oasis WAX	For Weak Acids pK_a 2–8: Use Oasis MAX	For Strong Bases pK_a >10: 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

For an additional level of phospholipid clean-up for basic analytes, Oasis PRiME MCX is recommended.
See more details on page 13.

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.

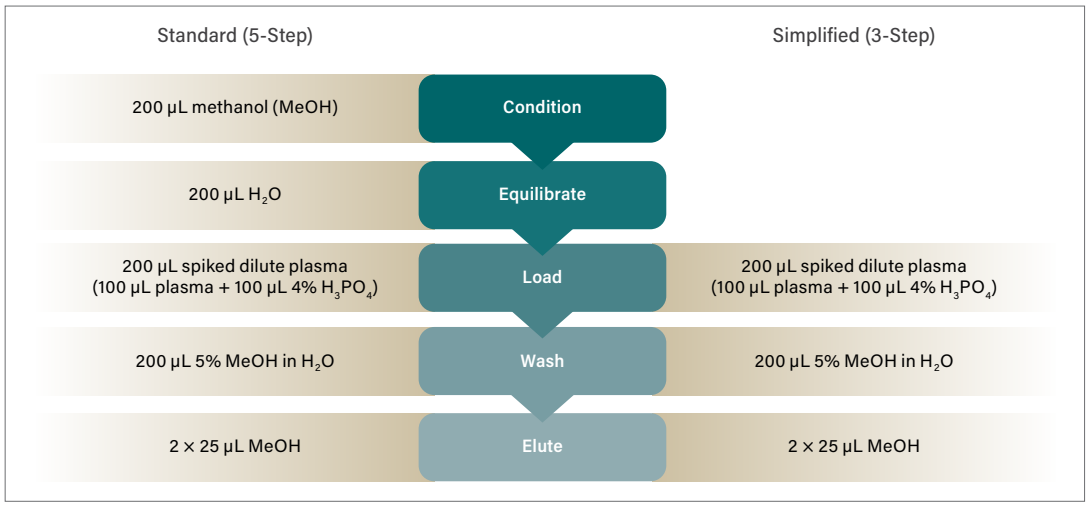
The ability to simplify and shorten SPE protocols is due to the unique water-wettable, balanced nature of the hydrophilic/lipophilic Oasis sorbent.



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



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

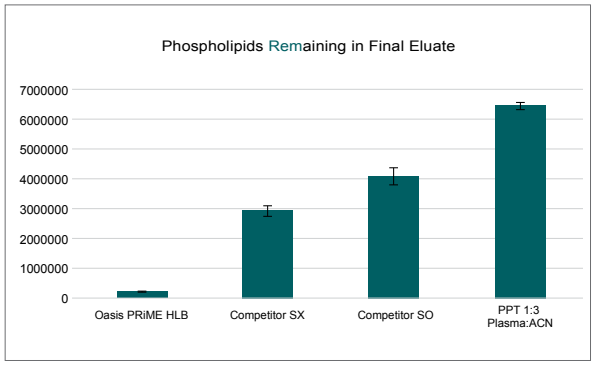
Simpler: Easy, efficient protocols

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.

ProtocolPhospholipids Remaining in Final Eluate

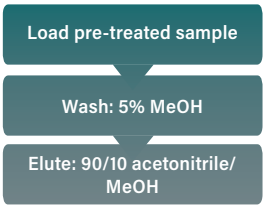


Fewer phospholipids remain in the final sample eluate with the Oasis PRiME HLB sorbent and 3-step protocol, compared to the final eluates using traditional 5-step protocol on the competitors' sorbents or protein precipitation (PPT). This removal is also more reproducible with Oasis PRiME HLB as indicated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

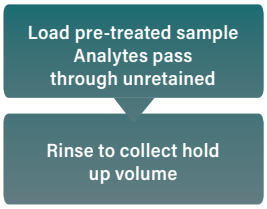
Choose the sample preparation method that meets your analytical needs.

3-Step Cleanup (Catch and Release)



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)



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 $pK_a \geq 4.5$. 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
- Compatibility with high throughput
- 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.

DID YOU KNOW...

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

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

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.

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

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

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

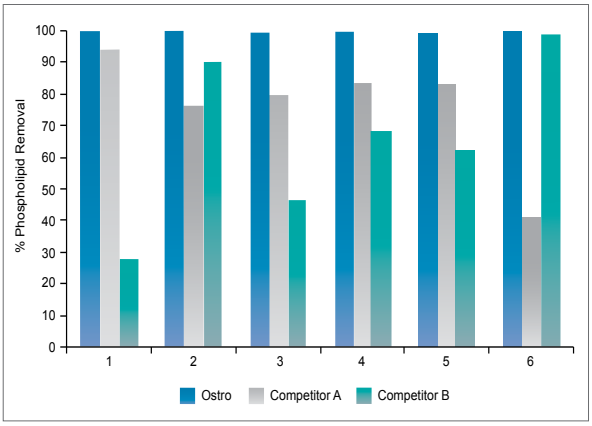
Ostro Pass-Through Sample Preparation Product

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

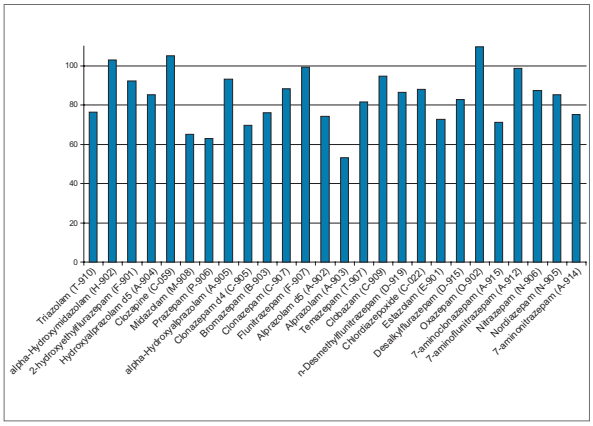


Reproducibility



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™ 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 in both Vac syringes and Plus format devices
- 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
- Potassium Carbonate–for synthesis of radiopharmaceuticals

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 $MgO•SiO_2$	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 waterand food ▪ EPA Method 537	▪ Particle size: 80 µm ▪ Quantity:200 mg and 500 mg in Vac syringes, 300 mg in Plus short cartridges ▪ pH range 0–14
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 ▪ EPA Methods 522 and 541	▪ Particle size: 85 µm ▪ Quantity: 400 mg/ cartridge ▪ pH range 1–12
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 Potassium Carbonate K_2CO_3	Potassium carbonate has been used as a mild base. When reacting with strong acids, it will produce salts, water, and carbon dioxide gas due to the carbonate breakdown.	▪ Synthesis of radiopharmaceuticals	▪ Quantity: 2 g of sorbent in Plus long cartridge

Ordering Information

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	–
Potassium Carbonate (K_2CO_3)	–	186009005** 2 g	–	–	–	–	–	–

*Hold-up volume.
**Only in Plus Long cartridge, 100/box*

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
Potassium Carbonate (K_2CO_3)	–	–	–	–	–	–	–	–

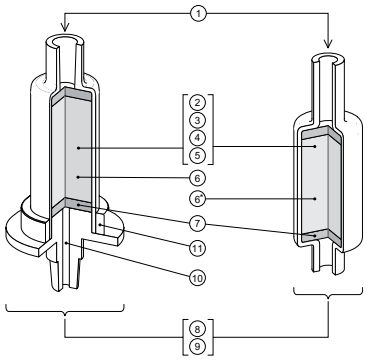
*Hold-up volume.

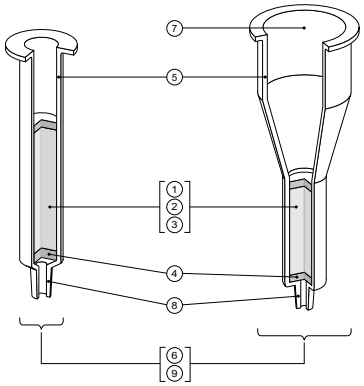
Sep-Pak 96-well µElution Plate

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



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

12. 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.
13. Broad range of sorbent surface activities available; each lot is tested under rigid specifications for chromatographic activity, retention, and selectivity.
14. Weight of sorbent in each cartridge is controlled within +/- 5% of specification to assure reproducible performance.
15. Special blend of HD and UHMW polyethylenes used for 20 µm frits.
16. Molded, medical-grade, polypropylene body.
17. Cartridges are sealed in a special polyfoil pouch to protect product integrity, sorbent activity, and purity.
18. Integral reservoir approximately 20 mL, robotic compatible.
19. Outlet make Luer tip.
20. 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)

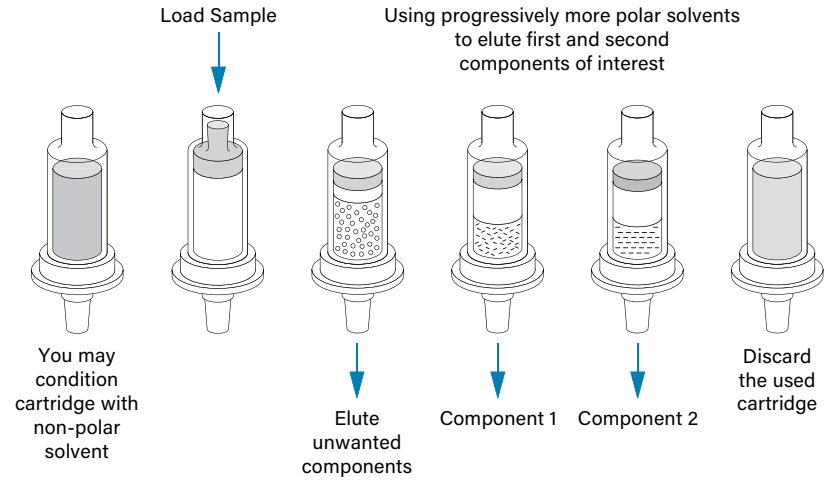
1. Load sample.
2. Use progressively more polar solvents to elute first and second components of interest.
3. You may condition cartridge with non-polar solvent.
4. Elute unwanted components.
5. Elute first component of interest (Component 1).
6. Elute second component of interest (Component 2).
7. Discard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

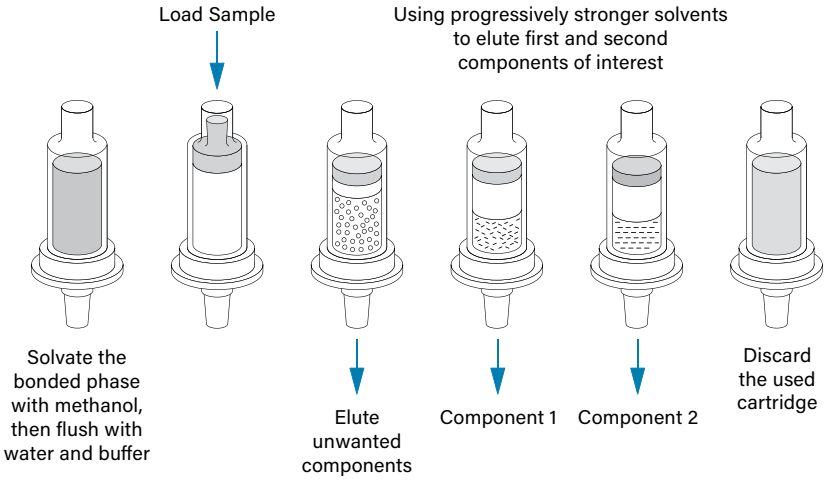
General Elution Protocol for Reversed-Phase Chromatography on Sep-Pak Cartridges (C_{18}, CN)

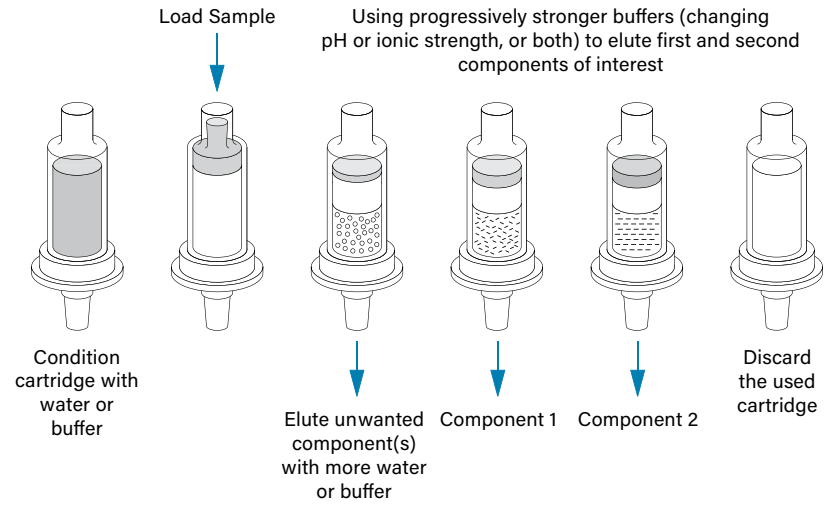
1. Load sample.
2. Use progressively stronger solvents to elute first and second components of interest.
3. Solvate the bonded phase with methanol, then flush with water and buffer.
4. Elute unwanted components.
5. Elute first component of interest (Component 1).
6. Elute second component of interest (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
Sep-Pak PS2	6 cc Vac syringe 500 mg sorbent weight, 30/pk	00/box	WAT200610
Sep-Pak AC2	Plus Short cartridge, 400 mg sorbent per cartridge, 50/pk	00/box	JJAN20229

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:

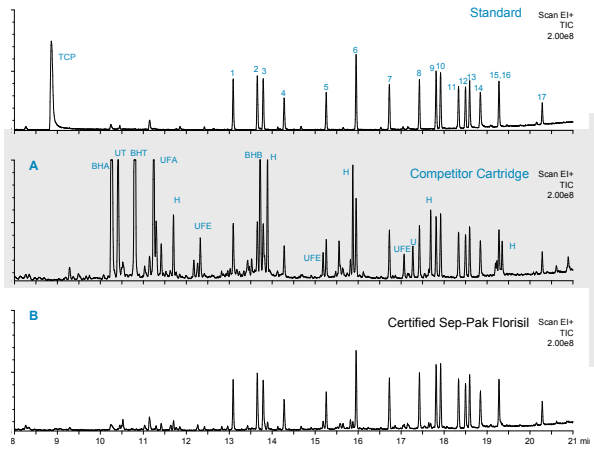
- Contaminants including hydrocarbons and other environmental contaminants
- Sorbent functionality including:
  - ligand density
  - particle size distribution
  - surface activity
- Chromatographic performance

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™ Rxn 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

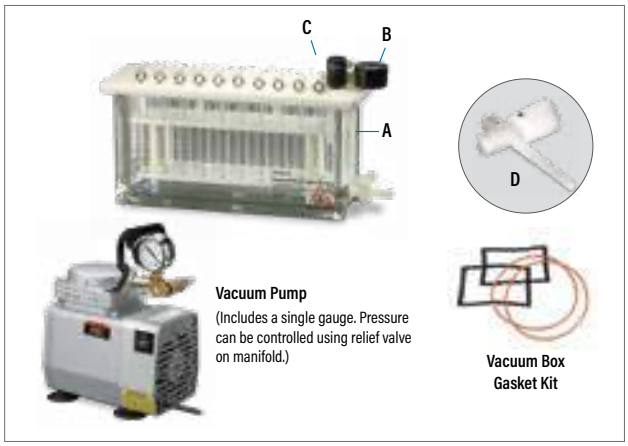
PoraPak Rxn Cartridges and Bulk Material

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

Vacuum Manifold and 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.

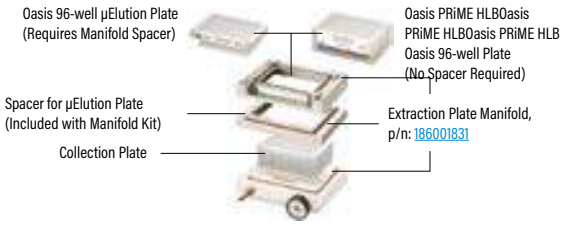
D. High-purity, polypropylene needle valves and needle tips with minimum dead volume (opening and closing the valves is required to prevent silica-based SPE cartridges from drying out).

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, Vac, and Classic Cartridges)	48/pk	WAT011390
Reservoir, 60 cc (for Plus, 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

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.

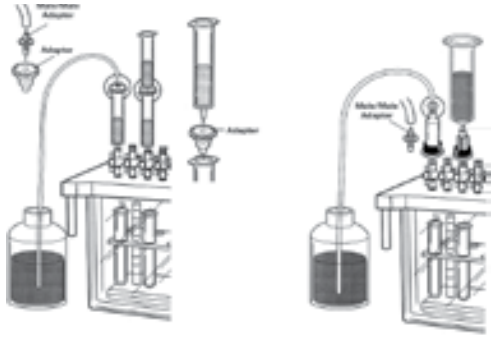


Ordering Information

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 and Vac Cartridges)	48/pk	WAT011390
Reservoir, 60 cc (for Plus 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	186009083

DisQuE Sample Preparation Solutions for QuEChERS

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.

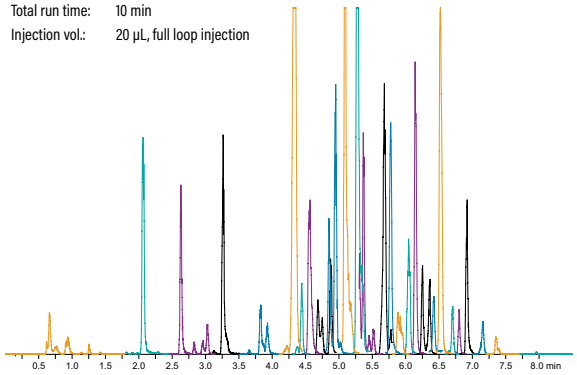
402 Pesticide Residues at 10 ppb ng/g In One 10-Minute Run

UPLC Conditions		MS Conditions	
System:	ACQUITY UPLC Column: ACQUITY UPLC BEH C_{18}, 1.7 µm, 2.1 × 100 mm (p/n: 186002352)	System:	ACQUITY TQ Detector
		Ionization mode:	ESI positive polarity
		Capillary voltage:	1 kV
Column temp.:	40 °C	Desolvation gas:	Nitrogen, 800 L/Hr, 400 °C
Sample temp.:	4 °C	Cone gas:	Nitrogen, 5 L/Hr
Flow rate:	0.450 mL/min	Source temp.:	120 °C
Mobile phase A:	98:2 water: methanol + 0.1% formic acid	Acquisition:	Multiple Reaction Monitoring (MRM)
Mobile phase B:	Methanol + 0.1% formic acid	Collision gas:	Argon at 3.5 mBar

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



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



Bulk Sorbents

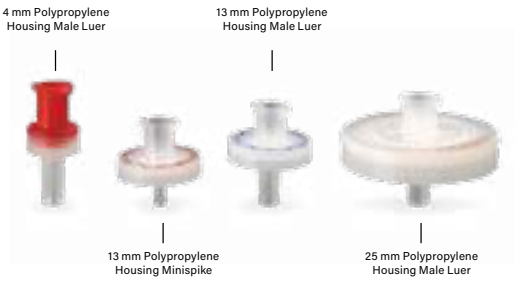
Description	P/N
Graphitized Carbon Black, 25 g Bottle	186004835
C_{18}, 100 g Bottle	WAT035672

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.



Literature References

Title	Literature Code
The First LC-MS Certified Filter with Extremely Low Levels of Extractables	720007168EN
Acrodisc wwPTFE Syringe Filters Versus Syringe Filters with Hydrophilic Polypropylene (GHP) Membranes White Paper	720007171EN

Choosing the Right Filter for Your Application

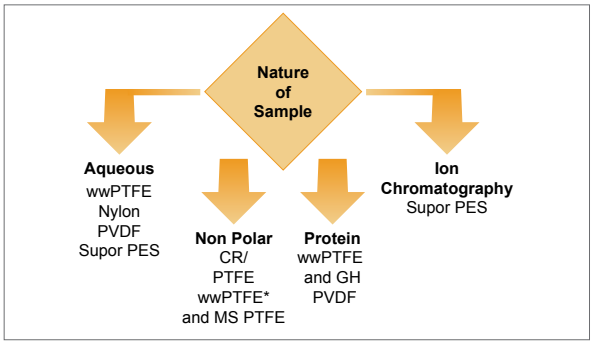
To choose the right filter, you need to consider sample characteristics, volume, pore size; and decide if the sample may require prefiltration because it is laden with particulate matter.

Membrane Choices

- **Acrodisc MS wwPTFE Syringe Filters:** Designed specifically to extend the lifespan of LC columns used for LC-MS analyses without adding significant extractables and with minimal analyte adsorption. These filters are constructed with a water-wettable polytetrafluoroethylene (wwPTFE) membrane in high density polyethylene (HDPE) housings.
- **wwPTFE Acrodiscs:** Water wettable, hydrophillic, polytetrafluoroethylene membranes are a "next generation", all-purpose, hydrophilic membrane for aqueous, acidic, basic, non-aggressive organic, and aggressive organic solutions. It offers low protein binding and low levels of UV-absorbing extractables.
- **Nylon Acrodiscs:** This hydrophilic membrane works well with both aqueous and organic solvents. Nylon is particularly suitable for high-pH samples but should be avoided in any protein recovery applications.
- **wwPTFE 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 (GF) Acrodiscs:** Can be used alone or as a prefilter with another Acrodisc in series
- **Acrodisc PVDF (LC):** Hydrophilic polyvinylidene fluoride (PVDF) membranes good for aqueous and organic solvents
- **Acrodisc PTFE (CR):** Hydrophobic, polytetrafluoroethylene (PTFE) membranes are recommended for use with non-aqueous solvents. Organic-based, highly acidic or basic samples and solvents
- **Supor PES (IC) Filters for Ion Chromatography:** Polyethersulfone (PES) IC filters are certified to contain low ionic backgrounds for ion chromatography

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 wwPTFE 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	13 mm or 25 mm

Choice: Membrane 0.45 µm wwPTFE Acrodisc in 4 mm or larger. You can also use the Nylon, PVDF or Supor 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

		PVDF (LC) Membrane	Glass Fiber Media	Nylon Membrane	Supor PES (IC) Membrane	RPTFE (CR) Membrane	wwPTFE Membrane
	Media Materials						
ACIDS	Acetic acid, glacial	R	R	N	R	R	R
	Acetic acid, 90%	R	R	N	R	R	R
	Acetic acid, 30%	R	R	L	R	R	R
	Acetic acid, 10%	R	R	R	R	R	R
	Hydrochloric acid, conc. (35%)	R	R	R	R	R	R
	Hydrochloric acid, 6 N (20%)	R	R	R	R	R	R
	Hydrochloric acid, 1 N (3.3%)	R	R	R	R	R	R
	Nitric acid, conc. (67%)	R	L	N	N	R	R
	Nitric acid, 6 N (27%)	R	—	L	—	R	R
	Sulfuric acid, conc. (96%)	N	R	N	N	R	R
	Sulfuric acid, 6 N (16%)	—	R	L	—	R	R
ALCOHOLS	Amyl alcohol	R	R	L	N	R	R
	Benzyl alcohol	R	N	N	N	R	R
	Butanol	R	R	L	R	R	R
	Ethanol	R	R	R	R	R	R
	Isopropanol	R	R	L	R	R	R
	Methanol	R	R	L	R	R	R
BASES	Ammonium hydroxide, 3 N (5.7%)	N	R	R	R	R	R
	Ammonium hydroxide, 6 N (11.4%)	N	R	L	R	R	R
	Potassium hydroxide, 3 N (15%)	N	N	R	R	R	R

FILTER DESIGN AND MEMBRANE CHOICES *Continued*

	Media Materials	PVDF (LC) Membrane	Glass Fiber Media	Nylon Membrane	Supor PES (IC) Membrane	PTFE (CR) Membrane	wwPTFE Membrane
BASES	Sodium hydroxide, 3 N (11%)	N	—	R	R	R	R
	Sodium hydroxide, 6 N (22%)	N	—	L	R	R	R
ESTERS	Amyl acetate	R	R	L	R	R	R
	Butyl acetate	R	R	R	R	R	R
	2-Ethoxyethyl acetate	L	R	—	R	R	R
	Ethyl acetate	R	R	R	N	R	R
	Isopropyl acetate	R	R	N	R	R	R
	Methyl acetate	R	R	N	N	R	R
ETHERS	Ethyl ether	R	R	N	R	R	R
	Tetrahydrofuran	N	L	R	N	R	R
	Tetrahydrofuran/water (50/50,v/v)	—	—	—	—	R	R
GLYCOLS	Ethylene glycol	R	R	R	R	R	R
	Glycerol	R	R	R	R	R	R
	Propylene glycol	R	R	—	R	R	R
AROMATIC HYDROCARBONS	Benzene	R	R	R	R	R	R
	Toluene	R	R	L	R	R	R
	Xylene	R	R	L	R	R	R
HALOGENATED HYDROCARBONS	Carbon tetrachloride	R	R	R	R	R	R
	Chloroform	R	R	R	N	R	R
	Ethylene dichloride	R	R	N	N	R	R
	Methylene chloride	R	R	R	N	R	R
	Tetrachloroethylene	R	R	L	R	R	R
KEYTONES	Acetone	N	R	L	N	R	R
	Cyclohexanone	L	R	R	N	R	R
	Methyl ethyl ketone (MEK)	N	R	L	N	R	R
	Methyl isobutyl ketone	N	R	L	R	R	R
OILS	Cottonseed	R	R	R	R	R	R
	Peanut	R	R	R	R	R	R
MISCELLANEOUS	Acetonitrile	R	R	—	R	R	R
	Dimethyl formamide (DMF)	N	R	N	N	R	R
	Dimethyl sulfoxide (DMSO)	N	R	—	N	R	R
	Formaldehyde, 37%	R	R	R	R	R	R
	Formaldehyde, 4%	R	R	R	R	R	R
	Hexane, dry	R	R	L	L	R	R
	Kerosene	R	R	L	R	R	R
	Pyridine	N	R	N	N	R	R
	18 Megohm water	R	R	R	R	R	R

Test Methods: The data presented in this chart is a compilation of testing by Pall Corporation with certain chemicals, manufacturer's data, or compatibility recommendations from the Compass Corrosion Guide by Kenneth M. Pruett. This data is intended to provide expected results when filtration devices are exposed to chemicals under static conditions for 48 hours at 25 °C (77 °F), unless otherwise noted. Membrane integrity for syringe filters was tested by bubble point.

This chart is intended only as a guide. Accuracy cannot be guaranteed. Users should verify chemical compatibility with a specific filter under actual use conditions. Because chemical compatibility is affected by many variables (including temperature, pressure, concentration, and purity), various chemical combinations prevent complete accuracy.

Caution: Alcohol residues that are allowed to dry on a filter may cause stress cracks. Pall Corporation recommends that filters used in alcohol processing should remain alcohol wet or should be flushed with copious quantities of water to remove residuals prior to drying and subsequent reuse.

R = Resistant: No significant change was observed in flow rate or bubble point of the membrane. No visible indication of chemical attack was detected.

N = Not Resistant: The membrane or housing is basically unstable and is not recommended for use.

L = Limited Resistance: Moderate changes in physical properties or dimensions of the membrane were observed. The filter may be suitable for short term, non-critical use. Hardware or housing may be suitable for short-term exposure at low pressures and ambient temperatures.

— = Insufficient Data: Information is not available. Trial testing is recommended.

Ordering Information

Syringe Filters

Acrodisc 4 mm							
Sample	**Membrane**	**P/N (50/pk)**	**P/N (100/pk)**	**P/N (1000/pk)**	**P/N (50/pk)**	**P/N (250/pk)**	**P/N (1000/pk)**
		Pore Size: 0.2 µm	**Pore Size: 0.2 µm**	**Pore Size: 0.2 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**
Organic / Non Polar	PTFE (CR)	–	–	–	–	WAT200508	–

Acrodisc 13 mm		P/N (50/pk)	P/N (100/pk)	P/N (1000/pk)	P/N (50/pk)	P/N (100/pk)	P/N (1000/pk)
		Pore Size: 0.2 µm	**Pore Size: 0.2 µm**	**Pore Size: 0.2 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**
Aqueous / Polar	Nylon	–	WAT200524	WAT200834	–	WAT200520	WAT200832
	PVDF (LC)	–	WAT200806	–	–	WAT200512	WAT200827
	wwPTFE	–	186009314	186009331	–	186009315	186009319
	wwPTFE GF	–	–	–	–	–	–
	MS wwPTFE	186009243	–	–	–	–	
Organic / Non Polar	PTFE (CR)	–	WAT200506	WAT200823	–	WAT200502	WAT200821
Ion Chromatography	PES (IC)	–	–	WAT200844	–	–	–

Acrodisc 13 mm Minispike		P/N (50/pk)	P/N (100/pk)	P/N (1000/pk)	P/N (50/pk)	P/N (100/pk)	P/N (1000/pk)
		Pore Size: 0.2 µm	**Pore Size: 0.2 µm**	**Pore Size: 0.2 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**
Aqueous / Polar	Nylon	–	WAT200562	WAT200835	–	WAT200564	WAT200836
	PVDF (LC)	–	WAT200804	WAT200838	–	WAT200560	WAT200828
Organic / Non Polar	PTFE (CR)	–	WAT200556	WAT200824	–	WAT200558	WAT200825
Ion Chromatography	PES (IC)	–	WAT200810	–	–	WAT200812	–

Acrodisc 25 mm		P/N (50/pk)	P/N (100/pk)	P/N (1000/pk)	P/N (50/pk)	P/N 100/pk)	P/N (1000/pk)
		Pore Size: 0.2 µm	**Pore Size: 0.2 µm**	**Pore Size: 0.2 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**
Aqueous / Polar	Nylon	WAT200522	–	WAT200833	WAT200518	–	WAT200831
	Nylon GF *	–	–	–	WAT200800	–	WAT200846
	PVDF (LC)	WAT200808	–	WAT200839	WAT200510	–	WAT200826
	wwPTFE	186009327	–	–	186009326	–	186009323
	wwPTFE GF *	–	–	–	186009329	–	186009328
	MS wwPTFE	186009244	–	–	–	–	
Organic / Non Polar	PTFE (CR)	WAT200504	–	WAT200822	WAT200500	–	WAT200820
Ion Chromatography	PES (IC)	–	–	–	–	–	WAT200843

Acrodisc 25 mm		P/N (50/pk)	P/N (1000/pk)
		Pore Size: 1 µm	**Pore Size: 1 µm**
Aqueous / Polar	Glass Filter	WAT200818	WAT200840

Also available are 20–45 µm polypropylene filters in 96-well plates, 1.5–1.7 mL per well: 54 per pack, p/n: 186002799

*wwPTFE GF and Nylon GF are glass fiber prefilters in combination with wwPTFE and Nylon filters for precipitate laden samples.

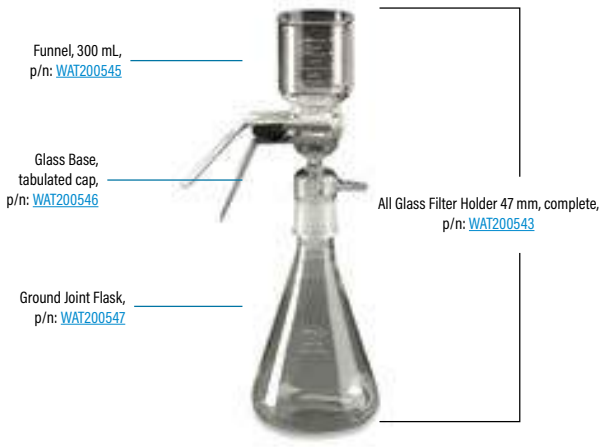
SOLVENT FILTRATION APPARATUS

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
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



Syringe Filters

Acrodisc 47 mm							
Sample	**Membrane**	**P/N (50/pk)**	**P/N (100/pk)**	**P/N (1000/pk)**	**P/N (50/pk)**	**P/N (100/pk)**	**P/N (1000/pk)**
		Pore Size: 0.2 µm	**Pore Size: 0.2 µm**	**Pore Size: 0.2 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**
Aqueous / Polar	Nylon	–	WAT200533	–	–	WAT200532	–
	PVDF (LC)	–	WAT200531	–	–	–	–
	wwPTFE	186009330	–	186009324	186009316	–	–
Organic / Non Polar	PTFE (CR)	–	WAT200535	–	–	WAT200534	–
Ion Chromatography	PES (IC)	–	WAT200539	–	–	WAT200538	–

Acrodisc 13 mm		P/N (50/pk)	P/N (100/pk)	P/N (1000/pk)	P/N (50/pk)	P/N (100/pk)	P/N (1000/pk)
		Pore Size: 0.2 µm	**Pore Size: 0.2 µm**	**Pore Size: 0.2 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**	**Pore Size: 0.45 µm**
Organic / Non Polar	PTFE (CR)	–	–	–	–	WAT200536	–
Ion Chromatography	PES (IC)	–	–	–	–	WAT200540	–

Liquid Handling Automations

Andrew
the pipetting robot

FLEXIBLE AUTOMATION FOR THE CONNECTED LABORATORY

The Andrew+ robot and OneLab software is your modern, liquid-handling automation platform that is easy to set up, without the need for extensive programming or engineering experience.

Benefits of Andrew+ Pipetting Robot Include:

- **Reproducibility:** Automated pipetting minimizes error
- **Productivity:** Time freed up for higher level tasks. User choice of any combination of single/multichannel pipetting increases flexibility
- **Promoting Health:** Reduced repetitive movement and exposure to hazardous materials

ONE ROBOT—MANY APPLICATIONS



Single/Multichannel Pipetting	Flexible Working Deck	Small Footprint	OneLab Communication
■ Best-in-Class Andrew Alliance electronic pipettes ■ Manufactured by Sartorius ■ Bluetooth communication with **Andrew+**	■ Wide range of consumables ■ Supported by an ever expanding range of domino accessories	■ Compact multichannel pipetting robot ■ Doesn't require dedicated space ■ Easily located under a hood	■ Intuitive design of pipetting protocols ■ Execute OneLab protocols on **Andrew+** through a WiFi/Ethernet connection ■ Securely share protocols with other lab members

The Andrew+ robot executes OneLab protocols, enabling fully automated, traceable, and highly repeatable pipetting, in addition to an expanding range of more complex protocols.

General Liquid Handling

- Serial Dilution – OneLab calculates required volumes and concentrations, taking full account of sample viscosity and dilution of inhibitors/substances in the samples that can interfere with downstream analytics.
- Standard Curve – Create a series of standards of increasing concentration in order to produce a calibration curve.
- Concentration Normalization – OneLab, through its Normalization Wizard, and Andrew+ automates the production of concentration normalized volumes, typically saving time required for what is often a highly laborious exercise.
- Microplate Reformatting – Handle a wide range of aliquoting operations between different types of microplate, microtube, vials, and racked HPLC tubes.

General Sample Preparation

- Dilute and Shoot – Samples are diluted with an internal standard to be directly injected onto an LC-MS system.
- Protein Precipitation (PPT) – Methods to concentrate proteins and purify them from various matrices.
- Phospholipid Removal – One of the major causes of ion suppression in bio-analysis is phospholipids.
- Solid-Phase Extraction – With the Vacuum+ you can automate micro and macro elution SPE plates. Addition of the Ika pump allows for vacuum control.

Complex Workflows

There are a wide range of protocols available on onelab.andrewalliance.com for automation of more complex workflows that require liquid handling, SPE, heating/shaking, magnetic bead based separation and more. Protocol categories include:

- Bioanalysis
- Biopharmaceutical
- Biomedical Research
- Cell Biology
- Diagnostics
- Drug Discovery
- Food testing

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APPLICATION AREA: Automated liquid handling in all the labs where transferring methods between devices

"Excellent product as easy to design and executive protocols. Minimizes human intervention and ensures compliance."

REVIEWER: Ningappa H M

ORGANIZATION: AIC ENTERPRICES PVT. LTD

SMARTER, REPRODUCIBLE AND TRACEABLE PIPETTING

Pipette
easy pipetting

Electronic pipettes made smart through connectivity. Using step-by-step visual guidance, Pipette+ allows you to execute protocols designed in OneLab with connected, electronic pipettes to minimize execution errors and provide full experimental traceability.

Benefits of Pipette+ Guided Pipetting System Include:

- **Reproducibility**: Volume and pipette parameters are set automatically, correct pipette selection confirmed, and usage monitored; all contributing to minimizing error
- **Productivity:** Researchers spend less time repeating experiments
- **Traceability:** Ensures systematic and accurate identification of sources of pipetting error







OneLab

- Intuitive graphical design of executable pipetting protocols.
- Step-by-step guidance of experiment protocols, ensuring repeatability.
- Facilitates sharing protocols with other researchers.

Pipette+ Stand

- Intelligent, computerized stand communicating with OneLab through Wifi/Ethernet and with pipettes by Bluetooth.
- Identifies and confirms correct pipette selection.
- Pipette parameters are set by OneLab. Correct use assured by real-time monitoring of pipette identity, performance and possible errors.
- Charges pipettes.

Andrew Alliance Pipettes

- Range of single channel (0.2 µL to 10 mL) and 8- and 12-channel electronic pipettes provides maximum flexibility of use.
- Pipette parameters are set automatically by OneLab while user conducts experiment.
- Lightest electronic pipettes on the market + electronic tip ejection = best-in-class ergonomics.

Ordering Information

Pipettes

Description	Compatability	P/N
Single channel AA Pipette, 0.2–10 µL	Andrew+, Pipette+	186009769
Single channel AA Pipette, 5–120 µL	Andrew+, Pipette+	186009765
Single channel Pipette, 10–300 µL	Andrew+, Pipette+	186009606
Single channel AA Pipette, 50–1000 µL	Andrew+, Pipette+	186009766
Single channel Pipette, 100–5000 µL	Andrew+, Pipette+	186009608
Single channel AA Pipette, 500–10000 µL	Andrew+, Pipette+	186009767
8-channel AA Pipette, 0.2–10 µL	Andrew+, Pipette+	186009768
8-Channel AA Pipette, 5–120 µL	Andrew+, Pipette+	186009605
8-Channel AA Pipette, 10–300 µL	Andrew+, Pipette+	186009607
8-Channel AA Pipette, 5–1200 µL	Andrew+, Pipette+	186009615
12-channel AA pipette, 0.2–10 µL	Pipette+	186010102
12-channel AA Pipette, 5–120 µL	Pipette+	186010103
12-channel AA Pipette, 10–300 µL	Pipette+	186010104
12-channel AA Pipette, 50–1200 µL	Pipette+	186010105

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APPLICATION AREA: Power generation

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REVIEWER: Garimesh Sharma

ORGANIZATION: Sidhee Cement Limited

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Discover the rapidly evolving ecosystem of connected devices and tools for use with Andrew+, Pipette+ and OneLab to support a wide range of laboratory workflows.

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andrewalliance.com/additional-connected-devices

Ordering Information

Connected Devices + Tools

Description	P/N*
96-PCR Plate Magnet+	176004850
50 mL Tube Magnet+	176004851
Deepwell Magnet+	176004854
Microplate Peltier+	176004852
96-PCR Plate Peltier+	176004584
Tube Shaker+	176004853
Microplate Shaker+	176004577
Microplate Vacuum+	176004579
Microplate Gripper	186009776
Tube Gripper	186010179

*Includes Device+ license to connect with OneLab

UNIQUE SOFTWARE FOR THE DESIGN AND EXECUTION OF LAB PROTOCOLS

OneLab
design & execute

OneLab is a browser-based software environment enabling researchers to design, share, and execute protocols, through an intuitive graphical interface. Use drag-and-drop to design new protocols on any PC or tablet from anywhere, whether you are in the lab or at your desk. You can also start with existing protocols, by selecting from the comprehensive OneLab library, enabling you to get up and running even faster. Executed step-by-step experiments with Pipette+ for manual, guided pipetting, or with Andrew+ and connected devices for a fully automated, walk-away solution.



Benefits of OneLab Laboratory Software Include:

- **Traceability**: Trace all steps from protocol design to experiment execution and report generation
- **Security and Data Privacy:** Ensures security of lab protocols through secure user identification and access control
- **Laboratory Management:** Seamless collaboration and training and the elimination of tedious manual procedures

APPLICATION AREA: Automated liquid handling in all the labs where transferring methods between devices

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"Good results for every day use in lab. Allowing full traceability of biological experiments with browser-based software environment, graphically design own pipetting protocols with short term executed results and option for monitoring ongoing experiments, it's high quality user friendly interface with modern design, great sampling and good return of investment."

REVIEWER: Bernard Zjakic

ORGANIZATION: Kajak kanu klub Una Bihać

Sample Processing Devices and Accessories

SEMI-AUTOMATED SOLID PHASE EXTRACTION PROCESSING

The Otto™ SPEcialist Positive Pressure Manifold is designed to further improve method robustness and sample reproducibility for solid-phase extraction. Controlled by an interfaced tablet with easy-to-use software, the semi-automated Otto SPEcialist simplifies method development and transfer, positive pressure optimization, and real-time manipulation of pressure profiles while removing the variability of manual extraction systems. The Otto SPEcialist is compatible with µElution and macro elution plates; and 1 cc, 3 cc, and 6 cc cartridges.



Compatible SPE Devices:

- (1) µElution™ Plate
  (1) Macro Elution Plate
- (24) 1 cc Flanged/Flangeless Cartridges
- (96) 1 cc Flangeless Cartridges
- (24) 3 cc Flanged/Flangeless Cartridges
- (18) 6 cc Flanged/Flangeless Cartridges

Ordering Information

Description	Contents	P/N
Otto SPEcialist Positive Pressure Manifold	Otto SPEcialist Positive Pressure Manifold	725000682
Otto Elution Plate Startup Kit	186009712 µElution Spacer 186009713 µElution Platform 186009714 Drainless Waste Reservoir	176004605
Otto 1 cc Cartridge for 13 mm Collection Tubes Startup Kit	186009716 1 cc Top Rack 186009715 13 mm Tube Collection Rack 186009708 13 mm Tube Spacer for 75 mm 186009714 Drainless Waste Reservoir	176004606
Otto 1 cc Flangeless Cartridge for 96-Well Collection Plate Startup Kit	186009717 Flangeless 1 cc Top Rack 186009713 µElution Platform 186009718 2 mL Collection Plate Position 186009714 Drainless Waste Reservoir	176004607
Otto 3 cc Cartridge for 13 mm Collection Tubes Startup Kit	186009719 3 cc Top Rack 186009715 13 mm Tube Collection Rack 186009708 13 mm Tube Spacer for 75 mm 186009714 Drainless Waste Reservoir	176004608
Otto 3 cc Cartridge for 16 mm Collection Tubes Startup Kit	186009719 3 cc Top Rack 186009720 16 mm Tube Collection Rack for 3 cc 186009721 3 cc 16 mm Tube Spacer for 75 mm 186009714 Drainless Waste Reservoir	176004609
Otto 6 cc Cartridge for 13 mm Collection Tubes Startup Kit	186009722 6 cc Top Rack 186009723 13 mm Tube Collection Rack for 6 cc 186009724 6 cc 13 mm Tube Spacer for 75 mm 186009714 Drainless Waste Reservoir	176004610
Otto 6 cc Cartridge for 16 mm Collection Tubes Startup Kit	186009722 6 cc Top Rack 186009725 16 mm Tube Collection Rack for 6 cc 186009726 6 cc 16 mm Tube Spacer for 75 mm 186009714 Drainless Waste Reservoir	176004611
Waste Reservoir with Drain	Waste Reservoir with Drain	186009727

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Reduce risks and costs while increasing data quality by choosing the most reliable Waters vial for your LC analysis.



	Routine Analysis		Advanced Analysis	
Vial Type	**High Value Glass and Polypropylene**	**LCGC Certified**	**TruView™ pH Control LCMS Certified**	**QuanRecovery™ with MaxPeak™ HPS**
Applications	Legacy methods and higher analyte concentrations. Optional polypropylene vials where glass surface is not applicable.	High-throughput QC analysis in the regulated environment, for compounds in µg/mL.	LC-MS and routine QC analysis and quantification for sample concentrations below 1 ng/mL. Ideal for pH sensitive assays. Reduced adsorption of polar analytes.	Qualification and quantification of low abundant species with complex structures (i.e, peptides and hydrophobic compounds).
Benefits	High value, low cost. Choose cap and septum separately.	No UV-interferences from glass manufacturing, packaging residues, or septa material.	For pH-sensitive compounds and unbuffered diluents; reduced adsorption of polar bases with high vial-to-vial consistency.	High recovery and reproducibility after short- or long-term storage of low abundance species with complex structures.
Features		Vials are assembled and tested for contaminants with a gradient UPLC-UV separation at 195 nm. ~~detection, in-process~~ dimensional checks.	Coating-free, enhanced glass surface to reduce leaching of Na and other metal ions into solution with a high vial-to-vial consistency (<3 ppm) and reduced adsorption effects.	Coating-free, modified polypropylene surface to reduce active sites, non-specific binding, and hydrophobic interaction.
Certification Tests	▪ Dimensionally tested ▪ Lot traceability	▪ UPLC-UV certified assembly ▪ Dimensionally tested	▪ pH certified ▪ Low adsorption certified ▪ MS certified cap and septa ▪ UPLC-UV certified assembly	▪ Protein recovery QC tested ▪ Dimensionally tested
Shapes				
Surfaces	USP Type I, 33 Glass (clear) USP Type I, 51 Glass (amber) Polypropylene	USP Type I, 33 Glass (clear) USP Type I, 51 Glass (amber)	USP Type I, 33 Glass, Low Na (clear) USP Type I, 51 Glass, Low Na (amber)	MaxPeak HPS (High Performance Surfaces) Polypropylene

Visit us online to view our infographic
waters.com/vials

LCGC Certified	**TruView™ pH Control LCMS Certified**	**QuanRecovery™ with MaxPeak™ HPS**

Learn more by visiting waters.com/vialselector

Sample Vials and Accessories

Contents

Certified Vials 53
- Dimensional Test 53
- Chemistry Tests 54

Vial Selection 54
- Choosing the Right Vial 54

Sample Plates and Seals 57
- Sample Plates 57
- Seals 57

Quan Recovery Vials and Plates 58

Vials and Accessories for ACQUITY UPLC Systems 59
- Quick Selection Guide: Fixed-Loop-Needle ACQUITY Systems 61
- Quick Selection Guide: Flow-Through-Needle ACQUITY Systems 64

Vials and Accessories for Alliance HPLC Systems 66
- Autosampler Vials, Plates, and Seals for Use with Alliance HPLC Systems 66
- Settings for Alliance HPLC Vials and Low Volume Inserts (LVI) 66
- Quick Selection Guide: Alliance HPLC Systems 67
- Autosampler Vials for Waters Systems 72
- Autosampler Vials for Compatible Systems 75

Vials Descriptions 79

Vials Troubleshooting Guide 81

Certified Containers 82

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.

Section 1: Technical Information

Section 2: Quick Selection Guide

Section 3: Complete Product listing

Certified Vials

Waters offers three lines of certified vials:

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

Find the best sample vial for your Autosampler and application online with our Vial Selector Tool

To try this tool, visit waters.com/VialSelector

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	Waters LC/GC CERTIFIED	Waters LCMS CERTIFIED	Waters TruView™ LCMS CERTIFIED
Dimensional Test	✓	✓	✓
Septum GC Test	✓	✓	✓
HPLC UV Test	✓	✓	✓
MS Scan		✓	✓
Low Adsorption Test			✓
To download these whitepapers, visit 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

Waters

THE SCIENCE OF WHAT'S POSSIBLE.™

What's New?

QuanRecovery™ WITH MAXPEAK™ HPS



Improve recovery, sensitivity and repeatability by mitigating non-specific binding losses

Use it! Don't lose it!

Learn more by visting waters.com/**QuanRecovery**

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.

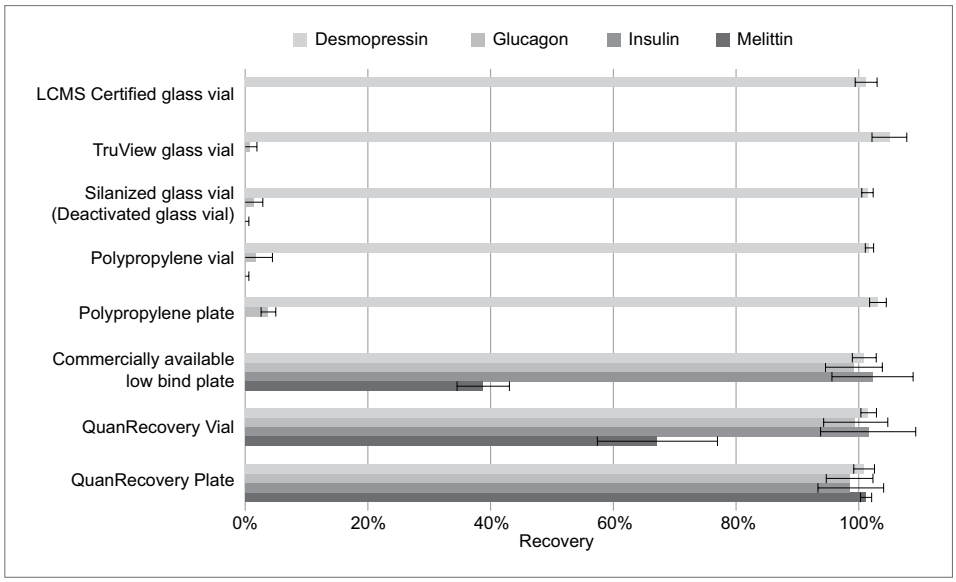
Adhesive Seal

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.

Quan Recovery Vials and Plates

Designed for LC-MS bioanalysts, QuanRecovery Vials with MaxPeak HPS reduce peptide and protein losses due to ionic interactions and non specific binding. A reduction in these losses lead to higher recovery, sensitivity and repeatability in analytical results. Non -specific binding and ionic interactions can cause losses and be a problem at low and at higher concentrations. Quan Recovery minimized this level of uncertainty with the use of High Performance Surfaces.

MaxPeak High Performance Surfaces are technologies designed to increase analyte recovery, sensitivity and reproducibility by minimizing analyte/surface interactions that can lead to sample losses.



Average recovery (n = 4) of four peptides (1 ng/mL per peptide) after 24 hours of storage at 4 °C. The error bars show the standard deviations. Peptide solutions were prepared in 80:20 water-acetonitrile which was acidified with 0.2% trifluoroacetic acid (TFA). The more hydrophobic peptides are marked with darker grey.

Ordering Information

QuanRecovery for ACQUITY UPLC H-Class, I-Class, M-Class and PREMIER, Arc/Arc Bio, Alliance HPLC

Description	P/N
QuanRecovery with MaxPeak HPS Vial Package (186009186) with pre-slit PTFE silicone cap and septum, 100/pk	176004434
QuanRecovery with MaxPeak HPS 300 µL vials, 100/pk	186009186
QuanRecovery with MaxPeak HPS 700 µL 96 well plates, 25/pk	186009184

QuanRecovery Vials and Plate details - for ACQUITY UPLC H-Class, I-Class, M-Class and PREMIER, Arc/Arc Bio, Alliance HPLC

	Vials	Plates
Shape		
P/N	176004434 (pk/100 with PTFE/Silicone preslit caps) 186009186 (pk/100)	186009184 (pk/25)
Format	12 × 32 (2 mL) vial	96 Well plate
Total Volume (Vial or Well)	300 µL	700 µL
Bottom Shape	Conical	Conical
Plate Selection from Chromatographic Data System	ANSI-48-vial, 2 mL vial holder	ANSI-96-well 1 mL
Residual volume at default needle setting for ACQUIY UPLC	≥ 5 µL (FL: 2 mm – default; FTN: 3 mm)	≥ 8 µL (FL and FTN 2 mm – default)
Max Centrifugal Force	N/A	2000 g
pH range	0–14	0–14

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.



ACQUITY UPLC System.

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

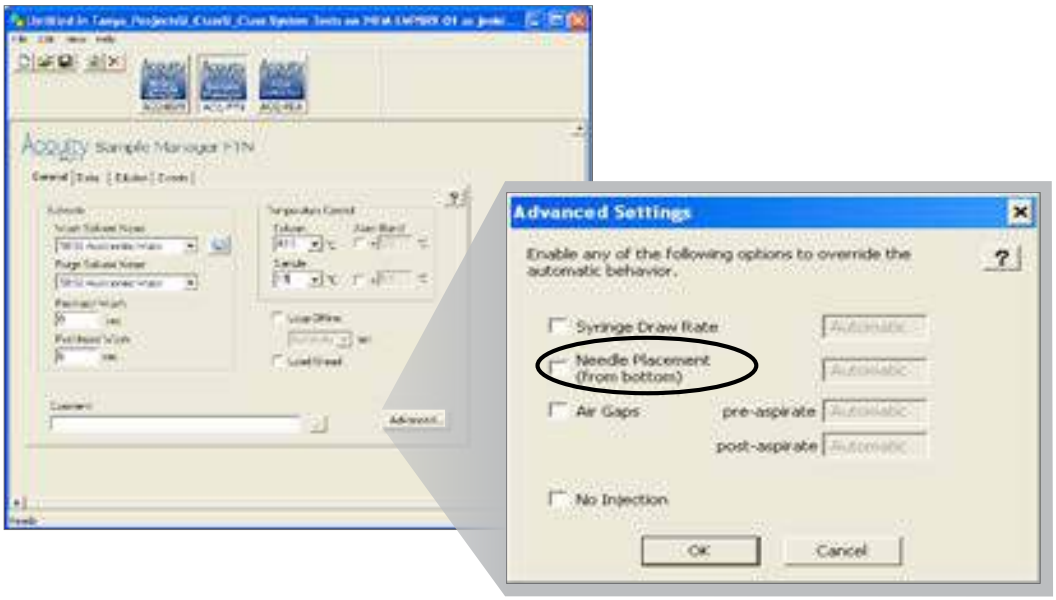
Flow Through Needle
Vials: ACQUITY UPLC H-Class/H-Class Bio, ACQUITY Arc,™ ACQUITY Arc™ Bio, ACQUITY UPLC I-Class FTN, and ACQUITY Advanced Polymer Chromatography™
Plates: ACQUITY UPLC H-Class/H-Class Bio, ACQUITY Arc/Arc Bio, and ACQUITY UPLC I-Class FTN

Residual Volumes

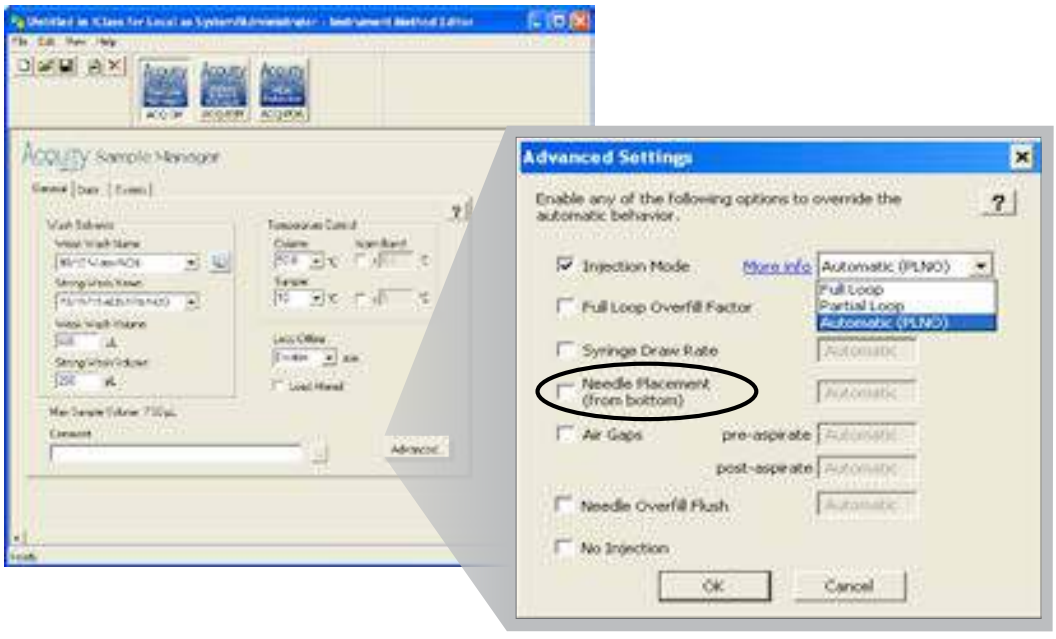
All residual volumes shown in the following table are calculated at the default needle placement setting. For sample-limited applications, you can adjust the needle placement via the software, in the Advanced Settings dialog box of the sample manager's instrument method editor (see figure on the following 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 59.

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

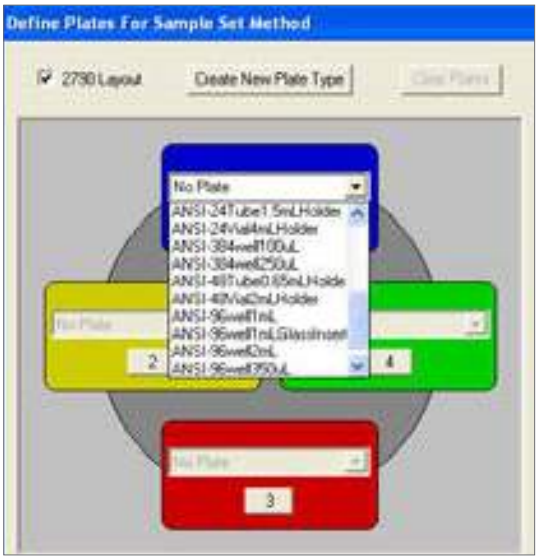
*Adhesive seal is designed for use with buffer solutions and can tolerate alcohols and acetonitrile content in buffers.

	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 59.

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



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.

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.

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.



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



APPLICATION AREA: Analyze Mycotoxins in Animal Feed

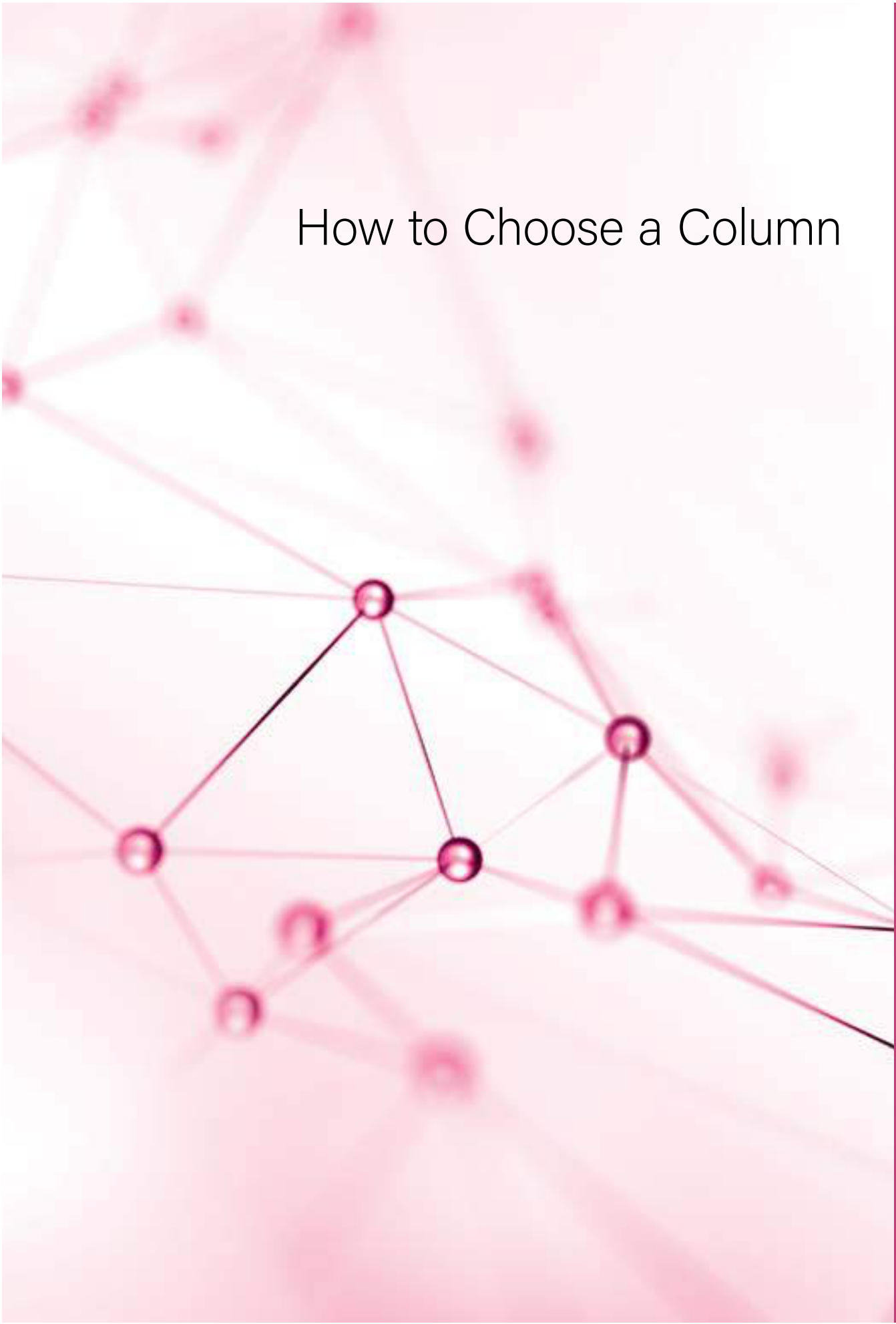
"TruView vials provide the quality product needed for our process. Amber glass protects our solution from degradation and the slated glass is critical in avoiding compound plating out on the glass. The slit top caps reduce pressure on the injection needle and we feel it maintains even atmospheric pressure 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 waters.com/certifiedcontainers

How to Choose a Column



How to Choose a Column

Contents

Particle Technology **85**
- Ethylene Bridged Hybrid (BEH) Particle Technology 85
- Charged Surface Hybrid (CSH) Particle Technology 86
- High Strength Silica (HSS) Particle Technology 86
- Solid-Core Particle Technology 86
- Reversed Phase and HILIC Chemistries 86

Column Selection **87**
- USP "L" Column Listing 87

Column Configurations for Any LC System **91**
- Column Nomenclature 91
- Column Configuration 91
- L/dp Comparison Chart for LC Columns 92

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 extensive portfolio 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

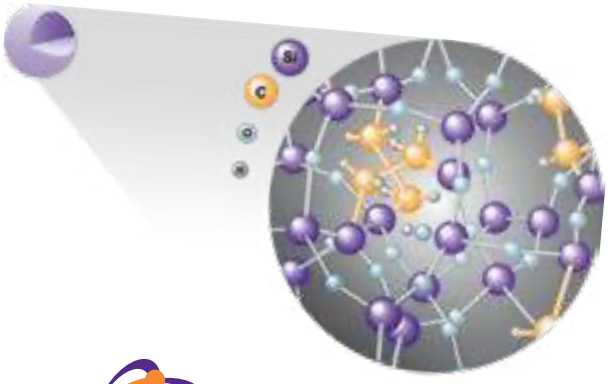


Solid-Core Technology

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

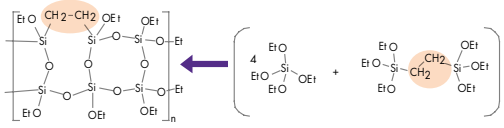
ETHYLENE BRIDGED HYBRID (BEH) PARTICLE TECHNOLOGY

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.



BEH Technology™

Particle Synthesis



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

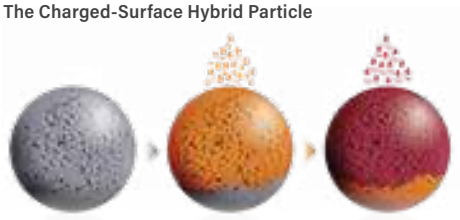
*US Patents 6,686,035; 7,223,473; 7,250,214.

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.

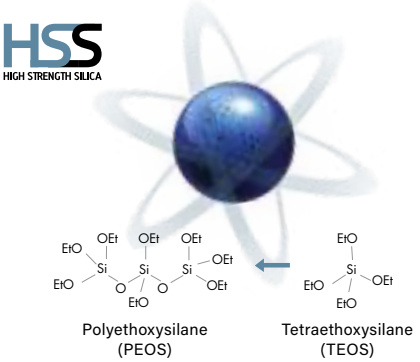
The Charged-Surface Hybrid Particle



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

HIGH STRENGTH SILICA (HSS) PARTICLE TECHNOLOGY

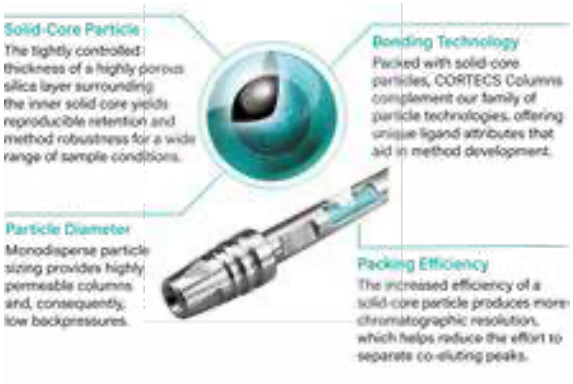
High strength silica (HSS) technology was developed specifically to complement the chromatographic performance of BEH and CSH particles. Compared with the ethylene-bridged BEH and CSH particles, the HSS particle's higher silanophilicity (100% silica) offers chromatographers significant advantages, including 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).



Polyethoxysilane (PEOS) | Tetraethoxysilane (TEOS)

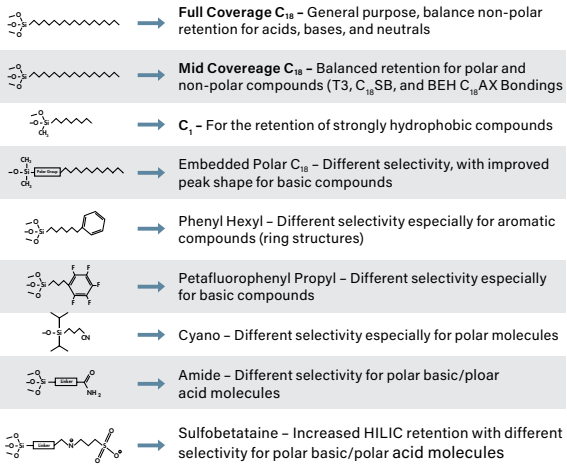
SOLID-CORE PARTICLE TECHNOLOGY

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.



REVERSED PHASE AND HILIC CHEMISTRIES

To maximize selectivity, which is critical for analytical methods development, Waters offers a wide range of chemistries to help you separate the most challenging of compounds. For both reversed-phase and HILIC applicators, Waters has the chemistry you need to get the job done. Rugged and robust ligands that ensure long column lifetimes and reproducible separations over the lifetime of you method. Highlighted are some of Waters chemistries used for reversed-phase and HILIC separations.



Full Coverage C_{18} – General purpose, balance non-polar retention for acids, bases, and neutrals

Mid Covereage C_{18} – Balanced retention for polar and non-polar compounds (T3, C_{18}SB, and BEH C_{18}AX Bondings

C_1 – For the retention of strongly hydrophobic compounds

Embedded Polar C_{18} – Different selectivity, with improved peak shape for basic compounds

Phenyl Hexyl – Different selectivity especially for aromatic compounds (ring structures)

Petafluorophenyl Propyl – Different selectivity especially for basic compounds

Cyano – Different selectivity especially for polar molecules

Amide – Different selectivity for polar basic/ploar acid molecules

Sulfobetataine – Increased HILIC retention with different selectivity for polar basic/polar acid molecules

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	347
ACQUITY UPLC BEH C_{18}	1.7 µm	Spherical	118, 373
ACQUITY UPLC BEH Shield RP18	1.7 µm	Spherical	118
ACQUITY UPLC CSH C_{18}	1.7 µm	Spherical	114
ACQUITY UPLC HSS C_{18}	1.7 µm	Spherical	121
ACQUITY UPLC HSS C_{18} SB	1.7 µm	Spherical	121
ACQUITY UPLC HSS T3	1.7 µm	Spherical	122
ACQUITY UPLC Oligonucleotide C_{18}	1.7 µm	Spherical	377
ACQUITY UPLC Peptide BEH C_{18}	1.7 µm	Spherical	377
ACQUITY Premier BEH C_{18}	1.7 µm	Spherical	99
ACQUITY Premier HSS T3	187 µm	Spherical	99
ACQUITY Premier Peptide BEH C_{18}	1.7 µm	Spherical	100
ACQUITY Premier Oligonucleotide C_{18}	1.7 µm	Spherical	100
ACQUITY Premier Shield RP18	1.7 µm	Spherical	99
ACQUITY Premier CSH C_{18}	1.7 µm	Spherical	99
XBridge Premier C_{18}	2.5 µm	Spherical	101
XBridge Premier Shield RP18	2.5 µm	Spherical	101
XBridge Premier Peptide 130 Å	2.5 µm	Spherical	377
XBridge Premier Peptide 300 Å	2.5 µm	Spherical	377
XBridge Premier Oligonucleotide C_{18}	2.5 µm	Spherical	377
XSelect Premier CSH C_{18}	2.5 µm	Spherical	101
XSelect Premier HSS T3	2.5 µm	Spherical	102
Atlantis dC_{18}	3, 5, 10 µm	Spherical	209
Atlantis T3	3, 5, 10 µm	Spherical	208
CORTECS C_{18}	2.7 µm	Spherical	241
CORTECS C_{18}+	2.7 µm	Spherical	241
CORTECS Shield RP18	2.7 µm	Spherical	241
CORTECS T3	2.7 µm	Spherical	241
CORTECS UPLC C_{18}	1.6 µm	Spherical	110

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**
CORTECS UPLC C_{18}+	1.6 µm	Spherical	110
CORTECS UPLC Shield RP18	1.6 µm	Spherical	111
CORTECS UPLC T3	1.6 µm	Spherical	111
Delta-Pak C_{18}	5 µm	Spherical	301
µBondapak C_{18}	10 µm	Irregular	300
µBondapak C_{18} Radial-Pak	10 µm	Irregular	307
Nova-Pak C_{18}	4, 6 µm	Spherical	299
Prep Nova-Pak HR C_{18}	6 µm	Spherical	308
Radial-Pak C_{18}	Spherical	Spherical	307
Resolve C_{18}	5, 10 µm	Spherical	244, 307
Spherisorb ODS1	3, 5, 10 µm	Spherical	295
Spherisorb ODS2	3, 5, 10 µm	Spherical	295
Spherisorb ODS-B	5 µm	Spherical	228
SunFire C_{18}	2.5, 3.5, 5, 10 µm	Spherical	172, 277
Symmetry C_{18}	3.5, 5 µm	Spherical	291
SymmetryPrep C_{18}	5, 7 µm	Spherical	217, 292
Symmetry 300 C_{18}	3.5, 5 µm	Spherical	293
SymmetryShield RP18	3.5, 5 µm	Spherical	292, 293
XBridge C_{18}	2.5, 3.5, 5, 10 µm	Spherical	255
XBridge Peptide BEH, 130 Å	3.5, 5, 10 µm	Spherical	260
XBridge Peptide BEH, 300 Å	3.5, 5, 10 µm	Spherical	261
XBridge BEH C_{18}	2.5, 3.5, 5, 10 µm	Spherical	254
XBridge Oligonucleotide C_{18}	2.5 µm	Spherical	262
XBridge Shield RP18	2.5, 3.5, 5, 10 µm	Spherical	256
XSelect CSH C_{18}	2.5, 3.5, 5 µm	Spherical	267
XSelect HSS C_{18}	2.5, 3.5, 5 µm	Spherical	270
XSelect HSS C_{18} SB	2.5, 3.5, 5 µm	Spherical	270
XSelect HSS T3	2.5, 3.5, 5 µm	Spherical	271
XTerra MS C_{18}	2.5, 3.5, 5, 10 µm	Spherical	286
XTerra RP18	3.5, 5, 10 µm	Spherical	288, 289

( ) - 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	236

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	118,119
Atlantis HILIC Silica	3, 5 µm	Spherical	284
CORTECS HILIC	2.7 µm	Spherical	134
CORTECS UPLC HILIC	1.6 µm	Spherical	112
µPorasil	10 µm	Spherical	237, 244
Nova-Pak Silica	4, 6 µm	Spherical	299
Prep Nova-Pak HR Silica	6 µm	Spherical	308
Resolve Silica	5, 10 µm	Spherical	244, 307
Spherisorb Silica	3, 5, 10 µm	Spherical	230, 295
SunFire Silica	5, 10 µm	Spherical	172, 279
XBridge BEH HILIC	2.5, 3.5, 5, 10 µm	Spherical	265

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	303

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	118
CORTECS C_8	2.7 µm	Spherical	123
CORTECS UPLC C_8	1.6 µm	Spherical	111
CORTECS Phenyl	2.7 µm	Spherical	112
CORTECS UPLC Phenyl	1.6 µm	Spherical	124
Nova-Pak C_8	4, 6 µm	Spherical	299
Resolve C_8	10 µm	Spherical	307
Spherisorb C_8	3, 5, 10 µm	Spherical	229, 296
SunFire C_8 Silica	3.5, 5, 10 µm	Spherical	173, 280
Symmetry C_8	3.5, 5, 7 µm	Spherical	292
SymmetryPrep C_8	7 µm	Spherical	213
SymmetryShield RP8	3.5, 5 µm	Spherical	293
XBridge BEH C_8	2.5 3.5, 5, 10 µm	Spherical	102, 185
XTerra MS C_8	2.5 3.5, 5, 10 µm	Spherical	223, 287
XTerra Shield RP8	3.5, 5, 10 µm	Spherical	225, 289

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	_	495
µBondapak NH_2	10 µm	Irregular	236
Spherisorb NH_2	3, 5, 10 µm	Spherical	229, 297

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	231, 298

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	122
µBondapak CN	10 µm	Irregular	236, 300
NovaPak CN HP	4 µm	Spherical	299
Resolve CN	10 µm	Spherical	307
Spherisorb CN	3, 5, 10 µm	Spherical	230, 297
Spherisorb CN RP	3, 5, 10 µm	Spherical	230, 298
XSelect HSS CN	2.5, 3.5, 5 µm	Spherical	206

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	119
ACQUITY UPLC CSH Phenyl-Hexyl	1.7 µm	Spherical	114
ACQUITY Premier CSH Phenyl-Hexyl	1.7 µm	Spherical	99
XSelect Premier CSH Phenyl-Hexyl	1.7 µm	Spherical	102
CORTECS Phenyl	2.7 µm	Spherical	136
CORTECS UPLC Phenyl	1.6 µm	Spherical	112
µBondapak Phenyl	10 µm	Irregular	236
NovaPak Phenyl	4 µm	Spherical	233
Spherisorb Phenyl	3, 5, 10 µm	Spherical	230
XBridge BEH Phenyl	2.5, 3.5, 5 µm	Spherical	147
XSelect CSH Phenyl-Hexyl	2.5, 3.5, 5 µm	Spherical	158
XTerra Phenyl	3.5, 5 µm	Spherical	177

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	450

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

Source: United States Pharmacopeia.

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	229, 296

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	231, 298

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	229, 296

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	497
IC-Pak Cation	10 µm	Irregular	500
IC-Pak Ion Exclusion	7 µm	Spherical	497
Shodex RSpak DC-613	6 µm	Spherical	237

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	496
Sugar-Pak 1	9 µm	Spherical	496

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	119
BioSuite 125, 250, 450 series	4, 5, 8, 10, (13), (17) µm	Spherical	433
Insulin HMWP	–	N/A	429
Protein-Pak 60	10 µm	Spherical	433
Protein-Pak 125	10 µm	Spherical	433
Protein-Pak 200SW and 300SW	10 µm	Spherical	433
XBridge Protein BEH SEC, 125 Å	3.5 µm	Spherical	466
XBridge Protein BEH SEC, 200 Å	3.5 µm	Spherical	466
XBridge Protein BEH SEC, 450 Å	3.5 µm	Spherical	466

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

Source: United States Pharmacopeia.

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

Brand	Particle Size	Type	Page
Styragel HR 0.5, 1, 2, 3 and 4	–	Spherical	406
Styragel HR 4E	–	Spherical	406
Styragel HR 5E	–	Spherical	406

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	500
Shodex RSpak DC-613	6 µm	Spherical	237
Shodex Sugar SP0810	8 µm	Spherical	496

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	446
BioSuite Q AXC	10, 13 µm	Spherical	446
BioSuite Q-PEEK	10 µm	Spherical	446
IC-Pak Anion	10 µm	Spherical	500
IC-Pak A HC	10 µm	Spherical	500
Protein-Pak Q 8HR	8 µm	Spherical	447

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	473

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	416
Delta-Pak C_4	5 µm	Spherical	234
Symmetry300 C_4	3.5, 5 µm	Spherical	241, 242
XBridge BEH300 C_4	3.5, 5, 10 µm	Spherical	241

L27 Porous silica particles, 30 to 50 µm in diameter

Brand	Particle Size	Type	Page
Porasil	37–55 µm	Spherical	303, 307

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	427

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	496

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	473

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

Brand	Particle Size	Type	Page
Ultrahydrogel series	N/A	Spherical	473

L39 A hydrophilic polyhydroxymethacrylate gel of totally porous spherical resin

Brand	Particle Size	Type	Page
Ultrahydrogel series	N/A	Spherical	473

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	114
ACQUITY UPLC HSS PFP	1.8 µm	Spherical	122
XSelect CSH Fluoro-Phenyl	2.5, 3.5, 5 µm	Spherical	157, 160, 161
XSelect HSS PFP	2.5, 3.5, 5 µm	Spherical	165, 167

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	500

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	500

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	119
BioSuite 125, 250, 450 series	4–17 µm	Spherical	433
Protein-Pak 60	10 µm	Spherical	433, 471
Protein-Pak 300SW	10 µm	Spherical	433, 471

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	119
ACQUITY UPLC BEH Amide	1.7 µm	Spherical	118
ACQUITY Premier Glycan BEH Amide	1.7 µm	Spherical	369
ACQUITY Premier BEH Amide	1.7 µm	Spherical	383
XBridge Premier Glycan BEH Amide	2.5 µm	Spherical	338
XBridge BEH Amide	2.5, 3.5, 5 µm	Spherical	338
XBridge Premier BEH Amide	2.5 µm	Spherical	101
XBridge BEH Amide Glycan	2.5, 3.5 µm	Spherical	370

L78 A silane ligand that consists of both reversed-phase (an alkyl chain longer than C_8) and anion-exchange (primary, secondary, tertiary, or quartenary amino groups) functional groups chemically bonded to porous or non-porous silica or ceramic micro-particles, 1.0 to 50 µm in diameter, or a monolithic rod.

Brand	Particle Size	Type	Page
Atlantis Premier BEH C_{18} AX	1.7, 2.5, 5 µm	Spherical	104

L122 Sulfobetaine graft-polymerized to totally or superficially porous hydrophilic polymer particles, 1.0 to 10 µm in diameter, or a monolithic rod. Packing having densely bonded zwitterionic groups with 1:1 charge balance

Brand	Particle Size	Type	Page
Atlantis Premier BEH Z-HILIC	1.7, 2.5, 5 µm	Spherical	104

( ) - 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	>30 µL	—
Routine Pressure	<15,000 psi	<18,000 psi	<10,000 psi	<10,000 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

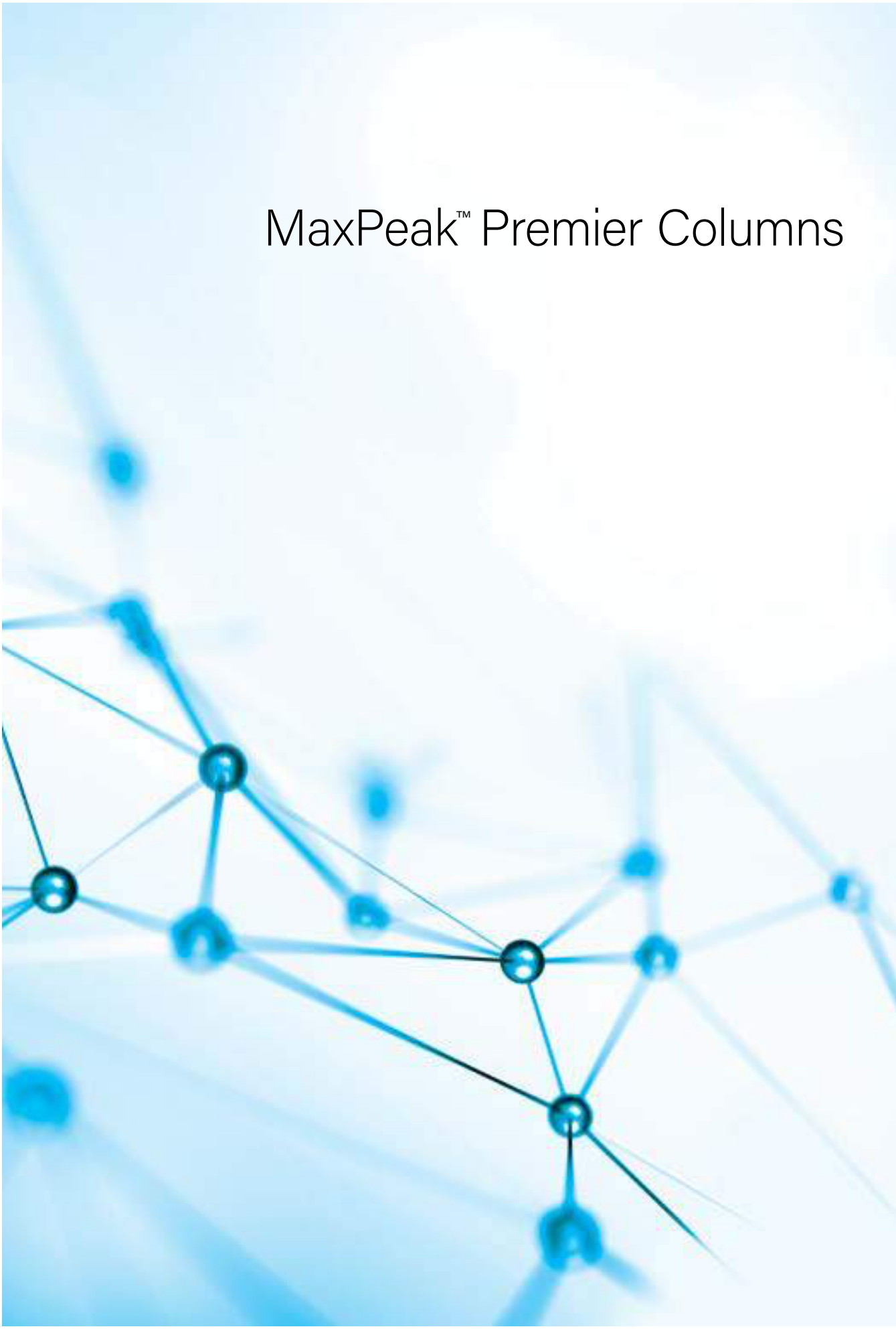
To convert an HPLC method to a UPLC or UHPLC method with no loss in resolution, select columns that have equivalent length-to-particle-size (L/d_p) ratio.

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

MaxPeak™ Premier Columns



MaxPeak Premier Columns

Contents

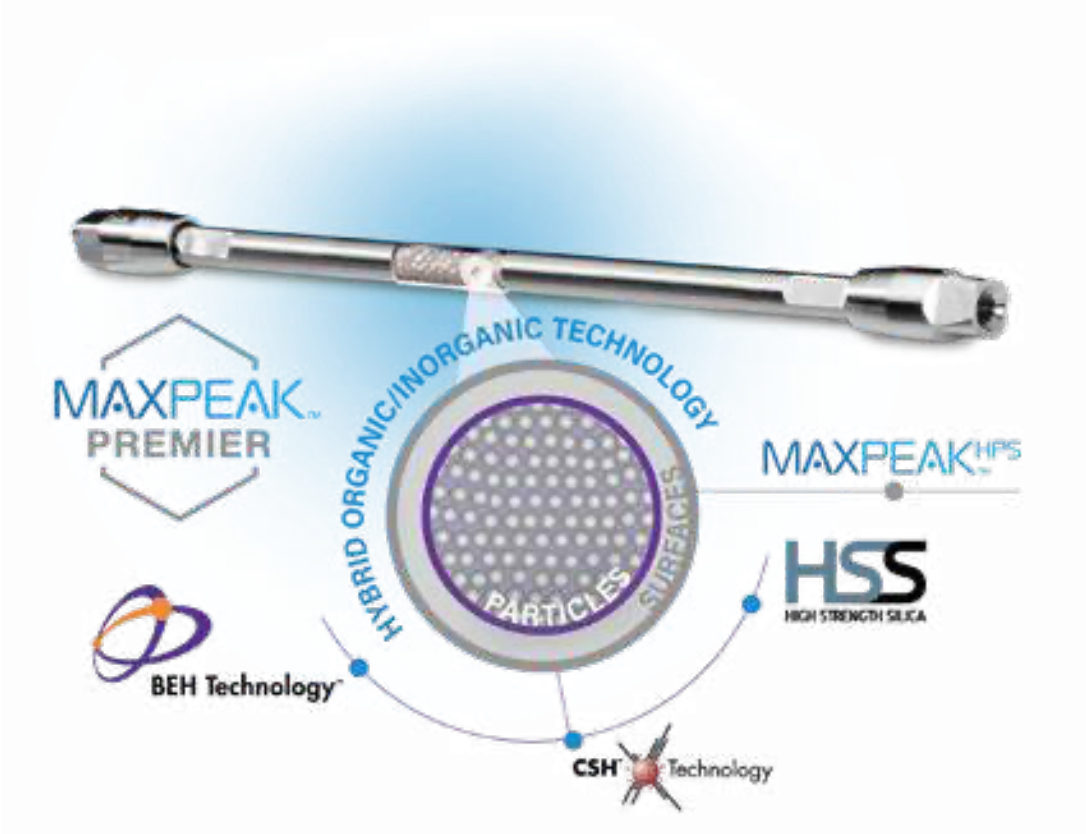
MaxPeak Premier Small Molecule Column Selection **96**
Small Molecule Column Chemistries 96

Application-Specific Column Selection **98**
Peptide Analysis 98
Oligonucleotide Analysis 98
Glycan Analysis 98

MaxPeak Premier Columns

Good Chromatography is as much about preventing the detrimental interactions you don't want, as it is creating the ones you do.

Waters™ MaxPeak™ Premier Columns enable scientists to have more control over their chromatographic separations by mitigating the loss of metal sensitive analytes, such as lipids, organic acids, acidic peptides, oligonucleotides, or other compounds containing phosphate or carboxylate functionalities. All MaxPeak Premier columns utilize MaxPeak™ High Performance Surfaces (HPS), new and innovative technologies designed to increase analyte recovery, sensitivity, and reproducibility by minimizing analyte/surface interactions that can lead to sample losses. MaxPeak HPS technology can also be found with Waters QuanRecovery™ plates and vial; for more information, please go to the QuanRecovery product information referenced here (page 58).



MaxPeak Premier Columns provide:

- Reduced column conditioning and passivation times
- Improved sensitivity and peak shapes
- Simpler mobile phases, without complex additives
- Time savings in method development
- Reduced risk and greater confidence in data and decision making

Available with particle technologies and quality manufacturing you can trust for small molecule, peptide, oligonucleotide, and glycan separations in both reversed-phase and HILIC separation modes.

MaxPeak Premier Small Molecule Column Selection

Waters offers a wider range of MaxPeak Premier columns, available with different particle technologies and bonded phases to meet all of your application needs. Trusted Bridged Ethyl Hybrid, High Strength Silica, and Charged Surface Hybrid particle technologies ideal for high performance UPLC/UHPLC and HPLC separations.



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



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

SMALL MOLECULE COLUMN CHEMISTRIES

There are ten chemistries to choose from, that range in utility and selectivity to maximize methods development flexibilty.

Reversed-phase column chemistries:

- BEH C_{18} – General purpose phase ideally suited for methods development due to extreme pH and temperature stability
- BEH C_{18} AX – High retention mixed mode reversed-phase/anion exchange chemistry for increased retention for acidic analytes at low pH
- BEH C_8 - General purpose phase ideally suited for method development due to pH and temperature stability; ideal for analyzing strongly hydrophobic compounds
- BEH Shield RP18 – alternative selectivity to alkyl C_{18} phases particularly phenolic compounds, and improved peak shape for bases at neutral pH
- BEH Phenyl - Alternative selectivity particularly for polyaromatic compounds. Provides unique level of pH stability for a phenyl bonded phase
- CSH C_{18} – General purpose phase that provides improved peak shape for bases at low pH, and rapid equilibration for methods development
- CSH Phenyl-Hexyl – Alternative selectivity to C_{18} phases, particularly for aromatic compounds due to pi-pi bond interactions when using methanol
- HSS T3 – 100% aqueous mobile phase compatible, ideal for reversed phase polar analyte retention

HILIC Column Chemistries:

- BEH Amide – pH and temperature stable amide chemistry, for the separation of a wide range of polar compounds including sugars and carbohydrates
- BEH Z-HILIC – sulfobetaine bonding that provides increased retention and alternative selectivity to other HILIC phases, excellent choice for metabolomics analysis

Column Characteristics

	C_{18}	C_{18} AX	C_8	Shield RP18	Phenyl	C_4
Particle/Ligand						
Ligand Density	3.1 µmol/m²	1.6 µmol/m²	3.2 µmol/m²	3.3 µmol/m²	3.0 µmol/m²	2.4 µmol/m²
Pore Diameter	130 Å, 300 Å	95 Å	130 Å	130 Å	130 Å	300 Å
Carbon Load	18%	17%	13%	17%	57%	8%
Endcapped	proprietary	proprietary	proprietary	TMS	proprietary	N/A
USP Class No.	L1	L78	L7	L1	L11	L26
pH Range	1–12	2–10	1–12	2–11	1–12	2–10
Temperature Limits	Low pH = 80 °C, High pH = 60 °C	Low pH = 60 °C, High pH = 65 °C	Low pH = 60 °C, High pH = 05 °C	Low pH = 50 °C, High pH = 45 °C	Low pH = 80 °C, High pH = 60 °C	Low pH = 80 °C, High pH = 50 °C
Surface Area	185 m²/g	270 m²/g	185 m²/g	185 m²/g	185 m²/g	90 m²/g

	Amide	Z-HILIC	BEH-PEO	CSH C_{18}	CSH Phenyl-Hexyl	HSS T3
Particle/Ligand						
Ligand Density	7.5 µmol/m²	3.0 µmol/m²	1.5 µmol/m²	2.3 µmol/m²	2.3 µmol/m²	1.6 µmol/m²
Pore Diameter	130 Å	95 Å	250 Å	130 Å	130 Å	100 Å
Carbon Load	12%	17%	12%	15%	14%	11%
Endcapped	N/A	N/A	N/A	proprietary	proprietary	proprietary
USP Class No.	L68	L122	L33	L1	L11	L1
pH Range	2–11	1–12	2–10	2–11	2–10	2–11
Temperature Limits	Low pH = 90 °C, High pH = 90 °C	Low pH = 60 °C, High pH = 60 °C	Low pH = 60 °C, High pH = 60 °C	Low pH = 80 °C, High pH = 45 °C	Low pH = 80 °C, High pH = 45 °C	Low pH = 45 °C, High pH = 45 °C
Surface Area	185 m²/g	270 m²/g	174 m²/g	185 m²/g	185 m²/g	230 m²/g



Have confidence that the methods you develop today will have the same repeatable results tomorrow. Quality is at the heart of everything we do, whether it is column particles, reliable quality manufacturing, customer support, or supply chain.

Application-Specific Column Selections

PEPTIDE ANALYSIS

ACQUITY Premier BEH C_{18} and XBridge™ Premier BEH C_{18} Particle Technology

- Outstanding peak capacity and superior peak shape in TFA, DFA, and FA
- Two pore sizes (130 Å and 300 Å) to provide different separation selectivities for small and large peptides

ACQUITY Premier CSH C_{18} and XSelect™ CSH C_{18} Premier Particle Technology

- Accepts greater peptide mass loads for improved low-level detection of impurities
- Excellent performance with TFA for optical applications, FA for MS, and DFA for dual detection

ACQUITY Premier HSS T3 and XSelect HSS T3 Premier Particle Technology

- Ideal choice for the separation of small, polar peptides with greater retentivity than hybrid (BEH, CSH) particle technology columns

PROTEIN AGGREGATE, MONOMER, AND FRAGMENT ANALYSIS

ACQUITY Premier Protein SEC and XBridge Premier Protein SEC 250 Å, 1.7 µm and 2.5 µm Particle Technology

- Efficiently separate protein size variants from simple to complex biotherapeutics (e.g., mAb, ADCs, bi-specifics, fusion proteins) that range from approximately 10,000
- to 650,000 Daltons in a single SEC analysis for reliable component quantitation
- Minimize method development by using a single SEC buffer formulation without the need for co-solvents/additives for a variety of samples without sacrificing resolution
- Reduce the cost per analysis using MaxPeak Premier SEC 250 Å Guards that will not degrade the quality of challenging applications

OLIGONUCLEOTIDE ANALYSIS

ACQUITY Premier BEH C_{18} and XBridge Premier BEH C_{18} Particle Technology

- Outstanding peak capacity and superior peak shape and lifetime in HFIP, HAA, and TEA
- Two pore sizes (130 Å and 300 Å) to provide different separation selectivities

GLYCAN ANALYSIS

ACQUITY Premier BEH Amide and XBridge Premier BEH Amide Particle Technology

- Best suited for the analysis of released, N-labeled glycans using pre-column labeling with 2-AB, 2-AA, or Waters innovative and enabling *Rapi*Fluor-MS™ reagent
- Two pore sizes (130 Å and 300 Å) to provide different selectivities from released glycans to large glycans, glycopeptides, and glycoproteins

ACQUITY Premier BEH C_{18} AX and XBridge Premier BEH C_{18} AX Particle Technology

- harge-based separation of neutral-to-highly acidic released N-glycans
- Improved resolution and recovery for sialylated and phosphorylated glycans

INTACT AND SUBUNIT PROTEIN ANALYSIS

ACQUITY Premier Protein BEH C_4 and XBridge Premier Protein BEH C_4, 300 Å, 1.7 µm and 2.5 µm Particle Technology

- Separates proteins of various sizes, hydrophobicities, and isoelectric points
- Tolerates extreme pH and temperature, and provides minimal secondary interactions
- Improves sensitivity for phosphorylated proteins and low-level intact and subunit mAb analyses

For more information on Waters columns for bio separations, see page 327.

Ordering Information

ACQUITY Premier Columns

BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009452
	2.1 × 100 mm	186009453
	2.1 × 150 mm	186009454

BEH C_{18}, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009497
	2.1 × 100 mm	186009457
	2.1 × 150 mm	186009458

BEH Phenyl 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186010336
	2.1 × 100 mm	186010337
	2.1 × 150 mm	186010294

BEH Phenyl 130 Å , VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186010338
	2.1 × 100 mm	186010339
	2.1 × 150 mm	186010340

BEH C_8 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186010356
	2.1 × 100 mm	186010357
	2.1 × 150 mm	186010358

BEH C_8 130 Å , VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186010359
	2.1 × 100 mm	186010360
	2.1 × 150 mm	186010361

BEH Shield RP18, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009490
	2.1 × 100 mm	186009498
	2.1 × 150 mm	186009499

BEH Shield RP18, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009500
	2.1 × 100 mm	186009501
	2.1 × 150 mm	186009502

BEH Amide, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009504
	2.1 × 100 mm	186009505
	2.1 × 150 mm	186009506

BEH Amide, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009507
	2.1 × 100 mm	186009508
	2.1 × 150 mm	186009509

CSH C_{18}, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009460
	2.1 × 100 mm	186009461
	2.1 × 150 mm	186009462

CSH C_{18}, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009463
	2.1 × 100 mm	186009464
	2.1 × 150 mm	186009465

CSH Phenyl Hexyl, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009474
	2.1 × 100 mm	186009475
	2.1 × 150 mm	186009476

CSH Phenyl Hexyl, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009477
	2.1 × 100 mm	186009478
	2.1 × 150 mm	186009479

HSS T3, 100 Å	Particle Size: 1.8 µm	
	2.1 × 50 mm	186009467
	2.1 × 100 mm	186009468
	2.1 × 150 mm	186009469

HSS T3, 100 Å, VanGuard FIT	Particle Size: 1.8 µm	
	2.1 × 50 mm	186009470
	2.1 × 100 mm	186009471
	2.1 × 150 mm	186009472

ACQUITY Premier Van Guard FIT Cartidges

BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186009459

BEH Phenyl 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186010341

BEH C_8 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186010362

BEH Shield RP18, 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186009503

BEH Amide, 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186009510

CSH C_{18}, 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186009466

CSH Phenyl Hexyl, 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186009480

HSS T3, 100 Å	Particle Size: 1.8 µm	
	2.1 × 5 mm	186009473

MaxPeak Premier 1.7 µm Columns for Bioseparations

Glycan BEH C_{18} AX, 95 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009758
	2.1 × 100 mm	186009759
	2.1 × 150 mm	186009760

Glycan BEH C_{18} AX, 95 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009970
	2.1 × 100 mm	186009971
	2.1 × 150 mm	186009972

Glycan BEH Amide, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009522
	2.1 × 100 mm	186009523
	2.1 × 150 mm	186009524

Glycan BEH Amide, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009974
	2.1 × 100 mm	186009975
	2.1 × 150 mm	186009976

Glycoprotein BEH Amide, 300 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009547
	2.1 × 100 mm	186009548
	2.1 × 150 mm	186009549

Oligonucleotide BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009484
	2.1 × 100 mm	186009485
	2.1 × 150 mm	186009486

Peptide BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009481
	2.1 × 100 mm	186009482
	2.1 × 150 mm	186009483

MaxPeak Premier 1.7 µm Van Guard FIT Cartidges

Glycan BEH C_{18} AX, 95 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 5 mm	186009973

Glycan BEH Amide, 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186009977

Peptide BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009493*
	2.1 × 100 mm	186009494*
	2.1 × 150 mm	186009495*

Peptide CSH C_{18}, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009487
	2.1 × 100 mm	186009488
	2.1 × 150 mm	186009489

Peptide HSS T3, 100 Å	Particle Size: 1.8 µm	
	2.1 × 50 mm	186009490
	2.1 × 100 mm	186009491
	2.1 × 150 mm	186009492

Protein BEH C_4, 300 Å Column and Standard	Particle Size: 1.7 µm	
	2.1 × 50 mm	176005107**
	2.1 × 100 mm	176005108**
	2.1 × 150 mm	176005109**

Protein SEC, 250 Å Column and Standard	Particle Size: 1.7 µm	
	4.6 × 150 mm	176005071***
	4.6 × 300 mm	176005072***

Protein SEC, 250 Å Column, Standard, and Guard	Particle Size: 1.7 µm	
	4.6 × 150 mm	176004794***
	4.6 × 300 mm	176004795***

*Peptide BEH 300 Å columns may also be used for oligonucleotide analyses requiring wider pore sizes.
**MassPREP Protein Mix Standard p/n: 186004900
***mAb Size Variant Standard p/n: 186009429; MaxPeak Premier Protein SEC 250 Å, 2.5 µm, 4.6 × 30 mm Guard p/n: 186009969

MaxPeak Premier 2.5 µm Columns

XBridge Premier BEH C_{18}, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 50 mm	186009827
	2.1 × 100 mm	186009828
	2.1 × 150 mm	186009829
	4.6 × 50 mm	186009847
	4.6 × 100 mm	186009848
	4.6 × 150 mm	186009849

XBridge Premier BEH C_{18}, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009843
	2.1 × 100 mm	186009844
	2.1 × 150 mm	186009845
	4.6 × 50 mm	186009850
	4.6 × 100 mm	186009851
	4.6 × 150 mm	186009852

XBridge Premier BEH Amide, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009928
	2.1 × 100 mm	186009929
	2.1 × 150 mm	186009930
	4.6 × 50 mm	186009935
	4.6 × 100 mm	186009936
	4.6 × 150 mm	186009937

XBridge Premier BEH Amide, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009931
	2.1 × 100 mm	186009932
	2.1 × 150 mm	186009933
	4.6 × 50 mm	186009938
	4.6 × 100 mm	186009939
	4.6 × 150 mm	186009940

XBridge Premier BEH Phenyl,130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186010342
	2.1 × 100 mm	186010343
	2.1 × 150 mm	186010344
	4.6 × 50 mm	186010349
	4.6 × 100 mm	186010350
	4.6 × 150 mm	186010351

XBridge Premier BEH Phenyl, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186010345
	2.1 × 100 mm	186010346
	2.1 × 150 mm	186010347
	4.6 × 50 mm	186010352
	4.6 × 100 mm	186010353
	4.6 × 150 mm	186010354

XBridge Premier BEH C_8, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186010363
	2.1 × 100 mm	186010364
	2.1 × 150 mm	186010365
	4.6 × 50 mm	186010370
	4.6 × 100 mm	186010371
	4.6 × 150 mm	186010372

XBridge Premier BEH C_8, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186010366
	2.1 × 100 mm	186010367
	2.1 × 150 mm	186010368
	4.6 × 50 mm	186010373
	4.6 × 100 mm	186010374
	4.6 × 150 mm	186010375

XBridge Premier BEH Shield RP18, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009914
	2.1 × 100 mm	186009915
	2.1 × 150 mm	186009916
	4.6 × 50 mm	186009921
	4.6 × 100 mm	186009922
	4.6 × 150 mm	186009923

XBridge Premier BEH Shield RP18, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009917
	2.1 × 100 mm	186009918
	2.1 × 150 mm	186009919
	4.6 × 50 mm	186009924
	4.6 × 100 mm	186009925
	4.6 × 150 mm	186009926

XSelect Premier CSH C_{18}, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009865
	2.1 × 100 mm	186009866
	2.1 × 150 mm	186009867
	4.6 × 50 mm	186009872
	4.6 × 100 mm	186009873
	4.6 × 150 mm	186009874

XSelect Premier CSH C_{18}, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009868
	2.1 × 100 mm	186009869
	2.1 × 150 mm	186009870
	4.6 × 50 mm	186009875
	4.6 × 100 mm	186009876
	4.6 × 150 mm	186009877

MaxPeak Premier 2.5 µm Columns

XSelect Premier CSH Phenyl Hexyl, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 50 mm	186009879
	2.1 × 100 mm	186009880
	2.1 × 150 mm	186009881
	4.6 × 50 mm	186009886
	4.6 × 100 mm	186009887
	4.6 × 150 mm	186009888

XSelect Premier CSH Phenyl Hexyl, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009882
	2.1 × 100 mm	186009883
	2.1 × 150 mm	186009884
	4.6 × 50 mm	186009889
	4.6 × 100 mm	186009890
	4.6 × 150 mm	186009891

XSelect Premier HSS T3, 100 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 50 mm	186009830
	2.1 × 100 mm	186009831
	2.1 × 150 mm	186009832
	4.6 × 50 mm	186009858
	4.6 × 100 mm	186009859
	4.6 × 150 mm	186009860

XSelect Premier HSS T3, 100 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009854
	2.1 × 100 mm	186009855
	2.1 × 150 mm	186009856
	4.6 × 50 mm	186009861
	4.6 × 100 mm	186009862
	4.6 × 150 mm	186009863

MaxPeak Premier 2.5 µm Van Guard FIT Cartidges

XBridge BEH C_{18}, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 5 mm	186009842
	3.9 × 5 mm	186009846

XBridge BEH Amide, 130 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009927
	3.9 × 5 mm	186009934

XBridge BEH Phenyl 130 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186010348
	3.9 × 5 mm	186010355

XBridge BEH C_8 130 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186010369
	3.9 × 5 mm	186010376

XBridge BEH Shield RP18, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 5 mm	186009913
	3.9 × 5 mm	186009920

XSelect CSH C_{18}, 130 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009864
	3.9 × 5 mm	186009871

XSelect CSH Phenyl Hexyl, 130 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009878
	3.9 × 5 mm	186009885

XSelect HSS T3, 100 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009853
	3.9 × 5 mm	186009857

DID YOU KNOW...

To protect your investment, select columns are available with VanGuard™ FIT integrated guard column technology. With a FIT column design created specifically to integrate a guard column, separation efficiency is maintained, along with column lifetime.



VANGUARD FIT

MaxPeak Premier 2.5 µm Columns for Bioseparations

XBridge Premier Glycan BEH C_{18} AX, 95 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 50 mm	186009947
	2.1 × 100 mm	186009948
	2.1 × 150 mm	186009949
	4.6 × 50 mm	186009950
	4.6 × 100 mm	186009951
	4.6 × 150 mm	186009952

XBridge Premier Glycan BEH Amide, 130 Å	Particle Size: 2.5 µm
2.1 × 50 mm	186009941
2.1 × 100 mm	186009942
2.1 × 150 mm	186009943
4.6 × 50 mm	186009944
4.6 × 100 mm	186009945
4.6 × 150 mm	186009946

XBridge Premier Oligonucleotide BEH C_{18}, 130 Å	Particle Size: 2.5 µm
2.1 × 50 mm	186009836
2.1 × 100 mm	186009837
2.1 × 150 mm	186009838
4.6 × 50 mm	186009901
4.6 × 100 mm	186009902
4.6 × 150 mm	186009903

XBridge Premier Peptide BEH C_{18}, 130 Å	Particle Size: 2.5 µm
2.1 × 50 mm	186009733
2.1 × 100 mm	186009734
2.1 × 150 mm	186009835
4.6 × 50 mm	186009898
4.6 × 100 mm	186009899
4.6 × 150 mm	186009900

XBridge Premier Peptide BEH C_{18}, 300 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 50 mm	186009892*
	2.1 × 100 mm	186009893*
	2.1 × 150 mm	186009894*
	4.6 × 50 mm	186009895*
	4.6 × 100 mm	186009896*
	4.6 × 150 mm	186009897*

XBridge Premier Protein BEH C_4, 300 Å Column and Standard	Particle Size: 2.5 µm
2.1 × 50 mm	176005110**
2.1 × 100 mm	176005111**
2.1 × 150 mm	176005112**
4.6 × 50 mm	176005113**
4.6 × 100 mm	176005114**
4.6 × 150 mm	176005115**

XSelect Premier Peptide HSS T3, 100 Å	Particle Size: 2.5 µm
2.1 × 50 mm	186009839
2.1 × 100 mm	186009840
2.1 × 150 mm	186009841
4.6 × 50 mm	186009910
4.6 × 100 mm	186009911
4.6 × 150 mm	186009912

XBridge Premier Protein SEC 250 Å, Column and Standard	Particle Size: 2.5 µm
4.6 × 150 mm	176005067***
4.6 × 300 mm	176005068***
7.8 × 150 mm	176005069***
7.8 × 150 mm	176005070***

XBridge Premier Protein SEC 250 Å, Column, Standard, and Guard	Particle Size: 2.5 µm
4.6 × 150 mm	176004790***
4.6 × 300 mm	176004791***
7.8 × 150 mm	176004792***
7.8 × 150 mm	176004793***

*XBridge Premier Peptide BEH 300 Å Columns may also be used for oligonucleotide analyses requiring wider pore sizes.

**MassPREP Protein Mix Standard p/n: 186004900

***mAb Size Variant Standard p/n: 186009429; MaxPeak Premier Protein SEC 250 Å, 2.5 µm, 4.6 × 30 mm Guard p/n: 186009969

Atlantis Premier Columns

	Particle Size: 1.7 µm		Particle Size: 2.5 µm		Particle Size: 5 µm	
	Dimension	P/N	Dimension	P/N	Dimension	P/N
BEH C_{18} AX, 95 Å	2.1 × 30 mm	186009365	2.1 × 30 mm	186009389	2.1 × 50 mm	186009407
	2.1 × 50 mm	186009366	2.1 × 50 mm	186009390	2.1 × 100 mm	186009408
	2.1 × 75 mm	186009367	2.1 × 75 mm	186009391	2.1 × 150 mm	186009409
	2.1 × 100 mm	186009368	2.1 × 100 mm	186009392	4.6 × 50 mm	186009427
	2.1 × 150 mm	186009369	2.1 × 150 mm	186009393	4.6 × 100 mm	186009416
			4.6 × 50 mm	186009426	4.6 × 150 mm	186009417
			4.6 × 100 mm	186009397	4.6 × 250 mm	186009418
			4.6 × 150 mm	186009398		
BEH C_{18} AX, 95 Å, VanGuard FIT	2.1 × 30 mm	186009357	2.1 × 30 mm	186009374	2.1 × 50 mm	186009404
	2.1 × 50 mm	186009358	2.1 × 50 mm	186009375	2.1 × 100 mm	186009405
	2.1 × 75 mm	186009359	2.1 × 75 mm	186009376	2.1 × 150 mm	186009406
	2.1 × 100 mm	186009360	2.1 × 100 mm	186009378	4.6 × 50 mm	186009410
	2.1 × 150 mm	186009361	2.1 × 150 mm	186009379	4.6 × 100 mm	186009411
			4.6 × 50 mm	186009383	4.6 × 150 mm	186009412
			4.6 × 100 mm	186009384	4.6 × 250 mm	186009413
			4.6 × 150 mm	186009385		
BEH Z-HILIC, 95 Å	2.1 × 50 mm	186009978	2.1 × 50 mm	186009985	2.1 × 50 mm	186009999
	2.1 × 100 mm	186009979	2.1 × 100 mm	186009986	2.1 × 100 mm	186010000
	2.1 × 150 mm	186009980	2.1 × 150 mm	186009987	2.1 × 150 mm	186010001
			4.6 × 50 mm	186009992	4.6 × 50 mm	186010006
			4.6 × 100 mm	186009993	4.6 × 100 mm	186010007
			4.6 × 150 mm	186009994	4.6 × 150 mm	186010008
					4.6 × 250 mm	186010009
BEH Z-HILIC, 95 Å, VanGuard FIT	2.1 × 50 mm	186009981	2.1 × 50 mm	186009988	2.1 × 50 mm	186010002
	2.1 × 100 mm	186009982	2.1 × 100 mm	186009989	2.1 × 100 mm	186010003
	2.1 × 150 mm	186009983	2.1 × 150 mm	186009990	2.1 × 150 mm	186010004
			4.6 × 50 mm	186009995	4.6 × 50 mm	186010010
			4.6 × 100 mm	186009996	4.6 × 100 mm	186010011
			4.6 × 150 mm	186009997	4.6 × 150 mm	186010012
					4.6 × 250 mm	186010013

Atlantis Premier Van Guard FIT Cartidges

	Particle Size: 1.7 µm		Particle Size: 2.5 µm		Particle Size: 5 µm	
	Dimension	P/N	Dimension	P/N	Dimension	P/N
BEH C_{18} AX, 95 Å	2.1 × 5 mm	186009373	2.1 × 5 mm	186009402	2.1 × 5 mm	186009421
			3.9 × 5 mm	186009403	3.9 × 5 mm	186009422
BEH Z-HILIC, 95 Å	2.1 × 5 mm	186009984	2.1 × 5 mm	186009991	2.1 × 5 mm	186010005
			3.9 × 5 mm	186009998	3.9 × 5 mm	186010014

Sub-2 µm UPLC Columns



Sub-2 µm UPLC Columns

Contents

UltraPerformance Liquid Chromatography 107

CORTECS UPLC Columns 108

ACQUITY UPLC Columns 113

- ACQUITY UPLC Charged Surface Hybrid (CSH) Columns 113
- ACQUITY UPLC Ethylene Bridged Hybrid (BEH) Columns 116
- ACQUITY UPLC High Strength Silica (HSS) Columns 120

ACQUITY UPLC and CORTECS 1.6 µm Method Validation Kits 123

ACQUITY UPLC Method Development Kits 127

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 95 Å, BEH 125 Å, 130 Å, 200 Å, 300 Å, and 450 Å; HSS; and CSH) scalable between HPLC, UHPLC, and UPLC particle sizes. Additionally, we offer 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.

DID YOU KNOW...

A select group of ACQUITY UPLC Columns are also available in Waters MaxPeak High Performance Surface hardware.

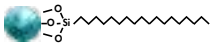
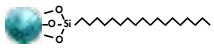
A complete list of the MaxPeak Premier Columns can be found on page 99.

MAXPEAK™ PREMIER

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.

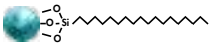
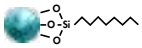
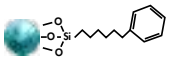
DID YOU KNOW...

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

For more information, see page 132.

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	–



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



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.

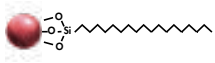
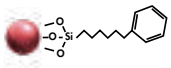
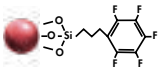
CSH™ Technology



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

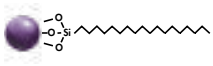
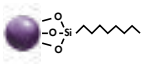
Description	P/N
Neutrals QC Reference Material	186006360
Reversed-Phase QC Reference Material	186006363

For more information on Peptide Columns, refer to page 385; for ACQUITY UPLC Peptide Column Ordering Information, refer to page 392.

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

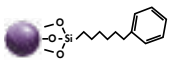
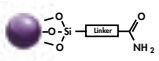
	BEH C_{18}, 130 Å	BEH C_8, 130 Å	BEH Shield RP18, 130 Å
	UPLC: 1.7 µm	**UPLC: 1.7 µm**	**UPLC: 1.7 µm**
Particle/Ligand			
Ligand Density	3.1 µmol/m^2	3.2 µmol/m^2	3.3 µmol/m^2
Carbon Load	18%	13%	17%
Endcapped	Yes	Yes	Yes
USP Class No.	L1	L7	L1
pH Range	1–12	1–12	2–11
Temperature Limits	Low pH = 80 ˚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 181 and 184.

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

Ordering Information

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

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

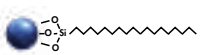
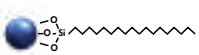
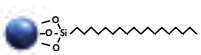
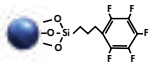
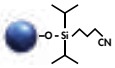
For more information on ACQUITY UPLC Protein Columns, refer to page 427.

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 390; for Ordering Information, refer to page 392.

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
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

* 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.

	Particle Size: 1.7 µm	
	Dimension	P/N (3/pk)
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]

	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

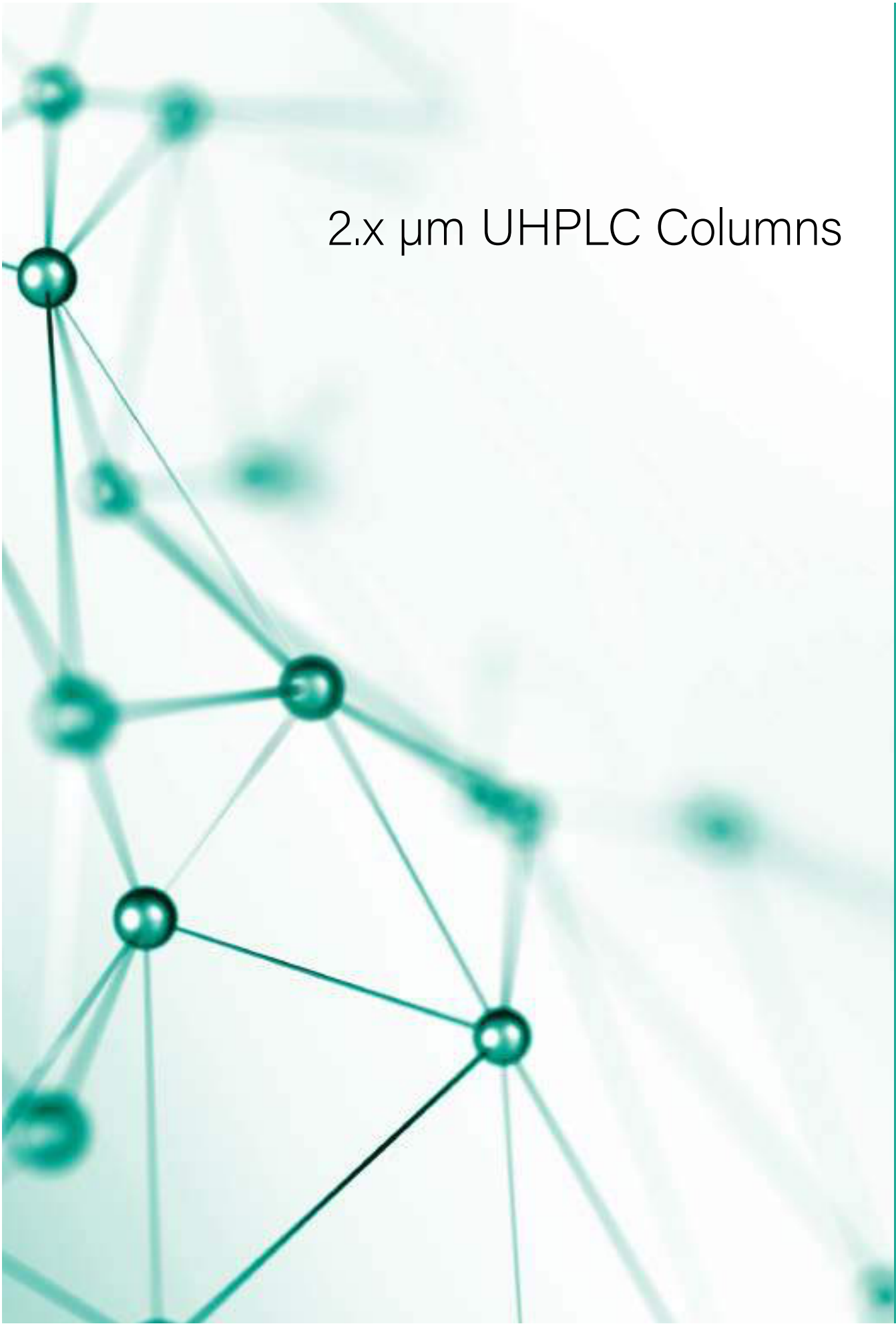
With a seemingly endless number of method parameters to try, developing a new chromatographic method can be an overwhelming, time-consuming experience. Finding a column that reliably and robustly delivers the desired separation results is essential to any method development strategy. The UPLC Columns 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

Column Selection Guide 131

CORTECS 2.7 µm Columns 132

XBridge BEH *XP* Columns 142

XSelect CSH *XP* and HSS *XP* Columns 155

SunFire Columns 169

XTerra Columns 174

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	<6000 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.

MAXPEAK™ PREMIER

Select 2.x µm columns are available with MaxPeak High Performance Surface Technology. A complete list of the MaxPeak Premier Columns can be found on page 99.

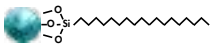
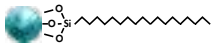
System	LC Technique	Bandspread*	Recommended Column Particle Sizes and I.D.s
Shimadzu Prominence UFLC	HPLC	41 µL	XBridge 3.5, 5 µm; XSelect 3.5, 5 µm; CORTECS 2.7 µm 3.0–4.6 mm I.D.
Arc HPLC or Alliance 2695 HPLC	HPLC	29 µL	
Agilent 1260 UHPLC (600 bar)	HPLC	28 µL	
Thermo Accela UHPLC	HPLC	21 µL	XBridge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

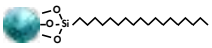
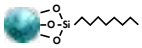
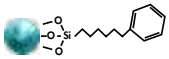
	C_{18}+, 90 Å	C_{18}, 90 Å	Shield RP18, 90 Å
	UPLC: 1.6 µm, UHPLC: 2.7 µm	**UPLC: 1.6 µm, UHPLC: 2.7 µm**	**UPLC: 1.6 µm, UHPLC: 2.7 µm**
Particle/Ligand			
Ligand Density*	2.4 µmol/m^2	2.7 µmol/m^2	3.2 µmol/m^2
Carbon Load*	5.7%	6.6%	6.4%
Endcapped	Yes	Yes	Yes
USP Class No.	L1	L1	L1
pH Range	2–8	2–8	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 m^2/g	100 m^2/g	100 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.

For more information on CORTECS Columns, refer to page 108.

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

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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

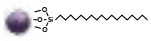
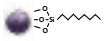
XBridge BEH *XP* Columns

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.

MAXPEAK PREMIER

Select XBridge MaxPeak Premier Columns can be found on page 101.

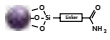
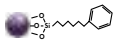
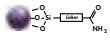
Column Characteristics

	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/m²	3.2 µmol/m²	3.3 µmol/m²	3.1 µmol/m²	3.1 µmol/m²	2.4 µmol/m²
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 m²/g	185 m²/g	185 m²/g	185 m²/g	90 m²/g	90 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	**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 181.



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	—	—



APPLICATION AREA: Oligonucleotides (Preparation and Analytical)

"Gold standard for separation of oligos."

REVIEWER: Jan Zimmermann

ORGANIZATION: ADX

Ordering Information

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 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

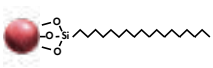
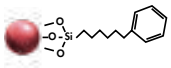
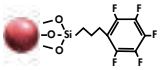
For the method developer, columns that maximize separation selectivity are among the most powerful tools for influencing chromatographic behavior. The carefully chosen bonded ligands used for XSelect CSH ***XP*** and XSelect HSS ***XP*** Columns redefine the broadly selective phases tailored for modern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



MAXPEAK PREMIER

Select XSelect CSH and HSS MaxPeak Premier Columns can be found on page 101.

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 113 and 120.
*Expected or approximate value.

SeparationsNow 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 196.

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

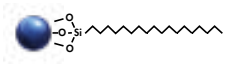
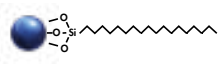
"This (XSelect ***XP***) column has provided amazing and very reproducible results when coupling HPLC to MS. Great peak shapes and no retention time drifts after long batches of analysis."

REVIEWER: Javier Jimenez Villarin

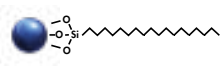
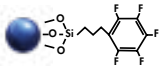
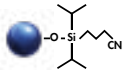
ORGANIZATION: University of Barcelona

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/m²	1.6 µmol/m²
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 m²/g	230 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

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	–

Ordering Information

XSelect HSS Columns

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.

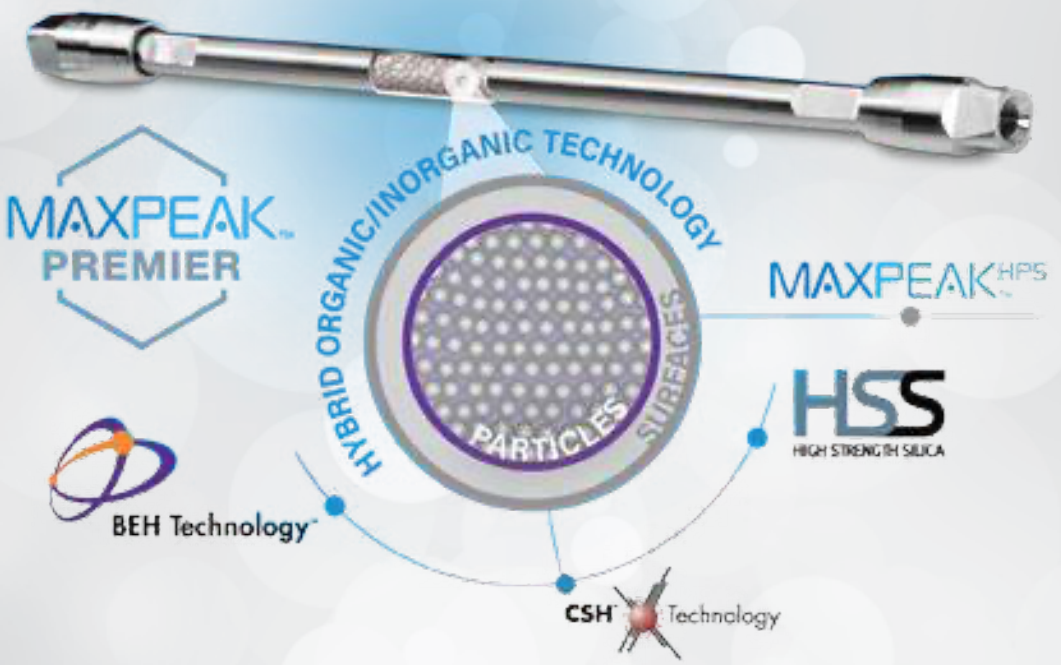
XSelect HSS VanGuard Cartridges

	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

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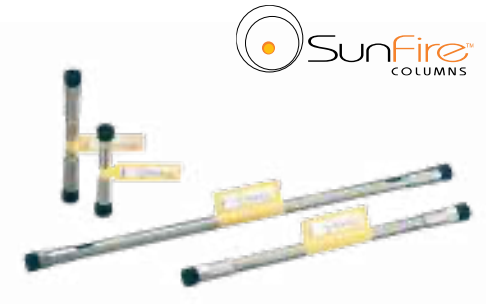
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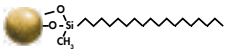
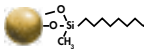
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Column Characteristics

	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 211.

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

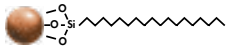
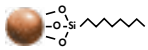
Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

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).



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 221.

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	
	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

[VANGUARD COLUMN PROTECTION]

Cost Effective Column Protection Available in 3 Formats

VANGUARD™
COLUMN PROTECTION



VanGuard FIT: Holistic, all in one guard and column design for select MaxPeak Premier Columns

- Fully Integrated Technology (FIT) that eliminates dead volume
- MaxPeak HPS Technology, available for specific MaxPeak Premier column chemistries

MAXPEAK™ PREMIER



VanGuard PreColumns: Optimized for ACQUITY UPLC Columns

- One piece holistic designed that reduces dispersion; providing exceptional performance
- Packed with Sub 2 µm particles that maximize separation efficiency

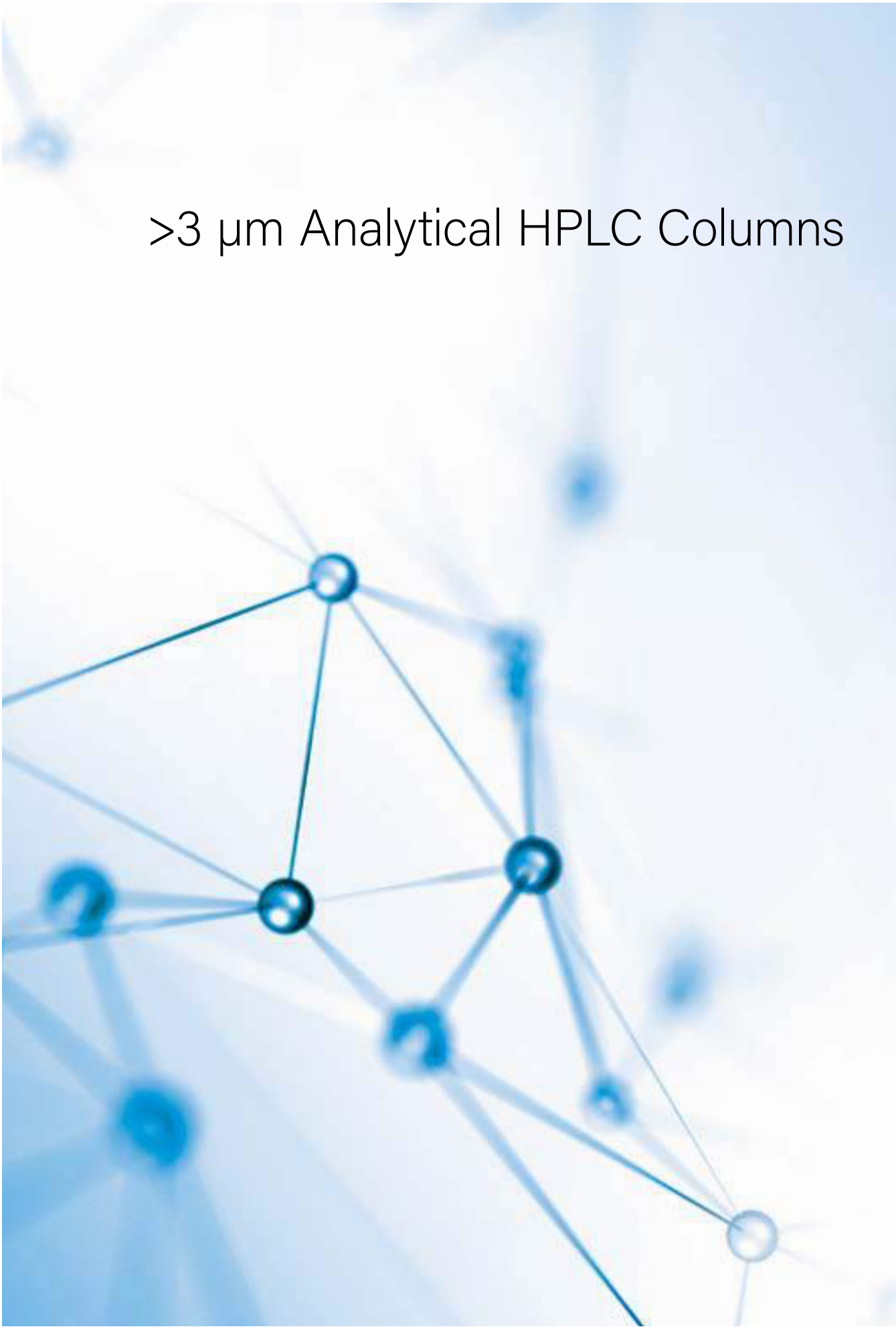


VanGuard Cartridge and Holder: Optimized for HPLC/UHPLC Columns and separations

- Two-piece cartridge and holder
- Accommodates Waters XP, CORTECS UHPLC and Waters HPLC Columns

Learn more on **page 241** or by visting **waters.com**

>3 µm Analytical HPLC Columns



>3 µm Analytical HPLC Columns

Contents

XBridge BEH Columns 181

XSelect Columns 196

Atlantis Columns 207

SunFire Columns 211

Symmetry Columns 216

XTerra Columns 221

Spherisorb Columns 227

Nova-Pak Columns 232

Resolve Columns 233

Delta-Pak Columns 234

µBondapak/Bondapak Columns 235

µPorasil/Porasil Columns 237

Shodex RSpak Polymer Reversed-Phase Columns 237

Primers 238

Cartridge and Guard Columns, Fittings, and Accessoriess 240

- Cartridge Columns 240
- Spherisorb Cartridge and Guard Columns 240
- VanGuard Pre-columns and Cartridges 241
- Sentry Guard Cartridges 244
- Guard-Pak Holder and Inserts 246

≥3 µm Analytical HPLC Columns



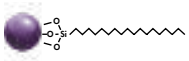
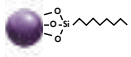
XBridge BEH Columns

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 13 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.

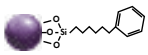
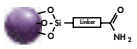
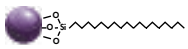
Column Characteristics

	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**
Ligand Benefit	General purpose, ideally suited for method development due to extreme pH stability and applicability to the broadest range of compound classes.	Alternate selectivity compared to straight chain C_{18}, particularly with phenolic analytes. Compatible with 100% aqueous-phase composition.	General purpose, ideally suited for method development due to extreme pH stability. Applicable to the broadest range of compound classes.
Particle/Ligand			
Ligand Density*	3.1 µmol/m²	3.3 µmol/m²	3.2 µmol/m²
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 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.

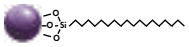
BEH Technology is also available in UPLC particle sizes (ACQUITY UPLC BEH 1.7 µm), please refer to page 117.

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**
Ligand Benefit	Excellent for method development and offers a unique level of pH stability. Provides alternate selectivity, particularly in regard to polyaromatic compounds.	Excellent for retention of very polar, basic, water soluble analytes. Excellent for mobile phases containing high concentrations of organic solvent.	Good to separate a wide range of very polar compounds, particularly good at separating carbohydrates (saccharides) using high concentrations of organic modifier, elevated temperature, and high pH.	Retention of polar acidic glycans.	High pH and temperature stable. Provides high peptide retention.
Particle/Ligand					
Ligand Density*	3.0 µmol/m²	N/A	7.5 µmol/m²	7.5 µmol/m²	3.1 µmol/m²
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 m²/g	185 m²/g	185 m²/g	185 m²/g	185 m²/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 117.

	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**
	High pH and temperature stable. Great separations for oligonucleotides (<45 mers).	High pH and temperature stable. The go-to option for intact proteins.	Helps to minimize secondary interactions in size exclusion mode. For use in fragment, monomer and aggregate analysis. Best for separations of proteins or peptides sized 1 kD - 80 kD.	Helps to minimize secondary interactions in size exclusion mode. For use in fragment, monomer and aggregate analysis. Best for separations of proteins sized 10 kD – 450 kD.	Helps to minimize secondary interactions in size exclusion mode. For use in fragment, monomer and aggregate analysis. Best for separations of proteins sized 100 kD – 1.5 million daltons.
					
	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

*Each catridge listed requires use of Universal VanGuard Cartirdge Holder (Listed below, p/n 186007949)

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.

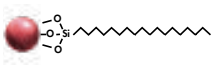
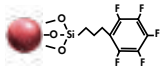
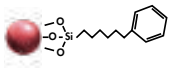
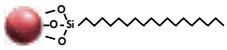


XSelect Columns are:

- 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).

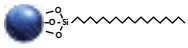
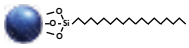
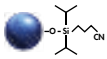
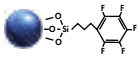
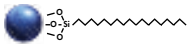
Column Characteristics

	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**
Ligand Benefits	General purpose with excellent pH stability and rapid mobile-phase re-equilibration. Yields superior peak shape and increased loading capacity for basic compounds.	General purpose, provides a very high degree of analyte selectivity, especially in low-pH mobile phases. Provides superior peak shape and increased loading capacity for acidic compounds.	General purpose and alternative selectivity versus C_{18}. Provides excellent retention for polyaromatic compounds. Maintains excellent reproducibility at pH extremes and delivers superior peak shape and increased loading capacity for basic compounds.	General purpose, offers excellent pH stability and peak shape for basic peptides in low ionic strength mobile phases.
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 113 and 120.

Column Characteristics *Continued*

	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**
Ligand Benefits	Ultra performance and general purpose, provides increased retention, superior peak shape and resists acid hydrolysis at low pH.	Provides unique selectivity for bases when operating in low-pH conditions.	General purpose, shows contrasting analyte selectivity when compared to C_{18} phases, can be used in either reversed-phase and normal-phase mode.	General purpose, maximizes selectivity differences for Lewis bases through pi-pi interactions. The rigid aromatic ring provides additional selectivity based on shape, dipole moment, and hydrogen bonding interactions.	Exceptional polar compound retention and aqueous mobile-phase compatible.
Particle/Ligand					
Ligand Density*	3.2 µmol/m^2	1.6 µmol/m^2	2.0 µmol/m^2	3.2 µmol/m^2	1.6 µmol/m^2
Carbon Load*	15%	8%	5%	7%	11%
Endcapped	Yes	No	No	No	Yes
USP Class No.	L1	L1	L10	L43	L1
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

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

*Each catridge listed requires use of Universal VanGuard Cartirdge Holder (Listed below, p/n 186007949)

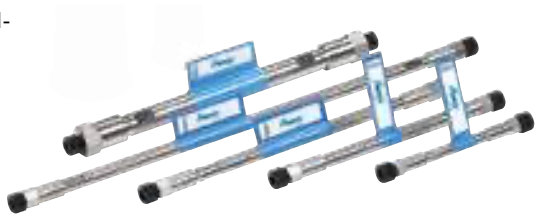
Universal VanGuard Cartridge Holder

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

Atlantis Columns

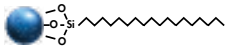
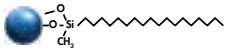
For polar compounds, Atlantis™ HPLC Columns provide exceptional performance, versatility, and retention when operating under reversed-phase conditions. The balanced retention of Atlantis Columns affords the separation of polar and non-polar analytes while providing:

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



For Atlantis Premier BEH C_{18} AX, and Atlantis Premier BEH Z-HILIC columns, please go to the MaxPeak Premier Column section found on page 104.

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**
Ligand Benefit	Exceptional polar compound retention and balanced retention of acids, bases and neutrals. Aqueous mobile-phase compatibility, low MS bleed	General purpose, high efficiency, delivers balanced retention of acids, bases, and neutrals in mid-range pH conditions.	No ligand, general purpose separations of highly ploar compounds for use in HILIC separations
Particle/Ligand			
Ligand Density*	1.6 µmol/m^2	1.6 µmol/m^2	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 m^2/g	330 m^2/g	330 m^2/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.



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

Ordering Information

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 *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 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

*Each catridge listed requires use of Universal VanGuard Cartirdge Holder (Listed below, p/n 186007949)

Universal VanGuard Cartridge Holder

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

SunFire Columns

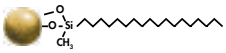
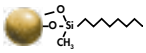
SunFire Columns set the standard for state-of-the-art bonded C_{18} and C_8 silica HPLC columns. Benefiting from years of research and product development, SunFire Columns deliver industry-leading levels of chromatographic performance, representing the best in particle and bonding expertise.



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**
Ligand Benefit	Highly efficient, general purpose for acids, bases, and neutrals with highest loading capacity in TFA mobile phases	General purpose, efficient and similar selectivity to C_{18} but with less compound retentivity	No ligand, general purpose separations of highly ploar compounds for use in normal phase mode
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 pages 169-173.

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

*Each catridge listed requires use of Universal VanGuard Cartirdge Holder (Listed below, p/n 186007949)

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

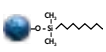
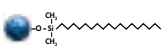
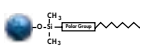
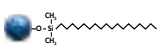
Symmetry Columns

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**
Ligand Benefit	General purpose, highly reproducible, similar selectivity to C_{18} with slightly less retention	General purpose and highly reproducible, balanced retention for acids, bases, and neutrals	Alternate selectivity compared to straight chain C_{18}, particularly with phenolic analytes. Provides reduced silanol activity ("shielding") to improve peak shape and resolution comparably	Alternate selectivity compared to straight chain C_{18}, particularly with phenolic analytes. Provides reduced silanol activity ("shielding") to improve peak shape and resolution comparably	Wide-pore particle. Good retention of larger (> 1kD) molecules versus C_{18}	Wide-pore particle. Good retention of large molecules (> 1kD)
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.

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.

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 /S	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 /S	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	
Symmetry300 C_4	Dimension	P/N (1/pk)	Dimension	P/N (1/pk)
	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

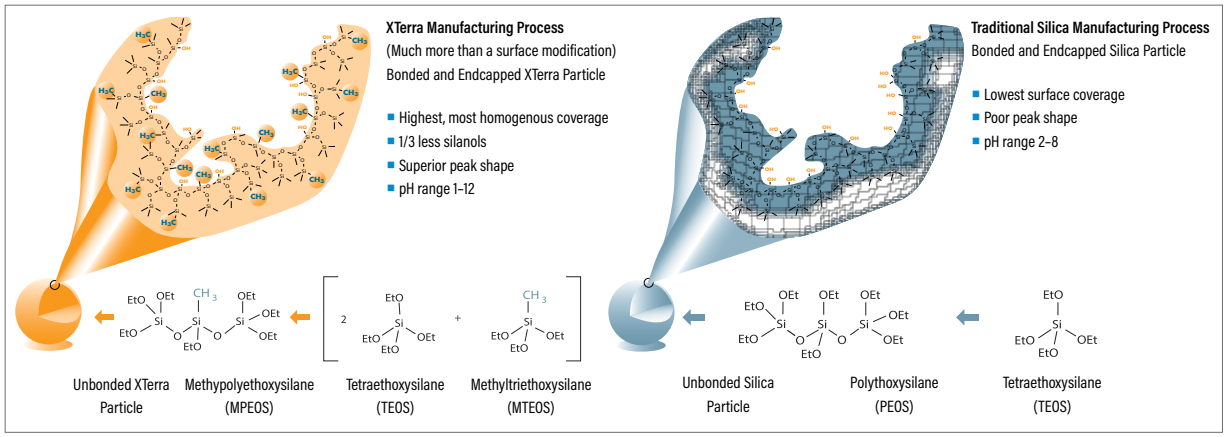
*Each catridge listed requires use of Universal VanGuard Cartirdge Holder (Listed below, p/n 186007949)

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**
Ligand Benefit	General purpose, efficient, low MS-bleed delivers good compound retentivity for acids, bases and neutrals	Highly efficient, provides alternate selectivity compared to straight chain C_{18}, particularly with phenolic analytes. Compatible with 100% aqueous-phase composition	General purpose, efficient, low MS-bleed and similar selectivity to MS C_{18}, but delivers less compound retentivity	Highly efficient and similar selectivity to Shield RP18, but delivers less compound retentivity	Alternate selectivity versus straight chain MS C_{18}, alternate selectivity, particularly in regard to polyaromatic compounds
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 pages 174-177.

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*

Phenyl	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	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

*Each catridge listed requires use of Universal VanGuard Cartirdge Holder (Listed below, p/n 186007949)

Universal VanGuard Cartridge Holder

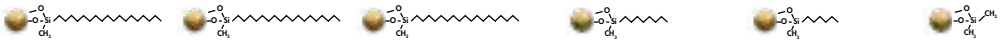
Description	P/N (1/pk)
Universal VanGuard Cartridge Holder	186007949

Spherisorb Columns

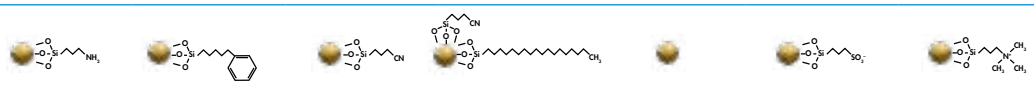
Waters Spherisorb™ Columns are available in a wide range of particle sizes (3, 5, and 10 µm) and bonded phases. Their high quality bonded phases afford many different and unique separation selectivities. Analytical columns are supplied with icommon, Parker-style, column end fittings.



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 Benefit	General purpose, balanced retention for acids, bases, and neutrals	General purpose, balanced retention for acids, bases, and neutrals	General purpose, balanced retention for acids, bases, and neutrals	Good retention for strong hydrophobic compounds	Increased retention for strong hydrophobic compounds	Superior retention for very strong hydrophobic compounds
Particle/Ligand						
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 Benefit	Alternate retention for polar compounds	Better retention for aromatic compounds	Alternate selectivity for polar compounds	Alternate selectivity for polar compounds	No ligand, for use in cation exchange mode for retention of large highly polar and/or charged compounds	No ligand, for general purpose separation of polar compounds in normal phase mode	No ligand, for use in anion exchange mode for retention of large highly polar and/or charged compounds
Particle/Ligand							
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 pages 295-298.

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

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

*For the 10 × 4.6 mm guards, use either the In Line Guard Cartridge Holder (p/n: PSS830008) or an Extended Endfitting for 4.6 × 10 mm Guard Cartridge (p/n: PSS614108). The 30 × 4.6 mm guards require a Removable Endfitting (p/n: PSS614100) and a Column Coupler (p/n: PSS614102).

Spherisorb Guard Cartridge Holders*

Description	Qty.	P/N
In Line Guard Cartridge Holder Kit for 4.6 × 10 mm Guards		PSS830008
Extended Endfitting for Integral Guard Cartridge (for use with 4.6 × 10 mm guard cartridge)	1/pk	PSS614108
Removable Cartridge Column Endfitting (for use with 30 × 10 mm guard cartridge)	2/pk	PSS614100
Column Coupler (for use with 30 × 10 mm guard cartridge)	2/pk	PSS614102

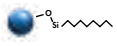
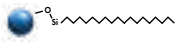
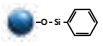
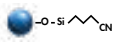
*See Cartridge and Guard Columns, Fittings, and Accessories section for more additional detail (page 240)

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 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**
Ligand Benefit	Better retention for strong hydrophobic compounds	Balanced retention for polar and nonpolar compounds	Better retention for aromatic compounds	Alternate retention for polar compounds	No ligand , best for polar compound retention when used in normal phase mode
Particle/Ligand					
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

Nova-Pak C_{18}	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

For Nova-Pak Preparative Columns, please refer to page 299.

Nova-Pak Columns *Continued*

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

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.

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
Ligand Benefit	General purpose, balanced retention for acids, bases and neutrals. Less retentive than C_{18}	General purpose, balanced retention for acids, bases and neutrals	No ligand , best for polar compound retention when used in normal phase mode	Alternate selectivity for polar molecules
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.

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

For Resolve Radial Compression Columns and PrepPak™ Cartridges, please refer to page 307.

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**
Ligand Benefit	General purpose, balanced retention for acids, bases, and neutrals	Wide-pore, general purpose, balanced retention for acids, bases, and neutral compounds	General purpose, provides less retention of hydrophobic compounds versus C_{18}	Wide-pore, provides less retention of larger hydrophobic compounds versus C_{18}
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.

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

For Delta-Pak Preparative Columns, please refer to page 301.

Delta-Pak Columns *Continued*

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

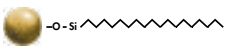
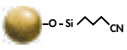
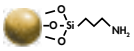
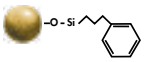
Delta-Pak C_4, 100 Å	PREPARATIVE COLUMNS	
	Particle Size: 15 µm	
	Dimension	P/N (1/pk)
	3.9 × 300 mm	WAT011807
	7.8 × 300 mm	WAT011808
	19 × 300 mm	WAT011809
	30 × 300 mm	WAT011810

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
Ligand Benefit	General purpose, balanced retention for acids, bases, and neutrals	General purpose, contrasting selectivity for polar compounds versus C_{18}. For use in normal or reversed-phase modes	Contrasting selectivity for polar compounds versus C_{18}. For use in normal or reversed-phase modes	Alternate selectivity versus C_{18}, provides better retention of aromatic compounds
Particle/Ligand				
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 299.

µPorasil/Porasil Columns

µPorasil and Porasil particles were one of the first commerci*ally 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

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

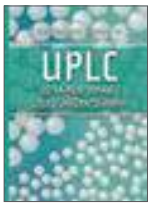


Hydrolysis and Analysis of Amino Acids from Purified Peptides/Proteins, Foods, and Feeds

Sample hydrolysis is an important first step in the workflow for analysis of bound amino acids, such as peptides and proteins. Hydrolysis allows for the analysis of the released amino acids, which can be separated using either ion-exchange or reversed-phase chromatographic methods. Given the challenges of the sample preparation workflow, this document was compiled to provide useful guidelines for sample hydrolysis.

Paperback, 69 pages, ISBN 978-1-879732-13-1

Hydrolysis and Analysis of Amino Acids from Purified Peptides/Proteins, Foods, and Feeds	Part No. 715006455



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

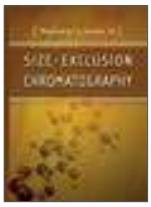


Comprehensive Guide to HILIC (Hydrophilic Interaction Chromatography)

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

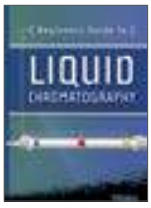


The Mass Spectrometry Primer

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

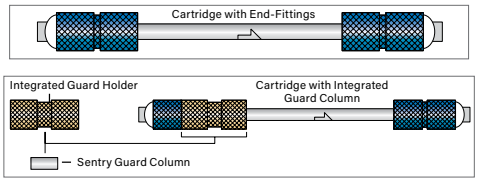
Beginner's Guide to SPE (Solid-Phase Extraction) Part No. 715003405

Cartridge and Guard 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

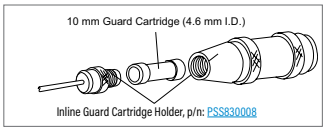
SPHERISORB CARTRIDGE AND GUARD COLUMNS

Ordering Information

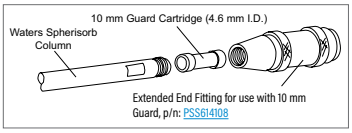


1. 30 mm Stand Alone Guard/Column shown with end fittings (end fittings not included)
2. Guard holder end fitting for use with 10 mm Integral Guard, p/n: PSS614108
3. 10 mm Integral Guard Column
4. Column Coupler, p/n: PSS614102 (for use with cartridge columns only)

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**	
T3	**Dimension**	**P/N (3/pk)**	**Dimension**	**P/N (3/pk)**
	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 page 212.

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 216.

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 page 181.

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 page 196.

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 page 221.

SENTRY GUARD CARTRIDGES

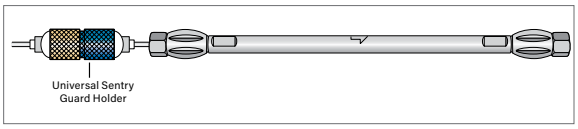
Waters Sentry Guard Cartridges are widely used as a cost-effective way to prolong HPLC column life by reducing particulate matter and chemical contaminants. Two holder designs are offered, one for use as an integrated part of the Waters Cartridge Column with reusable end fittings, the other for use with 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 (Use with 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

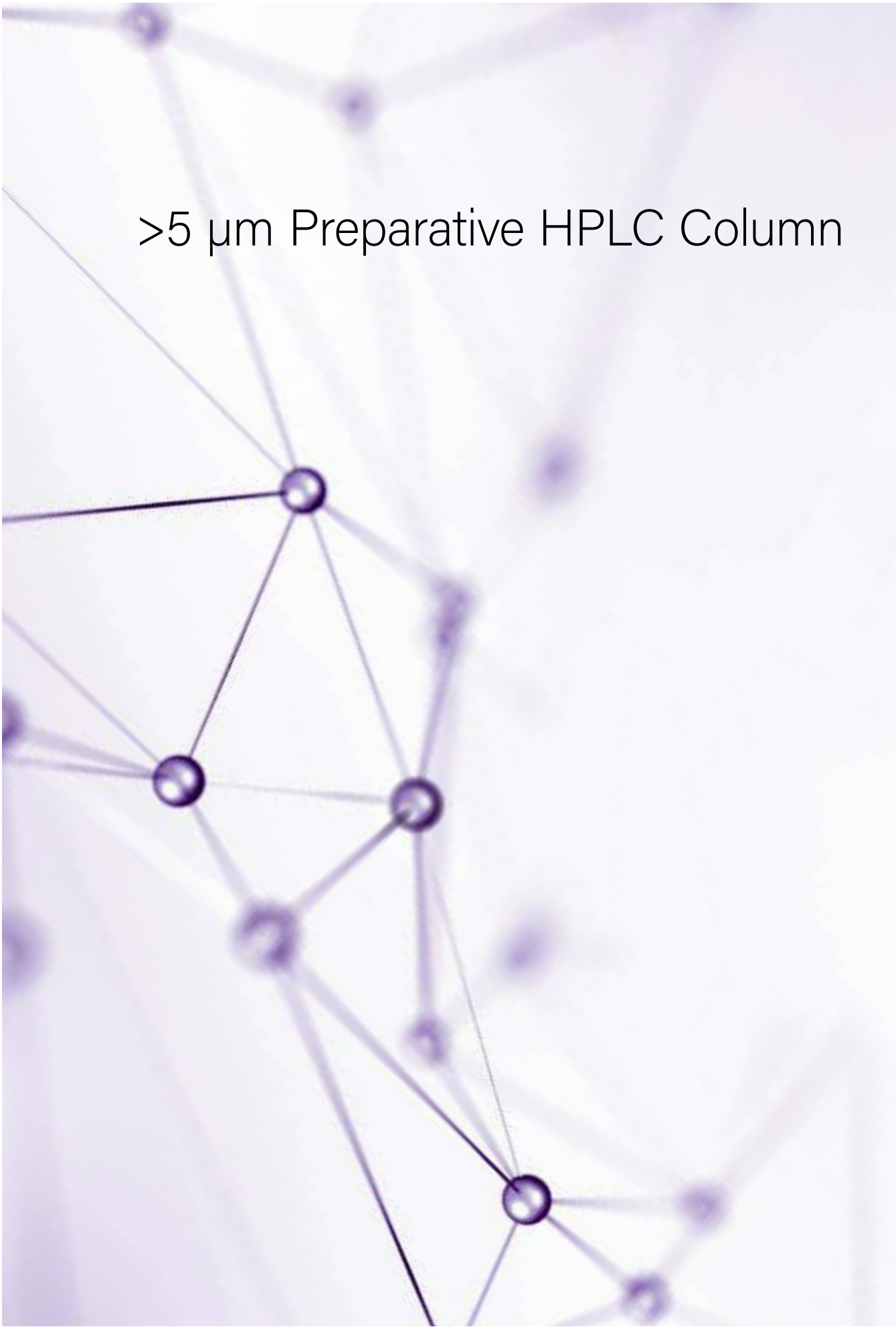
Description	P/N (1/pk)
Guard-Pak Holder	WAT088141
Guard-Pak Holder Connector	WAT080046

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 Column



>5 µm Preparative HPLC Column

Contents

From Productivity Comes Predictability 249
Column Stability and Reliability—Long, Predictable Lifetimes 249
How to Choose the Right OBD Preparative Column 250
Mass Loading 251

XBridge OBD Preparative Columns 253
The Benchmark for Ruggedness and Longevity in LC Methods 253

XSelect OBD Preparative Columns 266
Versatility and Selectivity 266

SunFire OBD Preparative Columns 276
High-Mass Loading 276

Atlantis OBD Preparative Columns 281
Retention of Polar Compounds 281

XTerra OBD Preparative Columns 285

Symmetry Preparative Columns 291

Spherisorb Preparative Columns 295

Nova-Pak Preparative Columns 299

µBondapak/Bondapak and µPorasil/Porasil Columns 299

Delta-Pak Preparative Columns 301

Preparative Guard Cartridge Holders 301

Preparative Standards 302
How Do You Know Your Chromatographic System Is In Proper Working Order? 302

Preparative Bulk Material 303

Gas Chromatography Packings 304
Versatility for Specialty Applications 304

Radial Compression Module Products 305

≥5 µm Preparative HPLC Columns

From Productivity Comes Predictability

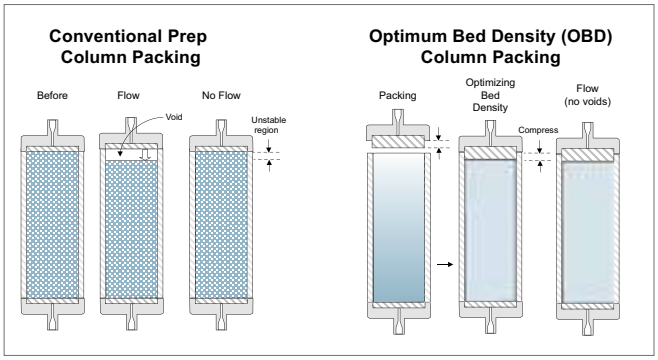


Why struggle with inconsistencies in column-to-column performance, unpredictable column lifetimes, lost samples, repeat purification runs, and poor scalability from small- to large-volume columns?

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

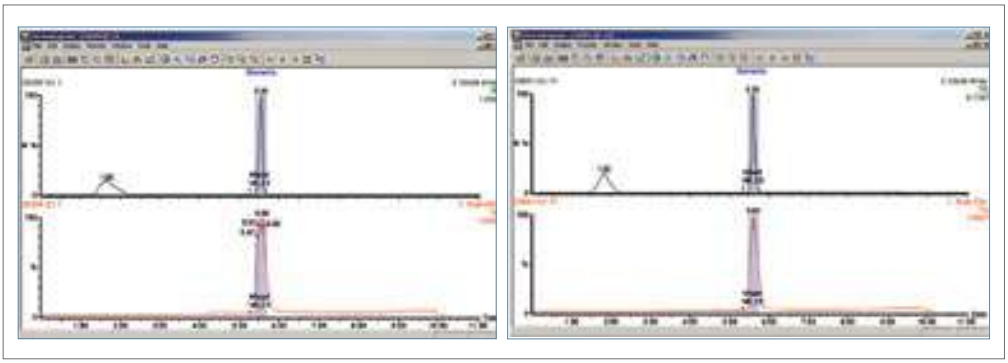


The OBD Preparative Column design and packing process results in predictable, uniform density profiles throughout the column. During the final capping process, our established procedures do not over compress or disrupt in any non-uniform way, eliminating the potential for voids.

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.

Approximate Peptide Mass Loading Capacities (mg) for OBD Preparative Columns (Gradient Mode)

	Diameter (mm)				
Length (mm)	**4.6**	**10**	**19**	**30**	**50**
50	0.3–0.6 mg	1.5–3.0 mg	4–9 mg	11–22 mg	31–62 mg
100	0.5–1.0 mg	2.5–5.0 mg	9 18 mg	22–45 mg	62–125 mg
150	0.8–1.6 mg	4.0–8.0 mg	13–27 mg	34–68 mg	93–186 mg
250	1.3–2.6 mg	6.0–12.0 mg	22–45 mg	56–112 mg	155–310 mg
Reasonable flow rate (mL/min)	0.9–1.8	4.5–9.0	16–32	40–80	111–222 mg
Reasonable injection volume (µL)	20	100	350	880	2450

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 Small Molecule 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.

Estimates for peptide mass load are broad because capacioty depends on the solubility of the peptide in the mobile phase.

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 waters.com/prepcalculator



Increase Your Productivity Through Higher Recoveries and Longer Column Lifetimes

With Optimum Bed Density (OBD™) Preparative Columns you have the ability to:

- 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

Waters OBD Preparative Columns Calculator

This convenient 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 or UHPLC to preparative method transfer



Learn more on **pages 250–251** or to try this tool, visit **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 over 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.

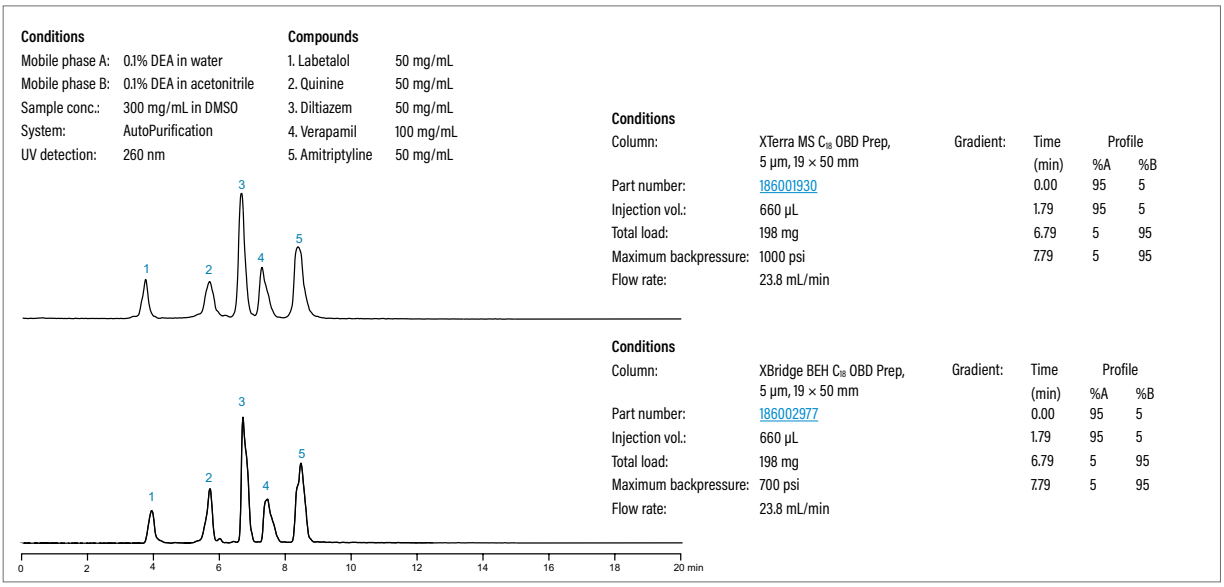
XBridge OBD Preparative Columns offer:

- 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



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 142 for 2.5 µm and page 181 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: 186008745.
[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: 186008745.
[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: 186008745.
[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: 186008745.
[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: 186008745.
[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: 186008745.
[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: 186008745.



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
19 × 50 mm	OBD Column	186008962
30 × 50 mm	OBD Column	186008963
50 × 50 mm	OBD Column	186008964

[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.

Column (mm)	30	50
2.1 × 50	0.04	0.2
4.6 × 50	0.20	1.0
10.0 × 50	1.00	4.5
19.0 × 50	4.00	16.0
30.0 × 50	9.00	40.0
50.0 × 50	25.00	110.0



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 separations from analytical to preparative, 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

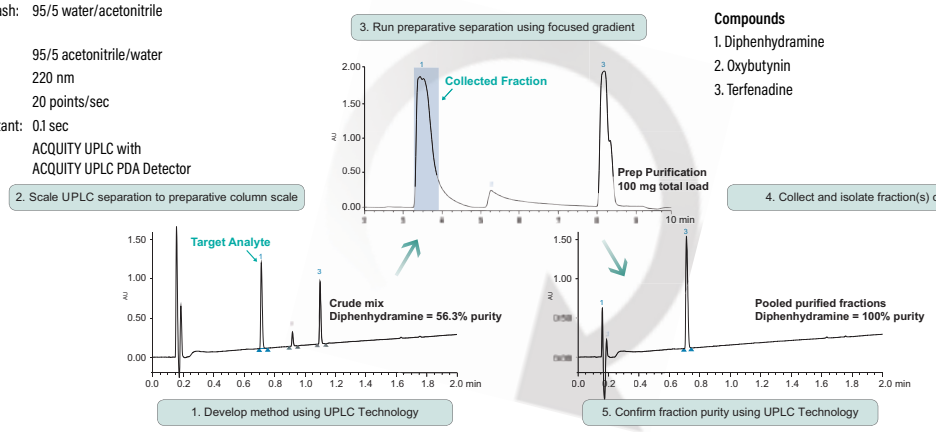
Gradient:

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

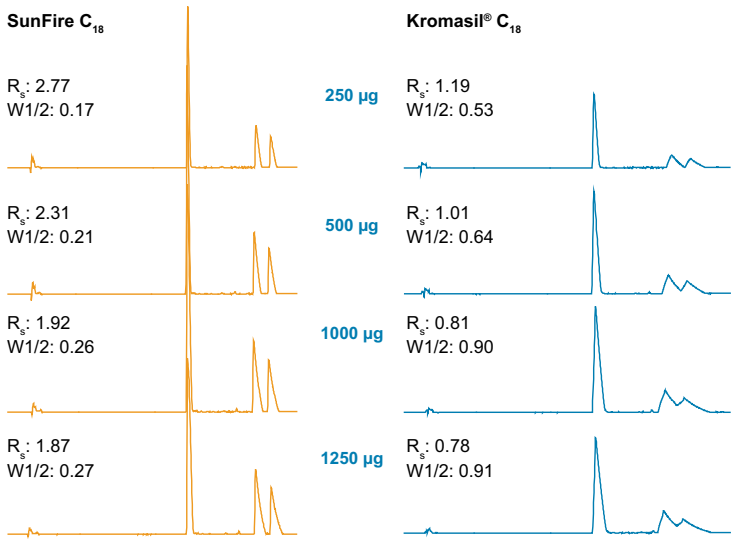
HIGH-MASS LOADING

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 169 for 2.5 µm and page 211 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

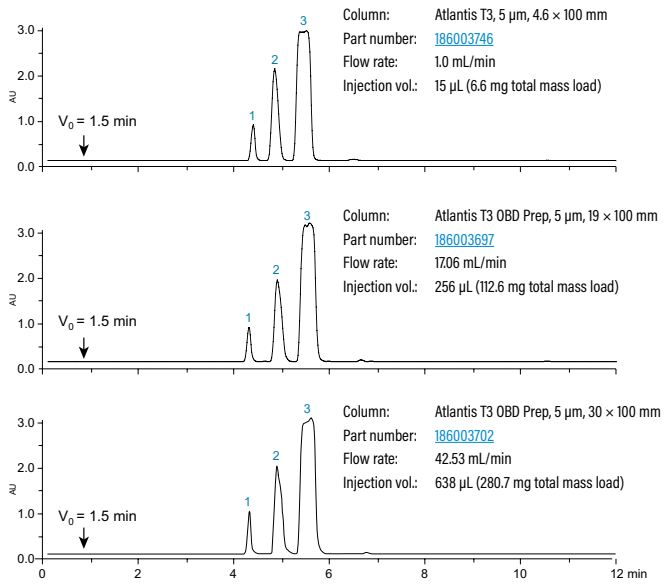
RETENTION OF POLAR COMPOUNDS

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 207.

Ordering Information

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

BioAdvisor

Discover the best chemistry solutions for your application with this tool.



BioAdvisor enables you to select an appropriate UPLC/UHPLC or HPLC column and/or chemistry consumable for a desired application, all organized by molecule type.

For more information, visit **waters.com/BioAdvisor**

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 174 for 2.5 µm and page 221 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	
	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

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 216.

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 /S	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 /S	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			
Symmetry300 C_4	**Particle Size: 3.5 µm**		**Particle Size: 5 µm**	
	Dimension	**P/N (1/pk)**	**Dimension**	**P/N (1/pk)**
	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 227.

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

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

For more information on Nova-Pak Columns, refer to page 232.

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.

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

For µBondapak/Bondapak and µPorasil/Porasil Preparative Columns, please refer to pages 235-237.

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 and 30 × 10 mm Prep Guard Holder and Cartridge



For more information on Delta-Pak Columns, refer to page 234.

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, ensuring long-term reproducible material.

Bulk materials are available packaged in quantities of 100 g to 25 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



(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 305.

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 305.

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.

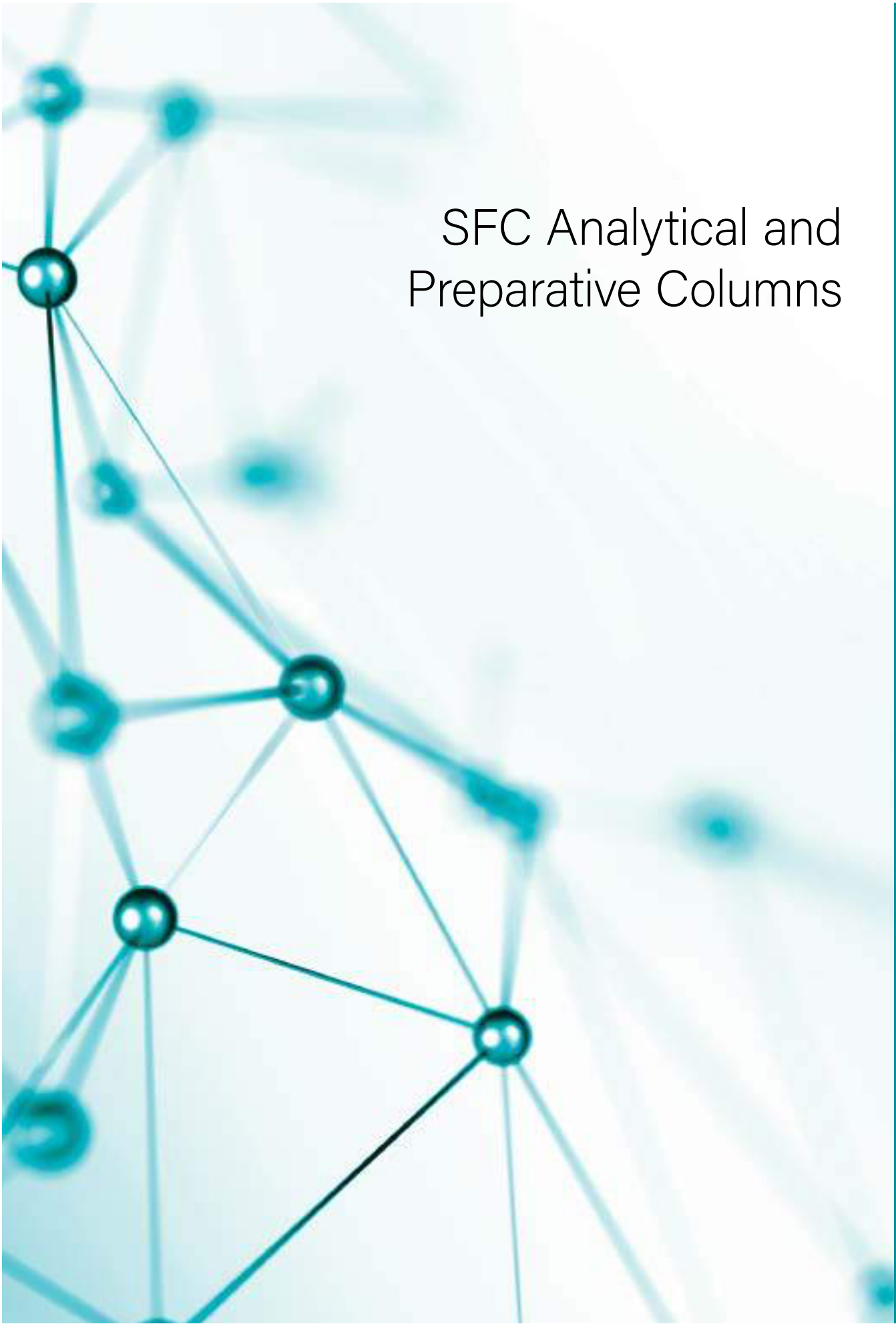
Prep Nova-Pak HR Radial-Pak Column Segments	Particle Size: 6 µm	
C_{18}, 60 Å	8 × 100 mm	WAT025843
Silica, 60 Å	8 × 100 mm	WAT025844

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



SFC Analytical and Preparative Columns

SFC Analytical and Preparative Columns

Contents

Torus, Trefoil, and Viridis Columns for Achiral and Chiral SFC Separations 311

Torus Columns for Achiral SFC Separations 312

Torus 2-PIC (2-Picolylamine) 313

Torus DEA (Diethylamine) 313

Torus DIOL (High-Density Diol) 313

Torus 1-AA (1-Aminoanthracene) 313

Torus Preparative Achiral SFC Columns 315

ACQUITY UPC2 System: Quality Control Reference Materials 316

How Do You Know Your Chromatographic System is Operating Properly? 317

Trefoil Columns for Chiral SFC Separations 318

Transfer Normal-Phase Methods to Convergence Chiral Methods 318

Viridis Columns 320

Viridis Hybrid and HSS SFC Columns 320

Viridis Silica-Based SFC Columns 320

Supercritical Fluid Chromatography (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 alternate selectivity of normal-phase chromatography with the ease and reliability of reversed-phase chromatography. These high quality achiral and chiral SFC column chemistries provide the ability to handle achiral and chiral separations deliver novel selectivity and robustness with unequaled speed and unparalleled confidence.

Column Characteristics

Column	Particle Shape	Particle Size	Pore Volume	Pore Size	Surface Area	Carbon Load	Chemistry
Torus Analytical and 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 and 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.

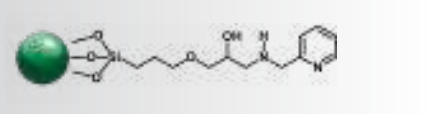
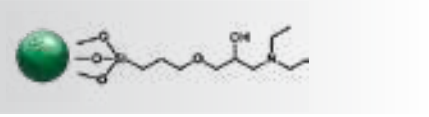
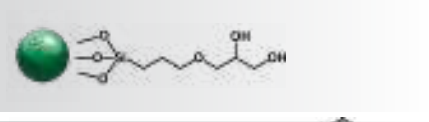
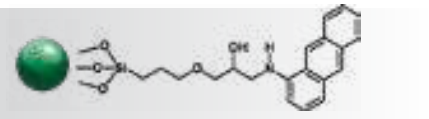
Torus Columns for Achiral SFC Separations

Torus Columns offer:

- Excellent peak shapes
- A wide range of unique selectivities with unique ligands
- Highest efficiency and QC-ready robustness
- Waters OBD Technology

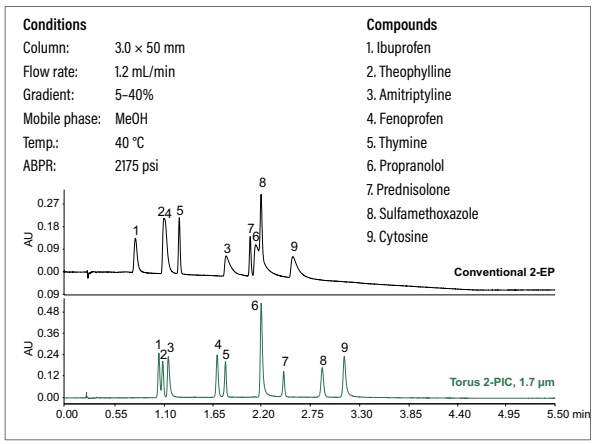
Torus Columns are designed for achiral SFC separations, offer a wide range of selectivity, excellent peak shape, and are ideally suited for method transfer and method scale-up. Torus Columns are offered in 1.7 and 5 µm chemistries in both analytical and preparative column formats.

The Torus Phases are based on patented 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)

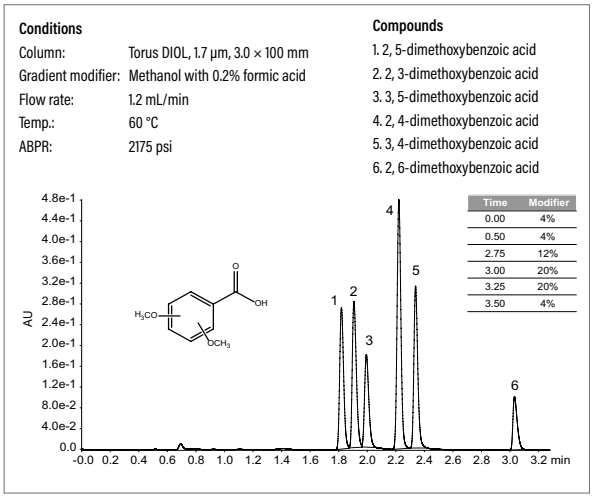
Torus 2-PIC Columns were designed for general use and are the first choice for a wide range of applications with acidic and basic compounds. The Torus 2-PIC phase demonstrates enhanced performance compared to conventional 2-ethylpyridine (2-EP), displaying improved peak shape, added retention, and novel selectivity.



Torus 2-PIC has excellent peak shape characteristics for wide ranges of acidic and basic compounds.

TORUS DIOL (HIGH-DENSITY DIOL)

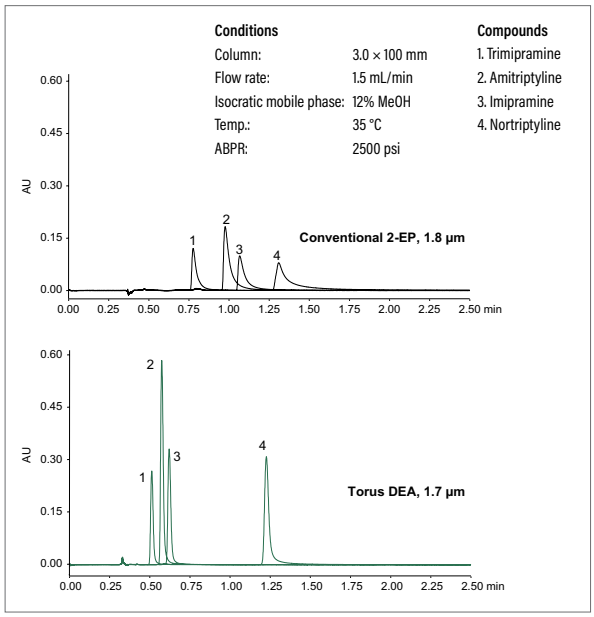
Torus DIOL Columns were developed to provide additional selectivity choices. High-density diol surface bonding offers chromatography performance similar to that of traditional, unbonded silica phases, and adds overall method robustness when utilized with additives.



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.



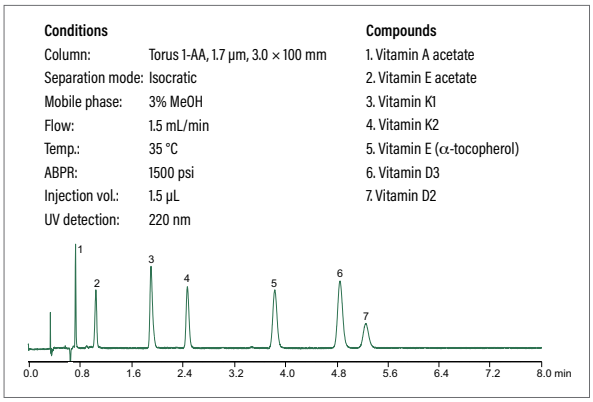
Torus DEA exhibits excellent peak shape for strong basic compounds when compared to a silica 2-EP column.

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 **waters.com/torus** and view the webcast titled "Torus Columns for Achiral Method Development".

Visit 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.

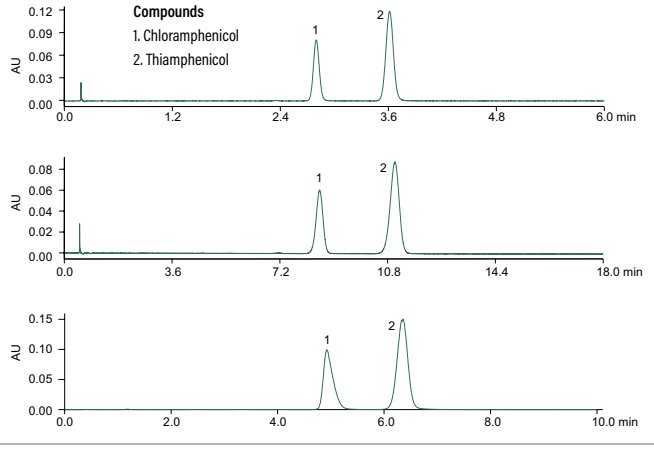
You can base a scale up of screening methods on any of the four Torus analytical column chemistries to perform 5 µm Torus Preparative SFC Separations.

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

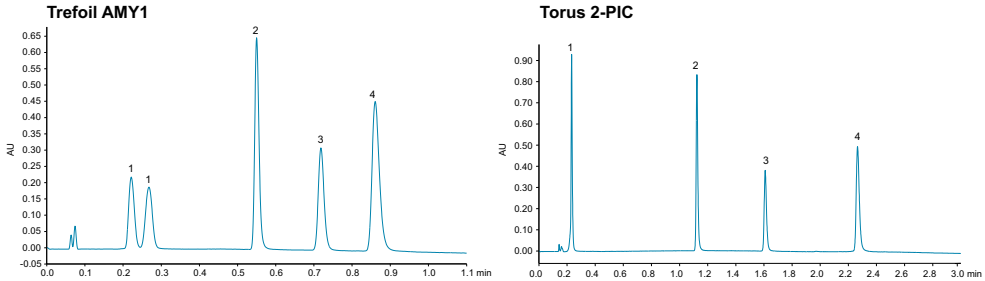
Dimension	Particle Size: 5 µm			
	P/N	P/N	P/N	P/N
	2-PIC	DIOL	DEA	AA
OBD 10 × 50 mm	186008581	186008598	186008615	186008632
OBD 10 × 100 mm	186008582	186008599	186008616	186008633
OBD 10 × 150 mm	186008583	186008600	186008617	186008634
OBD 10 × 250 mm	186008584	186008601	186008618	186008635
19 × 10 mm 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 UPC² System: Quality Control Reference Materials

The Quality Control Reference Materials (QC Reference Materials) for the ACQUITY UPC²™ 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



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

Conditions

System:	ACQUITY UPC²
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

Single QC Reference Material for Trefoil and Torus Columns on an ACQUITY UPC² 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

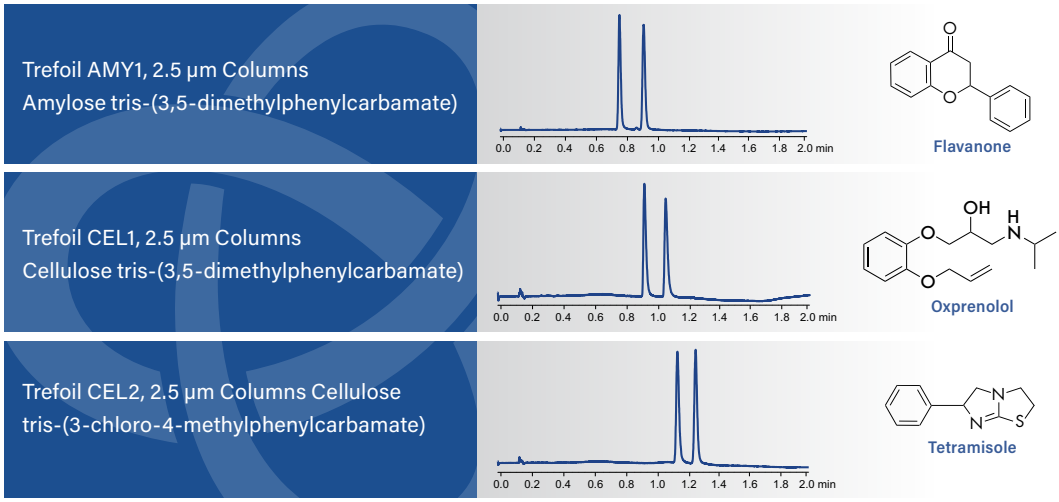
Trefoil Columns for Chiral SFC Separations

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

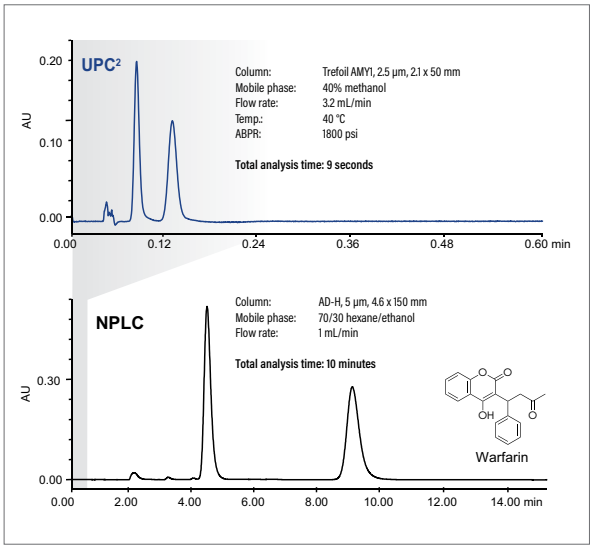
Trefoil modified polysaccharide-based stationary phases provide broad spectrum chiral selectivity. Trefoil AMY1, Trefoil CEL1, and Trefoil CEL2 Column Chemistries are complementary to each other and independently offer different retention characteristics for separating chiral compounds. Selectivity can 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.



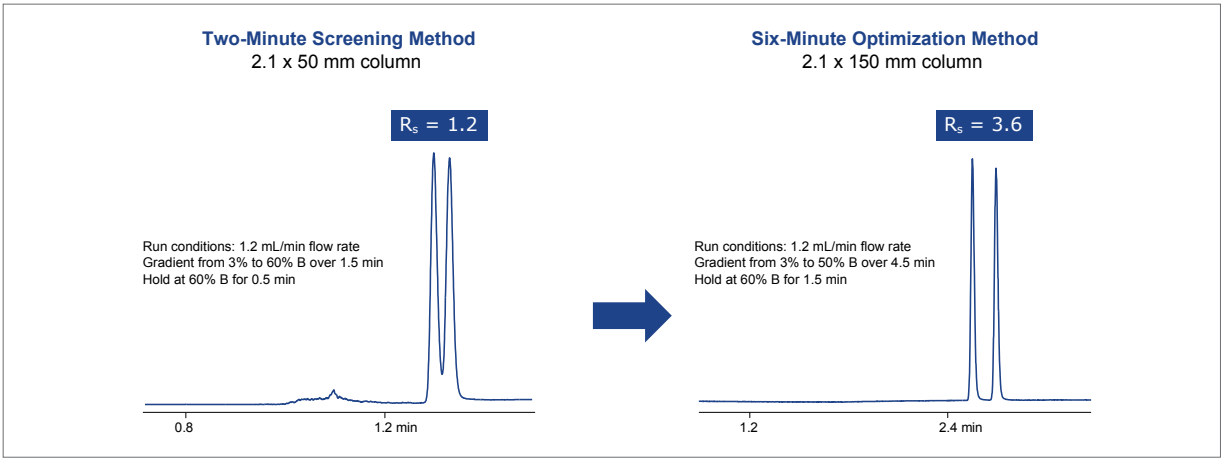
ACQUITY UPC² System with Trefoil Columns can be more than 30 times faster, use 75 times less solvent per run, and cost 100 times less per analysis.

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 **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

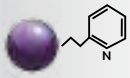
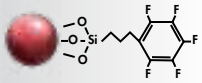
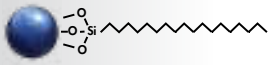
Description	Particle Size: 2.5 µm
	P/N
Trefoil Column Screening Kit, 2.1 × 50 mm (AMY1, CEL1, CEL2), 3/pk	176003577
Trefoil Column Optimization Kit, 3.0 × 150 mm (AMY1, CEL1, CEL2), 3/pk	176003578

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.



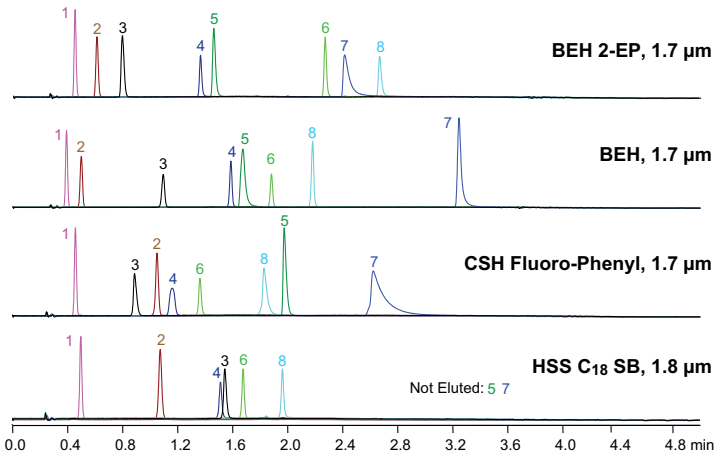
Viridis BEH 2-EP, 1.7, 3.5, and 5 µm Columns	
Viridis BEH, 1.7, 3.5, and 5 µm Columns	
Viridis CSH Fluoro-Phenyl, 1.7, 3.5, and 5 µm Columns	
Viridis HSS C_{18} SB, 1.7 and 3.5 µm Columns	

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

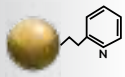
1. Coumarin
2. Flavone
3. Caffeine
4. Thymine
5. Papaverine
6. Sulfamethoxazole
7. Cytosine
8. Sulfamethizole



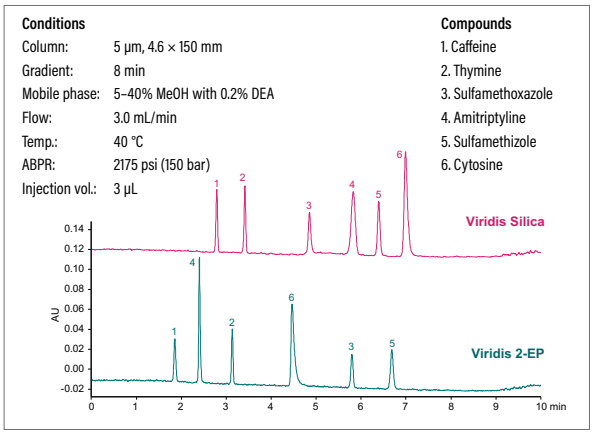
Viridis Analytical Columns provide multiple selectivities.

VIRIDIS SILICA-BASED SFC COLUMNS

Based on Waters long history producing superior grades 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 purifications, Viridis Preparative Columns exhibit good retention, peak shape, and selectivity properties both with and without the use of additives. These prep columns are rugged and deliver reliable separation performance for complex mixtures time and time again."



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

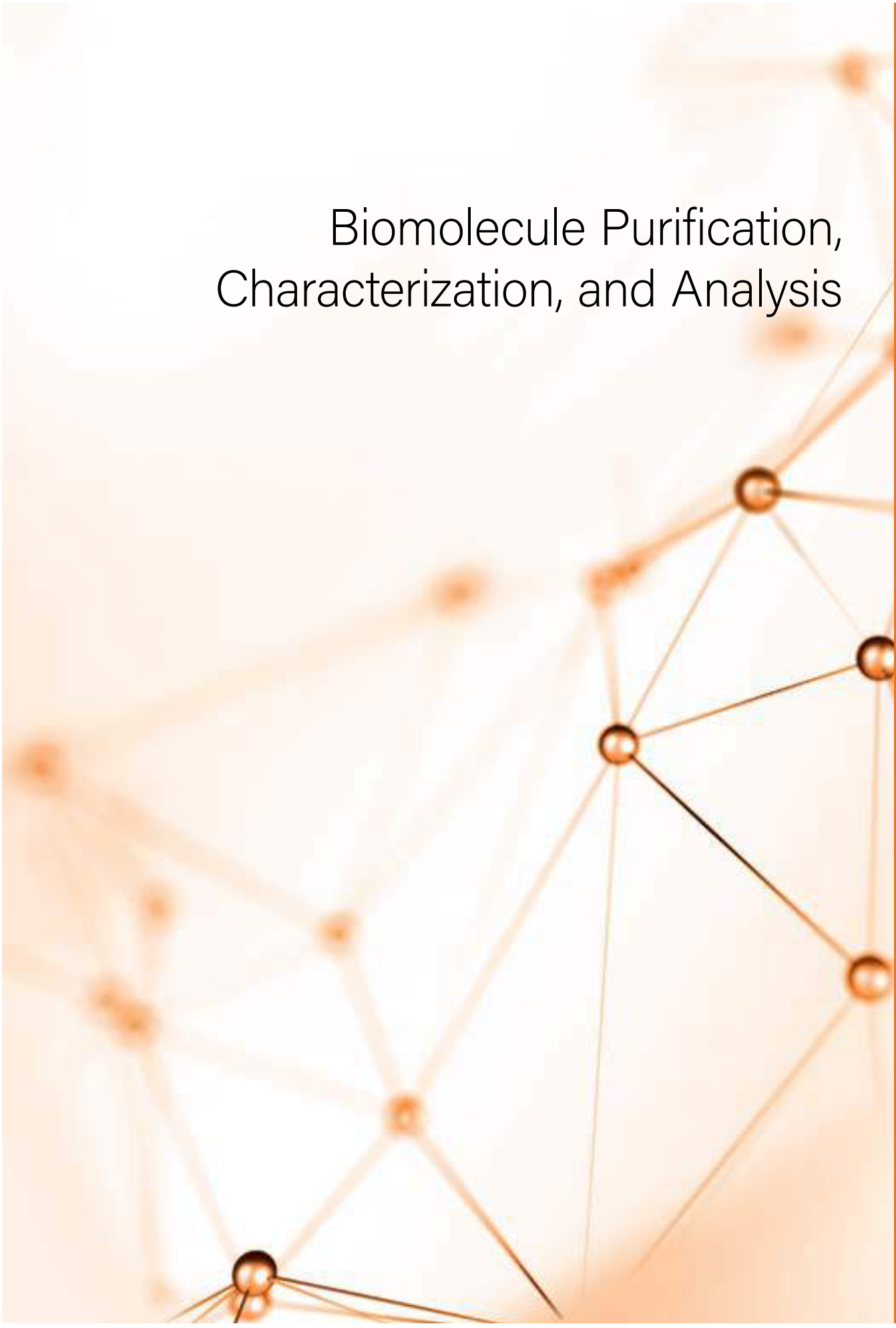
Quality Control Reference Materials

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

Biomolecule Purification, Characterization, and Analysis

Contents

Innovative Technologies from the Leader in Separation Science and Analytical Biochemistry 325

Factors to Consider when Investing and Using HPLC, UHPLC, or UPLC Columns for Bioseparations 327

- Column Selection and Installation 327
- BioSeparation Method Development 330

Application-Specific Column Selections 334

- Peptide Analysis 334
- Protein Aggregate, Monomer, and Fragment Analysis 334
- Oligonucleotide Analysis 334
- Glycan Analysis 334
- Intact and Subunit Protein Analysis 334

Amino Acid 340

- Accurate Amino Acid Analyses from Varied Sample Matrices 341
- UPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis Solution 342
- UHPLC and HPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis 343
- AccQ•Tag Ultra C_{18} HPLC Chemistry 344
- HPLC: AccQ•Tag Amino Acid Analysis Solution 349
- HPLC: Pico•Tag Method 350

Glycan and Glycoprotein Analysis 353

- Consolidating Complementary Techniques to Streamline Glycan Analysis 353
- Intact Glycoprotein Analysis 354
- Glycoprotein Subunit Analysis 356
- Glycopeptide Analysis 358
- Glycoprotein Performance Test Standard 360
- Released N-Glycan Analysis 361
- GlycoWorks *Rapi*Fluor-aMS Released N-Glycan Sample Preparation 363
- Automation of Released N-Glycan Analysis 364
- Phosphoglycan SPE Buffer Improves Recover 364
- Glycan Performance Test Standards and Dextran Calibration Ladders 366
- Glycan Columns 366
- Monosaccharide and Sialic Acid Analysis from Glycoproteins 372

Nucleic Acid Separations 375

- Exceptional Resolution of Exceptional Resolution of Oligonucleotide Mixtures 376
- Columns for Large DNA/RNA Species 380
- Anion-Exchange HPLC of Nucleic Acids 381
- Hydrophilic Interaction Chromatography (HILIC) of Nucleic Acids 382
- MassPREP Oligonucleotide Standard 384
- Oligonucleotide Desalting by Solid-Phase Extraction 384

Peptide Analysis 385

- A Wide Range of Chemistries for Reversed-Phase Peptide Separations 385
- MaxPeak Premier Peptide Columns 387
- Peptide BEH C_{18}, 130 Å and 300 Å Column 388
- Peptide CSH C_{18}, 130 Å Columns 389
- Peptide HSS T3 Columns 390
- Therapeutic Peptide Method Development Kit 397
- Cation-Exchange Peptide and Polypeptide Separations 397
- BioSuite Cation-Exchange HPLC Columns 398
- BioSuite HPLC and UHPLC Peptide Analysis Columns 399
- Symmetry HPLC and UHPLC Columns 400
- Delta-Pak HPLC and UHPLC Columns 401
- Peptide Standards and Reagents 402
- Cytochrome c Digestion Standard 402
- MassPREP Peptide Standard 403

Protein Analysis 406

- Intact Protein and mAb Subunit Analysis 406
  - BioResolve RP mAb 406
  - mAb Subunit Standard 409
  - Analysis of Adenoviral Vector Proteins using BioResolve RP mAb Polyphenyl 410
  - MaxPeak Premier and Protein BEH C_4, 300 Å Colum 412
  - MassPREP Protein Standard Mix 415
  - Protein-Pak Hi Res HIC Columns and HIC Protein Standard 417
  - BioSuite Hydrophobic-Interaction Chromatography (HIC) HPLC Columns 418
  - ACQUITY UPLC Glycoprotein BEH Amide, 300 Å Columns 419
- Protein SEC Columns 421
- SEC Aggregate Analysis 422
- ACQUITY and XBridge Premier Protein SEC Offerings For SEC Platform Method Applications 424
- BioResolve SEC mAb offerings For mAb Aggregate, Monomer, and Fragment Analyses 426
- ACQUITY Protein SEC Offerings For High Throughput SEC Applications 427
- XBridge BEH SEC Offerings 428
- SEC Analysis of Insulin 429
- mAb Size Variant Standard 429
- Protein Standards 429
- SEC Column Connectors and Connector Kits 430
  - BioSuite Size-Exclusion (SEC) HPLC Columns 431
  - Protein-Pak and Shodex Size-Exclusion HPLC Columns 433
- Charge Variant and Ion-Exchange Analysis 435
  - BioResolve SCX mAb Columns 435
  - mAb Charge Variant Standard 437
  - VanGuard FIT Cartridge 437
  - BioResolve CX pH Buffers 438
- LC-MS Analysis with IonHance CX-MS pH Buffer 439
  - Protein-Pak Hi Res Ion-Exchange (IEX) Columns for ACQUITY UPLC Applications 442
  - Ion-Exchange Standards 443
  - BioSuite Ion-Exchange HPLC Columns 445
  - Protein-Pak PW Series Columns 446
  - Protein-Pak High Resolution (HR) Ion-Exchange Glass Columns 447
  - Advanced Purification (AP) Glass Columns 448
  - AccellPlus Ion-Exchange Packings 450
  - AccellPlus Sep-Pak Cartridges 450
  - AccellPlus PrepPak Cartridges (47 × 300 mm) 450
  - AccellPlus Ion-Exchange Bulk Packings 451
  - BioSuite pC_{18} and pPhenyl Reversed-Phase Chromatography (RPC) HPLC Columns 452

Biomolecule Purification, Characterization, and Analysis

Innovative Technologies 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.

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.

Waters comprehensive chemistry consumables family includes:

- BioResolve™ line of application specific columns that help streamline analytical challenges associated with mAb characterizations and associated biotherapeutic drug separations
- Scalable peptide columns for nano, capillary, analytical, and preparative 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, columns and standards, and HILIC and Mixed-Mode Glycan Columns for the analysis of released glycans
- MaxPeak™ Premier High Performance Surface Technology available with many of the biomolecule chemistries reducing the need for long conditioning and significantly reducing non-specific binding and analyte loss
- IonHance™ LC-MS grade mobile phases and additives help deliver high-quality data
- Automation for many of the complex sample preparation workflows with the Biopharma Andrew+™ Pipetting Robot and scripts for Hamilton and Tecan.

In addition, several of our biomolecule separation offerings (e.g. ACQUITY™ Premier Protein SEC 250 Å, ACQUITY UPLC Glycoprotein BEH Amide, 300 Å offering, and Waters UPLC Amino Acid Analysis Solution) were developed for use on ACQUITY UPLC-based Systems to help obtain accurate, precise, and highly resolving quantitative analysis of various therapeutics.

Designed and QC tested with relevant biomolecules to help ensure reliable, high performing column-to-column consistency.

Bioseparations Columns

waters.com/biosep

Bioseparations Analytical Standards and Reagents

waters.com/biostds



BioAdvisor

Discover the best chemistry solutions for your application with this tool.



BioAdvisor enables you to select an appropriate UPLC/UHPLC or HPLC column and/or chemistry consumable for a desired application, all organized by molecule type.

For more information, visit **waters.com/BioAdvisor**

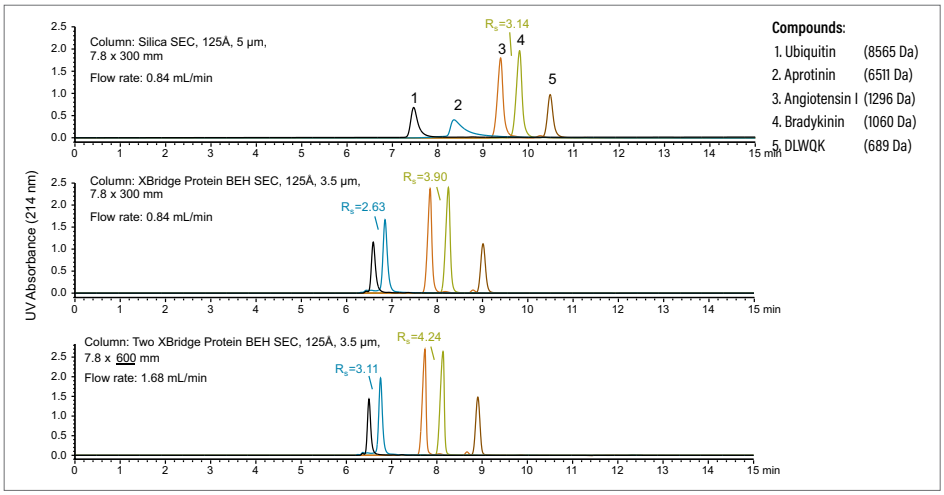
Factors to Consider when Investing and Using HPLC, UHPLC, or UPLC Columns for Bioseparations

Many factors can affect the quality of data obtained from LC-based separations of peptides, proteins, and other biomolecules. The following pages list just a few of the important factors to consider when selecting an appropriate HPLC, UHPLC, or UPLC column for analytical or lab-scale applications. Once an appropriate column is selected, time must be invested in developing a satisfactory separation, so we have also included a few useful method development "tips and tricks". We hope that these few examples will help chromatographers select a column and develop a method that matches their specific instrumentation and application needs.

PART 1: COLUMN SELECTION AND INSTALLATION

Effect of Particle Composition on SEC Peptide Separations

- Particle composition (e.g., silica, polymer, hybrid) influences desired LC separations
- These non-desired secondary interactions (i.e., ionic or hydrophobic) can be beneficial or detrimental
- Particle composition can also influence column life (e.g., silica-based at pH >7)

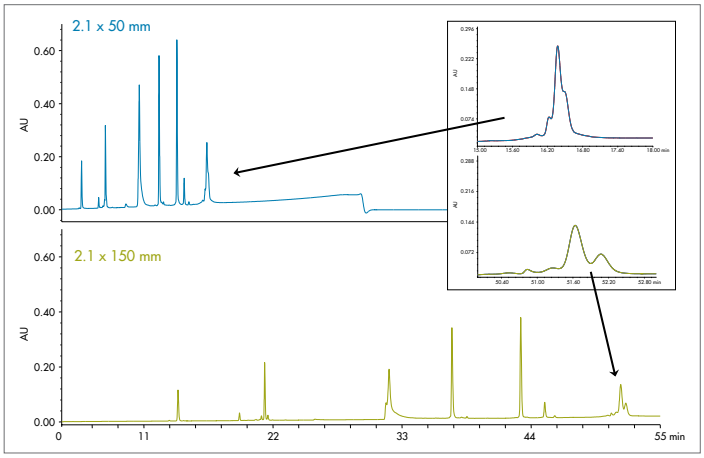


In the size-exclusion chromatographic (SEC) separation shown, a series of synthetic peptides are separated on a column containing 100% silica-based, diol-coated particles (top) vs. Waters diol-coated, bridged-ethylene hybrid (BEH Technology™) particles that have less-undesired-free silanols. Consequently, and as shown in this example, use of SEC columns that contain BEH particles results in comparatively less undesired secondary ionic interactions between the ubiquitin and aprotinin peaks and less peak tailing making quantitation of these peptides more reliable.

For more information, reference application note 720005369EN.

Effect of Column Length on Reversed-Phase Protein Separations

- Use of longer LC columns can translate into improved component resolution
- Analysis time increases as column length increases
- Separated peak volume increases as column length increases

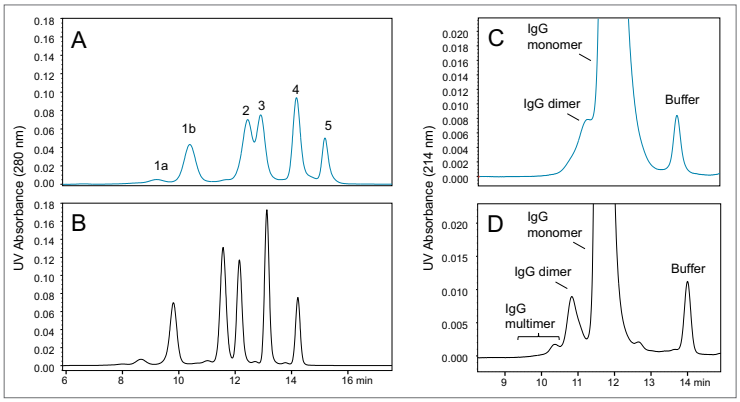


Increasing the length of the column will increase the resolving power for a separation. This is shown with the separation of a protein mixture. The additional small peaks surrounding the Phosphorylase b can be seen more readily on the longer column, as seen in the inset, but it comes at the cost of a 3-fold increase in run time and ~40% loss of sensitivity. Depending on the application objective, this may be a useful parameter to improve resolution.

For more information, reference application note 720003875EN.

Effect of Particle Size on SEC Protein Separations

- Well-packed columns containing small particles can improve a separation
- System back pressure will increase as particle size decreases
- Consequently, LC instrumentation can limit potential column use



A comparison of separations of Waters BEH450 SEC Protein Standard Mix (p/n: 186006842) and Intact mAb Mass Check Standard (p/n: 186006552, diluted to 1 mg/mL) on 450 Å, silica-based 8 µm (Frames A and C) and 450 Å, BEH 3.5 µm (Frames B and D) SEC columns. Both columns were the same dimensions (7.8 × 300 mm) and separations were performed with the same flow rate (0.84 mL/min) and with the same sample loads. Peak identities for chromatograms A and B are: 1a) thyroglobulin dimer (1.3 MDa), 1b) thyroglobulin (669 KDa), 2) IgG (150 KDa), 3) BSA (67 KDa), 4) myoglobin (14 KDa), and uracil (112 Da). For the chromatograms in frames C and D the molecular weights of the IgG monomer, dimer, and multimer are approximately 150 KDa 300 KDa, and ≥450 KDa, respectively.

For more information, reference application note 720005202EN.

Choosing an Analytical Column that Best Matches LC-based Instrumentation

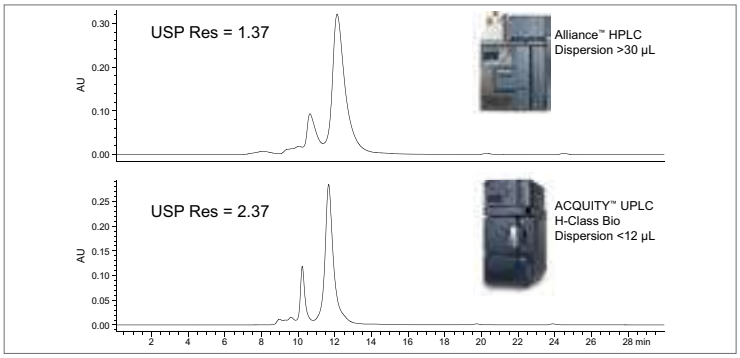
- Standard methods can be performed to measure system dispersion (band broadening)
- Different LC systems have different dispersion values (e.g., band broadening)
- Optimal chromatographic separations are obtained when the appropriate column (e.g., column I.D., particle size) and separation conditions (e.g., flow rate, temperature, gradient) are selected based on LC system design

HPLC	UHPLC	UPLC
Dispersion >30 µL	Dispersion 12–30 µL	Dispersion <12 µL
Columns: 3.0–4.6 mm I.D.; 3–10 µm particles	Columns: 2.1–4.6 mm I.D.; 1.7–5 µm particles	Columns: 1.0–4.6 mm I.D.; 1.6–5 µm particles
Recommended column: 4.6 mm I.D., 5 µm particles	Recommended column: 3.0 mm I.D., 2.5 µm particles	Recommended column: 2.1 mm I.D., 1.7 µm particles
Typical operating pressure: <6000 PSI	Typical operating pressure: <10,000 PSI	Typical operating pressure: <15,000 PSI

Dispersion – n. Broadening of an analyte band due to both on-column effects (diffusion and mass transfer kinetics which are both dependent on particle size and linear velocity) and system effects (tubing internal diameter [I.D.] and length, connections, detector flow cell volumes, etc.) True separation performance is governed by the system dispersion paired with a flow rate range that yields the highest possible efficiency for a given analytical column. Due to these dispersion levels, we can appropriately match the right type of column size (volume) with the system dispersion. UPLC, having a very low dispersion volume, provides the greatest flexibility in terms of the columns that can be run on the system.

Effect of LC System Dispersion on SEC Monoclonal Protein Separations

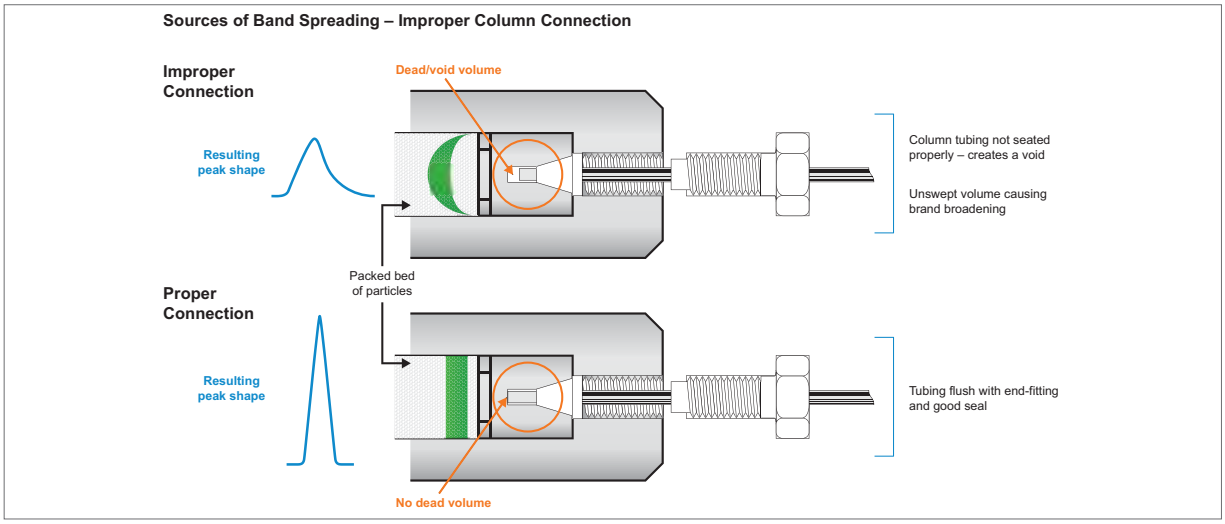
- LC Systems with lower system volumes better maintain column generated separations
- Isocratic-based SEC separations are most sensitive to deleterious band broadening effects



The extra system volume of the traditional HPLC System (top) caused the column separated peaks to "partially remix" resulting in a USP resolution factor of 1.37 vs. the superior 2.37 value obtained when the separation was performed on an ACQUITY UPLC System. This slide shows how the LC system's "band broadening" can adversely affect the quality of the mAb separation generated with the same XBridge™ Protein BEH SEC, 200 Å, 2.5 µm Column, SEC eluent, and sample.

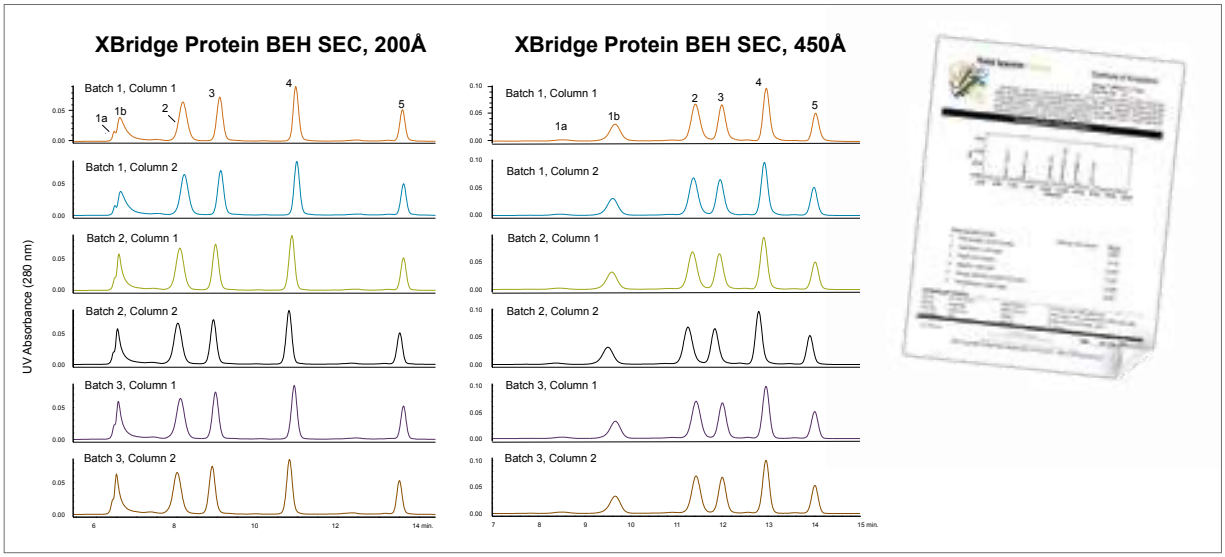
Importance of Making Good Connections from Column to LC System

- Poor column-to-instrument connections can degrade a chromatographic separation
- Perceived column leaking can also be caused by a poor connection



Importance of Batch-to-Batch and Column-to-Column Reproducibility

- Column reproducibility is a key attribute when selecting a column
- QC testing with relevant biological standards can help ensure consistency

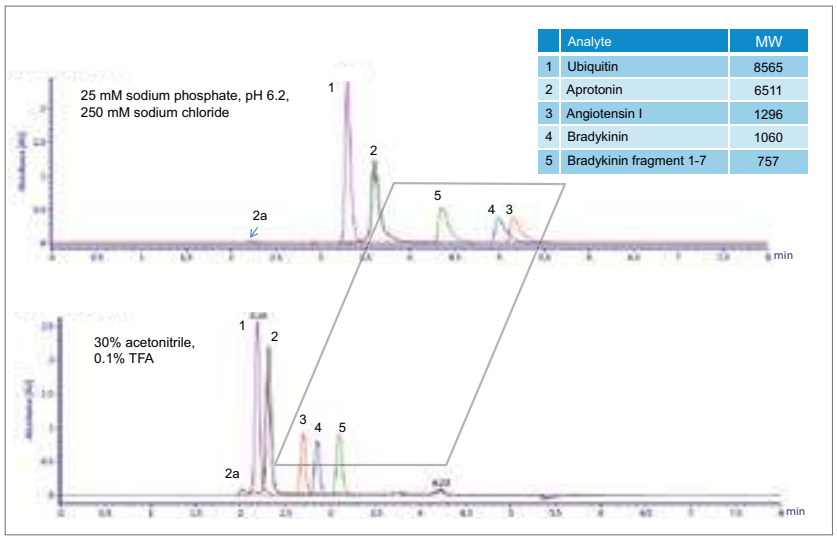


Shown are overlays of the separations of Waters BEH200 SEC Molecular Weight Standard (p/n: 186006518) on 200 Å and 450 Å BEH 3.5 µm SEC columns. Two columns (300 mm length × 7.8 mm I.D.) were packed from three individual manufactured batches of particles to evaluate both batch-to-batch and column-to-column reproducibility. Peak identities are: 1a) thyroglobulin dimer (1.34 MDa), 1b) thyroglobulin (669 KDa), 2) IgG (150 KDa), 3) BSA (67 KDa), 4) myoglobin (14 KDa), and 5) uracil (112 Da). Separations were performed on an ACQUITY UPLC H-Class Bio System.

PART 2: BIOSEPARATION METHOD DEVELOPMENT

Eluent Effect on SEC Peptide Separations

- Non-desired, secondary interactions can compromise LC separations
- Use of an appropriate LC eluent can minimize secondary interactions



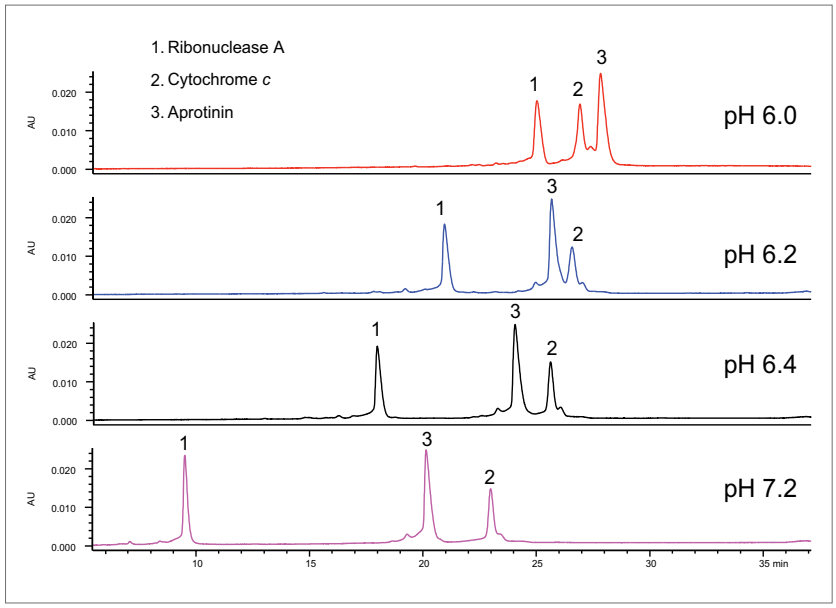
	Analyte	MW
1	Ubiquitin	8565
2	Aprotonin	6511
3	Angiotensin I	1296
4	Bradykinin	1060
5	Bradykinin fragment 1-7	757

Method development experiments evaluated the effect of mobile-phase pH and salt concentration. The results showed minimal effect of salt concentrations (150–350 mM) and mobile-phase pH (6.2–7.4) on retention time (data not shown). All of the aqueous mobile phases resulted in later than expected elution for most small peptides and proteins (<17,000 Da) as well as elution order that did not correspond to published molecular weight values. For example, bradykinin fragment 1–7 (MW 757) eluted before greater molecular weight peptides such as angiotensin I (MW 1296) and bradykinin (MW 1060). These results also suggest the non-ideal interactions of the tested peptides with the media is not solely due to an "ion-exchange" mechanism since increasing salt concentration had no significant impact on retention time.

For more information, reference application note 720004412EN.

Effect of pH on Ion-Exchange Protein Separations

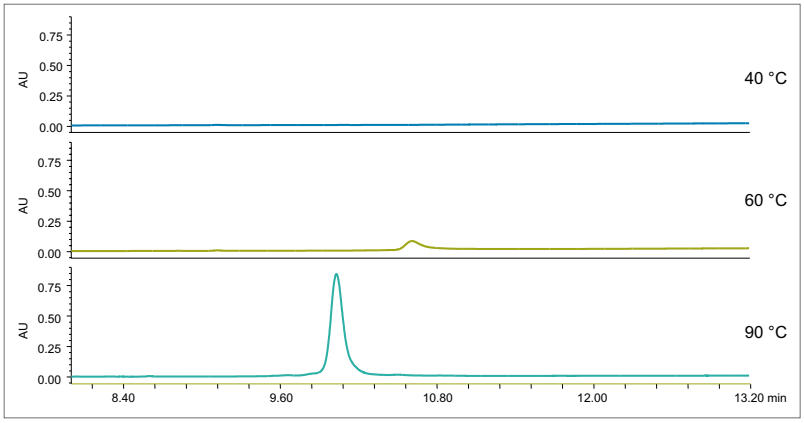
- pH has a significant influence on IEX separations
- Optimal pH for a separation is sample dependent



To illustrate the effect of buffer pH, a mixture of proteins was separated using weak cation-exchange chromatography at various pH values. At a pH of 6, different selectivity was observed for the most basic proteins vs. the separation at pH 6.2 and greater. At pH 6, ribonuclease A elutes before cytochrome c; this elution order is reversed when the separation was performed at pH 6.2 or greater, as shown in the figure. Sample: bovine, α-chymotryspinogen, bovine ribonucelase A, equine cyctochrome c. Column: Protein-Pak Hi Res CM 7 µm, 4.6 × 100 mm. Conditions: 20 mM buffer (MES or sodium phosphate) pH 6 to 7.2, 1 mL/min, 0 to 0.2 M NaCl in 34 minutes at 30 °C.

Temperature Effect on Reversed-Phase Protein Separations

- Use of “room temperature” is NOT always the ideal separation temperature
- Use of a column heater is strongly recommended for reproducible analyses

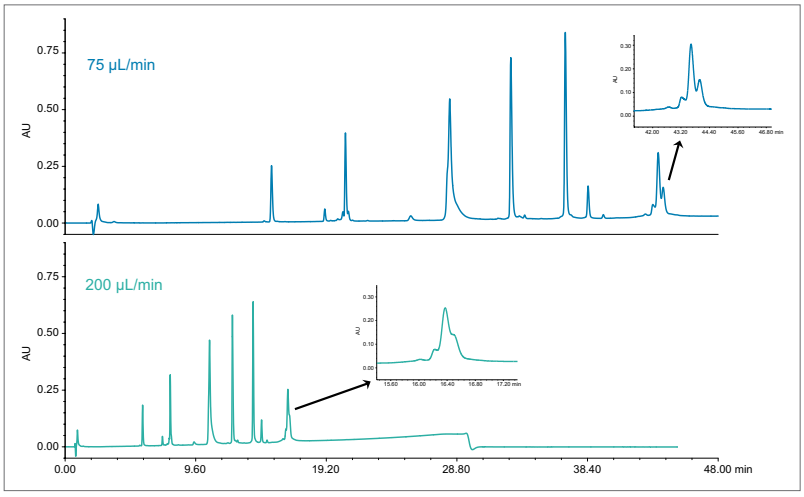


The intact IgG sample gave no observable peak at 40 °C, but recovery for the IgG sample improves with increasing temperature. There is not a measurable increase in recovery or improvement in peak shape above 80 °C. Column temperature has a large effect on reversed-phase separation of molecules. Changes in recovery and selectivity are not uncommon with small molecule separations. While increasing the temperature for proteins can significantly improve recovery, particularly for intact monoclonal antibodies, it doesn't generally affect the selectivity of the separation. However, not all proteins require higher temperatures for improved recovery. In fact, some protein separations have more desirable results with lower separation temperatures. Therefore, it is recommended that an evaluation of temperature be included in any method development strategy for new samples.

For more information, reference application note 720003875EN.

Effect of Flow Rate on Reversed-Phase Protein Separations

- Use of lower flows can translate into improved component resolution
- Analysis time will increase as flow rate increases
- Sample complexity can influence selected separation flow rate

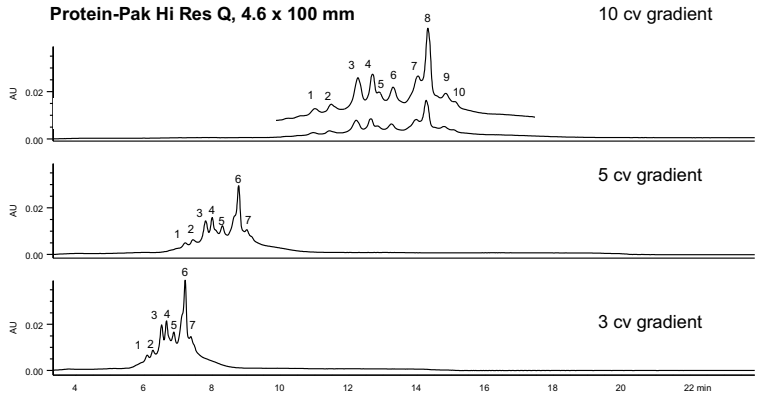


Decreasing the flow rate provides increased resolution without a compromise in the sensitivity, as seen in this separation of the protein mixture at 40 °C. The improved separation of the phosphorylase b sub-units can be seen (inset) at the lower flow rate. The run time of the analysis is increased proportionally to preserve the same gradient slope in both separations. Flow rate is seldom treated as an important parameter in method development except as an indirect modification of gradient slope. The impact of this variable is, however, more significant for larger molecules.

For more information, reference application note 720003875EN.

Effect of Gradient Duration on an IEX Protein Separation

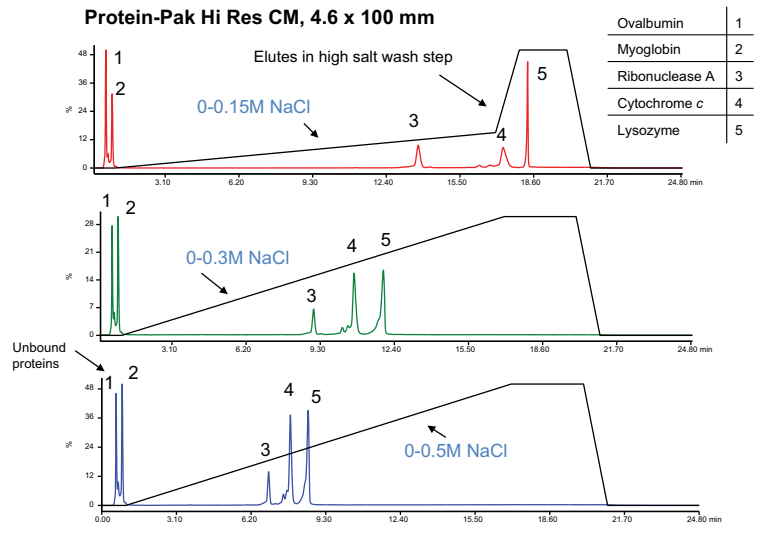
- Use of longer gradient time can translate into improved component resolution
- Analysis time will increase using longer gradients as will peak volume
- Sample complexity can influence selected gradient duration



The use of salt gradients can also be used to analyze variants of a single protein. In this example, chicken albumin was analyzed by anion-exchange chromatography. Three different gradient slopes were employed to analyze the variants of albumin formed by post transitional modifications, such as methylation, phosphorylation, and glycolysation. As can be observed in the chromatograms, the gradient slope can affect the number of variants detected, with shallower gradients reducing sensitivity but allowing for resolution of additional variants. Note: All gradients were performed at same flow rate from 0 to 0.5 M NaCl at same buffer pH.

Effect of Gradient Slope on an IEX Protein Separation

- Gradients of differing salt concentration affect in IEX protein separations
- Selected start and final salt concentration based on sample composition
- Analysis time and component resolution increases using increasingly shallow gradients

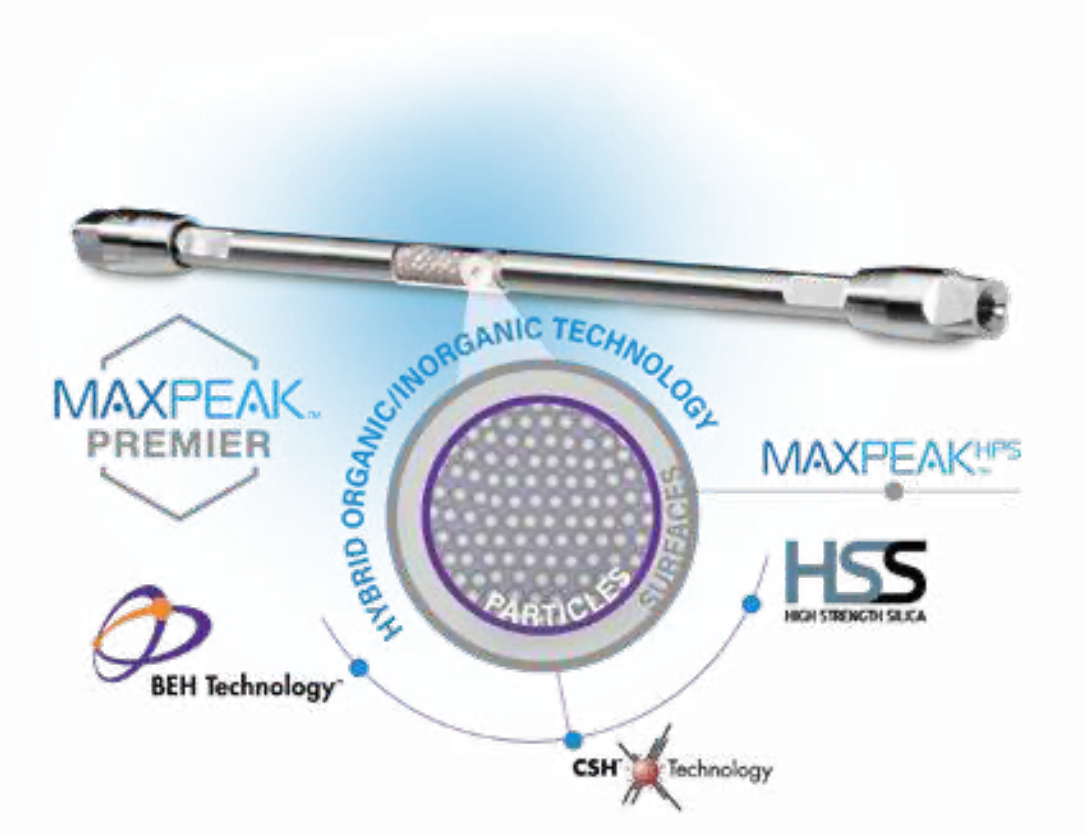


Gradients of differing salt concentration are frequently used in IEX protein separations to optimize retention time, component resolution, and overall analysis time. In this example, a protein mix was analyzed using three different salt gradients but keeping the run time identical. The higher salt gradient shown on the bottom of the chromatogram increases the salt concentration from 0–0.5 M NaCl, while the top chromatogram has a gradient which ends at 0.15 M NaCl, with the middle chromatogram ending at 0.3 M NaCl — note effect gradient has on separation. Flow rates same for all separations.

MaxPeak™ Premier Columns

Good Chromatography is as much about preventing the detrimental interactions you don't want, as it is creating the ones you do.

Waters™ MaxPeak Premier Columns enable scientists to have more control over their chromatographic separations by mitigating the loss of metal sensitive analytes, such as lipids, organic acids, acidic peptides, oligonucleotides, or other compounds containing phosphate or carboxylate functionalities. All MaxPeak Premier columns utilize MaxPeak High Performance Surfaces (HPS), new and innovative technologies designed to increase analyte recovery, sensitivity, and reproducibility by minimizing analyte/surface interactions that can lead to sample losses. MaxPeak HPS technology can also be found with Waters QuanRecovery™ plates and vial; for more information, please go to the QuanRecovery product information referenced on page 58.



MaxPeak Premier Columns provide:

- Reduced column conditioning and passivation times
- Improved sensitivity and peak shapes
- Simpler mobile phases, without complex additives
- Time savings in method development
- Reduced risk and greater confidence in data and decision making

Available with particle technologies and quality manufacturing you can trust for small molecule, protein, peptide, oligonucleotide, and glycan separations in both reversed-phase and HILIC separation modes.

Application-Specific Column Selections

PEPTIDE ANALYSIS

ACQUITY™ Premier BEH and XBridge™ Premier Particle Technology

- Outstanding peak capacity and superior peak shape in TFA, DFA, and FA
- Two pore sizes (130 Å and 300 Å) to provide different separation selectivities

ACQUITY Premier CSH C_{18}+ and XSelect™ CSH C_{18}+ Premier Particle Technology

- Accepts greater peptide mass loads for improved low-level detection of impurities
- Excellent performance with TFA for optical applications, FA for MS, and DFA for dual detection

ACQUITY Premier HSS T3 and XSelect HSS T3 Premier Particle Technology

- Ideal choice for the separation of small, polar peptides with greater retentivity than hybrid (BEH, CSH) particle technology columns

PROTEIN AGGREGATE, MONOMER, AND FRAGMENT ANALYSIS ANALYSIS

ACQUITY Premier Protein SEC and XBridge Premier Protein SEC 250 Å, 1.7 µm and 2.5 µm Particle Technology

- Efficiently separate protein size variants from simple to complex biotherapeutics (e.g., mAb, ADCs, bi-specifics, fusion proteins) that range from approximately 10,000 to 650,000 Daltons in a single SEC analysis for reliable component quantitation
- Mimize method development by using a single SEC buffer formulation without the need for co-solvents/additives for a variety of samples without sacrificing resolution
- Reduce the cost per analysis using MaxPeak Premier SEC 250 Å Guards that will not degrade the quality of challenging apllications

OLIGONUCLEOTIDE ANALYSIS

ACQUITY Premier BEH C_{18} and XBridge Premier BEH C_{18} Particle Technology

- Outstanding peak capacity and superior peak shape and lifetime in HFIP, HAA, and TEA
- Two pore sizes (130 Å and 300 Å) to provide different separation selectivities

GLYCAN ANALYSIS

ACQUITY Premier BEH Amide and XBridge Premier BEH Amide Particle Technology

- Best suited for the analysis of released, N-labeled glycans using pre-column labeling with 2-AB, 2-AA, or Waters innovative and enabling *Rapi*Fluor-MS™ reagent
- Two pore sizes (130 Å and 300 Å) to provide different selectivities from released glycans to large glycans, glycopeptides, and glycoproteins

ACQUITY Premier BEH C_{18} AX and XBridge Premier BEH C_{18} AX Particle Technology

- Charge-based separation of neutral-to-highly acidic released N-glycans
- Improved resolution and recovery for sialylated and phosphorylated glycans

INTACT AND SUBUNIT PROTEIN ANALYSIS

ACQUITY Premier Protein BEH C_4 and XBridge Premier Protein BEH C_4, 300 Å, 1.7 µm and 2.5 µm Particle Technology

- Separates proteins af various sizes, hydrophobicities, and isoelectric points
- tolerates extreme pH and temperature, and provides minimal secondary interactions
- Improves sensitivity for phosphorylated proteins and low-level intact and subunit mAb analysis

Ordering Information

ACQUITY Premier Columns

BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009452
	2.1 × 100 mm	186009453
	2.1 × 150 mm	186009454

BEH C_{18}, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009497
	2.1 × 100 mm	186009457
	2.1 × 150 mm	186009458

BEH Shield RP18, 130 Å	Particle Size: 1.8 µm	
	2.1 × 50 mm	186009490
	2.1 × 100 mm	186009498
	2.1 × 150 mm	186009499

BEH Shield RP18, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009500
	2.1 × 100 mm	186009501
	2.1 × 150 mm	186009502

BEH Amide, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009504
	2.1 × 100 mm	186009505
	2.1 × 150 mm	186009506

BEH Amide, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009507
	2.1 × 100 mm	186009508
	2.1 × 150 mm	186009509

CSH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009460
	2.1 × 100 mm	186009461
	2.1 × 150 mm	186009462

CSH C_{18}, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009463
	2.1 × 100 mm	186009464
	2.1 × 150 mm	186009465

CSH Phenyl Hexyl, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009474
	2.1 × 100 mm	186009475
	2.1 × 150 mm	186009476

CSH Phenyl Hexyl, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009477
	2.1 × 100 mm	186009478
	2.1 × 150 mm	186009479

HSS T3, 100 Å	Particle Size: 1.8 µm	
	2.1 × 50 mm	186009467
	2.1 × 100 mm	186009468
	2.1 × 150 mm	186009469

HSS T3, 100 Å, VanGuard FIT	Particle Size: 1.8 µm	
	2.1 × 50 mm	186009470
	2.1 × 100 mm	186009471
	2.1 × 150 mm	186009472

ACQUITY Premier Van Guard FIT Cartridges

BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 5 mm	186009459

BEH Shield RP18, 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186009503

BEH Amide, 130 Å	Particle Size: 1.8 µm	
	2.1 × 5 mm	186009510

CSH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 5 mm	186009466

CSH Phenyl Hexyl, 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186009480

HSS T3, 100 Å	Particle Size: 1.8 µm	
	2.1 × 5 mm	186009473

ACQUITY Premier 1.7 µm Columns for Bioseparations

Glycan BEH C_{18} AX, 95 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009758
	2.1 × 100 mm	186009759
	2.1 × 150 mm	186009760

Glycan BEH C_{18} AX, 95 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009970
	2.1 × 100 mm	186009971
	2.1 × 150 mm	186009972

Glycan BEH Amide, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009522
	2.1 × 100 mm	186009523
	2.1 × 150 mm	186009524

Glycan BEH Amide, 130 Å, VanGuard FIT	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009974
	2.1 × 100 mm	186009975
	2.1 × 150 mm	186009976

Glycoprotein BEH Amide, 300 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009547
	2.1 × 100 mm	186009548
	2.1 × 150 mm	186009549

Oligonucleotide BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009484
	2.1 × 100 mm	186009485
	2.1 × 150 mm	186009486

Peptide BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009481
	2.1 × 100 mm	186009482
	2.1 × 150 mm	186009483

ACQUITY Premier 1.7 µm Van Guard FIT Cartidges

Glycan BEH C_{18} AX, 95 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 5 mm	186009973

Glycan BEH Amide, 130 Å	Particle Size: 1.7 µm	
	2.1 × 5 mm	186009977

Peptide BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009493*
	2.1 × 100 mm	186009494*
	2.1 × 150 mm	186009495*

Peptide CSH C_{18}, 130 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009487
	2.1 × 100 mm	186009488
	2.1 × 150 mm	186009489

Peptide HSS T3, 100 Å	Particle Size: 1.8 µm	
	2.1 × 50 mm	186009490
	2.1 × 100 mm	186009491
	2.1 × 150 mm	186009492

Protein BEH C_4, 300 Å Column and Standard	Particle Size: 1.7 µm	
	2.1 × 50 mm	176005107**
	2.1 × 100 mm	176005108**
	2.1 × 150 mm	176005109**

Protein SEC, 250 Å Column and Standard	Particle Size: 1.7 µm	
	4.6 × 150 mm	176005071***
	4.6 × 300 mm	176005072***

Protein SEC, 250 Å Column, Standard, and Guard	Particle Size: 1.7 µm	
	4.6 × 150 mm	176004794***
	4.6 × 300 mm	176004795***

*Peptide BEH 300 Å columns may also be used for oligonucleotide analyses requiring wider pore sizes.
**MassPREP Protein Mix Standard p/n: 186004900
***mAb Size Variant Standard p/n: 186009429; MaxPeak Premier Protein SEC 250 Å, 2.5 µm, 4.6 × 30 mm Guard p/n: 186009969

XBridge Premier BEH C_{18}, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 50 mm	186009827
	2.1 × 100 mm	186009828
	2.1 × 150 mm	186009829
	4.6 × 50 mm	186009847
	4.6 × 100 mm	186009848
	4.6 × 150 mm	186009849

XBridge Premier BEH C_{18}, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009843
	2.1 × 100 mm	186009844
	2.1 × 150 mm	186009845
	4.6 × 50 mm	186009850
	4.6 × 100 mm	186009851
	4.6 × 150 mm	186009852

XBridge Premier BEH Amide, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009928
	2.1 × 100 mm	186009929
	2.1 × 150 mm	186009930
	4.6 × 50 mm	186009935
	4.6 × 100 mm	186009936
	4.6 × 150 mm	186009937

XBridge Premier BEH Amide, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009931
	2.1 × 100 mm	186009932
	2.1 × 150 mm	186009933
	4.6 × 50 mm	186009938
	4.6 × 100 mm	186009939
	4.6 × 150 mm	186009940

XBridge Premier BEH Shield RP18, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009914
	2.1 × 100 mm	186009915
	2.1 × 150 mm	186009916
	4.6 × 50 mm	186009921
	4.6 × 100 mm	186009922
	4.6 × 150 mm	186009923

XBridge Premier BEH Shield RP18, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009917
	2.1 × 100 mm	186009918
	2.1 × 150 mm	186009919
	4.6 × 50 mm	186009924
	4.6 × 100 mm	186009925
	4.6 × 150 mm	186009926

XSelect Premier CSH C_{18}, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009865
	2.1 × 100 mm	186009866
	2.1 × 150 mm	186009867
	4.6 × 50 mm	186009872
	4.6 × 100 mm	186009873
	4.6 × 150 mm	186009874

XSelect Premier CSH C_{18}, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009868
	2.1 × 100 mm	186009869
	2.1 × 150 mm	186009870
	4.6 × 50 mm	186009875
	4.6 × 100 mm	186009876
	4.6 × 150 mm	186009877

XSelect Premier CSH Phenyl Hexyl, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009879
	2.1 × 100 mm	186009880
	2.1 × 150 mm	186009881
	4.6 × 50 mm	186009886
	4.6 × 100 mm	186009887
	4.6 × 150 mm	186009888

XSelect Premier CSH Phenyl Hexyl, 130 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009882
	2.1 × 100 mm	186009883
	2.1 × 150 mm	186009884
	4.6 × 50 mm	186009889
	4.6 × 100 mm	186009890
	4.6 × 150 mm	186009891

XSelect Premier HSS T3, 100 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009830
	2.1 × 100 mm	186009831
	2.1 × 150 mm	186009832
	4.6 × 50 mm	186009858
	4.6 × 100 mm	186009859
	4.6 × 150 mm	186009860

XSelect Premier HSS T3, 100 Å, VanGuard FIT	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009854
	2.1 × 100 mm	186009855
	2.1 × 150 mm	186009856
	4.6 × 50 mm	186009861
	4.6 × 100 mm	186009862
	4.6 × 150 mm	186009863

MaxPeak Premier 2.5 µm Van Guard FIT Cartidges

XBridge BEH C_{18}, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 5 mm	186009842
	3.9 × 5 mm	186009846

XBridge BEH Amide, 130 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009927
	3.9 × 5 mm	186009934

XBridge BEH Shield RP18, 130 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009913
	3.9 × 5 mm	186009920

XSelect CSH C_{18}, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 5 mm	186009864
	3.9 × 5 mm	186009871

XSelect CSH Phenyl Hexyl, 130 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009878
	3.9 × 5 mm	186009885

XSelect HSS T3, 100 Å	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009853
	3.9 × 5 mm	186009857

MaxPeak Premier 2.5 µm Columns for Bioseparations

XBridge Premier Glycan BEH C_{18} AX, 95 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 50 mm	186009947
	2.1 × 100 mm	186009948
	2.1 × 150 mm	186009949
	4.6 × 50 mm	186009950
	4.6 × 100 mm	186009951
	4.6 × 150 mm	186009952

XBridge Premier Glycan BEH Amide, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009941
	2.1 × 100 mm	186009942
	2.1 × 150 mm	186009943
	4.6 × 50 mm	186009944
	4.6 × 100 mm	186009945
	4.6 × 150 mm	186009946

XBridge Premier Oligonucleotide BEH C_{18}, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009836
	2.1 × 100 mm	186009837
	2.1 × 150 mm	186009838
	4.6 × 50 mm	186009901
	4.6 × 100 mm	186009902
	4.6 × 150 mm	186009903

XBridge Premier Peptide BEH C_{18}, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009733
	2.1 × 100 mm	186009734
	2.1 × 150 mm	186009835
	4.6 × 50 mm	186009898
	4.6 × 100 mm	186009899
	4.6 × 150 mm	186009900

XBridge Premier Peptide BEH C_{18}, 300 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009892*
	2.1 × 100 mm	186009893*
	2.1 × 150 mm	186009894*
	4.6 × 50 mm	186009895*
	4.6 × 100 mm	186009896*
	4.6 × 150 mm	186009897*

XBridge Premier Protein BEH C_4, 300 Å Column and Standard	Particle Size: 2.5 µm	
	2.1 × 50 mm	176005110**
	2.1 × 100 mm	176005111**
	2.1 × 150 mm	176005112**
	4.6 × 50 mm	176005113**
	4.6 × 100 mm	176005114**
	4.6 × 150 mm	176005115**

XSelect Premier Peptide HSS T3, 100 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009839
	2.1 × 100 mm	186009840
	2.1 × 150 mm	186009841
	4.6 × 50 mm	186009910
	4.6 × 100 mm	186009911
	4.6 × 150 mm	186009912

XBridge Premier Protein SEC 250 Å, Column and Standard	Particle Size: 2.5 µm	
	4.6 × 150 mm	176005067***
	4.6 × 300 mm	176005068***
	7.8 × 150 mm	176005069***
	7.8 × 150 mm	176005070***

XBridge Premier Protein SEC 250 Å, Column, Standard, and Guard	Particle Size: 2.5 µm	
	4.6 × 150 mm	176004790***
	4.6 × 300 mm	176004791***
	7.8 × 150 mm	176004792***
	7.8 × 150 mm	176004793***

*XBridge Premier Peptide BEH 300 Å Columns may also be used for oligonucleotide analyses requiring wider pore sizes.
**MassPREP Protein Mix Standard p/n: 186004900
***mAb Size Variant Standard p/n: 186009429; MaxPeak Premier Protein SEC 250 Å, 2.5 µm, 4.6 × 30 mm Guard p/n: 186009969

Atlantis Premier Columns

	Particle Size: 1.7 µm		Particle Size: 2.5 µm		Particle Size: 5 µm	
	Dimension	P/N	Dimension	P/N	Dimension	P/N
BEH C_{18} AX, 95 Å	2.1 × 30 mm	186009365	2.1 × 30 mm	186009389	2.1 × 50 mm	186009407
	2.1 × 50 mm	186009366	2.1 × 50 mm	186009390	2.1 × 100 mm	186009408
	2.1 × 75 mm	186009367	2.1 × 75 mm	186009391	2.1 × 150 mm	186009409
	2.1 × 100 mm	186009368	2.1 × 100 mm	186009392	4.6 × 50 mm	186009427
	2.1 × 150 mm	186009369	2.1 × 150 mm	186009393	4.6 × 100 mm	186009416
			4.6 × 50 mm	186009426	4.6 × 150 mm	186009417
			4.6 × 100 mm	186009397	4.6 × 250 mm	186009418
			4.6 × 150 mm	186009398		
BEH C_{18} AX, 95 Å, VanGuard FIT	2.1 × 30 mm	186009357	2.1 × 30 mm	186009374	2.1 × 50 mm	186009404
	2.1 × 50 mm	186009358	2.1 × 50 mm	186009375	2.1 × 100 mm	186009405
	2.1 × 75 mm	186009359	2.1 × 75 mm	186009376	2.1 × 150 mm	186009406
	2.1 × 100 mm	186009360	2.1 × 100 mm	186009378	4.6 × 50 mm	186009410
	2.1 × 150 mm	186009361	2.1 × 150 mm	186009379	4.6 × 100 mm	186009411
			4.6 × 50 mm	186009383	4.6 × 150 mm	186009412
			4.6 × 100 mm	186009384	4.6 × 250 mm	186009413
			4.6 × 150 mm	186009385		
BEH Z-HILIC, 95 Å	2.1 × 50 mm	186009978	2.1 × 50 mm	186009985	2.1 × 50 mm	186009999
	2.1 × 100 mm	186009979	2.1 × 100 mm	186009986	2.1 × 100 mm	186010000
	2.1 × 150 mm	186009980	2.1 × 150 mm	186009987	2.1 × 150 mm	186010001
			4.6 × 50 mm	186009992	4.6 × 50 mm	186010006
			4.6 × 100 mm	186009993	4.6 × 100 mm	186010007
			4.6 × 150 mm	186009994	4.6 × 150 mm	186010008
					4.6 × 250 mm	186010009
BEH Z-HILIC, 95 Å, VanGuard FIT	2.1 × 50 mm	186009981	2.1 × 50 mm	186009988	2.1 × 50 mm	186010002
	2.1 × 100 mm	186009982	2.1 × 100 mm	186009989	2.1 × 100 mm	186010003
	2.1 × 150 mm	186009983	2.1 × 150 mm	186009990	2.1 × 150 mm	186010004
			4.6 × 50 mm	186009995	4.6 × 50 mm	186010010
			4.6 × 100 mm	186009996	4.6 × 100 mm	186010011
			4.6 × 150 mm	186009997	4.6 × 150 mm	186010012
					4.6 × 250 mm	186010013

Atlantis Premier Van Guard FIT Cartidges

	Particle Size: 1.7 µm		Particle Size: 2.5 µm		Particle Size: 5 µm	
	Dimension	P/N	Dimension	P/N	Dimension	P/N
BEH C_{18} AX, 95 Å	2.1 × 5 mm	186009373	2.1 × 5 mm	186009402	2.1 × 5 mm	186009421
			3.9 × 5 mm	186009403	3.9 × 5 mm	186009422
BEH Z-HILIC, 95 Å	2.1 × 5 mm	186009984	2.1 × 5 mm	186009991	2.1 × 5 mm	186010005
			3.9 × 5 mm	186009998	3.9 × 5 mm	186010014

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. For LC-MS based physiological amino acid analysis solution, please refer to Kairos in Application Specific Columns, Kits, and Spare Parts chapter.

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 C_{18}.

Pico•Tag Method	AccQ•Tag Method	AccQ•Tag Ultra C_{18} 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 C_{18} 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

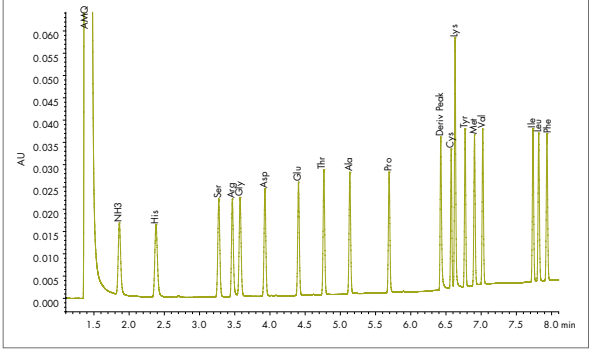
ACCURATE AMINO ACID ANALYSES FROM VARIED SAMPLE MATRICES

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

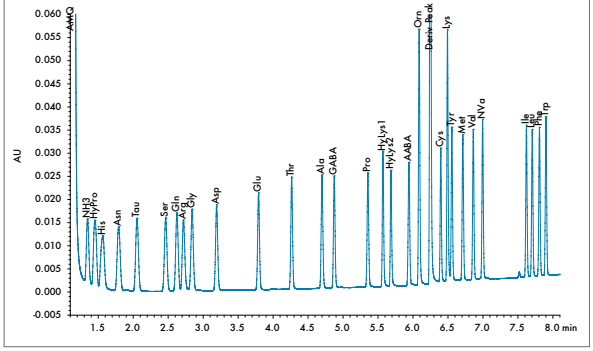


Separation of standard amino acids using the UPLC Amino Acid Analysis Solution Hydrolysate Method.

Cell Culture Standard 10 pmol/µL

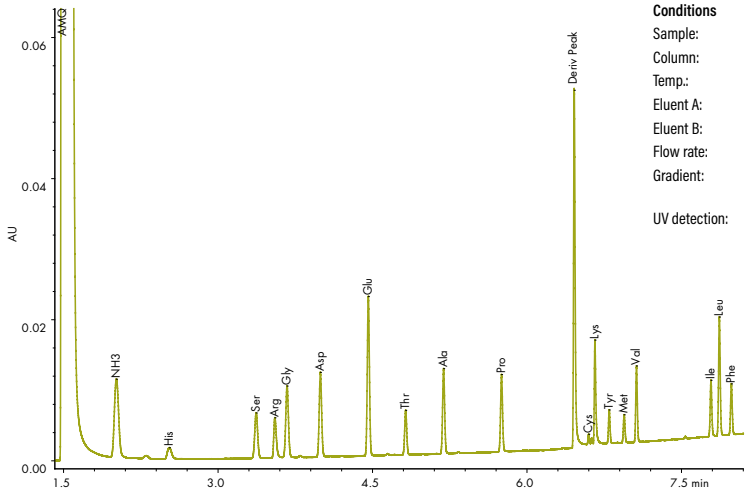
Conditions

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

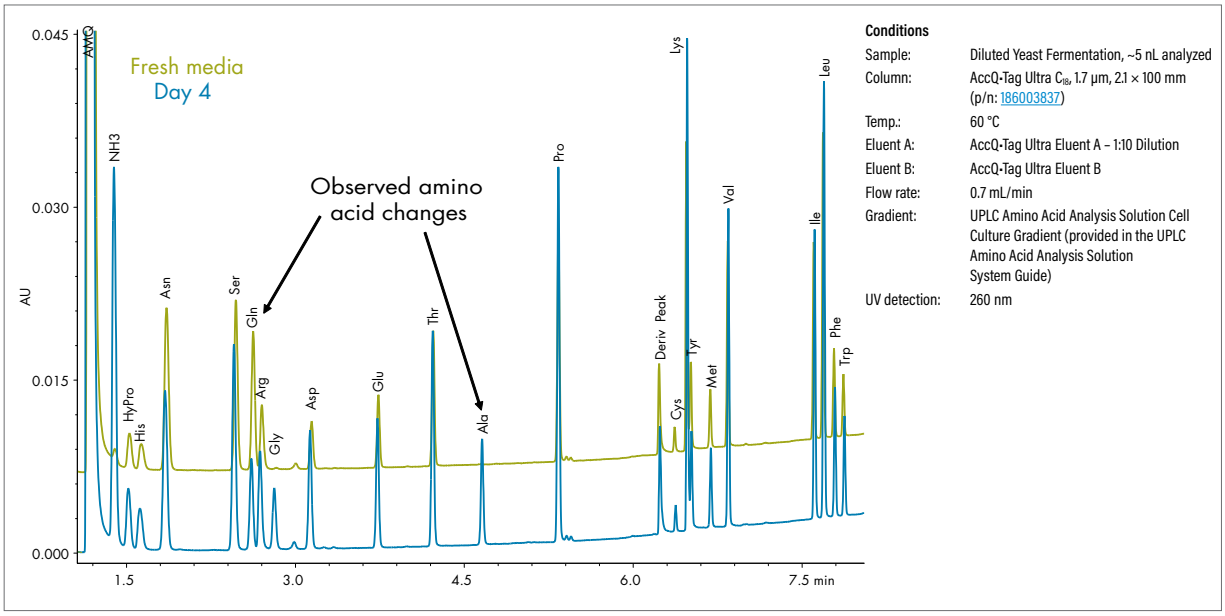


Conditions

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 C_{18} 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 pre-column derivatization 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 H-Class (quaternary*) System with a tunable UV detector for enhanced chromatographic resolution and maximum-sensitivity detection
- AccQ•Tag Ultra C_{18} derivatization chemistries including quality-controlled 1.7 µm columns, reagents, and eluents
- Empower™ 3 pre-configured projects, methods, and report templates
- Installation and application training and support
- Connections INSIGHT™ ISDP instrument diagnostics to ensure continuous, consistent, and reliable operation
- Standards and kits to validate and troubleshoot

** Amino acid analysis can be performed on other systems such as ACQUITY UPLC H-Class PLUS Binary and ACQUITY Premier Binary systems. These are not considered as a total solution.*

UHPLC AND HPLC: AccQ•Tag ULTRA C_{18} AMINO ACID ANALYSIS

In 2022, Waters expanded its Amino Acid Analysis offerings with the introduction of the same BEH-based, C_{18} columns (as used in UPLC-based applications) but using 2.5 µm particles all amino analysis batch tested to work on UHPLC and HPLC systems with <70 µl dispersion with UV detection. These columns combined with the AccQ•Tag Ultra C_{18} pre-column derivatization kit for 250 analyses, completes this flexible portfolio to help scientists quickly and accurately obtain accurate quantitative data in half the time compared to use of legacy HPLC methods with FLR detection. Samples can now be successfully analyzed in under an hour.

** This is not a full system solution but a detailed care and use manual is available to help successfully use this offering on appropriate LC Systems.*

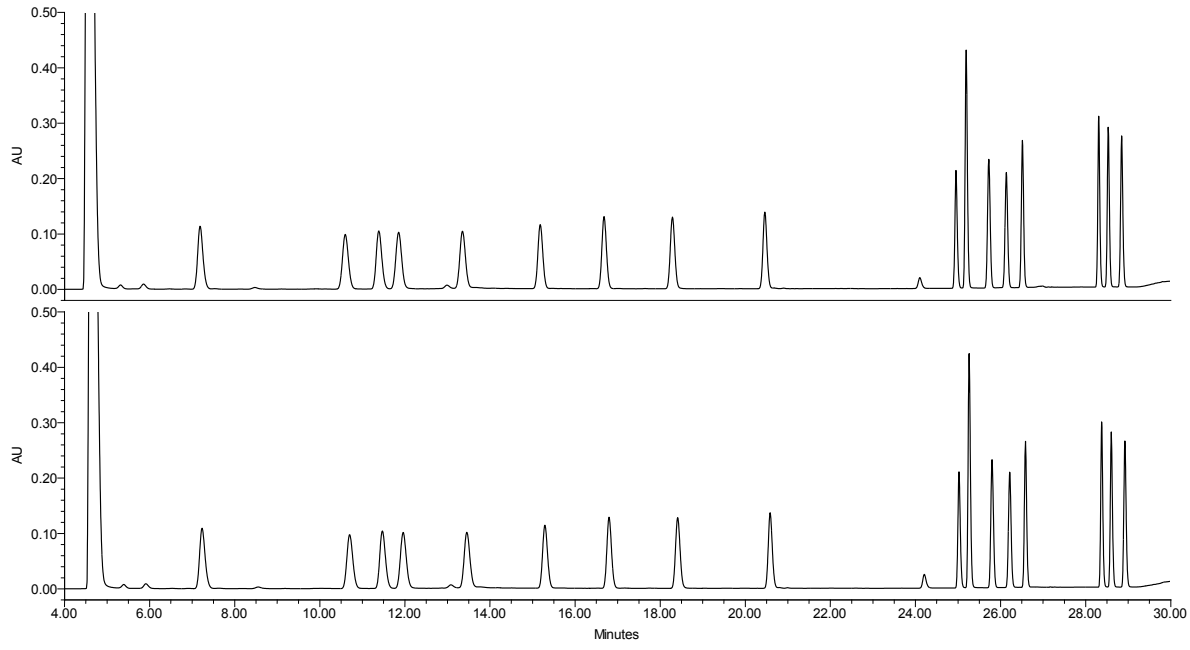
Hydrolysate Standard (500 µm) Chromatographic Comparison

Conditions

LC systems:	Waters Arc HPLC with 2998 Detector (10 mm HPLC Analytical Flow Cell) and 30 cm CHC with Passive Preheater. Note: Total LC System Dispersion without column or guard > 70 µL.
Detection:	UV @ 260 nm
Column:	AccQ•Tag Ultra C_{18}, 2.5 µm Column 4.6 × 150 mm (p/n: 186010407)
Guard:	AccQ•Tag Ultra C_{18}, 2.5 µm VanGuard Cartridge 3.9 × 5 mm (p/n: 186010407®)
Column temp.:	43 °C
Sample temp.:	20 °C
Injection volume:	5.0 µL
Flow rate:	1.5 mL/min
Mobile phase A:	AccQ•Tag Eluent A (p/n: 186003838)
Mobile phase B:	90:10 (v/v) Water:AccQ•Tag Ultra Eluent B
Mobile phase C:	Milli-Q Water
Mobile phase D:	AccQ•Tag Eluent B (p/n: 186003839)

Gradient

	Time (min)	Flow (mL/min)	%A	%B	%C	%D	Curve
1	Initial	1.500	10.0	0.0	90.0	0.0	Initial
2	0.86	1.500	10.0	0.0	90.0	0.0	11
3	20.17	1.500	9.0	80.0	11.0	0.0	7
4	25.57	1.500	8.0	16.0	60.0	16.0	7
5	26.24	1.500	8.0	16.0	58.0	18.0	6
6	27.55	1.500	7.8	0.0	70.9	21.3	6
7	28.70	1.500	4.0	0.0	36.3	59.7	6
8	30.58	1.500	4.0	0.0	36.3	59.7	6
9	30.88	1.500	10.0	0.0	90.0	0.0	6
10	35.98	1.500	10.0	0.0	90.0	0.0	6



Analysis of Protein Hydrolysate standard on the AccQ•Tag Ultra C_{18}, 2.5 µm 4.6 × 150 mm Column with (top) and without AccQ•Tag Ultra C_{18}, 2.5 µm VanGuard Cartridge 3.9 × 5 mm (bottom) installed on a Waters Arc HPLC with 2898 Detector. 1) AMQ, 2) His, 3) Ser, 4) Arg, 5) Gly, 6) Asp, 7) Glu, 8) Thr, 9) Ala, 10) Pro, 11) Derivatization peak, 12) Cys, 13) Lys, 15) Tyr, 15) Met, 16) Val, 17) Ile, 18) Leu, 19) Phe.

ACCQ•TAG ULTRA C_{18} HPLC CHEMISTRY

The AccQ•Tag Ultra C_{18} Chemistry is an integral component of the Waters 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 C_{18} Chemistry without the rest of the application solution is not supported as an Amino Acid Analysis method.

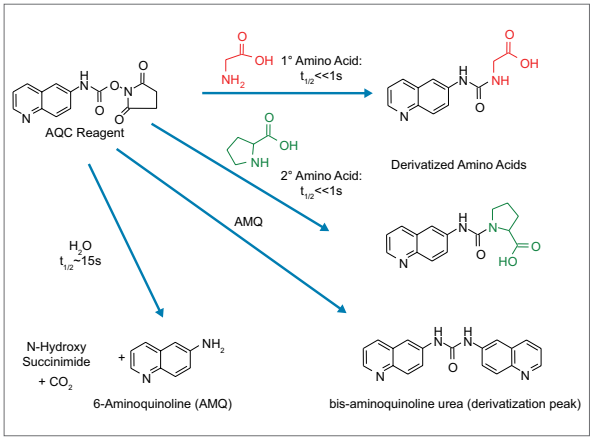
AccQ•Tag Ultra C_{18} Chemistry is different from the AccQ•Tag HPLC method, that uses an HPLC Column containing 100% Silica-based C_{18}, 4 µm particles, described later in this chapter. Although the components of the two derivatization kits are the same, the QC tests are based on the specific separation 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 C_{18} 1.7 µm and 2.5 µm Guard and Columns have a completely different chemistry from the AccQ•Tag HPLC Column. The AccQ•Tag Ultra C_{18} Columns leverage Waters 1.7 µm and 2.5 µm hybrid-silica BEH Technology particles that deliver excellent column efficiency and resolution. The AccQ•Tag Ultra C_{18} 1.7 µm Column is designed for use on Waters ACQUITY™ UPLC Systems and include use of Waters eCord™ Intelligent Chip Technology that is permanently attached to the column to easily track use history. The mobile phases used in the AccQ•Tag Ultra C_{18} method is different from that used for the AccQ•Tag HPLC method, each being optimized for the specific column and detection technique.

Compared to traditional HPLC methods, Waters UPLC Amino Acid Analysis Solution, that uses the AccQ•Tag Ultra C_{18}, 1.7 µm Column, 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 C_{18} 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

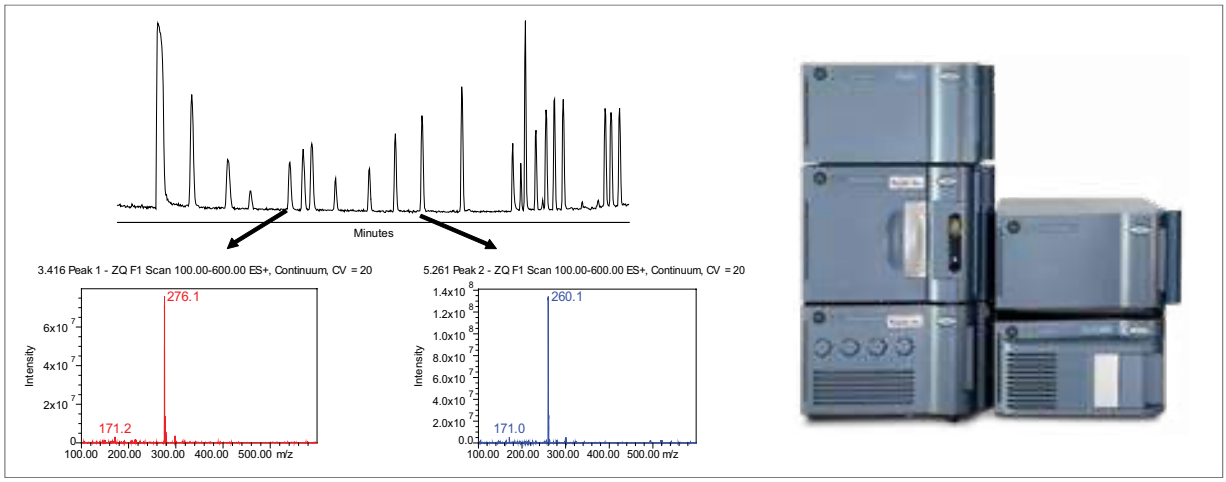
Chemistry of the AccQ•Tag Derivatization Reaction



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

Amino acid analysis is required in many applications in pharmaceutical and food and feed industries. A variety of standards containing free amino acids are offered for qualitative and quantitative determination of amino acids, method development, and troubleshooting of the AccQ•Tag™ Ultra C_{18} or AccQ•Tag HPLC methods.

Ordering Information

Amino Acid Standard

Description	P/N
Amino Acid Standard	WAT088122
10 × 1 mL ampules of unlabeled amino acid standards	
Amino Acid Cell Culture Standard Kit	186009300
Kit contains:	
2 vials contain 17 amino acids	
8 vials contain 9 cell culture supplemental amino acids	
Amino Acid Food and Feed Standard Kit	186009299
Kit contains:	
2 vials contain 17 amino acids	
8 vials contain 4 food and feed supplemental amino acids	
Amino Acid Internal Standard – Norvaline	186009301
1 vial	

List of Amino Acids in Each Amino Acid Standard Amino Acid Standard

Amino Acid	Amino Acid Standard	Cell Culture Standard Kit	Food and Feed Standard Kit	Internal Standard
	p/n: WAT088122	p/n: 186009300	p/n: 186009299	p/n: 186009301
Alanine	■	■	■	—
Arginine	■	■	■	—
Aspartic acid	■	■	■	—
Cystine	■	■	■	—
Glutamic acid	■	■	■	—
Glycine	■	■	■	—
Histidine	■	■	■	—
Isoleucine	■	■	■	—
Leucine	■	■	■	—
Lysine	■	■	■	—
Methionine	■	■	■	—
Phenylalanine	■	■	■	—
Proline	■	■	■	—
Serine	■	■	■	—
Threonine	■	■	■	—
Tyrosine	■	■	■	—
Valine	■	■	■	—
Taurine	—	■	■	—
HydroxyProline	—	■	—	—
Asparagine	—	■	—	—
Glutamine	—	■	—	—
GABA (γ-Aminobutyric acid)	—	■	—	—
Tryptophan	—	■	—	—
Ornithine	—	■	—	—
AABA (α-Aminobutyric acid)	—	■	■	—
HydroxyLysine	—	■	—	—
Methionine Sulfone	—	—	■	—
Cysteic Acid	—	—	■	—
Norvaline	—	—	—	■

Ordering Information

UPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis Kits and Accessories designed for use on a Waters, low dispersion, ACQUITY UPLCs

Description	Qty.	P/N
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	1 L	
AccQ•Tag Ultra Eluent B	1 L	
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		
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	1 L	
AccQ•Tag Ultra Eluent B	1 L	
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	
AccQTag Ultra Borate Buffer – 10 mL		186009283
Amino Acid Standard, Hydrolysate (AccQ•Tag, Pico•Tag, AccQ•Tag Ultra)	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 C_{18}, 1.7 µm, 2.1 × 50 mm Column, 1/pk		186009953
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 150 mm Column, 1/pk		186009954
AccQ•Tag Ultra C_{18}, 1.7 µm, VanGuard Pre-Column, 2.1 × 5 mm, 3/Pk		186009955
AccQ•Tag Ultra Eluent A, concentrate	1 L	186003838
AccQ•Tag Ultra Eluent B	1 L	186003839
Hydrolysis Primer, Amino Acid Analysis		715006455

UHPLC and HPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis Kit

Description	Qty.	P/N
UHPLC and HPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis Kit		176005152
The kit is intended to provide all the materials needed in order to get started running the AccQ•Tag Ultra chemistries on a UHPLC and HPLC system.		
Kit contains:		
AccQ•Tag Ultra Derivatization Kit, 250 analyses		
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 150 mm Column		
AccQ•Tag Ultra Eluent A, concentrate	1 L	
AccQ•Tag Ultra Eluent B	1 L	
Amino acid standard, hydrolysate	10 × 1 mL	
Total recovery vials	3 × 100/pk	

UPLC-based Amino Acid Analysis

Description	P/N
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 50 mm Column	186009953
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 100 mm Column	186003837
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 150 mm Column	186009954
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 5 mm VanGuard Pre-Column	186009955

UHPLC and HPLC-based Amino Acid Analysis

Description	P/N
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 50 mm Column	186010405
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 100 mm Column	186010406
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 150 mm Column	186010406
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 5 mm VanGuard Cartridge*, 3/pk	186010408

* Requires use of VanGuard 3.9 mm ID Cartridge Holder: p/n 186007949

Amino Acid Primer

Description	P/N
Hydrolysis Primer, Amino Acid	715006455



Amino Acid Analysis Automation

Automation increases efficiency, repeatability and avoids contamination and human errors. Amino acid analysis automation is enabled through the automation derivatization kit and verified automation scripts on Andrew+, Tecan, or Hamilton automation platforms. The automation derivatization kit is system agnostic and designed in a 32 × 3 format for up to 96 sample preparation. It has a larger volume per sample than the manual derivatization kit to accommodate the residual volumes required by automation workflow. The script includes barcode scanning, linearity calibration, sample dilution, derivatization, heating, shaking functions, which allow analysts to walk away during sample preparations, and 96 samples are prepared in less than an hour.

Ordering Information

Automation: AccQ•Tag Ultra C_{18} Amino Acid Analysis Kits and Accessories

Description	P/N
AccQ•Tag Ultra C_{18} Derivatization Kit – Automation, 96 analyses	186009232
AccQ•Tag Borate Buffer – 10 mL	186009283
96-Well Sample Collection Plate, 800 µL Round Well, 50/pk	186002481
Cap Mat, 5/pk	186006332
AccQ•Tag Ultra Cell Culture Chemistry Kit – Automation	176004534
AccQ•Tag Ultra Food and Feed Chemistry Kit – Automation	176004533
AccQ•Tag Ultra Hydrolysates Chemistry Kit – Automation	176004542
AccQ•Tag Ultra Cell Culture Tecan Script Starter Kit – CD	176004543
AccQ•Tag Ultra Cell Culture Tecan Script Starter Kit – USB	176004544
AccQ•Tag Ultra Cell Culture Hamilton Script Starter Kit – CD	176004545
AccQ•Tag Ultra Cell Culture Hamilton Script Starter Kit – USB	176004546



AccQ•Tag Ultra C_{18} Derivatization Automation Kit

AccQ•Tag Ultra Amino Acid Analysis Automation Kits for Andrew+

Description	P/N
Andrew+ Pipetting Robot Andrew+ Pipetting Robot, waste base, waste container, power supply, cables, and 1 × each single and multi-channel pipette adaptors	176004567
Andrew+ Startup Kit Intended for all new Andrew+ systems and includes Dominos, pipette adaptors, and lab kit with consumables for system installation	176004568
Pipette Kit for AccQ•Tag Includes 3× Andrew Alliance Pipettes	176004583
Domino Kit for AccQ•Tag Includes additional dominos and connected devices for Amino Acid OneLab protocol with Andrew+ automation	176004582
AccQ•Tag Ultra Derivatization Kit – Automation Provides simplified tools to enhance high throughput amino acid automation, enabling processing of up to 96 samples in 3 × 32 sample batches	186009232
Roller for Cap mats Helps to smooth out the cap mat before putting it on system for injection	186002633

AccQ•Tag Ultra Amino Acid Analysis Optional Accessories for Andrew+

Description	P/N
Amino Acid Cell Culture Standard Kit Contains 26 amino acids monitored in cell culture media or other matrices. The standard is designed for both ID and quantitative amino acid analysis	186009300
Amino Acid Food and Feed Standard Kit Contains 21 amino acids analyzed in food and feed matrix. The standard is designed for both ID and quantitative amino acid analysis	186009299
Amino Acid Internal Standard – Norvaline Compensates for the variability generated in sample hydrolysis and amino acid analysis	186009301
AccQ•Tag Ultra 1.7 µm, 2.1 × 100 mm Column Separates the amino acid derivatives produced in the reaction with Waters AccQ•Tag Ultra Derivatization Reagent	186003837
AccQ•Tag Ultra Eluent A Mobile phase eluents for reversed phase separation of amino acid derivatives	186003838
AccQ•Tag Ultra Eluent B Mobile-phase eluents for reversed phase separation of amino acid derivatives	186003839

HPLC: AccQ•Tag AMINO ACID ANALYSIS SOLUTION

The HPLC-based AccQ•Tag Method utilizes the same pre-column derivatization step as used for the AccQ•Tag Ultra C_{18} Method but uses a 100% silica-based, C_{18}, 4 µm column resulting in a 60 min analysis time using fluorescent detection. 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.

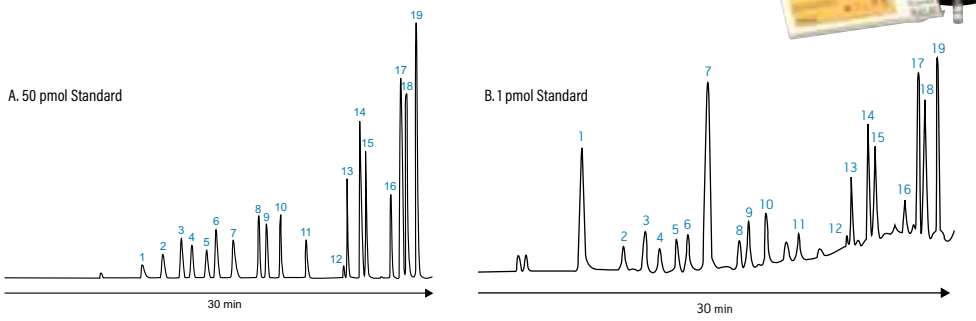
Ordering Information

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

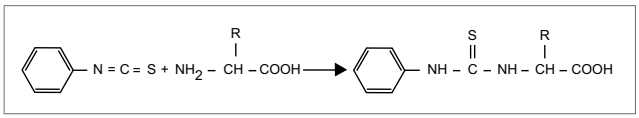
1. AMQ	6. His	11. Pro	16. Lys
2. Asp	7. NH_3	12. Cys	17. Ile
3. Ser	8. Arg	13. Tyr	18. Leu
4. Glu	9. Thr	14. Val	19. Phe
5. Gly	10. Ala	15. Met	

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).

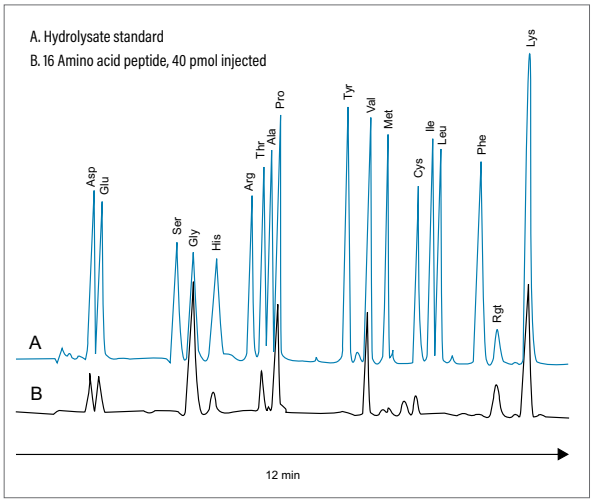
HPLC: Pico•Tag METHOD

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

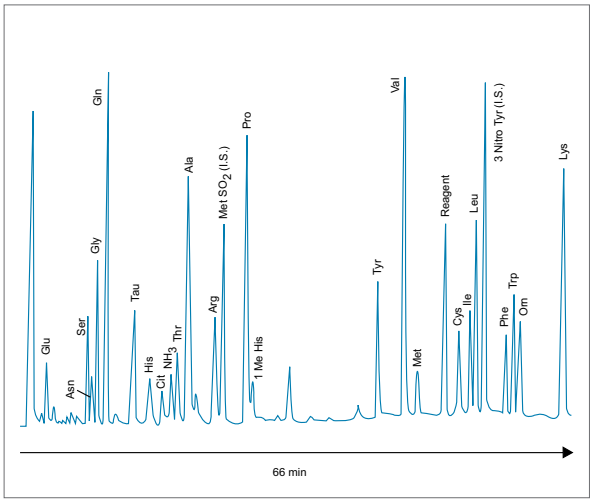


Peptide Hydrolysate Amino Acid Analysis Using the Pico•Tag Method



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

[AUTOMATION]

Need an hand in your lab?



EFFORTLESS WORKFLOWS

Effortlessly transition from laborious manual pipetting procedures and sample preparation to error-free workflows – without any knowledge of programming, laboratory robotics, or automation engineering.

- Method design wizards and OneLab cloud protocol library with the Andrew+ Pipetting Robot
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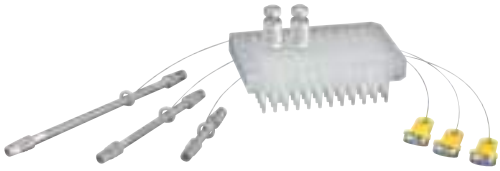
TRULY ACCESSIBLE SOLUTION

Welcome to the connected lab!

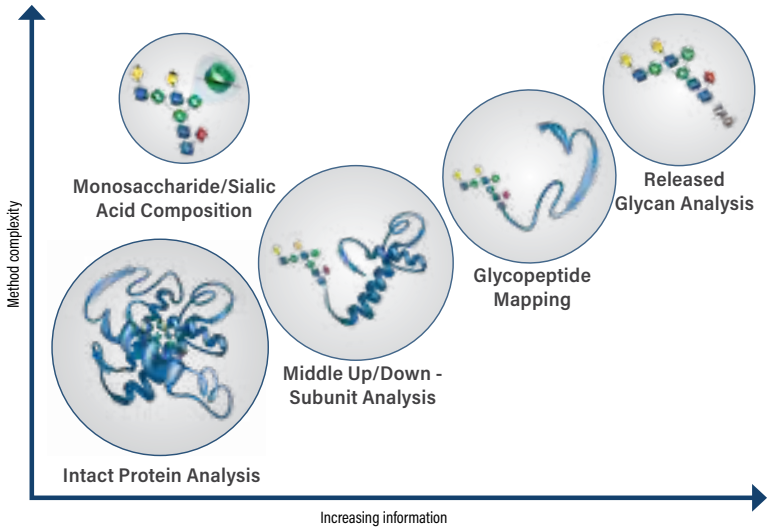
Learn more on pages 45-50 or visit waters.com/automate

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:

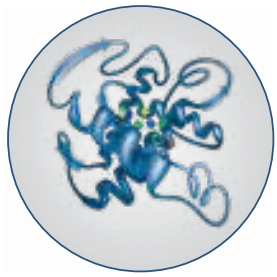
- Intact glycoprotein profiling (e.g., glycan occupancy determination)
- Middle up/down - subunit analysis
- Glycopeptide mapping
- Released and labeled glycan analysis
- Monosaccharide/sialic acid composition

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)
- MaxPeak Premier column format reduces sample adsorption onto metal surfaces and delivers the representative performance from the first injection.

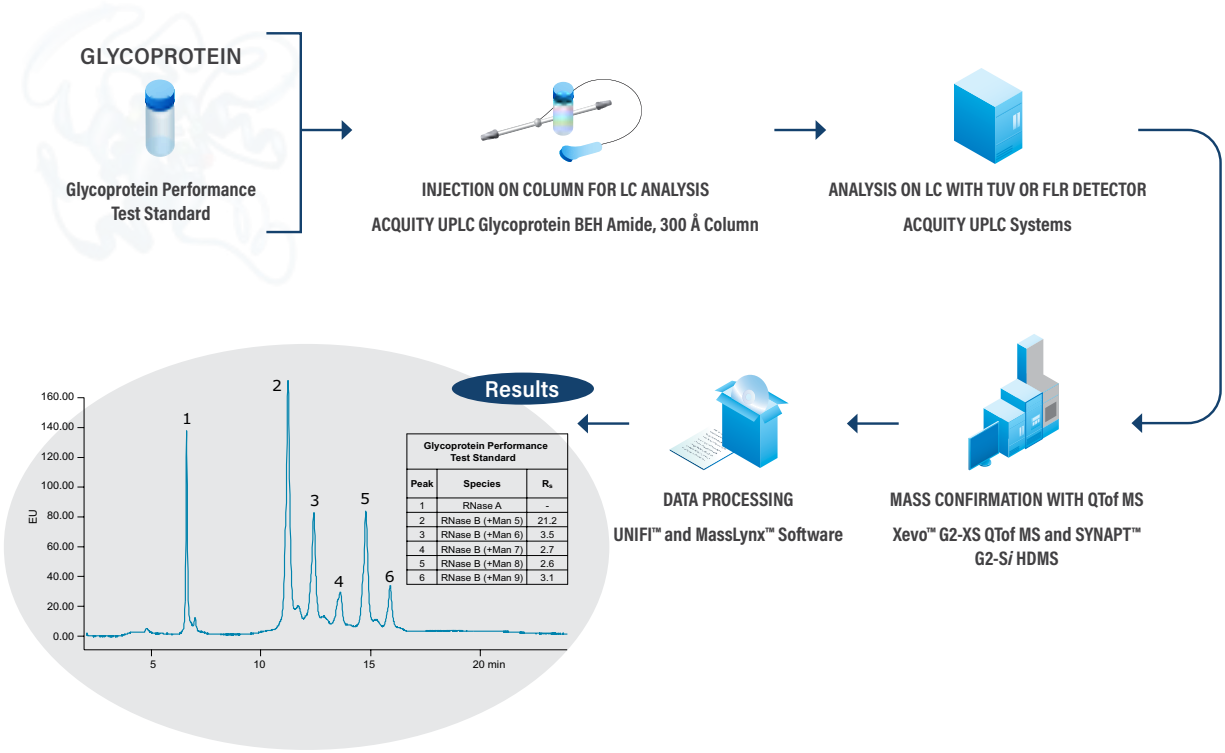
INTACT GLYCOPROTEIN ANALYSIS



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+

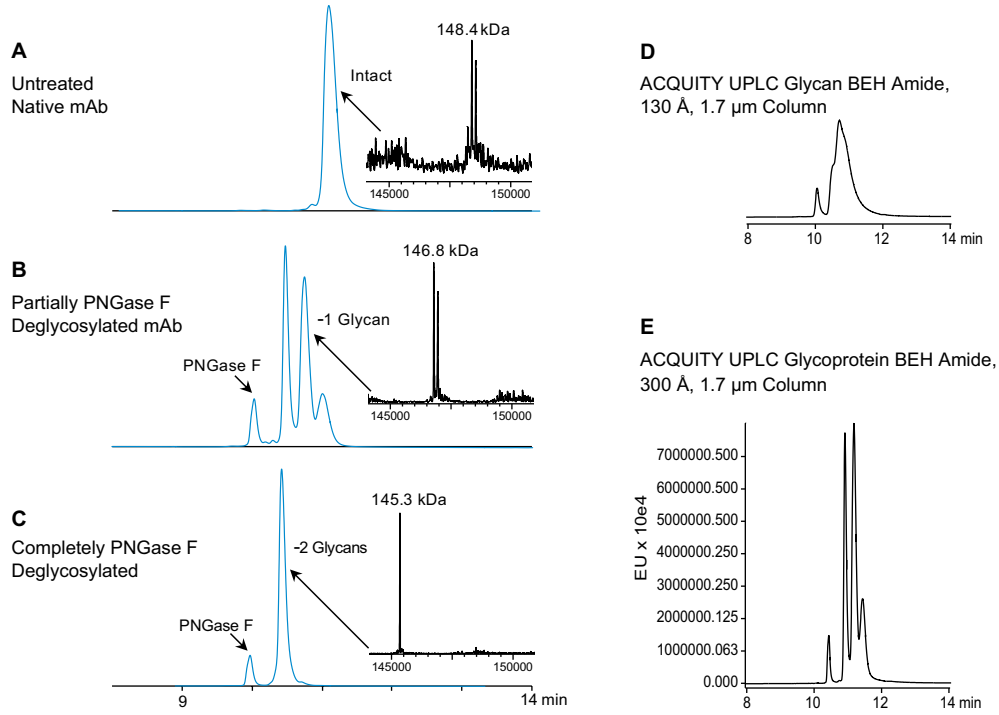
Analyzer mode: Resolution (~20 K)

Capillary voltage: 3.0 kV

Cone voltage: 45 V

Source temp.: 150 °C

Desolvation temp.: 350 °C



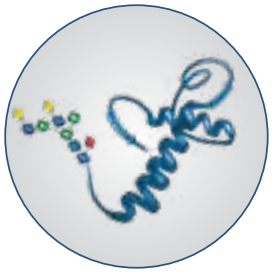
Glycoprotein BEH Amide, 300 Å, 1.7 µm Column analyses of Waters mAb Mass Check Standard showing native (A), partially deglycosylated (B), and completely deglycosylated (C) samples. Also showing HILIC fluorescence profiles of partially deglycosylated Intact mAb Mass Check Standard using two ACQUITY UPLC 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
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 50 mm, 1/pk	186009547
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 100 mm, 1/pk	186009548
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 150 mm, 1/pk	186009549
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 50 mm, 1/pk with Glycoprotein Performance Test Standard	176004866
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 100 mm, 1/pk with Glycoprotein Performance Test Standard	176004867
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 150 mm, 1/pk with Glycoprotein Performance Test Standard	176004868

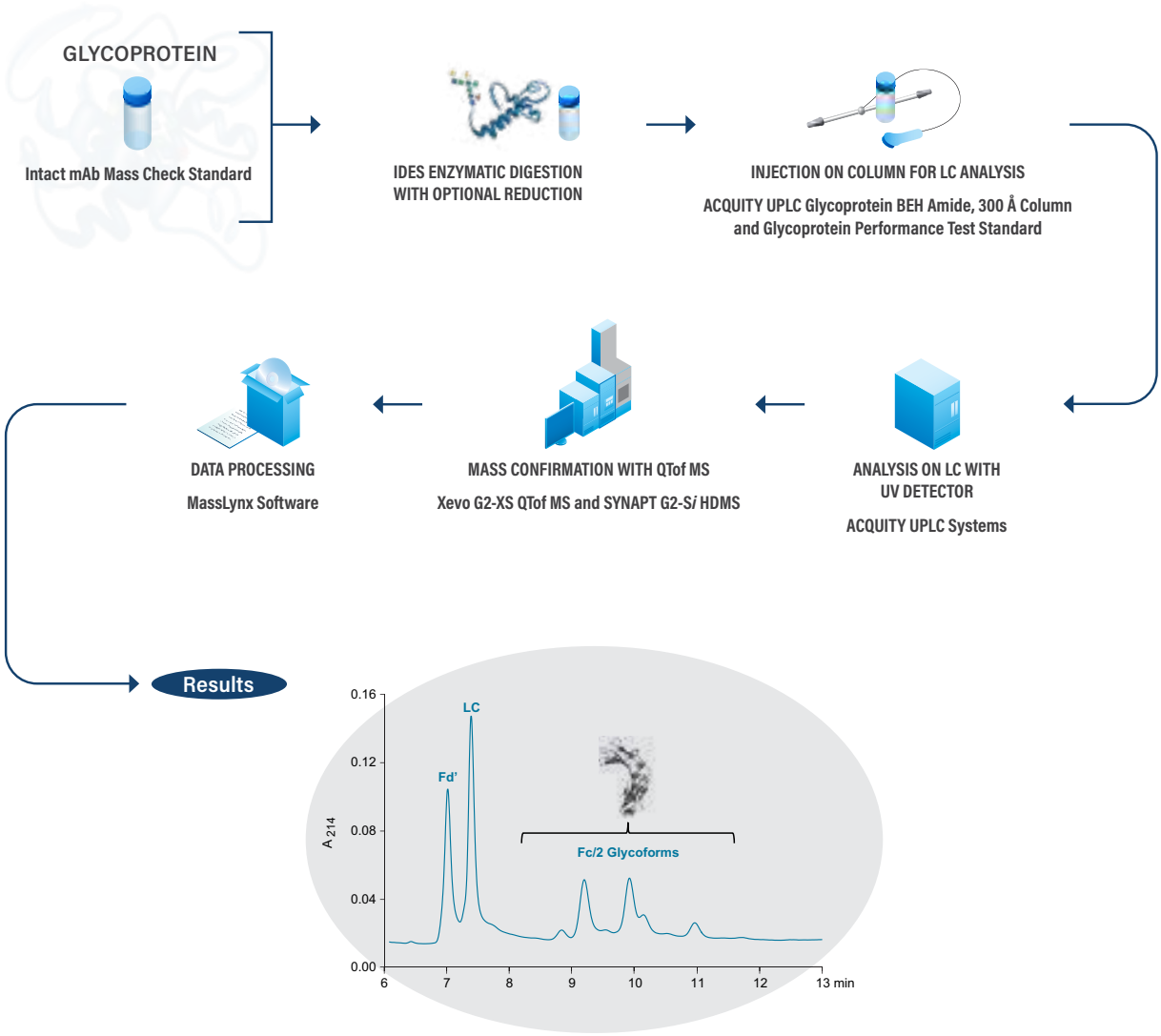
GLYCOPROTEIN SUBUNIT ANALYSIS



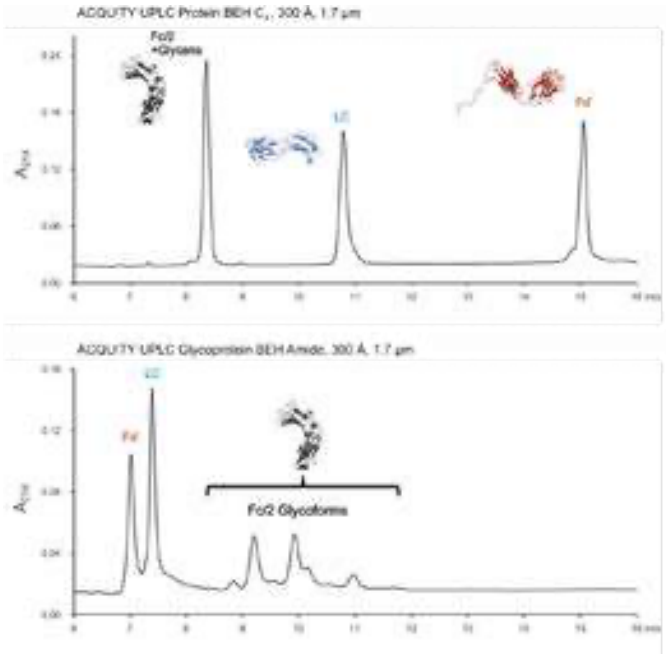
Reversed-phase chromatography is a well-established and commonly used technique to analyze intact protein of protein subunits generated from digestions with enzymes such as FabRICATOR (IdeS protease) that generates a site cleavage at the hinge region of a monoclonal antibody generating Fc and F(ab')2 fragments (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

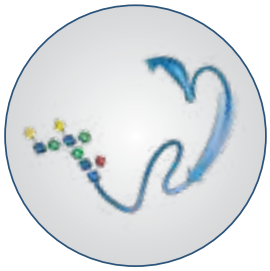
Trastuzumab subunit separations. Top: 1 µg of reduced IdeS digest separated using an ACQUITY UPLC Protein BEH C_4, 300 Å, 1.7 µm Column (0.7 µL aqueous injection). Bottom: 1 µg of reduced IdeS digest separated using an ACQUITY UPLC Glycoprotein BEH Amide, 300 Å, 1.7 µm Column (0.7 µL aqueous injection).

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
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 50 mm, 1/pk	186009547
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 100 mm, 1/pk	186009548
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 150 mm, 1/pk	186009549
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 50 mm, 1/pk with Glycoprotein Performance Test Standard	176004866
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 100 mm, 1/pk with Glycoprotein Performance Test Standard	176004867
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 150 mm, 1/pk with Glycoprotein Performance Test Standard	176004868

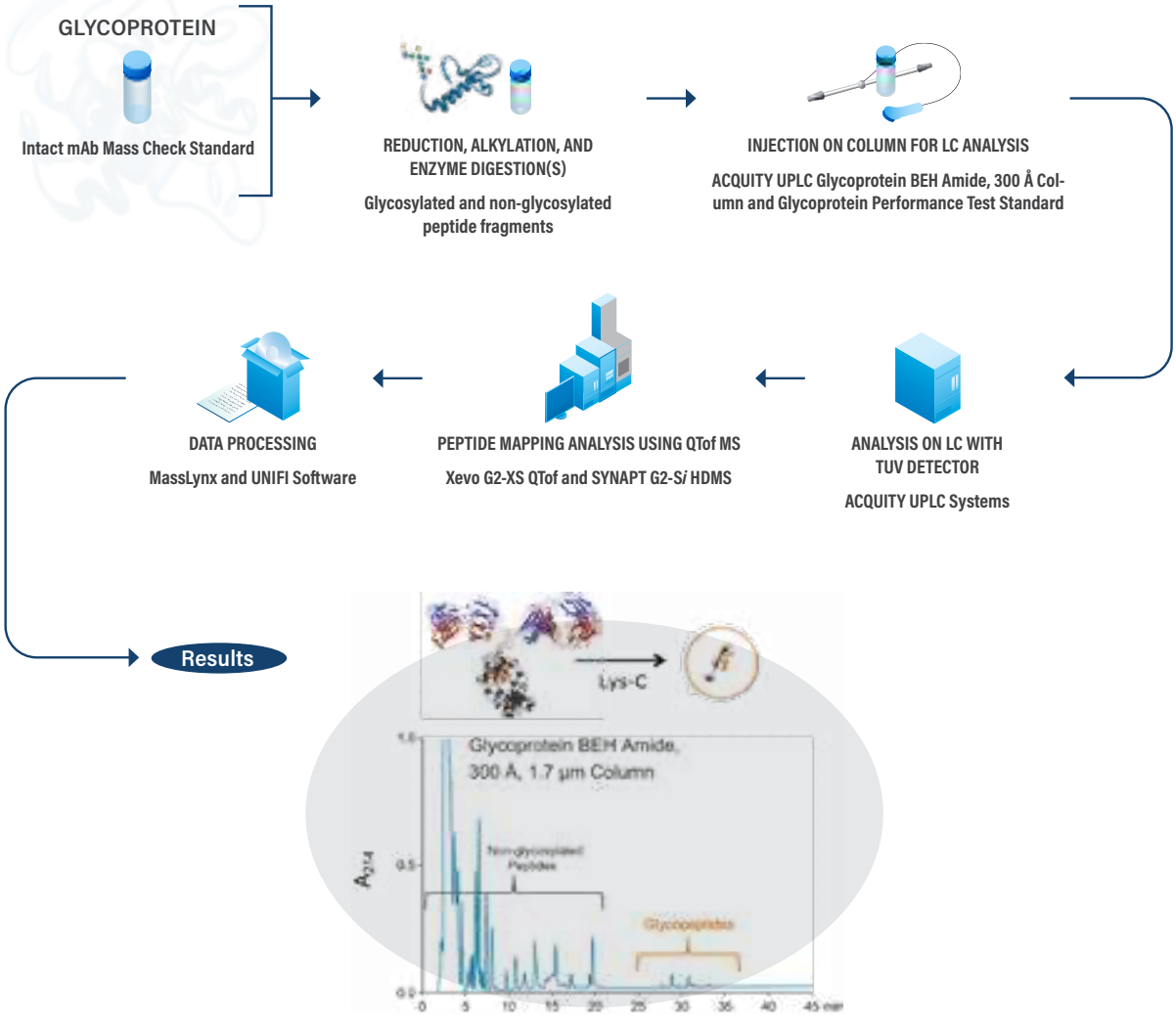
GLYCOPEPTIDE ANALYSIS



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



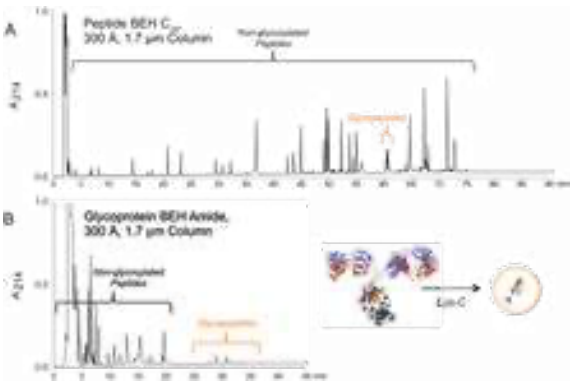
Reversed-Phase vs. HILIC-Based Analyses of a Lys-C Digest of Trastuzumab

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

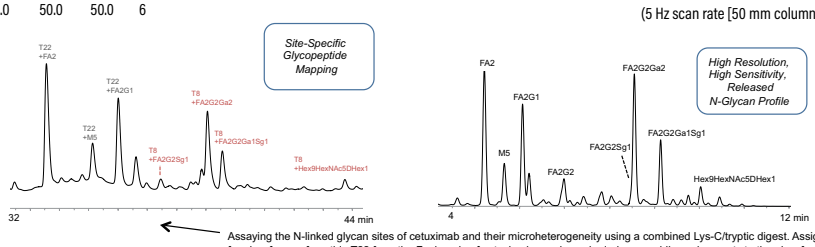
System:	SYNAPT G2-S*i* HDMS
Ionization mode:	ESI+
Analyzer mode:	Resolution (~20 K)
Capillary voltage:	3.0 kV
Cone voltage:	25 V
Source temp.:	120 °C
Desolvation temp.:	350 °C
Desolvation gas flow:	800 L/hr
Acquisition:	50–2500 *m/z*, 0.1 sec scan rate
Data management:	MassLynx Software (v4.1)/ UNIFI 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.

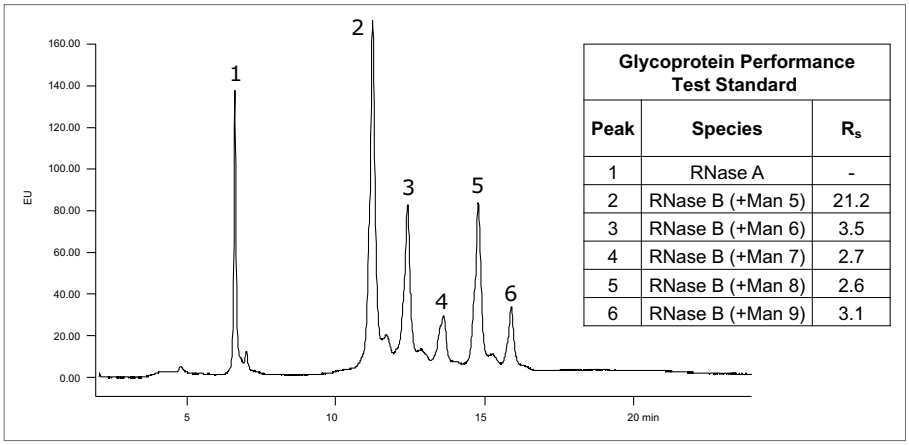
For more information, reference application note 720005385EN.

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
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 50 mm, 1/pk	186009547
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 100 mm, 1/pk	186009548
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 150 mm, 1/pk	186009549
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 50 mm, 1/pk with Glycoprotein Performance Test Standard	176004866
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 100 mm, 1/pk with Glycoprotein Performance Test Standard	176004867
ACQUITY Premier Glycoprotein BEH Amide Column, 300 Å, 1.7 µm, 2.1 × 150 mm, 1/pk with Glycoprotein Performance Test Standard	176004868

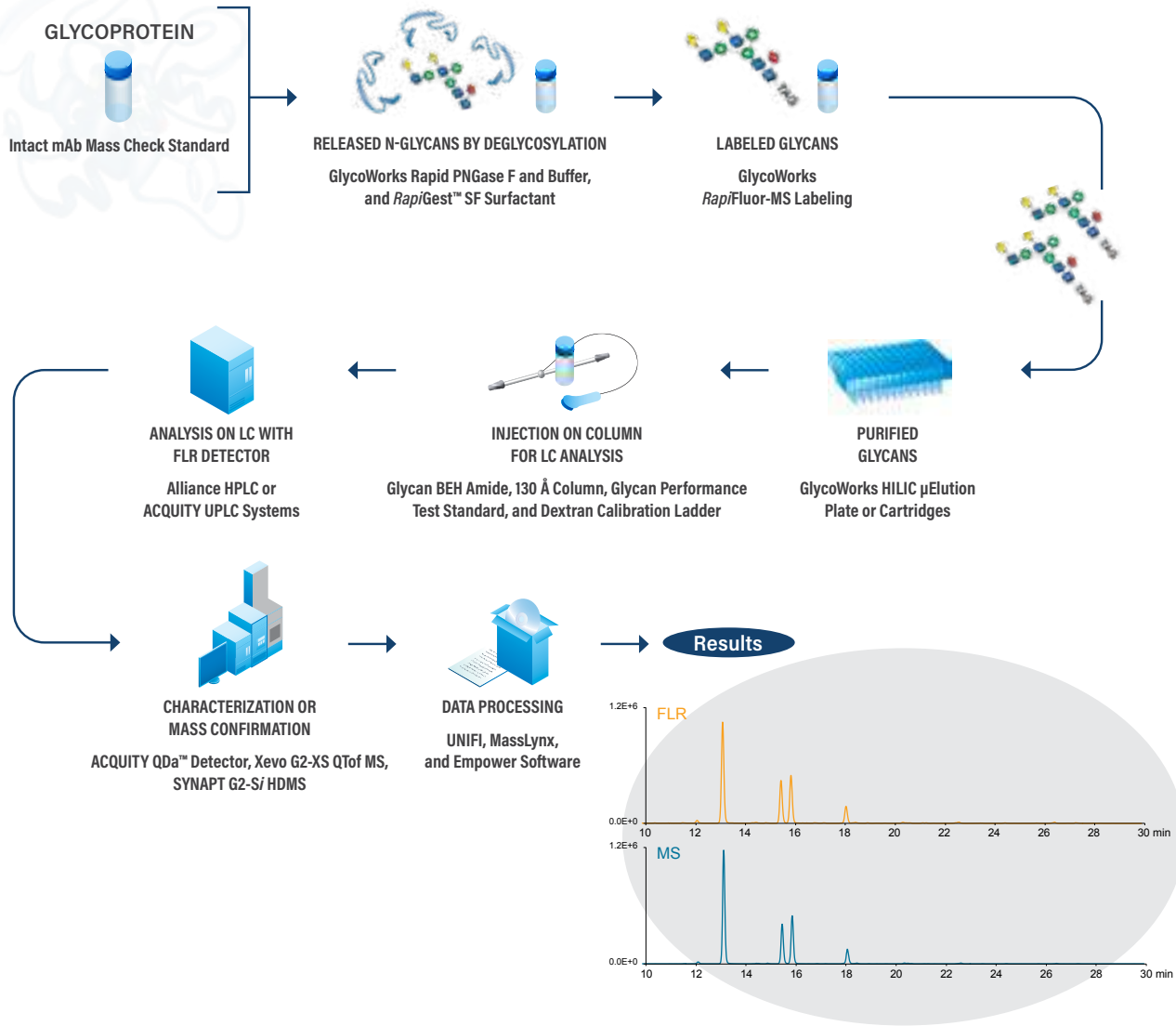
RELEASED N-GLYCAN ANALYSIS



Waters GlycoWorks Sample Preparation Kits and Standards, along with the ACQUITY UPLC and HPLC Glycan 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
- Automation-enabled sample preparations with verified scripts
- Alternative selectivity with either HILIC or Mixed-mode separations
- MaxPeak Premier column format reduces sample adsorption onto metal surfaces and delivers the representative performance from the first injection
- Glycan standards for benchmarking chromatographic performance, calibration and quantification, and complex profiling

Released N-Glycan Workflow



GlycoWorks *Rapi*Fluor-MS N-Glycan Kits

Reduce complicated, time consuming sample preparation

- Increased fluorescence quantification and supreme mass spectral response
- One label that provides valuable information from characterization to routine monitoring
- Simple to follow protocols with detailed tips and tricks provided for adaptation
- The ability to easily train non-glycan experts
- An experimentally derived library to help with data analysis



waters.com/glycans

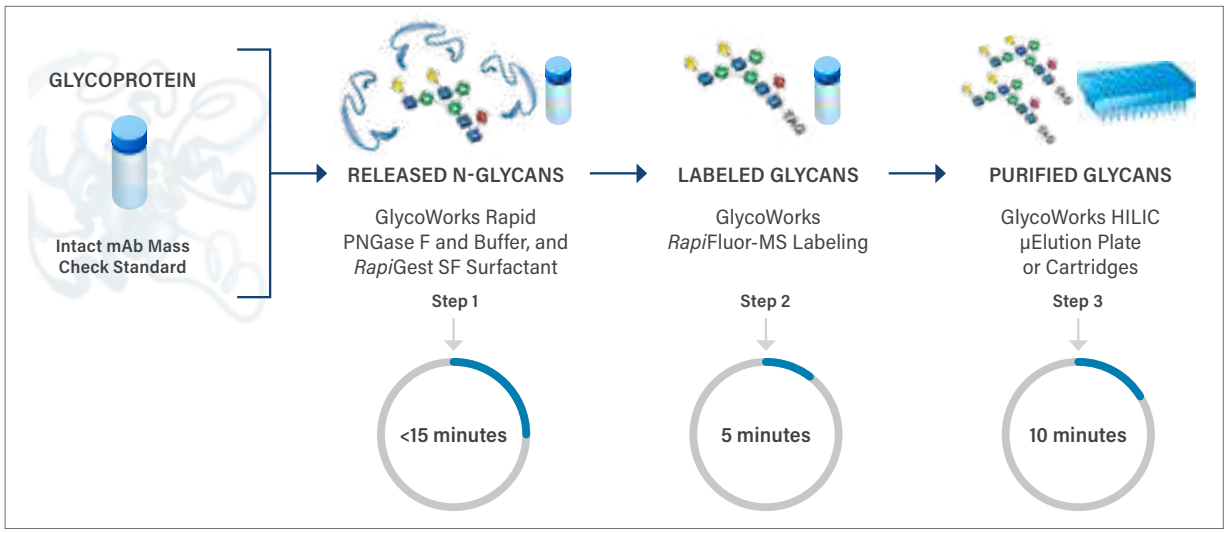
See page 361 for more information.

GLYCOWORKS *RAPI*FLUOR-MS RELEASED N-GLYCANS SAMPLE PREPARATION

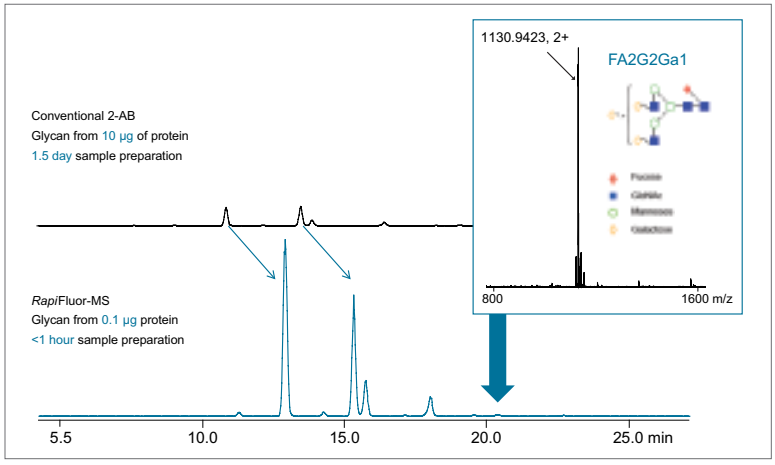
Waters GlycoWorks Consumables offer a more convenient, comprehensive, and effective sample-preparation solution for glycan analysis.

- The GlycoWorks *Rapi*Fluor-MS N-Glycan Kit ensures easy, quick preparation of released-labeled, N-glycan samples
- Streamline standard protocols (720005470EN, 720005343EN) for mAbs and a variety of glycoproteins; Optimized reducing protocols (720006992EN, 720006991EN) for complex proteins with multiple disulfide bonds
- 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.

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AUTOMATION OF RELEASED N-GLYCAN ANALYSIS

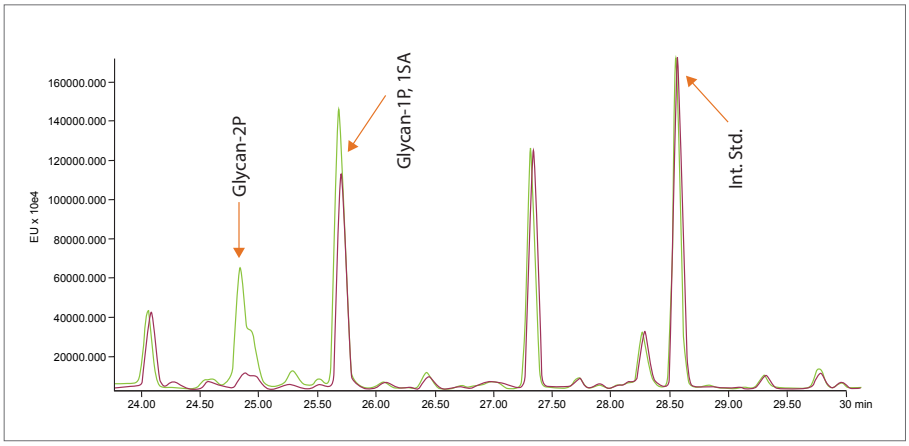
Waters GlycoWorks Consumables offer a more convenient, comprehensive, and effective sample-preparation solution for Released N-glycan analysis. The sample preparation procedures involve multiple steps including enzymatic deglycosylation, labeling, and SPE clean up. Due to this complexity, Waters has developed an application-specific configuration of the Andrew+ Pipetting Robot for released N-glycan analysis. Additionally, verified scripts for the GlycoWorks *Rapi*Fluor-MS method are available for our partner platforms. We provide you with the information needed, no matter the platform, to ensure that you can start achieving your automation results faster.



*GlycoWorks **Rapi**Fluor MS N-Glycan Kit*

PHOSPHOGLYCAN SPE BUFFER IMPROVES RECOVERY

The loss of labeled acidic glycans, especially phosphorylated glycan species, during SPE purification has been considered a challenge to accurately monitor the glycosylation of biotherapeutics. The GlycoWorks Phosphoglycan SPE Elution Buffer, optimized with citrate additive, facilitates the elution and recovery of phosphorylated glycans and achieves maximum yield.



Improved recovery of phosphorylated glycans using citrate containing SPE eluent

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, Glycan *Rapi*Fluor-MS performance Test std, Intact mAb Mass Check Standard	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, Intact mAb Mass Check Standard	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, Glycan *Rapi*Fluor-MS performance Test std, Intact mAb Mass Check Standard	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, Intact mAb Mass Check Standard	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 Rapid Deglycosylation kit 4 × 24	186008840
GlycoWorks *Rapi*Fluor -MS Labeling Kits—24 Sample	186008091
GlycoWorks *Rapi*Fluor -MS Labeling Kits—96 Sample	186007989
GlycoWorks SPE Reagents	186007992
GlycoWorks Phosphoglycan SPE Reagents HILIC	186010209
GlycoWorks Phosphoglycan SPE Elution Buffer, 4/pk	186009763
GlycoWorks HILIC uElution Plate	186002780
GlycoWorks Sample Collection Module	186007988

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
Andrew+ 24 Sample GlycoWorks Application Kit contains: GlycoWorks Rapid Deglyco Module 24-sample, GlycoWorks *Rapi*Fluor-MS Labeling—24 sample, GlycoWorks HILIC uElution Plate, GlycoWorks SPE Reagents – Automation, Intact mAb Mass Check Standard	176003349
Andrew+ 96 Sample GlycoWorks Application Kit contains: GlycoWorks Rapid Deglyco Module 96-sample, GlycoWorks *Rapi*Fluor-MS Labeling—96 sample, GlycoWorks HILIC uElution Plate, GlycoWorks SPE Reagents – Automation, Intact mAb Mass Check Standard	17600335
Andrew+ 96 Sample GlycoWorks Application Kit contains: GlycoWorks Rapid Deglyco Module 2 × 48, GlycoWorks *Rapi*Fluor-MS Labeling – Automation, GlycoWorks HILIC µElution Plate, GlycoWorks SPE Reagents – Automation, Intact mAb Mass Check Standard	176003351

GLYCAN PERFORMANCE TEST STANDARDS AND DEXTRAN CALIBRATION LADDERS

Benchmarking, Method Development, and Troubleshooting

Waters purified glycan library standards are used as qualitative/quantitative standards for LC/FLR and LC/MS. These standards come pre-labeled, lyophilized for long term storage in Waters Certified Vials for ease of solubilization and injection.

Chromatographic Performance
To ensure that the system and chromatographic method is working, it is highly recommended to use a pre-labeled standard to access observed retention time by monitoring the major peaks for performance of the method.

Calibration and Quantitation
When using LC optical detection, it is important to have standards to assist in profiling glycans under HILIC conditions to ensure reproducible chromatographic assignment providing confidence in data generation.

Complex Profiling
These performance test standards are helpful when looking for specific glycans monitored in manufacturing and are useful to check retention time of major peaks in LC/FLR, accurate mass or to assess sample preparation efficiency.

Ordering Information

*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
2-AB Glycan Performance Test Standard	186006349
2-AB Dextran Calibration Ladder	186006841

* 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
GlycoWorks Rapid Buffer—5 mL	186008100

GLYCAN COLUMNS



Choose the most appropriate LC-based technology to address your specific glycan analysis needs and laboratory instrumentation

HILIC for Released Glycans
ACQUITY UPLC and XBridge Glycan BEH Amide 130 Å Columns are best suited for the analysis of released, N-labeled glycans using pre-column labeling with 2-AB, 2-AA, or Waters innovative and enabling *Rapi*Fluor-MS reagent. ACQUITY Premier Glycan BEH Amide Columns with MaxPeak High Performance Surfaces (HPS) Technology, that reduces sample loss caused by non-specific adsorption on metal surfaces, deliver the representative performance of Glycan BEH Amide chemistry from the first injection.

Mixed Mode for Released Glycans
Glycan BEH C_{18} AX Columns are packed with a mixed-mode, reversed-phase/anion-exchange chemistry that provides charge-based separations and extra resolution for acidic glycans. With the mixed-mode separation, glycans are grouped by different charged states, and retention is increased with analyte net charge. Additional resolution of isomeric glycan species within the same charged group can be achieved due to the RP properties of the stationary phase. The ACQUITY Premier Glycan BEH C_{18} AX Columns are integrated with an easy-to-use, MS-grade mobile-phase concentrate and the *Rapi*Fluor-MS Sialylated Glycan Performance Test Standard, providing a complete charge-based separation solution.

Application Example 1

LC Conditions

System:	ACQUITY UPLC H-Class Bio
Data Acquisition:	MassLynx v4.1
Column:	ACQUITY Premier Glycan BEH C_{18} AX, 1.7 µm, 2.1 × 150 mm (p/n: 186009760)
Sample Temp.:	8 °C
Sample Injection Volume:	1 µL
FLR Wavelengths:	265 Ex/425 Em (RFMS-labeled glycans) 3 30 Ex/420 Em (2-AB-labeled glycans)
Column Temp.:	60 °C
Seal Wash:	330% ACN/70% 18.2 MΩ water v/v (seal wash interval set to 5 min)
Mobile Phase A[1]:	18.2 MΩ water
Mobile Phase B[2]:	10% IonHance Glycan C_{18} AX 1 M ammonium formate concentrate in 40%/60% water/acetonitrile (v/v)
Active Preheater:	Enabled
Scan Rate:	10 points/sec
Filter Time Constant:	Normal
Autozero on Inject Start:	Yes
Autozero on Wavelength:	Maintain baseline

1. The water only mobile phase can be susceptible to bacterial growth. It is recommended to replace the mobile phase frequently (every 3 days) and periodically flush solvent line with 90/10 acetonitrile/water mixture.

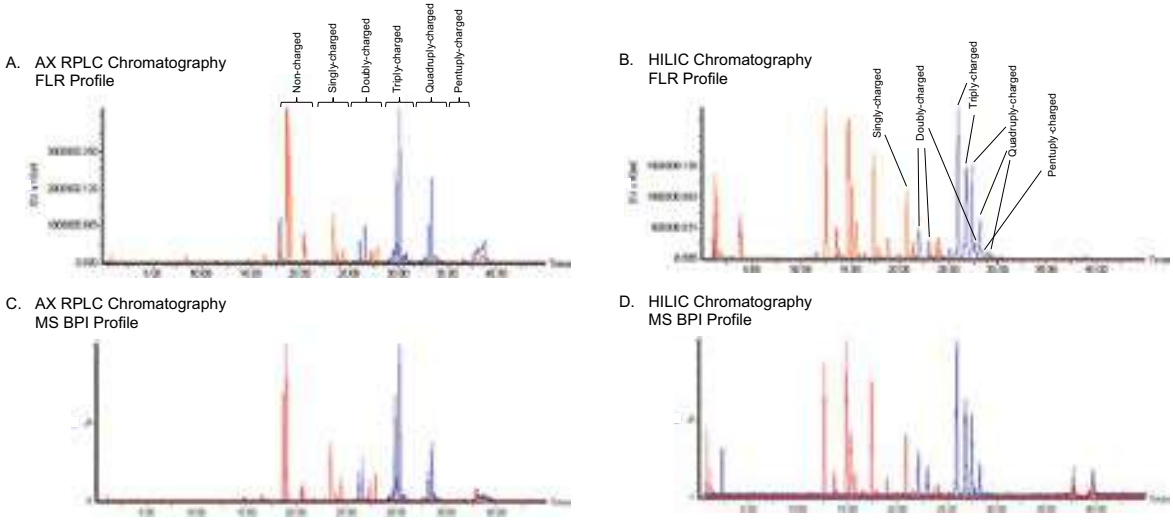
2. Mobile Phase B is prepared by diluting 100 mL of IonHance Glycan C_{18} AX 1 M Ammonium Formate concentrate with 320 mL of MilliQ water and 580 mL of acetonitrile. It is recommended to replace this mobile phase B frequently (every 3 days) to avoid any potential performance change caused by acetonitrile evaporation.

MS Conditions

System:	Xevo G2-XS QTof
Ionization Mode:	ESI, Positive
Acquisition Range:	700–3000 Da
Capillary Voltage:	2.2 kV
Source Offset:	50 V
Collision Energy:	Off
Cone Voltage:	75 V
Desolvation Gas:	600 L/hr
Source Temp.:	120 °C
Desolvation Temp.:	500 °C
Scan Rate:	2 Hz

Gradient - *Rapi*Fluor-MS Labeled Glycans

Time (min)	Flow (mL/min)	%A	%B	Curve
0.0	0.4	100	0	Initial
36.0	0.4	78	22	6
36.3	0.4	0	100	6
37.3	0.4	0	100	6
38.0	0.4	100	0	6
45.0	0.4	100	0	6



FLR Chromatograms of RFMS-labeled glycans from human IgG (red) and Fetuin (blue) using different LC chromatography. Stainless hardware with High Performance Surface were used to pack all columns. Figure 1 A, C: FLR profiling (A) and MS BPI profiling (C) using an anion exchange reversed phase liquid chromatography (AX RPLC) mixed mode separation with BEH C_{18} AX stationary phase. Figure 1 B, D: FLR profiling (B) and MS BPI profiling (D) using HILIC separation achieved with amide bonded BEH stationary phase.

For more information, reference application note 720007038EN.

Application Example 2

LC Conditions
Standard Configuration

System:	ACQUITY UPLC I-Class PLUS
Detection:	ACQUITY FLR Detector (λ.excitation=265 nm, λ.emission=425 nm, 2 Hz)
Columns:	ACQUITY Glycan BEH Amide Column, 1.7 µm, 130 Å, 2.1 × 150 mm (p/n: 186004742)
Vials:	QuanRecovery with MaxPeak HPS 300 µL Vials (p/n: 186009186)
Column Temp.:	60 °C
Sample Temp.:	6 °C
Injection Amount:	1 µL
Seal Wash:	20% acetonitrile in water
Mobile Phase A:	H_2O with 50 mM NH_4HCO_2
Mobile Phase B:	Acetonitrile

MS Conditions

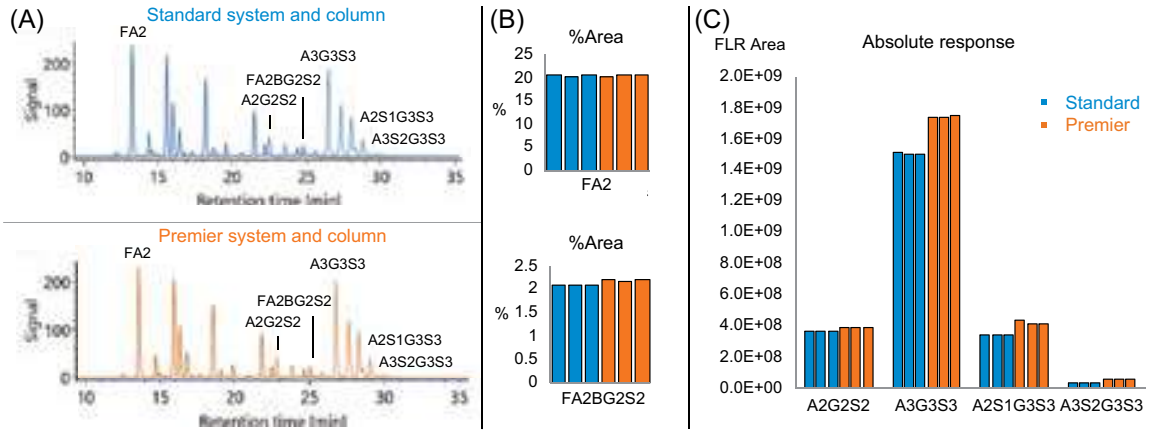
System:	ACQUITY RDa Mass Detector
Ionization Mode:	ESI, Positive
Acquisition Range:	50–2,000 *m/z*
Capillary Voltage:	1.5 kV
Source Offset:	50 V
Cone Voltage:	45 V
Fragmentation CV:	70–90 V

LC Conditions
AQUITY Premier Solution

System:	ACQUITY Premier (BSM) UPLC
Detection:	ACQUITY Premier FLR Detector (λ.excitation=265 nm, λ.emission=425 nm, 2 Hz)
Columns:	ACQUITY Premier Glycan BEH Amide Column, 1.7 µm, 130 Å, 2.1 × 150 mm (p/n: 186009524)
Vials:	QuanRecovery with MaxPeak HPS 300 µL Vials (p/n: 186009186)
Column Temp.:	60 °C
Sample Temp.:	6 °C
Injection Amount:	1 µL
Seal Wash:	20% acetonitrile in water
Mobile Phase A:	H_2O with 50 mM NH_4HCO_2
Mobile Phase B:	Acetonitrile

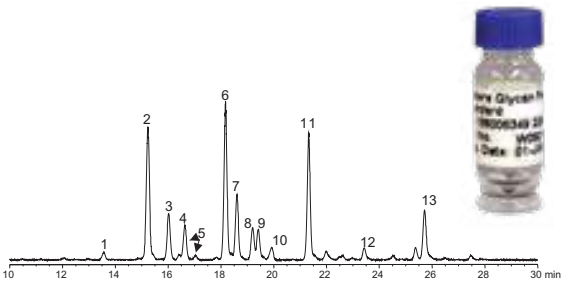
Gradient

Time (min)	Flow (mL/min)	%A	%B	Curve
0.00	0.4	25	75	6
35.00	0.4	46	54	6
36.50	0.2	80	20	6
39.50	0.2	80	20	6
43.10	0.2	25	75	6
47.60	0.4	25	75	6
55.00	0.4	25	75	6



The recovery of sialylated glycans are slightly better using the BioAccord System with ACQUITY Premier LC and Column. (A) overlaid chromatograms of the separation of neutral and sialylated RFMS labeled glycan performance test standards (GPTS) on Standard vs. ACQUITY Premier System and Column. (B) Comparison of relative abundances of a neutral glycan, FA2, vs. a sialylated glycan, FA2BG2S2 in the neutral GPTS. (C) Comparison of the absolute response of the representative glycans in the sialylated GPTS.

For more information, reference application note 720007261EN.



Peak Identification

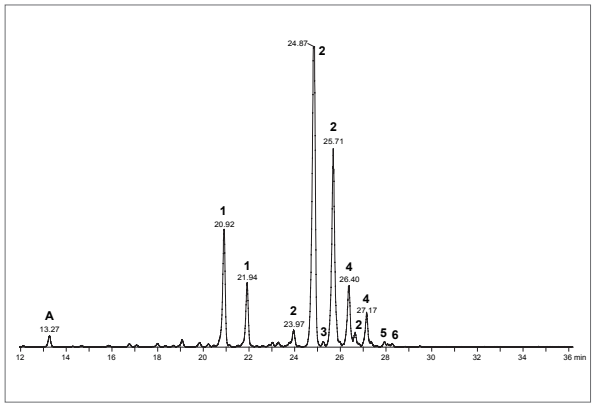
1. G0 (NGA2)	5. G1	9. Man-6	13. G2F+SA (A1F)
2. G0F (NGA2F)	6. G1Fa (NA2G1F)	10. G2 (NA2)	
3. Man-5	7. G1Fb (NA2G1F)	11. G2F (NA2F)	
4. G0F+GN	8. G1F+GN	12. G1F+SA	

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 × 150 mm Column	186004742

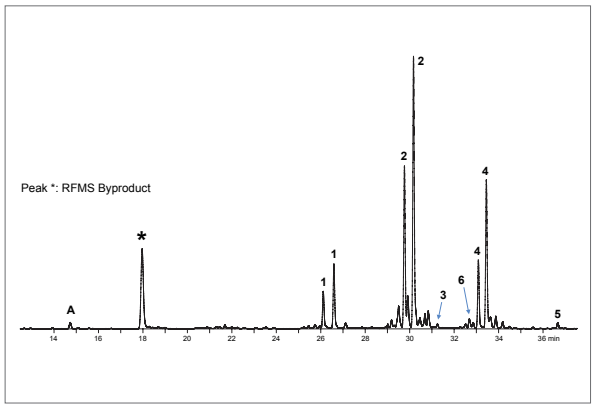
Note: ACQUITY UPLC Glycan BEH Amide, 1.7 µm Columns are designed for use with the ACQUITY UPLC System. The benefits of the small particle packing in ACQUITY UPLC Glycan BEH Amide, 1.7 µm Columns are only realized with the low system volume and low detector dispersion of an ACQUITY UPLC System.
[1]Three columns from three different batches of BEH Amide, 130 Å material.

HILIC Separation



Chromatographic profile of the RapiFluor-MS™ Sialylated Glycan Performance Test Standard.

Mixed-mode Separation



Chromatographic Profile of the RapiFluor-MS Sialylated Glycan Performance Test Standard.

Peak	Name	*Rapi*Flour-MS Labeled Glycan Composition	M, (Da)
1	A2G2S2	C101H159N11O63	2533.9576
2	A3G3S3	C126H199N13O81	3190.1852
3	FA3G3S3	C132H209N13O85	3336.2431
4	A3S1G3S3	C137H216N14O89	3481.2806
5	A3S2G3S3	C148H233N15O97	3772.3761
6	A4G4S4	C151H239N15O99	3846.4128
A	M5	C63H99N7O37	1545.6080

Ordering Information

ACQUITY Premier Glycan BEH Amide columns and Eluent

Description	P/N
ACQUITY Premier Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 50 mm Column	186009522
ACQUITY Premier Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 100 mm Column	186009523
ACQUITY Premier Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 150 mm Column	186009524
ACQUITY Premier Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 50 mm VanGuard FIT Column	186009974
ACQUITY Premier Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 100 mm VanGuard FIT Column	186009975
ACQUITY Premier Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 150 mm VanGuard FIT Column	186009976
ACQUITY Premier Glycan BEH Amide, 130 Å, 1.7 µm, 2.1 × 5 mm (Guard) VanGuard FIT Column	186009977
Ammonium Formate Solution -Glycan Analysis	186007081

ACQUITY Premier Glycan BEH C_{18} AX columns and Eluent

Description	P/N
ACQUITY Premier Glycan BEH C_{18} AX, 1.7 µm, 2.1 × 50 mm Column	186009758
ACQUITY Premier Glycan BEH C_{18} AX, 1.7 µm, 2.1 × 100 mm Column	186009759
ACQUITY Premier Glycan BEH C_{18} AX, 1.7 µm, 2.1 × 150 mm Column	186009760
ACQUITY Premier Glycan BEH C_{18} AX, 1.7 µm, 2.1 × 50 mm VanGuard FIT Column	186009970
ACQUITY Premier Glycan BEH C_{18} AX, 1.7 µm, 2.1 × 100 mm VanGuard FIT Column	186009971
ACQUITY Premier Glycan BEH C_{18} AX, 1.7 µm, 2.1 × 150 mm VanGuard FIT Column	186009972
ACQUITY Premier Glycan BEH C_{18} AX, 1.7 µm, 2.1 × 5 mm (Guard) VanGuard FIT Column	186009973
ACQUITY C_{18} AX Charge Based Glycan Kit (Standard Mobile Phase Concentrate, and 1.7 µm, 2.1 × 50 mm Column)	186004732
ACQUITY C_{18} AX Charge Based Glycan Kit (Standard Mobile Phase Concentrate, and 1.7 µm, 2.1 × 100 mm Column)	186004733
ACQUITY C_{18} AX Charge Based Glycan Kit (Standard Mobile Phase Concentrate, and 1.7 µm, 2.1 × 150 mm Column)	186004734
IonHance Glycan C_{18} AX Ammonium Formate Concentrate	186009762

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
XBridge Premier Glycan BEH Amide, 130 Å, 2.5 µm, 2.1 × 50 mm Column	186009941
XBridge Premier Glycan BEH Amide, 130 Å, 2.5 µm, 2.1 × 100 mm Column	186009942
XBridge Premier Glycan BEH Amide, 130 Å, 2.5 µm, 2.1 × 150 mm Column	186009943
XBridge Premier Glycan BEH Amide, 130 Å, 2.5 µm, 4.6 × 50 mm Column	186009944
XBridge Premier Glycan BEH Amide, 130 Å, 2.5 µm, 4.6 × 100 mm Column	186009945
XBridge Premier Glycan BEH Amide, 130 Å, 2.5 µm, 4.6 × 150 mm Column	186009946
XBridge Premier Glycan BEH C_{18} AX, 2.5 µm, 2.1 × 50 mm Column	186009947
XBridge Premier Glycan BEH C_{18} AX, 2.5 µm, 2.1 × 100 mm Column	186009948
XBridge Premier Glycan BEH C_{18} AX, 2.5 µm, 2.1 × 150 mm Column	186009949
XBridge Premier Glycan BEH C_{18} AX, 2.5 µm, 4.6 × 50 mm Column	186009950
XBridge Premier Glycan BEH C_{18} AX, 2.5 µm, 4.6 × 100 mm Column	186009951
XBridge Premier Glycan BEH C_{18} AX, 2.5 µm, 4.6 × 150 mm Column	186009952

[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

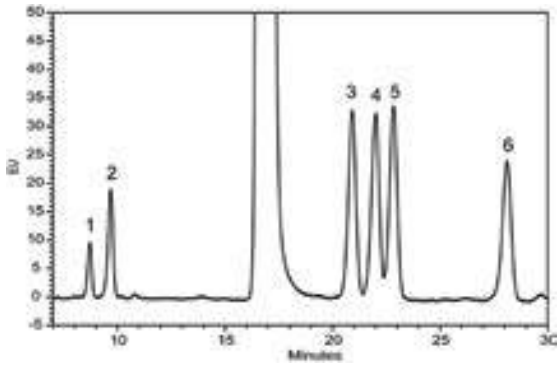
Description	P/N
GlycoWorks Reductive Amination High-Throughput Prep Kit Kit contains: GlycoWorks HILIC µElution 96-Well Plate, *Rapi*Gest SF 1 mg Vial, GlycoWorks Reagent Kit, Manifold Waste Tray	176003090
GlycoWorks HILIC µElution 96-Well Plate	186002780
*Rapi*Gest SF 1 mg Vial	186001860
GlycoWorks Reagent Kit	186007034
Manifold Waste Tray	600001282
GlycoWorks Reductive Amination Single-Use Prep Kit Kit contains: GlycoWorks HILIC 1 cc Cartridge (20/pk), *Rapi*Gest SF 1 mg Vial, GlycoWorks Reagent Kit	176003119
GlycoWorks HILIC 1 cc Cartridge (20/pk)	186007080
*Rapi*Gest SF 1 mg Vial	186001860
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
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 AND SIALIC ACID ANALYSIS FROM GLYCOPROTEINS

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" (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



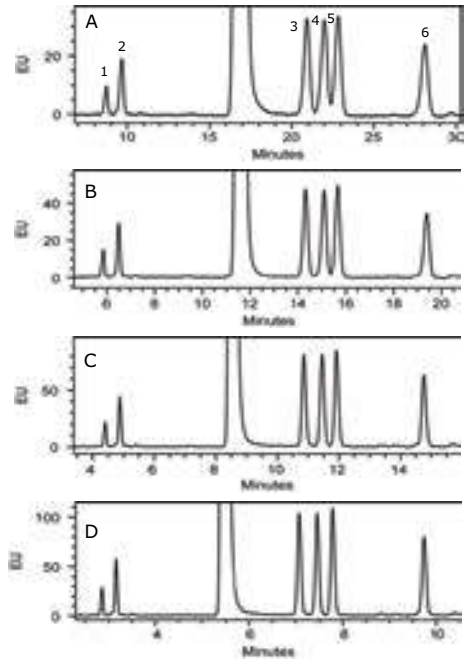
LC Conditions

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_g	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)

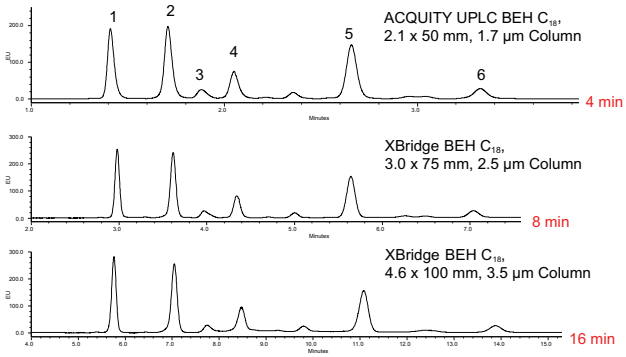
		5 µm		3.5 µm		2.5 µm		1.7 µm	
Step	%B[1]	Flow (mL min-1)	Time (min)	Flow (mL min-1)	Time (min)	Flow (mL min-1)	Time (min)	Flow (mL min-1)	Time (min)
1	7	0.480	0.00	0.685	0.00	0.200	0.00	0.294	0.00
2	7	0.480	7.78	0.685	5.45	0.200	3.89	0.294	2.64
3	17	0.480	27.78	0.685	19.47	0.200	13.88	0.294	9.44
4	100	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

Is NSA Sabotaging Your Lab's Productivity?

The Hidden Impacts of Non-Specific Adsorption (NSA)



- Did you know that NSA can negatively impact your chromatographic peak shapes, sensitivity and reproducibility?
- Did you believe the only solutions include the use of additives or lengthy passivation procedures?

MAXPEAK™ PREMIER

Waters MaxPeak Premier Columns dramatically reduce NSA with MaxPeak High Performance Surfaces, innovative technologies to reduce analyte loss due to analyte/surface interactions.



Learn more on pages 93-104 or by visiting waters.com

Nucleic Acid Separations

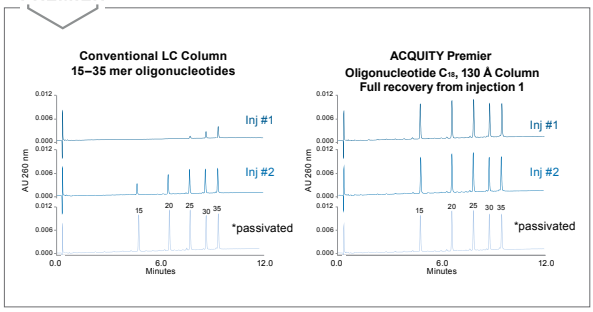
For more than 30 years, Waters has pioneered LC-based separations for nucleic acids from HPLC to UPLC. The ACQUITY and XBridge Premier Oligonucleotide BEH C_{18} Columns utilize MaxPeak™ High Performance Surfaces which is our latest innovation designed to increase analyte recovery, sensitivity, and reproducibility by minimizing analyte/surface interactions that can lead to sample losses.

Waters Oligonucleotide Columns whether it is in Premier hardware or stainless steel hardware 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.

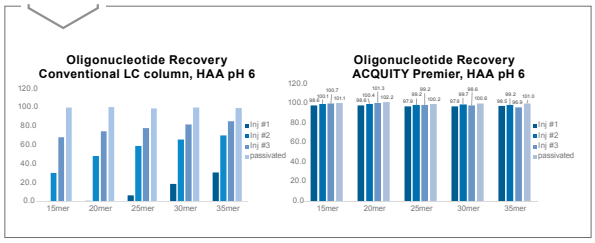
- Synthetic oligonucleotide separations efficiencies equivalent to or exceeding those of PAGE, CGE, or ion-exchange HPLC methods
- The ability to distinguish/separate failure sequences from detritylated full-length products
- Column scalability for laboratory-scale isolation needs
- Exceptional column life for reduced cost per analysis
- QC tested with MassPREP Oligonucleotide Standard (p/n: 186004135) to help ensure performance consistency

MAXPEAK™ PREMIER **Out-of-the-box Performance**



*Injection of 2 µL of standard diluted in water, 10 pmol of each oligonucleotide injected on column. *"Passivation" with 500 pmol injection of 35 mer, followed by "post passivation" injection of 10 pmol of standard..*

MAXPEAK™ PREMIER **High Recovery and Repeatability**



*Injection of 2 µL of standard diluted in water, 10 pmol of each oligonucleotide injected on column. *"Passivation" with 500 pmol injection of 35 mer, followed by "post passivation" injection of 10 pmol of standard.*



Have confidence that the methods you develop today will have the same repeatable results tomorrow. Quality is at the heart of everything we do, whether it is column particles, reliable quality manufacturing, customer support, or supply chain.

EXCEPTIONAL RESOLUTION OF OLIGONUCLEOTIDE MIXTURES

ACQUITY UPLC Oligonucleotide BEH C_{18}, 1.7 µm (designed for use with an ACQUITY UPLC System) and XBridge Oligonucleotide BEH 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.

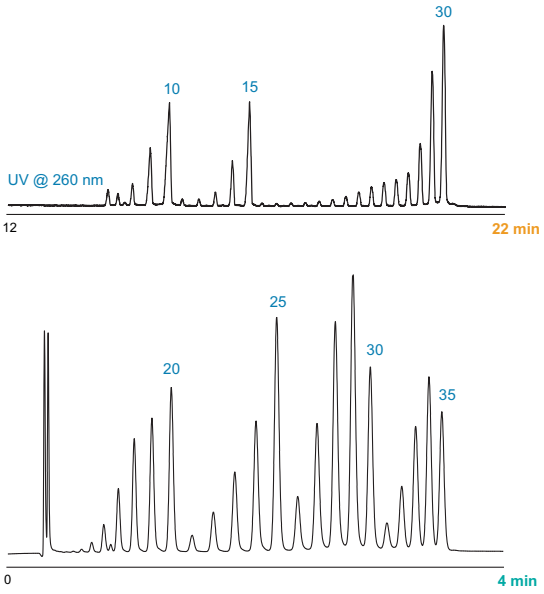
Separation of Detritylated Oligodeoxythymidine Ladders by Capillary Gel Electrophoresis (CGE) vs. Ion-Pair, Reversed-Phase Chromatography

CGE Conditions

System:	Capillary Gel Electrophoresis
Column:	PEG sieving matrix (BioCap 75 µm × 27.5 [to detector]/ 34.5 cm [total length])
Injection:	45 injection at 5 kV
Running:	15 kV
Column temp.:	30 °C

LC Conditions

System:	ACQUITY UPLC
Column:	ACQUITY UPLC Oligonucleotide BEH C_{18}, 1.7 µm, 2.1 × 50 mm (p/n: 186003949)
Mobile phase A:	15 mM TEA, 400 mM hexafluoroisopropanol, pH 7.9
Mobile phase B:	50% A, 50% methanol
Flow rate:	0.4 mL/min
Column temp.:	60 °C
Gradient:	40 to 48% B in 4 min (20–24% methanol)
UV detection:	260 nm



Ordering Information

ACQUITY Premier Columns for Oligonucleotide Analysis

	Particle Size: 1.7 µm	
Oligonucleotide BEH C_{18}, 130 Å, 1.7 µm	**Dimension**	**P/N**
	2.1 × 50 mm	186009484
	2.1 × 100 mm	186009485
	2.1 × 150 mm	186009486
Peptide BEH C_{18}, 300 Å, 1.7 µm*	2.1 × 50 mm	186009493
	2.1 × 100 mm	186009494
	2.1 × 150 mm	186009495

*Quality control tested for peptides; large pore size that is well suited for oligonucleotide separations.

XBridge™ Premier Columns for Oligonucleotide Analysis

	Particle Size: 2.5 µm	
Oligonucleotide BEH C_{18}, 130 Å, 2.5 µm	**Dimension**	**P/N**
	2.1 × 50 mm	186009836
	2.1 × 100 mm	186009837
	2.1 × 150 mm	186009838
	4.6 × 50 mm	186009901
	4.6 × 100 mm	186009902
	4.6 × 150 mm	186009903
Peptide BEH C_{18}, 300 Å, 2.5 µm*	2.1 × 50 mm	186009892
	2.1 × 100 mm	186009893
	2.1 × 150 mm	186009894
	4.6 × 50 mm	186009895
	4.6 × 100 mm	186009896
	4.6 × 150 mm	186009897

*Quality control tested for peptides; large pore size that is well suited for oligonucleotide separations.

ACQUITY UPLC Oligonucleotide BEH C_{18} Columns and Method Validation Kits

	Particle Size: 1.7 µm	
BEH C_{18}, 130 Å*	**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**	2.1 × 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

	Particle Size: 2.5 µm	
BEH C_{18}, 130 Å	**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.



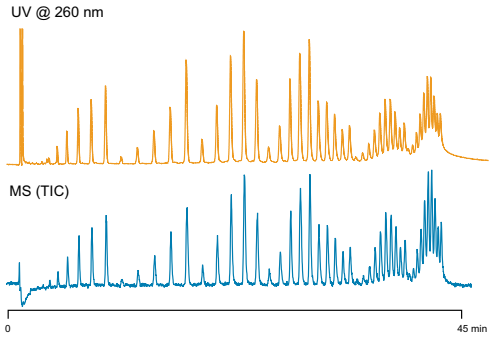
"The Waters ACQUITY™ Premier Peptide BEH C_{18} 300 Å Column shows an excellent degree of specificity and selectivity in denaturing and non-denaturing analysis of synthetic oligonucleotides, due to the absence of non-specific binding properties of this new column hardware in combination with great stationary phase performance. The Waters ACQUITY Premier Column is a highly valuable addition to our test package for the future development of synthetic oligonucleotides analytical methods."

ORGANIZATION: Janssen

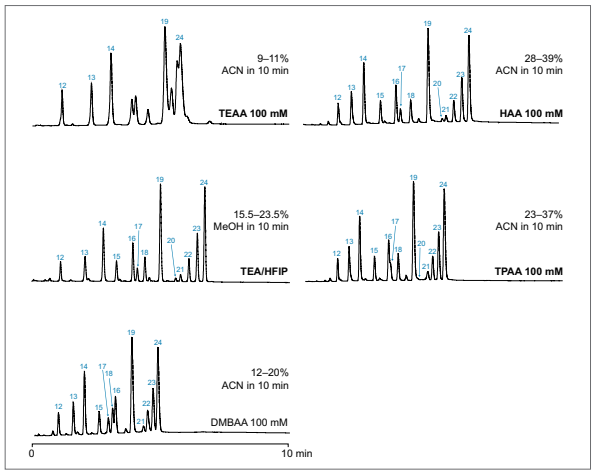
Separation of a 15–60 mer Detritylated Oligodeoxythymidine Ladder

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

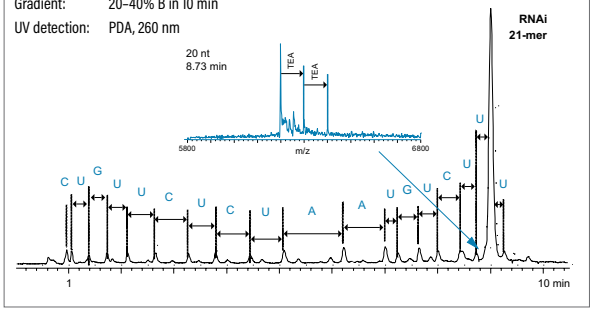
Discovery of the RNA interference (RNAi) mechanism now broadly used for silencing of target gene expression has prompted a need for the analysis of small interfering RNAs (siRNA) molecules. To satisfy the need for a robust, fast, and sensitive analysis of 20–25 nucleotides of small interfering RNA (siRNA), 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.

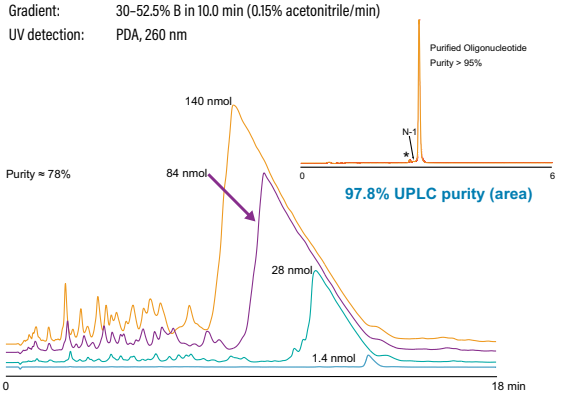
For researchers involved in gene silencing it is often necessary to work with RNA of high purity. Crude synthetic oligonucleotides used for gene knockout are typically purified. The figure below illustrates a lab-scale purification of 21 mer RNA at various column loads. Using an Oligonucleotide column 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

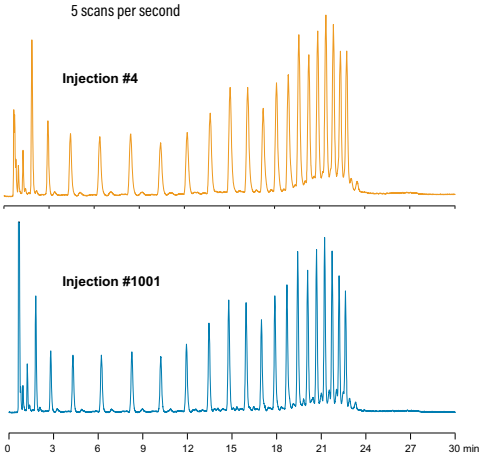
System:	Alliance HPLC
Column:	XBridge Oligonucleotide BEH C_{18}, 130 Å, 2.5 µm, 4.6 × 50 mm (p/n: 186003953)
Column temp.:	60 °C
Flow rate:	1.0 mL/min
Mobile phase A:	0.1 M triethylammonium acetate, pH 7.5
Mobile phase B:	20% acetonitrile in A
Gradient:	30–52.5% B in 10.0 min (0.15% acetonitrile/min)
UV detection:	PDA, 260 nm



Separation of 5–25 mer Detritylated Oligodeoxythymidine Ladder

LC Conditions

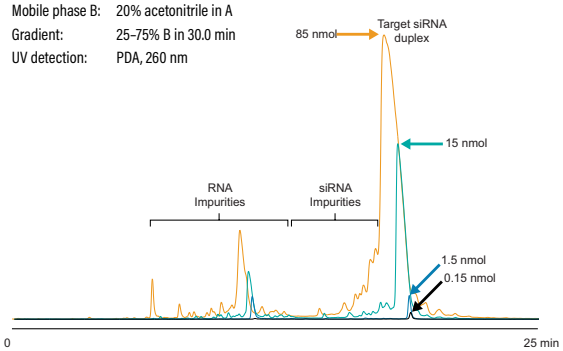
System:	Alliance HPLC with PDA
Column:	XBridge Oligonucleotide BEH C_{18}, 130 Å, 2.5 µm, 2.1 × 50 mm (p/n: 186003952)
Mobile phase A:	10% methanol/90% (385 mM Hexafluoroisopropanol + 14.3 mM TEA)
Mobile phase B:	25% methanol/75% (385 mM Hexafluoroisopropanol + 14.3 mM TEA)
Column temp.:	60 °C
Gradient:	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 and ACQUITY Premier Peptide BEH C_{18}, 300 Å Reversed-Phase, Protein-Pak Hi Res Q 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

siRNA duplex analysis was performed on ACQUITY Premier Peptide BEH C_{18}, 300 Å Column as shown on right with more details available in the following application: "Analysis of siRNA Drugs at Denaturing UPLC Conditions Using MaxPeak Premier Column Technology" Waters Application Note 720007362.

Ordering Information

ACQUITY Premier Peptide BEH C_{18}, 300 Å Columns for DNA/RNA Fragments

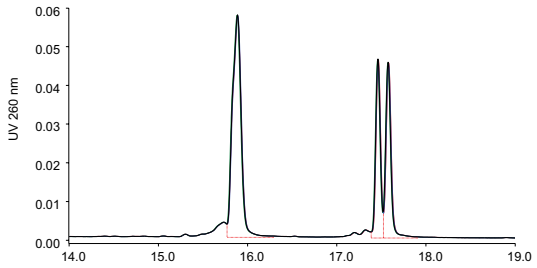
Peptide BEH C_{18}, 300 Å, 1.7 µm	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009493
	2.1 × 100 mm	186009494
	2.1 × 150 mm	186009495

siRNA Duplex Analysis on ACQUITY Premier Peptide BEH C_{18} 300 Å Column

Method **Conditions**

Column: ACQUITY Premier Peptide BEH C_{18}, 300 Å, 1.7 µm, 2.1 × 150 mm (p/n: 186009495)
Mobile phase 1: 0.07% (v/v) TEA and 0.60% v/v HFIP solution in Milli-Q water (5 mM TEA, 60 mM HFIP aqueous solution)
Mobile phase 2: 70/30% v/v Methanol/acetonitrile
Mobile phase 3: 85/15% (v/v) Mixture of mobile phase 1 and 2
Mobile phase 4: 30/70% (v/v) Mixture of mobile phase 1 and 2
Column temp.: 75 °C
UV detection: 260 nm PDA, titanium 5 mm detector cell
Injection volume: 3 µL

Time (min)	Flow (mL/min)	A (% vol)	C (% vol)	D (% vol)	Curve
0	0.30	100	0	0	Initial
20	0.30	0	100	0	6
25	0.30	0	0	100	6
26	0.30	0	0	100	6
28	0.30	100	0	0	6
34	0.30	100	0	0	6



Four consecutive injections of 3 µL of Duplex C (0.40 mg/mL) using the ACQUITY Premier Peptide BEH C_{18}, 300 Å Column.

ANION-EXCHANGE HPLC OF NUCLEIC ACIDS

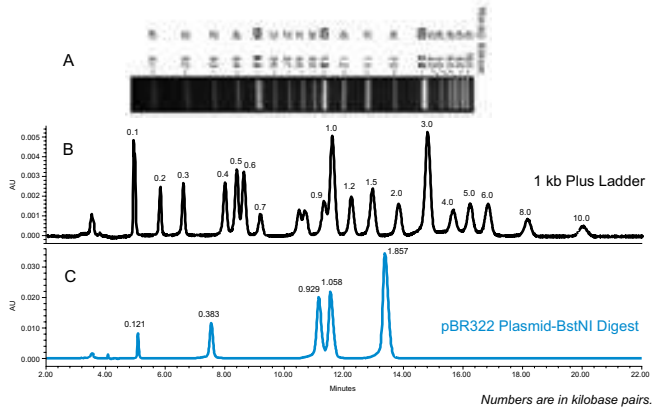
Protein-Pak Hi Res Q Anion Exchange Columns

Waters Protein-Pak Hi Res Q columns although commercially developed for protein applications, more recently over the last few years have been used in nucleic acid applications for separations of empty/full capsids of adeno-associated viruses (AAVs), plasmid isoforms, mRNA and dsDNA fragment separation and size assessment of up to 10 kilobase pairs (kbp). The non-porous particle is functionalized with a quaternary ammonium ligand which is a strong anion exchanger that provides excellent separations for negatively charged species such as nucleic acids. The chromatogram below is a 1 kb plus DNA Ladder and a pBR322 Plasmid-BstNI Digest separated on the Protein-Pak Hi Res Q column and more details can be found in the application: "Separation and Size Assessment of dsDNA Fragments by Anion-Exchange Chromatography" Waters Application Note 720007321.

Separation and Size Assessment of dsDNA Fragments by Anion Exchange Chromatography

LC Conditions

System:	ACQUITY UPLC H-Class Bio System
Column:	Protein-Pak Hi Res Q, 5 µm, 4.6 × 100 mm (p/n: 186004931)
Column temp.:	30 °C
Sample temp.:	10 °C
Injection volume:	0.3 µm
Flow rate:	0.4 mL/min
Vials:	Polypropylene 12 × 32 mm Screw Neck Vial, with Cap an Pre-slit PTFE/ Silicone Septum, 300 µL Volume, 100/pk (p/n: 186002639)
Mobile phase A:	100 mM Tris-HCl
Mobile phase B:	100 mM Tris Base
Mobile phase C:	13 M Tetramethylammonium chloride (TMAC)
Mobile phase D:	Water
Buffer conc. to deliver:	20 mM
UV detection:	AQUITY UPLC TUV Detector with 5 mm titanium flow cell, wavelength: 260 nm



Numbers are in kilobase pairs.

Time (min)	%A	%B	%C	%D
0	17.8	2.2	0.0	80.0
1	17.8	2.2	0.0	80.0
2	17.8	2.2	54	26
4	17.8	2.2	54	26
24	17.8	2.2	59.3	20.7
26	17.8	2.2	80.0	0.0
26.1	17.8	2.2	0.0	80.0
42	17.8	2.2	0.0	80.0

Ordering Information

Protein-Pak Hi Res Q, 5 µm Column

Description	Dimension	P/N
Protein-Pak Hi Res Q, 5 µm	4.6 × 100 mm	186004931

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.

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

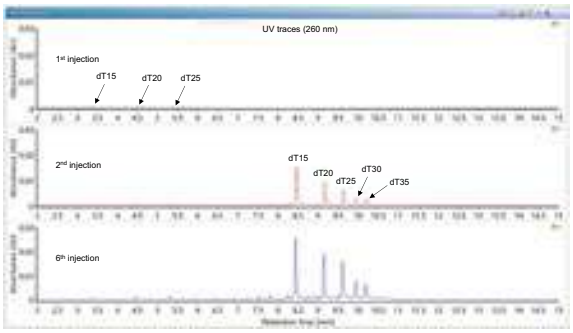
HYDROPHILIC INTERACTION CHROMATOGRAPHY (HILIC) OF NUCLEIC ACIDS

ACQUITY Premier BEH Amide Columns

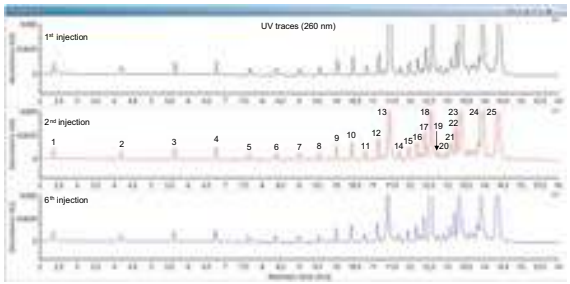
HILIC separation of oligonucleotides offers three main advantages in terms of mobile phase considerations when compared with the traditional ion-pair reversed phase (IP-RP) separations: at least 10x reduction in mobile phase cost, significantly reduced toxicity and at least 10x improvement in mobile phase stability (up to two weeks) for LC-MS operation. The ACQUITY Premier BEH Amide Column with MaxPeak High Performance Surfaces resulted in no column conditioning as compared with the traditional ACQUITY BEH Amide Column in stainless-steel hardware, saving time in column passivation right out of the box as shown below in the chromatograms. For more details, refer to application: "HILIC as an Alternative Separation Mode for Intact Mass Confirmation of Oligonucleotides on the BioAccord System" Waters Application Note 720007395.

HILIC as an Alternative Separation Mode for Intact Mass Confirmation of Oligonucleotides on the BioAccord System

2A



2B



LC Conditions

System:	BioAccord System incorporating the ACQUITY UPLC I-Class PLUS System, TUV Detector, and the ACQUITY RDa Detector
Column:	ACQUITY Premier BEH Amide 1.7 µm, 130 Å, 2.1 × 50 mm, (p/n: 186009504)
Column temp.:	60 °C
Sample temp.:	6 °C
Injection volume:	1 µL
Flow rate:	300 µL/min
Vials:	QuanRecovery MaxPeak Vials (p/n: 186009186)
Mobile phase A:	10 mM Ammonium acetate, 75% acetonitrile in DI water
Mobile phase B:	10 mM Ammonium acetate, 25% acetonitrile in DI water

Time (min)	Flow rate (mL/min)	Solvent A composition (%)	Solvent B composition (%)	Curve profile
0.00	0.3	100	0	Initial
1.00	0.3	100	0	
16.00	0.3	50	50	6
20.00	0.3	50	50	6
21.00	0.3	10	90	6
22.00	0.3	10	90	6
23.00	0.3	100	0	6
30.00	0.3	100	0	6

TUV chromatograms showing the first consecutive injections of the OST mixture performed on 2.1 × 50 mm columns: (A) conventional stainless-steel ACQUITY UPLC BEH Amide Column (p/n: 186000480[9]); (B) ACQUITY Premier BEH Amide Column (p/n: 186009504). The conventional column required extensive conditioning before a stable UV signal could be produced, while the ACQUITY Premier Column does not require any conditioning. Reproducible chromatographic separations can be obtained even for low-level impurities on the ACQUITY Premier Column without any need for column conditioning/passivation. The oligonucleotides separated in Figure 2B correspond to the following failure sequences of deoxythiamidates: Peak 1-dT3, 2-dT4, 3-dT5, 4-dT6, 5-dT7, 6-dT8, 7-dT9, 8-dT10, 9-dT11, 10-dT12, 11-dT13, 12-dT14, 13-dT15 (major component), 14-dT16, 15-dT17, 16-dT18, 17-dT19, 18-dT20 (major component), peaks 19–22 correspond to dT21–24 according to their elution order, and peaks 23–25 belong to the major components dT25, dT30, and dT35.

Ordering Information

ACQUITY and XBridge Premier BEH Amide Columns for HILIC Separations of Nucleic Acids

ACQUITY Premier BEH Amide, 130 Å	**Particle Size: 1.7 µm**	
	Dimension	**P/N (1/pk)**
	2.1 × 50 mm	186009504
	2.1 × 100 mm	186009505
	2.1 × 150 mm	186009506
ACQUITY Premier BEH Amide, 130 Å, VanGuard FIT	**Particle Size: 1.7 µm**	
	2.1 × 50 mm	186009507
	2.1 × 100 mm	186009508
	2.1 × 150 mm	186009509
XBridge Premier BEH Amide, 130 Å	**Particle Size: 2.5 µm**	
	2.1 × 50 mm	186009928
	2.1 × 100 mm	186009929
	2.1 × 150 mm	186009930
	4.6 × 50 mm	186009935
	4.6 × 100 mm	186009936
	4.6 × 150 mm	186009937
XBridge Premier BEH Amide, 130 Å, VanGuard FIT	**Particle Size: 2.5 µm**	
	2.1 × 50 mm	186009931
	2.1 × 100 mm	186009932
	2.1 × 150 mm	186009933
	4.6 × 50 mm	186009938
	4.6 × 100 mm	186009939
	4.6 × 150 mm	186009940
VanGuard FIT Catridges	**Particle Size: 1.7 µm**	
	2.1 × 5 mm	186009510
	Particle Size: 2.5 µm	
	2.1 × 5 mm	186009927
	3.9× 5 mm	186009934

MassPREP OLIGONUCLEOTIDE STANDARD

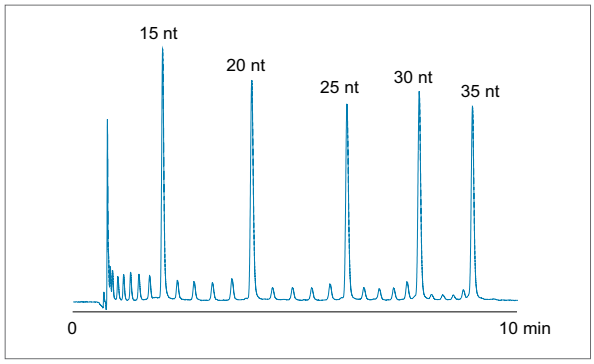


Benchmarking, Method Development, and Troubleshooting

- 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

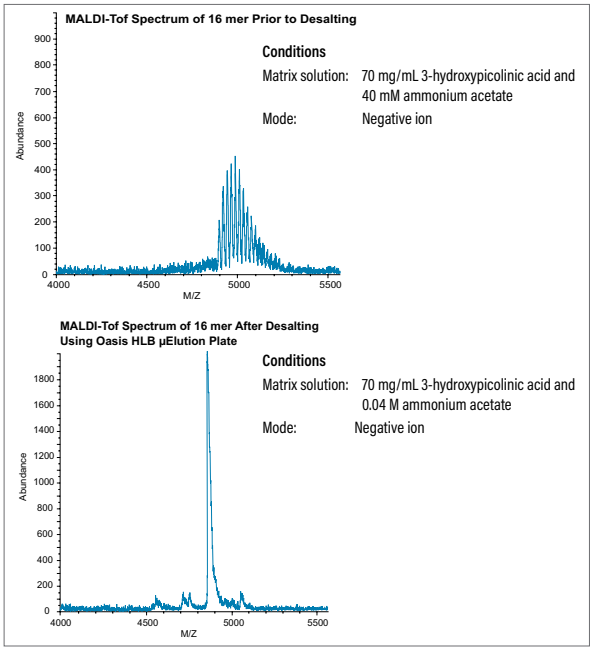


Oasis µElution Plates

- 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



Separating, quantifying, and identifying peptides in biotherapeutic characterization and proteomics applications is challenging.

To address these challenges, reversed-phase chromatography using ion-pairing reagents such as TFA and formic acid can deliver highly resolved separations of complex peptide mixtures, (e.g., tryptic protein digests or lengthy synthetic peptide sequences) whose sequences may differ by a single amino acid. In general, the hydrophobicity of the peptide determines the elution order, with the least hydrophobic peptides eluting first.

Factors such as particle composition (silica vs hybrids), pore size (130 Å vs 300 Å), ligand density, as well as separation conditions (e.g., gradient duration, separation temperature, flow rate) all play an important role in obtaining a separation that meets application requirements.

As with other bioseparations, when using smaller particle sizes, UPLC/UHPLC column offerings provide superior component resolution and in less time compared to HPLC-based columns for this demanding application.

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



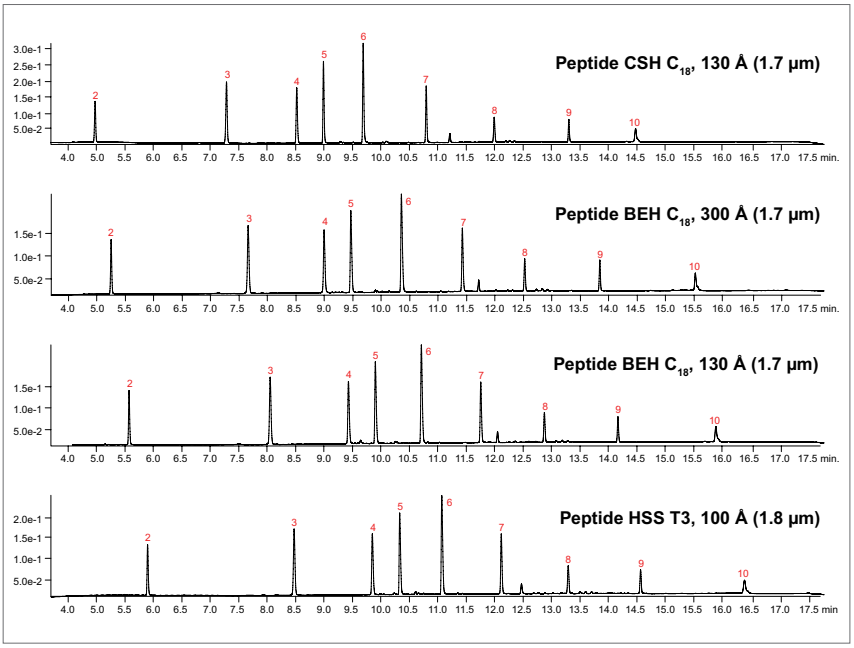
HSS (High Strength Silica)

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

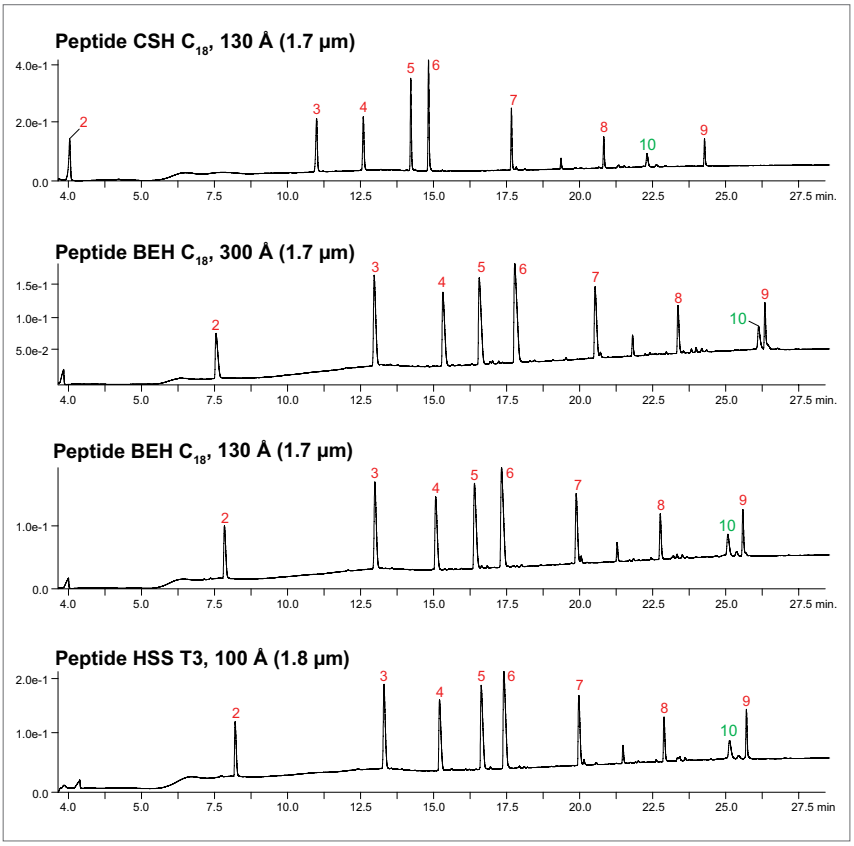
Separation of Peptide Standards Using 0.1% TFA Ion Pairing on Waters Peptide Separation Columns



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



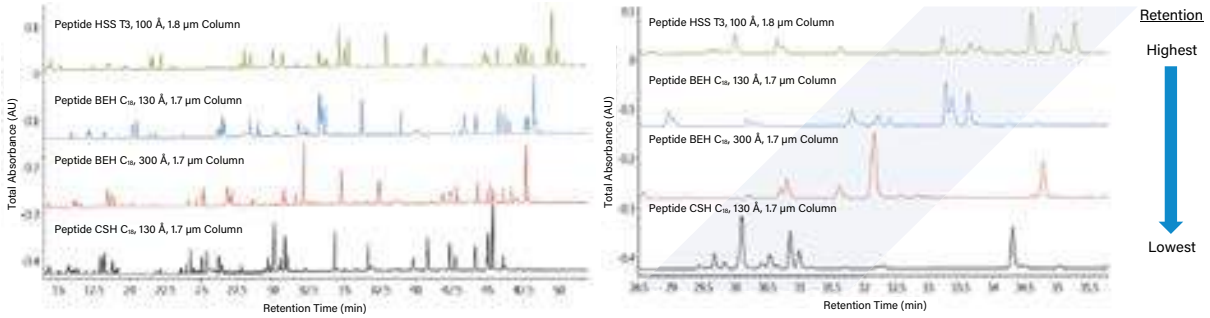
Peptides contained in Waters MassPREP Peptide Standard Mixture, p/n: 186002337, were separated on 2.1 × 150 mm columns containing Waters Peptide CSH C_{18}, 130 Å (1.7 µm), Peptide BEH C_{18}, 300 Å (1.7 µm), Peptide BEH C_{18}, 130 Å (1.7 µm), or Peptide HSS T3, 100 Å (1.8 µm) UPLC-based particles on 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 NIST 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 × 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.

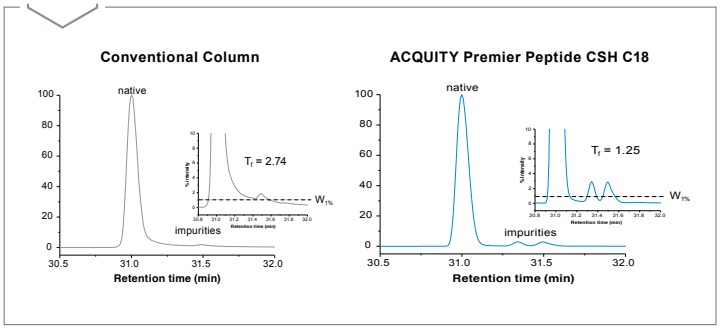
MAXPEAK PREMIER PEPTIDE COLUMNS

In addition, Waters offers versions of each of the three peptide chemistries as MaxPeak Premier columns. Waters MaxPeak Premier Columns represent the latest innovative technologies and provide the highest level of chromatographic performance, flexibility, and assurance to enhance the capabilities of scientific laboratories around the world. Available in 1.7 µm (ACQUITY Premier Columns) and 2.5 µm (XBridge Premier Columns, XSelect Premier Columns) particle sizes.

Utilizing MaxPeak High Performance Surfaces (HPS) technology in the column hardware design, MaxPeak Premier Columns provide significant improvements in reproducibility, peak shape, and recovery by minimizing analyte/surface interactions.

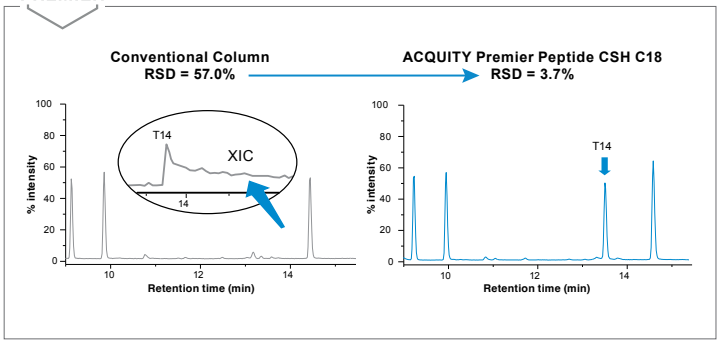
MaxPeak Premier columns also reduce the need for time-consuming passivation procedures or complex additive use that is typically required to achieve optimal performance with traditional stainless-steel columns.

MAXPEAK PREMIER **Reduced Tailing**



54% reduction in tailing.

MAXPEAK PREMIER **Increased Sensitivity and Repeatability**



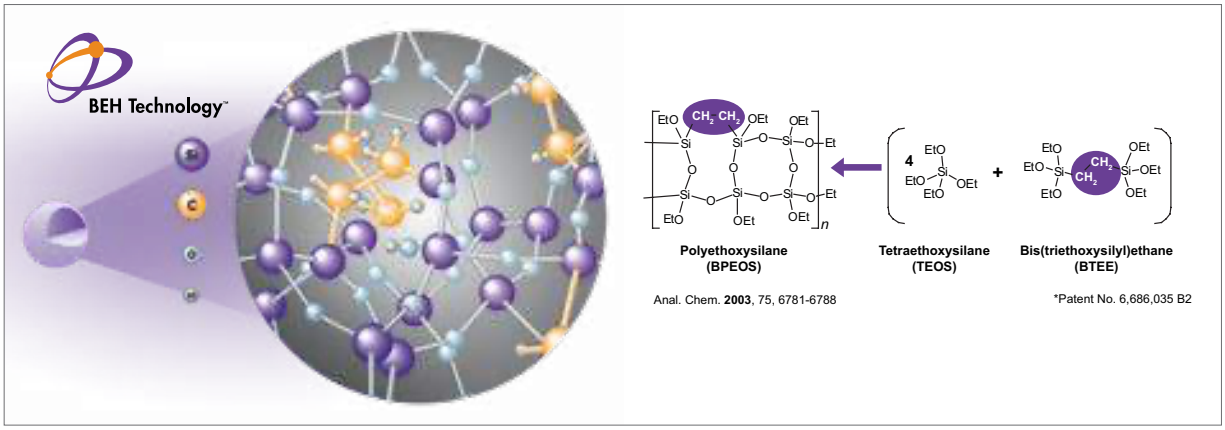
35-fold increase in sensitivity.

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

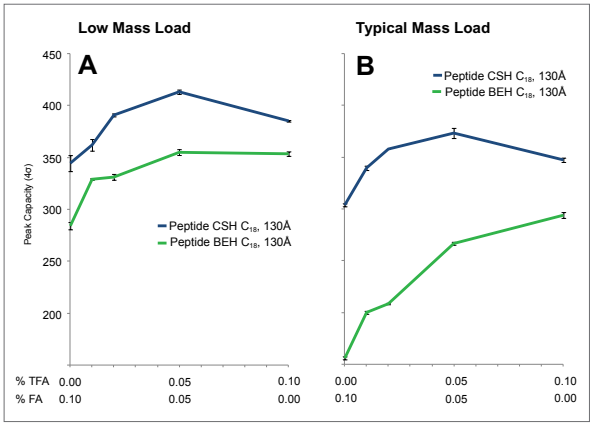
Charged Surface Hybrid Particles Deliver Superior Peptide Separations in LC and LC-MS Applications

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.

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.

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



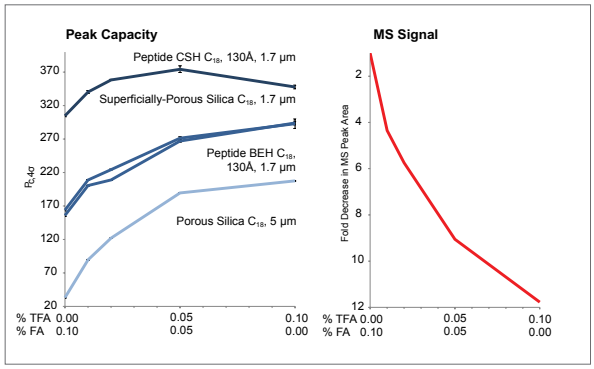
Effect of column mass load on separated peptide peak capacity in formic acid, trifluoroacetic acid, and eluent blends of formic acid and trifluoroacetic acid. (A) approximate sample load of 0.06 µg peptide mixture. (B) approx. 0.6 µg peptide mixture. Values were derived from two replicates. Waters MassPREP Peptide Standard Mixture (p/n: 186002337) was used in the study.

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.

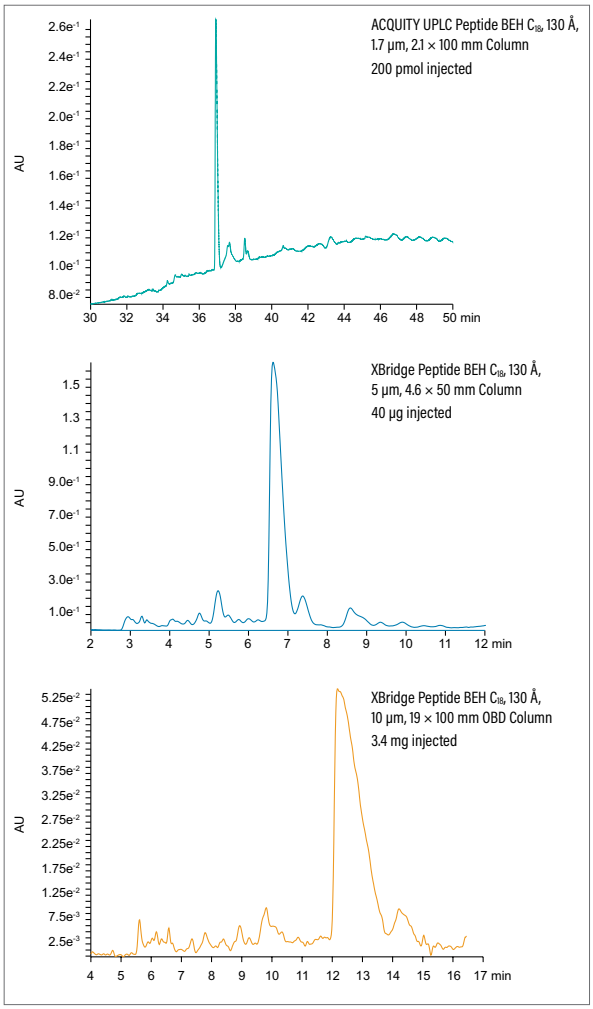
Certificate of analysis information includes a labeled chromatogram of the gradient separation of a tryptic digest of bovine cytochrome *c* (p/n: 186006371) using eluents that contain 0.1% formic acid. You can purchase the same protein digest test mixture to ensure the proper performance of your Peptide CSH C_{18}, 130 Å Column.



Peptide Packing Material in OBD Columns for Maximum Chemical and Physical Stability

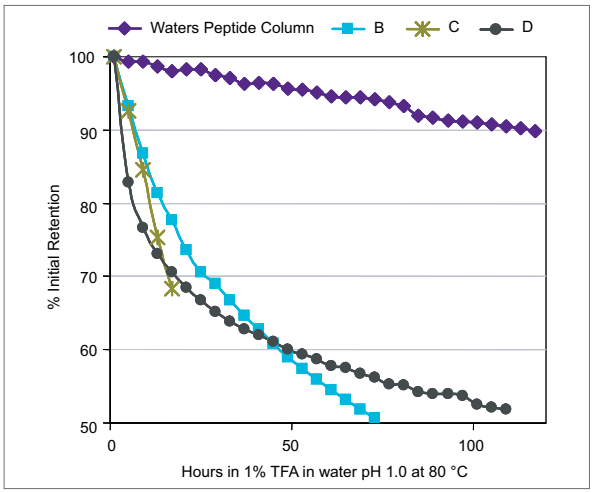
When columns fail, they do so both physically and chemically. For columns used with low-pH mobile phases, the usual cause of abbreviated column life is hydrolysis of the bonded phase, which manifests itself as significant changes in peptide retention. Our BEH Technology Columns incorporate proprietary 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 waters.com/OBD for details about OBD Technology.

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

Ordering Information

ACQUITY Premier Peptide Columns

BEH C_{18}, 130 Å	Particle Size: 1.7 µm	
	Dimension	P/N
	2.1 × 50 mm	186009481
	2.1 × 100 mm	186009482
	2.1 × 150 mm	186009483

CSH C_{18}, 300 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009487
	2.1 × 100 mm	186009488
	2.1 × 150 mm	186009489

HSS T3, 100 Å	Particle Size: 1.8 µm	
	2.1 × 50 mm	186009490
	2.1 × 100 mm	186009491
	2.1 × 150 mm	186009492

BEH C_{18}, 300 Å	Particle Size: 1.7 µm	
	2.1 × 50 mm	186009493
	2.1 × 100 mm	186009494
	2.1 × 150 mm	186009495

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 Premier Peptide Columns

BEH C_{18}, 130 Å	Particle Size: 2.5 µm	
	Dimension	P/N
	2.1 × 50 mm	186009733
	2.1 × 100 mm	186009734
	2.1 × 150 mm	186009735
	4.6 × 50 mm	186009898
	4.6 × 100 mm	186009899
	4.6 × 150 mm	186009900

BEH C_{18}, 300 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009892
	2.1 × 100 mm	186009893
	2.1 × 150 mm	186009894
	4.6 × 50 mm	186009895
	4.6 × 100 mm	186009896
	4.6 × 150 mm	186009897

XSelect Premier Peptide Columns

CSH C_{18}, 130 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009904
	2.1 × 100 mm	186009905
	2.1 × 150 mm	186009906
	4.6 × 50 mm	186009907
	4.6 × 100 mm	186009908
	4.6 × 150 mm	186009909

HSS T3,100 Å	Particle Size: 2.5 µm	
	2.1 × 50 mm	186009839
	2.1 × 100 mm	186009840
	2.1 × 150 mm	186009841
	4.6 × 50 mm	186009910
	4.6 × 100 mm	186009911
	4.6 × 150 mm	186009912

XBridge Peptide BEH C_{18} Method Validation Kits*

	Particle Size: 2.5 µm		Particle Size: 3.5 µm		Particle Size: 5 µm	
BEH C_{18}, 130 Å	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.

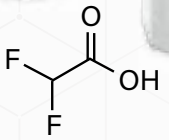
XBridge Peptide BEH C_{18} VanGuard Cartridges, 3/pk

	Particle Size: 2.5 µm	
BEH C_{18}, 130 Å	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

[IONHANCE DIFLUOROACETIC ACID]

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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.

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.

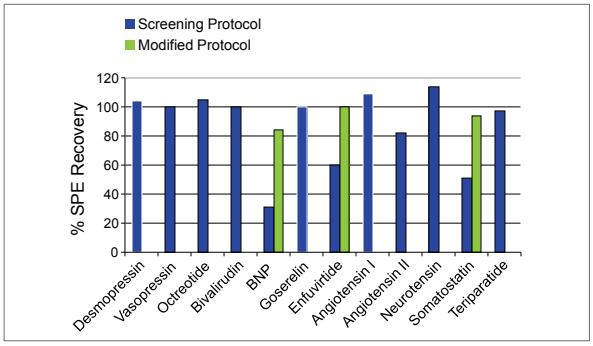
Although big progress has been made in sample pretreatment over the last years, there are still considerable limitations when it comes to overcoming complexity and dynamic range problems associated with peptide analyses from biological matrices. We focus on techniques which can be employed prior to liquid 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 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.

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.

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

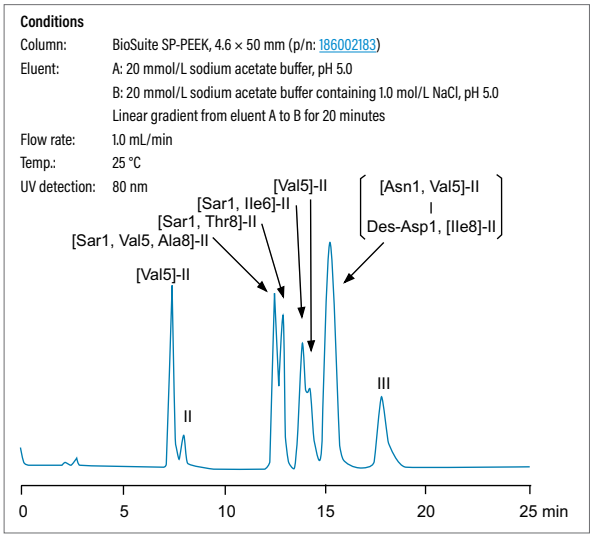
Additional Products (Not Included in Kits)		
Oasis MAX 96-Well µElution Plate	1	186001829
Oasis WCX 96-Well µElution Plate	1	186002499
96-Well 1 mL Collection Plate	50	186002481
Cap Mats for 1 mL Collection Plate	50	186002483
Disposable Reservoir Tray	25	WAT058942
Extraction Manifold for 96-Well Plates	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 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

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 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.

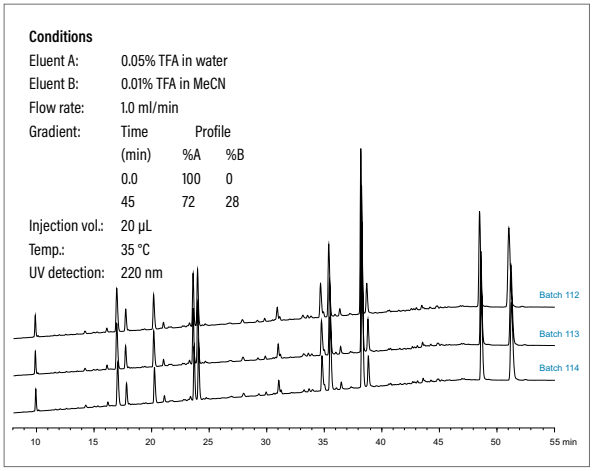
- Outstanding performance when separating complex digests containing hydrophilic, hydrophobic, and basic peptides
- Superior peak shape and capacity for peptide separations using TFA containing eluents (e.g., 0.1% TFA)
- Good choice for the separation of larger peptide fragments generated by some endoproteases (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

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

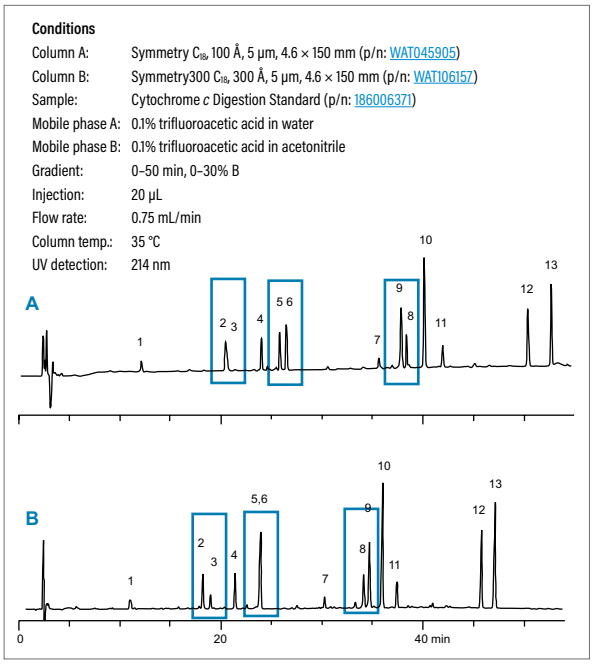
Symmetry300 HPLC and UHPLC Columns

	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



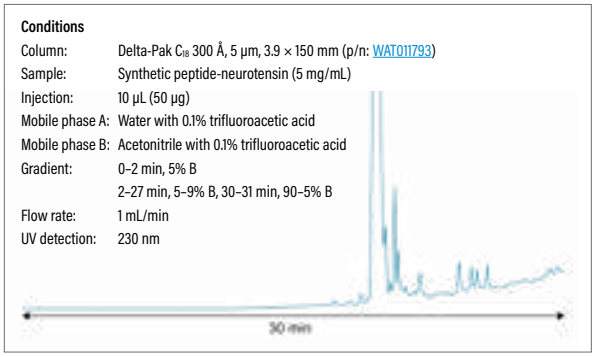
Waters' Symmetry-based C_{18} Column consists of a 100% porous silica particle containing a C_{18} ligand and endcapping to minimize undesired secondary interactions between the peptide analytes and column chemistry. As indicated by the gradient separation of a cytochrome c tryptic digest, different 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.

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.

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

PEPTIDE STANDARDS AND REAGENTS

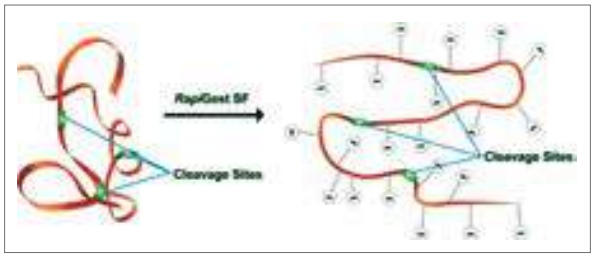
*Rapi*Gest SF Protein Digestion Surfactant



*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.

- Compatible with liquid chromatography (LC) and MS analysis
- Enables same-day digestions and analysis
- Minimal or no post-digestion sample preparation is required
- Improves efficiency and speed of digestion
- Simplifies digestion protocols and improves throughput of analysis
- Does not inhibit enzyme activity, unlike conventional denaturants
- Allows use of lesser amounts of expensive endoproteases because it is not disruptive of endoprotease activity

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

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

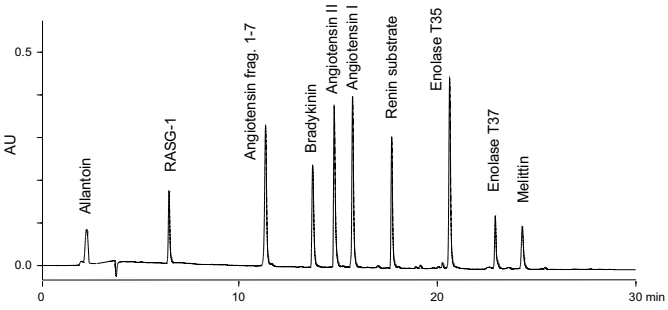
MassPREP PEPTIDE STANDARD



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

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

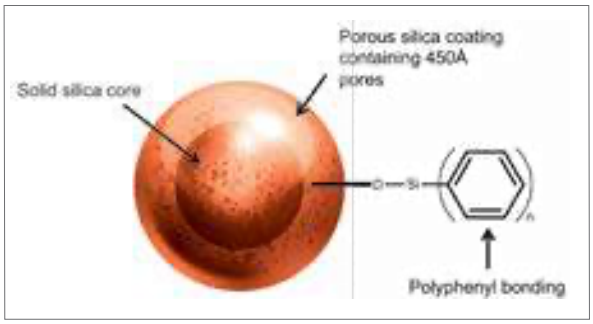
Description	Volume	P/N
MassPREP Phosphopeptide Standard Enolase	Solid	186003285
Four yeast enolase derived phosphorylated peptides: T18 1P, T19 1P, T43 1P, T43 2P. Used to optimize phosphopeptide detection in LC-MS, LC/UV, and MALDI-MS.		
MassPREP Enolase Digest with Phosphopeptides Mix	Solid	186003286
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

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, monomer, and fragment analysis
- Ion-exchange for charge variant analysis

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.

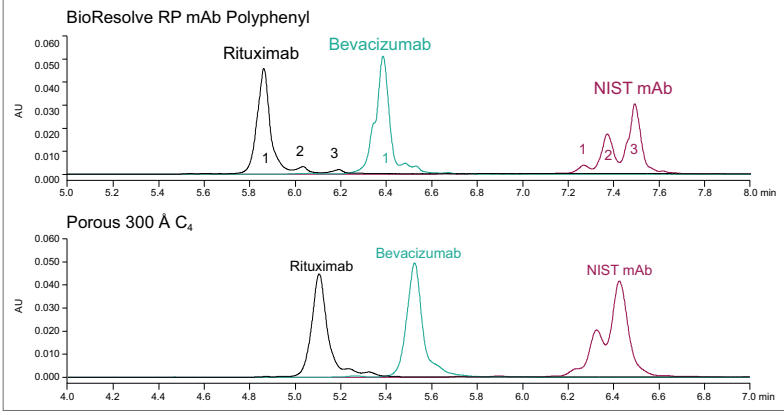
INTACT PROTEIN AND mAb SUBUNIT ANALYSIS

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

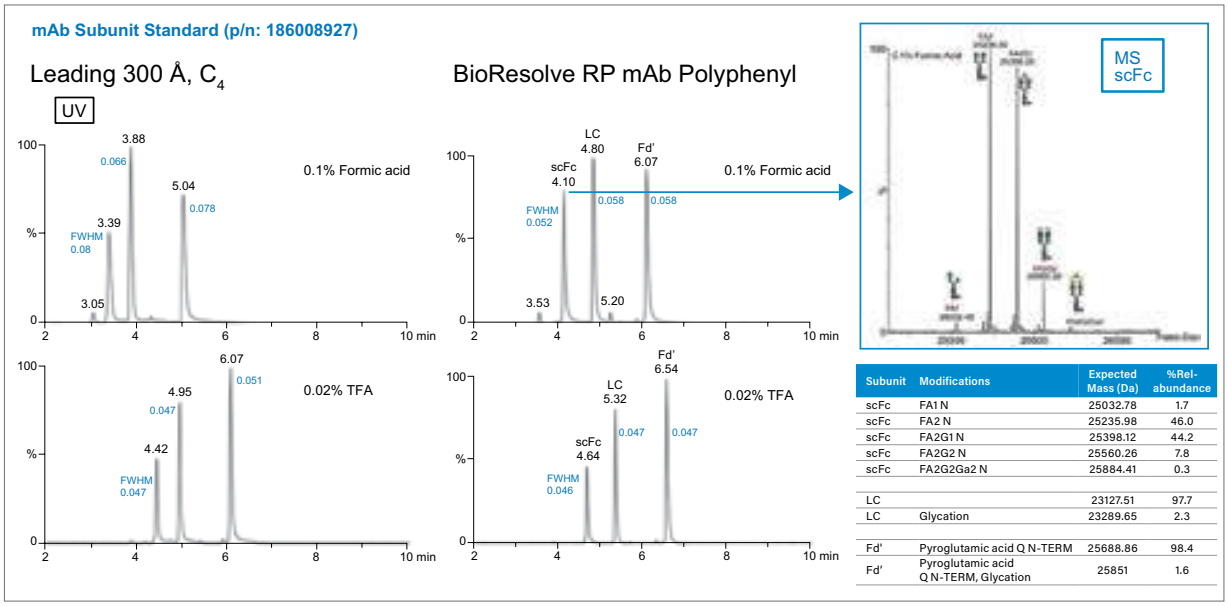


mAb	Peak	Mass (Da)	
Rituximab	1	147,243	Rituximab
	2	147,246	*
	3	147,244	*
Bevacizumab	1	149,202	Bevacizumab
	2	149,191	Sequence variance
	3		*
NIST mAb	1	148,234 (low intensity)	Oxidation
	2	148,220	Oxidation
	3	148,204	NIST mAb
	4	148,205 (low intensity)	*

*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.

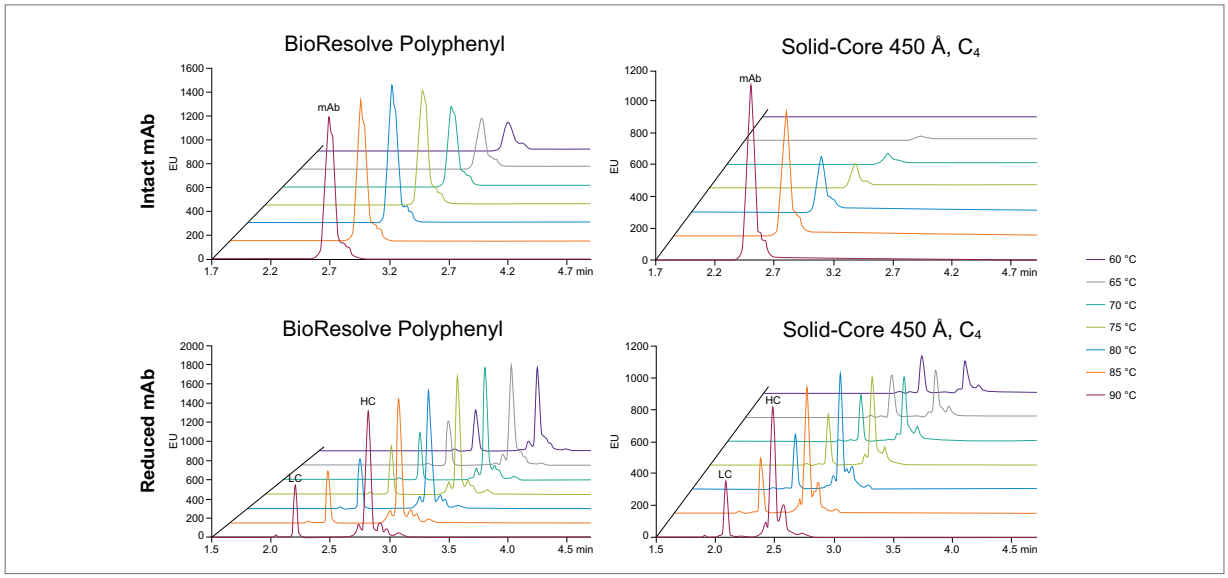
High-Quality MS Data without Adverse Peak Tailing



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.

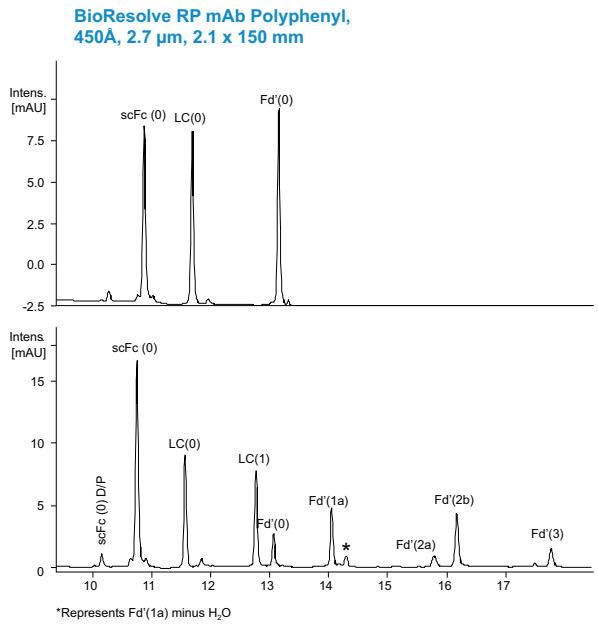
Native mAb (top) vs. Reduced Panitumumab (bottom) Recoveries at Different Gradient Separation Temperatures



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



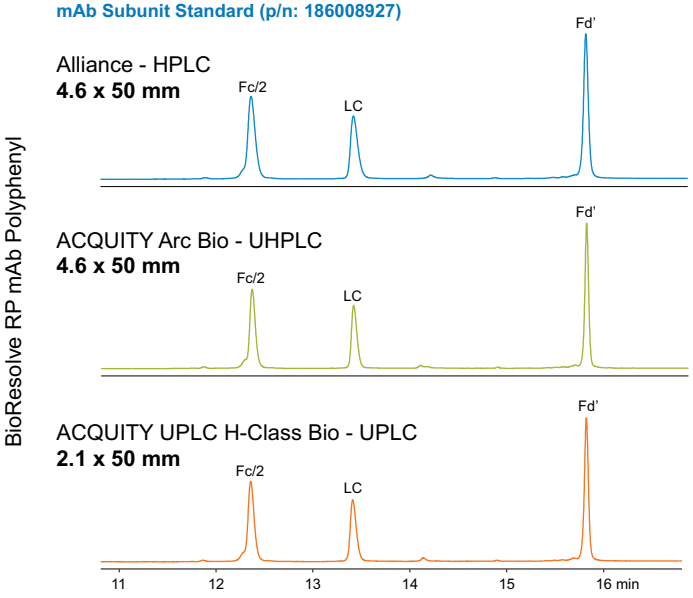
Relative Peak Area of Subunits for mAb and ADC

Isoforms	mAb Relative % Peak Area	mAb Total % Subunit	ADC Relative % Peak Area	ADC % Subunit
Fd' (0)	35.9	35.9	5.8	37.4
Fd' (3)	n/a		4.1	
Fd' (2b)	n/a		11.4	
Fd' (2a)	n/a		3.5	
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

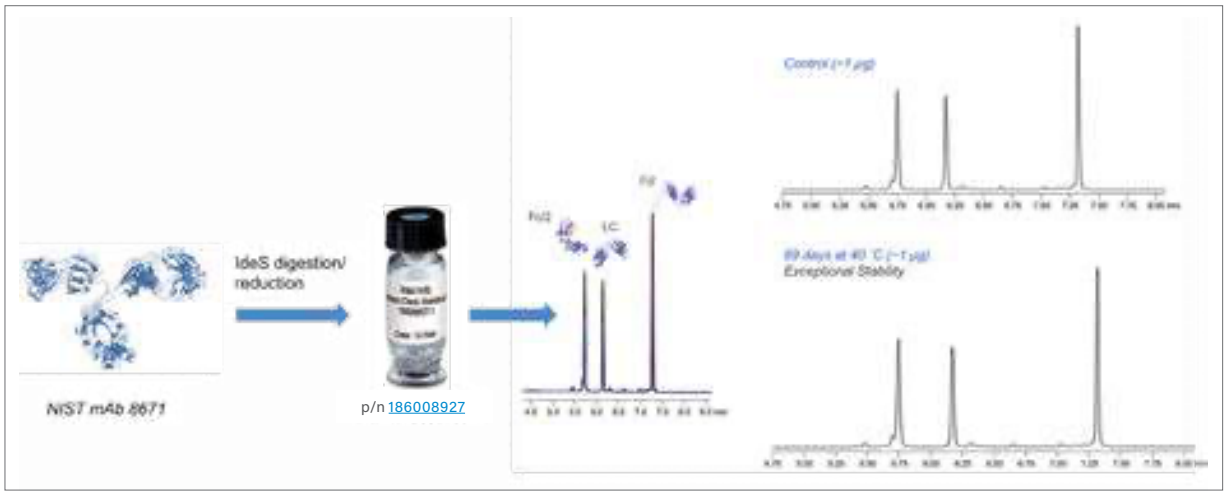
It is possible to use a column containing the exact same material while developing a method during discovery, working through product development, and implementing QC manufacturing controls. This capability can be attributed to the solid-core particle design and innovative polyphenyl ligand bonding of 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





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."

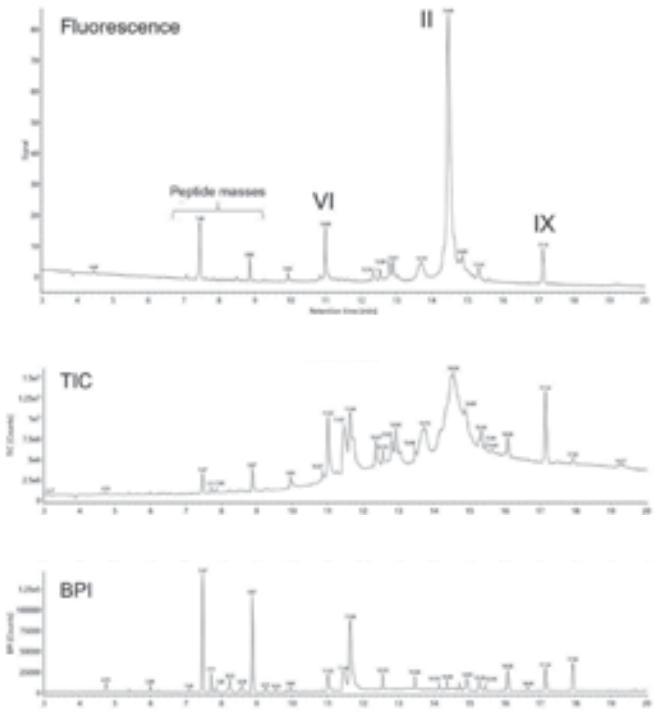
REVIEWER: Sonia Ciudad Fernández

ORGANIZATION: IECB

Analysis of Adenoviral Vector Proteins using BioResolve RP mAb Polyphenyl

Adenovirus (AdV) is being used as a viral vector for vaccines and gene therapies alike. It is comprised of a relatively complex proteome. The use of IonHance Difluoroacetic Acid (DFA) ion pairing and the BioResolve RP mAb Polyphenyl column quickly separates the AdV proteins while obtaining high sensitivity mass spectra. This is a reversed phase method that facilitates investigating protein copy ratios and measurement of intact protein masses. As such, it should present an excellent starting point for the characterization of current and future AdV based vaccines and gene therapies (refer to Waters Application Note 720007403).

Analysis of Adenoviral Vector Proteins by RPLC, Native Fluorescence, and Online MS



LC Conditions

System:	ACQUITY UPLC H-Class PLUS Bio System
Detector:	ACQUITY UPLC FLR
Ex wavelength:	280 nm
Em wavelength:	360 nm
Scan rate:	20 Hz
Column:	BioResolve RP mAb Polyphenyl 450 Å, 2.7 µm, 2.1 × 150 mm (p/n: 186008946)
Column temp.:	80 °C
Sample temp.:	8 °C
Injection:	10 µL of 10 × 10^{12} pfu/mL
Flow rate:	0.4 mL/min
Mobile phase A:	0.1% DFA (v/v) (IonHance DFA, p/n: 186009201) in 18.2 MΩ water
Mobile phase B:	0.1% DFA (v/v) in LC-MS grade acetonitrile

Time (min)	mL/min	A	B	Curve
Initial	0.4	90	10	*
20.00	0.4	50	50	6
20.50	0.4	10	90	6
21.00	0.4	90	10	6
30.00	0.4	90	10	6
Run time = 30 minutes, MS Divert for first 2 minutes				

LC-MS chromatograms of adenoviral vector proteins from HuAdV5 GFP as obtained with 2.1 × 150 mm BioResolve RP mAb Polyphenyl 450 Å 2.7 µm Column and difluoroacetic acid (DFA) modified water/acetonitrile mobile phases. Separations were performed with an ACQUITY UPLC H-Class PLUS Bio System, 10 µL injections of 10 × 1012 pfu/mL sample, a flow rate of 0.4 mL/min, and a column temperature of 80 °C. Fluorescence detection was performed along with intact mass analysis by Tof mass spectrometry.

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

MaxPeak Premier and Protein BEH C_4, 300 Å Columns



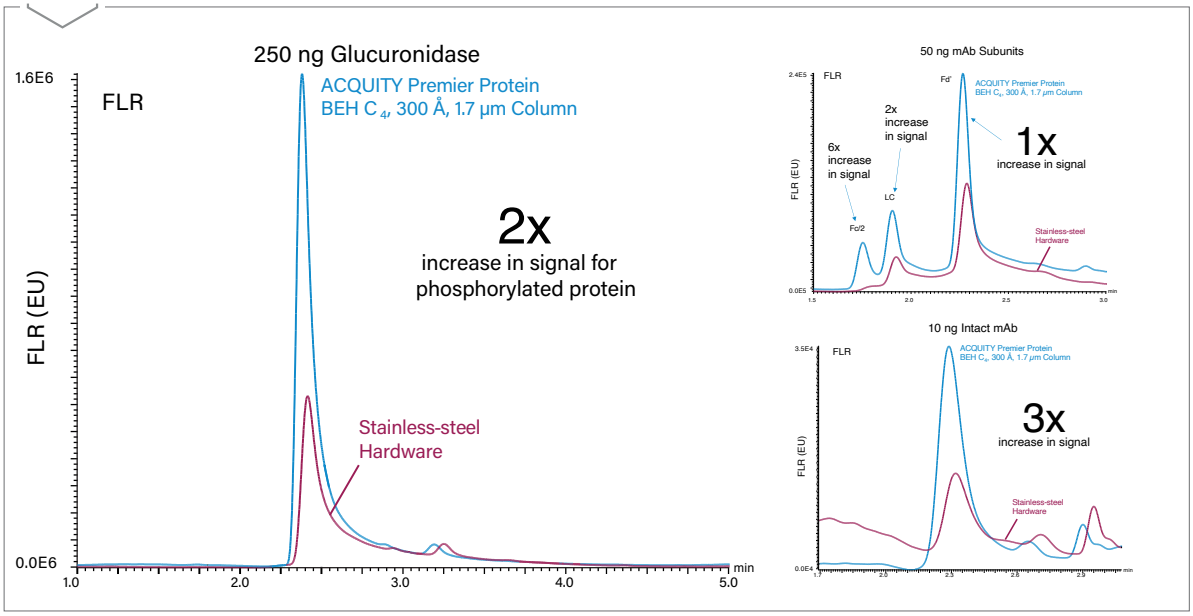
The analysis and characterization of protein samples requires the detection of small chemical differences between large molecules. Most often these analyses have employed an array of analytical techniques, each sensitive to a different property of the protein. Reversed-phase HPLC has not been fully exploited 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.

The latest innovation to Waters reversed-phase protein columns is our MaxPeak Premier Class of Columns, which deliver the chromatographic performance expected from our particle technologies while increasing reproducibility, peak shape, and recovery for metal-sensitive analytes. The ACQUITY and XBridge Premier Protein BEH C_4 300 A columns contain the same stationary phase as the traditional stainless steel version but utilize MaxPeak High Performace Surface technology hardware which has shown to help minimize ionic interactions of phosphorylated proteins and increase sensitivity for low-level intact and subunit analysis of mAbs.

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)

MAXPEAK™ PREMIER **Increased Sensitivity and Recovery**



MaxPeak™ Premier Columns utilize MaxPeak High Performance Surfaces that are designed to increase analyte recovery, sensitivity, and reproducibility by minimizing analyte/surface interactions that can lead to sample losses.

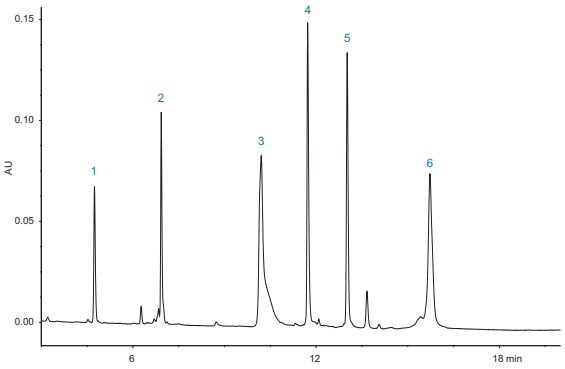
C_4, 300 Å Columns Developed for Protein Chromatography

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.

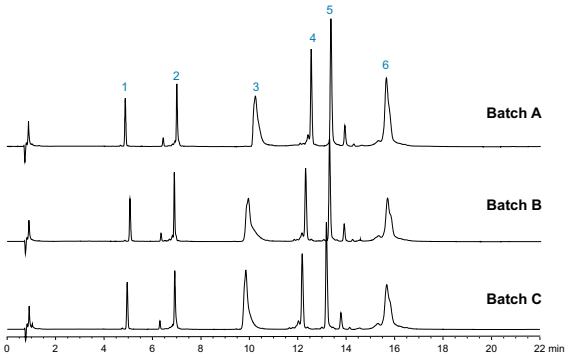
Batch-to-Batch Reproducibility

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

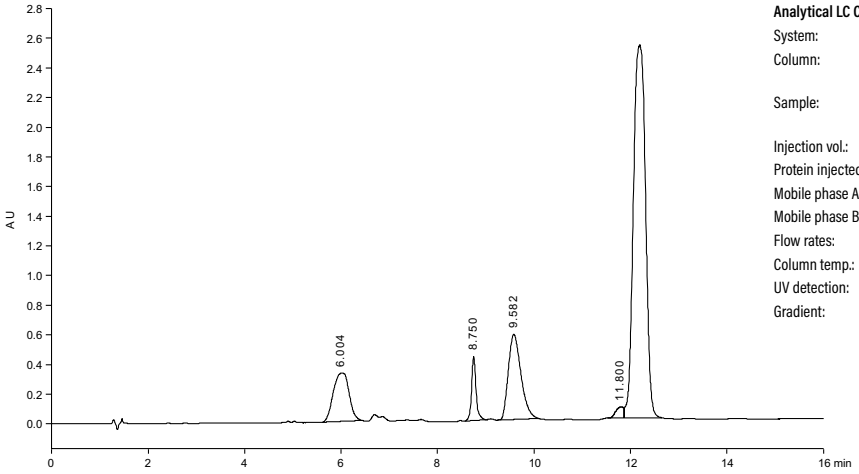
Compounds

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

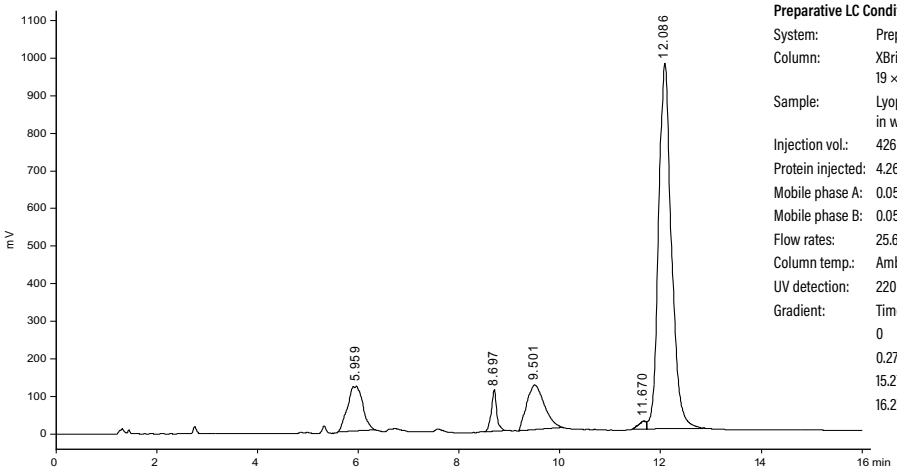
System:	Alliance
Column:	XBridge Protein BEH C_4, 300 Å, 3.5 µm, 4.6 × 150 mm (p/n: 186004504)
Sample:	Lyophilized chicken egg white, 10 mg/mL in 0.05% TFA in water
Injection vol.:	25 µL
Protein injected:	0.25 mg
Mobile phase A:	0.05% TFA in water
Mobile phase B:	0.05% TFA in acetonitrile
Flow rates:	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

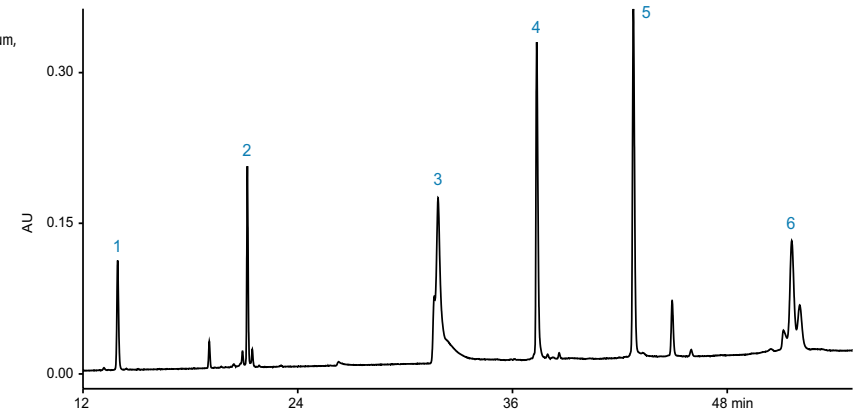
MassPREP Protein Standard Mix on an ACQUITY UPLC Protein BEH C_4, 1.7 µm, 2.1 × 150 mm Column

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

ACQUITY Premier Protein BEH C_4, 300 Å

Particle Size: 1.7 µm		
Dimension	P/N	w/Standard
2.1 × 50 mm	186010326	176005107
2.1 × 100 mm	186010327	176005108
2.1 × 150 mm	186010328	176005109

ACQUITY Protein BEH C_4, 300 Å

Particle Size: 1.7 µm		
Dimension	P/N	w/Standard
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	–

ACQUITY Protein BEH C_4, 300 Å VanGuard Pre-Column, 3/pk

Particle Size: 1.7 µm	
Dimension	P/N
2.1 × 5 mm	186004623

ACQUITY Protein BEH C_4, 300 Å Method Validation Kit*

Particle Size: 1.7 µm	
Dimension	P/N
2.1 × 100 mm	186004899
2.1 × 150 mm	186006549

XBridge Protein BEH HPLC and UHPLC Columns and Method Validation Kits

XBridge Premier Protein BEH C_4, 300 Å

Particle Size: 2.5 µm		
Dimension	P/N	w/Standard
2.1 × 50 mm	186010329	176005110
2.1 × 100 mm	186010330	176005111
2.1 × 150 mm	186010331	176005112
4.6 × 50 mm	186010332	176005113
4.6 × 100 mm	186010333	176005114
4.6 × 150 mm	186010334	176005115

XBridge Protein BEH C_4, 300 Å VanGuard Pre-column, 3/pk*

Particle Size: 2.5 µm	
Dimension	P/N
2.1 × 5 mm	186009131
3.9 × 5 mm	186009140

XBridge Protein BEH C_4, 300 Å Method Validation Kit*

Particle Size: 2.5 µm	
Dimension	P/N
2.1 × 5 mm	186009131
3 × 150 mm	186009135
4.6 × 150 mm	186009139

XBridge 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		

*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



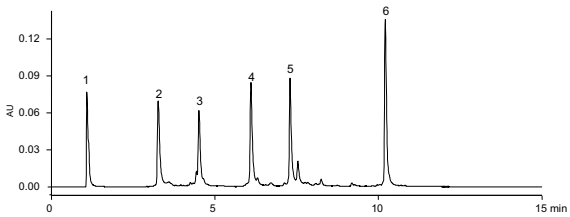
Protein-Pak Hi Res HIC Column and HIC Protein Standard

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

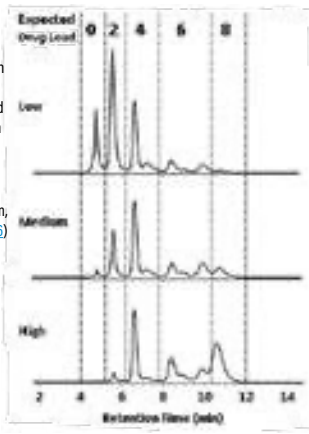


Using a gradient of decreasing salt concentration and on-denaturing eluents, Waters Protein-Pak Hi Res HIC Column is well suited for the separation of proteins of various molecular weights and hydrophobic interactions.

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

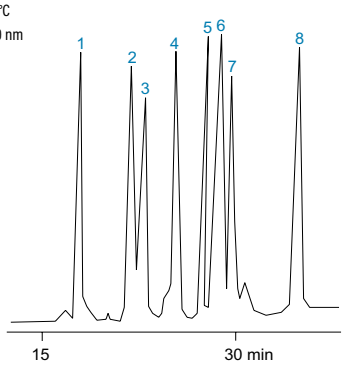
The separation of proteins and peptides based upon hydrophobic characteristics is a powerful chromatographic technique. However, some proteins denature at elevated organic solvent concentrations making reversed-phase chromatography (RPC) difficult. BioSuite Phenyl Hydrophobic-interaction Chromatography (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

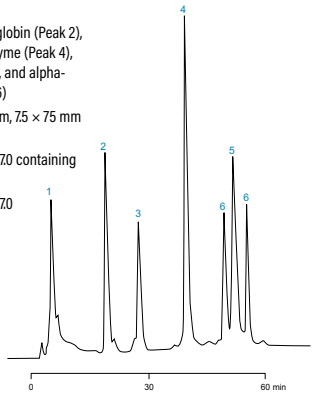


The BioSuite pPhenyl, 1000 Å RPC Columns have a higher ligand density compared to the BioSuite Phenyl, 1000 Å HIC Columns and are not recommended for hydrophobic-interaction separations.

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

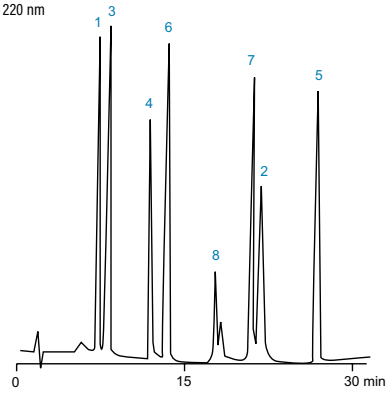


The BioSuite Phenyl, 1000 Å HIC Columns have a lower ligand density compared to the BioSuite pPhenyl, 1000 Å RPC Columns and are not recommended for reversed-phase separations.

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.

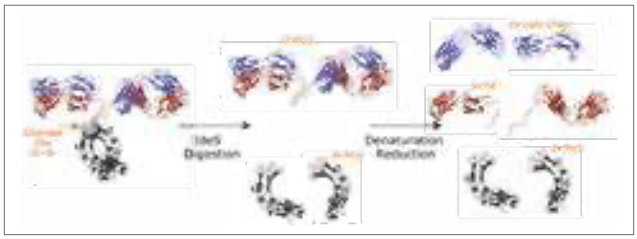
Ordering Information

Hydrophobic-Interaction HPLC and UHPLC Column

Description	Dimension	P/N
Shodex PH-814 Column, 8 µm	8 × 75 mm	WAT035520

ACQUITY UPLC Glycoprotein BEH Amide, 300 Å Columns

HILIC for Large Molecules

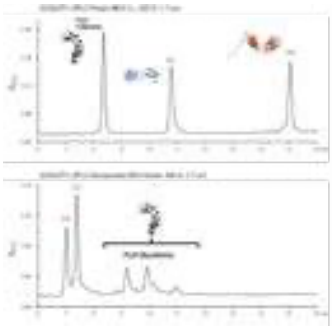


IdeS digestion and reduction scheme for preparing IgG LC, Fd', and Fc/2 subunits.

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

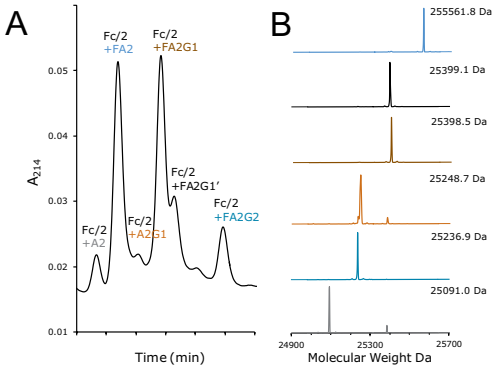
Gradient used for HILIC separations of IgG subunits:

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

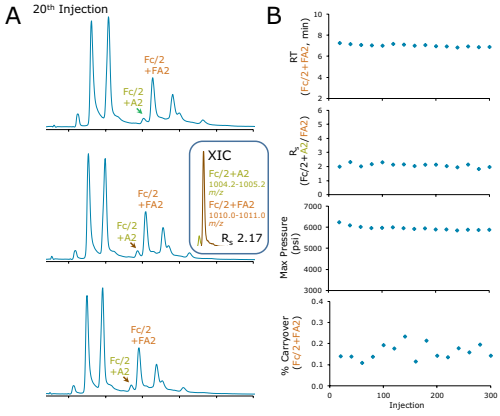
Species	MW_{Avg} Theoretical (Da)	MW_{Avg} Observed (Da)
Fd'	25383.6	25383.3
LC	23443.1	23443.1
Fc/2+A2	25090.2	25091.0
Fc/2+FA2	25236.3	25236.9
Fc/2+A2G1	25252.3	25248.7
Fc/2+FA2G1	25398.5	25398.5
Fc/2+FA2G1'	25398.5	25399.1
Fc/2+FA2G2	25560.6	25561.8

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.

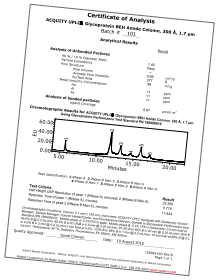


LC Conditions

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.

ACQUITY Premier Glycoprotein BEH Amide Columns

Utilizing the MaxPeak High Performance Surfaces (HPS) Technology, the ACQUITY Premier Glycoprotein BEH Amide columns reduce sample loss caused by non-specific adsorption onto metal surfaces, deliver the representative performance known of the BEH Amide chemistry from the first injection.

Ordering Information

ACQUITY UPLC Glycoprotein BEH Amide, 300 Å Columns and Standards

	Particle Size: 1.7 µm		
BEH Amide, 300 Å	**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
ACQUITY Premier Glycoprotein BEH Amide, 300 Å	2.1 × 50 mm	—	176009547
	2.1 × 100 mm	—	176009548
	2.1 × 150 mm	—	176009549
ACQUITY Premier Glycoprotein BEH Amide, 300 Å	2.1 × 50 mm	1/pk with standard	176004866
	2.1 × 100 mm	1/pk with standard	176004867
	2.1 × 150 mm	1/pk with standard	176004868
Glycoprotein Performance Test Standard			186008010

PROTEIN SEC COLUMNS

Size-Exclusion Chromatography



Size-exclusion chromatography (SEC), also known as gel filtration, separates proteins based on their sizes (hydrodynamic radii versus absolute molecular weight) in solution with larger sized species eluting before smaller proteins. The primary driving mechanism for this isocratic based technique is based on the pore size and volume of the SEC particles used in the packed column. As the molecular weight of the proteins of interest increases, SEC columns containing comparatively larger pore size particles are selected.

Why choose BEH-based SEC column technology?

- Less undesired secondary interactions with BEH-Diol and BEH-PEO SEC particles for increased confidence in results and data reproducibility
- Unlike silica-based particles, BEH based particles have enhanced > pH 8.0 stability for method flexibility
- Outstanding column lifetime that includes SEC columns containing 1.7 µm, 2.5 µm, or 3.5 µm particles
- Scalable chemistries for method transfer from drug discovery to manufactured product testing
- Pore size options include 125 Å, 200 Å, 250 Å, and 450 Å depending on application needs
- Comprehensive series BEH-based SEC Care and Use manuals assist users in developing reliable methods
- Synthesized batches are QC tested with relevant samples (e.g., mAb size Variant Std) to help ensure consistency
- Synergistic combination of MaxPeak™ Premier hardware with BEH-PEO particles for use on Platform Methods

BEH Technology for SEC-based Separations

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 productsin 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. Waters SEC columns containing diol-coated, BEH particles were developed to primarily minimize non-desired secondary ionic interaction between the biomolecules and separation media. In 2022, was introduced PEO-coated, BEH particles packed in Waters MaxPeak Premier technology to help address both non-desired secondary ionic and hydrophobic interactions.

SEC AGGREGATE ANALYSIS

Size-exclusion chromatography (SEC) is the analytical "gold standard" for the separation and accurate quantitation of aggregates contained in biotherapeutic peptides and proteins (e.g., mAbs).

The principle of SEC chromatography involves the ability of an appropriately selected column to separate molecules based on differences in the molecules' "size in solution" that loosely correlates to their molecular weight.

A partial list of customer-desired benefits using Waters BEH-based SEC columns include:

- Available guards and columns containing 125 Å, 200 Å, 250 Å, or 450 Å pores
- Purposely designed columns containing different particle sizes for UPLC, UHPLC, or HPLC-based applications
- Less ionic interactions using stable diol-coating for higher confidence in obtained data.
- Less non-desired ionic interactions using MaxPeak Premier HPS Guards and Columns
- State-of-the-art column packing technologies for outstanding column life and pH stability from 2–10 for enhanced method development flexibility for challenging samples
- Quality control tested with relevant proteins and peptides to help ensure consistent batch-to-batch and column-to-column performance

The following four factors provide guidance for selecting an appropriate SEC column that matches your application and laboratory needs.

1) Molecular weight vs pore size selection

Column pore size and sample molecular weight (MW) go in-hand when selecting an SEC column. The pore size of the column media, generally expressed in angstroms (Å), determines both how quickly a sample will travel through the column and how well the sample will be retained in relation to the sample's molecular weight. The inclusion of "in relation to your samples molecular weight" is an important distinction to make here. Without it, it might be assumed that smaller pore size equals better results, however, that is not the case. For example, if the pore size is too small, based on the sample's MW, larger molecules will not move as freely, reducing retention and column efficiency.

Therefore, the MW of the substance being tested would influence, if not determine, what column pore size to choose. A sample with a molecular weight between 1000–8000 Da would be best suited for a 125 Å column. This selection will provide better retention characteristics in separating small compounds compared to a similar column with a pore size of 200 or 450 Å. If the sample's molecular weight is between 10,000–450,000 Da, then a column pore size of 200 or 450 Å should be chosen. Any sample with a MW over 450,000 Da should be analyzed with a 450 Å column.

2) LC system dispersion

LC system dispersion can also significantly affect SEC column choice. In SEC, analytes elute within a single column volume during the isocratic separation. This makes it important to consider the total LC system volume, including the injector, tubing, and detector volumes of the obtained separation. In general, the lower the total LC system dispersion volume relative to the column volume, the narrower the peaks.

Examples of system dispersion specifications for column recommendations:

LC system dispersions <20 µL (UPLC) = 1.7 µm column

LC system dispersions >20 – <35 µL (UHPLC) = 2.5 µm column

LC system dispersions >35 µL (HPLC) = 2.5 or 3.5 µm column

3) Resolving multiple species that are less than two-fold different in molecular weight

The ability to adequately resolve compounds that differ by two-fold in molecular weight (e.g., 300 K, mAb IgG dimer from 150 K monomer) can be relatively easy to accomplish when using an appropriate SEC column. However, a far more challenging scenario involves the species separation that differs by less than 2x molecular weight (e.g., 150 K, mAb IgG monomer from 100 K "Clip"). In addition, the ability to obtain reliable quantitation is challenged when the minor components exist at <0.5% compared to the major peak of interest.

4) Speed of separation

The final factor to consider when selecting an appropriate SEC column is the desired speed for the separation. Generally, there is a trade-off between resolution and speed when implementing size-exclusion chromatography. However, a balance can be achieved by selecting the appropriate column. When an SEC column containing comparatively smaller particles (e.g., 1.7 µm) is used on an appropriate LC system, quicker results are obtained which differs from separations performed on larger particle-sized (2.5 or 3.5 µm) SEC columns. For example, an SEC 1.7 µm, 4.6 × 300 mm column can provide excellent resolution in under nine minutes. Meanwhile a separation on an SEC 2.5 µm, 7.8 × 300 mm column will generally take approximately 12 minutes; and, on an SEC 3.5 µm, 7.8 × 300 mm column it will take 18 minutes.

An appropriate SEC column selection, that is based on the separation needs and the LC system being used, can generate reproducible separations and accurate component quantitation for various protein and peptide samples. To get the best resolution, reproducibility, and speed, keep in mind the four factors outlined above and how they relate to your specific samples. This will help ensure you select the best possible column for your application.

Four-Step Guide for Successful SEC Column Selection

What is the molecular weight of what you are trying to separate?			
NEED:	**MW 1–8K Da**	**MW 10–450K / 650K Da**	**MW 100–1500K Da**
Recommended column specifications	125 Å	200 A / 250 A	450 Å

What type of LC system dispersion* are you using?			
NEED:	**<20 µL (UPLC)**	**>20–<35 µL (UHPLC)**	**>35 µL (HPLC)**
Recommended column specifications	1.7 µm or 2.5 µm	2.5 µm	2.5 µm or 3.5 µm

Do you need to resolve something that is less than 2-fold difference in MW?**			
NEED:	**2.5 µm**	**2.5 µm**	**2.5 µm or 3.5 µm**
REC. Recommended column specifications SPEC:	4.6 × 300 mm or 7.8 × 300 mm	7.8 × 300 mm	7.8 × 300 mm

Do you need maximum speed on a MW greater than two-fold?			
NEED:	**<9 min**	**<12 min**	**<18 min**
REC. Recommended column specifications SPEC:	1.7 µm 4.6 × 150 mm	2.5 µm 4.6 × 150 mm	2.5 µm 7.8 × 150 mm

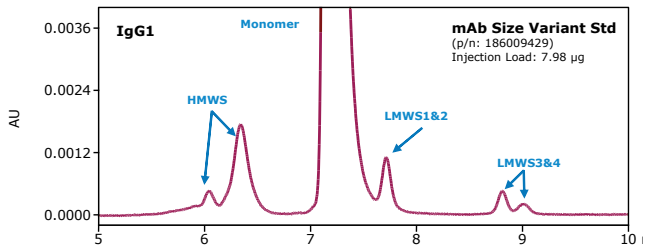
**For guidance on measuring system dispersion, download the SEC Optimization Guide (720006067EN) on waters.com.*
*** To understand the "why" behind these recommendations, read the Application Note (720006336EN) on waters.com.*

ACQUITY AND XBRIDGE PREMIER PROTEIN SEC OFFERINGS FOR SEC PLATFORM METHOD APPLICATIONS

ACQUITY™ and XBridge™ PREMIER Protein SEC 250 Å columns help scientists obtain reliable protein separations as has been made possible through the use of Waters MaxPeak High Performance Surfaces and novel BEH-PEO SEC particle technologies. Advancements in SEC column hardware and particle technology work to minimize secondary ionic or hydrophobic interactions between proteins and the column to allow chromatographers to use a "generic" or "platform-type" method.

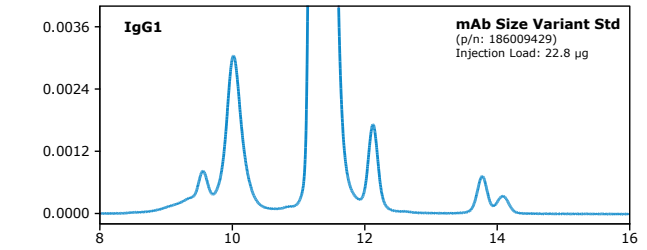
Waters XBridge PREMIER Protein SEC 250 Å 2.5 µm guard column is also available, which can provide effective trapping of insoluble particulates and excipients sometimes present in samples and eluents, thereby extending the analytical column's lifetime.

Scalable SEC Column Offerings using 2x PBS Mobile Phase



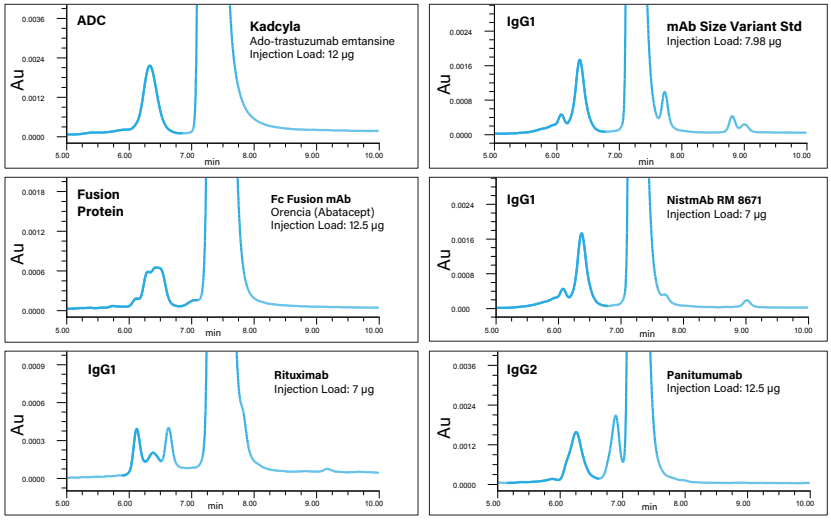
Conditions

Column:	ACQUITY™ Premier Protein SEC 250 Å,1.7 µm
Dimension:	4.6 × 300 mm
Flow rate:	300 µL/min
Temp.:	35 °C
Wavelength:	280 nm
Mobile phase:	2x PBS (20 mM phosphate, 276 mM NaCl, 5.4 mM KCl pH 7.4)
Instrument:	ACQUITY UPLC H-Class Bio
System dispersion:	<10 µL



Column:	XBridge™ Premier Protein SEC 250 Å, 2.5 µm
Dimension:	7.8 × 300 mm
Flow rate:	575 µL/min
Temp.:	35 °C
Wavelength:	280 nm
Mobile phase:	2x PBS (20 mM phosphate, 276 mM NaCl, 5.4 mM KCl pH 7.4)
Instrument:	ACQUITY UPLC H-Class Bio
Systemdispersion:	30 µL

Classes of therapeutic proteins separated on ACQUITY™ Premier Protein SEC 250 Å, 1.7 µm Column

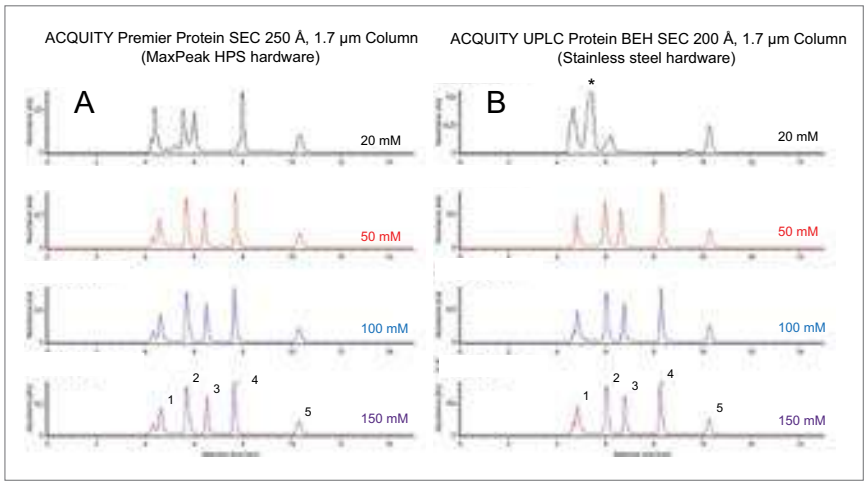


Conditions

Column:	ACQUITY Premier Protein SEC 250 Å, 1.7 µm
Dimension:	4.6 × 300 mm
Flow rate:	0.3 mL/min
Temp.:	35 °C
Wavelength:	280 nm
Mobile phase:	2xPBS (20 mM phosphate, 276 mM NaCl, 5.4 mM KCl pH 7.4)
Instrument:	ACQUITY UPLC™ H-Class Bio
LC system dispersion:	<10 µL

MS Compatibility

Native SEC separations can now be readily coupled to MS to facilitate deep characterization of protein therapeutics and the study of non-covalent protein complexes. The inertness of the ACQUITY PREMIER Protein SEC columns improves upon the chromatography that has to date been obtainable with ammonium acetate mobile phases. This can be seen in the form of improved sample recoveries, the preservation of non-covalent protein complexes, and lower limits of detection. Figure W provides a comparison study wherein it was found that a PREMIER Protein SEC 250 Å column was able to yield protein recoveries in ammonium acetate mobile phase at a level significantly lower than that of an alternative state-of-the-art column technology.



Ammonium Acetate Native SEC Chromatography with 4.6 × 150 mm, 1.7 µm Columns. A sample of BEH200 Protein Standard Mix was used for analysis with an (A) ACQUITY Premier Protein SEC 250 Å or (B) ACQUITY UPLC BEH SEC 200 Å Column. Mobile phases with varying ammonium acetate concentrations were evaluated. Peak 1: Thyroglobulin (pre-peak is thyroglobulin dimer); Peak 2: IgG; Peak 3: Bovine Serum Albumin; Peak 4: Myoglobin; Peak 5: Uracil. The asterisk (*) denotes a co-elution of IgG and BSA.

Ordering Information

MaxPeak Premier SEC 1.7 and 2.5 µm

Pore Size	MW Range	Particle Size	P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N
			4.6 mm ID × Column Length								
			30 mm Guard	150 mm No Standard	300 mm No Standard	150 mm w/Standard	300 mm w/Standard	150 mm w/Guard	300 mm w/Guard	150 mm Guard w/Std	300 mm Guard w/Std
250 Å	10 K–650 K	1.7 µm	–	186009963	186009964	176005071	176005072	176004783	176004784	176004794	176004795
250 Å	10 K–650 K	2.5 µm	186009969	186009959[5]	186009960	176005067	176005068	176004779	176004780	176004790	176004791

Pore Size	MW Range	Particle Size	P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N
			7.8 mm ID × Column Length								
			30 mm Guard	150 mm No Standard	300 mm No Standard	150 mm w/Standard	300 mm w/Standard	150 mm Guard w/Std	300 mm Guard w/Std	150 mm Guard w/Std	300 mm Guard w/Std
250 Å	10 K–650 K	1.7 µm	–	–	–	–	–	–	–	–	–
250 Å	10 K–650 K	2.5 µm	–	186009961	186009962	176005069	176005070	176004781	176004782	176004792	176004793

mAb Size Variant Standard, 160 g *	186009429
XBridge™ Premier Protein SEC 250 Å, 2.5 µm, 4.6 × 150 mm Column MVK	176004801
XBridge™ Premier Protein SEC 250 Å, 2.5 µm, 4.6 × 300 mm Column MVK	176004802
XBridge™ Premier Protein SEC 250 Å, 2.5 µm, 7.8 × 150 mm Column MVK	176004803
XBridge™ Premier Protein SEC 250 Å, 2.5 µm, 7.8 × 300 mm Column MVK	176004804
ACQUITY™ Premier Protein SEC 250 Å, 1.7 µm, 4.6 × 150 mm Column MVK	176004805
ACQUITY™ Premier Protein SEC 250 Å, 1.7 µm, 4.6 × 300 mm Column MVK	176004806

Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

** Method Validation Kit (MVK) contains three columns from three dierent batches.

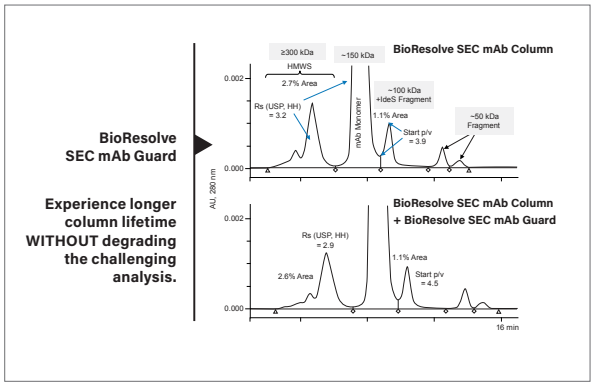
BIORESOLVE SEC MAB OFFERINGS FOR mAb AGGREGATE, MONOMER, AND FRAGMENT ANALYSES

Waters™ BioResolve™ SEC mAb Columns and BioResolve SEC mAb Guards are specifically manufactured and quality control tested to deliver reproducible, accurate quantitation of monoclonal antibodies (mAbs), associated high molecular weight aggregates (≥300,000 Da) and lower molecular weight fragments (≤100,000 Da). A range of available column sizes provides flexibility for performance optimization on a variety of chromatographic platforms, ranging from higher dispersion HPLC to lower dispersion UPLC™ systems. A guard column is also available which can provide effective trapping of insoluble particulates and excipients sometimes present in samples and/or eluents, thereby extending analytical column lifetime.

The BioResolve SEC mAb Columns and Guards:

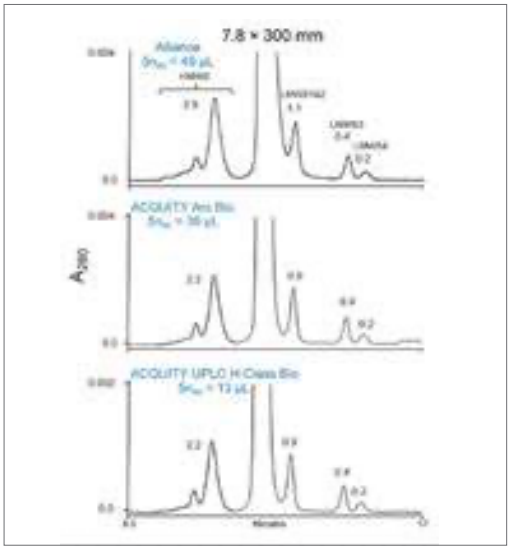
- Provide out-of-the-box performance
- Tested with Waters NIST-based, mAb Size Variant to help ensure consistent column-to-column and batch-to-batch performance, regardless of LC platform

Use of BioResolve SEC mAb Guard can help extend SEC column life without compromising needed component resolution



Separation of Waters mAb Size Variant Standard on BioResolve SEC mAb,

More Than Just a Column



Separation of Waters mAb Size Variant Standard on BioResolve SEC mAb, 7.8 × 300 mm and 7.8 × 150 mm Columns on LC systems with 49 µL (Alliance), 30 µL (ACQUITY Arc), and 10 or 13 µL (ACQUITY UPLC H-Class) system dispersions. Percent areas are reported for each chromatogram. Conditions provided in the experimental section.

Ordering Information

BioResolve SEC mAb Columns, Guards, and Method Validation Kits

Pore Size	MW Range	Particle Size	P/N 4.6 mm ID × Column Length 30 mm Guard	P/N 150 mm No Standard	P/N 300 mm No Standard	P/N 150 mm w/Standard	P/N 300 mm w/Standard	P/N 150 mm Guard w/Std	P/N 300 mm Guard w/Standard
200 Å	10 K–450 K	2.5 µm	186009443	186009435	186009437	176004592	176004593	176004596	176004597

Pore Size	MW Range	Particle Size	7.8 mm ID × Column Length 30 mm Guard	150 mm No Standard	300 mm No Standard	150 mm w/Standard	300 mm w/Standard	150 mm Guard w/Std	300 mm Guard w/Std
200 Å	10 K–450 K	2.5 µm	—	186009439	186009441	176004594	176004595	176004598	176004599

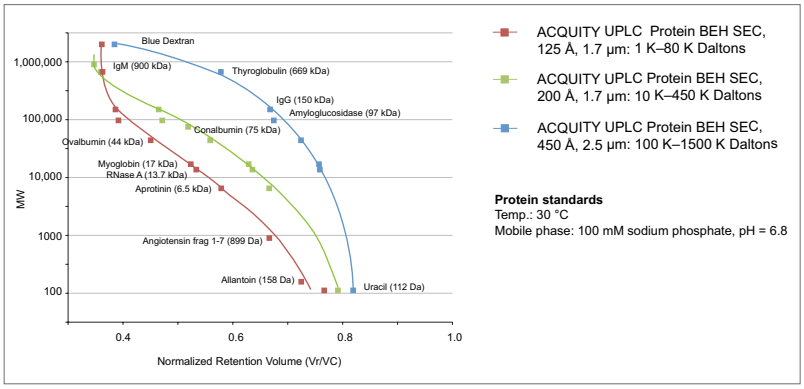
BioResolve SEC mAb Method Validation Kit: 200 Å, 2.5 µm, 4.6 × 150 mm Columns**	176004639
BioResolve SEC mAb Method Validation Kit: 200 Å, 2.5 µm, 4.6 × 300 mm Columns**	176004640
BioResolve SEC mAb Method Validation Kit: 200 Å, 2.5 µm, 7.8 × 150 mm Columns**	176004641
BioResolve SEC mAb Method Validation Kit: 200 Å, 2.5 µm, 7.8 × 300 mm Columns**	176004642
mAb Size Variant Standard, 160 g *	186009429
Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

SEC Protein Standards are matched to the pore size of the column.
** Method Validation Kit (MVK) contains three columns from three dierent batches.

ACQUITY PROTEIN SEC OFFERINGS FOR HIGH THROUGHPUT SEC APPLICATIONS

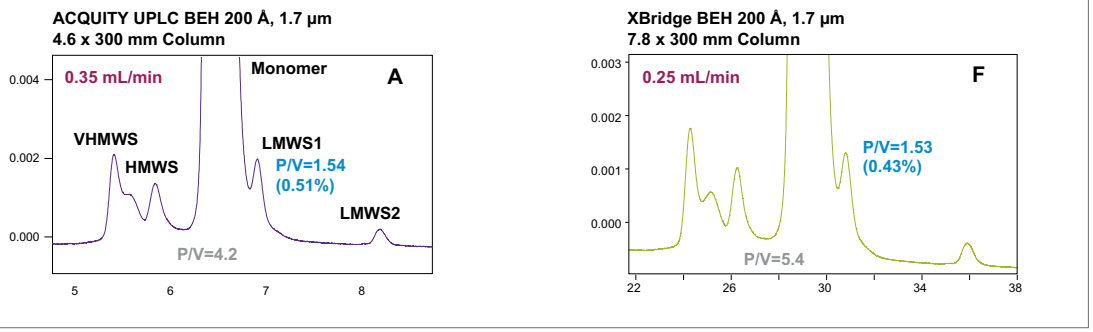
Waters™ ACQUITY™ UPLC™ Protein BEH SEC Guard, Column, and/or Standard Mix that are integral parts of Waters' ACQUITY UPLC SEC System solution. The ACQUITY UPLC Protein BEH SEC 125 Å offering is best suited for the analysis of peptides and proteins in the molecular weight range from 1000–80,000 Daltons that include insulin and its aggregates. The ACQUITY UPLC Protein BEH SEC 200 Å Column was designed to characterize proteins ranging in molecular weight range from 10,000–450,000 Daltons that include monoclonal IgG monomers from aggregates, while our ACQUITY UPLC Protein BEH SEC 450 Å is best suited for the analyses of proteins and conjugates that range from 100,000–1.5 million Daltons

Calibration Curves on ACQUITY UPLC Protein BEH SEC, 125 Å, 200 Å, and 450 Å Columns



All of these SEC chemistries are based on Waters' Ethylene Bridged Hybrid (BEH)-based particle technology and diol-bonded surface that provide a stable chemistry with minimal non-desired secondary interactions for proteins and peptides.

When Speed is Critical for SEC – Harnessing the power of UPLC



ACQUITY UPLC Technology allows scientists the ability to exceed what is obtainable using UHPLC or traditional HPLC separations by improving data quality while increasing sample throughput and productivity.

Ordering Information

ACQUITY UPLC Protein BEH SEC Columns, 1.7 and 2.5 µm

			P/N	P/N	P/N	P/N	P/N	P/N	P/N
Pore Size	MW Range	Particle Size	4.6 mm ID × Column Length						2.1 mm ID × CL
			30 mm Guard*	50 mm No Standard	150 mm No Standard	300 mm No Standard	150 mm w/Standard	300 mm w/Standard	50 mm No Standard
125 Å	1 K–80 K	1.7 µm	186006504	–	186006505	186006506	176003906	176003907	–
200 Å	10 K–450 K	1.7 µm	186005793	186009082	186005225	186005226	176003904	176003905	186008471
450 Å	100 K–1500 k	2.5 µm	186006850	–	186006851	186006852	176002996	176002997	–

Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

SEC Protein Standards are matched to the pore size of the column.

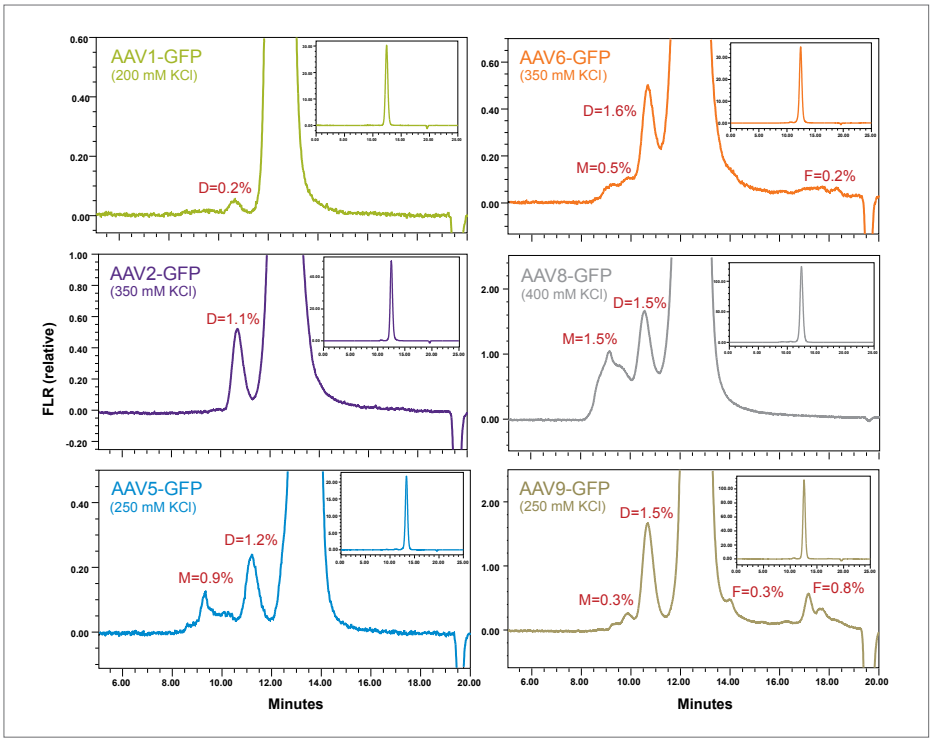
*Size-exclusion chromatography may require modifications to an existing ACQUITY UPLC System. Please reference "Size-Exclusion and Ion-Exchange Chromatography of Proteins using the ACQUITY UPLC System" (p/n: 715002147) or "Size Exclusion and Ion-Exchange Chromatography of Proteins using the ACQUITY UPLC H-Class System" (p/n: 715002909) for specific recommendations.

*To connect two UPLC SEC Columns together in series, we recommend using a Waters Sample Loop (p/n: 430001516).

XBRIDGE BEH SEC OFFERINGS

Waters™ XBridge™ Protein BEH SEC, 125 Å, 200 Å, and 450 Å, 2.5 and 3.5 µm Columns were developed to complement the 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/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 lab instrumentation and component resolution or sample throughput needs.

Adeno-Associated Virus (AAV) Analyses



XBridge BEH SEC 450 Å, 3.5 µm Columns effectively separate and quantitate AAV monomers from their HMW D11/3/2021 dimers, lower valency multimers, and LMW fragments.

Ordering Information

XBridge Protein BEH SEC Columns, 2.5 µm, UHPLC

Pore Size	MW Range	Particle Size	P/N	P/N	P/N	P/N	P/N	P/N
			4.6 mm ID × Column Length					
			30 mm Guard	150 mm No Standard	300 mm No Standard	30 mm Guard w/ Std	150 mm w/Standard	300 mm w/Standard
125 Å	1 K–80 K	2.5 µm	186009170	186009171	186009172	176004331	176004332	176004333
200 Å	10 K–450 K	2.5 µm	186009174	186009175	186009176	176004334	176004335	176004336
450 Å	100 K–1500 k	2.5 µm	186006850	186009179	186009180	176002995	176002996	176002997

Pore Size	MW Range	Particle Size	7.8 mm ID × Column Length					
			30 mm Guard No Standard	150 mm No Standard	300 mm No Standard	30 mm Guard w/Std	150 mm w/Standard	300 mm w/Standard
125 Å	1 K–80 K	2.5 µm	186009158	186009159	186009160	176004322	176004323	176004324
200 Å	10 K–450 K	2.5 µm	186009162	186009163	186009164	176004325	176004326	176004327

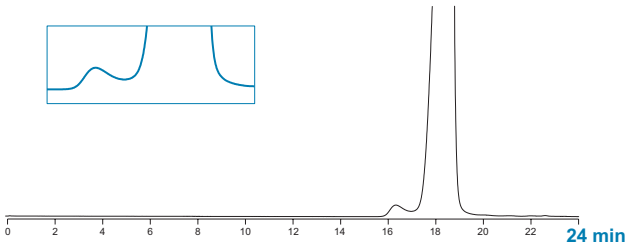
Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

SEC Protein Standards are matched to the pore size of the column.

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

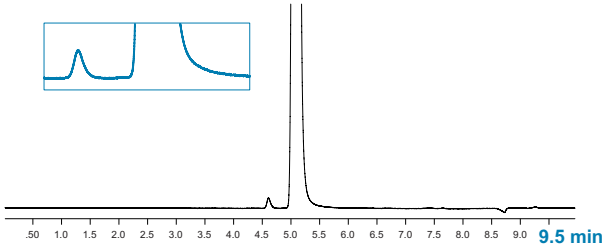


LC Conditions

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.

mAB SIZE VARIANT STANDARD

Waters mAb Size Variant Standard (p/n: 186009429) contains the NIST humanized monoclonal antibody (Reference Material 8671) and non-reduced IdeS digested NIST mAb fragments F(ab')2 (~100,000 Da) and (Fc/2)2 (~50,000 Da). By aliquoting small, standard amounts of IdeS fragments, Waters mAb size variant standard can be effectively used to test column and LC System ability to separate mAb aggregates, monomer, and fragments/clips via SEC.



Ordering Information

mAb Size Variant Standard

Description	P/N
mAb Size Variant Standard	186009429

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.



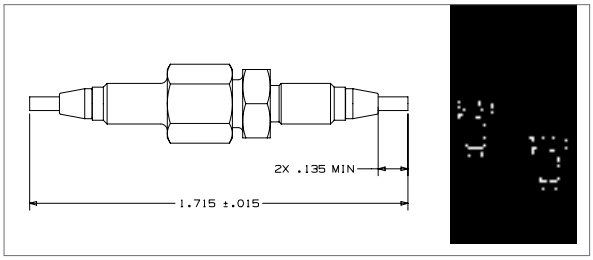
Ordering Information

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.

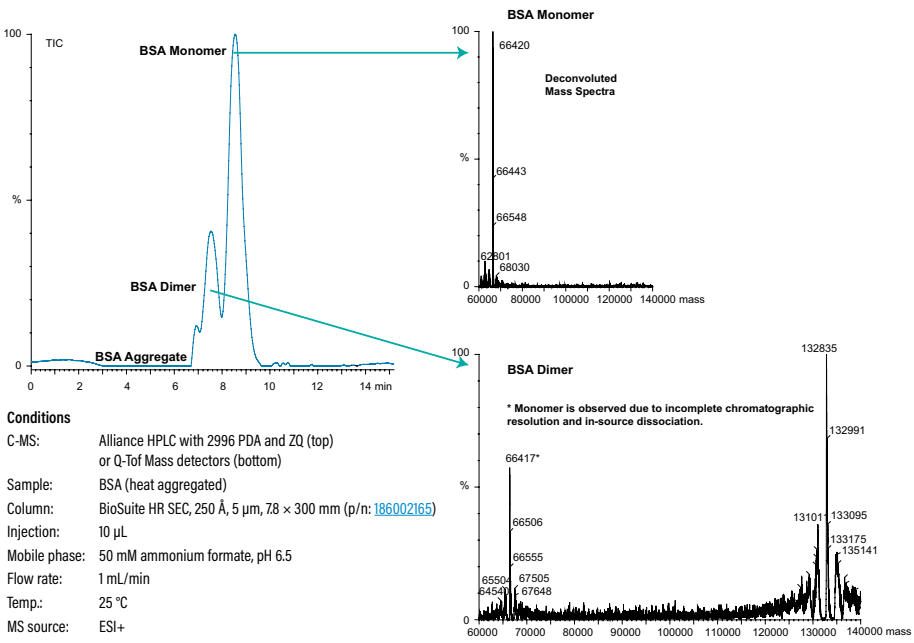
Connector Kits

Description	P/N
ACQUITY CM-S 4-Column Bank Connection Kit 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)	205001172
ACQUITY CM-S 3-Column Bank Connection Kit 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)	205001171
ACQUITY CM-S 2-Column Bank Connection Kit 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)	205001169

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 HR SEC, 250 Å, 5 µm Column SEC Column

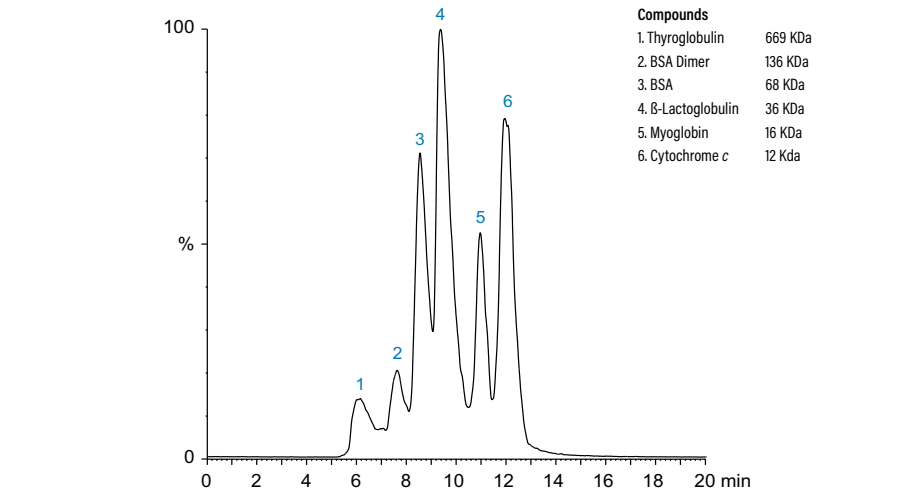


Conditions

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 HR SEC, 250 Å, 5 µm Column (LC-MS conditions as above)

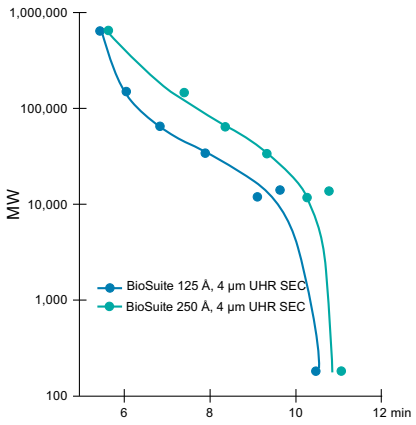


Compounds

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

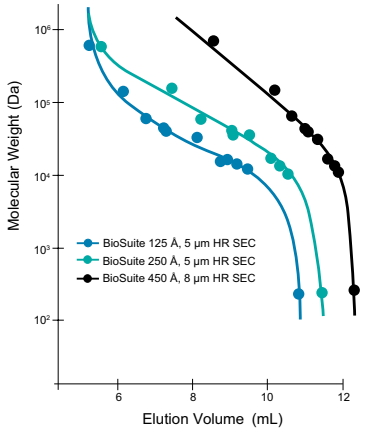
Column temp.: 25 °C

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

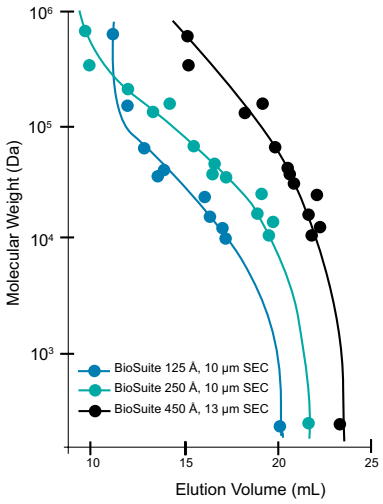
Flow rate: 1.0 mL/min

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.

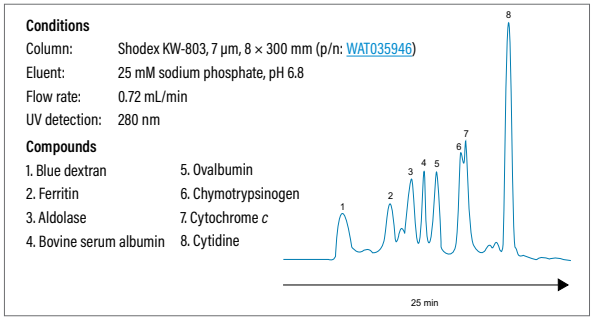
** Operating flow rates for BioSuite Ultra-High Resolution (UHR) SEC Columns (4.6 mm I.D.) are from 0.1–0.4 mL/min. Use of an HPLC system (e.g., Waters Alliance HPLC System) capable of operating at these flows is essential for optimal UHR SEC Column performance.

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

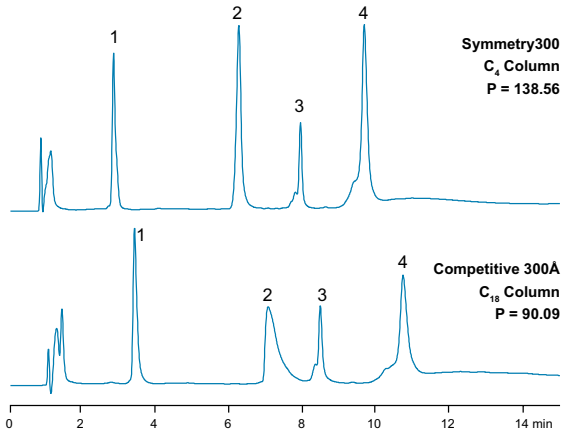
Description	Particle Size	Dimension	MW Range	P/N
Protein KW-802.5	7 µm	8 × 300 mm	100–50,000	WAT035943
Protein KW-803	7 µm	8 × 300 mm	100–150,000	WAT035946
Protein KW-804	7 µm	8 × 300 mm	500–600,000	WAT036613

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

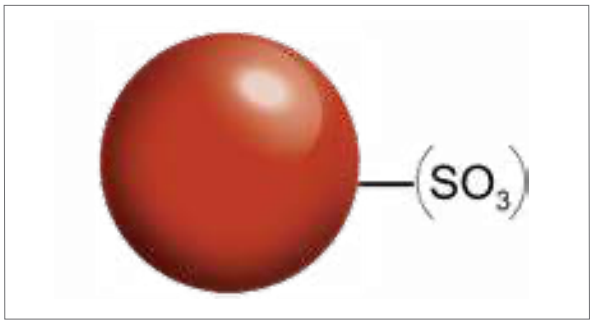
Ion-Exchange (IEX) separations are most commonly performed using gradients of increasing salt, changing pH, or simultaneous salt increases and pH changes with less charged protein species eluting prior to more highly charged molecules. Based on protein type and separation pH, either an anion or cation 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

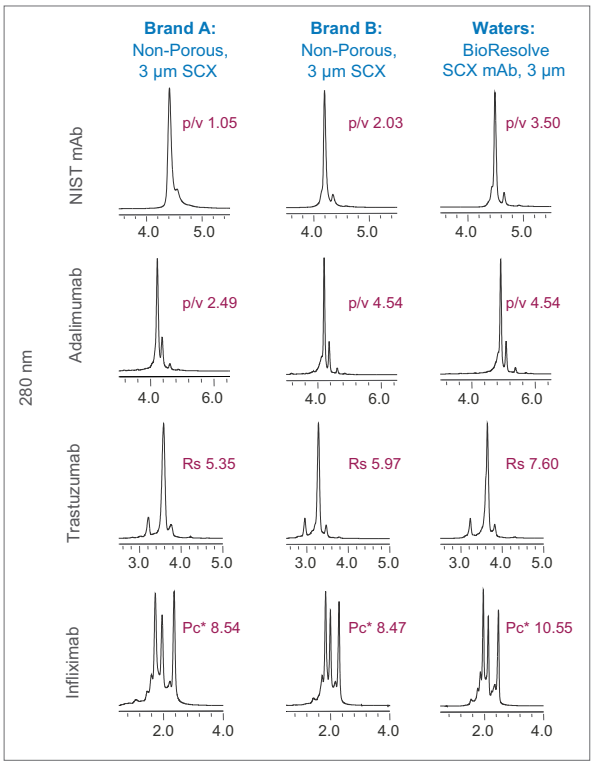
Charge variant profiling is one of several important characterization techniques performed on monoclonal antibody biotherapeutics. To help ensure that reliable results are obtained in these types of analyses, Waters developed corrosion–resistant columns containing BioResolve SCX mAb, non-porous, polymer-based 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

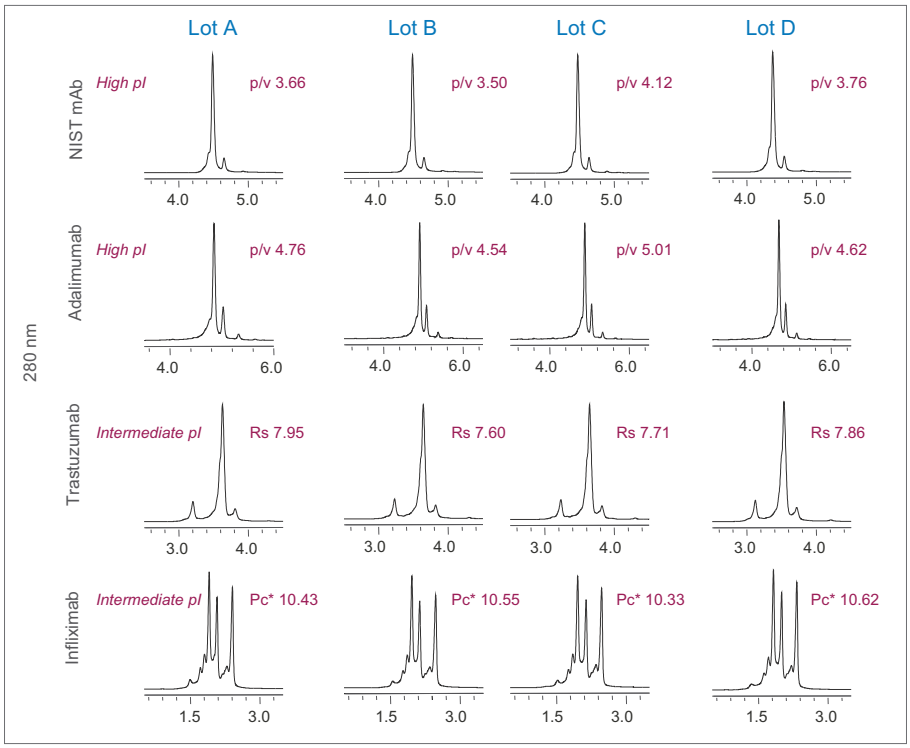


LC Analysis of Monoclonal Antibodies - BioResolve SCX mAb Column vs. Commercially Available, Non-Porous, Cation-Exchange Columns



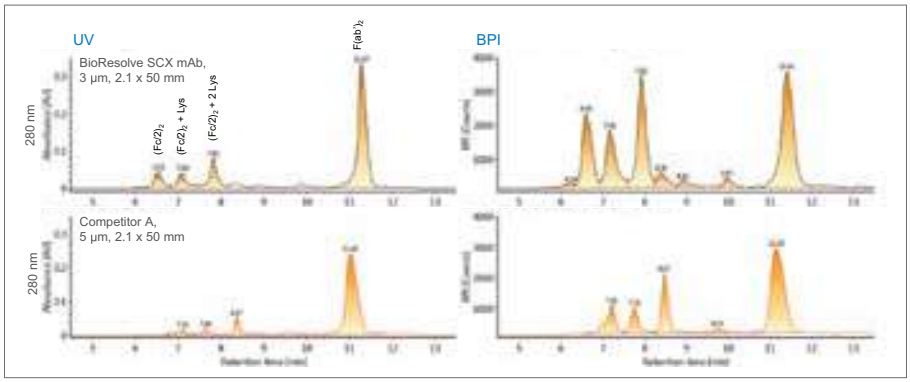
Comparative peak valley (P/V) ratios, component resolution (Rs), and measured peak capacities of four biotherapeutic antibodies separated on Waters vs. commercially available, cation-exchange columns noting higher quality data obtained on a BioResolve SCX mAb, 3 µm Column. All separations were performed 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.

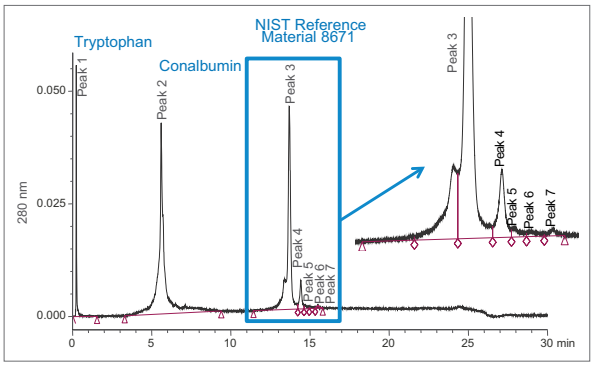
VanGuard FIT Cartridge

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.

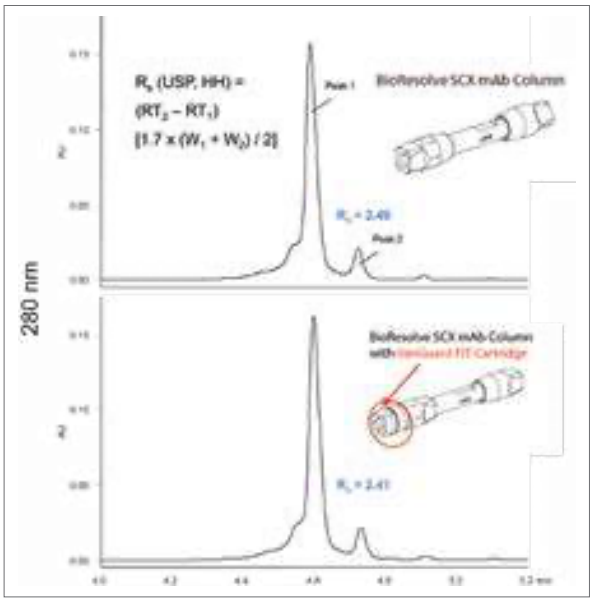
Separation of Waters mAb Charge Variant Standard on a BioResolve SCX mAb, 3 µm Column



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



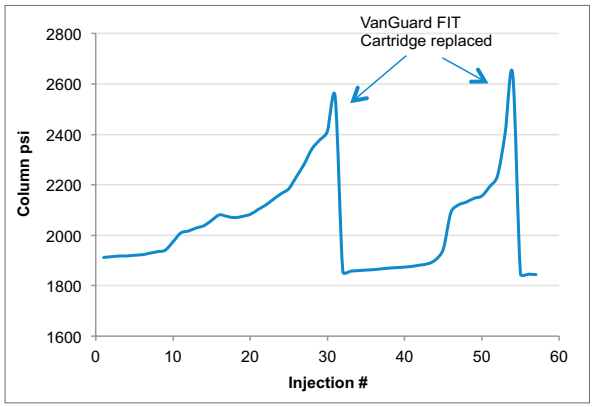
Separation of NIST mAb Reference Material 8671 (12.5 µg injected) on a BioResolve SCX mAb, 3 µm, 4.6 × 50 mm Column with and without an Integrated VanGuard FIT Cartridge. All separations were performed on an ACQUITY UPLC H-Class Bio System at 0.96 mL/min using a 7.5 min linear gradient from 10 mm to 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

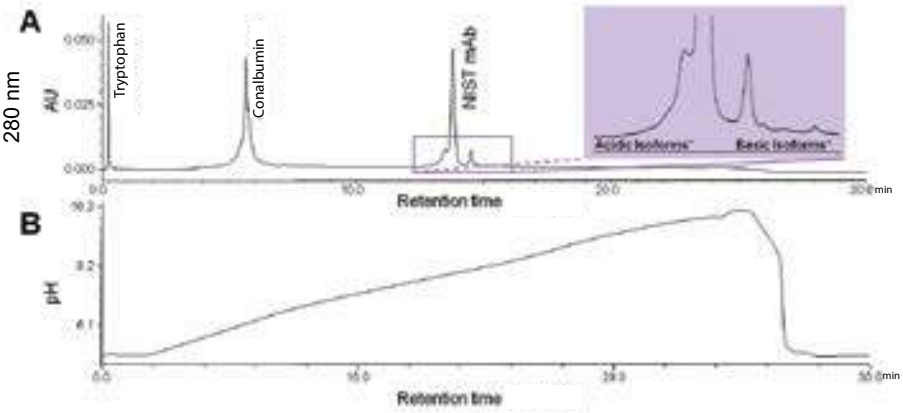
While ion-exchange chromatography using a gradient of increasing salt concentration is commonly used for charge variant profiling of mAb-based therapeutics, it often requires the optimization of methods for each individual sample. By comparison, use of a more universal pH gradient offers the potential 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.

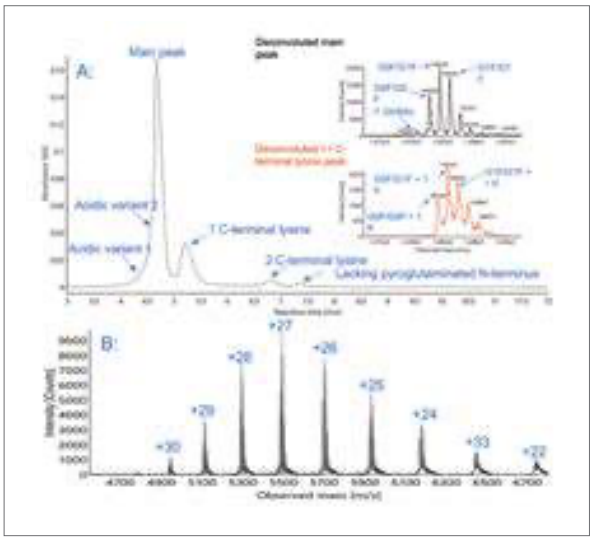
LC-MS ANALYSIS WITH IONHANCE CX-MS PH BUFFERS

Native protein analysis by cation-exchange chromatography coupled to mass spectrometry (CX-MS) is a robust way to characterize microheterogeneities in biopharmaceuticals, particularly monoclonal antibodies (mAbs), from research through final commercialization. To address this need, Waters developed IonHance CX-MS pH Buffers (Concentrates A and B) for use with the BioResolve SCX mAb, 3 µm Columns.

The IonHance CX-MS pH 10x concentrates were purposely designed to deliver robust, charge-based separations and high-quality MS spectral data. They are shipped as 100 mL aliquots in 1 L trace metal certified low-density polyethylene bottles (confirmed <100 ppb levels of sodium, potassium, and calcium). Concentrate A is formulated to yield a pH 5.0 mobile phase and Concentrate B is formulated to generate a higher ionic strength pH 8.5 mobile phase. Both concentrates are prepared with 20% acetonitrile to minimize bacterial growth.

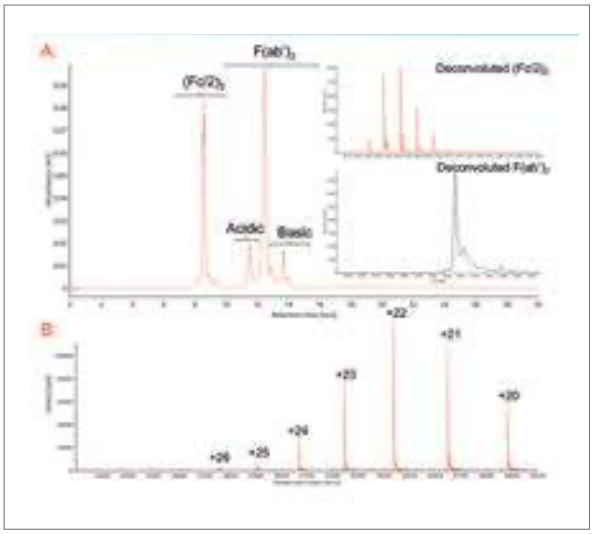
When running IonHance CX-MS buffers, it is recommended to use the Humanized mAb Mass Check Standard (p/n: 186009125) as a system QC and not the mAb Charge Variant Standard (p/n: 186009065). The mAb Charge Variant Standard is a mix of NIST mAb, conalbumin amd tryptophan. The conalbumin peak is not well resolved using the IonHance CX-MS buffers.

LC-MS Analysis of Intact Adalimumab Using a BioResolve SCX mAb Column and IonHance CX-MS pH Buffer



Representative UV chromatogram (280 nm) of adalimumab with deconvolution of base and +1 lysine (K) peak between 147.8–148.8 kDa, as well as mass spectra for base peak with m/z window of 4600–7000. The data were obtained with a BioAccord System comprised of an ACQUITY UPLC I-Class PLUS System coupled to an ACQUITY TUV Detector that was set to 280 nm, fitted with a 2.1 × 50 mm BioResolve SCX mAb Column. Buffer A = 10 mM ammonium acetate, pH 5.00. Buffer B = 75 mM ammonium acetate, pH 8.38.

LC-MS Analysis of Non-Reduced IdeS Digested Trastuzumab



(A) Representative UV chromatogram of IdeS digested Trastuzumab with deconvolution of main (Fc/2)2 peak between 50.1–52.0 kDa and the main F(ab')2 peak between 97.0–98.0 kDa.(B) Mass spectra for primary F(ab')2 peak with m/z window of 3200–5000. The data were obtained with a BioAccord System comprised of an ACQUITY UPLC I-Class PLUS System coupled to an ACQUITY RDa Mass Detector fitted with a BioResolve SCX mAb, 2.1 × 50 mm Column.

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

Ordering Information

IonHance CX-MS pH Concentrates

Description	P/N
IonHance CX-MS pH Concentrate A in Certified LDPE Container	186009280
IonHance CX-MS pH Concentrate B in Certified LDPE Container	186009281
IonHance CX-MS pH Concentrates A&B Kit	176004498

IonHance CX-MS pH Concentrate and BioResolve SCX mAb Startup Kits

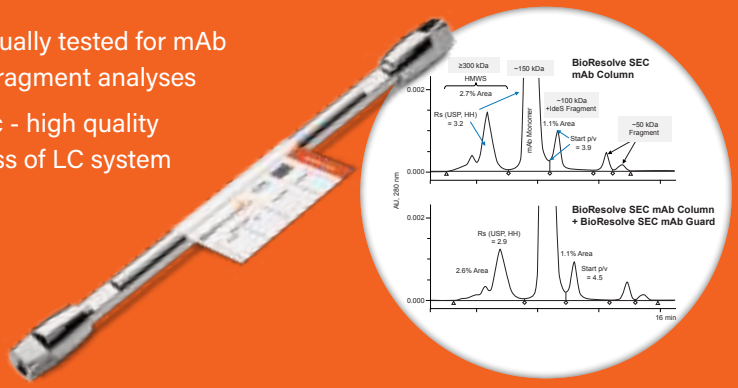
Description	P/N
Kit: IonHance CX-MS pH Concentrates A and B in certified LDPE containers; BioResolve SCX mAb, 3 µm, 2.1 × 50 mm Column with VanGuard FIT; and Humanized mAb Mass Check Standard	176004499
Kit: IonHance CX-MS pH Concentrates A and B in certified LDPE containers; BioResolve SCX mAb, 3 µm, 2.1 × 50 mm Column; and Humanized mAb Mass Check Standard	176004500
Kit: IonHance CX-MS pH Concentrates A and B in certified LDPE containers; BioResolve SCX mAb, 3 µm, 2.1 × 100 mm Column with VanGuard FIT; and Humanized mAb Mass Check Standard	176004501
Kit: IonHance CX-MS pH Concentrates A and B in certified LDPE containers; BioResolve SCX mAb, 3 µm, 2.1 × 100 mm Column; and Humanized mAb Mass Check Standard	176004502

BioResolve™ COLUMNS

Looking for reliable monoclonal antibody aggregate, monomer, and fragment analysis?

We listened. We learned. We designed.

- Columns individually tested for mAb aggregate and fragment analyses
- System agnostic - high quality results regardless of LC system



For more information, visit **waters.com/BioResolveSEC**

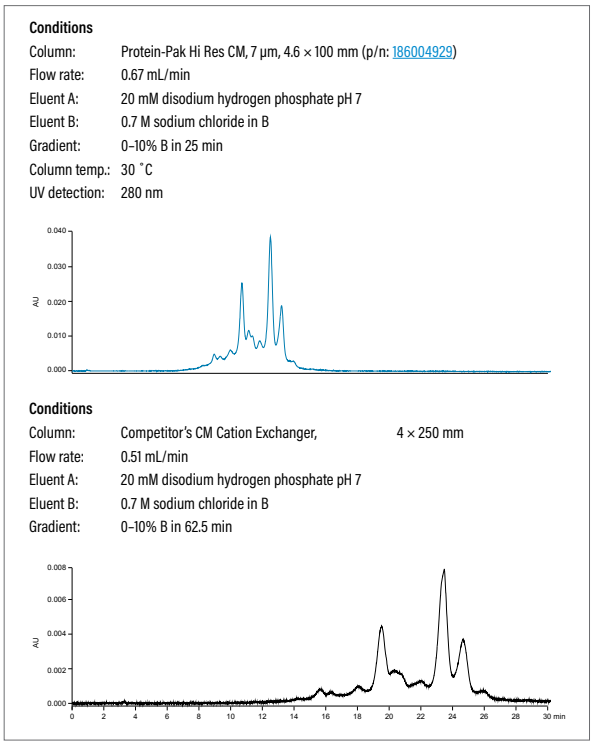
Protein-Pak Hi Res Ion-Exchange (IEX) Columns for ACQUITY UPLC Applications

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

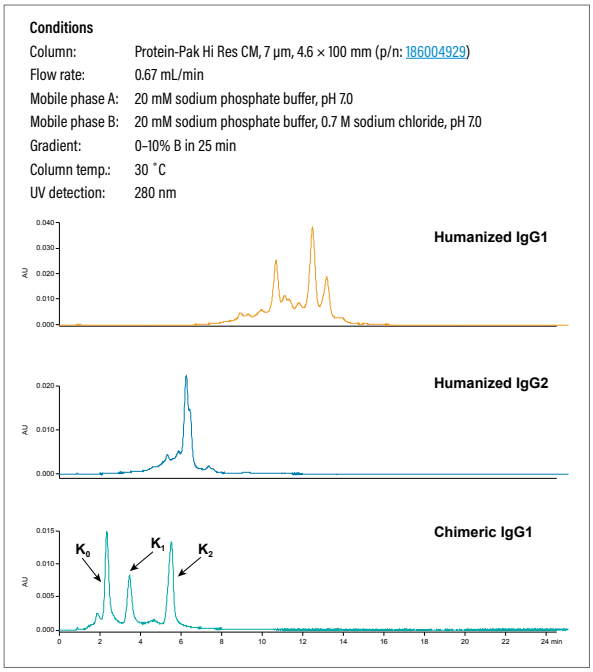


Resolved Monoclonal Antibody (mAb) Isoform Separation



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

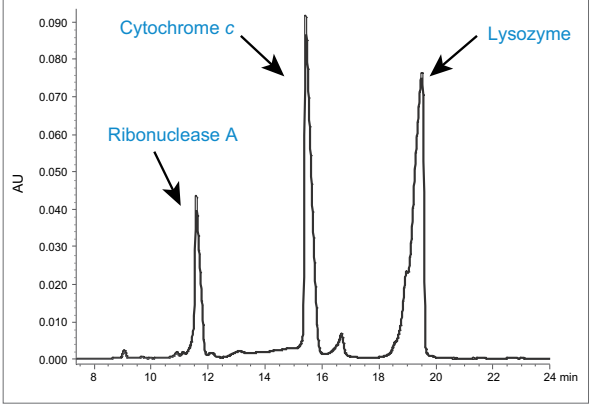
Ion-Exchange Standards are sets of standards that allow the user to benchmark anion- or cation-exchange columns on a regular basis in order to have confidence in results as well as providing a troubleshooting tool for any issues that may arise.

- 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.

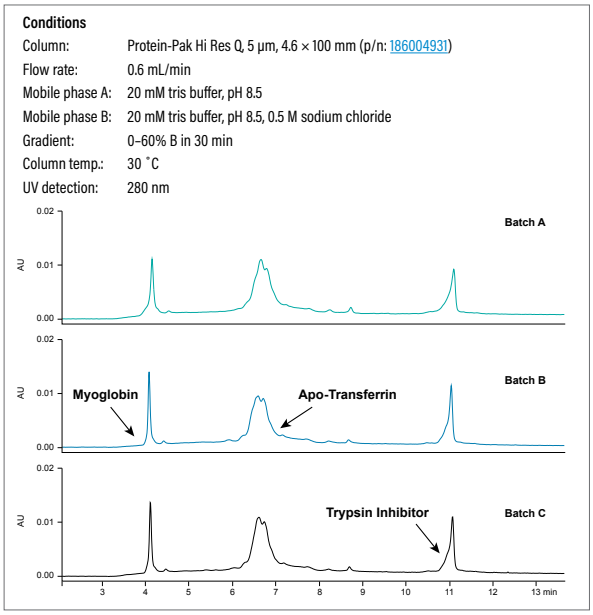
Novel IEX Particles Ideal for Biomolecule Characterizations

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

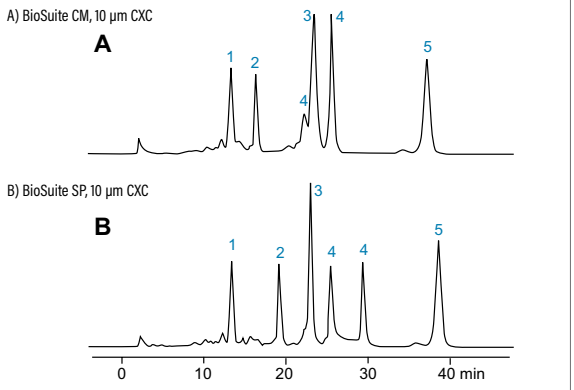


Each batch of Protein-Pak Hi Res SP, CM, and Q Column packing material is chromatography tested using a relevant protein standard mixture to help ensure consistent and predictable performance.

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

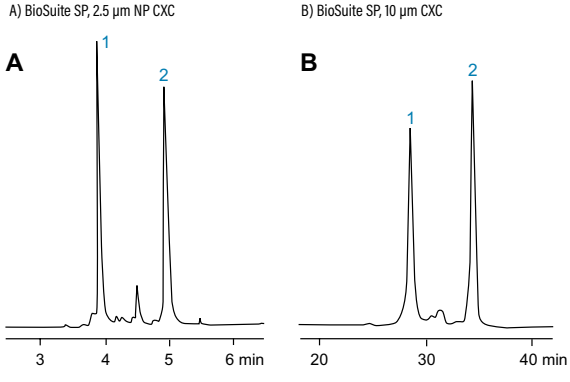


Conditions

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.

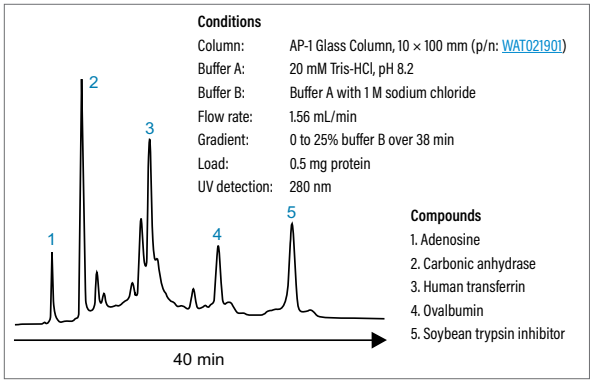
Protein-Pak HR ion exchangers are available with a Q functional group, a strong anion exchanger; DEAE, a weak anion exchanger; SP, a strong cation exchanger; and CM, a weak cation exchanger. The principal difference between a weak and strong ion exchanger does not lie in the protein binding capacity, 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

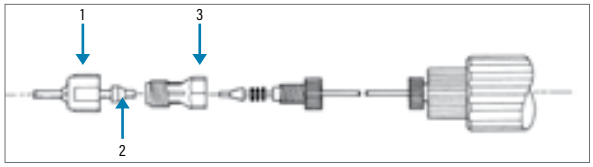
Advanced Purification (AP) Glass Columns

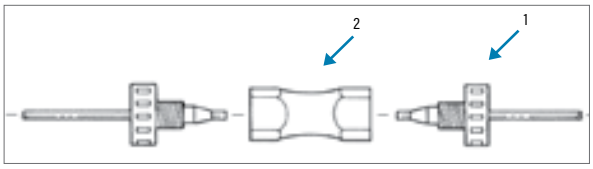
Dimension	Bed Volume (mL)	Flow Rate (mL/min)	Pressure Rating (psi/MPa)	P/N
5 × 50 mm	0.8–1.2	0–4	1500 psi/10 MPa	WAT064-01
5 × 100 mm	1.8–2.2	0–4	1500 psi/10 MPa	WAT064-02
10 × 100 mm	5–8	0–4	1500 psi/10 MPa	WAT021901
10 × 200 mm	13–16	0–4	1500 psi/10 MPa	WAT021902
10 × 300 mm	21–24	0–4	1500 psi/10 MPa	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

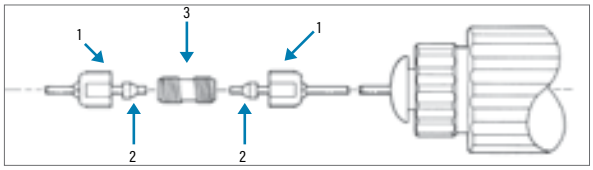
AP MiniColumn Accessories and Spare Parts		
Description	**Dimension**	**P/N**
Glass Tube	5 × 50 mm	WAT038802
	5 × 100 mm	WAT038803
Column Jacket	5 × 50 mm	WAT038804
	5 × 100 mm	WAT038805
Filters, 10/pk	–	WAT038806
O-Rings, 13/pk (includes 10 inlet/outlet and 3 funnel)	–	WAT038807
Inlet Connector Assembly	–	WAT038800

AP-1 Column

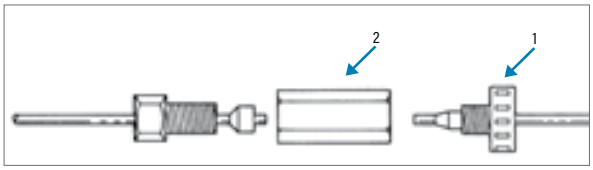
Description	Qty.	P/N
1. Compression Screw and Ferrule 'Z' Fitting, Plastic	1/pk	WAT082708
2. Union 'Z' Fitting, Plastic	1/pk	WAT082745

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

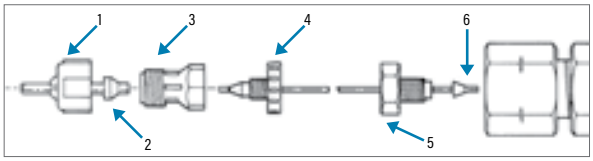
AP-5 Column

Description	Qty.	P/N
1. Compression Screw and Ferrule 'Z' Fitting, Plastic	1/pk	WAT082708
2. Union, Plastic	1/pk	WAT021951

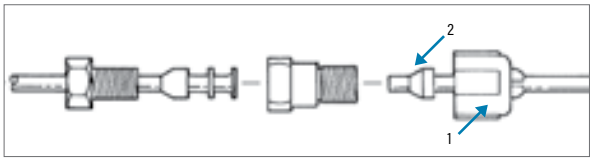
AP-5 Column Accessories and Spare Parts

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 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

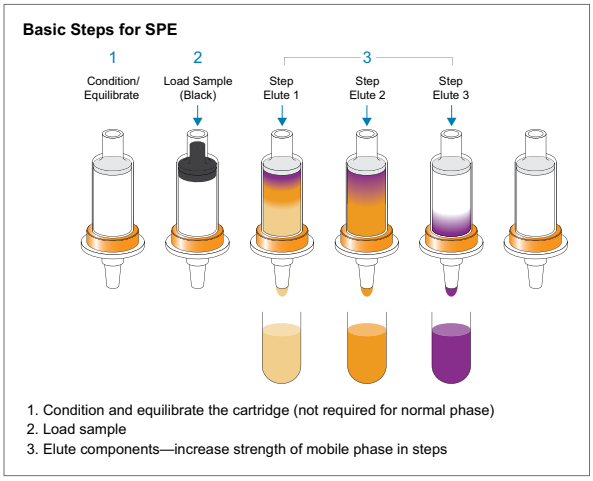
For all preparative isolations based on ionic interactions, particularly proteins, enzymes, and immunoglobulins.

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

BioSuite pC_{18} and pPhenyl Reversed-Phase Chromatography (RPC) HPLC Columns

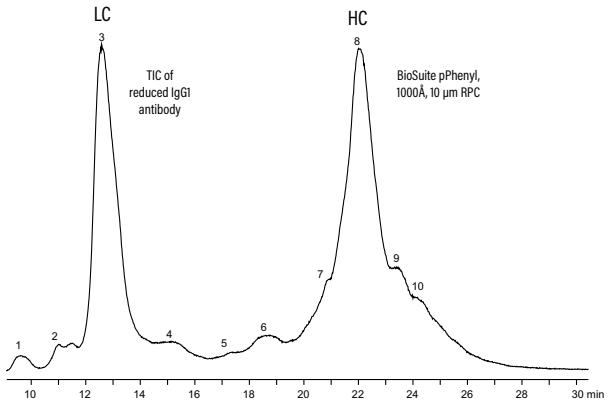
Reversed-phase chromatography (RPC) has become a widely accepted tool for the separation of proteins, peptides, synthetic oligonucleotides, and other biomolecules. For many applications, Symmetry and Symmetry300, Atlantis T3, or BEH 130 Å and BEH 300 Å Chemistries can be successfully used for the isolation 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



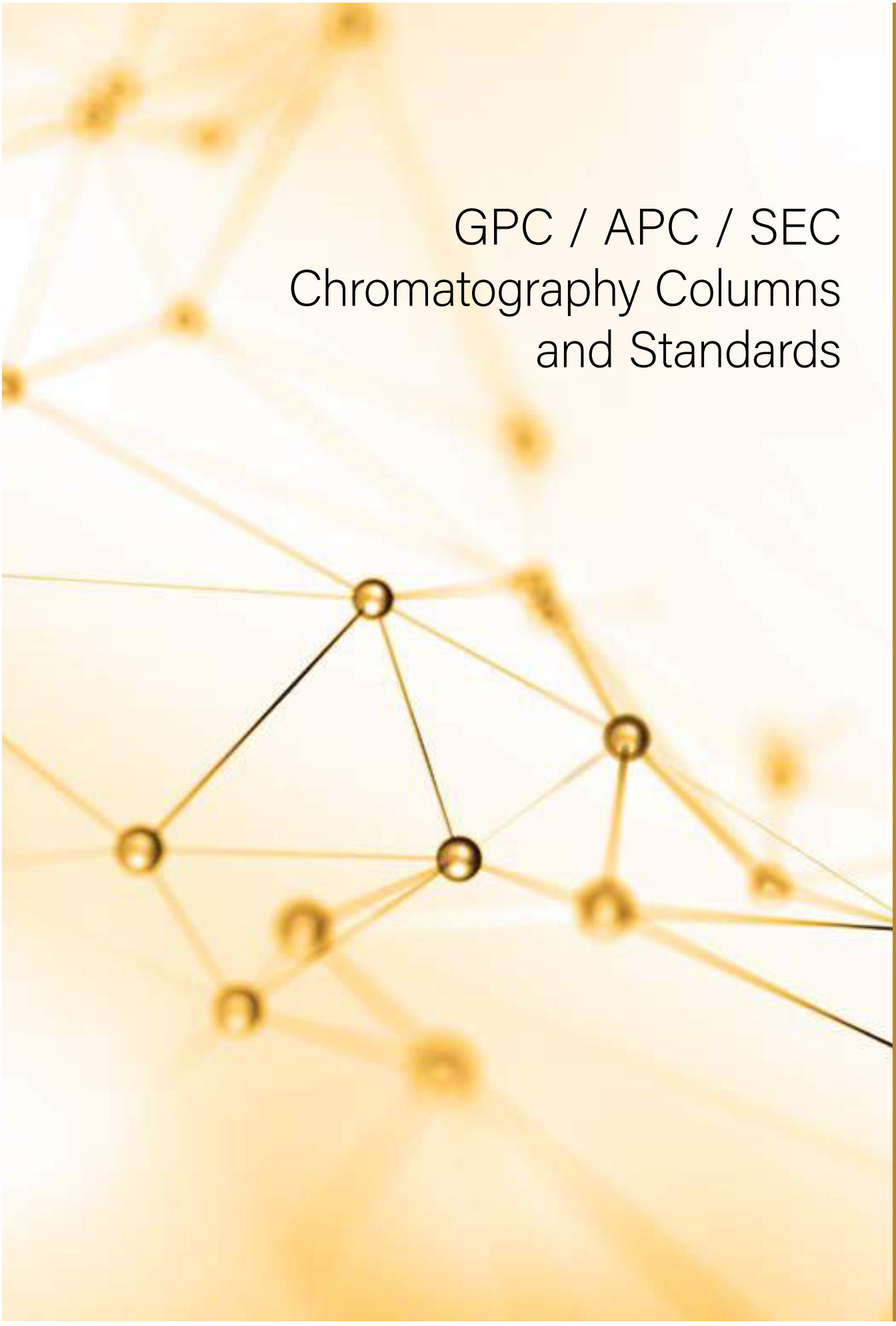
The BioSuite pPhenyl, 1000 Å RPC Columns have a higher ligand density compared to the BioSuite Phenyl, 1000 Å HIC Columns and are not recommended for hydrophobic-interaction separations.

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

GPC / APC / SEC Chromatography Columns and Standards



GPC / APC / SEC Chromatography Columns and Standards

Contents

GPC Columns for Non-Aqueous Samples **455**
- ACQUITY APC XT Columns 455
- Styragel Columns Selection Guide 457
- Styragel HT (High-Temperature) Columns 459
- Ultrastyragel Columns 460
- HSPgel Columns 461
- Shodex Columns 463
- Envirogel High-Resolution GPC Cleanup Columns 463

SEC Columns **464**
- ACQUITY APC AQ Columns 464
- XBridge Protein BEH SEC Columns 466
- XBridge Protein BEH SEC Columns For UHPL-Based Separations 467
- ACQUITY UPLC Protein SEC Columns 468
- BioResolve SEC mAB For Monoclonal Aggregate, Monomer, and Fragment Analyses 469
- Acquity and XBridge Premier Protein SEC 250 Å Columns 470
- Protein-Pak Size-Exclusion HPLC Columns 471
- mAB Size Variant Standard 471
- Protein Standards 471
- SEC Column Connectors and Connector Kits 472
- Ultrahydrogel Columns 473

Solvent Guide **474**

Calibration Standards **476**
- ACQUITY APC Calibration Standards 476
- ReadyCal Standards 478
- Polymer-Specific Calibration Standards 478
- Individual MW Standards 479
- SEC Calibration Standards 479

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.

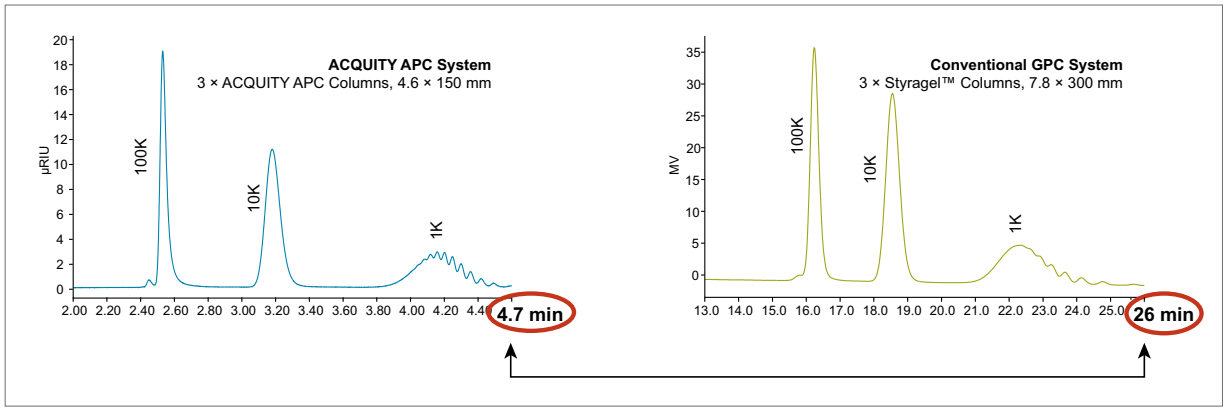
As a market leader and a primary manufacturer of chromatographic instrumentation and consumables, Waters will continue to influence the field of separation science, providing the highest quality products and expert applications support.

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.

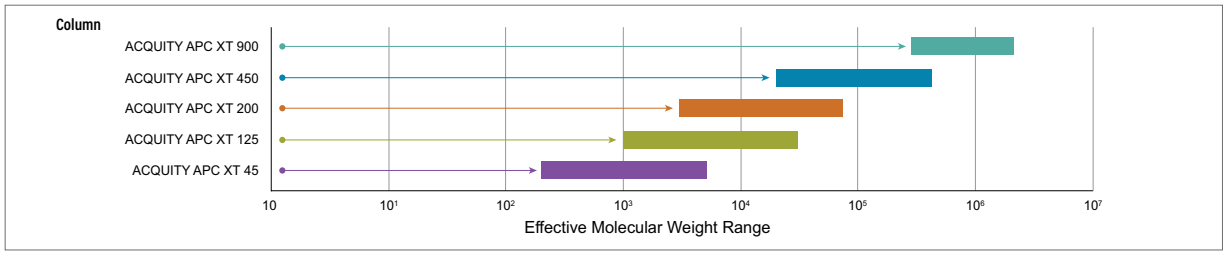
ACQUITY APC XT COLUMNS

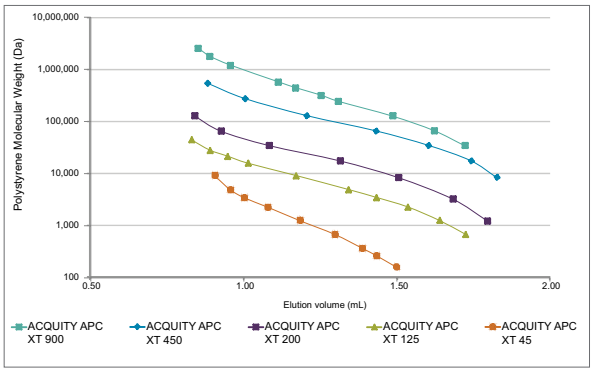
Using ACQUITY APC XT Columns, you can quantify and characterize polymer samples with accuracy and confidence while maximizing productivity. The high-performance chemistries contained in ACQUITY Advanced Polymer Chromatography (APC) Columns enable rapid and accurate chromatographic characterization of 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.

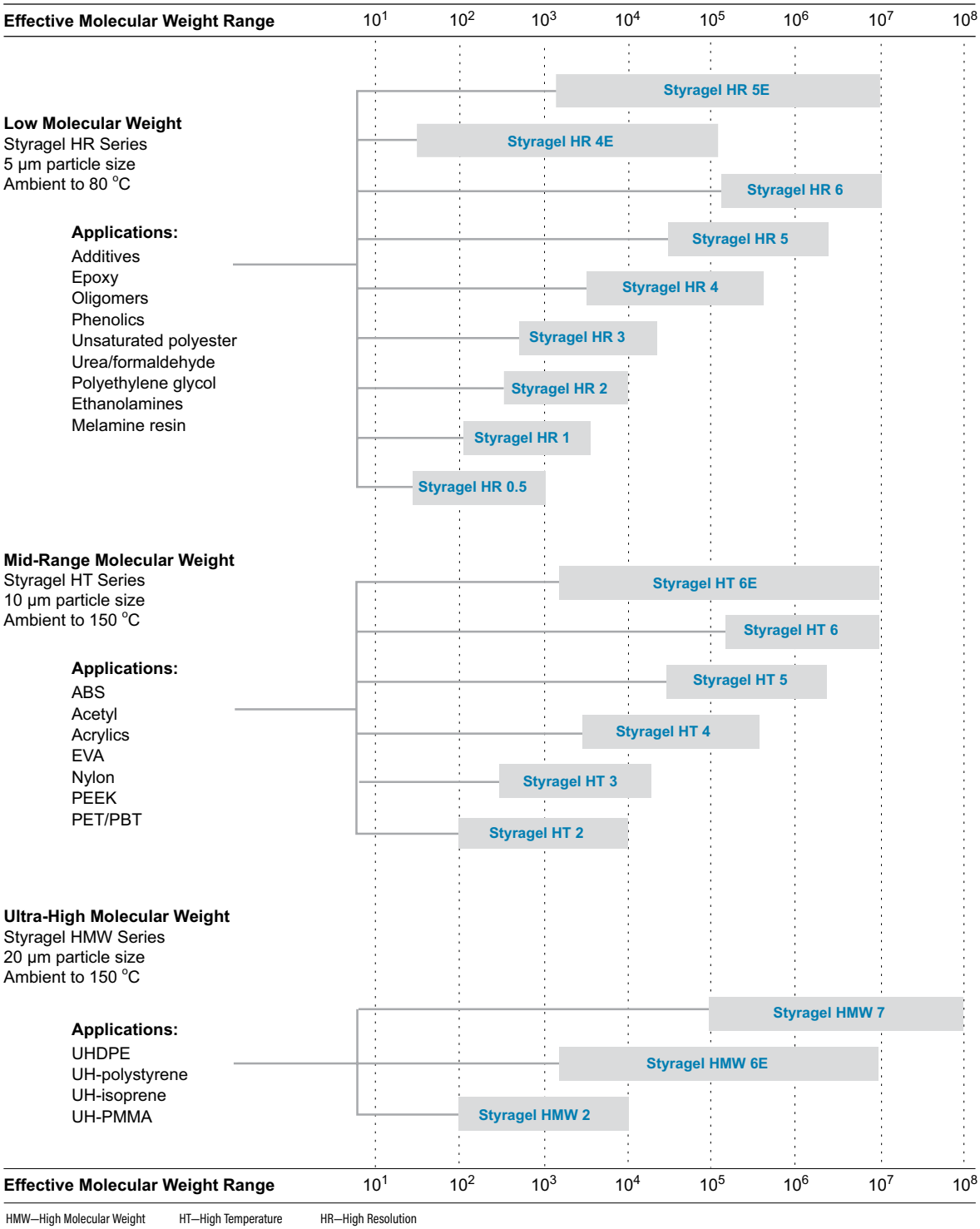
To try this tool, go to waters.com/APCselector



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.

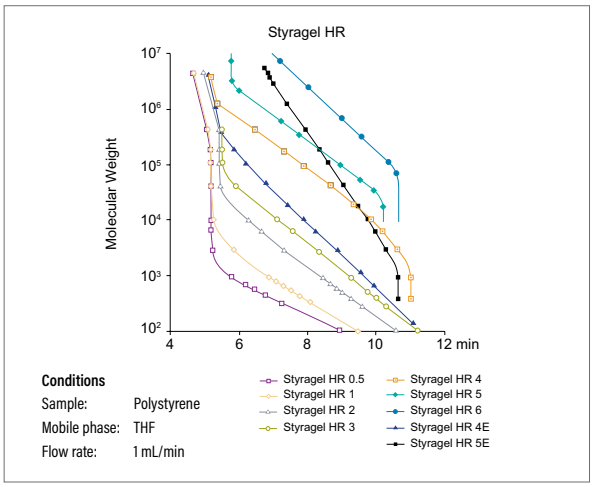
Selection Guide



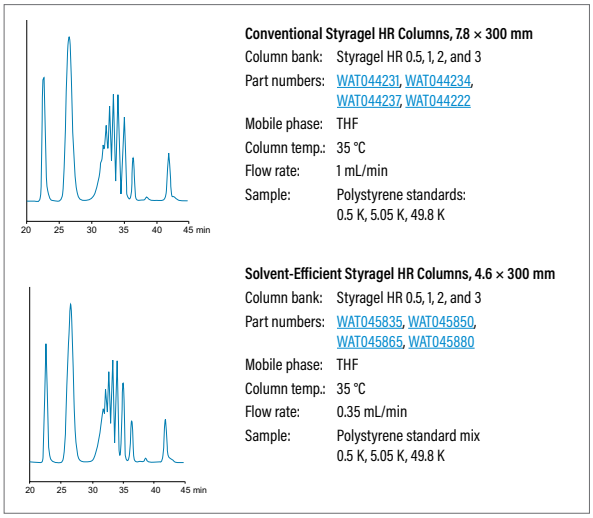
Styragel HR (High-Resolution) Columns

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



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)*

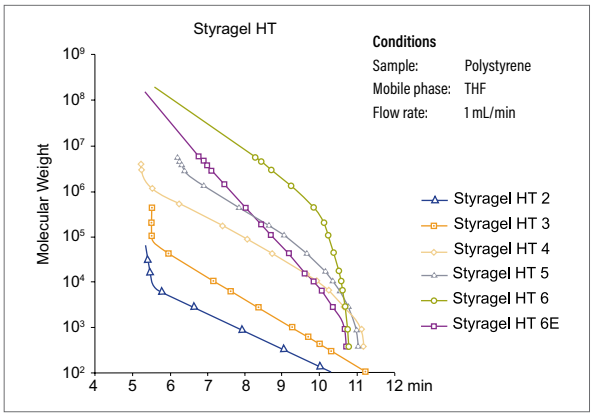
		P/N	P/N	P/N
Description	**Effective MW Range**	**THF**	**DMF**	**Toluene**
Styragel HR 0.5, 50 Å	0–1000	WAT045835	WAT045840	WAT045830
Styragel HR 1, 100 Å	100–5000	WAT045850	WAT045855	WAT045845
Styragel HR 2, 500 Å	500–20,000	WAT045865	WAT045870	WAT045860
Styragel HR 3, 10^3 Å	500–30,000	WAT045880	WAT045885	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.

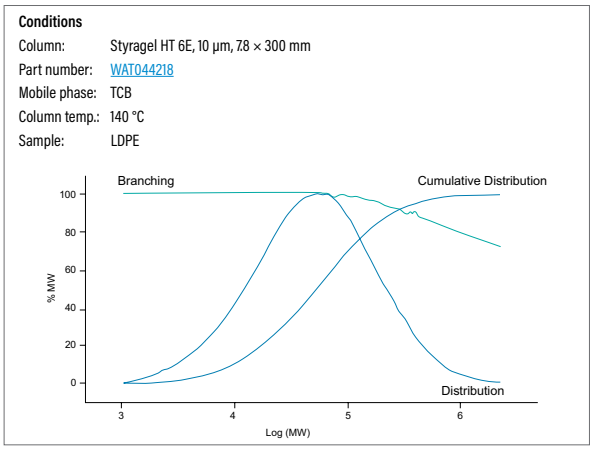
STYRAGEL HT (HIGH-TEMPERATURE) COLUMNS

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

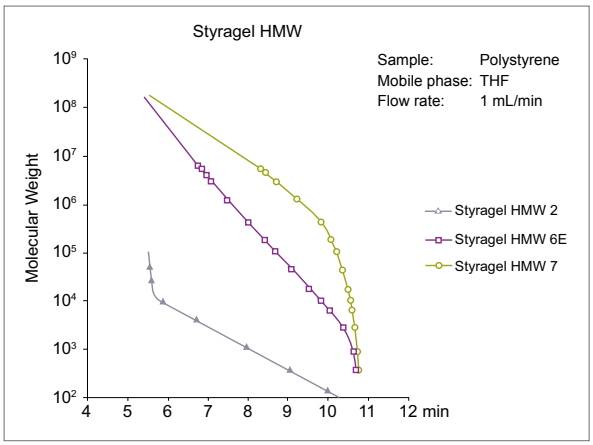
The Styragel HMW Columns are designed specifically to analyze polymers of ultra-high-molecular-weight, which are susceptible to shearing. Combining high-porosity, 10 µm frits and 20 µm particles, the Styragel HMW Columns minimize polymer shear effects. Usable at ambient or elevated temperatures, these state-of-the-art columns exhibit excellent lifetimes.

Ordering Information

Styragel HMW Columns (7.8 × 300 mm)

Description	Effective MW Range	P/N THF	P/N DMF	P/N 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)*

Description	Effective MW Range	P/N THF	P/N DMF	P/N 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)

Pore Size	Effective MW Range	Flow Rate (mL/min)	P/N Toluene	P/N 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)

Pore Size	Effective MW Range	P/N Toluene	P/N THF
100 Å	50–1500	WAT085500	WAT010570
500 Å	100–10,000	WAT085501	WAT010571

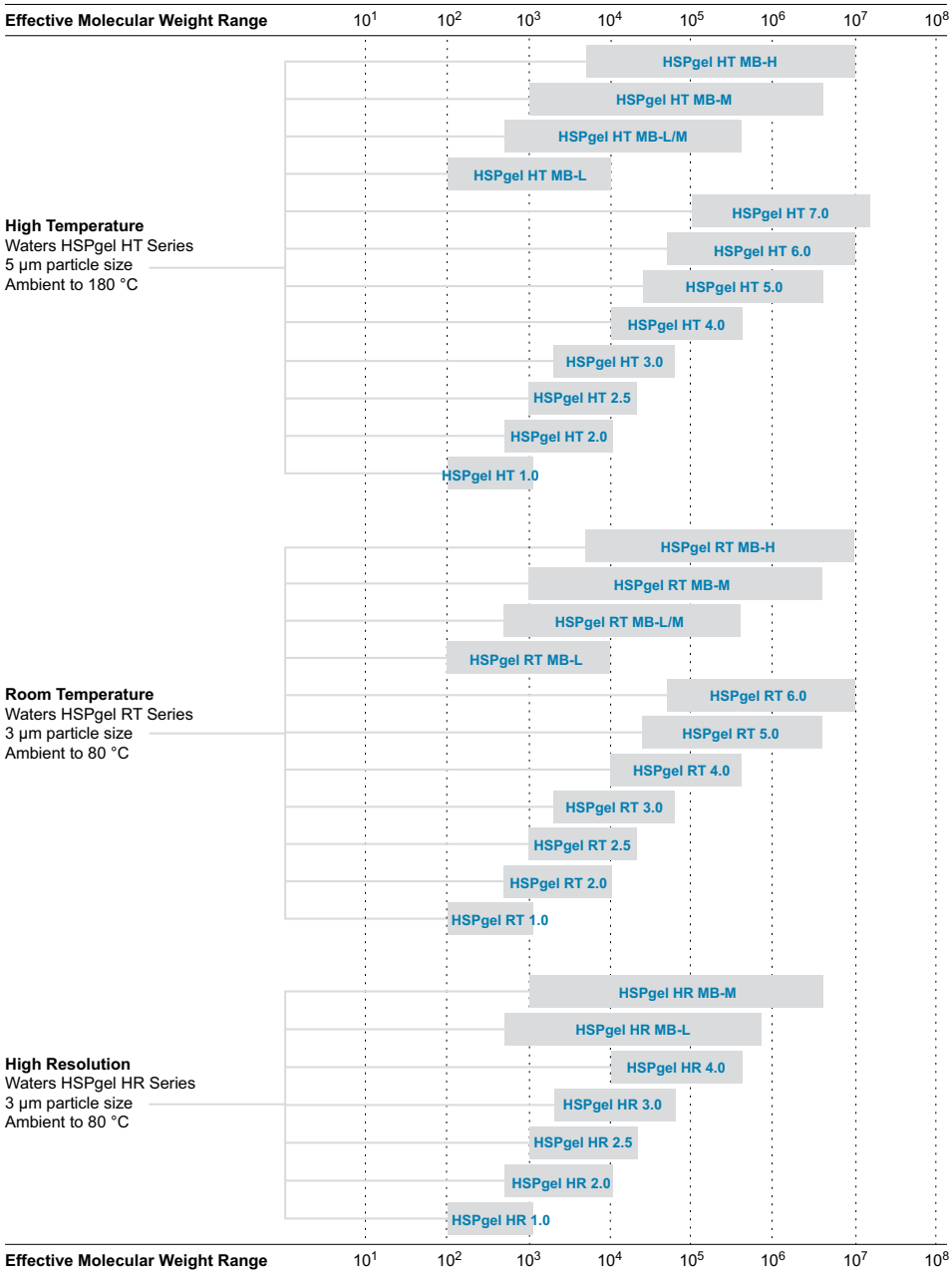
HSPgel COLUMNS

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
HT—High Temperature
L—Low MW Range
L/M—Low/Medium MW Range
RT—Room Temperature
MB—Mixed Bed
M—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	WAT030699
Shodex K-803	70,000	WAT034100
Shodex K-804	400,000	WAT034101
Shodex K-805	4,000,000	WAT034102
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

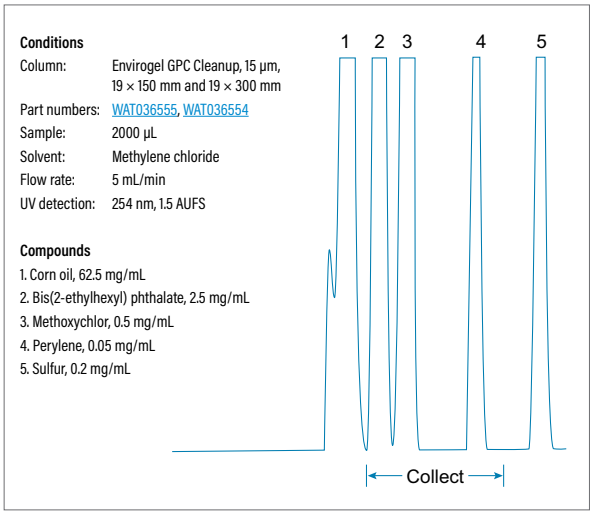
HFIP-800 Column Series

These columns have the same high efficiency as the K-series columns shipped in HFIP.

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



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

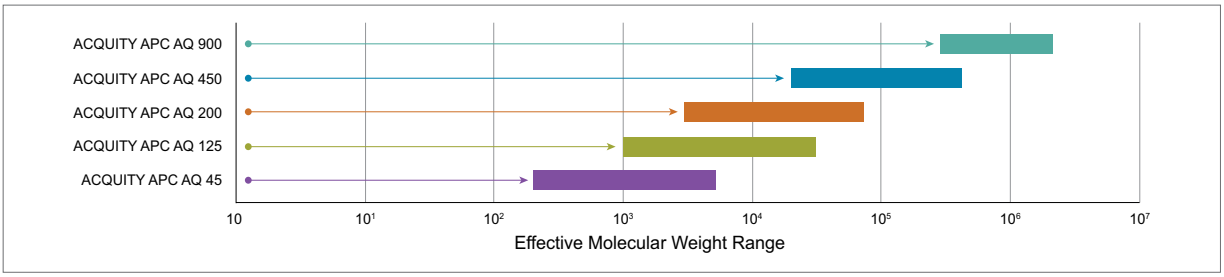
SEC Columns

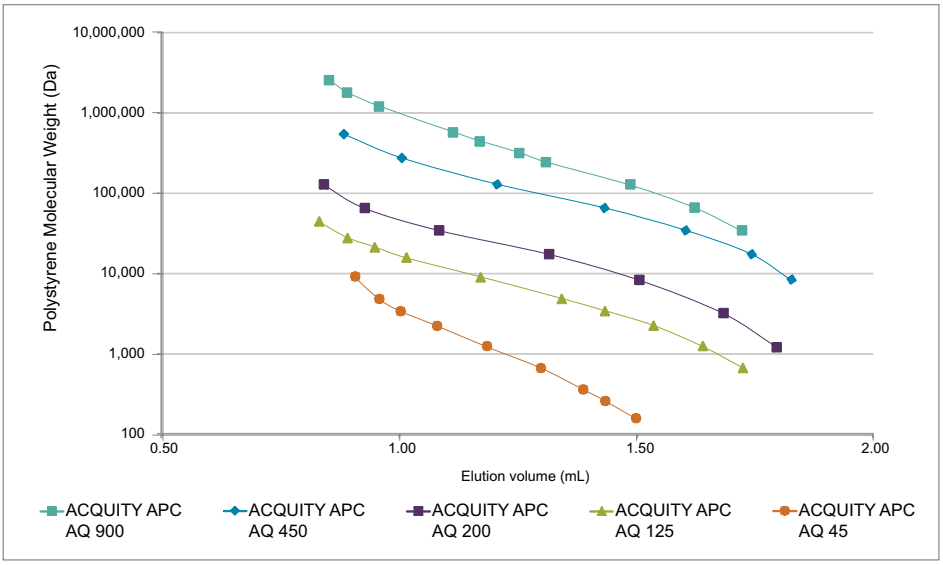
Size-exclusion chromatography (SEC) and gel-filtration chromatography (GFC) are synonymous terms for techniques used to separate macromolecules in aqueous environments according to their hydrodynamic volume. Waters SEC Columns efficiently separate cationic, anionic, and non-ionic macromolecules in many 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.

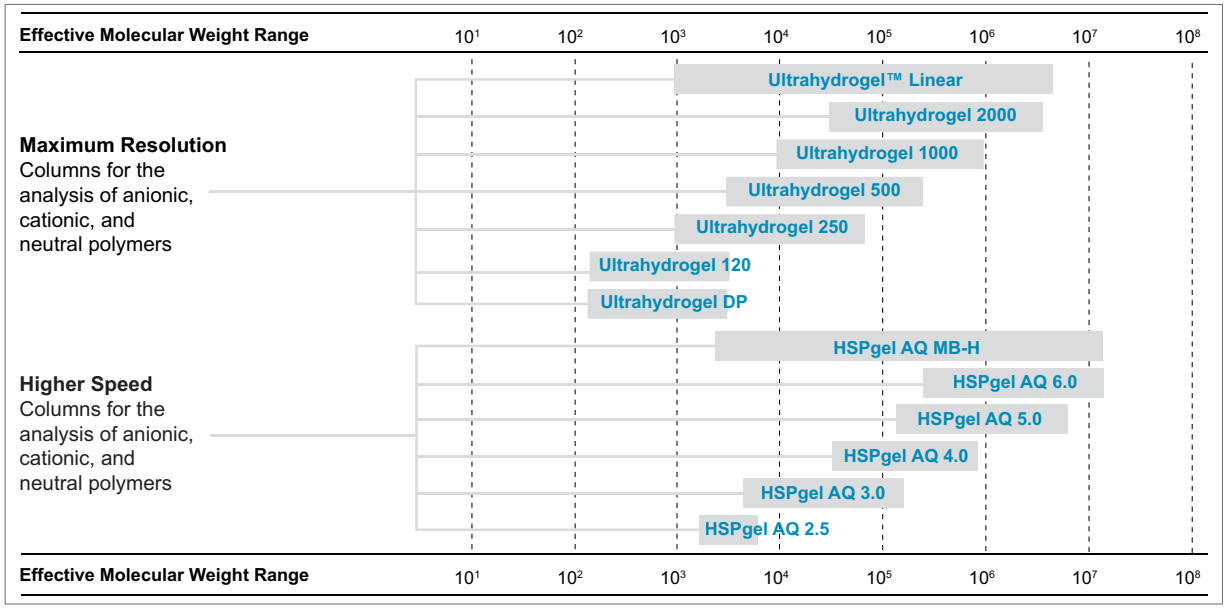
Ordering Information

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."

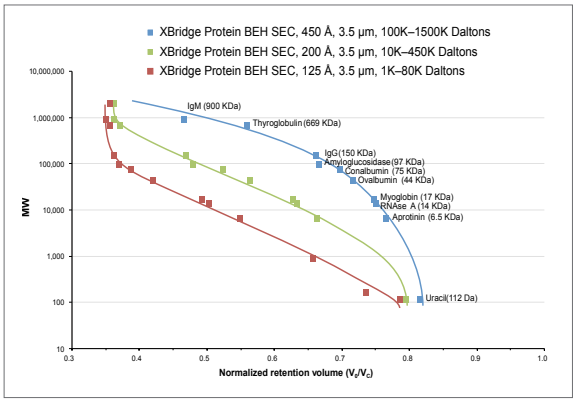
REVIEWER: Jang Shing Chiou

ORGANIZATION: Alcon Research Ltd.

XBRIDGE PROTEIN BEH SEC COLUMNS

XBridge Protein BEH SEC Columns containing 3.5 µm are primarily designed for use on HPLC instrumentation. These 3.5 µm guards and 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.



Four-Step Guide for Successful SEC Column Selection

What is the molecular weight of what you are trying to separate?			
NEED:	**MW 1–8 K Da**	**MW 10–450 / 650 K Da**	**MW 100–1500 K Da**
Recommended column specifications	125 Å	200 Å / 250 Å	400 Å

What type of LC system dispersion* are you using?			
NEED:	**<20 µL (UPLC)**	**>20–<35 µL (UHPLC)**	**>35 µL (HPLC)**
Recommended column specifications	1.7 µm or 2.5 µm	2.5 µm	2.5 µm or 3.5 µm

Do you need to resolve something that is less than 2-fold difference in MW?**			
NEED:	**2.5 µm**	**2.5 µm**	**2.5 µm or 3.5 µm**
REC. Recommended column specifications SPEC:	4.6 × 300 mm or 7.8 × 300 mm	7.8 × 300 mm	7.8 × 300 mm

Do you need maximum speed on a MW greater than two-fold?			
NEED:	**<9 min**	**<12 min**	**<18 min**
REC. Recommended column specifications SPEC:	1.7 µm 4.6 × 150 mm	2.5 µm 4.6 × 150 mm	2.5 µm 7.8 × 150 mm

**For guidance on measuring system dispersion, download the SEC Optimization Guide (720006067EN) on waters.com.*
*** To understand the "why" behind these recommendations, read the Application Note (720006336EN) on waters.com.*

Ordering Information

XBridge Protein BEH SEC Columns for HPLC System, 3.5 µm

Pore Size	Effective MW Range*	Particle Size	P/N Column Length 30 mm Guard w/Standard	P/N Column Length 150 mm w/Standard	P/N Column Length 300 m w/Standard
125 Å	1 K–80 K	3.5 µm	176003591	176003592	176003593
200 Å	10 K–450 K	3.5 µm	176003594	176003595	176003596
450 Å	100 K–1500 K	3.5 µm	176003597	176003598	176003599

Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

SEC Protein Standards are matched to the pore size of the column.

XBRIDGE PROTEIN BEH SEC COLUMNS FOR UHPLC-BASED SEPARATIONS

XBridge Protein BEH SEC Columns containing 2.5 µm are primarily designed for use on UHPLC instrumentation. These 2.5 µm guards and 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.

Ordering Information

XBridge Protein BEH SEC Columns, 2.5 µm, UHPLC

Pore Size	MW Range	Particle Size	P/N	P/N	P/N	P/N	P/N	P/N
			4.6 mm ID × Column Length					
			30 mm Guard	150 mm No Standard	300 mm No Standard	30 mm Guard w/ Std	150 mm w/Standard	300 mm w/Standard
125 Å	1 K–80 K	2.5 µm	186009170	186009171	186009172	176004331	176004332	176004333
200 Å	10 K–450 K	2.5 µm	186009174	186009175	186009176	176004334	176004335	176004336
450 Å	100 K–1500 k	2.5 µm	186006850	186009179	186009180	176002995	176002996	176002997

Pore Size	MW Range	Particle Size						
			7.8 mm ID × Column Length					
			30 mm Guard No Std	150 mm No Standard	300 mm No Standard	30 mm Guard w/Std	150 mm w/Standard	300 mm w/Standard
125 Å	1 K–80 K	2.5 µm	186009158	186009159	186009160	176004322	176004323	176004324
200 Å	10 K–450 K	2.5 µm	186009162	186009163	186009164	176004325	176004326	176004327

Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

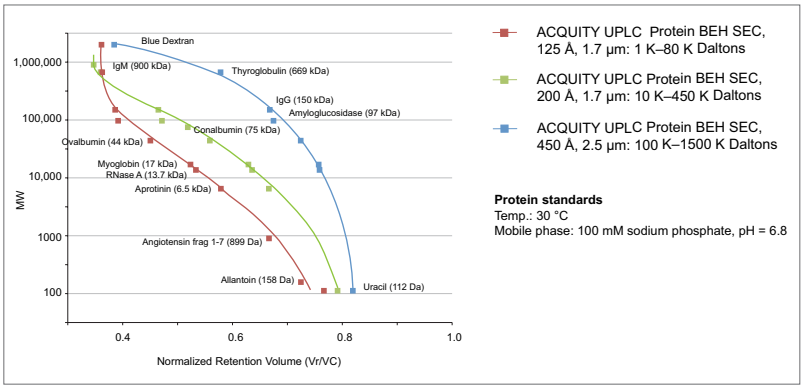
SEC Protein Standards are matched to the pore size of the column.

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.

NOTE: These columns were designed for use on low dispersion LC Systems in order to maintain the separation performance obtain on Columns containing these sub 2 micron SEC particles.

Calibration Curves on ACQUITY UPLC Protein BEH SEC, 125 Å, 200 Å, and 450 Å Columns



Ordering Information

ACQUITY UPLC Protein BEH SEC Columns, 1.7 and 2.5 µm

			P/N	P/N	P/N	P/N	P/N	P/N	P/N
Pore Size	MW Range	Particle Size	4.6 mm ID × Column Length						2.1 mm ID × CL
			30 mm Guard*	50 mm No Standard	150 mm No Standard	300 mm No Standard	150 mm w/Standard	300 mm w/Standard	50 mm No Standard
125 Å	1 K–80 K	1.7 µm	186006504	–	186006505	186006506	176003906	176003907	–
200 Å	10 K–450 K	1.7 µm	186005793	186009082	186005225	186005226	176003904	176003905	186008471
450 Å	100 K–1500 k	2.5 µm	186006850	–	186006851	186006852	176002996	176002997	–

Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

SEC Protein Standards are matched to the pore size of the column.
*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.
*To connect two UPLC SEC Columns together in series, we recommend using a Waters Sample Loop (p/n: 430001516).



APPLICATION AREA: Size Characterisation of Proteins

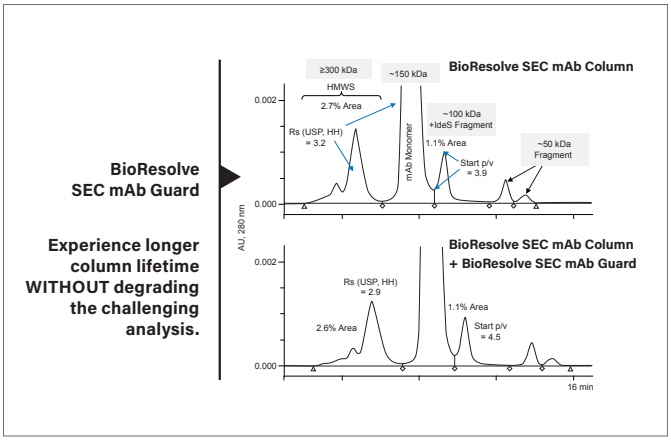
"We use the BEH columns for all our SEC runs. They are UPLC compliant and take around six minutes a run. This means they work fantastically well for high throughput screening and at least for our application they last much longer than other columns – we get >1000 runs per column. The only complaint is 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

BIORESOLVE SEC MAB FOR MONOCLONAL AGGREGATE, MONOMER, AND FRAGMENT ANALYSES

The BioResolve SEC mAb Guards and Columns contain 2.5 µm BEH particle technology and is application specifically tested with the mAb Size Variant Standard to help ensure accurate and highly reproducible quantitation of monoclonal antibody (mAb) monomers from frequently associated high molecular weight aggregates (≥300,000 Da) and lower molecular weight fragments (e.g., ≤100,000 Da). Use of 2.5 µm particles in with 4.6 mm or 7.8 mm ID make them well suited for use on Waters ACQUITY UPLCs, UHPLC, or HPLC platforms.

BioResolve mAb SEC Separation of mAb Size Variant



Ordering Information

BioResolve SEC mAb Columns, Guards, and Method Validation Kits

Pore Size	MW Range	Particle Size	P/N	P/N	P/N	P/N	P/N	P/N	
			4.6 mm ID × Column Length						
			30 mm Guard	150 mm No Standard	300 mm No Standard	150 mm w/Standard	300 mm w/Standard	150 mm Guard w/Std	300 mm Guard w/Std
200 Å	10 K–450 K	2.5 µm	186009443	186009435	186009437	176004592	176004593	176004596	176004597
Pore Size	MW Range	Particle Size	7.8 mm ID × Column Length						
			30 mm Guard	150 mm No Standard	300 mm No Standard	150 mm w/Standard	300 mm w/Standard	150 mm Guard w/Std	300 mm Guard w/Std
200 Å	10 K–450 K	2.5 µm	—	186009439	186009441	176004594	176004595	176004598	176004599

BioResolve SEC mAb Method Validation Kit – 200 Å, 2.5 µm, 4.6 × 150 mm Columns**	176004639
BioResolve SEC mAb Method Validation Kit – 200 Å, 2.5 µm, 4.6 × 300 mm Columns**	176004640
BioResolve SEC mAb Method Validation Kit – 200 Å, 2.5 µm, 7.8 × 150 mm Columns**	176004641
BioResolve SEC mAb Method Validation Kit – 200 Å, 2.5 µm, 7.8 × 300 mm Columns**	176004642
mAb Size Variant Standard, 160 g *	186009429

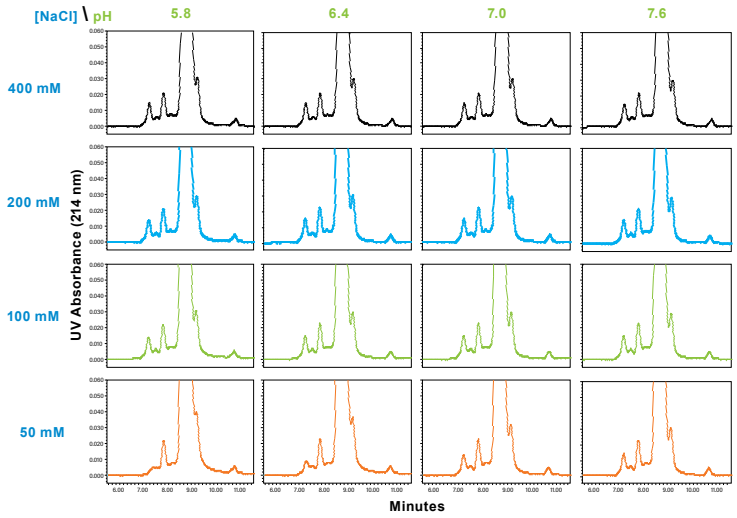
Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

SEC Protein Standards are matched to the pore size of the column.
** Method Validation Kit (MVK) contains three columns from three dierent batches.

ACQUITY AND XBRIDGE PREMIER PROTEIN SEC 250 Å COLUMNS

Waters advancements in MaxPeak PREMIER guard and column hardware as well as SEC BEH-PEO particle technology synergistically work to minimize non-desired secondary ionic or hydrophobic interactions between proteins and the SEC offering. This allows chromatographers to obtain reliable protein aggregate, monomer, and fragment analyses using a "generic" or "platform-type" method for LC or LC/MS applications. In addition, a cost and performance effective MaxPeak PREMIER Protein SEC 250 Å Guard column is available to effectively trap insoluble sample or eluent related particulates that can degrade column performance and shorten column life.

Universality of Method



Conditions

Column:	XBridge™ Premier SEC 250 Å, 2.5 µm, 7.8 × 300 mm
Mobile phase:	AutoBlend™ Plus (phosphate, NaCl, Empirical)
Flow rate:	0.75 mL/min
Column temp.:	25 °C
Sample:	Rituximab @ 10 mg/mL
Injection volume:	10 µL
LC system dispersion:	<10 µL

Ordering Information

MaxPeak Premier SEC 1.7 and 2.5 µm

Pore Size	MW Range	Particle Size	P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N
			4.6 mm ID × Column Length								
			30 mm Guard	150 mm No Standard	300 mm No Standard	150 mm w/Standard	300 mm w/Standard	150 mm w/Guard	300 mm w/Guard	150 mm Guard w/Std	300 mm Guard w/Std
250 Å	10 K–650 K	1.7 µm	—	186009963	186009964	176005071	176005072	176004783	176004784	176004794	176004795
250 Å	10 K–650 K	2.5 µm	186009969	186009959[5]	186009960	176005067	176005068	176004779	176004780	176004790	176004791

Pore Size	MW Range	Particle Size	P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N	P/N
			7.8 mm ID × Column Length								
			30 mm Guard	150 mm No Standard	300 mm No Standard	150 mm w/Standard	300 mm w/Standard	150 mm Guard w/Std	300 mm Guard w/Std	150 mm Guard w/Std	300 mm Guard w/Std
250 Å	10 K–650 K	1.7 µm	—	—	—	—	—	—	—	—	—
250 Å	10 K–650 K	2.5 µm	—	186009961	186009962	176005069	176005070	176004781	176004782	176004792	176004793

mAb Size Variant Standard, 160 g *	186009429
XBridge™ Premier Protein SEC 250 Å, 2.5 µm, 4.6 × 150 mm Column MVK	176004801
XBridge Premier Protein SEC 250 Å, 2.5 µm, 4.6 × 300 mm Column MVK	176004802
XBridge Premier Protein SEC 250 Å, 2.5 µm, 7.8 × 150 mm Column MVK	176004803
XBridge Premier Protein SEC 250 Å, 2.5 µm, 7.8 × 300 mm Column MVK	176004804
ACQUITY Premier Protein SEC 250 Å, 1.7 µm, 4.6 × 150 mm Column MVK	176004805
ACQUITY Premier Protein SEC 250 Å, 1.7 µm, 4.6 × 300 mm Column MVK	176004806

Straight Connection Tubing and End-fittings	WAT022681
U-Bend Connection Tubing and End-fittings	WAT084080

** Method Validation Kit (MVK) contains three columns from three dierent batches.

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

mAB SIZE VARIANT STANDARD

Waters mAb Size Variant Standard (p/n: 186009429) contains the NIST humanized monoclonal antibody (Reference Material 8671) and non-reduced IdeS digested NIST mAb fragments F(ab')2 (~100,000 Da) and (Fc/2)2 (~50,000 Da). By aliquoting small, standard amounts of IdeS fragments, Waters mAb size variant standard can be effectively used to test column and LC System ability to separate mAb aggregates, monomer, and fragments/clips via SEC.



Ordering Information

mAb Size Variant Standard

Description	P/N
mAb Size Variant Standard	186009429

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.



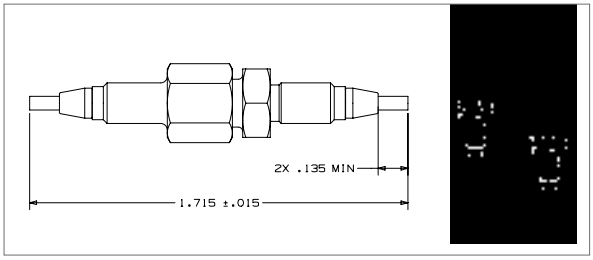
Ordering Information

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 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)	205001172
ACQUITY CM-S 3-Column Bank Connection Kit 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)	205001171
ACQUITY CM-S 2-Column Bank Connection Kit 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)	205001169

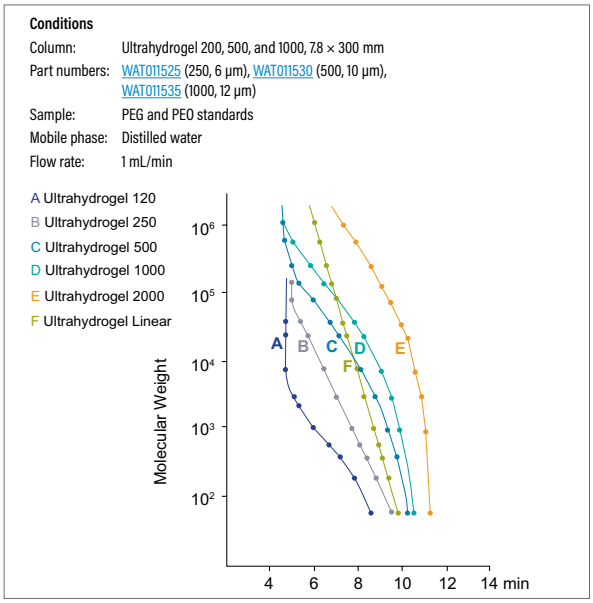
ULTRAHYDROGEL COLUMNS

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.

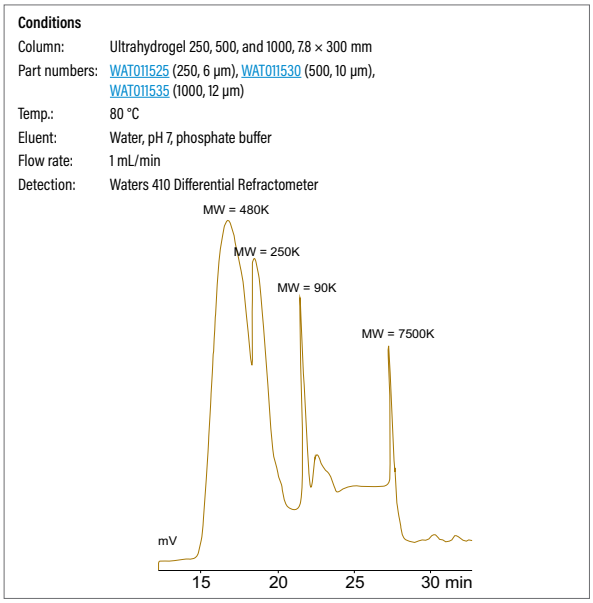
These 7.8 × 300 mm, high-resolution columns offer many advantages over conventional aqueous SEC columns:

- 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)*

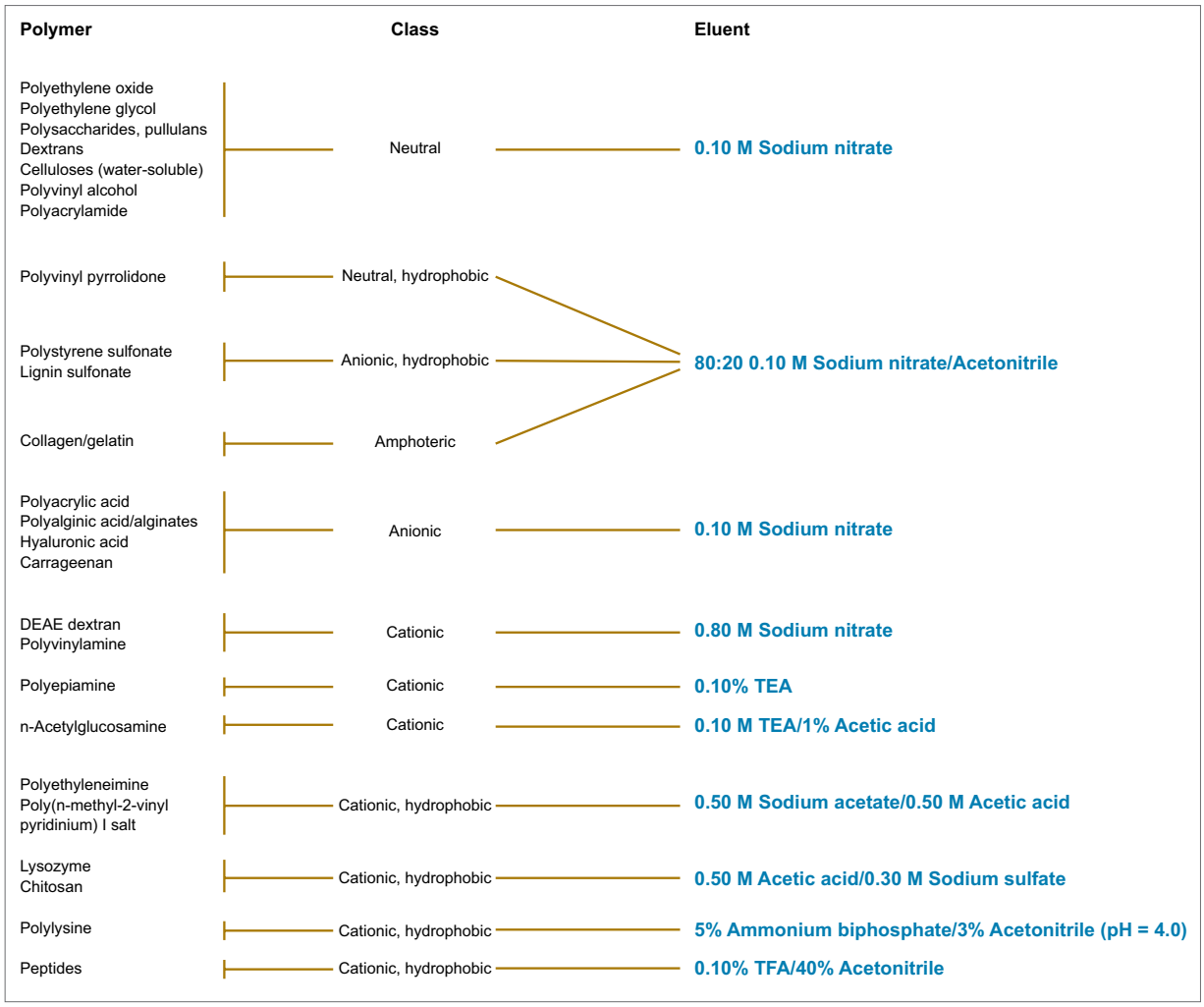
Description	Pore Size	Particle Size	Exclusion Limit	P/N
Ultrahydrogel 120	120 Å	6 µm	5000	WAT011520
Ultrahydrogel 250	250 Å	6 µm	80,000	WAT011525
Ultrahydrogel 500	500 Å	10 µm	400,000	WAT011530
Ultrahydrogel 1000	1000 Å	12 µm	1,000,000	WAT011535
Ultrahydrogel 2000	2000 Å	12 µm	7,000,000	WAT011540
Ultrahydrogel 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.

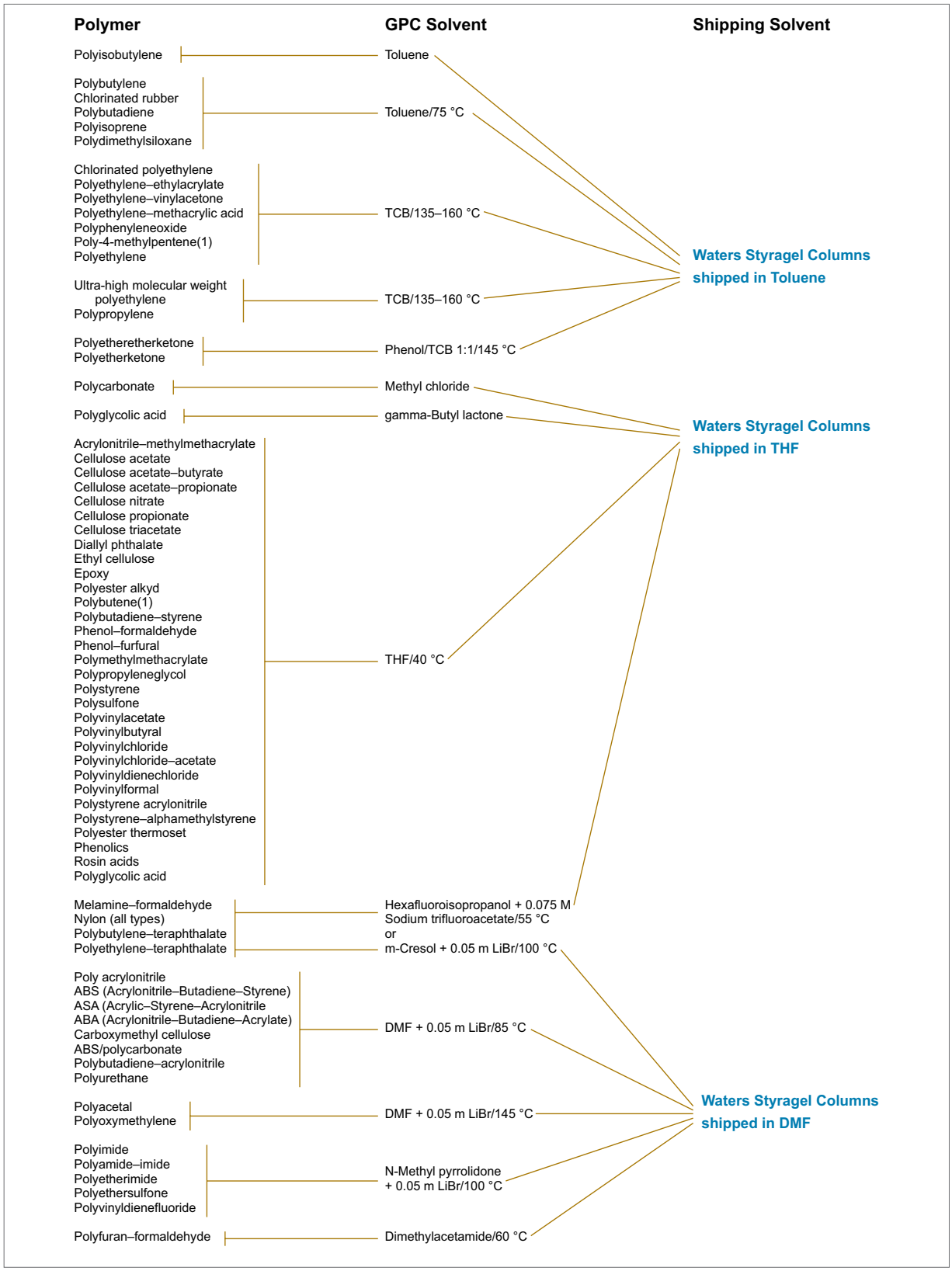
Solvent Guide

The following graphic is a guide for eluents.

Aqueous SEC Solvent Selection Guide



Non-Aqueous GPC Solvent Selection Guide

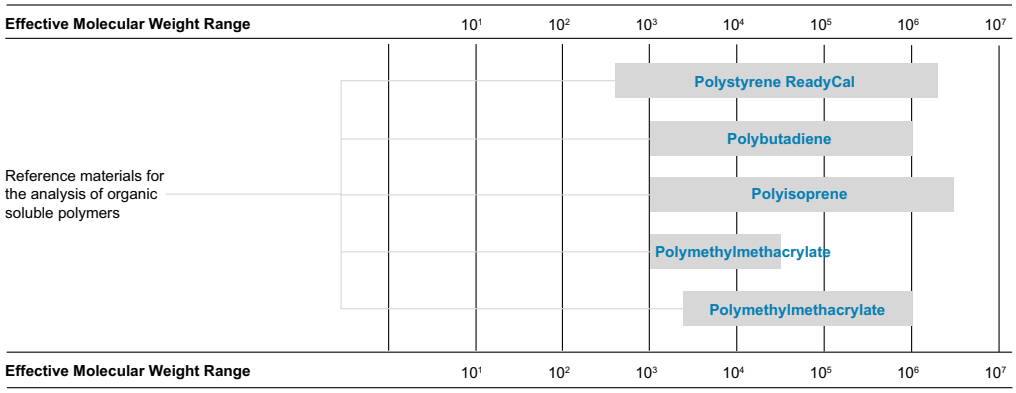


For more information on XBridge Protein BEH SEC Columns, refer to page 428.

Calibration Standards

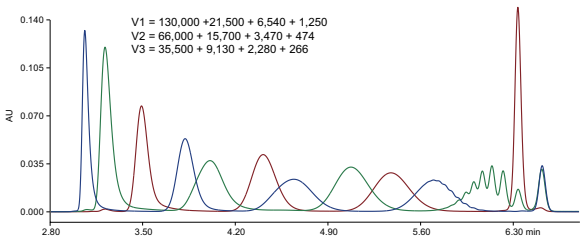
Waters offers a selection of well-characterized polymer standards for calibration. The offering includes kits as well as individual standards. The standards are available for aqueous and non-aqueous applications.

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.



Medium MW standards
MW: 266–130,000
Columns: 45 Å + 125 Å + 200 Å
150 mm each
THF at 0.8 mL/min
10 µL PDA @ 254 nm

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 15.5 K, 4.71 K, 1.25 K Vial 2: MW 8.90 K, 3.46 K, 0.570 K Vial 3: MW 6.67 K, 2.25 K, 0.266 K	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 125 K, 21.2 K, 6.67 K, 1.25 K Vial 2: MW 62.5 K, 15.5 K, 3.46 K, 0.570 K Vial 3: MW 35.4 K, 8.90 K, 2.25 K, 0.266 K	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 1760 K; and 1.5 mg 271 K, 34. 0 K, 3.46 K Vial 2: 0.75 mg MW 1170 K; and 1.5 mg 125 K, 17. 3 K, 0.570 K Vial 3: 1.5 mg MW 554 K, 62.5 K, 8.9 0 K, 0.266 K	266–2,500,000	186007541
ACQUITY APC Polystyrene Method Development MW Calibration Kit Three vials containing the following: Vial 1: 0.75 mg Mp 1210 K; and 1.5 mg 130 K, 17.6 K, 0.474 K Vial 2: 0.75 mg Mp 1800 K; and 1.5 mg 277 K, 34.8 K, 3.47 K Vial 3: 1.5 mg Mp 552 K, 66.0 K, 9.13 K, 0.266 K Vial 4: 1.5 mg Mp 66.0 K, 15.7 K, 3.47 K, 0.474 K Vial 5: 1.5 mg Mp 130 K, 21.5 K, 6.54 K, 1.25 K Vial 6: 1.5 mg Mp 35.5 K, 9.13 K, 2.28 K, 0.266 K Vial 7: 1.5 mg Mp 15.7 K, 4.92 K, 1.25 K Vial 8: 1.5 mg Mp 9.13 K, 3.47 K, 0.474 K Vial 9: 1.5 mg Mp 6.54 K, 2.28 K, 0.266 K 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 12.5 K, 4.14 K, 0.997 K Vials 2: MW 9.59 K, 3.15 K, 0.573 K Vials 3: MW 6.27 K, 2.26 K, 0.202 K	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 199 K, 40.3 K, 6.27 K, 0.997 K Vials 2: MW 107 K, 23.2 K, 4.14 K, 0.573 K Vials 3: MW 69.0 K, 12.5 K, 2.26 K, 0.202 K	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 199 K, 23.2 K, 6.37 K Vial 2: 1.5 mg MW 592 K, 86.7 K, 12.5 K, 0.573 K Vial 3: 1.5 mg MW 335 K, 40.3 K, 6.27 K, 0.202 K	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 1600 K; and 1.5 mg Mp 201 K, 23.5 K, 2.38 K Vial 2: 1.5 mg Mp 608 K, 88.5 K, 12.6 K, 0.602 K Vial 3: 1.5 mg Mp 340 K, 41.4 K, 6.37 K, 0.202 K Vial 4: 1.5 mg Mp 108 K, 23.5 K, 4.23 K, 0.602 K Vial 5: 1.5 mg Mp 201 K, 41.4 K, 6.37 K, 1.102 K Vial 6: 1.5 mg Mp 71.8 K, 12.6 K, 2.38 K, 0.202 K Vial 7: 1.5 mg Mp 12.6 K, 4.23 K, 1.102 K Vial 8: 1.5 mg Mp 9.68 K, 3.21 K, 0.602 K Vial 9: 1.5 mg Mp 6.37 K, 2.38 K, 0.202 K 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

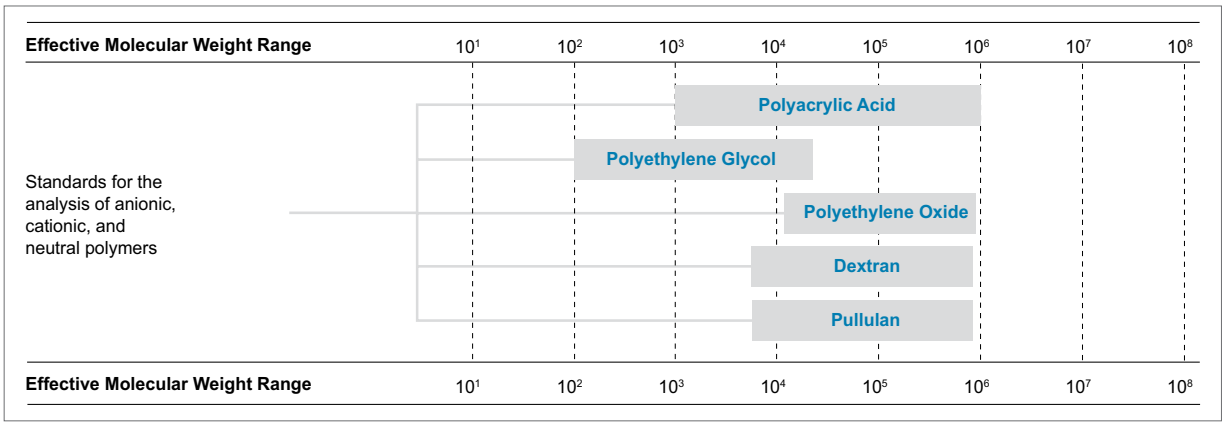
Description*	P/N
Polystyrene Standard 430,000 5 g/vial polystyrene, 430,000 MW	WAT011612
Polystyrene Standard 780,000 5 g/vial polystyrene, 780,000 MW	WAT011614
Polystyrene Standard 1,300,000 1 g/vial polystyrene, 1,300,000 MW	WAT011616
Polystyrene Standard 2,800,000 1 g/vial polystyrene, 2,800,000 MW	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.

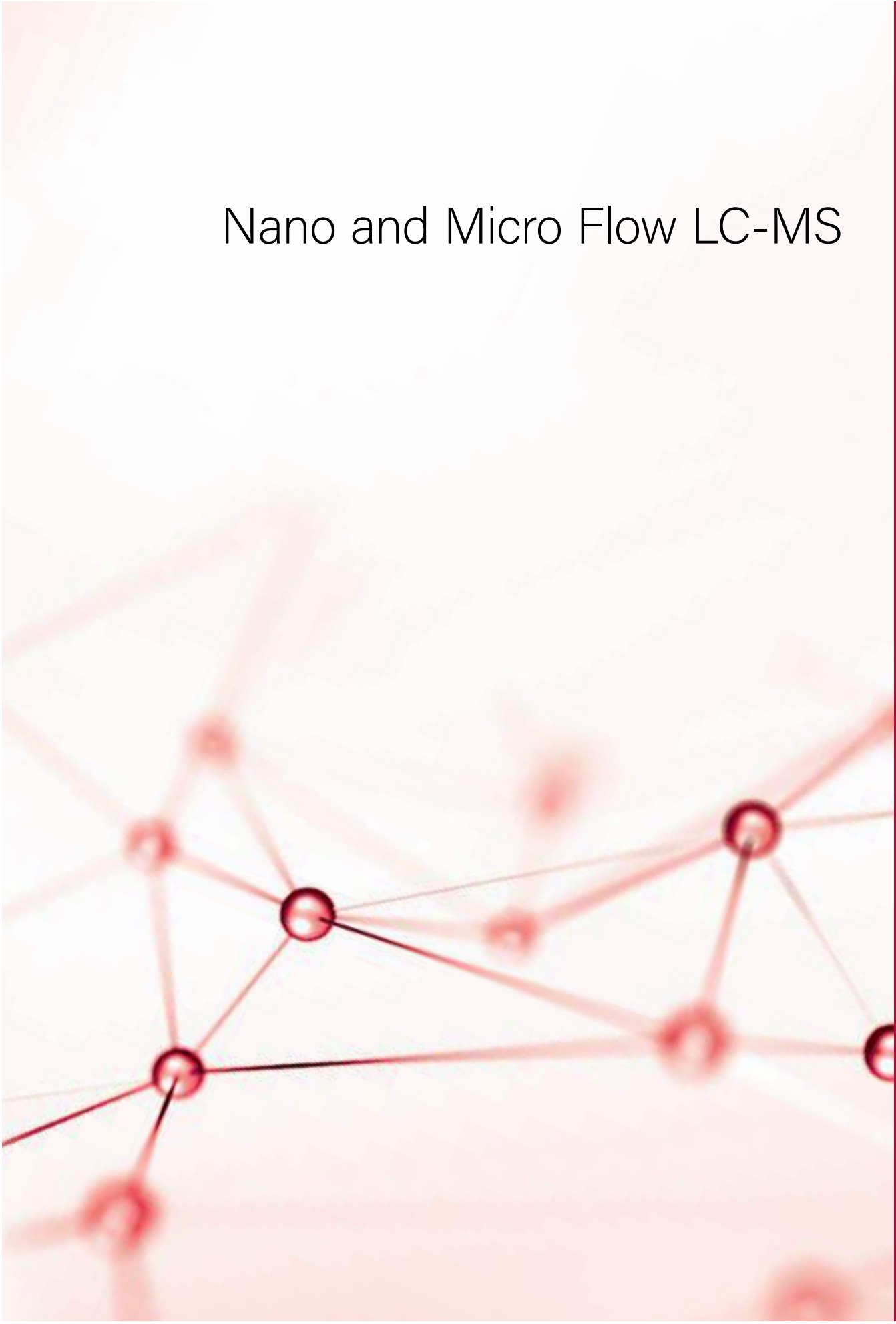
Ordering Information

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

ionKey/MS **485**
Simplified Micro-Flow LC-MS with Enhanced Sensitivity 485

iKey Separation Device **486**

Nano- and Micro-Flow Columns and Trapping Columns **488**
Separation Columns 488
Trapping Columns 488

ACQUITY UPLC M-Class with HDX Technology **490**
Enzymate Pepsin Online Digestion Column 490

LC-MS Accessories **491**
TruView LCMS Certified Vials 491
Waters Certified Containers 492
pH Buffers 492

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.

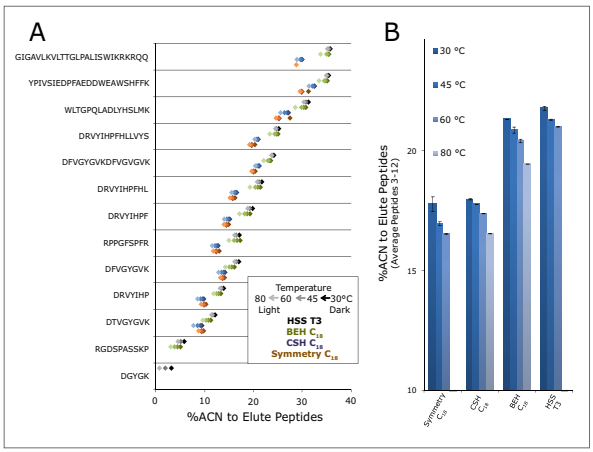
The selected stationary phases for nano-LC columns facilitate the efficiency and selectivity required for separations of complex peptide and protein separations as well as other sample-limited analyses.

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



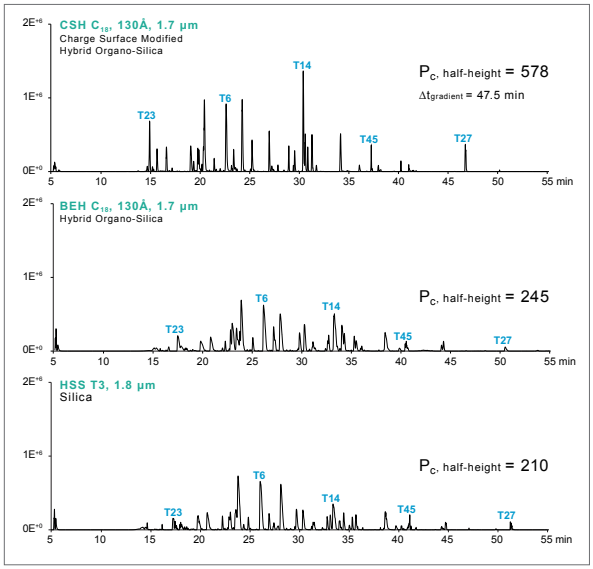
Peptide retentivity comparison of different stationary phases, including Symmetry Silica (the lower retention of Symmetry is used in trap-elute separations).

For more information on Waters Particle Technology, please refer to page 85.

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.

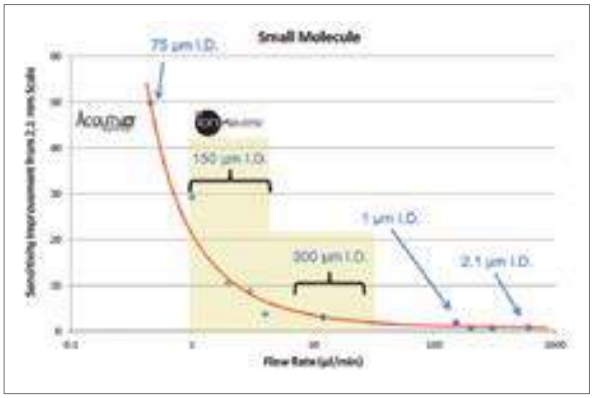
In micro-flow LC-MS, the inner diameter of the separation column, and thus the flow rate of the mobile phase can dramatically alter the sensitivity of the mass spectrometry as follows:

- 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

ionKey/MS™



- 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

zenFiT™ Connection Technology



- 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

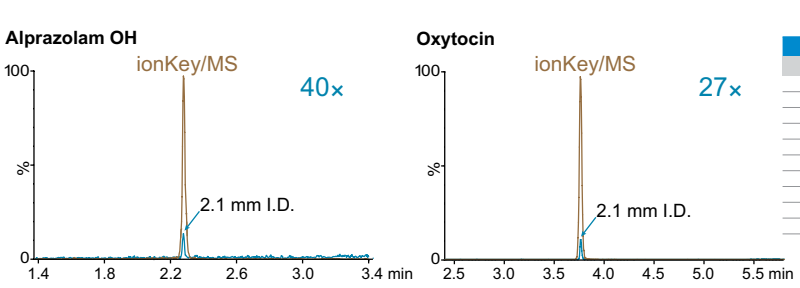
SIMPLIFIED MICRO-FLOW LC-MS WITH ENHANCED SENSITIVITY

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

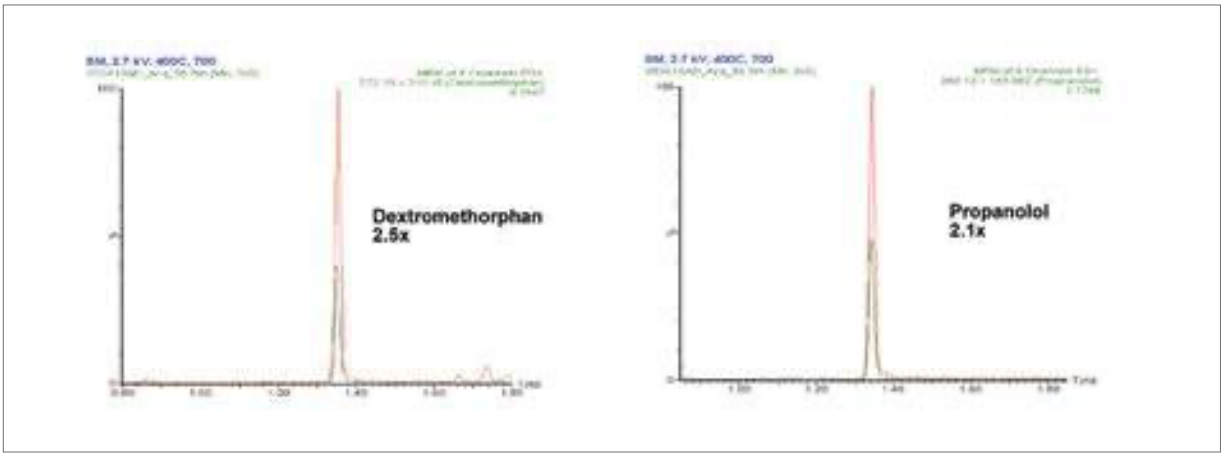


UPLC/MRM comparison of ionKey/MS relative to 2.1 mm I.D. chromatography

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 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

	Dimension	P/N (1/pk)
	Particle Size: 1.7 µm	
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



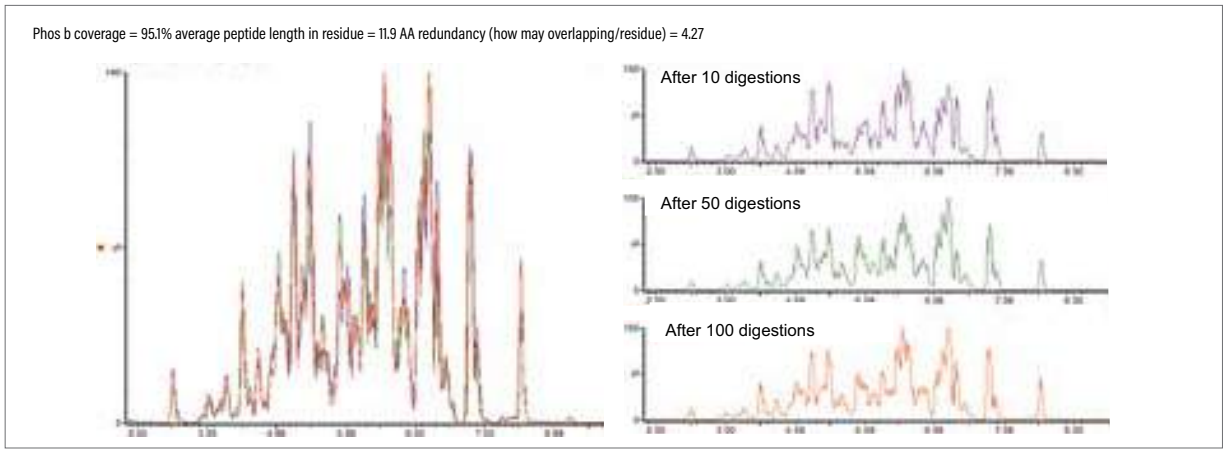
Enzymate Pepsin Online Digestion Column.

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:

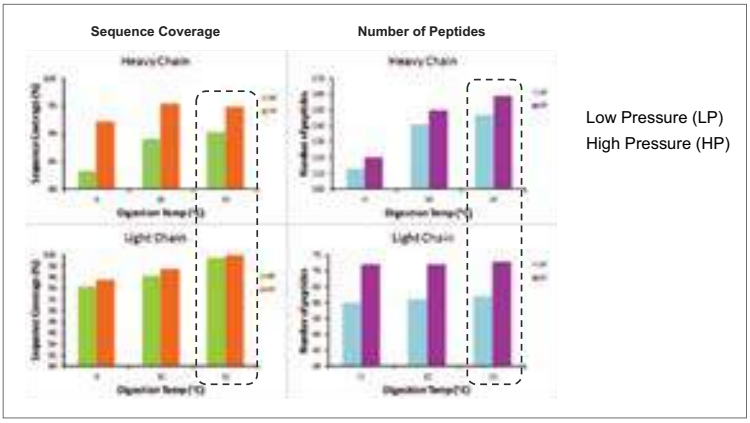
- Fast, reproducible, and efficient online protein digestion, typically within 30 seconds
- Shortened preparation time (overall) for protein samples
- Ability to optimize the efficiency of protein digestion by changing temperature, flow rate, or both

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, Kits, and Spare Parts

Contents

Application-Specific Columns **495**
- Sugar and Carbohydrate Analysis 495
- Fermentation Analysis, Organic Acids, Alcohols, and Carbohydrates 497
- Free Fatty Acid Analysis 498
- Polar Pesticide Analysis 498
- Polyaromatic Hydrocarbon Analysis 499
- Ion Analysis 500

Amino Acid Analysis **501**
- UPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis Solution 502
- UHPLC and HPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis 503
- Released N-Glycan Analysis 509
- GlycoWorks *Rapi*Fluor-MS Released N-Glycans Sample Preparation 510
- Automation of Released N-Glycan Analysis 511
- Phosphoglycan SPE Buffer Improves Recovery 511
- Glycan Performance Test Standards and Dextran Calibration Ladders 513

Application-Specific Kits – Bioanalysis **514**
- ProteinWorks SAMPLE PREPARATION KITS for Protein Quantification 514
- Therapeutic Peptide Method Development Kits 516

Application-Specific Kits – Clinical Research **517**
- Kairos Amino Acid Ki 517
- SARS-CoV-2 LC-MS Kit 519

Application-Specific Kits – Food and Environmental **521**
- Acrylamide Analysis Kits 521
- ACQUITY UPLC Bisphenol A Column and Method Kits 522
- Beverage Analysis Kit 522
- Carbamate Analysis Kits 523
- EPA Method 1694 Analysis Kit 523
- Oasis WAX for PFAS Analysis 523

Spare Parts **524**
- Column and Cartridge Fittings 524
- PEEK Tubing and Fittings 524
- LC System Filters 527

Application-Specific Columns, 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 - Semi-macropore 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	Semi-macropore 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 Fruit 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 Column	7.8 × 150 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:

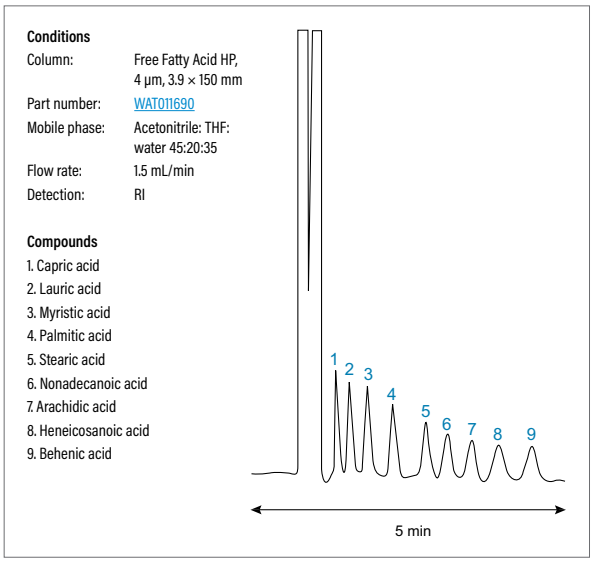
- Straight chain saturated acids, which elute in order of increasing carbon number
- Unsaturated acids which elute before the analogous saturated compound
- Carbon number and chain configuration: the greater the unsaturation, the earlier the elution

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



POLAR PESTICIDE ANALYSIS

Analyze, Without the Need to Derivatize

Waters Anionic Polar Pesticide Column has been designed specifically to provide quick, reproducible testing methods for highly anionic polar pesticides in agriculture products and finished foods. Polar pesticides such as Glyphosate can be challenging to analyze due to their zwitterionic properties and highly polar nature, however, the Anionic Polar Pesticide column provides application specific column chemistry for ease-of-use, quicker results and reliable low-level detection while maintaining key analyte separations.

- Extended Peak Shape Integrity
- Maintain Key Analyte Separations
- Retention Without Derivatization
- Reliable Low-Level Detection – No Need for Non-MS Friendly Buffers



Ordering Information

Anionic Polar Pesticide Columns

Description	Dimension	Qty.	P/N
Anionic Polar Pesticide, 130 Å, 5 µm Column	2.1 × 50 mm	1/pk	186009286
Anionic Polar Pesticide, 130 Å, 5 µm Column	2.1 × 100 mm	1/pk	186009287
Anionic Polar Pesticide, 130 Å, 5 µm Column	2.1 × 150 mm	1/pk	186009288
Anionic Polar Pesticide VanGuard, 130 Å, 5 µm Cartridge	2.1 × 5 mm	3/pk	186009285

POLYAROMATIC HYDROCARBON ANALYSIS

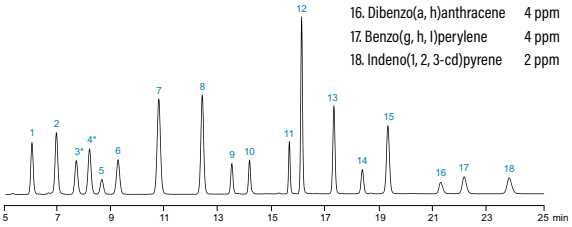
Waters PAH Columns are optimized for the HPLC analysis of polyaromatic hydrocarbons to achieve baseline resolution for 16 target analytes in fewer than 25 minutes. These columns are available in seven dimensions (including a capillary format) and two particle sizes. A complete certificate of analysis 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

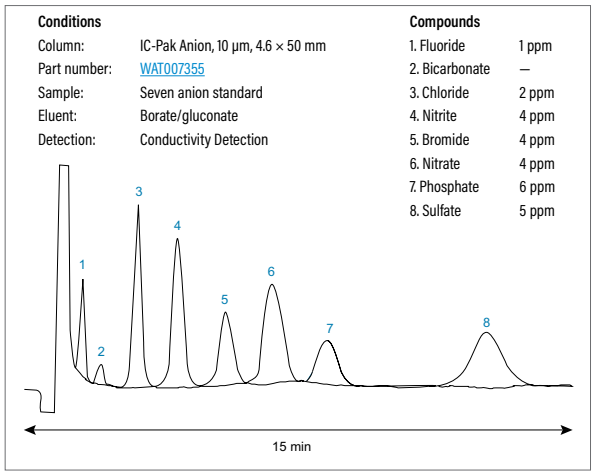
ION ANALYSIS

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 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]

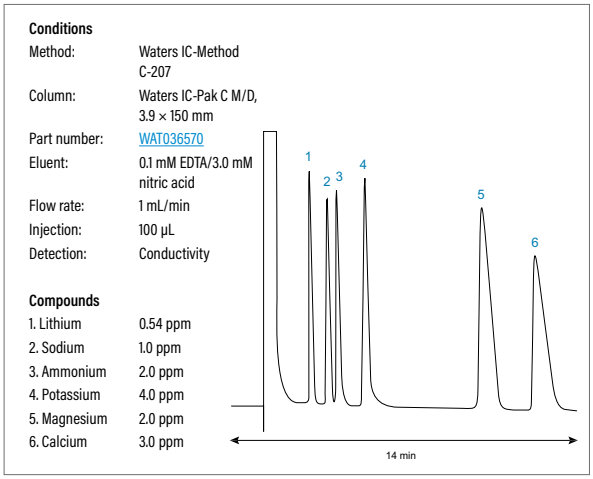
[9]Requires Guard-Pak Holder, p/n: WAT088141.

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



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. For LC-MS based physiological amino acid analysis solution, please refer to Kairos in Application Specific Columns, Kits, and Spare Parts chapter.

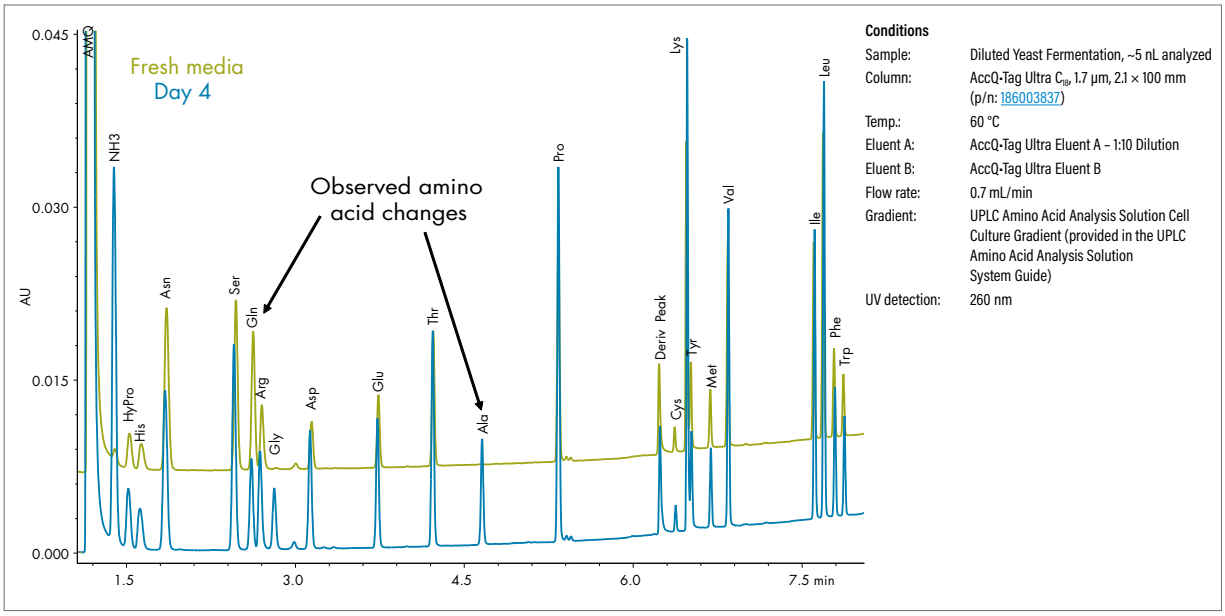
The accurate identification and quantification of amino acids in biological research and in the development and commercialization of food, beverage, and biotherapeutic products is challenging. This set of analytes covers a wide range of chemical properties (e.g., acidic, basic, neutral), yet resolution 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 C_{18}.

Pico•Tag Method	AccQ•Tag Method	AccQ•Tag Ultra C_{18} 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 C_{18} 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

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 C_{18} 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 pre-column derivatization 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 H-Class (quaternary*) System with a tunable UV detector for enhanced chromatographic resolution and maximum-sensitivity detection
- AccQ•Tag Ultra C_{18} derivatization chemistries including quality-controlled 1.7 µm columns, reagents, and eluents
- Empower™ 3 pre-configured projects, methods, and report templates
- Installation and application training and support
- Connections INSIGHT™ ISDP instrument diagnostics to ensure continuous, consistent, and reliable operation
- Standards and kits to validate and troubleshoot

** Amino acid analysis can be performed on other systems such as ACQUITY UPLC H-Class PLUS Binary and ACQUITY Premier Binary systems. These are not considered as a total solution.*

UHPLC AND HPLC: AccQ•Tag ULTRA C_{18} AMINO ACID ANALYSIS

In 2022, Waters expanded its Amino Acid Analysis offerings with the introduction of the same BEH-based, C_{18} columns (as used in UPLC-based applications) but using 2.5 µm particles all amino analysis batch tested to work on UHPLC and HPLC systems with <70 µl dispersion with UV detection. These columns combined with the AccQ•Tag Ultra C_{18} pre-column derivatization kit for 250 analyses, completes this flexible portfolio to help scientists quickly and accurately obtain accurate quantitative data in half the time compared to use of legacy HPLC methods with FLR detection. Samples can now be successfully analyzed in under an hour.

** This is not a full system solution but a detailed care and use manual is available to help successfully use this offering on appropriate LC Systems.*

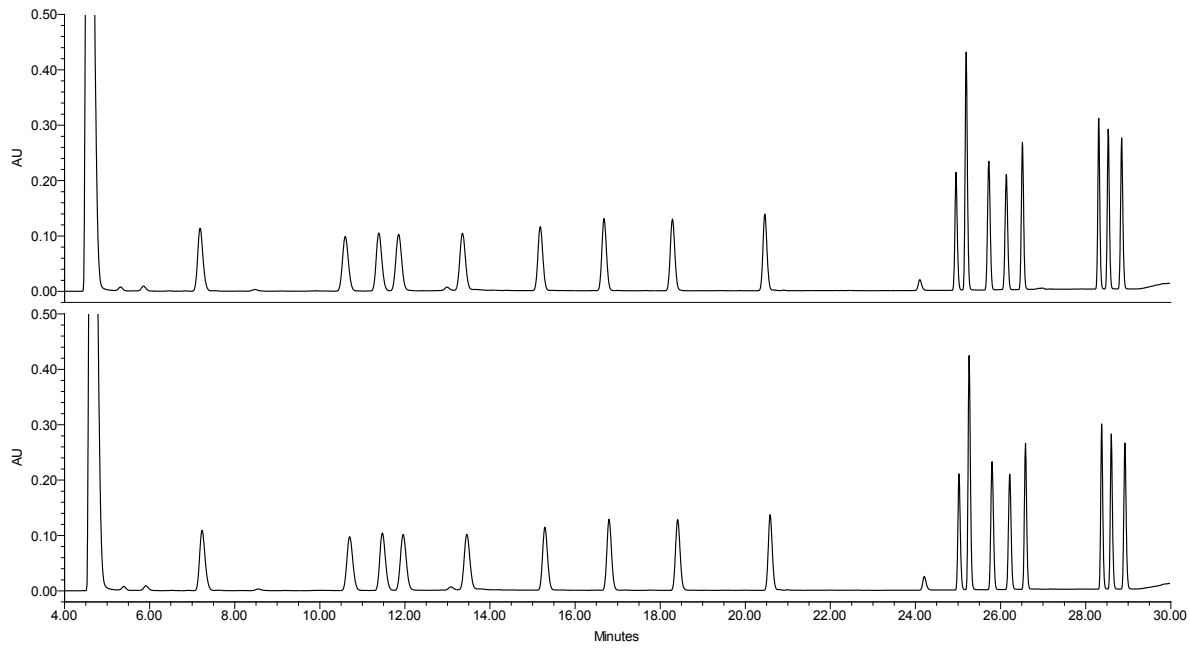
Hydrolysate Standard (500 µm) Chromatographic Comparison

Conditions

LC systems:	Waters Arc HPLC with 2998 Detector (10 mm HPLC Analytical Flow Cell) and 30 cm CHC with Passive Preheater. Note: Total LC System Dispersion without column or guard > 70 µL.
Detection:	UV @ 260 nm
Column:	AccQ•Tag Ultra C_{18}, 2.5 µm Column 4.6 × 150 mm (p/n: 186010407)
Guard:	AccQ•Tag Ultra C_{18}, 2.5 µm VanGuard Cartridge 3.9 × 5 mm (p/n: 186010407®)
Column temp.:	43 °C
Sample temp.:	20 °C
Injection volume:	5.0 µL
Flow rate:	1.5 mL/min
Mobile phase A:	AccQ•Tag Eluent A (p/n: 186003838)
Mobile phase B:	90:10 (v/v) Water:AccQ•Tag Ultra Eluent B
Mobile phase C:	Milli-Q Water
Mobile phase D:	AccQ•Tag Eluent B (p/n: 186003839)

Gradient

	Time (min)	Flow (mL/min)	%A	%B	%C	%D	Curve
1	Initial	1.500	10.0	0.0	90.0	0.0	Initial
2	0.86	1.500	10.0	0.0	90.0	0.0	11
3	20.17	1.500	9.0	80.0	11.0	0.0	7
4	25.57	1.500	8.0	16.0	60.0	16.0	7
5	26.24	1.500	8.0	16.0	58.0	18.0	6
6	27.55	1.500	7.8	0.0	70.9	21.3	6
7	28.70	1.500	4.0	0.0	36.3	59.7	6
8	30.58	1.500	4.0	0.0	36.3	59.7	6
9	30.88	1.500	10.0	0.0	90.0	0.0	6
10	35.98	1.500	10.0	0.0	90.0	0.0	6



Analysis of Protein Hydrolysate standard on the AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 150 mm Column with (top) and without AccQ•Tag Ultra C_{18}, 2.5 µm VanGuard Cartridge 3.9 × 5 mm (bottom) installed on a Waters Arc HPLC with 2898 Detector. 1) AMQ, 2) His, 3) Ser, 4) Arg, 5) Gly, 6) Asp, 7) Glu, 8) Thr, 9) Ala, 10) Pro, 11) Derivatization peak, 12) Cys, 13) Lys, 15) Tyr, 15) Met, 16) Val, 17) Ile, 18) Leu, 19) Phe.

AccQ•Tag Ultra C_{18} HPLC Chemistry

The AccQ•Tag Ultra C_{18} Chemistry is an integral component of the Waters 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 C_{18} Chemistry without the rest of the application solution is not supported as an Amino Acid Analysis method.

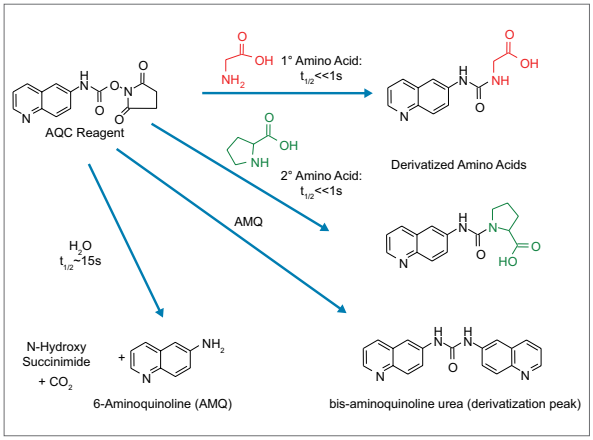
AccQ•Tag Ultra C_{18} Chemistry is different from the AccQ•Tag HPLC method, that uses an HPLC Column containing 100% Silica-based C_{18}, 4 µm particles, described later in this chapter. Although the components of the two derivatization kits are the same, the QC tests are based on the specific separation 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 C_{18} 1.7 µm and 2.5 µm Guard and Columns have a completely different chemistry from the AccQ•Tag HPLC Column. The AccQ•Tag Ultra C_{18} Columns leverage Waters 1.7 µm and 2.5 µm hybrid-silica BEH Technology particles that deliver excellent column efficiency and resolution. The AccQ•Tag Ultra C_{18} 1.7 µm Column is designed for use on Waters ACQUITY™ UPLC Systems and include use of Waters eCord™ Intelligent Chip Technology that is permanently attached to the column to easily track use history. The mobile phases used in the AccQ•Tag Ultra C_{18} method is different from that used for the AccQ•Tag HPLC method, each being optimized for the specific column and detection technique.

Compared to traditional HPLC methods, Waters UPLC Amino Acid Analysis Solution, that uses the AccQ•Tag Ultra C_{18}, 1.7 µm Column, 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 C_{18} 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

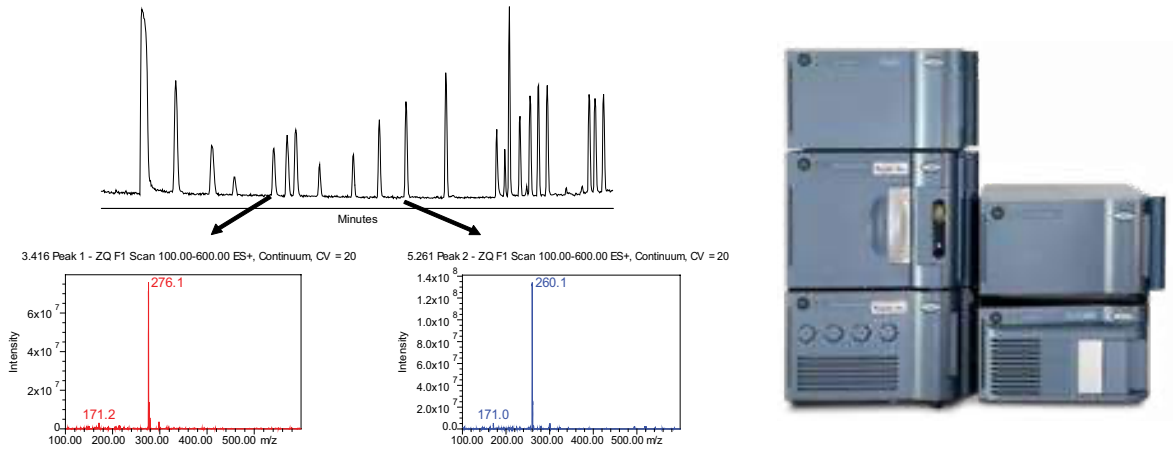
Chemistry of the AccQ•Tag Derivatization Reaction



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

Amino acid analysis is required in many applications in pharmaceutical and food and feed industries. A variety of standards containing free amino acids are offered for qualitative and quantitative determination of amino acids, method development, and troubleshooting of the AccQ•Tag™ Ultra C_{18} or AccQ•Tag HPLC methods.

Ordering Information

Amino Acid Standard

Description	P/N
Amino Acid Standard	WAT088122
10 × 1 mL ampules of unlabeled amino acid standards	
Amino Acid Cell Culture Standard Kit	186009300
Kit contains:	
2 vials contain 17 amino acids	
8 vials contain 9 cell culture supplemental amino acids	
Amino Acid Food and Feed Standard Kit	186009299
Kit contains:	
2 vials contain 17 amino acids	
8 vials contain 4 food and feed supplemental amino acids	
Amino Acid Internal Standard – Norvaline	186009301
1 vial	

List of Amino Acids in Each Amino Acid Standard Amino Acid Standard

Amino Acid	Amino Acid Standard	Cell Culture Standard Kit	Food and Feed Standard Kit	Internal Standard
	p/n: WAT088122	p/n: 186009300	p/n: 186009299	p/n: 186009301
Alanine	■	■	■	—
Arginine	■	■	■	—
Aspartic acid	■	■	■	—
Cystine	■	■	■	—
Glutamic acid	■	■	■	—
Glycine	■	■	■	—
Histidine	■	■	■	—
Isoleucine	■	■	■	—
Leucine	■	■	■	—
Lysine	■	■	■	—
Methionine	■	■	■	—
Phenylalanine	■	■	■	—
Proline	■	■	■	—
Serine	■	■	■	—
Threonine	■	■	■	—
Tyrosine	■	■	■	—
Valine	■	■	■	—
Taurine	—	■	■	—
HydroxyProline	—	■	—	—
Asparagine	—	■	—	—
Glutamine	—	■	—	—
GABA (γ-Aminobutyric acid)	—	■	—	—
Tryptophan	—	■	—	—
Ornithine	—	■	—	—
AABA (α-Aminobutyric acid)	—	■	■	—
HydroxyLysine	—	■	—	—
Methionine Sulfone	—	—	■	—
Cysteic Acid	—	—	■	—
Norvaline	—	—	—	■

Ordering Information

UPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis Kits and Accessories designed for use on a Waters, low dispersion, ACQUITY UPLCs

Description	Qty.	P/N
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	1 L	
AccQ•Tag Ultra Eluent B	1 L	
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		
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	1 L	
AccQ•Tag Ultra Eluent B	1 L	
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	
AccQTag Ultra Borate Buffer – 10 mL		186009283
Amino Acid Standard, Hydrolysate (AccQ•Tag, Pico•Tag, AccQ•Tag Ultra)	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 C_{18}, 1.7 µm, 2.1 × 50 mm Column, 1/pk		186009953
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 150 mm Column, 1/pk		186009954
AccQ•Tag Ultra C_{18}, 1.7 µm, VanGuard Pre-Column, 2.1 × 5 mm, 3/Pk		186009955
AccQ•Tag Ultra Eluent A, concentrate	1 L	186003838
AccQ•Tag Ultra Eluent B	1 L	186003839
Hydrolysis Primer, Amino Acid Analysis		715006455

UHPLC and HPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis Kit

Description	Qty.	P/N
UHPLC and HPLC: AccQ•Tag Ultra C_{18} Amino Acid Analysis Kit		176005152
The kit is intended to provide all the materials needed in order to get started running the AccQ•Tag Ultra chemistries on a UHPLC and HPLC system.		
Kit contains:		
AccQ•Tag Ultra Derivatization Kit, 250 analyses		
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 150 mm Column		
AccQ•Tag Ultra Eluent A, concentrate	1 L	
AccQ•Tag Ultra Eluent B	1 L	
Amino acid standard, hydrolysate	10 × 1 mL	
Total recovery vials	3 × 100/pk	

UPLC-based Amino Acid Analysis

Description	P/N
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 50 mm Column	186009953
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 100 mm Column	186003837
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 150 mm Column	186009954
AccQ•Tag Ultra C_{18}, 1.7 µm, 2.1 × 5 mm VanGuard Pre-Column	186009955

UHPLC and HPLC-based Amino Acid Analysis

Description	P/N
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 50 mm Column	186010405
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 100 mm Column	186010406
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 150 mm Column	186010406
AccQ•Tag Ultra C_{18}, 2.5 µm, 4.6 × 5 mm VanGuard Cartridge*, 3/pk	186010408

* Requires use of VanGuard 3.9 mm ID Cartridge Holder: p/n 186007949

Amino Acid Primer

Description	P/N
Hydrolysis Primer, Amino Acid	715006455



Amino Acid Analysis Automation

Automation increases efficiency, repeatability and avoids contamination and human errors. Amino acid analysis automation is enabled through the automation derivatization kit and verified automation scripts on Andrew+, Tecan, or Hamilton automation platforms. The automation derivatization kit is system agnostic and designed in a 32 × 3 format for up to 96 sample preparation. It has a larger volume per sample than the manual derivatization kit to accommodate the residual volumes required by automation workflow. The script includes barcode scanning, linearity calibration, sample dilution, derivatization, heating, shaking functions, which allow analysts to walk away during sample preparations, and 96 samples are prepared in less than an hour.

Ordering Information

Automation: AccQ•Tag Ultra C_{18} Amino Acid Analysis Kits and Accessories

Description	P/N
AccQ•Tag Ultra C_{18} Derivatization Kit – Automation, 96 analyses	186009232
AccQ•Tag Borate Buffer – 10 mL	186009283
96-Well Sample Collection Plate, 800 µL Round Well, 50/pk	186002481
Cap Mat, 5/pk	186006332
AccQ•Tag Ultra Cell Culture Chemistry Kit – Automation	176004534
AccQ•Tag Ultra Food & Feed Chemistry Kit – Automation	176004533
AccQ•Tag Ultra Hydrolysates Chemistry Kit – Automation	176004542
AccQ•Tag Ultra Cell Culture Tecan Script Starter Kit – CD	176004543
AccQ•Tag Ultra Cell Culture Tecan Script Starter Kit – USB	176004544
AccQ•Tag Ultra Cell Culture Hamilton Script Starter Kit – CD	176004545
AccQ•Tag Ultra Cell Culture Hamilton Script Starter Kit – USB	176004546



AccQ•Tag Ultra C_{18} Derivatization Automation Kit

AccQ•Tag Ultra Amino Acid Analysis Automation Kits for Andrew+

Description	P/N
Andrew+ Pipetting Robot Andrew+ Pipetting Robot, waste base, waste container, power supply, cables, and 1 × each single and multi-channel pipette adaptors	176004567
Andrew+ Startup Kit Intended for all new Andrew+ systems and includes Dominos, pipette adaptors, and lab kit with consumables for system installation	176004568
Pipette Kit for AccQ•Tag Includes 3× Andrew Alliance Pipettes	176004583
Domino Kit for AccQ•Tag Includes additional dominos and connected devices for Amino Acid OneLab protocol with Andrew+ automation	176004582
AccQ•Tag Ultra Derivatization Kit – Automation Provides simplified tools to enhance high throughput amino acid automation, enabling processing of up to 96 samples in 3 × 32 sample batches	186009232
Roller for Cap mats Helps to smooth out the cap mat before putting it on system for injection	186002633

AccQ•Tag Ultra Amino Acid Analysis Optional Accessories for Andrew+

Description	P/N
Amino Acid Cell Culture Standard Kit Contains 26 amino acids monitored in cell culture media or other matrices. The standard is designed for both ID and quantitative amino acid analysis	186009300
Amino Acid Food and Feed Standard Kit Contains 21 amino acids analyzed in food and feed matrix. The standard is designed for both ID and quantitative amino acid analysis	186009299
Amino Acid Internal Standard – Norvaline Compensates for the variability generated in sample hydrolysis and amino acid analysis	186009301
AccQ•Tag Ultra 1.7 µm, 2.1 × 100 mm Column Separates the amino acid derivatives produced in the reaction with Waters AccQ•Tag Ultra Derivatization Reagent	186003837
AccQ•Tag Ultra Eluent A Mobile phase eluents for reversed phase separation of amino acid derivatives	186003838
AccQ•Tag Ultra Eluent B Mobile-phase eluents for reversed phase separation of amino acid derivatives	186003839

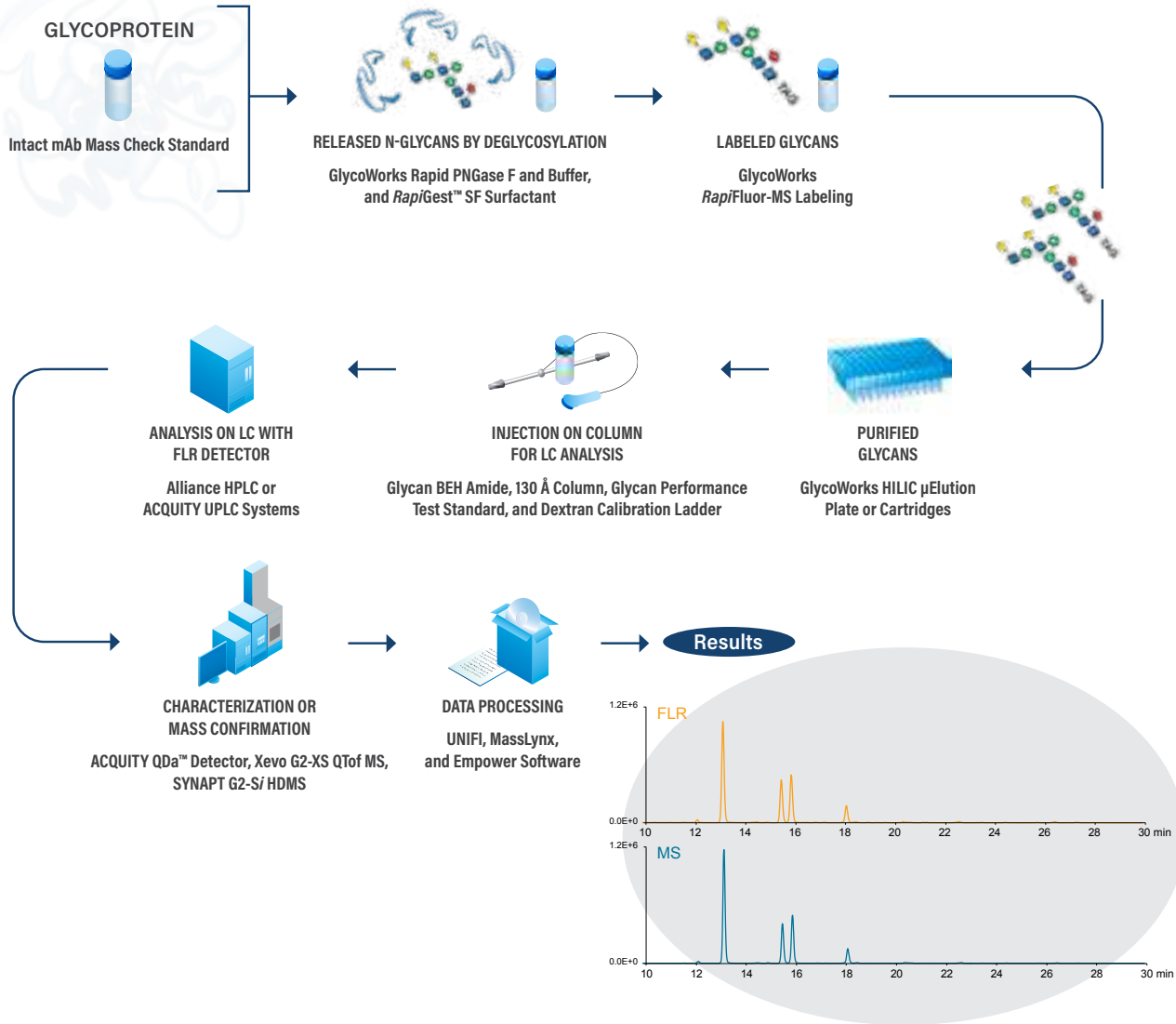
RELEASED N-GLYCAN ANALYSIS



Waters GlycoWorks Sample Preparation Kits and Standards, along with the ACQUITY UPLC and HPLC Glycan 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
- Automation-enabled sample preparations with verified scripts
- Alternative selectivity with either HILIC or Mixed-mode separations
- MaxPeak Premier column format reduces sample adsorption onto metal surfaces and delivers the representative performance from the first injection
- Glycan standards for benchmarking chromatographic performance, calibration and quantification, and complex profiling

Released N-Glycan Workflow

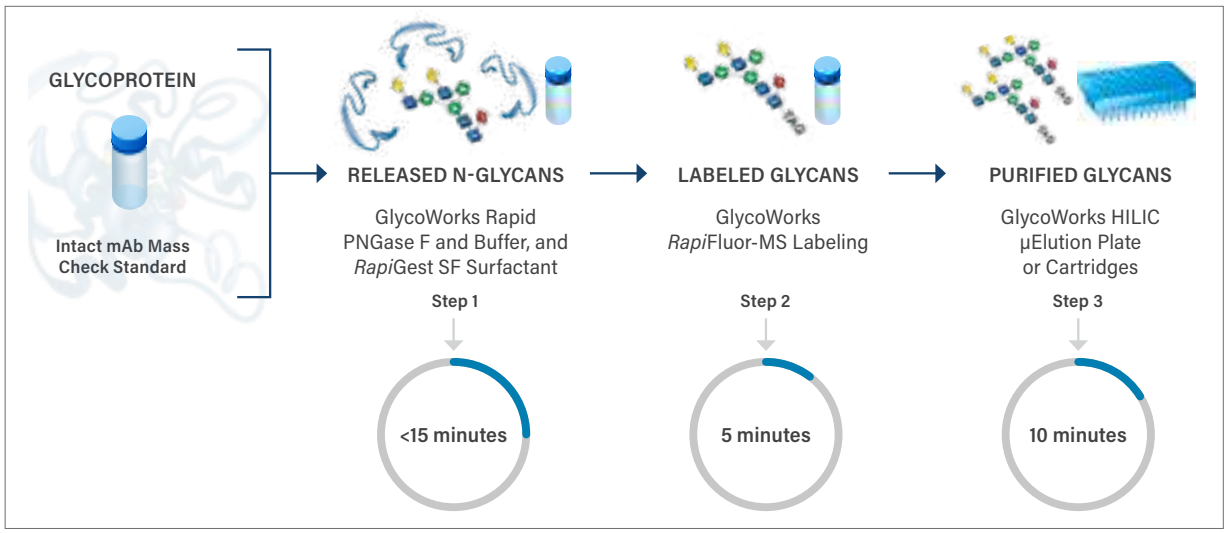


GLYCOWORKS *RAPI*FLUOR-MS RELEASED N-GLYCANS SAMPLE PREPARATION

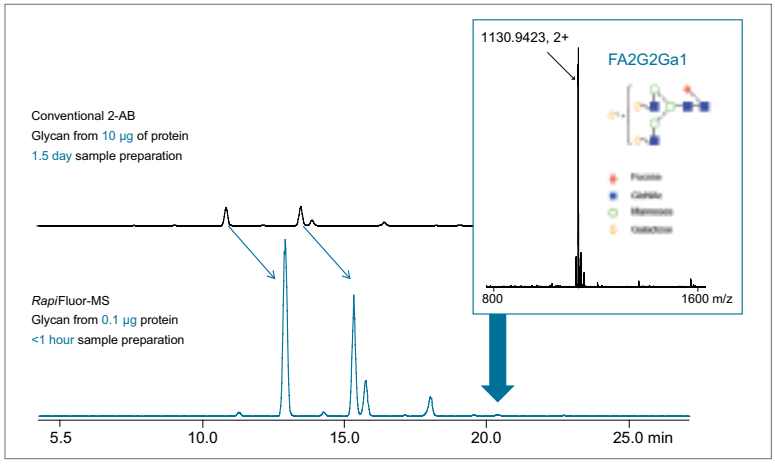
Waters GlycoWorks Consumables offer a more convenient, comprehensive, and effective sample-preparation solution for glycan analysis.

- The GlycoWorks *Rapi*Fluor-MS N-Glycan Kit ensures easy, quick preparation of released-labeled, N-glycan samples
- Streamline standard protocols (720005470EN, 720005343EN) for mAbs and a variety of glycoproteins; Optimized reducing protocols (720006992EN, 720006991EN) for complex proteins with multiple disulfide bonds
- 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**



AUTOMATION OF RELEASED N-GLYCAN ANALYSIS

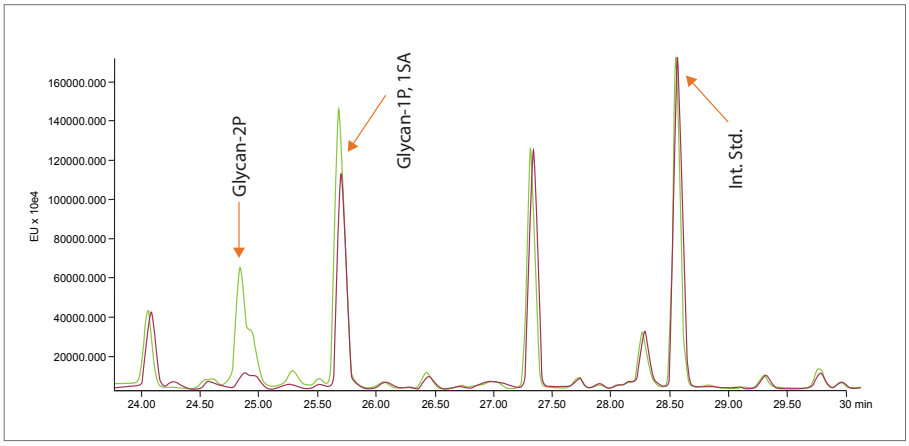
Waters GlycoWorks Consumables offer a more convenient, comprehensive, and effective sample-preparation solution for Released N-glycan analysis. The sample preparation procedures involve multiple steps including enzymatic deglycosylation, labeling, and SPE clean up. Due to this complexity, Waters has developed an application-specific configuration of the Andrew+ Pipetting Robot for released N-glycan analysis. Additionally, verified scripts for the GlycoWorks *Rapi*Fluor-MS method are available for our partner platforms. We provide you with the information needed, no matter the platform, to ensure that you can start achieving your automation results faster.



GlycoWorks RapiFluor MS N-Glycan Kit.

PHOSPHOGLYCAN SPE BUFFER IMPROVES RECOVERY

The loss of labeled acidic glycans, especially phosphorylated glycan species, during SPE purification has been considered a challenge to accurately monitor the glycosylation of biotherapeutics. The GlycoWorks Phosphoglycan SPE Elution Buffer, optimized with citrate additive, facilitates the elution and recovery of phosphorylated glycans and achieves maximum yield.



Improved recovery of phosphorylated glycans using citrate containing SPE eluent.

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, Glycan *Rapi*Fluor-MS performance Test std, Intact mAb Mass Check Standard	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, Intact mAb Mass Check Standard	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, Glycan *Rapi*Fluor-MS performance Test std, Intact mAb Mass Check Standard	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, Intact mAb Mass Check Standard	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 Rapid Deglycosylation kit 4 × 24	186008840
GlycoWorks *Rapi*Fluor -MS Labeling Kits—24 Sample	186008091
GlycoWorks *Rapi*Fluor -MS Labeling Kits—96 Sample	186007989
GlycoWorks SPE Reagents	186007992
GlycoWorks Phosphoglycan SPE Reagents HILIC	186010209
GlycoWorks Phosphoglycan SPE Elution Buffer, 4/pk	186009763
GlycoWorks HILIC µElution Plate	186002780
GlycoWorks Sample Collection Module	186007988

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
Andrew+ 24 Sample GlycoWorks Application Kit contains: GlycoWorks Rapid Deglyco Module 24-sample, GlycoWorks *Rapi*Fluor-MS Labeling—24 sample, GlycoWorks HILIC µElution Plate, GlycoWorks SPE Reagents – Automation, Intact mAb Mass Check Standard	176003349
Andrew+ 96 Sample GlycoWorks Application Kit contains: GlycoWorks Rapid Deglyco Module 96-sample, GlycoWorks *Rapi*Fluor-MS Labeling—96 sample, GlycoWorks HILIC µElution Plate, GlycoWorks SPE Reagents – Automation, Intact mAb Mass Check Standard	17600335
Andrew+ 96 Sample GlycoWorks Application Kit contains: GlycoWorks Rapid Deglyco Module 2 × 48, GlycoWorks *Rapi*Fluor-MS Labeling – Automation, GlycoWorks HILIC µElution Plate, GlycoWorks SPE Reagents – Automation, Intact mAb Mass Check Standard	176003351

GLYCAN PERFORMANCE TEST STANDARDS AND DEXTRAN CALIBRATION LADDERS

Benchmarking, Method Development, and Troubleshooting

Waters purified glycan library standards are used as qualitative/quantitative standards for LC/FLR and LC/MS. These standards come pre-labeled, lyophilized for long term storage in Waters Certified Vials for ease of solubilization and injection.

Chromatographic Performance
To ensure that the system and chromatographic method is working, it is highly recommended to use a pre-labeled standard to access observed retention time by monitoring the major peaks for performance of the method.

Calibration and Quantitation
When using LC optical detection, it is important to have standards to assist in profiling glycans under HILIC conditions to ensure reproducible chromatographic assignment providing confidence in data generation.

Complex Profiling
These performance test standards are helpful when looking for specific glycans monitored in manufacturing and are useful to check retention time of major peaks in LC/FLR, accurate mass or to assess sample preparation efficiency.

Ordering Information

*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
2-AB Glycan Performance Test Standard	186006349
2-AB Dextran Calibration Ladder	186006841

* 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
GlycoWorks Rapid Buffer—5 mL	186008100

Application-Specific Kits – Bioanalysis

PROTEINWORKS SAMPLE PREPARATION KITS FOR PROTEIN 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 in whole or immunopurified plasma via the surrogate peptide approach. This flexible and automatable kit-based approach reduces method development time and is easily deployable from lab-to-lab and site-to-site.

- 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
- With pre-measured reagents and automation protocols, ProteinWorks can be automated on the Hamilton STARWorks platform

ProteinWorks eXpress Digest kits are suitable for immuno-purified plasma and serum samples or samples with low total protein content (0.2–1.0 mg total protein). eXpress Direct Digest kits are suitable for non-immuno-purified whole plasma or serum or samples with high total protein content (1.0–5.25 mg total protein)

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 Auto-eXpress Low 3 Digest Kit Suitable for low 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 low 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 Suitable for non-immuno-purified whole plasma and serum samples or samples with high protein content (1.0–5.25 mg total protein) and contains: Pre-Measured, Lot-Traceable Reagents; a Flexible 96-Tube Sample Collection Module; and Optimized Protocols	176003688
ProteinWorks eXpress Digest Start-Up Kit Kit contains: eXpress Digest Kit, ProteinWorks µElution SPE Cleanup Kit, and a Murine mAb Standard	176003696
ProteinWorks eXpress Digest Kit suitable for immuno-purified plasma and serum samples or samples with low protein content (0.2–1.0 mg total protein) and contains: 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

Ordering Information

ProteinWorks Sample Preparation Kits

Description	P/N
96 Sample Kits	
ProteinWorks Auto-eXpress High Digest Kit - Ambient Refill Kit Kit includes: digestion buffer (1x), trypsin dissolving reagent (1x), digestion inactivation reagent (1x), and *Rapi*Gest denaturant (1x) for high protein content samples (1.0–5.25 mg total protein)	186008872
ProteinWorks Auto-eXpress Low Digest Kit - Ambient Refill Kit Kit includes: digestion buffer (1x), trypsin dissolving reagent (1x), digestion inactivation reagent (1x), and *Rapi*Gest denaturant (1x) for low protein content samples (0.2–1.0 mg total protein)	186008873
ProteinWorks Reduction Alkylation Kit - Cold Storage Refill Kit Kit includes: reduction reagent (3x), alkylation reagent (3x)	186008889
ProteinWorks Auto-eXpress High Trypsin Kit - Cold Storage Refill Kit Kit includes: trypsin (1x) suitable for high protein content samples (1.0–5.25 mg total protein)	186008874
ProteinWorks Auto-eXpress Low Trypsin Kit - Cold Storage Refill Kit Kit includes: trypsin suitable (1x) for low protein content samples (0.2–1.0 mg total protein)	186008875
ProteinWorks eXpress Direct Digest Kit - Ambient Refill Kit Kit includes: digestion buffer (1x), trypsin dissolving reagent (1x), digestion inactivation reagent (1x), denaturant rack (1x), strip caps (1x) suitable for high protein content samples (1.0–5.25 mg total protein) or samples in whole non-immuno-purified serum or plasma	186008065
ProteinWorks eXpress Direct Digest Kit - Cold Storage Refill Kit Kit includes: trypsin (1x), alkylation reagent (3x), and reduction reagent (3x) suitable for high protein content samples (1.0–5.25 mg total protein per sample) or samples in whole non-immuno-purified plasma or serum	186008066
ProteinWorks eXpress Digest Kit - Ambient Refill Kit Kit includes: digestion buffer (1x), trypsin dissolving reagent (1x), digestion inactivation reagent (1x), denaturant rack (1x), strip caps (1x), suitable for low protein content samples (0.2–10 mg total protein) or samples in whole immuno-purified serum or plasma	186008067
ProteinWorks eXpress Digest Kit - Cold Storage Refill Kit Kit includes: trypsin (1x), alkylation reagent (3x), and reduction reagent (3x) suitable for low protein content samples (0.2–1.0 mg total protein per sample) or samples in immuno-purified plasma or serum	186008068



APPLICATION AREA: Pharmacokinetic Matricies

"The VanGuard column guards are an exceptional product. They've increased my column life from 8–10 K analysis to over 18 K, 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.

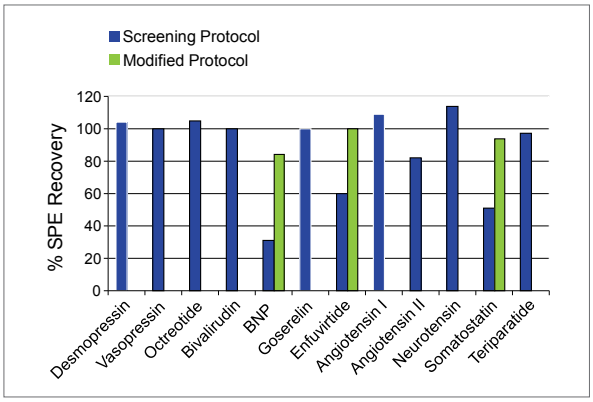
The peptide columns are specifically QC tested with a cytochrome *c* tryptic digest that helps ensure batch-to-batch consistency in validated methods ideally suited for separating a wide range of large and small, acidic and basic, hydrophilic and hydrophobic peptides.

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 resources, visit our Simplfying Bioanalysis Application Note, Method Development Webinar and our DMPK Bootcamp Series 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

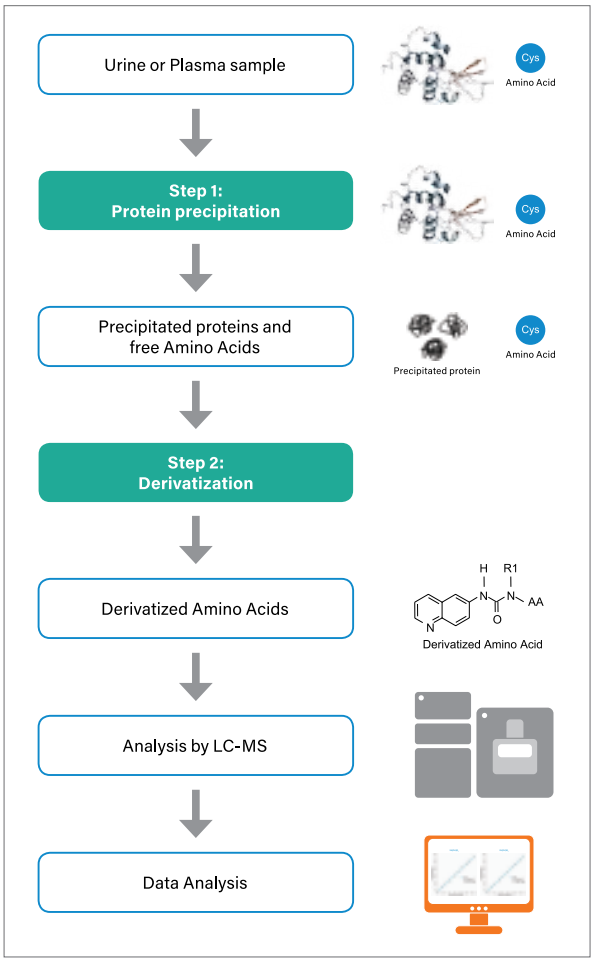
KAIROS AMINO ACID KIT

The Kairos amino acid kit is the LC-MS-based kit designed to quantitate 40+ amino acids in physiological matrices such as plasma and urine. Built on AccQ•Tag derivatization chemistry, this kit enables unprecedented sensitivity, accuracy, and precision. The Kairos Amino Acid Kit, which can bring run times to under 10 minutes, is fully automated with manual options for physiological samples in both high-throughput (500+ samples) and lower-throughput (100+ samples) amino acid analysis. Automated sample preparation workflow is verified with scripts available on Tecan and Andrew + Systems.



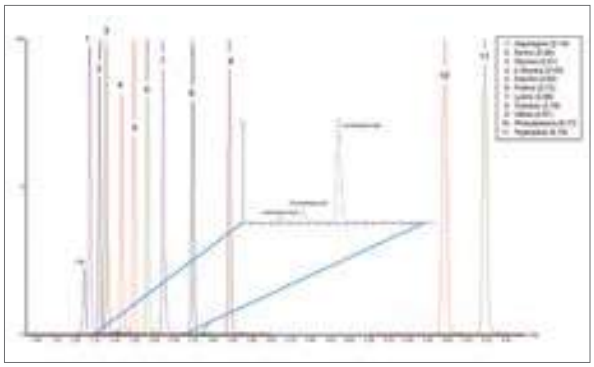
For information about amino acid analysis in cell culture media, food and feed samples, and hydrolysates, please refer to the amino acid section in the chapter of Application Specific Columns, Kits, and Spare Parts.

Amino Acid Analysis Protocol



2-step sample preparation protocol developed around the AccQTag Ultra derivitization kit and CORTECS column chemistry for LCMS results in complex physiological matrices.

UPLC-MS/MS Analysis of a Complex Sample



Total Ion Chromatogram (TIC) for 11 amino acids present in a plasma sample and inset a chromatogram to show the separation of gamma-aminobutyric acid, beta-aminoisobutyric acid, and alpha-aminobutyric acid in the same plasma sample.

For more information, reference application note 720006487EN.

Ordering Information

Acrylamide Analysis Kits

Description	P/N
Kairos Amino Acid 100+ Manual First Time Includes: Amino Acid Calibrator Set (100+); Amino Acid QC Set (100+); Amino Acid Internal Standard (100+); AccQ•Tag Ultra Derivatization Kit x 2; Amino Acid Reconstitution Reagents; Formic Acid, 1 mL; TruView LCMS Certified Vials, 2/pk; CORTECS UPLC C_{18}, 1.6 µm, 2.1 × 150 mm Column	176004375
Kairos Amino Acid 100+ Re-order Includes: Amino Acid Calibrator Set (100+); Amino Acid QC Set (100+); Amino Acid Internal Standard (100+); AccQ•Tag Ultra Derivatization Kit x 2; Amino Acid Reconstitution Reagents; Formic Acid, 1 mL; TruView LCMS Certified Vials, 2/pk	176004376
Kairos Amino Acid 500+ Manual First Time Includes: Amino Acid Calibrator Set (500+); Amino Acid QC Set (500+); Amino Acid Internal Standard (500+); AccQTag Ultra "3x" Derivatization Kit x 3; Amino Acid Reconstitution Reagents; Formic Acid, 1 mL; TruView LCMS Certified Vials, 10/pk; CORTECS UPLC C_{18}, 1.6 µm, 2.1 × 150 mm Column	176004379
Kairos Amino Acid 500+ Manual Re-order Includes: Amino Acid Calibrator Set (500+); Amino Acid QC Set (500+); Amino Acid Internal Standard (500+); AccQ•Tag Ultra "3x" Derivatization Kit x 3; Amino Acid Reconstitution Reagents; Formic Acid, 1 mL; TruView LCMS Certified Vials, 10/pk	176004380
Kairos Amino Acid 500+ Automation First ncludes: AccQ•Tag Ultra "3x" Derivatization Kit x 3; Amino Acid Reconstitution Reagents; Formic Acid, 1 mL x3; Amino Acid Sample Prep Kit; Amino Acid Script Pack; CORTECS UPLC C_{18} 1.6 µm, 2.1 × 150 mm Column	176004377
Kairos Amino Acid 500+ Automation Re-order Includes: AccQ•Tag Ultra "3x" Derivatization Kit x 3; Amino Acid Reconstitution Reagents; Formic Acid, 1 mL x3; Amino Acid Sample Prep Kit; Amino Acid Script Pack	176004378
Amino Acid Calibrator Set (100+) Includes: Calibrator 1, 5 µm, One Vial; Calibrator 2, 20 µm, One Vial; Calibrator 3, 100 µm, One Vial; Calibrator 4, 250 µm, One Vial; Calibrator 5, 500 µm, One Vial; Calibrator 6, 1000 µm, One Vial; Calibrator 7, 4000 µm, One Vial– Calibrators 1–6 Contain 45 Amino Acids; Calibrator 7 Contains 10 Amino Acids	186009193
Amino Acid Calibrator Set (500+) Includes: Calibrator 1, 5 µm, One Vial; Calibrator 2, 20 µm, One Vial; Calibrator 3, 100 µm, One Vial; Calibrator 4, 250 µm, One Vial; Calibrator 5, 500 µm, One Vial; Calibrator6, 1000 µm, One Vial; Calibrator 7, 4000 µm, One Vial– Calibrator 1–6 Contain 45 Amino Acids; Calibrator 7 Contains 10 Amino Acids	186009048
Amino Acid QC Set (100+) Includes: QC Low, 50 µm, 2 Vials; QC High, 700 µm, 2 Vials– 45 Amino Acids in Each Standard	186009194
Amino Acid Quality Control Set (500+) Includes: QC Low, 50 µm, 2 Vials; QC High, 700 µm, 2 Vials – 45 Amino Acids in Each Standard	186009049
Amino Acid Internal Standard (100+) Includes: Isotopically Labelled 20 Amino Acids, 1 Vial	186009051
Amino Acid Internal Standard Set (500+) Includes: Isotopically Labelled 20 Amino Acids, 5 Vials	186009050
Amino Acid Sample Preparation Kit Includes: 1 mL Sample Collection Plates, 6/pk; 2 mL Sample Collection Plates, 6/pk; Pre-slit Cap Mats, 6/pk	186009102
Amino Acid Reconstitution Reagents Includes: 0.1 N HCl, 30 mL; 10% Sulfosalicylic Acid, 50 mL	186009103
AccQ•Tag Ultra Derivatization Kit	186003836
AccQ•Tag Ultra "3x" Derivatization Kit	186004535
AccQ•Tag Ultra Borate Buffer, 10 mL	186009283

SARS-COV-2 LC-MS KIT

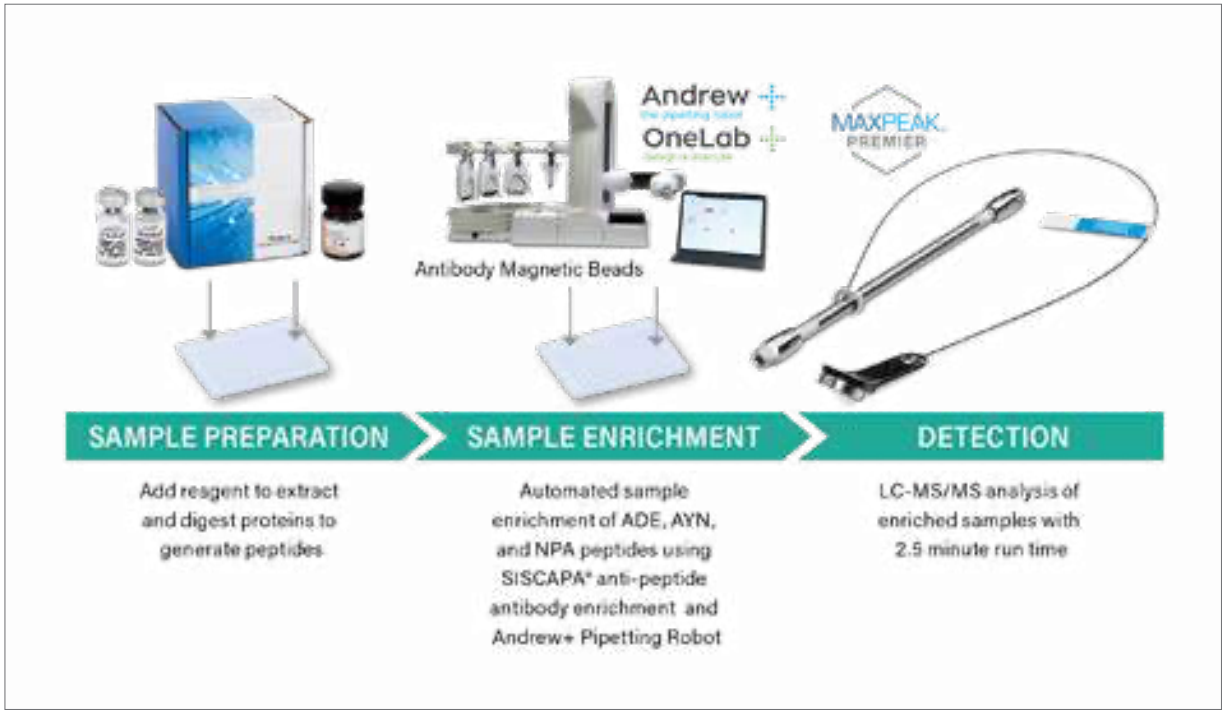
Waters SARS-CoV-2 LC-MS Kit (RUO) can directly detect and quantify SARS-CoV-2 signature NCAP peptides, without the need to amplify the target analytes. Scientists can harness the flexibility and reproducibility of LC-MS to advance critical SARS-CoV-2 research.

- Achieve reproducible results between and within labs
- Ensure high accuracy and analytical sensitivity to enable critical research
- Empower research and development of pioneering SARS-CoV-2 testing, using an alternative and complementary technology to common infectious pathogen research
- Because the method runs on an LC-MS platform it has the potential be multiplexed with other peptides and biomarkers for broader research

Ensure accurate, sensitive and analytically selective results

The SARS CoV-2 LC-MS Kit (RUO) uses the innovative SISCAPA® anti-peptide antibody enrichment sample preparation method from SISCAPA Assay Technologies, Inc. that improves the performance of mass spectrometry for measurement of pre-selected protein targets.

A Robust and Automatable Workflow



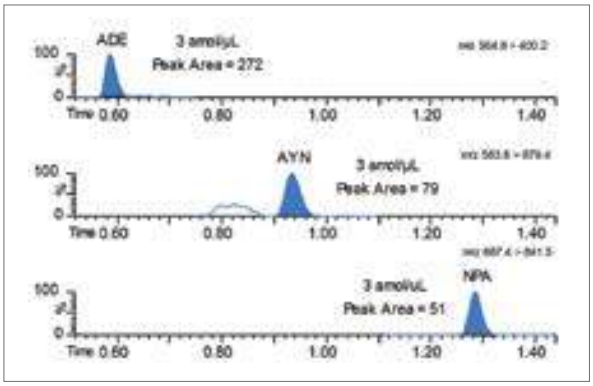
This kit is for research use only and has not been approved for use in clinical diagnostic procedures. This RUO Kit has not been tested with clinical samples. SISCAPA® is a mark of Anderson Forschung Group LLC (AFG).

Ensure Accurate, Sensitive, and Analytically Selective Results

Achieve the analytical sensitivity required to detect low levels of SARS-CoV-2 peptides from complex digested samples with stable isotope standards and capture by anti-peptide antibodies. Increase laboratory efficiency as all components necessary to quickly deploy the supplied method are packaged together for the busy research laboratory.

- Highly analytically selective to three SARS-CoV-2 NCAP signature peptides
- Lower limit of quantitation (LloQ) of 3 amol/µL
- Anti-peptide antibody capture results in clean, low-noise chromatograms with an ultra-fast run time (<2 minutes)
- The method minimizes sample media interference, providing greater flexibility for the analysis of multiple research samples

Analytical Sensitivity for NCAP Peptides



Chromatogram of the ADE, AYN, and NPA peptides at 3 amol/µL in VTM after antibody enrichment.

Ordering Information

SARS-CoV-2 Kits

Description	P/N
Waters SARS-CoV-2 LC-MS Starter Kit Kit contains: Enrichment Set, Reagent Set, Calibrator and Internal Standard Set, and System Suitability Solution Set, ACQUITY PREMIER Peptide BEH 300 Å, C_{18}, 2.1 × 30 mm column, ACQUITY In-Line Filter, Mobile Phase Additive - Formic Acid (2 × 1 mL)	176004946
Waters SARS-CoV-2 LC-MS Re-Order Kit Kit contains: Enrichment Set, Reagent Set, Calibrator and Internal Standard Set, and System Suitability Solution Set	176004947
Waters SARS-CoV-2 LC-MS Sample Preparation and Reagent Kit Kit contains: Enrichment Set, Reagent Set, and Calibrator and Internal Standard Set	176004948
Waters SARS-CoV-2 LC-MS System Suitability Set Kit contains: NCAP Peptide Mixture (ADE, AYN, NPA and DGI), LCGC Certified Vials and Cap with Preslit Septum, 2 mL, 100/pk	176004949
Waters SARS-CoV-2 LC-MS System Suitability Kit contains: 1 vial NCAP peptide mixture at a concentration of 100 fmole/µL	186010232

Application-Specific Kits – Food and Environmental

ACRYLAMIDE ANALYSIS KITS



Kits for the Extraction and Cleanup of Acrylamide in Processed Foods Prior to LC-MS/MS Analysis

The Acrylamide Analysis Starter and Refill Kits include consumables for the extraction, cleanup and separation of acrylamide from processed foods by LC-MS/MS. These kits provide you with a simple workflow, supporting your method development.

Starter kits include the chromatographic column and consumables including DisQuE Extraction Pouches and dSPE cleanup tubes, Oasis MCX Cartridges, and vials for the preparation of 100 samples. Refill kits contain the necessary consumables for 100 additional samples.

Ordering Information

Acrylamide Analysis Kits

Description	P/N
Acrylamide Starter Kit LC-MS Kit contains: ACQUITY UPLC HSS C_{18} SB Column, 100 Å, 1.8 µm, 2.1 mm × 100 mm, 2 × DisQuE, 1.5 g Sodium Acetate and 6 g $MgSO_4$, 50 mL Pouch, 50/pkg, 2 × DisQuE 900 mg MgSO4 and 300 mg PSA, 15 mL Tube, 50/pkg, and TruView LCMS Certified Clear Glass 12 × 32 mm Screw Neck Vial, with Cap and Preslit PTFE/Silicone Septa, 100/pkg	176004417
Acrylamide Refill Kit LC-MS Kit contains: 2 × DisQuE, 1.5 g Sodium Acetate and 6 g MgSO4, 50 mL Pouch, 50/pkg, 2 x DisQuE 900 mg MgSO4 and 300 mg PSA, 15 mL Tube, 50/pkg, and TruView LCMS Certified Clear Glass 12 × 32 mm Screw Neck Vial, with Cap and Preslit PTFE/Silicone Septa, 100/pkg	176004418
Acrylamide Starter Kit LC-MS Enhanced Cleanup Kit contains: ACQUITY UPLC HSS C_{18} SB Column, 100 Å, 1.8 µm, 2.1 mm × 100 mm, 2 × DisQuE, 1.5 g Sodium Acetate and 6 g $MgSO_4$, 50 mL Pouch, 50/pkg, Oasis MCX 3 cc Vac Cartridge, 60 mg Sorbent per Cartridge, 60 µm Particle Size, 100/pk, and TruView LCMS Certified Clear Glass 12 × 32 mm Screw Neck Vial, with Cap and Preslit PTFE/Silicone Septa, 100/pkg	176004419
Acrylamide Refill Kit LC-MS Enhanced Cleanup Kit contains: 2 × DisQuE, 1.5 g Sodium Acetate and 6 g $MgSO_4$, 50 mL Pouch, 50/pkg, Oasis MCX 3 cc Vac Cartridge, 60 mg Sorbent per Cartridge, 60 µm Particle Size, 100/pk, and TruView LCMS Certified Clear Glass 12 × 32 mm Screw Neck Vial, with Cap and Preslit PTFE/Silicone Septa, 100/pkg	176004420
Acrylamide Starter Kit UHPLC Enhanced Cleanup Kit contains: XSelect HSS C_{18} SB ***XP*** Column, 100 Å, 2.5 µm, 2.1 mm × 100 mm, 2 × DisQuE, 1.5 g Sodium Acetate and 6 g $MgSO_4$, 50 mL Pouch, 50/pkg, Oasis MCX 3 cc Vac Cartridge, 60 mg Sorbent per Cartridge, 60 µm Particle Size, 100/pk, and TruView LCMS Certified Clear Glass 12 × 32 mm Screw Neck Vial, with Cap and Preslit PTFE/Silicone Septa, 100/pkg	176004423
Acrylamide Refill Kit UHPLC Enhanced Cleanup Kit contains: 2 × DisQuE, 1.5 g Sodium Acetate and 6 g $MgSO_4$, 50 mL Pouch, 50/pkg, Oasis MCX 3 cc Vac Cartridge, 60 mg Sorbent per Cartridge, 60 µm Particle Size, 100/pk, and TruView LCMS Certified Clear Glass 12 × 32 mm Screw Neck Vial, with Cap and Preslit PTFE/Silicone Septa, 100/pkgTruView LCMS Certified Clear Glass 12 × 32 mm Screw Neck Vial, with Cap and Preslit PTFE/Silicone Septa, 100/pkg	176004424

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

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
Oasis HLB 20 cc Vac, 1 g (20/box)	186000117

OASIS WAX FOR PFAS ANALYSIS

Extraction and Concentration Without the Low Background Contamination



Per- and Polyfluoroalkyl substances (PFAS) are a growing environmental concern. Now your lab can extract and concentrate PFAS without worrying about low background contamination through the power of Oasis WAX for PFAS Analysis, a comprehensive quality-control pre-screening test for 32 PFAS. Achieve reproducible results with solutions designed specifically for environmental and food testing laboratories.

PFAS Solution Installation Kits provide everything to meet your PFAS workflow needs. Kits include columns, Isolator column, PEEK™ Tubing and Solvent Lines, Fittings, SPE, Vials, and Standard.

Ordering Information

Acrylamide Analysis Kits

Description	P/N
Oasis WAX for PFAS Analysis 6 cc/150 mg, 30 µm, 300/pk	186009344
Oasis WAX for PFAS Analysis 6 cc/150 mg, 30 µm, 30/pk	186009345
Oasis WAX for PFAS Analysis 6 cc/500 mg, 60 µm, 300/pk	186009346
Oasis WAX for PFAS Analysis 6 cc/500 mg, 60 µm, 30/pk	186009347
Oasis WAX for PFAS Analysis 6 cc/500 mg, 30 µm, 30/pk	186009568
PFAS Solution Installation Kit with Oasis 150 mg Kit 1	176004548

*Without PFAC30PAR standard solution

Description	P/N
PFAS Solution Installation Kit with Oasis WAX 500 mg Kit 2	176004549
PFAS Solution Installation Kit with Sep-Pak PS-2 Kit 3	176004550
PFAS Solution Installation Kit for Direct Injection Kit 4	176004554
PFAS Solution Installation Kit for EPA Method 533	176001767
PFAS Solution Installation Kit with Oasis 150 mg (APAC)*	176004588
Native PFAS Precision and Recovery Standard Solution	PFAC30PAR

*Without PFAC30PAR standard solution

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

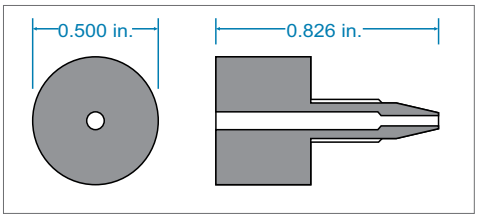


PEEK TUBING AND FITTINGS

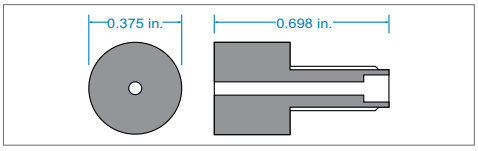
PEEK One-Piece Fingertight Fitting, 1/16-inch, 10–32 Thread

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.

PEEK Fingertight One-Piece Fitting



PEEK Fingertight Two-Piece Nut



Ordering Information

Description	P/N
PEEK Fingertight One-piece Fitting	186008714

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.

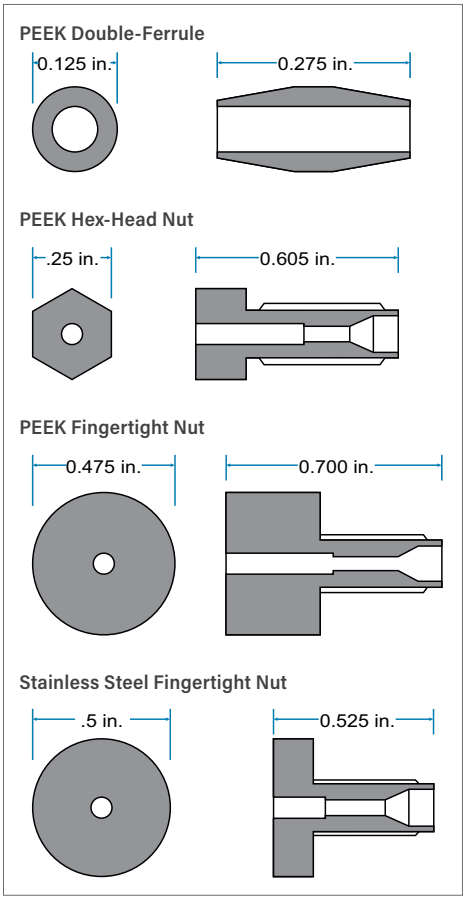
Only Waters Quality Parts™ are tested and certified for ensuring optimal performance of Waters systems. Fitting our component parts to your instruments instills confidence that they will operate in a dependable, invariable manner over time; that results will be accurate, precise, and reproducible; and 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

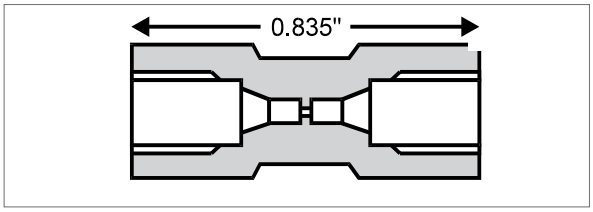
Description	P/N
Ferrule, 01, Stainless Steel, 10/pk	WAT005063
Compression Screw, 0.0625 in., 10/pk	WAT005070
Compression Fitting Plug, Stainless Steel, 5/pk	WAT005079
Rheodyne Ferrule, 10/pk	WAT007020
Ferrule, Stainless Steel	WAT022330
Ferrule, 1/16 in. O.D., PEEK	WAT021817
Compression Screw, Stainless 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

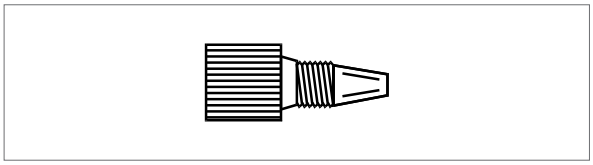


Ordering Information

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).



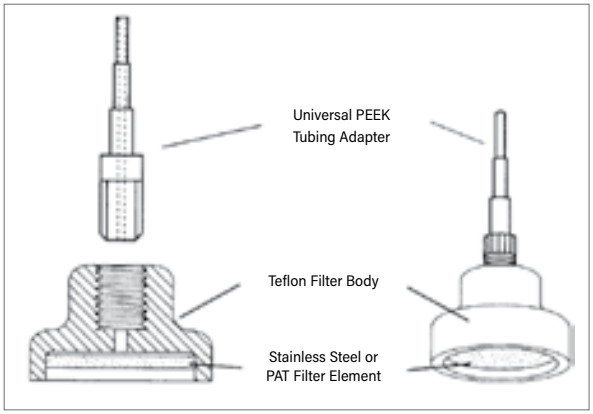
Ordering Information

Handilok Fittings	P/N
1/16 in. Fitting, 1/pk	PSL618021
1/16 in. Fitting, 10/pk	PSL618022

LC SYSTEM 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.

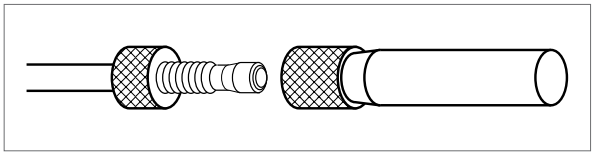


Ordering Information

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.



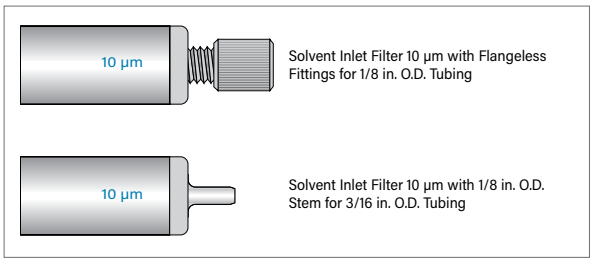
Ordering Information

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.

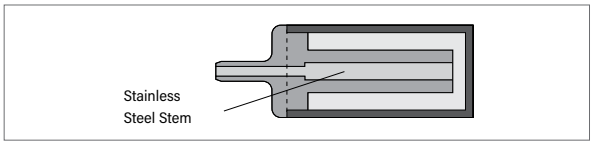


Ordering Information

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



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

★★★★★

DID YOU KNOW...

Onsite Training

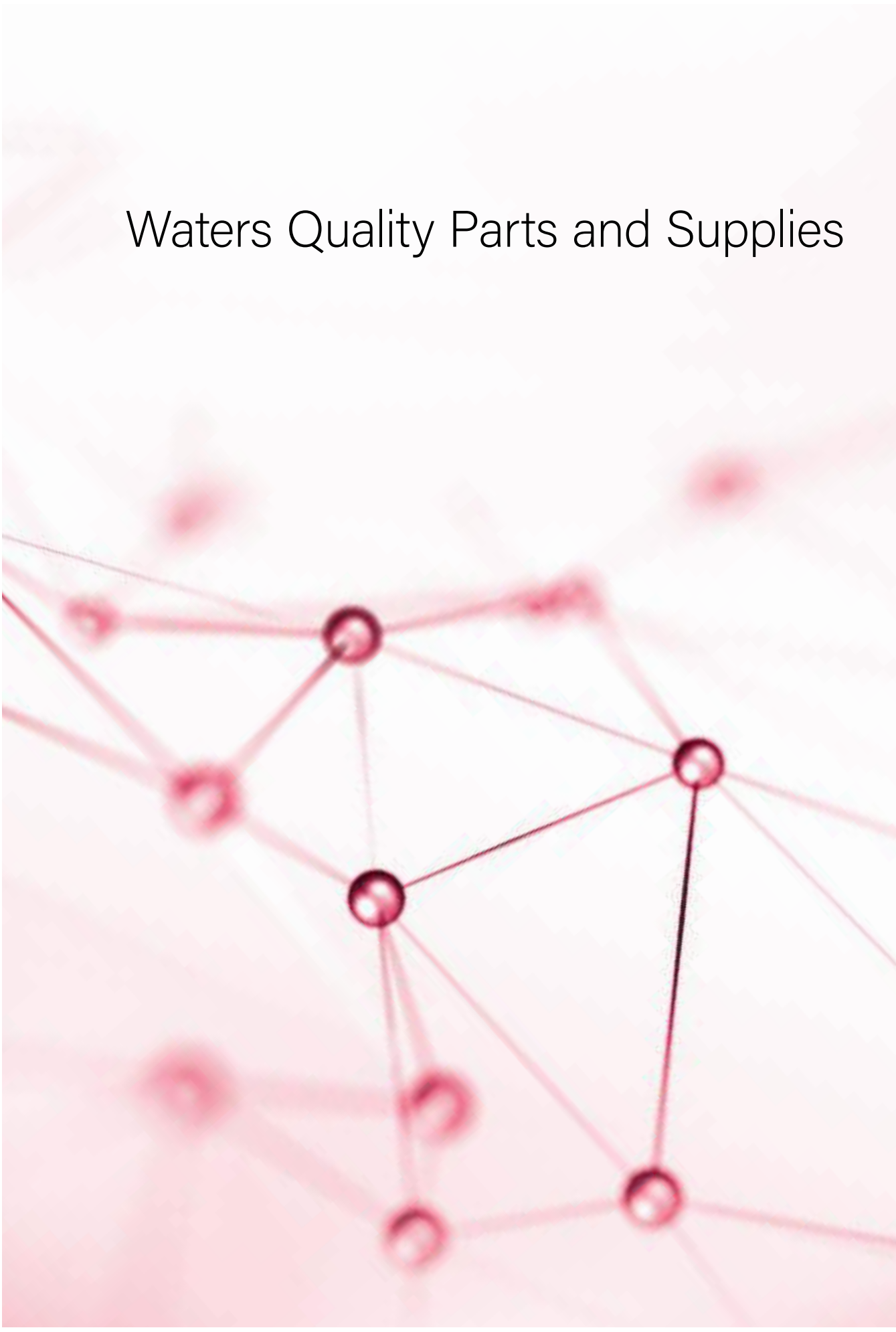
Invite us to visit your site at a time of your choosing to train your employees. We offer the choice of comprehensive training programs or "designer" programs tailored to meet the particular challenges of your work.

These are some additional benefits of choosing Waters onsite training:

- **Group training**—ideal for laboratories that must train groups of employees, from 5 to more than 500.
- **Efficiency**—for a flat fee, we can train a maximum number of employees in new skills or technology in minimal time.
- **Home advantage**—train your entire group in a familiar, confidential environment.
- **Relevance**—encourage synergy in the learning experience, the effect of lectures and hands-on sessions that relate to your specific laboratory operations.
- **Economy**—eliminate travel-related costs and minimize time away from the laboratory.
- **Expertise**—our certified instructors are not only experts, they're talented teachers who know how to deliver maximum skills in the allotted time.

Visit waters.com/onsite to request onsite training to meet your specific needs.

Waters Quality Parts and Supplies



Waters Quality Parts and Supplies

Contents

Rely on Genuine Waters Quality Parts 531

Performance Maintenance Kits — All the Parts You Need, in One Box 531

ACQUITY Premier 532

ACQUITY I-Class Plus 532

ACQUITY H-Class Plus 534

ACQUITY H-Class Plus Bio 535

Arc Premier 536

ACQUITY Arc Bio 537

Arc HPLC 538

ACQUITY Arc System 539

ACQUITY UPC2 System 540

ACQUITY APC System 542

ACQUITY UPLC I-Class System 543

ACQUITY UPLC System 548

ACQUITY UPLC H-Class System 545

ACQUITY UPLC H-Class Bio System 546

ACQUITY UPLC M-Class System 553

nanoACQUITY UPLC System 554

Alliance Separations Modules 556

Common Parts for Alliance Systems 558

HPLC Pumps 559

Gradient Modules 561

Fluid Handling Units 562

Injectors/Fraction Collectors 563

Detectors 566

Quadrupole Time-of-Flight Mass Spectrometers 569

Tandem Quadrupole Mass Spectrometers 571

Atmospheric Solids Analysis Probe (ASAP) 573

Tool Free Probes 574

Single Quadrupole Mass Spectrometers 574

Time-of-Flight (Tof) Mass Spectrometers 576

Magnetic Sector Mass Spectrometer 577

Column and Cartridge Fittings and Accessories 578

SLIPFREE Connectors 579

PEEK Tubing and Fittings 580

Filters 582

Waters Quality Parts and Supplies

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.

Performance Maintenance Kits —All the Parts You Need, in One Box

Our Performance Maintenance (PM) kits meet the requirements of our instruments, providing a dependable, economical way to ensure proper maintenance. Each kit contains the parts necessary to keep an instrument operating at peak performance. You'll also find a sticker, for affixing to the instrument. On it you can document the performance of maintenance procedures and thus be reminded when they are once again due.

Performance maintenance protocols for Waters instruments can be obtained from our support library on **waters.com**. The protocols include details of maintenance tasks and may also include calibration and diagnostic tests, to ensure the instruments function correctly.

Ordering is Easy, Online or by Phone

Our local Waters sales office can quote prices, in any currency, for PM Kits and Waters Quality Parts. In the United States and Canada, you can obtain pricing by phone at 1-800-252-4752. If you are located elsewhere, you can consult the inside back cover of this catalog, which lists our worldwide sales offices and contact information. Finally, if you're a registered user of the Waters website, you can obtain local-currency prices at **waters.com/order**.

To Find Parts: Use Our Waters Quality Parts Locator

Visit Waters online at **waters.com/partslocator** to use the Waters Quality Parts Locator to browse Waters systems, identify replacement components, and make purchases.

The Quality Parts Locator provides access to far more items than those that appear in this catalog. It also offers troubleshooting information, by our technical experts, to help you determine how best to correct problems.



The online Waters Quality Parts Locator provides a simple way to find the component parts you need. You move the cursor over depictions of instruments, click on assemblies, and then click on component parts.

ACQUITY Premier



ACQUITY Premier System.

Ordering information

NEW ACQUITY Premier BSM

Description	P/N
ACQUITY Premier BSM Performance Maintenance Kit PM Kit consists of: Check Valves, Mixers, Filters, Plungers & Seals	201000328

NEW ACQUITY Premier QSM

Description	P/N
ACQUITY Premier QSM Performance Maintenance Kit PM Kit consists of: Check Valves, Mixers, Filters, Plungers & Seals	201000244

NEW ACQUITY Premier SM-FTN

Description	P/N
ACQUITY Premier Sample Manager-FTN Performance Maintenance Kit PM Kit consists of: Syringe, 15 µL Textured Needle, Guide & Seat, Inject Valve Cartridge, and Filters	201000334

ACQUITY I-Class Plus



ACQUITY I-Class Plus System.

Ordering information

ACQUITY I-Class PLUS Sample Manager-FTN

Description	P/N
ACQUITY I-Class PLUS Sample Manager-FTN Performance Maintenance Kit PM Kit consists of: Syringe, 15 µL Textured Needle, Guide & Seat, Inject Valve Cartridge, and Filters	201000316

Parts and Accessories	
Inject Valve Cartridge	700006057
Air Filter, Side Panel	401000694
Guide, Sample Needle	405008854
Seat, Vespel with Anti-rot	405011492
Syringe, 100 µL, HP	700002570
Assy, Seat Port, .003 I.D.	700006056
Assy Textured Needle 15 µL with Guide and Seat	700011628
Assy, Tube, Out, Wash Pump	430002345
Assy, Tube, Feed, Injection Port	430002346
Assy, Tube, Feed, Syringe	430002347
Assy, Tube, Feed, Transducer	430002348
Assy, Tube, Feed, Injection Valve	430002349

Parts and Accessories	
Assy, Tube, Waste, EXT., Injection Valve 430002360	700009534
Assy, Tube, Waste, Injection Valve	430002362
Tube Assy, Sample Manager Purge	430002462
Tube, ACQUITY UPLC I-Class to MS MP35N 17 in.	700008939
Tube, ACQUITY UPLC I-Class to MS PEEKsil 17 in.	700008940
Tube, ACQUITY UPLC I-Class to MS PEEK 17 in.	700008941
Tube, ACQUITY UPLC I-Class to MS PEEK 21 in.	700008942
Tube, ACQUITY UPLC I-Class to MS PEEKsil 21 in.	700008943
Tube, ACQUITY UPLC I-Class to MS PEEKsil. 003 × 21 in.	700008944
ACQ. I-Class PDA Tubing Single Detector	700011803
ACQ. I-Class TUV Tubing Single Detector	700011804

ACQUITY I-Class PLUS Sample Manager-FL

Description	P/N
ACQUITY I-Class PLUS Sample Manager-FL Performance Maintenance Kit PM Kit consists of: Syringes, Std 10 µL PEEK Needle, Injection Cartridge, 10 µL Loop and Filters	201000258

Parts and Accessories	
Inject Valve Cartridge	700006069
Syringe, 100 µL, HP	700002570
Syringe, 2.5 mL, Inverted	700006070
Assy, Sample Loop, EXT. Hypo Tip, 5 µL	430002936
Assy, Sample Loop, Hypo Tip, 10 µL	430002938
Assy, Sample Loop, EXTD. Hypo Tip, 1 µL	430003166
Assy, Sample Loop, EXT. Hypo Tip, 2 µL	430002928
Assy, Tube, SSV/P-3 to Transducer	430002558
Assy, Tube, SSV P-2 to VM/SSV	430002560
Assy, Tube, WS1 to VM/S-SY	430002564
Assy, Tube, WS2 to VM/W-SY	430002566
Assy, Tube, WS to VM/W-In.	430002568
Assy, Tube, SS to VM/S-In.	430002571
Assy, Tube, NCS Inlet	430002579
Tube, NCS, Puncture Needle to Elbow	430003159
Port, Seal, Needle Wash	700002886
Assy, Puncture Needle, .059 O.D.	700006067
Kit, I-Class FEP/Metal Needle, 10 µL	700005925
Kit, I-Class PEEKsil Needle 10 µL	700005926
Kit, I-Class FEP/Metal Needle, 20 µL	700005929
Kit, I-Class ACQUITY UPLC PEEKsil Needle	700005930
Kit, I-Class PEEK Needle, 10 µL	700005923

ACQUITY I-Class PLUS BSM

Description	P/N
ACQUITY I-Class BSM Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000260

Parts and Accessories	
Primary Inlet Check Valve Filter Kit, 2/pk	700002912
HP Seal, Dual Spring, Perform Seal, 2/pk	700009135
Plunger Assy, 2/pk	700002600
Assy, Housing, Seal Wash, .045, SST, 2PT	700009194
Assy, Cartridge, Filter, SS Frit	700002913
Marker Set, Tubing, ACQUITY, 2/pk	700003102
Filter, Solvent Bottle, SS, 7/pk	700003616
Seal, Wash, .0787 I.D., Fixed, 2/pk	700006048
Kit, Check Valve, Dual Ball and Seat, 2/pk	700003755
Assy, Cart, Vent, Dogleg, 18 K psi, Dome	700006052
Pump Head, 316 SS, DLC, Face Seal	700009190
Support Plant, Thickened, VHP, Head	700002601
Assy, Tube, Degasser Port B2 to SSV B	430001113
Assy, Tube, Degasser Port B1 to SSV B	430001114
Assy, Tube, Degasser Port A1 to SSV A	430001115
Assy, Tube, Degasser Port A2 to SSV A	430001116
Assy, Tube, Accu. "B" Xducer—Vent Valve	430001199
Assy, Tube, Accu. "A" Xducer—Vent Valve	430001200
Assy, Tube, Vent Valve P5 to Tee/Filter	430001207
Assy, Tube, Vent Valve P2 to Tee/Filter	430001208
Assy, Tube, SSV to i2V	430001443
Assy, Tube, Vent Valve P1 to Waste	430001893
Assy, Tube, Vent Valve P4 to Waste	430001894
Assy, Tube, Head to Xducer, MP35N	430002472
Assy, Tube, Prim-out Xducer to CV, MP35N	430002583
Tube Assy, Solvent Inlet, BSM-CR	430002800

ACQUITY I-Class PLUS CM-A

Parts and Accessories	P/N
ACQUITY I-Class PLUS APH, SS, 12.5 LG	205001757
Kit, ACQ. UPLC I-Class PLUS CM-A Tubing 2 Col	205001826
9-port Valve Cartridge Assembly	700008871

DID YOU KNOW...

To ensure the maximum performance and longevity of your ACQUITY UPLC System, it is critical that you use Waters Quality Parts for maintenance.

ACQUITY H-Class Plus

Ordering information

ACQUITY H-Class PLUS Sample Manager-FTN

Description	P/N
ACQUITY H-Class PLUS Sample Manager-FTN Performance Maintenance Kit PM Kit consists of: Syringe, 15 µL Textured Needle, Guide & Seat, Inject Valve Cartridge, Seat Port Assy and Filters	201000314
Parts and Accessories	
Inject Valve Cartridge	700005236
Air Filter, Side Panel	401000694
Guide, Sample Needle	405008854
Seat, Vespel with Anti-rot	405011492
Syringe, 100 µL, HP	700002570
Assy, Seat Port, .004 I.D.	700005234
Assy Textured Needle 15 µL with Guide and Seat	700011628
Assy, Tube, Out, Wash Pump	430002345
Assy, Tube, Feed, Injection Port	430002346
Assy, Tube, Feed, Syringe	430002347
Assy, Tube, Feed, Transducer	430002348
Assy, Tube, Feed, Injection Valve	430002349
Assy, Tube, Waste, EXT., Injection Valve	430002360
Assy, Tube, Waste, Injection Valve	430002362
Tube Assy, Sample Manager Purge	430002462
Tube Assy, Sample Manager Purge, Bio	430002464
Tube Assy, Sample Manager Wash, Bio	430002487



ACQUITY H-Class Plus System.

ACQUITY H-Class PLUS Binary Solvent Manager

Description	P/N
ACQUITY H-Class PLUS BSM Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000260
Parts and Accessories	
Primary Inlet Check Valve Filter Kit, 2/pk	700002912
HP Seal, Dual Spring, Perform Seal, 2/pk	700009135
Plunger Assy, 2/pk	700002600
Assy, Housing, Seal Wash, .045, SST, 2PT	700009194
Assy, Cartridge, Filter, SS Frit	700002913
Marker Set, Tubing, ACQUITY, 2/pk	700003102
Filter, Solvent Bottle, SS, 7/pk	700003616
Seal, Wash, .0787 I.D., Fixed, 2/pk	700006048
Kit, Check Valve, Dual Ball and Seat, 2/pk	700003755
Assy, Cart, Vent, Dogleg, 18 K psi, Dome	700006052
Pump Head, 316 SS, DLC, Face Seal	700009190
Support Plant, Thickened, VHP, Head	700002601
Assy, Tube, Degasser Port B2 to SSV B	430001113
Assy, Tube, Degasser Port B1 to SSV B	430001114
Assy, Tube, Degasser Port A1 to SSV A	430001115
Assy, Tube, Degasser Port A2 to SSV A	430001116
Assy, Tube, Accu. "B" Xducer—Vent Valve	430001199
Assy, Tube, Accu. "A" Xducer—Vent Valve	430001200
Assy, Tube, Vent Valve P5 to Tee/Filter	430001207
Assy, Tube, Vent Valve P2 to Tee/Filter	430001208
Assy, Tube, SSV to i2V	430001443
Assy, Tube, Vent Valve P1 to Waste	430001893
Assy, Tube, Vent Valve P4 to Waste	430001894
Assy, Tube, Head to Xducer, MP35N	430002472
Assy, Tube, Prim-out Xducer to CV, MP35N	430002583
Tube Assy, Solvent Inlet, BSM-CR	430002800

ACQUITY H-Class PLUS Quaternary Solvent Manager

Description	P/N
ACQUITY H-Class Quaternary Solvent Manager Performance Maintenance Kit PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters	201000233

Parts and Accessories	
Seal Wash Housing Seal, 2/pk	700002598
Head Plunger Seal, 2/pk	700002599
Plunger, 2/pk	700002600
Head Support Plate	700002601
Vent Valve Cartridge Assembly	700002660
Check Valve, Double Ball and Seat, 1/pk	700005164
i2 V Valve Cartridge, 1/pk	700005165
Filter, Air, Door	700005167
Filter for GPV, 4/pk	700005173
Assy, Mixer, 100 µL, QSM	700005119
O-ring, Teflon, Pump Head	WAT076152
Pump Head	700002595
Seal Wash Housing	700002597
Tube Assembly, Degasser to GPV	430002208
Tube Assembly, Transducer to Vent Valve	430002316
Tube Assembly, Vent Valve P4 to Waste	430002317
Tube Assembly, Vent Valve P2 to Outlet Filter	430002319
Tube Assembly, Transducer to Check Valve	430002357
Tube Assembly, GPV-D to Mixer Manifold	430002387
Tube Assembly, GPV-C to Mixer Manifold	430002388
Tube Assembly, GPV-A to Mixer Manifold	430002389
Tube Assembly, GPV-B to Mixer Manifold	430002390
Tube Assembly, Mixer Manifold to i2 V	430002400

ACQUITY H-Class PLUS CM-A

Parts and Accessories	P/N
ACQUITY H-Class PLUS APH, SS, 12.5 LG	205001774
Kit, ACQ. UPLC H-Class PLUS CM-A Tubing 2 Col	205001819
Kit, ACQ. UPLC H-Class PLUS CM-A Tubing 4 Col	205001821
ACQUITY H-Class PLUS APH, SS, 18.5 LG	205001758
Kit, ACQUITY UPLC 4 × 50 mm CM-A	205001832
Kit, ACQ. UPLC H-Class PLUS CM-A Tubing 6 Col	205001822
9-port Valve Cartridge Assembly	700005438

ACQUITY H-Class Plus Bio



ACQUITY H-Class Plus Bio System.

Ordering information

ACQUITY H-Class PLUS Bio Sample Manager-FTN

Description	P/N
ACQUITY H-Class PLUS Bio Sample Manager-FTN Performance Maintenance Kit PM Kit consists of: Syringe, 15 µL Textured Needle, Guide & Seat, Inject Valve Cartridge, Seat Port Assy and Filters	201000315

Parts and Accessories	
Inject Valve Cartridge	700005407
Air Filter, Side Panel	401000694
Guide, Sample Needle	405008854
Seat, Vespel with Anti-rot	405011492
Syringe, 100 µL, HP	700002570
Assy, Seat Port, .004 I.D.	700005682
Assy Textured Needle 15 µL with Guide and Seat	700011658
Assy, Tube, Out, Wash Pump	430002345
Assy, Tube, Feed, Injection Port	430002346
Assy, Tube, Feed, Syringe	430002347
Assy, Tube, Feed, Transducer	430002348
Assy, Tube, Feed, Injection Valve	430002349
Assy, Tube, Waste, EXT., Injection Valve	430002360
Assy, Tube, Waste, Injection Valve	430002362
Tube Assy, Sample Manager Purge, Bio	430002464
Tube Assy, Sample Manager Wash, Bio	430002487

ACQUITY H-Class PLUS Bio Quaternary Solvent Manager

Description	P/N
ACQUITY H-Class PLUS Bio QSM Performance Maintenance Kit PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters	201000244

Parts and Accessories	
Pump Head, ACQUITY, Titanium	700005411
Plunger, .0787 Diameter × 1.415, 2/pk	700002600
Assy, Mixer, 100 µL, BioQSM	700005258
Fitting and Lock Ring, GPV Filter, 4/pk	700005259
Solvent Filter, Titanium, 7/pk	700005378
Cartridge, i2V, BioACQUITY	700005414
Check Valve, Accumulator, Ti	700005415
HP Seal, .0787 I.D., Flanged, Bio	700005418
Holder, 20 Micron Frit, Titanium, 4/pk	700005419
Wash Seal, .0787 I.D., Flanged, Bio	700005422
Ferrule, Flangeless, Tefzel, Lock Ring	700003796
Ferrule, Lock Ring and Screws, Flangeless, 7/pk	700003797
Filter, Air, Door	700005167
Cartridge, Vent Valve, BioQSM	700005413

Parts and Accessories	
Barbed Seal Wash Housing, Titanium	700005410
Tube Assy, Solvent Inlet, BioQSM	430002274
Assy, Tube, Vent Valve P4 to Waste, QSM	430002317
Assy, Tube, Head to Xducer, MP35N	430002472
Assy, Tube, Degasser to GPV, MP35N	430002474
Assy, Tube, Xducer to Check Valve, MP35N	430002475
Assy, Tube, Xducer to Vent Valve, MP35N	430002476
Assy, Tube, Vent VLV P2 to Filter, MP35N	430002477
Assy, Tube, Mixer Manifold to i2 V, MP35N	430002479
Assy, Tube, GPV-A to Mixer, MP35N	430002481
Assy, Tube, GPV-B to Mixer, MP35N	430002482
Assy, Tube, GPV-C to Mixer, MP35N	430002483
Assy, Tube, GPV-D to Mixer, MP35N	430002484
Support Plant, Thickened, VHP, Head	700002601

ACQUITY H-Class PLUS Bio CM-A

Parts and Accessories	P/N
ACQUITY H-Class PLUS APH, MP35N, 12.5 LG	205001754
Kit, ACQ. UPLC H-Class PLUS Bio CM-A Tubing 2 Col	205001823
Kit, ACQ. UPLC H-Class PLUS Bio CM-A Tubing 4 Col	205001824
ACQUITY H-Class PLUS APH, MP35N, 18.5 LG	205001755
Kit, ACQUITY UPLC 4 × 50 mm CM-A	205001830
Kit, ACQ. UPLC H-Class PLUS CM-A Tubing 6 Col	205001825
9-port Valve Cartridge Assembly	700005461

Arc Premier



ARC Premier System.

Ordering information

NEW Arc Premier BSM

Description	P/N
Arc Premier BSM Performance Maintenance Kit PM Kit consists of: Check Valves, Mixers, Filters, Plungers & Seals	201000336

NEW Arc Premier QSM

Description	P/N
Arc Premier QSM Performance Maintenance Kit PM Kit consists of: Check Valves, Mixers, Filters, Plungers & Seals	201000338

NEW Arc Premier SM-FTN

Description	P/N
Arc Premier Sample Manager-FTN Performance Maintenance Kit PM Kit consists of: 100 µl Syringe, 30 µL Textured Needle, Guide & Seat, Inject Valve Cartridge, and Filters	201000337

ACQUITY Arc Bio

Ordering information

ACQUITY H-Class PLUS Binary Solvent Manager

Description	P/N
Arc Bio QSM Performance Maintenance Kit PM Kit consists of: Check Valves, Mixers, Filters, Plungers & Seals	201000311

Parts and Accessories	
Assy, Barbed Seal Wash Housing	700011660
Assy, Plunger, .125 Dia, 2/pk	700010661
Pump Head, Ti	700011661
Wash Seal, Dual Spring MP35N .125 I.D, 2/pk	700011663
Hi Pressure Seal, Dual Spring MP35N .125 I.D, 2/pk	700010662
O-Ring, 2–016, Teflon	WAT076152
Check Valve Accumulator, Ti, 1/pk	700005415
Check Valve Primary, Spring Loaded, 1/pk	700010642
PEEK washer	700005221
Assy, Mixer, 4.6 mm × 100 mm, Path 1	700011553
Assy, Mixer, 4.6 mm × 50 mm, Path 2	700011554
Assy, Cartridge, Dual Mixer Vent Valve	700011664
Assy, Cartridge, Inlet Filter, Ti	700011679
Assy, Solvent Filter, Thru Tube, Ti	700011675
Assy, Solvent Filter, Thru Tube, Ti 7/pk	700011676
Assy, Tube, GPV to PCV	700011677
Assy, Tube, Head to Transducer	700011668
Assy, Tube, Xducer - VV	700011689
Assy, Tube, Xducer - ACC	700011670
Tube Assy, Solvent Inlet	700011674
Tubing, .040 PEEK, GPV, 4/pk	700011680
Assy, Tube, VV P7 to Waste	700011681
Assy, Tube, VV P4 to 100 mm Mixer	700011671
Assy, Tube, VV P2 to 50 mm Mixer	700011672
Assy, Tube, Mixer to VV P1 Path 1	700011673

ACQUITY Arc BIO 2489, 2998

Description	P/N
ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit PM Kit consists of: PerformancePLUS Lamp	201000281

Parts and Accessories	
Arc Bio 2998 Flow Cell, Inert,	205001043
Arc Bio 2489 Flow Cell, Low Dispersion	205001731
Performance Plus HB Deuterium Lamp Assy	700009330



ACQUITY ARC Bio System.

ACQUITY Arc Bio FTN

Description	P/N
ACQUITY Arc SM FTN-R Performance Maintenance Kit PM Kit consists of: 30 µL Needle Assembly, Guide & Seat, 100 µL Syringe, Injection Valve, Seat Port Assy and Filters	201000312

Parts and Accessories	
Assy, Cart, Inject, Bio FTN, 18 K psi	700005407
Seat, Vespel with Anti-rot	405011492
Kit, Assy, Seat Port, MP35N, .007 I.D.	700011690
Assy, Needle, 15 µL, FTN	700005421
Guide, Sample Needle	405008854
Syringe, 100 µL, HP	700002570
Assy, Solvent Filter, Thru Tube, Ti	700011675
Air Filter, Side Panel	401000694

ACQUITY Arc Bio 30 CM Column Heater and Column Heater/Cooler

Description	P/N
Passive Pre-Heater Kit, .005	205001709
Passive Pre-Heater Kit, .007	205001726
Tube. MP35N, .062 × .005 × 10 L	700012304
Union, Titanium, V-V, .010" Thru	405011424
Tube, PEEK, .062 × .005 × 24	700010530
Tube, PEEK, .062 × .007 × 24	700010701

ACQUITY 30 CM Column Heater—Active

Description	P/N
ACQUITY UPLC APH, Bio .005 I.D. 23.5 LG	205001727
ACQUITY UPLC APH, Bio .007 I.D. 23.5 LG	205001728

Arc HPLC

Ordering information

Arc HPLC QSM

Description	P/N
Arc HPLC QSM Performance Maintenance Kit PM Kit consists of: Check Valves, Filters, Plungers & Seals	201000346

Parts and Accessories	
Assy, Plunger, .125 Dia, 2/pk	700010661
Wash Seal, Floating, .125 I.D., 2/pk	700009137
HP Seal, Flanged, .125 I.D., Thin Bur, 2/pk	700010663
O-Ring, 2–016, Teflon	WAT076152
Primary Check Valve, 1/pk	700010664
Assy, Check Valve, Double Ball and Seat, 1/pk	700005164
Washer, Check Valve, PEEK	700005221
Assy, Mixer, 4.6 mm × 100 mm, 200 µm	700011656
Assy, Cartridge, Dual Mixer Vent Valve	700010669
Assy, Filter, In-Line, SS Frit	700002912
Assy, Cartridge, Inline Filter, SS Frit	700002913
Assy, Solvent Filter, Bottle, 2/pk	700010196
Assy, Barbed Seal Wash Housing	700012760
Support Plate, Thickened, VHP Head	700002601
Pump Head, 9 K, Shallow Gland	700010662
Tubing, .040 PEEK, GPV, 4/pk	700010683
Assy, Tube, GPV to PCV	700010678
Assy, Tube, Head to Transducer	700010679
Assy, Tube, Xducer – VV	700010680
Assy, Tube, Xducer – ACC	700010681
Tube Assy, Solvent Inlet	700010682
Assy, Tube, VV P7 to Waste	700010684
Assy, Tube, VV P4–5 to Mixers	700010685
Assy, Tube, Mixer to VV P1 Path 1	700010687



ARC HPLC System.

Arc HPLC 2489, 2998

Description	P/N
ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit PM Kit consists of: PerformancePLUS Lamp	201000281

Parts and Accessories	
Arc HPLC 2998 Analytical Flow Cell	205001023
Arc HPLC 2489 Analytical Flow Cell	205001027
Performance Plus HB Deuterium Lamp Assy	700009330

Arc HPLC CH-A

Description	P/N
Active Pre-Heater 12.5 in.	205001002

Arc HPLC FTN

Description	P/N
Arc HPLC SM FTN-R Performance Maintenance Kit PM Kit consists of: 30 µL Needle Assembly, Guide & Seat, 100 µL Syringe, Seat Port Assy and Filters	201000345

Parts and Accessories	
Seat, Vespel with Anti-rot	405011492
Kit, Assy, Seat Port, SST, .007 I.D.	700010726
Assy, Needle, 30 µL, FTN	700005279
Guide, Sample Needle	405008854
Syringe, 100 µL, HP	700002570
Inject Valve Cartridge	700005236

Parts and Accessories	
Filter, Solvent Bottle, SS, 1/pk	700003615
Filter, Solvent Bottle, SS, 7/pk	700003616
Air Filter, Side Panel	401000694

ACQUITY Arc System

Ordering Information

ACQUITY Arc QSM-R

Description	P/N
Arc QSM Performance Maintenance Kit	201000303
Parts and Accessories	
Pump, Solenoid, Wash	700010657
Assy, Barbed Seal Wash Housing, SFC-BSM	700008999
Support Plate, Thickened, VHP Head	700002601
Assy, Plunger, .125 Dia, 2/pk	700010661
Pump Head, 9 K, Shallow Gland	700010662
Wash Seal, Floating, .125 I.D., 2/pk	700009137
HP Seal, Flanged, .125 I.D., Thin Bur, 2/pk	700010663
O-Ring, 2–016, Teflon	WAT076152
Primary Check Valve, 1/pk	700010664
Assy, Check Valve, Double Ball and Seat, 1/pk	700005164
Washer, Check Valve, PEEK	700005221
Assy, Mixer, 4.6 mm × 100 mm, 200 µm Path 1	700010589
Assy, Mixer, 4.6 mm × 30 mm, 200 µm Path 2	700010590
Assy, Cartridge, Dual Mixer Vent Valve	700010669
Assy, Filter, In-Line, SS Frit	700002912
Assy, Cartridge, Inline Filter, SS Frit	700002913
Assy, Solvent Filter, Bottle, 2/pk	700010196
Assy, Tube, GPV to PCV	700010678
Assy, Tube, Head to Transducer	700010679
Assy, Tube, Xducer - VV	700010680
Assy, Tube, Xducer - ACC	700010681
Tube Assy, Solvent Inlet	700010682
Tubing, .040 PEEK, GPV, 4/pk	700010683
Assy, Tube, VV P7 to Waste	700010684
Assy, Tube, VV P4–5 to Mixers	700010685
Assy, Tube, VV P2 to Mixer Path 2	700010686
Assy, Tube, Mixer to VV P1 Path 1	700010687

ACQUITY Arc FTN-R

Description	P/N
ACQUITY Arc SM FTN-R Performance Maintenance Kit	201000302
Parts and Accessories	
Assy, Cart, Inject, STR, FTN, 18 K psi	700006057
Seat, Vespel with Anti-rot	405011492
Kit, Assy, Seat Port, SST, .007 I.D.	700010726
Assy, Needle, 30 µL, FTN	700005279
Guide, Sample Needle	405008854
Syringe, 100 µL, HP	700002570
Filter, Solvent Bottle, SS, 1/pk	700003615
Filter, Solvent Bottle, SS, 7/pk	700003616
Air Filter, Side Panel	401000694



ACQUITY Arc System.

ACQUITY 30 CM Column Heater and Column Heater/Cooler

Description	P/N
Kit, ACQUITY Arc CM Column H/HC PPH, .005	205001484
Kit, ACQUITY Arc 30 CM Column H/HC PPH, .007	205001524
Tube. SST, .062 × .005 × 10 L	700010708
Tube. SST, .062 × .007 × 10 L, High Flow	700010540
Assy, Tube, SST, .005 I.D., Valve Inlet	700010694
Assy, Tube, SST, .005 I.D., Column Inlet	700010695
Assy, Tube, SST, .007 I.D., Valve Inlet	700010696
Assy, Tube, SST, .007 I.D., Column Inlet	700010697
Valve, 3 Column Switch, 8 Port, 9.5 K psi	700010692
Rebuild Kit, Rotor, 3 Col Switch VLV, 9.5 K	700010447
Assy, Restriction Tube	700001598
PEEK Comp. Screw, Ferr, with Lock Ring, 5/pk	700000991
Kit, Screw, Comp., Lock Ring, Knurled, 8/pk	700010011
Kit, Ferrule B/L PEEK, 1/16 Machined, 10/pk	700010009
Screw, Comp., 10–32, SS Gold Plated, Long, 10/pk	700002645
Ferrule, Set, .062, Two-piece, 10/pk	700002635
Union, SST, V-V, .010" Thru	700010702

ACQUITY 30 CM Column Heater—Active

Description	P/N
ACQUITY UPLC APH, SS .005 I.D. 23.5 LG	205001452
ACQUITY UPLC APH, SS .007 I.D. 23.5 LG	205001451
Assy, Tube, APH to Column, .005 I.D.	700010700
Assy, Tube, APH to Column, .007 I.D.	700010698
Tube, PEEK, .062 × .005 × 24	700010530
Tube, PEEK, .062 × .007 × 24	700010701
PEEK Comp. Screw, Ferr, with Lock Ring, 5/pk	700000991
Screw, Comp., Lock Ring, Hex, Captured	700010699
Kit, Ferrule B/L PEEK, 1/16 Mach, 10/pk	700010009
Screw, Comp., 10–32, SS Gold Plated, Long, 10/pk	700002645
Ferrule, Set, .062, Two-piece, 10/pk	700002635

ACQUITY DETECTORS FOR ACQUITY ARC SYSTEM

2489 UV/Vis Detector

Description	P/N
ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit PM Kit consists of: PerformancePLUS Lamp	201000281
Parts and Accessories	
Performance Plus HB Deuterium Lamp Assy	700009330
Low Dispersion Analytical Flow Cell for Arc 2489	205001553
Flow Cell Rebuild Kit	WAS081346

2998 PDA Detector

Description	P/N
Performance Plus HB Deuterium Lamp Assy PM Kit consists of: PerformancePLUS Lamp	700009330
Parts and Accessories	
ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit	201000281
Low Dispersion Analytical Flow Cell for Arc 2998	205001552

2414 RI Detector

Description	P/N
Valve, 2-way Solenoid	700002360
Assy, Pressure Relief, 1/4-28, 35 psi	700002361
Valve, 3-way Recycle	700002362
Tubing, Union to Relief Valve	700002363
Tubing, Union to Purge Valve	700002364
Tubing, 2-way to 3-way Valve	700002378

Common Tubing for Arc Detectors

Description	P/N
Tubing Convoluted	700010532
Tube Assy, PEEK, .062 × .005 × 17 in.	700010533
Tube Assy, PEEK, .062 × .005 × 24 in.	700010530
Tube Assy, PEEK, .062 × .020 × 60 in., Waste	700010531

2475 FLR Detector

Description	P/N
ACQUITY UPLC FLR Detector Performance Maintenance Kit PM Kit consists of: Lamp Assy	201000193
Parts and Accessories	
Low Dispersion Flow Cell for Arc 2475	205001554

ACQUITY UPC² System



ACQUITY UPC² System.

Ordering Information

ACQUITY UPC² BSM

Description	P/N
UPC² BSM Performance Maintenance Kit PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters	201000270
Parts and Accessories	
Assy, Seal Wash Housing, B-Pump	700008999
Assy Plunger, SFC, 0.125 Diameter, 2/pk	700009000
Head, SFC	700009001
Assy, Tube, Head to Transducer, No Loop	430003165
Transducer Assy, SFC A-Pump, 15 K psi, Parylene Coated	700009006
Assy, Seal Wash, Copper, SFC A-Pump	700009007
Support Plate, SFC Head, A-Pump	700009008
Insulating Sleeve, SFC Head, 2/pk	700009009
Assy, 250 µL Mixer	700008909
Kit, Cover, Head Insulator UPC² BSM	700009012
Bulkhead Actuator Insulation , SFC-BSM	415001943
Insulator, Actuator, Pre-chiller, SFC-BSM	415001945
Assy, Tube, SSV to i2 V, SFC	430003096
Assy, Tube, Degasser to SSV, SFC-BSM	430003104
Assy, Tube, Transducer to C-Valve, SFC-BSM	430003105
Assy Tube, Vent Valve P2 to Tee/Filter, SFC	430003108
Assy, Tube, Vent Valve P5 to Tee/Filter, SFC	430003109
Assy, Tube, Accu, CO_2 Transducer, V-Valve	430003161
Assy Tube, Solvent Inlet, SFC-BSM	430003274
Assy Tube, Vent Valve P4 to Waste	430003277
Assy Tube, Vent Valve P1 to Waste	430003278
Head Seal	700009136
Head Support Plate (Pump B)	700002601
Screw Metric Skt Cap M3 × 16, 4/pk	700004023
Screw M5 × 25, 2/pk	700002478
Screw, Metric, Skt Cap M5 × 40, 138 K , 4/pk	700006049
Transducer Assy, Head Mounted	700002594
Wash Seal, 2/pk	700009137
Solvent Select Valve Cartridge	700005408
Union, 0.020 in. I.D. V-Detail	700002636
Tube, Degasser 2 to SSV 2	700003387
Tube, Degasser 3 to SSV 3	700003388
Tube, Degasser 4 to SSV 4	700003389
Air Filter, Side Panel, Fan Intake	401000813
Air Filter, Vista Pump	700002632
Connector Plug, 12-pin	700001539
ACQUITY UPC² CO_2 Connections Kit	205001006

ACQUITY UPC² SM-FL

Description	P/N
UPC² SM-FL Performance Maintenance Kit PM Kit consists of: Syringes, Needle Assy, Injection Cartridge, 10 µL Loop, Tube Assys, and Filters	201000271

Parts and Accessories	
Injection Valve Cartridge	700009057
In-line Waste Valve	410003180
PEEK Sample Needle Kit, 10 µL	700009095
Needle Assy, 250 µm, PEEKsil	700005179
Syringe, 100 µL	700002570
Volume Detection Device	700009094
Wash Port Fitting, 1/4–28 PEEK	700005297
Sample Loop, 2 µL	430002928
Sample Loop, 5 µL	430002936
Sample Loop, 10 µL	430002938

ACQUITY UPC² Convergence Manager

Description	P/N
Convergence Manager Performance Maintenance Kit PM Kit consists of: Valve Cartridge, Pressure Regulator, and Filters	201000272

Parts and Accessories	
Tee, V-Detail, SFC	405013607
Assy Tube, Tee to Vent Valve, SFC	430003194
Assy, Cartridge, Static Regulator	700009459
Assy Tube, Transducer to ABPR	430003200
Assy, Filter, 20 µm, 19 mm	700009059
Tube, Convoluted, 3/8 in. I.D., Cuffed End	430003142
Tube, Convoluted, 1/4 in. I.D., Cuffed End	430003191
Assy Tube, Vent Valve Tee to ABPR	430003201
Welded Tube, SM P6 to CM P1	430003351
Welded Tube, SS 0.007 in. I.D. × 14.5 in.	430003211
Welded Tube, SM P5 to CM P4	430003350
Welded Tube, SS 0.007 in. I.D. × 26.0 in.	430003339
Welded Tube, SS 0.007 in. I.D. × 20.5 in.	430003341
Injection Cartridge	700009052
Air Filter	401000813

ACQUITY CM-A

Description	P/N
ACQUITY CM-A/CM-A Aux Performance Maintenance Kit PM Kit consists of: Filters	201000207

Parts and Accessories	
Kit, ACQUITY UPC², SST, .007 in. I.D. × 12.5 in.	205001002
Kit, ACQUITY UPC², SST, .007 in. I.D. × 18.5 in.	205001003
Kit, ACQUITY UPC², SST, .007 in. I.D. × 36.5 in.	205001004
Kit, ACQUITY UPC² CM-A 6 Column Tubing	205001001
Kit, ACQUITY UPC² CM-A 4 Column Tubing	205000999
Kit, ACQUITY UPC² CM-A 2 Column Tubing	205000986
Valve Cartridge, Rotary Shear, SS	700005438

ACQUITY UPC² PDA Detector

Description	P/N
PDA/TUV Performance Maintenance Kit PM Kit consists of: PerformancePLUS Lamp	201000273

Parts and Accessories	
PerformancePLUS HB Deuterium Lamp Assembly	700005269
I/O Connector 6-pin	700005237
Ethernet Cable, Shielded CAT 5 Cross-over, 3 ft.	440000145
Ethernet Patch Cord, Shielded, 10 ft.	441000372
Fuse Holder	WAT055426
Back Pressure Regulator, 250 psi	700002676
ACQUITY UPC² Analytical Flow Cell	205015037
Leak Sensor Assy	205000505

ACQUITY APC System

Ordering information

ACQUITY APC CM-S

Description	P/N
CM-S Performance Maintenance Kit PM Kit consists of: Filters	201000282
Parts and Accessories	
Kit, Tubing Configuration, No Vlvs, CM-S	205001166
Kit, 2-column Bank Connection, CM-S	205001169
Kit, 3-column Bank Connection, CM-S	205001171
Kit, 4-column Bank Connection, CM-S	205001172
Tubing, SS Bypass, .004 in. I.D.	430002725
Welded Tube Assy, SST, 44.0 LG, LP	430002772
Welded Tube Assy, SS, 19.0 LG	700005478
Welded Tube Assy, SS, 22.5 LG, LP	700005480
Welded Tube Assy, MP35N, 14.5 LG, LP	700005482
Latch Set, CM-A/CM-Aux Trough Cover, L&R	700005980
Assy, Cartridge, 9-port CM-S	700008871
Tube, .005 I.D., Col Conn, In-line	700009524
Tube, .004 I.D., Col Conn, Offset "U"	700009534
Tube, .004 I.D., Col Conn, "U"	700009535
Cover, Column Manager	700009538
Gasket, Trough Cover	700009539
Retainer Clip. CM-S Trough, APH	700009540
Gasket, Thin, APH, CM-S	700009541
Tube, .004 I.D., Col Conn, Long	700009560

ACQUITY APC SM-FTN

Description	P/N
ACQUITY APC SM-FTN Performance Maintenance Kit PM Kit consists of: Syringe, Std Needle, Injection Cartridge and Filters	201000285
Parts and Accessories	
Assy, Extension Loop, 250 µL	430002007
Assy, Extension Loop, 100 µL	430002011
Assy, Extension Loop, 50 µL	430002012
Cup, Overflow	700009505
Support Sleeve, Fountain Wash PPS	700009506
Guide, Sample Needle, PPS	700009512
Syringe, 100 µL, HP PPS Tip	700009529
Set Screw, M3 × 5, T6, for Needle Guide	700009530
Syringe, 250 µL, HPLC PPS Tip	700009576
Needle, 30 µL, pFTN	700009580
Cartridge, Inject, FTN, 18 K psi, APC	700009919



ACQUITY APC System.

ACQUITY APC PDA TS

Description	P/N
PDA/TUV Performance Maintenance Kit PM Kit consists of: PerformancePLUS Lamp	201000273
Parts and Accessories	
ACQ PDA TS Analytical Flow Cell	205001162
Assy, Tube Inlet .004 I.D. LT PEEK Nut	430001748
Assy, Tube Inlet .0025 I.D. LT PEEK Nut	430001749
Assy, Tube Inlet .0025 I.D. PEEK Nut PDA	430001783
Union, .020 I.D., V-detail	700002636
Performance Plus HB Deuterium Lamp Assy	700005269
Backpressure Restrictor	700009590

ACQUITY APC p-ISM

Description	P/N
p-ISM Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000283
Parts and Accessories	
22 µL Filter Assy	205000731
Tube, Transducer to Check Valve, MP35N	430002475
Tubing Kit, SS, Standard Flow TUV/PDA, 6 and 10 in.	700003756
i2V Cartridge, Hexane/THF	700005272
Assy Check Valve, Dual Ball, and Seat	700005273
Transducer Pressure, Flex Cable	700006045
Assy, Cartridge Vent Valve	700006052
Pump Head, 316 SS, DLC, Face Seal	700009190
Tube, Degasser to i2 V	700009478
Tube Assy, Solvent Inlet, ISM	700009483
Tube, VV P4 to Waste, p-ISM	700009484
Tube, SW to Accum, EFTE	700009485
Tube, SW, Accum to Pri, EFTE	700009489
Tube, Seal to Waste, EFTE	700009490
Tube, Vent Valve P2 to Filter, ISM	700009491
Tube, VV to Waste	700009493
Tubing, GP Pump Outlet	700009911

ACQUITY UPLC I-Class System

Ordering Information

ACQUITY I-Class Sample Manager-FTN

Description	P/N
ACQUITY I-Class Sample Manager-FTN Performance Maintenance Kit PM Kit consists of: Syringe, Std Needle, Injection Cartridge, and Filters	201000259

Parts and Accessories	
Air Filter, Side Panel	401000694
Guide, Sample Needle	405008854
Seat, Vespel with Anti-rot	405011492
Assy, Tube, Out, Wash Pump	430002345
Assy, Tube, Feed, Injection Port	430002346
Assy, Tube, Feed, Syringe	430002347
Assy, Tube, Feed, Transducer	430002348
Assy, Tube, Feed, Injection Valve	430002349
Assy, Tube, Waste, EXT., Injection Valve	430002360
Assy, Tube, Waste, Injection Valve	430002362
Tube Assy, Sample Manager Purge	430002462
Syringe, 100 µL, HP	700002570
Filter, Solvent Bottle, SS, 7/pk	700003616
Assy Needle 15 µL with Guide and Seat 18 K psi	700008977
Assy, Seat Port, .003 I.D.	700006056
Assy, Cart, Inject, STR, FTN, 18 K psi	700006057
Tube, ACQUITY UPLC I-Class to MS MP35N 17 in.	700008939
Tube, ACQUITY UPLC I-Class to MS PEEKsil 17 in.	700008940
Tube, ACQUITY UPLC I-Class to MS PEEK 17 in.	700008941
Tube, ACQUITY UPLC I-Class to MS PEEK 21 in.	700008942
Tube, ACQUITY UPLC I-Class to MS PEEKsil 21 in.	700008943
Tube, ACQUITY UPLC I-Class to MS PEEKsil. 003 × 21 in.	700008944
10.5 in. Col to PDA Det Inlet, SST	205000895
8.5 in. Col to TUV Det Inlet, SST	205000896



ACQUITY UPLC I-Class System.

ACQUITY I-Class Sample Manager-FL

Description	P/N
ACQUITY I-Class Sample Manager-FL Performance Maintenance Kit PM Kit consists of: Syringes, Std Needle, Injection Cartridge, 10 µL Loop and Filters	201000258

Parts and Accessories	
Assy, Tube, SSV/P-3 to Transducer	430002558
Assy, Tube, SSV P-2 to VM/SSV	430002560
Assy, Tube, WS1 to VM/S-SY	430002564
Assy, Tube, WS2 to VM/W-SY	430002566
Assy, Tube, WS to VM/W-In.	430002568
Assy, Tube, SS to VM/S-In.	430002571
Assy, Tube, NCS Inlet	430002579
Assy, Tube, VDD	430003103
Tube, NCS, Puncture Needle to Elbow	430003159
Syringe, 100 µL, HP	700002570
Port, Seal, Needle Wash	700002886
Assy, Puncture Needle, .059 O.D.	700006067
Assy, Cart, Inject, STR, FL, 18 K psi	700006069
Syringe, 2.5 mL, Inverted	700006070
Assy, Sample Loop, EXT. Hypo Tip, 5 µL	430002936
Assy, Sample Loop, Hypo Tip, 10 µL	430002938
Assy, Sample Loop, EXTD. Hypo Tip, 1 µL	430003166
Assy, Sample Loop, EXT. Hypo Tip, 2 µL	430002928
Kit, I-Class FEP/Metal Needle, 10 µL	700005925
Kit, I-Class PEEKsil Needle 10 µL	700005926
Kit, I-Class FEP/Metal Needle, 20 µL	700005929
Kit, I-Class ACQUITY UPLC PEEKsil Needle	700005930
Kit, I-Class PEEK Needle, 10 µL	700005923

ACQUITY I-Class BSM

Description	P/N
ACQUITY I-Class BSM Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000260

Parts and Accessories	
Filter, Air	405003507
Assy, Tube, Degasser Port B2 to SSV B	430001113
Assy, Tube, Degasser Port B1 to SSV B	430001114
Assy, Tube, Degasser Port A1 to SSV A	430001115
Assy, Tube, Degasser Port A2 to SSV A	430001116
Assy, Tube, Accu. "B" Xducer—Vent Valve	430001199
Assy, Tube, Accu. "A" Xducer—Vent Valve	430001200
Assy, Tube, Vent Valve P5 to Tee/Filter	430001207
Assy, Tube, Vent Valve P2 to Tee/Filter	430001208
Assy, Tube, SSV to i2V	430001443
Assy, Tube, Vent Valve P1 to Waste	430001893
Assy, Tube, Vent Valve P4 to Waste	430001894
Assy, Tube, Head to Xducer, MP35N	430002472
Assy, Tube, Prim-out Xducer to CV, MP35N	430002583
Tube Assy, Solvent Inlet, BSM-CR	430002800
Plunger Assy, 2/pk	700002600
Support Plant, Thickened, VHP, Head	700002601
Filter, Air	700002632

Parts and Accessories	
Filter, Air	700002633
Screw, Comp., 10–32, SS Gold Plated, Short, 10/pk	700002634
Ferrule, Set, .062, Two-piece, 10/pk	700002635
Screw, Comp., 10–32, SS Gold Plated, Long, 10/pk	700002645
Primary Inlet Check Valve Filter Kit, 2/pk	700002912
Assy, Cartridge, Filter, SS Frit	700002913
Marker Set, Tubing, ACQUITY, 2/pk	700003102
Filter, Solvent Bottle, SS, 7/pk	700003616
Kit, Check Valve, Dual Ball and Seat, 2/pk	700003755
Ferrule, Lock Ring and Screws, Flangless, 7/pk	700003797
Assy, Cartridge, i2 V, Hexane/THF, 2/pk	700004139
Fitting and Lock Ring, GPV Filter, 4/pk	700005259
Pump Head, 316 SS, DLC, Face Seal	700009190
Seal, Wash, .0787 I.D., Fixed, 2/pk	700006048
SCR, Metric SKT Cap M5 × 40, 138 K psi, 4/pk	700006049
Assy, Cart, Vent, Dogleg, 18 K psi, Dome	700006052
*HP Seal, Dual Spring, Perform Seal, 2/pk	700009135
Assy, Housing, Seal Wash, .045, SST, 2PT	700009194

*S/N prior to G12BUR641M must use 0.045 Seal Wash Housing and Seals Conversion Kit (p/n:205001097) first.

ACQUITY UPLC H-Class System



ACQUITY UPLC H-Class System.

Ordering Information

ACQUITY H-Class Sample Manager-FTN

Description	P/N
ACQUITY H-Class Sample Manager Flow Through Needle Performance Maintenance Kit PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters	201000234
Parts and Accessories	
Sample Needle Kit, 15 µL	700005215
In-line Waste Valve, 1/4–28 Thread	410003180
Seal Extension Tube	700005234
Injector Valve Cartridge, SM-FTN	700005236
Sample Needle Guide	405008854
Needle Seat	405011492
Syringe 100 µL, HP	700002570

ACQUITY H-Class Column Heater Active

Description	P/N
Door Latch with Pins	700005248
Clip Retainer	415001544
Active Preheater Assembly	205000730
Column Support Clips, 10/pk	205000478
Screw, Panel, M4 × 16, Blue	410003295
Extension Arm Kit, Optional	205000726
Drip Tray, CH-A	415001608
Tygon Tubing (0.375 in. O.D. × 0.250 in. I.D.)	700001796
External Cable, Right Angle	441001040
I-button, CH-A	700005251

ACQUITY H-Class Quaternary Solvent Manager

Description	P/N
ACQUITY H-Class Quaternary Solvent Manager Performance Maintenance Kit PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters	201000233
Parts and Accessories	
Bottle Tray	289002414
Seal Wash Waste Fittings	405003015
Plunger Removal Tool	405007627
Inlet Manifold	405010508
Screw, Metric Skt Cap M5 × 40, 2/pk	410001296
Tube Assembly, Degasser to GPV	430002208
Tube Assembly, Transducer to Vent Valve	430002316
Tube Assembly, Vent Valve P4 to Waste	430002317
Tube Assembly, Vent Valve P2 to Outlet Filter	430002319
Tube Assembly, Transducer to Check Valve	430002357
Tube Assembly, GPV-D to Mixer Manifold	430002387
Tube Assembly, GPV-C to Mixer Manifold	430002388
Tube Assembly, GPV-A to Mixer Manifold	430002389
Tube Assembly, GPV-B to Mixer Manifold	430002390
Tube Assembly, Mixer Manifold to i2 V	430002400
Outlet Housing Cartridge, Stainless Steel	700001530
Transducer	700002594
Pump Head	700002595
Seal Wash Housing	700002597
Seal Wash Housing Seal	700002598
Head Plunger Seal	700002599
Plunger	700002600
Head Support Plate	700002601
Ferrule Set (.062, 2-piece), 10/pk	700002635
Vent Valve Cartridge Assembly	700002660
Screw, Metric Skt Cap M3 × 16, 4/pk	700004023
i2 V Valve	700005162
Check Valve, Double Ball and Seat	700005164
i2 V Valve Cartridge, 1/pk	700005165
Filter, Air, Door	700005167
Filter for GPV, 4/pk	700005173
Assy, Mixer, 100 µL, QSM	700005119
O-ring, Teflon, Pump Head	WAT076152
Seal Wash Pump Solenoid	WAT270926

ACQUITY UPLC H-Class Bio System



ACQUITY UPLC H-Class Bio System.

Ordering Information

ACQUITY H-Class Bio Column Management

Description	P/N
CH30-A	
APH Bio MP35N, 12.5 in. LG	205000756
APH Bio MP35N, 23 in. LG	205000777
CH-30A Tubing Kit, Bio	205000792
Tube, Outlet, MP35N, 22.5 in. LG	700008914
Tube, Outlet, MP35N, 36 in. LG	700008915
CM-A	
CM-A and CM-Aux Performance Maintenance Kit PM Kit consists of: Filters	201000207
Parts and Accessories	
Assy, MP35N, 14.5 LG, HP	700005481
Assy, MP35N, 14.5 LG, LP	700005482
Assy, MP35N, 19.0 LG, LP	700005483
Assy, MP35N, 19.0 LG, HP	700005484
Assy, MP35N, 22.5 LG, LP	700005485
By-pass Tubing, MP35N, .005 in. I.D.	430002779
APH Bio MP35N, 12.5 in. LG	205000756
APH Bio MP35N, 18.5 in. LG	205000775
Valve Cartridge Kit, Ti CM-A	205000773

ACQUITY H-Class Bio SM-FTN

Description	P/N
H-Class Bio FTN Performance Maintenance Kit PM Kit consists of: Syringe, Std Needle, Injection Cartridge, and Filters	201000201
Parts and Accessories	
Air Filter, Side Panel	401000694
Seat, Vespel with Anti-rot	405011492
Calibration Pin, RZZ Mechanism	405013532
Union, 1/4–28, THRU	410001281
Ferrule, Set, .062, Two-piece	410001349
Assy, Tube, Out, Wash Pump	430002345
Assy, Tube, Feed, Injection Port	430002346
Assy, Tube, Feed, Syringe	430002347
Assy, Tube, Feed, Transducer	430002348
Assy, Tube, Feed, Injection Valve	430002349
Assy, Tube, Waste, EXT., Injection Valve	430002360
Assy, Tube, Waste, Injection Valve	430002362
Tube Assy, Sample Manager Purge, Bio	430002464
Tube Assy, Sample Manager Wash, Bio	430002487
Syringe, 100 µL, HP	700002570
Screw, Comp., 10–32, SS Gold Plated, Short, 10/pk	700002634
Ferrule, Set, .062, Two-piece, 10/pk	700002635
Ferrule, Flangeless, Tefzel, Lock Ring	700003796
Ferrule, Lock Ring and Screws, Flangeless, 7/pk	700003797
Solvent Filter, Titanium, 7/pk	700005378
Cartridge, Inject Valve, Bio	700005407
Needle, DI-15 µL, MP35N, BioSM-FTN	700005421
Kit, Tube Markers, Purge/Wash	700005429

ACQUITY H-Class Bio QSM

Description	P/N
ACQUITY H-Class Bio QSM Performance Maintenance Kit PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters	201000244

Parts and Accessories	
Tube Assy, Solvent Inlet, BioQSM	430002274
Assy, Tube, Vent Valve P4 to Waste, QSM	430002317
Assy, Tube, Head to Xducer, MP35N	430002472
Assy, Tube, Degasser to GPV, MP35N	430002474
Assy, Tube, Xducer to Check Valve, MP35N	430002475
Assy, Tube, Xducer to Vent Valve, MP35N	430002476
Assy, Tube, Vent VLV P2 to Filter, MP35N	430002477
Assy, Tube, Mixer Manifold to i2 V, MP35N	430002479
Assy, Tube, GPV-A to Mixer, MP35N	430002481
Assy, Tube, GPV-B to Mixer, MP35N	430002482
Assy, Tube, GPV-C to Mixer, MP35N	430002483
Assy, Tube, GPV-D to Mixer, MP35N	430002484
Transducer Assy, Head Mounted, 15 K psi	700002594
Plunger, .0787 Diameter × 1.415, 2/pk	700002600
Support Plant, Thickened, VHP, Head	700002601
Screw, Comp., 10–32, SS Gold Plated, Short, 10/pk	700002634
Ferrule, Set, .062, Two-piece, 10/pk	700002635
Screw, Comp., 10–32, SS Gold Plated, Long, 10/pk	700002645
Pin Plug, 1/16 in., High Pressure, 5/pk	700002747
Ferrule, Flangeless, Tefzel, Lock Ring	700003796
Ferrule, Lock Ring and Screws, Flangeless, 7/pk	700003797
Filter, Air, Door	700005167
Assy, Mixer, 100 µL, BioQSM	700005258
Fitting and Lock Ring, GPV Filter, 4/pk	700005259
Solvent Filter, Titanium, 7/pk	700005378
Barbed Seal Wash Housing, Titanium	700005410
Pump Head, ACQUITY, Titanium	700005411
Cartridge, Vent Valve, BioQSM	700005413
Cartridge, i2V, BioACQUITY	700005414
Check Valve, Accumulator, Ti	700005415
HP Seal, .0787 I.D., Flanged, Bio	700005418
Holder, 20 Micron Frit, Titanium, 4/pk	700005419
Wash Seal, .0787 I.D., Flanged, Bio	700005422

ACQUITY UPLC System

Ordering Information

ACQUITY UPLC Binary Solvent Manager

Description	P/N
ACQUITY i2 Valve Binary Solvent Manager Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000197
ACQUITY Binary Solvent Manager Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000173

Parts and Accessories	
100 µL Filter Mixer	205000404
High Sensitivity Filter Mixer, 425 µL	205000403
Tube Assembly, Solvent Inlet SDS	430001020
Degasser Port B2 to SSV B Tube Assembly	430001113
Tube Assembly, Transducer to Check Valve	430001121
Vent Valve P5 to Tee/Filter Tube Assembly	430001207
Tube Assembly, System Outlet SDS	430001486
Transducer Assembly, Head Mounted, 15 K psi	700002594
15 K psi Head	700002595
UPLC Primary Check Valve Assembly, 2/pk	700002596
Seal Wash Housing	700002597
Wash Seal, 2/pk	700002598
Head Plunger Seal	700002599
Plunger, 2/pk	700002600
Support Plate, Thickened, VHP Head	700002601
Solenoid Valve, Solvent Select	700002603
Fuse, 5A, 250 V, 5 × 20 mm, SLO BLO, 5/pk	700002604
Screw, Comp., 10–32, SS Gold Plated, Short 10/pk	700002634
Ferrule Set, 1/16 in. I.D., Two-piece, 10/pk	700002635
Union, .020 I.D.	700002636
Screw, Comp., 10–32, SS Gold Plated, Long, 10/pk	700002645
Vent Valve/Trap Valve Cartridge	700002660
Solvent Bottle Filter, Stainless Steel, 7/pk	700003616
Solvent Bottle Filter, Stainless Steel, 1/pk	700003615
50 µL High Pressure Filter Mixer	700002911
Primary Inlet Check Valve Filter Kit, 2/pk	700002912
ACQUITY Accum. Check Valve, 2/pk	700002968
O-ring, Teflon	WAT076152
Assembly, Actuator	700003557
Assembly, Tube, Transducer to Check Valve	430001773
Assembly, Tube, SSV to Active Check Valve	430001443
Fuse, 0.5 A Slow Blow	WAT042091



ACQUITY UPLC System.

ACQUITY UPLC Sample Manager

Description	P/N
ACQUITY Sample Manager Performance Maintenance Kit PM Kit consists of: Syringe, Needle, and Filters	201000174

Parts and Accessories	
ACQUITY UPLC Column In-line Filter Kit	205000343
Needle Stainless Steel, 30 µL	205000362
Needle, 15 µL Stainless Steel	205000363
Needle, Stainless Steel Tip, 30 µL	205000369
Needle, Stainless Steel Tip, 15 µL	205000370
Tube Holder, 24-well, 1.5 mL Tubes	405003740
Tube Holder, 48-well, 0.65 mL Tubes	405003741
Vial Holder, 24-well, 4 mL Vial	405003742
Vial Holder, 48-well, 2 mL Vial	700011047[7]
250 µL Sample Syringe	410001347
Sample Needle Fitting Kit	410001659
Tube Assembly, Inject Outlet, (UPLC Fittings both ends)	430001084
Needle Guide Tube	430001086
Tube Assembly, Inject Out, (UPLC fitting at injector and HPLC fitting at Col. Inlet)	430001221
Sample Loop, 2 µL	430001264
Sample Loop, 5 µL	430001311
Sample Loop, 20 µL, Std.	430001320
Sample Loop, 50 µL	430001325
Sample Loop, 10 µL	430001326
2.5 mL Wash Syringe	700002569
100 µL Sample Syringe	700002570
Needle Seal O-ring, 002 Kalrez	700002572
Needle Assembly, PEEK	700002644
ACQUITY Injector Pod/Cartridge	700002765
0.2 µm SS Column In-line Replacement Frits, 5/pk	700002775

ACQUITY UPLC Sample Organizer

Description	P/N
ACQUITY Sample Organizer Performance Maintenance Kit PM Kit consists of: Filters	201000208

Parts and Accessories	
Door Window Shade	700003794
Vial Holder, 48-well, 2 mL Vial	700011047
Vial Holder, 24-well, 1.5 mL Tubes	405003740
Vial Holder, 48-well, 0.65 mL Tubes	405003741
Vial Holder, 24-well, 4 mL Vial	405003742



ACQUITY UPLC Bottle Accessory Kit.

ACQUITY UPLC Bottle Accessory Kit

Description	P/N
ACQUITY UPLC Bottle Accessory Kit	205000589

ACQUITY UPLC Column Manager, Column Heater, and Cooler

Description	P/N
Column Stabilizer Kit, 50/100 mm Columns	205000291
Column Stabilizer Kit, 150 mm Columns	205000365
Column Support Clips, 10/pk	205000478
Ferrule, PEEK, 1/16, HPFT, 10/pk	700003114
Fingertight Reusable Fittings Kit	700003139
Door Seal Gasket	700003147
Snap-in. Clip, 1/16 Tubing	700003151
Column Retainer Rod, 2/pk	700003156
Exit Drip Tray	700003164
I-button Cord Clip	700003167
Collet, Reusable, HPFT, 10/pk	700003168
Screw, Comp., Reusable, HPFT, Gold, 10/pk	700003169
1-piece Fitting, 10–32, 10/pk	700004841
Column Support Clips, Column Heater, 10/pk	205000263
Column Heater Thermal Gasket	425000536
Front Cover, Column Heater	700002587
Collet, Reusable, HPFT, 2/pk	700003115
Screw, Comp., Reusable, HPFT, Gold, 2/pk	700003116

ACQUITY UPLC Open Architecture System

Description	P/N
Open Architecture UPLC Performance Maintenance Kit PM Kit consists of: Injection Cartridge, 10 µL Loop Tension Cords, and Lubricant (Relevant Syringe is ordered separately)	201000198

Parts and Accessories	
10 µL Sample Loop	430001326
25 µL Syringe	700002705
5 µL Sample Loop	430001311
Column Manager Tubing Assembly	430002015
Column Stabilizer Tubing Assembly	205000585
Injection Valve Adapter	700004145
Injection Valve Pod	700011083
MS Inlet Tubing Assembly	430001229
O-ring, Injection Valve Drive	700004147
Syringe Kit, 25 µL	205000275
System Outlet Tubing	430001017
Valve Drive	700002455
Waste Check Valve Kit	700004057
Ferrule Set, (062), 2-piece	700002635
Screw, Comp., 10–32, SS Gold Plated, Long 10/pk	700002645
Screw, Comp., 10–32, SS Gold Plated, Short 10/pk	700002634

DID YOU KNOW...

Waters supplies System Performance Standards that can help you benchmark and trend ACQUITY UPLC data, enhancing productivity and increasing the accuracy of results.

For more information, visit asr.waters.com



ACQUITY Isocratic Solvent Manager.

ACQUITY Isocratic Solvent Manager

Description	P/N
ACQUITY ISM Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000286

Parts and Accessories	
22 µL Filter Assy	205000731
Assy, Tube, Head to Xducer	430001120
Assy, Tube, Xducer to Check Valve	430002357
Wash Pump Solenoid	WAT270926
Plunger, .0787 Diameter × 1.415, 2/pk	700002600
Support Plant, Thickened, VHP, Head	700002601
Primary Inlet Check Valve Filter Kit	700002912
Transducer, Pressure	700006045
Seal, Wash, .787 I.D., Fixed, 2/pk	700006048
Tube, Vent Valve P2 to Filter, ISM	700009491
Tubing, .156 O.D. × .031 I.D., Pharmed	700009694
Tube, Inlet to Check Valve	700009699
Tube Assy, Solvent Inlet, ISM	700009700
Tee, w/Bracket	700009708
Tube, PEEK, .007 in. I.D. × 16 in. L	700009709
Module, Restrictor, 100 S/R	700009712
Module, Restrictor, 10 S/R	700009713
Module, Restrictor, 250 S/R	700009714
Capillary Tube, ISM Outlet	700009715
Capillary Tube, Optic Det Inlet	700009716
Module, Restrictor, 5 S/R	700009776
Tube, PEEK, .062 × .010 × 60.0 LG	700009778
Tube, PEEK, .062 × .005 × 26.0 LG	700009779
Tube, PEEK, .007 I.D., 28.0 in. LG	700009780
Tube, Connector, UPC^2	700009781
Module, Coiled Probe, Dual Det	700009782
Module, Coiled Probe, Triple Det	700009783
Tube, PEEKsil, 75 µm × 31 in. L	700009784
Support Plate for Drip Tab	700009789
Tube, SST w/AU, .007 in. I.D. × 28 in. LG	700009796
Tube, SST, .005 in. I.D. × 20 in. L	700009797
Tube, SST, .01 in. I.D. × 60 in. L	700009798
Tube, SST/w/AU, .007 in. I.D. × 5 in. L	700009799
Solvent Filter, Thru Tube, 316SS	700010196
O-ring, 2–016, Teflon	WAT076152

ACQUITY UPLC DETECTORS

ACQUITY QDa Detector

Description	P/N
ACQUITY QDa® 'KAB' STD Performance Maintenance Kit PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, and Calibration Pin	201000300
ACQUITY QDa 'KAD' STD Performance Maintenance Kit PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, and Calibration Pin	201000308
ACQUITY QDa 'KAB' High Performance Maintenance Kit PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, Calibration Pin, and Rotary Pump Components	201000301
ACQUITY QDa 'KAD' High Performance Maintenance Kit PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, Calibration Pin, and Rotary Pump Components	201000309

Performance Maintenance Kit does not include the probe. We strongly recommend you purchase and replace annually the appropriate probe, selecting it from the list below.

Note: Instruments prior to KAB1052 will also require MKII Ion Block Assy, (p/n: 700010377) fitted to the instrument.

Parts and Accessories	
ESI Probe Assembly 250 mm	700009641
ESI Probe Assembly 500 mm	700009642
SFC Probe Assembly 200 mm	700009771
Probe Assembly 750 L × 50 µm	700009977
O-ring, 2.6 I.D. × 1.9 C/S Viton, 10/pk	700000943
MKII Ion Block Assembly	700010377
Sample Cone	700009597
Gasket, Pumping Block (Front)	700011132
Seal, Custom Shaft	700009601
Gasket, Ion Block	700009603
Source Aperture Carrier	700009608
O-ring, Viton, 28 × 1 mm	700009614
Cone Gas Nozzle	700009625
Cone Clamp	700009626
Source Gas Seal	700009627
Calibration Pin, Assy (for MKII Ion Block)	700011295
Pumping Block Assembly	700009678
Rotary Pump, RE6 B-oil, 1 L	700009679
Diaphragm Pump Service Kit	700009680
ESI Source Attachment Knob, 2/pk	700009690
Aperture Disc Assembly, 0.2 mm, Performance	700009768
Aperture Disc Assembly, 0.09 mm, Standard	700009769
O-ring, Conductive, 7.1 × 1.6 mm	700009810
Septa, Advanced Green, Non Stick, 11 mm	700009976
External Valve Drain Assembly	700010156
Thumbscrew Assembly	700010158
Oil Filter Insert	700010211
Absorbent Felt	700010213
Gasket, Pumping Block (Rear)	700011133



ACQUITY UPLC RI Detector.

ACQUITY UPLC RI Detector

Description	P/N
Kit, ACQUITY RI Compatibility Kit for APC	205001157
Parts and Accessories	
Valve, 2-way Solenoid	700002360
Assy, Pressure Relief, 1/4–28, 35 psi	700002361
Valve, 3-way Recycle	700002362
Tubing, Union to Relief Valve	700002363
Tubing, Union to Purge Valve	700002364
Tubing, 2-way to 3-way Valve	700002378
Welded Tube Assy, SST, 14.5 LG, HP	700005476
Ferrule, Flangeless w/Lock Ring—3/pk	700009440
Tubing, ETFE, .030 I.D. × .062 O.D.	700009554

ACQUITY UPLC TUV Detector

Description	P/N
ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit PM Kit consists of: PerformancePLUS Lamp (TUV with S/N K05UPT700N or higher)	201000281
Parts and Accessories	
ACQUITY UPLC I.D. Cell TUV, Analytical	205015033
Flow Cell, High Sensitivity, 2.4 µL Vol. (TUV with S/N K05UPT700N or higher)	205015018
Connector Plug, 10-position	323000247
Tube Assembly, Low Flow, TUV Inlet	430001749
Tube Assembly, Std. Flow, TUV Inlet	430001748
Ethernet Patch Cord, 5 ft.	441000456
Fuse, 3.15A (250 V, 5 × 20 mm), 2/pk	700001800
Backpressure Regulator	700002676
Power Cord, 110 V	442000176

ACQUITY UPLC PDA Detector and eLambda Detector

Description	P/N
ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit PM Kit consists of: PerformancePLUS Lamp	201000281
Parts and Accessories	
ACQUITY PDA, Standard Flow Cell, 10 mm, 500 nL (for earlier models)	205015036
ACQUITY UPLC I.D. Cell PDA, Analytical Flow Cell	205015017
ACQUITY UPLC I.D. Cell PDA, High Sensitivity	205015019
Connector Plug, 10-position	323000247
Ethernet Patch Cord, Shielded, 5 ft.	441000456
Event Cable, 6 ft.	441000373
Backpressure Regulator, 250 psi	700002676
Fuse, 3.15A (250 V, 5 × 20 mm), 2/pk	700001800
Power Cord, 110 V	442000176
Assembly, Tube Inlet .004 I.D. PDA	430001784
Leak Sensor	205000505
Tube Assembly, Low Flow, PDA Inlet	430001783

ACQUITY UPLC FLR Detector

Description	P/N
ACQUITY UPLC FLR Detector Performance Maintenance Kit PM Kit consists of: Lamp Assy	201000193
Parts and Accessories	
ACQUITY FLR Flow Cell Assembly	700003711
Fuse Drawer	WAT055426
Fuse 3.15A, 250 V	700001800
10-position I/O Connector	323000247
Connector Shell Cover	323000446
Union, Internal Reducer	410002096
Backpressure Regulator	700002676
Fluorescence System PQ Solution	700003694
Analog Out Cable Assembly	WAT057235
Power Cord, 110 V	442000176
External Ethernet Cable	441000372

ACQUITY UPLC ELS Detector

Description	P/N
ACQUITY ELSD/ELSD Performance Maintenance Kit PM Kit consists of: Lamp Assy	201000159
Parts and Accessories	
Nebulizer	205000342
Connector Plug, 10-position	323000247
Packing Ring, Nebulizer	425000326
PEEK Tubing, 6 in. × .004 in. I.D.	430001562
PEEK Tubing, 14 in. × .004 in. I.D.	430001565
Ethernet Cross-over Cable, 3 ft.	440000145
Ethernet Patch Cord, 5 ft.	441000456
Bottle/Vapor Trap, 1000 mL	700002682
Siphon Drain Tube	700002801
Event In./Out Cable Assembly	WAT020321
Analog Out Cable Assembly	WAT057235
Fuse 5.0A, 250 V, 5 × 20 mm, Fast-acting	WAT163-18

WATERS HIGH BRIGHTNESS LAMP WITH INTELLIGENT TECHNOLOGY

The Waters High Brightness (HB) Lamp boasts features that outshine its competition's. In a lamp history file in the Empower Software Database, the lamp's "intelligent" technology records its serial number, hours of use, and number of ignitions. Moreover, you can include the lamp history in a comprehensive status report, so if you transfer the lamp between units, its data remain with it. Thus you always know exactly how many hours the lamp has operated.

The High Brightness Lamp with Intelligent Technology is currently available for our latest ACQUITY UPLC PDA and TUV Detectors.



Description	P/N
PerformancePLUS HB Deuterium Lamp Assembly	700005269

Waters Fraction Manager—Analytical

Description	P/N
Analytical Fraction Manager Performance Maintenance Kit	201000291
Parts and Accessories	
Assy, Needle, FC-007 I.D., MP35N	700009406
Assy, Needle, FM-10 I.D., MP35N	700010339
Guide, Needle, FC	700010380
Syringe, 250 µL, HPLC	410001347
Assy, Fraction Valve with Coupling	700009400
Basin, Needle Wash	700010215
Assy, Tube, FM Flush	700010453
Assy, Tube, MSV-FV, Interconnect	700010457
Assy, Tube, FV, Inlet	700010458
Tube, Convoluted, 1/4 I.D. × 72 LG	700009402
Tube, Convoluted, 1/4 I.D. × 1.75 LG	700009408
WFMA Delay Coil 0.1–1 mL Flow Kit #1	205001416
WFMA Delay Coil 0.5–2.2 mL Flow Kit #2	205001417
WFMA Delay Coil 2.2–5 mL Flow Kit #3	205001418
WFMA w/QDa Delay Coil 0.1–1 mL Flow Kit 4	205001419
Low Flow Detector—WFMA Tubing Kit	205001427
Assy, Tube, Det-FM, .007" × 14" L, ETFE	700010334
Assy, Tube, Det-FM, .007" × 32" L, ETFE	700010335
High Flow Detector—WFMA Tubing Kit	205001428
Assy, Tube, Det-FM, .010" × 14" L, ETFE	700010336
Assy, Tube, Det-FM, .010" × 32" L, ETFE	700010337
Assy, Tube, Restrictor/Waste, Frac Valve	700010338
Assy, Tube, Res/Waste, FV, Hi Flow	700010345
Kit, 10 mL Vial Holder	205001042
Vial, 2 2 × 45 mm with 20–400 screw top, 100/pk	186001420
96 Well 350 µL ACQUITY Collection Plate	186002643
Plate, 96-well, 700 µL Round Well, 25/pk	186005837
1 mL Round Collection Plate, 50/pk	186002481
2 mL Square Collection Plate, 50/pk	186002482
Holder, 48-well, 2 mL Vial	700011047
Glass Vial with Screw Neck, 100/pk	186000273
Holder, 24-well, 4 mL Vial	405003742
4 mL Vial, Screw Top, 100/pk	186000840
Holder, 48-well, .65 mL Tubes	405003741
Holder, 24-well, 1.5 mL Tube	405003740

DID YOU KNOW...

Waters offers a range of services to support Agilent LC and GC Systems.

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ACQUITY UPLC M-Class System

Ordering Information

ACQUITY M-Class µBSM/ASM

Description	P/N
µBSM/ASM Performance Maintenance Kit PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters	201000289
Parts and Accessories	
Certified Container Low Volume Kit	186007278
Assy, Tube, Vent Valve P1 to Waste	430001209
Assy, Tube, Vent Valve P4 to Waste	430001210
Assy, Tube, Head to Xducer, MP35N	430002472
Assy, Tube, Prim-out Xducer to CV, MP35N	430002583
Plunger, .0787 Diameter × 1.415, 2/pk	700002600
Support Plant, Thickened, VHP, Head	700002601
Valve, Solenoid, Solvent Select	700002603
Tubing, 3/16 in. O.D. × 1/16 in. I.D., TYGON, 25 in.	700003751
Filter, In-line, Titanium Kit, 2/pk	700003784
Cartridge, Filtered Ferrule, Titanium, 2/pk	700003785
i2V PEEK High Pressure Gasket	700005218
PEEK Check Valve Washer	700005221
Reduced Height i2V, Bio	700005412
Cartridge, Valve, Vent	700005413
Cartridge, i2V, BioACQUITY	700005414
Check Valve, Accumulator, Ti	700005415
Transducer, Pressure	700006045
Filter, 1/2 micron, HP, Titanium	700009010
Tee, nano, M-detail, Ti	700009830
Seal, Wash HSG, Dual Sprg, 2P, Ti	700009836
Pump Head, Ti, DLC, Face Seal, Straight	700009837
HP Seal, Dual Spring, .045, 2/pk	700009838
Seal, Wash .0787 I.D., Fixed, Bio, 2/pk	700009839
Tube, Degass Port B2-SSV B, MP35N	700009843
Tube, Degass Port A2-SSV A, MP35N	700009844
Tube, SSV to i2V, MP35N	700009845
Tube, Vent Valve P2-filter, MP35N	700009846
Tube, Vent Valve P5-filter, MP35N	700009847
Tube, Accu "A" XDucer-V V P3	700009848
Tube, Accu "B" XDucer-VV P6, MP35N	700009849
Tube, Filter Inlet A, FCM, MP35N	700009850
Tube, Filter Inlet B, FCM, MP35N	700009851
Tube Assembly, Inlet ASM	700009858
O-ring, 2–016, Teflon	WAT076152



ACQUITY UPLC M-Class System.

ACQUITY M-Class µSM-FL

Description	P/N
µSM-FL Performance Maintenance Kit PM Kit consists of: Syringes, Std Needle, and Filter	201000290
Parts and Accessories	
Plug, One-piece, 10–32, Coned	410001400
Tube Assy, Strong Needle Wash-in.	430002491
Tube Assy, Weak Needle Wash-in.	430002680
Sample Loop, Ext. Hypo Tip, 2 µL	430002928
Sample Loop, Ext. Hypo Tip, 5 µL	430002936
Sample Loop, Ext. Hypo Tip, 10 µL	430002938
Sample Loop, Ext. Hypo Tip, 1 µL	430003166
Syringe, 100 µL, HP	700002570
Kit, I-Class PEEKsil Needle 10 µL	700005926
Puncture Needle, .059 O.D.	700006067
Tube, Vent/Drain	700009863
Cart, Injection, 18 K psi, µSM-FL	700009864

ACQUITY M-Class TVM

Description	P/N
Tee, MMV Nano	289004442
Tube, Cap, 40 µm × 10 in., V-V, HP	700009875
Tube, Cap, 25 µm × 30 in., M-M, HP	700009876
Tube, Cap, 40 µm × 6 in., V-V, HP	700009878
Tube, Cap, 40 µm × 6 in., M-V, HP	700009880
Tube, Cap, 40 µm × 26 in., V-V, HP	700009881
Cap Tube, 40 µm × 30 in., V-PT, HP	700009889
Capillary Tubing, 40 µm × 40 in., Inlet	700010399
Waste Tube, TVM, 31 in.	700009892
Cap Tube, 40 µm × 20 in. L, M-V	700009894
Cap Tube, 25 µm × 20 in. L, M-V	700009895
Assy, Waste Tube	700010401
Nano Tee, #6–40 Ports	700009920
Tube, PEEKsil, 25 µm × 30 in. L, M-V	700010040
Tube, PEEKsil, 25 µm × 50 cm. LG, V-V	700010042
Tube, Cap w/Frit, 40 µm × 26 in. L	700010059

nanoACQUITY UPLC System

Ordering Information

nanoACQUITY High Pressure BSM/ASM

Description	P/N
nanoACQUITY Solvent Manager Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000181

Parts and Accessories	
Assembly, Bottle Tray	289002414
1/2 µm Filter Assembly	289002111
Solvent Filter Assembly, 5 µm	289002172
Degasser Port B2 to SSV B Tube Assembly	430001113
Degasser Port B1 to SSV B Tube Assembly	430001114
Degasser Port A1 to SSV A Tube Assembly	430001115
Degasser Port A2 to SSV A Tube Assembly	430001116
Tube Assembly, Pump Head to Transducer	430001120
Tube Assembly, Transducer to Check Valve	430001121
Tube, Vent Valve Port 1 to Waste	430001209
Tube, Vent Valve Port 4 to Waste	430001210
Tube, Vent Valve Port 5 to Filter	430001346
Solvent Inlet Tube (Aux. Pump Only)	430001389
Tube Set, A2 and B2 Inlet Lines	430001436
Tube, Vent Valve Port 2 to Filter	430001511
Tube, Vent Valve Port 5 to Filter	430001512
Tube, ACC. A Transducer to Vent Valve P3	430001534
Tube, ACC. B Transducer to Vent Valve P6	430001535
Tube, Filter to Flow Sensor Inlet A	430001568
Tube, Filter to Flow Sensor Inlet B	430001569
Tube, ASM to MS, 25 µm × 60 in.	430001572
Fuse Drawer	700001502
Transducer Assembly, Head Mounted, 15 K psi	700002594
15 K Pump Head	700002595
UPLC Primary Check Valve Assembly, 2/pk	700002596
Wash Seal, 2/pk	700002598
Head Plunger Seal	700002599
I/O Connector Plug, 12 pin	WAT270868
Plunger, 2/pk	700002600
Support Plate, Thickened	700002601
Solenoid Valve, Solvent Select	700002603
Fuse, 5A, 250 V, 5 × 20 mm, SLO BLO, 5/pk	700002604
Ferrule Set, 1/16 I.D., Two-piece, 10/pk	700002635
Screw, Comp., 10–32, SS Gold Plated, Long, 10/pk	700002645
Vent Valve/Trap Valve Cartridge	700002660
1/2 µm Filter Insert Assembly	700002696
Tube, Vent Valve Port 2 to Filter	700002702
Tube, ASM to MS, 25 µm × 60 in.	700002712
Solvent Inlet System Tube Set	700002713
Check Valve, Double Ball and Seat, 2/pk	700002968
O-ring, Teflon	WAT076152



nanoACQUITY UPLC System.

nanoACQUITY High Pressure Sample Manager

Description	P/N
nanoACQUITY Sample Manager Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000182

Parts and Accessories	
Shuttle Tray Kit	205000542
Kit, Tubing 2D/2 Pmp. Trap, nanoACQUITY	205000398
Union, Zero Dead Volume	289000439
nano-Tee without Gauge Pin	289002576
nano Trap Column Holder	289002802
Tube Holder, 24-well, 1.5 mL Tubes	405003740
Tube Holder, 48-well, 0.65 mL Tubes	405003741
Vial Holder, 24-well, 4 mL Vial	405003742
Vial Holder, 48-well, 2 mL Vial	700011047
Fitting, Plug, PEEK, Knurled	405005067
Fitting, PEEK, Knurled One-piece	405005068
50 µL Sample Syringe	410001348
2 µL Sample Loop	430001264
5 µL Sample Loop	430001311
20 µL Sample Loop	430001320
50 µL Sample Loop	430001325
10 µL Sample Loop	430001326
Assembly, Cap. Tube with Frit 25 µm × 18 in.	430002242
Capillary Tubing with Frit, 25 µm × 10 in.	430001570
Capillary Tubing with Frit, 40 µm × 16 in.	430001571
25 µm Capillary, BSM to Trap Valve	430001575
40 µm Capillary, ASM to Inject Valve	430001576
Capillary Tubing Assembly, Injection Valve to Column	430001577
Capillary Tubing Assembly, Injection Valve to Trap Valve	430001629
2.5 mL Wash Syringe	700002569
100 µL Sample Syringe	700002570
Needle Seal O-ring, 002 Kalrez	700002572
Fuse, 0.25A, 250 V	700002576
Fuse, 10A, 5 mm × 20 mm, Slo Blo	700002577
Screw, Comp., 10–32, SS Gold Plated, Short, 10/pk	700002634
Sample Needle, PEEK, 15 µL	700002708
Capillary Tube, 300 µm Column Inlet	700002754
Capillary Tube, 300 µm Column Outlet	700002755
300 µm Column Inlet/Outlet Tubing Kit	700002757
Injector Valve Pod/Cartridge	700002907
Column Heater	700002908

nanoACQUITY TUV Detector

Description	P/N
ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit PM Kit consists of: PerformancePLUS Deuterium Lamps (with S/N K05UPT700N and above)	201000281
Parts and Accessories	
TUV Flow Cell, 10 nL (TUV with S/N K05UPT700N and above)	205015013
Connector Plug, 10-position	323000247
Fuse, 3.15A (250 V, 5 × 20 mm), 2/pk	700001800
Backpressure Regulator	700002676
Fuse Holder	WAT055426

nanoACQUITY UPLC System with 2D Technology

Description	P/N
Assembly, Waste Tube, HTM, PEEK	430001456
Union, Nano, 6–40	289004407
Tee, Nano M-M-V-Detail	289004442
Capillary Tubing, BSM-MMV Tee, M-M 25 µm × 24 in.	430002140
Capillary Tubing, Injection Valve to Trap Valve, V-V 40 µm × 13 in.	430001629
Holder, MVM nano-Tee	700004599
Assembly, Capillary Tubing, 1st D Col. In./Out 10 in.	430002183
Assembly, Capillary Tubing, Trap Valve to MMV Tee 12 in.	430002153
Assembly, Capillary Tubing, BSM2-Injection Valve, 22 in.	430002155
Assembly, Capillary Tubing, BSM-Trap Valve, 30 in.	430001575
Assembly, Pod, Trap Valve, 3 trace	700004601
Assembly, Capillary Tube with Frit 25 µm × 18 in.	430002242
nano-Tee, M-M-M Detail	289002576
Pin Plug, 1/16 in., High Press.	700002747
Capillary Tubing Assembly Injection Valve to Trap Valve	430001577
Capillary Tubing with Frit, 40 µm × 16 in.	430001571
Tubing Assembly, Solvent Select Valve to In-line Filter	430001470
Mixer Assembly, 1.0 × 50 mm, Zirc. Bead	289003345
Tubing, Capillary, 300 µm Col. Outlet	430001848
Tubing, Capillary with Frit, 75 µm × 10 in.	430001837
Tubing, Capillary with Frit, 75 µm × 8 in.	430001835
Thumb Screw, Stainless Steel, M5 × 11 mm Large	410001697
Ethernet Switch Box, 8-port	725000455
Mixer Kit for 1 mm Column	205000540

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nanoACQUITY HDX Manager

Description	P/N
Parts and Accessories	
Assy, Tube, Post Column, .005 I.D.	430001919
Assy, Tube, Column HTR/CLR, HPLC	430001923
Column Clip, 4/pk	700002143
Ferrule Set, 1/16 I.D., Two-piece, 10/pk	700002635
Screw, Comp., 10–32, SS Gold Plated, Long, 10/pk	700002645
One-piece Fitting, 10–32, 10/pk	700004841
Clip, Snap-in., 1/16 in. Tubing, 5/pk	700003792
Union	WAT097332

ACQUITY UPLC FLEXCARTS

Make Your System Mobile

A complete-system platform, the ACQUITY UPLC FlexCart wheeled cart provides the means to position an ACQUITY UPLC System close to a mass spectrometer's ionization source, facilitating its installation and operation. Fitted with electrical outlets, a computer monitor and keypad, and a container for fluid waste, the FlexCart is compatible for use with ACQUITY UPLC and nanoACQUITY Systems.



Description	P/N
ACQUITY UPLC FlexCart	205015015
nanoACQUITY UPLC FlexCart	205016040

Alliance Separations Modules

Ordering Information

e2695 SEPARATIONS MODULE



e2695 Performance Maintenance Kit



Replacement Plunger



Description	P/N
e2695 Separations Module Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, Filters, Needle, Syringe (250 µL), and enhanced Injector Rebuild Kit	201000313

2695 SEPARATIONS MODULE



2695 Performance Maintenance Kit



Replacement Plunger



Description	P/N
2695 Separations Module Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, Filters, Needle, Syringe (250 µL), and Injector Rebuild Kit	WAT270944

2695D SEPARATIONS MODULE



2695D Separations Module 8 Needle Performance Maintenance Kit



Description	P/N
2695D Separations Module 8 Needle Performance Maintenance Kit* PM Kit consists of: Dispenser Syringes, Needles, and Filters	700000201

*Note: For proper maintenance of the 2695D, please make sure to order, PM Kit: 700000201 and PM Kit: WAT270944.

IMPORTANT INFORMATION ABOUT SELECTING COMPONENTS FOR WATERS SEPARATIONS

Modules and Pumps

Waters separations modules and pumps are constructed using the highest-quality components available. The component parts recommended in Waters' Performance Maintenance protocols are intended to optimize a system's performance for the widest range of applications possible. Yet, to meet certain performance expectations, some applications may require an alternative technology. For such applications, several options are available that may in some cases affect superior performance in a particular operating environment.

The information that follows serves as a guide to selecting alternative components. It is not intended as a hard-and-fast set of rules. Rather, it is a set of recommendations that, if adopted, may prove more effective, depending on specific application requirements. To determine the best configuration for an application, you may need to experiment.

Sapphire Plungers

Sustained and proper operation of any pump depends on the cleanliness and smoothness of its plungers. Our Performance Maintenance strategy recommends you change sapphire plungers once a year.

The condition of an LC system's sapphire plungers is critically important to its reliable operation. Our PerformancePLUS Sapphire Plunger's crystalline structure is oriented lengthwise, rather than randomly. The effect is a harder, better-sealing surface at the circumference of the plunger and durability that extends the plunger's usable life considerably beyond that of other plungers.

Plunger Seals

The material out of which plunger seals are made is critical. You can obtain seals made of various materials that serve as alternatives to the recommended ones. Some of these seals improve performance in specific applications. The usable life of plunger seals is typically six months to one year. If you find that the life of your seals is shorter than six months, you might try alternative seals.

Plunger-Seal Wash

Seal-wash solvent lubricates the plungers and flushes away any solvent or dried salts forced past the plunger seal from the high-pressure side of the piston chamber. This wash cycle extends the life of the seals. Position the plunger seal-wash reservoir in a visible location above the solvent management system, and refill the reservoir, as necessary, with a solvent suited to your application.

For reversed-phase HPLC applications, use an aqueous seal-wash solution, adding enough organic content to inhibit bacterial growth. For example, depending on your application, you might use an 80:20 water/methanol or water/acetonitrile mixture. For all GPC (normal-phase) separations, use a 50:50 methanol/water mixture as the seal-wash solution.

Note: Ensure that you use separate solutions and containers for the plunger-seal wash and the needle wash for the sample-management system or autosampler. Because the functions of these solutions differ, the use of one solution for both functions may compromise the effectiveness of either needle washing or plunger-seal washing. Change plunger seal wash seals whenever you change the main plunger seals.

Check Valves

Check-valve failures can be a common cause of reproducibility problems. Check-valve failure modes, such as sticking (failure to open or close) and intermittent leaks, can cause variable retention times and pressure fluctuations. Intermittent leaks are often caused by particulate matter that sticks to the ball of the check valve. These particulates can come from the mobile phase, shredded seal material, dirty glassware, or an unclean laboratory environment.

We offer the choice of various types of check-valve cartridges. The standard cartridge incorporates a valve fitted with a ball made of synthetic ruby and a seat made of sapphire. A second option is the PerformancePLUS™ Check-valve Cartridge,* standard on 500- and 600-series pumps. Like the standard cartridge, the PerformancePLUS Cartridge incorporates a ruby ball and sapphire seat, though both are larger than those in the standard cartridge, as is the internal volume. The PerformancePLUS Cartridge also provides excellent sealing characteristics and, at higher flow rates, its larger orifices can provide a performance advantage. Finally, the PerformancePLUS Cartridge is more effective than the standard cartridge in its resistance to sticking. Nevertheless, where sticking problems associated with ruby/sapphire ball-and-seat check-valves persist, we offer a valve fitted with ceramic ball and seat.

For most applications, expect check valves to perform to specifications for a year or more. Note, however, that laboratory practices, such as solvent preparation, choice of plunger-seal material, and the mobile phase required for certain applications can significantly shorten the usable life of these valves. You can reduce or eliminate a tendency toward sticking. To do so, experiment with different ball-and-seat sizes and materials of construction. Then determine which provide optimal performance for a particular application and operating environment.

*Requires PerformancePLUS Separations Module Check Valve Housing, p/n: 700002332, 2/pk.

Common Parts for Alliance Systems



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Ordering Information

Common Parts for Alliance System 2695/D

Description	P/N
PerformancePLUS Alliance Plunger Assy	WAT270959
Head, Plunger Seal Kit (Clear)	700001326
Head, Plunger Seals Repl. Kit (Std—Yellow)	WAT270938
Head, GFP Plunger Seal Kit (Optional Black)	WAT271066
Head, Face Seals Replacement Kit, 4/pk	WAT270939
Wash Tubes Seals Replacement Kit, S/W	WAT270940
Seal Wash Face Seal Replacement Kit	WAT271017
Seal Wash Plunger Seal Replacement Kit	WAT271018
Check Valve Cartridge Replacement Kit (2 cart.)	WAT270941
PerformancePLUS Check Valve Cartridge	700002399
Check Valve Cartridge	700002761
Ceramic Check Valve	700002333
PerformancePLUS Check Valve Housing	700002332
In-line Filter	WAT035190
Filter Insert	WAT088084
Assembly, GPV	WAT270927
Nut, Head	WAT270964
Degasser Chamber	700001218
25 µL Syringe	WAT077343
250 µL Syringe	WAT073109
100 µL Syringe	700011456

Description	P/N
2500 µL Syringe	WAT077342
PerformancePLUS Needle	700001247
HPMV Rebuild Kit	WAT045424
HPMV and Seal Tool Kit	WAT045427
Assembly, Seal Pack Replacement Kit with Needle	700002791
Seal Pack Rebuild Kit with Needle	WAT271019
Kit, Carousel Set, 5/pk	WAT270328
Solvent Bottle Caps, 4 L, 4/pk	WAT062341
Bottle Caps, 1 L, 4/pk	WAT062479

HPLC Pumps

Ordering Information

515 HPLC PUMP



515 Performance Maintenance Kit



Clear-100™ Plunger Seals, 4/pk



Description	P/N
515 HPLC Pump Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	WAT052587

1515 SERIES HPLC PUMP



1515 Performance Maintenance Kit



Solvent Filter



Clear-100 Plunger Seals, 4/pk



Description	P/N
1515 Series HPLC Pump Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000113

1525 SERIES HPLC PUMP



1525 Performance Maintenance Kit



Solvent Filter



Clear-100™ Plunger Seals, 4/pk



Description	P/N
1525 Series HPLC Pumps Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000114

Parts and Accessories	
1525 to 1525 Extended Flow Conversion Kit	205000324
1525 EF Performance Maintenance Kit	201000160

1525 MICRO HPLC PUMP



1525 micro Performance Maintenance Kit



Description	P/N
1525 micro HPLC Pump Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000161

Common Parts for HPLC Pumps

Description	515	1515 1525	1525 Micro	Extended Flow	P/N
1525 micro Seal Kit			•		205000202
Active Seal Wash Kit 1525		•			205000251
Active Seal Wash Kit 1525 EF				•	205000252
Active Seal Wash Kit 1525 micro			•		205000250
AQ Seal Repl., 2/pk	•	•			WAT025296
AQ Seal Repl., 4/pk	•	•			WAT025297
Plunger Seal UP30, 1/pk				•	700002282
Plunger Seal, TAN (Rulon)	•	•			WAT025384
Seal, Clear-100	•	•			WAT022934
Seal, Clear-100, 4/pk	•	•			WAT022946
Seal, Kit Black, Replace	•	•			WAT026613
Seals, Aqueous, Buffer, 2/pk	•	•			WAT025296
Seals, Aqueous, Buffer, 4/pk	•	•			WAT025297
1525, Check Valve, 2/pk			•		700002275
B and S Check Valve Kit				•	WAT088223
Extended Flow Update Kit	•			•	WAT207119
Inlet Check Valve				•	WAT032646
Inlet Check Valve Housing				•	WAT060308
Outlet Check Valve				•	WAT025028

Description	515	1515 1525	1525 Micro	Extended Flow	P/N
Outlet Check Valve				•	WAT025216
Outlet Check Valve Housing				•	WAT025207
Outlet Check Valve Rebuild Kit				•	WAT026014
PerformancePLUS Cartridge with Housing, 2/pk	•	•	•		700000253
PerformancePLUS Ceramic Check Valve Cartridge	•	•	•		700002399
PerformancePLUS Check Valve Cartridge	•	•	•		700000254
Plunger Wash Kit (225 µL)				•	WAT030852
Assembly, Plunger	•	•			WAS207069
Oriented Plunger, 510	•	•			WAT069511
Plunger				•	WAT060304
Retaining Ring	•	•	•	•	WAT025360
Assembly, Solvent Filter	•	•	•	•	WAT025531
Reference Valve 600/510	•	•		•	WAT026592
Reference Valve Rebuild Pump Kit	•	•	•	•	WAT025746
Safety Syringe, 10 mL	•	•	•	•	WAT027629
Priming Syringe Needle	•	•	•	•	WAT025559
Head Support Bushing	•	•	•	•	WAT060305
Ind. Rod Kit	•	•	•	•	WAT069583

Gradient Modules

Ordering Information

2545/2525 BINARY GRADIENT MODULE



2545/2525 Performance Maintenance Kit



Description	P/N
2545/2525 Binary Gradient Module Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000130

2545 QUATERNARY GRADIENT MODULE



2545Q Performance Maintenance Kit



Description	P/N
2545Q Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000199

2535 QUATERNARY GRADIENT MODULE



2535 Performance Maintenance Kit



Description	P/N
2535 QGM Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000209

2555 QUATERNARY GRADIENT MODULE



2555 Performance Maintenance Kit



Description	P/N
2555 QGM Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000210

Common Parts for Gradient Modules

	Binary	Quaternary			
Description	2545/ 2525	2535	2555	2545	P/N
Assembly, Leak Sensor		•	•	•	205000505
Plate, Head Support			•		405006414
Pump Head .395			•		405008440
Plunger C-Clip		•		•	410000570
Tubing, Mixer to Vent Valve		•	•	•	430002032
Assembly Tube, Right Transducer Outlet		•	•	•	430002121
Check Valve Cartridge Kit, 4/pk	•				700001493
Plunger Seal Kit, 4/pk	•				700001494
Assembly, Cartridge Housing Outlet		•	•	•	700001530
Assembly Housing, Inlet Check Valve		•	•	•	700001529
Outlet Pump Filter Assembly			•		700001836
Block, Stop Valve Positioning		•	•	•	700004425
Drip Tray, Leak Sensor, 2545Q, LS Ready		•	•	•	700004430

	Binary	Quaternary			
Description	2545/2525	2535	2555	2545	P/N
Inlet Manifold Block		•	•	•	700004431
Bracket Mixer Inlet, Manifold Z		•	•		700004439
Assembly, Mixer				•	700004436
Manifold Outlet Check Valve		•	•	•	700004445
Pump Head Assembly		•		•	700004454
Assembly, Tube 1/4 Solvent Inlet (from Solvent Bottle)			•	•	700004607
Assembly Pump Head Support Plate		•		•	700004613
Solvent Filters, 4/pk		•			700005083
Assembly Mixer			•		700005084
Helium Connection Kit		•	•	•	WAT023486
Assembly, Solvent Filters (Sparge)		•	•	•	WAT025531
Manifold Tee 2555Q			•		WAT070122

Fluid Handling Units

Ordering Information

REAGENT MANAGER



Description	P/N
Reagent Manager Performance Maintenance Kit PM Kit consists of: Plungers, Check Valves, Seals, and Filters	201000102

Parts and Accessories	
EZ Grip Nut, 3/pk	700000146
EZ Grip Ferrule, 3/pk	700000145

Tools

Description	P/N
Capillary Tubing Cutter	605000101
PEEK Tubing Cutter	700001012
Collet and Compression Screw Multi-tool	700003170
3/16 in. Open End Wrench	700000610
Plunger Insertion Tool	WAT011042
Snap Ring Pliers	WAT025263
Tubing Cutter for 1/16 in. Stainless Steel Tubing	WAT022384
Tubing Cutter, Spare Blades, 3/pk	WAT022385
Hex Key for 2465 Flow Cell Assembly	700001985

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Injectors/Fraction Collectors

NEW 3767



Description	P/N
3767 Performance Maintenance Kit PM Kit consists of: Analytical and Preparative Valve Rebuild kits, Vented Probe/Needle, Inject Ports & Grease. Appropriate Syringes for the configured injection volume should also be ordered separately	201000333

Parts and Accessories	
Syringe, 1.0 mL, 3767	700012876
Syringe, 2.5 mL, 3767	700012877
Syringe, 5.0 mL, 3767	700012878
Syringe, 12.5 mL, 3767	700012879
Vented Probe/Needle	700001387
Inject Port Assembly 4/pk	700002284
Analytical Valve Rebuild Kit	201000124
Preparative Valve Rebuild Kit	700001331
Sample Loop, 2 mL	700001987
Sample Loop, 5 mL	700001989
Sample Loop, 10 mL	700001991
Kit, 2.5 mL Syringe, 3767*	700013083
Kit, 5.0 mL Syringe, 3767*	700013084
Kit, 12.5 mL Syringe, 3767*	700013085

* Kit includes:Syringes, Loops and Holding Loops and accessories to enable injection volumes of 2 ml, 5 ml or 10 ml.

NEW GC PAL 3

Description	P/N
GC-PAL3 Performance Maintenance Kit PM Kit consists of: Replacement Wash Vials, Lubrication Kit & Agitator belts	201000335

Parts and Accessories	
Drive Belt, PAL3 Agitator, 6 × 20 ml, 3/pk	700012528
Wash Vial Kit, 10 ml	700013059
PAL, Lubrication Kit	700002945
Liquid Tool	700012879
Smart Syringe, 10 µL	700012540

NEW 3777C



Description	P/N
3777C Performance Maintenance Kit PM Kit consists of: 10 µl Syringe, Needle, One piece Needle Seal, Replacement Rotor for Analytical Valve, Holding & Sample Loops Rebuild kits, Vented Probe/Needle, Inject Ports & Lubrication Kit	201000318

Parts and Accessories	
100 µl Syringe 3777C	700011725
Needle 3777C (3/pk)	700011726
Holding Loop 3777C	700011727
Sample Loop 10 µL	700002504
Rotor Inject Valve, 6 Port, 2 Position	700002292
One Piece Needle Seal 3777C (5/pk)	700012893
PAL, Lubrication Kit	700002945



Parts and Accessories	
Headspace Tool:	
Smart Syringe, 2500 µL	700012539
Cap, Magnetic, for 20-ml Vial, Headspace, 100/pk	700012542
Vial, Amber, 20-ml, with Screw Cap, Headspace, 100/pk	700012516
Vial, Clear, 20-ml, with Screw Cap, Headspace, 100/pk	700012541

2777/2777C SAMPLE MANAGER

2777C Sample Manager



2777 Sample Manager

Description	P/N
2777/2777C Sample Manager Performance Maintenance Kit PM Kit consists of: Tension Cord and Lubrication Kit	201000162

Rotors List Associated with the Valco Valves	
Rotor 10 Port 2 Pos 0.4 mm Cheminert Valve	700001230
Rotor 6 Port 2 Pos 0.4 mm LC Injection Valve	700002210
Rotor 6 Port 2 Pos 0.4 mm Cheminert	700002292
Rotor 6 Port 2 Pos 0.25 mm Cheminert	700002293
Rotor 10 Port 2 Pos 0.4 mm LC Injection Valve	700002297
Rotor 4 Port 2 Pos 0.5 µL Internal Loop LC Injection Valve	700002298
Rotor 6 Port 2 Pos 0.75 mm Cheminert	700002439

Note: These rotors are not included in the PM Kit; must be ordered separately based on the type of valve.

2767 AUTOSAMPLER



2767 Performance Maintenance Kit



Description	P/N
2767 AutoSampler Performance Maintenance Kit PM Kit consists of: Probe, Injector Port, and Rotors	201000195

Syringes to complement the 2767 AutoSampler Performance Maintenance Kit:	
500 µL Reagent Syringe	700003434
1.0 mL Reagent Syringe	700003435
2.5 mL Reagent Syringe	700003436
5.0 mL Reagent Syringe	700003437
10 mL Reagent Syringe	700003438

2707 AUTOSAMPLER



2707 Performance Maintenance Kit



Description	P/N
2707 Performance Maintenance Kit PM Kit consists of: Syringe (500 µL), Needle, and Rotor Seal	201000196
2707 Prep Performance Maintenance Kit PM kit consists of: Syringe (2500 µL), Prep Needle, and Rotor Seal	201000306

Parts and Accessories	
Stainless Steel Sample Loop, 20 µL	700000680
Stainless Steel Sample Loop, 5 µL	700000683
Bio-compatible Sample Loop, 100 µL	700000684
Stainless Steel Sample Loop, 100 µL	700000685
Wash Bottle, Glass, 250 mL	700004063
Stainless Steel Sample Loop, 10 µL	700003872
Air Needles, 50 mm, Yellow	700003921
Air Needles, 56 mm, Red	700003922
Air Needles, 68 mm, Blue	700003923
Air Needles, 74 mm, Green	700003924
Air Needles, 80 mm, Black	700003925
Stainless Steel Sample Loop, 50 µL	700003928
Preparative Sample Loop	700004086
Bio-compatible Sample Loop, 10 µL	700004088
Bio-compatible Sample Loop, 20 µL	700004089
Bio-compatible Sample Loop, 50 µL	700004090
Syringe, 500 µL	700000862
Needle Assy, Std	700003842
Needle Assy, Bio	700003843
Rotor Seal	700003851
Stator	700003852
Bottle, Wash Solvent, 250 mL, Glass	700004063
Vial Holder Tray, 12 pos., 10 mL	700004082
Needle Assy, 60 µL, Prep	700004085

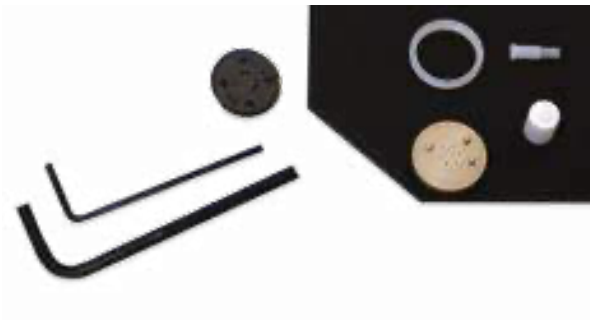
WATERS FRACTION COLLECTOR III



Description	P/N
Tabletop Rack (for use with prep funnel rack)	289000440
Prep Funnel (32 position, 2 each set)	725000106
Prep Funnel Rack (holds up to 4 prep funnels)	725000107
4-Microtiter Plate Rack	725000110
Multi-purpose Rack	725000113
Carousel Rack (2 × 2690 Carousels)	725000144
Eppendorf Tube Collection Rack	725000145
17 mm O.D. Vial Collection Rack	725000146
28 mm O.D. Vial Collection Rack	725000147
Standard Test Tube Rack, 120 positions	725000152
Tygon Tubing, 6.35 mm I.D. × 9.52 mm O.D. × 5 m, 2/pk (use with prep funnel rack)	WAT037047
Teflon Tubing 8 mm I.D. × 50 ft. (for use with prep funnel rack)	WAT037090

MANUAL INJECTORS

7725 Analytical Injector Performance Maintenance Kit



Description	P/N
3725 High Pressure Manual Valve Performance Maintenance Kit	201000116
7010 Analytical Injector Performance Maintenance Kit	201000117
7125 Sample Injector Performance Maintenance Kit	201000118
7725 Analytical Injector Performance Maintenance Kit	201000119
8125 Micro-scale Injector Performance Maintenance Kit	201000120
9125 PEEK Valve Performance Maintenance Kit	201000121
7750E Stainless Steel Switching Platform Performance Maintenance Kit	201000122
7750E-075 Motorized Sample Injector Performance Maintenance Kit	201000125

Waters Quality Parts and Performance Maintenance Kits

We design and manufacture Waters Quality Parts and Performance Maintenance Kits according to demanding Waters Critical Clean™ processes. The same strict regulatory standards (ISO-9001 and cGMP) that we apply when manufacturing your high-performance systems apply to Waters Critical Clean processes. This unrelenting focus on quality confers these benefits:

- ☑ Continued system compliance
- ☑ Maximum lifetime and reliability of instruments and spare parts
- ☑ Contamination-free environment
- ☑ Accurate and reproducible results



Waters Performance Maintenance Kits offer a single, ready source of all the Waters Quality Parts needed to operate your instruments at peak performance for 12 to 24 months.

Visit **waters.com/parts**, and use our convenient spare-parts catalog or the graphical parts locator to order Waters Quality Parts and Performance Maintenance Kits.

For more information, consult your local Waters representative.

In the U.S. and Canada, call 1.800.252.4742

Detectors

NEW 3465



Description	P/N
Flexcell GC sb	700013047
Flexcell Au sb	700013048
Flexcell GC ISAAC	700013049
Flexcell GC HyREF	700013064
Flexcell Pt HyREF	700013065
Flexcell Au HyREF	700013050
Flexcell Ag HyREF	700013051
Flexcell BDD sb	700013066
Flexcell BDD HyREF	700013067
Flexcell Au HyREF with SS AUX	700013068
SenCell 2 mm GC sb	700013052
SenCell 2 mm Au sb	700013053
SenCell 2 mm Pt sb	700013069
SenCell 2 mm GC ISAAC	700013070
SenCell 2 mm Au ISAAC	700013054
SenCell 2 mm Pt ISAAC	700013071
SenCell 2 mm GC HyREF	700013055
SenCell 2 mm Au HyREF	700013056
SenCell 2 mm Pt HyREF	700013072
SenCell 2 mm Ag HyREF	700013057
ISAAC solution 10 mL	700001949
Fingertight fitting VT-03, M5	700001950
Polishing disc for WE	700001954
Polishing disc for REF	700002069
10 mL diamond slurry 1 µm	700001955
50 ml KCl solution sat'd, with AgCl	700001959

2489 UV/VISIBLE DUAL-WAVELENGTH ABSORBANCE DETECTOR



2489 Performance Maintenance Kit



Description	P/N
ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit PM Kit consists of: PerformancePLUS Deuterium Lamp	201000281

Parts and Accessories	
Autopure Flow Cell	289000614
Analytical Flow Cell	WAS081140
Inert Taper Slit Flow Cell	WAT081157
Semi-prep Flow Cell	WAT081158
Microbore Flow Cell	WAT081159
High Pressure Flow Cell	WAT081321
MS Flow Cell Rebuild Kit	700000168
10 mm Flow Cell Rebuild Kit	WAS081346
3 mm Flow Cell Rebuild Kit	WAS081347
I/O Connector, 10 Pin	323000247
Assembly, Cable, Ethernet, 10 ft. Straight Through	441000372
Ethernet 10 ft. Crossover Cable	700003423
Cuvette Holder Assembly	WAS081333
Gasket Kit, 10/pk	WAS081348
10 mm Cell, Linearity Solutions	WAT042881
Wavelength Accuracy Solutions	WAT042885
PQ Test Mix for Absorbance Detector	WAT042887
Two Cuvette Kit (empty)	700004155
Fuse, 3.25A, 250 V 5 × 20 mm, Fast-acting, 5/pk	700001800
Analog Out Cable Assembly	WAT057235
Power Cord, 110 V	442000176

2414 REFRACTIVE INDEX DETECTOR



Description	P/N
2414 Valve Upgrade Kit	700002670
Sample Inlet Tubing Assembly	700001710
Compression Screws and Ferrules Kit, 5/pk	WAT025604
Stainless Steel Tubing, 0.062 in. × .040 in. I.D. × 10 ft.	WAT026805
Stainless Steel Tubing, 0.062 in. × .009 in. I.D. × 10 ft.	WAT026973
Analog Signal Cable	WAT057235
IEEE-488 Cable 6 ft. (2 meter)	WAT087141
Power Cord, 110 V	442000176
I/O Connector Plug, 12 Pin	WAT270868

2424 EVAPORATIVE LIGHT SCATTERING (ELS) DETECTOR



2424/2420 Performance Maintenance Kit



Description	P/N
2424 ELS Detector Performance Maintenance Kit PM Kit consists of: PerformancePLUS Lamp Cartridge Assembly	201000159

Parts and Accessories	
Drip Tray	415000415
Vapor Trap (10 mm O.D. Bottle Trap)	700000574

2998 PHOTODIODE ARRAY DETECTOR (PDA)



2996 Performance Maintenance Kit



Description	P/N
ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit	201000281

Parts and Accessories	
2998 Analytical Flow Cell Kit	205000399
2998 Microbore Flow Cell Kit	205000400
2998 Semi-prep Flow Cell Kit	205000401
2998 AutoPurification Flow Cell Kit	205000402
Fuse, 3.15A, 250 V, 5 × 20 mm Fast Acting, 2/pk	700001800
Connector Plug, 10-Position	323000247
Connector Shell Cover	323000446
Ethernet Patch Cord, Shielded, 10 ft.	441000372
Event Cable, 6 ft.	441000373
Crossover Cable, 5E, 10 ft., Ethernet	700003423
Tubing, 3/8 in. O.D. × 1/4 in. I.D., Tygon	700001796
Cable, Assembly, Shield, Analog Output Signal Cable	WAT057235
PEEK Compression Fitting	WAT021815
Knob, Compression Fitting	WAT021816
Convoluted Tubing	430001556

DID YOU KNOW...

To enhance productivity and increase the accuracy of your results, we supply system-performance standards. For use with all detectors, these standards are for calibration, linearity, sensitivity, and benchmarking.

Visit waters.com/standards

2465 ELECTROCHEMICAL DETECTOR



Description	P/N
Flow Cell Kit: 0.7 mm GC Working Electrode, Salt Bridge Reference Electrode	205004100
Flow Cell Kit: 2 mm GC Working Electrode, Salt Bridge Reference Electrode	205004115
Flow Cell Kit: 2 mm GC Working Electrode, ISAAC Reference Electrode	205004215
Flow Cell Kit: 3 mm Pt Working Electrode, ISAAC Reference Electrode	205004220
Flow Cell Kit: 3 mm AU Working Electrode, "HyREF" Reference Electrode	205004325
Flow Cell Kit: 3 mm Ag Working Electrode, "HyREF" Reference Electrode	205004330
Fuse, 5 × 20, 2.5A, T 250 V	700001004
RS-232 Cable	700001942
Dummy Flow Cell	700001943
External I/O Cable	700001948
ISAAC Solution, 10 mL	700001949
Fingertight Flow Cell Fitting	700001950
Spacer, 120 µm	700001951
Spacer, 25 µm	700001952
Spacer, 50 µm	700001953
Polishing Disk, Work Electrode	700001954
Diamond Slurry, 1 µm, 10 mL	700001955
Swivel, 2465 Salt Bridge Reference Electrode	700001956
Body, 2465 Salt Bridge Reference Electrode	700001957
Salt Bridge Ag/AgCl Reference Electrode	700001958
KCl Solution for Salt Bridge Ref (50 mL)	700001959
Working Electrode Block, 2 mm GC	700001960
Working Electrode Block, 3 mm, Platinum	700001961
Working Electrode Block, 3 mm, Gold	700001962
Working Electrode Block, 2 mm, Silver	700001963
Salt Bridge Inlet Block	700001964
HyREF Inlet Block	700001965
Cell Cable	700001968
2465 Integrator Cable	700001994
2465 ISAAC Inlet Block	700002003
Polishing Disk, Reference Electrode	700002069
Capillary Connection Kit for Micro Cell	700002103

2475 MULTI-WAVELENGTH FLUORESCENCE DETECTOR



2475 Performance Maintenance Kit



Description	P/N
2475 Multi-wavelength Fluorescence Detector PM Kit consists of: Xenon Lamp Assembly	201000131

Parts and Accessories	
Fuse, 4A SMD with Holder, 2/pk	700001840
Flow Cell	700001618

NEW 2432 CONDUCTIVITY DETECTOR



Description	P/N
Assembly, Cell 2432	700011185
Inlet tube, 2432	700011137
Outlet Tube, 2432	700011186

Quadrupole Time-of-Flight Mass Spectrometers



NEW SYNAPT XS

Description	P/N
SYNAPT XS Performance Maintenance Kit PM Kit consists of: Source Components, Heater Cartridge, Gaskets, Seals, LockSpray Reference Probe, Probe Tips, Air Filters.	201000326

Parts and Accessories	
ESI Probe Assembly 500 mm × 125 µm	700011241
ESI Probe Assembly 750 mm × 125 µm	700011242
ESI Probe Assembly (UPC²) 750 mm × 5 0 µm	700011376
APCI Probe, 500 mm × 125 µm	700011244
APCI Probe, 750 mm × 12 5 µm	700011245
APCI Probe (UPC²), 750 mm × 50 µm	700011427
LockSpray Reference Probe	700012329
Sample Cone	700011217

Note: The appropriate tool free probe should also be ordered as required for the system configuration.



NEW SELECT SERIES CYCLIC IMS

Description	P/N
SELECT SERIES Cyclic IMS Performance Maintenance Kit PM Kit consists of: Source Components, Heater Cartridge, Gaskets, Seals, Reference Probe, Probe Tips, Air Filters.	201000327

Parts and Accessories	
ESI Probe Assembly 500 mm × 125 µm	700011241
ESI Probe Assembly 750 mm × 125 µm	700011242
ESI Probe Assembly (UPC²) 750 mm × 50 µm	700011376
APCI Probe, 500 mm × 125 µm	700011244
APCI Probe, 750 mm × 125 µm	700011245
APCI Probe (UPC²), 750 mm × 50 µm	700011427
LockSpray Reference Probe	700012329
Sample Cone	700011217

Note: The appropriate tool free probe should also be ordered as required for the system configuration.



VION IMS Q-TOF

Description	P/N
Vion™ IMS QTof™ Performance Maintenance Kit PM Kit consists of: Source Components, ESI and Reference Probe Components	201000307

Parts and Accessories	
IonSABRE II Service Kit	700005744
APGC Service Kit	700004842



SYNAPT G2-S AND SYNAPT G2-S*i*

Description		P/N
SYNAPT G2-S/G2-S*i* LockSpray (Rotary) Performance Maintenance Kit	PM Kits consist of: Source Components, ESI and Reference Probe Components, and Vacuum Pump Components	201000254
SYNAPT G2-S/G2-S*i* LockSpray (Scroll) Performance Maintenance Kit		201000255
SYNAPT G2-S/G2-S*i* NanoLockSpray (Rotary) Performance Maintenance Kit		201000256
SYNAPT G2-S/G2-S*i* NanoLockSpray (Scroll) Performance Maintenance Kit		201000257

Parts and Accessories	
Outer APPI Source Service Kit	700004730
IonSABRE II Service Kit	700005744
APGC Service Kit	700004842
ETD Service Kit	700005276
MALDI Service Kit	700005275



SYNAPT G2

Description		P/N
SYNAPT G2 LockSpray Performance Maintenance Kit	PM Kits consist of: Source Components, ESI and Reference Probe Components, and Vacuum Pump Components	201000229
SYNAPT G2 NanoLockSpray Performance Maintenance Kit		201000230

Parts and Accessories	
Outer APPI Source Service Kit	700004730
APCI Probe Service Kit	700004673
APGC Service Kit	700004842
ETD Service Kit	700005276
MALDI Service Kit	700005275



XEVO G2-XS QTOF AND XEVO G2-S QTOF

Description		P/N
Xevo G2-S LS (Rotary) Performance Maintenance Kit	PM Kit consists of: Source Components, ESI and Reference Probe Components, and Vacuum Pump Components	201000276
Xevo G2-S LS (Scroll) Performance Maintenance Kit		201000277
Xevo G2-S NLS (Rotary) Performance Maintenance Kit		201000278
Xevo G2-S NLS (Scroll) Performance Maintenance Kit		201000279

Parts and Accessories	
Xevo G2-S ASAP Accessory	176002472
Outer APPI Source Service Kit	700004730
APCI Probe Service Kit	700004673
APGC Service Kit	700004842



XEVO G2 QTOF

Description		P/N
Xevo G2 QTof LS (Rotary) Performance Maintenance Kit	PM Kits consist of: Source Components, ESI and Reference Probe Components, and Vacuum Pump Components	201000238
Xevo G2 QTof LS (Scroll) Performance Maintenance Kit		201000239
Xevo G2 QTof NLS (Rotary) Performance Maintenance Kit		201000240
Xevo G2 QTof NLS (Scroll) Performance Maintenance Kit		201000241

Parts and Accessories	
Xevo G2 QTof ASAP Accessory	176002472
Outer APPI Source Service Kit	700004730
APCI Probe Service Kit	700004673
APGC Service Kit	700004842

Tandem Quadrupole Mass Spectrometers



NEW XEVO TQ-GC

Description	P/N
Xevo TQ-GC Performance Maintenance Kit PM Kit consists of: EI Filament Assy, EI Ion Chamber, Repeller, Ceramic Spacer, Fittings, Air Filters and RE6 Rotary Pump Components. Also purchased as part of 176004385 Xevo TQ-GC Perf Maint kit w/Chem which also provides test samples	201000325

Parts and Accessories	
EI Filament Assembly	700011877
Repeller, XL Source	700011883
EI Ion Chamber	700011878
CI Filament Assembly	700011877
CI Ion Chamber	700012014
Purifier Module, Helium 1/8" Fittings	700012331
Xevo TQ-GC CI Service Kit	700012077
Rotary Pump, RE6 B-oil, 1 L	70009679
Oil Filter Insert	700010211
Absorbent Felt	700010213



NEW XEVO TQ-S CRONOS

Description	P/N
Xevo TQ-S cronos Performance Maintenance Kit PM Kit consists of: O-rings, Seals, Filters, Aperture Disk, Calibration Pin, and nRV14i Rotary Pump Components	201000325

Parts and Accessories	
ESI Probe Assembly 500 LG × 125 µm	700011241
ESI Probe Assembly 750 LG × 125 µm	700011242
ESI Probe Assembly (UPC²) 750 LG × 50 µm	700011376
Sample Cone (Reverse)	700012275
O-ring, Viton, 10 × 1.5 C/S	700004321
O-ring, Silicone, 009 (5/pk)	700004728
Seal, Custom Shaft	700009601
Lens Seal	700009602
O-ring, Viton, 28 × 1 mm	700009614
Rotary Pump Oil	5560020-S
Oil Filter	6060142
APCI Probe, 500 mm × 125 µm	700011244
APCI Probe, 750 mm × 125 µm	700011245
APCI Probe (UPC²), 750 mm × 50 µm	700011427



XEVO TQ-XS

Description		P/N
Xevo TQ-XS Performance Maintenance Kit with Chemical Kit	PM Kit consists of: Source Components	176004023

Parts and Accessories	
ESI Probe Assembly, 500 LG × 125 µm	700011241
ESI Probe Assembly, 750 LG × 125 µm	700011242
APCI Probe Assembly, 500 LG × 125 µm	700011244
APCI Probe Assembly, 750 LG × 125 µm	700011245



XEVO TQ-S

Description		P/N
Xevo TQ-S (Rotary) Performance Maintenance Kit with Chemical Kit	PM Kits consist of: Source Components, ESI Probe Components, and Vacuum Pump Components	176002745
Xevo TQ-S (Scroll) Performance Maintenance Kit with Chemical Kit		176002744

Parts and Accessories	
Xevo TQ-S ASAP Accessory	176002472
Outer APPI Source Service Kit	700004730
IonSABRE II Service Kit	700005744
APGC Service Kit	700004842



XEVO TQ-S MICRO

Description		P/N
Xevo TQ-S Micro (Rotary) Performance Maintenance Kit with Chemical Kit	PM Kits consist of: Source Components, ESI Probe Components, and Vacuum Pump Components	176003850
Xevo TQ-S Micro (Scroll) Performance Maintenance Kit with Chemical Kit		176003851

Parts and Accessories	
Xevo TQ-S Micro ASAP Accessory	176002472
IonSABRE II Service Kit	700005744
Outer APPI Source Service Kit	700004730
APGC Service Kit	700004842



XEVO TQD

Description		P/N
Xevo TQD (Rotary) Performance Maintenance Kit with Chemical Kit	PM Kits consist of: Source Components, ESI Probe Components, and Vacuum Pump Components	176002780
Xevo TQD (Scroll) Performance Maintenance Kit with Chemical Kit		176002781

Parts and Accessories	
Xevo TQD ASAP Accessory	176002472
IonSABRE II Service Kit	700005744
Outer APPI Source Service Kit	700004730
APGC Service Kit	700004842



XEVO TQ

Description		P/N
Xevo TQ (Rotary) Performance Maintenance Kit with Chemical Kit	PM Kits consist of: Source Components, ESI Probe Components, and Vacuum Pump Components	176002058
Xevo TQ (Scroll) Performance Maintenance Kit with Chemical Kit		176002059

Parts and Accessories	
APCI Probe Service Kit	700004673
Outer APPI Source Service Kit	700004730
APGC Service Kit	700004842



TQ DETECTOR (TQD)

Description		P/N
TQD (Rotary)Performance Maintenance Kit with Chemical Kit	PM Kits consist of: Source Components, ESI Probe Components, and Vacuum Pump Components	176002064
TQD (Oil Free)Performance Maintenance Kit with Chemical Kit		176002135

Parts and Accessories	
SQD/TQD ASAP Accessory	176002049

Atmospheric Solids Analysis Probe (ASAP)

INCREASE WATERS LC AND MS SYSTEM PERFORMANCE WITH COST-EFFECTIVE UPGRADES

You can extend you laboratory's sample-analysis capabilities and flexibility by fitting certain Waters SYNAPT, Xevo, SQD, and TQD Mass Spectrometers with the Atmospheric Solids Analysis Probe. When installed in the following instruments, the probe enables rapid, direct analyses of volatile and semi-volatile solid and liquid samples:

- Xevo TQ-S
- Xevo TQ-S micro
- SYNAPT G2-S*i*
- Xevo G2 Tof/QTof
- Xevo G2-S Tof/QTof
- Xevo G2-XS Tof/QTof
- Xevo TQD/SQ Detector 2
- SQD/TQD Instruments



Owing to the game-changing nature of ASAP, these instruments can now perform analyses that they previously could not. For a relatively low cost, ASAP increases asset utilization and provides optimum productivity.

The ASAP technique proves a good alternative to analyses that rely on an EI/CI solids probe, doing so without the need of a vacuum lock. The technique offers these additional benefits:

- High-sensitivity analysis of low-polarity or nonpolar compounds unable to be ionized by ESI, APCI, or APPI
- Direct analysis of complex mixtures—no need for sample preparation or chromatographic separation

Description	P/N
SQD/TQD/3100 ASAP Accessory	176002049
SYNAPT G2-S*i*, Xevo G2 Tof/QTof, Xevo G2-S Tof/ QTof, Xevo G2-XS Tof/QTof, and ASAP Accessory	176002472
Xevo TQD, Xevo TQ-S, Xevo TQ-S micro, SQD Detector 2 ASAP Accessory	176003243

Tool Free Probes

Tool free probes are now available as standard for many MS instruments and it is now possible to update the following instruments with the same enhanced customer experience that is provided with current production instruments.

XEVO TQ-S, XEVO TQD, XEVO TQ-S MICRO, XEVO G2-S, XEVO G2-XS, VION, SYNAPT G2-S, SYNAPT G2-SI

These probes provide significant customer user experience improvements

- 2 min to change capillary now vs 30 min manual rebuild activity previously
- Better operator-to-operator reproducibility
- Improved spray stability with UPC²
- Reduced number of potential leak pathways, delivering additional robustness and reliability
- Reduced level of operator training
- Time saving at Performance Maintenance visits



Description	P/N
Upgrade to MKIII Probe – Electrospray Contains ESI probe adaptor & probes 700011241 and 700011242	205001866
Upgrade to MKIII Probe – APCI Contains APCI probe adaptor & probes 700011244 and 700011245	205001867
Upgrade to MKIII Probe - UPC²/ESI Contains ESI probe adaptor & probe 700011376	205001868
Upgrade to MKIII Probe - UPC²/APCI Contains APCI probe adaptor & probe 700011427	205001869

There are preconfigured kits for your convenience based on your application listed above. If you wish to run more than one ESI application, or one APCI application you only need one probe adaptor, as pictured. Simply order the listed capillary starting 700... from the other kit as needed to meet your additional application requirements.

Note: Narrowbore / low flow Electrospray probes and IVD systems cannot be updated to tool free probes at this time.

Single Quadrupole Mass Spectrometers



NEW RADIAN ASAP

Description	P/N
RADIAN ASAP (High) Performance Maintenance Kit PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, Calibration Pin, and RE6 Rotary Pump Components	201000330
RADIAN ASAP (Std) Performance Maintenance Kit PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, and Calibration Pin	201000329

Parts and Accessories	
Glass Capillaries, 100/pk	700005025
Aperture Disc Assembly, 0.2 mm, Performance	700009768
Aperture Disc Assembly, 0.09 mm, Standard	700009769
MKII Ion Block Assembly	700010377
Sample Cone	700009597
Gasket, Pumping Block (Front)	700011132
Seal, Custom Shaft	700009601
Gasket, Ion Block	700009603
Source Aperture Carrier	700009608
O-ring, Viton, 28 × 1 mm	700009614
Cone Gas Nozzle	700009625
Cone Clamp	700009626
Source Gas Seal	700009627
Calibration Pin, Assy (for MKII Ion Block)	700011295
Pumping Block Assembly	700009678
Rotary Pump, RE6 B-oil, 1 L	700009679
Diaphragm Pump Service Kit	700009680
O-ring, Conductive, 7.1 × 1.6 mm	700009810
Septa, Advanced Green, Non Stick, 11 mm	700009976
Oil Filter Insert	700010211
Absorbent Felt	700010213
Gasket, Pumping Block (Rear) MKII FEPM	700012138



SQ DETECTOR2

Description		P/N
SQ Detector 2 (Rotary) Performance Maintenance Kit with Chemical Kit	PM Kits consist of: Source Components, ESI Probe Components, and Vacuum Pump Components	176002780
SQ Detector 2 (Scroll) Performance Maintenance Kit with Chemical Kit		176002781

Parts and Accessories	
Xevo TQD ASAP Accessory	176002472
IonSABRE II Service Kit	700005744
Outer APPI Source Service Kit	700004730
APGC Service Kit	700004842



SQ MASS DETECTOR

Description		P/N
SQD (Rotary) Performance Maintenance Kit with Chemical Kit	PM Kits consist of: Source Components, ESI Probe Components, and Vacuum Pump Components	176002064
SQD (Oil-free) Performance Maintenance Kit with Chemical Kit		176002135

Parts and Accessories	
SQD/TQD/3100 ASAP Accessory	176002049



3100 MASS DETECTOR

Description		P/N
3100 (Rotary) Performance Maintenance Kit with Chemical Kit	PM Kits consist of: Source Components, ESI Probe Components, and Vacuum Pump Components	176002064
3100 (Oil-free) Performance Maintenance Kit with Chemical Kit		176002135

Increase Waters LC and MS System Performance with Cost-Effective Upgrades

Expand the analytical capabilities of your current LC, UPLC, or MS system with a cost-effective upgrade. Visit **waters.com/instrumentupgrades** for more information about Waters' wide range of upgrades and accessories.



Time-of-Flight (Tof) Mass Spectrometers



NEW ACQUITY RDA

Description	P/N
ACQUITY RDa Performance Maintenance Kit PM Kit consists of: O-rings, Seals, Filters, Aperture Disk, Calibration Pin, and nRV14i Rotary Pump Components	201000325

Parts and Accessories	
Aperture Disc 0.2 mm, 5/pk	700012106
ESI Probe Assembly 500 mm	700011871
Sample Cone	700012132
O-Ring, Viton, 5.5 × 1.6 C/S	700012105
Seal, Custom Shaft	700009601
Gasket, Ion Block	700009603
O-ring, Viton, 28 × 1 mm	700009614
O-Ring, Viton, 7.1 × 1.6 C/S	5711180
O-Ring, Viton, 11.1 × 1.6 C/S	700009758
Cone Gas Nozzle	700009625
Cone Clamp	700009626
Source Gas Seal	700009627
Restrictor	700012103
Ion Block Assembly	700012137
Pumping Block Assembly	700009678
Gasket, Pumping Block (Front)	700011132
Gasket, Pumping Block (Rear)	700012138
Rotary Pump Oil	5560020-S
Oil Filter	6060142



XEVO G2-XS TOF AND XEVO G2-S TOF

Description		P/N
Xevo G2-S LS (Rotary) Performance Maintenance Kit	PM Kits consist of: Source Components, ESI and Reference Probe Components, and Vacuum Pump Components	201000276
Xevo G2-S LS (Scroll) Performance Maintenance Kit		201000277
Xevo G2-S NLS (Rotary) Performance Maintenance Kit		201000278
Xevo G2-S NLS (Scroll) Performance Maintenance Kit		201000279

Parts and Accessories	
Xevo G2-S ASAP Accessory	176002472
Outer APPI Source Service Kit	700004730
APCI Probe Service Kit	700004673
APGC Service Kit	700004842



XEVO G2 TOF

Description		P/N
Xevo G2 Tof LS (Rotary) Performance Maintenance Kit	PM Kits consist of: Source Components, ESI and Reference Probe Components, and Vacuum Pump Components	201000238
Xevo G2 Tof LS (Scroll) Performance Maintenance Kit		201000239
Xevo G2 Tof NLS (Rotary) Performance Maintenance Kit		201000240
Xevo G2 Tof NLS (Scroll) Performance Maintenance Kit		201000241

Parts and Accessories	
Xevo G2 Tof ASAP Accessory	176002472
Outer APPI Source Service Kit	700004730
APCI Probe Service Kit	700004673
APGC Service Kit	700004842

Magnetic Sector Mass Spectrometer



AUTOSPEC/AUTO SPEC PREMIER

Description		P/N
AutoSpec Premier Mass Spectrometer Base Performance Maintenance Kit (Rotary)	PM Kits consist of: Vacuum Pump Maintenance Components	201000245
AutoSpec Premier Mass Spectrometer Base Performance Maintenance Kit (Scroll)		201000246

Parts and Accessories	
Electron Impact (EI) Source PM Kit for AutoSpec	201000152
Chemical Ionization (CI) Source PM Kit for AutoSpec	201000151
Alternate CI/EI (ACE) Source PM Kit for AutoSpec	201000153
Field Desorption (FD) Source PM Kit for AutoSpec	201000155
LSIMS/CS Gun Source PM Kit for AutoSpec	201000150
Outer Source Service Kit	700005589
Lock, Probe, and Valves Service Kit	700005590
GC Interface Service Kit	700005591

Column and Cartridge Fittings and Accessories

ACQUITY UPLC COLUMN IN-LINE FILTER UNIT



Description	P/N
In-line Filter Holder and six 0.2 µm Stainless Steel Replacement Filters	205000343
Five 0.2 µm Stainless Steel Replacement Filters and End Nuts for 205000343	700002775

ACQUITY UPLC COLUMN REPLACEMENT PARTS



Description	P/N
Three 0.2 µm Inlet/Outlet Frits for 2.1 mm I.D. UPLC Columns	700003776
Three 0.2 µm Inlet/Outlet Frits for 1.0 mm I.D. UPLC Columns	700003775
One Inlet End Nut for 2.1 mm I.D. UPLC Column	700003779
One Outlet End Nut for 2.1 mm I.D. UPLC Column	700003780

END CONNECTOR KIT (END-FITTINGS FOR CARTRIDGE COLUMNS)



Description	P/N
End Connector Kit (contains 1 Pair of End-fittings, C-clips and Coupling)	WAT037525
Replacement O-ring, 2/pk	WAT023401
Replacement C-clip, 1/pk	WAT037560

REPLACEMENT FILTER ASSEMBLIES FOR COLUMNS



Description	Porosity	P/N
2.1 mm	2 µm	600000177
2.1 mm	0.5 µm	600000178
3.0, 3.9, 4.6 mm	2 µm	600000179
3.0, 3.9, 4.6 mm	0.5 µm	600000180
7.8 mm	2 µm	600000181
7.8 mm	5 µm	600000182
19 mm	2 µm	600000183
30 mm	2 µm	600000184

PARKER-STYLE CARTRIDGE FITTINGS AND ACCESSORIES

You can use the end-fittings and accessories shown in the following table with these cartridge sizes:

- 46 mm (I.D.)
- 40 mm (I.D.)
- 30 mm (I.D.)

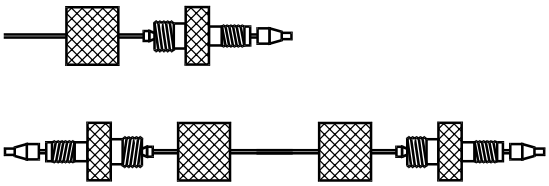


Description	P/N
Removable Column End-fitting, 2/pk	PSS614100
Frit Assembly (2 µm), 5/pk	PSS614103
Frit Assembly (0.5 µm), 5/pk	PSS614104
Column Coupler, 2/pk	PSS614102
Extended End-fitting for use with 10 mm Integral Guard, 1/pk	PSS614108
Nylon Column Plugs for Storage of Complete Column, 1/pk	WAT015674
Nylon Column Caps for Storage of Replacement Cartridge Column, 10/pk	PSS614113
In-line 10 mm Guard Cartridge Holder Kit for use with above items	PSS830008

[1] 30 mm Stand Alone Guard/Column (end-fittings not included).
[2] Extended end-fitting for use with 10 mm Integral Guard, p/n: PSS614108.
[3] 10 mm Integral Guard Column.
[4] Column Coupler, p/n: PSS614102.

SLIPFREE Connectors

GENERATION HPLC COLUMN CONNECTOR



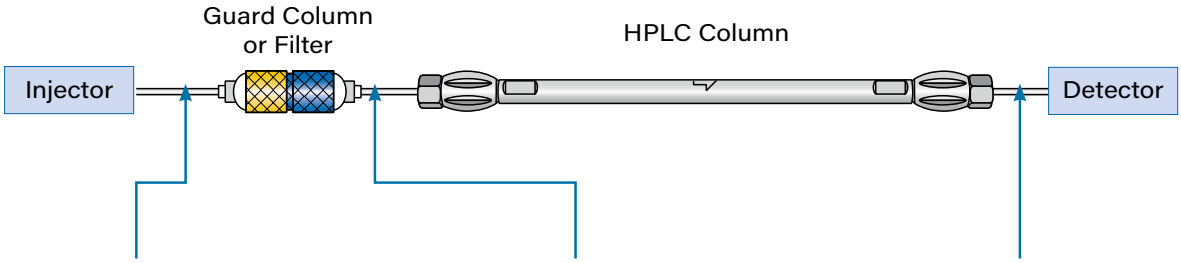
- Guarantees a void-free connection because it pushes tubing into the end-fitting (the connector is installed on the tubing at the factory)
- Fingertight to 10,000 psi—never need wrenches
- Readjusts to all column end-fittings; compatible with all tested commercially available end-fittings
- Stainless steel tread, for good stability and no particle generation
- Unique design separates tube-holding function from sealing function

SLIPFREE Fittings	P/N
Single SLIPFREE, 6 cm Long, 0.005 in. I.D.	PSL618000
Single SLIPFREE, 20 cm Long, 0.005 in. I.D.	PSL618004
Single SLIPFREE, 6 cm Long, 0.010 in. I.D.	PSL618006
Single SLIPFREE, 10 cm Long, 0.010 in. I.D.	PSL618008
Single SLIPFREE, 20 cm Long, 0.010 in. I.D.	PSL618010
Double SLIPFREE, 6 cm Long, 0.005 in. I.D.	PSL618001
Double SLIPFREE, 10 cm Long, 0.005 in. I.D.	PSL618003
Double SLIPFREE, 20 cm Long, 0.005 in. I.D.	PSL618005
Double SLIPFREE, 6 cm Long, 0.010 in. I.D.	PSL618007
Double SLIPFREE, 10 cm Long, 0.010 in. I.D.	PSL618009
Double SLIPFREE, 20 cm Long, 0.010 in. I.D.	PSL618011

0.010 in. I.D. is recommended for routine work.
0.005 in. I.D. is recommended for column connection to short 4.6 mm I.D. and for small-bore or microbore connections.
0.020 in. I.D. is recommended for prep or semi-prep connections, or for connections ahead of the injector.

How to Use a SLIPFREE Connector

Place a SLIPFREE Connector at any location in an HPLC system where connections must be made or broken frequently Install a single SLIPFREE Connector at the injector or at any other fitting with conventional nuts and ferrules that would require infrequent removal. Install a double SLIPFREE Connector for column coupling or places where both ends of the connector must be loosened frequently.



Single SLIPFREE (length as needed)

The connecting end of a single SLIPFREE Connector should be placed where connections and disconnections will be made frequently, for example, the end-fitting of a column or detector. In the image, the other end-fitting is seated within the injector, held in place by a stainless steel nut and ferrule compatible with the injector brand.

Double SLIPFREE (60 mm length)

Place a double SLIPFREE Connector where you will make frequent connections and disconnections at both ends of the connector, for example, between an analytical column and guard column. Very short (6 cm) connectors of small inner diameter are available, to minimize resultant dead-volume. SLIPFREE Connectors fit the end-fitting of any column, regardless of its manufacturer.

Single SLIPFREE (length as needed)

Place the connecting end of a single SLIPFREE Connector where you will frequently make connections and disconnections, for example, the end-fitting of a column or detector. In the image, the other end of the tubing is seated within the detector, held in place by a stainless steel nut and ferrule compatible with the detector brand. If there is not a convenient way to connect to the detector, you can attach a union.

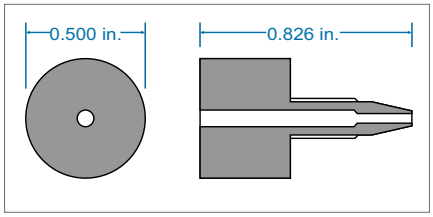
PEEK Tubing and Fittings

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.

Description	P/N
PEEK Fingertight One-piece Fitting	186008714

PEEK Fingertight One-Piece Fitting

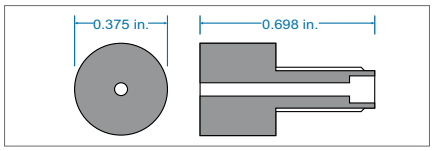


PEEK TWO-PIECE FINGERTIGHT FITTINGS, 1/16-INCH, 10–32 THREAD

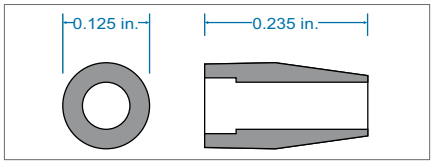
Two-piece fingertight fittings, with a pressure rating of 4000 psi (280 bar), allow connections by hand. The inexpensive PEEK ferrules resist wear and deformation, lasting for at least 50 connections and disconnections before they require replacement. The nuts can be reused repeatedly. Chemically inert to a high degree, the PEEK ferrule can be used with any mobile phase. This fitting provides an inexpensive alternative to traditional HPLC fittings. It fits almost all HPLC fittings, including Swagelok, Parker, Rheodyne, Beckman, Valco, Waters, etc.—all with 10–32 female threads.

Description	P/N
PEEK Single Ferrule	PSL613316

PEEK Fingertight Two-Piece Nut



PEEK Single Ferrule



PEEK FITTINGS WITH DOUBLE FERRULES, 1/16-INCH, 10–32 THREAD

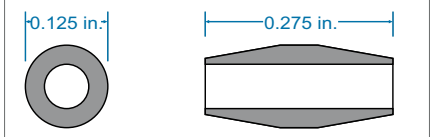
Double-ferrule fittings made of PEEK grip tubing in two places. The ferrules provide twice the holding power of single-ferrule fittings. They are ideal for use with PEEK and Tefzel tubing, which often slip when used with single-ferrule fittings. When used with stainless steel or titanium tubing, double-ferrule 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.

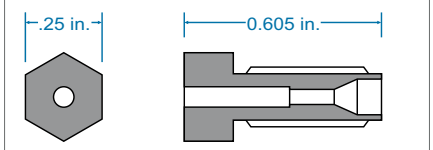
These fittings fit virtually any female 1/16-inch fitting, including Parker, Swagelok, Waters, Valco, Rheodyne, UPChurch, etc.—all with 10–32 threads.

Description	P/N
PEEK Double-ferrule	PSL613302
PEEK Hex-head Nut	PSL613324
PEEK Fingertight Nut	PSL613301
Stainless Steel Fingertight Nut	PSL613325

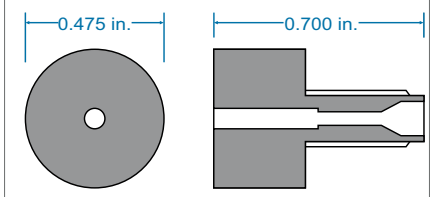
PEEK Double-Ferrule



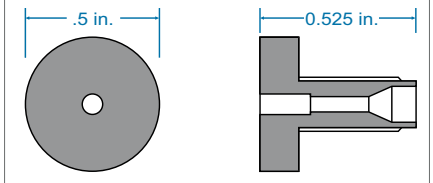
PEEK Hex-Head Nut



PEEK Fingertight Nut



Stainless Steel Fingertight Nut



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

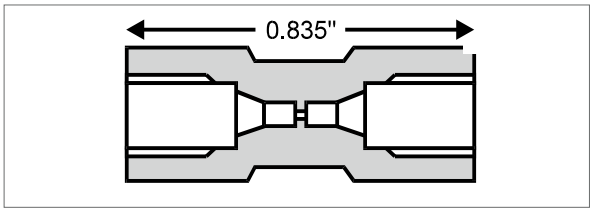
Description	P/N
Ferrule, 01, Stainless Steel, 10/pk	WAT005063
Compression Screw, 0.0625 in., 10/pk	WAT005070
Compression Fitting Plug, Stainless Steel, 5/pk	WAT005079
Rheodyne Ferrule, 10/pk	WAT007020
Ferrule, Stainless Steel	WAT022330
Ferrule, 1/16 in. O.D., PEEK	WAT021817
Compression Screw, Stainless 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

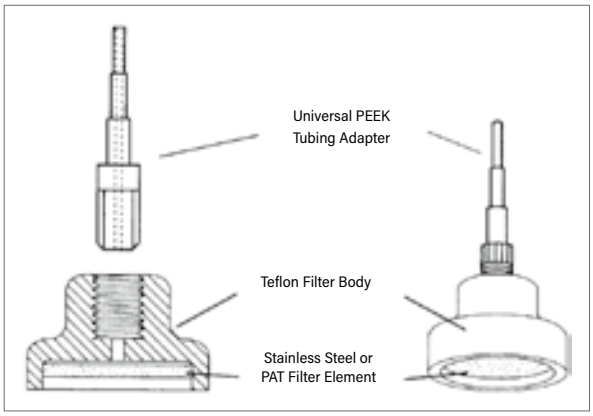


Description	P/N
PEEK Union with 2 PEEK Fingertight Nuts and Double Ferrules 1/16 in.	PSL613312
PEEK Union without Nuts and Ferrules 1/16 in.	PSL613313
PEEK TEE with One-piece Fingertight Fitting	PSL613317
PEEK CROSS with One-piece Fingertight Fitting	PSL613319
PEEK TEE without Fittings	PSL613318
PEEK CROSS without Fittings	PSL613320
PEEK One-piece Fingertight Fitting	186008714

Filters

LAST DROP MOBILE PHASE FILTERS

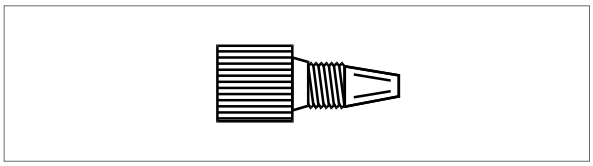
The Last Drop mobile-phase filter incorporates a flat filter element set parallel to the bottom of a reservoir. This design allows the filter to draw all but the last 2% of mobile phase from the reservoir without drawing air into the system. Last Drop filters are available with 316 L stainless steel 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.



Description	P/N
Filter with 2 µm Stainless Steel Filter	PSL901290

HANDILOK CTFE FITTINGS

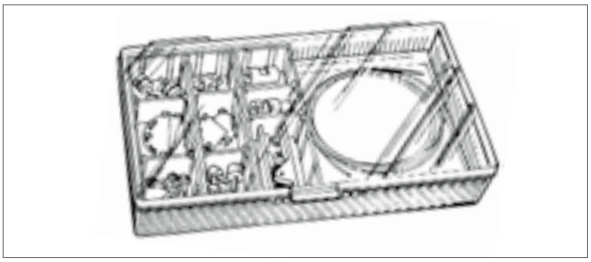
Handilok fittings can replace, without the need for tools, conventional compression fittings used with 1/16-inch tubing. Compatible with all internal fittings with a 10–32 thread, these fittings meet rigid high-pressure requirements, withstanding pressures greater than 4000 psi (280 bar).



Handilok Fittings	P/N
1/16 in. Fitting, 1/pk	PSL618021
1/16 in. Fitting, 10/pk	PSL618022

PEEK STARTER KIT

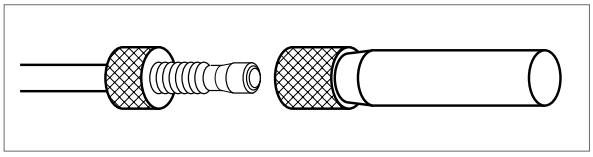
By replacing stainless steel parts, such as tubing, fittings, ferrules, mobile-phase filters, in-line filters, etc., you create a biocompatible, metal-free environment for samples and mobile phases. In a sturdy plastic case, the PEEK Starter Kit contains items that all biochromatographers will find helpful. Purchasing this kit earns you savings of 25% of the cost of purchasing its components individually.



Description	P/N
PEEK Starter Kit	PSL613321
Contains the following:	
PEEK Fingertight One-piece, 6/pk	
PEEK Handtight Nut, 4/pk	
PEEK Hex-head Nut, 4/pk	
PEEK Double Ferrules, 20/pk	
PEEK Tubing 1/16 in. × 0.25 mm (1 × 3 m)	
PEEK Tubing 1/16 in. × 0.50 mm (1 × 3 m)	
PEEK Union, 1/pk	
Elbow 90 Degrees, 2/pk	
Elbow 180 Degrees, 2/pk	
Guillotine Cutter, 1/pk	
PAT Mobile Phase Filter—"Last Drop", 1/pk	

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.

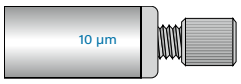


Description	P/N
Biocompatible Mobile Phase Filter	PSL901282

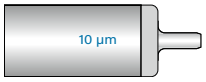
SOLVENT INLET FILTERS

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.



Solvent Inlet Filter 10 µm with Flangeless Fittings for 1/8 in. O.D. Tubing

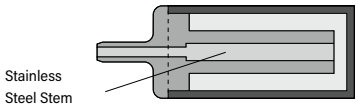


Solvent Inlet Filter 10 µm with 1/8 in. O.D. Stem for 3/16 in. O.D. Tubing

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.

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 Filter	P/N
Stainless Steel Filter Assembly	PSL613457

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Indices

Contents

Alphabetical Index 457

Part Number Index 463

Alphabetical Index

≥3 µm Analytical HPLC Columns 181
- Application-Specific Columns 493
- Atlantis Columns 207
- Cartridge Columns, Fittings and Accessories 240
- Delta-Pak Columns 234
- Ion Analysis Columns 494, 500
- µBondapak/Bondapak Columns 235
- µPorasil/Porasil Columns 237
- Nova-Pak Columns 232
- PAH Columns 499
- Peptide Columns 385
- Resolve Columns 233
- Shodex RSpak Polymer Reversed-Phase Columns 237
- Spherisorb Columns 227
- SunFire Columns 211
- Symmetry Columns 216
- XBridge Columns 181
- XSelect Columns 196
- XTerra Columns 221

≥5 µm Preparative HPLC Columns 247
- AccellPlus PrepPak Cartridges 450
- Atlantis Columns 281
- Delta-Pak Columns 301
- Gas Chromatography Packings 304
- µBondapak/Bondapak Columns 299
- µPorasil/Porasil Columns 299
- Nova-Pak Columns 299
- Peptide Columns 390, 392
- Radial Compression-Module Products 305
- Spherisorb Columns 295
- SunFire Columns 276
- Symmetry Columns 291
- XBridge Columns 264
- XSelect Columns 266
- XTerra Columns 285

2.x µm Columns and Consumables 130
- AccQ•Tag Ultra 2.5 µm 343, 507
- BioResolve RP mAb Polyphenyl Columns 406, 435
- BioResolve SCX Columns 435-441
- Column Selection Guide 131
- CORTECS 2.7 µm Columns 132
- CORTECS 2.7 µm Method Validation Kits 138
- CORTECS 2.7 µm VanGuard Cartridges 141
- SunFire Columns 169
- SunFire Columns Method Validation Kits 173
- SunFire VanGuard Cartridges 173
- Universal VanGuard Cartridge Holder 173
- XBridge BEH ***XP*** Columns 142
- XBridge BEH ***XP*** Glycan Columns 150
- XBridge BEH ***XP*** Method Validation Kits 152
- XBridge BEH VanGuard Cartridges 154
- XBridge Oligonucleotide BEH Columns 154
- XBridge Peptide BEH ***XP*** Columns 150
- XBridge Protein BEH Columns 142
- XSelect CSH Peptide ***XP*** Columns 159
- XSelect CSH ***XP*** Columns 155
- XSelect CSH ***XP*** Method Validation Kits 160
- XSelect CSH ***XP*** VanGuard Cartridges 161
- XSelect HSS ***XP*** Columns 155
- XSelect HSS ***XP*** Method Validation Kits 166
- XSelect HSS ***XP*** VanGuard Cartridges 167
- XSelect Peptide HSS ***XP*** Columns 162
- XTerra Columns 174
- XTerra Method Validation Kits 177
- XTerra VanGuard Cartridges 177

8 × 100 Cartridge Holder, Parts, and Accessories 305

96-well Plates 57

µBondapak/Bondapak Columns 235
- ≥3 µm Analytical HPLC Columns 181
- ≥5 µm Preparative HPLC Columns 249

µElution 96-well Plates 17

µPorasil/Porasil Columns 237
- ≥3 µm Analytical HPLC Columns 181
- ≥5 µm Preparative HPLC Columns 249

A

AccellPlus 20, 27, 324, 450

AccellPlus Ion-Exchange Bulk Packings 451

AccellPlus PrepPak Cartridges 450

AccQ•Tag Amino Acid Analysis Using HPLC 344

AccQ•Tag Amino Acid Analysis Using UPLC 343

AccQ•Tag Derivitization Kit 343

AccQ•Tag Ultra 2.5 µm 344

ACQUITY APC
- ACQUITY APC AQ Columns 464
- ACQUITY APC XT Columns 455
- ACQUITY APC Calibration Standards 476
- Vials for Fixed-Loop-Needle ACQUITY Systems 61
- Vials for Flow-Through-Needle ACQUITY Systems 64

ACQUITY UPC²
- Columns 311
- Quality Control Reference Materials 316
- Standards for SFC and UPC² Systems 317

ACQUITY UPLC
- Sub-2 µm-Columns 113
- In-Line Filter Unit 578
- Method Development Kits 127
- Method Validation Kits 123
- Quality Control Reference Materials 115
- VanGuard Pre-columns 180, 241
- Vials for Fixed-Loop-Needle ACQUITY Systems 61
- Vials for Flow-Through-Needle ACQUITY Systems 64

ACQUITY UPLC H-Class
- Sub-2 µm-Columns 105
- Vials for Fixed-Loop-Needle ACQUITY Systems 61
- Vials for Flow-Through-Needle ACQUITY Systems 64

ACQUITY UPLC H-Class Bio
- Sub-2 µm-Columns 105
- Vials for Fixed-Loop-Needle ACQUITY Systems 61
- Vials for Flow-Through-Needle ACQUITY Systems 64

ACQUITY UPLC I-Class
- CORTECS UPLC Columns 106
- Vials for Fixed-Loop-Needle ACQUITY Systems 61
- Vials for Flow-Through-Needle ACQUITY Systems 64

ACQUITY UPLC M-Class
- ACQUITY UPLC M-Class Columns 488
- HDX Technology 490
- LC-MS Accessories 491
- Trap Columns 488
- Vials for Fixed-Loop-Needle ACQUITY Systems 61
- Vials for Flow-Through-Needle ACQUITY Systems 64

Advanced Purification (AP) Glass Columns 448

Alcohols Columns 497

Amino Acids Analysis 501

Analysis Cartridge Column 495

Andrew+ Pipetting Robot and Automation Kits 44

Application-Specific Columns 495
- Sugar and Carbohydrate Analysis 495
- Fermentation Analysis, Organic Acids, Alcohols, and Carbohydrates 497
- Free Fatty Acid Analysis 498
- Ion Analysis 500
- Polyaromatic Hydrocarbon Analysis 499

Application-Specific Kits
- ACQUITY UPLC Biphenol A Column and Method Kits 522
- Beverage Analysis Kit 522
- Carbamate Analysis Kits 523
- EPA Method 1694 Analysis Kit 523
- GlycoWorks *Rapi*Fluor-MS N-Glycan Kits 362
- ProteinWorks SAMPLE PREPARATION KITS 514
- SARS-CoV-2 LC-MS Kit 519
- UPLC Amino Acid Solution 342
- Therapeutic Peptide Method Development Kits 516

Atlantis Columns
≥3 µm Analytical HPLC Columns ... 181
≥5 µm Preparative HPLC Columns ... 249
Method Validation Kits ... 210
VanGuard Cartridges ... 406

Autosampler Vials for Compatible Systems ... 75

Autosampler Vials for Waters Systems ... 72

B

BEH Particle Technology ... 469
ACQUITY UPLC BEH Columns ... 116
XBridge BEH Columns ... 180

Biomolecule Purification, Characterization, and Analysis ... 323
AccellPlus Ion-Exchange Bulk Packings ... 451
AccellPlus Ion-Exchange Packings ... 450
AccellPlus PrepPak Cartridges ... 450
AccellPlus Sep-Pak Cartridges ... 450
AccQ•Tag Derivitization Kit ... 349
AccQ•Tag Ultra Amino Acid Analysis Using HPLC ... 503
AccQ•Tag Ultra Amino Acid Analysis Using UPLC ... 502
ACQUITY UPLC SEC System Solution ... 427
Advanced Purification (AP) Glass Columns ... 448
Amino Acid Analysis ... 340
BioResolve Columns ... 325
BioSuite Columns ... 398, 418, 431
Capillary, Nano, and Trapping Columns ... 488
Certified Containers ... 492
Columns for Large DNA/RNA Species ... 380
Cytochrome *c* Digestion Standard ... 402
Nucleic Acid Separations ... 375
Enzymate Pepsin Online Digestion Column ... 490
Gen-Pak FAX Anion-Exchange Columns ... 380
Glycan Separations ... 353
Glycoprotein Separations ... 353
GlycoWorks Kits ... 361
iKey Separation Device ... 486
Insulin HMWP HPLC Column ... 429
Ion-Exchange Columns ... 380, 435, 443
Ion-Exchange Standards ... 443
ionKey ... 485
ionKey/MS ... 485
MassPREP Oligonucleotide Standard ... 384
MassPREP Peptide Standard ... 402
MassPREP Phosphopeptide Standard ... 405
MassPREP Protein Standard Mix ... 415
Nano and Micro-Flow Columns and Trapping Columns ... 488
nanoEase M/Z Columns ... 488
Oasis µElution Plates ... 384
Oligonucleotide Separations ... 375
Peptide Separations ... 385
Pico•Tag HPLC Method ... 350
Protein-Pak Hi Res HIC Column and HIC Protein Standard ... 417
Protein-Pak Hi Res Ion-Exchange (IEX) Columns ... 442
Protein-Pak High Resolution (HR) UPLC Columns ... 417
Protein-Pak HR Ion-Exchange Glass Columns ... 447
Protein Separations ... 412
Protein Test Mixtures ... 417
*Rapi*Gest SF Protein Digestion Surfactant ... 402
Symmetry300 C_4 HPLC Columns ... 434
Symmetry HPLC and UHPLC Columns ... 400
Therapeutic Peptide Method Development Kits ... 516
TruView LCMS Certified Vials ... 491
Ultrahydrogel HPLC Columns ... 473
XBridge Protein BEH SEC, 125 Å, 200 Å ... 466

BioResolve Columns and Buffers
BioResolve CX pH Buffer Concentrates ... 438
BioResolve SEC mAb Columns ... 426
RP mAb Polyphenyl Columns ... 406
SCX mAb Columns ... 435

BioSuite
BioSuite HPLC and UHPLC Peptide Analysis Columns ... 399
Hydrophobic-Interaction Chromatography HPLC Columns ... 452
Ion-Exchange HPLC Columns ... 445
pC18 and pPhenyl RPc HPLC Columns ... 452
Size-Exclusion Chromatography (SEC) HPLC Columns ... 471

Bottom-of-the-Bottle Solvent Filters ... 528

Bulk Sorbents
Graphitized Carbon Black ... 38
Oasis ... 8
PoraPak Rxn ... 34

C

Cap Mats Roller ... 71

Capillary, Nano, and Trapping Columns ... 488

Carbamate Analysis Kits ... 523
Environmental Testing ... 523
Food Testing ... 523

Carbohydrate Analysis Column ... 495

Cartridge Columns ... 240

Cartridge Columns and Guard Holders ... 240

Cartridge Columns, Fittings and Accessories ...
Cartridge Columns and Guard Holder ... 240
Guard-Pak Holder and Inserts ... 246
Sentry Guard Cartridges ... 244
Spherisorb Cartridge and Guard Columns ... 240
VanGuard Pre-columns and Cartridges ... 241

Cation Analysis ... 500

Certified Containers ... 82

Certified Sep-Pak Solid-Phase Extraction (SPE) Cartridges ... 31

Certified Sep-Pak Sorbent Selection Guide ... 32

Certified Vials ... 53

Charged Surface Hybrid Particle Technology ... 86

Chiral Methods Using Trefoil Columns ... 319

Column and Cartridge Fittings and Accessories
ACQUITY UPLC Column In-line Filter Unit ... 578
ACQUITY UPLC Column Replacement Parts ... 578
End Connector Kit (End Fittings for Cartridge Columns) ... 578
Replacement Filter Assemblies for Columns ... 578

Column Configurations ... 83

Column L/dp Comparison Chart ... 92

Column Nomenclature ... 91

Column Selection Guide ... 87, 131

Columns
µBondapak/Bondapak Columns ... 235, 299
µPorasil/Porasil Columns ... 237, 299
ACQUITY UPLC Columns ... 113
Amino Acid Analysis Columns ... 501
Analysis Cartridge Columns ... 495
APC Columns ... 464
Application-Specific Columns ... 494
Atlantis Columns ... 180, 207
BioResolve Columns ... 406, 435
Carbohydrate Analysis Column ... 495
Cartridge Columns ... 495
Cartridge Columns and Guard Holders ... 240
Cartridge Columns, Fittings and Accessories ... 240
Column Configurations ... 91
Column Nomenclature ... 91
Column Selection Guide ... 131
CORTECS 2.7 µm Columns ... 132
CORTECS UPLC ... 108
Delta-Pak Columns ... 234
Nucleic Acid Separations ... 375
Envirogel High-Resolution GPC Cleanup Columns ... 463
Fermentation Analysis, Organic Acids, Alcohols, and Carbohydrates Columns ... 495
Free Fatty Acids Columns ... 498
Glycan Analysis Columns ... 98
Guard Cartridges ... 244
Guard Column Fittings and Accessories ... 224
Guard-Pak Holder and Inserts ... 246
HPLC Columns ... 247
HSPgel Columns ... 461
HSPgel Columns for High-Speed GPC Analysis ... 461
Insulin HMWP HPLC Columns ... 429
Ion Analysis ... 500
Ion-Exclusion Columns ... 500
Nova-Pak Columns ... 232
Oligonucleotides Separations Columns ... 334
PAH Columns ... 499

Particle Technologies 85
Peptides Separations Columns 385
Polyaromatic Hydrocarbon Analysis Columns 499
Prep Nova-Pak HR Columns 299

Preparative Columns
Protein Separations Columns 406
Resolve Columns 233
SEC Columns 422
Sentry Guard Cartridges 244
Shodex GPC Columns 463
Shodex RSpak Polymer Reversed-Phase Columns 237
Spherisorb Cartridge Columns 240
Spherisorb Columns 227, 295
Styragel Columns for Polymer Characterization 457
Sugar and Carbohydrate Analysis Columns 495
SunFire Columns 169, 211, 276
Symmetry Columns 216, 291
Torus Columns 312, 314
Trefoil Columns 318
Ultrahydrogel Columns 473
Ultrastyragel Columns 460
UPLC Columns 86
USP "L" Column Listing 87
VanGuard Pre-columns 241
XBridge Columns 142, 181, 253
XP 2.5 µm Columns 142, 155, 162
XSelect Columns 155, 196, 266
XTerra Columns 174, 221, 285

Column Particle Technology 85

Columns for Large DNA 380

Compression Screws and Ferrules 526

CORTECS
CORTECS UPLC 1.6 µm Columns 108
CORTECS 2.7 µm Columns 132
CORTECS 2.7 µm Method Validation Kits 123, 138
CORTECS 2.7 µm VanGuard Cartridges 112, 141

CSH Particle Technology 86

Cytochrome *c* Digestion Standard 402

D

Delta-Pak
≥3 µm Analytical HPLC Columns 181
≥5 µm Preparative HPLC Columns 249
Delta-Pak HPLC and UHPLC Columns 401
Radial Compression Column Segments 307

Dispersive Sample Preparation 37

DisQuE Sample Preparation Solutions for QuEChERS 37
Extraction and Cleanup Tubes and Pouches 38
Kitted Solutions 37

DNA/RNA Species Columns 379

DNA, RNA, and Oligonucleotides 379

E

End Connector Kit (End-Fittings for Cartridge Columns) 578

Envirogel High-Resolution GPC Cleanup Columns 463

Environmental and Food Solution Kits
ACQUITY UPLC Bisphenol A Column and Method Kits 522
Beverage Analysis Kit 522
Carbamate Analysis Kit 523
EPA Method 1694 Analysis Kit 523

Ethylene Bridged Hybrid Particle Technology 85

Enzymate Pepsin Online Digestion Column 490

e*X*tended *P*erformance [*XP*] Columns
XBridge BEH 142, 181, 428
XSelect CSH 155-160
XSelect HSS 155, 164-167

Extraction Cartridges Manifold and Accessories 36

Extraction Manifolds Spare Parts 35

Extraction Plate Manifold and Accessories 35

F

Fatty Acid Analysis 498

Fermentation Analysis Columns, Alcohols, and Carbohydrates 497

Filter Design and Membrane Choices 40

Filters
Bottom-of-the-Bottle Solvent Filters 528
Handilok CTFE Fittings 582
Last Drop Mobile Phase Filters 582
PEEK Biocompatible Mobile Phase Filter 582
Solvent Inlet Filters 583
Waters/Pall Life Sciences Sample and Solvent Filtration Products 39

Free Fatty Acid HP Column 498

G

Gas-Chromatography Packings 304

Gen-Pak FAX Anion-Exchange Columns 380

Glass Cartridges for PPT Detection Levels 18

Glycan Analysis Standards 98

Glycans and Glycoprotein Analysis 353

Glycoprotein Performance Test Standard 360

GlycoWorks Kits 365

GPC Columns for Non-Aqueous Samples 455

Guard-Pak Holder and Inserts 246

Guide to Shodex Sugar Columns 495

H

Handilok CTFE Fittings 582

High-Performance Carbohydrate Analysis Cartridge Column 495

High Strength Silica Particle Technology 86

HILIC QC Reference Material 109

Holder for 12 x 32 mm Vials 71

HPLC Columns and Consumables
≥3 µm HPLC Analytical Columns 181
≥5 µm Preparative HPLC Columns 249
µBondapak/Bondapak Columns 235
µPorasil/Porasil Columns 237
Anion Analysis 500
Application-Specific Columns 495
Atlantis HPLC Columns 281
Carbamate Analysis Kit for Environmental Testing 523
Carbamate Analysis Kit for Food Testing 523
Cartridge Column Fittings and Accessories 240
Cartridge Columns 240
Cation Analysis 500
CORTECS Columns 241
Delta-Pak Columns 234
Fermentation Analysis, Organic Acids, Alcohols, and Carbohydrates 497
Free Fatty Acid Analysis 498
Gas-Chromatography Packings 304
Guard Column Fittings and Accessories 240
Guard Holders 244
Guard-Pak Holder and Inserts 246
High-Performance Carbohydrate Analysis Cartridge Column 495
Ion Analysis Columns 500
Ion-Exclusion Columns 500
Nova-Pak Columns 232
PAH Columns 499
Resolve Columns 233
Sentry Guard Cartridges 245
Shodex Columns 463
Spherisorb Cartridge Columns 227, 240
Sugar and Carbohydrate Analysis 495
SunFire HPLC Columns 211
Symmetry HPLC Columns 216
USP "L" Column Listing 87
XBridge Columns 181
XP 2.5 µm Columns 142, 155
XSelect Columns 196, 266
XTerra Columns 221, 285

HSPgel Columns 454, 461

HSS Particle Technology 86

I

iKey Separation Device 485

In-line Guard Cartridge Holder 240

Insulin HMWP HPLC Column **429**

Intelligent Technology
- Ion Analysis 500
- Anion Analysis 500
- Cation Analysis 500

Ion Analysis Columns **500**

Ion-Exchange
- AccellPlus Ion-Exchange Bulk Packings 451
- Glass Columns 446

Ion Exclusion **497**

IonHance .....
- IonHance CX-MS Buffers 439
- IonHance Difluoroacetic Acid 410
- IonHance Glycan C_{18} AX Ammonium Formate Concentrate 367, 369

ionKey **485**

L

L/dp Comparison Chart for Columns **92**

Last Drop Mobile Phase Filters **527, 582**

LC/GC Certified Vials **53**

LCMS Certified Vials **53**

M

MassPREP
- Digestion Standard Mixtures 404
- Oligonucleotide Standard 384
- Peptide Standard 403
- Phosphopeptide Standard 405
- Protein Standard Mix 415

MaxPeak Premier **93**

Method Development Kits
- ACQUITY UPLC 127
- Therapeutic Peptide 397
- Torus 314
- Trefoil 319
- Viridis 322

M-Class **490, 553**

N

Nano- and Micro-Flow LC **483**
- ACQUITY UPLC M-Class Columns 489
- ACQUITY UPLC M-Class Peptide Columns 489
- ACQUITY UPLC M-Class Protein Columns 489
- ACQUITY UPLC M-Class Trap Columns 489
- ACQUITY UPLC M-Class with HDX Technology 490
- Enzymate Pepsin Online Digestion Column 490
- iKey Separation Device 486
- ionKey/MS 485
- nanoACQUITY UPLC 489

nanoEase M/Z Columns **488**

nanoEase M/Z Trap Columns **489**

Trapping Columns **488**

nanoEase M/Z Columns **488**

Neutrals QC Reference Materials **119, 122**

NIST Digestion Standards **404**

Normal-Phase SunFire Silica OBD Preparative Columns **276**

Nova-Pak .....
- ≥3 µm Analytical HPLC Columns 181
- ≥5 µm Preparative HPLC Columns 249
- Radial Compression Column Segments and PrepPak Cartridges 307

Nucleic Acid Separations **375**
- MaxPeak Premier Oligonucleotide BEH Columns 333
- Oligonucleotide BEH Columns 334

O

Oasis Solid-Phase Extraction (SPE) Products **8**
- µElution 96-well Plates 17
- µElution Plates for Oligonucleotides 384
- 2 × 4 Method Development Protocol 16
- Analysis/Column/Method Development Kits 522
- Bulk Sorbents 18
- HLB (Hydrophilic-lipophilic Balanced) Sample Extraction Products 12
- MAX (for acidic compounds) Sample Extraction Products 15
- MCX (for basic compounds) Sample Extraction Products 14
- On-Line Columns and Cartridges 17
- PRiME HLB 12
- PRiME MCX 14
- Product Selection Guide 10
- Sorbents 12
- Symbiosis/Prospekt-2 Cartridges 17
- WAX (for strong acidic compounds) Sample Extraction Products 16
- WCX (for strong basic compounds) Sample Extraction Products 15

OBD Column Design **249**

Organic Acids Columns **497**
- Organic-Soluble Polymers .....
- Envirogel High-Resolution GPC Cleanup Columns 463
- GPC Columns for Non-Aqueous Samples 455
- HSPgel Columns for High-Speed GPC Analysis 461
- Shodex GPC Columns 463
- Styragel Columns for Polymer Characterization 457
- Ultrastyragel Columns 460

Ostro Pass-Through Sample Preparation Plate **19**

Otto SPEcialist and Consumable Kits **29**

Ozone Scrubber Cartridges **29**

P

PAH Columns **499**

Particle Technology **85**
- BEH (Ethylene Bridged Hybrid) 85
- CSH (Charged Surface Hybrid) 86
- HSS (High Strength Silica) 86

PEEK
- Biocompatible Mobile Phase Filter 527
- Compression Screws and Ferrules 526
- Fittings with Double-Ferrules 525
- One-piece Finger-tight Fitting 526
- Tubing and Fittings 524
- Unions, Tees, and Crosses 526
- Stainless Steel Tubing and Fittings 525

Peptide Mapping
- see Peptide Analysis 385

Peptide Separations **385**

Pesticide Analysis **23**

pH Buffers **492**

Pico•Tag HPLC Method **350**

Pipette+ **46**

Plates **62, 63, 65, 71, 74**

PoraPak RDX Sep-Pak Extraction Cartridge .. **29**

PoraPak Rxn Bulk Material **34**

PoraPak Rxn Cartridges **34**

Premier Columns **95**

Prep Nova-Pak Radial Compression Column Segments and PrepPak Cartridges **308**

Preparative Bulk Material **303**

Preparative Guard Cartridge Holders **301**

Preparative LC Columns
- see ≥5 µm Preparative HPLC Columns

Preparative Standards **302**

PrepPak Cartridges **307**

PRiME HLB **12**

Protein Separations **406**
- AccellPlus PrepPak Cartridges 450
- AccellPlus Sep-Pak Cartridges 450
- ACQUITY UPLC SEC System Solution 427
- Advanced Purification (AP) Glass Columns 448
- BEH SEC Protein Standards 429
- BioResolve Columns 325
- BioSuite Hydrophobic-Interaction Chromatography HPLC Columns 452
- BioSuite Ion-Exchange HPLC Columns 445
- BioSuite pC18 and pPhenyl Reversed-Phase Chromatography (RPC) HPLC Columns 452
- BioSuite Size-Exclusion Columns (SEC) 431

Ion-Exchange Sample Preparation with Sep-Pak Cartridges 451
Ion-Exchange Standards 443
MassPREP Protein Standard Mix 415
MaxPeak Premier Protein Columns 412
Protein BEH Columns 412
Protein Standards 415
Protein-Pak Hi Res HIC Column and HIC Protein Standard 417
Protein-Pak Hi Res Ion-Exchange (IEX) Columns 442
Protein-Pak High Resolution (HR) Ion-Exchange Glass Columns 447
ProteinWorks Digest Kits 514
SEC HPLC Columns 433
Symmetry300 C_4 HPLC Columns 434
Ultrahydrogel HPLC Columns 473
XBridge Protein BEH SEC, 125 Å, 200 Å, and 450 Å Columns and Protein Standard Test Mixtures 466

Protein-Pak
Hi Res HIC Column and HIC Protein Standard 417
Hi Res Ion-Exchange (IEX) Columns 442
High Resolution (HR) Ion-Exchange Glass Columns 447
High Resolution (HR) UPLC Columns 447

ProteinWorks Digest Kits 514

PTFE Tubing and Fittings 525

Purification and Isolation Cartridge Holders 301

Q

QC Reference Materials
HILIC QC Reference Materials 119
Neutrals QC Reference Materials 119
Reversed-Phase QC Reference Materials 119
UPC² QC Reference Materials 316

Quality Control Reference Materials
see QC Reference Materials

Quantitative Peptide Analysis Standards 404

R

Radial Compression Module Products 305
Delta-Pak Radial Compression Column Segments 307
Nova-Pak Radial Compression Column Segments and PrepPak Cartridges 308
Prep Nova-Pak Radial Compression Column Segments and PrepPak Cartridge 308
PrepPak Cartridges 307
Resolve Radial Compression Column Segments and PrepPak Cartridges 307

***Rapi*Fluor-MS 363**

***Rapi*Fluor-MS Dextran Calibration Standard 366, 513**

***Rapi*Fluor-MS Intact mAb Standard 366, 513**

***Rapi*Fluor-MS Quantitative Glycan Standard 366, 513**

***Rapi*Fluor-MS Sialylated Glycan Performance Test Standard 366, 513**

***Rapi*Gest SF Protein Digestion Surfactant 402**

Replacement Filter Assemblies for Columns 36

Resolve Columns 233, 307

Reversed-Phase QC Reference Materials 112

Roller for Cap Mats 71

S

Sample Plates and Seals 57

Sample Preparation 3
Accessories 49
Bulk Sorbents 18, 38
Certified Sep-Pak Solid-Phase Extraction (SPE) Cartridges 31
DisQuE Sample Preparation Solutions for QuEChERS 37
Extraction Cartridges Manifold and Accessories 36
Extraction Manifolds Spare Parts 35
Extraction Plate Manifold and Accessories 35
Oasis Solid-Phase Extraction (SPE) Products 8
Ostro Pass-Through Sample Preparation Plate 19
Ozone Scrubber Cartridges 29
PoraPak Rxn Cartridges for Post-Synthesis Cleanup 34
QuEChERS 37-38
Sep-Pak Solid-Phase Extraction (SPE) Products 20
Solvent Filtration Products 39
SPE Products 8
Therapeutic Peptide Method Development Kits 397, 516
Vacuum Manifold 35, 366, 513
Waters/Pall Life Sciences Sample and Solvent Filtration Products 39

Sample Vials and Accessories 51-53

SARS-CoV-2 LC-MS Kit 519

Seals 57

SEC Column Connectors and Connector Kits 430, 472

SEC Columns for Aqueous Samples 464

Selection Guide
2.x µm Columns 131
Aqueous SEC Columns 473
Aqueous SEC Solvents 474
Aqueous SEC Standards 479
Cartridge Selection Guide 24
Certified Sep-Pak Sorbents 32
Columns 87
HSPgel Columns 461
Non-Aqueous GPC Solvents 475
Non-Aqueous GPC Standards 476
Oasis Products 8–9
Sep-Pak Cartridges 24
Sep-Pak Sorbents 21
Shodex Sugar Columns 495
SPE Formats 6
Styragel Columns 457, 460
Vials for Alliance HPLC Systems 67
Vials for Fixed-Loop-Needle ACQUITY Systems 61
Vials for Flow-Through-Needle ACQUITY Systems 64
Vials Selection 54

Sentry Guard Cartridges 244-245

Sep-Pak Solid-Phase Extraction (SPE) Products 20
96-well µElution Plates 20
Cartridge Accessories 36
Cartridge Connections Kit 36
Cartridge Selection Guide 24
Certified Sep-Pak Solid-Phase Extraction (SPE) Cartridges 31
Certified Sep-Pak Sorbent Selection Guide 32
DNPH-Silica Cartridges 29
Dry SPE Cartridge 30
Formats 20
Ozone Scrubber Cartridge 29, 30
PoraPak RDX Cartridges and Accessories 29
Sorbent Selection Guide 21-22, 32
Specialty Chemistries 6, 30
XPoSure Aldehyde Sampler Cartridge 29-30

SFC Analytical and Preparative Columns 309
Torus (for Achiral SFC) 312
Torus Preparative (for Achiral SFC) 315
Trefoil (for Chiral SFC) 318
Viridis Columns 311, 320

Shodex GPC Columns 463

Shodex RSpak Polymer Reversed-Phase Columns 237

Shodex Sugar Columns 495

Size-Exclusion Chromatography Columns and Standards 455, 464-468

Solid Core Particle Technology 86

Solvent Filtration Apparatus 43

Solvent Filtration Products 39

Solvent Inlet Filters 583

SPE Products
see Sample Preparation

Spherisorb
≥3 µm Analytical HPLC Columns 240
≥5 µm Preparative HPLC Columns 295

Stainless Steel Tubing and Fittings 581

Standard 96-Well Plates 57

Standards
ACQUITY APC Calibration Standards 476
ACQUITY UPC² and SFC Standards 322
Amino Acid 345

BEH SEC Protein Standards 429
Glycan Analysis Standards 513
Glycoprotein Performance Test Standard 360
Ion Exchange Standards 443
mAb Subunit Standard 471
MassPREP Oligonucleotide Standard 384
Preparative Standards 302
Protein Standard 471
*Rapi*Fluor-MS Dextran Calibration Standard 366
*Rapi*Fluor-MS Intact mAb Standard 366
*Rapi*Fluor-MS Quantitative Glycan Standard 366
*Rapi*Fluor-MS Sialylated Glycan Performance Test Standard 366
SFC and UPC² Standards 317

Styragel Columns for Polymer Characterization 457

Sub-2 µm-Columns 105
ACQUITY UPLC Columns 113
Amino Acid Analysis Columns 340
Column Accessories 112, 115, 119, 122
CORTECS Columns 108
Glycan Columns 355
In-line Filter Unit 112, 115, 119, 122
Method Development Kits 127
Method Validation Kits 123
Oligonucleotide Columns 375
QC Reference Materials 112, 115, 119, 122
Peptide Columns 385
Protein Columns 406
VanGuard Pre-columns 112, 115, 119, 122
Waters UPLC Particle Technology 107

Sugar and Carbohydrate Analysis Columns 495

Sugar Pak I Column 495

**SunFire ..... **
≥3 µm Analytical HPLC Columns 211
≥5 µm Preparative HPLC Columns 276
2.5 µm Columns 169
Method Validation Kits 173, 215, 280
Preparative Scouting Columns 172, 214, 279
VanGuard Cartridges 173, 215, 280

Supercritical Fluid Chromatography (SFC) ... 311

Symmetry
≥3 µm Columns 216
≥5 µm Preparative HPLC Columns 291
Method Validation Kits 220, 294
VanGuard Cartridges 220, 294

T

Therapeutic Peptide Method Development Kits 397, 494, 516

Torus
Analytical Columns (for Achiral SFC Separations) 314
Method Development Kits 314
Preparative Columns (for Achiral SFC Separations) 315

Trefoil
Columns (for Chiral SFC Separations) 319
Method Development Kits 319

TruView LCMS Certified Vials 53

U

UHPLC Columns and Consumables
see 2.x µm Columns and Consumables

Ultrahydrogel Columns 473

Ultrastyragel Columns 460

Universal VanGuard Cartridge Holder 215

UPC²
ACQUITY UPC² QC Reference Materials 316
Chiral Methods Using Trefoil Columns 319

UPLC Columns and Consumables
see Sub-2 µm-Columns

USP "L" Column Listing 87-90

V

Vacuum Manifold 35

VanGuard Cartridges
Atlantis 210
CORTECS 2.7 µm 141
SunFire 173
Symmetry 195
XBridge 154
XSelect CSH 161
XSelect HSS 167
XTERRA 177

VanGuard Pre-columns and Cartridges 241

Vials and Accessories 53
Autosampler Vials for Compatible Systems 75
Autosampler Vials for Waters Systems 72
Certified Containers 82
Certified Vials 53
Holder for 12 x 32 mm Vials 71
Plates 57
Quick Selection Guide: Alliance HPLC Systems 67
Quick Selection Guide: Fixed-Loop-Needle ACQUITY Systems 61
Quick Selection Guide: Flow-Through-Needle ACQUITY Systems 64
Sample Plates 57
Seals 57
Vials Descriptions 79
Vials Holder 61
Vials for Aqua Analysis System 73
Vials for ACQUITY UPLC Systems 79
Vials for Alliance Systems 79
Vials for GPC 2000 73
Vials for PATROL UPLC Process Analysis System 73
Vials Troubleshooting Guide 81

Viridis
Hybrid and HSS SFC Columns 320
Method Development Kits 322
QC Reference Materials 322
Silica-Based SFC Columns 320

W

**Waters/Pall Life Sciences Sample and Solvent Filtration Products ..... **
Filter Design 40
Membrane Choices 40
Solvent Filtration Apparatus 43
Syringe Filters 42

Water-Soluble Polymers and Small Molecules
HSPgel Columns 461
SEC Columns for Aqueous Samples 464
Ultrahydrogel Columns 473

WAX 16

WCX 15

X

**XBridge BEH ..... **
≥3 µm HPLC Analytical Columns 181
≥5 µm Preparative HPLC Columns 253
2.x µm UHPLC Columns 142
Glycan Columns 370
Method Validation Kits 193
Oligonucleotide Columns 377
OSM Cartridges 18
Peptide BEH Columns 150
Protein BEH Columns 416
VanGuard Cartridges 154

***XP* 2.5 µm Columns**
XBridge BEH 142
XSelect CSH 156
XSelect HSS 164

XSelect
≥3 µm Columns 196
≥5 µm Preparative HPLC Columns 266
2.5 µm Columns 155
CSH Peptide Columns 155
Peptide HSS Columns 162
XSelect CSH ***XP*** Columns 156
XSelect CSH ***XP*** Method Validation Kits 160
XSelect CSH ***XP*** VanGuard Cartridges 161
XSelect HSS ***XP*** Columns 164
XSelect HSS ***XP*** Method Validation Kits 166
XSelect HSS ***XP*** VanGuard Cartridges 167

XTerra
≥3 µm Columns 221
≥5 µm Preparative HPLC Columns 285
2.5 µm Columns 174
2.5 µm VanGuard Cartridges 177, 226, 290
Method Validation Kits 177, 226, 290

Part Number Index

5711180 576
6060142 571, 576
17600335 365, 512
70009679 571
176001042 128
176001043 128
176001121 121
176001122 121
176001123 121
176001124 121
176001125 121
176001126 121
176001127 121
176001129 121
176001130 121
176001131 121
176001132 121
176001133 121
176001235 347, 507
176001375 121
176001398 121
176001556 121
176001557 121
176001558 121
176001559 121
176001560 121
176001561 121
176001562 121
176001603 128
176001604 128
176001605 128
176001606 128
176001607 128
176001608 128
176001609 128
176001610 128
176001634 523
176001676 37
176001740 523
176001767 523
176001813 121
176001814 121
176001815 121
176001816 121
176001817 121
176001818 121
176001819 121
176001820 121
176001821 121
176001822 121
176001823 121
176001824 121
176001835 397, 516
176001836 397, 516
176001881 128
176001882 128
176001883 128
176001884 128
176001885 128
176001886 128
176001887 128
176001888 128
176001889 128
176001890 128
176001903 37
176001955 522
176001959 128
176001960 128
176001961 128
176001962 128
176001963 128
176001964 128
176001965 128
176001966 128
176002049 573, 575
176002058 573
176002059 573
176002064 573, 575
176002123 128
176002124 128
176002125 128
176002126 128
176002127 128
176002128 128
176002129 128
176002130 128
176002135 573, 575
176002136 114
176002137 114
176002138 114
176002139 114
176002140 114
176002141 114
176002142 114
176002143 114
176002144 114
176002145 114
176002146 114
176002148 114
176002149 114
176002150 114
176002151 114
176002152 114
176002153 114
176002154 114
176002155 114
176002156 114
176002157 114
176002158 114
176002159 114
176002160 114
176002161 114
176002162 114
176002163 114
176002164 114
176002165 114
176002166 114
176002167 114
176002168 114
176002169 114
176002472 570, 572-573, 575-577
176002534 522
176002546 144, 184, 254
176002547 144, 184, 254
176002548 144, 184, 254
176002549 144, 184, 254
176002550 144, 184, 254
176002551 144, 184, 254
176002552 144, 184, 254
176002553 144, 184, 254
176002554 145, 185, 255
176002555 145, 185, 255
176002556 145, 185, 255
176002557 145, 185, 255
176002558 145, 185, 255
176002559 145, 185, 255
176002560 145, 185, 255
176002561 145, 185, 255
176002562 146, 186, 256
176002563 146, 186, 256
176002564 146, 186, 256
176002565 146, 186, 256
176002566 146, 186, 256
176002567 146, 186, 256
176002568 146, 186, 256
176002569 146, 186, 256
176002570 147, 187, 257
176002571 147, 187, 257
176002572 147, 187, 257
176002573 147, 187, 257
176002574 147, 187, 257
176002575 147, 187, 257
176002576 147, 187, 257
176002577 147, 187, 257
176002578 148, 188, 258
176002579 148, 188, 258
176002580 148, 188, 258
176002581 148, 188, 258
176002582 148, 188, 258
176002583 148, 188, 258
176002584 148, 188, 258
176002585 148, 188, 258
176002586 149, 189, 259
176002587 149, 189, 259
176002588 149, 189, 259
176002589 149, 189, 259
176002590 149, 189, 259
176002591 149, 189, 259
176002592 149, 189, 259
176002593 149, 189, 259
176002594 156, 198, 267
176002595 156, 198, 267
176002596 156, 198, 267
176002597 156, 198, 267
176002598 156, 198, 267
176002599 156, 198, 267
176002600 156, 198, 267
176002601 156, 198, 267
176002602 157, 199, 268
176002603 157, 199, 268
176002604 157, 199, 268
176002605 157, 199, 268
176002606 157, 199, 268
176002607 157, 199, 268
176002608 157, 199, 268
176002609 157, 199, 268
176002610 158, 200, 269
176002611 158, 200, 269
176002612 158, 200, 269
176002613 158, 200, 269
176002614 158, 200, 269
176002615 158, 200, 269
176002616 158, 200, 269
176002617 158, 200, 269
176002618 164, 201, 270
176002619 164, 201, 270
176002620 164, 201, 270
176002621 164, 201, 270
176002622 164, 201, 270
176002623 164, 201, 270
176002624 164, 201, 270
176002625 164, 201, 270
176002626 165, 202, 271
176002627 165, 202, 271
176002628 165, 202, 271
176002629 165, 202, 271
176002630 165, 202, 271
176002631 165, 202, 271
176002632 165, 202, 271
176002633 165, 202, 271
176002634 164, 201, 270
176002635 164, 201, 270
176002636 164, 201, 270
176002637 164, 201, 270
176002638 164, 201, 270
176002639 164, 201, 270
176002640 164, 201, 270
176002641 164, 201, 270
176002642 165, 202, 271
176002643 165, 202, 271
176002644 165, 202, 271
176002645 165, 202, 271
176002646 165, 202, 271
176002647 165, 202, 271
176002648 165, 202, 271
176002649 165, 202, 271
176002650 166, 203, 272
176002651 166, 203, 272
176002652 166, 203, 272
176002653 166, 203, 272
176002654 166, 203, 272
176002655 166, 203, 272
176002656 166, 203, 272
176002657 166, 203, 272
176002690 122
176002691 122
176002692 122
176002693 122
176002694 122
176002695 122
176002696 122
176002697 122
176002698 122
176002699 122
176002700 122
176002701 122
176002702 122
176002703 122
176002704 122
176002705 122
176002706 122
176002707 122
176002708 122
176002709 122
176002710 122
176002711 122
176002712 122
176002713 122
176002714 122
176002715 122
176002744 572
176002745 572
176002780 572, 575
176002781 572, 575
176002811 317, 322
176002879 144, 184, 254
176002880 144, 184, 254
176002881 145, 185, 255
176002882 145, 185, 255
176002883 146, 186, 256
176002884 146, 186, 256
176002885 147, 187, 257
176002886 147, 187, 257
176002887 148, 188, 258
176002888 148, 188, 258
176002889 149, 189, 259
176002890 149, 189, 259
176002891 156, 198, 267
176002892 156, 198, 267
176002893 157, 199, 268

176002894 157, 199, 268
176002895 158, 200, 269
176002896 158, 200, 269
176002897 164, 201, 270
176002898 164, 201, 270
176002899 165, 202, 271
176002900 165, 202, 271
176002901 164, 201, 270
176002902 164, 201, 270
176002903 165, 202, 271
176002904 165, 202, 271
176002905 166, 203, 272
176002906 166, 203, 272
176002922 37
176002923 37
176002983 347, 507
176002995 428, 467
176002996 427-428, 467-468
176002997 427-428, 467-468
176003050 322
176003061 126, 395
176003062 126, 395
176003063 126, 395
176003064 126, 395
176003065 126, 395
176003066 395
176003067 115, 395
176003068 126, 395
176003069 395
176003070 395
176003071 395
176003072 396
176003073 396
176003074 395
176003075 395
176003076 396
176003077 395
176003078 395
176003079 395
176003080 396
176003081 395
176003082 395
176003083 395
176003084 395
176003085 395
176003086 396
176003090 370
176003091 322
176003093 395
176003119 370
176003146 110, 134
176003147 110, 134
176003148 110, 134
176003149 110, 134
176003150 110, 134
176003151 110, 134
176003152 110, 134
176003153 110, 134
176003154 110, 134
176003155 110, 134
176003156 112, 135
176003157 112, 135
176003158 112, 135
176003159 112, 135
176003160 112, 135
176003161 112, 135
176003162 112, 135
176003163 112, 135
176003164 112, 135
176003165 112, 135
176003166 110, 134
176003167 110, 134
176003168 110, 134
176003169 110, 134
176003170 110, 134
176003171 110, 134
176003172 110, 134
176003173 110, 134
176003174 110, 134
176003175 110, 134
176003243 573
176003269 110, 134
176003270 110, 134
176003271 110, 134
176003272 110, 134
176003273 110, 134
176003274 110, 134
176003275 110, 134
176003276 110, 134
176003277 110, 134
176003278 110, 134
176003279 112, 135
176003280 112, 135
176003281 112, 135
176003282 112, 135
176003283 112, 135
176003284 112, 135
176003285 112, 135
176003286 112, 135
176003287 112, 135
176003288 112, 135
176003289 110, 134
176003290 110, 134
176003291 110, 134
176003292 110, 134
176003293 110, 134
176003294 110, 134
176003295 110, 134
176003296 110, 134
176003297 110, 134
176003298 110, 134
176003312 110, 134
176003313 110, 134
176003314 110, 134
176003315 110, 134
176003316 110, 134
176003317 112, 135
176003318 112, 135
176003319 112, 135
176003320 112, 135
176003321 112, 135
176003322 110, 134
176003323 110, 134
176003324 110, 134
176003325 110, 134
176003326 110, 134
176003349 365, 512
176003351 365, 512
176003575 417
176003576 417
176003577 319
176003578 319
176003579 314
176003580 314
176003591 466
176003592 466
176003593 466
176003594 466
176003595 466
176003596 466
176003597 466
176003598 466
176003599 466
176003606 365, 512
176003635 365, 512
176003688 514
176003689 514
176003695 514
176003696 514
176003699 355, 357, 360, 420
176003700 355, 357, 360, 420
176003701 355, 357, 360, 420
176003702 355, 357, 359-360, 419-420
176003703 355, 357, 360, 420
176003712 365, 512
176003713 365, 512
176003714 365, 512
176003789 112, 136
176003790 112, 136
176003791 112, 136
176003792 112, 136
176003793 112, 136
176003794 112, 136
176003795 112, 136
176003796 112, 136
176003797 112, 136
176003798 112, 136
176003799 112, 136
176003800 112, 136
176003801 112, 136
176003802 112, 136
176003803 112, 136
176003804 111, 135
176003805 111, 135
176003806 111, 135
176003807 111, 135
176003808 111, 135
176003809 111, 135
176003810 111, 135
176003811 111, 135
176003812 111, 135
176003813 111, 135
176003814 111, 135
176003815 111, 135
176003816 111, 135
176003817 111, 135
176003818 111, 135
176003819 112, 136
176003820 112, 136
176003821 112, 136
176003822 112, 136
176003823 112, 136
176003824 112, 136
176003825 112, 136
176003826 112, 136
176003827 112, 136
176003828 112, 136
176003829 111, 135
176003830 111, 135
176003831 111, 135
176003832 111, 135
176003833 111, 135
176003834 111, 135
176003835 111, 135
176003836 111, 135
176003837 111, 135
176003838 111, 135
176003850 572
176003851 572
176003876 111, 137
176003877 111, 137
176003878 111, 137
176003879 111, 137
176003880 111, 137
176003881 111, 137
176003882 111, 137
176003883 111, 137
176003884 111, 137
176003885 111, 137
176003886 111, 137
176003887 111, 137
176003888 111, 137
176003889 111, 137
176003890 111, 137
176003891 111, 137
176003892 111, 137
176003893 111, 137
176003894 111, 137
176003895 111, 137
176003896 111, 137
176003897 111, 137
176003898 111, 137
176003899 111, 137
176003900 111, 137
176003904 119, 427, 468
176003905 119, 427, 468
176003906 119, 427, 468
176003907 119, 427, 468
176003912 111, 136
176003913 111, 136
176003914 111, 136
176003915 111, 136
176003916 111, 136
176003917 111, 136
176003918 111, 136
176003919 111, 136
176003920 111, 136
176003921 111, 136
176003922 111, 136
176003923 111, 136
176003924 111, 136
176003925 111, 136
176003926 111, 136
176003927 111, 136
176003928 111, 136
176003929 111, 136
176003930 111, 136
176003931 111, 136
176003932 111, 136
176003933 111, 136
176003934 111, 136
176003935 111, 136
176003936 111, 136
176003992 396
176003993 396
176003994 396
176003995 396
176003996 396
176003997 396
176003998 396
176003999 396
176004006 396
176004007 396
176004008 396
176004009 396
176004017 396
176004018 396
176004020 396
176004021 396
176004023 572
176004077 514
176004078 514
176004079 514
176004080 514
176004151 365, 512
176004152 365, 512
176004153 365, 512
176004154 365, 512
176004156 411
176004157 411
176004158 411

176004159 411
176004160 411
176004161 411
176004167 411
176004168 411
176004169 411
176004170 411
176004171 411
176004212 411
176004322 428, 467
176004323 428, 467
176004324 428, 467
176004325 428, 467
176004326 428, 467
176004327 428, 467
176004331 428, 467
176004332 428, 467
176004333 428, 467
176004334 428, 467
176004335 428, 467
176004336 428, 467
176004340 440
176004341 440
176004342 440
176004343 440
176004344 440
176004345 440
176004346 440
176004347 440
176004348 440
176004349 440
176004350 440
176004351 440
176004352 440
176004353 440
176004354 440
176004355 440
176004356 440
176004357 440
176004358 440
176004375 518
176004376 518
176004377 518
176004378 518
176004379 518
176004380 518
176004385 571
176004417 521
176004418 521
176004419 521
176004420 521
176004423 521
176004424 521
176004434 58
176004498 441
176004499 441
176004500 441
176004501 441
176004502 441
176004533 348, 508
176004534 348, 508
176004542 348, 508
176004543 348, 508
176004544 348, 508
176004545 348, 508
176004546 348, 508
176004548 523
176004549 523
176004550 523
176004554 523
176004567 348, 508
176004568 348, 508
176004577 47
176004579 47
176004582 348, 508
176004583 348, 508
176004584 47
176004588 523
176004592 426, 469
176004593 426, 469
176004594 426, 469
176004595 426, 469
176004596 426, 469
176004597 426, 469
176004598 426, 469
176004599 426, 469
176004605 49
176004606 49
176004607 49
176004608 49
176004609 49
176004610 49
176004611 49
176004639 426, 469
176004640 426, 469
176004641 426, 469
176004642 426, 469
176004779 425, 470
176004780 425, 470
176004781 425, 470
176004782 425, 470
176004783 425, 470
176004784 425, 470
176004790 103, 338, 425, 470
176004791 103, 338, 425, 470
176004792 103, 338, 425, 470
176004793 103, 338, 425, 470
176004794 100, 336, 425, 470
176004795 100, 336, 425, 470
176004801 425, 470
176004802 425, 470
176004803 425, 470
176004804 425, 470
176004805 425, 470
176004806 425, 470
176004850 47
176004851 47
176004852 47
176004853 47
176004854 47
176004866 355, 357, 360, 420
176004867 355, 357, 360, 420
176004868 355, 357, 360, 420
176004946 520
176004947 520
176004948 520
176004949 520
176005067 103, 338, 425, 470
176005068 103, 338, 425, 470
176005069 103, 338, 425, 470
176005070 103, 338, 425, 470
176005071 100, 336, 425, 470
176005072 100, 336, 425, 470
176005107 100, 336, 416
176005108 100, 336, 416
176005109 100, 336, 416
176005110 103, 338, 416
176005111 103, 338, 416
176005112 103, 338, 416
176005113 103, 338, 416
176005114 103, 338, 416
176005115 103, 338, 416
176005152 347, 507
176009547 420
176009548 420
176009549 420
186000102 220, 294
186000103 220, 294
186000107 245
186000108 218, 292
186000109 218, 292
186000111 218, 292
186000112 218, 292
186000115 11, 13
186000116 11, 13
186000117 11, 13, 523
186000118 11, 13
186000128 13, 17
186000132 11, 13
186000169 245
186000172 218, 292
186000173 218, 292
186000174 218, 292
186000177 218, 292
186000178 218, 292
186000179 218, 292
186000180 218, 292
186000181 220, 294
186000185 400
186000187 219, 293, 400
186000188 219, 293, 400
186000189 219, 293, 400
186000190 219, 293, 400
186000195 220, 294
186000197 219, 293, 400
186000198 245
186000200 219, 293, 400
186000201 219, 293, 400
186000206 217, 291
186000207 217, 291
186000208 217, 291
186000209 217, 291
186000210 217, 291
186000211 217, 291
186000213 218, 292
186000214 218, 292
186000215 218, 292
186000217 218, 292
186000218 218, 292
186000224 219, 293
186000229 218, 292
186000234 70
186000236 217-218, 291-292
186000237 218, 292
186000238 218, 292
186000248 14, 17
186000250 14, 17
186000252 11, 14
186000253 11, 14
186000254 11, 14
186000255 11, 14
186000256 11, 14
186000259 14, 17
186000261 11, 14
186000262 36, 244-245
186000270 218, 292
186000271 217, 291
186000273 68, 76, 552
186000274 69, 77
186000275 245
186000276 400, 434
186000277 220, 294, 400, 434
186000278 220, 294, 400, 434
186000279 220, 294, 400, 434
186000280 220, 294, 400, 434
186000281 220, 294, 400, 434
186000282 220, 294, 400, 434
186000283 220, 294, 400, 434
186000284 245
186000285 220, 294, 400, 434
186000286 220, 294, 400, 434
186000287 220, 294, 400, 434
186000288 220, 294, 400, 434
186000289 220, 294, 400, 434
186000291 220, 294
186000293 220, 294
186000294 220, 294
186000295 220, 294
186000302 70
186000303 70, 75
186000304 70, 75
186000305 69, 77
186000309 13, 17
186000328 70, 75
186000349 62-63, 65
186000366 11, 15
186000367 11, 15
186000368 11, 15
186000369 11, 15
186000370 11, 15
186000371 11, 15
186000372 11, 15
186000373 15, 17
186000375 15, 17
186000378 11, 15
186000380 11, 14
186000381 11, 13
186000382 11, 13
186000383 11, 13
186000398 175, 222, 286
186000400 175, 222, 286
186000401 176, 223, 287
186000402 224, 288
186000404 175, 222, 286
186000405 176, 223, 287
186000406 224, 288
186000408 175, 222, 286
186000409 176, 223, 287
186000410 224, 288
186000414 175, 222, 286
186000416 224, 288
186000417 225, 289
186000418 175, 222, 286
186000420 224, 288
186000421 225, 289
186000422 175, 222, 286
186000424 224, 288
186000425 225, 289
186000426 175, 222, 286
186000427 176, 223, 287
186000428 224, 288
186000429 225, 289
186000430 175, 222, 286
186000432 175, 222, 286
186000433 176, 223, 287
186000434 224, 288
186000435 225, 289
186000436 175, 222, 286

186000437 176, 223, 287
186000438 224, 288
186000439 225, 289
186000440 175, 222, 286
186000441 176, 223, 287
186000442 224, 288
186000443 225, 289
186000446 175, 222, 286
186000447 176, 223, 287
186000448 224, 288
186000450 175, 222, 286
186000451 176, 223, 287
186000452 224, 288
186000454 175, 222, 286
186000455 176, 223, 287
186000456 224, 288
186000457 225, 289
186000458 175, 222, 286
186000459 176, 223, 287
186000460 224, 288
186000462 175, 222, 286
186000464 224, 288
186000466 175, 222, 286
186000468 224, 288
186000469 225, 289
186000470 175, 222, 286
186000472 224, 288
186000473 225, 289
186000474 175, 222, 286
186000476 224, 288
186000478 175, 222, 286
186000479 176, 223, 287
186000480 224, 288, 382
186000481 225, 289
186000482 175, 222, 286
186000483 176, 223, 287
186000484 224, 288
186000485 225, 289
186000486 175, 222, 286
186000487 176, 223, 287
186000488 224, 288
186000489 225, 289
186000490 175, 222, 286
186000491 176, 223, 287
186000492 224, 288
186000493 225, 289
186000494 175, 222, 286
186000495 176, 223, 287
186000496 224, 288
186000497 225, 289
186000592 175, 222, 286
186000600 175, 222, 286
186000602 175, 222, 286
186000603 176, 223, 287
186000644 245
186000646 245
186000652 245
186000654 245
186000656 245
186000658 245
186000660 245
186000661 245
186000662 245
186000678 14, 17
186000679 13, 17
186000683 11, 13, 18
186000690 217, 291
186000691 218, 292
186000692 218, 292
186000693 218, 292
186000695 217, 291
186000696 217, 291
186000697 218, 292
186000698 218, 292
186000699 218, 292
186000700 218, 292
186000701 245
186000706 17
186000708 175-176, 217-219, 222-225, 286-289, 291-293, 301, 497
186000709 144-152, 156-159, 164, 170-172, 175-176, 184-192, 198-201, 203, 208-210, 212-214, 217-219, 222-225, 261-262, 267-270, 272, 277-279, 282-284, 286-289, 291-293, 301, 394-396, 416
186000711 217, 291
186000712 218, 292
186000713 217, 291
186000714 218, 292
186000715 217, 291
186000717 217, 291
186000718 218, 292
186000776 11, 14
186000777 11, 14
186000778 11, 14
186000782 11, 14
186000826 177, 226, 290
186000829 177, 226, 290
186000830 177, 226, 290
186000840 72-73, 78, 552
186000841 72, 78
186000842 72, 78
186000848 68, 76
186000855 62, 65
186000861 177, 226, 290
186000862 177, 226, 290
186000863 177, 226, 290
186000865 11, 15
186000925 236, 300
186000926 433, 471
186000965 72, 78
186000981 175, 222, 286
186000984 70, 75
186000988 13
186000989 69
186000998 218, 292
186000999 72, 78
186001001 175, 222, 286
186001002 175, 222, 286
186001006 224, 288
186001007 224, 288
186001008 225, 289
186001009 225, 289
186001034 175, 222, 286
186001035 176, 223, 287
186001036 224, 288
186001037 225, 289
186001104 175, 222, 286
186001105 176, 223, 287
186001106 224, 288
186001107 225, 289
186001124 75
186001125 75
186001127 75
186001135 72, 78
186001138 177, 226, 290
186001139 177, 226, 290
186001140 177, 226, 290
186001142 177, 226, 290
186001143 177, 226, 290
186001144 177, 226, 290
186001145 177, 226, 290
186001146 177, 226, 290
186001147 177, 226, 290
186001152 175, 222, 286
186001153 176, 223, 287
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186001173 176, 223, 287
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186001178 177, 226, 290
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186001184 177, 226, 290
186001205 15, 17
186001256 15, 17
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186001361 209, 283
186001363 209-210, 283-284
186001365 209, 283
186001367 209, 283
186001369 209-210, 283-284
186001371 209-210, 283-284
186001373 209, 283
186001377 245
186001389 209, 283
186001393 209, 283
186001413 17
186001414 17
186001420 73-74, 552
186001421 73
186001422 73
186001436 62, 65
186001437 62-63, 65
186001438 62-63, 65
186001470 175, 222, 286
186001471 176, 223, 287
186001472 224, 288
186001473 225, 289
186001474 177, 226, 290
186001475 175, 222, 286
186001476 176, 223, 287
186001477 224, 288
186001478 225, 289
186001728 73
186001741 462
186001742 462
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186001780 462
186001781 462
186001782 462
186001783 462
186001784 462
186001792 17
186001829 15, 17, 397, 516
186001831 35, 366, 397, 513, 516
186001835 218, 292
186001836 218, 292
186001837 218, 292
186001838 218, 292
186001839 218, 292
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186001847 219, 293, 400
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186001850 219, 293
186001855 11
186001860 370, 402
186001861 402
186001879 11, 13
186001880 11, 13
186001881 11, 14
186001882 11, 14
186001883 11, 15
186001884 11, 15
186001888 11
186001889 175, 222, 286
186001913 464
186001914 464
186001915 464
186001916 464
186001917 24
186001920 245
186001925 224, 288
186001927 245
186001930 175, 222, 253, 286
186001931 176, 223, 287
186001932 224, 288
186001934 175, 222, 286
186001935 176, 223, 287
186001936 224, 288
186001937 225, 289
186001938 175, 222, 286
186001940 224, 288
186001941 225, 289
186001942 175, 222, 286
186001943 176, 223, 287
186001944 224, 288
186001945 225, 289
186001979 175, 222, 286
186002005 245
186002007 210, 284
186002009 210, 284
186002011 210, 284
186002012 210, 284
186002013 210, 284
186002014 210, 284
186002015 210, 284
186002016 210, 284
186002017 210, 284
186002018 210, 284
186002019 210, 284
186002027 210, 284
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186002057 17
186002082 217, 291
186002084 218, 292
186002086 217, 291
186002087 218, 292
186002089 219, 293
186002094 217, 291
186002122 402
186002123 366, 402, 513
186002127 69, 77
186002128 69, 77
186002129 69, 77
186002130 69, 77
186002152 445
186002153 445
186002154 418, 445
186002155 445
186002156 445, 452
186002157 418, 445
186002158 445
186002159 418, 452
186002160 452
186002161 432-433
186002162 432-433
186002163 433
186002164 432-433
186002165 431-433
186002166 432-433
186002167 433
186002168 432-433
186002169 433
186002170 432-433
186002171 433
186002172 432-433
186002173 433
186002174 433
186002175 433
186002176 446
186002177 446
186002178 446
186002179 446
186002180 446
186002181 446
186002182 398, 446
186002183 398, 445-446
186002184 398, 445-446
186002185 398, 446
186002186 445-446
186002187 446
186002218 175, 222, 286
186002219 176, 223, 287
186002220 224, 288
186002221 225, 289
186002222 175, 222, 286
186002223 176, 223, 287
186002224 224, 288
186002225 225, 289
186002254 175, 222, 286
186002255 175, 222, 286
186002256 176, 223, 287
186002257 224, 288
186002258 225, 289
186002259 175, 222, 286
186002260 176, 223, 287
186002261 224, 288
186002262 225, 289
186002263 175, 222, 286
186002264 176, 223, 287
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186002268 176, 223, 287
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186002276 176, 223, 287
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186002280 176, 223, 287
186002281 224, 288
186002282 225, 289
186002300 209, 283
186002314 210, 284
186002315 210, 284
186002316 210, 284
186002318 25
186002319 24
186002320 24
186002321 24
186002325 404-405
186002326 404
186002327 404
186002328 404
186002329 404
186002330 404
186002337 386, 389, 403
186002338 403
186002344 118
186002346 118
186002347 118
186002349 118
186002350 118, 373
186002352 118, 372-373
186002353 118
186002379 175, 222, 286
186002380 176, 223, 287
186002381 224, 288
186002382 225, 289
186002388 176, 223, 287
186002389 224, 288
186002390 225, 289
186002418 209-210, 283-284
186002425 399
186002426 399
186002427 399
186002428 399
186002429 399
186002430 399
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186002433 399
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186002437 399
186002438 399
186002439 399
186002440 399
186002452 209-210, 283-284
186002455 209, 283
186002456 69
186002457 69
186002481 57, 62-63, 65, 71, 74, 348, 397, 508, 516, 552
186002482 57, 62-63, 65, 71, 74, 552
186002483 62-63, 71, 74, 397, 516
186002484 62-63, 71, 74
186002489 11, 16
186002490 11, 16
186002491 11, 16
186002492 11, 16
186002493 11, 16
186002494 11, 15
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186002498 11, 15
186002499 15, 17, 397, 516
186002500 16-17
186002501 15, 17
186002502 16-17
186002503 15, 17
186002504 16-17
186002505 17
186002507 17
186002508 17
186002509 17
186002520 72, 78
186002530 245
186002533 170, 212, 277
186002534 170, 212, 277
186002535 170, 212, 277
186002536 245
186002539 170, 212, 277
186002540 170, 212, 277
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186002560 170, 212, 277
186002565 170, 212, 277
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186002567 170, 212, 277
186002568 170, 212, 277
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186002572 170, 212, 277
186002608 217, 291
186002609 218, 292
186002612 217, 291
186002616 217, 291
186002617 218, 292
186002618 218, 292
186002619 219, 293
186002626 68, 76
186002628 70, 75
186002631 57, 62-63, 71, 74
186002632 57, 62-63, 65, 71, 74
186002633 71, 348, 508
186002639 61, 64, 67-68, 74, 76, 381
186002640 68, 74, 76, 359
186002641 70, 75
186002642 70, 75
186002643 57, 62-63, 65, 71, 74, 552
186002645 70, 75
186002646 70, 75

186002647 70, 75
186002648 70, 75
186002649 70, 75
186002650 70, 75
186002663 170, 212, 277
186002666 170, 212, 277
186002667 170, 212, 277
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186002673 170, 212, 277
186002675 173, 215, 280
186002676 173, 215, 280
186002679 173, 215, 280
186002680 173, 215, 280
186002681 245
186002682 245
186002683 245
186002684 245
186002708 245
186002710 171, 213, 278
186002711 171, 213, 278
186002712 171, 213, 278
186002713 245
186002715 171, 213, 278
186002716 171, 213, 278
186002717 171, 213, 278
186002718 245
186002719 171, 213, 278
186002720 171, 213, 278
186002721 171, 213, 278
186002722 245
186002723 171, 213, 278
186002724 171, 213, 278
186002725 171, 213, 278
186002727 245
186002729 171, 213, 278
186002730 171, 213, 278
186002731 171, 213, 278
186002732 171, 213, 278
186002733 245
186002734 171, 213, 278
186002735 171, 213, 278
186002736 171, 213, 278
186002737 171, 213, 278
186002738 171, 213, 278
186002740 173, 215, 280
186002741 173, 215, 280
186002744 173, 215, 280
186002745 173, 215, 280
186002750 171, 213, 278
186002751 171, 213, 278
186002752 171, 213, 278
186002753 171, 213, 278
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186002756 171, 213, 278
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186002758 171, 213, 278
186002761 171, 213, 278
186002763 171, 213, 278
186002764 171, 213, 278
186002765 171, 213, 278
186002766 171, 213, 278
186002767 171, 213, 278
186002768 171, 213, 278
186002780 365, 370, 512
186002788 62-63, 65, 71, 74
186002789 62-63, 71, 74
186002795 171, 213, 278
186002797 170, 212, 277
186002799 42
186002800 209, 283
186002801 209, 283
186002802 68, 76
186002803 76
186002804 76
186002805 68
186002843 175, 222, 286
186002844 176, 223, 287
186002846 225, 289
186002847 175, 222, 286
186002849 224, 288
186002850 225, 289
186002851 118
186002852 118
186002853 118
186002854 118
186002867 170, 212, 277
186002868 171, 213, 278
186002869 170, 212, 277
186002870 171, 213, 278
186002871 170, 212, 277
186002872 171, 213, 278
186002875 118
186002876 118
186002877 118
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186002884 118
186002885 118
186002972 144, 184, 254
186002975 144, 184, 254
186002977 144, 184, 253-254
186002978 144, 184, 254
186002979 144, 184, 254
186002980 144, 184, 254
186002981 144, 184, 254
186002982 144, 184, 254
186002983 146, 186, 256
186002984 146, 186, 256
186002985 146, 186, 256
186002986 146, 186, 256
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186002990 146, 186, 256
186002991 145, 185, 255
186002992 145, 185, 255
186002993 145, 185, 255
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186002996 145, 185, 255
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186002999 146, 186, 256
186003002 146, 186, 256
186003003 146, 186, 256
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186003006 146, 186, 256
186003007 146, 186, 256
186003008 146, 186, 256
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186003010 146, 186, 256
186003011 145, 185, 255
186003012 145, 185, 255
186003013 145, 185, 255
186003014 145, 185, 255
186003015 145, 185, 255
186003016 145, 185, 255
186003017 145, 185, 255
186003018 145, 185, 255
186003019 144, 184, 254
186003020 144, 184, 254
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186003028 144, 184, 254
186003030 144, 184, 254
186003031 144, 184, 254
186003032 144, 184, 254
186003033 144, 184, 254, 372-373
186003034 144, 184, 254
186003035 146, 186, 256
186003036 146, 186, 256
186003037 146, 186, 256
186003038 146, 186, 256
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186003080 245
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186003082 245
186003083 145, 185, 255
186003107 144, 184, 254
186003108 144, 184, 254
186003109 144, 184, 254
186003110 144, 184, 254
186003111 144, 184, 254
186003112 144, 184, 254
186003113 144, 184, 254
186003114 144, 184, 254
186003115 144, 184, 254, 371-373
186003116 144, 184, 254
186003117 144, 184, 254
186003129 144, 184, 254
186003131 144, 184, 254
186003132 144, 184, 254
186003133 144, 184, 254
186003135 144, 184, 254
186003140 146, 186, 256
186003144 146, 186, 256
186003153 146, 186, 256
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186003182 145, 185, 255
186003184 145, 185, 255
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186003190 145, 185, 255
186003191 145, 185, 255
186003192 145, 185, 255
186003194 145, 185, 255
186003195 145, 185, 255
186003249 16
186003262 146, 186, 256
186003269 145, 185, 255
186003276 147, 187, 257
186003277 147, 187, 257
186003278 147, 187, 257
186003279 147, 187, 257
186003284 144, 184, 254
186003285 405
186003286 405
186003287 405
186003321 147, 187, 257
186003322 147, 187, 257
186003323 147, 187, 257
186003324 147, 187, 257
186003327 147, 187, 257
186003328 147, 187, 257
186003329 147, 187, 257
186003331 147, 187, 257
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186003334 147, 187, 257
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186003358 147, 187, 257
186003365 11, 13
186003369 30
186003373 118
186003374 118
186003375 118
186003376 118
186003377 118
186003378 118
186003379 11, 13
186003390 172, 214, 279
186003391 172, 214, 279
186003399 170, 212, 277
186003401 170, 212, 277
186003407 170, 212, 277
186003409 170, 212, 277
186003410 171, 213, 278
186003417 170, 212, 277
186003429 172, 214, 279
186003431 172, 214, 279
186003432 172, 214, 279
186003433 172, 214, 279
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186003455 69
186003457 118
186003458 118
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186003460 118
186003461 118
186003462 118
186003463 16
186003467 172, 214, 279
186003468 172, 214, 279
186003516 11, 14
186003517 11, 15
186003518 11, 15
186003519 11, 16
186003522 35, 397, 516
186003529 121
186003530 121
186003531 121
186003532 121
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186003534 121
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186003536 121
186003537 121
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186003554 119, 392
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186003556 119, 392
186003560 150, 190, 260, 394
186003561 150, 190, 260, 394
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186003563 150, 190, 260, 394
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186003577 150, 190, 260, 394
186003578 150, 190, 260, 394
186003579 150, 190, 260, 394
186003580 150, 190, 260, 394
186003581 150, 190, 260, 394
186003586 150, 190, 260, 394
186003587 150, 190, 260, 394
186003604 151, 191, 261, 394
186003605 151, 191, 261, 394
186003606 151, 191, 261, 394
186003607 151, 191, 261, 394, 397, 516
186003608 151, 191, 261, 394
186003609 151, 191, 261, 394
186003610 151, 191, 261, 394
186003611 151, 191, 261, 394
186003612 151, 191, 261, 394
186003613 151, 191, 261, 394
186003614 151, 191, 261, 394
186003615 191, 261, 394
186003616 191, 261, 394
186003617 191, 261, 394
186003618 191, 261, 394
186003619 191, 261, 394
186003620 191, 261, 394
186003621 191, 261, 394
186003622 191, 261, 394
186003623 191, 261, 394
186003624 191, 261, 394
186003625 191, 261, 394
186003630 151, 191, 261, 394
186003631 151, 191, 261, 394
186003648 150, 190, 260, 394
186003649 150, 190, 260, 394
186003650 150, 190, 260, 394
186003651 150, 190, 260, 394
186003656 150, 190, 260, 394
186003657 150, 190, 260, 394
186003658 150, 190, 260, 394
186003659 150, 190, 260, 394
186003660 150, 190, 260, 394
186003661 150, 190, 260, 394
186003662 150, 190, 260, 394
186003663 151, 191, 261, 394
186003664 151, 191, 261, 394
186003665 151, 191, 261, 394
186003666 151, 191, 261, 394
186003671 151, 191, 261, 394
186003672 151, 191, 261, 394
186003673 151, 191, 261, 394
186003674 151, 191, 261, 394
186003675 151, 191, 261, 394
186003676 151, 191, 261, 394
186003677 151, 191, 261, 394
186003685 119, 392, 397, 516
186003686 119, 392
186003687 119, 359, 392
186003695 208, 282
186003696 208, 282
186003697 208, 281-282
186003698 208, 282
186003699 208, 282
186003700 208, 282
186003701 208, 282
186003702 208, 281-282
186003703 208, 282
186003706 208, 282
186003707 208, 282
186003708 208, 282
186003709 208, 282
186003710 208, 282
186003711 208, 282
186003712 208, 282
186003713 208, 282
186003714 208, 282
186003715 208, 282
186003716 208, 282
186003717 208, 282
186003718 208, 282
186003719 208, 282
186003721 208, 282
186003722 208, 282
186003723 208, 282
186003726 208, 282
186003727 208, 282
186003728 208, 282
186003729 208, 282
186003733 208, 282
186003734 208, 282
186003735 208, 282
186003736 208, 282
186003738 208, 282
186003739 208, 282
186003740 208, 282
186003741 208, 282
186003744 208, 282
186003745 208, 282
186003746 208, 281-282
186003747 208, 282
186003748 208, 282
186003751 210, 284
186003754 210, 284
186003755 210, 284
186003756 245
186003758 245
186003761 245
186003766 153, 193, 263
186003767 153, 193, 263
186003768 153, 193, 263
186003769 153, 193, 263
186003770 153, 193, 263
186003771 153, 193, 263
186003772 153, 193, 263
186003773 153, 193, 263
186003774 153, 193, 263
186003775 153, 193, 263
186003776 153, 193, 263
186003777 153, 193, 263
186003778 153, 193, 263
186003779 153, 193, 263
186003780 153, 193, 263
186003781 153, 193, 263
186003782 153, 193, 263
186003783 153, 193, 263
186003784 153, 193, 263
186003785 153, 193, 263
186003786 153, 193, 263
186003787 153, 193, 263
186003788 153, 193, 263
186003789 153, 193, 263
186003790 153, 193, 263
186003791 153, 193, 263
186003792 153, 193, 263
186003793 153, 193, 263
186003794 153, 193, 263
186003795 153, 193, 263
186003796 153, 193, 263
186003797 153, 193, 263
186003798 153, 193, 263
186003799 153, 193, 263
186003800 153, 193, 263
186003801 153, 193, 263
186003802 153, 193, 263
186003803 153, 193, 263
186003804 153, 193, 263
186003805 153, 193, 263
186003806 153, 193, 263
186003807 153, 193, 263
186003808 153, 193, 263
186003809 153, 193, 263
186003820 405
186003836 347, 507, 518
186003837 341-342, 347-348, 502, 507-508
186003838 343, 347-348, 503, 507-508
186003839 343, 347-348, 503, 507-508
186003849 13
186003852 11, 13
186003853 171, 213, 278
186003854 170, 212, 277
186003855 172, 214, 279
186003863 405
186003864 405
186003889 144, 184, 254
186003892 144, 184, 254
186003893 144, 184, 254
186003894 144, 184, 254
186003895 144, 184, 254
186003896 144, 184, 254
186003897 144, 184, 254
186003898 144, 184, 254
186003899 144, 184, 254
186003900 144, 184, 254
186003901 144, 184, 254
186003902 144, 184, 254
186003908 13
186003909 118
186003910 118
186003911 118
186003915 16-17
186003929 144, 184, 254
186003930 144, 184, 254
186003933 144, 184, 254
186003934 145, 185, 255
186003935 146, 186, 256
186003936 147, 187, 257
186003937 144, 184, 254
186003938 145, 185, 255
186003939 146, 186, 256
186003940 147, 187, 257
186003941 170, 212, 277
186003943 144, 184, 254
186003944 121
186003945 150, 190, 260, 394
186003946 151, 191, 261, 394
186003949 376-378
186003950 377
186003952 377, 379
186003953 377, 379
186003956 210, 284
186003957 210, 284
186003958 210, 284
186003959 210, 284
186003960 210, 284
186003961 210, 284
186003962 210, 284

186003963 145, 185, 255
186003964 146, 186, 256
186003965 147, 187, 257
186003966 24
186003969 170, 212, 277
186003970 170, 212, 277
186003971 170, 212, 277
186003972 170, 212, 277
186003975 119, 241, 392
186003976 122, 241
186003977 119, 241
186003978 119, 241
186003979 119, 241
186003980 119, 241
186003981 122, 241
186003987 121
186003988 146, 186, 256
186003991 146, 186, 256
186003992 146, 186, 256
186003993 146, 186, 256
186003994 146, 186, 256
186003995 146, 186, 256
186003996 146, 186, 256
186003997 146, 186, 256
186003998 146, 186, 256
186003999 146, 186, 256
186004001 146, 186, 256
186004002 146, 186, 256
186004003 145, 185, 255
186004006 145, 185, 255
186004007 145, 185, 255
186004008 145, 185, 255
186004009 145, 185, 255
186004010 145, 185, 255
186004011 145, 185, 255
186004012 145, 185, 255
186004013 145, 185, 255
186004014 145, 185, 255
186004015 145, 185, 255
186004016 145, 185, 255
186004021 144, 184, 254
186004022 146, 186, 256
186004023 145, 185, 255
186004024 147, 187, 257
186004025 144, 184, 254
186004026 208, 282
186004027 170, 212, 277
186004028 171, 213, 278
186004029 172, 214, 279
186004030 209, 283
186004031 72, 78
186004044 126
186004045 126
186004046 126
186004047 126
186004048 126
186004049 126
186004050 126
186004051 30
186004052 126
186004053 126
186004054 126
186004055 126
186004056 126
186004057 126
186004058 126
186004080 208, 282
186004081 208, 282
186004082 208, 282
186004083 208, 282
186004084 208, 282
186004085 208, 282
186004086 208, 282
186004107 144, 184, 254
186004108 73
186004109 73
186004111 73
186004112 61, 64, 68
186004114 121
186004115 121
186004116 121
186004117 121
186004118 121
186004119 121
186004120 121
186004134 11, 13
186004135 143, 182, 375, 384
186004136 122, 241
186004137 126
186004138 126
186004169 69, 77
186004432 148, 188, 258
186004433 148, 188, 258
186004434 148, 188, 258
186004436 148, 188, 258
186004439 148, 188, 258
186004440 148, 188, 258
186004441 148, 188, 258
186004444 148, 188, 258
186004445 148, 188, 258
186004446 148, 188, 258
186004448 148, 188, 258
186004451 148, 188, 258
186004452 148, 188, 258
186004453 148, 188, 258
186004454 148, 188, 258
186004464 150, 190, 260, 394
186004465 150, 190, 260, 394
186004466 151, 191, 261, 394
186004467 151, 191, 261, 394
186004468 150, 190, 260, 394
186004469 150, 190, 260, 394
186004470 151, 191, 261, 394
186004471 151, 191, 261, 394
186004475 16-17
186004487 71
186004495 413, 416
186004496 357, 416
186004497 415-416, 419
186004498 152, 192, 262, 413, 416
186004499 152, 192, 262, 416
186004500 152, 192, 262, 416
186004501 152, 192, 262, 416
186004502 152, 192, 262, 416
186004503 152, 192, 262, 416
186004504 152, 192, 262, 414, 416
186004505 152, 192, 262, 416
186004535 518
186004536 25
186004537 25
186004538 25
186004540 30, 450
186004541 34
186004542 34
186004543 34
186004544 34
186004545 34
186004546 34
186004547 34
186004548 34
186004560 25
186004561 25
186004562 25
186004563 25
186004564 25
186004565 25
186004566 25
186004567 25
186004568 25
186004569 34
186004570 34
186004571 38
186004572 38
186004578 25
186004579 365, 512
186004590 30
186004598 25
186004602 33
186004603 33
186004604 33
186004605 33
186004606 33
186004607 33
186004608 33
186004609 33
186004610 33
186004611 33
186004612 33
186004613 33
186004614 32
186004615 32
186004616 32
186004617 32
186004618 32
186004619 32
186004620 32
186004621 32
186004623 416
186004629 392
186004632 74
186004646 11, 15
186004647 11, 16
186004648 11, 14
186004649 11, 15
186004650 11, 15
186004651 11, 16
186004653 17
186004654 17
186004655 17
186004656 17
186004659 118
186004660 118
186004661 118
186004663 118
186004664 118
186004665 118
186004666 118
186004667 118
186004668 118
186004669 118
186004670 118
186004671 118
186004672 118
186004673 118
186004674 118
186004675 118
186004676 118
186004677 118
186004678 121
186004679 121
186004680 121
186004681 121
186004682 121
186004683 121
186004684 121
186004685 121
186004686 121
186004687 121
186004689 121
186004690 118
186004691 126
186004692 126
186004693 126
186004694 126
186004695 126
186004696 126
186004697 126
186004698 126
186004699 126
186004700 126
186004701 126
186004702 126
186004703 126
186004704 126
186004705 126
186004709 126
186004711 144, 184, 254
186004712 208, 282
186004713 17, 397, 516
186004717 77
186004719 523
186004720 148, 188, 258
186004723 148, 188, 258
186004724 148, 188, 258
186004725 148, 188, 258
186004726 148, 188, 258
186004727 148, 188, 258
186004728 148, 188, 258
186004729 148, 188, 258
186004730 148, 188, 258
186004731 148, 188, 258
186004732 148, 188, 258, 369
186004733 148, 188, 258, 369
186004734 148, 188, 258, 369
186004735 148, 188, 258
186004739 119, 368
186004740 119, 359, 368
186004741 119, 368
186004742 119, 368, 373
186004743 164, 201, 270
186004744 164, 201, 270
186004747 164, 201, 270
186004748 164, 201, 270
186004749 164, 201, 270
186004751 164, 201, 270
186004753 164, 201, 270
186004754 164, 201, 270
186004756 164, 201, 270
186004757 164, 201, 270
186004758 164, 201, 270
186004762 164, 201, 270
186004763 164, 201, 270
186004765 164, 201, 270
186004766 164, 201, 270
186004767 164, 201, 270
186004768 164, 201, 270
186004770 164, 201, 270
186004772 164, 201, 270
186004773 164, 201, 270
186004775 164, 201, 270
186004776 164, 201, 270
186004780 165, 202, 271
186004781 165, 202, 271
186004782 245
186004783 165, 202, 271

186004784 ..... 165, 202, 271
186004785 ..... 165, 202, 271
186004786 ..... 165, 202, 271
186004787 245
186004788 ..... 165, 202, 271
186004790 ..... 165, 202, 271
186004791 ..... 165, 202, 271
186004792 245
186004793 ..... 165, 202, 271
186004794 ..... 165, 202, 271
186004795 ..... 165, 202, 271
186004799 ..... 119, 241
186004800 118
186004801 118
186004802 118
186004803 118
186004804 118
186004805 118
186004806 118
186004807 126
186004808 126
186004809 126
186004810 126
186004826 121
186004830 38
186004831 38
186004832 38
186004833 38
186004834 38
186004835 38
186004837 38
186004839 118
186004848 118
186004849 118
186004850 118
186004852 ..... 164, 201, 270
186004858 ..... 149, 189, 259
186004859 ..... 149, 189, 259
186004860 ..... 149, 189, 259
186004861 ..... 149, 189, 259
186004863 ..... 149, 189, 259
186004864 ..... 149, 189, 259
186004867 ..... 149, 189, 259
186004868 ..... 149, 189, 259
186004869 ..... 149, 189, 259
186004870 ..... 149, 189, 259
186004896 ..... 126, 392
186004897 392
186004898 377
186004899 416
186004900 ..... 100, 103, 143, 182, 216, 234, 336, 338, 412-413, 415
186004904 393
186004905 393
186004906 ..... 154, 193, 263, 377
186004907 ..... 126, 368
186004908 321
186004909 321
186004910 321
186004911 321
186004916 322
186004917 322
186004918 322
186004919 322
186004920 322
186004921 322
186004922 322
186004923 322
186004924 322
186004925 322
186004926 322
186004927 322
186004928 322
186004929 442-443
186004930 442
186004931 ..... 381, 442, 444
186004932 522
186004935 321
186004936 321
186004937 321
186004938 321
186004943 322
186004944 322
186004945 322
186004946 322
186004947 322
186004948 322
186004949 322
186004950 322
186004951 322
186004952 322
186004953 322
186004954 322
186004955 322
186005125 ..... 11, 13
186005219 ..... 68, 76
186005220 ..... 68, 76
186005221 ..... 61, 64, 68, 76
186005222 ..... 70, 75
186005223 ..... 70, 75
186005224 ..... 70, 75
186005225 ..... 119, 427, 468
186005226 ..... 119, 427, 468
186005230 ..... 61, 64, 68
186005231 18
186005232 18
186005233 18
186005249 ..... 156, 198, 267
186005251 ..... 156, 198, 267
186005252 245
186005254 ..... 156, 198, 267
186005255 ..... 156, 198, 267
186005256 ..... 156, 198, 267
186005257 ..... 156, 198, 267
186005258 245
186005260 ..... 156, 198, 267
186005261 ..... 156, 198, 267
186005262 ..... 156, 198, 267
186005263 ..... 156, 198, 267
186005264 245
186005267 ..... 156, 198, 267
186005268 ..... 156, 198, 267
186005269 ..... 156, 198, 267
186005270 ..... 156, 198, 267
186005274 ..... 156, 198, 267
186005275 ..... 156, 198, 267
186005276 ..... 156, 198, 267
186005279 ..... 156, 198, 267
186005280 ..... 156, 198, 267
186005281 ..... 156, 198, 267
186005282 ..... 156, 198, 267
186005283 ..... 156, 198, 267
186005285 245
186005287 ..... 156, 198, 267
186005289 ..... 156, 198, 267
186005290 ..... 156, 198, 267
186005291 ..... 156, 198, 267
186005292 114
186005293 114
186005294 114
186005295 114
186005296 ..... 114, 266
186005297 114
186005298 114
186005299 114
186005300 114
186005301 114
186005302 114
186005303 ..... 115, 241
186005310 ..... 157, 199, 268
186005311 ..... 157, 199, 268
186005312 ..... 157, 199, 268
186005316 ..... 157, 199, 268
186005317 ..... 157, 199, 268
186005318 ..... 157, 199, 268
186005322 ..... 157, 199, 268
186005323 ..... 157, 199, 268
186005324 ..... 157, 199, 268
186005325 ..... 157, 199, 268
186005329 ..... 157, 199, 268
186005330 ..... 157, 199, 268
186005331 ..... 157, 199, 268
186005335 ..... 157, 199, 268
186005336 ..... 157, 199, 268
186005337 ..... 157, 199, 268
186005338 ..... 157, 199, 268
186005342 ..... 157, 199, 268
186005343 ..... 157, 199, 268
186005344 ..... 157, 199, 268
186005345 ..... 157, 199, 268
186005346 ..... 157, 199, 268
186005347 114
186005348 114
186005349 114
186005350 114
186005351 114
186005352 114
186005353 114
186005354 114
186005355 114
186005356 114
186005357 114
186005358 ..... 115, 241
186005365 ..... 158, 200, 269
186005366 ..... 158, 200, 269
186005367 ..... 158, 200, 269
186005371 ..... 158, 200, 269
186005372 ..... 158, 200, 269
186005373 ..... 158, 200, 269
186005377 ..... 158, 200, 269
186005378 ..... 158, 200, 269
186005379 ..... 158, 200, 269
186005380 ..... 158, 200, 269
186005384 ..... 158, 200, 269
186005385 ..... 158, 200, 269
186005386 ..... 158, 200, 269
186005390 ..... 158, 200, 269
186005391 ..... 158, 200, 269
186005392 ..... 158, 200, 269
186005393 ..... 158, 200, 269
186005397 ..... 158, 200, 269
186005398 ..... 158, 200, 269
186005399 ..... 158, 200, 269
186005400 ..... 158, 200, 269
186005401 ..... 158, 200, 269
186005402 114
186005403 114
186005404 114
186005405 114
186005406 114
186005407 114
186005408 114
186005409 114
186005410 114
186005411 114
186005412 114
186005413 ..... 115, 241
186005418 ..... 156, 198, 267
186005420 ..... 156, 198, 267
186005421 .. 156, 198, 266-267
186005422 ..... 156, 198, 267
186005423 ..... 156, 198, 267
186005424 ..... 156, 198, 267
186005425 ..... 156, 198, 267
186005426 ..... 156, 198, 267
186005431 ..... 157, 199, 268
186005433 ..... 157, 199, 268
186005434 ..... 157, 199, 268
186005435 ..... 157, 199, 268
186005436 ..... 157, 199, 268
186005437 ..... 157, 199, 268
186005438 ..... 157, 199, 268
186005439 ..... 157, 199, 268
186005444 ..... 158, 200, 269
186005446 ..... 158, 200, 269
186005447 ..... 158, 200, 269
186005448 ..... 158, 200, 269
186005450 ..... 158, 200, 269
186005451 ..... 158, 200, 269
186005452 ..... 158, 200, 269
186005463 393
186005464 393
186005465 416
186005491 ..... 156, 198, 267
186005492 ..... 156, 198, 267
186005493 ..... 156, 198, 267
186005494 ..... 156, 198, 267
186005495 ..... 156, 198, 267
186005496 ..... 156, 198, 267
186005497 ..... 156, 198, 267
186005498 ..... 157, 199, 268
186005499 ..... 157, 199, 268
186005500 ..... 157, 199, 268
186005501 ..... 157, 199, 268
186005502 ..... 157, 199, 268
186005503 ..... 157, 199, 268
186005504 ..... 157, 199, 268
186005505 ..... 158, 200, 269
186005506 ..... 158, 200, 269
186005507 ..... 158, 200, 269
186005508 ..... 158, 200, 269
186005509 ..... 158, 200, 269
186005510 ..... 158, 200, 269
186005511 ..... 158, 200, 269
186005516 377
186005518 19
186005520 ..... 158, 200, 269
186005538 ..... 160, 204, 273
186005539 ..... 160, 204, 273
186005540 ..... 160, 204, 273
186005541 ..... 160, 204, 273
186005542 ..... 160, 204, 273
186005543 ..... 160, 204, 273
186005544 ..... 160, 204, 273
186005545 ..... 160, 204, 273
186005546 ..... 160, 204, 273
186005547 ..... 160, 204, 273
186005548 ..... 160, 204, 273
186005549 ..... 160, 204, 273
186005550 ..... 160, 204, 273
186005551 ..... 160, 204, 273
186005552 ..... 160, 204, 273
186005553 ..... 160, 204, 273
186005554 ..... 160, 204, 273
186005555 ..... 160, 204, 273
186005556 ..... 160, 204, 273
186005557 ..... 160, 204, 273
186005558 ..... 160, 204, 273
186005559 ..... 160, 204, 273
186005560 ..... 160, 204, 273
186005561 ..... 160, 204, 273
186005562 ..... 160, 204, 273
186005563 ..... 160, 204, 273
186005564 ..... 160, 204, 273

186005565 160, 204, 273
186005566 160, 204, 273
186005567 160, 204, 273
186005568 160, 204, 273
186005569 160, 204, 273
186005570 160, 204, 273
186005571 126
186005572 126
186005573 126
186005574 126
186005575 126
186005576 126
186005577 126
186005578 126
186005579 126
186005580 126
186005581 126
186005582 126
186005587 29, 35-36
186005589 416
186005590 416
186005591 416
186005592 119, 392
186005593 119, 392
186005594 119, 392
186005604 118
186005605 118
186005606 118
186005607 118
186005608 118
186005609 118
186005610 118
186005611 118
186005612 118
186005613 118
186005614 121
186005615 121
186005616 121
186005617 121
186005618 121
186005619 121
186005620 114
186005621 114
186005622 114
186005623 114
186005624 114
186005625 114
186005634 170, 212, 277
186005636 170, 212, 277
186005641 165, 202, 271
186005642 164, 201, 270
186005643 164, 201, 270
186005644 156, 198, 267
186005645 158, 200, 269
186005646 157, 199, 268
186005647 156, 198, 267
186005648 158, 200, 269
186005649 157, 199, 268
186005652 208, 282
186005653 208, 282
186005657 118
186005658 118
186005671 17
186005672 18
186005673 18
186005688 321
186005689 321
186005690 321
186005691 321
186005692 321
186005693 321
186005694 321
186005695 321
186005700 322
186005701 322
186005702 322
186005703 322
186005704 322
186005705 322
186005706 322
186005707 322
186005708 322
186005709 322
186005710 322
186005711 322
186005712 322
186005719 321
186005720 321
186005721 321
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186005732 322
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186005742 322
186005743 322
186005750 321
186005751 321
186005752 321
186005753 321
186005754 321
186005755 321
186005756 321
186005757 321
186005762 322
186005763 322
186005764 322
186005765 322
186005766 322
186005767 322
186005768 322
186005769 322
186005770 322
186005771 322
186005772 322
186005773 322
186005774 322
186005781 17
186005782 17
186005783 17
186005784 17
186005785 17
186005786 17
186005791 303
186005792 119
186005793 119, 427, 468
186005794 217, 291
186005800 321
186005801 321
186005802 321
186005803 321
186005804 321
186005805 321
186005806 321
186005807 321
186005826 69
186005827 69
186005828 69
186005829 69
186005837 57, 62-63, 65, 71, 74, 552
186005847 165, 202, 271
186005848 165, 202, 271
186005849 165, 202, 271
186005850 165, 202, 271
186005852 165, 202, 271
186005853 165, 202, 271
186005854 165, 202, 271
186005855 165, 202, 271
186005856 165, 202, 271
186005859 165, 202, 271
186005860 165, 202, 271
186005861 165, 202, 271
186005862 165, 202, 271
186005863 165, 202, 271
186005869 165, 202, 271
186005871 165, 202, 271
186005872 165, 202, 271
186005875 165, 202, 271
186005877 165, 202, 271
186005878 165, 202, 271
186005879 165, 202, 271
186005882 165, 202, 271
186005883 165, 202, 271
186005884 165, 202, 271
186005885 165, 202, 271
186005886 165, 202, 271
186005890 167, 205, 274
186005891 167, 205, 274
186005892 167, 205, 274
186005893 167, 205, 274
186005894 167, 205, 274
186005895 167, 205, 274
186005896 167, 205, 274
186005897 167, 205, 274
186005898 167, 205, 274
186005899 167, 205, 274
186005900 167, 205, 274
186005907 166, 203, 272
186005908 166, 203, 272
186005909 166, 203, 272
186005910 166, 203, 272
186005913 166, 203, 272
186005914 166, 203, 272
186005915 166, 203, 272
186005916 166, 203, 272
186005919 166, 203, 272
186005920 166, 203, 272
186005921 166, 203, 272
186005922 166, 203, 272
186005923 166, 203, 272
186005929 166, 203, 272
186005931 166, 203, 272
186005932 166, 203, 272
186005935 166, 203, 272
186005937 166, 203, 272
186005938 166, 203, 272
186005939 166, 203, 272
186005942 166, 203, 272
186005943 166, 203, 272
186005944 166, 203, 272
186005945 166, 203, 272
186005946 166, 203, 272
186005950 167, 206, 275
186005951 167, 206, 275
186005952 167, 206, 275
186005953 167, 206, 275
186005954 167, 206, 275
186005955 167, 206, 275
186005956 167, 206, 275
186005957 167, 206, 275
186005958 167, 206, 275
186005959 167, 206, 275
186005960 167, 206, 275
186005961 122
186005962 122
186005963 122
186005964 122
186005965 122
186005966 122
186005967 122
186005968 122
186005969 122
186005970 122
186005971 122
186005972 122
186005973 122
186005974 122, 241
186005975 126
186005976 126
186005977 126
186005978 126
186005982 122
186005983 122
186005984 122
186005985 122
186005986 122
186005987 122
186005988 122
186005989 122
186005990 122
186005991 122
186005992 122
186005993 122
186005994 122
186005995 122, 241
186005996 126
186005997 126
186005998 126
186005999 126
186006006 522
186006007 522
186006008 522
186006010 522
186006011 404
186006012 404
186006016 126
186006017 126
186006018 126
186006019 126
186006020 126
186006021 126
186006022 126
186006023 126
186006024 126
186006025 126
186006026 126
186006027 126
186006028 144, 151, 184, 191, 254, 261
186006029 144, 151, 184, 191, 254, 261
186006030 144, 151, 184, 191, 254, 261
186006031 144, 151, 184, 191, 254, 261, 372-373
186006032 144, 151, 184, 191, 254, 261
186006033 144, 151, 184, 191, 254, 261
186006034 144, 151, 184, 191, 254, 261
186006035 144, 151, 184, 191, 254, 261, 373
186006036 144, 151, 184, 191, 254, 261
186006037 144, 151, 184, 191, 254, 261

186006038....144, 151, 184, 191, 254, 261
186006039....144, 151, 184, 191, 254, 261
186006040....145, 185, 255
186006041....145, 185, 255
186006042....145, 185, 255
186006043....145, 185, 255
186006044....145, 185, 255
186006045....145, 185, 255
186006046....145, 185, 255
186006047....145, 185, 255
186006048....145, 185, 255
186006049....145, 185, 255
186006050....145, 185, 255
186006051....145, 185, 255
186006052....146, 186, 256
186006053....146, 186, 256
186006054....146, 186, 256
186006055....146, 186, 256
186006056....146, 186, 256
186006057....146, 186, 256
186006058....146, 186, 256
186006059....146, 186, 256
186006060....146, 186, 256
186006061....146, 186, 256
186006062....146, 186, 256
186006063....146, 186, 256
186006064....147, 187, 257
186006065....147, 187, 257
186006066....147, 187, 257
186006067....147, 187, 257
186006068....147, 187, 257
186006069....147, 187, 257
186006070....147, 187, 257
186006071....147, 187, 257
186006072....147, 187, 257
186006073....147, 187, 257
186006074....147, 187, 257
186006075....147, 187, 257
186006076....148, 188, 258
186006077....148, 188, 258
186006078....148, 188, 258
186006079....148, 188, 258
186006080....148, 188, 258
186006081....148, 188, 258
186006082....148, 188, 258
186006083....148, 188, 258
186006084....148, 188, 258
186006085....148, 188, 258
186006086....148, 188, 258
186006087....148, 188, 258
186006088....149, 189, 259
186006089....149, 189, 259
186006090....149, 189, 259
186006091....149, 189, 259
186006092....149, 189, 259
186006093....149, 189, 259
186006094....149, 189, 259
186006095....149, 189, 259
186006096....149, 189, 259
186006097....149, 189, 259
186006098....149, 189, 259
186006099....149, 189, 259
186006100....156, 198, 267
186006101....156, 198, 267
186006102....156, 198, 267
186006103....156, 198, 267
186006104....156, 198, 267
186006105....156, 198, 267
186006106....156, 198, 267
186006107....156, 198, 267
186006108....156, 198, 267
186006109....156, 198, 267
186006110....156, 198, 267
186006111....156, 198, 267
186006112....157, 199, 268
186006113....157, 199, 268
186006114....157, 199, 268
186006115....157, 199, 268
186006116....157, 199, 268
186006117....157, 199, 268
186006118....157, 199, 268
186006119....157, 199, 268
186006120....157, 199, 268
186006121....157, 199, 268
186006122....157, 199, 268
186006123....157, 199, 268
186006124....158, 200, 269
186006125....158, 200, 269
186006126....158, 200, 269
186006127....158, 200, 269
186006128....158, 200, 269
186006129....158, 200, 269
186006130....158, 200, 269
186006131....158, 200, 269
186006132....158, 200, 269
186006133....158, 200, 269
186006134....158, 200, 269
186006135....158, 200, 269
186006136....164, 201, 270
186006137....164, 201, 270
186006138....164, 201, 270
186006139....164, 201, 270
186006140....164, 201, 270
186006141....164, 201, 270
186006142....164, 201, 270
186006143....164, 201, 270
186006144....164, 201, 270
186006145....164, 201, 270
186006146....164, 201, 270
186006147....164, 201, 270
186006148....165, 202, 271
186006149....165, 202, 271
186006150....165, 202, 271
186006151....165, 202, 271
186006152....165, 202, 271
186006153....165, 202, 271
186006154....165, 202, 271
186006155....165, 202, 271
186006156....165, 202, 271
186006157....165, 202, 271
186006158....165, 202, 271
186006159....165, 202, 271
186006160....164, 201, 270
186006161....164, 201, 270
186006162....164, 201, 270
186006163....164, 201, 270
186006164....164, 201, 270
186006165....164, 201, 270
186006166....164, 201, 270
186006167....164, 201, 270
186006168....164, 201, 270
186006169....164, 201, 270
186006170....164, 201, 270
186006171....164, 201, 270
186006172....165, 202, 271
186006173....165, 202, 271
186006174....165, 202, 271
186006175....165, 202, 271
186006176....165, 202, 271
186006177....165, 202, 271
186006178....165, 202, 271
186006179....165, 202, 271
186006180....165, 202, 271
186006181....165, 202, 271
186006182....165, 202, 271
186006183....165, 202, 271
186006184....166, 203, 272
186006185....166, 203, 272
186006186....166, 203, 272
186006187....166, 203, 272
186006188....166, 203, 272
186006189....166, 203, 272
186006190....166, 203, 272
186006191....166, 203, 272
186006192....166, 203, 272
186006193....166, 203, 272
186006194....166, 203, 272
186006195....166, 203, 272
186006197....153, 193, 263
186006198....153, 193, 263
186006199....153, 193, 263
186006200....153, 193, 263
186006201....153, 193, 263
186006202....153, 193, 263
186006203....153, 193, 263
186006204....153, 193, 263
186006205....153, 193, 263
186006206....153, 193, 263
186006207....153, 193, 263
186006208....153, 193, 263
186006209....153, 193, 263
186006210....153, 193, 263
186006211....153, 193, 263
186006212....153, 193, 263
186006213....153, 193, 263
186006214....153, 193, 263
186006215....153, 193, 263
186006216....153, 193, 263
186006217....153, 193, 263
186006218....153, 193, 263
186006219....153, 193, 263
186006220....153, 193, 263
186006221....154, 194, 264
186006222....154, 194, 264
186006223....154, 194, 264
186006224....154, 194, 264
186006225....154, 194, 264
186006226....154, 194, 264
186006227....154, 194, 264
186006228....154, 194, 264
186006229....154, 194, 264
186006230....154, 194, 264
186006231....154, 194, 264
186006232....154, 194, 264
186006233....160, 204, 273
186006234....160, 204, 273
186006235....160, 204, 273
186006236....160, 204, 273
186006237....160, 204, 273
186006238....160, 204, 273
186006239....160, 204, 273
186006240....160, 204, 273
186006241....160, 204, 273
186006242....160, 204, 273
186006243....160, 204, 273
186006244....160, 204, 273
186006245....160, 204, 273
186006246....160, 204, 273
186006247....160, 204, 273
186006248....160, 204, 273
186006249....160, 204, 273
186006250....160, 204, 273
186006251....166, 205, 274
186006252....166, 205, 274
186006253....166, 205, 274
186006254....166, 205, 274
186006255....166, 205, 274
186006256....166, 205, 274
186006257....167, 205, 274
186006258....167, 205, 274
186006259....167, 205, 274
186006260....167, 205, 274
186006261....167, 205, 274
186006262....167, 205, 274
186006263....166, 205, 274
186006264....166, 205, 274
186006265....166, 205, 274
186006266....166, 205, 274
186006267....166, 205, 274
186006268....166, 205, 274
186006273....167, 205, 274
186006274....167, 205, 274
186006275....167, 206, 275
186006276....167, 206, 275
186006277....167, 206, 275
186006278....167, 206, 275
186006279....167, 206, 275
186006280....167, 206, 275
186006332....62, 65, 71, 74, 348, 508
186006333....71, 74
186006334....71, 74
186006335....62, 65, 71, 74
186006336....62-63, 65, 71, 74
186006339....11
186006340....11
186006341....11
186006342....11
186006343....11
186006344....16
186006345....16
186006349....182, 366, 370, 513
186006360....108, 112-113, 115, 117, 119-120, 122, 133, 143, 155, 163, 169, 174, 181-182, 196-197, 207, 211, 216, 221, 232-235
186006363....108, 112-113, 115, 117, 119-120, 122, 133, 143, 155, 163, 169, 174, 181-182, 196-197, 207, 211, 216, 221, 232-235
186006371....115, 126, 143, 182, 196, 216, 390, 395-396, 399-400, 402, 404
186006372....317, 322
186006380....164, 201, 270
186006381....164, 201, 270
186006382....164, 201, 270
186006383....164, 201, 270
186006384....164, 201, 270
186006387....164, 201, 270
186006391....164, 201, 270
186006392....164, 201, 270
186006393....164, 201, 270
186006396....164, 201, 270
186006397....164, 201, 270
186006398....164, 201, 270
186006399....164, 201, 270
186006402....164, 201, 270
186006403....164, 201, 270
186006406....166, 205, 274
186006407....166, 205, 274
186006408....166, 205, 274
186006409....166, 205, 274
186006410....166, 205, 274
186006411....166, 205, 274
186006412....166, 205, 274
186006413....166, 205, 274
186006414....166, 205, 274
186006415....166, 205, 274
186006416....166, 205, 274
186006422....164, 201, 270
186006423....164, 201, 270
186006424....164, 201, 270
186006425....164, 201, 270
186006428....164, 201, 270
186006432....164, 201, 270

186006433....164, 201, 270
186006434....164, 201, 270
186006437....164, 201, 270
186006438....164, 201, 270
186006439....164, 201, 270
186006440....164, 201, 270
186006443....164, 201, 270
186006444....164, 201, 270
186006447....166, 205, 274
186006448....166, 205, 274
186006449....166, 205, 274
186006450....166, 205, 274
186006451....166, 205, 274
186006452....166, 205, 274
186006453....166, 205, 274
186006454....166, 205, 274
186006455....166, 205, 274
186006456....166, 205, 274
186006457....166, 205, 274
186006459....165, 202, 271
186006460....165, 202, 271
186006462....165, 202, 271
186006463....165, 202, 271
186006464....165, 202, 271
186006465....165, 202, 271
186006466....165, 202, 271
186006469....165, 202, 271
186006470....245
186006473....165, 202, 271
186006474....165, 202, 271
186006475....165, 202, 271
186006478....165, 202, 271
186006479....165, 202, 271
186006480....165, 202, 271
186006481....165, 202, 271
186006484....165, 202, 271
186006485....165, 202, 271
186006488....167, 205, 274
186006489....167, 205, 274
186006490....167, 205, 274
186006491....167, 205, 274
186006492....167, 205, 274
186006493....167, 205, 274
186006494....167, 205, 274
186006495....167, 205, 274
186006496....167, 205, 274
186006497....167, 205, 274
186006498....167, 205, 274
186006499....11
186006500....11
186006501....11
186006502....11
186006504....119, 427, 468
186006505....119, 427, 468
186006506....119, 427, 429, 468
186006516....392
186006517....126, 392
186006518....143, 182, 329, 429, 471
186006519....143, 182, 429, 471
186006521....317, 322
186006522....317, 322
186006523....317, 322
186006524....317, 322
186006541....321
186006542....321
186006543....321
186006544....321
186006545....321
186006549....416
186006551....317, 322
186006552....328, 355, 357, 360, 366, 411, 415, 513
186006555....143, 182, 196, 216, 404
186006557....321
186006558....321
186006559....321
186006560....321
186006561....321
186006562....321
186006563....321
186006564....321
186006566....321
186006567....321
186006568....321
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186006573....321
186006575....321
186006576....321
186006577....321
186006578....321
186006579....321
186006580....321
186006581....321
186006582....321
186006587....149, 189, 259
186006588....149, 189, 259
186006589....149, 189, 259
186006590....149, 189, 259
186006591....149, 189, 259
186006592....149, 189, 259
186006593....149, 189, 259
186006594....149, 189, 259
186006595....149, 189, 259
186006596....149, 189, 259
186006597....149, 189, 259
186006598....149, 189, 259
186006603....149, 189, 259
186006604....149, 189, 259
186006605....149, 189, 259
186006606....149, 189, 259
186006607....149, 189, 259
186006608....149, 189, 259
186006609....149, 189, 259
186006610....149, 189, 259
186006611....149, 189, 259
186006613....119, 430, 472
186006614....317, 322
186006616....321
186006617....321
186006618....321
186006619....321
186006620....321
186006621....321
186006622....321
186006623....321
186006624....321
186006625....321
186006626....321
186006627....321
186006628....321
186006629....321
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186006637....321
186006638....321
186006639....321
186006640....321
186006641....321
186006642....321
186006643....321
186006644....321
186006645....321
186006646....321
186006647....321
186006648....321
186006649....321
186006650....321
186006651....321
186006652....321
186006653....321
186006654....321
186006655....321
186006656....321
186006657....321
186006658....321
186006659....321
186006685....321
186006686....321
186006687....321
186006688....321
186006703....302
186006709....144, 151, 184, 191, 254, 261
186006710....144, 151, 184, 191, 254, 261, 373
186006711....144, 151, 184, 191, 254, 261
186006712....145, 185, 255
186006713....145, 185, 255
186006714....145, 185, 255
186006715....146, 186, 256
186006716....146, 186, 256
186006717....146, 186, 256
186006718....147, 187, 257
186006719....147, 187, 257
186006720....147, 187, 257
186006721....148, 188, 258
186006722....148, 188, 258
186006723....148, 188, 258
186006724....149, 189, 259
186006725....149, 189, 259
186006726....149, 189, 259
186006727....156, 198, 267
186006728....156, 198, 267
186006729....156, 198, 267
186006730....157, 199, 268
186006731....157, 199, 268
186006732....157, 199, 268
186006733....158, 200, 269
186006734....158, 200, 269
186006735....158, 200, 269
186006736....164, 201, 270
186006737....164, 201, 270
186006738....164, 201, 270
186006739....165, 202, 271
186006740....165, 202, 271
186006741....165, 202, 271
186006742....164, 201, 270
186006743....164, 201, 270
186006744....164, 201, 270
186006745....165, 202, 271
186006746....165, 202, 271
186006747....165, 202, 271
186006748....166, 203, 272
186006749....166, 203, 272
186006750....166, 203, 272
186006757....153, 193, 263
186006758....153, 193, 263
186006759....153, 193, 263
186006760....153, 193, 263
186006761....153, 193, 263
186006762....153, 193, 263
186006763....153, 193, 263
186006764....487
186006765....487
186006766....487
186006774....153, 193, 263
186006775....153, 193, 263
186006776....153, 193, 263
186006777....153, 193, 263
186006778....153, 193, 263
186006779....154, 194, 264
186006780....154, 194, 264
186006781....154, 194, 264
186006782....154, 194, 264
186006783....154, 194, 264
186006784....154, 194, 264
186006785....160, 204, 273
186006786....160, 204, 273
186006787....160, 204, 273
186006788....160, 204, 273
186006789....160, 204, 273
186006790....160, 204, 273
186006791....160, 204, 273
186006792....160, 204, 273
186006793....160, 204, 273
186006794....166, 205, 274
186006795....166, 205, 274
186006796....166, 205, 274
186006797....167, 205, 274
186006798....167, 205, 274
186006799....167, 205, 274
186006800....166, 205, 274
186006801....166, 205, 274
186006802....166, 205, 274
186006803....167, 205, 274
186006804....167, 205, 274
186006805....167, 205, 274
186006806....167, 206, 275
186006807....167, 206, 275
186006808....167, 206, 275
186006812....38
186006813....38
186006814....38
186006815....167, 205, 274
186006816....167, 205, 274
186006817....167, 205, 274
186006818....167, 205, 274
186006841....182, 366, 370, 513
186006842....143, 182, 328, 429, 471
186006850....427-428, 467-468
186006851....427, 468
186006852....427, 468
186006869....443
186006870....443
186006875....209-210, 283-284
186006876....209, 283
186006877....210, 284
186006878....208, 282
186006879....208, 282
186006880....394
186006882....151, 191, 261, 394
186006884....170, 212, 277
186006885....170, 212, 277
186006886....171, 213, 278
186006887....171, 213, 278
186006888....172, 214, 279
186006889....172, 214, 279
186006890....149, 189, 259
186006891....147, 187, 257
186006892....144, 184, 254
186006893....144, 184, 254
186006894....145, 185, 255
186006895....145, 185, 255

186006896 148, 188, 258
186006897 146, 186, 256
186006898 146, 186, 256
186006899 156, 198, 267
186006900 157, 199, 268
186006901 158, 200, 269
186006902 175, 222, 286
186006903 175, 222, 286
186006904 176, 223, 287
186006905 224, 288
186006906 224, 288
186006907 322
186006908 322
186006909 322
186006910 322
186006911 322
186006912 144-149, 151-152, 156-158, 164, 170-172, 175-176, 184-189, 191-192, 198-201, 208-210, 212-214, 222-224, 254-259, 261-262, 267-270, 277-279, 282-284, 286-288, 301, 315, 322, 394, 416
186006933 115, 395
186006934 115, 395
186006935 115, 395
186006936 115, 395
186006937 115, 395
186006938 115, 395
186006939 115, 395
186006940 126, 395
186006941 159, 203, 272, 395
186006942 159, 203, 272, 395
186006943 159, 203, 272, 395
186006944 396
186006945 160, 204, 274, 396
186006946 159, 203, 272, 395
186006947 159, 203, 272, 395
186006950 159, 203, 272, 395
186006951 159, 203, 272, 395
186006952 159, 203, 272, 395
186006953 160, 204, 274, 396
186006954 395
186006955 159, 203, 272, 395
186006956 159, 203, 272, 395
186006957 159, 203, 272, 395
186006958 395
186006959 160, 204, 274, 396
186006961 366, 513
186006966 160, 204, 274, 396
186006967 70
186006968 487
186006969 487
186006970 487
186006972 465
186006973 465
186006975 465
186006977 465
186006978 465
186006980 465
186006982 465
186006983 465
186006985 465
186006987 465
186006988 465
186006990 465
186006992 456
186006993 456
186006995 456
186006997 456
186006998 456
186007000 456
186007002 456
186007003 456
186007005 456
186007007 456
186007008 456
186007010 456
186007012 301
186007015 159, 203, 272, 395
186007019 159, 203, 272, 395
186007020 159, 203, 272, 395
186007021 159, 203, 272, 395
186007022 159, 203, 272, 395
186007023 159, 203, 272, 395
186007024 159, 203, 272, 395
186007025 159, 203, 272, 395
186007026 159, 203, 272, 395
186007027 159, 203, 272, 395
186007028 159, 203, 272, 395
186007029 159, 203, 272, 395
186007030 159, 203, 272, 395
186007031 159, 203, 272, 395
186007034 370
186007038 159, 203, 272, 395
186007049 487
186007051 487
186007076 159, 203, 272, 395
186007077 159, 203, 272, 395
186007078 159, 203, 272, 395
186007080 370
186007081 359, 369-370
186007083 404
186007084 404
186007088 82, 492
186007089 82, 492
186007090 82, 492
186007092 110, 134
186007093 110, 134
186007094 110, 134
186007095 110, 134
186007096 110, 134
186007097 110, 134
186007098 110, 134
186007099 110, 134
186007100 110, 134
186007102 110, 134
186007103 112, 135
186007104 112, 135
186007105 112, 135
186007106 112, 135
186007107 112, 135
186007108 112, 135
186007109 112, 135
186007110 112, 135
186007111 112, 135
186007112 112, 135
186007113 110, 134
186007114 110, 134
186007115 110, 134
186007116 110, 134
186007117 110, 134
186007118 110, 134
186007119 110, 134
186007120 110, 134
186007121 110, 134
186007122 110, 134
186007123 112, 241
186007124 112, 241
186007125 112, 241
186007156 124, 138
186007157 124, 138
186007158 124, 138
186007159 124, 138
186007160 124, 138
186007161 124, 138
186007162 124, 138
186007163 124, 138
186007164 124, 138
186007165 124, 138
186007166 124, 139
186007167 124, 139
186007168 124, 139
186007169 124, 139
186007170 124, 139
186007171 124, 139
186007172 124, 139
186007173 124, 139
186007174 124, 139
186007175 124, 139
186007176 123, 138
186007177 123, 138
186007178 123, 138
186007179 123, 138
186007180 123, 138
186007181 123, 138
186007182 123, 138
186007183 123, 138
186007184 123, 138
186007185 123, 138
186007187 61, 64, 67, 69, 74, 77
186007198 69
186007224 72-73, 78
186007226 108, 112, 117, 119, 133, 143, 169, 182, 207, 211
186007230 416
186007231 522
186007232 522
186007233 491
186007235 416
186007239 370
186007244 487
186007245 487
186007249 465
186007250 465
186007251 465
186007252 456
186007253 456
186007254 456
186007256 487
186007257 487
186007258 487
186007259 487
186007260 487
186007261 487
186007262 370
186007263 150, 190, 260, 370
186007264 150, 190, 260, 370
186007265 150, 190, 260, 370
186007266 154, 194, 264, 370
186007267 370
186007268 150, 190, 260, 370
186007269 150, 190, 260, 370
186007270 150, 190, 260, 370
186007271 154, 194, 264, 370
186007272 370
186007273 150, 190, 260, 370
186007274 150, 190, 260, 370
186007275 150, 190, 260, 370
186007276 150, 190, 260, 370
186007277 370
186007278 82, 492, 553
186007285 156, 198, 267
186007290 156, 198, 267
186007291 156, 198, 267
186007292 156, 198, 267
186007293 156, 198, 267
186007294 156, 198, 267
186007295 156, 198, 267
186007296 156, 198, 267
186007297 156, 198, 267
186007298 156, 198, 267
186007299 156, 198, 267
186007300 156, 198, 267
186007301 156, 198, 267
186007302 156, 198, 267
186007303 156, 198, 267
186007304 156, 198, 267
186007305 152, 192, 262, 416
186007310 152, 192, 262, 416
186007311 152, 192, 262, 416
186007312 152, 192, 262, 416
186007313 152, 192, 262, 414, 416
186007314 152, 192, 262, 416
186007315 152, 192, 262, 416
186007316 152, 192, 262, 416
186007317 152, 192, 262, 416
186007318 152, 192, 262, 416
186007319 152, 192, 262, 416
186007320 152, 192, 262, 416
186007325 152, 192, 262, 416
186007330 152, 192, 262, 416
186007331 152, 192, 262, 416
186007332 152, 192, 262, 416
186007333 152, 192, 262, 416
186007334 152, 192, 262, 416
186007335 152, 192, 262, 416
186007336 152, 192, 262, 416
186007337 152, 192, 262, 416
186007338 152, 192, 262, 416
186007339 152, 192, 262, 416
186007340 152, 192, 262
186007364 110, 134
186007365 110, 134
186007366 110, 134
186007367 110, 134
186007368 110, 134
186007369 110, 134
186007370 110, 134
186007371 110, 134
186007372 110, 134
186007373 110, 134
186007374 110, 134
186007375 110, 134
186007376 110, 134
186007377 110, 134
186007378 110, 134
186007379 112, 135
186007380 112, 135
186007381 112, 135
186007382 112, 135
186007383 112, 135
186007384 112, 135
186007385 112, 135
186007386 112, 135
186007387 112, 135
186007388 112, 135
186007389 112, 135
186007390 112, 135
186007391 112, 135
186007392 112, 135
186007393 112, 135
186007394 110, 134
186007395 110, 134
186007396 110, 134
186007397 110, 134

186007398 ..... 110, 134
186007399 ..... 110, 134
186007400 ..... 110, 134
186007401 ..... 110, 134
186007402 ..... 110, 134
186007403 ..... 110, 134
186007404 ..... 110, 134
186007405 ..... 110, 134
186007406 ..... 110, 134
186007407 ..... 110, 134
186007408 ..... 110, 134
186007409 ..... 124, 138
186007410 ..... 124, 138
186007411 ..... 124, 138
186007412 ..... 124, 138
186007413 ..... 124, 138
186007414 ..... 124, 138
186007415 ..... 124, 138
186007416 ..... 124, 138
186007417 ..... 124, 138
186007418 ..... 124, 138
186007419 ..... 124, 138
186007420 ..... 124, 138
186007421 ..... 124, 138
186007422 ..... 124, 138
186007423 ..... 124, 138
186007424 ..... 124, 139
186007425 ..... 124, 139
186007426 ..... 124, 139
186007427 ..... 124, 139
186007428 ..... 124, 139
186007429 ..... 124, 139
186007430 ..... 124, 139
186007431 ..... 124, 139
186007432 ..... 124, 139
186007433 ..... 124, 139
186007434 ..... 124, 139
186007435 ..... 124, 139
186007436 ..... 124, 139
186007437 ..... 124, 139
186007438 ..... 124, 139
186007439 ..... 123, 138
186007440 ..... 123, 138
186007441 ..... 123, 138
186007442 ..... 123, 138
186007443 ..... 123, 138
186007444 ..... 123, 138
186007445 ..... 123, 138
186007446 ..... 123, 138
186007447 ..... 123, 138
186007448 ..... 123, 138
186007449 ..... 123, 138
186007450 ..... 123, 138
186007451 ..... 123, 138
186007452 ..... 123, 138
186007453 ..... 123, 138
186007457 319
186007458 319
186007459 319
186007460 319
186007461 319
186007462 319
186007463 319
186007464 319
186007471 489
186007472 489
186007473 489
186007474 489
186007475 489
186007476 489
186007477 489
186007478 489
186007479 489
186007480 489
186007481 489
186007482 489
186007483 489
186007484 489
186007485 489
186007486 489
186007487 489
186007488 489
186007489 489
186007490 489
186007491 489
186007492 489
186007493 489
186007494 489
186007495 489
186007496 489
186007497 489
186007498 489
186007499 489
186007500 489
186007502 ..... 150, 190, 260, 370
186007503 ..... 150, 190, 260, 370
186007504 ..... 150, 190, 260, 370
186007505 370
186007513 489
186007514 489
186007539 477
186007540 477
186007541 477
186007542 477
186007543 477
186007544 477
186007545 477
186007546 477
186007549 18
186007550 18
186007551 18
186007552 18
186007553 18
186007554 18
186007557 487
186007559 489
186007560 489
186007561 489
186007562 489
186007563 489
186007564 489
186007565 489
186007566 489
186007567 489
186007568 489
186007569 489
186007570 489
186007571 489
186007572 489
186007573 73
186007580 487
186007592 489
186007596 314
186007597 314
186007598 314
186007599 314
186007600 314
186007601 314
186007602 314
186007603 314
186007604 314
186007605 314
186007606 314
186007607 314
186007608 314
186007609 314
186007610 314
186007611 314
186007612 314
186007613 314
186007614 314
186007615 314
186007616 314
186007617 314
186007618 314
186007619 314
186007620 314
186007621 314
186007622 314
186007623 314
186007624 314
186007625 314
186007626 314
186007627 314
186007628 314
186007629 314
186007630 314
186007631 314
186007646 13
186007650 303
186007654 319
186007655 319
186007656 319
186007657 319
186007658 ..... 210, 241, 284
186007660 ..... 210, 241, 284
186007662 ..... 210, 241, 284
186007664 ..... 210, 241, 284
186007666 ..... 210, 241, 284
186007668 ..... 210, 241, 284
186007670 ..... 210, 241, 284
186007672 ..... 210, 241, 284
186007674 ..... 210, 241, 284
186007676 ..... 210, 241, 284
186007678 ..... 210, 241, 284
186007680 ..... 210, 241, 284
186007682 141
186007684 141
186007685 141
186007687 141
186007688 141
186007690 141
186007691 ..... 173, 215, 241, 280
186007693 ..... 173, 215, 241, 280
186007694 ..... 173, 215, 241, 280
186007696 ..... 173, 215, 241, 280
186007697 ..... 173, 215, 241, 280
186007699 ..... 173, 215, 241, 280
186007700 ..... 173, 215, 241, 280
186007702 ..... 173, 215, 241, 280
186007703 ..... 173, 215, 241, 280
186007705 ..... 173, 215, 241, 280
186007706 ..... 173, 215, 241, 280
186007708 ..... 173, 215, 241, 280
186007709 ..... 220, 242, 294
186007711 ..... 220, 242, 294
186007713 ..... 220, 242, 294
186007715 ..... 220, 242, 294
186007717 ..... 220, 242, 294
186007719 ..... 220, 242, 294
186007721 ..... 220, 242, 294
186007723 ..... 220, 242, 294
186007725 ..... 220, 242, 294
186007727 ..... 220, 242, 294
186007729 ..... 220, 242, 294
186007731 ..... 220, 242, 294
186007733 ..... 220, 242, 294
186007735 ..... 177, 220, 226, 242, 290, 294
186007737 ..... 220, 242, 294
186007739 ..... 177, 220, 226, 242, 290, 294
186007741 ..... 220, 242, 294
186007743 ..... 220, 242, 294
186007745 ..... 220, 242, 294
186007747 ..... 220, 242, 294
186007749 ..... 220, 242, 294
186007751 ..... 220, 242, 294
186007753 ..... 220, 242, 294
186007755 ..... 220, 242, 294
186007757 ..... 154, 195, 242, 265
186007759 ..... 154, 195, 242, 265
186007760 ..... 154, 195, 242, 265
186007762 ..... 154, 195, 242, 265
186007763 ..... 154, 195, 242, 265
186007765 ..... 154, 195, 242, 265
186007766 ..... 154, 195, 242, 265
186007768 ..... 154, 195, 242, 265
186007769 ..... 154, 195, 242, 265
186007771 ..... 154, 195, 242, 265
186007772 ..... 154, 195, 242, 265
186007774 ..... 154, 195, 242, 265
186007775 ..... 154, 195, 242, 265
186007777 ..... 154, 195, 242, 265
186007778 ..... 154, 195, 242, 265
186007780 ..... 154, 195, 242, 265
186007781 ..... 154, 195, 242, 265
186007783 ..... 154, 195, 242, 265
186007784 ..... 154, 195, 242, 265
186007786 ..... 154, 195, 242, 265
186007787 ..... 154, 195, 242, 265
186007789 ..... 154, 195, 242, 265
186007790 ..... 154, 195, 242, 265
186007792 ..... 154, 195, 242, 265
186007793 ..... 154, 195, 242, 265
186007795 ..... 154, 195, 242, 265
186007796 ..... 154, 195, 242, 265
186007798 ..... 154, 195, 242, 265
186007799 ..... 154, 195, 242, 265
186007801 ..... 154, 195, 242, 265
186007802 ..... 154, 195, 242, 265
186007804 ..... 154, 195, 242, 265
186007805 ..... 154, 195, 242, 265
186007807 ..... 154, 195, 242, 265
186007808 ..... 154, 195, 242, 265
186007810 ..... 154, 195, 242, 265
186007811 ..... 161, 206, 243, 275
186007813 ..... 161, 206, 243, 275
186007814 ..... 161, 206, 243, 275
186007816 ..... 161, 206, 243, 275
186007817 ..... 161, 206, 243, 275
186007819 ..... 161, 206, 243, 275
186007820 ..... 161, 206, 243, 275
186007822 ..... 161, 206, 243, 275
186007824 ..... 161, 206, 243, 275
186007826 ..... 161, 206, 243, 275
186007827 ..... 161, 206, 243, 275
186007829 ..... 161, 206, 243, 275
186007830 ..... 161, 206, 243, 275
186007832 ..... 161, 206, 243, 275
186007836 ..... 161, 206, 243, 275
186007838 ..... 161, 206, 243, 275
186007839 ..... 161, 206, 243, 275
186007841 ..... 161, 206, 243, 275
186007842 ..... 167, 206, 243, 275
186007844 ..... 167, 206, 243, 275
186007845 ..... 167, 206, 243, 275
186007847 ..... 167, 206, 243, 275
186007848 ..... 167, 206, 243, 275
186007850 ..... 167, 206, 243, 275
186007851 ..... 167, 206, 243, 275
186007853 ..... 167, 206, 243, 275
186007854 ..... 167, 206, 243, 275
186007856 ..... 167, 206, 243, 275
186007857 ..... 167, 206, 243, 275
186007859 ..... 167, 206, 243, 275

186007860 ..... 167, 206, 243, 275
186007862 ..... 167, 206, 243, 275
186007863 ..... 167, 206, 243, 275
186007865 ..... 167, 206, 243, 275
186007866 ..... 167, 206, 243, 275
186007868 ..... 167, 206, 243, 275
186007869 ..... 167, 206, 243, 275
186007871 ..... 167, 206, 243, 275
186007872 ..... 167, 206, 243, 275
186007874 ..... 167, 206, 243, 275
186007875 ..... 167, 206, 243, 275
186007877 ..... 167, 206, 243, 275
186007878 ..... 167, 206, 243, 275
186007880 ..... 167, 206, 243, 275
186007881 ..... 167, 206, 243, 275
186007883 ..... 167, 206, 243, 275
186007884 ..... 167, 206, 243, 275
186007886 ..... 167, 206, 243, 275
186007887 ..... 177, 226, 243, 290
186007889 ..... 177, 226, 243, 290
186007892 ..... 177, 226, 243, 290
186007894 ..... 177, 226, 243, 290
186007896 ..... 177, 226, 243, 290
186007899 ..... 177, 226, 243, 290
186007901 ..... 177, 226, 243, 290
186007903 ..... 177, 226, 243, 290
186007905 ..... 177, 226, 243, 290
186007907 243
186007909 ..... 177, 226, 243, 290
186007911 243
186007917 ..... 177, 226, 243, 290
186007919 ..... 177, 226, 243, 290
186007921 ..... 177, 226, 243, 290
186007923 ..... 177, 226, 243, 290
186007929 ..... 177, 226, 243, 290
186007931 ..... 177, 226, 243, 290
186007933 ..... 177, 226, 243, 290
186007935 ..... 177, 226, 243, 290
186007941 ..... 177, 226, 243, 290
186007943 ..... 177, 226, 243, 290
186007947 ..... 177, 226, 243, 290
186007949 ..... 141, 154, 161, 166, 173, 177, 195, 206, 210, 215, 220, 226, 241, 265, 275, 280, 284, 290, 294, 347, 396, 411, 416, 507
186007950 ..... 317, 322
186007953 417
186007982 ..... 366, 513
186007983 ..... 366, 513
186007985 ..... 366, 513
186007986 ..... 366, 513
186007987 ..... 366, 513
186007988 ..... 365, 512
186007989 ..... 365, 512
186007992 ..... 365, 370, 512
186008006 489
186008007 489
186008008 489
186008009 489
186008010 ..... 355, 357, 359-360, 419-420
186008029 489
186008038 ..... 150, 190, 260, 370
186008039 ..... 150, 190, 260, 370
186008040 ..... 150, 190, 260, 370
186008052 ..... 12, 17
186008053 ..... 12, 17
186008054 ..... 12, 17
186008055 ..... 10, 12
186008056 ..... 10, 12
186008057 ..... 11, 12
186008065 515
186008066 515
186008067 515
186008068 515
186008071 38
186008072 38
186008073 38
186008074 38
186008075 38
186008076 38
186008077 38
186008078 38
186008079 38
186008080 38
186008081 38
186008090 ..... 366, 402, 513
186008091 ..... 365, 512
186008100 ..... 366, 513
186008103 ..... 175, 222, 286
186008104 ..... 176, 223, 287
186008105 ..... 224, 288
186008106 ..... 225, 289
186008107 ..... 175, 222, 286
186008128 ..... 224, 288
186008129 ..... 175, 222, 286
186008130 ..... 176, 223, 287
186008131 ..... 224, 288
186008132 ..... 225, 289
186008133 ..... 175, 222, 286
186008134 ..... 176, 223, 287
186008135 ..... 224, 288
186008136 ..... 225, 289
186008137 ..... 175, 222, 286
186008138 ..... 176, 223, 287
186008139 ..... 224, 288
186008140 ..... 225, 289
186008141 ..... 175, 222, 286
186008142 ..... 176, 223, 287
186008143 ..... 224, 288
186008144 ..... 225, 289
186008146 ..... 209, 283
186008148 ..... 209, 283
186008149 ..... 209-210, 283-284
186008151 ..... 209-210, 283-284
186008152 ..... 170, 212, 277
186008153 ..... 170, 212, 277
186008154 ..... 170, 212, 277
186008155 ..... 170, 212, 277
186008156 ..... 170, 212, 277
186008157 ..... 170, 212, 277
186008158 ..... 171, 213, 278
186008159 ..... 171, 213, 278
186008160 ..... 171, 213, 278
186008161 ..... 171, 213, 278
186008162 ..... 171, 213, 278
186008163 ..... 171, 213, 278
186008164 ..... 144, 184, 254
186008165 ..... 144, 184, 254
186008166 ..... 144, 184, 254
186008167 ..... 144, 184, 254
186008168 ..... 146, 186, 256
186008169 ..... 146, 186, 256
186008170 ..... 146, 186, 256
186008171 ..... 146, 186, 256
186008172 ..... 145, 185, 255
186008173 ..... 145, 185, 255
186008174 ..... 145, 185, 255
186008175 ..... 145, 185, 255
186008176 ..... 147, 187, 257
186008177 ..... 147, 187, 257
186008178 ..... 147, 187, 257
186008179 ..... 147, 187, 257
186008180 ..... 172, 214, 279
186008181 ..... 172, 214, 279
186008182 ..... 172, 214, 279
186008183 ..... 172, 214, 279
186008184 ..... 172, 214, 279
186008185 ..... 172, 214, 279
186008186 ..... 150, 190, 260, 394
186008187 ..... 150, 190, 260, 394
186008188 ..... 150, 190, 260, 394
186008189 ..... 150, 190, 260, 394
186008190 ..... 151, 191, 261, 394
186008191 ..... 151, 191, 261, 394
186008192 ..... 151, 191, 261, 394
186008193 ..... 151, 191, 261, 394
186008194 ..... 150, 190, 260, 394
186008195 ..... 150, 190, 260, 394
186008196 ..... 150, 190, 260, 394
186008197 ..... 150, 190, 260, 394
186008198 ..... 151, 191, 261, 394
186008199 ..... 151, 191, 261, 394
186008200 ..... 151, 191, 261, 394
186008201 ..... 151, 191, 261, 394
186008202 ..... 208, 282
186008203 ..... 208, 282
186008204 ..... 208, 282
186008205 ..... 208, 282
186008206 ..... 208, 282
186008207 ..... 208, 282
186008208 ..... 170, 212, 277
186008209 ..... 171, 213, 278
186008210 ..... 144, 184, 254
186008211 ..... 144, 184, 254
186008212 ..... 152, 192, 262, 377
186008213 ..... 146, 186, 256
186008214 ..... 146, 186, 256
186008215 ..... 145, 185, 255
186008216 ..... 145, 185, 255
186008217 ..... 148, 188, 258
186008218 ..... 148, 188, 258
186008219 ..... 164, 201, 270
186008220 ..... 164, 201, 270
186008221 ..... 164, 201, 270
186008222 ..... 164, 201, 270
186008223 ..... 164, 201, 270
186008224 ..... 164, 201, 270
186008225 ..... 165, 202, 271
186008226 ..... 165, 202, 271
186008227 ..... 165, 202, 271
186008228 322
186008229 322
186008230 322
186008231 322
186008232 322
186008233 322
186008234 322
186008235 322
186008236 ..... 156, 198, 267
186008237 ..... 156, 198, 267
186008238 ..... 156, 198, 267
186008239 ..... 156, 198, 267
186008240 ..... 157, 199, 268
186008241 ..... 157, 199, 268
186008242 ..... 157, 199, 268
186008243 ..... 157, 199, 268
186008244 ..... 158, 200, 269
186008245 ..... 158, 200, 269
186008246 ..... 158, 200, 269
186008247 ..... 158, 200, 269
186008248 322
186008249 322
186008250 322
186008251 322
186008252 322
186008253 322
186008254 322
186008255 322
186008256 322
186008257 322
186008258 322
186008259 322
186008260 ..... 149, 189, 259
186008261 ..... 149, 189, 259
186008262 ..... 149, 189, 259
186008263 ..... 149, 189, 259
186008264 ..... 159, 203, 272, 395
186008265 ..... 159, 203, 272, 395
186008266 ..... 159, 203, 272, 395
186008267 ..... 159, 203, 272, 395
186008268 ..... 156, 198, 267
186008269 ..... 156, 198, 267
186008270 ..... 156, 198, 267
186008271 ..... 156, 198, 267
186008272 ..... 152, 192, 262, 416
186008273 ..... 152, 192, 262, 416
186008274 ..... 152, 192, 262, 416
186008275 ..... 152, 192, 262, 416
186008276 ..... 152, 192, 262, 416
186008277 ..... 152, 192, 262, 416
186008278 ..... 152, 192, 262, 416
186008279 ..... 152, 192, 262, 416
186008280 ..... 165, 202, 271
186008281 ..... 230, 298
186008282 ..... 230, 298
186008284 ..... 228, 295
186008285 ..... 228, 295
186008286 ..... 230, 297
186008287 ..... 230, 297
186008288 ..... 229, 296
186008289 ..... 229, 297
186008291 ..... 228, 296
186008292 ..... 228, 295
186008294 ..... 228, 295
186008295 ..... 229, 296
186008296 ..... 231, 298
186008297 ..... 228, 296
186008298 ..... 230, 297
186008299 ..... 229, 297
186008300 ..... 230, 297
186008301 ..... 231, 298
186008302 ..... 231, 298
186008303 ..... 231, 298
186008304 514
186008317 ..... 366, 513
186008318 ..... 112, 136
186008319 ..... 112, 136
186008320 ..... 112, 136
186008321 ..... 112, 136
186008322 ..... 112, 136
186008323 ..... 124, 140
186008324 ..... 124, 140
186008325 ..... 124, 140
186008326 ..... 124, 140
186008327 ..... 124, 140
186008328 ..... 112, 136
186008329 ..... 112, 136
186008330 ..... 112, 136
186008331 ..... 112, 136
186008332 ..... 112, 136
186008333 ..... 124, 140
186008334 ..... 124, 140
186008335 ..... 124, 140
186008336 ..... 124, 140
186008337 ..... 124, 140
186008338 ..... 112, 136
186008339 ..... 112, 136
186008340 ..... 112, 136
186008341 ..... 112, 136
186008342 ..... 112, 136
186008343 ..... 124, 140
186008344 ..... 124, 140
186008345 ..... 124, 140
186008346 ..... 124, 140

186008347 124, 140
186008348 111, 135
186008349 111, 135
186008350 111, 135
186008351 111, 135
186008352 111, 135
186008353 123, 139
186008354 123, 139
186008355 123, 139
186008356 123, 139
186008357 123, 139
186008358 111, 135
186008359 111, 135
186008360 111, 135
186008361 111, 135
186008362 111, 135
186008363 123, 139
186008364 123, 139
186008365 123, 139
186008366 123, 139
186008367 123, 139
186008368 111, 135
186008369 111, 135
186008370 111, 135
186008371 111, 135
186008372 111, 135
186008373 123, 139
186008374 123, 139
186008375 123, 139
186008376 123, 139
186008377 123, 139
186008378 112, 136
186008379 112, 136
186008380 112, 136
186008381 112, 136
186008382 112, 136
186008383 124, 140
186008384 124, 140
186008386 124, 140
186008387 124, 140
186008388 112, 136
186008389 112, 136
186008390 112, 136
186008391 112, 136
186008392 112, 136
186008393 124, 140
186008394 124, 140
186008395 124, 140
186008396 124, 140
186008397 124, 140
186008398 111, 135
186008399 111, 135
186008400 111, 135
186008401 111, 135
186008402 111, 135
186008403 123, 139
186008404 123, 139
186008405 123-124, 139-140
186008406 123, 139
186008407 123, 139
186008408 111, 135
186008409 111, 135
186008410 111, 135
186008411 111, 135
186008412 111, 135
186008413 123, 139
186008414 123, 139
186008415 123, 139
186008416 123, 139
186008417 123, 139
186008418 141
186008419 141
186008420 112, 241
186008421 141
186008422 141
186008423 112, 241
186008450 487
186008470 489
186008471 119, 427, 468
186008481 111, 137
186008482 111, 137
186008483 111, 137
186008484 111, 137
186008485 111, 137
186008486 111, 137
186008487 111, 137
186008488 111, 137
186008489 111, 137
186008490 111, 137
186008491 111, 137
186008492 111, 137
186008493 111, 137
186008494 111, 137
186008495 111, 137
186008496 111, 137
186008497 111, 137
186008498 111, 137
186008499 111, 137
186008500 111, 137
186008501 111, 137
186008502 111, 137
186008503 111, 137
186008504 111, 137
186008505 111, 137
186008506 141
186008507 141
186008508 112, 241
186008509 125, 141
186008510 125, 141
186008516 125, 141
186008517 125, 141
186008518 125, 141
186008519 125, 141
186008520 125, 141
186008521 125, 141
186008522 125, 141
186008523 125, 141
186008524 125, 141
186008525 125, 141
186008526 125, 141
186008527 125, 141
186008528 125, 141
186008529 125, 141
186008530 125, 141
186008531 125, 141
186008536 125, 141
186008537 125, 141
186008538 125, 141
186008539 125, 141
186008540 125, 141
186008541 125, 141
186008542 125, 141
186008543 314
186008544 314
186008545 314
186008546 314
186008549 314
186008550 314
186008551 314
186008552 314
186008553 314
186008554 314
186008555 314
186008556 314
186008557 314
186008558 314
186008559 314
186008560 314
186008561 314
186008562 314
186008563 314
186008564 314
186008565 314
186008566 314
186008567 314
186008568 314
186008569 314
186008570 314
186008571 314
186008572 314
186008573 314
186008574 314
186008575 314
186008576 314
186008577 314
186008578 314
186008579 314
186008580 314
186008581 315
186008582 315
186008583 315
186008584 315
186008585 315
186008586 315
186008587 315
186008588 315
186008589 315
186008590 315
186008591 315
186008592 315
186008593 315
186008594 315
186008595 315
186008596 315
186008597 315
186008598 315
186008599 315
186008600 315
186008601 315
186008602 315
186008603 315
186008604 315
186008605 315
186008606 315
186008607 315
186008608 315
186008609 315
186008610 315
186008611 315
186008612 315
186008613 315
186008614 315
186008615 315
186008616 315
186008617 315
186008618 315
186008619 315
186008620 315
186008621 315
186008622 315
186008623 315
186008624 315
186008625 315
186008626 315
186008627 315
186008628 315
186008629 315
186008630 315
186008631 315
186008632 315
186008633 315
186008634 315
186008635 315
186008636 315
186008637 315
186008638 315
186008639 315
186008640 315
186008641 315
186008642 315
186008643 315
186008644 315
186008645 315
186008646 315
186008648 315
186008649 315
186008650 315
186008651 315
186008652 315
186008653 315
186008658 303
186008660 366, 513
186008661 111, 136
186008662 111, 136
186008663 111, 136
186008664 111, 136
186008665 111, 136
186008666 125, 140
186008667 125, 140
186008668 125, 140
186008669 125, 140
186008670 125, 140
186008671 111, 136
186008672 111, 136
186008673 111, 136
186008674 111, 136
186008675 111, 136
186008676 125, 140
186008677 125, 140
186008678 125, 140
186008679 125, 140
186008680 125, 140
186008681 111, 136
186008682 111, 136
186008683 111, 136
186008684 111, 136
186008685 111, 136
186008686 125, 140
186008687 125, 140
186008688 125, 140
186008689 125, 140
186008690 125, 140
186008691 111, 136
186008692 111, 136
186008693 111, 136
186008694 111, 136
186008695 111, 136
186008696 125, 140
186008697 125, 140
186008698 125, 140
186008699 125, 140
186008700 125, 140
186008701 111, 136
186008702 111, 136
186008703 111, 136
186008704 111, 136
186008705 111, 136
186008706 125, 140
186008707 125, 140
186008708 125, 140
186008709 125, 140
186008710 125, 140
186008711 141
186008712 141
186008713 112, 241

186008714....524, 526, 580-581
186008717....12-Nov
186008718....12-Nov
186008727....1-May
186008741....315
186008742....315
186008743....315
186008744....315
186008745....254-260, 315
186008751....396
186008752....396
186008753....396
186008754....396
186008755....396
186008756....396
186008757....396
186008758....396
186008759....396
186008760....396
186008761....396
186008762....396
186008763....396
186008764....396
186008765....396
186008775....396
186008776....396
186008777....396
186008779....396
186008780....396
186008781....396
186008782....396
186008783....396
186008784....396
186008787....396
186008788....396
186008791....366, 513
186008792....488
186008793....488
186008794....488
186008795....488
186008796....488
186008797....488
186008798....488
186008799....488
186008800....488
186008801....488
186008802....488
186008803....488
186008804....488
186008805....488
186008806....488
186008807....488
186008808....488
186008809....488
186008810....488
186008811....488
186008812....488
186008813....488
186008814....488
186008815....488
186008816....488
186008817....488
186008818....488
186008819....488
186008820....488
186008821....489
186008840....365, 512
186008841....365, 512
186008843....366, 513
186008846....228, 295
186008847....228, 295
186008848....228, 296
186008849....229, 296
186008850....229, 296
186008851....230, 298
186008852....230, 297
186008853....229, 297
186008854....230, 297
186008855....231, 298
186008856....231, 298
186008857....228, 295
186008858....228, 295
186008859....228, 296
186008860....229, 296
186008861....229, 296
186008862....230, 298
186008863....230, 297
186008864....229, 297
186008865....230, 297
186008866....231, 298
186008867....231, 298
186008872....515
186008873....515
186008874....515
186008875....515
186008886....11, 12
186008887....11, 12
186008889....515
186008914....14, 17
186008915....14, 17
186008916....14, 17
186008917....11, 14
186008918....11, 14
186008919....11, 14
186008927....404, 411
186008939....365, 512
186008943....411
186008944....411
186008945....411
186008946....410-411
186008947....411
186008948....411
186008949....411
186008950....411
186008953....411
186008954....411
186008955....411
186008956....411
186008957....411
186008958....411
186008959....411
186008960....411
186008961....411
186008962....262, 377
186008963....262, 377
186008964....262, 377
186008979....394
186008980....394
186008981....394
186008982....394
186008983....394
186008984....394
186008985....394
186008986....394
186008987....394
186008988....393
186008989....393
186008990....35
186008991....35
186008994....35
186008995....35
186008996....35
186008997....35
186008998....36
186009002....393
186009003....393
186009004....393
186009005....25
186009015....411
186009016....411
186009017....411
186009018....411
186009019....411
186009048....518
186009049....518
186009050....518
186009051....518
186009061....440
186009062....440
186009063....440
186009064....440
186009065....404, 438-440
186009068....394
186009069....394
186009070....394
186009071....394
186009072....394
186009073....394
186009074....394
186009075....394
186009076....394
186009077....393-394
186009078....393
186009079....393
186009080....393
186009081....393
186009082....427, 468
186009083....35-36
186009084....35
186009102....518
186009103....518
186009110....440
186009125....411, 439
186009126....404
186009127....416
186009128....416
186009129....416
186009131....416
186009132....416
186009133....416
186009134....416
186009135....416
186009136....416
186009137....416
186009138....416
186009139....416
186009140....416
186009158....428, 467
186009159....428, 467
186009160....428, 467
186009162....428, 467
186009163....428, 467
186009164....428, 467
186009170....428, 467
186009171....428, 467
186009172....428, 467
186009174....428, 467
186009175....428, 467
186009176....428, 467
186009179....428, 467
186009180....428, 467
186009184....58
186009186....58, 368, 382
186009193....518
186009194....518
186009201....410
186009232....348, 508
186009243....42
186009244....42
186009280....441
186009281....441
186009283....347-348, 507-508, 518
186009285....498
186009286....498
186009287....498
186009288....498
186009299....345-346, 348, 505-506, 508
186009300....345-346, 348, 505-506, 508
186009301....345-346, 348, 505-506, 508
186009314....42
186009315....42
186009316....43
186009319....42
186009323....42
186009324....43
186009326....42
186009327....42
186009328....42
186009329....42
186009330....43
186009331....42
186009344....523
186009345....523
186009346....523
186009347....523
186009357....104, 339
186009358....104, 339
186009359....104, 339
186009360....104, 339
186009361....104, 339
186009365....104, 339
186009366....104, 339
186009367....104, 339
186009368....104, 339
186009369....104, 339
186009373....104, 339
186009374....104, 339
186009375....104, 339
186009376....104, 339
186009378....104, 339
186009379....104, 339
186009383....104, 339
186009384....104, 339
186009385....104, 339
186009389....104, 339
186009390....104, 339
186009391....104, 339
186009392....104, 339
186009393....104, 339
186009397....104, 339
186009398....104, 339
186009402....104, 339
186009403....104, 339
186009404....104, 339
186009405....104, 339
186009406....104, 339
186009407....104, 339
186009408....104, 339
186009409....104, 339
186009410....104, 339
186009411....104, 339
186009412....104, 339
186009413....104, 339
186009416....104, 339
186009417....104, 339
186009418....104, 339
186009421....104, 339
186009422....104, 339
186009426....104, 339
186009427....104, 339
186009429....100, 103, 336, 338, 425-426, 429, 469-471
186009435....426, 469
186009437....426, 469

186009439....426, 469
186009441....426, 469
186009443....426, 469
186009452....99, 335
186009453....99, 335
186009454....99, 335
186009457....99, 335
186009458....99, 335
186009459....99, 335
186009460....99, 335
186009461....99, 335
186009462....99, 335
186009463....99, 335
186009464....99, 335
186009465....99, 335
186009466....99, 335
186009467....99, 335
186009468....99, 335
186009469....99, 335
186009470....99, 335
186009471....99, 335
186009472....99, 335
186009473....99, 335
186009474....99, 335
186009475....99, 335
186009476....99, 335
186009477....99, 335
186009478....99, 335
186009479....99, 335
186009480....99, 335
186009481....100, 336, 392
186009482....100, 336, 392
186009483....100, 336, 392
186009484....100, 336, 377
186009485....100, 336, 377
186009486....100, 336, 377
186009487....100, 336, 392
186009488....100, 336, 392
186009489....100, 336, 392
186009490....100, 335-336, 392
186009491....100, 336, 392
186009492....100, 336, 392
186009493....100, 336, 377, 380, 392
186009494....100, 336, 377, 380, 392
186009495....100, 336, 377, 380, 392
186009497....99, 335
186009498....99, 335
186009499....99, 335
186009500....99, 335
186009501....99, 335
186009502....99, 335
186009503....99, 335
186009504....99, 335, 382-383
186009505....99, 335, 383
186009506....99, 335, 383
186009507....99, 335, 383
186009508....99, 335, 383
186009509....99, 335, 383
186009510....99, 335, 383
186009522....100, 336, 369
186009523....100, 336, 369
186009524....100, 336, 368-369
186009547....100, 336, 355, 357, 360
186009548....100, 336, 355, 357, 360
186009549....100, 336, 355, 357, 360
186009568....523
186009605....47
186009606....47
186009607....47
186009608....47
186009615....47
186009708....49
186009712....49
186009713....49
186009714....49
186009715....49
186009716....49
186009717....49
186009718....49
186009719....49
186009720....49
186009721....49
186009722....49
186009723....49
186009724....49
186009725....49
186009726....49
186009727....49
186009733....103, 338, 392
186009734....103, 338, 392
186009735....392
186009758....100, 336, 369
186009759....100, 336, 369
186009760100, 336, 367, 369
186009763....365, 512
186009765....47
186009766....47
186009767....47
186009768....47
186009769....47
186009776....47
186009827....101, 337
186009828....101, 337
186009829....101, 337
186009830....102, 337
186009831....102, 337
186009832....102, 337
186009835....103, 338
186009836....103, 338, 377
186009837....103, 338, 377
186009838....103, 338, 377
186009839....103, 338, 392
186009840....103, 338, 392
186009841....103, 338, 392
186009842....102, 338
186009843....101, 337
186009844....101, 337
186009845....101, 337
186009846....102, 338
186009847....101, 337
186009848....101, 337
186009849....101, 337
186009850....101, 337
186009851....101, 337
186009852....101, 337
186009853....102, 338
186009854....102, 337
186009855....102, 337
186009856....102, 337
186009857....102, 338
186009858....102, 337
186009859....102, 337
186009860....102, 337
186009861....102, 337
186009862....102, 337
186009863....102, 337
186009864....102, 338
186009865....101, 337
186009866....101, 337
186009867....101, 337
186009868....101, 337
186009869....101, 337
186009870....101, 337
186009871....102, 338
186009872....101, 337
186009873....101, 337
186009874....101, 337
186009875....101, 337
186009876....101, 337
186009877....101, 337
186009878....102, 338
186009879....102, 337
186009880....102, 337
186009881....102, 337
186009882....102, 337
186009883....102, 337
186009884....102, 337
186009885....102, 338
186009886....102, 337
186009887....102, 337
186009888....102, 337
186009889....102, 337
186009890....102, 337
186009891....102, 337
186009892....103, 338, 377, 392
186009893....103, 338, 377, 392
186009894....103, 338, 377, 392
186009895....103, 338, 377, 392
186009896....103, 338, 377, 392
186009897....103, 338, 377, 392
186009898....103, 338, 392
186009899....103, 338, 392
186009900....103, 338, 392
186009901....103, 338, 377
186009902....103, 338, 377
186009903....103, 338, 377
186009904....392
186009905....392
186009906....392
186009907....392
186009908....392
186009909....392
186009910....103, 338, 392
186009911....103, 338, 392
186009912....103, 338, 392
186009913....102, 338
186009914....101, 337
186009915....101, 337
186009916....101, 337
186009917....101, 337
186009918....101, 337
186009919....101, 337
186009920....102, 338
186009921....101, 337
186009922....101, 337
186009923....101, 337
186009924....101, 337
186009925....101, 337
186009926....101, 337
186009927....102, 338, 383
186009928....101, 337, 383
186009929....101, 337, 383
186009930....101, 337, 383
186009931....101, 337, 383
186009932....101, 337, 383
186009933....101, 337, 383
186009934....102, 338, 383
186009935....101, 337, 383
186009936....101, 337, 383
186009937....101, 337, 383
186009938....101, 337, 383
186009939....101, 337, 383
186009940....101, 337, 383
186009941....103, 338, 370
186009942....103, 338, 370
186009943....103, 338, 370
186009944....103, 338, 370
186009945....103, 338, 370
186009946....103, 338, 370
186009947....103, 338, 370
186009948....103, 338, 370
186009949....103, 338, 370
186009950....103, 338, 370
186009951....103, 338, 370
186009952....103, 338, 370
186009953....347, 507
186009954....347, 507
186009955....347, 507
186009959....425, 470
186009960....425, 470
186009961....425, 470
186009962....425, 470
186009963....425, 470
186009964....425, 470
186009969....100, 103, 336, 338, 425, 470
186009970....100, 336, 369
186009971....100, 336, 369
186009972....100, 336, 369
186009973....100, 336, 369
186009974....100, 336, 369
186009975....100, 336, 369
186009976....100, 336, 369
186009977....100, 336, 369
186009978....104, 339
186009979....104, 339
186009980....104, 339
186009981....104, 339
186009982....104, 339
186009983....104, 339
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186009996....104, 339
186009997....104, 339
186009998....104, 339
186009999....104, 339
186010000....104, 339
186010001....104, 339
186010002....104, 339
186010003....104, 339
186010004....104, 339
186010005....104, 339
186010006....104, 339
186010007....104, 339
186010008....104, 339
186010009....104, 339
186010010....104, 339
186010011....104, 339
186010012....104, 339
186010013....104, 339
186010014....104, 339
186010102....47
186010103....47
186010104....47, 365, 512
186010105....47
186010179....47
186010209....365, 512
186010232....520
186010294....99

186010326 416
186010327 416
186010328 416
186010329 416
186010330 416
186010331 416
186010332 416
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186010405 347, 507
186010406 347, 507
186010407 343, 503
186010408 347, 507
201000102 562
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205000505 541, 551, 561
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205000642 82, 492
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289000439 554
289000440 565
289000614 566
289000779 144-152, 156-159, 164-165, 170-172, 175-176, 184-192, 198-203, 208-210, 212-214, 222-225, 254-262, 267-272, 277-279, 282-284, 286-289, 301, 394, 396, 416
289002111 554
289002172 554
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323000446 551, 567
401000694 532, 534-535, 537-539, 543, 546
401000813 540-541
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405013532 546
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430001114 533-534, 544, 554
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430001456 555
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430001516 427, 468
430001534 554
430001535 554
430001556 567
430001562 119, 552
430001565 552
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600000177 578
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600000184 578
600001043 397, 516
600001282 370
605000101 562
615003783 61, 64
700000117 240
700000145 562
700000146 562
700000168 566
700000201 556
700000253 560
700000254 560
700000574 567
700000610 562
700000680 564
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700000862 564
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700000991 539
700001004 568
700001012 562
700001019 301, 396
700001020 301
700001218 558
700001230 564
700001247 558
700001326 558
700001331 563
700001387 563
700001436 301, 396
700001493 561
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700001618 568
700001710 567
700001796 545, 567
700001800 551, 555, 566-567
700001836 561
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700001942 568
700001943 568
700001948 568
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700001950 566, 568
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700001985 562
700001987 563
700001989 563
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700001994 568
700002003 568
700002069 566, 568
700002103 568
700002143 555
700002210 564
700002275 560
700002282 560
700002284 563
700002292 563-564
700002293 564
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700002332 557-558
700002333 558
700002360 540, 551
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700002399 558, 560
700002439 564
700002455 549
700002478 540
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700002569 548, 554
700002570 532-535, 537-539, 541, 543, 545-546, 548, 553-554
700002572 548, 554

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700002594 540, 545, 547-548, 554
700002595 535, 545, 548, 554
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700002599 535, 545, 548, 554
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700002660 535, 545, 548, 554
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700002761 558
700002765 548
700002775 112, 115, 119, 122, 524, 548, 578
700002791 558
700002801 552
700002886 533, 543
700002907 554
700002908 554
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700002912 533-534, 538-539, 544, 548, 550
700002913 533-534, 538-539, 544
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700002968 548, 554
700003102 533-534, 544
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700003557 548
700003615 82, 538-539, 548
700003616 82, 533-534, 538-539, 543-544, 548
700003694 551
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700003796 536, 546-547
700003797 536, 544, 546-547
700003842 564
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700004715 449
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700004730 570, 572-573, 575-577
700004841 549, 555
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700005025 574
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700005162 545
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700005167 535-536, 545, 547
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700005378 536, 546-547
700005407 535, 537, 546
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700005674 317, 322
700005675 317, 322
700005682 535
700005744 569-570, 572, 575
700005923 533, 543
700005925 533, 543
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700010009 539
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700010059 553
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700010196 538-539, 550
700010211 550, 571, 574
700010213 550, 571, 574
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700010377 550, 574
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700010699 539
700010700 539
700010701 537, 539
700010702 539
700010708 539
700010726 538-539
700011047 61, 64, 548-549, 552, 554
700011083 549
700011132 550, 574, 576
700011133 550
700011137 568
700011185 568
700011186 568
700011217 569
700011241 569, 571-572, 574
700011242 569, 571-572, 574
700011244 569, 571-572, 574
700011245 569, 571-572, 574
700011295 550, 574
700011376 569, 571, 574
700011427 569, 571, 574
700011456 558
700011553 537
700011554 537
700011628 532, 534
700011656 538
700011658 535
700011660 537
700011661 537
700011663 537
700011664 537
700011668 537
700011670 537
700011671 537
700011672 537
700011673 537
700011674 537
700011675 537
700011676 537
700011677 537
700011679 537
700011680 537
700011681 537
700011689 537
700011690 537
700011725 563
700011726 563
700011727 563
700011803 532
700011804 532
700011871 576
700011877 571
700011878 571
700011883 571
700012014 571
700012077 571
700012103 576
700012105 576
700012106 576
700012132 576
700012137 576
700012138 574, 576
700012275 571
700012304 537
700012329 569
700012331 571
700012516 563
700012528 563
700012539 563
700012540 563
700012541 563
700012542 563
700012760 538
700012876 563
700012877 563
700012878 563
700012879 563
700012893 563
700013047 566
700013048 566
700013049 566
700013050 566
700013051 566
700013052 566
700013053 566
700013054 566
700013055 566
700013056 566
700013057 566
700013059 563
700013064 566
700013065 566
700013066 566
700013067 566
700013068 566
700013069 566
700013070 566
700013071 566
700013072 566
700013083 563
700013084 563
700013085 563
715001531 239
715001940 239
715002098 238
715002099 239
715002147 427, 442, 468
715002531 239
715002909 427, 468
715003405 239
715004398 239
715004472 238
715005427 238
715005428 238
715005429 238
715006455 238, 347, 507
716000765 302
725000106 565
725000107 565
725000110 565
725000113 565
725000144 565
725000145 565
725000146 565
725000147 565
725000152 565
725000417 35-36, 43, 397, 516
725000418 516
725000455 555
725000604 35-36, 43, 366, 397, 513
725000682 49
186000272C 68, 74, 76
186000272DV 68, 76
186000273DV 68, 76
186000302DV 70
186000307C 61, 64, 67-68, 74, 76
186000307DV 61, 64, 67-68, 74, 76
186000326C 68, 74, 76
186000326DV 68, 76
186000327C 61, 64, 67-68, 74, 76
186000327DV 61, 64, 67-68, 74, 76
186000384C 68, 347, 507
186000384DV 68
186000385C 61, 64, 67-68
186000385DV 61, 64, 67-68
186000837C 73
186000837DV 73
186000838C 72, 78
186000838DV 72, 78
186000839C 72, 78
186000839DV 72, 78
186000840DV 78
186000846C 68, 74, 76
186000846DV 68, 76
186000847C 61, 64, 67-68, 74, 76
186000847DV 61, 64, 67-68, 74, 76
186000848DV 68, 76
186000984DV 70, 75
186001126C 76
186001126DV 76
186001128C 76
186001128DV 76
186001130C 76
186001130DV 76
186001131C 76
186001131DV 76
186001133C 72, 78
186001133DV 72, 78
186001134C 72, 78
186001134DV 72, 78
186001135DV 78
186001828BA 13, 17, 384
186001830BA 14, 17

186002629C 72, 78
186002630C 72, 78
186003885C 68, 74, 76
186003886C 61, 64, 67-68, 74, 76
186004132C 61, 64, 67-68
186004133C 61, 64, 68
186004167C 61, 64, 68
186004168C 61, 64, 68
186004902C 73
186004903C 73
186005660CV 68, 491
186005661CV 61, 64, 67-68, 491
186005662CV 61, 64, 67-68, 491
186005663CV 61, 64, 67-68, 491
186005664CV 68, 491
186005666CV 61, 64, 67-68, 491
186005667CV 68, 491
186005668CV 68, 491
186005669CV 68, 491
186005670CV 61, 64, 67-68, 491
186007193C 68
186007194C 68
186007195C 68
186007196C 68
186007197C 68
186007199C 68
186007200C 68
186007201C 68
186007202C 68
186007203C 68
5560020-S 571, 576
600000668CV 61, 64, 67-68, 74, 76
600000669CV 61, 64, 67-68, 74, 76
600000670CV 61, 64, 67-68, 74, 76
600000671CV 61, 64, 67-68
600000749CV 68, 76
600000750CV 68
600000751CV 68, 76
600000752CV 68, 76
600000754CV 68, 76
600000755CV 61, 64, 67-68, 74, 76
JJAN20229 30
PFAC30PAR 523
PSL404219 70, 75
PSL404231 70, 75
PSL613301 525, 580
PSL613302 525, 580
PSL613312 526, 581
PSL613313 526, 581
PSL613316 580
PSL613317 526, 581
PSL613318 526, 581
PSL613319 526, 581
PSL613320 526, 581
PSL613321 582
PSL613324 525, 580
PSL613325 525, 580
PSL613457 528, 583
PSL613570 527, 583
PSL613578 527, 583
PSL613602 527, 583
PSL613604 527, 583
PSL613607 527, 583
PSL613608 527, 583
PSL613609 527, 583
PSL618000 579
PSL618001 579
PSL618003 579
PSL618004 579
PSL618005 579
PSL618006 579
PSL618007 579
PSL618008 579
PSL618009 579
PSL618010 579
PSL618011 579
PSL618021 526, 582
PSL618022 526, 582
PSL901282 527, 582
PSL901290 527, 582
PSL904301 70
PSS614100 231, 240, 578
PSS614102 231, 240, 578
PSS614103 240, 578
PSS614104 240, 578
PSS614108 231, 240, 578
PSS614113 240, 578
PSS830008 231, 240, 245, 578
PSS830051 231, 240
PSS830053 231, 240
PSS830055 231, 240
PSS830057 231, 240
PSS830073 231, 240
PSS830074 231, 240
PSS830075 231, 240
PSS830076 231, 240
PSS830077 231, 240
PSS830079 231, 240
PSS830115 230, 298
PSS830125 230, 298
PSS830612 228, 295
PSS830613 228, 295
PSS830615 228, 295
PSS830815 230, 297
PSS830908 230, 298
PSS830909 230, 298
PSS830912 230, 297
PSS830913 230, 297
PSS830915 230, 297
PSS831012 229, 296
PSS831015 229, 296
PSS831113 229, 297
PSS831115 229, 297
PSS831812 228, 296
PSS831813 228, 296
PSS831815 228, 296
PSS831911 228, 295
PSS831912 228, 295
PSS831913 228, 295
PSS831915 228, 295
PSS832013 230, 298
PSS832111 228, 295
PSS832112 228, 295
PSS832113 228, 295
PSS832211 228, 296
PSS832212 228, 296
PSS832213 228, 296
PSS832311 229, 297
PSS832312 229, 297
PSS832313 229, 297
PSS832322 229, 297
PSS832413 230, 297
PSS832612 229, 296
PSS832613 229, 296
PSS832615 229, 296
PSS832711 231, 298
PSS832713 231, 298
PSS832715 231, 298
PSS833113 229, 296
PSS833411 228, 295
PSS833412 228, 295
PSS833413 228, 295
PSS833422 228, 295
PSS833713 230, 297
PSS837511 231, 298
PSS837512 231, 298
PSS837513 231, 298
PSS837515 231, 298
PSS837813 231, 298
PSS837815 231, 298
PSS839451 231, 240
PSS839458 231, 240
PSS839465 231, 240
PSS839471 231, 240
PSS839476 231, 240
PSS839478 231, 240
PSS845277 228, 295
PSS845280 228, 296
PSS845281 228, 296
PSS845284 229, 296
PSS845293 230, 297
PSS845297 230, 297
PSS845301 229, 297
PSS845305 231, 298
PSS845309 231, 298
PSS845540 230, 298
PSS845541 228, 295
PSS845542 228, 295
PSS845543 228, 295
WAS081140 566
WAS081333 566
WAS081346 540, 566
WAS081347 566
WAS081348 566
WAS207069 560
WAT005063 449, 526, 581
WAT005070 449, 526, 581
WAT005079 526, 581
WAT005129 305-306
WAT005130 305
WAT005136 448-449
WAT005137 305, 448-449, 525, 581
WAT005138 448-449
WAT005139 36
WAT005147 305
WAT007020 526, 581
WAT007354 500
WAT007355 500
WAT007356 500
WAT007358 500
WAT007360 351
WAT007571 347, 507
WAT010001 303
WAT010004 303
WAT010025 233, 299
WAT010223 308
WAT010224 308
WAT010270 233, 299
WAT010290 497, 500
WAT010295 500
WAT010551 500
WAT010570 460
WAT010571 460
WAT010639 497
WAT010640 446
WAT010656 233, 299
WAT010657 308
WAT010658 308
WAT010739 451
WAT010740 451
WAT010741 451
WAT010742 451
WAT010823 25
WAT010830 25
WAT010835 25
WAT010873 496
WAT010910 25
WAT010947 351
WAT010950 351
WAT010960 351
WAT010965 351
WAT010983 351
WAT010985 351
WAT010986 308
WAT010987 308
WAT010988 307
WAT011042 562
WAT011390 35-36
WAT011400 36
WAT011520 473
WAT011525 473
WAT011530 473
WAT011535 473
WAT011540 473
WAT011545 473
WAT011550 473
WAT011560 473
WAT011565 473
WAT011570 473
WAT011572 480
WAT011574 480
WAT011576 480
WAT011578 480
WAT011580 480
WAT011582 480
WAT011584 480
WAT011586 480
WAT011588 478
WAT011590 479
WAT011592 479
WAT011594 479
WAT011596 479
WAT011598 479
WAT011600 479
WAT011602 479
WAT011604 479
WAT011606 479
WAT011608 479
WAT011610 478
WAT011612 479
WAT011614 479
WAT011616 479
WAT011618 479
WAT011620 479
WAT011622 479
WAT011624 479
WAT011626 479
WAT011628 479
WAT011630 479
WAT011633 307
WAT011669 307
WAT011670 232, 299
WAT011675 233, 299
WAT011690 498
WAT011695 232, 299
WAT011740 233
WAT011783 446
WAT011784 446
WAT011786 433
WAT011787 433
WAT011793 234, 301, 401
WAT011794 234, 301, 401
WAT011795 401
WAT011796 401
WAT011797 235, 301, 401
WAT011798 235, 301, 401

WAT011799 ..... 235, 301, 401
WAT011800 ..... 235, 301, 401
WAT011801 ..... 235, 301, 401
WAT011802 ..... 234, 301, 401
WAT011803 ..... 234, 301, 401
WAT011804 ..... 234, 301, 401
WAT011805 ..... 234, 301, 401
WAT011807 ..... 235, 301, 401
WAT011808 ..... 235, 301, 401
WAT011809 ..... 235, 301, 401
WAT011810 ..... 235, 301, 401
WAT011812 ..... 234, 301, 401
WAT011813 ..... 234, 301, 401
WAT011814 ..... 234, 301, 401
WAT011815 ..... 234, 301, 401
WAT015199 ..... 72, 78
WAT015199DV 78
WAT015207 497
WAT015209 496
WAT015220 246
WAT015401 307
WAT015490 381
WAT015674 ..... 240, 578
WAT015715 381
WAT015797 305
WAT015814 305
WAT015831 305-306
WAT015833 305-306
WAT015834 305-306
WAT015835 306
WAT015848 305-306
WAT015854 305
WAT015859 306
WAT015860 305-306
WAT019311 305
WAT019876 449
WAT019877 449
WAT019878 449
WAT019891 449
WAT019892 449
WAT019893 449
WAT020321 552
WAT020500 25
WAT020505 25
WAT020510 25
WAT020515 25
WAT020520 25
WAT020525 25
WAT020530 25
WAT020535 25
WAT020540 25
WAT020545 ..... 25, 450
WAT020550 ..... 25, 450
WAT020587 303
WAT020588 303
WAT020589 303
WAT020594 303
WAT020595 303
WAT020596 303
WAT020721 303
WAT020722 303
WAT020723 303
WAT020724 303
WAT020731 303
WAT020732 303
WAT020733 303
WAT020734 303
WAT020739 303
WAT020740 303
WAT020741 303
WAT020770 500
WAT020805 25
WAT020810 25
WAT020815 25
WAT020820 25
WAT020825 25
WAT020830 25
WAT020835 25
WAT020840 25
WAT020845 25
WAT020850 25
WAT020855 25
WAT021812 ..... 526, 581
WAT021815 ..... 526, 567, 581
WAT021816 ..... 526, 567, 581
WAT021817 ..... 526, 581
WAT021901 448
WAT021902 448
WAT021903 448
WAT021904 448
WAT021906 448
WAT021907 448
WAT021908 305
WAT021910 448
WAT021927 448
WAT021945 448
WAT021946 448
WAT021947 448
WAT021950 448
WAT021951 449
WAT021992 448
WAT022033 448
WAT022034 448
WAT022035 448
WAT022180 305
WAT022276 306
WAT022280 306
WAT022281 306
WAT022282 306
WAT022283 306
WAT022330 ..... 526, 581
WAT022365 305
WAT022384 ..... 525, 562, 581
WAT022385 ..... 525, 562, 581
WAT022400 306
WAT022440 305
WAT022441 305
WAT022453 306
WAT022454 306
WAT022476 73
WAT022479 73
WAT022681 ..... 244, 425-426, 428, 430, 466-467, 469-470, 472
WAT022861 ..... 72, 78
WAT022934 560
WAT022946 560
WAT022995 ..... 526, 581
WAT022996 ..... 526, 581
WAT022997 ..... 526, 581
WAT022998 ..... 526, 581
WAT022999 ..... 526, 581
WAT023321 448
WAT023323 448
WAT023326 448
WAT023332 448
WAT023343 449
WAT023344 ..... 29, 449
WAT023345 449
WAT023346 449
WAT023347 449
WAT023348 449
WAT023349 449
WAT023370 449
WAT023371 449
WAT023372 449
WAT023373 449
WAT023396 449
WAT023401 ..... 244, 578
WAT023486 561
WAT023501 25
WAT023507 25
WAT023513 25
WAT023519 25
WAT023525 25
WAT023531 25
WAT023537 25
WAT023543 25
WAT023549 25
WAT023555 25
WAT023561 25
WAT023575 25
WAT023580 25
WAT023585 25
WAT023590 25
WAT023595 25
WAT023600 25
WAT023605 25
WAT023610 25
WAT023615 25
WAT023620 25
WAT023625 25
WAT023635 25
WAT023650 401
WAT023655 ..... 232, 299
WAT024310 ..... 29, 35-36
WAT025028 560
WAT025050 ..... 72, 78
WAT025051 ..... 72, 78
WAT025053C 73
WAT025053DV 73
WAT025054C 73
WAT025054DV 73
WAT025207 560
WAT025216 560
WAT025263 562
WAT025296 560
WAT025297 560
WAT025313 ..... 526, 581
WAT025360 560
WAT025384 560
WAT025531 ..... 527, 560-561, 583
WAT025559 560
WAT025566 ..... 526, 581
WAT025604 ..... 306, 526, 567, 581
WAT025746 560
WAT025820 ..... 232, 299
WAT025821 ..... 233, 299
WAT025822 ..... 232, 299
WAT025823 ..... 233, 299
WAT025828 ..... 236, 300
WAT025829 ..... 237, 300
WAT025830 ..... 433, 471
WAT025831 ..... 433, 471
WAT025832 ..... 236, 300
WAT025834 ..... 236, 300
WAT025835 ..... 237, 300
WAT025843 308
WAT025844 308
WAT025845 ..... 307, 401
WAT025846 ..... 307, 401
WAT025848 ..... 307, 401
WAT025853 307
WAT025859 460
WAT025860 460
WAT025861 460
WAT025862 460
WAT025863 460
WAT025864 460
WAT025865 460
WAT025866 460
WAT025867 460
WAT025868 460
WAT025869 460
WAT025870 460
WAT025871 460
WAT025872 460
WAT025874 ..... 237, 300
WAT025875 ..... 236, 300
WAT025876 307
WAT025877 307
WAT026-04 ..... 526, 581
WAT026014 560
WAT026592 560
WAT026613 560
WAT026745 246
WAT026760 246
WAT026765 500
WAT026770 500
WAT026804 ..... 525, 581
WAT026805 ..... 525, 567, 581
WAT026806 ..... 525, 581
WAT026807 ..... 525, 581
WAT026808 ..... 525, 581
WAT026809 ..... 525, 581
WAT026810 ..... 525, 581
WAT026973 ..... 525, 567, 581
WAT026974 ..... 525, 581
WAT027047 304
WAT027048 304
WAT027049 304
WAT027053 304
WAT027054 304
WAT027055 304
WAT027059 304
WAT027060 304
WAT027061 304
WAT027065 304
WAT027066 304
WAT027067 304
WAT027071 304
WAT027072 304
WAT027073 304
WAT027077 304
WAT027078 304
WAT027079 304
WAT027083 304
WAT027084 304
WAT027085 304
WAT027089 304
WAT027090 304
WAT027091 304
WAT027198 ..... 236, 300
WAT027324 ..... 236, 300
WAT027477 ..... 237, 300
WAT027501 448
WAT027502 448
WAT027503 448
WAT027506 448
WAT027509 306
WAT027518 306
WAT027519 306
WAT027525 449
WAT027528 449
WAT027530 449
WAT027542 449
WAT027543 449
WAT027544 449
WAT027577 305
WAT027578 305
WAT027629 560
WAT030632 303
WAT030633 303
WAT030634 303
WAT030697 463
WAT030698 463

WAT030699 463
WAT030852 560
WAT031795 526, 581
WAT032472 401
WAT032646 560
WAT033994 305
WAT033996 306
WAT033997 306
WAT034100 463
WAT034101 463
WAT034102 463
WAT034104 463
WAT034105 463
WAT034106 463
WAT034116 463
WAT034117 463
WAT034118 463
WAT034119 463
WAT034120 463
WAT034122 463
WAT034123 463
WAT034124 463
WAT034125 463
WAT034207 480
WAT034208 478
WAT034209 478
WAT034210 478
WAT034220 237
WAT034221 237
WAT034223 237
WAT034224 237
WAT034225 237
WAT034227 237
WAT034236 496
WAT034238 496-497
WAT034243 496
WAT034244 496-497
WAT034245 496
WAT034276 496
WAT034298 497
WAT035190 558
WAT035501 497
WAT035520 418
WAT035524 463
WAT035577 523
WAT035650 447
WAT035655 447
WAT035672 38, 303
WAT035674 303
WAT035676 303
WAT035706 478
WAT035707 478
WAT035708 478
WAT035709 478
WAT035711 480
WAT035714 480
WAT035876 233, 299
WAT035877 233, 299
WAT035880 246
WAT035884 308
WAT035890 308
WAT035943 434
WAT035946 433-434
WAT035970 447
WAT035980 447
WAT036545 450
WAT036554 464
WAT036555 464
WAT036570 500
WAT036613 434
WAT036770 25
WAT036775 25
WAT036780 25
WAT036785 25
WAT036790 25
WAT036795 25
WAT036800 25
WAT036805 25
WAT036810 25
WAT036815 25
WAT036820 25
WAT036865 401
WAT036870 401
WAT036875 401
WAT036905 25
WAT036910 25
WAT036915 25
WAT036920 25
WAT036925 25
WAT036930 25
WAT036935 25
WAT036940 25
WAT036945 25
WAT036950 25
WAT036954 496
WAT037047 565
WAT037090 565
WAT037500 29-30
WAT037525 240, 578
WAT037560 578
WAT037663 447
WAT037688 307, 401
WAT037692 307, 401
WAT037696 307, 401
WAT037700 307, 401
WAT037704 308
WAT037842 307, 401
WAT037845 307, 401
WAT037851 307, 401
WAT037854 308
WAT037857 308
WAT038500 232, 299
WAT038501 233, 299
WAT038506 307, 401
WAT038507 307, 401
WAT038508 307, 401
WAT038509 307, 401
WAT038510 308
WAT038511 308
WAT038520 307, 401
WAT038522 307, 401
WAT038524 307, 401
WAT038526 307, 401
WAT038528 308
WAT038530 308
WAT038564 447
WAT038567 447
WAT038570 307
WAT038571 307
WAT038800 448
WAT038802 448
WAT038803 448
WAT038804 448
WAT038805 448
WAT038806 448
WAT038807 448
WAT038846 305
WAT038849 305
WAT038851 305
WAT039550 29-30
WAT039570 447
WAT039575 447
WAT039625 447
WAT039630 447
WAT039780 447
WAT039782 447
WAT039783 447
WAT039785 447
WAT039786 447
WAT039787 447
WAT039790 447
WAT039791 447
WAT042091 548
WAT042881 566
WAT042885 566
WAT042887 566
WAT043345 25
WAT043350 25
WAT043355 25
WAT043360 25
WAT043365 25
WAT043370 25
WAT043375 25
WAT043380 25
WAT043385 25
WAT043390 25
WAT043395 25
WAT043400 25
WAT043405 25
WAT043410 25
WAT043415 25
WAT043425 25
WAT043430 25
WAT043435 25
WAT043460 25
WAT043475 25
WAT043485 25
WAT044200 460
WAT044201 460
WAT044202 460
WAT044203 460
WAT044204 460
WAT044205 460
WAT044206 459
WAT044207 459
WAT044208 459
WAT044209 459
WAT044210 459
WAT044211 459
WAT044212 459
WAT044213 459
WAT044214 459
WAT044215 459
WAT044216 459
WAT044217 459
WAT044218 459
WAT044219 459
WAT044220 459
WAT044221 458
WAT044222 458
WAT044223 458
WAT044224 458
WAT044225 458
WAT044226 458
WAT044227 458
WAT044228 458
WAT044229 458
WAT044230 458
WAT044231 458
WAT044232 458
WAT044233 458
WAT044234 458
WAT044235 458
WAT044236 458
WAT044237 458
WAT044238 458
WAT044239 458
WAT044240 458
WAT044241 458
WAT044245 233, 299
WAT044250 500
WAT044355 240, 495-496
WAT044370 236, 300
WAT044375 232, 299
WAT044380 244
WAT044385 36
WAT044395 36
WAT044480 244
WAT045424 558
WAT045427 558
WAT045800 458
WAT045805 458
WAT045810 458
WAT045815 458
WAT045820 458
WAT045825 458
WAT045830 458
WAT045835 458
WAT045840 458
WAT045845 458
WAT045850 458
WAT045855 458
WAT045860 458
WAT045865 458
WAT045870 458
WAT045875 458
WAT045880 458
WAT045885 458
WAT045890 458
WAT045895 458
WAT045900 458
WAT045905 217, 291, 400
WAT045915 459
WAT045920 459
WAT045925 459
WAT045930 459
WAT045935 459
WAT045940 459
WAT045945 459
WAT045950 459
WAT045955 459
WAT045960 459
WAT045965 459
WAT045970 459
WAT045975 459
WAT045980 459
WAT045985 459
WAT045995 218, 292
WAT046-12 526, 581
WAT046800 460
WAT046805 460
WAT046810 460
WAT046815 460
WAT046820 460
WAT046825 460
WAT046830 244
WAT046835 244
WAT046840 244
WAT046845 244
WAT046850 244
WAT046855 244
WAT046860 244
WAT046865 244
WAT046875 244, 401
WAT046880 244, 401
WAT046885 244, 401
WAT046890 244, 401
WAT046895 496
WAT046905 244, 496
WAT046910 36, 244-245, 370, 395, 401, 416, 433, 471
WAT046915 244
WAT046955 220, 294
WAT046970 218, 292
WAT046980 217, 291

WAT047205 29-30
WAT047210 220, 294
WAT047220 29-30
WAT048160 35-36
WAT051041 525, 581
WAT051052 525, 581
WAT051800 25
WAT051810 25
WAT051820 25
WAT051900 25
WAT051910 25
WAT051960 25
WAT052587 559
WAT052705 25
WAT052710 25
WAT052715 25
WAT052720 25
WAT052725 25
WAT052740 233, 299
WAT052745 233, 299
WAT052860 240
WAT052874 349
WAT052875 349
WAT052880 349
WAT052885 349
WAT052890 349
WAT052895 349
WAT054200 217, 291
WAT054225 245
WAT054230 218, 292
WAT054250 245
WAT054260 29, 35-36
WAT054265 30
WAT054270 218, 292
WAT054275 217, 291
WAT054392 480
WAT054405 458-460
WAT054410 458-460
WAT054415 458-460
WAT054420 29-30
WAT054435 220, 294
WAT054438 220, 294
WAT054448 220, 294
WAT054450 220, 294
WAT054460 458
WAT054464 458
WAT054466 458
WAT054468 458
WAT054470 458
WAT054474 458
WAT054475 459
WAT054476 459
WAT054480 459
WAT054488 460
WAT054490 460
WAT054494 460
WAT054500 25
WAT054505 25
WAT054515 25
WAT054520 25
WAT054525 25
WAT054530 25
WAT054535 25
WAT054540 25
WAT054545 25
WAT054550 25
WAT054555 25
WAT054560 25
WAT054565 25
WAT054570 25
WAT054575 25
WAT054580 25
WAT054585 25
WAT054590 25
WAT054595 25
WAT054600 25
WAT054605 25
WAT054610 25
WAT054615 25
WAT054620 25
WAT054625 25
WAT054630 25
WAT054635 25
WAT054640 25
WAT054645 25
WAT054650 25
WAT054655 25
WAT054660 25
WAT054665 25
WAT054670 25
WAT054675 25
WAT054680 25
WAT054685 25
WAT054690 25
WAT054695 25
WAT054700 25
WAT054705 25
WAT054710 25
WAT054715 25
WAT054720 25
WAT054725 25
WAT054730 25
WAT054735 25
WAT054740 25
WAT054925 25
WAT054930 25
WAT054935 25
WAT054940 25
WAT054945 25
WAT054955 25
WAT054960 25
WAT054965 25
WAT054975 25
WAT054980 25
WAT054985 25
WAT055426 541, 551, 555
WAT056920 233, 299
WAT056955 218, 292
WAT056975 217, 291
WAT057235 551-552, 566-567
WAT058839 35
WAT058840 35
WAT058851 35
WAT058874 69, 77
WAT058875 69, 77
WAT058876 77
WAT058882 11, 13
WAT058883 11, 13
WAT058886 77
WAT058930 478
WAT058931 478
WAT058942 35, 397, 516
WAT058943 35
WAT058951 13, 17
WAT058958 35
WAT058959 35
WAT058961 218, 292
WAT058965 217, 291
WAT058969 219, 293
WAT058973 217, 291
WAT060051 526, 581
WAT060304 560
WAT060305 560
WAT060308 560
WAT062341 82, 558
WAT062479 558
WAT063300 68, 76
WAT063300DV 68, 76
WAT064-01 448
WAT064-02 448
WAT066200 218, 292
WAT066204 218, 292
WAT066220 217, 291
WAT066224 217, 291
WAT066225 218, 292
WAT066228 218, 292
WAT066230 218, 292
WAT066235 217, 291
WAT066240 217, 291
WAT066245 217, 291
WAT066285 218, 292
WAT066288 217, 291
WAT069511 560
WAT069583 560
WAT070122 561
WAT072030 72, 78
WAT072294 73
WAT072704 72, 78
WAT072704DV 78
WAT072708 72, 78
WAT072711 72-73, 78
WAT072714 72-73, 78
WAT073005 72, 78
WAT073109 558
WAT075215 526, 581
WAT076152 535, 537-539, 545, 548, 550, 553-554
WAT077342 558
WAT077343 558
WAT078515 73
WAT080013 433, 471
WAT080046 246
WAT080100 308
WAT081157 566
WAT081158 566
WAT081159 566
WAT081321 566
WAT082708 448-449
WAT082734 449
WAT082745 36, 448
WAT082853 306
WAT082887 305, 307-308
WAT082888 305
WAT082892 305
WAT084038 495-496
WAT084040 236, 300
WAT084042 236, 300
WAT084078 526, 581
WAT084080 425-428, 430, 466-470, 472
WAT084175 237, 300
WAT084176 236, 300
WAT084177 236, 300
WAT084178 236, 300
WAT084179 236, 300
WAT084560 36
WAT084601 433, 471
WAT084620 307
WAT084624 307
WAT084626 307
WAT084630 307
WAT084634 307
WAT084636 307
WAT084720 307
WAT084730 307
WAT085188 495-496
WAT085250 433, 471
WAT085500 460
WAT085501 460
WAT085650 496
WAT085670 307
WAT085672 307
WAT085711 233
WAT085824 246
WAT086342 308
WAT086344 232, 299
WAT086680 236, 300
WAT086684 236, 300
WAT086688 236, 300
WAT086692 237, 300
WAT087141 567
WAT088027 305
WAT088043 446
WAT088044 446
WAT088070 246
WAT088084 558
WAT088108 351
WAT088112 351
WAT088119 351
WAT088122 345-347, 349, 505-507
WAT088123 351
WAT088131 351
WAT088141 246, 401, 496, 500
WAT088223 560
WAT088430 525, 581
WAT088431 525, 581
WAT088432 525, 581
WAT088494 305
WAT088500 236, 300
WAT088561 525, 581
WAT088563 525, 581
WAT088919 305
WAT089592 307, 450
WAT091631 307
WAT091648 237, 300
WAT091681 351
WAT091784 307
WAT094170 69-70, 75-76
WAT094170DV 76
WAT094171 67, 69-70, 74-76
WAT094171DV 76
WAT094172 76
WAT094174 77
WAT094219 70, 75
WAT094219DV 70, 75
WAT094220 70, 75
WAT094220DV 70, 75
WAT094222 70, 75
WAT094222DV 70, 75
WAT094223 70, 75
WAT094223DV 70, 75
WAT094225 11, 13
WAT094226 11, 13
WAT094237 220, 294
WAT094240 220, 294
WAT094243 219, 293
WAT094245 219, 293
WAT094257 219, 293
WAT094260 219, 293
WAT094263 219, 293
WAT094266 219, 293
WAT094269 219, 293
WAT094278 220, 294
WAT097332 526, 555, 581
WAT097944 35
WAT097945 35
WAT097946 35
WAT097954 244
WAT097958 244-245, 370, 395, 416
WAT106005 217, 291
WAT106008 219, 293
WAT106011 218, 292
WAT106127 245
WAT106128 245

WAT106129 245
WAT106151 ..... 219, 293, 400
WAT106154 400
WAT106157 ..... 219, 293, 400
WAT106166 245
WAT106172 ..... 219, 293, 400
WAT106184 ..... 220, 294
WAT106187 ..... 220, 294
WAT106190 ..... 220, 294
WAT106202 ..... 11, 13
WAT106209 ..... 219, 293, 400
WAT163-18 552
WAT200500 42
WAT200502 42
WAT200504 42
WAT200506 42
WAT200508 42
WAT200510 42
WAT200512 42
WAT200518 42
WAT200520 42
WAT200522 42
WAT200524 42
WAT200531 43
WAT200532 43
WAT200533 43
WAT200534 43
WAT200535 43
WAT200536 43
WAT200538 43
WAT200539 43
WAT200540 43
WAT200543 43
WAT200545 43
WAT200546 43
WAT200547 43
WAT200556 42
WAT200558 42
WAT200560 42
WAT200562 42
WAT200564 42
WAT200566 43
WAT200606 36
WAT200607 36
WAT200608 36
WAT200609 36
WAT200610 30
WAT200620 ..... 218, 292
WAT200624 ..... 218, 292
WAT200625 ..... 217, 291
WAT200630 ..... 218, 292
WAT200632 ..... 217, 291
WAT200650 ..... 217, 291
WAT200655 ..... 219, 293
WAT200662 ..... 219, 293
WAT200670 ..... 219, 293
WAT200675 245
WAT200685 35
WAT200687 35
WAT200689 35
WAT200690 35
WAT200691 35
WAT200800 42
WAT200804 42
WAT200806 42
WAT200808 42
WAT200810 42
WAT200812 42
WAT200818 42
WAT200820 42
WAT200821 42
WAT200822 42
WAT200823 42
WAT200824 42
WAT200825 42
WAT200826 42
WAT200827 42
WAT200828 42
WAT200831 42
WAT200832 42
WAT200833 42
WAT200834 42
WAT200835 42
WAT200836 42
WAT200838 42
WAT200839 42
WAT200840 42
WAT200843 42
WAT200844 42
WAT200846 42
WAT201549 429
WAT207119 560
WAT210591 ..... 220, 294
WAT210685 77
WAT241039 ..... 525, 581
WAT270328 558
WAT270868 ..... 554, 567
WAT270926 ..... 545, 550
WAT270927 558
WAT270938 558
WAT270939 558
WAT270940 558
WAT270941 558
WAT270944 556
WAT270946C 67-68, 76
WAT270946DV 68, 76
WAT270959 558
WAT270964 558
WAT271017 558
WAT271018 558
WAT271019 558
WAT271066 558

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