

# Waters Quality Parts, Chromatography Columns, and Supplies Catalog

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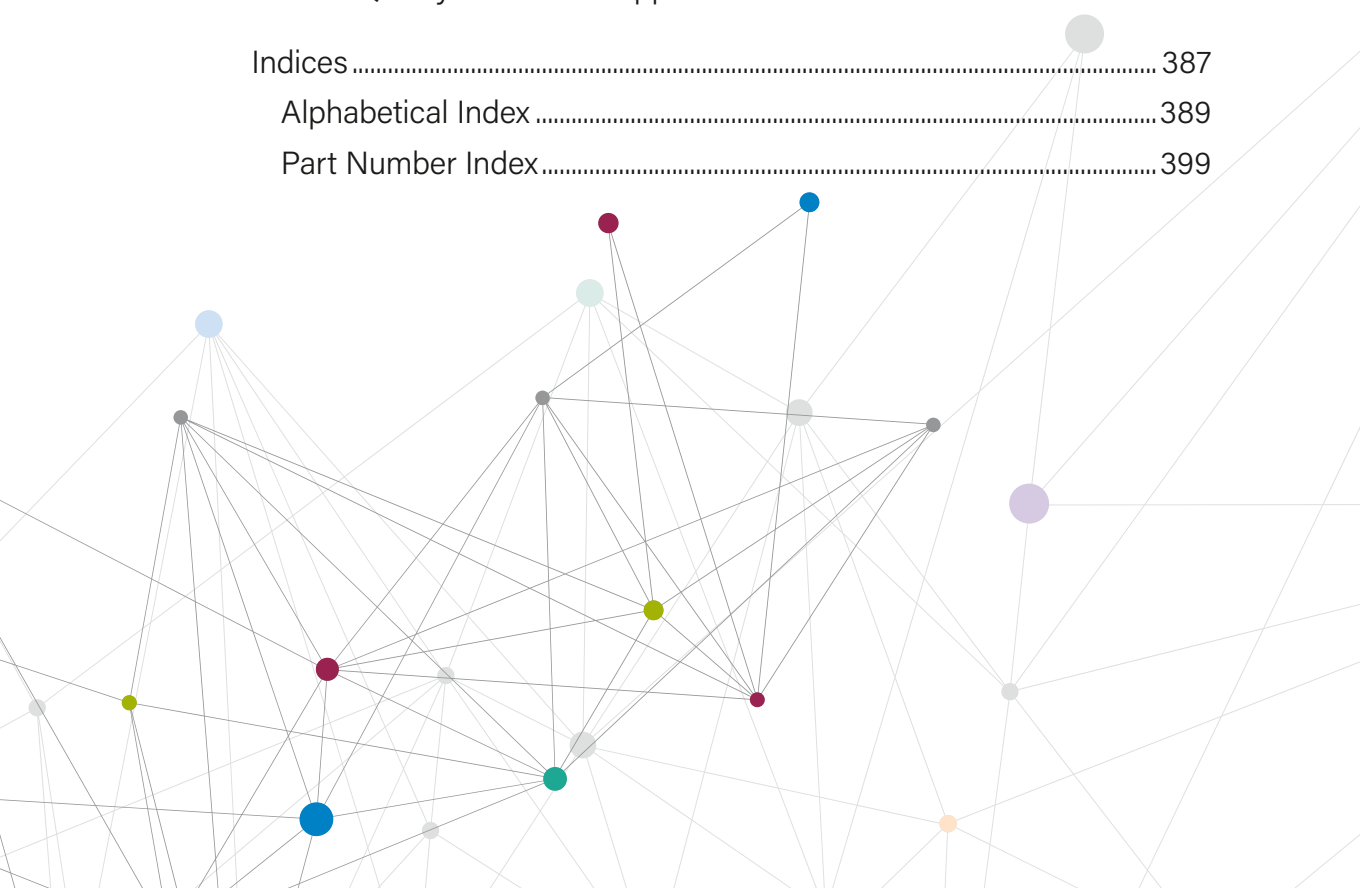
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# Sample Preparation

Sample Preparation



"We are focused on quality and reproducibility."

~ Pat Curtis, Principal Process Chemist, Wexford, Ireland

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# Sample Preparation





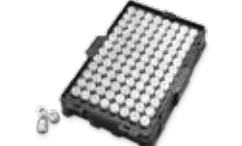
## Goals of Sample Preparation

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

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

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

## SELECTING THE CORRECT SPE FORMAT

| Formats                               |   |   |
|---------------------------------------|---|---|
| <b>μElution Plates</b>                | <ul style="list-style-type: none"><li>■ Patented μElution™ plate design.</li><li>■ Ideal for SPE cleanup and analyte enrichment of sample volumes ranging from 10 μL to 375 μL.</li><li>■ No evaporation and reconstitution necessary due to elution volumes as low as 25 μL.</li><li>■ Up to a 15x increase in concentration.</li><li>■ Compatible with most liquid-handling robotic systems for automated, reliable, high-throughput SPE (HT-SPE).</li></ul>                  |    |
| <b>96-well Extraction Plates</b>      | <ul style="list-style-type: none"><li>■ Innovative, award-winning, two-stage well design.</li><li>■ High throughput and high recovery.</li><li>■ Available with 5 mg, 10 mg, 30 mg, and 60 mg of sorbent per well.</li><li>■ Compatible with most liquid-handling robotic systems for automated, reliable high throughput SPE (HT-SPE).</li></ul>   |  |
| <b>Syringe-barrel Cartridges</b>      | <ul style="list-style-type: none"><li>■ Ultra-clean syringe barrel and frits.</li><li>■ Available with cartridge sizes ranging from 1 cc/10 mg up to 35 cc/6 g.</li><li>■ Flangeless syringe-barrel cartridges available in 1 cc, 3 cc, and 6 cc configurations.</li><li>■ Plus-style cartridges with Luer inlet hub and outlet tip with 225 mg of sorbent.</li></ul>   |  |
| <b>Glass Cartridges</b>               | <ul style="list-style-type: none"><li>■ Ultra-clean glass syringe with Teflon frit.</li><li>■ For trace level detection and analysis at part-per-trillion levels.</li><li>■ Available in 5 cc with 200 mg of sorbent configuration.</li></ul>   |  |
| <b>On-line Columns and Cartridges</b> | <ul style="list-style-type: none"><li>■ For rugged, reproducible, and ultra-fast on-line analysis.</li><li>■ Wide choice of configurations, particle sizes, and sorbent chemistries.</li><li>■ Available with six patented Oasis® Sorbents—HLB, PRiME HLB, MCX, MAX, WCX, and WAX.</li><li>■ High recovery and reproducible results for a wide range of compounds.</li><li>■ Cartridge format for use with Spark Holland Prospekt-2/Symbiosis systems also available.</li></ul> |  |

# Oasis Solid-Phase Extraction (SPE) Products

## 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 PRiME HLB

**First Choice:**  
Reversed-phase SPE cleanup  
of samples in routine analysis

All matrices

#### Oasis HLB

**Choose If:**  
Require ultra high capacity  
of very polar compounds

All matrices

#### Oasis Mixed-Mode

**Choose If:**  
Higher analyte specificity, sensitivity,  
and/or cleanliness required

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
- 2 screening protocols, 4 sorbents

#### Oasis HLB

Load sample



Wash with 5% CH<sub>3</sub>OH in H<sub>2</sub>O



Elute 100% CH<sub>3</sub>OH

#### Oasis PRiME HLB

Load sample



Wash with 5% CH<sub>3</sub>OH in H<sub>2</sub>O



Elute with 90/10 ACN/CH<sub>3</sub>OH

#### Oasis Mixed-Mode Sorbents

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



For Weak Bases  
pK<sub>a</sub> 2–10:

Use Oasis MCX

For Strong Acids  
pK<sub>a</sub> <1:

Use Oasis WAX

For Weak Acids  
pK<sub>a</sub> 2–8:

Use Oasis MAX

For Strong Bases  
pK<sub>a</sub> >10:

Use Oasis WCX

#### Apply Protocol 1

Load pre-treated sample

Wash: 2% HCOOH

Elute 1: 100% CH<sub>3</sub>OH

Elute 2:  
5% NH<sub>4</sub>OH in CH<sub>3</sub>OH

#### Apply Protocol 2

Load pre-treated sample

Wash: 5% NH<sub>4</sub>OH

Elute 1: 100% CH<sub>3</sub>OH

Elute 2:  
2% HCOOH in CH<sub>3</sub>OH

SIMPLEST

Combined Advantage  
with Oasis PRiME HLB

CLEANEST

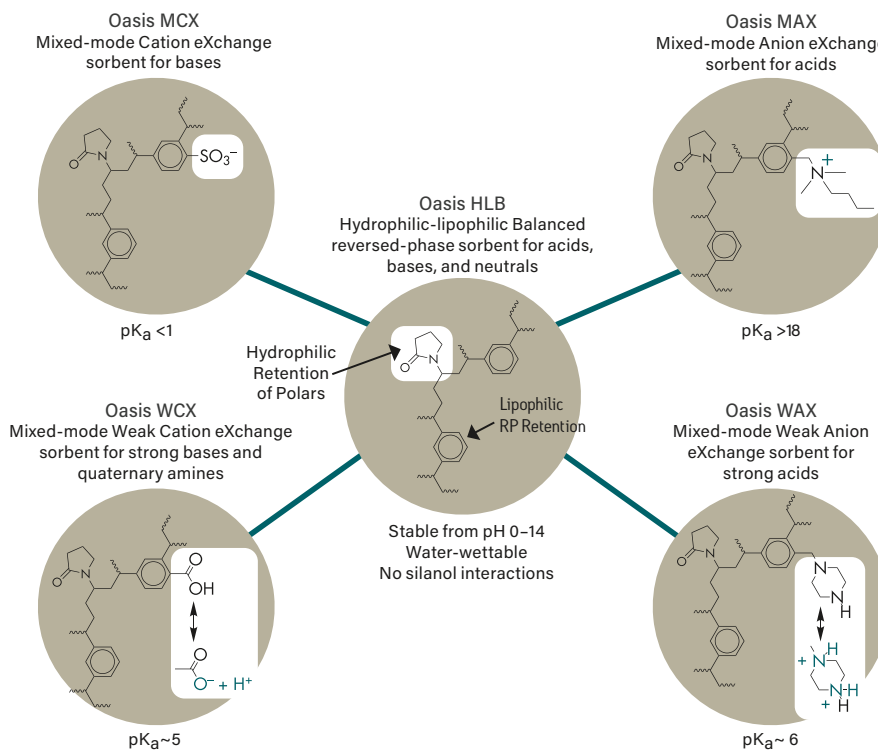
Solid-Phase Extraction enables scientists to:

- Reduce chromatographic complexity
- Increase signal to noise/improve detection limits
- Minimize risks associated with matrix effects
- Concentrate analytes of interest
- Reduce variability in analytical results/increase robustness of analysis
- Increase column lifetime
- Reduce system downtime

Waters introduced Oasis HLB in 1996, effectively changing the way scientists performed solid-phase extraction (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 allows direct loading of aqueous samples without sacrificing recovery.



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

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

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

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



## Oasis Product Selection Guide




|                 | 1 cc/10 mg | 1 cc/10 mg | 1 cc/30 mg | 1 cc/30 mg | 1 cc/30 mg     | 3 cc/60 mg | 3 cc/60 mg | 3 cc/60 mg | 3 cc/150 mg    | 3 cc/540 mg | 3 cc/540 mg | 6 cc/150 mg |
|-----------------|------------|------------|------------|------------|----------------|------------|------------|------------|----------------|-------------|-------------|-------------|
|                 | Flangeless |            | Flangeless |            | Gilson Adapter |            | Flangeless |            | Gilson Adapter |             | Flangeless  |             |
| 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 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  | —          | —          | —              | —           | —           | —           |
| Oasis PRIME HLB | —          | —          | 186008055  | —          | —              | 186008056  | —          | —          | 186008717      | —           | —           | —           |

## Simplifying Solid-Phase Extraction

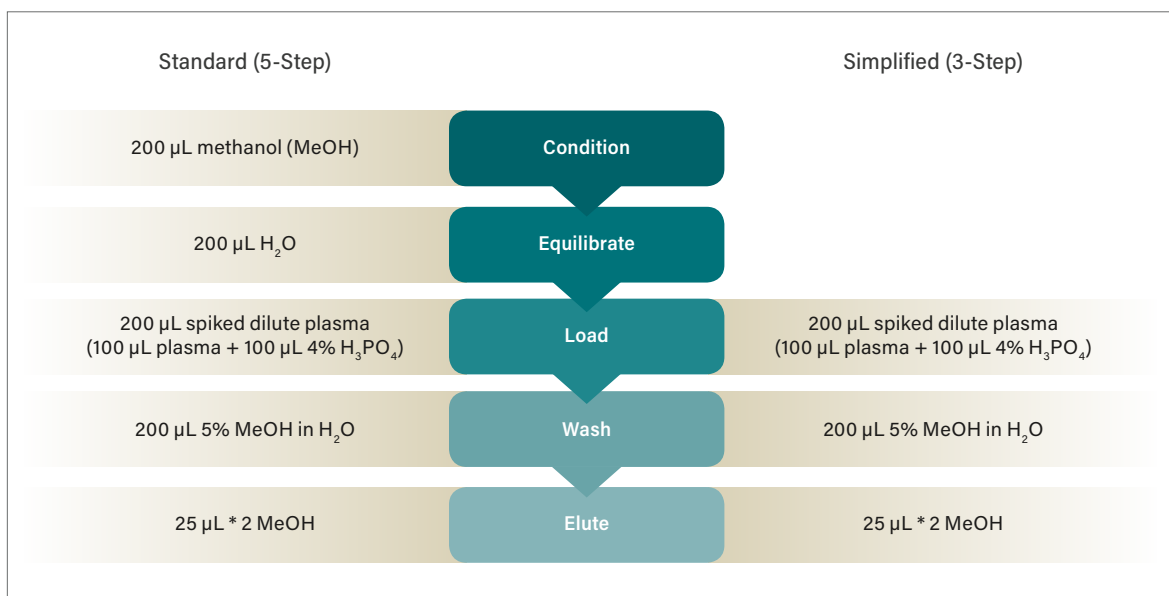
Traditionally, solid-phase extraction methods have required condition and equilibration steps to prepare the sorbent for sample introduction. The condition step was required to wet the sorbent and allow liquid to enter the pores, enabling retention within the sorbent. Once wetted, the sorbent needed 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.



|                 | 6 cc/200 mg | 6 cc/400 mg | 6 cc/500 mg | 12 cc/500 mg | 20 cc/1 g | 35 cc/6 g | 225 mg     | 30 mg      | 30 mg     | 60 mg     | 5 cc/200 mg     |
|-----------------|-------------|-------------|-------------|--------------|-----------|-----------|------------|------------|-----------|-----------|-----------------|
|                 | Flangeless  |             |             |              |           |           | Plus Short | Plus Light | Vac RC    | Vac RC    | Glass Cartridge |
| Sorbent         | 30/box      | 100/box     | 30/box      | 20/box       | 20/box    | 10/box    | 50/box     | 50/box     | 50/box    | 50/box    | 30/box          |
| Oasis HLB 30 µm | WAT106202   | —           | —           | —            | —         | —         | —          | 186005125  | 186000382 | 186000381 | —               |
| Oasis HLB 60 µm | —           | —           | 186000115   | 186000116    | 186000117 | 186000118 | 186000132  | —          | —         | —         | 186000683       |
| Oasis MCX 30 µm | —           | 186001216   | —           | —            | —         | —         | —          | —          | —         | 186000261 | —               |
| Oasis MCX 60 µm | —           | —           | 186000776   | —            | 186000777 | 186000778 | 186003516  | —          | —         | 186000380 | —               |
| Oasis MAX 30 µm | —           | 186001855   | —           | —            | —         | —         | —          | —          | 186000372 | 186000371 | —               |
| Oasis MAX 60 µm | —           | —           | 186000865   | —            | —         | —         | 186003517  | —          | —         | 186000378 | —               |
| Oasis WCX 30 µm | —           | —           | —           | —            | —         | —         | —          | —          | —         | —         | —               |
| Oasis WCX 60 µm | —           | —           | 186004646   | —            | —         | —         | 186003518  | —          | —         | —         | —               |
| Oasis WAX 30 µm | —           | —           | —           | —            | —         | —         | —          | —          | —         | —         | —               |
| Oasis WAX 60 µm | —           | —           | 186004647   | —            | —         | —         | 186003519  | —          | —         | —         | —               |
| Oasis PRIME HLB | 186008057   | —           | 186008718   | —            | —         | —         | —          | —          | —         | —         | —               |

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



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

## 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 below. 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<sub>18</sub> silica-based sorbents to Oasis SPE Sorbents, use approximately 2/3 less Oasis Sorbent (100 mg C<sub>18</sub> 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.

### 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

### 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                        | Nonpolar drugs and GC compatible |
| Methylene chloride | Dipole-dipole | High                        | Nonpolar 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).

#### APPLICATION AREA: Sample Cleanup

"We tested the Waters Oasis HLB μElution PRiME plate by direct comparison with a standard HLB μElution plate using a validated method for 2 analytes. The end results were the same, in terms of sample cleanliness and recovery. The flow characteristics were also the same (some positive pressure required, not unexpected with μElution SPE). Time was saved as no conditioning or equilibration was required. As the price is the same as the standard HLB plates, we would not hesitate to use it routinely in our lab in order to save time and money (no solvent required for conditioning). I look forward to using the standard HLB PRiME plate for flow rate comparison."

REVIEWER: Hayley Hawthorne

ORGANIZATION: York Bioanalytical Solutions



## 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

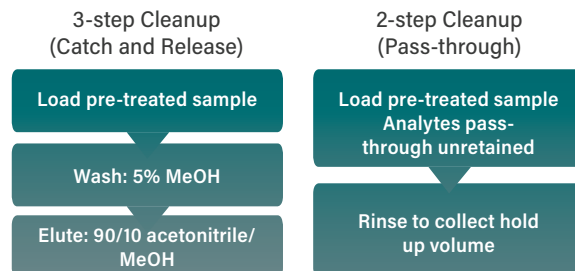
The Oasis PRiME HLB copolymer is extremely water-wettable, making it possible to eliminate the condition and equilibration steps that are absolutely essential when using silica based or other polymeric sorbents. This saves valuable sample processing time and costly solvent purchase and disposal.

### 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.

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

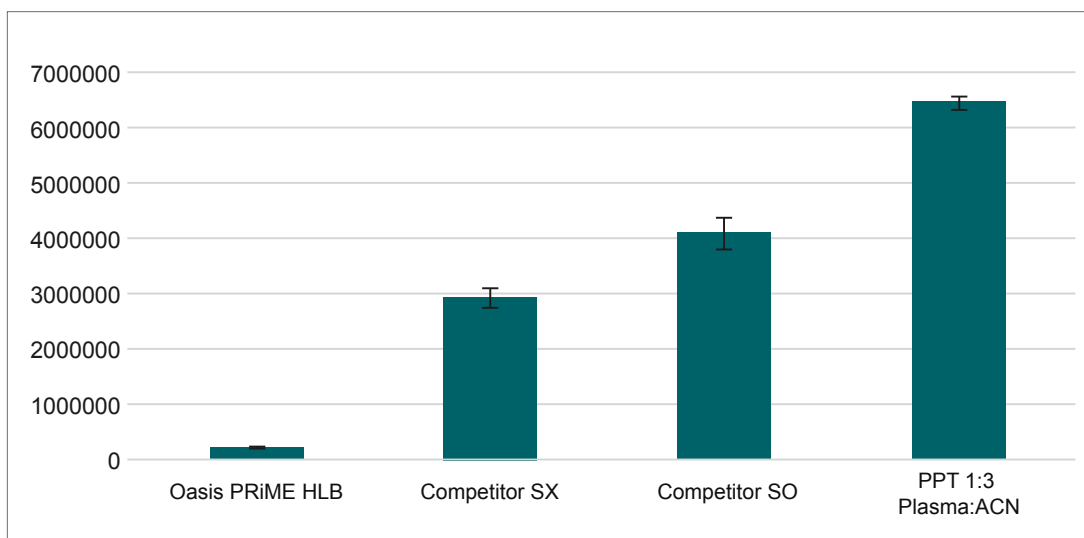
Choose the sample preparation method that meets your analytical needs.



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.

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.

### Phospholipids Remaining in Final Eluate



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

## 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 PRiME HLB Cartridge                     | 3 cc/150 mg   | —             | 100/box  | 186008717   |
| Oasis PRiME HLB Cartridge                     | 3 cc/150 mg   | —             | 30/box   | 186008718   |
| 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 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   |

### DID YOU KNOW...

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

## OASIS MAX FOR ACIDIC COMPOUNDS

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

### DID YOU KNOW...

When compared to other sample preparation techniques, SPE offers:

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

## OASIS WCX FOR STRONG BASIC COMPOUNDS

The Oasis WCX (Weak Cation eXchange) SPE material was developed to provide 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 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 |

## 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 was developed to provide 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...

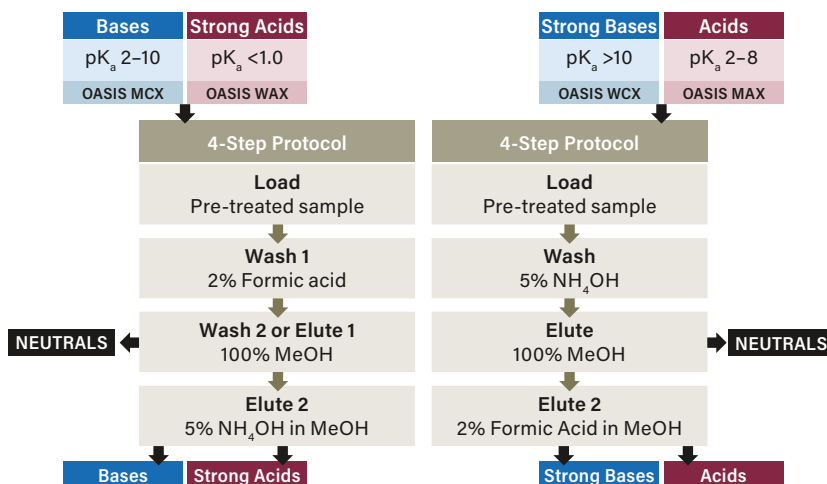
You can reduce non specific binding as well as sample loss, when working with therapeutic peptides on  $\mu$ Elution plates.

## 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 $\mu$ m    | 100/box | 186004651 |
| Oasis WAX Cartridge           | 1 cc/30 mg    | 30 $\mu$ m    | 100/box | 186002489 |
| Oasis WAX Cartridge           | 3 cc/60 mg    | 30 $\mu$ m    | 100/box | 186002490 |
| Oasis WAX Cartridge           | 6 cc/150 mg   | 30 $\mu$ m    | 30/box  | 186002493 |
| Oasis WAX Cartridge           | 1 cc/30 mg    | 60 $\mu$ m    | 100/box | 186002491 |
| Oasis WAX Cartridge           | 3 cc/60 mg    | 60 $\mu$ m    | 100/box | 186002492 |
| Oasis WAX Cartridge           | 6 cc/500 mg   | 60 $\mu$ m    | 30/box  | 186004647 |
| Oasis WAX Plus Cartridge      | 225 mg        | 60 $\mu$ m    | 50/box  | 186003519 |
| Oasis WAX $\mu$ Elution Plate | 2 mg/96-well  | 30 $\mu$ m    | 1/pk    | 186002500 |
| Oasis WAX 96-well Plate       | 10 mg/96-well | 30 $\mu$ m    | 1/pk    | 186002502 |
| Oasis WAX 96-well Plate       | 30 mg/96-well | 30 $\mu$ m    | 1/pk    | 186002504 |
| Oasis WAX 96-well Plate       | 60 mg         | 30 $\mu$ m    | 1/pk    | 186003915 |

### Oasis 2 $\times$ 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                | 30 mg/96-well | 30 $\mu$ m    | 186003249 |
| Oasis $\mu$ Elution Sorbent Selection Plate, 3 rows each: MCX, MAX, WCX, and WAX  | 2 mg/96-well  | 30 $\mu$ m    | 186004475 |
| Oasis Sorbent Selection Cartridge Kit, 10 each: MCX, MAX, WCX, and WAX            | 1 cc/30 mg    | 30 $\mu$ m    | 186003463 |
| Oasis Sorbent Selection Flangeless Cartridge Kit, 10 each: MCX, MAX, WCX, and WAX | 1 cc/10 mg    | 30 $\mu$ m    | 186006344 |
| Oasis Sorbent Selection Flangeless Cartridge Kit, 10 each: MCX, MAX, WCX, and WAX | 1 cc/30 mg    | 30 $\mu$ m    | 186006345 |

## Oasis $\mu$ Elution 96-well Plates

| Description | Particle Size | Qty. | P/N         |
|-------------|---------------|------|-------------|
| Oasis HLB   | 30 $\mu$ m    | 1/pk | 186001828BA |
| Oasis MCX   | 30 $\mu$ m    | 1/pk | 186001830BA |
| Oasis MAX   | 30 $\mu$ m    | 1/pk | 186001829   |
| Oasis WCX   | 30 $\mu$ m    | 1/pk | 186002499   |
| Oasis WAX   | 30 $\mu$ m    | 1/pk | 186002500   |

## Oasis 96-well Plates

| Description | Particle Size | 5 mg/<br>96-well | 10 mg/<br>96-well | 30 mg/<br>96-well | 60 mg/<br>96-well |
|-------------|---------------|------------------|-------------------|-------------------|-------------------|
|             |               | 1/pk             | 1/pk              | 1/pk              | 1/pk              |
| Oasis HLB   | 30 $\mu$ m    | 186000309        | 186000128         | WAT058951         | —                 |
| Oasis HLB   | 60 $\mu$ m    | —                | —                 | —                 | 186000679         |
| Oasis MCX   | 30 $\mu$ m    | —                | 186000259         | 186000248         | —                 |
| Oasis MCX   | 60 $\mu$ m    | —                | —                 | 186000250         | 186000678         |
| Oasis MAX   | 30 $\mu$ m    | —                | 186000375         | 186000373         | 186001256         |
| Oasis MAX   | 60 $\mu$ m    | —                | —                 | —                 | 186001205         |
| Oasis WCX   | 30 $\mu$ m    | —                | 186002501         | 186002503         | —                 |
| Oasis WAX   | 30 $\mu$ m    | —                | 186002502         | 186002504         | 186003915         |

## Oasis Symbiosis/Prospekt-2 Cartridges

| Description                                  | Format           | Particle Size | Qty.   | P/N       |
|--|------------------|---------------|--------|-----------|
| Oasis HLB Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 10 mm | 30 $\mu$ m    | 96/box | 186005781 |
| Oasis HLB Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 20 mm | 30 $\mu$ m    | 96/box | 186005786 |
| Oasis MCX Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 10 mm | 30 $\mu$ m    | 96/box | 186005782 |
| Oasis MCX Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 20 mm | 30 $\mu$ m    | 96/box | 186004653 |
| Oasis MAX Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 10 mm | 30 $\mu$ m    | 96/box | 186005783 |
| Oasis MAX Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 20 mm | 30 $\mu$ m    | 96/box | 186004654 |
| Oasis WCX Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 10 mm | 30 $\mu$ m    | 96/box | 186005784 |
| Oasis WCX Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 20 mm | 30 $\mu$ m    | 96/box | 186004655 |
| Oasis WAX Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 10 mm | 30 $\mu$ m    | 96/box | 186005785 |
| Oasis WAX Symbiosis/<br>Prospekt-2 Cartridge | 1 $\times$ 20 mm | 30 $\mu$ m    | 96/box | 186004656 |

**APPLICATION AREA:** Analyze Metabolites in Human Urine Samples

"The cartridges from Waters are the only ones that helped cleanup the samples for our method. Waters' cartridges produce high quality data and it is a great value for the price."

**REVIEWER:** Mike Trinidad

**ORGANIZATION:** CDC



## On-Line SPE Columns and Cartridge Columns

| Description                     | Format             | Particle Size | Qty. | P/N       |
|---------------------------------|--------------------|---------------|------|-----------|
| Oasis HLB Column                | 2.1 $\times$ 20 mm | 5 $\mu$ m     | 1/pk | 186002034 |
| Oasis HLB Column                | 3.0 $\times$ 20 mm | 5 $\mu$ m     | 1/pk | 186002037 |
| Oasis HLB Column                | 3.9 $\times$ 20 mm | 5 $\mu$ m     | 1/pk | 186002040 |
| Oasis HLB Cartridge Column      | 3.9 $\times$ 20 mm | 5 $\mu$ m     | 1/pk | 186001413 |
| Oasis HLB Column                | 4.6 $\times$ 20 mm | 5 $\mu$ m     | 1/pk | 186002043 |
| Oasis HLB Column                | 2.1 $\times$ 20 mm | 15 $\mu$ m    | 1/pk | 186002035 |
| Oasis HLB Column                | 3.0 $\times$ 20 mm | 15 $\mu$ m    | 1/pk | 186002038 |
| Oasis HLB Column                | 3.9 $\times$ 20 mm | 15 $\mu$ m    | 1/pk | 186002041 |
| Oasis HLB Cartridge Column      | 3.9 $\times$ 20 mm | 15 $\mu$ m    | 1/pk | 186001414 |
| Oasis HLB Column                | 4.6 $\times$ 20 mm | 15 $\mu$ m    | 1/pk | 186002044 |
| Oasis HLB Column                | 2.1 $\times$ 20 mm | 25 $\mu$ m    | 1/pk | 186002036 |
| Oasis HLB Cartridge Column      | 2.1 $\times$ 20 mm | 25 $\mu$ m    | 1/pk | 186000706 |
| Oasis HLB Column                | 3.0 $\times$ 20 mm | 25 $\mu$ m    | 1/pk | 186002039 |
| Oasis HLB Column                | 3.9 $\times$ 20 mm | 25 $\mu$ m    | 1/pk | 186002042 |
| Oasis HLB Column                | 4.6 $\times$ 20 mm | 25 $\mu$ m    | 1/pk | 186002045 |
| Oasis HLB Direct Connect Column | 2.0 $\times$ 15 mm | 25 $\mu$ m    | 1/pk | 186001792 |
| Oasis MCX Column                | 2.1 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002046 |
| Oasis MCX Cartridge Column      | 2.1 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002051 |
| Oasis MCX Column                | 3.0 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002047 |
| Oasis MCX Column                | 3.9 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002048 |
| Oasis MCX Column                | 4.6 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002049 |
| Oasis MAX Column                | 2.1 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002052 |
| Oasis MAX Cartridge Column      | 2.1 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002057 |
| Oasis MAX Column                | 3.0 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002053 |
| Oasis MAX Column                | 3.9 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002054 |
| Oasis MAX Column                | 4.6 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002055 |
| Oasis WCX Column                | 2.1 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002505 |
| Oasis WCX Column                | 3.9 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002507 |
| Oasis WAX Column                | 2.1 $\times$ 20 mm | 30 $\mu$ m    | 1/pk | 186002508 |
| Oasis WAX Column                | 3.9 $\times$ 20 mm | 30 $\mu$ m    | 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 $\times$ 10 mm | 30 $\mu$ m    | 96/pk | 186005671 |

The XBridge<sup>®</sup> C<sub>18</sub> and C<sub>8</sub> Sorbents use Waters proprietary Ethylene Bridged Hybrid (BEH) Technology to produce a sorbent with high mechanical strength, and excellent stability for reversed-phase separations. These sorbents can provide separations with superior peak shape and high efficiency.

## Ordering Information

### XBridge OSM Cartridges

| Description                           | Format           | Particle Size | Qty.  | P/N       |
|---------------------------------------|------------------|---------------|-------|-----------|
| XBridge C <sub>18</sub> OSM Cartridge | 1 $\times$ 10 mm | 10 $\mu$ m    | 96/pk | 186005672 |
| XBridge C <sub>8</sub> OSM Cartridge  | 1 $\times$ 10 mm | 10 $\mu$ m    | 96/pk | 186005673 |



## SPE COLUMNS FOR WATERS UPLC WITH ON-LINE SPE TECHNOLOGY



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

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

## Ordering Information

### Oasis Bulk Sorbents

| Description                                      | Dimension   | Particle Size | Qty.   | P/N       |
|--|-------------|---------------|--------|-----------|
| Oasis HLB  | —           | 30 µm/100 gm  | —      | 186007549 |
| Oasis HLB  | —           | 30 µm/250 gm  | —      | 186007550 |
| Oasis MAX  | —           | 30 µm/100 gm  | —      | 186007551 |
| Oasis MAX  | —           | 30 µm/250 gm  | —      | 186007552 |
| Oasis MCX  | —           | 30 µm/100 gm  | —      | 186007553 |
| Oasis MCX  | —           | 30 µm/250 gm  | —      | 186007554 |
| 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 <sub>18</sub> Direct Connect HP Column | 2.1 × 30 mm | 10 µm         | 1/pk   | 186005232 |
| XBridge C <sub>8</sub> Direct Connect HP Column  | 2.1 × 30 mm | 10 µm         | 1/pk   | 186005233 |

### Columns for Online 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 <sub>18</sub> Direct Connect HP Column | 2.1 × 30 mm | 10 µm         | 1/pk | 186005232 |
| XBridge C <sub>8</sub> Direct Connect HP Column  | 2.1 × 30 mm | 10 µm         | 1/pk | 186005233 |

## OASIS GLASS CARTRIDGES FOR PPT DETECTION LEVELS

Waters 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 |

 To learn more, visit [www.waters.com/onlineSPE](http://www.waters.com/onlineSPE)

### ACQUITY UPLC PFC COLUMN KIT

Optimized for trace level detection of Perfluorinated Compounds (PFCs) with the ACQUITY UPLC® System, this kit contains the ACQUITY UPLC BEH C<sub>18</sub>, 1.7 µm, 2.1 × 50 mm Column, the ACQUITY UPLC PFC Isolator Column, and PFC reference standards.



| Description            | P/N       |
|------------------------|-----------|
| ACQUITY PFC Column Kit | 176001692 |

### ACQUITY UPLC PFC ANALYSIS KIT

The ACQUITY UPLC PFC Analysis Kit includes Oasis SPE Cartridges, PFC calibration and reference standards, certified vials, ACQUITY UPLC Columns, and the necessary instrument components to optimize your instrument for trace level detection of PFCs.



| Description              | P/N       |
|--------------------------|-----------|
| ACQUITY PFC Analysis Kit | 176001744 |

### 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<sub>18</sub> Column and ACQUITY UPLC Isolator Column. The Method Kit also includes Oasis HLB SPE Cartridges and LCMS Certified Vials.



| Description                    | P/N       |
|--------------------------------|-----------|
| ACQUITY Bisphenol A Column Kit | 176001955 |
| ACQUITY Bisphenol A Method Kit | 186004932 |

### EPA METHOD 1694 ANALYSIS KIT

Waters EPA Method 1694 Analysis Kit includes the XTerra® MS C<sub>18</sub> Column, Atlantis® HILIC Column, and Oasis HLB Cartridges; all of which are specified in the EPA Method.



| Description                                | P/N       |
|--|-----------|
| EPA Method 1694 Analysis Kit               | 176001634 |
| Sep-Pak Vac, 500 mg, PS2 (30/box)          | WAT200601 |
| Sep-Pak QMA Plus Carbonate, 46 mg (50/box) | 186004540 |

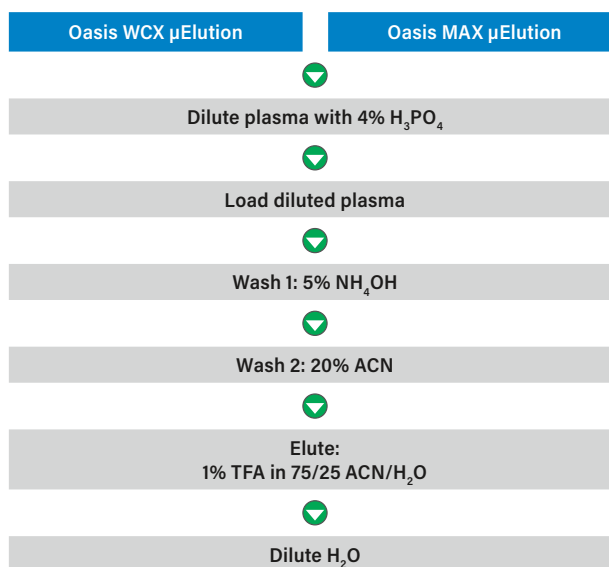
## THERAPEUTIC PEPTIDE METHOD DEVELOPMENT KITS

The Therapeutic Peptide Method Development Kits have been developed to simplify the process of sample preparation and LC method development for the analysis of therapeutic peptides in plasma. The kits contain an Oasis Peptide  $\mu$ Elution Method Development Plate, a 1.7  $\mu$ m or 3.5  $\mu$ m BEH C<sub>18</sub>, 300Å, 2.1 × 50 mm reversed-phase column, collection plates, cap mats, and the detailed screening protocol.

Mixed Mode Solid-Phase Extraction for Peptides:

- Generic screening method for wide range of peptides
- Achieves maximum sensitivity and selectivity for peptides
- Concentrates without evaporation
- Minimizes adsorption/sample loss
- Reduces matrix effects
- Streamlines method development for peptide analytes

### Peptide Separation Technology



## Ordering Information

### Therapeutic Peptide Method Development Kits

| Description  | P/N       |
|--|-----------|
| UPLC Therapeutic Peptide Method Development Kit includes:  |           |
| ■ (1) Oasis Peptide Method Development 96-well $\mu$ Elution Plate, p/n: 186004713                     | 176001835 |
| ■ (1) ACQUITY UPLC Peptide BEH C <sub>18</sub> , 300Å, 1.7 $\mu$ m, 2.1 × 50 mm Column, p/n: 186003685 |           |
| ■ (3) 96-well 1 mL Collection Plate and Cap Mat, p/n: 600001043  |           |
| HPLC Therapeutic Peptide Method Development Kit includes:  |           |
| ■ (1) Oasis Peptide Method Development 96-well $\mu$ Elution Plate, p/n: 186004713                     | 176001836 |
| ■ (1) XBridge Peptide BEH C <sub>18</sub> , 300Å, 3.5 $\mu$ m, 2.1 × 50 mm Column, p/n: 186003607      |           |
| ■ (3) 96-well 1 mL Collection Plate and Cap Mat, p/n: 600001043  |           |



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

### The Most Referenced and Widely Used Sample Preparation Technology

Sep-Pak® bonded silica devices are recognized throughout the world and remain the most referenced SPE product for sample preparation. A diverse selection of formats and sorbents make Sep-Pak SPE Products ideally suited for all types of samples for GC, HPLC, and UPLC analysis methods.



### Formats



#### Oasis μElution Plates

- Patented μElution plate design\*
- Enabling technology facilitates elution volumes as low as 25 μL
- No evaporation and reconstitution necessary, just elute and shoot
- Ideal for small sample volumes
- Concentrates samples up to 15x
- Easily automated for reliable high-throughput SPE

#### Oasis 96-well Extraction Plates

- Innovative two-stage well design
- High throughput and high recovery
- Available in 5 mg, 10 mg, 30 mg, and 60 mg per well formats
- Easily automated for reliable high-throughput SPE

#### Oasis Syringe Barrel Cartridges

- Ultra-clean syringe barrel and frits
- Available in cartridges ranging from 1 cc to 60 cc
- Flangeless syringe-barrel cartridges available in 1 cc, 3 cc, and 6 cc
- "Plus" style cartridges designed for manual and automated instrument use
- Additional formats available for specific robotic instruments
- Custom cartridge format and chemistry available on request

\*U.S. patent 6,723,236.

## Ordering Information

### Sep-Pak 96-well Plates

| Description                           | P/N       |
|---------------------------------------|-----------|
| Sep-Pak tC <sub>18</sub> 25 mg Plate  | 186002319 |
| Sep-Pak tC <sub>18</sub> 40 mg Plate  | 186002320 |
| Sep-Pak tC <sub>18</sub> 100 mg Plate | 186002321 |
| Sep-Pak AccellPlus QMA, 100 mg Plate  | 186001917 |
| Sep-Pak C <sub>18</sub> 40 mg Plate   | 186003966 |

### Sep-Pak 96-well μElution Plate

| Description                             | P/N       |
|---|-----------|
| Sep-Pak tC <sub>18</sub> μElution Plate | 186002318 |

## Sep-Pak Sorbent Selection Guide

| Reversed Phase   |  |   |  |
|--|--|---|--|
|  | Description  | Applications  | Properties   |
| <b>Sep-Pak C<sub>18</sub></b><br>Si(CH <sub>3</sub> ) <sub>2</sub> C <sub>18</sub> H <sub>37</sub> | Hydrophobic, silica-based bonded phase used to adsorb analytes from aqueous solutions. Monofunctional bonding provides alternate selectivity versus tC <sub>18</sub> .                         | <ul style="list-style-type: none"> <li>Lipid fractionation; ganglioside isolation</li> <li>Organic acids in fruit juice, wine</li> <li>JPMHLW and CDFA official methods for pesticides in food</li> <li>Natural products</li> <li>AOAC methods for food colors, sugars</li> </ul> | <ul style="list-style-type: none"> <li>Particle size: 55–105 μm</li> <li>Pore size: 125 Å</li> <li>Surface area: 325 m<sup>2</sup>/g</li> <li>Carbon load: 12%</li> <li>pH range: 2–8</li> </ul> |
| <b>Sep-Pak tC<sub>18</sub></b><br>SiC <sub>18</sub> H <sub>37</sub>                                | Strongly hydrophobic, silica-based bonded phase used to adsorb analytes from aqueous solutions. Trifunctional bonding chemistry for increased hydrolytic stability.                            | <ul style="list-style-type: none"> <li>JPMHLW official methods for pesticides in water</li> <li>JPMHLW official methods for odorants in water</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 37–55 μm</li> <li>Pore size: 125 Å</li> <li>Surface area: 325 m<sup>2</sup>/g</li> <li>Carbon load: 17%</li> <li>pH range: 2–8</li> </ul>  |
| <b>Sep-Pak C<sub>8</sub></b><br>Si(CH <sub>3</sub> ) <sub>2</sub> C <sub>8</sub> H <sub>17</sub>   | Moderately hydrophobic, silica-based bonded phase used in methods when less retention than that of HLB or C <sub>18</sub> is required.   | <ul style="list-style-type: none"> <li>Drugs and their metabolites in biofluids</li> <li>Peptides in serum and plasma</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 37–55 μm</li> <li>Pore size: 125 Å</li> <li>Surface area: 325 m<sup>2</sup>/g</li> <li>Carbon load: 9%</li> <li>pH range: 2–8</li> </ul>   |
| <b>Sep-Pak tC2</b><br>SiC <sub>2</sub> H <sub>5</sub>  | Weakly hydrophobic, silica-based bonded phase used in methods when less retention than that of C <sub>8</sub> is required. Trifunctional bonding chemistry for increased hydrolytic stability. | <ul style="list-style-type: none"> <li>Applications are similar to those of C<sub>18</sub> and C<sub>8</sub></li> </ul>   | <ul style="list-style-type: none"> <li>Particle size: 37–55 μm</li> <li>Pore size: 125 Å</li> <li>Surface area: 325 m<sup>2</sup>/g</li> <li>Carbon load: 2.7%</li> <li>pH range: 2–8</li> </ul> |

| Reversed or Normal Phase   |   |  |   |
|--|---|--|---|
|  | Description   | Applications   | Properties  |
| <b>Sep-Pak Aminopropyl</b><br>Si(CH <sub>2</sub> ) <sub>3</sub> NH <sub>2</sub>                    | 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. | <ul style="list-style-type: none"> <li>Phenols, phenolic pigments, natural products</li> <li>Petroleum fractionation</li> <li>Saccharides</li> <li>Drugs and drug metabolites</li> <li>JPMHLW official methods for pesticides in food</li> </ul> | <ul style="list-style-type: none"> <li>Particle size: 55–105 μm</li> <li>Pore size: 125 Å</li> <li>Surface area: 325 m<sup>2</sup>/g</li> <li>Carbon load: 3.5%</li> <li>pH range: 2–8</li> </ul> |
| <b>Sep-Pak Cyanopropyl</b><br>Si(CH <sub>3</sub> )(CH <sub>2</sub> ) <sub>3</sub> (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 <sub>18</sub> or C <sub>8</sub> .                                    | <ul style="list-style-type: none"> <li>Drugs and their metabolites</li> <li>Pesticides</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 55–105 μm</li> <li>Pore size: 125 Å</li> <li>Surface area: 325 m<sup>2</sup>/g</li> <li>Carbon load: 6.5%</li> <li>pH range: 2–8</li> </ul> |
| <b>Sep-Pak Diol</b><br>Si(CH <sub>2</sub> ) <sub>3</sub> OCH <sub>2</sub> CH(OH)CH <sub>2</sub> OH | 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.                          | <ul style="list-style-type: none"> <li>Antibiotics in cosmetics</li> <li>Protein and peptide isolation by HIC (hydrophobic-interaction chromatography)</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 37–55 μm</li> <li>Pore size: 300 Å</li> <li>Surface area: 100 m<sup>2</sup>/g</li> <li>Carbon load: 2%</li> <li>pH range: 2–8</li> </ul>    |

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.

| Normal Phase   |   |   |   |
|--|---|---|---|
|  | Description   | Applications  | Properties  |
| <b>Sep-Pak Silica</b><br>SiO <sub>2</sub>  | Polar sorbent binds analytes in non-aqueous solvents. Also used as an intermediate-strength cation exchanges in aqueous media and as a support for liquid-liquid partition separations.   | <ul style="list-style-type: none"> <li>Vitamins and food additives</li> <li>Lipid classification</li> <li>Synthetic organic compounds</li> <li>Natural products, plant pigments</li> <li>JPMHLW official methods for pesticides in food</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 55–105 µm</li> <li>Pore size: 125Å</li> <li>Surface area: 325 m<sup>2</sup>/g</li> <li>Activity: High (≤3.2% water)</li> </ul>                                    |
| <b>Sep-Pak Alumina (A, B &amp; N)</b><br>Al <sub>2</sub> O <sub>3</sub>  | 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. | <ul style="list-style-type: none"> <li>Petroleum, synthetic crude oil fractionation (N)</li> <li>Radioactive compound isolation, isotope generators (A, B)</li> <li>Phospholipids, steroids, catecholamines (B)</li> <li>Food, feed additives (A, N), synthetic organic compounds (N)</li> <li>Pesticide, herbicide, priority pollutant isolation (N, B)</li> <li>Alternative to official AOAC and EPA methods (A, N, B)</li> </ul> | <ul style="list-style-type: none"> <li>Particle size: 50–300 µm</li> <li>Pore size: 120Å</li> <li>Activity: High, ≤1 on Brockmann scale (≤1.5% water)</li> <li>pH of 10% aqueous slurry: A: 4, N: 7.5, B: 10</li> </ul> |
| <b>Sep-Pak Florisil</b><br>MgO·SiO <sub>2</sub>  | Polar, highly active, weakly basic sorbent for the adsorption of low to moderately polar species from non-aqueous solutions.  | <ul style="list-style-type: none"> <li>AOAC and EPA official methods for pesticides</li> <li>JPMHLW official methods for pesticides in food</li> <li>Polychlorinated biphenyls (PCBs) in transformer oil</li> </ul>   | <ul style="list-style-type: none"> <li>Particle size: 50–200 µm</li> <li>Pore size: 60Å</li> <li>Activity: High (≤2.5% water)</li> <li>pH of 10% aqueous slurry: 8.5</li> </ul>   |
| Ion Exchange   |   |   |   |
|  | Description   | Applications  | Properties  |
| <b>Sep-Pak AccellPlus QMA</b><br>Strong Anion Exchanger<br>C(O)NH(CH <sub>2</sub> ) <sub>3</sub> N(CH <sub>3</sub> ) <sub>3</sub> <sup>+</sup> Cl <sup>-</sup> | Silica-based, hydrophilic, strong anion exchanger with large pore size used to extract anionic analytes in aqueous and non-aqueous solutions.   | <ul style="list-style-type: none"> <li>Isolation of anionic proteins</li> <li>Acidic pigments in wine, fruit juices, food extracts</li> <li>Phenolic compounds</li> <li>Peptide pool fractionation</li> <li>Inorganic anions in environmental samples</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 37–55 µm</li> <li>Pore size: 300Å</li> <li>pH range: 2–9</li> <li>Carbon load: 6%</li> <li>Ligand density: 220 µmoles/g</li> </ul>                                |
| <b>Sep-Pak AccellPlus CM</b><br>Weak Cation Exchanger<br>COO <sup>-</sup> Na <sup>+</sup>  | Silica-based, hydrophilic, weak cation exchanger with large pore size used to extract cationic analytes in aqueous and non-aqueous solutions.   | <ul style="list-style-type: none"> <li>Isolation of cationic proteins</li> <li>Pesticides, herbicides</li> <li>Steroids</li> <li>Inorganic cations in environmental samples</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 37–55 µm</li> <li>Pore size: 300Å</li> <li>pH range: 2–9</li> <li>Carbon load: 5.5%</li> <li>Ligand density: 350 µmoles/g</li> </ul>                              |

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| Application Specific   |  |  |   |
|--|--|--|---|
|  | Description  | Applications   | Properties  |
| <b>PoraPak RDX</b><br>Divinylbenzene/<br>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.   | <ul style="list-style-type: none"> <li>EPA Method 8330 Nitroaromatics, Nitrosamines</li> <li>EPA Method 529 Explosives and related compounds</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 125–150 µm</li> <li>Pore size: 200Å</li> </ul>  |
| <b>Sep-Pak DNPH</b><br>Diphenylhydrazine coated on silica                        | Acidified dinitrophenylhydrazine reagent coated on silica used for collection of air samples. Aldehydes and ketones react <i>in situ</i> to form hydrazone derivatives; these are then eluted and quantitated by HPLC analysis.  | <ul style="list-style-type: none"> <li>EPA Method TO-11A; ASTM D5197 for carbonyl compounds in air</li> <li>JPMOE Official Methods for aldehydes: odor in outdoor air and in exhaust gas</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 55–105 µm</li> <li>Pore size: 125Å</li> <li>Recommended maximum capacity: 75 µg (2.5 µmoles) formaldehyde/cartridge</li> </ul>                            |
| <b>Sep-Pak XPOsure</b><br>Aldehyde sampler<br>Diphenylhydrazine coated on silica | Acidified dinitrophenylhydrazine reagent coated on silica used for collection of air samples. Aldehydes and ketones react <i>in situ</i> to form hydrazone derivatives; these are then eluted and quantitated by HPLC analysis. Larger particle size optimized for low-pressure personal air monitors. | <ul style="list-style-type: none"> <li>JPMHLW official methods for aldehydes in indoor air</li> <li>EPA Methods TO-11A and IP-6A, ASTM D5197 for carbonyl compounds in air</li> <li>NIOSH Method 2532 for glutaraldehyde in air</li> </ul> | <ul style="list-style-type: none"> <li>Particle size: 500–1000 µm</li> <li>Pore size: 125Å</li> <li>Recommended maximum capacity: 70 µg (2.3 µmoles) formaldehyde/cartridge</li> </ul>                          |
| <b>Sep-Pak Ozone Scrubber</b><br>Potassium iodide                                | Potassium iodide cartridge is used in series with Sep-Pak DNPH and XPOsure Aldehyde Sampler cartridges to remove ozone interferences.  | <ul style="list-style-type: none"> <li>EPA Method IP-6A and ASTM D5197 for carbonyl compounds in air</li> </ul>  | <ul style="list-style-type: none"> <li>Quantity: 1.4 g KI</li> <li>Capacity: 4.2 mmoles ozone/cartridge (theoretical)</li> </ul>  |
| <b>Sep-Pak Dry</b><br>Anhydrous sodium sulfate                                   | High-capacity desiccant used to remove residual water from normal-phase SPE extracts (in water-immiscible organic solvents).   | <ul style="list-style-type: none"> <li>General purpose</li> </ul>  | <ul style="list-style-type: none"> <li>Quantity: 2.85 g anhydrous Na<sub>2</sub>SO<sub>4</sub></li> <li>Theoretical capacity: 3.6 g H<sub>2</sub>O</li> </ul>   |
| <b>Sep-Pak PS2</b><br>Styrene-DVB copolymer                                      | Very hydrophobic copolymer designed for multi-residue pesticide analysis in water samples.   | <ul style="list-style-type: none"> <li>JPMHLW official methods for pesticides in water</li> <li>JPMHLW official methods for pesticides in food</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 80 µm</li> <li>Quantity: 265 mg/cartridge</li> </ul>  |
| <b>Sep-Pak AC2</b><br>Activated carbon   | Highly hydrophobic, low ash content, activated carbon used to remove or enrich very polar organic molecules from water.  | <ul style="list-style-type: none"> <li>JPMHLW official method for 1,4-dioxane analysis in water</li> <li>Pesticides, herbicides, especially highly polar small molecules</li> </ul>  | <ul style="list-style-type: none"> <li>Particle size: 85 µm</li> <li>Quantity: 400 mg/cartridge</li> </ul>  |
| <b>Sep-Pak Carbon Black/Aminopropyl</b><br>Carbon black aminopropyl silica       | Two-layer sorbent bed used for pesticide cleanup in food matrices prior to GC analysis.  | <ul style="list-style-type: none"> <li>JPMHLW official methods for pesticides in food</li> <li>JPMHLW official method for propham</li> </ul>   | <ul style="list-style-type: none"> <li>Particle size: 37–105 µm (carbon black, top layer); 55–105 µm (aminopropyl silica, bottom layer)</li> <li>Quantity: 500 mg of each sorbent, separated by frit</li> </ul> |
| <b>Sep-Pak Carbon Black/PSA</b><br>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.  | <ul style="list-style-type: none"> <li>JPMHLW official methods for pesticides in food</li> </ul>   | <ul style="list-style-type: none"> <li>Particle size: 37–105 µm (carbon black, top layer); 37–55 µm (PSA, bottom layer)</li> <li>Quantity: 500 mg of each sorbent, separated by frit</li> </ul>                 |

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# GlycoWorks *RapiFluor*-MS N-Glycan Kits

Reduce complicated, time consuming sample preparation

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See page 253 for more 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<br>Mass/Volume*        | P/N<br>Mass/Volume*         | P/N<br>Mass/Volume*         | P/N<br>Mass/Volume*         | P/N<br>Mass/Volume*         | P/N<br>Volume*       | P/N<br>Volume*       | P/N<br>Volume*       |
| C <sub>18</sub>                   | WAT020515<br>360 mg/0.7 mL | WAT023635<br>820 mg/1.6 mL  | WAT023501<br>130 mg/0.3 mL  | WAT051910<br>360 mg/0.85 mL | —                           | WAT054955<br>0.13 mL | WAT023590<br>0.2 mL  | WAT036935<br>0.2 mL  |
| tC <sub>18</sub>                  | WAT036810<br>400 mg/0.8 mL | WAT036800<br>900 mg/1.4 mL  | WAT036805<br>145 mg/0.4 mL  | —                           | —                           | WAT054960<br>0.11 mL | WAT036820<br>0.25 mL | WAT043410<br>0.25 mL |
| C <sub>8</sub>                    | WAT036775<br>400 mg/0.8 mL | —                           | WAT036770<br>145 mg/0.4 mL  | —                           | —                           | WAT054965<br>0.11 mL | WAT036785<br>0.25 mL | WAT043415<br>0.25 mL |
| tC <sub>2</sub>                   | WAT052720<br>400 mg/0.8 mL | —                           | WAT052725<br>145 mg/0.4 mL  | —                           | —                           | —                    | WAT052710<br>0.25 mL | —                    |
| Silica                            | —                          | WAT020520<br>690 mg/1.6 mL  | WAT023537<br>120 mg/0.4 mL  | —                           | WAT051900<br>690 mg/2.0 mL  | WAT054980<br>0.15 mL | WAT023595<br>0.25 mL | WAT036940<br>0.25 mL |
| Florisil                          | —                          | WAT020525<br>910 mg/1.4 mL  | WAT023543<br>145 mg/0.3 mL  | —                           | WAT051960<br>900 mg/1.7 mL  | WAT054985<br>0.12 mL | WAT023600<br>0.2 mL  | —                    |
| AccellPlus<br>CM                  | WAT020550<br>360 mg/0.8 mL | —                           | WAT023531<br>130 mg/0.4 mL  | WAT010910<br>360 mg/1.1 mL  | —                           | —                    | WAT023625<br>0.25 mL | —                    |
| AccellPlus<br>QMA                 | WAT020545<br>360 mg/0.8 mL | —                           | WAT023525<br>130 mg/0.4 mL  | WAT010835<br>360 mg/1.1 mL  | —                           | —                    | WAT023620<br>0.25 mL | WAT043460<br>0.25 mL |
| Alumina A                         | —                          | WAT020500<br>1710 mg/1.2 mL | WAT023549<br>280 mg/0.35 mL | —                           | WAT051800<br>1850 mg/1.8 mL | —                    | WAT023575<br>0.1 mL  | —                    |
| Alumina B                         | —                          | WAT020505<br>1710 mg/1.2 mL | WAT023555<br>280 mg/0.35 mL | —                           | WAT051820<br>1850 mg/1.8 mL | —                    | WAT023580<br>0.1 mL  | —                    |
| Alumina N                         | —                          | WAT020510<br>1710 mg/1.2 mL | WAT023561<br>280 mg/0.35 mL | —                           | WAT051810<br>1850 mg/1.8 mL | —                    | WAT023585<br>0.1 mL  | —                    |
| Aminopropyl<br>(NH <sub>2</sub> ) | WAT020535<br>360 mg/0.7 mL | —                           | WAT023513<br>130 mg/0.3 mL  | WAT010830<br>360 mg/0.85 mL | —                           | —                    | WAT023610<br>0.2 mL  | WAT043475<br>0.2 mL  |
| Cyanopropyl<br>(CN)               | WAT020540<br>360 mg/0.7 mL | —                           | WAT023507<br>130 mg/0.3 mL  | WAT010823<br>360 mg/0.85 mL | —                           | WAT054975<br>0.13 mL | WAT023615<br>0.2 mL  | —                    |
| PSA                               | 186004538<br>360 mg/0.7 mL | —                           | 186004578<br>130 mg/0.3 mL  | 186004560<br>360 mg/0.85 mL | —                           | 186004562<br>0.1 mL  | 186004561<br>0.2 mL  | 186004567<br>0.2 mL  |
| Diol                              | WAT020530<br>360 mg/0.8 mL | —                           | WAT023519<br>130 mg/0.4 mL  | —                           | —                           | —                    | WAT023605<br>0.25 mL | WAT043480<br>0.25 mL |

\*Hold-up volume.

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 |



|                                   | 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<br>Volume*       | P/N<br>Volume*      | P/N<br>Volume*      | P/N<br>Volume*      | P/N<br>Volume*      | P/N<br>Volume*      | P/N<br>Volume*       | P/N<br>Volume*       |
| C <sub>18</sub>                   | WAT054945<br>0.42 mL | WAT020805<br>0.8 mL | WAT036945<br>0.8 mL | WAT043395<br>1.2 mL | WAT036905<br>2.0 mL | WAT036915<br>3.6 mL | WAT036925<br>8.0 mL  | WAT043345<br>16.8 mL |
| tC <sub>18</sub>                  | WAT054925<br>0.34 mL | WAT036815<br>1.0 mL | WAT043425<br>1.0 mL | WAT036790<br>1.1 mL | WAT036795<br>1.9 mL | WAT043380<br>3.5 mL | WAT043365<br>7.8 mL  | WAT043350<br>16.3 mL |
| C <sub>8</sub>                    | WAT054940<br>0.34 mL | WAT036780<br>1.0 mL | WAT043430<br>1.0 mL | WAT054525<br>1.1 mL | WAT054570<br>1.9 mL | WAT054615<br>3.5 mL | WAT054660<br>7.8 mL  | WAT054700<br>16.3 mL |
| tC <sub>2</sub>                   | —                    | WAT052715<br>1.0 mL | —                   | —                   | WAT052705<br>1.9 mL | —                   | —                    | —                    |
| Silica                            | WAT054930<br>0.53 mL | WAT020810<br>1.2 mL | WAT036950<br>1.2 mL | WAT043400<br>1.2 mL | WAT036910<br>1.9 mL | WAT036920<br>3.9 mL | WAT036930<br>11.0 mL | WAT043355<br>23.4 mL |
| Florisol                          | —                    | WAT020815<br>0.8 mL | WAT043435<br>0.8 mL | WAT043405<br>1.2 mL | WAT043390<br>2.0 mL | WAT043385<br>3.6 mL | WAT043370<br>8.0 mL  | WAT043360<br>16.8 mL |
| AccellPlus<br>CM                  | —                    | WAT020855<br>1.1 mL | WAT054505<br>1.1 mL | WAT054545<br>1.2 mL | WAT054590<br>1.9 mL | WAT054635<br>3.5 mL | WAT054675<br>7.8 mL  | WAT054720<br>16.3 mL |
| AccellPlus<br>QMA                 | —                    | WAT020850<br>1.1 mL | WAT054500<br>1.1 mL | WAT054550<br>1.2 mL | WAT054595<br>1.9 mL | WAT054640<br>3.5 mL | WAT054680<br>7.8 mL  | WAT054725<br>16.3 mL |
| Alumina A                         | —                    | WAT020820<br>0.4 mL | —                   | WAT054535<br>0.5 mL | WAT054580<br>0.8 mL | WAT054620<br>1.8 mL | WAT054670<br>3.9 mL  | WAT054710<br>8.2 mL  |
| Alumina B                         | —                    | WAT020825<br>0.4 mL | —                   | WAT054540<br>0.5 mL | WAT054585<br>0.8 mL | WAT054625<br>1.8 mL | WAT054665<br>3.9 mL  | WAT054715<br>8.2 mL  |
| Alumina N                         | —                    | WAT020830<br>0.4 mL | WAT043485<br>0.4 mL | WAT054530<br>0.5 mL | WAT054575<br>0.8 mL | WAT054630<br>1.8 mL | WAT043375<br>3.9 mL  | WAT054705<br>8.2 mL  |
| Aminopropyl<br>(NH <sub>2</sub> ) | —                    | WAT020840<br>0.8 mL | WAT054515<br>0.8 mL | WAT054560<br>1.2 mL | WAT054605<br>2.0 mL | WAT054650<br>3.6 mL | WAT054695<br>8.0 mL  | WAT054740<br>16.8 mL |
| Cyanopropyl<br>(CN)               | WAT054935<br>0.42 mL | WAT020835<br>0.8 mL | —                   | WAT054555<br>1.2 mL | WAT054600<br>2.0 mL | WAT054645<br>3.6 mL | WAT054685<br>8.0 mL  | WAT054730<br>16.8 mL |
| PSA                               | 186004598            | 186004536<br>0.8 mL | 186004568<br>0.8 mL | 186004563<br>1.2 mL | 186004537<br>2.0 mL | 186004564<br>3.6 mL | 186004565<br>8.0 mL  | 186004566<br>16.8 mL |
| Diol                              | —                    | WAT020845<br>1.0 mL | WAT054520<br>1.0 mL | WAT054565<br>1.1 mL | WAT054610<br>1.9 mL | WAT054655<br>3.5 mL | WAT054690<br>7.8 mL  | WAT054735<br>16.3 mL |

\*Hold-up volume.

### Sep-Pak Specialty Chemistries

| Description   | Mass/Volume/Type  | Qty.   | P/N       |
|---|---|--------|-----------|
| <b>Food, Environmental, and Biological Testing</b>    |   |        |           |
| 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 |

## 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

## 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-coated 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 the Waters Sep-Pak DNPH-Silica Cartridges or XPoSure™ Aldehyde Sampler Cartridges.

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

Based on an extension of our 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 |

### 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 |



### Ordering Information

Sep-Pak Ozone Scrubber

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



## 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 |

## 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:

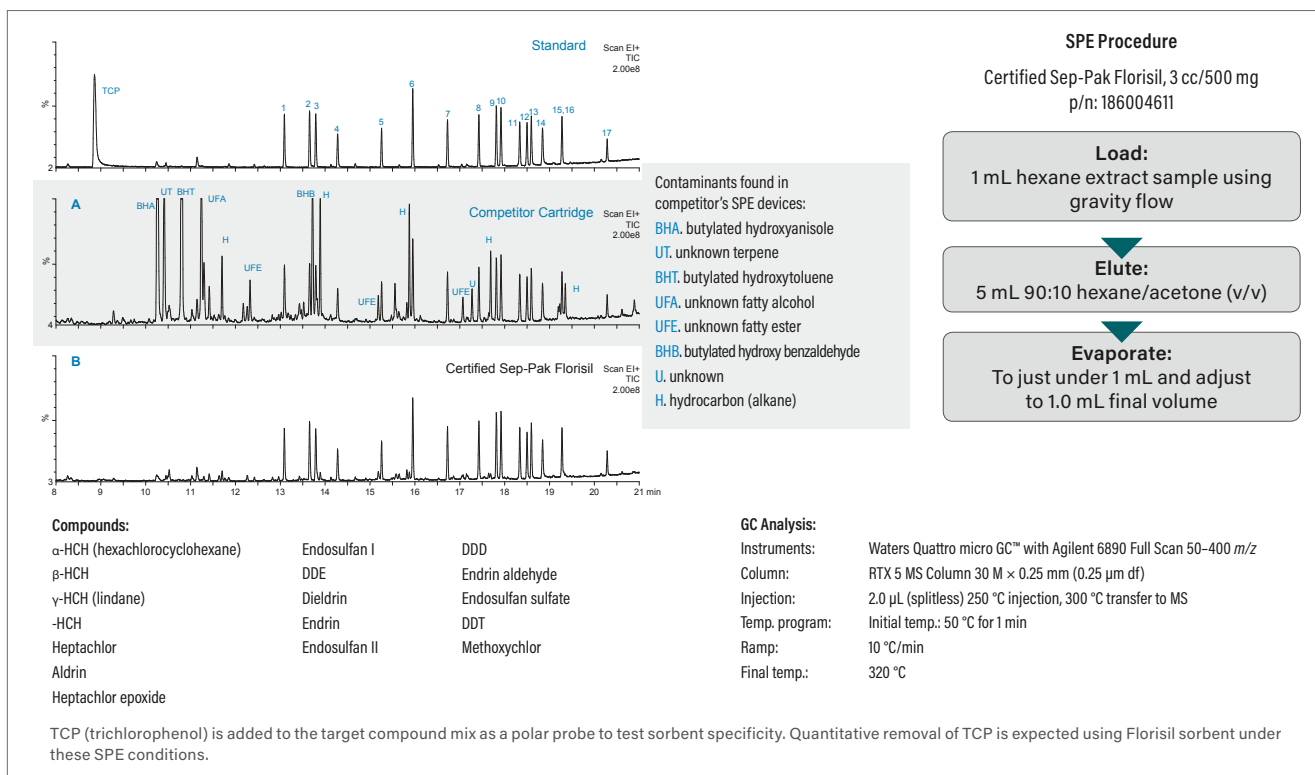
- Contaminants including hydrocarbons and other environmental contaminants
- Sorbent functionality including:
  - ligand density
  - particle size distribution
  - surface activity
- Chromatographic performance

Assembly specifications based on:

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



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



## CERTIFIED SEP-PAK SORBENT SELECTION GUIDE

### C<sub>18</sub>

- 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<sub>18</sub> Sorbent

|                 | 3 cc/200 mg | 3 cc/500 mg | 6 cc/500 mg | 6 cc/1g   |
|-----------------|-------------|-------------|-------------|-----------|
| Sorbent         | 50/box      | 50/box      | 30/box      | 30/box    |
| C <sub>18</sub> | 186004618   | 186004619   | 186004620   | 186004621 |

### Silica Sorbent

|         | 3 cc/200 mg | 3 cc/500 mg | 6 cc/500 mg | 6 cc/1g   |
|---------|-------------|-------------|-------------|-----------|
| 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  $\pi$ -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



## 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 |

## 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 |

## 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.

# Ostro Pass-Through Sample Preparation Product

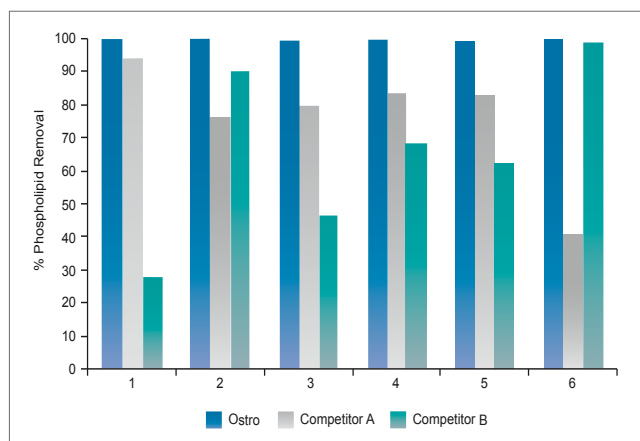


The Simplest Way to Cleaner Samples: Ostro™ Pass-through 96-well Plate provides a novel solution for cleanup, requiring minimal to no method development, using a combination of filtration and sorbent interactions to produce cleaner samples in less time.

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

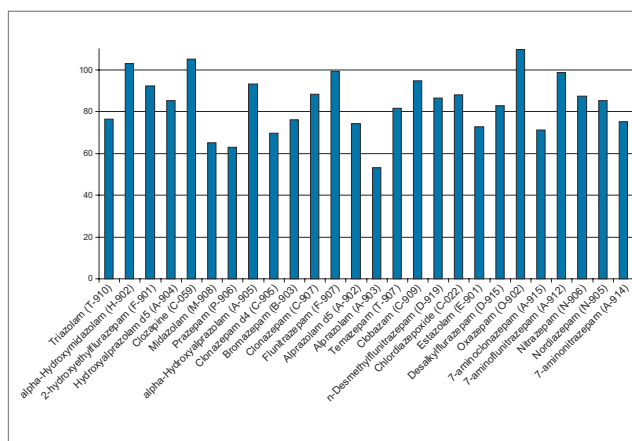


## Reproducibility



Comparative % removal of total phospholipids from 6 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.

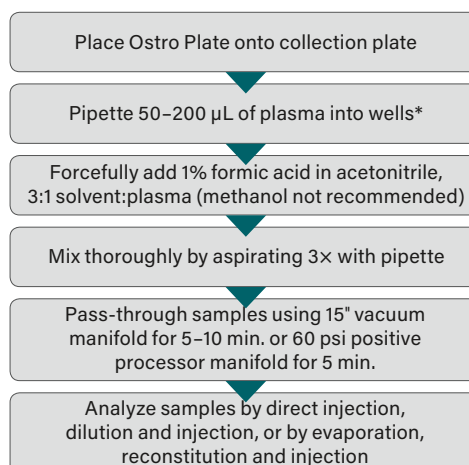
## Ordering Information

Ostro Pass-through Sample Preparation Plate

| Description   | Qty. | P/N       |
|---|------|-----------|
| Ostro Pass-through Sample Preparation 96-well Plate (25 mg) | 1    | 186005518 |

## Protocol

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



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

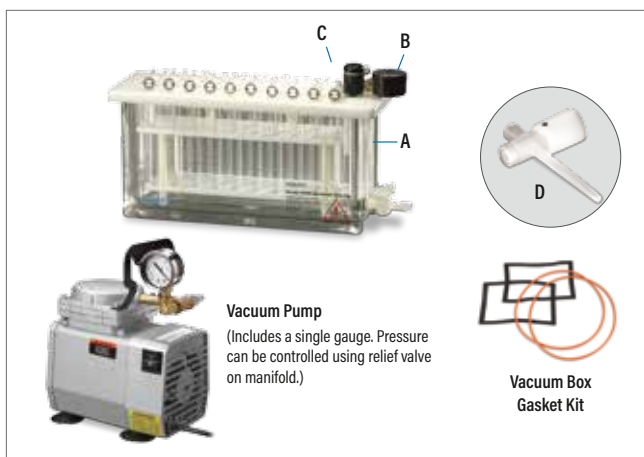
## ACCESSORIES

### Waters Vacuum Manifold for Use with SPE Cartridges

The vacuum manifold has the capacity to process up to twenty 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:

- Precision-machined Delrin cover with alignment posts for quick and easy alignment with test tube rack.
- Vacuum gauge placement on cover, not in fluid path, allows for quick and easy waste removal at bottom by vacuum.
- Enhanced vacuum control valve designed for use with Waters Oasis Extraction Cartridges, allows for a quick and momentary rise in vacuum above the frit bubble point at the touch of a finger.
- 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).

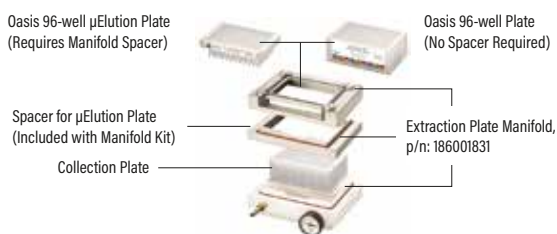


## Ordering Information

### Spare Parts for the 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   | —      | WAT200686 |
| Gauge Assembly, Vacuum  | —      | WAT200687 |
| Reservoir, Glass with Outlet Valve  | —      | WAT200688 |
| Outlet Valve Kit  | —      | WAT200689 |
| Gasket for Cover  | —      | WAT200690 |
| Ejector Tool  | —      | WAT058839 |
| Luer Plugs  | 25/pk  | WAT058851 |
| Rubber Ball Ring (for vacuum gauge assembly)  | —      | WAT058840 |
| Reversible Vial Rack for 1 mL or 4 mL Autosampler Vials   | —      | WAT058871 |
| 2 mL Vial Rack for Manifold   | —      | 186005234 |
| 13 × 75 mm Test Tube Rack   | —      | WAT200678 |
| 13 × 100 mm Test Tube Rack  | —      | WAT200679 |
| 16 × 75 mm Test Tube Rack   | —      | WAT200680 |
| 16 × 100 mm Test Tube Rack  | —      | WAT200681 |
| Reservoir, 30 cc (for Plus, Light, Vac, and Classic Cartridges)   | 48/pk  | WAT011390 |
| Reservoir, 60 cc (for Plus, Light, and Vac Cartridges)  | 12/pk  | 186005587 |
| Adapter, Male-male Luer (for Classic Cartridges)  | 100/pk | WAT024310 |
| Adapter (to attach reservoir to 1, 3, and 6 cc Vac Cartridges)  | 12/pk  | WAT054260 |
| Adapter (to attach reservoir to 12, 20, and 35 cc Vac Cartridges)   | 10/pk  | WAT048160 |
| Vacuum Pump (110 V, 60 Hz)  | —      | 725000417 |
| Vacuum Pump (220 V, 50 Hz)  | —      | 725000604 |

### Manifold and Accessories for Extraction Plate



| Description  | Qty.   | P/N       |
|--|--------|-----------|
| Extraction Plate Manifold for Oasis 96-well Plates   | 1/box  | 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/pk  | WAT058959 |
| Vacuum Pump (115 V, 60 Hz)   | —      | 725000417 |
| Vacuum Pump (240 V, 50 Hz)   | —      | 725000604 |
| Vacuum Box Gasket Kit (Kit includes: 2 foam top gaskets, 2 orange O-rings)   | —      | 186003522 |



## Manifold and Accessories for Extraction Cartridges

| Description  | Qty.   | P/N       | Description   | Qty.   | P/N       |
|--|--------|-----------|---|--------|-----------|
| Waters Extraction Manifold, 20-position without rack (includes 20 needle tips, 25 plugs, and ejector tool) | —      | WAT200677 | 30 cc Reservoir                                     | 48/pk  | WAT011390 |
| Waters Extraction Manifold, 20-position (complete with rack for 13 × 75 mm tubes)                          | —      | WAT200606 | 60 cc Reservoir                                     | 12/pk  | 186005587 |
| Waters Extraction Manifold, 20-position (complete with rack for 13 × 100 mm tubes)                         | —      | WAT200607 | Reservoir Adapters for 1, 3, and 6 cc Cartridges    | 12/pk  | WAT054260 |
| Waters Extraction Manifold, 20-position (complete with rack for 16 × 75 mm tubes)                          | —      | WAT200608 | Reservoir Adapters for 12, 20, and 35 cc Cartridges | 10/pk  | WAT048160 |
| Waters Extraction Manifold, 20-position (complete with rack for 16 × 100 mm tubes)                         | —      | WAT200609 | Male-Male Adapter                                   | 100/pk | WAT024310 |
| Female Luer Plugs  | 100/pk | WAT044385 | 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.

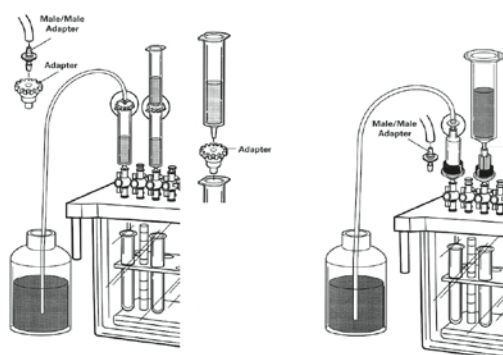


### Ordering Information

#### 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)  | —      | 725000417 |
| Vacuum Pump (240 V, 50 Hz)  | —      | 725000604 |
| Reservoir, 30 cc (for Plus, Light, and Vac Cartridges)            | 48/pk  | WAT011390 |
| Reservoir, 60 cc (for Plus, Light, and Vac Cartridges)            | 12/pk  | 186005587 |
| Adapter, Male-male Luer (for Classic Cartridges)                  | 100/pk | WAT024310 |
| Adapter (to attach reservoir to 1, 3, and 6 cc Vac Cartridges)    | 12/pk  | WAT054260 |
| Adapter (to attach reservoir to 12, 20, and 35 cc Vac Cartridges) | 10/pk  | WAT048160 |
| 2 mL Vial Rack for Manifold                                       | —      | 186005234 |

# 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:

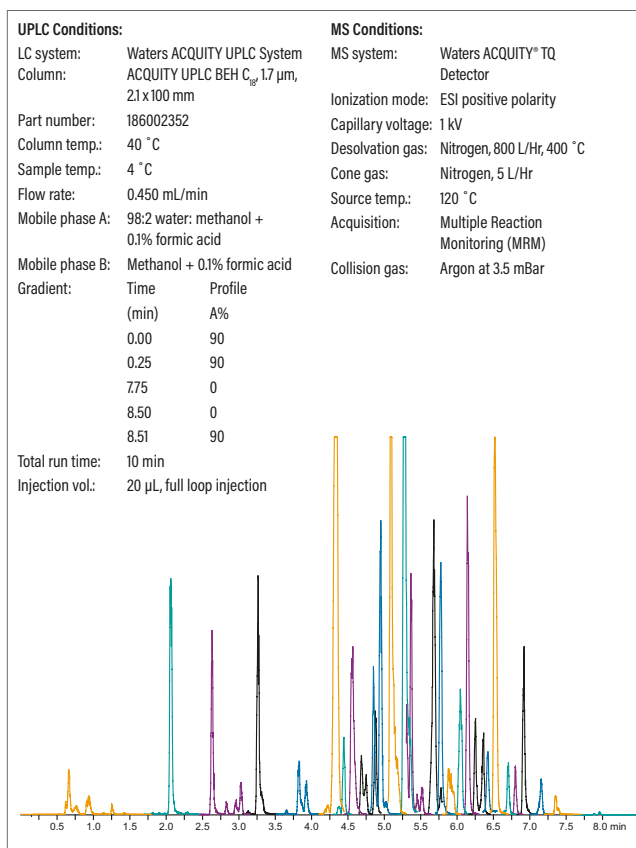
- Simplified QuEChERS protocols
- Decreased sample preparation time
- Efficient and cost effective sample preparation
- Consistent, high quality sorbents, and packaging

## 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.

### Chromatogram Showing 402 Pesticide Residues at 10 ppb ng/g In One 10 Minute Run



## Ordering Information

### DisQuE Dispersive Sample Preparation Kits



| Description   | P/N       |
|---|-----------|
| <b>DisQuE Kits</b>  |           |
| DisQuE AOAC Dispersive SPE Kit-Pouch Format <ul style="list-style-type: none"> <li>■ Pouch: 1.5 g sodium acetate and 6 g MgSO<sub>4</sub></li> <li>■ 50 mL Tube: Empty</li> <li>■ 2 mL Tube: 150 mg MgSO<sub>4</sub> and 50 mg PSA</li> </ul>   | 176002922 |
| DisQuE CEN Dispersive SPE Kit-Pouch Format <ul style="list-style-type: none"> <li>■ Pouch: 1 g trisodium citrate dihydrate, 0.5 g disodium hydrogencitrate sesquihydrate, 1 NaCl and 4 g MgSO<sub>4</sub></li> <li>■ 50 mL Tube: Empty</li> <li>■ 2 mL Tube: 150 mg MgSO<sub>4</sub>, 25 mg PSA, and 25 mg C<sub>18</sub></li> </ul>    | 176002923 |
| DisQuE AOAC Dispersive SPE Kit <ul style="list-style-type: none"> <li>■ Tube 1: 50 mL tube containing: 1.5 g sodium acetate and 6 g MgSO<sub>4</sub></li> <li>■ Tube 2: 2 mL tube containing: 150 mg MgSO<sub>4</sub> and 50 mg PSA</li> </ul>  | 176001676 |
| DisQuE CEN Dispersive SPE Kit <ul style="list-style-type: none"> <li>■ Tube 1: 50 mL tube containing: 1 g trisodium citrate dihydrate, 0.5 g disodium hydrogencitrate sesquihydrate, 1 g NaCl and 4 g MgSO<sub>4</sub></li> <li>■ Tube 2: 2 mL Tube containing: 150 mg MgSO<sub>4</sub>, 25 mg PSA, and 25 mg C<sub>18</sub></li> </ul> | 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       |
|---|-----------|
| <b>Individual Extraction Tubes (Tube 1)</b>   |           |
| 50 mL Empty Tube for QuEChERS Extraction  | 186006814 |
| DisQuE 50 mL Tube/<br>AOAC-Acetate  |           |
|  <ul style="list-style-type: none"> <li>DisQuE 50 mL tube containing: 1.5 g Sodium Acetate and 6 g MgSO<sub>4</sub>, 100/pk</li> </ul>  | 186004571 |
| DisQuE 50 mL Tube/<br>CEN-Citrate   |           |
|  <ul style="list-style-type: none"> <li>DisQuE 50 mL tube containing: 1 g trisodium citrate dihydrate, 0.5 g disodium hydrogencitrate sesquihydrate, 1 g NaCl and 4 g MgSO<sub>4</sub>, 100/pk</li> </ul> | 186004837 |

| Description  | P/N                    |
|--|------------------------|
| <b>Individual Extraction Pouch</b>   |                        |
| DisQuE Pouch   |                        |
|  <ul style="list-style-type: none"> <li>1.5 g sodium acetate, 6 g MgSO<sub>4</sub>, 50/pk</li> <li>4 g MgSO<sub>4</sub>, 1 g NaCl, 1 g trisodium citrate dehydrate, 0.5 g disodium hydrogencitrate sesquihydrate, 50/pk</li> </ul> | 186006812<br>186006813 |

#### DisQuE Cleanup Tubes (Tube 2)

| AOAC Method  |           |           |
|--|-----------|-----------|
| Description  | Tube Size | P/N       |
| DisQuE Tube containing: 150 mg MgSO <sub>4</sub> and 50 mg PSA, 100/pk   | 2 mL      | 186004572 |
| DisQuE Tube containing: 150 mg MgSO <sub>4</sub> , 50 mg PSA and 50 mg C <sub>18</sub> , 100/pk                | 2 mL      | 186004830 |
| DisQuE Tube containing: 900 mg MgSO <sub>4</sub> and 300 mg PSA, 50/pk   | 15 mL     | 186008077 |
| DisQuE Tube containing: 900 mg MgSO <sub>4</sub> , 300 mg PSA and 300 mg C <sub>18</sub> , 50/pk               | 15 mL     | 186008078 |
| DisQuE Tube containing: 1200 mg MgSO <sub>4</sub> and 400 mg PSA, 50/pk  | 15 mL     | 186008072 |
| DisQuE Tube containing: 1200 mg MgSO <sub>4</sub> , 400 mg PSA and 400 mg C <sub>18</sub> , 50/pk              | 15 mL     | 186008073 |
| DisQuE Tube containing: 1200 mg MgSO <sub>4</sub> , 400 mg PSA, 400 mg C <sub>18</sub> , 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 <sub>4</sub> and 25 mg PSA, 100/pk                            | 2 mL      | 186004831 |
| DisQuE Tube containing: 150 mg MgSO <sub>4</sub> , 25 mg PSA, and 25 mg C <sub>18</sub> , 100/pk  | 2 mL      | 186004832 |
| DisQuE Tube containing: 150 mg MgSO <sub>4</sub> , 25 mg PSA, and 2.5 mg GCB, 100/pk              | 2 mL      | 186008076 |
| DisQuE Tube containing: 900 mg MgSO <sub>4</sub> , 150 mg PSA, 50/pk                              | 15 mL     | 186004833 |
| DisQuE Tube containing: 900 mg MgSO <sub>4</sub> , 150 mg PSA, and 150 mg C <sub>18</sub> , 50/pk | 15 mL     | 186004834 |

#### DisQuE Cleanup Tubes (Tube 2)

| Specialty Cleanup Tubes   |           |           |
|---|-----------|-----------|
| Description   | Tube Size | P/N       |
| DisQuE Tube containing: 150 mg MgSO <sub>4</sub> and 50 mg C <sub>18</sub> , 100/pk                                 | 2 mL      | 186008075 |
| DisQuE Tube containing: 150 mg MgSO <sub>4</sub> , 25 mg PSA, 25 mg C <sub>18</sub> , and 7 mg GCB, 100/pk          | 2 mL      | 186008071 |
| DisQuE Tube containing: 900 mg MgSO <sub>4</sub> , 450 mg PSA, 300 mg C <sub>18</sub> , and 50 mg GCB, 50/pk        | 15 mL     | 186008079 |
| DisQuE Tube containing: 150 mg MgSO <sub>4</sub> , 50 mg PSA, 30 mg C <sub>18</sub> , and 30 mg Alumina-N, 100/pk   | 2 mL      | 186008081 |
| DisQuE Tube containing: 750 mg MgSO <sub>4</sub> , 250 mg PSA, 150 mg C <sub>18</sub> , and 150 mg Alumina-N, 50/pk | 15 mL     | 186008080 |



#### Bulk Sorbents

| Description                           | P/N       |
|---------------------------------------|-----------|
| Graphitized Carbon Black, 25 g Bottle | 186004835 |
| C <sub>18</sub> , 100 g Bottle        | WAT035672 |

## PoraPak Rxn Cartridges for Post-Synthesis Cleanup



PoraPak Rxn, a family of polymer-based chromatography products for superior cleanup of synthetic reactions. PoraPak Rxn Products are available in two chemistries:

- PoraPak Rxn CX, a strong cation-exchange sorbent
- PoraPak Rxn RP, a 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 the following 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
- THF
- DMF
- DMSO
- DCM
- 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      |

## Waters Positive Pressure-96 Processor

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

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

### Ordering Information

#### Waters Positive Pressure-96 Processor

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



## Waters/Pall Life Sciences Sample and Solvent Filtration Products

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

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

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

### Choosing the Right Filter for your Application

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

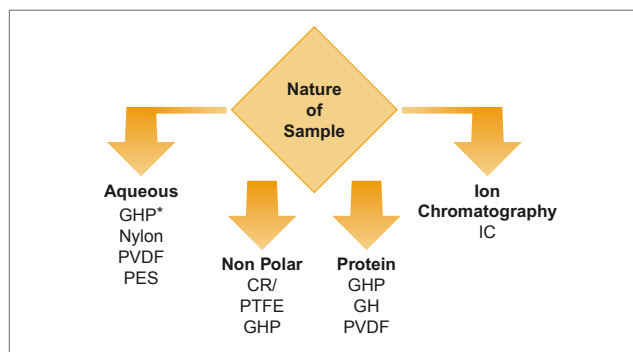
#### Membrane Choices

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



### Concerned about particulate matter in your sample?

#### Step 1: What is the nature of your sample?



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

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

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

#### Step 3: What is the volume of your sample?

| Volume  | Acrodisc Size    | Hold Up Volume |
|---------|------------------|----------------|
| <2 mL   | 4 mm             | <10 µL         |
| <10 mL  | 13 mm minispikes | <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    | Particle size in column | 5 µm    | 0.45 µm        |
| 3    | Volume                  | 1.5 mL  | 4 mm or larger |

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

## FILTER DESIGN AND MEMBRANE CHOICES

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

### Note:

R = Resistant

No significant change was observed in flow rate or bubble point of the membrane.

\*UV absorbance was set at 254 nm.

LR = Limited Resistance

Moderate changes in physical properties or dimension of the membrane were observed.

The filter may be suitable for short term, non-critical use at room temperature.

NR = Not Resistant

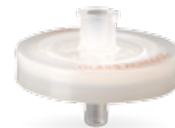
The membrane is basically unstable. In most cases, extensive shrinkage or swelling occurs.

The filter may gradually weaken or partially dissolve after extended exposure.

• = Insufficient Data.

4 mm Polypropylene Housing Male Luer

13 mm Polypropylene Housing Male Luer



13 mm Polypropylene Housing Minispike

25 mm Polypropylene Housing Male Luer

## Ordering Information

### Syringe Filters

| Acrodisc 13 mm     |           |                       |           |                        |           |
|--------------------|-----------|-----------------------|-----------|------------------------|-----------|
|                    | Pack Size | 100                   | 1000      | 100                    | 1000      |
|                    |           | Particle Size: 0.2 µm |           | Particle Size: 0.45 µm |           |
| Aqueous            | NYLON     | WAT200524             | WAT200834 | WAT200520              | WAT200832 |
|                    | PVDF      | WAT200806             | —         | WAT200512              | WAT200827 |
| Non Polar          | CR        | WAT200506             | WAT200823 | WAT200502              | WAT200821 |
| Protein            | PVDF      | WAT200806             | —         | WAT200512              | WAT200827 |
| Ion Chromatography | IC        | WAT200810             | WAT200844 | WAT200812              | WAT200842 |

| Acrodisc 13 mm Minispike |           |                       |           |                        |           |
|--------------------------|-----------|-----------------------|-----------|------------------------|-----------|
|                          | Pack Size | 100                   | 1000      | 100                    | 1000      |
|                          |           | Particle Size: 0.2 µm |           | Particle Size: 0.45 µm |           |
| Aqueous                  | GHP       | WAT097962             | 186005595 | WAT200516              | WAT200830 |
|                          | NYLON     | WAT200562             | WAT200835 | WAT200564              | WAT200836 |
|                          | PVDF      | WAT200804             | WAT200838 | WAT200560              | WAT200828 |
| Non Polar                | CR        | WAT200556             | WAT200824 | WAT200558              | WAT200825 |
|                          | GHP       | WAT097962             | 186005595 | WAT200516              | WAT200830 |
| Protein                  | PVDF      | WAT200804             | WAT200838 | WAT200560              | WAT200828 |

| Acrodisc 25 mm     |           |                       |           |                        |           |
|--------------------|-----------|-----------------------|-----------|------------------------|-----------|
|                    | Pack Size | 50                    | 1000      | 50                     | 1000      |
|                    |           | Particle Size: 0.2 µm |           | Particle Size: 0.45 µm |           |
| Aqueous            | GHP       | WAT097964             | 186005596 | WAT200514              | WAT200829 |
|                    | NYLON     | WAT200522             | WAT200833 | WAT200518              | WAT200831 |
|                    | PVDF      | WAT200808             | WAT200839 | WAT200510              | WAT200826 |
|                    | GHP GF*   | —                     | —         | WAT200802              | WAT058853 |
|                    | NYLON GF* | —                     | —         | WAT200800              | WAT200846 |
|                    | GF**      | —                     | —         | WAT200818              | WAT200840 |
| Non Polar          | CR        | WAT200504             | WAT200822 | WAT200500              | WAT200820 |
|                    | GHP       | WAT097964             | 186005596 | WAT200514              | WAT200829 |
| Protein            | PVDF      | WAT200808             | WAT200839 | WAT200510              | WAT200826 |
| Ion Chromatography | IC        | —                     | —         | —                      | WAT200843 |

\* GHP GF and Nylon GF are glass fiber pre-filters in combination with GHP and Nylon filters for precipitate laden samples.

\*\*Glass fiber filters are 1 µm in pore size.

## Waters Filter Selector

The Waters Filter Selector helps you select the most appropriate filter for your analysis. Simply answer 3 easy questions about particle size, sample volume, and sample type and we will identify the most suitable filter.



For more information about Waters Filter Selector, please visit: [www.waters.com/filterselector](http://www.waters.com/filterselector)



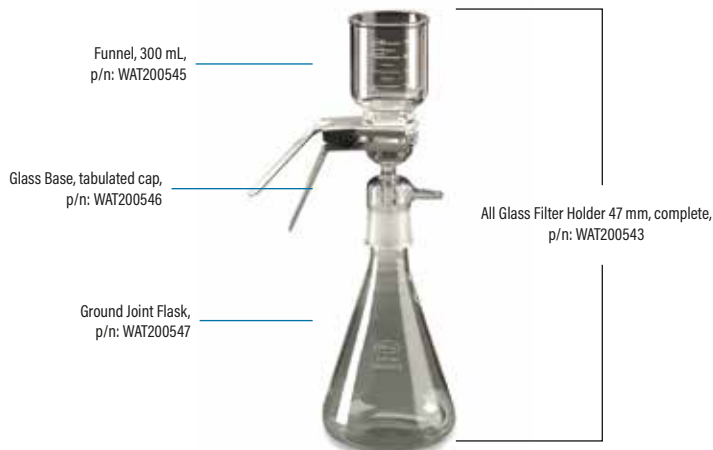
## Solvent Filtration Apparatus

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

### Ordering Information

#### Solvent Filtration Apparatus

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



#### Solvent Filtration Membranes

| Description        | Diameter | Pore Size | Qty.   | P/N       |
|--------------------|----------|-----------|--------|-----------|
| PVDF Filter        | 47 mm    | 0.45 µm   | 100/pk | WAT200530 |
| Nylon Filter       | 47 mm    | 0.45 µm   | 100/pk | WAT200532 |
| PTFE Filter        | 47 mm    | 0.45 µm   | 100/pk | WAT200534 |
|                    | 13 mm    | 0.45 µm   | 100/pk | WAT200536 |
| GH Polypro Filter  | 47 mm    | 0.45 µm   | 100/pk | WAT200537 |
| Supor (PES) Filter | 47 mm    | 0.45 µm   | 100/pk | WAT200538 |
|                    | 13 mm    | 0.45 µm   | 100/pk | WAT200540 |
| PVDF Filter        | 47 mm    | 0.2 µm    | 100/pk | WAT200531 |
| Nylon Filter       | 47 mm    | 0.2 µm    | 100/pk | WAT200533 |
| PTFE Filter        | 47 mm    | 0.2 µm    | 100/pk | WAT200535 |
| GHP                | 47 mm    | 0.2 mm    | 100/pk | 186003524 |
| Supor (PES) Filter | 47 mm    | 0.2 µm    | 100/pk | WAT200539 |

# Waters Sample Vials and Accessories

Waters Sample Vials and Accessories



"Quality has to do with the company as a whole, not just the end result."

~ Emma French, Project Manager, Wexford, Ireland

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# Waters Sample Vials and Accessories

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

## Certified Vials

Waters offers three lines of certified vials:

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

### DIMENSIONAL TEST

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

### CHEMISTRY TESTS

**LC/GC Certified Vials** are UV-tested by HPLC. The HPLC test detects trace levels of chemicals used in the manufacturing and packaging process. These chemicals include lubricants, surfactants, antistatic agents, and antioxidants from packaging. To ensure cleanliness, we test each batch of vials after it has been packaged for several days. An additional test, 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 total ion count and the presence of clusters in the high-mass range.

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

#### Types of Certified Vials

| Certification Tests | CERTIFIED | LCMS<br>CERTIFIED | TruView™ LCMS<br>CERTIFIED |
|---------------------|-----------|-------------------|----------------------------|
| Dimensional Test    | ✓         | ✓                 | ✓                          |
| Septum GC Test      | ✓         | ✓                 | ✓                          |
| HPLC UV Test        | ✓         | ✓                 | ✓                          |
| MS Scan             |           | ✓                 | ✓                          |
| Low Adsorption Test |           |                   | ✓                          |

To download these whitepapers, visit [www.waters.com](http://www.waters.com) and search by these literature codes:

|  | Waters Certified Sample Vials Whitepaper<br>720001303EN | Waters LCMS Certified Sample Vials Whitepaper<br>720001517EN | TruView LCMS Certified Sample Vials Whitepaper<br>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.

#### 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  $33 \times 10^{-7} \text{ }^\circ\text{C}$ . All of our clear glass vials are made using type 1, 33-expansion glass.

#### Type 1, 51-Expansion Glass

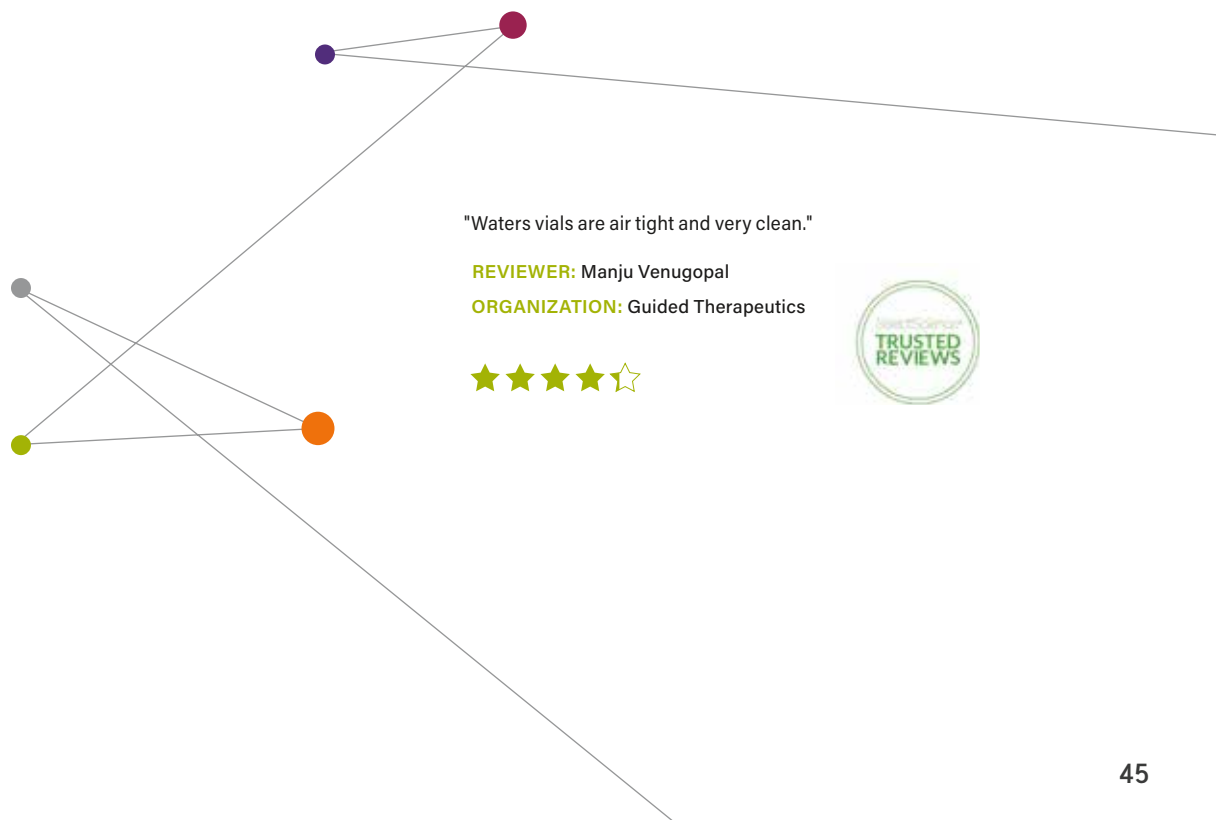
More alkaline than type 1, 33-expansion glass, type 1, 51-expansion glass, is nonetheless adequate for use in many laboratories. Composed primarily of silicone and oxygen, with trace amounts of boron, its expansion coefficient is  $51 \times 10^{-7} \text{ }^\circ\text{C}$ . All of our amber glassware 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  $135 \text{ }^\circ\text{C}$ .



## 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-well Plates

| Description                          | Maximum Centrifugal Force | P/N       |
|--------------------------------------|---------------------------|-----------|
| 96-well Plate, 350 $\mu$ L per well  | 5000 g                    | 186002643 |
| 96-well Plate, 700 $\mu$ L per well  | 2000 g                    | 186005837 |
| 96-well Plate, 800 $\mu$ L per well  | 2000 g                    | 186002481 |
| 96-well Plate, 2 mL per well         | 5000 g                    | 186002482 |
| 384-well Plate, 100 $\mu$ L per well | 5000 g                    | 186002631 |
| 384-well Plate, 250 $\mu$ L 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 fit all 96-well plates and offer the chemical resistance of polypropylene.

#### 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.

#### Clear Polyester Heat Seal

The clear polyester seal, usable between  $-80^{\circ}\text{C}$  and  $80^{\circ}\text{C}$ , 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  $-200^{\circ}\text{C}$  to  $90^{\circ}\text{C}$ . 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  $-80^{\circ}\text{C}$  and  $80^{\circ}\text{C}$ , is resistant to low concentrations (0–30%) of polar organic solvents. No heat sealing equipment is needed to apply the seal.

## Vials and Accessories for ACQUITY UPLC Systems

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

### Compatibility Tables

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

| Fixed Loop Needle  | Flow Through Needle   |
|--|---|
| <p><b>Vials:</b> ACQUITY UPLC, ACQUITY UPLC M-Class, nanoACQUITY UPLC, ACQUITY UPC<sup>2</sup>, and ACQUITY UPLC I-Class FL; Sample Managers</p> <p><b>Plates:</b> ACQUITY UPLC, ACQUITY UPLC M-Class, nanoACQUITY UPLC, and ACQUITY UPLC I-Class FL; Metal and Metal Tip Needles</p> <p>ACQUITY UPLC, ACQUITY UPLC M-Class, nanoACQUITY UPLC, ACQUITY UPC<sup>2</sup> and ACQUITY UPLC I-Class FL; PEEK and PEEKsil Needles</p> | <p><b>Vials:</b> ACQUITY UPLC H-Class, ACQUITY UPLC I-Class FTN, ACQUITY Arc<sup>®</sup> UHPLC, and ACQUITY Advanced Polymer Chromatography</p> <p><b>Plates:</b> ACQUITY UPLC H-Class, ACQUITY UPLC I-Class FTN, and ACQUITY Arc UHPLC</p> |

### 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  |

**APPLICATION AREA:** Bioanalytical Impurity Analysis

"Absolutely a must have for any discovery laboratory doing UPLC work. Robust, highly reproducible, great after purchase care, lots of options in terms of tubing/line compatibility, injection settings, extensions, etc. Lots of detectors available."

**REVIEWER:** Michal Kliman

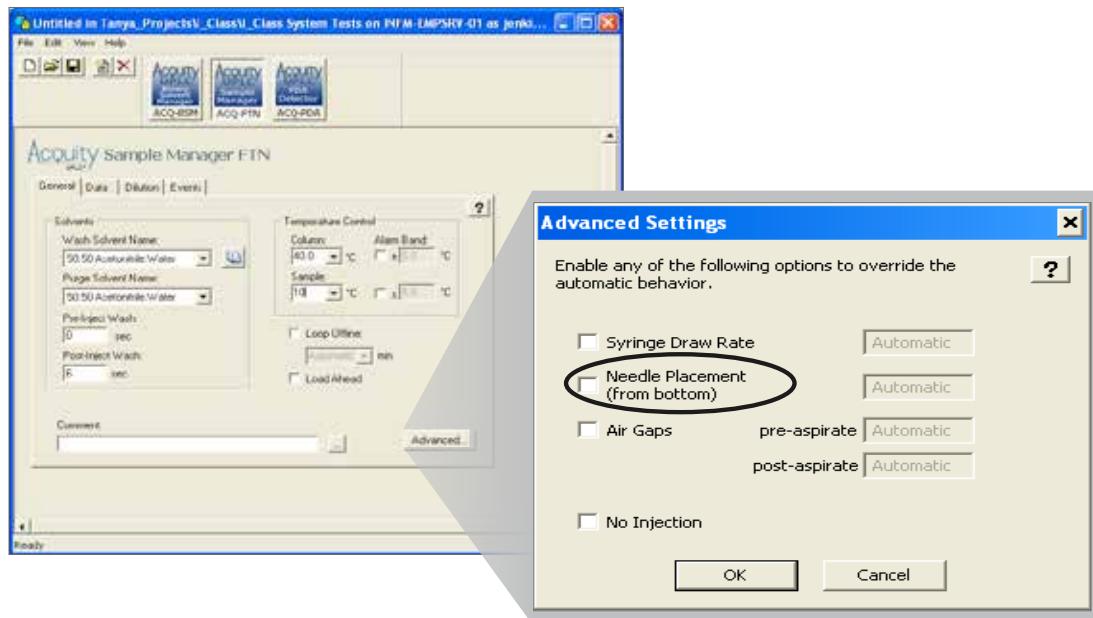
**ORGANIZATION:** InVision Biomedical Group



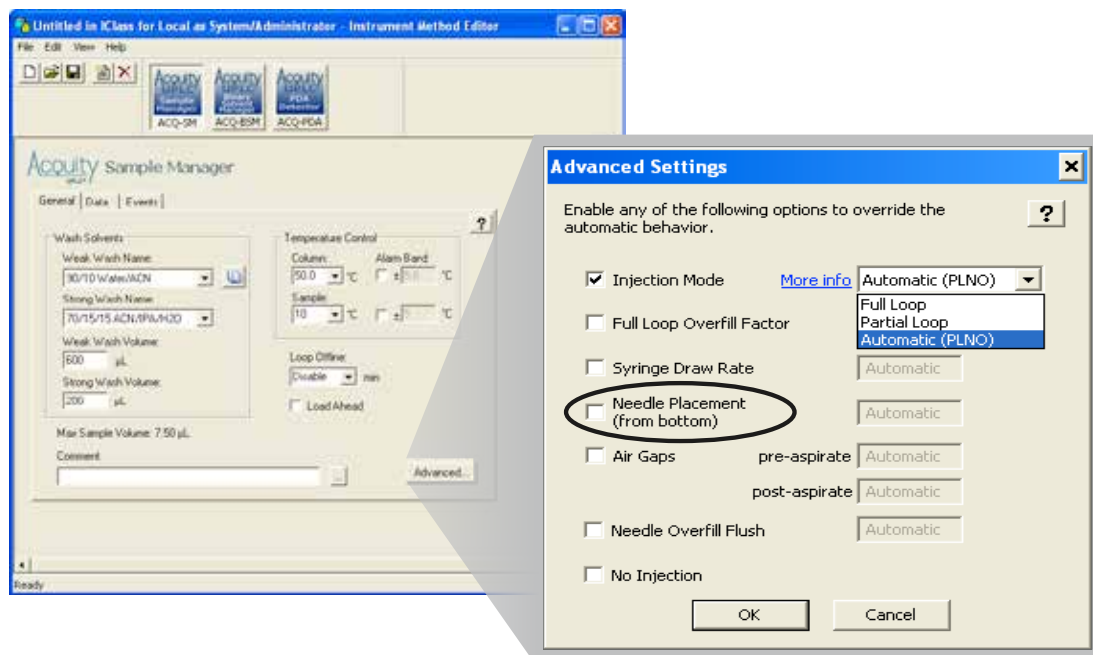


## How to Change Needle Depth with the ACQUITY Sample Manager

### Flow Through Needle (FTN)



### 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 UPC<sup>2</sup>

| 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   |  |  |  |  |  |  |  |  |
| <b>Vial Number</b>   | <b>1</b>  | <b>2</b>  | <b>3</b>  | <b>4</b>  | <b>5</b>   | <b>6</b>  | <b>7</b>  | <b>8</b>  |
| <b>TruView LCMS Certified Combination Packs</b>                  |   |   |   |   |  |   |   |   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                     | 186005666CV   | 186005661CV   | 186005662CV   | 186005670CV   | —  | —   | —   | 186005663CV   |
| <b>LCMS Certified Combination Packs</b>                          |   |   |   |   |  |   |   |   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                     | 600000668CV   | 600000669CV   | 600000670CV   | 600000755CV   | —  | —   | —   | 600000671CV   |
| <b>LC/GC Certified Combination Packs</b>                         |   |   |   |   |  |   |   |   |
| Bonded Pre-slit Silicone/PTFE Septum                             | 186000307C  | 186000847C  | 186000327C  | 186003886C  | —  | —   | —   | 186000385C  |
| Combination with PE Septumless Cap                               | 186004132C  | 186004133C  | 186004168C  | —   | —  | —   | 186004132C  | 186004167C  |
| <b>Combination Packs</b>   |   |   |   |   |  |   |   |   |
| 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  | —   | —   | —   |
| <b>Injectable Volumes</b>  |   |   |   |   |  |   |   |   |
| 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  |
| <b>Storage Cap</b>   |   |   |   |   |  |   |   |   |
| Black Solid 9 mm Cap with Silicone/PTFE Liner for Sample Storage | 186007187   | 186007187   | 186007187   | 186007187   | 186007187  | 186007187   | 186007187   | 186007187   |

### ACQUITY Sample Organizer Accessories

| Description                            | P/N       |
|--|-----------|
| Vial Holder, 48-well, 2 mL Vial        | 700011047 |
| Label, 48-well, 2 mL Vial, Open Access | 615003783 |

 For the complete selection of vials and accessories for ACQUITY Systems, refer to page 56.

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         |                         |
|--|------------------------|----------------------|----------------------|----------------------|-------------------------|-------------------------|
|  |                        |                      |                      |                      |                         |                         |
| <b>Well Shape</b>  |                        |                      |                      |                      |                         |                         |
| <b>Plates</b>  | 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                  |
| <b>Sealing Options</b>   |                        |                      |                      |                      |                         |                         |
| 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                      |
| Height of Plate  | 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<br>350 µL | ANSI-96-well<br>1 mL | ANSI-96-well<br>1 mL | ANSI-96-well<br>2 mL | ANSI-384-well<br>250 µL | ANSI-384-well<br>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 |

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

Plates for ACQUITY UPLC, ACQUITY UPLC I-Class, ACQUITY UPLC M-Class, nanoACQUITY UPLC, and ACQUITY UPC<sup>2</sup>

| Fixed Loop (FL), PEEK and PEEKsil Needles                      | 96-well Plates         |                      |                      |                      | 384-well Plates         |                         |
|--|------------------------|----------------------|----------------------|----------------------|-------------------------|-------------------------|
|  |                        |                      |                      |                      |                         |                         |
| <b>Well Shape</b>  |                        |                      |                      |                      |                         |                         |
| <b>Plates</b>  | 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                  |
| <b>Sealing Options</b>   |                        |                      |                      |                      |                         |                         |
| 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                      |
| Height of Plate  | 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<br>350 µL | ANSI-96-well<br>1 mL | ANSI-96-well<br>1 mL | ANSI-96-well<br>2 mL | ANSI-384-well<br>250 µL | ANSI-384-well<br>100 µL |

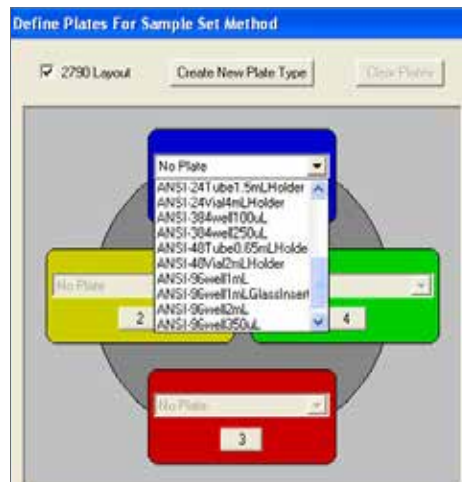
\*Adhesive seal is designed for use with buffer solutions and can tolerate alcohols and acetonitrile content in buffers.

| 96-well Glass Inserts  |                                  |
|--|----------------------------------|
| <b>Glass Insert 96-well Plates</b>                             | <b>700 µL</b>                    |
| 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 |

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

### 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, ACQUITY UPLC I-Class, ACQUITY Arc, 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   |  |  |  |  |  |  |  |  |
| <b>Vial Number</b>   | <b>1</b>  | <b>2</b>  | <b>3</b>  | <b>4</b>  | <b>5</b>  | <b>6</b>  | <b>7</b>  | <b>8</b>  |
| <b>TruView LCMS Certified Combination Packs</b>                  |   |   |   |   |   |   |   |   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                     | 186005666CV   | 186005661CV   | 186005662CV   | 186005670CV   | —   | —   | —   | 186005663CV   |
| <b>LCMS Certified Combination Packs</b>                          |   |   |   |   |   |   |   |   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                     | 600000668CV   | 600000669CV   | 600000670CV   | 600000755CV   | —   | —   | —   | 600000671CV   |
| <b>LC/GC Certified Combination Packs</b>                         |   |   |   |   |   |   |   |   |
| Bonded Pre-slit Silicone/PTFE Septum                             | 186000307C  | 186000847C  | 186000327C  | 186003886C  | —   | —   | —   | 186000385C  |
| Combination with PE Septumless Cap                               | 186004132C  | 186004133C  | 186004168C  | —   | —   | —   | 186004132C  | 186004167C  |
| <b>Combination Packs</b>   |   |   |   |   |   |   |   |   |
| 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   | —   | —   | —   |
| <b>Injectable Volumes</b>  |   |   |   |   |   |   |   |   |
| 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  |
| <b>Storage Cap</b>   |   |   |   |   |   |   |   |   |
| Black Solid 9 mm Cap with Silicone/PTFE Liner for Sample Storage | 186007187   | 186007187   | 186007187   | 186007187   | 186007187   | 186007187   | 186007187   | 186007187   |

#### ACQUITY Sample Organizer Accessories

| Description                            | P/N       |
|--|-----------|
| Vial Holder, 48-well, 2 mL Vial        | 700011047 |
| Label, 48-well, 2 mL Vial, Open Access | 615003783 |

 For the complete selection of vials and accessories for ACQUITY Systems, refer to page 56.

Plates for ACQUITY UPLC H-Class 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  |
| <b>Sealing Options</b>   |   |   |  |   |   |
| PTFE/Silicone Pre-slit, 5/pk                                   | 186006332   | 186006332   | 186006332  | 186006335   | —   |
| Clear Polyester Heat Seal, 100/pk                              | 186002788   | 186002788   | 186002788  | 186002788   | 186002788   |
| Aluminum Foil Laminate Heat Seal, 100/pk                       | 186002789   | 186002789   | 186002789  | 186002789   | 186002789   |
| 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  |
| Height of Plate  | 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<br>350 µL  | ANSI-96-well<br>1 mL  | ANSI-96-well<br>1 mL   | ANSI-96-well<br>2 mL  | ANSI-384-well<br>250 µL   |
| Plate Selection from Chromatography Data System                | ANSI-96-well<br>350 µL  | ANSI-96-well<br>1 mL  | ANSI-96-well<br>1 mL   | ANSI-96-well<br>2 mL  | ANSI-384-well<br>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                        | —                              |
| 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 |

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

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.

## Vials and Accessories for Alliance HPLC Systems

### WATERS 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 HPLC System.

#### 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: R&D

"I have used several brands of HPLC and Waters systems/software are the most versatile and dependable I have used. The support and service I receive are the best I have experienced."

REVIEWER: Vic Granat

ORGANIZATION: Sterling Pharmaceutical Services











## QUICK SELECTION GUIDE: ALLIANCE HPLC SYSTEMS

This selection of 12 × 32 mm vials are the most commonly ordered vials by customers using Waters Alliance Separations Modules. This page is intended to be a quick selection guide. For the complete selection of vials and accessories for Alliance Systems, turn to page 56.

### 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   |  |  |  |  |  |  |  |  |
| <b>Vial Number</b>   | <b>9</b>  | <b>10</b>   | <b>11</b>   | <b>12</b>   | <b>13</b>  | <b>14</b>   | <b>15</b>   | <b>16</b>   |
| <b>Compatible Systems</b>  |   |   |   |   |  |   |   |   |
| Alliance 2690/2695   | ▪   | ▪   | —   | ▪   | ▪  | ▪   | —   | ▪   |
| Alliance 2790/2795   | ▪   | ▪   | ▪   | ▪   | —  | —   | ▪   | ▪   |
| <b>TruView LCMS Certified Combination Packs</b>                  |   |   |   |   |  |   |   |   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                     | 186005666CV   | 186005661CV   | 186005662CV   | —   | —  | 186005663CV   | 186005670CV   | —   |
| <b>LCMS Certified Combination Packs</b>                          |   |   |   |   |  |   |   |   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                     | 600000668CV   | 600000669CV   | 600000670CV   | —   | —  | 600000671CV   | 600000755CV   | —   |
| <b>LC/GC Certified Combination Packs</b>                         |   |   |   |   |  |   |   |   |
| Bonded Pre-slit Silicone/PTFE Septum                             | 186000307C  | 186000847C  | 186000327C  | 186002639*  | —  | 186000385C  | 186003886C  | —   |
| Silicone/PTFE Septum   | —   | —   | —   | —   | WAT270946C   | —   | —   | —   |
| Combination with PE Septumless Cap                               | —   | —   | —   | —   | —  | —   | —   | 186004132C  |
| <b>Combination Packs</b>   |   |   |   |   |  |   |   |   |
| Combination Deactivated  | 186000307DV   | 186000847DV   | 186000327DV   | —   | —  | 186000385DV   | —   | —   |
| <b>Injectable Volumes Alliance 2690/2695</b>                     |   |   |   |   |  |   |   |   |
| 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  |
| <b>Injectable Volumes Alliance 2790/2795</b>                     |   |   |   |   |  |   |   |   |
| 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  |
| <b>Insert</b>  |   |   |   |   |  |   |   |   |
| 150 µL with Poly Spring  | WAT094171(DV)   | WAT094171(DV)   | —   | —   | WAT094171(DV)  | —   | —   | WAT094171(DV)   |
| Max Volume Injection/<br>Max Residual Volume                     | 144 µL/6 µL   | 144 µL/6 µL   | —   | —   | 144 µL/6 µL  | —   | —   | 144 µL/6 µL   |
| <b>Storage Cap</b>   |   |   |   |   |  |   |   |   |
| Black Solid 9 mm Cap with Silicone/PTFE Liner for Sample Storage | 186007187   | 186007187   | 186007187   | 186007187   | —  | 186007187   | 186007187   | 186007187   |

\*Not certified.

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









| Screw Cap Vials   | Clear   | Amber   | Max Recovery  | 300 µL PP   | 750 µL PP   | 10 mm Cap Clear   | Total Recovery  | Amber Max   |
|---|---|---|---|---|---|---|---|---|
| 12 × 32 mm  |  |  |  |  |  |  |  |  |
| <b>Vial Number</b>  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  |
| <b>Compatible Systems</b>                                       |   |   |   |   |   |   |   |   |
| Alliance 2690/2695  | ▪   | ▪   | —   | ▪   | ▪   | ▪   | ▪   | —   |
| Alliance 2790/2795  | ▪   | ▪   | ▪   | ▪   | ▪   | —   | —   | ▪   |
| ACQUITY   | ▪   | ▪   | ▪   | ▪   | ▪   | —   | ▪   | ▪   |
| <b>TruView LCMS Certified Combination Packs</b>                 |   |   |   |   |   |   |   |   |
| Vial, Cap, and Silicone/PTFE Septum                             | 186005660CV   | 186005667CV   | 186005668CV   | —   | —   | —   | 186005669CV   | 186005664CV   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                    | 186005666CV   | 186005661CV   | 186005662CV   | —   | —   | —   | 186005663CV   | 186005670CV   |
| <b>LCMS Certified Combination Packs</b>                         |   |   |   |   |   |   |   |   |
| Vial, Cap, and Silicone/PTFE Septum                             | 600000751CV   | 600000752CV   | 600000749CV   | —   | —   | —   | 600000750CV   | 600000754CV   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                    | 600000668CV   | 600000669CV   | 600000670CV   | —   | —   | —   | 600000671CV   | 600000755CV   |
| <b>LC/GC Certified Combination Packs</b>                        |   |   |   |   |   |   |   |   |
| 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*  | —   | —   | 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  |
| <b>Vials Only</b>   |   |   |   |   |   |   |   |   |
| Vials Only  | 186000273   | 186000848   | 186002802   | 186002626   | 186005219   | WAT063300   | 186002805   | —   |
| Deactivated Vials Only  | 186000273DV   | 186000848DV   | —   | —   | —   | WAT063300DV   | —   | —   |
| <b>Injectable Volumes Alliance 2690/2695</b>                    |   |   |   |   |   |   |   |   |
| 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  | —   |
| <b>Injectable Volumes Alliance 2790/2795</b>                    |   |   |   |   |   |   |   |   |
| 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   |

\*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   |               |               |              |           |           |                 |                |           |
| <b>Vial Number</b>   | 17            | 18            | 19           | 20        | 21        | 22              | 23             | 24        |
| <b>Compatible Systems</b>  |               |               |              |           |           |                 |                |           |
| Alliance 2690/2695   | ▪             | ▪             | —            | ▪         | ▪         | ▪               | ▪              | —         |
| Alliance 2790/2795   | ▪             | ▪             | ▪            | ▪         | ▪         | —               | —              | ▪         |
| ACQUITY  | ▪             | ▪             | ▪            | ▪         | ▪         | —               | ▪              | ▪         |
| <b>Inserts</b>   |               |               |              |           |           |                 |                |           |
| 300 µL with Poly Spring  | WAT094170(DV) | WAT094170(DV) | —            | —         | —         | WAT094170(DV)   | —              | —         |
| Max Volume Injection/<br>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/<br>Max Residual Volume                         | 144 µL/6 µL   | 144 µL/6 µL   | —            | —         | —         | 144 µL/6 µL     | —              | —         |
| <b>Black Screw Cap for TruView Vials</b>                             |               |               |              |           |           |                 |                |           |
| PTFE/Silicone Septum   | 186005826     | 186005826     | 186005826    | —         | —         | —               | 186005826      | 186005826 |
| Pre-slit PTFE/Silicone Septum  | 186005827     | 186005827     | 186005827    | —         | —         | —               | 186005827      | 186005827 |
| <b>Light Blue Screw Cap for LCMS Certified Vials</b>                 |               |               |              |           |           |                 |                |           |
| PTFE/Silicone Septum   | 186005828     | 186005828     | 186005828    | —         | —         | —               | 186005828      | 186005828 |
| Pre-slit PTFE/Silicone Septum  | 186005829     | 186005829     | 186005829    | —         | —         | —               | 186005829      | 186005829 |
| <b>Screw Cap and Septum-Silicone/PTFE</b>                            |               |               |              |           |           |                 |                |           |
| 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 |
| <b>Screw Cap and Pre-slit Septum-Silicone/PTFE</b>                   |               |               |              |           |           |                 |                |           |
| 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 |
| <b>For Dissolution System</b>  |               |               |              |           |           |                 |                |           |
| Pre-assembled Vial, Cap, and<br>Pre-slit Septum                      | 186000989(DV) | 186003455     | —            | —         | —         | —               | —              | —         |
| <b>Storage Cap</b>   |               |               |              |           |           |                 |                |           |
| Black Solid 9 mm Cap with Silicone/<br>PTFE Liner for Sample Storage | 186007187     | 186007187     | 186007187    | 186007187 | 186007187 | —               | 186007187      | 186007187 |

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.

| 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  |
| <b>Compatible Systems</b>                         |   |   |   |   |   |   |   |   |
| Alliance 2690/2695                                | ▪   | ▪   | —   | ▪   | ▪   | ▪   | ▪   | ▪   |
| Alliance 2790/2795                                | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   | —   |
| ACQUITY   | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   |
| <b>Combination Packs</b>                          |   |   |   |   |   |   |   |   |
| Vial, Cap, and Silicone/wPTFE Septum              | —   | —   | —   | 186002642   | 186005223   | —   | —   | 186000234(DV)   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum      | —   | —   | —   | 186002641   | 186005222   | —   | —   | —   |
| <b>Vials</b>                                      |   |   |   |   |   |   |   |   |
| Vials Only  | WAT094219   | WAT094220   | 186000984   | 186002628   | 186005224   | WAT094222   | WAT094223   | 186000302   |
| Deactivated Vials Only                            | WAT094219DV   | WAT094220DV   | 186000984DV   | —   | —   | WAT094222DV   | WAT094223DV   | 186000302DV   |
| <b>Injectable Volumes Alliance 2690/2695</b>      |   |   |   |   |   |   |   |   |
| 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  |
| <b>Injectable Volumes Alliance 2790/2795</b>      |   |   |   |   |   |   |   |   |
| 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  | —   |
| <b>Inserts</b>                                    |   |   |   |   |   |   |   |   |
| 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   | —   |
| <b>Snap Cap and Septum-Silicone/PTFE</b>          |   |   |   |   |   |   |   |   |
| Blue  | 186000303   | 186000303   | 186000303   | 186000303   | 186000303   | —   | —   | 186000303   |
| Black   | 186002649   | 186002649   | 186002649   | 186002649   | 186002649   | —   | —   | 186002649   |
| Red   | 186002650   | 186002650   | 186002650   | 186002650   | 186002650   | —   | —   | 186002650   |
| <b>Snap Cap and Pre-slit Septum-Silicone/PTFE</b> |   |   |   |   |   |   |   |   |
| Blue  | 186000304   | 186000304   | 186000304   | 186000304   | 186000304   | —   | —   | 186000304   |
| Black   | 186002648   | 186002648   | 186002648   | 186002648   | 186002648   | —   | —   | 186002648   |
| Red   | 186002647   | 186002647   | 186002647   | 186002647   | 186002647   | —   | —   | 186002647   |
| <b>Snap Cap and PTFE Septum</b>                   |   |   |   |   |   |   |   |   |
| Blue  | 186000328   | 186000328   | 186000328   | 186000328   | 186000328   | —   | —   | 186000328   |
| Black   | 186002645   | 186002645   | 186002645   | 186002645   | 186002645   | —   | —   | 186002645   |
| Red   | 186002646   | 186002646   | 186002646   | 186002646   | 186002646   | —   | —   | 186002646   |
| <b>Crimp Cap</b>                                  |   |   |   |   |   |   |   |   |
| 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   |                  |                  |                  |                  |                  |                  |
| <b>Plates</b>  | <b>186002643</b> | <b>186005837</b> | <b>186002481</b> | <b>186002482</b> | <b>186002632</b> | <b>186002631</b> |
| Pack Size  | 100              | 25               | 50               | 50               | 50               | 50               |
| Well Volume  | 350 µL           | 700 µL           | 800 µL           | 2 mL             | 250 µL           | 100 µL           |
| <b>Sealing Options</b>   |                  |                  |                  |                  |                  |                  |
| 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               |
| Height of Plate  | 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<br>Screw Neck  | Amber<br>Screw Neck   | Total<br>Recovery   | PP Screw<br>Neck Vial   | PP<br>Conical   | Glass<br>Shell Vial   | Amber Glass<br>Shell Vial   |
|-----------------------------|---|---|---|---|---|---|---|
| 15 × 45 mm                  |  |  |  |  |  |  |  |
| <b>48-position Carousel</b> | <b>33</b>   | <b>34</b>   | <b>35</b>   | <b>36</b>   | <b>37</b>   | <b>38</b>   | <b>39</b>   |

| Combination Packs   |             |             |            |   |           |           |           |
|---|-------------|-------------|------------|---|-----------|-----------|-----------|
| Vial, Cap, and LectraBond PTFE/Silicone Septum              | 186000838C  | 186001133C  | 186002629C | — | —         | —         | —         |
| Combination Deactivated                                     | 186000838DV | 186001133DV | —          | — | —         | —         | —         |
| Vial, Cap, and LectraBond Pre-slit PTFE/<br>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 <sup>1</sup> | —             | —               | —               |
| 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,<br>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 <sup>2</sup>                         | WAT072704(DV)   | WAT072704(DV)   | —             | —                      | —             | —               | —               |
| Max Volume Injection/Max Residual Volume                 | 244 µL/6 µL     | 244 µL/6 µL     | —             | —                      | —             | —               | —               |
| 250 µL Glass Insert, 144/pk <sup>2</sup>                 | 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 <sup>2</sup> | 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/<br>PTFE Liner for Sample Storage | 186007224 | 186007224 | 186007224 | — | — | — | — |

<sup>1</sup>Item contains 1000 vials.

<sup>2</sup>Inserts requires springs, p/n: WAT072708.

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 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     | —             | —           | —            |

\*Vials not certified.

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 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   |  |  |  |  |  |  |
| <b>Vial Number</b>   | 44  | 45  | 46  | 47  | 48  | 49  |
| <b>LCMS Certified Combination Packs</b>                          |   |   |   |   |   |   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                     | 600000668CV   | 600000669CV   | 600000670CV   | 600000755CV   | —   | —   |
| <b>LC/GC Certified Combination Packs</b>                         |   |   |   |   |   |   |
| 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  | —   | —   |
| <b>Combination Packs</b>   |   |   |   |   |   |   |
| Bonded Pre-slit Silicone/PTFE Septum                             | —   | —   | —   | —   | 186002639   | —   |
| Bonded Silicone/PTFE Septum                                      | —   | —   | —   | —   | 186002640   | —   |
| <b>Injectable Volumes ACQUITY UPLC</b>                           |   |   |   |   |   |   |
| Max  | 1600 µL   | 1600 µL   | 1100 µL   | 1100 µL   | 240 µL  | —   |
| Residual   | 150 µL  | 150 µL  | 10 µL   | 10 µL   | 10 µL   | —   |
| <b>Components</b>  |   |   |   |   |   |   |
| 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   |
| <b>Storage Cap</b>   |   |   |   |   |   |   |
| 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 67.

## Plates for Waters 2707 Autosampler

| Well Shape                               | 96-well Plates  |   |   |  | 384-well Plates   |   |
|--|---|---|---|--|---|---|
|  |  |  |  |  |  |  |
| <b>Plates</b>                            | 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  |
| <b>Sealing Options</b>                   |   |   |   |  |   |   |
| 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   |  |  |  |  |  |  |  |  |
| <b>Vial Number</b>   | <b>60</b>   | <b>61</b>   | <b>62</b>   | <b>63</b>   | <b>64</b>  | <b>65</b>   | <b>66</b>   | <b>67</b>   |
| <b>Compatible Systems</b>  |   |   |   |   |  |   |   |   |
| Agilent Technologies, Beckman, Dynatech, Finnigan, Fisons, Gilson, Hitachi, LDC, Perkin-Elmer, Shimadzu, Spectra-Physics, Varian | ▪   | ▪   | ▪   | ▪   | ▪  | ▪   | ▪   | ▪   |
| CTC, Spark, Thermal Separations  | —   | —   | —   | —   | —  | —   | ▪   | ▪   |
| <b>Combination Packs</b>   |   |   |   |   |  |   |   |   |
| 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)   | —  | —   | —   | —   |
| <b>Vials Only</b>  |   |   |   |   |  |   |   |   |
| Vials Only   | WAT094219   | WAT094220   | 186000984   | —   | 186002628  | 186005224   | WAT094222   | WAT094223   |
| Deactivated Vials Only   | WAT094219DV   | WAT094220DV   | 186000984DV   | —   | —  | —   | WAT094222DV   | WAT094223DV   |
| <b>Inserts</b>   |   |   |   |   |  |   |   |   |
| 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)   |
| <b>Snap Cap and Septum-Silicone/PTFE</b>   |   |   |   |   |  |   |   |   |
| Blue   | 186000303   | 186000303   | 186000303   | 186000303   | 186000303  | 186000303   | —   | —   |
| Black  | 186002649   | 186002649   | 186002649   | 186002649   | 186002649  | 186002649   | —   | —   |
| Red  | 186002650   | 186002650   | 186002650   | 186002650   | 186002650  | 186002650   | —   | —   |
| <b>Snap Cap and Pre-slit Septum-Silicone/PTFE</b>  |   |   |   |   |  |   |   |   |
| Blue   | 186000304   | 186000304   | 186000304   | 186000304   | 186000304  | 186000304   | —   | —   |
| Black  | 186002648   | 186002648   | 186002648   | 186002648   | 186002648  | 186002648   | —   | —   |
| Red  | 186002647   | 186002647   | 186002647   | 186002647   | 186002647  | 186002647   | —   | —   |
| <b>Snap Cap and PTFE Septum</b>  |   |   |   |   |  |   |   |   |
| Blue   | 186000328   | 186000328   | 186000328   | 186000328   | 186000328  | 186000328   | —   | —   |
| Black  | 186002645   | 186002645   | 186002645   | 186002645   | 186002645  | 186002645   | —   | —   |
| Red  | 186002646   | 186002646   | 186002646   | 186002646   | 186002646  | 186002646   | —   | —   |
| <b>Crimp Cap</b>   |   |   |   |   |  |   |   |   |
| Crimp Cap Silicone/PTFE Septum   | —   | —   | —   | —   | —  | —   | PSL404219   | PSL404219   |
| Crimp Cap PTFE/Silicone/PTFE Septum  | —   | —   | —   | —   | —  | —   | PSL404231   | PSL404231   |

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

 For the complete selection of 12 × 32 mm vials refer to page 56.



## Screw Cap Vials for Compatible Systems











|   | Clear   | Amber   | Amber<br>Max Recovery   | Clear Glass<br>Max Recovery   | Qsert<br>Vial   | Amber<br>Qsert  | PP<br>300 µL   | PP<br>750 µL  | 10 mm<br>Cap  | PP 250 µL<br>8 mm Cap   |
|---|---|---|---|---|---|---|--|---|---|---|
| 12 × 32 mm  |  |  |  |  |  |  |  |  |  |  |
| <b>Vial Number</b>  | <b>50</b>   | <b>51</b>   | <b>52</b>   | <b>53</b>   | <b>54</b>   | <b>55</b>   | <b>56</b>  | <b>57</b>   | <b>58</b>   | <b>59</b>   |
| <b>Compatible Systems</b>   |   |   |   |   |   |   |  |   |   |   |
| Agilent Technologies  | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   | ▪  | ▪   | —   | —   |
| Alcott, Antek, CTC, Spark Thermal Separations                         | —   | —   | —   | —   | —   | —   | —  | —   | ▪   | ▪   |
| Beckman, Dynatech, Finnigan, Fisons, Gilson                           | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   | ▪  | ▪   | —   | —   |
| Hitachi, LDC, Perkin-Elmer, Shimadzu, Spectra-Physics, Thermo, Varian | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   | ▪  | ▪   | ▪   | ▪   |
| <b>LCMS Certified Combination Packs</b>                               |   |   |   |   |   |   |  |   |   |   |
| Vial, Cap, and Silicone/PTFE Septum                                   | 600000751CV   | 600000752CV   | 600000754CV   | 600000749CV   | —   | —   | —  | —   | —   | —   |
| Vial, Cap, and Pre-slit Silicone/PTFE Septum                          | 600000668CV   | 600000669CV   | 600000755CV   | 600000670CV   | —   | —   | —  | —   | —   | —   |
| <b>LC/GC Certified Combination Packs</b>                              |   |   |   |   |   |   |  |   |   |   |
| Bonded Silicone/PTFE Septum   | 186000272C  | 186000846C  | 186003885C  | 186000326C  | 186001126C  | 186001130C  | —  | —   | WAT270946C <sup>1</sup>   | —   |
| Combination Deactivated <sup>2</sup>                                  | 186000272DV   | 186000846DV   | —   | 186000326DV   | 186001126DV   | 186001130DV   | —  | —   | WAT270946DV   | —   |
| Bonded Pre-slit Silicone/PTFE Septum                                  | 186000307C  | 186000847C  | 186003886C  | 186000327C  | 186001128C  | 186001131C  | —  | —   | —   | —   |
| Combination Deactivated <sup>2</sup>                                  | 186000307DV   | 186000847DV   | —   | 186000327DV   | 186001128DV   | 186001131DV   | —  | —   | —   | —   |
| <b>Combination Packs</b>  |   |   |   |   |   |   |  |   |   |   |
| Bonded Silicone/PTFE Septum   | —   | —   | —   | —   | —   | —   | 186002640  | 186005220   | —   | —   |
| Bonded Pre-slit Silicone/PTFE Septum                                  | —   | —   | —   | —   | —   | —   | 186002639  | 186005221   | —   | —   |
| <b>Vials Only</b>   |   |   |   |   |   |   |  |   |   |   |
| Vials Only  | 186000273   | 186000848   | —   | 186002802   | 186002804   | 186002803   | 186002626  | 186005219   | WAT063300   | WAT094172   |
| Deactivated Vials Only  | 186000273DV   | 186000848DV   | —   | —   | —   | —   | —  | —   | WAT063300DV   | —   |
| <b>Inserts</b>  |   |   |   |   |   |   |  |   |   |   |
| 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   | —   |

<sup>1</sup> Septum not bonded.

<sup>2</sup> Not certified.








All items come in quantities of 100 unless otherwise noted.

## Screw Cap Vials for Compatible Systems

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

All items come in quantities of 100 unless otherwise noted.

## Vials for Compatible Systems

|   | 4 mL<br>Screw Neck  | Amber<br>Screw Neck   | Total<br>Recovery   | PP Screw<br>Neck Vial   | PP<br>Snap Cap  | Glass<br>Shell Vial   | Amber Glass<br>Shell Vial   |
|---|---|---|---|---|---|---|---|
| 15 × 45 mm  |  |  |  |  |  |  |  |
| <b>Vial Number</b>  | <b>68</b>   | <b>69</b>   | <b>70</b>   | <b>71</b>   | <b>72</b>   | <b>73</b>   | <b>74</b>   |
| <b>Compatible Systems</b>   |   |   |   |   |   |   |   |
| Bruker, Kontron, Perkin-Elmer, Shimadzu, Tosoh, Unicam              | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   | ▪   |
| <b>Combination Packs</b>  |   |   |   |   |   |   |   |
| 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   |
| <b>Components</b>   |   |   |   |   |   |   |   |
| Vials Only  | 186000840   | 186001135   | 186002520   | 186000999 <sup>1</sup>  | —   | —   | —   |
| Deactivated Vials Only  | 186000840DV   | 186001135DV   | —   | —   | —   | —   | —   |
| <b>LectraBond Cap and Septum</b>                                    |   |   |   |   |   |   |   |
| 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   | —   | —   | —   | —   |
| <b>Caps, Septa, and Inserts</b>                                     |   |   |   |   |   |   |   |
| 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   | —   | —   | —   | —   |
| <b>Storage Cap</b>  |   |   |   |   |   |   |   |
| Black Solid Cap with Silicone/PTFE Liner for Sample Storage, 100/pk | 186007224   | 186007224   | 186007224   | —   | —   | —   | —   |

<sup>1</sup>Item contains 1000 vials.

## Vial 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           | Waters Clear Maximum Recovery Vial, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). |
| 4           | Waters Amber Maximum Recovery Vial, 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           | Waters Total Recovery Vial, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).         |

### Vials for Alliance Systems

| Vial 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 Vial 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          | Total Recovery Vial Clear 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).   |
| 15          | Amber Maximum Recovery Vial, 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).           |

| Vial 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 Vial 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          | Total Recovery Vial Clear 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).   |
| 24          | Amber Maximum Recovery Vial, 12 × 32, Type 1 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). |

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

| Vial Number | Vials for Waters 717 Autosampler: 15 × 45 mm Vials                              |
|-------------|---|
| 33          | Clear 15 × 45, Type 1, 33-Expansion Glass, Screw Neck Vial.                     |
| 34          | Amber 15 × 45, Type 1, 51-Expansion Glass, Screw Neck Vial.                     |
| 35          | Total Recovery Screw Neck Vial Clear Glass 15 × 45, Type 1, 33-Expansion Glass. |
| 36          | Polypropylene 15 × 45, 3 mL Round Bottom Screw Neck Vial, 1000/pk.              |
| 37          | Polypropylene Snap Cap Vial with Conical Bottom, PE Snap Caps.                  |
| 38          | 4 mL Glass Shell Vial with Polyethylene Snap Cap, Type 1, 51-Expansion Glass.   |
| 39          | 4 mL Amber Shell Vial with Polyethylene Snap Cap, Type 1, 51-Expansion Glass.   |

| Vial Number | Vials for Waters 717 Autosampler: 8 × 40 mm Vials  |
|-------------|--|
| 40          | 1 mL Clear Glass Shell Vial (8 × 40 mm) Type 1, 51-Expansion Glass with Polyethylene Snap Cap, 250/pk.         |
| 41          | 1 mL Amber Glass Shell Vial (8 × 40 mm) Type 1, 51-Expansion Glass with Polyethylene Snap Cap, Type 1, 250/pk. |
| 42          | Total Recovery Clear Glass Vial (8 × 40 mm) with Polyethylene Snap Cap, Type 1, 51-Expansion Glass.            |
| 43          | 650 µL Polypropylene Vial (8 × 40 mm) with Polyethylene Snap Cap.  |

### Vials for Compatible Systems

| Vial 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          | Waters Maximum Recovery Vial, 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap).       |
| 47          | Waters Amber Maximum Recovery Vial, 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 Screw Neck Vial.   |

| Vial 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 Vial 12 × 32, Type 1, 51-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). |
| 53          | Clear Maximum Recovery Vial 12 × 32, Type 1, 33-Expansion Glass, Screw Neck with Quick Thread Design (6 mm opening, 9 mm cap). |
| 54          | Qsert Vial Clear Screw Cap Glass Vial, Quick Thread Design with Fused in Glass Insert (6 mm opening, 9 mm cap).                |
| 55          | Qsert Vial Amber Screw Cap Glass Vial, 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 Vial (6 mm opening, 8 mm cap).  |

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

| 15 × 45 mm Vials for Compatible Systems: Vials and Accessories |   |
|--|---|
| 68   | Clear 15 × 45, Type 1, 33-Expansion Glass, Screw Neck Vial.                               |
| 69   | Amber 15 × 45, Type 1, 51-Expansion Glass, Screw Neck Vial.                               |
| 70   | Waters Total Recovery Screw Neck Vial Clear Glass 15 × 45 mm, Type 1, 33-Expansion Glass. |
| 71   | Polypropylene 15 × 45, 3 mL Screw Neck Vial.  |
| 72   | Polypropylene Snap Cap Vial with Conical Bottom, PE Snap Caps.                            |
| 73   | 4 mL Glass Shell Vial with Polyethylene Snap Cap, Type 1, 51-Expansion Glass.             |
| 74   | 4 mL Amber Shell Vial with Polyethylene Snap Cap, Type 1, 51-Expansion Glass.             |
| 15 × 45 mm Vials for Compatible Systems: GPC 2000 Vials        |   |
| 75   | 4 mL Glass Screw Neck Vial, Type 1, 33-Expansion Glass for GPC 2000.                      |
| 76   | 10 mL Screw Neck Glass Vial for GPC 2000.   |

## Vials Troubleshooting Guide

| Problem   | Impact   | Solution   |
|---|--|--|
| Septum dislodged during shipment or use   | <ul style="list-style-type: none"> <li>Need to insert septum or rerun analysis</li> <li>Loss of time</li> </ul>  | <ul style="list-style-type: none"> <li>Check to see if needle is piercing in center of septa</li> <li>Check to see if needle is sharp</li> </ul>   |
| Vacuum forms in vial during sample draw   | <ul style="list-style-type: none"> <li>Sample spill over</li> <li>Sample draw reproducibility problems</li> </ul>  | <ul style="list-style-type: none"> <li>Use pre-slit septa, which provides proper venting, eliminating sample spill over and insuring reproducible sample draw volumes</li> </ul>   |
| Sample-limited applications require the use of cumbersome low-volume inserts  | <ul style="list-style-type: none"> <li>Increased labor required for inserting the LVI into the vial leads to delays in sample processing</li> <li>Increased labor time and difficulty when pipetting into small neck opening of LVI</li> <li>Additional handling increases chance of contamination</li> <li>Increased costs from purchasing multiple components: vial, cap, and LVI</li> </ul> | <ul style="list-style-type: none"> <li>Use Waters Total Recovery Vial and Maximum Recovery Vial:                             <ul style="list-style-type: none"> <li>No need to use LVIs</li> <li>Wide neck opening for easy sample pipetting</li> <li>One less handling step reduces chance of contamination</li> <li>Only need one component, saving storage space and costs</li> </ul> </li> </ul> |
| 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 | <ul style="list-style-type: none"> <li>Increased labor to fill additional sample vials</li> <li>Increased cost to purchase additional sample vials and LVIs</li> </ul>   | <ul style="list-style-type: none"> <li>Use Waters Total Recovery Vial and Maximum Recovery Vial</li> <li>The increased capacity and low residual volume allows you to perform multiple injections with minimum residual volume in a single vial</li> </ul>   |
| Need to use glass inserts in a 96-well plate format but it requires capping each insert one-at-a-time   | <ul style="list-style-type: none"> <li>Delay in sample processing</li> </ul>   | <ul style="list-style-type: none"> <li>The glass inserts in the Waters 96-well format allows for the use of a sealing cap mat, saving time and labor</li> </ul>  |
| Frequent needle damage  | <ul style="list-style-type: none"> <li>Downtime causing missed deadlines</li> <li>Cost of repairs</li> </ul>   | <ul style="list-style-type: none"> <li>All Waters vials have dimensional specifications that eliminate the potential of needle damage</li> </ul>   |
| Laboratory owns HPLC instruments from several different manufacturers   | <ul style="list-style-type: none"> <li>Purchasing several different vials</li> <li>Increased number of purchase orders</li> <li>Unable to take advantage of quantity discounts, leading to higher costs</li> </ul>   | <ul style="list-style-type: none"> <li>The tight dimensional tolerances on all Waters vials and accessories make them ideal for use with virtually all HPLC systems</li> <li>Reduce the number of purchase orders and take advantage of quantity discounts by buying all your sample vials from Waters</li> </ul>  |
| Analyte compounds are sticking to the glass surface of the vial   | <ul style="list-style-type: none"> <li>Loss of sample</li> <li>Loss of time</li> <li>Need to run the analysis again</li> </ul>   | <ul style="list-style-type: none"> <li>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</li> </ul>   |
| Inconsistent quality between laboratory sites   | <ul style="list-style-type: none"> <li>N/A</li> </ul>  | <ul style="list-style-type: none"> <li>Waters vials are distributed worldwide from the same source</li> </ul>  |

### 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

## 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 documenting TOC level.



### Ordering Information

#### Certified Containers

| Description                         | Contents   | P/N       |
|-------------------------------------|--|-----------|
| Certified Container Kit             | Kit includes:<br>(4) 1 L certified containers, (3) 500 mL certified containers<br>(1) certified container cap kit    | 186007088 |
| Certified Container, 1000 mL Volume | 1 certified container  | 186007089 |
| Certified Container, 500 mL Volume  | 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 includes:<br>(5) 250 mL certified containers, (1) 500 mL certified container,<br>(1) certified container cap kit | 186007278 |

#### Related Parts to Certified Containers

| Description                                 | P/N       |
|---|-----------|
| Solvent Bottle Caps, 1 L, 4/pk              | WAT062479 |
| Solvent Bottle Caps, 4 L, 4/pk              | WAT062341 |
| Stainless Steel Filter Assembly             | PSL613457 |
| Tubing, Clear Teflon, 1/16 in. I.D. × 25 ft | WAT077043 |
| Tubing, Green Teflon, 1/16 in. I.D. × 25 ft | WAT077044 |
| ACQUITY/Alliance Bottle Accessory Kit       | 205000589 |
| Alliance Bottle Tray Kit                    | 205000329 |



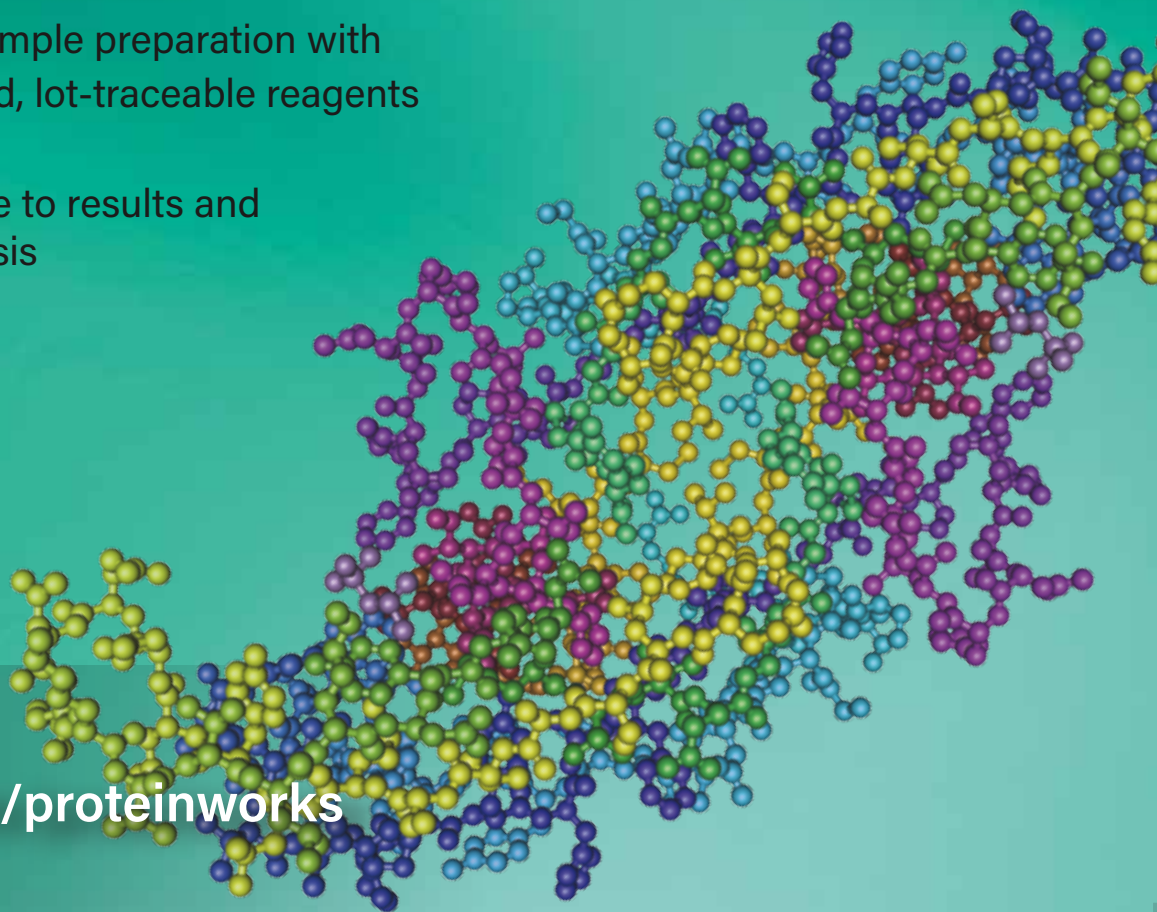
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Take the complexity out of protein quantification

- Reproducible and accurate results for several monoclonal antibodies
- Standardized approach to protein quantification
- Simplified sample preparation with pre-measured, lot-traceable reagents
- Reduced time to results and cost of analysis

[waters.com/proteinworks](http://waters.com/proteinworks)

See page 298 for more information.



# How to Choose a Column



"You can trust that products made today will be the same as products made 30 years from now."

~ Mike Costello, Senior Master Scheduler, Taunton, MA, U.S.A.

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# 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

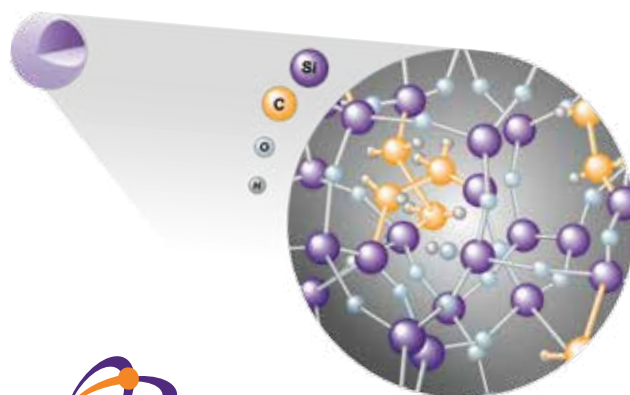
Reproducibility and transferability are the cornerstones of Waters' BEH, CSH,<sup>™</sup> HSS, and solid-core particle technologies. Our premier lines of scalable LC columns exhibit all of the chemical and physical characteristics you would expect from modern LC packing materials.



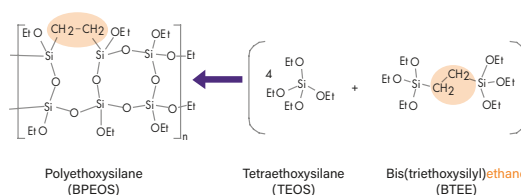
| BEH Technology   | CSH Technology   | HSS Technology  | Solid-Core Technology  |
|--|--|---|--|
| <ul style="list-style-type: none"> <li>High retentivity for basic compounds</li> <li>Exceptional peak shape at elevated pH</li> <li>Good universal column choice for a wide variety of compounds</li> <li>Stable across a wide pH range</li> <li>For separations at high temperatures (80 °C)</li> </ul> | <ul style="list-style-type: none"> <li>Good separations for basic compounds under low pH conditions</li> <li>Excellent MS performance with formic acid as a mobile phase modifier</li> <li>Fast pH switching and column equilibration</li> </ul> | <ul style="list-style-type: none"> <li>High retentivity for polar organic compounds and metabolites</li> <li>Balanced retention of polar and hydrophobic analytes</li> <li>High strength silica for mechanical stability</li> </ul> | <ul style="list-style-type: none"> <li>Maximum efficiency</li> <li>Increased sensitivity</li> <li>Seamless scalability from UPLC to UHPLC to HPLC</li> </ul> |

### 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, alkaline, and neutral species. The BEH-particle family includes general-purpose and application-specific bonded phases that serve application areas that rely on ACQUITY UPLC, ACQUITY UPC<sup>2</sup>, ACQUITY APC, and XBridge Columns.



#### Particle Synthesis



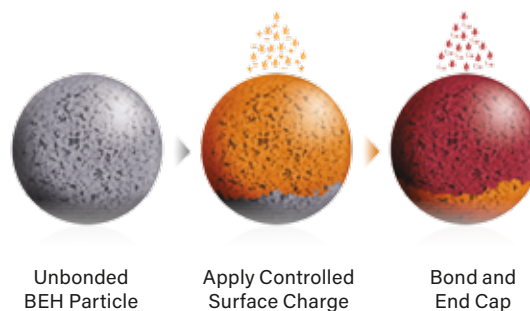
\*US Patents 6,686,035; 7,223,473; 7,250,214.

Refer to "Ethylene-Bridged [BEH Technology<sup>™</sup>] Hybrids and Their Use in Liquid Chromatography" whitepaper (720001159EN) for further detail.

## CHARGED SURFACE HYBRID (CSH) PARTICLE TECHNOLOGY

Columns packed with charged surface hybrid particles manifest the best attributes of BEH particles. CSH stationary phases provide chromatographic selectivity and superior performance in the presence of mobile phases of low ionic strength. The optimized surface charge, pore properties, and bonded phases make charged-surface, hybrid-based columns ideal for rapid method development. ACQUITY UPLC CSH and XSelect® CSH HPLC Columns offer easily scaled analytical solutions, from sub-2- $\mu\text{m}$  to preparative-particle dimensions.

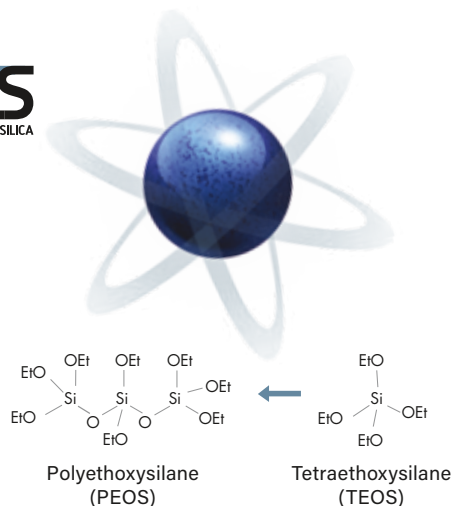
### The Charged-Surface Hybrid Particle



## HIGH STRENGTH SILICA (HSS) PARTICLE TECHNOLOGY

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

**HSS**  
HIGH STRENGTH SILICA



## SOLID-CORE PARTICLE TECHNOLOGY

Compared to columns packed with fully-porous particles, those packed with superficially porous particles demonstrate higher chromatographic efficiency and lower backpressures. The optimized porous layer that surrounds the solid-silica substrate gives rise to the key benefits of speed and efficiency. UPLC columns packed with CORTECS® 1.6  $\mu\text{m}$  particles yield maximum efficiency when used with the ultra-low dispersion ACQUITY UPLC instrument platform. Fully scalable CORTECS Columns packed with 2.7  $\mu\text{m}$  particles offer maximum flexibility, providing increased efficiencies at the backpressure limits of UHPLC and HPLC operation.

### Solid-Core Particle

The tightly controlled thickness of a highly porous silica layer surrounding the inner solid-core yields reproducible retention and method robustness for a wide range of sample conditions.

### Bonding Technology

Packed with solid-core particles, CORTECS Columns complement our family of particle technologies, offering unique ligand attributes that aid in method development.

### Particle Diameter

Monodisperse particle sizing provides highly permeable columns and, consequently, low backpressures.

### Packing Efficiency

The increased efficiency of a solid-core particle produces more chromatographic resolution, which helps reduce the effort to separate co-eluting peaks.

## 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 brands of Waters columns that are registered according to classifications prescribed in the United States Pharmacopeia (USP).

### USP "L" COLUMN LISTING

| L1 Octadecylsilane (ODS or C <sub>18</sub> ) chemically bonded to porous silica or ceramic particles—1.5 to 10 µm in diameter. |               |           |          |
|--|---------------|-----------|----------|
| Brand  | Particle Size | Type      | Page     |
| AccQ-Tag Ultra   | 1.7 µm        | Spherical | 245      |
| ACQUITY UPLC BEH C <sub>18</sub>   | 1.7 µm        | Spherical | 96       |
| ACQUITY UPLC BEH Shield RP18   | 1.7 µm        | Spherical | 96       |
| ACQUITY UPLC CSH C <sub>18</sub>   | 1.7 µm        | Spherical | 91       |
| ACQUITY UPLC HSS C <sub>18</sub>   | 1.7 µm        | Spherical | 102      |
| ACQUITY UPLC HSS C <sub>18</sub> SB  | 1.8 µm        | Spherical | 102      |
| ACQUITY UPLC HSS T3  | 1.8 µm        | Spherical | 102      |
| ACQUITY UPLC Oligonucleotide C <sub>18</sub>   | 1.7 µm        | Spherical | 258      |
| Atlantis T3  | 3, 5, 10 µm   | Spherical | 156, 208 |
| Atlantis dC <sub>18</sub>  | 3, 5, 10 µm   | Spherical | 156, 208 |
| CORTECS C <sub>18</sub>  | 2.7 µm        | Spherical | 116      |
| CORTECS C <sub>18</sub> +  | 2.7 µm        | Spherical | 116      |
| CORTECS Shield RP18  | 2.7 µm        | Spherical | 117      |
| CORTECS T3   | 2.7 µm        | Spherical | 117      |
| CORTECS UPLC C <sub>18</sub>   | 1.6 µm        | Spherical | 88       |
| CORTECS UPLC C <sub>18</sub> +   | 1.6 µm        | Spherical | 88       |
| CORTECS UPLC Shield RP18   | 1.6 µm        | Spherical | 88       |
| CORTECS UPLC T3  | 1.6 µm        | Spherical | 88       |
| Delta-Pak C <sub>18</sub>  | 5 µm          | Spherical | 174      |
| µBondapak C <sub>18</sub>  | 10 µm         | Irregular | 175      |
| µBondapak C <sub>18</sub> Radial-Pak   | 10 µm         | Irregular | 22       |

| L1 Octadecylsilane (ODS or C <sub>18</sub> ) chemically bonded to porous silica or ceramic particles—1.5 to 10 µm in diameter. |                    |           |               |
|--|--------------------|-----------|---------------|
| Brand  | Particle Size      | Type      | Page          |
| Nova-Pak C <sub>18</sub>   | 4, 6 µm            | Spherical | 173, 190, 223 |
| Prep Nova-Pak HR C <sub>18</sub>   | 6 µm               | Spherical | 214           |
| Resolve C <sub>18</sub>  | 5, 10 µm           | Spherical | 174, 222      |
| SunFire C <sub>18</sub>  | 2.5, 3.5, 5, 10 µm | Spherical | 132, 159, 205 |
| Symmetry C <sub>18</sub>   | 3.5, 5 µm          | Spherical | 167           |
| SymmetryPrep C <sub>18</sub>   | 5, 7 µm            | Spherical | 212           |
| Symmetry300 C <sub>18</sub>  | 3.5, 5 µm          | Spherical | 163           |
| SymmetryShield RP18  | 3.5, 5 µm          | Spherical | 163           |
| Waters Spherisorb ODS1   | 3, 5, 10 µm        | Spherical | 171, 213      |
| Waters Spherisorb ODS2   | 3, 5, 10 µm        | Spherical | 171, 213      |
| Waters Spherisorb ODSB   | 5 µm               | Spherical | 171           |
| XBridge Peptide BEH, 130Å  | 3.5, 5, 10 µm      | Spherical | 268           |
| XBridge Peptide BEH, 300Å  | 3.5, 5, 10 µm      | Spherical | 268           |
| XBridge C <sub>18</sub>  | 2.5, 3.5, 5, 10 µm | Spherical | 122, 140, 197 |
| XBridge Oligonucleotide C <sub>18</sub>  | 2.5 µm             | Spherical | 200, 258      |
| XBridge Shield RP18  | 2.5, 3.5, 5, 10 µm | Spherical | 122, 141, 198 |
| XSelect CSH C <sub>18</sub>  | 2.5, 3.5, 5 µm     | Spherical | 126, 148      |
| XSelect HSS C <sub>18</sub>  | 2.5, 3.5, 5 µm     | Spherical | 128, 149      |
| XSelect HSS C <sub>18</sub> SB   | 2.5, 3.5, 5 µm     | Spherical | 128, 150      |
| XSelect HSS T3   | 2.5, 3.5, 5 µm     | Spherical | 128, 150      |
| XTerra MS C <sub>18</sub>  | 2.5, 3.5, 5, 10 µm | Spherical | 133, 167, 209 |
| XTerra Shield RP18   | 3.5, 5, 10 µm      | Spherical | 168, 210      |

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

Source: United States Pharmacopeia.

**L2** Octadecylsilane (ODS or C<sub>18</sub>) chemically bonded to silica gel of a controlled surface porosity bonded to a solid spherical core—30 to 50 µm in diameter.

**L3** Porous silica particles—1.5 to 10 µm in diameter.

| Brand                  | Particle Size      | Type      | Page          |
|------------------------|--------------------|-----------|---------------|
| ACQUITY UPLC BEH HILIC | 1.7 µm             | Spherical | 97            |
| Atlantis HILIC Silica  | 3, 5 µm            | Spherical | 157           |
| CORTECS UPLC HILIC     | 1.6 µm             | Spherical | 89            |
| CORTECS HILIC          | 2.7 µm             | Spherical | 116           |
| Nova-Pak               | 4, 6 µm            | Spherical | 173, 214      |
| µPorasil               | 10 µm              | Spherical | 175           |
| Resolve                | 5, 10 µm           | Spherical | 174, 222      |
| SunFire Silica         | 5, 10 µm           | Spherical | 159, 205      |
| Waters Spherisorb      | 3, 5, 10 µm        | Spherical | 171, 213      |
| XBridge BEH HILIC      | 2.5, 3.5, 5, 10 µm | Spherical | 123, 142, 198 |

**L4** Silica gel of a controlled surface porosity bonded to a solid spherical core—30 to 50 µm in diameter.

**L5** Alumina of controlled surface porosity bonded to a solid spherical core—30 to 50 µm in diameter.

**L6** Strong cation exchanger packing-sulfonated fluorocarbon polymer coated on a solid spherical core—30 to 50 µm in diameter.

**L7** Octylsilane (C<sub>8</sub>) chemically bonded to porous silica particles—1.5 to 10 µm in diameter.

| Brand                            | Particle Size      | Type      | Page          |
|----------------------------------|--------------------|-----------|---------------|
| ACQUITY UPLC BEH C <sub>8</sub>  | 1.7 µm             | Spherical | 96            |
| Nova-Pak C <sub>8</sub>          | 4, 6 µm            | Spherical | 173, 223      |
| Resolve C <sub>8</sub>           | 10 µm              | Spherical | 222           |
| Waters Spherisorb C <sub>8</sub> | 3, 5, 10 µm        | Spherical | 170, 213      |
| SunFire C <sub>8</sub>           | 3.5, 5, 10 µm      | Spherical | 159, 205      |
| Symmetry C <sub>8</sub>          | 3.5, 5, 7 µm       | Spherical | 162           |
| SymmetryShield RP8               | 3.5, 5 µm          | Spherical | 163, 213      |
| SymmetryPrep C <sub>8</sub>      | 7 µm               | Spherical | 212           |
| XBridge BEH C <sub>8</sub>       | 2.5, 3.5, 5, 10 µm | Spherical | 122, 149, 197 |
| XTerra MS C <sub>8</sub>         | 2.5, 3.5, 5, 10 µm | Spherical | 133, 167, 210 |
| XTerra Shield RP8                | 3.5, 5, 10 µm      | Spherical | 168, 211      |

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

Source: United States Pharmacopeia.

**L8** An essentially monomolecular layer of aminopropylsilane (NH<sub>2</sub>) chemically bonded to totally porous silica gel support—3 to 10 µm in diameter.

| Brand                                  | Particle Size | Type      | Page     |
|--|---------------|-----------|----------|
| µBondapak NH <sub>2</sub>              | 10 µm         | Irregular | 175      |
| High Performance Carbohydrate Analysis | 3, 5 µm       | —         | 177      |
| Waters Spherisorb NH <sub>2</sub>      | 3, 5, 10 µm   | Spherical | 171, 213 |

**L9** 3 to 10 µm irregular, totally porous silica gel having a chemically bonded strongly acidic cation exchanger coating (SCX).

| Brand                 | Particle Size | Type      | Page     |
|-----------------------|---------------|-----------|----------|
| Waters Spherisorb SCX | 5, 10 µm      | Spherical | 172, 214 |

**L10** Nitrile groups (CN) chemically bonded to porous silica particles—3 to 10 µm in diameter.

| Brand                | Particle Size | Type      | Page     |
|----------------------|---------------|-----------|----------|
| µBondapak CN         | 10 µm         | Irregular | 175      |
| Nova-Pak CN HP       | 4 µm          | Spherical | 173      |
| Resolve CN           | 10 µm         | Spherical | 222      |
| Waters Spherisorb CN | 3, 5, 10 µm   | Spherical | 172, 214 |
| XSelect HSS CN       | 3.5, 5 µm     | Spherical | 151      |

**L11** Phenyl groups chemically bonded to porous silica particles—1.5 to 10 µm in diameter.

| Brand                         | Particle Size  | Type      | Page          |
|-------------------------------|----------------|-----------|---------------|
| ACQUITY UPLC CSH Phenyl-Hexyl | 1.7 µm         | Spherical | 91            |
| ACQUITY UPLC BEH Phenyl       | 1.7 µm         | Spherical | 97            |
| µBondapak Phenyl              | 10 µm          | Irregular | 175           |
| Nova-Pak Phenyl               | 4 µm           | Spherical | 173           |
| XBridge BEH Phenyl            | 2.5, 3.5, 5 µm | Spherical | 122, 141, 198 |
| Waters Spherisorb Phenyl      | 3, 5, 10 µm    | Spherical | 171, 214      |
| XSelect CSH Phenyl-Hexyl      | 2.5, 3.5, 5 µm | Spherical | 126, 149, 202 |
| XTerra Phenyl                 | 3.5, 5 µm      | Spherical | 168           |

**L12** A strong anion exchanger 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 | 50 µm         | Irregular | 19   |

**L13** Trimethylsilane (C<sub>1</sub>) chemically bonded to porous silica particles—3 to 10 µm in diameter.

| Brand                            | Particle Size | Type      | Page     |
|----------------------------------|---------------|-----------|----------|
| Waters Spherisorb C <sub>1</sub> | 3, 5, 10 µm   | Spherical | 171, 213 |

**L14** Silica gel having a chemically bonded, strongly basic quaternary ammonium anion exchanger (SAX) coating—5 to 10 µm in diameter.

| Brand                 | Particle Size | Type      | Page     |
|-----------------------|---------------|-----------|----------|
| Waters Spherisorb SAX | 5, 10 µm      | Spherical | 172, 214 |

**L15** Hexylsilane (C<sub>6</sub>) chemically bonded to a totally porous silica particle—3 to 10 μm in diameter.

| Brand                            | Particle Size | Type      | Page     |
|----------------------------------|---------------|-----------|----------|
| Waters Spherisorb C <sub>6</sub> | 3, 5, 10 μm   | Spherical | 171, 213 |

**L16** Dimethylsilane (C<sub>2</sub>) chemically bonded to a totally porous silica particle—5 to 10 μm in diameter.

**L17** Strong cation exchange resin consisting of sulfonated, cross-linked styrene divinylbenzene copolymer in the hydrogen form—7 to 11 μm in diameter.

| Brand                | Particle Size | Type      | Page |
|----------------------|---------------|-----------|------|
| Fast Fruit Juice     | N/A           | N/A       | 178  |
| IC-Pak Ion-Exclusion | 7 μm          | Spherical | 178  |
| IC-Pak Cation        | 10 μm         | Irregular | 181  |
| Shodex RSPak DC-613  | 6 μm          | Spherical | 176  |

**L18** Amino (NH<sub>2</sub>) and Cyano (CN) groups chemically bonded to porous silica particles—3 to 10 μm in diameter.

**L19** Strong cation exchange resin consisting of sulfonated, cross-linked styrene divinylbenzene copolymer in the calcium form—about 9 μm in diameter.

| Brand          | Particle Size | Type      | Page |
|----------------|---------------|-----------|------|
| Sugar-Pak 1    | 9 μm          | Spherical | 177  |
| Shodex SC-1011 | 7 μm          | Spherical | 177  |

**L20** Dihydroxypropane groups chemically bonded to porous silica particles—3 to 10 μm in diameter.

| Brand                   | Particle Size              | Type      | Page |
|-------------------------|----------------------------|-----------|------|
| BioSuite 125, 250, 450Å | 4, 5, 8, 10, (13), (17) μm | Spherical | 294  |
| Insulin HMWP            | —                          | N/A       | 278  |

**L21** A rigid, spherical styrene-divinylbenzene copolymer—5 to 10 μm in diameter.

| Brand                           | Particle Size | Type      | Page |
|---------------------------------|---------------|-----------|------|
| Shodex RSPak 613                | 6 μm          | Spherical | 176  |
| Styragel HR 0.5, 1, 2, 3, and 4 | —             | Spherical | 304  |
| Styragel HR 4E                  | —             | Spherical | 304  |
| Styragel 5E                     | —             | Spherical | 304  |

**L22** A cation-exchange resin made of porous polystyrene with sulfonic acid groups—about 10 μm in size.

| Brand                | Particle Size | Type      | Page |
|----------------------|---------------|-----------|------|
| IC-Pak Ion-Exclusion | 7 μm          | Spherical | 178  |
| Shodex RSPak DC 613  | 6 μm          | Spherical | 176  |
| Shodex SP-0810       | 8 μm          | Spherical | 177  |

**L23** An anion-exchange resin made of porous polymethacrylate or polyacrylate gel with quaternary ammonium groups—about 10 μm in size.

| Brand             | Particle Size    | Type      | Page |
|-------------------|------------------|-----------|------|
| BioSuite Q AXC    | 10, 13 μm        | Spherical | 293  |
| BioSuite DEAE     | (2.5), 10, 13 μm | Spherical | 293  |
| BioSuite Q-PEEK   | 10 μm            | Spherical | 293  |
| IC-Pak Anion      | 10 μm            | Spherical | 181  |
| Protein-Pak Q 8HR | 8 μm             | Spherical | 295  |

**L24** A semi-rigid hydrophilic gel consisting of vinyl polymers with numerous hydroxyl groups on the matrix surface—32 to 63 μm in diameter.

**L25** Packing having the capacity to separate compounds with a molecular weight range from 100 to 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 groups), was found suitable.

| Brand                   | Particle Size | Type      | Page |
|-------------------------|---------------|-----------|------|
| Ultrahydrogel DP, + 120 | 10 μm         | Spherical | 314  |

**L26** Butylsilane (C<sub>4</sub>) chemically bonded to porous silica particles—3 to 10 μm in diameter.

| Brand                                    | Particle Size | Type      | Page     |
|--|---------------|-----------|----------|
| Delta-Pak C <sub>4</sub> , 100Å and 200Å | 5 μm          | Spherical | 174      |
| Symmetry300 C <sub>4</sub>               | 3.5, 5 μm     | Spherical | 163      |
| XBridge BEH C <sub>4</sub> , 300Å        | 3.5, 5, 10 μm | Spherical | 200, 287 |

**L27** Porous silica particles—30 to 50 μm in diameter.

| Brand   | Particle Size | Type      | Page |
|---------|---------------|-----------|------|
| Porasil | 37–55 μm      | Irregular | 175  |

**L28** A multifunctional support which consists of a high purity, 100Å, spherical silica substrate that has been bonded with anionic (amine) functionality in addition to a conventional reversed-phase C<sub>8</sub> functionality.

**L29** Gamma alumina, reversed-phase, low carbon percentage by weight alumina-based polybutadiene spherical particles—5 μm in diameter with a pore diameter of 80Å.

**L30** Ethylsilane chemically bonded to a totally porous silica particle—3 to 10 μm in diameter.

**L31** A strong anion-exchange resin-quaternary amine bonded on latex particles attached to a core of 8.5 μm macroporous particles having a pore size of 2000Å and consisting of ethylvinylbenzene cross-linked with 55% divinyl benzene.

**L32** A chiral-ligand exchange packing—L proline copper complex covalently bonded to irregularly shaped silica particles—5 to 10 μm in diameter.

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

Source: United States Pharmacopeia.



**L33** Packing having the capacity to separate proteins of 4000 to 400,000 daltons. It is spherical, silica-based and processed to provide pH stability.

| Brand                                     | Particle Size | Type      | Page |
|---|---------------|-----------|------|
| ACQUITY UPLC Protein BEH SEC Column, 125Å | 1.7 µm        | Spherical | 279  |
| ACQUITY UPLC Protein BEH SEC Column, 200Å | 1.7 µm        | Spherical | 279  |

**L34** Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the lead form—about 9 µm in diameter.

| Brand          | Particle Size | Type      | Page |
|----------------|---------------|-----------|------|
| Shodex SP-0810 | N/A           | Spherical | 177  |

**L35** Zirconium-stabilized spherical silica packing with a hydrophilic (diol-type) molecular mono layer bonded phase having a pore size of 150Å.

**L36** 3,5-dinitrobenzoyl derivative of L-phenylglycine covalently bonded to a 5 µm aminopropyl silica.

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

| Brand             | Particle Size | Type      | Page |
|-------------------|---------------|-----------|------|
| Ultrahydrogel 250 | N/A           | Spherical | 314  |

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

| Brand         | Particle Size | Type      | Page |
|---------------|---------------|-----------|------|
| Ultrahydrogel | N/A           | Spherical | 314  |

**L39** A hydrophilic-polyhydroxymethacrylate gel of totally porous spherical resin.

| Brand         | Particle Size | Type      | Page |
|---------------|---------------|-----------|------|
| Ultrahydrogel | N/A           | Spherical | 314  |

**L40** Cellulose tris-3,5-dimethylphenylcarbamate coated porous silica particles—5 to 20 µm in diameter.

**L41** Immobilized α1-acid glycoprotein on spherical silica particles—5 µm in diameter.

**L42** Octylsilane and octadecylsilane groups chemically bonded to porous silica particles—5 µm in diameter.

**L43** Pentafluorophenyl groups chemically bonded to silica particles—5 to 10 µm in diameter.

| Brand                     | Particle Size | Type      | Page     |
|---------------------------|---------------|-----------|----------|
| XSelect CSH Fluoro-Phenyl | 5 µm          | Spherical | 148, 202 |
| XSelect HSS PFP           | 5 µm          | Spherical | 151      |

**L44** A multifunctional support, which consists of a high purity, 60Å, spherical silica substrate that has been bonded with a cationic exchanger, sulfonic acid functionality in addition to a convention reversed-phase C<sub>8</sub> functionality.

**L45** Beta cyclodextrin bonded to porous silica particles—5 to 10 µm in diameter.

**L46** Polystyrene/divinylbenzene substrate agglomerated with quaternary amine functionalized latex beads—10 µm in diameter.

**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  | 181  |

**L59** Packing having the capacity to separate proteins by molecular weight over the range of 10 to 500 kDa. It is spherical (10 µm), silica-based, and processed to provide hydrophilic characteristics and pH stability.

| Brand                          | Particle Size | Type      | Page |
|--------------------------------|---------------|-----------|------|
| BioSuite 125, 250, 450Å Series | 4–17 µm       | Spherical | 294  |

(-) - 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 <i>XP</i> (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 <i>XP</i> (2.5 µm) | XSelect CSH <i>XP</i> (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 <i>XP</i> (2.5 µm) | XSelect HSS <i>XP</i> (3.5, 5 µm) | XSelect HSS OBD (5 µm)     |
| —                                 | CORTECS UPLC (1.6 µm)     | CORTECS (2.7 µm)               | —                                 | —                          |

### COLUMN CONFIGURATIONS


















System dispersion, the combined effect of tubing and its connections, sample valves, flow cells, and column end-fittings, is inherent in every chromatographic system. Dispersion causes sample peaks to broaden, owing to dilution, that begins at the injector and ends at the detector's outflow. As the size of particles in an LC column are reduced or the internal diameter and length of the column is decreased, the potential peak broadening in a non-optimized LC system increases. Optimum column configuration, therefore, depends mainly on the extent of sample dispersion within the LC system.

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



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

When you transfer LC methods, instrument bandspread 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 $\mu$ L  |  XBridge 3.5, 5 $\mu$ m   |
| Alliance 2695 HPLC                       | 29 $\mu$ L  |  XSelect 3.5, 5 $\mu$ m<br> CORTECS 2.7 $\mu$ m  |
| Agilent 1260 UHPLC (600 bar)             | 28 $\mu$ L  | <b>3.0–4.6 mm I.D.</b>   |
| Thermo Accela UHPLC                      | 21 $\mu$ L  |  XBridge 2.5, 3.5, 5 $\mu$ m<br> XSelect 2.5, 3.5, 5 $\mu$ m   |
| Agilent 1290 UHPLC (1200 bar)            | 17 $\mu$ L  |  CORTECS 2.7 $\mu$ m<br><b>3.0 mm I.D.</b>  |
| ACQUITY Arc                              | 23 $\mu$ L  |  XBridge 2.5, 3.5, 5 $\mu$ m<br> XSelect 2.5, 3.5, 5 $\mu$ m<br> CORTECS 2.7 $\mu$ m<br><b>3.0 mm I.D.</b> |
| ACQUITY UPLC                             | 12 $\mu$ L  |  ACQUITY UPLC BEH 1.7 $\mu$ m   |
| ACQUITY UPLC H-Class with Column Manager | 12 $\mu$ L  |  ACQUITY UPLC CSH 1.7 $\mu$ m<br> ACQUITY UPLC HSS 1.8 $\mu$ m   |
| ACQUITY UPLC H-Class                     | 9 $\mu$ L   |  CORTECS UPLC 1.6 $\mu$ m<br><b>2.1 mm I.D.</b>   |
| ACQUITY UPLC I-Class (FTN)               | 7.5 $\mu$ L |  ACQUITY UPLC BEH 1.7 $\mu$ m<br> ACQUITY UPLC CSH 1.7 $\mu$ m<br> ACQUITY UPLC HSS 1.8 $\mu$ m       |
| ACQUITY UPLC I-Class (FL)                | 5.5 $\mu$ L |  CORTECS UPLC 1.6 $\mu$ m<br><b>1.0–2.1 mm I.D.</b>   |

\*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 changes the instrument bandspread, affecting the quality of chromatography.

# Sub-2- $\mu\text{m}$ UPLC Columns

Sub-2- $\mu\text{m}$  UPLC Columns



"Everything I do while on-site, I am thinking of the end customer."

~ Maria Hickey, Quality Engineer, Wexford, Ireland

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# Sub-2- $\mu\text{m}$ UPLC Columns



## UltraPerformance Liquid Chromatography

UltraPerformance Liquid Chromatography (UPLC) combines innovations in both instrumentation and column technology, providing significant increases in resolution, speed, and sensitivity.

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. These gains are maximized when UPLC Columns are used in conjunction with low-dispersive ACQUITY UPLC Instruments. A momentous advance in LC technology, the ACQUITY UPLC System maximizes column efficiency by maintaining ultra-low system dispersion. Now narrow-bore columns packed with small particles, of 1.6–1.8  $\mu\text{m}$  size, can achieve maximum performance while operating at pressures as high as 1240 bar (12,400 pK<sub>a</sub>; 18,000 psi).

Our UPLC Column Family of sub-2- $\mu\text{m}$  particles continues to evolve. Among its offerings are solid-core and fully porous particle substrates (CORTECS, BEH 125Å, 130Å, 200Å, 300Å, and 450Å; HSS; and CSH) consisting of 28 chemistries, scalable between HPLC, UHPLC, and UPLC particle sizes. Additionally, we offer nine application-directed UPLC Chemistries for SEC, amino acid analysis, proteins, peptides, oligonucleotides, and glycan analysis. Our vast range of selectivity choices, for both small-molecule and biopharmaceutical applications, ensures a UPLC Column for any application.

### APPLICATION AREA: Explosives Analysis

"This column is both robust and reasonably priced. I have been running EPA 8330B explosive analysis on the same column for months with little sign of degradation. Most importantly, in conjunction with a Waters UPLC, productivity has jumped close to 400% due to runtime reductions from ~45 mins on an HPLC to ~10 mins with this column."

REVIEWER: Jason Schlaff

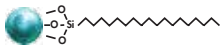
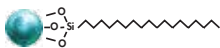

ORGANIZATION: RTI Laboratories



## CORTECS UPLC Columns

CORTECS UPLC 1.6  $\mu\text{m}$  Solid-Core Particle Columns are the performance standard. The sub-2- $\mu\text{m}$ , 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  $\mu\text{m}$  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

|                       | <b>C<sub>18</sub>+<br/>UPLC: 1.6 <math>\mu\text{m}</math></b>                     | <b>C<sub>18</sub><br/>UPLC: 1.6 <math>\mu\text{m}</math></b>                      | <b>Shield RP18<br/>UPLC: 1.6 <math>\mu\text{m}</math></b>                           |
|-----------------------|---|---|---|
| Particle/Ligand       |  |  |  |
| Ligand Density*       | 2.4 $\mu\text{mol}/\text{m}^2$  | 2.7 $\mu\text{mol}/\text{m}^2$  | 3.2 $\mu\text{mol}/\text{m}^2$  |
| Carbon Load*          | 5.7%  | 6.6%  | 6.4%  |
| Endcap Style          | Proprietary   | Proprietary   | Proprietary   |
| 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 $\text{m}^2/\text{g}$   | 100 $\text{m}^2/\text{g}$   | 100 $\text{m}^2/\text{g}$   |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                    |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                              |

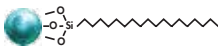
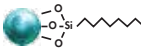
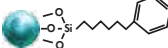

\*Expected or approximate value.

### DID YOU KNOW...

We offer CORTECS Columns packed with 2.7  $\mu\text{m}$  particles to use with HPLC and UHPLC systems.

 For more information, see page 114.



| T3  | C <sub>8</sub>  | Phenyl   | HILIC   |
|---|---|--|---|
| UPLC: 1.6 μm  | UPLC: 1.6 μm  | UPLC: 1.6 μm   | UPLC: 1.6 μm  |
|  |  |  |  |
| 1.6 μmol/m <sup>2</sup>   | 3.4 μmol/m <sup>2</sup>   | 3.2 μmol/m <sup>2</sup>  | N/A   |
| 4.7%  | 4.5%  | 5.9%   | Unbonded  |
| Proprietary   | Proprietary   | Proprietary  | 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 m <sup>2</sup> /g   | 100 m <sup>2</sup> /g   | 100 m <sup>2</sup> /g  | 100 m <sup>2</sup> /g   |
| Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                   | HILIC QC Reference Material<br>p/n: 186007226                                       |
| Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                             | —   |

**APPLICATION AREA:** Pharmacokinetics and Metabolism of Drugs

"The product is of great quality and retention time and pressure are optimal."

**REVIEWER:** Attilio Crea

**ORGANIZATION:** Menarini Ricerche SpA





## Ordering Information

### CORTECS UPLC 1.6 $\mu$ m Columns

|                                   | Dimension                  | P/N (1/pk) | Dimension                  | P/N (3/pk) |
|-----------------------------------|----------------------------|------------|----------------------------|------------|
|                                   | Particle Size: 1.6 $\mu$ m |            | Particle Size: 1.6 $\mu$ m |            |
| <b>C<sub>18</sub><sup>+</sup></b> | 2.1 × 30 mm                | 186007113  | 2.1 × 30 mm                | 176003166  |
|                                   | 2.1 × 50 mm                | 186007114  | 2.1 × 50 mm                | 176003167  |
|                                   | 2.1 × 75 mm                | 186007115  | 2.1 × 75 mm                | 176003168  |
|                                   | 2.1 × 100 mm               | 186007116  | 2.1 × 100 mm               | 176003169  |
|                                   | 2.1 × 150 mm               | 186007117  | 2.1 × 150 mm               | 176003170  |
|                                   | 3.0 × 30 mm                | 186007118  | 3.0 × 30 mm                | 176003171  |
|                                   | 3.0 × 50 mm                | 186007119  | 3.0 × 50 mm                | 176003172  |
|                                   | 3.0 × 75 mm                | 186007120  | 3.0 × 75 mm                | 176003173  |
|                                   | 3.0 × 100 mm               | 186007121  | 3.0 × 100 mm               | 176003174  |
|                                   | 3.0 × 150 mm               | 186007122  | 3.0 × 150 mm               | 176003175  |
| <b>C<sub>18</sub></b>             | 2.1 × 30 mm                | 186007092  | 2.1 × 30 mm                | 176003146  |
|                                   | 2.1 × 50 mm                | 186007093  | 2.1 × 50 mm                | 176003147  |
|                                   | 2.1 × 75 mm                | 186007094  | 2.1 × 75 mm                | 176003148  |
|                                   | 2.1 × 100 mm               | 186007095  | 2.1 × 100 mm               | 176003149  |
|                                   | 2.1 × 150 mm               | 186007096  | 2.1 × 150 mm               | 176003150  |
|                                   | 3.0 × 30 mm                | 186007097  | 3.0 × 30 mm                | 176003151  |
|                                   | 3.0 × 50 mm                | 186007098  | 3.0 × 50 mm                | 176003152  |
|                                   | 3.0 × 75 mm                | 186007099  | 3.0 × 75 mm                | 176003153  |
|                                   | 3.0 × 100 mm               | 186007100  | 3.0 × 100 mm               | 176003154  |
|                                   | 3.0 × 150 mm               | 186007102  | 3.0 × 150 mm               | 176003155  |
| <b>T3</b>                         | 2.1 × 30 mm                | 186008496  | 2.1 × 30 mm                | 176003891  |
|                                   | 2.1 × 50 mm                | 186008497  | 2.1 × 50 mm                | 176003892  |
|                                   | 2.1 × 75 mm                | 186008498  | 2.1 × 75 mm                | 176003893  |
|                                   | 2.1 × 100 mm               | 186008499  | 2.1 × 100 mm               | 176003894  |
|                                   | 2.1 × 150 mm               | 186008500  | 2.1 × 150 mm               | 176003895  |
|                                   | 3.0 × 30 mm                | 186008501  | 3.0 × 30 mm                | 176003896  |
|                                   | 3.0 × 50 mm                | 186008502  | 3.0 × 50 mm                | 176003897  |
|                                   | 3.0 × 75 mm                | 186008503  | 3.0 × 75 mm                | 176003898  |
|                                   | 3.0 × 100 mm               | 186008504  | 3.0 × 100 mm               | 176003899  |
|                                   | 3.0 × 150 mm               | 186008505  | 3.0 × 150 mm               | 176003900  |
| <b>Shield RP18</b>                | 2.1 × 30 mm                | 186008691  | 2.1 × 30 mm                | 176003927  |
|                                   | 2.1 × 50 mm                | 186008692  | 2.1 × 50 mm                | 176003928  |
|                                   | 2.1 × 75 mm                | 186008693  | 2.1 × 75 mm                | 176003929  |
|                                   | 2.1 × 100 mm               | 186008694  | 2.1 × 100 mm               | 176003930  |
|                                   | 2.1 × 150 mm               | 186008695  | 2.1 × 150 mm               | 176003931  |
|                                   | 3.0 × 30 mm                | 186008701  | 3.0 × 30 mm                | 176003932  |
|                                   | 3.0 × 50 mm                | 186008702  | 3.0 × 50 mm                | 176003933  |
|                                   | 3.0 × 75 mm                | 186008703  | 3.0 × 75 mm                | 176003934  |
|                                   | 3.0 × 100 mm               | 186008704  | 3.0 × 100 mm               | 176003935  |
|                                   | 3.0 × 150 mm               | 186008705  | 3.0 × 150 mm               | 176003936  |

CORTECS UPLC 1.6 µm Columns *Continued*

|                      | Dimension             | P/N (1/pk) | Dimension             | P/N (3/pk) |
|----------------------|-----------------------|------------|-----------------------|------------|
|                      | Particle Size: 1.6 µm |            | Particle Size: 1.6 µm |            |
| <b>C<sub>8</sub></b> | 2.1 × 30 mm           | 186008398  | 2.1 × 30 mm           | 176003829  |
|                      | 2.1 × 50 mm           | 186008399  | 2.1 × 50 mm           | 176003830  |
|                      | 2.1 × 75 mm           | 186008400  | 2.1 × 75 mm           | 176003831  |
|                      | 2.1 × 100 mm          | 186008401  | 2.1 × 100 mm          | 176003832  |
|                      | 2.1 × 150 mm          | 186008402  | 2.1 × 150 mm          | 176003833  |
|                      | 3.0 × 30 mm           | 186008408  | 3.0 × 30 mm           | 176003834  |
|                      | 3.0 × 50 mm           | 186008409  | 3.0 × 50 mm           | 176003835  |
|                      | 3.0 × 75 mm           | 186008410  | 3.0 × 75 mm           | 176003836  |
|                      | 3.0 × 100 mm          | 186008411  | 3.0 × 100 mm          | 176003837  |
|                      | 3.0 × 150 mm          | 186008412  | 3.0 × 150 mm          | 176003838  |
| <b>Phenyl</b>        | 2.1 × 30 mm           | 186008378  | 2.1 × 30 mm           | 176003819  |
|                      | 2.1 × 50 mm           | 186008379  | 2.1 × 50 mm           | 176003820  |
|                      | 2.1 × 75 mm           | 186008380  | 2.1 × 75 mm           | 176003821  |
|                      | 2.1 × 100 mm          | 186008381  | 2.1 × 100 mm          | 176003822  |
|                      | 2.1 × 150 mm          | 186008382  | 2.1 × 150 mm          | 176003823  |
|                      | 3.0 × 30 mm           | 186008388  | 3.0 × 30 mm           | 176003824  |
|                      | 3.0 × 50 mm           | 186008389  | 3.0 × 50 mm           | 176003825  |
|                      | 3.0 × 75 mm           | 186008390  | 3.0 × 75 mm           | 176003826  |
|                      | 3.0 × 100 mm          | 186008391  | 3.0 × 100 mm          | 176003827  |
|                      | 3.0 × 150 mm          | 186008392  | 3.0 × 150 mm          | 176003828  |
| <b>HILIC</b>         | 2.1 × 30 mm           | 186007103  | 2.1 × 30 mm           | 176003156  |
|                      | 2.1 × 50 mm           | 186007104  | 2.1 × 50 mm           | 176003157  |
|                      | 2.1 × 75 mm           | 186007105  | 2.1 × 75 mm           | 176003158  |
|                      | 2.1 × 100 mm          | 186007106  | 2.1 × 100 mm          | 176003159  |
|                      | 2.1 × 150 mm          | 186007107  | 2.1 × 150 mm          | 176003160  |
|                      | 3.0 × 30 mm           | 186007108  | 3.0 × 30 mm           | 176003161  |
|                      | 3.0 × 50 mm           | 186007109  | 3.0 × 50 mm           | 176003162  |
|                      | 3.0 × 75 mm           | 186007110  | 3.0 × 75 mm           | 176003163  |
|                      | 3.0 × 100 mm          | 186007111  | 3.0 × 100 mm          | 176003164  |
|                      | 3.0 × 150 mm          | 186007112  | 3.0 × 150 mm          | 176003165  |

## CORTECS UPLC VanGuard™ Pre-columns (Guard Columns), 3/pk

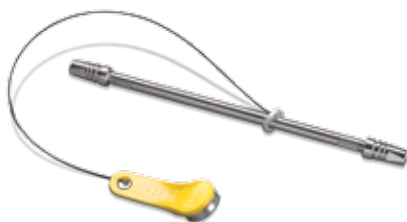
|                        | Dimension             | P/N       | Dimension             | P/N                  |
|------------------------|-----------------------|-----------|-----------------------|----------------------|
|                        | Particle Size: 1.6 µm |           | Particle Size: 1.6 µm |                      |
| <b>C<sub>18</sub>+</b> | 2.1 × 5 mm            | 186007125 | <b>C<sub>8</sub></b>  | 2.1 × 5 mm 186008423 |
| <b>C<sub>18</sub></b>  | 2.1 × 5 mm            | 186007123 | <b>Phenyl</b>         | 2.1 × 5 mm 186008420 |
| <b>T3</b>              | 2.1 × 5 mm            | 186008508 | <b>HILIC</b>          | 2.1 × 5 mm 186007124 |
| <b>Shield RP18</b>     | 2.1 × 5 mm            | 186008713 |                       |                      |

## 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 |
| (For 205000343) 0.2 µm stainless steel replacement filters (×5), with end nuts | 700002775 |



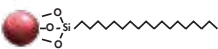
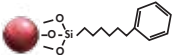
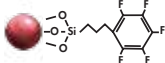
## ACQUITY UPLC Columns

ACQUITY UPLC Columns are designed to work seamlessly with ACQUITY UPLC Instrumentation. The sub-2- $\mu\text{m}$ , fully porous particles technologies, BEH, CSH, and HSS provide high efficiencies along with the widest sub-2- $\mu\text{m}$  selectivity space. Rugged base-particle technologies provide best-in-class column stability and ultimate flexibility for high-throughput method development.

### ACQUITY UPLC 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 basic analytes—without the need for the use of ion-pairing reagents.

#### Column Characteristics

|                        | <b>CSH C<sub>18</sub>, 130Å</b>  | <b>CSH Phenyl-Hexyl, 130Å</b>  | <b>CSH Fluoro-Phenyl, 300Å</b>   |
|------------------------|--|--|--|
|                        | UPLC: 1.7 $\mu\text{m}$  | UPLC: 1.7 $\mu\text{m}$  | UPLC: 1.7 $\mu\text{m}$  |
| <b>Particle/Ligand</b> |  |  |  |
| Ligand Density*        | 2.3 $\mu\text{mol}/\text{m}^2$   | 2.3 $\mu\text{mol}/\text{m}^2$   | 2.3 $\mu\text{mol}/\text{m}^2$   |
| Carbon Load*           | 15%  | 14%  | 10%  |
| Endcap Style           | Proprietary  | Proprietary  | None   |
| 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 $\text{m}^2/\text{g}$  | 185 $\text{m}^2/\text{g}$  | 185 $\text{m}^2/\text{g}$  |
| Performance Standards  | Neutrals QC Reference Material<br>p/n: 186006360                                   | Neutrals QC Reference Material<br>p/n: 186006360                                   | Neutrals QC Reference Material<br>p/n: 186006360                                     |
| Application Standards  | Reversed-Phase QC Reference Material<br>p/n: 186006363                             | Reversed-Phase QC Reference Material<br>p/n: 186006363                             | Reversed-Phase QC Reference Material<br>p/n: 186006363                               |

\*Expected or approximate value.

XSelect Columns are also available in HPLC particle sizes (XSelect HPLC CSH and HSS), refer to pages 125 and 128.

## Ordering Information

### ACQUITY UPLC CSH Columns

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

ACQUITY UPLC CSH VanGuard Pre-columns  
(Guard Columns), 3/pk

|                              | Dimension  | P/N       |
|------------------------------|------------|-----------|
| <b>Particle Size: 1.7 µm</b> |            |           |
| CSH C <sub>18</sub>          | 2.1 × 5 mm | 186005303 |
| CSH Fluoro-Phenyl            | 2.1 × 5 mm | 186005358 |
| CSH Phenyl-Hexyl             | 2.1 × 5 mm | 186005413 |

ACQUITY UPLC Peptide CSH C<sub>18</sub> Columns

|                              | Dimension    | P/N       |
|------------------------------|--------------|-----------|
| <b>Particle Size: 1.7 µm</b> |              |           |
| CSH C <sub>18</sub> 130Å     | 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 Peptide CSH C<sub>18</sub> VanGuard Columns, 3/pk

|                              | Dimension  | P/N                    |
|------------------------------|------------|------------------------|
| <b>Particle Size: 1.7 µm</b> |            |                        |
| CSH C <sub>18</sub>          | 2.1 × 5 mm | 186006939              |
|                              | 2.1 × 5 mm | 176003067 <sup>2</sup> |

<sup>2</sup>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 |
| (For 205000343) 0.2 µm stainless steel replacement filters (x5), with end nuts | 700002775 |

Quality Control Reference Materials

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

**APPLICATION AREA:** Pesticide Residues in Environmental Matrices

"Waters' CSH (Charged Surface Hybrid) columns offer a significant advantage over other types of columns. It offers superior peak shape for nearly all basic compounds, increased loading capacity (meaning more concentrated samples or higher injection volume), rapid column equilibration after changing mobile-phase pH (allows switching between mobile phases for changing retention order), and it is very stable at extreme pH ranges. Overall, it is a very good column that can be used for a variety of analysis."

**REVIEWER:** Tom Phillips

**ORGANIZATION:** State Chemist Section, Maryland Department of Agriculture

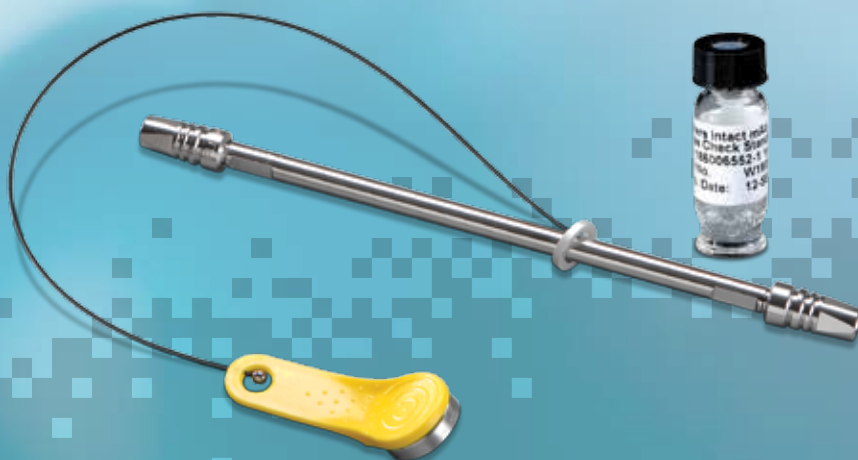


For more information on ACQUITY UPLC Peptide Columns, refer to page 262.

# A Single Column Chemistry for Multiple Glycoprotein Analyses

The ACQUITY UPLC Glycoprotein BEH Amide, 300Å,  
1.7 µm Column offers:

- Optimized wide-pore, HILIC stationary phase for resolving glycoforms from intact or digested glycoproteins
- Generation of domain specific glycan linkages with or without MS
- Elucidation of site specific glycan occupancy
- 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)
- QC tested with Waters Glycoprotein Performance Test Standard



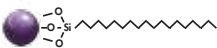
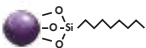

[waters.com/glycoprotein](http://waters.com/glycoprotein)

See page 250 for more information.

## ACQUITY UPLC BEH Columns

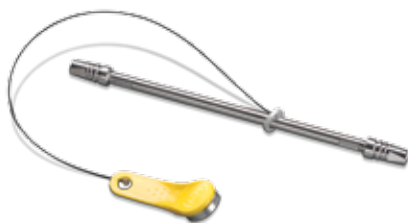
ACQUITY UPLC BEH Columns provide unprecedented levels of peak asymmetry, efficiency, and chemical stability. Available in both reversed-phase and HILIC, with chemistries that provide selectivity for many small-molecule compounds, these robust columns can operate at conditions of extreme pH. With the 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

|                              | <b>BEH C<sub>18</sub></b><br>UPLC: 1.7 μm   | <b>BEH C<sub>8</sub></b><br>UPLC: 1.7 μm  | <b>BEH Shield RP18</b><br>UPLC: 1.7 μm  |
|------------------------------|---|---|---|
| <b>Particle/Ligand</b>       |  |  |  |
| <b>Ligand Density</b>        | 3.1 μmol/m <sup>2</sup>   | 3.2 μmol/m <sup>2</sup>   | 3.3 μmol/m <sup>2</sup>   |
| <b>Carbon Load</b>           | 18%   | 13%   | 17%   |
| <b>Endcap Style</b>          | Proprietary   | Proprietary   | TMS   |
| <b>USP Class No.</b>         | L1  | L7  | L1  |
| <b>pH Range</b>              | 1–12  | 1–12  | 2–11  |
| <b>Temperature Limits</b>    | Low pH = 80 °C, High pH = 60 °C   | Low pH = 60 °C, High pH = 60 °C   | Low pH = 50 °C, High pH = 45 °C   |
| <b>Surface Area</b>          | 185 m <sup>2</sup> /g   | 185 m <sup>2</sup> /g   | 185 m <sup>2</sup> /g   |
| <b>Performance Standards</b> | <b>Neutrals QC Reference Material</b><br>p/n: 186006360                           | <b>Neutrals QC Reference Material</b><br>p/n: 186006360                           | <b>Neutrals QC Reference Material</b><br>p/n: 186006360                             |
| <b>Application Standards</b> | <b>Reversed-Phase QC Reference Material</b><br>p/n: 186006363                     | <b>Reversed-Phase QC Reference Material</b><br>p/n: 186006363                     | <b>Reversed-Phase QC Reference Material</b><br>p/n: 186006363                       |

\*Expected or approximate value.

 BEH Technology is also available in HPLC particle sizes (XBridge HPLC BEH), please refer to pages 137 and 196.



| BEH Phenyl   | BEH HILIC                                     | BEH Amide                                     |
|--|---|---|
| UPLC: 1.7 $\mu$ m                                      | UPLC: 1.7 $\mu$ m                             | UPLC: 1.7 $\mu$ m                             |
|  |   |   |
| 3.0 $\mu$ mol/m <sup>2</sup>                           | N/A   | 7.5 $\mu$ mol/m <sup>2</sup>                  |
| 15%  | Unbonded                                      | 12%   |
| Proprietary  | N/A   | None  |
| 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 <sup>2</sup> /g                                  | 185 m <sup>2</sup> /g                         | 185 m <sup>2</sup> /g                         |
| Neutrals QC Reference Material<br>p/n: 186006360       | HILIC QC Reference Material<br>p/n: 186007226 | HILIC QC Reference Material<br>p/n: 186007226 |
| Reversed-Phase QC Reference Material<br>p/n: 186006363 | HILIC QC Reference Material<br>p/n: 186007226 | —   |

**APPLICATION AREA:** Characterization of Stationary Phases

"This column really offers what the company promises: high efficient and fast separations with a long column life time even at high pressures. Thanks Waters!"

**REVIEWER:** Annamaria Sepsey

**ORGANIZATION:** University of Pecs





## Ordering Information

### ACQUITY UPLC BEH Columns

|                     | Dimension                  | P/N (1/pk) | Dimension                  | P/N (3/pk) |
|---------------------|----------------------------|------------|----------------------------|------------|
|                     | Particle Size: 1.7 $\mu$ m |            | Particle Size: 1.7 $\mu$ m |            |
| BEH C <sub>18</sub> | 1.0 $\times$ 50 mm         | 186002344  | 1.0 $\times$ 50 mm         | 176000861  |
|                     | 1.0 $\times$ 100 mm        | 186002346  | 1.0 $\times$ 100 mm        | 176000862  |
|                     | 1.0 $\times$ 150 mm        | 186002347  | 1.0 $\times$ 150 mm        | 176001044  |
|                     | 2.1 $\times$ 30 mm         | 186002349  | 2.1 $\times$ 30 mm         | 176001304  |
|                     | 2.1 $\times$ 50 mm         | 186002350  | 2.1 $\times$ 50 mm         | 176000863  |
|                     | 2.1 $\times$ 75 mm         | 186005604  | 2.1 $\times$ 100 mm        | 176000864  |
|                     | 2.1 $\times$ 100 mm        | 186002352  | 2.1 $\times$ 150 mm        | 176001048  |
|                     | 2.1 $\times$ 150 mm        | 186002353  | 3.0 $\times$ 30 mm         | 176001794  |
|                     | 3.0 $\times$ 30 mm         | 186004659  | 3.0 $\times$ 50 mm         | 176001795  |
|                     | 3.0 $\times$ 50 mm         | 186004660  | 3.0 $\times$ 100 mm        | 176001796  |
|                     | 3.0 $\times$ 75 mm         | 186005609  | 3.0 $\times$ 150 mm        | 176001797  |
|                     | 3.0 $\times$ 100 mm        | 186004661  |                            |            |
|                     | 3.0 $\times$ 150 mm        | 186004690  |                            |            |
| BEH Shield RP18     | 1.0 $\times$ 50 mm         | 186002851  | 1.0 $\times$ 50 mm         | 176000874  |
|                     | 1.0 $\times$ 100 mm        | 186002852  | 1.0 $\times$ 100 mm        | 176000875  |
|                     | 1.0 $\times$ 150 mm        | 186003373  | 1.0 $\times$ 150 mm        | 176001045  |
|                     | 2.1 $\times$ 30 mm         | 186003909  | 2.1 $\times$ 30 mm         | 176001309  |
|                     | 2.1 $\times$ 50 mm         | 186002853  | 2.1 $\times$ 50 mm         | 176000876  |
|                     | 2.1 $\times$ 75 mm         | 186005605  | 2.1 $\times$ 100 mm        | 176000877  |
|                     | 2.1 $\times$ 100 mm        | 186002854  | 2.1 $\times$ 150 mm        | 176001049  |
|                     | 2.1 $\times$ 150 mm        | 186003376  | 3.0 $\times$ 30 mm         | 176001802  |
|                     | 3.0 $\times$ 30 mm         | 186004667  | 3.0 $\times$ 50 mm         | 176001803  |
|                     | 3.0 $\times$ 50 mm         | 186004668  | 3.0 $\times$ 100 mm        | 176001804  |
|                     | 3.0 $\times$ 75 mm         | 186005610  | 3.0 $\times$ 150 mm        | 176001805  |
|                     | 3.0 $\times$ 100 mm        | 186004669  |                            |            |
|                     | 3.0 $\times$ 150 mm        | 186004670  |                            |            |
| BEH C <sub>8</sub>  | 1.0 $\times$ 50 mm         | 186002875  | 1.0 $\times$ 50 mm         | 176000882  |
|                     | 1.0 $\times$ 100 mm        | 186002876  | 1.0 $\times$ 100 mm        | 176000883  |
|                     | 1.0 $\times$ 150 mm        | 186003374  | 1.0 $\times$ 150 mm        | 176001046  |
|                     | 2.1 $\times$ 30 mm         | 186003910  | 2.1 $\times$ 30 mm         | 176001310  |
|                     | 2.1 $\times$ 50 mm         | 186002877  | 2.1 $\times$ 50 mm         | 176000884  |
|                     | 2.1 $\times$ 75 mm         | 186005606  | 2.1 $\times$ 100 mm        | 176000885  |
|                     | 2.1 $\times$ 100 mm        | 186002878  | 2.1 $\times$ 150 mm        | 176001050  |
|                     | 2.1 $\times$ 150 mm        | 186003377  | 3.0 $\times$ 30 mm         | 176001798  |
|                     | 3.0 $\times$ 30 mm         | 186004663  | 3.0 $\times$ 50 mm         | 176001799  |
|                     | 3.0 $\times$ 50 mm         | 186004664  | 3.0 $\times$ 100 mm        | 176001800  |
|                     | 3.0 $\times$ 75 mm         | 186005611  | 3.0 $\times$ 150 mm        | 176001801  |
|                     | 3.0 $\times$ 100 mm        | 186004665  |                            |            |
|                     | 3.0 $\times$ 150 mm        | 186004666  |                            |            |

ACQUITY UPLC BEH Columns *Continued*

|                   | Dimension                  | P/N (1/pk) | Dimension                  | P/N (3/pk) |
|-------------------|----------------------------|------------|----------------------------|------------|
|                   | Particle Size: 1.7 $\mu$ m |            | Particle Size: 1.7 $\mu$ m |            |
| <b>BEH Phenyl</b> | 1.0 $\times$ 50 mm         | 186002882  | 1.0 $\times$ 50 mm         | 176000905  |
|                   | 1.0 $\times$ 100 mm        | 186002883  | 1.0 $\times$ 100 mm        | 176000906  |
|                   | 1.0 $\times$ 150 mm        | 186003375  | 1.0 $\times$ 150 mm        | 176001047  |
|                   | 2.1 $\times$ 30 mm         | 186003911  | 2.1 $\times$ 30 mm         | 176001311  |
|                   | 2.1 $\times$ 50 mm         | 186002884  | 2.1 $\times$ 50 mm         | 176000907  |
|                   | 2.1 $\times$ 75 mm         | 186005607  | 2.1 $\times$ 100 mm        | 176000908  |
|                   | 2.1 $\times$ 100 mm        | 186002885  | 2.1 $\times$ 150 mm        | 176001051  |
|                   | 2.1 $\times$ 150 mm        | 186003378  | 3.0 $\times$ 30 mm         | 176001806  |
|                   | 3.0 $\times$ 30 mm         | 186004671  | 3.0 $\times$ 50 mm         | 176001807  |
|                   | 3.0 $\times$ 50 mm         | 186004672  | 3.0 $\times$ 100 mm        | 176001808  |
|                   | 3.0 $\times$ 75 mm         | 186005612  | 3.0 $\times$ 150 mm        | 176001809  |
|                   | 3.0 $\times$ 100 mm        | 186004673  |                            |            |
|                   | 3.0 $\times$ 150 mm        | 186004674  |                            |            |
| <b>BEH HILIC</b>  | 1.0 $\times$ 50 mm         | 186003457  | 1.0 $\times$ 50 mm         | 176001089  |
|                   | 1.0 $\times$ 100 mm        | 186003458  | 1.0 $\times$ 100 mm        | 176001090  |
|                   | 1.0 $\times$ 150 mm        | 186003459  | 1.0 $\times$ 150 mm        | 176001091  |
|                   | 2.1 $\times$ 50 mm         | 186003460  | 2.1 $\times$ 50 mm         | 176001092  |
|                   | 2.1 $\times$ 75 mm         | 186005608  | 2.1 $\times$ 100 mm        | 176001093  |
|                   | 2.1 $\times$ 100 mm        | 186003461  | 2.1 $\times$ 150 mm        | 176001094  |
|                   | 2.1 $\times$ 150 mm        | 186003462  | 3.0 $\times$ 50 mm         | 176001810  |
|                   | 3.0 $\times$ 50 mm         | 186004675  | 3.0 $\times$ 100 mm        | 176001811  |
|                   | 3.0 $\times$ 75 mm         | 186005613  | 3.0 $\times$ 150 mm        | 176001812  |
|                   | 3.0 $\times$ 100 mm        | 186004676  |                            |            |
|                   | 3.0 $\times$ 150 mm        | 186004677  |                            |            |
| <b>BEH Amide</b>  | 1.0 $\times$ 50 mm         | 186004848  | 1.0 $\times$ 50 mm         | 176001914  |
|                   | 1.0 $\times$ 100 mm        | 186004849  | 1.0 $\times$ 100 mm        | 176001915  |
|                   | 1.0 $\times$ 150 mm        | 186004850  | 1.0 $\times$ 150 mm        | 176001916  |
|                   | 2.1 $\times$ 30 mm         | 186004839  | 2.1 $\times$ 30 mm         | 176001906  |
|                   | 2.1 $\times$ 50 mm         | 186004800  | 2.1 $\times$ 50 mm         | 176001907  |
|                   | 2.1 $\times$ 75 mm         | 186005657  | 2.1 $\times$ 100 mm        | 176001908  |
|                   | 2.1 $\times$ 100 mm        | 186004801  | 2.1 $\times$ 150 mm        | 176001909  |
|                   | 2.1 $\times$ 150 mm        | 186004802  | 3.0 $\times$ 30 mm         | 176001910  |
|                   | 3.0 $\times$ 30 mm         | 186004803  | 3.0 $\times$ 50 mm         | 176001911  |
|                   | 3.0 $\times$ 50 mm         | 186004804  | 3.0 $\times$ 100 mm        | 176001912  |
|                   | 3.0 $\times$ 75 mm         | 186005658  | 3.0 $\times$ 150 mm        | 176001913  |
|                   | 3.0 $\times$ 100 mm        | 186004805  |                            |            |
|                   | 3.0 $\times$ 150 mm        | 186004806  |                            |            |

ACQUITY UPLC BEH VanGuard Pre-columns (Guard Columns), 3/pk

|                       | Dimension  | P/N       |                       | Dimension  | P/N       |
|-----------------------|------------|-----------|-----------------------|------------|-----------|
| Particle Size: 1.7 µm |            |           | Particle Size: 1.7 µm |            |           |
| BEH C <sub>18</sub>   | 2.1 × 5 mm | 186003975 | BEH Phenyl            | 2.1 × 5 mm | 186003979 |
| BEH Shield RP18       | 2.1 × 5 mm | 186003977 | BEH HILIC             | 2.1 × 5 mm | 186003980 |
| BEH C <sub>8</sub>    | 2.1 × 5 mm | 186003978 | BEH Amide             | 2.1 × 5 mm | 186004799 |

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 Glycan BEH Amide Columns

|                       | Dimension    | P/N (1/pk)             |
|-----------------------|--------------|------------------------|
| Particle Size: 1.7 µm |              |                        |
| BEH Amide, 130Å       | 2.1 × 50 mm  | 186004740              |
|                       | 2.1 × 100 mm | 186004741              |
|                       | 2.1 × 150 mm | 186004742              |
| BEH Amide, 300Å       | 2.1 × 50 mm  | 176003700 <sup>2</sup> |
|                       | 2.1 × 100 mm | 176003701 <sup>2</sup> |
|                       | 2.1 × 150 mm | 176003702 <sup>2</sup> |

<sup>2</sup>Kit includes column and one vial of Waters Glycoprotein Performance Test Standard, p/n: 186008010.

ACQUITY UPLC Glycan BEH Amide VanGuard Columns, 3/pk

|                       | Dimension  | P/N (1/pk)             |
|-----------------------|------------|------------------------|
| Particle Size: 1.7 µm |            |                        |
| BEH Amide, 130Å       | 2.1 × 5 mm | 186004739              |
| BEH Amide, 300Å       | 2.1 × 5 mm | 176003699 <sup>2</sup> |

<sup>2</sup>Kit includes column and one vial of Waters Glycoprotein Performance Test Standard, p/n: 186008010.

ACQUITY UPLC Peptide BEH C<sub>18</sub> Columns

|                            | Dimension    | P/N       |
|----------------------------|--------------|-----------|
| Particle Size: 1.7 µm      |              |           |
| BEH C <sub>18</sub> , 130Å | 2.1 × 50 mm  | 186003554 |
|                            | 2.1 × 100 mm | 186003555 |
|                            | 2.1 × 150 mm | 186003556 |
|                            | 2.1 × 300 mm | 186005792 |
| BEH C <sub>18</sub> , 300Å | 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 |

ACQUITY UPLC Peptide BEH C<sub>18</sub> VanGuard Pre-Columns, 3/pk

|                            | Dimension  | P/N (1/pk) |
|----------------------------|------------|------------|
| Particle Size: 1.7 µm      |            |            |
| BEH C <sub>18</sub> , 130Å | 2.1 × 5 mm | 186003975  |
| BEH C <sub>18</sub> , 300Å | 2.1 × 5 mm | 186004629  |

 For more information on ACQUITY UPLC Protein Columns, refer to page 276.

### ACQUITY UPLC Protein BEH SEC Columns

|                              | Dimension    | Type                             | P/N (1/pk) |
|------------------------------|--------------|----------------------------------|------------|
| <b>Particle Size: 1.7 µm</b> |              |                                  |            |
| <b>BEH SEC, 125Å</b>         | 4.6 × 30 mm  | Guard Column                     | 186006504  |
|                              | 4.6 × 150 mm | Column                           | 186006505  |
|                              | 4.6 × 150 mm | Column and Standard <sup>2</sup> | 176003906  |
|                              | 4.6 × 300 mm | Column                           | 186006506  |
|                              | 4.6 × 300 mm | Column and Standard <sup>2</sup> | 176003907  |
| <b>Particle Size: 2.5 µm</b> |              |                                  |            |
| <b>BEH SEC, 200Å</b>         | 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 <sup>2</sup> | 176003904  |
|                              | 4.6 × 300 mm | Column                           | 186005226  |
|                              | 4.6 × 300 mm | Column and Standard <sup>2</sup> | 176003905  |
| <b>Particle Size: 2.5 µm</b> |              |                                  |            |
| <b>BEH SEC, 450Å</b>         | 4.6 × 30 mm  | Guard Column                     | 186006850  |
|                              | 4.6 × 300 mm | Column                           | 186006852  |

<sup>1</sup>Includes one BEH200 SEC standard.

<sup>2</sup>Includes one BEH125 SEC standard.

### ACQUITY UPLC Columns In-Line Filter Unit

| Description  | P/N       |
|--|-----------|
| In-line filter holder and six, 0.2 µm stainless steel replacement filters      | 205000343 |
| (For 205000343) 0.2 µm stainless steel replacement filters (x5), with end nuts | 700002775 |

### ACQUITY UPLC Protein SEH 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 |

#### APPLICATION AREA: Peptide and Small Molecule Analytical Purposes

"The column very well-kept the reproducibility and the separation robustness even after ten thousand injections. Peak shapes are well-maintained at concentrations very close to lowest limit of quantification, no or very minimum peak smoothing is needed. After-sales cares are very professional and eager to help solving problems. When the column is conjugated with guard column and in-line filter, the life-time and separation reproducibility are ensured. Little expensive in the beginning, but definitely worth it in the long run."

**REVIEWER:** Yao Chen

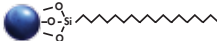
**ORGANIZATION:** University of Kansas



# ACQUITY UPLC HSS Columns

ACQUITY UPLC HSS Columns incorporate the first silica-based sub-2- $\mu\text{m}$  particle designed to withstand the high pressures required for UPLC separations. Available in five bonded phases, this robust particle technology maximizes the selectivity space. The ample array of bonded phases associated with ACQUITY UPLC HSS Columns enable traditional hydrophobic, reversed-phase interactions as well as dipole-dipole, aromatic, and hydrogen-bonding interactions.

## Column Characteristics

|                       | HSS C <sub>18</sub><br>UPLC: 1.8 $\mu\text{m}$                                    | HSS C <sub>18</sub> SB<br>UPLC: 1.8 $\mu\text{m}$                                   |
|-----------------------|---|---|
| Particle/Ligand       |  |  |
| Ligand Density        | 3.2 $\mu\text{mol}/\text{m}^2$  | 1.6 $\mu\text{mol}/\text{m}^2$  |
| Carbon Load           | 15%   | 8%  |
| Endcap Style          | Proprietary   | None  |
| 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 $\text{m}^2/\text{g}$   | 230 $\text{m}^2/\text{g}$   |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                    |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                              |

\*Expected or approximate value.

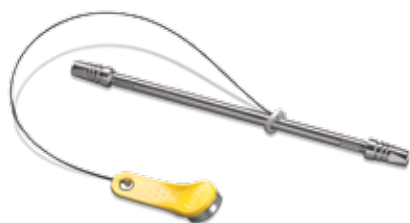
**APPLICATION AREA:** Metabolic Profiling of Urine Samples

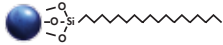
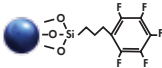
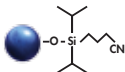
"We love this column. It is robust, reliable and durable. It is one of our favourite standard column to do high-throughput metabolomic profiling analysis."

**REVIEWER:** Verena Horneffer

**ORGANIZATION:** Clinical Phenome Centre






| HSS T3  | HSS PFP   | HSS CN  |
|---|---|---|
| UPLC: 1.8 μm  | UPLC: 1.8 μm  | UPLC: 1.8 μm  |
|  |  |  |
| 1.6 μmol/m <sup>2</sup>   | 3.2 μmol/m <sup>2</sup>   | 2.0 μmol/m <sup>2</sup>   |
| 11%   | 7%  | 5%  |
| Proprietary   | None  | None  |
| 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 <sup>2</sup> /g   | 230 m <sup>2</sup> /g   | 230 m <sup>2</sup> /g   |
| Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                    |
| Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | —   |

## Ordering Information

### ACQUITY UPLC HSS Columns

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

 For more information on Peptide HSS Columns, refer to page 271.

ACQUITY UPLC HSS Columns *Continued*

|           | Dimension                  | P/N (1/pk) | Dimension                  | P/N (3/pk) |
|-----------|----------------------------|------------|----------------------------|------------|
|           | Particle Size: 1.8 $\mu$ m |            | Particle Size: 1.8 $\mu$ m |            |
| HSS Cyano | 1.0 $\times$ 50 mm         | 186005982  | 1.0 $\times$ 50 mm         | 176002703  |
|           | 1.0 $\times$ 100 mm        | 186005983  | 1.0 $\times$ 100 mm        | 176002704  |
|           | 1.0 $\times$ 150 mm        | 186005984  | 1.0 $\times$ 150 mm        | 176002705  |
|           | 2.1 $\times$ 30 mm         | 186005985  | 2.1 $\times$ 30 mm         | 176002706  |
|           | 2.1 $\times$ 50 mm         | 186005986  | 2.1 $\times$ 50 mm         | 176002707  |
|           | 2.1 $\times$ 75 mm         | 186005987  | 2.1 $\times$ 75 mm         | 176002708  |
|           | 2.1 $\times$ 100 mm        | 186005988  | 2.1 $\times$ 100 mm        | 176002709  |
|           | 2.1 $\times$ 150 mm        | 186005989  | 2.1 $\times$ 150 mm        | 176002710  |
|           | 3.0 $\times$ 30 mm         | 186005990  | 3.0 $\times$ 30 mm         | 176002711  |
|           | 3.0 $\times$ 50 mm         | 186005991  | 3.0 $\times$ 50 mm         | 176002712  |
|           | 3.0 $\times$ 75 mm         | 186005992  | 3.0 $\times$ 75 mm         | 176002713  |
|           | 3.0 $\times$ 100 mm        | 186005993  | 3.0 $\times$ 100 mm        | 176002714  |
|           | 3.0 $\times$ 150 mm        | 186005994  | 3.0 $\times$ 150 mm        | 176002715  |

|         |                     |           |                     |           |
|---------|---------------------|-----------|---------------------|-----------|
| HSS PFP | 1.0 $\times$ 50 mm  | 186005961 | 1.0 $\times$ 50 mm  | 176002690 |
|         | 1.0 $\times$ 100 mm | 186005962 | 1.0 $\times$ 100 mm | 176002691 |
|         | 1.0 $\times$ 150 mm | 186005963 | 1.0 $\times$ 150 mm | 176002692 |
|         | 2.1 $\times$ 30 mm  | 186005964 | 2.1 $\times$ 30 mm  | 176002693 |
|         | 2.1 $\times$ 50 mm  | 186005965 | 2.1 $\times$ 50 mm  | 176002694 |
|         | 2.1 $\times$ 75 mm  | 186005966 | 2.1 $\times$ 75 mm  | 176002695 |
|         | 2.1 $\times$ 100 mm | 186005967 | 2.1 $\times$ 100 mm | 176002696 |
|         | 2.1 $\times$ 150 mm | 186005968 | 2.1 $\times$ 150 mm | 176002697 |
|         | 3.0 $\times$ 30 mm  | 186005969 | 3.0 $\times$ 30 mm  | 176002698 |
|         | 3.0 $\times$ 50 mm  | 186005970 | 3.0 $\times$ 50 mm  | 176002699 |
|         | 3.0 $\times$ 75 mm  | 186005971 | 3.0 $\times$ 75 mm  | 176002700 |
|         | 3.0 $\times$ 100 mm | 186005972 | 3.0 $\times$ 100 mm | 176002701 |
|         | 3.0 $\times$ 150 mm | 186005973 | 3.0 $\times$ 150 mm | 176002702 |

ACQUITY UPLC HSS VanGuard Pre-columns (Guard Columns), 3/pk

|                        | Dimension                  | P/N       |           | Dimension                  | P/N       |
|------------------------|----------------------------|-----------|-----------|----------------------------|-----------|
|                        | Particle Size: 1.8 $\mu$ m |           |           | Particle Size: 1.8 $\mu$ m |           |
| HSS C <sub>18</sub>    | 2.1 $\times$ 5 mm          | 186003981 | HSS PFP   | 2.1 $\times$ 5 mm          | 186005974 |
| HSS C <sub>18</sub> SB | 2.1 $\times$ 5 mm          | 186004136 | HSS Cyano | 2.1 $\times$ 5 mm          | 186005995 |
| HSS T3                 | 2.1 $\times$ 5 mm          | 186003976 |           |                            |           |

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 $\mu$ m stainless steel replacement filters               | 205000343 |
| (For 205000343) 0.2 $\mu$ m stainless steel replacement filters ( $\times$ 5), with end nuts | 700002775 |



## ACQUITY UPLC and CORTECS 1.6 $\mu$ m 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)\*

|                            | Dimension    | P/N       |
|----------------------------|--------------|-----------|
| Particle Size: 1.6 $\mu$ m |              |           |
| <b>C<sub>8</sub></b>       | 2.1 × 30 mm  | 186008403 |
|                            | 2.1 × 50 mm  | 186008404 |
|                            | 2.1 × 75 mm  | 186008405 |
|                            | 2.1 × 100 mm | 186008406 |
|                            | 2.1 × 150 mm | 186008407 |
|                            | 3.0 × 30 mm  | 186008413 |
|                            | 3.0 × 50 mm  | 186008414 |
|                            | 3.0 × 75 mm  | 186008415 |
|                            | 3.0 × 100 mm | 186008416 |
|                            | 3.0 × 150 mm | 186008417 |

|                                   |              |           |
|-----------------------------------|--------------|-----------|
| <b>C<sub>18</sub><sup>+</sup></b> | 2.1 × 30 mm  | 186007176 |
|                                   | 2.1 × 50 mm  | 186007177 |
|                                   | 2.1 × 75 mm  | 186007178 |
|                                   | 2.1 × 100 mm | 186007179 |
|                                   | 2.1 × 150 mm | 186007180 |
|                                   | 3.0 × 30 mm  | 186007181 |
|                                   | 3.0 × 50 mm  | 186007182 |
|                                   | 3.0 × 75 mm  | 186007183 |
|                                   | 3.0 × 100 mm | 186007184 |
|                                   | 3.0 × 150 mm | 186007185 |

|                       |              |           |
|-----------------------|--------------|-----------|
| <b>C<sub>18</sub></b> | 2.1 × 30 mm  | 186007156 |
|                       | 2.1 × 50 mm  | 186007157 |
|                       | 2.1 × 75 mm  | 186007158 |
|                       | 2.1 × 100 mm | 186007159 |
|                       | 2.1 × 150 mm | 186007160 |
|                       | 3.0 × 30 mm  | 186007161 |
|                       | 3.0 × 50 mm  | 186007162 |
|                       | 3.0 × 75 mm  | 186007163 |
|                       | 3.0 × 100 mm | 186007164 |
|                       | 3.0 × 150 mm | 186007165 |

|                            | Dimension    | P/N       |
|----------------------------|--------------|-----------|
| Particle Size: 1.6 $\mu$ m |              |           |
| <b>HILIC</b>               | 2.1 × 30 mm  | 186007166 |
|                            | 2.1 × 50 mm  | 186007167 |
|                            | 2.1 × 75 mm  | 186007168 |
|                            | 2.1 × 100 mm | 186007169 |
|                            | 2.1 × 150 mm | 186007170 |
|                            | 3.0 × 30 mm  | 186007171 |
|                            | 3.0 × 50 mm  | 186007172 |
|                            | 3.0 × 75 mm  | 186007173 |
|                            | 3.0 × 100 mm | 186007174 |
|                            | 3.0 × 150 mm | 186007175 |

|               |              |           |
|---------------|--------------|-----------|
| <b>Phenyl</b> | 2.1 × 30 mm  | 186008383 |
|               | 2.1 × 50 mm  | 186008384 |
|               | 2.1 × 75 mm  | 186008405 |
|               | 2.1 × 100 mm | 186008386 |
|               | 2.1 × 150 mm | 186008387 |
|               | 3.0 × 30 mm  | 186008393 |
|               | 3.0 × 50 mm  | 186008394 |
|               | 3.0 × 75 mm  | 186008395 |
|               | 3.0 × 100 mm | 186008396 |
|               | 3.0 × 150 mm | 186008397 |

|           |              |           |
|-----------|--------------|-----------|
| <b>T3</b> | 2.1 × 30 mm  | 186008529 |
|           | 2.1 × 50 mm  | 186008530 |
|           | 2.1 × 75 mm  | 186008531 |
|           | 2.1 × 100 mm | 186008536 |
|           | 2.1 × 150 mm | 186008537 |
|           | 3.0 × 30 mm  | 186008538 |
|           | 3.0 × 50 mm  | 186008539 |
|           | 3.0 × 75 mm  | 186008540 |
|           | 3.0 × 100 mm | 186008541 |
|           | 3.0 × 150 mm | 186008542 |

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

## CORTECS UPLC Columns Method Validation Kits (MVK)\*

Continued

|                            | Dimension           | P/N       |
|----------------------------|---------------------|-----------|
| Particle Size: 1.6 $\mu$ m |                     |           |
| Shield RP18                | 2.1 $\times$ 30 mm  | 186008696 |
|                            | 2.1 $\times$ 50 mm  | 186008697 |
|                            | 2.1 $\times$ 75 mm  | 186008698 |
|                            | 2.1 $\times$ 100 mm | 186008699 |
|                            | 2.1 $\times$ 150 mm | 186008700 |
|                            | 3.0 $\times$ 30 mm  | 186008706 |
|                            | 3.0 $\times$ 50 mm  | 186008707 |
|                            | 3.0 $\times$ 75 mm  | 186008708 |
|                            | 3.0 $\times$ 100 mm | 186008709 |
|                            | 3.0 $\times$ 150 mm | 186008710 |

## ACQUITY UPLC Method Validation Kits\*

|                            | Dimension           | P/N       |
|----------------------------|---------------------|-----------|
| Particle Size: 1.7 $\mu$ m |                     |           |
| CSH C <sub>18</sub>        | 2.1 $\times$ 50 mm  | 186005571 |
|                            | 2.1 $\times$ 100 mm | 186005572 |
|                            | 2.1 $\times$ 150 mm | 186006016 |
|                            | 3.0 $\times$ 50 mm  | 186005573 |
|                            | 3.0 $\times$ 100 mm | 186005574 |
| CSH Phenyl-Hexyl           | 2.1 $\times$ 50 mm  | 186005579 |
|                            | 2.1 $\times$ 100 mm | 186005580 |
|                            | 2.1 $\times$ 150 mm | 186006017 |
|                            | 3.0 $\times$ 50 mm  | 186005581 |
|                            | 3.0 $\times$ 100 mm | 186005582 |
| CSH Fluoro-Phenyl          | 2.1 $\times$ 50 mm  | 186005575 |
|                            | 2.1 $\times$ 100 mm | 186005576 |
|                            | 2.1 $\times$ 150 mm | 186006018 |
|                            | 3.0 $\times$ 50 mm  | 186005577 |
| 3.0 $\times$ 100 mm        | 186005578           |           |
| BEH C <sub>18</sub>        | 2.1 $\times$ 50 mm  | 186004044 |
|                            | 2.1 $\times$ 100 mm | 186004045 |
|                            | 2.1 $\times$ 150 mm | 186006019 |
|                            | 3.0 $\times$ 50 mm  | 186004691 |
|                            | 3.0 $\times$ 100 mm | 186004692 |
| BEH C <sub>8</sub>         | 2.1 $\times$ 50 mm  | 186004046 |
|                            | 2.1 $\times$ 100 mm | 186004047 |
|                            | 2.1 $\times$ 150 mm | 186006020 |
|                            | 3.0 $\times$ 50 mm  | 186004693 |
|                            | 3.0 $\times$ 100 mm | 186004694 |

ACQUITY UPLC Method Validation Kits\* *Continued*

|                            | Dimension           | P/N       |
|----------------------------|---------------------|-----------|
| Particle Size: 1.7 $\mu$ m |                     |           |
| BEH Shield RP18            | 2.1 $\times$ 50 mm  | 186004048 |
|                            | 2.1 $\times$ 100 mm | 186004049 |
|                            | 2.1 $\times$ 150 mm | 186006021 |
|                            | 3.0 $\times$ 50 mm  | 186004695 |
|                            | 3.0 $\times$ 100 mm | 186004696 |
| BEH Phenyl                 | 2.1 $\times$ 50 mm  | 186004050 |
|                            | 2.1 $\times$ 100 mm | 186004052 |
|                            | 2.1 $\times$ 150 mm | 186006022 |
|                            | 3.0 $\times$ 50 mm  | 186004697 |
|                            | 3.0 $\times$ 100 mm | 186004698 |
| BEH HILIC                  | 2.1 $\times$ 50 mm  | 186004053 |
|                            | 2.1 $\times$ 100 mm | 186004054 |
|                            | 2.1 $\times$ 150 mm | 186006023 |
|                            | 3.0 $\times$ 50 mm  | 186004699 |
|                            | 3.0 $\times$ 100 mm | 186004700 |
| BEH Amide                  | 2.1 $\times$ 50 mm  | 186004807 |
|                            | 2.1 $\times$ 100 mm | 186004808 |
|                            | 2.1 $\times$ 150 mm | 186006024 |
|                            | 3.0 $\times$ 50 mm  | 186004809 |
|                            | 3.0 $\times$ 100 mm | 186004810 |
| Particle Size: 1.8 $\mu$ m |                     |           |
| HSS T3                     | 2.1 $\times$ 50 mm  | 186004055 |
|                            | 2.1 $\times$ 100 mm | 186004056 |
|                            | 2.1 $\times$ 150 mm | 186006025 |
|                            | 3.0 $\times$ 50 mm  | 186004701 |
|                            | 3.0 $\times$ 100 mm | 186004702 |
| HSS C <sub>18</sub>        | 2.1 $\times$ 50 mm  | 186004057 |
|                            | 2.1 $\times$ 100 mm | 186004058 |
|                            | 2.1 $\times$ 150 mm | 186006026 |
|                            | 3.0 $\times$ 50 mm  | 186004703 |
|                            | 3.0 $\times$ 100 mm | 186004704 |
| HSS C <sub>18</sub> SB     | 2.1 $\times$ 50 mm  | 186004137 |
|                            | 2.1 $\times$ 100 mm | 186004138 |
|                            | 2.1 $\times$ 150 mm | 186006027 |
|                            | 3.0 $\times$ 50 mm  | 186004705 |
|                            | 3.0 $\times$ 100 mm | 186004709 |

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

ACQUITY UPLC Method Validation Kits\* *Continued*

|                       | Dimension    | P/N       |
|-----------------------|--------------|-----------|
| Particle Size: 1.8 µm |              |           |
| 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 Glycan BEH Amide Method Validation Kits\*

|                       | Dimension    | P/N                    |
|-----------------------|--------------|------------------------|
| Particle Size: 1.7 µm |              |                        |
| BEH Amide, 130Å       | 2.1 × 100 mm | 186004907              |
| BEH Amide, 300Å       | 2.1 × 100 mm | 176003703 <sup>2</sup> |

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

<sup>2</sup>Kit includes column and one vial of Waters Glycoprotein Performance Test Standard, p/n: 186008010.

ACQUITY UPLC Peptide BEH C<sub>18</sub> Method Validation Kits\*

|                            | Dimension    | P/N       |
|----------------------------|--------------|-----------|
| Particle Size: 1.7 µm      |              |           |
| BEH C <sub>18</sub> , 130Å | 2.1 × 100 mm | 186004896 |
|                            | 2.1 × 150 mm | 186006517 |
| BEH C <sub>18</sub> , 300Å | 2.1 × 100 mm | 186004897 |
|                            | 2.1 × 150 mm | 186006516 |

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

ACQUITY UPLC Peptide CSH C<sub>18</sub> Method Validation Kits<sup>1</sup>

|                            | Dimension    | P/N       |
|----------------------------|--------------|-----------|
| Particle Size: 1.7 µm      |              |           |
| CSH C <sub>18</sub> , 130Å | 1.0 × 50 mm  | 176003061 |
|                            | 1.0 × 100 mm | 176003062 |
|                            | 1.0 × 150 mm | 176003063 |
|                            | 2.1 × 50 mm  | 176003064 |
|                            | 2.1 × 100 mm | 176003065 |
|                            | 2.1 × 150 mm | 176003066 |

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

<sup>1</sup>Kit includes column and one vial of Cytochrome c Digestion Standard, p/n: 186006371.

ACQUITY UPLC Peptide CSH C<sub>18</sub> Method Validation Kit<sup>1</sup>\*

|                       | Dimension    | P/N                    |
|-----------------------|--------------|------------------------|
| Particle Size: 1.7 µm |              |                        |
| CSH C <sub>18</sub>   | 2.1 × 150 mm | 186006940              |
|                       | 2.1 × 150 mm | 176003068 <sup>1</sup> |

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

<sup>1</sup>Kit includes columns and one vial of Cytochrome c Digestion Standard, p/n: 186006371.

## ACQUITY UPLC Method Transfer Kits

Method Transfer Kits are designed to preserve the integrity of a separation as it is transferred between UPLC and HPLC platforms. Based on the concept of maintaining column length (L) to particle size (dp) ratio (L/dp), these kits provide an ACQUITY UPLC Column with an HPLC column of equivalent selectivity and resolving power. Using the ACQUITY UPLC Columns Calculator, methods can be fully transferred from HPLC to UPLC or from UPLC to HPLC.

### Ordering Information

#### ACQUITY UPLC Method Transfer Kits\*

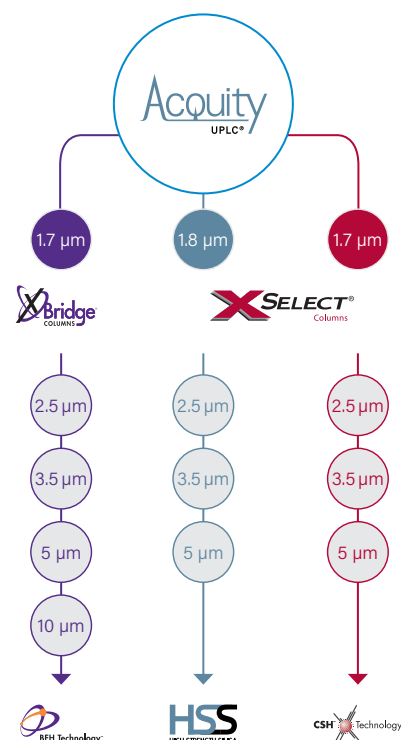
| Package Name                      | UPLC Column 2.1 mm I.D. | HPLC Column 4.6 mm I.D. | P/N       |
|-----------------------------------|-------------------------|-------------------------|-----------|
| CSH C <sub>18</sub> 1.7–5 µm      | 50 mm, 1.7 µm           | 150 mm, 5 µm            | 186005529 |
| CSH Phenyl-Hexyl 1.7–5 µm         | 50 mm, 1.7 µm           | 150 mm, 5 µm            | 186005530 |
| CSH Fluoro-Phenyl 1.7–5 µm        | 50 mm, 1.7 µm           | 150 mm, 5 µm            | 186005531 |
| BEH C <sub>18</sub> 1.7–5 µm      | 50 mm, 1.7 µm           | 150 mm, 5 µm            | 186004958 |
| BEH Shield RP18 1.7–5 µm          | 50 mm, 1.7 µm           | 150 mm, 5 µm            | 186004959 |
| BEH HILIC 1.7–5 µm                | 50 mm, 1.7 µm           | 150 mm, 5 µm            | 186004960 |
| HSS C <sub>18</sub> 1.8–5 µm      | 50 mm, 1.8 µm           | 150 mm, 5 µm            | 186004961 |
| HSS T3 1.8–5 µm                   | 50 mm, 1.8 µm           | 150 mm, 5 µm            | 186004962 |
| HSS C <sub>18</sub> SB 1.8–5 µm   | 50 mm, 1.8 µm           | 150 mm, 5 µm            | 186004963 |
| CSH C <sub>18</sub> 1.7–3.5 µm    | 50 mm, 1.7 µm           | 100 mm, 3.5 µm          | 186005532 |
| CSH Phenyl-Hexyl 1.7–3.5 µm       | 50 mm, 1.7 µm           | 100 mm, 3.5 µm          | 186005533 |
| CSH Fluoro-Phenyl 1.7–3.5 µm      | 50 mm, 1.7 µm           | 100 mm, 3.5 µm          | 186005534 |
| BEH C <sub>18</sub> 1.7–3.5 µm    | 50 mm, 1.7 µm           | 100 mm, 3.5 µm          | 186004964 |
| BEH Shield RP18 1.7–3.5 µm        | 50 mm, 1.7 µm           | 100 mm, 3.5 µm          | 186004965 |
| BEH HILIC 1.7–3.5 µm              | 50 mm, 1.7 µm           | 100 mm, 3.5 µm          | 186004966 |
| BEH Amide 1.7–3.5 µm              | 50 mm, 1.7 µm           | 100 mm, 3.5 µm          | 186004967 |
| HSS C <sub>18</sub> 1.8–3.5 µm    | 50 mm, 1.8 µm           | 100 mm, 3.5 µm          | 186004968 |
| HSS T3 1.8–3.5 µm                 | 50 mm, 1.8 µm           | 100 mm, 3.5 µm          | 186004969 |
| HSS C <sub>18</sub> SB 1.8–3.5 µm | 50 mm, 1.8 µm           | 100 mm, 3.5 µm          | 186004970 |
| HSS Cyano 1.8–5 µm                | 50 mm, 1.8 µm           | 150 mm, 5 µm            | 186006000 |
| HSS PFP 1.8–5 µm                  | 50 mm, 1.8 µm           | 150 mm, 5 µm            | 186005979 |
| HSS Cyano 1.8–3.5 µm              | 50 mm, 1.8 µm           | 100 mm, 3.5 µm          | 186006001 |
| HSS PFP 1.8–3.5 µm                | 50 mm, 1.8 µm           | 100 mm, 3.5 µm          | 186005980 |

\*Each kit contains one UPLC column and one HPLC column.

#### ACQUITY UPLC High Res Method Transfer Kits\*

| Package Name                      | UPLC Column 2.1 mm I.D. | HPLC Column 4.6 mm I.D. | P/N       |
|-----------------------------------|-------------------------|-------------------------|-----------|
| CSH C <sub>18</sub> 1.7–3.5 µm    | 100 mm, 1.7 µm          | 150 mm, 3.5 µm          | 186005535 |
| CSH Phenyl-Hexyl 1.7–3.5 µm       | 100 mm, 1.7 µm          | 150 mm, 3.5 µm          | 186005536 |
| CSH Fluoro-Phenyl 1.7–3.5 µm      | 100 mm, 1.7 µm          | 150 mm, 3.5 µm          | 186005537 |
| BEH C <sub>18</sub> 1.7–3.5 µm    | 100 mm, 1.7 µm          | 150 mm, 3.5 µm          | 186004971 |
| BEH Shield RP18 1.7–3.5 µm        | 100 mm, 1.7 µm          | 150 mm, 3.5 µm          | 186004972 |
| BEH HILIC 1.7–3.5 µm              | 100 mm, 1.7 µm          | 150 mm, 3.5 µm          | 186004973 |
| BEH Amide 1.7–3.5 µm              | 100 mm, 1.7 µm          | 150 mm, 3.5 µm          | 186004974 |
| HSS C <sub>18</sub> 1.8–3.5 µm    | 100 mm, 1.8 µm          | 150 mm, 3.5 µm          | 186004975 |
| HSS T3 1.8–3.5 µm                 | 100 mm, 1.8 µm          | 150 mm, 3.5 µm          | 186004976 |
| HSS C <sub>18</sub> SB 1.8–3.5 µm | 100 mm, 1.8 µm          | 150 mm, 3.5 µm          | 186004977 |
| HSS Cyano 1.8–3.5 µm              | 100 mm, 1.8 µm          | 150 mm, 3.5 µm          | 186006002 |
| HSS PFP 1.8–3.5 µm                | 100 mm, 1.8 µm          | 150 mm, 3.5 µm          | 186005981 |

\*Each kit contains one UPLC column and one HPLC column.



### DID YOU KNOW...

You can download the ACQUITY UPLC Columns Calculator from the ACQUITY UPLC Online Community at [www.waters.com/myuplc](http://www.waters.com/myuplc)

## 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.

| Package Name   | Chemistries  | Method Development Strategy  |
|--|--|--|
| Maximum Selectivity UPLC Method Development Kit              | CSH C <sub>18</sub> <sup>r</sup> , CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C <sub>18</sub> 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 <sub>18</sub> <sup>r</sup> , BEH C <sub>8</sub> <sup>r</sup> , BEH Shield RP18, BEH Phenyl     | Maximize separation selectivity by exploring low and high mobile-phase pH.   |
| UPLC Method Development Kit                                  | BEH C <sub>18</sub> <sup>r</sup> , 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 <sub>18</sub> <sup>r</sup> , BEH Shield RP18, HSS C <sub>18</sub> <sup>r</sup> , HSS T3        | C <sub>18</sub> columns that differ in silanol activity and hydrophobicity within the US Pharmacopeia L1 classification.   |
| Mass Spec UPLC Columns Kit                                   | BEH C <sub>18</sub> <sup>r</sup> , HSS C <sub>18</sub> <sup>r</sup> , HSS T3, HSS C <sub>18</sub> SB | Straight-chain-alkyl C <sub>18</sub> 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 <sub>18</sub> <sup>r</sup> , HSS C <sub>18</sub> 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 <sub>18</sub> <sup>r</sup> , 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 <sub>18</sub> <sup>r</sup> , BEH Shield RP18, BEH Amide, HSS C <sub>18</sub> 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

| Package Name   | Qty. | Chemistries   | Particle Size(s)         | Dimension    | P/N       |
|--|------|---|--------------------------|--------------|-----------|
| Maximum Selectivity UPLC                               | 4/pk | CSH C <sub>18</sub> , CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C <sub>18</sub> SB | CSH: 1.7 µm; HSS: 1.8 µm | 2.1 × 50 mm  | 176002123 |
| Maximum Selectivity UPLC                               | 4/pk | CSH C <sub>18</sub> , CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C <sub>18</sub> SB | CSH: 1.7 µm; HSS: 1.8 µm | 2.1 × 100 mm | 176002124 |
| Maximum Selectivity UPLC                               | 4/pk | CSH C <sub>18</sub> , CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C <sub>18</sub> SB | CSH: 1.7 µm; HSS: 1.8 µm | 3.0 × 50 mm  | 176002125 |
| Maximum Selectivity UPLC                               | 4/pk | CSH C <sub>18</sub> , CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C <sub>18</sub> 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 <sub>18</sub> , BEH C <sub>8</sub> , 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 <sub>18</sub> , BEH C <sub>8</sub> , 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 <sub>18</sub> , BEH C <sub>8</sub> , 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 <sub>18</sub> , BEH C <sub>8</sub> , BEH Shield RP18, BEH Phenyl            | BEH: 1.7 µm              | 3.0 × 100 mm | 176001882 |
| UPLC   | 4/pk | BEH C <sub>18</sub> , 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 <sub>18</sub> , 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 <sub>18</sub> , 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 <sub>18</sub> , 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 <sub>18</sub> , BEH Shield RP18, HSS C <sub>18</sub> , HSS T3               | BEH: 1.7 µm; HSS: 1.8 µm | 2.1 × 50 mm  | 176001605 |
| L1 UPLC Columns Kit                                    | 4/pk | BEH C <sub>18</sub> , BEH Shield RP18, HSS C <sub>18</sub> , HSS T3               | BEH: 1.7 µm; HSS: 1.8 µm | 2.1 × 100 mm | 176001606 |
| L1 UPLC Columns Kit                                    | 4/pk | BEH C <sub>18</sub> , BEH Shield RP18, HSS C <sub>18</sub> , HSS T3               | BEH: 1.7 µm; HSS: 1.8 µm | 3.0 × 50 mm  | 176001885 |
| L1 UPLC Columns Kit                                    | 4/pk | BEH C <sub>18</sub> , BEH Shield RP18, HSS C <sub>18</sub> , HSS T3               | BEH: 1.7 µm; HSS: 1.8 µm | 3.0 × 100 mm | 176001886 |
| Mass Spec UPLC Columns Kit                             | 4/pk | BEH C <sub>18</sub> , HSS C <sub>18</sub> , HSS C <sub>18</sub> 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 <sub>18</sub> , HSS C <sub>18</sub> , HSS C <sub>18</sub> 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 <sub>18</sub> , HSS C <sub>18</sub> , HSS C <sub>18</sub> 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 <sub>18</sub> , HSS C <sub>18</sub> , HSS C <sub>18</sub> 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 <sub>18</sub> , HSS C <sub>18</sub> 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 <sub>18</sub> , HSS C <sub>18</sub> 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 <sub>18</sub> , HSS C <sub>18</sub> 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 <sub>18</sub> , HSS C <sub>18</sub> SB         | BEH: 1.7 µm; HSS: 1.8 µm | 3.0 × 100 mm | 176001890 |
| Maximum Selectivity RP and HILIC                       | 4/pk | CSH C <sub>18</sub> , 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 <sub>18</sub> , 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 <sub>18</sub> , 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 <sub>18</sub> , 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 <sub>18</sub> , BEH Shield RP18, BEH Amide, HSS C <sub>18</sub> SB          | BEH: 1.7 µm; HSS: 1.8 µm | 2.1 × 50 mm  | 176001959 |
| UPLC RP and HILIC                                      | 4/pk | BEH C <sub>18</sub> , BEH Shield RP18, BEH Amide, HSS C <sub>18</sub> SB          | BEH: 1.7 µm; HSS: 1.8 µm | 2.1 × 100 mm | 176001960 |
| UPLC RP and HILIC                                      | 4/pk | BEH C <sub>18</sub> , BEH Shield RP18, BEH Amide, HSS C <sub>18</sub> SB          | BEH: 1.7 µm; HSS: 1.8 µm | 3.0 × 50 mm  | 176001961 |
| UPLC RP and HILIC                                      | 4/pk | BEH C <sub>18</sub> , BEH Shield RP18, BEH Amide, HSS C <sub>18</sub> 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 |

# ACQUITY UPLC Column Accessories

## Ordering Information

### ACQUITY UPLC Columns Replacement Parts

| Description  | P/N       |
|--|-----------|
| 0.2 µm inlet/outlet frit (×3), for 3.0 mm (I.D.) UPLC columns  | 700004790 |
| 0.2 µm inlet/outlet frits (×3), for 2.1 mm (I.D.) UPLC columns | 700003776 |
| 0.2 µm inlet/outlet frits (×3), for 1.0 mm (I.D.) UPLC columns | 700003775 |
| Inlet end-nut (×1) for 3.0 mm (I.D.) UPLC column               | 700004792 |
| Outlet end-nut (×1) for 3.0 mm (I.D.) UPLC column              | 700004791 |
| Inlet end-nut (×1) for 2.1 mm (I.D.) UPLC column               | 700003779 |
| Outlet end-nut (×1) for 2.1 mm (I.D.) UPLC column              | 700003780 |
| Inlet end-nut (×1) for 1.0 mm (I.D.) UPLC column               | 700003777 |
| Outlet end-nut (×1) for 1.0 mm (I.D.) UPLC column              | 700003778 |

# 2.x $\mu\text{m}$ UHPLC Columns

2.x  $\mu\text{m}$  UHPLC Columns



"Quality is the final experience you get from Waters."

~ Leanne Davey, Technical Operations Manager, Wexford, Ireland



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## 2. x μm UHPLC Columns

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

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

### Column Selection Guide



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

Recommended column dimension matched for Waters LC Systems.

### Ideal Column Configurations for Any LC System

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

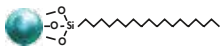

| System                                | LC Technique | Bandspread* | Recommended Column Particle Sizes and I.D.s  |
|---------------------------------------|--------------|-------------|--|
| Shimadzu Prominence UFLC              | HPLC         | 41 μL       | XBridge 3.5, 5 μm; XSelect 3.5, 5 μm;<br>CORTECS 2.7 μm<br>3.0–4.6 mm I.D.                           |
| Alliance 2695 HPLC                    | HPLC         | 29 μL       |  |
| Agilent 1260 UHPLC (600 bar)          | HPLC         | 28 μL       |  |
| Thermo Accela UHPLC                   | HPLC         | 21 μL       | XBridge 2.5, 3.5, 5 μm; XSelect 2.5, 3.5, 5 μm;<br>CORTECS 2.7 μm<br>3.0 mm I.D.                     |
| Agilent 1290 UHPLC (1200 bar)         | UHPLC        | 17 μL       |  |
| ACQUITY Arc                           | UHPLC        | 23 μL       | XBridge 2.5, 3.5, 5 μm; XSelect 2.5, 3.5, 5 μm;<br>ACQUITY HSS 1.8 μm, CORTECS 2.7 μm<br>3.0 mm I.D. |
| ACQUITY UPLC                          | UHPLC        | 12 μL       | ACQUITY BEH 1.7 μm; ACQUITY CSH 1.7 μm;<br>ACQUITY HSS 1.8 μm, CORTECS 1.6 μm<br>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, narrower peaks, allowing faster flow rates at lower operational back-pressure.

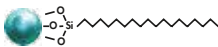
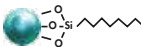
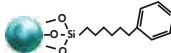

### Column Characteristics

|                       | <b>C<sub>18</sub><sup>+</sup></b>   | <b>C<sub>18</sub></b>   | <b>Shield RP18</b>  |
|-----------------------|---|---|---|
|                       | UPLC: 1.6 µm, UHPLC: 2.7 µm, HPLC: 2.7 µm   | UPLC: 1.6 µm, UHPLC: 2.7 µm, HPLC: 2.7 µm   | UPLC: 1.6 µm, UHPLC: 2.7 µm   |
| Particle/Ligand       |  |  |  |
| Ligand Density*       | 2.4 µmol/m <sup>2</sup>   | 2.7 µmol/m <sup>2</sup>   | 3.2 µmol/m <sup>2</sup>   |
| Carbon Load*          | 5.7%  | 6.6%  | 6.4%  |
| Endcap Style          | Proprietary   | Proprietary   | Proprietary   |
| 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 <sup>2</sup> /g   | 100 m <sup>2</sup> /g   | 100 m <sup>2</sup> /g   |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                    |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                              |

\*Expected or approximate value.

 For more information on CORTECS Columns, refer to page 86.



| T3  | C <sub>8</sub>  | Phenyl   | HILIC   |
|---|---|--|---|
| UPLC: 1.6 μm, UHPLC: 2.7 μm   | UPLC: 1.6 μm, UHPLC: 2.7 μm, HPLC: 2.7 μm   | UPLC: 1.6 μm, UHPLC: 2.7 μm, HPLC: 2.7 μm  | UPLC: 1.6 μm, UHPLC: 2.7 μm, HPLC: 2.7 μm   |
|  |  |  |  |
| 1.6 μmol/m <sup>2</sup>   | 3.4 μmol/m <sup>2</sup>   | 3.2 μmol/m <sup>2</sup>  | N/A   |
| 4.7%  | 4.5%  | 5.9%   | Unbonded  |
| Proprietary   | Proprietary   | Proprietary  | 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 m <sup>2</sup> /g   | 100 m <sup>2</sup> /g   | 100 m <sup>2</sup> /g  | 100 m <sup>2</sup> /g   |
| Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                   | HILIC QC Reference Material<br>p/n: 186007226                                       |
| Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                             | HILIC QC Reference Material<br>p/n: 186007226                                       |

**APPLICATION AREA:** Hormone Assay

"Needed to develop a RP UV method, had one week from start to finish. I tried a few columns before I decided to contact Waters. Waters sent me a CORTECS C<sub>18</sub> and the results was amazing. Perfect symmetry and repeatability for a method that otherwise needed more time to refine. Saved me a lot of time for this project."

**REVIEWER:** Tomas Forsberg

**ORGANIZATION:** Cobra Biologics



## Ordering Information

### CORTECS Columns

|                        | Dimension                  | P/N (1/pk) | P/N (3/pk) |
|------------------------|----------------------------|------------|------------|
|                        | Particle Size: 2.7 $\mu$ m |            |            |
| <b>C<sub>18</sub>+</b> | 2.1 $\times$ 30 mm         | 186007394  | 176003289  |
|                        | 2.1 $\times$ 50 mm         | 186007395  | 176003290  |
|                        | 2.1 $\times$ 75 mm         | 186007396  | 176003291  |
|                        | 2.1 $\times$ 100 mm        | 186007397  | 176003292  |
|                        | 2.1 $\times$ 150 mm        | 186007398  | 176003293  |
|                        | 3.0 $\times$ 30 mm         | 186007399  | 176003294  |
|                        | 3.0 $\times$ 50 mm         | 186007400  | 176003295  |
|                        | 3.0 $\times$ 75 mm         | 186007401  | 176003296  |
|                        | 3.0 $\times$ 100 mm        | 186007402  | 176003297  |
|                        | 3.0 $\times$ 150 mm        | 186007403  | 176003298  |
|                        | 4.6 $\times$ 30 mm         | 186007404  | 176003322  |
|                        | 4.6 $\times$ 50 mm         | 186007405  | 176003323  |
|                        | 4.6 $\times$ 75 mm         | 186007406  | 176003324  |
|                        | 4.6 $\times$ 100 mm        | 186007407  | 176003325  |
|                        | 4.6 $\times$ 150 mm        | 186007408  | 176003326  |

|                       | Dimension                  | P/N (1/pk) | P/N (3/pk) |
|-----------------------|----------------------------|------------|------------|
|                       | Particle Size: 2.7 $\mu$ m |            |            |
| <b>C<sub>18</sub></b> | 2.1 $\times$ 30 mm         | 186007364  | 176003269  |
|                       | 2.1 $\times$ 50 mm         | 186007365  | 176003270  |
|                       | 2.1 $\times$ 75 mm         | 186007366  | 176003271  |
|                       | 2.1 $\times$ 100 mm        | 186007367  | 176003272  |
|                       | 2.1 $\times$ 150 mm        | 186007368  | 176003273  |
|                       | 3.0 $\times$ 30 mm         | 186007369  | 176003274  |
|                       | 3.0 $\times$ 50 mm         | 186007370  | 176003275  |
|                       | 3.0 $\times$ 75 mm         | 186007371  | 176003276  |
|                       | 3.0 $\times$ 100 mm        | 186007372  | 176003277  |
|                       | 3.0 $\times$ 150 mm        | 186007373  | 176003278  |
|                       | 4.6 $\times$ 30 mm         | 186007374  | 176003312  |
|                       | 4.6 $\times$ 50 mm         | 186007375  | 176003313  |
|                       | 4.6 $\times$ 75 mm         | 186007376  | 176003314  |
|                       | 4.6 $\times$ 100 mm        | 186007377  | 176003315  |
|                       | 4.6 $\times$ 150 mm        | 186007378  | 176003316  |

|                      | Dimension                  | P/N (1/pk) | P/N (3/pk) |
|----------------------|----------------------------|------------|------------|
|                      | Particle Size: 2.7 $\mu$ m |            |            |
| <b>C<sub>8</sub></b> | 2.1 $\times$ 30 mm         | 186008348  | 176003804  |
|                      | 2.1 $\times$ 50 mm         | 186008349  | 176003805  |
|                      | 2.1 $\times$ 75 mm         | 186008350  | 176003806  |
|                      | 2.1 $\times$ 100 mm        | 186008351  | 176003807  |
|                      | 2.1 $\times$ 150 mm        | 186008352  | 176003808  |
|                      | 3.0 $\times$ 30 mm         | 186008358  | 176003809  |
|                      | 3.0 $\times$ 50 mm         | 186008359  | 176003810  |
|                      | 3.0 $\times$ 75 mm         | 186008360  | 176003811  |
|                      | 3.0 $\times$ 100 mm        | 186008361  | 176003812  |
|                      | 3.0 $\times$ 150 mm        | 186008362  | 176003813  |
|                      | 4.6 $\times$ 30 mm         | 186008368  | 176003814  |
|                      | 4.6 $\times$ 50 mm         | 186008369  | 176003815  |
|                      | 4.6 $\times$ 75 mm         | 186008370  | 176003816  |
|                      | 4.6 $\times$ 100 mm        | 186008371  | 176003817  |
|                      | 4.6 $\times$ 150 mm        | 186008372  | 176003818  |

|              | Dimension                  | P/N (1/pk) | P/N (3/pk) |
|--------------|----------------------------|------------|------------|
|              | Particle Size: 2.7 $\mu$ m |            |            |
| <b>HILIC</b> | 2.1 $\times$ 30 mm         | 186007379  | 176003279  |
|              | 2.1 $\times$ 50 mm         | 186007380  | 176003280  |
|              | 2.1 $\times$ 75 mm         | 186007381  | 176003281  |
|              | 2.1 $\times$ 100 mm        | 186007382  | 176003282  |
|              | 2.1 $\times$ 150 mm        | 186007383  | 176003283  |
|              | 3.0 $\times$ 30 mm         | 186007384  | 176003284  |
|              | 3.0 $\times$ 50 mm         | 186007385  | 176003285  |
|              | 3.0 $\times$ 75 mm         | 186007386  | 176003286  |
|              | 3.0 $\times$ 100 mm        | 186007387  | 176003287  |
|              | 3.0 $\times$ 150 mm        | 186007388  | 176003288  |
|              | 4.6 $\times$ 30 mm         | 186007389  | 176003317  |
|              | 4.6 $\times$ 50 mm         | 186007390  | 176003318  |
|              | 4.6 $\times$ 75 mm         | 186007391  | 176003319  |
|              | 4.6 $\times$ 100 mm        | 186007392  | 176003320  |
|              | 4.6 $\times$ 150 mm        | 186007393  | 176003321  |

CORTECS Columns *Continued*

|                       | Dimension    | P/N (1/pk) | P/N (3/pk) |
|-----------------------|--------------|------------|------------|
| Particle Size: 2.7 µm |              |            |            |
| Phenyl                | 2.1 × 30 mm  | 186008318  | 176003789  |
|                       | 2.1 × 50 mm  | 186008319  | 176003790  |
|                       | 2.1 × 75 mm  | 186008320  | 176003791  |
|                       | 2.1 × 100 mm | 186008321  | 176003792  |
|                       | 2.1 × 150 mm | 186008322  | 176003793  |
|                       | 3.0 × 30 mm  | 186008328  | 176003794  |
|                       | 3.0 × 50 mm  | 186008329  | 176003795  |
|                       | 3.0 × 75 mm  | 186008330  | 176003796  |
|                       | 3.0 × 100 mm | 186008331  | 176003797  |
|                       | 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  |

|                       | Dimension    | P/N (1/pk) | P/N (3/pk) |
|-----------------------|--------------|------------|------------|
| Particle Size: 2.7 µm |              |            |            |
| Shield RP18           | 2.1 × 30 mm  | 186008661  | 176003912  |
|                       | 2.1 × 50 mm  | 186008662  | 176003913  |
|                       | 2.1 × 75 mm  | 186008663  | 176003914  |
|                       | 2.1 × 100 mm | 186008664  | 176003915  |
|                       | 2.1 × 150 mm | 186008665  | 176003916  |
|                       | 3.0 × 30 mm  | 186008671  | 176003917  |
|                       | 3.0 × 50 mm  | 186008672  | 176003918  |
|                       | 3.0 × 75 mm  | 186008673  | 176003919  |
|                       | 3.0 × 100 mm | 186008674  | 176003920  |
|                       | 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  |

|                       | Dimension    | P/N (1/pk) | P/N (3/pk) |
|-----------------------|--------------|------------|------------|
| Particle Size: 2.7 µm |              |            |            |
| T3                    | 2.1 × 30 mm  | 186008481  | 176003876  |
|                       | 2.1 × 50 mm  | 186008482  | 176003877  |
|                       | 2.1 × 75 mm  | 186008483  | 176003878  |
|                       | 2.1 × 100 mm | 186008484  | 176003879  |
|                       | 2.1 × 150 mm | 186008485  | 176003880  |
|                       | 3.0 × 30 mm  | 186008486  | 176003881  |
|                       | 3.0 × 50 mm  | 186008487  | 176003882  |
|                       | 3.0 × 75 mm  | 186008488  | 176003883  |
|                       | 3.0 × 100 mm | 186008489  | 176003884  |
|                       | 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  |

**APPLICATION AREA:** Agricultural Chemistry

"The CORTECS T3 Column has provided excellent separation of mixed polarity compounds. The column, as expected, has provided excellent selectivity for moderately polar compounds. This is a great column to add to your method development screen!!"

**REVIEWER:** Justin Shearer

**ORGANIZATION:** Dow AgroSciences



## CORTECS Columns Method Validation Kits\*

|                              | Dimension             | P/N       |
|------------------------------|-----------------------|-----------|
|                              | Particle Size: 2.7 µm |           |
| C <sub>18</sub> <sup>+</sup> | 2.1 × 30 mm           | 186007439 |
|                              | 2.1 × 50 mm           | 186007440 |
|                              | 2.1 × 75 mm           | 186007441 |
|                              | 2.1 × 100 mm          | 186007442 |
|                              | 2.1 × 150 mm          | 186007443 |
|                              | 3.0 × 30 mm           | 186007444 |
|                              | 3.0 × 50 mm           | 186007445 |
|                              | 3.0 × 75 mm           | 186007446 |
|                              | 3.0 × 100 mm          | 186007447 |
|                              | 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 |

|                 | Dimension             | P/N       |
|-----------------|-----------------------|-----------|
|                 | Particle Size: 2.7 µm |           |
| C <sub>18</sub> | 2.1 × 30 mm           | 186007409 |
|                 | 2.1 × 50 mm           | 186007410 |
|                 | 2.1 × 75 mm           | 186007411 |
|                 | 2.1 × 100 mm          | 186007412 |
|                 | 2.1 × 150 mm          | 186007413 |
|                 | 3.0 × 30 mm           | 186007414 |
|                 | 3.0 × 50 mm           | 186007415 |
|                 | 3.0 × 75 mm           | 186007416 |
|                 | 3.0 × 100 mm          | 186007417 |
|                 | 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 |

|                | Dimension             | P/N       |
|----------------|-----------------------|-----------|
|                | Particle Size: 2.7 µm |           |
| C <sub>8</sub> | 2.1 × 30 mm           | 186008353 |
|                | 2.1 × 50 mm           | 186008354 |
|                | 2.1 × 75 mm           | 186008355 |
|                | 2.1 × 100 mm          | 186008356 |
|                | 2.1 × 150 mm          | 186008357 |
|                | 3.0 × 30 mm           | 186008363 |
|                | 3.0 × 50 mm           | 186008364 |
|                | 3.0 × 75 mm           | 186008365 |
|                | 3.0 × 100 mm          | 186008366 |
|                | 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 |

|       | Dimension             | P/N       |
|-------|-----------------------|-----------|
|       | Particle Size: 2.7 µm |           |
| HILIC | 2.1 × 30 mm           | 186007424 |
|       | 2.1 × 50 mm           | 186007425 |
|       | 2.1 × 75 mm           | 186007426 |
|       | 2.1 × 100 mm          | 186007427 |
|       | 2.1 × 150 mm          | 186007428 |
|       | 3.0 × 30 mm           | 186007429 |
|       | 3.0 × 50 mm           | 186007430 |
|       | 3.0 × 75 mm           | 186007431 |
|       | 3.0 × 100 mm          | 186007432 |
|       | 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 |

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

CORTECS Columns Method Validation Kits\* *Continued*

|                              | Dimension    | P/N       |
|------------------------------|--------------|-----------|
| <b>Particle Size: 2.7 µm</b> |              |           |
| <b>Phenyl</b>                | 2.1 × 30 mm  | 186008323 |
|                              | 2.1 × 50 mm  | 186008324 |
|                              | 2.1 × 75 mm  | 186008325 |
|                              | 2.1 × 100 mm | 186008326 |
|                              | 2.1 × 150 mm | 186008327 |
|                              | 3.0 × 30 mm  | 186008333 |
|                              | 3.0 × 50 mm  | 186008334 |
|                              | 3.0 × 75 mm  | 186008335 |
|                              | 3.0 × 100 mm | 186008336 |
|                              | 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 |

|                              | Dimension    | P/N       |
|------------------------------|--------------|-----------|
| <b>Particle Size: 2.7 µm</b> |              |           |
| <b>Shield RP18</b>           | 2.1 × 30 mm  | 186008666 |
|                              | 2.1 × 50 mm  | 186008667 |
|                              | 2.1 × 75 mm  | 186008668 |
|                              | 2.1 × 100 mm | 186008669 |
|                              | 2.1 × 150 mm | 186008670 |
|                              | 3.0 × 30 mm  | 186008676 |
|                              | 3.0 × 50 mm  | 186008677 |
|                              | 3.0 × 75 mm  | 186008678 |
|                              | 3.0 × 100 mm | 186008679 |
|                              | 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.

|                              | Dimension    | P/N       |
|------------------------------|--------------|-----------|
| <b>Particle Size: 2.7 µm</b> |              |           |
| <b>T3</b>                    | 2.1 × 30 mm  | 186008509 |
|                              | 2.1 × 50 mm  | 186008510 |
|                              | 2.1 × 75 mm  | 186008516 |
|                              | 2.1 × 100 mm | 186008517 |
|                              | 2.1 × 150 mm | 186008518 |
|                              | 3.0 × 30 mm  | 186008519 |
|                              | 3.0 × 50 mm  | 186008520 |
|                              | 3.0 × 75 mm  | 186008521 |
|                              | 3.0 × 100 mm | 186008522 |
|                              | 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

|                              | Dimension  | P/N       |
|------------------------------|------------|-----------|
| <b>Particle Size: 2.7 µm</b> |            |           |
| <b>C<sub>18</sub>+</b>       | 2.1 × 5 mm | 186007685 |
|                              | 3.9 × 5 mm | 186007687 |
| <b>C<sub>18</sub></b>        | 2.1 × 5 mm | 186007682 |
|                              | 3.9 × 5 mm | 186007684 |
| <b>C<sub>8</sub></b>         | 2.1 × 5 mm | 186008421 |
|                              | 3.9 × 5 mm | 186008422 |
| <b>HILIC</b>                 | 2.1 × 5 mm | 186007688 |
|                              | 3.9 × 5 mm | 186007690 |
| <b>Phenyl</b>                | 2.1 × 5 mm | 186008418 |
|                              | 3.9 × 5 mm | 186008419 |
| <b>Shield RP18</b>           | 2.1 × 5 mm | 186008712 |
|                              | 3.9 × 5 mm | 186008711 |
| <b>T3</b>                    | 2.1 × 5 mm | 186008506 |
|                              | 3.9 × 5 mm | 186008507 |

## Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |



## XBridge BEH *XP* Columns

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

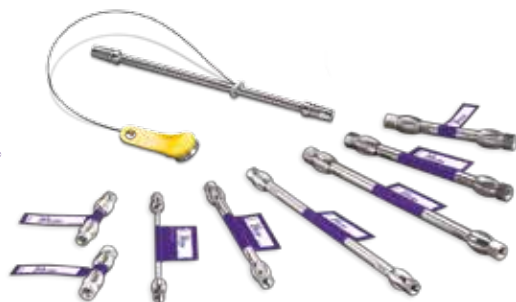
### Column Characteristics

|                       | BEH C <sub>18</sub> <sup>XP</sup><br>130Å              | BEH C <sub>8</sub> <sup>XP</sup><br>130Å               | BEH Shield RP18,<br>130Å                               | Peptide BEH C <sub>18</sub> <sup>XP</sup><br>130Å | Peptide BEH C <sub>18</sub> <sup>XP</sup><br>300Å | Protein BEH C <sub>4</sub> <sup>XP</sup><br>300Å |
|-----------------------|--|--|--|---|---|--|
|                       | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5, 10 µm         | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5, 10 µm         | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5, 10 µm         | HPLC: 3.5, 5, 10 µm                               | HPLC: 3.5, 5, 10 µm                               | HPLC: 3.5 µm                                     |
| Particle/Ligand       |  |  |  |   |   |  |
| Ligand Density*       | 3.1 µmol/m <sup>2</sup>                                | 3.2 µmol/m <sup>2</sup>                                | 3.3 µmol/m <sup>2</sup>                                | 3.1 µmol/m <sup>2</sup>                           | 3.1 µmol/m <sup>2</sup>                           | 2.4 µmol/m <sup>2</sup>                          |
| Carbon Load*          | 18%  | 13%  | 17%  | 18%   | 12%   | 8%   |
| Endcap Style          | Proprietary  | Proprietary  | TMS  | Proprietary                                       | Proprietary                                       | None   |
| 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,<br>High pH = 60 °C                     | Low pH = 60 °C,<br>High pH = 60 °C                     | Low pH = 50 °C,<br>High pH = 45 °C                     | Low pH = 80 °C,<br>High pH = 60 °C                | Low pH = 80 °C,<br>High pH = 60 °C                | Low pH = 80 °C,<br>High pH = 50 °C               |
| Surface Area*         | 185 m <sup>2</sup> /g                                  | 185 m <sup>2</sup> /g                                  | 185 m <sup>2</sup> /g                                  | 185 m <sup>2</sup> /g                             | 90 m <sup>2</sup> /g                              | 90 m <sup>2</sup> /g                             |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | Cytochrome c Digestion Standard<br>p/n: 186006371 | Cytochrome c Digestion Standard<br>p/n: 186006371 | MassPREP Protein Standard Mix<br>p/n: 186004900  |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Peptide Retention Standard<br>p/n: 186006555      | Peptide Retention Standard<br>p/n: 186006555      | MassPREP Protein Standard Mix<br>p/n: 186004900  |

\*Expected or approximate value.

BEH Technology is also available in UPLC particle sizes (ACQUITY UPLC BEH 1.7 µm), please refer to page 94.

For more information on XBridge BEH HPLC Columns, refer to page 137.



| Protein BEH SEC,<br>125Å                          | Protein BEH SEC,<br>200Å                             | Protein BEH SEC,<br>450Å                             | Oligonucleotide BEH C <sub>18</sub> <sup>r</sup> ,<br>130Å | BEH Phenyl,<br>130Å                                       | BEH HILIC,<br>130Å                               | BEH Amide,<br>130Å                               |
|---|--|--|--|---|--|--|
| HPLC: 3.5 µm                                      | HPLC: 3.5 µm   | HPLC: 3.5 µm   | HPLC: 2.5 µm   | UHPLC: 2.5 µm XP<br>HPLC: 3.5, 5, 10 µm                   | UHPLC: 2.5 µm XP<br>HPLC: 3.5 µm                 | UHPLC: 2.5 µm XP<br>HPLC: 3.5 µm                 |
|   |  |  |  |   |  |  |
| 4.9 µmol/m <sup>2</sup>                           | 5.5 µmol/m <sup>2</sup>                              | 4.8 µmol/m <sup>2</sup>                              | 3.1 µmol/m <sup>2</sup>                                    | 3.0 µmol/m <sup>2</sup>                                   | N/A  | 7.5 µmol/m <sup>2</sup>                          |
| 15%   | 12%  | 9%   | 18%  | 15%   | Unbonded   | 12%  |
| None  | None   | None   | Proprietary  | Proprietary   | N/A  | None   |
| L33   | L33  | L33  | L1   | L11   | L3   | L68  |
| 1-8   | 1-8  | 1-8  | 1-12   | 1-12  | 1-9  | 2-11   |
| Low pH = 60 °C,<br>High pH = 60 °C                | Low pH = 60 °C,<br>High pH = 60 °C                   | Low pH = 60 °C,<br>High pH = 60 °C                   | Low pH = 80 °C,<br>High pH = 60 °C                         | Low pH = 80 °C,<br>High pH = 60 °C                        | Low pH = 45 °C,<br>High pH = 45 °C               | Low pH = 90 °C,<br>High pH = 90 °C               |
| 395 m <sup>2</sup> /g                             | 220 m <sup>2</sup> /g                                | 80 m <sup>2</sup> /g                                 | 90 m <sup>2</sup> /g                                       | 185 m <sup>2</sup> /g                                     | 185 m <sup>2</sup> /g                            | 185 m <sup>2</sup> /g                            |
| BEH 125 Protein<br>Standard Mix<br>p/n: 186006519 | BEH200 SEC Protein<br>Standard Mix<br>p/n: 186006518 | BEH450 SEC Protein<br>Standard Mix<br>p/n: 186006842 | MassPREP<br>OST Standard<br>p/n: 186004135                 | Neutrals QC<br>Reference Material<br>p/n: 186006360       | HILIC QC<br>Reference Material<br>p/n: 186007226 | HILIC QC<br>Reference Material<br>p/n: 186007226 |
| BEH 125 Protein<br>Standard Mix<br>p/n: 186006519 | BEH200 SEC Protein<br>Standard Mix<br>p/n: 186006518 | BEH450 SEC Protein<br>Standard Mix<br>p/n: 186006842 | MassPREP<br>OST Standard<br>p/n: 186004135                 | Reversed-Phase QC<br>Reference Material<br>p/n: 186006363 | HILIC QC<br>Reference Material<br>p/n: 186007226 | HILIC QC<br>Reference Material<br>p/n: 186007226 |

## Ordering Information

### XBridge Analytical Columns

|                           | Dimension               | P/N (1/pk) | P/N (3/pk) |
|---------------------------|-------------------------|------------|------------|
| Particle Size: 2.5 µm     |                         |            |            |
| <b>BEH C<sub>18</sub></b> | 1.0 × 50 mm*            | 186003118  | —          |
|                           | 2.1 × 20 mm <i>IS</i> * | 186003201  | —          |
|                           | 2.1 × 30 mm <i>XP</i>   | 186006028  | 176002546  |
|                           | 2.1 × 50 mm <i>XP</i>   | 186006029  | 176002547  |
|                           | 2.1 × 75 mm <i>XP</i>   | 186006030  | 176002548  |
|                           | 2.1 × 100 mm <i>XP</i>  | 186006031  | 176002549  |
|                           | 2.1 × 150 mm <i>XP</i>  | 186006709  | 176002879  |
|                           | 3.0 × 30 mm <i>XP</i>   | 186006032  | 176002550  |
|                           | 3.0 × 50 mm <i>XP</i>   | 186006033  | 176002551  |
|                           | 3.0 × 75 mm <i>XP</i>   | 186006034  | 176002552  |
|                           | 3.0 × 100 mm <i>XP</i>  | 186006035  | 176002553  |
|                           | 3.0 × 150 mm <i>XP</i>  | 186006710  | 176002880  |
|                           | 4.6 × 30 mm <i>XP</i>   | 186006036  | —          |
|                           | 4.6 × 50 mm <i>XP</i>   | 186006037  | —          |
|                           | 4.6 × 75 mm <i>XP</i>   | 186006038  | —          |
|                           | 4.6 × 100 mm <i>XP</i>  | 186006039  | —          |
|                           | 4.6 × 150 mm <i>XP</i>  | 186006711  | —          |

|                          | Dimension               | P/N (1/pk) | P/N (3/pk) |
|--------------------------|-------------------------|------------|------------|
| Particle Size: 2.5 µm    |                         |            |            |
| <b>BEH C<sub>8</sub></b> | 1.0 × 50 mm*            | 186003164  | —          |
|                          | 2.1 × 20 mm <i>IS</i> * | 186003167  | —          |
|                          | 2.1 × 30 mm <i>XP</i>   | 186006040  | 176002554  |
|                          | 2.1 × 50 mm <i>XP</i>   | 186006041  | 176002555  |
|                          | 2.1 × 75 mm <i>XP</i>   | 186006042  | 176002556  |
|                          | 2.1 × 100 mm <i>XP</i>  | 186006043  | 176002557  |
|                          | 2.1 × 150 mm <i>XP</i>  | 186006712  | 176002881  |
|                          | 3.0 × 20 mm <i>IS</i> * | 186003168  | —          |
|                          | 3.0 × 30 mm <i>XP</i>   | 186006044  | 176002558  |
|                          | 3.0 × 50 mm <i>XP</i>   | 186006045  | 176002559  |
|                          | 3.0 × 75 mm <i>XP</i>   | 186006046  | 176002560  |
|                          | 3.0 × 100 mm <i>XP</i>  | 186006047  | 176002561  |
|                          | 3.0 × 150 mm <i>XP</i>  | 186006713  | 176002882  |
|                          | 4.6 × 20 mm <i>IS</i> * | 186003172  | —          |
|                          | 4.6 × 30 mm <i>XP</i>   | 186006048  | —          |
|                          | 4.6 × 50 mm <i>XP</i>   | 186006049  | —          |
|                          | 4.6 × 75 mm <i>XP</i>   | 186006050  | —          |
|                          | 4.6 × 100 mm <i>XP</i>  | 186006051  | —          |
| 4.6 × 150 mm <i>XP</i>   | 186006714               | —          |            |

|                        | Dimension               | P/N (1/pk) | P/N (3/pk) |
|------------------------|-------------------------|------------|------------|
| Particle Size: 2.5 µm  |                         |            |            |
| <b>BEH Shield RP18</b> | 1.0 × 50 mm*            | 186003136  | —          |
|                        | 2.1 × 20 mm <i>IS</i> * | 186003139  | —          |
|                        | 2.1 × 30 mm <i>XP</i>   | 186006052  | 176002562  |
|                        | 2.1 × 50 mm <i>XP</i>   | 186006053  | 176002563  |
|                        | 2.1 × 75 mm <i>XP</i>   | 186006054  | 176002564  |
|                        | 2.1 × 100 mm <i>XP</i>  | 186006055  | 176002565  |
|                        | 2.1 × 150 mm <i>XP</i>  | 186006715  | 176002883  |
|                        | 3.0 × 20 mm <i>IS</i> * | 186003140  | —          |
|                        | 3.0 × 30 mm <i>XP</i>   | 186006056  | 176002566  |
|                        | 3.0 × 50 mm <i>XP</i>   | 186006057  | 176002567  |
|                        | 3.0 × 75 mm <i>XP</i>   | 186006058  | 176002568  |
|                        | 3.0 × 100 mm <i>XP</i>  | 186006059  | 176002569  |
|                        | 3.0 × 150 mm <i>XP</i>  | 186006716  | 176002884  |
|                        | 4.6 × 20 mm <i>IS</i> * | 186003144  | —          |
|                        | 4.6 × 30 mm <i>XP</i>   | 186006060  | —          |
|                        | 4.6 × 50 mm <i>XP</i>   | 186006061  | —          |
|                        | 4.6 × 75 mm <i>XP</i>   | 186006062  | —          |
|                        | 4.6 × 100 mm <i>XP</i>  | 186006063  | —          |
| 4.6 × 150 mm <i>XP</i> | 186006717               | —          |            |

|                       | Dimension               | P/N (1/pk) | P/N (3/pk) |
|-----------------------|-------------------------|------------|------------|
| Particle Size: 2.5 µm |                         |            |            |
| <b>BEH Phenyl</b>     | 1.0 × 50 mm*            | 186003306  | —          |
|                       | 2.1 × 30 mm <i>XP</i>   | 186006064  | 176002570  |
|                       | 2.1 × 50 mm <i>XP</i>   | 186006065  | 176002571  |
|                       | 2.1 × 75 mm <i>XP</i>   | 186006066  | 176002572  |
|                       | 2.1 × 100 mm <i>XP</i>  | 186006067  | 176002573  |
|                       | 2.1 × 150 mm <i>XP</i>  | 186006718  | 176002885  |
|                       | 3.0 × 30 mm <i>XP</i>   | 186006068  | 176002574  |
|                       | 3.0 × 50 mm <i>XP</i>   | 186006069  | 176002575  |
|                       | 3.0 × 75 mm <i>XP</i>   | 186006070  | 176002576  |
|                       | 3.0 × 100 mm <i>XP</i>  | 186006071  | 176002577  |
|                       | 3.0 × 150 mm <i>XP</i>  | 186006719  | 176002886  |
|                       | 4.6 × 20 mm <i>IS</i> * | 186003313  | —          |
|                       | 4.6 × 30 mm <i>XP</i>   | 186006072  | —          |
|                       | 4.6 × 50 mm <i>XP</i>   | 186006073  | —          |
|                       | 4.6 × 75 mm <i>XP</i>   | 186006074  | —          |
|                       | 4.6 × 100 mm <i>XP</i>  | 186006075  | —          |
|                       | 4.6 × 150 mm <i>XP</i>  | 186006720  | —          |

\*Recommended maximum pressure of 6000 psi (400 bar).

XBridge Analytical Columns *Continued*

|                       | Dimension              | P/N (1/pk) | P/N (3/pk) |
|-----------------------|------------------------|------------|------------|
| Particle Size: 2.5 µm |                        |            |            |
| <b>HILIC</b>          | 2.1 × 30 mm <i>XP</i>  | 186006076  | 176002578  |
|                       | 2.1 × 50 mm <i>XP</i>  | 186006077  | 176002579  |
|                       | 2.1 × 75 mm <i>XP</i>  | 186006078  | 176002580  |
|                       | 2.1 × 100 mm <i>XP</i> | 186006079  | 176002581  |
|                       | 2.1 × 150 mm <i>XP</i> | 186006721  | 176002887  |
|                       | 3.0 × 30 mm <i>XP</i>  | 186006080  | 176002582  |
|                       | 3.0 × 50 mm <i>XP</i>  | 186006081  | 176002583  |
|                       | 3.0 × 75 mm <i>XP</i>  | 186006082  | 176002584  |
|                       | 3.0 × 100 mm <i>XP</i> | 186006083  | 176002585  |
|                       | 3.0 × 150 mm <i>XP</i> | 186006722  | 176002888  |
|                       | 4.6 × 30 mm <i>XP</i>  | 186006084  | —          |
|                       | 4.6 × 50 mm <i>XP</i>  | 186006085  | —          |
|                       | 4.6 × 75 mm <i>XP</i>  | 186006086  | —          |
|                       | 4.6 × 100 mm <i>XP</i> | 186006087  | —          |
|                       | 4.6 × 150 mm <i>XP</i> | 186006723  | —          |

|                       | Dimension              | P/N (1/pk) | P/N (3/pk) |
|-----------------------|------------------------|------------|------------|
| Particle Size: 2.5 µm |                        |            |            |
| <b>Amide</b>          | 2.1 × 30 mm <i>XP</i>  | 186006088  | 176002586  |
|                       | 2.1 × 50 mm <i>XP</i>  | 186006089  | 176002587  |
|                       | 2.1 × 75 mm <i>XP</i>  | 186006090  | 176002588  |
|                       | 2.1 × 100 mm <i>XP</i> | 186006091  | 176002589  |
|                       | 2.1 × 150 mm <i>XP</i> | 186006724  | 176002889  |
|                       | 3.0 × 30 mm <i>XP</i>  | 186006092  | 176002590  |
|                       | 3.0 × 50 mm <i>XP</i>  | 186006093  | 176002591  |
|                       | 3.0 × 75 mm <i>XP</i>  | 186006094  | 176002592  |
|                       | 3.0 × 100 mm <i>XP</i> | 186006095  | 176002593  |
|                       | 3.0 × 150 mm <i>XP</i> | 186006725  | 176002890  |
|                       | 4.6 × 30 mm <i>XP</i>  | 186006096  | —          |
|                       | 4.6 × 50 mm <i>XP</i>  | 186006097  | —          |
|                       | 4.6 × 75 mm <i>XP</i>  | 186006098  | —          |
|                       | 4.6 × 100 mm <i>XP</i> | 186006099  | —          |
|                       | 4.6 × 150 mm <i>XP</i> | 186006726  | —          |

XBridge BEH Glycan Columns

|                        | Dimension              | P/N       |
|------------------------|------------------------|-----------|
| Particle Size: 2.5 µm  |                        |           |
| <b>BEH Amide, 130Å</b> | 2.1 × 50 mm <i>XP</i>  | 186007263 |
|                        | 2.1 × 100 mm <i>XP</i> | 186007264 |
|                        | 2.1 × 150 mm <i>XP</i> | 186007265 |
|                        | 3.0 × 30 mm <i>XP</i>  | 186008038 |
|                        | 3.0 × 75 mm <i>XP</i>  | 186008039 |
|                        | 3.0 × 150 mm <i>XP</i> | 186008040 |
|                        | 4.6 × 50 mm <i>XP</i>  | 186007268 |
|                        | 4.6 × 100 mm <i>XP</i> | 186007269 |
|                        | 4.6 × 150 mm <i>XP</i> | 186007270 |

XBridge Columns Method Validation Kits\*

|                           | Dimension              | P/N         |
|---------------------------|------------------------|-------------|
| Particle Size: 2.5 µm     |                        |             |
| <b>BEH C<sub>18</sub></b> | 2.1 × 50 mm <i>XP</i>  | 186006197   |
|                           | 2.1 × 100 mm <i>XP</i> | 186006198   |
|                           | 2.1 × 150 mm <i>XP</i> | 186006757   |
|                           | 3.0 × 50 mm <i>XP</i>  | 186006199   |
|                           | 3.0 × 100 mm <i>XP</i> | 186006200   |
|                           | 3.0 × 150 mm <i>XP</i> | 186006758   |
|                           | 4.6 × 50 mm            | 186004906** |
|                           | 4.6 × 50 mm <i>XP</i>  | 186006201   |
|                           | 4.6 × 100 mm <i>XP</i> | 186006202   |
|                           | 4.6 × 150 mm <i>XP</i> | 186006759   |

|                          | Dimension              | P/N       |
|--------------------------|------------------------|-----------|
| Particle Size: 2.5 µm    |                        |           |
| <b>BEH C<sub>8</sub></b> | 2.1 × 50 mm <i>XP</i>  | 186006203 |
|                          | 2.1 × 100 mm <i>XP</i> | 186006204 |
|                          | 2.1 × 150 mm <i>XP</i> | 186006760 |
|                          | 3.0 × 50 mm <i>XP</i>  | 186006205 |
|                          | 3.0 × 100 mm <i>XP</i> | 186006206 |
|                          | 3.0 × 150 mm <i>XP</i> | 186006761 |
|                          | 4.6 × 50 mm <i>XP</i>  | 186006207 |
|                          | 4.6 × 100 mm <i>XP</i> | 186006208 |
|                          | 4.6 × 150 mm <i>XP</i> | 186006762 |

|                        | Dimension              | P/N       |
|------------------------|------------------------|-----------|
| Particle Size: 2.5 µm  |                        |           |
| <b>BEH Shield RP18</b> | 2.1 × 50 mm <i>XP</i>  | 186006209 |
|                        | 2.1 × 100 mm <i>XP</i> | 186006210 |
|                        | 2.1 × 150 mm <i>XP</i> | 186006763 |
|                        | 3.0 × 50 mm <i>XP</i>  | 186006211 |
|                        | 3.0 × 100 mm <i>XP</i> | 186006212 |
|                        | 3.0 × 150 mm <i>XP</i> | 186006774 |
|                        | 4.6 × 50 mm <i>XP</i>  | 186006213 |
|                        | 4.6 × 100 mm <i>XP</i> | 186006214 |
|                        | 4.6 × 150 mm <i>XP</i> | 186006775 |

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

\*\* Oligonucleotide Method Validation Kit.

XBridge Columns Method Validation Kits *Continued*

|                              | Dimension              | P/N       |
|------------------------------|------------------------|-----------|
| <b>Particle Size: 2.7 µm</b> |                        |           |
| <b>Phenyl</b>                | 2.1 × 50 mm <i>XP</i>  | 186006215 |
|                              | 2.1 × 100 mm <i>XP</i> | 186006216 |
|                              | 2.1 × 150 mm <i>XP</i> | 186006776 |
|                              | 3.0 × 50 mm <i>XP</i>  | 186006217 |
|                              | 3.0 × 100 mm <i>XP</i> | 186006218 |
|                              | 3.0 × 150 mm <i>XP</i> | 186006777 |
|                              | 4.6 × 50 mm <i>XP</i>  | 186006219 |
|                              | 4.6 × 100 mm <i>XP</i> | 186006220 |
|                              | 4.6 × 150 mm <i>XP</i> | 186006778 |

|                              | Dimension              | P/N       |
|------------------------------|------------------------|-----------|
| <b>Particle Size: 2.5 µm</b> |                        |           |
| <b>HILIC</b>                 | 2.1 × 50 mm <i>XP</i>  | 186006221 |
|                              | 2.1 × 100 mm <i>XP</i> | 186006222 |
|                              | 2.1 × 150 mm <i>XP</i> | 186006779 |
|                              | 3.0 × 50 mm <i>XP</i>  | 186006223 |
|                              | 3.0 × 100 mm <i>XP</i> | 186006224 |
|                              | 3.0 × 150 mm <i>XP</i> | 186006780 |
|                              | 4.6 × 50 mm <i>XP</i>  | 186006225 |
|                              | 4.6 × 100 mm <i>XP</i> | 186006226 |
|                              | 4.6 × 150 mm <i>XP</i> | 186006781 |

|                              | Dimension              | P/N       |
|------------------------------|------------------------|-----------|
| <b>Particle Size: 2.5 µm</b> |                        |           |
| <b>Amide</b>                 | 2.1 × 50 mm <i>XP</i>  | 186006227 |
|                              | 2.1 × 100 mm <i>XP</i> | 186006228 |
|                              | 2.1 × 150 mm <i>XP</i> | 186006782 |
|                              | 3.0 × 50 mm <i>XP</i>  | 186006229 |
|                              | 3.0 × 100 mm <i>XP</i> | 186006230 |
|                              | 3.0 × 150 mm <i>XP</i> | 186006783 |
|                              | 4.6 × 50 mm <i>XP</i>  | 186006231 |
|                              | 4.6 × 100 mm <i>XP</i> | 186006232 |
|                              | 4.6 × 150 mm <i>XP</i> | 186006784 |

|                              | Dimension              | P/N       |
|------------------------------|------------------------|-----------|
| <b>Particle Size: 2.5 µm</b> |                        |           |
| <b>Glycan BEH Amide</b>      | 2.1 × 150 mm <i>XP</i> | 186007266 |
|                              | 4.6 × 150 mm <i>XP</i> | 186007271 |

XBridge VanGuard Cartridges

|                              | Dimension  | P/N       |
|------------------------------|------------|-----------|
| <b>Particle Size: 2.5 µm</b> |            |           |
| <b>BEH C<sub>18</sub></b>    | 2.1 × 5 mm | 186007772 |
|                              | 3.9 × 5 mm | 186007774 |
| <b>BEH C<sub>8</sub></b>     | 2.1 × 5 mm | 186007781 |
|                              | 3.9 × 5 mm | 186007783 |
| <b>BEH Shield RP18</b>       | 2.1 × 5 mm | 186007808 |
|                              | 3.9 × 5 mm | 186007810 |
| <b>Phenyl</b>                | 2.1 × 5 mm | 186007799 |
|                              | 3.9 × 5 mm | 186007801 |
| <b>HILIC</b>                 | 2.1 × 5 mm | 186007790 |
|                              | 3.9 × 5 mm | 186007792 |
| <b>Amide</b>                 | 2.1 × 5 mm | 186007763 |
|                              | 3.9 × 5 mm | 186007765 |

Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |

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

"This variety of column was a workhorse for a test that we were conducting; it was robust enough to keep running without much maintenance involved. The column we were using performed very well under the strict time constraints that we were working with."

**REVIEWER:** Gregory Rahm Jr.  
**ORGANIZATION:** Q Laboratories





## XSelect CSH *XP* and HSS *XP* HPLC Columns

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



### Column Characteristics

|                       | CSH $C_{18}$ , 130Å  | CSH Phenyl-Hexyl, 130Å   | CSH Fluoro-Phenyl, 300Å  |
|-----------------------|--|--|--|
|                       | UHPLC: 2.5 $\mu\text{m}$ <i>XP</i><br>HPLC: 3.5, 5, 10 $\mu\text{m}$ | UHPLC: 2.5 $\mu\text{m}$ <i>XP</i><br>HPLC: 3.5, 5 $\mu\text{m}$ | UHPLC: 2.5 $\mu\text{m}$ <i>XP</i><br>HPLC: 3.5, 5 $\mu\text{m}$ |
| Particle/Ligand       |  |  |  |
| Ligand Density*       | 2.3 $\mu\text{mol}/\text{m}^2$                                       | 2.3 $\mu\text{mol}/\text{m}^2$                                   | 2.3 $\mu\text{mol}/\text{m}^2$                                   |
| Carbon Load*          | 15%  | 14%  | 10%  |
| Endcap Style          | Proprietary  | Proprietary  | None   |
| 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 $\text{m}^2/\text{g}$  | 185 $\text{m}^2/\text{g}$  | 185 $\text{m}^2/\text{g}$  |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360                     | Neutrals QC Reference Material<br>p/n: 186006360                 | Neutrals QC Reference Material<br>p/n: 186006360                 |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363               | Reversed-Phase QC Reference Material<br>p/n: 186006363           | Reversed-Phase QC Reference Material<br>p/n: 186006363           |

\*Expected or approximate value.

XSelect Columns are also available in UPLC particle sizes (ACQUITY UPLC CSH 1.7  $\mu\text{m}$  and ACQUITY UPLC HSS 1.8  $\mu\text{m}$ ), refer to pages 90 and 100.

For more information on XSelect CSH and HSS HPLC Columns, refer to page 146.

## Ordering Information

### XSelect CSH Analytical Columns

|                       | Dimension              | P/N (1/pk) | P/N (3/pk) |
|-----------------------|------------------------|------------|------------|
| Particle Size: 2.5 µm |                        |            |            |
| CSH C <sub>18</sub>   | 2.1 × 30 mm <i>XP</i>  | 186006100  | 176002594  |
|                       | 2.1 × 50 mm <i>XP</i>  | 186006101  | 176002595  |
|                       | 2.1 × 75 mm <i>XP</i>  | 186006102  | 176002596  |
|                       | 2.1 × 100 mm <i>XP</i> | 186006103  | 176002597  |
|                       | 2.1 × 150 mm <i>XP</i> | 186006727  | 176002891  |
|                       | 3.0 × 30 mm <i>XP</i>  | 186006104  | 176002598  |
|                       | 3.0 × 50 mm <i>XP</i>  | 186006105  | 176002599  |
|                       | 3.0 × 75 mm <i>XP</i>  | 186006106  | 176002600  |
|                       | 3.0 × 100 mm <i>XP</i> | 186006107  | 176002601  |
|                       | 3.0 × 150 mm <i>XP</i> | 186006728  | 176002892  |
|                       | 4.6 × 30 mm <i>XP</i>  | 186006108  | —          |
|                       | 4.6 × 50 mm <i>XP</i>  | 186006109  | —          |
|                       | 4.6 × 75 mm <i>XP</i>  | 186006110  | —          |
|                       | 4.6 × 100 mm <i>XP</i> | 186006111  | —          |
|                       | 4.6 × 150 mm <i>XP</i> | 186006729  | —          |

|                       | Dimension              | P/N (1/pk) | P/N (3/pk) |
|-----------------------|------------------------|------------|------------|
| Particle Size: 2.5 µm |                        |            |            |
| CSH<br>Fluoro-Phenyl  | 2.1 × 30 mm <i>XP</i>  | 186006112  | 176002602  |
|                       | 2.1 × 50 mm <i>XP</i>  | 186006113  | 176002603  |
|                       | 2.1 × 75 mm <i>XP</i>  | 186006114  | 176002604  |
|                       | 2.1 × 100 mm <i>XP</i> | 186006115  | 176002605  |
|                       | 2.1 × 150 mm <i>XP</i> | 186006730  | 176002893  |
|                       | 3.0 × 30 mm <i>XP</i>  | 186006116  | 176002606  |
|                       | 3.0 × 50 mm <i>XP</i>  | 186006117  | 176002607  |
|                       | 3.0 × 75 mm <i>XP</i>  | 186006118  | 176002608  |
|                       | 3.0 × 100 mm <i>XP</i> | 186006119  | 176002609  |
|                       | 3.0 × 150 mm <i>XP</i> | 186006731  | 176002894  |
|                       | 4.6 × 30 mm <i>XP</i>  | 186006120  | —          |
|                       | 4.6 × 50 mm <i>XP</i>  | 186006121  | —          |
|                       | 4.6 × 75 mm <i>XP</i>  | 186006122  | —          |
|                       | 4.6 × 100 mm <i>XP</i> | 186006123  | —          |
|                       | 4.6 × 150 mm <i>XP</i> | 186006732  | —          |

|                       | Dimension              | P/N (1/pk) | P/N (3/pk) |
|-----------------------|------------------------|------------|------------|
| Particle Size: 2.5 µm |                        |            |            |
| CSH Phenyl-Hexyl      | 2.1 × 30 mm <i>XP</i>  | 186006124  | 176002610  |
|                       | 2.1 × 50 mm <i>XP</i>  | 186006125  | 176002611  |
|                       | 2.1 × 75 mm <i>XP</i>  | 186006126  | 176002612  |
|                       | 2.1 × 100 mm <i>XP</i> | 186006127  | 176002613  |
|                       | 2.1 × 150 mm <i>XP</i> | 186006733  | 176002895  |
|                       | 3.0 × 30 mm <i>XP</i>  | 186006128  | 176002614  |
|                       | 3.0 × 50 mm <i>XP</i>  | 186006129  | 176002615  |
|                       | 3.0 × 75 mm <i>XP</i>  | 186006130  | 176002616  |
|                       | 3.0 × 100 mm <i>XP</i> | 186006131  | 176002617  |
|                       | 3.0 × 150 mm <i>XP</i> | 186006734  | 176002896  |
|                       | 4.6 × 30 mm <i>XP</i>  | 186006132  | —          |
|                       | 4.6 × 50 mm <i>XP</i>  | 186006133  | —          |
|                       | 4.6 × 75 mm <i>XP</i>  | 186006134  | —          |
|                       | 4.6 × 100 mm <i>XP</i> | 186006135  | —          |
|                       | 4.6 × 150 mm <i>XP</i> | 186006735  | —          |

### XSelect CSH Peptide Columns

|                          | Dimension              | P/N       |
|--------------------------|------------------------|-----------|
| Particle Size: 2.5 µm    |                        |           |
| CSH C <sub>18</sub> 130Å | 2.1 × 50 mm <i>XP</i>  | 186006941 |
|                          | 2.1 × 100 mm <i>XP</i> | 186006942 |
|                          | 2.1 × 150 mm <i>XP</i> | 186006943 |
|                          | 4.6 × 50 mm <i>XP</i>  | 186006946 |
|                          | 4.6 × 100 mm <i>XP</i> | 186006947 |
|                          | 4.6 × 150 mm <i>XP</i> | 186007038 |

### XSelect CSH Columns Method Validation Kits\*

|                       | Dimension              | P/N       |
|-----------------------|------------------------|-----------|
| Particle Size: 2.5 µm |                        |           |
| CSH C <sub>18</sub>   | 2.1 × 50 mm <i>XP</i>  | 186006233 |
|                       | 2.1 × 100 mm <i>XP</i> | 186006234 |
|                       | 2.1 × 150 mm <i>XP</i> | 186006785 |
|                       | 3.0 × 50 mm <i>XP</i>  | 186006235 |
|                       | 3.0 × 100 mm <i>XP</i> | 186006236 |
|                       | 3.0 × 150 mm <i>XP</i> | 186006786 |
|                       | 4.6 × 50 mm <i>XP</i>  | 186006237 |
|                       | 4.6 × 100 mm <i>XP</i> | 186006238 |
|                       | 4.6 × 150 mm <i>XP</i> | 186006787 |

|                       | Dimension              | P/N       |
|-----------------------|------------------------|-----------|
| Particle Size: 2.5 µm |                        |           |
| CSH Fluoro-Phenyl     | 2.1 × 50 mm <i>XP</i>  | 186006239 |
|                       | 2.1 × 100 mm <i>XP</i> | 186006240 |
|                       | 2.1 × 150 mm <i>XP</i> | 186006788 |
|                       | 3.0 × 50 mm <i>XP</i>  | 186006241 |
|                       | 3.0 × 100 mm <i>XP</i> | 186006242 |
|                       | 3.0 × 150 mm <i>XP</i> | 186006789 |
|                       | 4.6 × 50 mm <i>XP</i>  | 186006243 |
|                       | 4.6 × 100 mm <i>XP</i> | 186006244 |
|                       | 4.6 × 150 mm <i>XP</i> | 186006790 |

|                       | Dimension              | P/N       |
|-----------------------|------------------------|-----------|
| Particle Size: 2.5 µm |                        |           |
| CSH Phenyl-Hexyl      | 2.1 × 50 mm <i>XP</i>  | 186006245 |
|                       | 2.1 × 100 mm <i>XP</i> | 186006246 |
|                       | 2.1 × 150 mm <i>XP</i> | 186006791 |
|                       | 3.0 × 50 mm <i>XP</i>  | 186006247 |
|                       | 3.0 × 100 mm <i>XP</i> | 186006248 |
|                       | 3.0 × 150 mm <i>XP</i> | 186006792 |
|                       | 4.6 × 50 mm <i>XP</i>  | 186006249 |
|                       | 4.6 × 100 mm <i>XP</i> | 186006250 |
|                       | 4.6 × 150 mm <i>XP</i> | 186006793 |

|                              | Dimension              | P/N       |
|------------------------------|------------------------|-----------|
| Particle Size: 2.5 µm        |                        |           |
| Peptide CSH, C <sub>18</sub> | 2.1 × 100 mm <i>XP</i> | 186006945 |
|                              | 4.6 × 100 mm <i>XP</i> | 186006966 |

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

### XSelect CSH VanGuard Cartridges

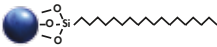
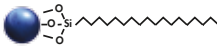
|                       | Dimension            | P/N       |
|-----------------------|----------------------|-----------|
| Particle Size: 2.5 µm |                      |           |
| CSH C <sub>18</sub>   | 2.1 × 5 mm <i>XP</i> | 186007817 |
|                       | 3.9 × 5 mm <i>XP</i> | 186007819 |
| CSH Fluoro-Phenyl     | 2.1 × 5 mm <i>XP</i> | 186007827 |
|                       | 3.9 × 5 mm <i>XP</i> | 186007829 |
| CSH Phenyl-Hexyl      | 2.1 × 5 mm <i>XP</i> | 186007839 |
|                       | 3.9 × 5 mm <i>XP</i> | 186007841 |

### Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |



Column Characteristics

|                       | HSS C <sub>18</sub>   | HSS C <sub>18</sub> SB  |
|-----------------------|---|---|
|                       | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5 µm  | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5 µm  |
| Particle/Ligand       |  |  |
| Ligand Density*       | 3.2 µmol/m <sup>2</sup>   | 1.6 µmol/m <sup>2</sup>   |
| Carbon Load*          | 15%   | 8%  |
| Endcap Style          | Proprietary   | None  |
| USP Class No.         | L1  | L1  |
| pH Range              | 1–8   | 2–8   |
| Temperature Limits    | Low pH = 45 °C, High pH = 45 °C   | Low pH = 45 °C, High pH = 45 °C   |
| Surface Area*         | 230 m <sup>2</sup> /g   | 230 m <sup>2</sup> /g   |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                    |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                              |

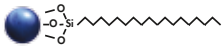
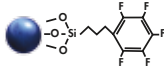
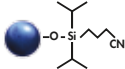
\*Expected or approximate value.

The HSS Technology is available in UPLC particle sizes (ACQUITY UPLC HSS 1.8 µm).

Ordering Information

XSelect HSS Analytical Columns

|                           | Dimension              | P/N (1/pk) | P/N (3/pk) |                              | Dimension              | P/N (1/pk) | P/N (3/pk) |               | Dimension              | P/N (1/pk) | P/N (3/pk) |
|---------------------------|------------------------|------------|------------|------------------------------|------------------------|------------|------------|---------------|------------------------|------------|------------|
|                           | Particle Size: 2.5 µm  |            |            |                              | Particle Size: 2.5 µm  |            |            |               | Particle Size: 2.5 µm  |            |            |
| <b>HSS C<sub>18</sub></b> | 2.1 × 30 mm <i>XP</i>  | 186006136  | 176002618  | <b>HSS C<sub>18</sub> SB</b> | 2.1 × 30 mm <i>XP</i>  | 186006160  | 176002634  | <b>HSS T3</b> | 2.1 × 30 mm <i>XP</i>  | 186006148  | 176002626  |
|                           | 2.1 × 50 mm <i>XP</i>  | 186006137  | 176002619  |                              | 2.1 × 50 mm <i>XP</i>  | 186006161  | 176002635  |               | 2.1 × 50 mm <i>XP</i>  | 186006149  | 176002627  |
|                           | 2.1 × 75 mm <i>XP</i>  | 186006138  | 176002620  |                              | 2.1 × 75 mm <i>XP</i>  | 186006162  | 176002636  |               | 2.1 × 75 mm <i>XP</i>  | 186006150  | 176002628  |
|                           | 2.1 × 100 mm <i>XP</i> | 186006139  | 176002621  |                              | 2.1 × 100 mm <i>XP</i> | 186006163  | 176002637  |               | 2.1 × 100 mm <i>XP</i> | 186006151  | 176002629  |
|                           | 2.1 × 150 mm <i>XP</i> | 186006736  | 176002897  |                              | 2.1 × 150 mm <i>XP</i> | 186006742  | 176002901  |               | 2.1 × 150 mm <i>XP</i> | 186006739  | 176002899  |
|                           | 3.0 × 30 mm <i>XP</i>  | 186006140  | 176002622  |                              | 3.0 × 30 mm <i>XP</i>  | 186006164  | 176002638  |               | 3.0 × 30 mm <i>XP</i>  | 186006152  | 176002630  |
|                           | 3.0 × 50 mm <i>XP</i>  | 186006141  | 176002623  |                              | 3.0 × 50 mm <i>XP</i>  | 186006165  | 176002639  |               | 3.0 × 50 mm <i>XP</i>  | 186006153  | 176002631  |
|                           | 3.0 × 75 mm <i>XP</i>  | 186006142  | 176002624  |                              | 3.0 × 75 mm <i>XP</i>  | 186006166  | 176002640  |               | 3.0 × 75 mm <i>XP</i>  | 186006154  | 176002632  |
|                           | 3.0 × 100 mm <i>XP</i> | 186006143  | 176002625  |                              | 3.0 × 100 mm <i>XP</i> | 186006167  | 176002641  |               | 3.0 × 100 mm <i>XP</i> | 186006155  | 176002633  |
|                           | 3.0 × 150 mm <i>XP</i> | 186006737  | 176002898  |                              | 3.0 × 150 mm <i>XP</i> | 186006743  | 176002902  |               | 3.0 × 150 mm <i>XP</i> | 186006740  | 176002900  |
|                           | 4.6 × 30 mm <i>XP</i>  | 186006144  | —          |                              | 4.6 × 30 mm <i>XP</i>  | 186006168  | —          |               | 4.6 × 30 mm <i>XP</i>  | 186006156  | —          |
|                           | 4.6 × 50 mm <i>XP</i>  | 186006145  | —          |                              | 4.6 × 50 mm <i>XP</i>  | 186006169  | —          |               | 4.6 × 50 mm <i>XP</i>  | 186006157  | —          |
|                           | 4.6 × 75 mm <i>XP</i>  | 186006146  | —          |                              | 4.6 × 75 mm <i>XP</i>  | 186006170  | —          |               | 4.6 × 75 mm <i>XP</i>  | 186006158  | —          |
|                           | 4.6 × 100 mm <i>XP</i> | 186006147  | —          |                              | 4.6 × 100 mm <i>XP</i> | 186006171  | —          |               | 4.6 × 100 mm <i>XP</i> | 186006159  | —          |
|                           | 4.6 × 150 mm <i>XP</i> | 186006738  | —          |                              | 4.6 × 150 mm <i>XP</i> | 186006744  | —          |               | 4.6 × 150 mm <i>XP</i> | 186006741  | —          |

| HSS T3  | HSS PFP   | HSS CN  |
|---|---|---|
| UHPLC: 2.5 $\mu\text{m}$ <i>XP</i><br>HPLC: 3.5, 5 $\mu\text{m}$                  | UHPLC: 2.5 $\mu\text{m}$ <i>XP</i><br>HPLC: 3.5, 5 $\mu\text{m}$                  | UHPLC: 2.5 $\mu\text{m}$ <i>XP</i><br>HPLC: 3.5, 5 $\mu\text{m}$                    |
|  |  |  |
| 1.6 $\mu\text{mol}/\text{m}^2$  | 3.2 $\mu\text{mol}/\text{m}^2$  | 2.0 $\mu\text{mol}/\text{m}^2$  |
| 11%   | 7%  | 5%  |
| Proprietary   | None  | None  |
| 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 $\text{m}^2/\text{g}$   | 230 $\text{m}^2/\text{g}$   | 230 $\text{m}^2/\text{g}$   |
| Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                    |
| Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | —   |

|                                  | Dimension                     | P/N (1/pk) | P/N (3/pk) |
|----------------------------------|-------------------------------|------------|------------|
| Particle Size: 2.5 $\mu\text{m}$ |                               |            |            |
| HSS<br>PFP                       | 2.1 $\times$ 30 mm <i>XP</i>  | 186006172  | 176002642  |
|                                  | 2.1 $\times$ 50 mm <i>XP</i>  | 186006173  | 176002643  |
|                                  | 2.1 $\times$ 75 mm <i>XP</i>  | 186006174  | 176002644  |
|                                  | 2.1 $\times$ 100 mm <i>XP</i> | 186006175  | 176002645  |
|                                  | 2.1 $\times$ 150 mm <i>XP</i> | 186006745  | 176002903  |
|                                  | 3.0 $\times$ 30 mm <i>XP</i>  | 186006176  | 176002646  |
|                                  | 3.0 $\times$ 50 mm <i>XP</i>  | 186006177  | 176002647  |
|                                  | 3.0 $\times$ 75 mm <i>XP</i>  | 186006178  | 176002648  |
|                                  | 3.0 $\times$ 100 mm <i>XP</i> | 186006179  | 176002649  |
|                                  | 3.0 $\times$ 150 mm <i>XP</i> | 186006746  | 176002904  |
|                                  | 4.6 $\times$ 30 mm <i>XP</i>  | 186006180  | —          |
|                                  | 4.6 $\times$ 50 mm <i>XP</i>  | 186006181  | —          |
|                                  | 4.6 $\times$ 75 mm <i>XP</i>  | 186006182  | —          |
|                                  | 4.6 $\times$ 100 mm <i>XP</i> | 186006183  | —          |
|                                  | 4.6 $\times$ 150 mm <i>XP</i> | 186006747  | —          |

|                                  | Dimension                     | P/N (1/pk) | P/N (3/pk) |
|----------------------------------|-------------------------------|------------|------------|
| Particle Size: 2.5 $\mu\text{m}$ |                               |            |            |
| HSS<br>CN                        | 2.1 $\times$ 30 mm <i>XP</i>  | 186006184  | 176002650  |
|                                  | 2.1 $\times$ 50 mm <i>XP</i>  | 186006185  | 176002651  |
|                                  | 2.1 $\times$ 75 mm <i>XP</i>  | 186006186  | 176002652  |
|                                  | 2.1 $\times$ 100 mm <i>XP</i> | 186006187  | 176002653  |
|                                  | 2.1 $\times$ 150 mm <i>XP</i> | 186006748  | 176002905  |
|                                  | 3.0 $\times$ 30 mm <i>XP</i>  | 186006188  | 176002654  |
|                                  | 3.0 $\times$ 50 mm <i>XP</i>  | 186006189  | 176002655  |
|                                  | 3.0 $\times$ 75 mm <i>XP</i>  | 186006190  | 176002656  |
|                                  | 3.0 $\times$ 100 mm <i>XP</i> | 186006191  | 176002657  |
|                                  | 3.0 $\times$ 150 mm <i>XP</i> | 186006749  | 176002906  |
|                                  | 4.6 $\times$ 30 mm <i>XP</i>  | 186006192  | —          |
|                                  | 4.6 $\times$ 50 mm <i>XP</i>  | 186006193  | —          |
|                                  | 4.6 $\times$ 75 mm <i>XP</i>  | 186006194  | —          |
|                                  | 4.6 $\times$ 100 mm <i>XP</i> | 186006195  | —          |
|                                  | 4.6 $\times$ 150 mm <i>XP</i> | 186006750  | —          |

### XSelect HSS Method Validation Kits\*

|                            | Dimension                     | P/N       |
|----------------------------|-------------------------------|-----------|
| Particle Size: 2.7 $\mu$ m |                               |           |
| HSS C <sub>18</sub>        | 2.1 $\times$ 50 mm <i>XP</i>  | 186006251 |
|                            | 2.1 $\times$ 100 mm <i>XP</i> | 186006252 |
|                            | 2.1 $\times$ 150 mm <i>XP</i> | 186006794 |
|                            | 3.0 $\times$ 50 mm <i>XP</i>  | 186006253 |
|                            | 3.0 $\times$ 100 mm <i>XP</i> | 186006254 |
|                            | 3.0 $\times$ 150 mm <i>XP</i> | 186006795 |
|                            | 4.6 $\times$ 50 mm <i>XP</i>  | 186006255 |
|                            | 4.6 $\times$ 100 mm <i>XP</i> | 186006256 |
|                            | 4.6 $\times$ 150 mm <i>XP</i> | 186006796 |

|                            | Dimension                     | P/N       |
|----------------------------|-------------------------------|-----------|
| Particle Size: 2.5 $\mu$ m |                               |           |
| HSS C <sub>18</sub> SB     | 2.1 $\times$ 50 mm <i>XP</i>  | 186006263 |
|                            | 2.1 $\times$ 100 mm <i>XP</i> | 186006264 |
|                            | 2.1 $\times$ 150 mm <i>XP</i> | 186006800 |
|                            | 3.0 $\times$ 50 mm <i>XP</i>  | 186006265 |
|                            | 3.0 $\times$ 100 mm <i>XP</i> | 186006266 |
|                            | 3.0 $\times$ 150 mm <i>XP</i> | 186006801 |
|                            | 4.6 $\times$ 50 mm <i>XP</i>  | 186006267 |
|                            | 4.6 $\times$ 100 mm <i>XP</i> | 186006268 |
|                            | 4.6 $\times$ 150 mm <i>XP</i> | 186006802 |

|        | Dimension                     | P/N       |
|--------|-------------------------------|-----------|
| HSS T3 | 2.1 $\times$ 50 mm <i>XP</i>  | 186006257 |
|        | 2.1 $\times$ 100 mm <i>XP</i> | 186006258 |
|        | 2.1 $\times$ 150 mm <i>XP</i> | 186006797 |
|        | 3.0 $\times$ 50 mm <i>XP</i>  | 186006259 |
|        | 3.0 $\times$ 100 mm <i>XP</i> | 186006260 |
|        | 3.0 $\times$ 150 mm <i>XP</i> | 186006798 |
|        | 4.6 $\times$ 50 mm <i>XP</i>  | 186006261 |
|        | 4.6 $\times$ 100 mm <i>XP</i> | 186006262 |
|        | 4.6 $\times$ 150 mm <i>XP</i> | 186006799 |

|                            | Dimension                     | P/N       |
|----------------------------|-------------------------------|-----------|
| Particle Size: 2.5 $\mu$ m |                               |           |
| HSS PFP                    | 2.1 $\times$ 50 mm <i>XP</i>  | 186006815 |
|                            | 2.1 $\times$ 100 mm <i>XP</i> | 186006816 |
|                            | 2.1 $\times$ 150 mm <i>XP</i> | 186006803 |
|                            | 3.0 $\times$ 50 mm <i>XP</i>  | 186006817 |
|                            | 3.0 $\times$ 100 mm <i>XP</i> | 186006818 |
|                            | 3.0 $\times$ 150 mm <i>XP</i> | 186006804 |
|                            | 4.6 $\times$ 50 mm <i>XP</i>  | 186006273 |
|                            | 4.6 $\times$ 100 mm <i>XP</i> | 186006274 |
|                            | 4.6 $\times$ 150 mm <i>XP</i> | 186006805 |

|        | Dimension                     | P/N       |
|--------|-------------------------------|-----------|
| HSS CN | 2.1 $\times$ 50 mm <i>XP</i>  | 186006275 |
|        | 2.1 $\times$ 100 mm <i>XP</i> | 186006276 |
|        | 2.1 $\times$ 150 mm <i>XP</i> | 186006806 |
|        | 3.0 $\times$ 50 mm <i>XP</i>  | 186006277 |
|        | 3.0 $\times$ 100 mm <i>XP</i> | 186006278 |
|        | 3.0 $\times$ 150 mm <i>XP</i> | 186006807 |
|        | 4.6 $\times$ 50 mm <i>XP</i>  | 186006279 |
|        | 4.6 $\times$ 100 mm <i>XP</i> | 186006280 |
|        | 4.6 $\times$ 150 mm <i>XP</i> | 186006808 |

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

### XSelect HSS VanGuard Cartridges

|                            | Dimension         | P/N       |
|----------------------------|-------------------|-----------|
| Particle Size: 2.5 $\mu$ m |                   |           |
| HSS C <sub>18</sub>        | 2.1 $\times$ 5 mm | 186007857 |
|                            | 3.9 $\times$ 5 mm | 186007859 |
| HSS C <sub>18</sub> SB     | 2.1 $\times$ 5 mm | 186007848 |
|                            | 3.9 $\times$ 5 mm | 186007850 |
| HSS T3                     | 2.1 $\times$ 5 mm | 186007884 |
|                            | 3.9 $\times$ 5 mm | 186007886 |
| HSS PFP                    | 2.1 $\times$ 5 mm | 186007875 |
|                            | 3.9 $\times$ 5 mm | 186007877 |
| HSS CN                     | 2.1 $\times$ 5 mm | 186007866 |
|                            | 3.9 $\times$ 5 mm | 186007868 |

### Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |



## SunFire HPLC Columns

SunFire® Columns set the standard for the state-of-the-art bonded C<sub>18</sub> and C<sub>8</sub> silica HPLC columns. Benefiting from years of research and product development, SunFire Columns represent the best in particle and bonding expertise and deliver the industry-leading level of chromatographic performance. The smaller 2.5 µm particle size allows chromatographers to gain improved sensitivity and greater efficiency. SunFire Columns with 2.5 µm particle size enable faster run times while maintaining the same resolution.

### Column Characteristics

|                       | C <sub>8</sub> , 100Å   | C <sub>18</sub> , 100Å                                 |
|-----------------------|---|--|
|                       | HPLC: 2.5, 3.5, 5, 10 µm  | HPLC: 2.5, 3.5, 5, 10 µm                               |
| Particle/Ligand       |   |  |
| Ligand Density*       | 3.5 µmol/m <sup>2</sup>   | 3.5 µmol/m <sup>2</sup>                                |
| Carbon Load*          | 12%   | 16%  |
| Endcap Style          | Proprietary   | Proprietary  |
| USP Class No.         | L7  | L1   |
| pH Range              | 2–8   | 2–8  |
| Temperature Limits    | Low pH = 40 °C, High pH = 40 °C   | Low pH = 50 °C, High pH = 40 °C                        |
| Surface Area*         | 340 m <sup>2</sup> /g   | 340 m <sup>2</sup> /g                                  |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360  | Neutrals QC Reference Material<br>p/n: 186006360       |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363<br>HILIC QC Reference Material<br>p/n: 186007226 | Reversed-Phase QC Reference Material<br>p/n: 186006363 |

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

## Ordering information

### SunFire Analytical Columns\*

|                              | Dimension   | P/N       |
|------------------------------|-------------|-----------|
| <b>Particle Size: 2.5 µm</b> |             |           |
| <b>C<sub>18</sub></b>        | 2.1 × 30 mm | 186003399 |
|                              | 2.1 × 50 mm | 186003401 |
|                              | 2.1 × 75 mm | 186005634 |
|                              | 3.0 × 30 mm | 186003407 |
|                              | 3.0 × 50 mm | 186003409 |
|                              | 3.0 × 75 mm | 186005636 |
|                              | 4.6 × 50 mm | 186003417 |
| <b>Particle Size: 2.5 µm</b> |             |           |
| <b>C<sub>8</sub></b>         | 2.1 × 75 mm | 186005635 |
|                              | 3.0 × 50 mm | 186003410 |

\*Recommended maximum pressure of 6000 psi (400 bar).

### SunFire VanGuard Cartridges

|                              | Dimension  | P/N       |
|------------------------------|------------|-----------|
| <b>Particle Size: 2.5 µm</b> |            |           |
| <b>C<sub>18</sub></b>        | 2.1 × 5 mm | 186007691 |
|                              | 3.9 × 5 mm | 186007693 |
| <b>C<sub>8</sub></b>         | 2.1 × 5 mm | 186007700 |
|                              | 3.9 × 5 mm | 186007702 |

### Universal VanGuard Cartridge Holder

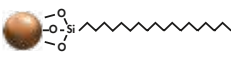
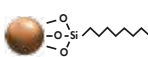
| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |



## XTerra HPLC Columns

XTerra MS and Phenyl 2.5  $\mu\text{m}$  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

|                       | <b>MS C<sub>18</sub>, 125Å</b>  | <b>MS C<sub>8</sub>, 125Å</b>   |
|-----------------------|---|---|
|                       | HPLC: 2.5, 3.5, 5, 10 $\mu\text{m}$   | HPLC: 2.5, 3.5, 5, 10 $\mu\text{m}$   |
| Particle/Ligand       |  |  |
| Carbon Load*          | 15.5%   | 12%   |
| Endcap Style          | Proprietary   | Proprietary   |
| USP Class No.         | L1  | L7  |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                    |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                              |

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

### Ordering Information

#### XTerra Analytical Columns\*

|  | Dimension             | P/N       |
|--|-----------------------|-----------|
| <b>Particle Size: 2.5 <math>\mu\text{m}</math></b> |                       |           |
| <b>MS C<sub>18</sub></b>                           | 2.1 $\times$ 30 mm    | 186000592 |
|  | 4.6 $\times$ 20 mm /S | 186001889 |
|  | 4.6 $\times$ 30 mm    | 186000600 |
|  | 4.6 $\times$ 50 mm    | 186000602 |
|  | 4.6 $\times$ 75 mm    | 186000981 |
| <b>Particle Size: 2.5 <math>\mu\text{m}</math></b> |                       |           |
| <b>MS C<sub>8</sub></b>                            | 4.6 $\times$ 50 mm    | 186000603 |

\*Recommended maximum pressure of 6000 psi (400 bar).

#### XTerra VanGuard Cartridges

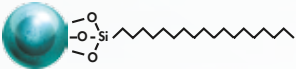
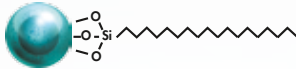
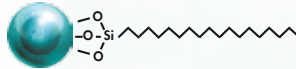
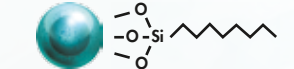
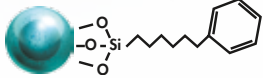
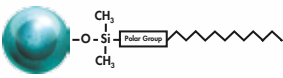

|  | Dimension         | P/N       |
|--|-------------------|-----------|
| <b>Particle Size: 2.5 <math>\mu\text{m}</math></b> |                   |           |
| <b>MSC<sub>18</sub></b>                            | 2.1 $\times$ 5 mm | 186007887 |
|  | 3.9 $\times$ 5 mm | 186007889 |
| <b>MSC<sub>8</sub></b>                             | 2.1 $\times$ 5 mm | 186007901 |
|  | 3.9 $\times$ 5 mm | 186007903 |

#### Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |

# Meet the Members of the CORTECS Family

A Solid-Core Particle that Lives Up to It's Potential

|   |   |  |  |
|---|---|--|--|
| <p><b>C<sub>18</sub><sup>+</sup></b></p>  | <p><b>C<sub>18</sub></b></p>  | <p><b>T3</b></p>   | <p><b>C<sub>8</sub></b></p>  |
|   |    |    |   |
| <ul style="list-style-type: none"> <li>▪ <b>General purpose</b></li> <li>▪ <b>High-efficiency</b></li> <li>▪ <b>Reversed-phase column</b></li> </ul> <p>A positively charged surface delivers excellent peak shape for basic compounds at low pH.</p> | <ul style="list-style-type: none"> <li>▪ <b>General purpose</b></li> <li>▪ <b>High-efficiency</b></li> <li>▪ <b>Reversed-phase column</b></li> </ul> <p>Balanced retention of acids, bases, and neutrals at low and mid-range pH.</p> | <ul style="list-style-type: none"> <li>▪ <b>General purpose</b></li> <li>▪ <b>High-efficiency</b></li> <li>▪ <b>Reversed-phase column</b></li> </ul> <p>Enables the use of 100% aqueous mobile phase and increased retention of polar compounds.</p> | <ul style="list-style-type: none"> <li>▪ <b>General purpose</b></li> <li>▪ <b>High-efficiency</b></li> <li>▪ <b>Reversed-phase column</b></li> </ul> <p>Similar selectivity but shorter retention when compared to C<sub>18</sub> columns.</p> |
| <p><b>Phenyl</b></p>  | <p><b>Shield RP18</b></p>   | <p><b>HILIC</b></p>  |  |
|    |    |   |  |
| <ul style="list-style-type: none"> <li>▪ <b>High-efficiency</b></li> <li>▪ <b>Method development column</b></li> </ul> <p>Provides alternate selectivity, particularly for polyaromatic compounds.</p>  | <ul style="list-style-type: none"> <li>▪ <b>High-efficiency</b></li> <li>▪ <b>Method development column</b></li> </ul> <p>Provides alternate selectivity, particularly for phenolic compounds.</p>                                    | <ul style="list-style-type: none"> <li>▪ <b>General purpose</b></li> <li>▪ <b>High-efficiency</b></li> <li>▪ <b>HILIC column</b></li> </ul> <p>Offers orthogonal selectivity when compared to C<sub>18</sub> columns.</p>                            |  |

[waters.com/cortecs](http://waters.com/cortecs)

See page 114 for more information.

# ≥3 μm Analytical HPLC Columns

≥3 μm Analytical HPLC Columns



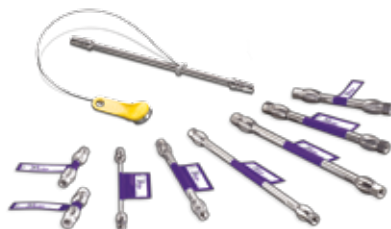
"Everything is done the same way, consistent across board and correctly."  
~ John Brown, Production Support Operator, Wexford, Ireland



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# ≥3 μm Analytical HPLC Columns



## XBridge BEH HPLC 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, XBridge Columns are an invaluable help.

- They improve pH stability, increasing column lifetime
- They improve column reliability, ensuring the ruggedness of assays
- They improve particle efficiency, providing unmatched peak shape and capacity

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

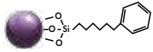

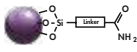


### Column Characteristics

|                       | BEH C <sub>18</sub> , 130Å                             | BEH Shield RP18, 130Å                                  | BEH C <sub>8</sub> , 130Å                              |
|-----------------------|--|--|--|
|                       | UHPLC: 2.5 μm <i>XP</i><br>HPLC: 3.5, 5, 10 μm         | UHPLC: 2.5 μm <i>XP</i><br>HPLC: 3.5, 5, 10 μm         | UHPLC: 2.5 μm <i>XP</i><br>HPLC: 3.5, 5, 10 μm         |
| Particle/Ligand       |  |  |  |
| Ligand Density*       | 3.1 μmol/m <sup>2</sup>                                | 3.3 μmol/m <sup>2</sup>                                | 3.2 μmol/m <sup>2</sup>                                |
| Carbon Load*          | 18%  | 17%  | 13%  |
| Endcap Style          | Proprietary  | TMS  | Proprietary  |
| USP Class No.         | L1   | L1   | L7   |
| pH Range              | 1-12   | 2-11   | 1-12   |
| Temperature Limits    | Low pH = 80 °C, High pH = 60 °C                        | Low pH = 50 °C, High pH = 45 °C                        | Low pH = 60 °C, High pH = 60 °C                        |
| Surface Area*         | 185 m <sup>2</sup> /g                                  | 185 m <sup>2</sup> /g                                  | 185 m <sup>2</sup> /g                                  |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 |

\*Expected or approximate value.


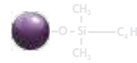
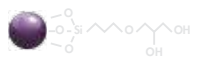

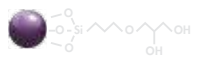
BEH Technology is also available in UPLC particle sizes (ACQUITY UPLC BEH 1.7 μm), please refer to page 94.

Column Characteristics *Continued*

|                       | <b>BEH Phenyl,<br/>130Å</b>   | <b>BEH HILIC,<br/>130Å</b>  | <b>BEH Amide,<br/>130Å</b>  | <b>Glycan BEH Amide,<br/>130Å</b>  | <b>Peptide BEH C<sub>18</sub>,<br/>130Å</b>   |
|-----------------------|---|---|---|--|---|
|                       | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5, 10 µm                                    | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5 µm   | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5 µm   | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5 µm  | HPLC: 3.5, 5, 10 µm   |
| Particle/Ligand       |  |  |  |    |  |
| Ligand Density*       | 3.0 µmol/m <sup>2</sup>   | N/A   | 7.5 µmol/m <sup>2</sup>   | 7.15 µmol/m <sup>2</sup>   | 3.1 µmol/m <sup>2</sup>   |
| Carbon Load*          | 15%   | Unbonded  | 12%   | 12%  | 18%   |
| Endcap Style          | Proprietary   | N/A   | None  | None   | Proprietary   |
| 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,<br>High pH = 60 °C  | Low pH = 45 °C,<br>High pH = 45 °C  | Low pH = 90 °C,<br>High pH = 90 °C  | Low pH = 90 °C,<br>High pH = 90 °C   | Low pH = 80 °C,<br>High pH = 60 °C  |
| Surface Area*         | 185 m <sup>2</sup> /g   | 185 m <sup>2</sup> /g   | 185 m <sup>2</sup> /g   | 194 m <sup>2</sup> /g  | 185 m <sup>2</sup> /g   |
| Performance Standards | <b>Neutrals QC<br/>Reference Material</b><br>p/n: 186006360                       | <b>HILIC QC<br/>Reference Material</b><br>p/n: 186007226                          | <b>HILIC QC<br/>Reference Material</b><br>p/n: 186007226                          | <b>Glycan Performance<br/>Test Standard</b><br>p/n: 186006349  | <b>Cytochrome c<br/>Digestion Standard</b><br>p/n: 186006371                        |
| Application Standards | <b>Reversed-Phase QC<br/>Reference Material</b><br>p/n: 186006363                 | <b>HILIC QC<br/>Reference Material</b><br>p/n: 186007226                          | <b>HILIC QC<br/>Reference Material</b><br>p/n: 186007226                          | <b>Glycan Performance<br/>Test Standard</b><br>p/n: 186006349<br><b>Dextran<br/>Calibration Standard</b><br>p/n: 186006841 | <b>Peptide<br/>Retention Standard</b><br>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 94.

| Oligonucleotide BEH C <sub>18</sub> ,<br>130Å                                     | Protein BEH C <sub>4</sub> ,<br>300Å  | Protein BEH SEC,<br>125Å  | Protein BEH SEC,<br>200Å   | Protein BEH SEC,<br>450Å  |
|---|---|---|--|---|
| HPLC: 2.5 µm  | HPLC: 3.5 µm  | HPLC: 3.5 µm  | HPLC: 3.5 µm   | HPLC: 3.5 µm  |
|  |  |  |  |  |
| 3.1 µmol/m <sup>2</sup>   | 2.4 µmol/m <sup>2</sup>   | 4.9 µmol/m <sup>2</sup>   | 5.5 µmol/m <sup>2</sup>  | 4.8 µmol/m <sup>2</sup>   |
| 18%   | 8%  | 15%   | 12%  | 9%  |
| Proprietary   | None  | None  | None   | None  |
| L1  | L26   | L33   | L33  | L33   |
| 1-12  | 1-10  | 1-8   | 1-8  | 1-8   |
| Low pH = 80 °C,<br>High pH = 60 °C  | Low pH = 80 °C,<br>High pH = 50 °C  | Low pH = 60 °C,<br>High pH = 60 °C  | Low pH = 60 °C,<br>High pH = 60 °C   | Low pH = 60 °C,<br>High pH = 60 °C  |
| 90 m <sup>2</sup> /g  | 90 m <sup>2</sup> /g  | 395 m <sup>2</sup> /g   | 220 m <sup>2</sup> /g  | 80 m <sup>2</sup> /g  |
| <b>MassPREP OST<br/>Standard</b><br>p/n: 186004135                                | <b>MassPREP Protein<br/>Standard Mix</b><br>p/n: 186004900                        | <b>BEH 125 Protein<br/>Standard Mix</b><br>p/n: 186006519                         | <b>BEH200 SEC Protein<br/>Standard Mix</b><br>p/n: 186006518                       | <b>BEH450 SEC Protein<br/>Standard Mix</b><br>p/n: 186006842                        |
| <b>MassPREP OST<br/>Standard</b><br>p/n: 186004135                                | <b>MassPREP Protein<br/>Standard Mix</b><br>p/n: 186004900                        | <b>BEH 125 Protein<br/>Standard Mix</b><br>p/n: 186006519                         | <b>BEH200 SEC Protein<br/>Standard Mix</b><br>p/n: 186006518                       | <b>BEH450 SEC Protein<br/>Standard Mix</b><br>p/n: 186006842                        |

## Ordering Information

### XBridge Analytical Columns

|                     | Dimension                  | P/N       | Dimension                | P/N       |
|---------------------|----------------------------|-----------|--------------------------|-----------|
|                     | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| BEH C <sub>18</sub> | 1.0 $\times$ 50 mm         | 186003126 | 2.1 $\times$ 20 mm /S    | 186003107 |
|                     | 1.0 $\times$ 100 mm        | 186003127 | 2.1 $\times$ 30 mm       | 186003129 |
|                     | 1.0 $\times$ 150 mm        | 186003128 | 2.1 $\times$ 50 mm       | 186003108 |
|                     | 2.1 $\times$ 20 mm /S      | 186003019 | 2.1 $\times$ 100 mm      | 186003109 |
|                     | 2.1 $\times$ 30 mm         | 186003020 | 2.1 $\times$ 150 mm      | 186003110 |
|                     | 2.1 $\times$ 50 mm         | 186003021 | 3.0 $\times$ 20 mm /S    | 186003130 |
|                     | 2.1 $\times$ 100 mm        | 186003022 | 3.0 $\times$ 30 mm       | 186003111 |
|                     | 2.1 $\times$ 150 mm        | 186003023 | 3.0 $\times$ 50 mm       | 186003131 |
|                     | 3.0 $\times$ 20 mm /S      | 186003024 | 3.0 $\times$ 100 mm      | 186003132 |
|                     | 3.0 $\times$ 30 mm         | 186003025 | 3.0 $\times$ 150 mm      | 186003112 |
|                     | 3.0 $\times$ 50 mm         | 186003026 | 3.0 $\times$ 250 mm      | 186003133 |
|                     | 3.0 $\times$ 100 mm        | 186003027 | 4.6 $\times$ 20 mm /S    | 186003134 |
|                     | 3.0 $\times$ 150 mm        | 186003028 | 4.6 $\times$ 30 mm       | 186003135 |
|                     | 4.6 $\times$ 20 mm /S      | 186003029 | 4.6 $\times$ 50 mm       | 186003113 |
|                     | 4.6 $\times$ 30 mm         | 186003030 | 4.6 $\times$ 75 mm       | 186003114 |
|                     | 4.6 $\times$ 50 mm         | 186003031 | 4.6 $\times$ 100 mm      | 186003115 |
|                     | 4.6 $\times$ 75 mm         | 186003032 | 4.6 $\times$ 150 mm      | 186003116 |
|                     | 4.6 $\times$ 100 mm        | 186003033 | 4.6 $\times$ 250 mm      | 186003117 |
| 4.6 $\times$ 150 mm | 186003034                  |           |                          |           |
| 4.6 $\times$ 250 mm | 186003943                  |           |                          |           |

|                     | Dimension                  | P/N       | Dimension                | P/N       |
|---------------------|----------------------------|-----------|--------------------------|-----------|
|                     | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| BEH C <sub>8</sub>  | 1.0 $\times$ 50 mm         | 186003177 | 2.1 $\times$ 20 mm /S    | 186003186 |
|                     | 1.0 $\times$ 100 mm        | 186003178 | 2.1 $\times$ 30 mm       | 186003187 |
|                     | 1.0 $\times$ 150 mm        | 186003179 | 2.1 $\times$ 50 mm       | 186003011 |
|                     | 2.1 $\times$ 20 mm /S      | 186003180 | 2.1 $\times$ 100 mm      | 186003012 |
|                     | 2.1 $\times$ 30 mm         | 186003046 | 2.1 $\times$ 150 mm      | 186003013 |
|                     | 2.1 $\times$ 50 mm         | 186003047 | 3.0 $\times$ 20 mm /S    | 186003188 |
|                     | 2.1 $\times$ 100 mm        | 186003048 | 3.0 $\times$ 30 mm       | 186003189 |
|                     | 2.1 $\times$ 150 mm        | 186003049 | 3.0 $\times$ 50 mm       | 186003190 |
|                     | 3.0 $\times$ 20 mm /S      | 186003181 | 3.0 $\times$ 100 mm      | 186003191 |
|                     | 3.0 $\times$ 30 mm         | 186003182 | 3.0 $\times$ 150 mm      | 186003014 |
|                     | 3.0 $\times$ 50 mm         | 186003050 | 3.0 $\times$ 250 mm      | 186003192 |
|                     | 3.0 $\times$ 100 mm        | 186003051 | 4.6 $\times$ 20 mm /S    | 186003193 |
|                     | 3.0 $\times$ 150 mm        | 186003052 | 4.6 $\times$ 30 mm       | 186003194 |
|                     | 4.6 $\times$ 20 mm /S      | 186003183 | 4.6 $\times$ 50 mm       | 186003015 |
|                     | 4.6 $\times$ 30 mm         | 186003184 | 4.6 $\times$ 75 mm       | 186003195 |
|                     | 4.6 $\times$ 50 mm         | 186003053 | 4.6 $\times$ 100 mm      | 186003016 |
|                     | 4.6 $\times$ 75 mm         | 186003185 | 4.6 $\times$ 150 mm      | 186003017 |
|                     | 4.6 $\times$ 100 mm        | 186003054 | 4.6 $\times$ 250 mm      | 186003018 |
| 4.6 $\times$ 150 mm | 186003055                  |           |                          |           |
| 4.6 $\times$ 250 mm | 186003963                  |           |                          |           |

XBridge Analytical Columns *Continued*

|                        | Dimension                  | P/N       | Dimension                | P/N       |
|------------------------|----------------------------|-----------|--------------------------|-----------|
|                        | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| <b>BEH Shield RP18</b> | 1.0 $\times$ 50 mm         | 186003148 | 2.1 $\times$ 20 mm /S    | 186003156 |
|                        | 1.0 $\times$ 100 mm        | 186003149 | 2.1 $\times$ 30 mm       | 186003157 |
|                        | 1.0 $\times$ 150 mm        | 186003150 | 2.1 $\times$ 50 mm       | 186002999 |
|                        | 2.1 $\times$ 20 mm /S      | 186003151 | 2.1 $\times$ 100 mm      | 186003002 |
|                        | 2.1 $\times$ 30 mm         | 186003035 | 2.1 $\times$ 150 mm      | 186003003 |
|                        | 2.1 $\times$ 50 mm         | 186003036 | 3.0 $\times$ 20 mm /S    | 186003158 |
|                        | 2.1 $\times$ 100 mm        | 186003037 | 3.0 $\times$ 30 mm       | 186003159 |
|                        | 2.1 $\times$ 150 mm        | 186003038 | 3.0 $\times$ 50 mm       | 186003160 |
|                        | 3.0 $\times$ 20 mm /S      | 186003152 | 3.0 $\times$ 100 mm      | 186003004 |
|                        | 3.0 $\times$ 30 mm         | 186003153 | 3.0 $\times$ 150 mm      | 186003005 |
|                        | 3.0 $\times$ 50 mm         | 186003039 | 3.0 $\times$ 250 mm      | 186003161 |
|                        | 3.0 $\times$ 100 mm        | 186003040 | 4.6 $\times$ 20 mm /S    | 186003162 |
|                        | 3.0 $\times$ 150 mm        | 186003041 | 4.6 $\times$ 30 mm       | 186003163 |
|                        | 4.6 $\times$ 20 mm /S      | 186003154 | 4.6 $\times$ 50 mm       | 186003006 |
|                        | 4.6 $\times$ 30 mm         | 186003155 | 4.6 $\times$ 75 mm       | 186003007 |
|                        | 4.6 $\times$ 50 mm         | 186003042 | 4.6 $\times$ 100 mm      | 186003008 |
|                        | 4.6 $\times$ 75 mm         | 186003043 | 4.6 $\times$ 150 mm      | 186003009 |
|                        | 4.6 $\times$ 100 mm        | 186003044 | 4.6 $\times$ 250 mm      | 186003010 |
|                        | 4.6 $\times$ 150 mm        | 186003045 |                          |           |
|                        | 4.6 $\times$ 250 mm        | 186003964 |                          |           |

|                     | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
|---------------------|----------------------------|-----------|--------------------------|-----------|
| <b>BEH Phenyl</b>   | 1.0 $\times$ 50 mm         | 186003317 | 2.1 $\times$ 20 mm /S    | 186003336 |
|                     | 1.0 $\times$ 100 mm        | 186003318 | 2.1 $\times$ 30 mm       | 186003337 |
|                     | 1.0 $\times$ 150 mm        | 186003319 | 2.1 $\times$ 50 mm       | 186003338 |
|                     | 2.1 $\times$ 20 mm /S      | 186003320 | 2.1 $\times$ 100 mm      | 186003339 |
|                     | 2.1 $\times$ 30 mm         | 186003321 | 2.1 $\times$ 150 mm      | 186003340 |
|                     | 2.1 $\times$ 50 mm         | 186003322 | 3.0 $\times$ 20 mm /S    | 186003341 |
|                     | 2.1 $\times$ 100 mm        | 186003323 | 3.0 $\times$ 30 mm       | 186003342 |
|                     | 2.1 $\times$ 150 mm        | 186003324 | 3.0 $\times$ 50 mm       | 186003343 |
|                     | 3.0 $\times$ 20 mm /S      | 186003325 | 3.0 $\times$ 100 mm      | 186003344 |
|                     | 3.0 $\times$ 30 mm         | 186003326 | 3.0 $\times$ 150 mm      | 186003345 |
|                     | 3.0 $\times$ 50 mm         | 186003327 | 3.0 $\times$ 250 mm      | 186003346 |
|                     | 3.0 $\times$ 100 mm        | 186003328 | 4.6 $\times$ 20 mm /S    | 186003347 |
|                     | 3.0 $\times$ 150 mm        | 186003329 | 4.6 $\times$ 30 mm       | 186003348 |
|                     | 4.6 $\times$ 20 mm /S      | 186003330 | 4.6 $\times$ 50 mm       | 186003349 |
|                     | 4.6 $\times$ 30 mm         | 186003331 | 4.6 $\times$ 75 mm       | 186003350 |
|                     | 4.6 $\times$ 50 mm         | 186003332 | 4.6 $\times$ 100 mm      | 186003351 |
|                     | 4.6 $\times$ 75 mm         | 186003333 | 4.6 $\times$ 150 mm      | 186003352 |
|                     | 4.6 $\times$ 100 mm        | 186003334 | 4.6 $\times$ 250 mm      | 186003353 |
|                     | 4.6 $\times$ 150 mm        | 186003335 |                          |           |
|                     | 4.6 $\times$ 250 mm        | 186003965 |                          |           |
| 4.6 $\times$ 250 mm | 186003963                  |           |                          |           |

XBridge Analytical Columns *Continued*

|                  | Dimension             | P/N       | Dimension           | P/N       |
|------------------|-----------------------|-----------|---------------------|-----------|
|                  | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| <b>BEH HILIC</b> | 1.0 × 50 mm           | 186004429 | 2.1 × 30 mm         | 186004443 |
|                  | 2.1 × 30 mm           | 186004431 | 2.1 × 50 mm         | 186004444 |
|                  | 2.1 × 50 mm           | 186004432 | 2.1 × 100 mm        | 186004445 |
|                  | 2.1 × 100 mm          | 186004433 | 2.1 × 150 mm        | 186004446 |
|                  | 2.1 × 150 mm          | 186004434 | 3.0 × 50 mm         | 186004447 |
|                  | 3.0 × 50 mm           | 186004435 | 3.0 × 100 mm        | 186004448 |
|                  | 3.0 × 100 mm          | 186004436 | 4.6 × 30 mm         | 186004450 |
|                  | 4.6 × 30 mm           | 186004438 | 4.6 × 50 mm         | 186004451 |
|                  | 4.6 × 50 mm           | 186004439 | 4.6 × 100 mm        | 186004452 |
|                  | 4.6 × 100 mm          | 186004440 | 4.6 × 150 mm        | 186004453 |
|                  | 4.6 × 150 mm          | 186004441 | 4.6 × 250 mm        | 186004454 |

|                  | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
|------------------|-----------------------|-----------|---------------------|-----------|
| <b>BEH Amide</b> | 1.0 × 50 mm           | 186004871 | 2.1 × 30 mm         | 186006587 |
|                  | 2.1 × 30 mm           | 186004858 | 2.1 × 50 mm         | 186006588 |
|                  | 2.1 × 50 mm           | 186004859 | 2.1 × 100 mm        | 186006589 |
|                  | 2.1 × 100 mm          | 186004860 | 2.1 × 150 mm        | 186006590 |
|                  | 2.1 × 150 mm          | 186004861 | 3.0 × 50 mm         | 186006591 |
|                  | 3.0 × 30 mm           | 186004862 | 3.0 × 100 mm        | 186006592 |
|                  | 3.0 × 50 mm           | 186004863 | 4.6 × 50 mm         | 186006593 |
|                  | 3.0 × 100 mm          | 186004864 | 4.6 × 100 mm        | 186006594 |
|                  | 4.6 × 30 mm           | 186004866 | 4.6 × 150 mm        | 186006595 |
|                  | 4.6 × 50 mm           | 186004867 | 4.6 × 250 mm        | 186006596 |
|                  | 4.6 × 100 mm          | 186004868 |                     |           |
|                  | 4.6 × 150 mm          | 186004869 |                     |           |
|                  | 4.6 × 250 mm          | 186004870 |                     |           |

XBridge Glycan Columns

|                        | Dimension             | P/N       |
|------------------------|-----------------------|-----------|
|                        | Particle Size: 3.5 µm |           |
| <b>BEH Amide, 130Å</b> | 2.1 × 50 mm           | 186007502 |
|                        | 2.1 × 100 mm          | 186007503 |
|                        | 2.1 × 150 mm          | 186007504 |
|                        | 4.6 × 50 mm           | 186007273 |
|                        | 4.6 × 100 mm          | 186007274 |
|                        | 4.6 × 150 mm          | 186007275 |
|                        | 4.6 × 250 mm          | 186007276 |

## XBridge Peptide Columns

|                            | Dimension                        | P/N          | Dimension                      | P/N       |
|----------------------------|----------------------------------|--------------|--------------------------------|-----------|
|                            | Particle Size: 3.5 $\mu\text{m}$ |              | Particle Size: 5 $\mu\text{m}$ |           |
| BEH C <sub>18</sub> , 130Å | 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                      |           |

|                            | Particle Size: 3.5 $\mu\text{m}$ |              | Particle Size: 5 $\mu\text{m}$ |           |
|----------------------------|----------------------------------|--------------|--------------------------------|-----------|
| BEH C <sub>18</sub> , 300Å | 1.0 × 50 mm                      | 186003604    | 1.0 × 50 mm                    | 186003615 |
|                            | 1.0 × 100 mm                     | 186003605    | 1.0 × 100 mm                   | 186003616 |
|                            | 1.0 × 150 mm                     | 186003606    | 1.0 × 150 mm                   | 186003617 |
|                            | 2.1 × 50 mm                      | 186003607    | 2.1 × 50 mm                    | 186003618 |
|                            | 2.1 × 100 mm                     | 186003608    | 2.1 × 100 mm                   | 186003619 |
|                            | 2.1 × 150 mm                     | 186003609    | 2.1 × 150 mm                   | 186003620 |
|                            | 2.1 × 250 mm                     | 186003610    | 2.1 × 250 mm                   | 186003621 |
|                            | 4.6 × 50 mm                      | 186003611    | 4.6 × 50 mm                    | 186003622 |
|                            | 4.6 × 100 mm                     | 186003612    | 4.6 × 100 mm                   | 186003623 |
|                            | 4.6 × 150 mm                     | 186003613    | 4.6 × 150 mm                   | 186003624 |
| 4.6 × 250 mm               | 186003614                        | 4.6 × 250 mm | 186003625                      |           |

|                           | Particle Size: 3.5 $\mu\text{m}$ |           |
|---------------------------|----------------------------------|-----------|
| BEH C <sub>4</sub> , 300Å | 2.1 × 50 mm                      | 186004498 |
|                           | 2.1 × 100 mm                     | 186004499 |
|                           | 2.1 × 150 mm                     | 186004500 |
|                           | 2.1 × 250 mm                     | 186004501 |
|                           | 4.6 × 50 mm                      | 186004502 |
|                           | 4.6 × 100 mm                     | 186004503 |
| 4.6 × 150 mm              | 186004504                        |           |
| 4.6 × 250 mm              | 186004505                        |           |

### APPLICATION AREA: Dicarboxylic Acids in Atmospheric Particulate Matter

"I used XBridge Amide 3.5  $\mu\text{m}$  column for HILIC separation of atmospheric dicarboxylic acids. I found it very reproducible over a large period of time (>3 months) while being extensively used during initial method development (use of different mobile phase buffers, pHs and organic solvents), method validation and application to atmospheric particulate matter. After more than 1000 injections with proper change of the guard, the analytical column preserved its initial efficiency and gave me the needed selectivity for separation of the various atmospheric acids. The column is still in good shape and operable. No increase of the column backpressure was observed during its use. We are very satisfied with the product and the level of service provided by Waters representatives."

**REVIEWER:** Zoran Kitanovski

**ORGANIZATION:** National Institute of Chemistry





XBridge Columns Method Validation Kits\*

|                           | Dimension                  | P/N       | Dimension                | P/N       |
|---------------------------|----------------------------|-----------|--------------------------|-----------|
|                           | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| <b>BEH C<sub>18</sub></b> | 2.1 $\times$ 100 mm        | 186003766 | 2.1 $\times$ 150 mm      | 186003771 |
|                           | 3.0 $\times$ 100 mm        | 186003767 | 3.0 $\times$ 100 mm      | 186003772 |
|                           | 3.0 $\times$ 150 mm        | 186003768 | 3.0 $\times$ 150 mm      | 186003773 |
|                           | 4.6 $\times$ 100 mm        | 186003769 | 4.6 $\times$ 100 mm      | 186003774 |
|                           | 4.6 $\times$ 150 mm        | 186003770 | 4.6 $\times$ 150 mm      | 186003775 |
|                           |                            |           | 4.6 $\times$ 250 mm      | 186003776 |
| <b>BEH C<sub>8</sub></b>  | 2.1 $\times$ 100 mm        | 186003777 | 2.1 $\times$ 150 mm      | 186003782 |
|                           | 3.0 $\times$ 100 mm        | 186003778 | 3.0 $\times$ 100 mm      | 186003783 |
|                           | 3.0 $\times$ 150 mm        | 186003779 | 3.0 $\times$ 150 mm      | 186003784 |
|                           | 4.6 $\times$ 100 mm        | 186003780 | 4.6 $\times$ 100 mm      | 186003785 |
|                           | 4.6 $\times$ 150 mm        | 186003781 | 4.6 $\times$ 150 mm      | 186003786 |
|                           |                            |           | 4.6 $\times$ 250 mm      | 186003787 |
| <b>BEH Shield RP18</b>    | 2.1 $\times$ 100 mm        | 186003788 | 2.1 $\times$ 150 mm      | 186003793 |
|                           | 3.0 $\times$ 100 mm        | 186003789 | 3.0 $\times$ 100 mm      | 186003794 |
|                           | 3.0 $\times$ 150 mm        | 186003790 | 3.0 $\times$ 150 mm      | 186003795 |
|                           | 4.6 $\times$ 100 mm        | 186003791 | 4.6 $\times$ 100 mm      | 186003796 |
|                           | 4.6 $\times$ 150 mm        | 186003792 | 4.6 $\times$ 150 mm      | 186003797 |
|                           |                            |           | 4.6 $\times$ 250 mm      | 186003798 |
| <b>BEH Phenyl</b>         | 2.1 $\times$ 100 mm        | 186003799 | 2.1 $\times$ 150 mm      | 186003804 |
|                           | 3.0 $\times$ 100 mm        | 186003800 | 3.0 $\times$ 100 mm      | 186003805 |
|                           | 3.0 $\times$ 150 mm        | 186003801 | 3.0 $\times$ 150 mm      | 186003806 |
|                           | 4.6 $\times$ 100 mm        | 186003802 | 4.6 $\times$ 100 mm      | 186003807 |
|                           | 4.6 $\times$ 150 mm        | 186003803 | 4.6 $\times$ 150 mm      | 186003808 |
|                           |                            |           | 4.6 $\times$ 250 mm      | 186003809 |

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

## XBridge VanGuard Cartridges

|                     | Dimension             | P/N       | Dimension           | P/N       |
|---------------------|-----------------------|-----------|---------------------|-----------|
|                     | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| BEH C <sub>18</sub> | 2.1 × 5 mm            | 186007766 | 2.1 × 5 mm          | 186007769 |
|                     | 3.9 × 5 mm            | 186007768 | 3.9 × 5 mm          | 186007771 |
| BEH C <sub>8</sub>  | 2.1 × 5 mm            | 186007775 | 2.1 × 5 mm          | 186007778 |
|                     | 3.9 × 5 mm            | 186007777 | 3.9 × 5 mm          | 186007780 |
| BEH Shield RP18     | 2.1 × 5 mm            | 186007802 | 2.1 × 5 mm          | 186007805 |
|                     | 3.9 × 5 mm            | 186007804 | 3.9 × 5 mm          | 186007807 |
| BEH Phenyl          | 2.1 × 5 mm            | 186007793 | 2.1 × 5 mm          | 186007796 |
|                     | 3.9 × 5 mm            | 186007795 | 3.9 × 5 mm          | 186007798 |
| BEH HILIC           | 2.1 × 5 mm            | 186007784 | 2.1 × 5 mm          | 186007787 |
|                     | 3.9 × 5 mm            | 186007786 | 3.9 × 5 mm          | 186007789 |
| BEH Amide           | 2.1 × 5 mm            | 186007757 | 2.1 × 5 mm          | 186007760 |
|                     | 3.9 × 5 mm            | 186007759 | 3.9 × 5 mm          | 186007762 |

## Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |

### APPLICATION AREA: Pharmaceutical Analysis

"In my opinion XBridge Columns are one of the best available on the market due to its universality. I am using it widely for analytical separations and (especially) for preparative purpose. The major advantages are: broad pH range; high stability at high pH; high durability and low column bleeding."

**REVIEWER:** Alexey Lapin

**ORGANIZATION:** Euroscreen SA



## XSelect HPLC Columns

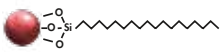
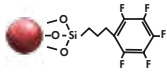
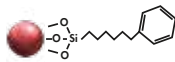
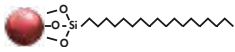
XSelect HPLC Columns are designed for the method-development scientist who requires a diverse selection of sorbents to easily separate the most difficult analyte co-elutions.

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 technologies of high strength silica (HSS) and charged surface hybrid (CSH).

### Column Characteristics

|                        | <b>CSH C<sub>18</sub>, 130Å</b>   | <b>CSH Fluoro-Phenyl, 300Å</b>  | <b>CSH Phenyl-Hexyl, 130Å</b>  | <b>Peptide CSH C<sub>18</sub>, 130A</b>   |
|------------------------|---|---|--|---|
|                        | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5, 10 µm                                    | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5 µm  | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5 µm   | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5, 10 µm                                      |
| <b>Particle/Ligand</b> |  |  |  |  |
| Ligand Density*        | 2.3 µmol/m <sup>2</sup>   | 2.3 µmol/m <sup>2</sup>   | 2.3 µmol/m <sup>2</sup>  | 2.3 µmol/m <sup>2</sup>   |
| Carbon Load*           | 15%   | 10%   | 14%  | 15%   |
| Endcap Style           | Proprietary   | None  | Proprietary  | Proprietary   |
| 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 m <sup>2</sup> /g   | 185 m <sup>2</sup> /g   | 185 m <sup>2</sup> /g  | 185 m <sup>2</sup> /g   |
| Performance Standards  | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                  | Neutrals QC Reference Material<br>p/n: 186006360                                   | Cytochrome c Digestion Standard<br>p/n: 186006371                                   |
| Application Standards  | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                            | Reversed-Phase QC Reference Material<br>p/n: 186006363                             | Peptide Retention Standard<br>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 90 and 100.



| HSS C <sub>18</sub> , 130Å                             | HSS C <sub>18</sub> SB, 130Å                           | HSS CN, 130Å                                     | HSS PFP, 130Å  | HSS T3, 130Å   |
|--|--|--|--|--|
| UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5 µm             | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5 µm             | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5 µm       | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5 µm             | UHPLC: 2.5 µm <i>XP</i><br>HPLC: 3.5, 5 µm             |
|  |  |  |  |  |
| 3.2 µmol/m <sup>2</sup>                                | 1.6 µmol/m <sup>2</sup>                                | 2.0 µmol/m <sup>2</sup>                          | 3.2 µmol/m <sup>2</sup>                                | 1.6 µmol/m <sup>2</sup>                                |
| 15%  | 8%   | 5%   | 7%   | 11%  |
| Proprietary  | None   | None   | None   | Proprietary  |
| L1   | L1   | L10  | L43  | L1   |
| 1-8  | 2-8  | 2-8  | 2-8  | 2-8  |
| Low pH = 45 °C, High pH = 45 °C                        | Low pH = 45 °C, High pH = 45 °C                        | Low pH = 45 °C, High pH = 45 °C                  | Low pH = 45 °C, High pH = 45 °C                        | Low pH = 45 °C, High pH = 45 °C                        |
| 230 m <sup>2</sup> /g                                  | 230 m <sup>2</sup> /g                                  | 230 m <sup>2</sup> /g                            | 230 m <sup>2</sup> /g                                  | 230 m <sup>2</sup> /g                                  |
| Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360 | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       |
| Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | —  | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 |

## XSelect Analytical Columns

|                     | Dimension                        | P/N       | Dimension                      | P/N       |
|---------------------|----------------------------------|-----------|--------------------------------|-----------|
|                     | Particle Size: 3.5 $\mu\text{m}$ |           | Particle Size: 5 $\mu\text{m}$ |           |
| CSH C <sub>18</sub> | 1.0 $\times$ 50 mm               | 186005249 | 2.1 $\times$ 30 mm             | 186005273 |
|                     | 1.0 $\times$ 100 mm              | 186005250 | 2.1 $\times$ 50 mm             | 186005274 |
|                     | 1.0 $\times$ 150 mm              | 186005251 | 2.1 $\times$ 100 mm            | 186005275 |
|                     | 2.1 $\times$ 30 mm               | 186005254 | 2.1 $\times$ 150 mm            | 186005276 |
|                     | 2.1 $\times$ 50 mm               | 186005255 | 3.0 $\times$ 30 mm             | 186005279 |
|                     | 2.1 $\times$ 75 mm               | 186005644 | 3.0 $\times$ 50 mm             | 186005280 |
|                     | 2.1 $\times$ 100 mm              | 186005256 | 3.0 $\times$ 100 mm            | 186005281 |
|                     | 2.1 $\times$ 150 mm              | 186005257 | 3.0 $\times$ 150 mm            | 186005282 |
|                     | 3.0 $\times$ 30 mm               | 186005260 | 3.0 $\times$ 250 mm            | 186005283 |
|                     | 3.0 $\times$ 50 mm               | 186005261 | 4.6 $\times$ 30 mm             | 186005286 |
|                     | 3.0 $\times$ 75 mm               | 186005647 | 4.6 $\times$ 50 mm             | 186005287 |
|                     | 3.0 $\times$ 100 mm              | 186005262 | 4.6 $\times$ 75 mm             | 186005288 |
|                     | 3.0 $\times$ 150 mm              | 186005263 | 4.6 $\times$ 100 mm            | 186005289 |
|                     | 4.6 $\times$ 30 mm               | 186005266 | 4.6 $\times$ 150 mm            | 186005290 |
|                     | 4.6 $\times$ 50 mm               | 186005267 | 4.6 $\times$ 250 mm            | 186005291 |
|                     | 4.6 $\times$ 75 mm               | 186005268 |                                |           |
| 4.6 $\times$ 100 mm | 186005269                        |           |                                |           |
| 4.6 $\times$ 150 mm | 186005270                        |           |                                |           |

|                     | Dimension                        | P/N       | Dimension                      | P/N       |
|---------------------|----------------------------------|-----------|--------------------------------|-----------|
|                     | Particle Size: 3.5 $\mu\text{m}$ |           | Particle Size: 5 $\mu\text{m}$ |           |
| CSH Fluoro-Phenyl   | 1.0 $\times$ 50 mm               | 186005304 | 2.1 $\times$ 30 mm             | 186005328 |
|                     | 1.0 $\times$ 100 mm              | 186005305 | 2.1 $\times$ 50 mm             | 186005329 |
|                     | 1.0 $\times$ 150 mm              | 186005306 | 2.1 $\times$ 100 mm            | 186005330 |
|                     | 2.1 $\times$ 30 mm               | 186005309 | 2.1 $\times$ 150 mm            | 186005331 |
|                     | 2.1 $\times$ 50 mm               | 186005310 | 3.0 $\times$ 30 mm             | 186005334 |
|                     | 2.1 $\times$ 75 mm               | 186005646 | 3.0 $\times$ 50 mm             | 186005335 |
|                     | 2.1 $\times$ 100 mm              | 186005311 | 3.0 $\times$ 100 mm            | 186005336 |
|                     | 2.1 $\times$ 150 mm              | 186005312 | 3.0 $\times$ 150 mm            | 186005337 |
|                     | 3.0 $\times$ 30 mm               | 186005315 | 3.0 $\times$ 250 mm            | 186005338 |
|                     | 3.0 $\times$ 50 mm               | 186005316 | 4.6 $\times$ 30 mm             | 186005341 |
|                     | 3.0 $\times$ 75 mm               | 186005649 | 4.6 $\times$ 50 mm             | 186005342 |
|                     | 3.0 $\times$ 100 mm              | 186005317 | 4.6 $\times$ 75 mm             | 186005343 |
|                     | 3.0 $\times$ 150 mm              | 186005318 | 4.6 $\times$ 100 mm            | 186005344 |
|                     | 4.6 $\times$ 30 mm               | 186005321 | 4.6 $\times$ 150 mm            | 186005345 |
|                     | 4.6 $\times$ 50 mm               | 186005322 | 4.6 $\times$ 250 mm            | 186005346 |
|                     | 4.6 $\times$ 75 mm               | 186005323 |                                |           |
| 4.6 $\times$ 100 mm | 186005324                        |           |                                |           |
| 4.6 $\times$ 150 mm | 186005325                        |           |                                |           |

XSelect Analytical Columns *Continued*

|                  | Dimension             | P/N       | Dimension           | P/N       |
|------------------|-----------------------|-----------|---------------------|-----------|
|                  | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| CSH Phenyl-Hexyl | 1.0 × 50 mm           | 186005359 | 2.1 × 30 mm         | 186005383 |
|                  | 1.0 × 100 mm          | 186005360 | 2.1 × 50 mm         | 186005384 |
|                  | 1.0 × 150 mm          | 186005361 | 2.1 × 100 mm        | 186005385 |
|                  | 2.1 × 30 mm           | 186005364 | 2.1 × 150 mm        | 186005386 |
|                  | 2.1 × 50 mm           | 186005365 | 3.0 × 30 mm         | 186005389 |
|                  | 2.1 × 75 mm           | 186005645 | 3.0 × 50 mm         | 186005390 |
|                  | 2.1 × 100 mm          | 186005366 | 3.0 × 100 mm        | 186005391 |
|                  | 2.1 × 150 mm          | 186005367 | 3.0 × 150 mm        | 186005392 |
|                  | 3.0 × 30 mm           | 186005370 | 3.0 × 250 mm        | 186005393 |
|                  | 3.0 × 50 mm           | 186005371 | 4.6 × 30 mm         | 186005396 |
|                  | 3.0 × 75 mm           | 186005648 | 4.6 × 50 mm         | 186005397 |
|                  | 3.0 × 100 mm          | 186005372 | 4.6 × 75 mm         | 186005398 |
|                  | 3.0 × 150 mm          | 186005373 | 4.6 × 100 mm        | 186005399 |
|                  | 4.6 × 30 mm           | 186005376 | 4.6 × 150 mm        | 186005400 |
|                  | 4.6 × 50 mm           | 186005377 | 4.6 × 250 mm        | 186005401 |
|                  | 4.6 × 75 mm           | 186005378 |                     |           |
|                  | 4.6 × 100 mm          | 186005379 |                     |           |
|                  | 4.6 × 150 mm          | 186005380 |                     |           |

|                    | Dimension             | P/N       | Dimension           | P/N       |
|--------------------|-----------------------|-----------|---------------------|-----------|
|                    | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| HSSC <sub>18</sub> | 1.0 × 50 mm           | 186006376 | 2.1 × 30 mm         | 186006390 |
|                    | 1.0 × 100 mm          | 186006377 | 2.1 × 50 mm         | 186006391 |
|                    | 1.0 × 150 mm          | 186006378 | 2.1 × 100 mm        | 186006392 |
|                    | 2.1 × 30 mm           | 186006380 | 2.1 × 150 mm        | 186006393 |
|                    | 2.1 × 50 mm           | 186006381 | 3.0 × 30 mm         | 186006395 |
|                    | 2.1 × 75 mm           | 186006382 | 3.0 × 50 mm         | 186006396 |
|                    | 2.1 × 100 mm          | 186006383 | 3.0 × 100 mm        | 186006397 |
|                    | 2.1 × 150 mm          | 186006384 | 3.0 × 150 mm        | 186006398 |
|                    | 3.0 × 30 mm           | 186004765 | 3.0 × 250 mm        | 186006399 |
|                    | 3.0 × 50 mm           | 186004766 | 4.6 × 30 mm         | 186006401 |
|                    | 3.0 × 75 mm           | 186005642 | 4.6 × 50 mm         | 186004852 |
|                    | 3.0 × 100 mm          | 186004762 | 4.6 × 75 mm         | 186006402 |
|                    | 3.0 × 150 mm          | 186004763 | 4.6 × 100 mm        | 186006403 |
|                    | 4.6 × 30 mm           | 186004771 | 4.6 × 150 mm        | 186004773 |
|                    | 4.6 × 50 mm           | 186004772 | 4.6 × 250 mm        | 186004775 |
|                    | 4.6 × 75 mm           | 186006387 |                     |           |
|                    | 4.6 × 100 mm          | 186004767 |                     |           |
|                    | 4.6 × 150 mm          | 186004768 |                     |           |
| 4.6 × 250 mm       | 186004770             |           |                     |           |

XSelect Analytical Columns *Continued*

|                              | Dimension             | P/N       | Dimension           | P/N       |
|------------------------------|-----------------------|-----------|---------------------|-----------|
|                              | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| <b>HSS C<sub>18</sub> SB</b> | 1.0 × 50 mm           | 186006417 | 2.1 × 30 mm         | 186006431 |
|                              | 1.0 × 100 mm          | 186006418 | 2.1 × 50 mm         | 186006432 |
|                              | 1.0 × 150 mm          | 186006419 | 2.1 × 100 mm        | 186006433 |
|                              | 2.1 × 30 mm           | 186006421 | 2.1 × 150 mm        | 186006434 |
|                              | 2.1 × 50 mm           | 186006422 | 3.0 × 30 mm         | 186006436 |
|                              | 2.1 × 75 mm           | 186006423 | 3.0 × 50 mm         | 186006437 |
|                              | 2.1 × 100 mm          | 186006424 | 3.0 × 100 mm        | 186006438 |
|                              | 2.1 × 150 mm          | 186006425 | 3.0 × 150 mm        | 186006439 |
|                              | 3.0 × 30 mm           | 186004746 | 3.0 × 250 mm        | 186006440 |
|                              | 3.0 × 50 mm           | 186004747 | 4.6 × 30 mm         | 186006442 |
|                              | 3.0 × 75 mm           | 186005643 | 4.6 × 50 mm         | 186004757 |
|                              | 3.0 × 100 mm          | 186004743 | 4.6 × 75 mm         | 186006443 |
|                              | 3.0 × 150 mm          | 186004744 | 4.6 × 100 mm        | 186006444 |
|                              | 4.6 × 30 mm           | 186004752 | 4.6 × 150 mm        | 186004754 |
|                              | 4.6 × 50 mm           | 186004753 | 4.6 × 250 mm        | 186004756 |
|                              | 4.6 × 75 mm           | 186006428 |                     |           |
|                              | 4.6 × 100 mm          | 186004748 |                     |           |
|                              | 4.6 × 150 mm          | 186004749 |                     |           |
|                              | 4.6 × 250 mm          | 186004751 |                     |           |

|               | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
|---------------|-----------------------|-----------|---------------------|-----------|
| <b>HSS T3</b> | 1.0 × 50 mm           | 186006458 | 2.1 × 30 mm         | 186006472 |
|               | 1.0 × 100 mm          | 186006459 | 2.1 × 50 mm         | 186006473 |
|               | 1.0 × 150 mm          | 186006460 | 2.1 × 100 mm        | 186006474 |
|               | 2.1 × 30 mm           | 186006462 | 2.1 × 150 mm        | 186006475 |
|               | 2.1 × 50 mm           | 186006463 | 3.0 × 30 mm         | 186006477 |
|               | 2.1 × 75 mm           | 186006464 | 3.0 × 50 mm         | 186006478 |
|               | 2.1 × 100 mm          | 186006465 | 3.0 × 100 mm        | 186006479 |
|               | 2.1 × 150 mm          | 186006466 | 3.0 × 150 mm        | 186006480 |
|               | 3.0 × 30 mm           | 186004783 | 3.0 × 250 mm        | 186006481 |
|               | 3.0 × 50 mm           | 186004784 | 4.6 × 30 mm         | 186006483 |
|               | 3.0 × 75 mm           | 186005641 | 4.6 × 50 mm         | 186004794 |
|               | 3.0 × 100 mm          | 186004780 | 4.6 × 75 mm         | 186006484 |
|               | 3.0 × 150 mm          | 186004781 | 4.6 × 100 mm        | 186006485 |
|               | 4.6 × 30 mm           | 186004789 | 4.6 × 150 mm        | 186004791 |
|               | 4.6 × 50 mm           | 186004790 | 4.6 × 250 mm        | 186004793 |
|               | 4.6 × 75 mm           | 186006469 |                     |           |
|               | 4.6 × 100 mm          | 186004785 |                     |           |
|               | 4.6 × 150 mm          | 186004786 |                     |           |
|               | 4.6 × 250 mm          | 186004788 |                     |           |

XSelect Analytical Columns *Continued*

|                | Dimension             | P/N       | Dimension           | P/N       |
|----------------|-----------------------|-----------|---------------------|-----------|
|                | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| <b>HSS PFP</b> | 1.0 × 50 mm           | 186005842 | 2.1 × 30 mm         | 186005868 |
|                | 1.0 × 100 mm          | 186005843 | 2.1 × 50 mm         | 186005869 |
|                | 1.0 × 150 mm          | 186005844 | 2.1 × 100 mm        | 186005871 |
|                | 2.1 × 30 mm           | 186005846 | 2.1 × 150 mm        | 186005872 |
|                | 2.1 × 50 mm           | 186005847 | 3.0 × 30 mm         | 186005874 |
|                | 2.1 × 75 mm           | 186005848 | 3.0 × 50 mm         | 186005875 |
|                | 2.1 × 100 mm          | 186005849 | 3.0 × 100 mm        | 186005877 |
|                | 2.1 × 150 mm          | 186005850 | 3.0 × 150 mm        | 186005878 |
|                | 3.0 × 30 mm           | 186005852 | 3.0 × 250 mm        | 186005879 |
|                | 3.0 × 50 mm           | 186005853 | 4.6 × 30 mm         | 186005881 |
|                | 3.0 × 75 mm           | 186005854 | 4.6 × 50 mm         | 186005882 |
|                | 3.0 × 100 mm          | 186005855 | 4.6 × 75 mm         | 186005883 |
|                | 3.0 × 150 mm          | 186005856 | 4.6 × 100 mm        | 186005884 |
|                | 4.6 × 30 mm           | 186005858 | 4.6 × 150 mm        | 186005885 |
|                | 4.6 × 50 mm           | 186005859 | 4.6 × 250 mm        | 186005886 |
|                | 4.6 × 75 mm           | 186005860 |                     |           |
|                | 4.6 × 100 mm          | 186005861 |                     |           |
|                | 4.6 × 150 mm          | 186005862 |                     |           |
|                | 4.6 × 250 mm          | 186005863 |                     |           |

|               | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
|---------------|-----------------------|-----------|---------------------|-----------|
| <b>HSS CN</b> | 1.0 × 50 mm           | 186005901 | 2.1 × 30 mm         | 186005928 |
|               | 1.0 × 100 mm          | 186005903 | 2.1 × 50 mm         | 186005929 |
|               | 1.0 × 150 mm          | 186005904 | 2.1 × 100 mm        | 186005931 |
|               | 2.1 × 30 mm           | 186005906 | 2.1 × 150 mm        | 186005932 |
|               | 2.1 × 50 mm           | 186005907 | 3.0 × 30 mm         | 186005934 |
|               | 2.1 × 75 mm           | 186005908 | 3.0 × 50 mm         | 186005935 |
|               | 2.1 × 100 mm          | 186005909 | 3.0 × 100 mm        | 186005937 |
|               | 2.1 × 150 mm          | 186005910 | 3.0 × 150 mm        | 186005938 |
|               | 3.0 × 30 mm           | 186005912 | 3.0 × 250 mm        | 186005939 |
|               | 3.0 × 50 mm           | 186005913 | 4.6 × 30 mm         | 186005941 |
|               | 3.0 × 75 mm           | 186005914 | 4.6 × 50 mm         | 186005942 |
|               | 3.0 × 100 mm          | 186005915 | 4.6 × 75 mm         | 186005943 |
|               | 3.0 × 150 mm          | 186005916 | 4.6 × 100 mm        | 186005944 |
|               | 4.6 × 30 mm           | 186005918 | 4.6 × 150 mm        | 186005945 |
|               | 4.6 × 50 mm           | 186005919 | 4.6 × 250 mm        | 186005946 |
|               | 4.6 × 75 mm           | 186005920 |                     |           |
|               | 4.6 × 100 mm          | 186005921 |                     |           |
|               | 4.6 × 150 mm          | 186005922 |                     |           |
|               | 4.6 × 250 mm          | 186005923 |                     |           |



## XSelect Peptide Columns

|                            | Dimension             | P/N       | Dimension           | P/N       |
|----------------------------|-----------------------|-----------|---------------------|-----------|
|                            | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| CSH C <sub>18</sub> , 130Å | 2.1 × 50 mm           | 186006950 | 4.6 × 50 mm         | 186007076 |
|                            | 2.1 × 100 mm          | 186006951 | 4.6 × 100 mm        | 186007077 |
|                            | 2.1 × 150 mm          | 186006952 | 4.6 × 150 mm        | 186007078 |
|                            | 4.6 × 50 mm           | 186006955 |                     |           |
|                            | 4.6 × 100 mm          | 186006956 |                     |           |
|                            | 4.6 × 150 mm          | 186006957 |                     |           |

## XSelect Columns Method Validation Kits\*

|                        | Dimension             | P/N       | Dimension           | P/N          |
|------------------------|-----------------------|-----------|---------------------|--------------|
|                        | Particle Size: 3.5 µm |           | Particle Size: 5 µm |              |
| CSH C <sub>18</sub>    | 2.1 × 100 mm          | 186005538 | 2.1 × 150 mm        | 186005543    |
|                        | 3.0 × 100 mm          | 186005539 | 3.0 × 100 mm        | 186005544    |
|                        | 3.0 × 150 mm          | 186005540 | 3.0 × 150 mm        | 186005545    |
|                        | 4.6 × 100 mm          | 186005541 | 4.6 × 100 mm        | 186005546    |
|                        | 4.6 × 150 mm          | 186005542 | 4.6 × 150 mm        | 186005547    |
|                        |                       |           |                     | 4.6 × 250 mm |
| CSH Fluoro-Phenyl      | 2.1 × 100 mm          | 186005549 | 2.1 × 150 mm        | 186005554    |
|                        | 3.0 × 100 mm          | 186005550 | 3.0 × 100 mm        | 186005555    |
|                        | 3.0 × 150 mm          | 186005551 | 3.0 × 150 mm        | 186005556    |
|                        | 4.6 × 100 mm          | 186005552 | 4.6 × 100 mm        | 186005557    |
|                        | 4.6 × 150 mm          | 186005553 | 4.6 × 150 mm        | 186005558    |
|                        |                       |           | 4.6 × 250 mm        | 186005559    |
| CSH Phenyl-Hexyl       | 2.1 × 100 mm          | 186005560 | 2.1 × 150 mm        | 186005565    |
|                        | 3.0 × 100 mm          | 186005561 | 3.0 × 100 mm        | 186005566    |
|                        | 3.0 × 150 mm          | 186005562 | 3.0 × 150 mm        | 186005567    |
|                        | 4.6 × 100 mm          | 186005563 | 4.6 × 100 mm        | 186005568    |
|                        | 4.6 × 150 mm          | 186005564 | 4.6 × 150 mm        | 186005569    |
|                        |                       |           | 4.6 × 250 mm        | 186005570    |
| HSS C <sub>18</sub>    | 2.1 × 100 mm          | 186006406 | 2.1 × 150 mm        | 186006411    |
|                        | 3.0 × 100 mm          | 186006407 | 3.0 × 100 mm        | 186006412    |
|                        | 3.0 × 150 mm          | 186006408 | 3.0 × 150 mm        | 186006413    |
|                        | 4.6 × 100 mm          | 186006409 | 4.6 × 100 mm        | 186006414    |
|                        | 4.6 × 150 mm          | 186006410 | 4.6 × 150 mm        | 186006415    |
|                        |                       |           | 4.6 × 250 mm        | 186006416    |
| HSS C <sub>18</sub> SB | 2.1 × 100 mm          | 186006447 | 2.1 × 150 mm        | 186006452    |
|                        | 3.0 × 100 mm          | 186006448 | 3.0 × 100 mm        | 186006453    |
|                        | 3.0 × 150 mm          | 186006449 | 3.0 × 150 mm        | 186006454    |
|                        | 4.6 × 100 mm          | 186006450 | 4.6 × 100 mm        | 186006455    |
|                        | 4.6 × 150 mm          | 186006451 | 4.6 × 150 mm        | 186006456    |
|                        |                       |           | 4.6 × 250 mm        | 186006457    |

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

XSelect Columns Method Validation Kits\* *Continued*

|                                   | Dimension             | P/N       | Dimension           | P/N       |
|-----------------------------------|-----------------------|-----------|---------------------|-----------|
|                                   | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| <b>HSS T3</b>                     | 2.1 × 100 mm          | 186006488 | 2.1 × 150 mm        | 186006493 |
|                                   | 3.0 × 100 mm          | 186006489 | 3.0 × 100 mm        | 186006494 |
|                                   | 3.0 × 150 mm          | 186006490 | 3.0 × 150 mm        | 186006495 |
|                                   | 4.6 × 100 mm          | 186006491 | 4.6 × 100 mm        | 186006496 |
|                                   | 4.6 × 150 mm          | 186006492 | 4.6 × 150 mm        | 186006497 |
|                                   |                       |           | 4.6 × 250 mm        | 186006498 |
| <b>HSS PFP</b>                    | 2.1 × 100 mm          | 186005890 | 2.1 × 150 mm        | 186005895 |
|                                   | 3.0 × 100 mm          | 186005891 | 3.0 × 100 mm        | 186005896 |
|                                   | 3.0 × 150 mm          | 186005892 | 3.0 × 150 mm        | 186005897 |
|                                   | 4.6 × 100 mm          | 186005893 | 4.6 × 100 mm        | 186005898 |
|                                   | 4.6 × 150 mm          | 186005894 | 4.6 × 150 mm        | 186005899 |
|                                   |                       |           | 4.6 × 250 mm        | 186005900 |
| <b>HSS CN</b>                     | 2.1 × 100 mm          | 186005950 | 2.1 × 150 mm        | 186005955 |
|                                   | 3.0 × 100 mm          | 186005951 | 3.0 × 100 mm        | 186005956 |
|                                   | 3.0 × 150 mm          | 186005952 | 3.0 × 150 mm        | 186005957 |
|                                   | 4.6 × 100 mm          | 186005953 | 4.6 × 100 mm        | 186005958 |
|                                   | 4.6 × 150 mm          | 186005954 | 4.6 × 150 mm        | 186005959 |
|                                   |                       |           | 4.6 × 250 mm        | 186005960 |
| <b>Peptide CSH C<sub>18</sub></b> | 2.1 × 100 mm          | 186006953 |                     |           |
|                                   | 4.6 × 100 mm          | 186006959 |                     |           |

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

**APPLICATION AREA:** Chemical Fingerprint of Natural Products

"The XSelect HSS T3 Column made difference in my work results!

Several attempts to obtain the chromatographic profile of a natural product extract were performed with other columns, which showed about

10 substances in the chemical fingerprint. The XSelect HSS T3 Column presented a chromatographic profile of my extract with about 20 substances with incredible separation! Including the substance, I was looking for it was trace in the sample and I did not observe it in the analysis carried out

with the other columns. It was a pleasant surprise and I was amazed with the separation profile obtained in LC-MS analyses."

**REVIEWER:** Ana Amaral

**ORGANIZATION:** FIOCRUZ



## XSelect VanGuard Cartridges

|                        | Dimension                        | P/N       | Dimension                      | P/N       |
|------------------------|----------------------------------|-----------|--------------------------------|-----------|
|                        | Particle Size: 3.5 $\mu\text{m}$ |           | Particle Size: 5 $\mu\text{m}$ |           |
| CSH C <sub>18</sub>    | 2.1 × 5 mm                       | 186007811 | 2.1 × 5 mm                     | 186007814 |
|                        | 3.9 × 5 mm                       | 186007813 | 3.9 × 5 mm                     | 186007816 |
| CSH Fluoro-Phenyl      | 2.1 × 5 mm                       | 186007820 | 2.1 × 5 mm                     | 186007824 |
|                        | 3.9 × 5 mm                       | 186007822 | 3.9 × 5 mm                     | 186007826 |
| CSH Phenyl-Hexyl       | 2.1 × 5 mm                       | 186007830 | 2.1 × 5 mm                     | 186007836 |
|                        | 3.9 × 5 mm                       | 186007832 | 3.9 × 5 mm                     | 186007838 |
| HSS C <sub>18</sub>    | 2.1 × 5 mm                       | 186007851 | 2.1 × 5 mm                     | 186007854 |
|                        | 3.9 × 5 mm                       | 186007853 | 3.9 × 5 mm                     | 186007856 |
| HSS C <sub>18</sub> SB | 2.1 × 5 mm                       | 186007842 | 2.1 × 5 mm                     | 186007845 |
|                        | 3.9 × 5 mm                       | 186007844 | 3.9 × 5 mm                     | 186007847 |
| HSS T3                 | 2.1 × 5 mm                       | 186007878 | 2.1 × 5 mm                     | 186007881 |
|                        | 3.9 × 5 mm                       | 186007880 | 3.9 × 5 mm                     | 186007883 |
| HSS PFP                | 2.1 × 5 mm                       | 186007869 | 2.1 × 5 mm                     | 186007872 |
|                        | 3.9 × 5 mm                       | 186007871 | 3.9 × 5 mm                     | 186007874 |
| HSS CN                 | 2.1 × 5 mm                       | 186007860 | 2.1 × 5 mm                     | 186007863 |
|                        | 3.9 × 5 mm                       | 186007862 | 3.9 × 5 mm                     | 186007865 |

## Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |

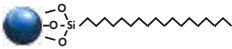
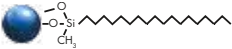



## Atlantis HPLC Columns

For polar compounds, Atlantis HPLC Columns provide exceptional performance, versatility, and retention. The balanced retention of Atlantis Columns affords the separation of polar and non-polar analytes while providing:

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

### Column Characteristics

|                       | <b>T3, 100Å</b><br>HPLC: 3, 5, 10 µm  | <b>dC<sub>18</sub>, 100Å</b><br>HPLC: 3, 5 µm                                     | <b>HILIC Silica, 100Å</b><br>HPLC: 3, 5 µm  |
|-----------------------|---|---|---|
| Particle/Ligand       |  |  |  |
| Ligand Density*       | 1.6 µmol/m <sup>2</sup>   | 1.6 µmol/m <sup>2</sup>   | N/A   |
| Carbon Load*          | 14%   | 12%   | Unbonded  |
| Endcap Style          | Proprietary   | Proprietary   | N/A   |
| 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 <sup>2</sup> /g   | 330 m <sup>2</sup> /g   | 330 m <sup>2</sup> /g   |
| Performance Standards | <b>Neutrals QC Reference Material</b><br>p/n: 186006360                           | <b>Neutrals QC Reference Material</b><br>p/n: 186006360                           | <b>HILIC QC Reference Material</b><br>p/n: 186007226                                |
| Application Standards | <b>Reversed-Phase QC Reference Material</b><br>p/n: 186006363                     | <b>Reversed-Phase QC Reference Material</b><br>p/n: 186006363                     | <b>HILIC QC Reference Material</b><br>p/n: 186007226                                |

\*Expected or approximate value.

Atlantis Analytical Columns

|              | Dimension           | P/N       | Dimension           | P/N       |
|--------------|---------------------|-----------|---------------------|-----------|
|              | Particle Size: 3 µm |           | Particle Size: 5 µm |           |
| T3           | 1.0 × 50 mm         | 186003713 | 2.1 × 30 mm         | 186003733 |
|              | 1.0 × 150 mm        | 186003714 | 2.1 × 50 mm         | 186003734 |
|              | 2.1 × 20 mm /S      | 186003715 | 2.1 × 100 mm        | 186003735 |
|              | 2.1 × 30 mm         | 186003716 | 2.1 × 150 mm        | 186003736 |
|              | 2.1 × 50 mm         | 186003717 | 3.0 × 50 mm         | 186003738 |
|              | 2.1 × 75 mm         | 186005652 | 3.0 × 100 mm        | 186003739 |
|              | 2.1 × 100 mm        | 186003718 | 3.0 × 150 mm        | 186003740 |
|              | 2.1 × 150 mm        | 186003719 | 3.0 × 250 mm        | 186003741 |
|              | 3.0 × 50 mm         | 186003721 | 4.6 × 30 mm         | 186003743 |
|              | 3.0 × 75 mm         | 186005653 | 4.6 × 50 mm         | 186003744 |
|              | 3.0 × 100 mm        | 186003722 | 4.6 × 75 mm         | 186003745 |
|              | 3.0 × 150 mm        | 186003723 | 4.6 × 100 mm        | 186003746 |
|              | 4.6 × 20 mm /S      | 186003724 | 4.6 × 150 mm        | 186003747 |
|              | 4.6 × 30 mm         | 186003725 | 4.6 × 250 mm        | 186003748 |
|              | 4.6 × 50 mm         | 186003726 |                     |           |
|              | 4.6 × 75 mm         | 186003727 |                     |           |
| 4.6 × 100 mm | 186003728           |           |                     |           |
| 4.6 × 150 mm | 186003729           |           |                     |           |

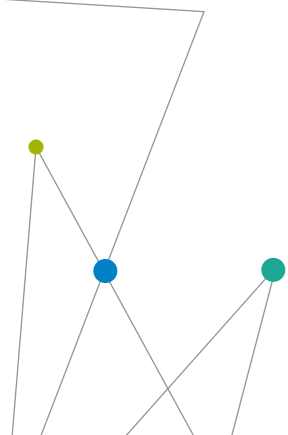
|                  | Dimension           | P/N       | Dimension           | P/N       |
|------------------|---------------------|-----------|---------------------|-----------|
|                  | Particle Size: 3 µm |           | Particle Size: 5 µm |           |
| dC <sub>18</sub> | 2.1 × 20 mm /S      | 186002058 | 2.1 × 20 mm /S      | 186002059 |
|                  | 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 × 100 mm        | 186001305 |
|                  | 3.0 × 150 mm        | 186001307 | 3.0 × 150 mm        | 186001309 |
|                  | 3.9 × 100 mm        | 186001393 | 3.0 × 250 mm        | 186001311 |
|                  | 3.9 × 150 mm        | 186001317 | 3.9 × 100 mm        | 186001395 |
|                  | 4.6 × 20 mm /S      | 186002062 | 3.9 × 150 mm        | 186001319 |
|                  | 4.6 × 50 mm         | 186001329 | 4.6 × 50 mm         | 186001331 |
|                  | 4.6 × 75 mm         | 186001333 | 4.6 × 75 mm         | 186001335 |
|                  | 4.6 × 100 mm        | 186001337 | 4.6 × 100 mm        | 186001340 |
|                  | 4.6 × 150 mm        | 186001342 | 4.6 × 150 mm        | 186001344 |
|                  |                     |           | 4.6 × 250 mm        | 186001346 |

**APPLICATION AREA:** Residue and Metabolism

"Reliable and requires little maintenance. The column has great performance it is reliable and requires little maintenance I recommended as a great tool."

**REVIEWER:** Christopher Bianca

**ORGANIZATION:** JRF America



## Atlantis Analytical Columns *Continued*

|              | Dimension                            | P/N       | Dimension                | P/N       |
|--------------|--------------------------------------|-----------|--------------------------|-----------|
|              | Particle Size: 3 $\mu$ m             |           | Particle Size: 5 $\mu$ m |           |
| HILIC Silica | 2.1 $\times$ 15 mm<br>Direct Connect | 186002007 | 1.0 $\times$ 50 mm       | 186002004 |
|              | 2.1 $\times$ 30 mm                   | 186002009 | 2.1 $\times$ 50 mm       | 186002012 |
|              | 2.1 $\times$ 50 mm                   | 186002011 | 2.1 $\times$ 100 mm      | 186002014 |
|              | 2.1 $\times$ 100 mm                  | 186002013 | 2.1 $\times$ 150 mm      | 186002016 |
|              | 2.1 $\times$ 150 mm                  | 186002015 | 3.0 $\times$ 50 mm       | 186002018 |
|              | 3.0 $\times$ 50 mm                   | 186002017 | 4.6 $\times$ 50 mm       | 186002028 |
|              | 3.0 $\times$ 100 mm                  | 186002019 | 4.6 $\times$ 100 mm      | 186002030 |
|              | 4.6 $\times$ 50 mm                   | 186002027 | 4.6 $\times$ 150 mm      | 186002032 |
|              | 4.6 $\times$ 100 mm                  | 186002029 | 4.6 $\times$ 250 mm      | 186002033 |
|              | 4.6 $\times$ 150 mm                  | 186002031 |                          |           |

## Atlantis Columns Method Validation Kits\*

|              | Dimension                | P/N       | Dimension                | P/N       |
|--------------|--------------------------|-----------|--------------------------|-----------|
|              | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| T3           | 4.6 $\times$ 150 mm      | 186003751 | 4.6 $\times$ 150 mm      | 186003754 |
|              |                          |           | 4.6 $\times$ 250 mm      | 186003755 |
| HILIC Silica | 4.6 $\times$ 150 mm      | 186002315 | 4.6 $\times$ 150 mm      | 186002314 |
|              |                          |           | 4.6 $\times$ 250 mm      | 186002316 |

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

## Atlantis VanGuard Cartridges

|                  | Dimension                | P/N       | Dimension                | P/N       |
|------------------|--------------------------|-----------|--------------------------|-----------|
|                  | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| T3               | 2.1 $\times$ 5 mm        | 186007674 | 2.1 $\times$ 5 mm        | 186007678 |
|                  | 3.9 $\times$ 5 mm        | 186007676 | 3.9 $\times$ 5 mm        | 186007680 |
| dC <sub>18</sub> | 2.1 $\times$ 5 mm        | 186007658 | 2.1 $\times$ 5 mm        | 186007662 |
|                  | 3.9 $\times$ 5 mm        | 186007660 | 3.9 $\times$ 5 mm        | 186007664 |
| HILIC Silica     | 2.1 $\times$ 5 mm        | 186007666 | 2.1 $\times$ 5 mm        | 186007670 |
|                  | 3.9 $\times$ 5 mm        | 186007668 | 3.9 $\times$ 5 mm        | 186007672 |

## Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |



## SunFire HPLC Columns

SunFire Columns set the standard for state-of-the-art bonded C<sub>18</sub> and C<sub>8</sub> 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 <sub>8</sub> , 100Å   | C <sub>18</sub> , 100Å                                 | Silica, 100Å                    |
|-----------------------|---|--|---------------------------------|
|                       | HPLC: 2.5, 3.5, 5, 10 µm  | HPLC: 2.5, 3.5, 5, 10 µm                               | HPLC: 5, 10 µm                  |
| Particle/Ligand       |   |  |                                 |
| Ligand Density*       | 3.5 µmol/m <sup>2</sup>   | 3.5 µmol/m <sup>2</sup>                                | N/A                             |
| Carbon Load*          | 12%   | 16%  | N/A                             |
| Endcap Style          | Proprietary   | Proprietary  | N/A                             |
| USP Class No.         | L7  | L1   | L3                              |
| pH Range              | 2–8   | 2–8  | 2–8                             |
| Temperature Limits    | Low pH = 40 °C, High pH = 40 °C   | Low pH = 50 °C, High pH = 40 °C                        | Low pH = 55 °C, High pH = 45 °C |
| Surface Area*         | 340 m <sup>2</sup> /g   | 340 m <sup>2</sup> /g                                  | 340 m <sup>2</sup> /g           |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360  | Neutrals QC Reference Material<br>p/n: 186006360       | —                               |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363<br>HILIC QC Reference Material<br>p/n: 186007226 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | —                               |

\*Expected or approximate value.

SunFire 2.5 µm Columns can be found on page 131.

## Ordering Information

### SunFire Analytical Columns

|                 | Dimension             | P/N       | Dimension           | P/N          |
|-----------------|-----------------------|-----------|---------------------|--------------|
|                 | Particle Size: 3.5 µm |           | Particle Size: 5 µm |              |
| C <sub>18</sub> | 2.1 × 50 mm           | 186002533 | 2.1 × 50 mm         | 186002539    |
|                 | 2.1 × 100 mm          | 186002534 | 2.1 × 100 mm        | 186002540    |
|                 | 2.1 × 150 mm          | 186002535 | 2.1 × 150 mm        | 186002541    |
|                 | 3.0 × 50 mm           | 186002542 | 3.0 × 50 mm         | 186002545    |
|                 | 3.0 × 100 mm          | 186002543 | 3.0 × 100 mm        | 186002546    |
|                 | 3.0 × 150 mm          | 186002544 | 3.0 × 150 mm        | 186002547    |
|                 | 4.6 × 20 mm /S        | 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 |

|                | Dimension             | P/N       | Dimension           | P/N       |
|----------------|-----------------------|-----------|---------------------|-----------|
|                | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| C <sub>8</sub> | 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 × 30 mm           | 186002728 | 4.6 × 30 mm         | 186002734 |
|                | 4.6 × 50 mm           | 186002729 | 4.6 × 50 mm         | 186002735 |
|                | 4.6 × 75 mm           | 186002730 | 4.6 × 100 mm        | 186002736 |
|                | 4.6 × 100 mm          | 186002731 | 4.6 × 150 mm        | 186002737 |
|                | 4.6 × 150 mm          | 186002732 | 4.6 × 250 mm        | 186002738 |

|        | Dimension           | P/N       | Dimension            | P/N       |
|--------|---------------------|-----------|----------------------|-----------|
|        | Particle Size: 5 µm |           | Particle Size: 10 µm |           |
| Silica | 4.6 × 150 mm        | 186003453 | 4.6 × 150 mm         | 186003467 |
|        | 4.6 × 250 mm        | 186003454 | 4.6 × 250 mm         | 186003468 |

#### APPLICATION AREA: API's Impurities

"When combined with LC-MS/MS returns excellent results. It is highly versatile, durable, high performance and with good durability and reliability."

REVIEWER: Paolo Piccinini

ORGANIZATION: LabAnalysis srl





### SunFire Columns Method Validation Kits\*

|                 | Dimension             | P/N       | Dimension           | P/N       |
|-----------------|-----------------------|-----------|---------------------|-----------|
|                 | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| C <sub>18</sub> | 4.6 × 100 mm          | 186002675 | 4.6 × 150 mm        | 186002679 |
|                 | 4.6 × 150 mm          | 186002676 | 4.6 × 250 mm        | 186002680 |
| C <sub>8</sub>  | 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

|                 | Dimension             | P/N       | Dimension           | P/N       |
|-----------------|-----------------------|-----------|---------------------|-----------|
|                 | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| C <sub>18</sub> | 2.1 × 5 mm            | 186007694 | 2.1 × 5 mm          | 186007697 |
|                 | 3.9 × 5 mm            | 186007696 | 3.9 × 5 mm          | 186007699 |
| C <sub>8</sub>  | 2.1 × 5 mm            | 186007703 | 2.1 × 5 mm          | 186007706 |
|                 | 3.9 × 5 mm            | 186007705 | 3.9 × 5 mm          | 186007708 |

### Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |



## Symmetry HPLC 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<sub>18</sub> and C<sub>8</sub> Columns deliver maximum reproducibility
- SymmetryShield™ RP18 and RP8 Columns provide superior peak shape
- Symmetry300™ C<sub>18</sub> and C<sub>4</sub> Columns offer high recoveries of peptides and proteins

### Column Characteristics

|                       | Symmetry C <sub>8</sub> and SymmetryPrep C <sub>8</sub> | Symmetry C <sub>18</sub> and SymmetryPrep C <sub>18</sub> | SymmetryShield RP8                                     | SymmetryShield RP18                                    | Symmetry300 C <sub>4</sub>                      | Symmetry300 C <sub>18</sub>                       |
|-----------------------|---|---|--|--|---|---|
|                       | HPLC: 3.5, 5, 7 μm                                      | HPLC: 3.5, 5, 7 μm  | HPLC: 3.5, 5, 7 μm                                     | HPLC: 3.5, 5, 7 μm                                     | HPLC: 3.5, 5 μm                                 | HPLC: 3.5, 5 μm                                   |
| Particle/Ligand       |   |   |  |  |   |   |
| Carbon Load*          | 12%   | 19%   | 15%  | 17%  | 2.8%  | 8.5%  |
| Endcap Style          | Proprietary   | Proprietary   | Proprietary  | Proprietary  | Proprietary                                     | Proprietary                                       |
| USP Class No.         | L7  | L1  | L1   | L1   | L26   | L1  |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360        | Neutrals QC Reference Material<br>p/n: 186006360          | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | MassPREP Protein Standard Mix<br>p/n: 186004900 | Cytochrome c Digestion Standard<br>p/n: 186006371 |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363  | Reversed-Phase QC Reference Material<br>p/n: 186006363    | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | MassPREP Protein Standard Mix<br>p/n: 186004900 | Peptide Retention Standard<br>p/n: 186006555      |

\*Expected or approximate value.

Symmetry, SymmetryShield, and Symmetry300 Analytical Columns

|                          | Dimension                  | P/N       | Dimension                | P/N       |
|--------------------------|----------------------------|-----------|--------------------------|-----------|
|                          | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| Symmetry C <sub>18</sub> | 1.0 $\times$ 50 mm         | WAT106056 | 2.1 $\times$ 20 mm /S    | 186002070 |
|                          | 1.0 $\times$ 150 mm        | WAT248059 | 2.1 $\times$ 50 mm       | 186000206 |
|                          | 2.1 $\times$ 30 mm         | WAT058973 | 2.1 $\times$ 100 mm      | 186002608 |
|                          | 2.1 $\times$ 50 mm         | WAT200650 | 2.1 $\times$ 150 mm      | WAT056975 |
|                          | 2.1 $\times$ 100 mm        | WAT058965 | 3.0 $\times$ 150 mm      | WAT054200 |
|                          | 2.1 $\times$ 150 mm        | WAT106005 | 3.0 $\times$ 250 mm      | 186000690 |
|                          | 3.0 $\times$ 50 mm         | 186002612 | 3.9 $\times$ 20 mm /S    | 186002086 |
|                          | 3.0 $\times$ 100 mm        | 186000696 | 3.9 $\times$ 150 mm      | WAT046980 |
|                          | 3.0 $\times$ 150 mm        | 186000695 | 4.6 $\times$ 20 mm /S    | 186002094 |
|                          | 3.9 $\times$ 20 mm /S      | 186002082 | 4.6 $\times$ 50 mm       | 186000207 |
|                          | 4.6 $\times$ 20 mm /S      | 186002090 | 4.6 $\times$ 100 mm      | 186002616 |
|                          | 4.6 $\times$ 30 mm         | 186000271 | 4.6 $\times$ 150 mm      | WAT045905 |
|                          | 4.6 $\times$ 50 mm         | WAT200625 | 4.6 $\times$ 250 mm      | WAT054275 |
|                          | 4.6 $\times$ 75 mm         | WAT066224 |                          |           |
|                          | 4.6 $\times$ 100 mm        | WAT066220 |                          |           |
|                          | 4.6 $\times$ 150 mm        | WAT200632 |                          |           |
| 4.6 $\times$ 250 mm      | 186005794                  |           |                          |           |

|                         | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
|-------------------------|----------------------------|-----------|--------------------------|-----------|
| Symmetry C <sub>8</sub> | 2.1 $\times$ 30 mm         | WAT058977 | 2.1 $\times$ 50 mm       | 186000212 |
|                         | 2.1 $\times$ 50 mm         | WAT200624 | 2.1 $\times$ 100 mm      | 186002609 |
|                         | 2.1 $\times$ 100 mm        | WAT058961 | 2.1 $\times$ 150 mm      | WAT056955 |
|                         | 2.1 $\times$ 150 mm        | WAT106011 | 3.0 $\times$ 150 mm      | WAT054230 |
|                         | 3.0 $\times$ 100 mm        | 186000698 | 3.0 $\times$ 250 mm      | 186000691 |
|                         | 3.0 $\times$ 150 mm        | 186000697 | 3.9 $\times$ 20 mm /S    | 186002087 |
|                         | 3.9 $\times$ 20 mm /S      | 186002083 | 3.9 $\times$ 150 mm      | WAT046970 |
|                         | 4.6 $\times$ 30 mm         | 186000270 | 4.6 $\times$ 50 mm       | 186000213 |
|                         | 4.6 $\times$ 50 mm         | WAT200620 | 4.6 $\times$ 100 mm      | 186002617 |
|                         | 4.6 $\times$ 75 mm         | WAT066200 | 4.6 $\times$ 150 mm      | WAT045995 |
|                         | 4.6 $\times$ 100 mm        | WAT066204 | 4.6 $\times$ 250 mm      | WAT054270 |
|                         | 4.6 $\times$ 150 mm        | WAT200630 |                          |           |

Symmetry, SymmetryShield, and Symmetry300 Analytical Columns *Continued*

|                     | Dimension                        | P/N       | Dimension                      | P/N       |
|---------------------|----------------------------------|-----------|--------------------------------|-----------|
|                     | Particle Size: 3.5 $\mu\text{m}$ |           | Particle Size: 5 $\mu\text{m}$ |           |
| SymmetryShield RP18 | 2.1 $\times$ 30 mm               | 186000171 | 2.1 $\times$ 50 mm             | 186000217 |
|                     | 2.1 $\times$ 50 mm               | 186000172 | 2.1 $\times$ 100 mm            | 186000998 |
|                     | 2.1 $\times$ 100 mm              | 186000173 | 2.1 $\times$ 150 mm            | 186000111 |
|                     | 2.1 $\times$ 150 mm              | 186000174 | 3.0 $\times$ 150 mm            | 186000692 |
|                     | 3.0 $\times$ 50 mm               | 186002614 | 3.0 $\times$ 250 mm            | 186000693 |
|                     | 3.0 $\times$ 100 mm              | 186000700 | 3.9 $\times$ 20 mm /S          | 186002088 |
|                     | 3.0 $\times$ 150 mm              | 186000699 | 3.9 $\times$ 150 mm            | 186000108 |
|                     | 3.9 $\times$ 20 mm /S            | 186002084 | 4.6 $\times$ 50 mm             | 186000218 |
|                     | 4.6 $\times$ 50 mm               | 186000177 | 4.6 $\times$ 100 mm            | 186002618 |
|                     | 4.6 $\times$ 75 mm               | 186000178 | 4.6 $\times$ 150 mm            | 186000109 |
|                     | 4.6 $\times$ 100 mm              | 186000179 | 4.6 $\times$ 250 mm            | 186000112 |
|                     | 4.6 $\times$ 150 mm              | 186000180 |                                |           |

|                    | Particle Size: 3.5 $\mu\text{m}$ |           | Particle Size: 5 $\mu\text{m}$ |           |
|--------------------|----------------------------------|-----------|--------------------------------|-----------|
| SymmetryShield RP8 | 2.1 $\times$ 50 mm               | WAT094257 | 2.1 $\times$ 50 mm             | 186000223 |
|                    | 2.1 $\times$ 100 mm              | WAT058969 | 2.1 $\times$ 150 mm            | WAT094245 |
|                    | 2.1 $\times$ 150 mm              | WAT106008 | 3.0 $\times$ 150 mm            | WAT094243 |
|                    | 3.0 $\times$ 100 mm              | 186000703 | 3.0 $\times$ 250 mm            | 186000694 |
|                    | 3.0 $\times$ 150 mm              | 186000702 | 3.9 $\times$ 20 mm /S          | 186002089 |
|                    | 3.0 $\times$ 100 mm              | 186000703 | 3.9 $\times$ 150 mm            | WAT200655 |
|                    | 3.0 $\times$ 150 mm              | 186000702 | 4.6 $\times$ 50 mm             | 186000224 |
|                    | 4.6 $\times$ 50 mm               | WAT094260 | 4.6 $\times$ 100 mm            | 186002619 |
|                    | 4.6 $\times$ 75 mm               | WAT094263 | 4.6 $\times$ 150 mm            | WAT200662 |
|                    | 4.6 $\times$ 100 mm              | WAT094266 | 4.6 $\times$ 250 mm            | WAT200670 |
|                    | 4.6 $\times$ 150 mm              | WAT094269 |                                |           |

|                             | Particle Size: 3.5 $\mu\text{m}$ |           | Particle Size: 5 $\mu\text{m}$ |           |
|-----------------------------|----------------------------------|-----------|--------------------------------|-----------|
| Symmetry300 C <sub>18</sub> | 2.1 $\times$ 50 mm               | 186000187 | 2.1 $\times$ 150 mm            | WAT106172 |
|                             | 2.1 $\times$ 100 mm              | 186000188 | 4.6 $\times$ 50 mm             | WAT106209 |
|                             | 2.1 $\times$ 150 mm              | 186000200 | 4.6 $\times$ 150 mm            | WAT106157 |
|                             | 4.6 $\times$ 50 mm               | 186000201 | 4.6 $\times$ 250 mm            | WAT106151 |
|                             | 4.6 $\times$ 75 mm               | 186000189 |                                |           |
|                             | 4.6 $\times$ 100 mm              | 186000190 |                                |           |
|                             | 4.6 $\times$ 150 mm              | 186000197 |                                |           |

|                            | Particle Size: 3.5 $\mu\text{m}$ |           | Particle Size: 5 $\mu\text{m}$ |           |
|----------------------------|----------------------------------|-----------|--------------------------------|-----------|
| Symmetry300 C <sub>4</sub> | 2.1 $\times$ 50 mm               | 186000277 | 2.1 $\times$ 150 mm            | 186000285 |
|                            | 2.1 $\times$ 100 mm              | 186000278 | 3.9 $\times$ 150 mm            | 186000286 |
|                            | 2.1 $\times$ 150 mm              | 186000279 | 4.6 $\times$ 50 mm             | 186000287 |
|                            | 4.6 $\times$ 50 mm               | 186000280 | 4.6 $\times$ 150 mm            | 186000288 |
|                            | 4.6 $\times$ 75 mm               | 186000281 | 4.6 $\times$ 250 mm            | 186000289 |
|                            | 4.6 $\times$ 100 mm              | 186000282 |                                |           |
|                            | 4.6 $\times$ 150 mm              | 186000283 |                                |           |

Symmetry, SymmetryShield, and Symmetry300 Method Validation Kits\*

|                             | Dimension    | P/N                   | Dimension    | P/N                 |  |
|-----------------------------|--------------|-----------------------|--------------|---------------------|--|
|                             |              | Particle Size: 3.5 µm |              | Particle Size: 5 µm |  |
| Symmetry C <sub>18</sub>    | 4.6 × 150 mm | WAT094240             | 3.9 × 150 mm | WAT047210           |  |
|                             |              |                       | 4.6 × 150 mm | WAT054448           |  |
|                             |              |                       | 4.6 × 250 mm | WAT054450           |  |
| Symmetry C <sub>8</sub>     | 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 <sub>18</sub> | 4.6 × 150 mm | 186000195             | 3.9 × 150 mm | WAT106187           |  |
|                             |              |                       | 4.6 × 150 mm | WAT106190           |  |
|                             |              |                       | 4.6 × 250 mm | WAT106184           |  |
| Symmetry300 C <sub>4</sub>  | 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.

Symmetry, SymmetryShield, and Symmetry300 Cartridge Method Validation Kits\*

|                             | Dimension    | P/N                    |
|-----------------------------|--------------|------------------------|
|                             |              | Particle Size: 5 µm    |
| Symmetry C <sub>18</sub>    | 3.9 × 150 mm | WAT054452 <sup>1</sup> |
|                             | 4.6 × 150 mm | WAT054454 <sup>1</sup> |
| Symmetry RP8                | 3.9 × 150 mm | WAT010582 <sup>1</sup> |
| Symmetry300 C <sub>18</sub> | 3.9 × 150 mm | WAT106181 <sup>1</sup> |

<sup>1</sup> Requires Cartridge End-fittings.

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

## Symmetry VanGuard Cartridges

|                             | Dimension             | P/N       | Dimension           | P/N       |
|-----------------------------|-----------------------|-----------|---------------------|-----------|
|                             | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| Symmetry C <sub>18</sub>    | 2.1 × 5 mm            | 186007725 | 2.1 × 5 mm          | 186007729 |
|                             | 3.9 × 5 mm            | 186007727 | 3.9 × 5 mm          | 186007731 |
| Symmetry C <sub>8</sub>     | 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 <sub>18</sub> | 2.1 × 5 mm            | 186007709 | 2.1 × 5 mm          | 186007713 |
|                             | 3.9 × 5 mm            | 186007711 | 3.9 × 5 mm          | 186007715 |
| Symmetry300 C <sub>4</sub>  | 2.1 × 5 mm            | 186007717 | 2.1 × 5 mm          | 186007721 |
|                             | 3.9 × 5 mm            | 186007719 | 3.9 × 5 mm          | 186007723 |

## Universal VanGuard Cartridge Holder

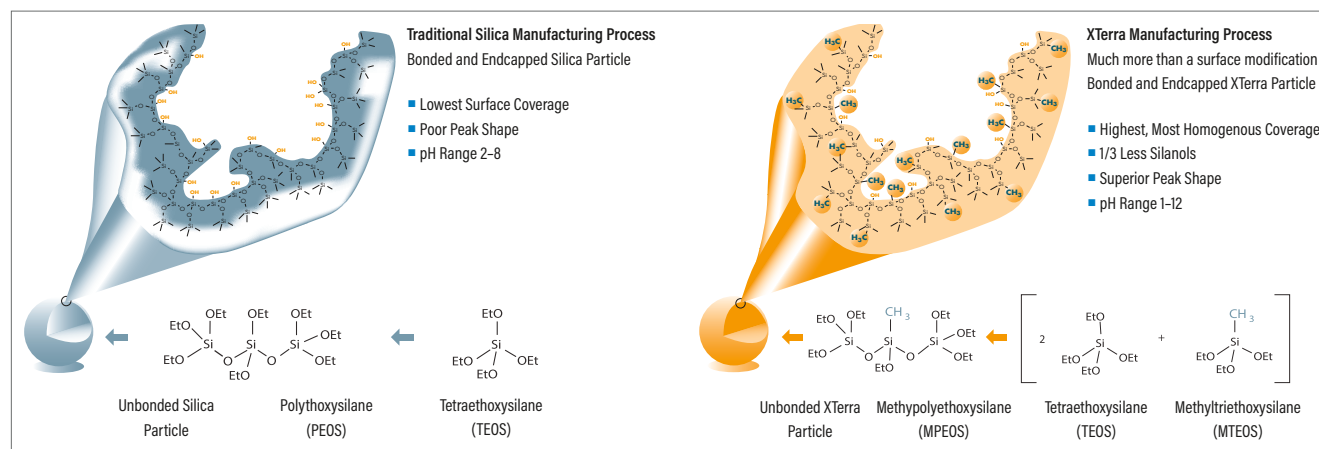
| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |



## XTerra HPLC 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. X Terra Manufacturing Process



### Column Characteristics

|                       | MS C <sub>18</sub> , 125Å                              | Shield RP18, 125Å                                      | MS C <sub>8</sub> , 125Å                               | Shield RP8, 125Å                                       | Phenyl, 125Å   |
|-----------------------|--|--|--|--|--|
| HPLC:                 | 3.5, 5 µm  | 3.5, 5 µm  | 3.5, 5 µm  | 3.5, 5 µm  | 3.5, 5 µm  |
| Particle/Ligand       |  |  |  |  |  |
| Carbon Load*          | 15.5%  | 15%  | 12%  | 13.5%  | 12%  |
| Endcap Style          | Proprietary  | Proprietary  | Proprietary  | Proprietary  | Proprietary  |
| USP Class No.         | L1   | L1   | L7   | L7   | L11  |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 |

\*Expected or approximate value.

For X Terra 2.5 µm Columns, please refer to page 133.

## Ordering Information

### XTerra Analytical Columns

|                    | Dimension                  | P/N       | Dimension                | P/N       |
|--------------------|----------------------------|-----------|--------------------------|-----------|
|                    | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| MS C <sub>18</sub> | 2.1 $\times$ 20 mm /S      | 186001923 | 2.1 $\times$ 20 mm /S    | 186001979 |
|                    | 2.1 $\times$ 30 mm         | 186000398 | 2.1 $\times$ 50 mm       | 186000446 |
|                    | 2.1 $\times$ 50 mm         | 186000400 | 2.1 $\times$ 100 mm      | 186000450 |
|                    | 2.1 $\times$ 100 mm        | 186000404 | 2.1 $\times$ 150 mm      | 186000454 |
|                    | 2.1 $\times$ 150 mm        | 186000408 | 2.1 $\times$ 250 mm      | 186000458 |
|                    | 3.0 $\times$ 30 mm         | 186000412 | 3.0 $\times$ 50 mm       | 186000462 |
|                    | 3.0 $\times$ 50 mm         | 186000414 | 3.0 $\times$ 100 mm      | 186000466 |
|                    | 3.0 $\times$ 100 mm        | 186000418 | 3.0 $\times$ 150 mm      | 186000470 |
|                    | 3.0 $\times$ 150 mm        | 186000422 | 3.0 $\times$ 250 mm      | 186000474 |
|                    | 3.9 $\times$ 100 mm        | 186000426 | 3.9 $\times$ 150 mm      | 186000478 |
|                    | 4.6 $\times$ 20 mm /S      | 186001891 | 4.6 $\times$ 30 mm       | 186000878 |
|                    | 4.6 $\times$ 30 mm         | 186000430 | 4.6 $\times$ 50 mm       | 186000482 |
|                    | 4.6 $\times$ 50 mm         | 186000432 | 4.6 $\times$ 100 mm      | 186000486 |
|                    | 4.6 $\times$ 100 mm        | 186000436 | 4.6 $\times$ 150 mm      | 186000490 |
|                    | 4.6 $\times$ 150 mm        | 186000440 | 4.6 $\times$ 250 mm      | 186000494 |
|                    | 4.6 $\times$ 250 mm        | 186001470 |                          |           |

|                   | Dimension                  | P/N       | Dimension                | P/N       |
|-------------------|----------------------------|-----------|--------------------------|-----------|
|                   | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| MS C <sub>8</sub> | 2.1 $\times$ 30 mm         | 186000399 | 2.1 $\times$ 50 mm       | 186000447 |
|                   | 2.1 $\times$ 50 mm         | 186000401 | 2.1 $\times$ 100 mm      | 186000451 |
|                   | 2.1 $\times$ 100 mm        | 186000405 | 2.1 $\times$ 150 mm      | 186000455 |
|                   | 2.1 $\times$ 150 mm        | 186000409 | 2.1 $\times$ 250 mm      | 186000459 |
|                   | 3.0 $\times$ 30 mm         | 186000413 | 3.0 $\times$ 50 mm       | 186000463 |
|                   | 3.0 $\times$ 50 mm         | 186000415 | 3.0 $\times$ 100 mm      | 186000467 |
|                   | 3.0 $\times$ 100 mm        | 186000419 | 3.0 $\times$ 150 mm      | 186000471 |
|                   | 3.0 $\times$ 150 mm        | 186000423 | 3.9 $\times$ 150 mm      | 186000479 |
|                   | 3.9 $\times$ 20 mm /S      | 186001898 | 4.6 $\times$ 30 mm       | 186000879 |
|                   | 4.6 $\times$ 50 mm         | 186000433 | 4.6 $\times$ 50 mm       | 186000483 |
|                   | 4.6 $\times$ 100 mm        | 186000437 | 4.6 $\times$ 100 mm      | 186000487 |
|                   | 4.6 $\times$ 150 mm        | 186000441 | 4.6 $\times$ 150 mm      | 186000491 |
|                   | 4.6 $\times$ 250 mm        | 186001471 | 4.6 $\times$ 250 mm      | 186000495 |



|                    | Dimension             | P/N       | Dimension           | P/N       |
|--------------------|-----------------------|-----------|---------------------|-----------|
|                    | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| <b>Shield RP18</b> | 2.1 × 20 mm /S        | 186001925 | 2.1 × 20 mm /S      | 186001982 |
|                    | 2.1 × 50 mm           | 186000402 | 2.1 × 50 mm         | 186000448 |
|                    | 2.1 × 100 mm          | 186000406 | 2.1 × 100 mm        | 186000452 |
|                    | 2.1 × 150 mm          | 186000410 | 2.1 × 150 mm        | 186000456 |
|                    | 3.0 × 50 mm           | 186000416 | 2.1 × 250 mm        | 186000460 |
|                    | 3.0 × 100 mm          | 186000420 | 3.0 × 50 mm         | 186000464 |
|                    | 3.0 × 150 mm          | 186000424 | 3.0 × 100 mm        | 186000468 |
|                    | 3.9 × 20 mm /S        | 186001902 | 3.0 × 150 mm        | 186000472 |
|                    | 3.9 × 100 mm          | 186000428 | 3.0 × 250 mm        | 186000476 |
|                    | 4.6 × 20 mm /S        | 186001893 | 3.9 × 150 mm        | 186000480 |
|                    | 4.6 × 50 mm           | 186000434 | 4.6 × 30 mm         | 186001909 |
|                    | 4.6 × 100 mm          | 186000438 | 4.6 × 20 mm /S      | 186001994 |
|                    | 4.6 × 150 mm          | 186000442 | 4.6 × 50 mm         | 186000484 |
|                    | 4.6 × 250 mm          | 186001472 | 4.6 × 100 mm        | 186000488 |
|                    |                       |           | 4.6 × 150 mm        | 186000492 |
|                    |                       |           | 4.6 × 250 mm        | 186000496 |

|                   | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
|-------------------|-----------------------|-----------|---------------------|-----------|
| <b>Shield RP8</b> | 2.1 × 50 mm           | 186000403 | 2.1 × 50 mm         | 186000449 |
|                   | 2.1 × 100 mm          | 186000407 | 2.1 × 100 mm        | 186000453 |
|                   | 2.1 × 150 mm          | 186000411 | 2.1 × 150 mm        | 186000457 |
|                   | 3.0 × 50 mm           | 186000417 | 2.1 × 250 mm        | 186000461 |
|                   | 3.0 × 100 mm          | 186000421 | 3.0 × 50 mm         | 186000465 |
|                   | 3.0 × 150 mm          | 186000425 | 3.0 × 100 mm        | 186000469 |
|                   | 3.9 × 100 mm          | 186000429 | 3.0 × 150 mm        | 186000473 |
|                   | 4.6 × 20 mm /S        | 186001894 | 3.9 × 20 mm /S      | 186001991 |
|                   | 4.6 × 50 mm           | 186000435 | 3.9 × 150 mm        | 186000481 |
|                   | 4.6 × 100 mm          | 186000439 | 4.6 × 50 mm         | 186000485 |
|                   | 4.6 × 150 mm          | 186000443 | 4.6 × 100 mm        | 186000489 |
|                   | 4.6 × 250 mm          | 186001473 | 4.6 × 150 mm        | 186000493 |
|                   |                       |           | 4.6 × 250 mm        | 186000497 |

|               | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
|---------------|-----------------------|-----------|---------------------|-----------|
| <b>Phenyl</b> | 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 × 50 mm           | 186001141 | 4.6 × 150 mm        | 186001146 |
|               | 3.0 × 100 mm          | 186001142 | 4.6 × 250 mm        | 186001147 |
|               | 3.0 × 150 mm          | 186001143 |                     |           |
|               | 3.9 × 100 mm          | 186001177 |                     |           |
|               | 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\*

|                          | Dimension             | P/N       | Dimension           | P/N       |
|--------------------------|-----------------------|-----------|---------------------|-----------|
|                          | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| <b>MS C<sub>18</sub></b> | 4.6 × 150 mm          | 186000826 | 4.6 × 150 mm        | 186000829 |
|                          |                       |           | 4.6 × 250 mm        | 186000830 |
| <b>Shield RP18</b>       | 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

|                          | Dimension             | P/N       | Dimension           | P/N       |
|--------------------------|-----------------------|-----------|---------------------|-----------|
|                          | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| <b>MS C<sub>18</sub></b> | 2.1 × 5 mm            | 186007892 | 2.1 × 5 mm          | 186007896 |
|                          | 3.9 × 5 mm            | 186007894 | 3.9 × 5 mm          | 186007899 |
| <b>MS C<sub>8</sub></b>  | 2.1 × 5 mm            | 186007905 | 2.1 × 5 mm          | 186007909 |
|                          | 3.9 × 5 mm            | 186007735 | 3.9 × 5 mm          | 186007739 |
| <b>Shield RP18</b>       | 2.1 × 5 mm            | 186007929 | 2.1 × 5 mm          | 186007933 |
|                          | 3.9 × 5 mm            | 186007931 | 3.9 × 5 mm          | 186007935 |
| <b>Shield RP8</b>        | 2.1 × 5 mm            | 186007941 | 3.9 × 5 mm          | 186007947 |
|                          | 3.9 × 5 mm            | 186007943 |                     |           |
| <b>Phenyl</b>            | 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       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |



**APPLICATION AREA:** Analysis of Mycotoxins

"With these columns, I am able to achieve great, reproducible results with amazing accuracy."

**REVIEWER:** Jeremy Kotowicz

**ORGANIZATION:** USDA



## Waters Spherisorb Columns

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



### Column Characteristics

|                 | ODS2 (C <sub>18</sub> ), 80Å | ODS1 (C <sub>18</sub> ), 80Å | ODSB (C <sub>18</sub> ), 80Å | C <sub>8</sub> , 80Å    | C <sub>6</sub> , 80Å    | C <sub>4</sub> , 80Å    |
|-----------------|------------------------------|------------------------------|------------------------------|-------------------------|-------------------------|-------------------------|
|                 | HPLC: 3, 5, 10 µm            | HPLC: 3, 5, 10 µm            | HPLC: 5 µm                   | HPLC: 3, 5, 10 µm       | HPLC: 3, 5, 10 µm       | HPLC: 3, 5, 10 µm       |
| Ligand Density* | 3.0 µmol/m <sup>2</sup>      | 1.5 µmol/m <sup>2</sup>      | 3.0 µmol/m <sup>2</sup>      | 3.0 µmol/m <sup>2</sup> | 3.4 µmol/m <sup>2</sup> | 3.0 µmol/m <sup>2</sup> |
| Carbon Load*    | Unbonded                     | 12%                          | 18%                          | 12%                     | 8%                      | 15%                     |
| Endcap Style    | Proprietary                  | None                         | Proprietary                  | Proprietary             | Proprietary             | None                    |
| USP Class No.   | L1                           | L1                           | L1                           | L7                      | L15                     | L13                     |
| Surface Area*   | 220 m <sup>2</sup> /g        | 220 m <sup>2</sup> /g        | 220 m <sup>2</sup> /g        | 220 m <sup>2</sup> /g   | 220 m <sup>2</sup> /g   | 220 m <sup>2</sup> /g   |

\*Expected or approximate value.

|                 | NH <sub>2</sub> (Amino), 80Å | Phenyl, 80Å             | CN Nitrile, 80Å         | OD/CN, 80Å              | W (Silica), 80Å       | SCX, 80Å              | SAX, 80Å              |
|-----------------|------------------------------|-------------------------|-------------------------|-------------------------|-----------------------|-----------------------|-----------------------|
|                 | HPLC: 3, 5, 10 µm            | HPLC: 3, 5, 10 µm       | HPLC: 3, 5, 10 µm       | HPLC: 5 µm              | HPLC: 3, 5, 10 µm     | HPLC: 5, 10 µm        | HPLC: 5, 10 µm        |
| Ligand Density* | 2.6 µmol/m <sup>2</sup>      | 2.7 µmol/m <sup>2</sup> | 3.3 µmol/m <sup>2</sup> | 1.2 µmol/m <sup>2</sup> | —                     | —                     | —                     |
| Carbon Load*    | 12%                          | 9%                      | 18%                     | 18%                     | 18%                   | 18%                   | 18%                   |
| Endcap Style    | None                         | None                    | None                    | Proprietary             | —                     | Proprietary           | Proprietary           |
| USP Class No.   | L8                           | L11                     | L10                     | —                       | L3                    | L9                    | L14                   |
| Surface Area*   | 220 m <sup>2</sup> /g        | 220 m <sup>2</sup> /g   | 220 m <sup>2</sup> /g   | 220 m <sup>2</sup> /g   | 220 m <sup>2</sup> /g | 220 m <sup>2</sup> /g | 220 m <sup>2</sup> /g |

\*Expected or approximate value.

 For Spherisorb Preparative Columns, please refer to page 213.

## Ordering Information

### Waters Spherisorb Columns

|                 | Dimension                | P/N       | Dimension                | P/N       |
|-----------------|--------------------------|-----------|--------------------------|-----------|
|                 | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| ODS1            | 2.0 $\times$ 100 mm      | PSS833422 | 4.0 $\times$ 125 mm      | PSS845541 |
|                 | 2.0 $\times$ 150 mm      | PSS833423 | 4.0 $\times$ 250 mm      | PSS845542 |
|                 | 4.6 $\times$ 50 mm       | PSS833411 | 4.6 $\times$ 100 mm      | PSS830612 |
|                 | 4.6 $\times$ 100 mm      | PSS833412 | 4.6 $\times$ 150 mm      | PSS830613 |
|                 | 4.6 $\times$ 150 mm      | PSS833413 | 4.6 $\times$ 250 mm      | PSS830615 |
|                 | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| ODS2            | 2.0 $\times$ 100 mm      | PSS832122 | 4.0 $\times$ 125 mm      | PSS845543 |
|                 | 2.0 $\times$ 150 mm      | PSS832123 | 4.0 $\times$ 250 mm      | PSS845277 |
|                 | 4.6 $\times$ 50 mm       | PSS832111 | 4.6 $\times$ 50 mm       | PSS831911 |
|                 | 4.6 $\times$ 60 mm       | PSS839853 | 4.6 $\times$ 100 mm      | PSS831912 |
|                 | 4.6 $\times$ 100 mm      | PSS832112 | 4.6 $\times$ 150 mm      | PSS831913 |
|                 | 4.6 $\times$ 150 mm      | PSS832113 | 4.6 $\times$ 250 mm      | PSS831915 |
|                 | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| C <sub>8</sub>  | 2.0 $\times$ 100 mm      | PSS832222 | 4.0 $\times$ 125 mm      | PSS845280 |
|                 | 2.0 $\times$ 150 mm      | PSS832223 | 4.0 $\times$ 250 mm      | PSS845281 |
|                 | 4.6 $\times$ 50 mm       | PSS832211 | 4.6 $\times$ 100 mm      | PSS831812 |
|                 | 4.6 $\times$ 100 mm      | PSS832212 | 4.6 $\times$ 150 mm      | PSS831813 |
|                 | 4.6 $\times$ 150 mm      | PSS832213 | 4.6 $\times$ 250 mm      | PSS831815 |
|                 | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| C <sub>6</sub>  | 4.6 $\times$ 150 mm      | PSS833113 | 4.0 $\times$ 125 mm      | PSS845284 |
|                 |                          |           | 4.6 $\times$ 100 mm      | PSS831012 |
|                 |                          |           | 4.6 $\times$ 250 mm      | PSS831015 |
|                 | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| C <sub>1</sub>  | 4.6 $\times$ 50 mm       | PSS832911 | 4.0 $\times$ 250 mm      | PSS845289 |
|                 | 4.6 $\times$ 150 mm      | PSS832913 | 4.6 $\times$ 100 mm      | PSS832612 |
|                 |                          |           | 4.6 $\times$ 150 mm      | PSS832613 |
|                 |                          |           | 4.6 $\times$ 250 mm      | PSS832615 |
|                 | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| NH <sub>2</sub> | 2.0 $\times$ 100 mm      | PSS832322 | 4.0 $\times$ 250 mm      | PSS845301 |
|                 | 4.6 $\times$ 50 mm       | PSS832311 | 4.6 $\times$ 150 mm      | PSS831113 |
|                 | 4.6 $\times$ 100 mm      | PSS832312 | 4.6 $\times$ 250 mm      | PSS831115 |
|                 | 4.6 $\times$ 150 mm      | PSS832313 |                          |           |
|                 | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| Phenyl          | 4.6 $\times$ 150 mm      | PSS833713 | 4.0 $\times$ 125 mm      | PSS845292 |
|                 |                          |           | 4.0 $\times$ 250 mm      | PSS845293 |
|                 |                          |           | 4.6 $\times$ 250 mm      | PSS830815 |

Waters Spherisorb Columns *Continued*

|                 | Dimension                | P/N       | Dimension                | P/N       |
|-----------------|--------------------------|-----------|--------------------------|-----------|
|                 | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| CN Normal Phase | 2.0 $\times$ 100 mm      | PSS832422 | 4.0 $\times$ 125 mm      | PSS845296 |
|                 | 4.6 $\times$ 100 mm      | PSS832412 | 4.0 $\times$ 250 mm      | PSS845297 |
|                 | 4.6 $\times$ 150 mm      | PSS832413 | 4.6 $\times$ 50 mm       | PSS830911 |
|                 |                          |           | 4.6 $\times$ 100 mm      | PSS830912 |
|                 |                          |           | 4.6 $\times$ 150 mm      | PSS830913 |
|                 |                          |           | 4.6 $\times$ 250 mm      | PSS830915 |

|                   | Particle Size: 3 $\mu$ m |           |
|-------------------|--------------------------|-----------|
| CN Reversed Phase | 4.6 $\times$ 150 mm      | PSS830908 |
|                   | 4.6 $\times$ 250 mm      | PSS830909 |

|          | Particle Size: 3 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
|----------|--------------------------|-----------|--------------------------|-----------|
| W Silica | 4.6 $\times$ 100 mm      | PSS832012 | 2.0 $\times$ 250 mm      | PSS830125 |
|          | 4.6 $\times$ 150 mm      | PSS832013 | 4.0 $\times$ 125 mm      | PSS845539 |
|          |                          |           | 4.0 $\times$ 250 mm      | PSS845540 |
|          |                          |           | 4.6 $\times$ 50 mm       | PSS830111 |
|          |                          |           | 4.6 $\times$ 250 mm      | PSS830115 |

|     | Particle Size: 5 $\mu$ m |           |
|-----|--------------------------|-----------|
| SAX | 4.0 $\times$ 125 mm      | PSS845304 |
|     | 4.0 $\times$ 250 mm      | PSS845305 |
|     | 4.6 $\times$ 50 mm       | PSS832711 |
|     | 4.6 $\times$ 150 mm      | PSS832713 |
|     | 4.6 $\times$ 250 mm      | PSS832715 |

|     |                     |           |
|-----|---------------------|-----------|
| SCX | 4.0 $\times$ 125 mm | PSS845308 |
|     | 4.0 $\times$ 250 mm | PSS845309 |
|     | 4.6 $\times$ 50 mm  | PSS837511 |
|     | 4.6 $\times$ 100 mm | PSS837512 |
|     | 4.6 $\times$ 150 mm | PSS837513 |
|     | 4.6 $\times$ 250 mm | PSS837515 |

|       |                     |           |
|-------|---------------------|-----------|
| OD/CN | 4.6 $\times$ 150 mm | PSS837813 |
|       | 4.6 $\times$ 250 mm | PSS837815 |

## Nova-Pak Columns

The bonded phases of Nova-Pak® Columns, available in 4- and 6 µm particle sizes, offer high resolution and fast, efficient chromatography. When used with relatively short column lengths, the smaller particles reduce solvent consumption while retaining their ability to resolve complex mixtures. Steel analytical columns packed with 4 µm particles are available in 75-, 150-, and 300-mm lengths. Packed with high efficiency 6 µm particles, semi-preparative Prep Nova-Pak HR Columns provide an unparalleled range of separation possibilities. Their faster separations produce concentrated fractions, and they require less solvent, significantly reducing costs.

### Column Characteristics

|                       | C <sub>8</sub> , 60Å                                   | C <sub>18</sub> , 60Å                                  | Phenyl, 60Å  | CN, 60Å     | Silica, 60Å |
|-----------------------|--|--|--|-------------|-------------|
|                       | HPLC: 4 µm   | HPLC: 4 µm   | HPLC: 4 µm   | HPLC: 4 µm  | HPLC: 4 µm  |
| Carbon Load*          | 4%   | 7%   | 5%   | 2%          | N/A         |
| Endcap Style          | Proprietary  | Proprietary  | Proprietary  | Proprietary | None        |
| USP Class No.         | L7   | L1   | L11  | L10         | L3          |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | Neutrals QC Reference Material<br>p/n: 186006360       | —           | —           |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | Reversed-Phase QC Reference Material<br>p/n: 186006363 | —           | —           |

\*Expected or approximate value.

### Ordering Information

#### Nova-Pak Columns


|                          | Dimension    | P/N       |
|--------------------------|--------------|-----------|
| Particle Size: 4 µm      |              |           |
| Nova-Pak C <sub>18</sub> | 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 <sub>8</sub>  | 2.1 × 150 mm | WAT052735 |
|                          | 3.9 × 75 mm  | WAT035877 |
|                          | 3.9 × 150 mm | WAT035876 |
| Nova-Pak Phenyl          | 2.1 × 150 mm | WAT052740 |
|                          | 3.9 × 75 mm  | WAT011675 |
|                          | 3.9 × 150 mm | WAT010656 |

|                     | Dimension    | P/N       |
|---------------------|--------------|-----------|
| Particle Size: 4 µm |              |           |
| 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 |

#### Nova-Pak Analytical Method Validation Kit

|                          | Dimension    | P/N       |
|--------------------------|--------------|-----------|
| Particle Size: 4 µm      |              |           |
| Nova-Pak C <sub>18</sub> | 3.9 × 150 mm | WAT052770 |



 For NovaPak Preparative Columns, please refer to page 214.


## Resolve Columns

The non-encapped 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 basic compounds, ion-pairing reagents are added to the mobile phase to reduce excessive tailing.

### Column Characteristics

|                       | <b>C<sub>18</sub>, 90Å</b>                                    | <b>C<sub>18</sub>, 90Å</b>                                    | <b>Silica, 90Å</b> | <b>CN, 90Å</b>     |
|-----------------------|---|---|--------------------|--------------------|
|                       | <b>HPLC: 5, 10 µm</b>   | <b>HPLC: 5, 10 µm</b>   | <b>HPLC: 10 µm</b> | <b>HPLC: 10 µm</b> |
| Carbon Load*          | 5%  | 10%   | 10%                | 3%                 |
| Endcap Style          | L7  | L1  | L3                 | L10                |
| USP Class No.         | None  | None  | None               | None               |
| Performance Standards | <b>Neutrals QC Reference Material</b><br>p/n: 186006360       | <b>Neutrals QC Reference Material</b><br>p/n: 186006360       | —                  | —                  |
| Application Standards | <b>Reversed-Phase QC Reference Material</b><br>p/n: 186006363 | <b>Reversed-Phase QC Reference Material</b><br>p/n: 186006363 | —                  | —                  |

\*Expected or approximate value.

 For Resolve Radial Compression Columns and PrepPak Cartridges, please refer to page 222.

## 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

|                       | <b>C<sub>18</sub>, 100Å</b>                                   | <b>C<sub>18</sub>, 300Å</b>                                   | <b>C<sub>4</sub>, 100Å</b>                             | <b>C<sub>4</sub>, 300Å</b>                             |
|-----------------------|---|---|--|--|
|                       | <b>HPLC: 5, 15 µm</b>   | <b>HPLC: 5, 15 µm</b>   | <b>HPLC: 5, 15 µm</b>                                  | <b>HPLC: 5, 15 µm</b>                                  |
| Carbon Load*          | 17%   | 7%  | 7%   | 3%   |
| Endcap Style          | L1  | L1  | L26  | L26  |
| USP Class No.         | Proprietary   | Proprietary   | Proprietary  | Proprietary  |
| Performance Standards | <b>Neutrals QC Reference Material</b><br>p/n: 186006360       | <b>Neutrals QC Reference Material</b><br>p/n: 186006360       | <b>MassPREP Protein Standard Mix</b><br>p/n: 186004900 | <b>MassPREP Protein Standard Mix</b><br>p/n: 186004900 |
| Application Standards | <b>Reversed-Phase QC Reference Material</b><br>p/n: 186006363 | <b>Reversed-Phase QC Reference Material</b><br>p/n: 186006363 | <b>MassPREP Protein Standard Mix</b><br>p/n: 186004900 | <b>MassPREP Protein Standard Mix</b><br>p/n: 186004900 |

\*Expected or approximate value.

 For Delta-Pak Preparative Columns, please refer to page 216.

## Ordering Information

### Resolve Columns

|                            | <b>Dimension</b> | <b>P/N</b>             |
|----------------------------|------------------|------------------------|
| <b>Particle Size: 5 µm</b> |                  |                        |
| <b>C<sub>18</sub></b>      | 3.9 × 300 mm     | WAT011740 <sup>1</sup> |
|                            | 3.9 × 150 mm     | WAT085711 <sup>1</sup> |

<sup>1</sup>Requires Guard-Pak Holders, p/n: WAT088141.

## Ordering Information

### Delta-Pak Columns

|                                 | <b>Dimension</b> | <b>P/N</b> |
|---------------------------------|------------------|------------|
| <b>Particle Size: 5 µm</b>      |                  |            |
| <b>Delta-Pak C<sub>18</sub></b> | 3.9 × 150 mm     | WAT011793  |
| <b>Delta-Pak C<sub>4</sub></b>  | 3.9 × 150 mm     | WAT011794  |

## μBondapak Columns

Waters makes the only column that contains the μBondapak® C<sub>18</sub> packing material. Other column manufacturers claim their products exhibit “μBondapak-like” selectivity. Yet none of them ever passed Waters’ stringent QC batch tests. Since 1973, μBondapak and Bondapak® packing materials have demonstrated year-to-year reproducibility, which is why μBondapak remains among the most frequently referenced column brands.

### Column Characteristics

|                       | C <sub>18</sub> , 125Å                                 | CN, 125Å    | NH <sub>2</sub> , 125Å | Phenyl, 125Å   |
|-----------------------|--|-------------|------------------------|--|
|                       | HPLC: 10 μm  | HPLC: 10 μm | HPLC: 10 μm            | HPLC: 10 μm  |
| Carbon Load*          | 10%  | 6%          | 3.5%                   | 8%   |
| Endcap Style          | L1   | L1          | L8                     | L11  |
| USP Class No.         | Proprietary  | Proprietary | None                   | Proprietary  |
| Performance Standards | Neutrals QC Reference Material<br>p/n: 186006360       | —           | —                      | Neutrals QC Reference Material<br>p/n: 186006360       |
| Application Standards | Reversed-Phase QC Reference Material<br>p/n: 186006363 | —           | —                      | Reversed-Phase QC Reference Material<br>p/n: 186006363 |


\*Expected or approximate value.

### Ordering Information

#### μBondapak/Bondapak

|                        | Dimension    | P/N       |
|------------------------|--------------|-----------|
| Particle Size: 10 μm   |              |           |
| C <sub>18</sub> , 125Å | 3.9 × 150 mm | WAT086684 |
|                        | 3.9 × 300 mm | WAT027324 |
|                        | 4.6 × 150 mm | WAT044370 |
|                        | 4.6 × 300 mm | 186000925 |
| CN, 125Å               | 3.9 × 150 mm | WAT086688 |
|                        | 3.9 × 300 mm | WAT084042 |

|                        | Dimension    | P/N       |
|------------------------|--------------|-----------|
| Particle Size: 10 μm   |              |           |
| NH <sub>2</sub> , 125Å | 3.9 × 300 mm | WAT084040 |
| Phenyl, 125Å           | 3.9 × 150 mm | WAT086680 |
|                        | 3.9 × 300 mm | WAT027198 |

 For μBondapak/Bondapak and μPorasil/Porasil Preparative Columns, please refer to page 215.

## μPorasil/Porasil Columns

μPorasil™ and Porasil™ particles were one of the first commercially available, fully porous packing materials used for LC separations.

In contrast to the reversed-phase separation ability of μBondapak C<sub>18</sub>, 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

|               | Silica, 125Å       |
|---------------|--------------------|
|               | HPLC: 10, 15–20 μm |
| Carbon Load*  | N/A                |
| Endcap Style  | L3                 |
| USP Class No. | None               |

\*Expected or approximate value.

### Ordering Information

#### μPorasil/Porasil

|                      | Dimension    | P/N       |
|----------------------|--------------|-----------|
| Particle Size: 10 μm |              |           |
| μPorasil, 125Å       | 3.9 × 300 mm | WAT027477 |



## 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       |
|-----------------|------------------|------------------|-------------|-----------|
| DS-613          | Polystyrene      | None             | 6 × 150 mm  | WAT034220 |
| DE-613          | Polymethacrylate | None             | 6 × 150 mm  | WAT034221 |
| DC-613          | Polystyrene      | Sulfonated       | 6 × 150 mm  | WAT034223 |
| DS-G Pre-column | —                | —                | 4,6 × 10 mm | WAT034224 |
| DE-G Pre-column | —                | —                | 4,6 × 10 mm | WAT034225 |
| DC-G Pre-column | —                | —                | 4,6 × 10 mm | WAT034227 |

## Application-Specific Columns

### SUGAR AND CARBOHYDRATE ANALYSIS

#### High-Performance Carbohydrate Analysis Cartridge Column, p/n: WAT044355

Waters High-Performance Carbohydrate Cartridge Column, with reusable end-fittings, is packed with a 4 µm, spherical silica. This column was developed to separate five monosaccharides and disaccharides with baseline resolution in less than 12 minutes. The 4.6 mm I.D. × 250 mm High-Performance Carbohydrate Cartridge Column offers optimal speed, resolution, and longevity. The pre-packed, disposable cartridge column requires reusable end-fittings, which are available separately.

#### Carbohydrate Analysis Column, p/n: WAT084038

The Carbohydrate Analysis Column uses a covalently bonded amino packing on a silica substrate. It is best suited for low-molecular-weight sugars such as mono-, di-, and tri-saccharides.

#### Sugar Pak I Column, p/n: WAT085188

The Sugar Pak I Column separates monosaccharides and sugar alcohols via a strong cation-exchange mechanism. The resin is based on a sulfonated styrene-divinylbenzene polymer that provides pH stability by means of a calcium counter ion.

Waters offers a range of columns for the analysis of sugars, carbohydrates, organic acids, and alcohols. Refer to the following tables for ordering information.

| Typical Applications for Sugar and Carbohydrate Columns |   |  |   |   |                                       |   |
|---|---|--|---|---|---------------------------------------|---|
| Cartridge/Column  | Carbohydrate Analysis Column  | SAM™ I Reagent with Silica Cartridge         | Sugar-Pak™ I, SC-1011, SP-0810                  | SH-1011, IC-Pak™ Ion-Exclusion Fast Fruit Juice | Dextro-Pak™                           | KS-800 series                                 |
| Mode  | Partition   | Partition                                    | Ion exchange/size exclusion                     | Ion exchange/size exclusion                     | Reversed phase                        | Size exclusion                                |
| Eluent  | 65–85% acetonitrile/water ambient to 70 °C                          | 70–80% acetonitrile/water 0.1% SAM I ambient | Water 75–95 °C                                  | 0.01 N phosphoric acid 50–60 °C                 | Water ambient                         | —   |
| Application   | Mono-, di- and tri-saccharides up to DP 8 sugars and sugar alcohols | Mono-, di- and tri-saccharides               | Mono-, di-, oligosaccharides and sugar alcohols | Sugar acids, sugar alcohols, organic acids      | Hydrolysed syrups, derivatized sugars | Mono- through oligosaccharides such as syrups |
| Elution Order   | Smallest elute first  | Smallest elute first                         | Largest elute first                             | Largest and most acidic elute first             | Smallest elute first                  | Largest elute first                           |

## Guide to Shodex Sugar Columns

| S               | C                    | 18                | 2         | 1                      |
|-----------------|----------------------|-------------------|-----------|------------------------|
| Type of Column  | Cation               | % Cross Linkage   | Pore Size | 0 - Gel Type           |
| S = sugar       | H = H <sup>+</sup>   | —                 | 1 = 20Å   | 1 - Semimacropore gel  |
|                 | C = Ca <sup>2+</sup> | —                 | 2 = 50Å   | 2 - Permanent pore gel |
|                 | P = Pb <sup>2+</sup> | —                 | 3 = 100Å  |                        |
|                 | Z = Zn <sup>2+</sup> | —                 | 4 = 500Å  |                        |
|                 | —                    | —                 | 5 = 1000Å |                        |
| <b>Example:</b> |                      |                   |           |                        |
| S               | C                    | 10                | 1         | 1                      |
| Sugar column    | Ca <sup>2+</sup>     | 10% cross linkage | 20Å       | Semimacropore gel      |

## Ordering Information

### SAM I Reagent Column

| Description   | Dimension    | Qty. | P/N       |
|---------------|--------------|------|-----------|
| SAM I Reagent | 7.8 × 300 mm | 1/pk | WAT010873 |

### Columns for Alcohols and Carbohydrates

| Description                                       | Dimension    | Particle Size | Qty.  | P/N                    |
|---|--------------|---------------|-------|------------------------|
| Carbohydrate Analysis Column                      | —            | —             | 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 <sup>1</sup> |
| SC-1011 Column                                    | 8.0 × 300 mm | —             | 1/pk  | WAT034238              |
| SC-1011P Pre-column                               | 6.0 × 50 mm  | —             | 1/pk  | WAT034244              |
| SH-1011   | 8.0 × 300 mm | —             | 1/pk  | WAT034236              |
| SH-1011P Pre-column                               | 6.0 × 50 mm  | —             | 1/pk  | WAT034243              |
| SP-0810 Column                                    | 8.0 × 300 mm | —             | 1/pk  | WAT036954              |
| SP-0810P Pre-column                               | 6.0 × 50 mm  | —             | 1/pk  | WAT034245              |
| Sugar-Pak 1 Column                                | 6.5 × 300 mm | —             | 1/pk  | WAT085188              |
| Sugar-Pak 1 Guard-Pak Inserts                     | —            | —             | 10/pk | WAT015209 <sup>2</sup> |
| Shodex KS-801                                     | —            | 7 μm          | 1/pk  | WAT034276              |

<sup>1</sup>Requires Sentry Guard Holder, p/n: WAT046905.

<sup>2</sup>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 |

## FERMENTATION ANALYSIS, ORGANIC ACIDS, ALCOHOLS, AND CARBOHYDRATES

The ion-exclusion mode is ideally suited for the separation of monosaccharides, organic acids, or sugar acids. The column packings are sulfonated styrene divinylbenzene resins in the hydrogen form (IC-Pak Ion-Exclusion or SH-1011), and the mobile phase is a dilute acid such as 0.01 N phosphoric acid using column temperatures of 50–60 °C.

In this mode, the Fast Juice column can effectively separate glycerol, acetic acid, and ethanol in grape or other fruit juice. The column can also analyze the degree of microbial defect, the extent of natural fermentation in grapes, and the amount of sulfite in various foods and beverages. The IC-Pak Ion-exclusion Column can separate a wide range of organic acids while the Shodex SH Column separates acids as well as larger carbohydrates.

The analysis of alcohols and organic acids is important, for they typically help determine the flavor characteristics of beverages such as wine, beer, and some distilled spirits. The presence of alcohols in fruit juices can indicate product deterioration. The Shodex KC-811 Column, which provides ion-exchange and reversed-phase chromatography modes, is packed with a sulfonated, rigid, styrene-divinylbenzene copolymer. With high efficiency, this packing separates low-molecular-weight organic acids and water-soluble organics such as alcohols, aldehydes, and nitriles. The column provides ion-exclusion and reversed-phase mode of chromatography. Typical mobile phases, run at 1 mL/min at 45–80 °C, are composed of aqueous solutions containing 1% phosphoric acid, acetic acid, or perchloric acid.

Shodex KC-811 Column Retention Chart for Organic Acids

| Sample              | Retention Time | Sample                  | Retention Time |
|---------------------|----------------|-------------------------|----------------|
| Oxalic Acid         | 5.20           | β-Hydroxypropionic Acid | 8.60           |
| Maleic Acid         | 5.80           | D-Glucuronic Acid       | 8.65           |
| a-Ketoglutaric Acid | 5.90           | Fumaric Acid            | 8.95           |
| Citric Acid         | 6.20           | Formic Acid             | 9.20           |
| Tartaric Acid       | 6.55           | Acetic Acid             | 9.80           |
| Pyruvic Acid        | 6.65           | Adipic Acid             | 9.80           |
| trans-Aconitic Acid | 6.95           | Levulinic Acid          | 10.00          |
| Glyoxylic Acid      | 7.00           | Mesaconic Acid          | 10.40          |
| Malic Acid          | 7.05           | Pyroglutamic Acid       | 10.70          |
| Malonic Acid        | 7.07           | Propionic Acid          | 11.25          |
| Citraconic Acid     | 7.20           | Acrylic Acid            | 11.60          |
| Succinic Acid       | 8.00           | Pivalic Acid            | 14.05          |
| Glycolic Acid       | 8.40           | Methacrylic Acid        | 14.10          |
| Itaconic            | 8.50           | trans-Crotonic Acid     | 15.65          |
| Lactic Acid         | 8.60           |                         |                |

Eluent: Water with 0.1% phosphoric acid, Temperature: 60 °C, Flow rate: 1 mL/min.

### Ordering Information

#### Columns for Fermentation Analysis, Organic Acids, Alcohols, and Carbohydrates

| Description                        | Dimension    | Qty.  | P/N                    |
|------------------------------------|--------------|-------|------------------------|
| Fast Fruit Juice Analysis          | 8.0 × 100 mm | 1/pk  | WAT010639              |
| Fast Fruit Juice Guard-Pak Inserts | —            | 10/pk | WAT015207 <sup>1</sup> |
| 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              |

<sup>1</sup>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

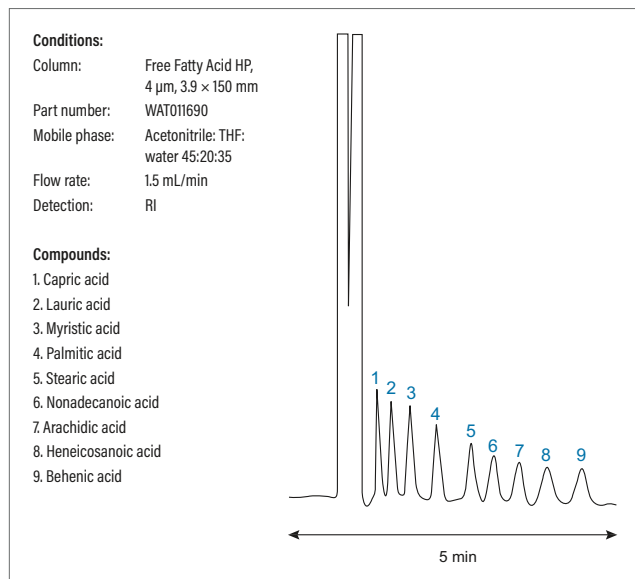
| Description        | Dimension    | Particle Size | Qty. | P/N       |
|--------------------|--------------|---------------|------|-----------|
| Free Fatty Acid HP | 3.9 × 150 mm | 4 μm          | 1/pk | WAT011690 |

## 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.

## Fatty Acid Standards



### 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

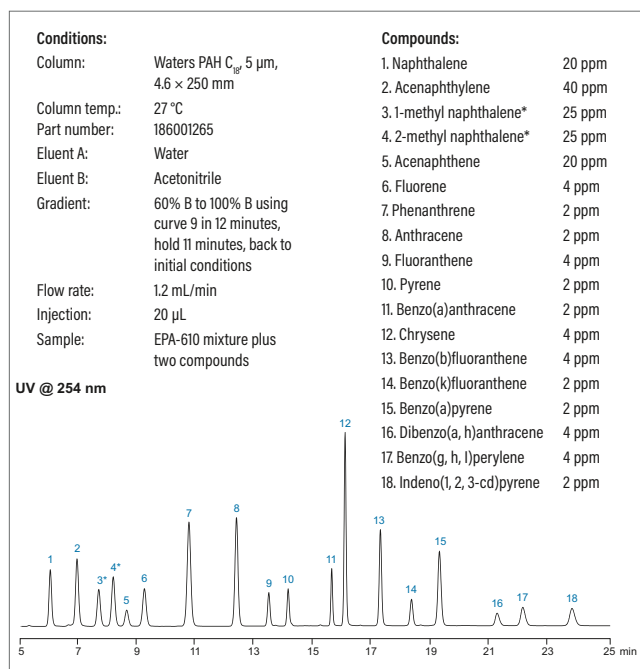
| Description        | Dimension    | Qty. | P/N       |
|--------------------|--------------|------|-----------|
| Carbamate Analysis | 3.9 × 150 mm | 1/pk | WAT035577 |

## Waters PAH Columns

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.

### POLYAROMATIC HYDROCARBON ANALYSIS USING WATERS PAH COLUMNS

#### PAH Analysis According to Florida Administrative Code 17.700



#### Ordering Information

##### PAH Columns

|                 | Dimension           | P/N       | Dimension           | P/N       |
|-----------------|---------------------|-----------|---------------------|-----------|
|                 | Particle Size: 3 μm |           | Particle Size: 5 μm |           |
| C <sub>18</sub> | 4.6 × 50 mm         | 186001260 | 2.1 × 150 mm        | 186001261 |
|                 |                     |           | 2.1 × 250 mm        | 186001262 |
|                 | 4.6 × 150 mm        | 186001264 | 3.0 × 250 mm        | 186001263 |
|                 |                     |           | 4.6 × 250 mm        | 186001265 |

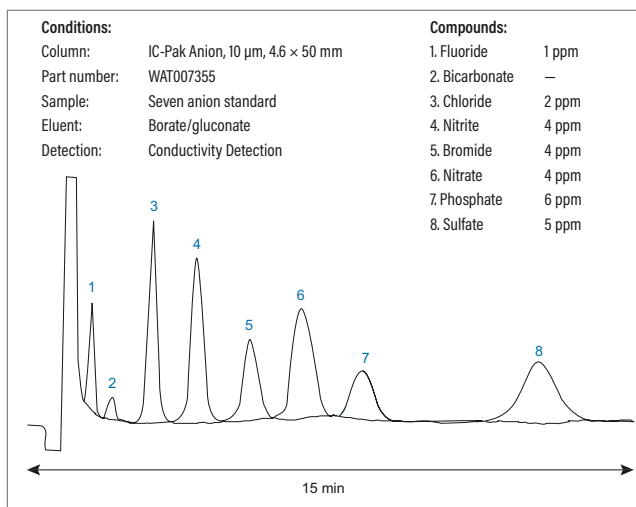
## Ion Analysis

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  $\mu$ m 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 $\times$ 50 mm  | 1/pk  | WAT007355              |
| IC-Pak Anion HR   | 4.6 $\times$ 75 mm  | 1/pk  | WAT026765              |
| IC-Pak Anion HC   | 4.6 $\times$ 150 mm | 1/pk  | WAT026770              |
| IC-Pak Anion Guard-Pak Kit (Guard-Pak Holder and 5 inserts) | —                   | 1/pk  | WAT007357              |
| IC-Pak Anion Concentrator Inserts                           | —                   | 5/pk  | WAT007358 <sup>9</sup> |
| IC-Pak Anion Guard-Pak Inserts                              | —                   | 5/pk  | WAT010551 <sup>9</sup> |
| IC-Pak C M/D Column   | 3.9 $\times$ 150 mm | 1/pk  | WAT036570              |
| IC-Pak C M/D Guard-Pak Inserts                              | —                   | 10/pk | WAT044250 <sup>9</sup> |
| IC-Pak Cation Column  | 4.6 $\times$ 50 mm  | 1/pk  | WAT007354              |
| IC-Pak Cation Guard Column                                  | 4.6 $\times$ 50 mm  | 1/pk  | WAT007356 <sup>9</sup> |
| IC-Pak Cation Concentrator Inserts                          | —                   | 5/pk  | WAT010565              |

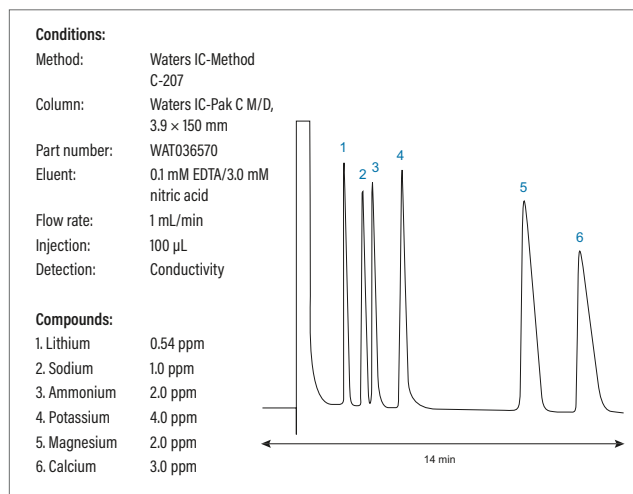
<sup>9</sup>Requires Guard-Pak Holder, p/n: WAT088141.

### Ion-Exclusion Columns

| Description                            | Dimension           | Qty.  | P/N                    |
|--|---------------------|-------|------------------------|
| IC-Pak Ion-Exclusion Column            | 7.8 $\times$ 150 mm | 1/pk  | WAT010295              |
| IC-Pak Ion-Exclusion Column            | 7.8 $\times$ 300 mm | 1/pk  | WAT010290              |
| IC-Pak Ion-Exclusion Guard-Pak Inserts | —                   | 10/pk | WAT020770 <sup>9</sup> |

<sup>9</sup>Requires Guard-Pak Holder, p/n: WAT088141.

### IC-Pak C M/D Cation Column

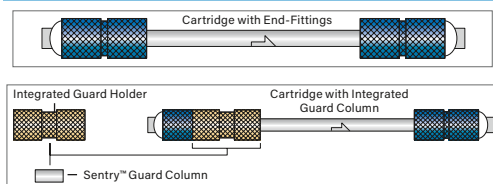


# Cartridge Columns, Fittings, and Accessories

## WATERS CARTRIDGE COLUMNS AND GUARD HOLDER

### Ordering Information

#### Cartridge Columns



| Applicable Column Dimension                              | Cartridge End-Fitting P/N |
|--|---------------------------|
| 2.1 × 50 mm, 2.1 × 100 mm,<br>2.1 × 150 mm, 2.1 × 250 mm | 700000117                 |
| 3.0 × 50 mm, 3.0 × 100 mm,<br>3.0 × 150 mm, 3.0 × 250 mm | WAT037525                 |
| 3.9 × 50 mm, 3.9 × 100 mm,<br>3.9 × 150 mm, 3.9 × 250 mm | WAT037525                 |
| 4.6 × 50 mm, 4.6 × 100 mm,<br>4.6 × 150 mm, 4.6 × 250 mm | WAT037525                 |

Integrated Sentry Guard Holder to go with Cartridge End-Fittings (see above).

#### Cartridge Columns

| Description  | Dimension    | Particle Size | Qty. | P/N       |
|--|--------------|---------------|------|-----------|
| High-Performance Carbohydrate Cartridge Column (requires end-fittings) | 4.6 × 250 mm | 4 μm          | 1/pk | WAT044355 |
| μBondapak/Bondapak Cartridge Columns                                   | 4.6 × 250 mm | 10 μm         | 1/pk | WAT052860 |

<sup>2</sup>Requires End Connector Kit, p/n: WAT037525.

#### Nova-Pak Cartridge Columns

| Dimension    | Type      | Particle Size | Qty. | C <sub>8</sub>         | C <sub>18</sub>        | CN-HP                  |
|--------------|-----------|---------------|------|------------------------|------------------------|------------------------|
| 3.9 × 150 mm | Cartridge | 4 μm          | 1/pk | WAT036985 <sup>2</sup> | WAT036975 <sup>2</sup> | —                      |
| 4.6 × 150 mm | Cartridge | 4 μm          | 1/pk | WAT052855 <sup>2</sup> | WAT052845 <sup>2</sup> | WAT044455 <sup>2</sup> |
| 4.6 × 250 mm | Cartridge | 4 μm          | 1/pk | WAT052850 <sup>2</sup> | WAT052840 <sup>2</sup> | WAT044460 <sup>2</sup> |

<sup>2</sup>Requires End Connector Kit, p/n: WAT037525.

#### Symmetry, SymmetryShield, and Cartridge Columns

| Dimension    | Type      | Particle Size | Qty. | Symmetry C <sub>18</sub> | Symmetry C <sub>8</sub> | SymmetryShield RP18     | SymmetryShield RP8      |
|--------------|-----------|---------------|------|--------------------------|-------------------------|-------------------------|-------------------------|
| 2.1 × 100 mm | Cartridge | 3.5 μm        | 1/pk | 186000151 <sup>10</sup>  | —                       | —                       | —                       |
| 4.6 × 75 mm  | Cartridge | 3.5 μm        | 1/pk | WAT066260 <sup>10</sup>  | —                       | —                       | —                       |
| 4.6 × 100 mm | Cartridge | 3.5 μm        | 1/pk | WAT066265 <sup>10</sup>  | WAT066215 <sup>10</sup> | 186000170 <sup>10</sup> | —                       |
| 3.9 × 50 mm  | Cartridge | 5 μm          | 1/pk | WAT054220 <sup>10</sup>  | —                       | —                       | —                       |
| 3.9 × 150 mm | Cartridge | 5 μm          | 1/pk | WAT054205 <sup>10</sup>  | WAT054235 <sup>10</sup> | 186000106 <sup>10</sup> | —                       |
| 4.6 × 150 mm | Cartridge | 5 μm          | 1/pk | WAT054210 <sup>10</sup>  | WAT054255 <sup>10</sup> | 186000110 <sup>10</sup> | —                       |
| 4.6 × 250 mm | Cartridge | 4 μm          | 1/pk | WAT054215 <sup>10</sup>  | WAT054245 <sup>10</sup> | 186000113 <sup>10</sup> | WAT200661 <sup>10</sup> |

<sup>10</sup>Requires Cartridge End-fittings.

#### XTerra Cartridge Columns

| Dimension    | Type      | Particle Size | Qty. | MS C <sub>18</sub>     | MS C <sub>8</sub>      | RP18                   | RP8                    |
|--------------|-----------|---------------|------|------------------------|------------------------|------------------------|------------------------|
| 3.0 × 150 mm | Cartridge | 3.5 μm        | 1/pk | 186000518 <sup>5</sup> | —                      | —                      | —                      |
| 4.6 × 50 mm  | Cartridge | 3.5 μm        | 1/pk | 186000526 <sup>5</sup> | —                      | —                      | —                      |
| 4.6 × 100 mm | Cartridge | 3.5 μm        | 1/pk | 186000530 <sup>5</sup> | 186000531 <sup>5</sup> | 186000532 <sup>5</sup> | —                      |
| 4.6 × 150 mm | Cartridge | 3.5 μm        | 1/pk | 186000534 <sup>5</sup> | —                      | 186000536 <sup>5</sup> | —                      |
| 2.1 × 150 mm | Cartridge | 5 μm          | 1/pk | 186000546 <sup>5</sup> | —                      | —                      | —                      |
| 3.9 × 150 mm | Cartridge | 5 μm          | 1/pk | 186000570 <sup>5</sup> | —                      | 186000572 <sup>5</sup> | —                      |
| 4.6 × 150 mm | Cartridge | 5 μm          | 1/pk | 186000578 <sup>5</sup> | —                      | 186000580 <sup>5</sup> | —                      |
| 4.6 × 250 mm | Cartridge | 5 μm          | 1/pk | 186000582 <sup>5</sup> | —                      | 186000584 <sup>5</sup> | 186000585 <sup>5</sup> |

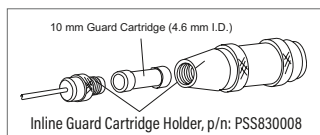
<sup>5</sup>Requires End Connector Kit, p/n: WAT037525.

## WATERS SPHERISORB CARTRIDGE AND GUARD COLUMNS

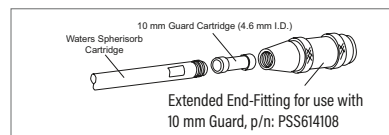
### Ordering Information



### 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 |
| Long Tail End-fitting  | 2/pk  | PSS614101 |
| 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\* and Cartridge Columns

| Dimension    | Type      | Particle Size | Qty. | ODS1                   | ODS2                   | ODS B     | C <sub>8</sub> | C <sub>6</sub> | C <sub>1</sub> | NH <sub>2</sub>        |
|--------------|-----------|---------------|------|------------------------|------------------------|-----------|----------------|----------------|----------------|------------------------|
| 3.0 x 125 mm | Cartridge | 5 µm          | 1/pk | —                      | PSS839546 <sup>1</sup> | —         | —              | —              | —              | —                      |
| 4.6 x 50 mm  | Cartridge | 5 µm          | 1/pk | PSS83850 <sup>1</sup>  | —                      | —         | —              | —              | —              | —                      |
| 4.6 x 100 mm | Cartridge | 5 µm          | 1/pk | —                      | PSS839537 <sup>1</sup> | —         | —              | —              | —              | —                      |
| 4.6 x 150 mm | Cartridge | 5 µm          | 1/pk | —                      | PSS839538 <sup>1</sup> | —         | —              | —              | —              | —                      |
| 4.6 x 250 mm | Cartridge | 5 µm          | 1/pk | PSS839510 <sup>1</sup> | PSS839540 <sup>1</sup> | —         | —              | —              | —              | PSS839530 <sup>1</sup> |
| 10 x 4.6 mm  | Guard     | 5 µm          | 3/pk | PSS830073              | PSS830053              | PSS830059 | PSS830074      | PSS830075      | PSS830076      | PSS830079              |
| 30 x 4.6 mm  | Guard     | 5 µm          | 3/pk | —                      | PSS839458              | —         | —              | —              | —              | PSS839478              |

| Dimension   | Type  | Particle Size | Qty. | CN Normal Phase | W Silica  | SAX       | SCX       |
|-------------|-------|---------------|------|-----------------|-----------|-----------|-----------|
| 10 x 4.6 mm | Guard | 5 µm          | 3/pk | PSS830077       | PSS830051 | PSS830055 | PSS830057 |
| 30 x 4.6 mm | Guard | 5 µm          | 3/pk | PSS839476       | PSS839451 | PSS839465 | PSS839471 |

\*Requires In-line Guard Cartridge Holder, p/n: PSS830008.

<sup>1</sup> Requires End Connector Kit, p/n PSS614100.



## 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 16 and 5  $\mu\text{m}$
- 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    | VanGuard Format  | VanGuard Dimension |
| 2.1 mm  | <2 $\mu\text{m}$ | Pre-column       | 2.1 $\times$ 5 mm  |
| 2.1 mm  | >2 $\mu\text{m}$ | Cartridge Column | 2.1 $\times$ 5 mm  |
| 3.0 mm  | >2 $\mu\text{m}$ | Cartridge Column | 2.1 $\times$ 5 mm  |
| 3.9 mm  | >2 $\mu\text{m}$ | Cartridge Column | 3.9 $\times$ 5 mm  |
| 4.6 mm  | >2 $\mu\text{m}$ | Cartridge Column | 3.9 $\times$ 5 mm  |

## Ordering Information

VanGuard Pre-columns (Guard Columns)

| Chemistry                            | Particle Size     | Dimension         | P/N (3/pk) |
|--------------------------------------|-------------------|-------------------|------------|
| BEH C <sub>18</sub>                  | 1.7 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186003975  |
| BEH Shield RP18                      | 1.7 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186003977  |
| BEH C <sub>8</sub>                   | 1.7 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186003978  |
| BEH Phenyl                           | 1.7 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186003979  |
| BEH HILIC                            | 1.7 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186003980  |
| BEH Amide                            | 1.7 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186004799  |
| CORTECS C <sub>18</sub> <sup>+</sup> | 1.6 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186007125  |
| CORTECS C <sub>18</sub>              | 1.6 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186007123  |
| CORTECS HILIC                        | 1.6 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186007124  |
| CORTECS Shield RP18                  | 1.6 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186008713  |
| CORTECS T3                           | 1.6 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186008508  |
| CSH C <sub>18</sub>                  | 1.7 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186005303  |
| CSH Fluoro-Phenyl                    | 1.7 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186005358  |
| CSH Phenyl-Hexyl                     | 1.7 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186005413  |
| HSS C <sub>18</sub>                  | 1.8 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186003981  |
| HSS C <sub>18</sub> SB               | 1.8 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186004136  |
| HSS T3                               | 1.8 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186003976  |
| HSS PFP                              | 1.8 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186005974  |
| HSS Cyano                            | 1.8 $\mu\text{m}$ | 2.1 $\times$ 5 mm | 186005995  |

## Recommended VanGuard Cartridge

| Brand       | Particle Size                 | Analytical Columns  |                     |
|-------------|-------------------------------|---------------------|---------------------|
|             |                               | 2.1 and 3.0 mm I.D. | 3.9 and 4.6 mm I.D. |
| Atlantis    | 3 and 5 $\mu\text{m}$         | 2.1 $\times$ 5 mm   | 3.9 $\times$ 5 mm   |
| CORTECS     | 2.7 $\mu\text{m}$             | 2.1 $\times$ 5 mm   | 3.9 $\times$ 5 mm   |
| SunFire     | 2.5, 3.5, and 5 $\mu\text{m}$ | 2.1 $\times$ 5 mm   | 3.9 $\times$ 5 mm   |
| Symmetry    | 3.5 and 5 $\mu\text{m}$       | 2.1 $\times$ 5 mm   | 3.9 $\times$ 5 mm   |
| XBridge     | 2.5, 3.5, and 5 $\mu\text{m}$ | 2.1 $\times$ 5 mm   | 3.9 $\times$ 5 mm   |
| XSelect CSH | 2.5, 3.5, and 5 $\mu\text{m}$ | 2.1 $\times$ 5 mm   | 3.9 $\times$ 5 mm   |
| XSelect HSS | 2.5, 3.5, and 5 $\mu\text{m}$ | 2.1 $\times$ 5 mm   | 3.9 $\times$ 5 mm   |
| XTerra      | 2.5, 3.5, and 5 $\mu\text{m}$ | 2.1 $\times$ 5 mm   | 3.9 $\times$ 5 mm   |



## Universal VanGuard Cartridge Holder

| Description                         | P/N       |
|-------------------------------------|-----------|
| Universal VanGuard Cartridge Holder | 186007949 |

## Atlantis VanGuard Cartridges

|                        | Dimension                        |           | P/N               |           | Dimension                      |           | P/N               |           |
|------------------------|----------------------------------|-----------|-------------------|-----------|--------------------------------|-----------|-------------------|-----------|
|                        | Particle Size: 3.5 $\mu\text{m}$ |           |                   |           | Particle Size: 5 $\mu\text{m}$ |           |                   |           |
| <b>T3</b>              | 2.1 $\times$ 5 mm                | 186007674 | 2.1 $\times$ 5 mm | 186007678 | 3.9 $\times$ 5 mm              | 186007676 | 3.9 $\times$ 5 mm | 186007680 |
|                        | 3.9 $\times$ 5 mm                | 186007676 | 3.9 $\times$ 5 mm | 186007680 |                                |           |                   |           |
| <b>dC<sub>18</sub></b> | 2.1 $\times$ 5 mm                | 186007658 | 2.1 $\times$ 5 mm | 186007662 | 3.9 $\times$ 5 mm              | 186007660 | 3.9 $\times$ 5 mm | 186007664 |
|                        | 3.9 $\times$ 5 mm                | 186007660 | 3.9 $\times$ 5 mm | 186007664 |                                |           |                   |           |
| <b>HILIC Silica</b>    | 2.1 $\times$ 5 mm                | 186007666 | 2.1 $\times$ 5 mm | 186007670 | 3.9 $\times$ 5 mm              | 186007668 | 3.9 $\times$ 5 mm | 186007672 |
|                        | 3.9 $\times$ 5 mm                | 186007668 | 3.9 $\times$ 5 mm | 186007672 |                                |           |                   |           |

## SunFire VanGuard Cartridges


|                       | Dimension                        |           | P/N               |           | Dimension                        |           | P/N               |           | Dimension                      |           | P/N               |           |
|-----------------------|----------------------------------|-----------|-------------------|-----------|----------------------------------|-----------|-------------------|-----------|--------------------------------|-----------|-------------------|-----------|
|                       | Particle Size: 2.5 $\mu\text{m}$ |           |                   |           | Particle Size: 3.5 $\mu\text{m}$ |           |                   |           | Particle Size: 5 $\mu\text{m}$ |           |                   |           |
| <b>C<sub>18</sub></b> | 2.1 $\times$ 5 mm                | 186007691 | 2.1 $\times$ 5 mm | 186007694 | 2.1 $\times$ 5 mm                | 186007697 | 3.9 $\times$ 5 mm | 186007693 | 3.9 $\times$ 5 mm              | 186007696 | 3.9 $\times$ 5 mm | 186007699 |
|                       | 3.9 $\times$ 5 mm                | 186007693 | 3.9 $\times$ 5 mm | 186007696 |                                  |           |                   |           |                                |           |                   |           |
| <b>C<sub>8</sub></b>  | 2.1 $\times$ 5 mm                | 186007700 | 2.1 $\times$ 5 mm | 186007703 | 2.1 $\times$ 5 mm                | 186007706 | 3.9 $\times$ 5 mm | 186007702 | 3.9 $\times$ 5 mm              | 186007705 | 3.9 $\times$ 5 mm | 186007708 |
|                       | 3.9 $\times$ 5 mm                | 186007702 | 3.9 $\times$ 5 mm | 186007705 |                                  |           |                   |           |                                |           |                   |           |

## Symmetry VanGuard Cartridges

|                                   | Dimension             | P/N       | Dimension           | P/N       |
|-----------------------------------|-----------------------|-----------|---------------------|-----------|
|                                   | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| <b>Symmetry C<sub>18</sub></b>    | 2.1 × 5 mm            | 186007725 | 2.1 × 5 mm          | 186007729 |
|                                   | 3.9 × 5 mm            | 186007727 | 3.9 × 5 mm          | 186007731 |
| <b>Symmetry C<sub>8</sub></b>     | 2.1 × 5 mm            | 186007733 | 2.1 × 5 mm          | 186007737 |
|                                   | 3.9 × 5 mm            | 186007735 | 3.9 × 5 mm          | 186007739 |
| <b>SymmetryShield RP18</b>        | 2.1 × 5 mm            | 186007749 | 2.1 × 5 mm          | 186007753 |
|                                   | 3.9 × 5 mm            | 186007751 | 3.9 × 5 mm          | 186007755 |
| <b>SymmetryShield RP8</b>         | 2.1 × 5 mm            | 186007741 | 2.1 × 5 mm          | 186007745 |
|                                   | 3.9 × 5 mm            | 186007743 | 3.9 × 5 mm          | 186007747 |
| <b>Symmetry300 C<sub>18</sub></b> | 2.1 × 5 mm            | 186007709 | 2.1 × 5 mm          | 186007713 |
|                                   | 3.9 × 5 mm            | 186007711 | 3.9 × 5 mm          | 186007715 |
| <b>Symmetry300 C<sub>4</sub></b>  | 2.1 × 5 mm            | 186007717 | 2.1 × 5 mm          | 186007721 |
|                                   | 3.9 × 5 mm            | 186007719 | 3.9 × 5 mm          | 186007723 |


## XBridge VanGuard Cartridges

|                           | Dimension             | P/N       | Dimension             | P/N       | Dimension           | P/N       |
|---------------------------|-----------------------|-----------|-----------------------|-----------|---------------------|-----------|
|                           | Particle Size: 2.5 µm |           | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| <b>BEH C<sub>18</sub></b> | 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 |
| <b>BEH C<sub>8</sub></b>  | 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 |
| <b>BEH Shield RP18</b>    | 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 |
| <b>Phenyl</b>             | 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 |
| <b>HILIC</b>              | 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 |
| <b>Amide</b>              | 2.1 × 5 mm            | 186007763 | 2.1 × 5 mm            | 186007757 | 2.1 × 5 mm          | 186007760 |
|                           | 3.9 × 5 mm            | 186007765 | 3.9 × 5 mm            | 186007759 | 3.9 × 5 mm          | 186007762 |

 For XBridge Analytical Columns, please refer to pages 124 and 140.


## XSelect VanGuard Cartridges

|                        | Dimension             | P/N       | Dimension             | P/N       | Dimension           | P/N       |
|------------------------|-----------------------|-----------|-----------------------|-----------|---------------------|-----------|
|                        | Particle Size: 2.5 µm |           | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| CSH C <sub>18</sub>    | 2.1 × 5 mm <i>XP</i>  | 186007817 | 2.1 × 5 mm            | 186007811 | 2.1 × 5 mm          | 186007814 |
|                        | 3.9 × 5 mm <i>XP</i>  | 186007819 | 3.9 × 5 mm            | 186007813 | 3.9 × 5 mm          | 186007816 |
| CSH Fluoro-Phenyl      | 2.1 × 5 mm <i>XP</i>  | 186007827 | 2.1 × 5 mm            | 186007820 | 2.1 × 5 mm          | 186007824 |
|                        | 3.9 × 5 mm <i>XP</i>  | 186007829 | 3.9 × 5 mm            | 186007822 | 3.9 × 5 mm          | 186007826 |
| CSH Phenyl-Hexyl       | 2.1 × 5 mm <i>XP</i>  | 186007839 | 2.1 × 5 mm            | 186007830 | 2.1 × 5 mm          | 186007836 |
|                        | 3.9 × 5 mm <i>XP</i>  | 186007841 | 3.9 × 5 mm            | 186007832 | 3.9 × 5 mm          | 186007838 |
| HSS C <sub>18</sub>    |                       |           | 2.1 × 5 mm            | 186007851 | 2.1 × 5 mm          | 186007854 |
|                        |                       |           | 3.9 × 5 mm            | 186007853 | 3.9 × 5 mm          | 186007856 |
| HSS C <sub>18</sub> SB |                       |           | 2.1 × 5 mm            | 186007842 | 2.1 × 5 mm          | 186007845 |
|                        |                       |           | 3.9 × 5 mm            | 186007844 | 3.9 × 5 mm          | 186007847 |
| HSS T3                 |                       |           | 2.1 × 5 mm            | 186007878 | 2.1 × 5 mm          | 186007881 |
|                        |                       |           | 3.9 × 5 mm            | 186007880 | 3.9 × 5 mm          | 186007883 |
| HSS PFP                |                       |           | 2.1 × 5 mm            | 186007869 | 2.1 × 5 mm          | 186007872 |
|                        |                       |           | 3.9 × 5 mm            | 186007871 | 3.9 × 5 mm          | 186007874 |
| HSS CN                 |                       |           | 2.1 × 5 mm            | 186007860 | 2.1 × 5 mm          | 186007863 |
|                        |                       |           | 3.9 × 5 mm            | 186007862 | 3.9 × 5 mm          | 186007865 |

 For XSelect Analytical Columns, please refer to pages 126 and 148.

## XTerra VanGuard Cartridges

|                    | Dimension             | P/N       | Dimension             | P/N       | Dimension           | P/N       |
|--------------------|-----------------------|-----------|-----------------------|-----------|---------------------|-----------|
|                    | Particle Size: 2.5 µm |           | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| MS C <sub>18</sub> | 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 <sub>8</sub>  | 2.1 × 5 mm            | 186007901 | 2.1 × 5 mm            | 186007905 | 2.1 × 5 mm          | 186007909 |
|                    | 3.9 × 5 mm            | 186007903 | 3.9 × 5 mm            | 186007907 | 3.9 × 5 mm          | 186007911 |
| Shield RP18        |                       |           | 2.1 × 5 mm            | 186007929 | 2.1 × 5 mm          | 186007933 |
|                    |                       |           | 3.9 × 5 mm            | 186007931 | 3.9 × 5 mm          | 186007935 |
| Shield RP8         |                       |           | 2.1 × 5 mm            | 186007941 | 3.9 × 5 mm          | 186007947 |
|                    |                       |           | 3.9 × 5 mm            | 186007943 |                     |           |
| Phenyl             |                       |           | 2.1 × 5 mm            | 186007917 | 2.1 × 5 mm          | 186007921 |
|                    |                       |           | 3.9 × 5 mm            | 186007919 | 3.9 × 5 mm          | 186007923 |

 For XTerra Analytical Columns, please refer to pages 133 and 167.

## WATERS SENTRY GUARD CARTRIDGES

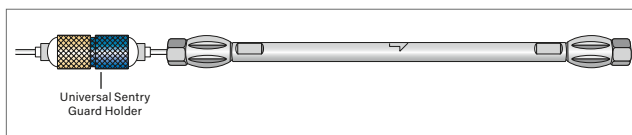
Waters Sentry Guard Cartridges are widely used as a cost-effective way to prolong HPLC column life by reducing particulate matter and chemical contaminants. Two holder designs are offered, one for use as an integrated part of the Waters cartridge column, with reusable end-fittings, the other for use 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       |
|-------------|-----------|
| 2.1 x 10 mm | WAT097958 |
| 2.1 x 20 mm | 186000262 |
| 3.0 x 20 mm | WAT046910 |
| 3.9 x 20 mm | WAT046910 |
| 4.6 x 20 mm | WAT046910 |

#### Sentry Guard Holders and Replacement Parts\*

| Description  | P/N       |
|--|-----------|
| Integrated Guard Holder (for Waters Cartridge Columns) | WAT046905 |

##### Replacement Parts

|   |           |
|---|-----------|
| O-ring Kit for Sentry 2.1 mm Guard Holder, 2/pk           | WAT097954 |
| O-Ring Kit for Sentry 3.0, 3.9, 4.6 mm Guard Holder, 2/pk | WAT023401 |
| Rigid Connector for Sentry 2.1 mm Guard Holder            | WAT022681 |

\*50 mm and 75 mm long Cartridge Columns must use the Universal Guard Holder.

#### µBondapak/Bondapak Sentry Guard Cartridges

|                       | Dimension   | P/N (2/pk)             |
|-----------------------|-------------|------------------------|
| Particle Size: 10 µm  |             |                        |
| <b>C<sub>18</sub></b> | 3.9 x 20 mm | WAT044480 <sup>2</sup> |
| <b>CN</b>             | 3.9 x 20 mm | WAT046855 <sup>2</sup> |
| <b>NH<sub>2</sub></b> | 3.9 x 20 mm | WAT046865 <sup>2</sup> |
| <b>Phenyl</b>         | 3.9 x 20 mm | WAT046850 <sup>2</sup> |

<sup>2</sup>Requires 3.0 x 20 mm/4.6 x 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

#### µPorasil/Porasil Sentry Guard Cartridges

|                      | Dimension   | P/N (2/pk)             |
|----------------------|-------------|------------------------|
| Particle Size: 10 µm |             |                        |
| <b>µPorasil</b>      | 3.9 x 20 mm | WAT046860 <sup>1</sup> |

<sup>1</sup>Requires 2.1 x 10 mm Universal Sentry Guard Holder, p/n: WAT097958.

#### Delta-Pak Sentry Guard Cartridges

|                            | Dimension   | P/N (2/pk)             |
|----------------------------|-------------|------------------------|
| Particle Size: 5 µm        |             |                        |
| <b>C<sub>4</sub>, 100Å</b> | 3.9 x 20 mm | WAT046875 <sup>2</sup> |
| <b>C<sub>4</sub>, 300Å</b> | 3.9 x 20 mm | WAT046885 <sup>2</sup> |

|                             |             |                        |
|-----------------------------|-------------|------------------------|
| <b>C<sub>18</sub>, 100Å</b> | 3.9 x 20 mm | WAT046880 <sup>2</sup> |
|-----------------------------|-------------|------------------------|

|                             |             |                        |
|-----------------------------|-------------|------------------------|
| <b>C<sub>18</sub>, 300Å</b> | 3.9 x 20 mm | WAT046890 <sup>2</sup> |
|-----------------------------|-------------|------------------------|

<sup>2</sup>Requires 3.0 x 20 mm/4.6 x 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

#### Nova-Pak Sentry Guard Cartridges

|                       | Dimension   | P/N (2/pk)             |
|-----------------------|-------------|------------------------|
| Particle Size: 4 µm   |             |                        |
| <b>C<sub>8</sub></b>  | 3.9 x 20 mm | WAT046830 <sup>2</sup> |
| <b>C<sub>18</sub></b> | 3.9 x 20 mm | WAT044380 <sup>2</sup> |
| <b>CN-HP</b>          | 3.9 x 20 mm | WAT046840 <sup>2</sup> |

|               |             |                        |
|---------------|-------------|------------------------|
| <b>Phenyl</b> | 3.9 x 20 mm | WAT046835 <sup>2</sup> |
|---------------|-------------|------------------------|

|               |             |                        |
|---------------|-------------|------------------------|
| <b>Silica</b> | 3.9 x 20 mm | WAT046845 <sup>2</sup> |
|---------------|-------------|------------------------|

<sup>2</sup>Requires 3.0 x 20 mm/4.6 x 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

#### Resolve Sentry Guard Cartridges

|                       | Dimension   | P/N (2/pk)             |
|-----------------------|-------------|------------------------|
| Particle Size: 5 µm   |             |                        |
| <b>C<sub>18</sub></b> | 3.9 x 20 mm | WAT046915 <sup>1</sup> |

<sup>1</sup>Requires 2.1 x 10 mm Universal Sentry Guard Holder, p/n: WAT097958.

## Atlantis Sentry Guard Cartridges

|                        | Dimension                | P/N (2/pk)             | Dimension                | P/N (2/pk)             |
|------------------------|--------------------------|------------------------|--------------------------|------------------------|
|                        | Particle Size: 3 $\mu$ m |                        | Particle Size: 5 $\mu$ m |                        |
| <b>T3</b>              | 2.1 $\times$ 10 mm       | 186003756 <sup>1</sup> | 4.6 $\times$ 20 mm       | 186003761 <sup>2</sup> |
|                        | 4.6 $\times$ 20 mm       | 186003758 <sup>2</sup> |                          |                        |
| <b>dC<sub>18</sub></b> | 2.1 $\times$ 10 mm       | 186001377 <sup>1</sup> | 4.6 $\times$ 20 mm       | 186001323 <sup>2</sup> |
|                        | 4.6 $\times$ 20 mm       | 186001321 <sup>2</sup> |                          |                        |
| <b>HILIC Silica</b>    | 2.1 $\times$ 10 mm       | 186002005 <sup>1</sup> |                          |                        |

<sup>1</sup> Requires 2.1  $\times$  10 mm Universal Sentry Guard Holder, p/n: WAT097958.

<sup>2</sup> Requires 3.0  $\times$  20 mm/4.6  $\times$  20 mm Universal Sentry Guard Holder, p/n: WAT046910.

## SunFire Sentry Guard Cartridges

|                       | Dimension                  | P/N (2/pk)             | Dimension                | P/N (2/pk)             |
|-----------------------|----------------------------|------------------------|--------------------------|------------------------|
|                       | Particle Size: 3.5 $\mu$ m |                        | Particle Size: 5 $\mu$ m |                        |
| <b>C<sub>8</sub></b>  | 2.1 $\times$ 10 mm         | 186002708 <sup>1</sup> | 2.1 $\times$ 10 mm       | 186002713 <sup>1</sup> |
|                       | 3.0 $\times$ 20 mm         | 186002718 <sup>2</sup> | 3.0 $\times$ 20 mm       | 186002722 <sup>2</sup> |
|                       | 4.6 $\times$ 20 mm         | 186002727 <sup>2</sup> | 4.6 $\times$ 20 mm       | 186002733 <sup>2</sup> |
| <b>C<sub>18</sub></b> | 2.1 $\times$ 10 mm         | 186002530 <sup>1</sup> | 2.1 $\times$ 10 mm       | 186002536 <sup>1</sup> |
|                       | 3.0 $\times$ 20 mm         | 186002681 <sup>2</sup> | 3.0 $\times$ 20 mm       | 186002683 <sup>2</sup> |
|                       | 4.6 $\times$ 20 mm         | 186002682 <sup>2</sup> | 4.6 $\times$ 20 mm       | 186002684 <sup>2</sup> |

<sup>1</sup> Requires 2.1  $\times$  10 mm Universal Sentry Guard Holder, p/n: WAT097958.

<sup>2</sup> Requires 3.0  $\times$  20 mm/4.6  $\times$  20 mm Universal Sentry Guard Holder, p/n: WAT046910.

## Symmetry, SymmetryShield, and Symmetry300 Sentry Guard Cartridges

|                                   | Dimension                  | P/N (2/pk)             | Dimension                | P/N (2/pk)             |
|-----------------------------------|----------------------------|------------------------|--------------------------|------------------------|
|                                   | Particle Size: 3.5 $\mu$ m |                        | Particle Size: 5 $\mu$ m |                        |
| <b>Symmetry C<sub>8</sub></b>     | 2.1 $\times$ 10 mm         | WAT106128 <sup>1</sup> | 3.9 $\times$ 20 mm       | WAT054250 <sup>2</sup> |
| <b>Symmetry C<sub>18</sub></b>    | 2.1 $\times$ 10 mm         | WAT106127 <sup>1</sup> | 3.9 $\times$ 20 mm       | WAT054225 <sup>2</sup> |
| <b>SymmetryShield RP8</b>         | 2.1 $\times$ 10 mm         | WAT106129 <sup>1</sup> | 3.9 $\times$ 20 mm       | WAT200675 <sup>2</sup> |
| <b>SymmetryShield RP18</b>        | 2.1 $\times$ 10 mm         | 186000169 <sup>1</sup> | 3.9 $\times$ 20 mm       | 186000107 <sup>2</sup> |
|                                   | 3.9 $\times$ 20 mm         | 186000701              |                          |                        |
| <b>Symmetry300 C<sub>4</sub></b>  | 2.1 $\times$ 10 mm         | 186000275 <sup>1</sup> | 3.9 $\times$ 20 mm       | 186000284 <sup>2</sup> |
| <b>Symmetry300 C<sub>18</sub></b> | 2.1 $\times$ 10 mm         | 186000198 <sup>1</sup> | 3.9 $\times$ 20 mm       | WAT106166 <sup>2</sup> |

<sup>1</sup> Requires 2.1  $\times$  10 mm Universal Sentry Guard Holder, p/n: WAT097958.

<sup>2</sup> Requires Sentry Guard Holders.

## XBridge Sentry Guard Cartridges

|                           | Dimension             | P/N (2/pk)             | Dimension           | P/N (2/pk)             |
|---------------------------|-----------------------|------------------------|---------------------|------------------------|
|                           | Particle Size: 3.5 µm |                        | Particle Size: 5 µm |                        |
| <b>BEH C<sub>8</sub></b>  | 3.0 × 20 mm           | 186003078 <sup>2</sup> | 2.1 × 10 mm         | 186003080 <sup>1</sup> |
|                           | 4.6 × 20 mm           | 186003079 <sup>2</sup> | 3.0 × 20 mm         | 186003081 <sup>2</sup> |
|                           |                       |                        | 4.6 × 20 mm         | 186003082 <sup>2</sup> |
| <b>BEH C<sub>18</sub></b> | 3.0 × 20 mm           | 186003060 <sup>2</sup> | 2.1 × 10 mm         | 186003062 <sup>1</sup> |
|                           | 4.6 × 20 mm           | 186003061 <sup>2</sup> | 3.0 × 20 mm         | 186003063 <sup>2</sup> |
|                           |                       |                        | 4.6 × 20 mm         | 186003064 <sup>2</sup> |
| <b>BEH Shield RP18</b>    | 3.0 × 20 mm           | 186003069 <sup>2</sup> | 2.1 × 10 mm         | 186003071 <sup>1</sup> |
|                           | 4.6 × 20 mm           | 186003070 <sup>2</sup> | 3.0 × 20 mm         | 186003072 <sup>2</sup> |
|                           |                       |                        | 4.6 × 20 mm         | 186003073 <sup>2</sup> |

<sup>1</sup>Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.

<sup>2</sup>Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

## XSelect Sentry Guard Cartridges

|                           | Dimension             | P/N (2/pk)             | Dimension           | P/N (2/pk)             |
|---------------------------|-----------------------|------------------------|---------------------|------------------------|
|                           | Particle Size: 3.5 µm |                        | Particle Size: 5 µm |                        |
| <b>CSH C<sub>18</sub></b> | 2.1 × 10 mm           | 186005252 <sup>1</sup> | 4.6 × 20 mm         | 186005285 <sup>2</sup> |
|                           | 3.0 × 20 mm           | 186005258 <sup>2</sup> |                     |                        |
|                           | 4.6 × 20 mm           | 186005264 <sup>2</sup> |                     |                        |
| <b>HSS T3</b>             | 2.1 × 10 mm           | 186006470 <sup>1</sup> | 4.6 × 20 mm         | 186004792 <sup>2</sup> |
|                           | 3.0 × 20 mm           | 186004782 <sup>2</sup> |                     |                        |
|                           | 4.6 × 20 mm           | 186004787 <sup>2</sup> |                     |                        |

<sup>1</sup>Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.

<sup>2</sup>Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

## XTerra Sentry Guard Cartridges

|                         | Dimension             | P/N (2/pk) | Dimension           | P/N (2/pk)             | Dimension              | P/N (2/pk)  | Dimension           | P/N (2/pk)             |             |                        |
|-------------------------|-----------------------|------------|---------------------|------------------------|------------------------|-------------|---------------------|------------------------|-------------|------------------------|
|                         | Particle Size: 3.5 µm |            | Particle Size: 5 µm |                        | Particle Size: 3.5 µm  |             | Particle Size: 5 µm |                        |             |                        |
| <b>MSC<sub>18</sub></b> | 3.9 × 20 mm           | 186000644  | 2.1 × 20 mm         | 186000652 <sup>3</sup> | <b>MSC<sub>8</sub></b> | —           | 3.9 × 20 mm         | 186000661 <sup>2</sup> |             |                        |
|                         | 4.6 × 10 mm           | 186001927  | 3.0 × 20 mm         | 186000656              |                        | <b>RP18</b> | 3.9 × 20 mm         | 186000646              | 2.1 × 20 mm | 186000654 <sup>3</sup> |
|                         |                       |            | 3.9 × 20 mm         | 186000660 <sup>2</sup> |                        |             | 3.0 × 20 mm         | 186000658              | 3.9 × 20 mm | 186000662 <sup>2</sup> |
|                         |                       |            | 4.6 × 10 mm         | 186001920 <sup>4</sup> |                        |             |                     |                        |             |                        |

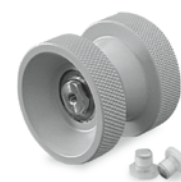
<sup>2</sup>Requires 3.0 × 20 mm/4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

<sup>3</sup>Requires Cartridge Column Holder, p/n: 186000262.

<sup>4</sup>Requires In-line Guard Cartridge Holder, p/n: PSS830008.

## WATERS 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       |
|----------------------------|-----------|
| Guard-Pak Holder           | WAT088141 |
| Guard-Pak Holder Connector | WAT080046 |
| In-line Filters, 5/pk      | WAT032472 |

#### Guard-Pak Inserts

| Description              | Particle size | Qty.  | Pore Size | P/N                    |
|--------------------------|---------------|-------|-----------|------------------------|
| Bondapak C <sub>18</sub> | 10 µm         | 10/pk | 125Å      | WAT088070 <sup>1</sup> |
| Bondapak NH <sub>2</sub> | 10 µm         | 10/pk | 125Å      | WAT026760 <sup>1</sup> |
| Bondapak Phenyl          | 10 µm         | 10/pk | 125Å      | WAT026745 <sup>1</sup> |
| Nova-Pak C <sub>8</sub>  | 4 µm          | 10/pk | 60Å       | WAT015220 <sup>1</sup> |
| Nova-Pak C <sub>18</sub> | 4 µm          | 10/pk | 60Å       | WAT035880 <sup>1</sup> |
| Resolve C <sub>18</sub>  | 10 µm         | 10/pk | 90Å       | WAT085824 <sup>1</sup> |

<sup>1</sup>Requires Guard-Pak Holder, p/n: WAT088141.

# $\geq 5 \mu\text{m}$ Preparative HPLC Columns

$\geq 5 \mu\text{m}$  Preparative HPLC Columns



"Your only as good as your last product."

*~ James Browne, Continuous Improvement Program Manager/Lean/6-Sigma Program Manager, Wexford, Ireland*



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# ≥5 μm Preparative HPLC Columns

## From Productivity Comes Predictability

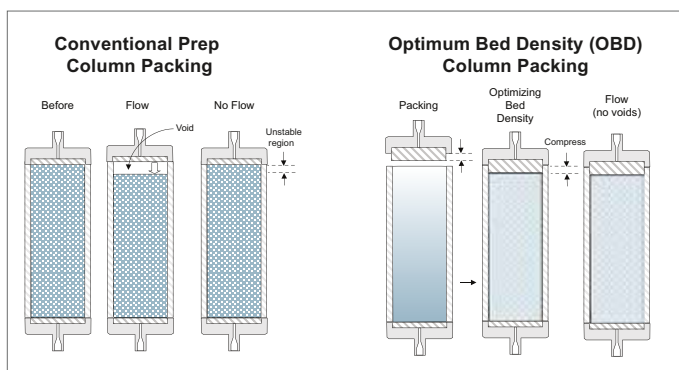
Why struggle with inconsistencies in column-to-column performance, unpredictable column lifetimes, lost samples, repeat purification runs, and poor scalability from small- to large-volume columns?

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

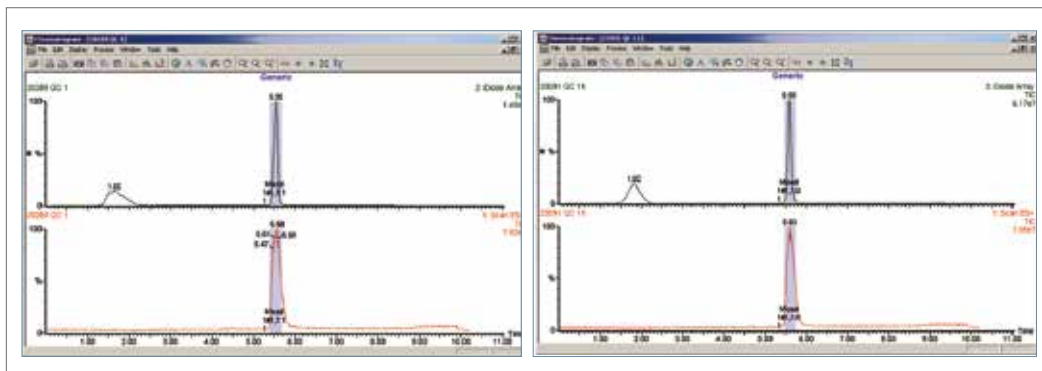


*The OBD Preparative Column design and packing process results in predictable, uniform density profiles throughout the column. During the final capping process, our established procedures do not over compress or disrupt, in any non-uniform way, eliminating the potential for voids.*

## 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: 7000 injections on an XBridge BEH C<sub>18</sub> OBD Prep Column, 130Å, 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 back pressure 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 approximately 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.

Capacity is:

- Higher for strongly retained material
- Higher for simple mixtures
- Lower where higher resolution is required
- Very strongly dependent on loading conditions
  - Limited by loading volume
  - Limited by diluent solvent strength

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

| Length (mm)                      | Diameter (mm) |       |        |        |         |
|----------------------------------|---------------|-------|--------|--------|---------|
|                                  | 4.6           | 10    | 19     | 30     | 50      |
| 50                               | 3 mg          | 15 mg | 45 mg  | 110 mg | 310 mg  |
| 75                               | -             | -     | -      | 165 mg | -       |
| 100                              | 5 mg          | 25 mg | 90 mg  | 225 mg | 620 mg  |
| 150                              | 8 mg          | 40 mg | 135 mg | 335 mg | 930 mg  |
| 250                              | 13 mg         | 60 mg | 225 mg | 560 mg | 1550 mg |
| Reasonable flow rate (mL/min)    | 1.4           | 6.6   | 24     | 60     | 164     |
| Reasonable injection volume (µL) | 20            | 100   | 350    | 880    | 2450    |



Reasonable flow rates are based on column diameter. Systems will be limited by increasing backpressure with increasing column length and decreasing particle size.

Reasonable injection volumes are based on column diameter at a length of 50 mm with relatively strong solvents. Increased length is compatible with larger injections, but not proportionately so. Weaker solvents significantly increase injection volume.

Mass loading capacities for peptides and purifications depend strongly on the sequence and may be estimated at 5–20% of listed values.

### Waters OBD Preparative Columns Calculator

This convenient online scale-up tool provides:

- Mass load scaling
- Gradient scaling with appropriate flow rate scale-up and predicting volume consumption
- Calculations for split flow ratios for those using mass spectrometer driven chromatography
- Focused gradient UPLC or UHPLC to preparative method transfer

 To try this tool, visit [www.waters.com/precalculator](http://www.waters.com/precalculator)





## XBridge OBD Preparative Columns

### THE BENCHMARK FOR RUGGEDNESS AND LONGEVITY IN LC METHODS

XBridge HPLC Columns include 10 general and application-specific sorbents that cover a wide range of particles sizes for analytical and preparative HPLC applications. With these versatile columns, you can use mobile phases in a wide pH range to quickly develop robust methods. In doing so, you benefit from high pH and temperature stability, for increased mass loading of basic compounds.

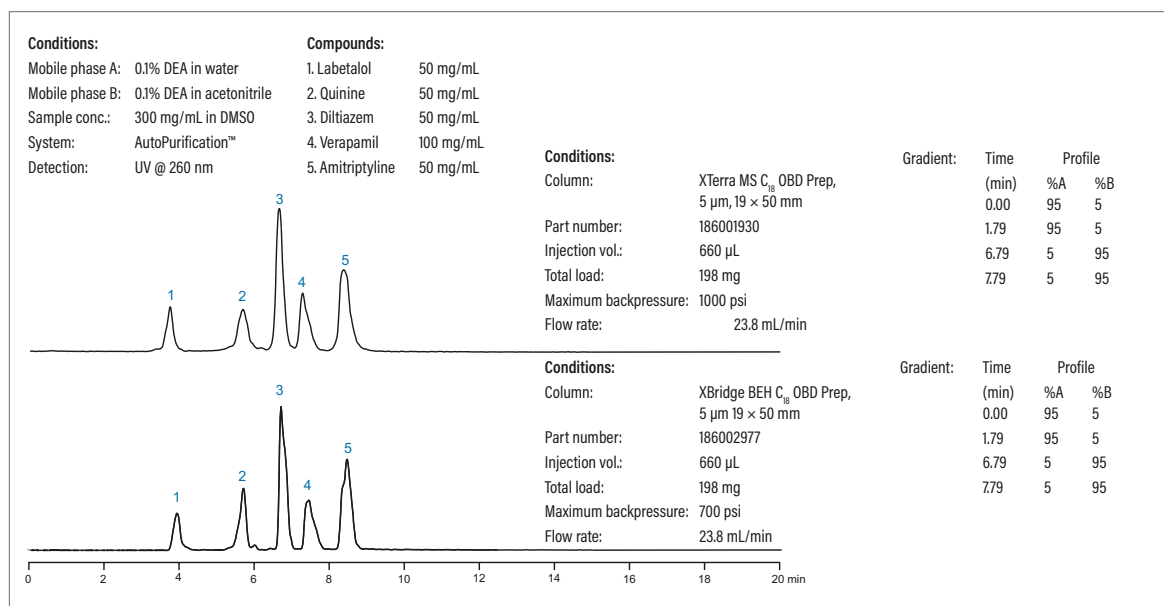
XBridge OBD Preparative Columns offer:

- Available as BEH C<sub>18</sub>, BEH C<sub>8</sub>, 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<sub>18</sub>, 130Å and 300Å Preparative Columns are QC tested for demanding peptide applications
- XBridge Protein BEH C<sub>4</sub>, 300Å Preparative Columns are QC tested for protein applications
- XBridge Oligonucleotide BEH C<sub>18</sub>, 130Å, 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.

**i** For more information on XBridge HPLC Columns, refer to page 120 for 2.5 µm and page 137 for 3–5 µm column offerings.

## Ordering Information

### XBridge Preparative Columns and Guard Cartridges

|                     | Dimension                      | Type            | P/N                    | Dimension                       | Type            | P/N                    |
|---------------------|--------------------------------|-----------------|------------------------|---------------------------------|-----------------|------------------------|
|                     | Particle Size: 5 $\mu\text{m}$ |                 |                        | Particle Size: 10 $\mu\text{m}$ |                 |                        |
| BEH C <sub>18</sub> | 10 $\times$ 10 mm              | Guard Cartridge | 186002972 <sup>1</sup> | 10 $\times$ 10 mm               | Guard Cartridge | 186003889 <sup>1</sup> |
|                     | 10 $\times$ 50 mm              | OBD Column      | 186008164              | 19 $\times$ 10 mm               | Guard Cartridge | 186003892 <sup>2</sup> |
|                     | 10 $\times$ 100 mm             | OBD Column      | 186008165              | 30 $\times$ 10 mm               | Guard Cartridge | 186006892 <sup>3</sup> |
|                     | 10 $\times$ 150 mm             | OBD Column      | 186008166              | 10 $\times$ 150 mm              | OBD Column      | 186008210              |
|                     | 10 $\times$ 250 mm             | OBD Column      | 186008167              | 10 $\times$ 250 mm              | OBD Column      | 186008211              |
|                     | 19 $\times$ 10 mm              | Guard Cartridge | 186002975 <sup>2</sup> | 19 $\times$ 50 mm               | OBD Column      | 186003893              |
|                     | 19 $\times$ 50 mm              | OBD Column      | 186002977              | 19 $\times$ 100 mm              | OBD Column      | 186003901              |
|                     | 19 $\times$ 100 mm             | OBD Column      | 186002978              | 19 $\times$ 150 mm              | OBD Column      | 186003894              |
|                     | 19 $\times$ 150 mm             | OBD Column      | 186002979              | 19 $\times$ 250 mm              | OBD Column      | 186003895              |
|                     | 19 $\times$ 250 mm             | OBD Column      | 186004021              | 30 $\times$ 75 mm               | OBD Column      | 186004711              |
|                     | 30 $\times$ 10 mm              | Guard Cartridge | 186006893 <sup>3</sup> | 30 $\times$ 100 mm              | OBD Column      | 186003930              |
|                     | 30 $\times$ 50 mm              | OBD Column      | 186002980              | 30 $\times$ 150 mm              | OBD Column      | 186003896              |
|                     | 30 $\times$ 75 mm              | OBD Column      | 186002981              | 30 $\times$ 250 mm              | OBD Column      | 186003897              |
|                     | 30 $\times$ 100 mm             | OBD Column      | 186002982              | 50 $\times$ 50 mm               | OBD Column      | 186003898              |
|                     | 30 $\times$ 150 mm             | OBD Column      | 186003284              | 50 $\times$ 100 mm              | OBD Column      | 186003902              |
|                     | 30 $\times$ 250 mm             | OBD Column      | 186004025              | 50 $\times$ 150 mm              | OBD Column      | 186003899              |
|                     | 50 $\times$ 50 mm              | OBD Column      | 186003933              | 50 $\times$ 250 mm              | OBD Column      | 186003900              |
|                     | 50 $\times$ 100 mm             | OBD Column      | 186003937              |                                 |                 |                        |
|                     | 50 $\times$ 150 mm             | OBD Column      | 186003929              |                                 |                 |                        |
|                     | 50 $\times$ 250 mm             | OBD Column      | 186004107              |                                 |                 |                        |

|                    | Particle Size: 5 $\mu\text{m}$ |                 |                        | Particle Size: 10 $\mu\text{m}$ |                 |                        |
|--------------------|--------------------------------|-----------------|------------------------|---------------------------------|-----------------|------------------------|
| BEH C <sub>8</sub> | 10 $\times$ 10 mm              | Guard Cartridge | 186002991 <sup>1</sup> | 10 $\times$ 10 mm               | Guard Cartridge | 186004003 <sup>1</sup> |
|                    | 10 $\times$ 50 mm              | OBD Column      | 186008172              | 19 $\times$ 10 mm               | Guard Cartridge | 186004006 <sup>2</sup> |
|                    | 10 $\times$ 100 mm             | OBD Column      | 186008173              | 30 $\times$ 10 mm               | Guard Cartridge | 186006894 <sup>3</sup> |
|                    | 10 $\times$ 150 mm             | OBD Column      | 186008174              | 10 $\times$ 150 mm              | OBD Column      | 186008215              |
|                    | 10 $\times$ 250 mm             | OBD Column      | 186008175              | 10 $\times$ 250 mm              | OBD Column      | 186008216              |
|                    | 19 $\times$ 10 mm              | Guard Cartridge | 186002992 <sup>2</sup> | 19 $\times$ 50 mm               | OBD Column      | 186004007              |
|                    | 19 $\times$ 50 mm              | OBD Column      | 186002993              | 19 $\times$ 100 mm              | OBD Column      | 186004008              |
|                    | 19 $\times$ 100 mm             | OBD Column      | 186002994              | 19 $\times$ 150 mm              | OBD Column      | 186004009              |
|                    | 19 $\times$ 150 mm             | OBD Column      | 186002995              | 19 $\times$ 250 mm              | OBD Column      | 186004010              |
|                    | 19 $\times$ 250 mm             | OBD Column      | 186004023              | 30 $\times$ 150 mm              | OBD Column      | 186004011              |
|                    | 30 $\times$ 10 mm              | Guard Cartridge | 186006895 <sup>3</sup> | 30 $\times$ 250 mm              | OBD Column      | 186004012              |
|                    | 30 $\times$ 50 mm              | OBD Column      | 186002996              | 50 $\times$ 50 mm               | OBD Column      | 186004013              |
|                    | 30 $\times$ 75 mm              | OBD Column      | 186003269              | 50 $\times$ 100 mm              | OBD Column      | 186004014              |
|                    | 30 $\times$ 100 mm             | OBD Column      | 186002997              | 50 $\times$ 150 mm              | OBD Column      | 186004015              |
|                    | 30 $\times$ 150 mm             | OBD Column      | 186003083              | 50 $\times$ 250 mm              | OBD Column      | 186004016              |
|                    | 50 $\times$ 50 mm              | OBD Column      | 186003934              |                                 |                 |                        |
|                    | 50 $\times$ 100 mm             | OBD Column      | 186003938              |                                 |                 |                        |

<sup>1</sup>Requires 10  $\times$  10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19  $\times$  10 mm Cartridge Holder, p/n: 186000709.

<sup>3</sup>Requires 30  $\times$  10 mm Prep Guard Holder, p/n: 186006912.

XBridge Preparative Columns and Guard Cartridges *Continued*

|                        | Dimension           | Type            | P/N                    | Dimension            | Type            | P/N                    |
|------------------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
|                        | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
| <b>BEH Shield RP18</b> | 10 × 10 mm          | Guard Cartridge | 186002983 <sup>1</sup> | 10 × 10 mm           | Guard Cartridge | 186003988 <sup>1</sup> |
|                        | 10 × 50 mm          | OBD Column      | 186008168              | 19 × 10 mm           | Guard Cartridge | 186003991 <sup>2</sup> |
|                        | 10 × 100 mm         | OBD Column      | 186008169              | 30 × 10 mm           | Guard Cartridge | 186006897 <sup>3</sup> |
|                        | 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 <sup>2</sup> | 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 <sup>3</sup> | 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              |                      |                 |                        |

|                   | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
|-------------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
| <b>BEH Phenyl</b> | 10 × 10 mm          | Guard Cartridge | 186003354 <sup>1</sup> | 19 × 250 mm          | OBD Column      | 186004024              |
|                   | 10 × 50 mm          | OBD Column      | 186008176              | 30 × 10 mm           | Guard Cartridge | 186006891 <sup>3</sup> |
|                   | 10 × 100 mm         | OBD Column      | 186008177              | 30 × 50 mm           | OBD Column      | 186003277              |
|                   | 10 × 150 mm         | OBD Column      | 186008178              | 30 × 75 mm           | OBD Column      | 186003278              |
|                   | 10 × 250 mm         | OBD Column      | 186008179              | 30 × 100 mm          | OBD Column      | 186003279              |
|                   | 19 × 10 mm          | Guard Cartridge | 186003355 <sup>2</sup> | 30 × 150 mm          | OBD Column      | 186003276              |
|                   | 19 × 50 mm          | OBD Column      | 186003356              | 50 × 50 mm           | OBD Column      | 186003936              |
|                   | 19 × 100 mm         | OBD Column      | 186003357              | 50 × 100 mm          | OBD Column      | 186003940              |
|                   | 19 × 150 mm         | OBD Column      | 186003358              |                      |                 |                        |

|                  | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |            |           |
|------------------|---------------------|-----------------|------------------------|----------------------|------------|-----------|
| <b>BEH HILIC</b> | 10 × 10 mm          | Guard Cartridge | 186004720 <sup>1</sup> | 30 × 50 mm           | OBD Column | 186004727 |
|                  | 10 × 50 mm          | OBD Column      | 186008217              | 30 × 100 mm          | OBD Column | 186004728 |
|                  | 10 × 100 mm         | OBD Column      | 186008218              | 30 × 150 mm          | OBD Column | 186004729 |
|                  | 19 × 10 mm          | Guard Cartridge | 186004723 <sup>2</sup> | 30 × 250 mm          | OBD Column | 186004731 |
|                  | 19 × 50 mm          | OBD Column      | 186004724              | 50 × 50 mm           | OBD Column | 186004732 |
|                  | 19 × 100 mm         | OBD Column      | 186004725              | 50 × 100 mm          | OBD Column | 186004733 |
|                  | 19 × 150 mm         | OBD Column      | 186004726              | 50 × 150 mm          | OBD Column | 186004734 |
|                  | 19 × 250 mm         | OBD Column      | 186004730              | 50 × 250 mm          | OBD Column | 186004735 |
|                  | 30 × 10 mm          | Guard Cartridge | 186006896 <sup>3</sup> |                      |            |           |

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

XBridge Preparative Columns and Guard Cartridges *Continued*

|           | Dimension                      | Type            | P/N                    | Dimension                       | Type            | P/N                    |
|-----------|--------------------------------|-----------------|------------------------|---------------------------------|-----------------|------------------------|
|           | Particle Size: 5 $\mu\text{m}$ |                 |                        | Particle Size: 10 $\mu\text{m}$ |                 |                        |
| BEH Amide | 10 $\times$ 10 mm              | Guard Cartridge | 186006597 <sup>1</sup> | 19 $\times$ 150 mm              | OBD Column      | 186006605              |
|           | 10 $\times$ 50 mm              | OBD Column      | 186008260              | 19 $\times$ 250 mm              | OBD Column      | 186006606              |
|           | 10 $\times$ 100 mm             | OBD Column      | 186008261              | 30 $\times$ 10 mm               | Guard Cartridge | 186006890 <sup>3</sup> |
|           | 10 $\times$ 150 mm             | OBD Column      | 186008262              | 30 $\times$ 50 mm               | OBD Column      | 186006607              |
|           | 10 $\times$ 250 mm             | OBD Column      | 186008263              | 30 $\times$ 75 mm               | OBD Column      | 186006608              |
|           | 19 $\times$ 10 mm              | Guard Cartridge | 186006598 <sup>2</sup> | 30 $\times$ 100 mm              | OBD Column      | 186006609              |
|           | 19 $\times$ 50 mm              | OBD Column      | 186006603              | 30 $\times$ 150 mm              | OBD Column      | 186006610              |
|           | 19 $\times$ 100 mm             | OBD Column      | 186006604              | 30 $\times$ 250 mm              | OBD Column      | 186006611              |

<sup>1</sup>Requires 10  $\times$  10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19  $\times$  10 mm Cartridge Holder, p/n: 186000709.

<sup>3</sup>Requires 30  $\times$  10 mm Prep Guard Holder, p/n: 186006912.

## XBridge Peptide BEH, Preparative Columns and Guard Cartridges

|                            | Dimension                      | Type            | P/N                    | Dimension                       | Type            | P/N                    |
|----------------------------|--------------------------------|-----------------|------------------------|---------------------------------|-----------------|------------------------|
|                            | Particle Size: 5 $\mu\text{m}$ |                 |                        | Particle Size: 10 $\mu\text{m}$ |                 |                        |
| BEH C <sub>18</sub> , 130Å | 10 $\times$ 10 mm              | Guard Cartridge | 186004469 <sup>1</sup> | 4.6 $\times$ 50 mm              | OBD Column      | 186003648              |
|                            | 10 $\times$ 50 mm              | OBD Column      | 186008186              | 4.6 $\times$ 100 mm             | OBD Column      | 186003649              |
|                            | 10 $\times$ 100 mm             | OBD Column      | 186008187              | 4.6 $\times$ 150 mm             | OBD Column      | 186003650              |
|                            | 10 $\times$ 150 mm             | OBD Column      | 186008188              | 4.6 $\times$ 250 mm             | OBD Column      | 186003651              |
|                            | 10 $\times$ 250 mm             | OBD Column      | 186008189              | 10 $\times$ 10 mm               | Guard Cartridge | 186004465 <sup>1</sup> |
|                            | 19 $\times$ 10 mm              | Guard Cartridge | 186004468 <sup>2</sup> | 10 $\times$ 50 mm               | OBD Column      | 186008194              |
|                            | 19 $\times$ 50 mm              | OBD Column      | 186003586              | 10 $\times$ 100 mm              | OBD Column      | 186008195              |
|                            | 19 $\times$ 100 mm             | OBD Column      | 186003587              | 10 $\times$ 150 mm              | OBD Column      | 186008196              |
|                            | 19 $\times$ 150 mm             | OBD Column      | 186003945              | 10 $\times$ 250 mm              | OBD Column      | 186008197              |
|                            |                                |                 |                        | 19 $\times$ 10 mm               | Guard Cartridge | 186004464 <sup>2</sup> |
|                            |                                |                 |                        | 19 $\times$ 50 mm               | OBD Column      | 186003656              |
|                            |                                |                 |                        | 19 $\times$ 150 mm              | OBD Column      | 186003657              |
|                            |                                |                 |                        | 19 $\times$ 250 mm              | OBD Column      | 186003658              |
|                            |                                |                 |                        | 30 $\times$ 50 mm               | OBD Column      | 186003659              |
|                            |                                |                 |                        | 30 $\times$ 100 mm              | OBD Column      | 186003660              |
|                            |                                |                 |                        | 30 $\times$ 150 mm              | OBD Column      | 186003661              |
|                            |                                |                 |                        | 30 $\times$ 250 mm              | OBD Column      | 186003662              |

<sup>1</sup>Requires 10  $\times$  10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19  $\times$  10 mm Cartridge Holder, p/n: 186000709.



XBridge Peptide BEH, Preparative Columns and Guard Cartridges *Continued*

|                            | Dimension           | Type            | P/N                    | Dimension            | Type            | P/N                    |
|----------------------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
|                            | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
| BEH C <sub>18</sub> , 300Å | 10 × 10 mm          | Guard Cartridge | 186004471 <sup>1</sup> | 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 <sup>1</sup> |
|                            | 19 × 10 mm          | Guard Cartridge | 186004470 <sup>2</sup> | 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 <sup>2</sup> |
|                            |                     |                 |                        | 19 × 50 mm           | OBD Column      | 186003671              |
|                            |                     |                 |                        | 19 × 150 mm          | OBD Column      | 186003672              |
|                            |                     |                 |                        | 19 × 250 mm          | OBD Column      | 186003673              |
|                            |                     |                 |                        | 30 × 50 mm           | OBD Column      | 186003674              |
|                            |                     |                 |                        | 30 × 100 mm          | OBD Column      | 186003675              |
|                            |                     |                 |                        | 30 × 150 mm          | OBD Column      | 186003676              |
|                            |                     |                 | 30 × 250 mm            | OBD Column           | 186003677       |                        |

<sup>1</sup>Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

XBridge Protein BEH, Preparative Columns and Guard Cartridges *Continued*

|                            | Dimension           | Type            | P/N                    | Dimension            | Type            | P/N                    |
|----------------------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
|                            | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
| BEH C <sub>18</sub> , 300Å | 10 × 10 mm          | Guard Cartridge | 186007305 <sup>1</sup> | 10 × 10 mm           | Guard Cartridge | 186007325 <sup>1</sup> |
|                            | 10 × 50 mm          | OBD Column      | 186008272              | 10 × 50 mm           | OBD Column      | 186008276              |
|                            | 10 × 100 mm         | OBD Column      | 186008273              | 10 × 100 mm          | OBD Column      | 186008277              |
|                            | 10 × 150 mm         | OBD Column      | 186008274              | 10 × 150 mm          | OBD Column      | 186008278              |
|                            | 10 × 250 mm         | OBD Column      | 186008275              | 10 × 250 mm          | OBD Column      | 186008279              |
|                            | 19 × 10 mm          | Guard Cartridge | 186007310 <sup>2</sup> | 19 × 10 mm           | Guard Cartridge | 186007330 <sup>2</sup> |
|                            | 19 × 50 mm          | OBD Column      | 186007311              | 19 × 50 mm           | OBD Column      | 186007331              |
|                            | 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 <sup>3</sup> | 30 × 10 mm           | Guard Cartridge | 186007335 <sup>3</sup> |
|                            | 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              |

<sup>1</sup>Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

<sup>3</sup>Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

XBridge Oligonucleotide BEH, Preparative Column

|                            | Dimension             | Type       | P/N       |
|----------------------------|-----------------------|------------|-----------|
|                            | Particle Size: 2.5 µm |            |           |
| BEH C <sub>18</sub> , 130Å | 10 × 50 mm            | OBD Column | 186008212 |



## XSelect OBD Preparative Columns

### VERSATILITY AND SELECTIVITY

XSelect HPLC Columns offer the opportunity to scale from analytical to preparative applications, taking advantage of alternative selectivity through different column chemistries and methods specifying different pH scales.

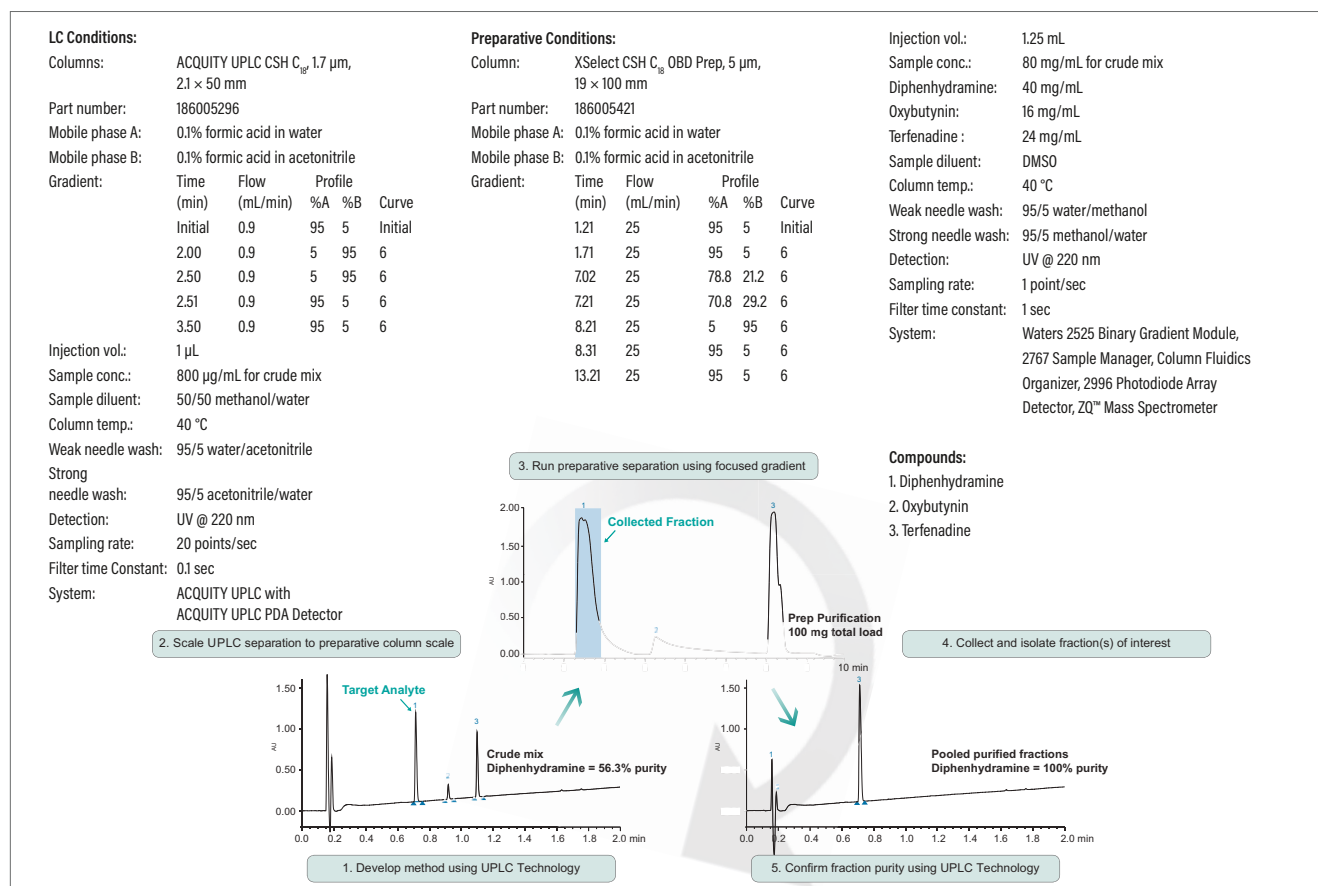
XSelect OBD Preparative Columns are:

- Available as CSH C<sub>18</sub>, CSH Fluoro-Phenyl, CSH Phenyl-Hexyl, HSS C<sub>18</sub>, HSS C<sub>18</sub> 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<sub>18</sub> Columns

### Columns Designed for Isolation and Purification



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.

## XSelect Preparative Columns and Guard Cartridges

|                     | Dimension           | Type            | P/N                    | Dimension           | Type            | P/N                    |
|---------------------|---------------------|-----------------|------------------------|---------------------|-----------------|------------------------|
|                     | Particle Size: 5 µm |                 |                        | Particle Size: 5 µm |                 |                        |
| CSH C <sub>18</sub> | 10 × 10 mm          | Guard Cartridge | 186005491 <sup>1</sup> | 30 × 10 mm          | Guard Cartridge | 186006899 <sup>3</sup> |
|                     | 10 × 50 mm          | OBD Column      | 186008236              | 30 × 50 mm          | OBD Column      | 186005423              |
|                     | 10 × 100 mm         | OBD Column      | 186008237              | 30 × 75 mm          | OBD Column      | 186005424              |
|                     | 10 × 150 mm         | OBD Column      | 186008238              | 30 × 100 mm         | OBD Column      | 186005425              |
|                     | 10 × 250 mm         | OBD Column      | 186008239              | 30 × 150 mm         | OBD Column      | 186005426              |
|                     | 19 × 10 mm          | Guard Cartridge | 186005418 <sup>2</sup> | 30 × 250 mm         | OBD Column      | 186005493              |
|                     | 19 × 50 mm          | OBD Column      | 186005420              | 50 × 50 mm          | OBD Column      | 186005494              |
|                     | 19 × 100 mm         | OBD Column      | 186005421              | 50 × 100 mm         | OBD Column      | 186005495              |
|                     | 19 × 150 mm         | OBD Column      | 186005422              | 50 × 150 mm         | OBD Column      | 186005496              |
|                     | 19 × 250 mm         | OBD Column      | 186005492              | 50 × 250 mm         | OBD Column      | 186005497              |

|                   | Particle Size: 5 µm |                 |                        | Particle Size: 5 µm |                 |                        |
|-------------------|---------------------|-----------------|------------------------|---------------------|-----------------|------------------------|
| CSH Fluoro-Phenyl | 10 × 10 mm          | Guard Cartridge | 186005498 <sup>1</sup> | 30 × 10 mm          | Guard Cartridge | 186006900 <sup>3</sup> |
|                   | 10 × 50 mm          | OBD Column      | 186008240              | 30 × 50 mm          | OBD Column      | 186005436              |
|                   | 10 × 100 mm         | OBD Column      | 186008241              | 30 × 75 mm          | OBD Column      | 186005437              |
|                   | 10 × 150 mm         | OBD Column      | 186008242              | 30 × 100 mm         | OBD Column      | 186005438              |
|                   | 10 × 250 mm         | OBD Column      | 186008243              | 30 × 150 mm         | OBD Column      | 186005439              |
|                   | 19 × 10 mm          | Guard Cartridge | 186005431 <sup>2</sup> | 30 × 250 mm         | OBD Column      | 186005500              |
|                   | 19 × 50 mm          | OBD Column      | 186005433              | 50 × 50 mm          | OBD Column      | 186005501              |
|                   | 19 × 100 mm         | OBD Column      | 186005434              | 50 × 100 mm         | OBD Column      | 186005502              |
|                   | 19 × 150 mm         | OBD Column      | 186005435              | 50 × 150 mm         | OBD Column      | 186005503              |
|                   | 19 × 250 mm         | OBD Column      | 186005499              | 50 × 250 mm         | OBD Column      | 186005504              |

|                  | Particle Size: 5 µm |                 |                        | Particle Size: 5 µm |                 |                        |
|------------------|---------------------|-----------------|------------------------|---------------------|-----------------|------------------------|
| CSH Phenyl-Hexyl | 10 × 10 mm          | Guard Cartridge | 186005505 <sup>1</sup> | 30 × 10 mm          | Guard Cartridge | 186006901 <sup>3</sup> |
|                  | 10 × 50 mm          | OBD Column      | 186008244              | 30 × 50 mm          | OBD Column      | 186005520              |
|                  | 10 × 100 mm         | OBD Column      | 186008245              | 30 × 75 mm          | OBD Column      | 186005450              |
|                  | 10 × 150 mm         | OBD Column      | 186008246              | 30 × 100 mm         | OBD Column      | 186005451              |
|                  | 10 × 250 mm         | OBD Column      | 186008247              | 30 × 150 mm         | OBD Column      | 186005452              |
|                  | 19 × 10 mm          | Guard Cartridge | 186005444 <sup>2</sup> | 30 × 250 mm         | OBD Column      | 186005507              |
|                  | 19 × 50 mm          | OBD Column      | 186005446              | 50 × 50 mm          | OBD Column      | 186005508              |
|                  | 19 × 100 mm         | OBD Column      | 186005447              | 50 × 100 mm         | OBD Column      | 186005509              |
|                  | 19 × 150 mm         | OBD Column      | 186005448              | 50 × 150 mm         | OBD Column      | 186005510              |
|                  | 19 × 250 mm         | OBD Column      | 186005506              | 50 × 250 mm         | OBD Column      | 186005511              |

|                     | Particle Size: 5 µm |                 |                        | Particle Size: 5 µm |            |           |
|---------------------|---------------------|-----------------|------------------------|---------------------|------------|-----------|
| HSS C <sub>18</sub> | 10 × 10 mm          | Guard Cartridge | 186004776 <sup>1</sup> | 10 × 100 mm         | OBD Column | 186008223 |
|                     | 10 × 50 mm          | OBD Column      | 186008222              | 10 × 150 mm         | OBD Column | 186008224 |

|                        | Particle Size: 5 µm |                 |                        | Particle Size: 5 µm |            |           |
|------------------------|---------------------|-----------------|------------------------|---------------------|------------|-----------|
| HSS C <sub>18</sub> SB | 10 × 10 mm          | Guard Cartridge | 186004758 <sup>1</sup> | 10 × 100 mm         | OBD Column | 186008220 |
|                        | 10 × 50 mm          | OBD Column      | 186008219              | 10 × 150 mm         | OBD Column | 186008221 |

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

XSelect Preparative Columns and Guard Cartridges *Continued*

|       | Dimension           | Type            | P/N                    | Dimension           | Type       | P/N       |
|-------|---------------------|-----------------|------------------------|---------------------|------------|-----------|
|       | Particle Size: 5 µm |                 |                        | Particle Size: 5 µm |            |           |
| HSST3 | 10 × 10 mm          | Guard Cartridge | 186004795 <sup>1</sup> | 10 × 150 mm         | OBD Column | 186008227 |
|       | 10 × 50 mm          | OBD Column      | 186008225              | 10 × 250 mm         | OBD Column | 186008280 |
|       | 10 × 100 mm         | OBD Column      | 186008226              |                     |            |           |

<sup>1</sup>Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

## XSelect Peptide CSH, Preparative Columns and Guard Cartridges

|                            | Dimension           | Type       | P/N                    | Dimension           | Type       | P/N                    |
|----------------------------|---------------------|------------|------------------------|---------------------|------------|------------------------|
|                            | Particle Size: 5 µm |            |                        | Particle Size: 5 µm |            |                        |
| CSH C <sub>18</sub> , 130Å | 4.6 × 50 mm         | Column     | 186007076 <sup>4</sup> | 19 × 250 mm         | OBD Column | 186007031              |
|                            | 4.6 × 100 mm        | Column     | 186007077 <sup>4</sup> | 19 × 10 mm          | Guard      | 186007019 <sup>3</sup> |
|                            | 4.6 × 150 mm        | Column     | 186007078 <sup>4</sup> | 30 × 50 mm          | OBD Column | 186007026              |
|                            | 10 × 50 mm          | OBD Column | 186008264              | 30 × 100 mm         | OBD Column | 186007025              |
|                            | 10 × 100 mm         | OBD Column | 186008265              | 30 × 150 mm         | OBD Column | 186007023              |
|                            | 10 × 150 mm         | OBD Column | 186008266              | 30 × 250 mm         | OBD Column | 186007024              |
|                            | 10 × 250 mm         | OBD Column | 186008267              | 50 × 50 mm          | OBD Column | 186007030              |
|                            | 10 × 10 mm          | Guard      | 186007015 <sup>1</sup> | 50 × 100 mm         | OBD Column | 186007027              |
|                            | 19 × 50 mm          | OBD Column | 186007022              | 50 × 150 mm         | OBD Column | 186007028              |
|                            | 19 × 100 mm         | OBD Column | 186007020              | 50 × 250 mm         | OBD Column | 186007029              |
|                            | 19 × 150 mm         | OBD Column | 186007021              |                     |            |                        |

<sup>1</sup>Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

<sup>3</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

<sup>4</sup>For use in developing lab-scale preparative chromatography.



## SunFire OBD Preparative Columns

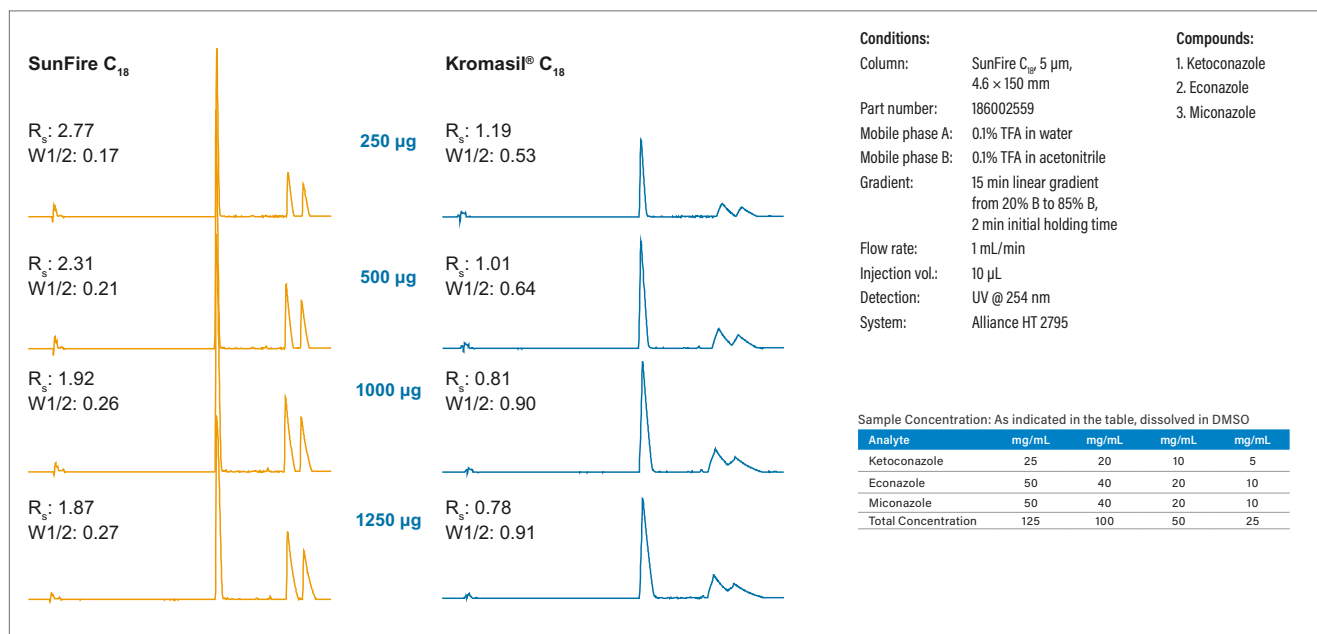
### HIGH-MASS LOADING

SunFire C<sub>18</sub>, C<sub>8</sub>, 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



## Ordering Information

### SunFire Preparative Columns and Guard Cartridges

|                       | Dimension                | Type            | P/N                    | Dimension                 | Type            | P/N                    |
|-----------------------|--------------------------|-----------------|------------------------|---------------------------|-----------------|------------------------|
|                       | Particle Size: 5 $\mu$ m |                 |                        | Particle Size: 10 $\mu$ m |                 |                        |
| <b>C<sub>18</sub></b> | 10 × 10 mm               | Guard Cartridge | 186002565 <sup>1</sup> | 10 × 10 mm                | Guard Cartridge | 186002663 <sup>1</sup> |
|                       | 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 <sup>2</sup> |
|                       | 19 × 10 mm               | Guard Cartridge | 186002569 <sup>2</sup> | 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 <sup>3</sup> |
|                       | 19 × 250 mm              | OBD Column      | 186004027              | 30 × 50 mm                | OBD Column      | 186003854              |
|                       | 30 × 10 mm               | Guard Cartridge | 186006885 <sup>3</sup> | 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              |                           |                 |                        |

|                      | Particle Size: 5 $\mu$ m |                 |                        | Particle Size: 10 $\mu$ m |                 |                        |
|----------------------|--------------------------|-----------------|------------------------|---------------------------|-----------------|------------------------|
| <b>C<sub>8</sub></b> | 10 × 10 mm               | Guard Cartridge | 186002750 <sup>1</sup> | 10 × 10 mm                | Guard Cartridge | 186002758 <sup>1</sup> |
|                      | 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 <sup>2</sup> |
|                      | 19 × 10 mm               | Guard Cartridge | 186002754 <sup>2</sup> | 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 <sup>3</sup> |
|                      | 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 <sup>3</sup> | 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              |                           |                 |                        |

<sup>1</sup>Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

<sup>3</sup>Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

SunFire Preparative Columns and Guard Cartridges *Continued*

|               | Dimension           | Type            | P/N                    | Dimension            | Type            | P/N                    |
|---------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
|               | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
| <b>Silica</b> | 10 × 10 mm          | Guard Cartridge | 186003429 <sup>1</sup> | 10 × 10 mm           | Guard Cartridge | 186003441 <sup>1</sup> |
|               | 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 <sup>2</sup> |
|               | 10 × 250 mm         | OBD Column      | 186008183              | 19 × 50 mm           | OBD Column      | 186003445              |
|               | 19 × 10 mm          | Guard Cartridge | 186003434 <sup>2</sup> | 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 <sup>3</sup> |
|               | 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 <sup>3</sup> | 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              |                      |                 |                        |

<sup>1</sup>Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

<sup>3</sup>Requires 30x10 mm Cartridge Holder, p/n: 186006912.

SunFire Preparative Scouting Columns

|                       | Dimension            | P/N       |                      |           |
|-----------------------|----------------------|-----------|----------------------|-----------|
|                       | Particle Size: 10 µm |           |                      |           |
| <b>C<sub>18</sub></b> | 4.6 × 150 mm         | 186003390 |                      |           |
|                       | 4.6 × 250 mm         | 186003391 |                      |           |
|                       | Particle Size: 5 µm  |           | Particle Size: 10 µm |           |
| <b>Silica</b>         | 4.6 × 150 mm         | 186003453 | 4.6 × 150 mm         | 186003467 |
|                       | 4.6 × 250 mm         | 186003454 | 4.6 × 250 mm         | 186003468 |



## Atlantis OBD Preparative Columns

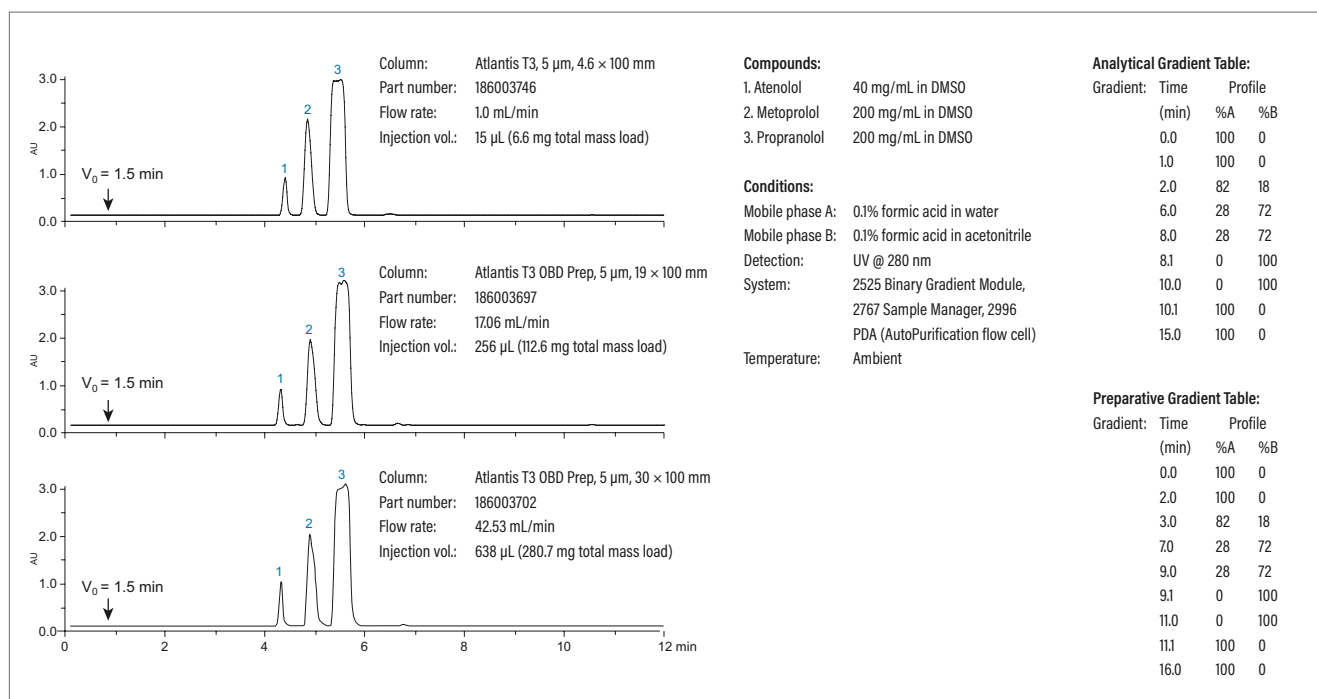
### RETENTION OF POLAR COMPOUNDS

Atlantis HPLC Columns provide balanced retention for broad analyte mixtures and exceptional performance, versatility, and retention for polar compounds.

Atlantis OBD Preparative Columns offer:

- Available as T3, HILIC, and dC<sub>18</sub> 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





## Atlantis Preparative Columns and Guard Cartridges

|             | Dimension           | Type            | P/N                    | Dimension            | Type            | P/N                    |
|-------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
|             | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
| T3          | 10 × 10 mm          | Guard Cartridge | 186003695 <sup>1</sup> | 10 × 10 mm           | Guard Cartridge | 186003706 <sup>1</sup> |
|             | 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 <sup>2</sup> |
|             | 10 × 250 mm         | OBD Column      | 186008205              | 19 × 50 mm           | OBD Column      | 186003707              |
|             | 19 × 10 mm          | Guard Cartridge | 186003699 <sup>2</sup> | 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 <sup>3</sup> |
|             | 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 <sup>3</sup> | 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       |                        |                      |                 |                        |

|       | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
|-------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
| HILIC | 19 × 10 mm          | Guard Cartridge | 186003956 <sup>2</sup> | 30 × 10 mm           | Guard Cartridge | 186006877 <sup>3</sup> |
|       | 19 × 50 mm          | OBD Column      | 186003957              | 30 × 50 mm           | OBD Column      | 186003960              |
|       | 19 × 100 mm         | OBD Column      | 186003958              | 30 × 100 mm          | OBD Column      | 186003961              |
|       | 19 × 150 mm         | OBD Column      | 186003959              | 30 × 150 mm          | OBD Column      | 186003962              |

|                  | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
|------------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
| dC <sub>18</sub> | 10 × 10 mm          | Guard Cartridge | 186002300 <sup>1</sup> | 10 × 10 mm           | Guard Cartridge | 186002452 <sup>1</sup> |
|                  | 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 <sup>2</sup> | 19 × 10 mm           | Guard Cartridge | 186001363 <sup>2</sup> |
|                  | 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 <sup>3</sup> |
|                  | 19 × 250 mm         | OBD Column      | 186004030              | 30 × 250 mm          | OBD Column      | 186002418              |
|                  | 30 × 10 mm          | Guard Cartridge | 186006876 <sup>3</sup> |                      |                 |                        |
|                  | 30 × 50 mm          | OBD Column      | 186001373              |                      |                 |                        |
|                  | 30 × 75 mm          | OBD Column      | 186002455              |                      |                 |                        |
|                  | 30 × 150 mm         | OBD Column      | 186002801              |                      |                 |                        |

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



## XTerra OBD Preparative Columns

XTerra HPLC Columns offer 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:

- Available as MS C<sub>18</sub>, MS C<sub>8</sub>, 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

### Ordering Information

#### XTerra Preparative Columns and Guard Cartridges

|                    | Dimension                | Type            | P/N                    | Dimension                 | Type            | P/N                    |
|--------------------|--------------------------|-----------------|------------------------|---------------------------|-----------------|------------------------|
|                    | Particle Size: 5 $\mu$ m |                 |                        | Particle Size: 10 $\mu$ m |                 |                        |
| MS C <sub>18</sub> | 7.8 × 10 mm              | Guard Cartridge | 186001168 <sup>5</sup> | 7.8 × 10 mm               | Guard Cartridge | 186001172 <sup>5</sup> |
|                    | 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 <sup>1</sup> |
|                    | 10 × 10 mm               | Guard Cartridge | 186001001 <sup>1</sup> | 10 × 150 mm               | Column          | 186008129              |
|                    | 10 × 50 mm               | Column          | 186008103              | 10 × 250 mm               | Column          | 186008133              |
|                    | 10 × 100 mm              | Column          | 186008107              | 10 × 300 mm               | Column          | 186008137              |
|                    | 10 × 150 mm              | Column          | 186008141              | 19 × 10 mm                | Guard Cartridge | 186001034 <sup>2</sup> |
|                    | 19 × 10 mm               | Guard Cartridge | 186001104 <sup>2</sup> | 19 × 50 mm                | OBD Column      | 186002254              |
|                    | 19 × 50 mm               | Column          | 186001930              | 19 × 150 mm               | Column          | 186002255              |
|                    | 19 × 100 mm              | Column          | 186001934              | 19 × 250 mm               | OBD Column      | 186002259              |
|                    | 19 × 150 mm              | Column          | 186002379              | 19 × 300 mm               | Column          | 186002263              |
|                    | 30 × 10 mm               | Guard Cartridge | 186006903 <sup>3</sup> | 30 × 10 mm                | Guard Cartridge | 186006902 <sup>3</sup> |
|                    | 30 × 50 mm               | Column          | 186001938              | 30 × 150 mm               | Column          | 186002267              |
|                    | 30 × 100 mm              | Column          | 186001942              | 30 × 250 mm               | OBD Column      | 186002271              |
|                    | 50 × 50 mm               | Column          | 186002218              | 30 × 300 mm               | Column          | 186002275              |
| 50 × 100 mm        | Column                   | 186002222       | 50 × 50 mm             | OBD Column                | 186002279       |                        |
|                    |                          |                 |                        | 50 × 150 mm               | Column          | 186002843              |
|                    |                          |                 |                        | 50 × 250 mm               | OBD Column      | 186002847              |

<sup>1</sup>Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

<sup>3</sup>Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

<sup>5</sup>Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.



For more information on XTerra Columns, refer to page 133 for 2.5  $\mu$ m and page 166 for 3–5  $\mu$ m column offerings.

XTerra Preparative Columns and Guard Cartridges *Continued*

|                         | Dimension           | Type            | P/N                    | Dimension            | Type            | P/N                    |
|-------------------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
|                         | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
| <b>MS C<sub>8</sub></b> | 7.8 × 10 mm         | Guard Cartridge | 186001169 <sup>5</sup> | 7.8 × 10 mm          | Guard Cartridge | 186001173 <sup>5</sup> |
|                         | 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          | Column          | 186008130              |
|                         | 10 × 50 mm          | Column          | 186008104              | 10 × 250 mm          | Column          | 186008134              |
|                         | 10 × 150 mm         | Column          | 186008142              | 10 × 300 mm          | Column          | 186008138              |
|                         | 19 × 10 mm          | Guard Cartridge | 186001105 <sup>2</sup> | 19 × 10 mm           | Guard Cartridge | 186001035 <sup>2</sup> |
|                         | 19 × 50 mm          | Column          | 186001931              | 19 × 150 mm          | Column          | 186002256              |
|                         | 19 × 100 mm         | Column          | 186001935              | 19 × 250 mm          | OBD Column      | 186002260              |
|                         | 19 × 150 mm         | Column          | 186002380              | 19 × 300 mm          | Column          | 186002264              |
|                         | 30 × 10 mm          | Guard Cartridge | 186006904 <sup>3</sup> | 30 × 150 mm          | Column          | 186002268              |
|                         | 30 × 50 mm          | Column          | 186001939              | 30 × 250 mm          | OBD Column      | 186002272              |
|                         | 30 × 75 mm          | Column          | 186002388              | 30 × 300 mm          | Column          | 186002276              |
|                         | 30 × 100 mm         | Column          | 186001943              | 50 × 50 mm           | OBD Column      | 186002280              |
|                         | 50 × 50 mm          | Column          | 186002219              | 50 × 150 mm          | Column          | 186002844              |
|                         | 50 × 100 mm         | Column          | 186002223              | 50 × 250 mm          | OBD Column      | 186002848              |

|                    | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |
|--------------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|
| <b>Shield RP18</b> | 7.8 × 10 mm         | Guard Cartridge | 186001170 <sup>5</sup> | 7.8 × 10 mm          | Guard Cartridge | 186001174 <sup>5</sup> |
|                    | 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 <sup>1</sup> |
|                    | 10 × 10 mm          | Guard Cartridge | 186001006 <sup>1</sup> | 10 × 150 mm          | Column          | 186008131              |
|                    | 10 × 50 mm          | Column          | 186008105              | 10 × 250 mm          | Column          | 186008135              |
|                    | 10 × 100 mm         | Column          | 186008128              | 10 × 300 mm          | Column          | 186008139              |
|                    | 10 × 150 mm         | Column          | 186008143              | 19 × 10 mm           | Guard Cartridge | 186001036 <sup>2</sup> |
|                    | 19 × 10 mm          | Guard Cartridge | 186001106 <sup>2</sup> | 19 × 150 mm          | Column          | 186002257              |
|                    | 19 × 50 mm          | Column          | 186001932              | 19 × 250 mm          | OBD Column      | 186002261              |
|                    | 19 × 100 mm         | Column          | 186001936              | 19 × 300 mm          | Column          | 186002265              |
|                    | 19 × 150 mm         | Column          | 186002381              | 30 × 10 mm           | Guard Cartridge | 186006905 <sup>3</sup> |
|                    | 30 × 10 mm          | Guard Cartridge | 186006906 <sup>3</sup> | 30 × 150 mm          | Column          | 186002269              |
|                    | 30 × 50 mm          | Column          | 186001940              | 30 × 250 mm          | OBD Column      | 186002273              |
|                    | 30 × 75 mm          | Column          | 186002389              | 30 × 300 mm          | Column          | 186002277              |
|                    | 30 × 100 mm         | Column          | 186001944              | 50 × 50 mm           | OBD Column      | 186002281              |
|                    | 50 × 50 mm          | Column          | 186002220              | 50 × 150 mm          | Column          | 186002845              |
| 50 × 100 mm        | Column              | 186002224       | 50 × 250 mm            | OBD Column           | 186002849       |                        |

<sup>1</sup>Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

<sup>3</sup>Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

<sup>5</sup>Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

XTerra Preparative Columns and Guard Cartridges *Continued*

|                   | Dimension           | Type            | P/N                    | Dimension            | Type            | P/N                    |           |
|-------------------|---------------------|-----------------|------------------------|----------------------|-----------------|------------------------|-----------|
|                   | Particle Size: 5 µm |                 |                        | Particle Size: 10 µm |                 |                        |           |
| <b>Shield RP8</b> | 7.8 × 10 mm         | Guard Cartridge | 186001171 <sup>5</sup> | 7.8 × 10 mm          | Guard Cartridge | 186001175 <sup>5</sup> |           |
|                   | 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 | 18601009 <sup>1</sup>  |           |
|                   | 10 × 10 mm          | Guard Cartridge | 186001008 <sup>1</sup> | 10 × 150 mm          | Column          | 186008132              |           |
|                   | 10 × 50 mm          | Column          | 186008106              | 10 × 250 mm          | Column          | 186008136              |           |
|                   | 10 × 150 mm         | Column          | 186008144              | 10 × 300 mm          | Column          | 186008140              |           |
|                   | 19 × 10 mm          | Guard Cartridge | 186001107 <sup>2</sup> | 19 × 10 mm           | Guard Cartridge | 186001037 <sup>2</sup> |           |
|                   | 19 × 50 mm          | Column          | 186001933              | 19 × 150 mm          | Column          | 186002258              |           |
|                   | 19 × 100 mm         | Column          | 186001937              | 19 × 250 mm          | OBD Column      | 186002262              |           |
|                   | 19 × 150 mm         | Column          | 186002382              | 19 × 300 mm          | Column          | 186002266              |           |
|                   | 30 × 50 mm          | Column          | 186001941              | 30 × 150 mm          | Column          | 186002270              |           |
|                   | 30 × 75 mm          | Column          | 186002390              | 30 × 250 mm          | OBD Column      | 186002274              |           |
|                   | 30 × 100 mm         | Column          | 186001945              | 30 × 300 mm          | Column          | 186002278              |           |
|                   | 50 × 50 mm          | Column          | 186002221              | 50 × 50 mm           | OBD Column      | 186002282              |           |
|                   | 50 × 100 mm         | Column          | 186002225              | 50 × 150 mm          | Column          | 186002846              |           |
|                   |                     |                 |                        |                      | 50 × 250 mm     | OBD Column             | 186002850 |

<sup>1</sup>Requires 10 × 10 mm Cartridge Holder, p/n: 289000779.

<sup>2</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

<sup>5</sup>Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

## 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<sub>18</sub> and C<sub>8</sub>), SymmetryShield (RP18 and RP8), and Symmetry300 (C<sub>18</sub>) Columns.

Symmetry Preparative Columns offer:

- High capacity
- High efficiency
- The ability to scale up methods from Symmetry analytical columns with particles of 35 and 5 µm

### Ordering Information

#### Symmetry Preparative Columns and Guard Cartridges

|                              | Dimension           | Type            | P/N                    | Dimension           | Type            | P/N                    |
|------------------------------|---------------------|-----------------|------------------------|---------------------|-----------------|------------------------|
|                              | Particle Size: 5 µm |                 |                        | Particle Size: 7 µm |                 |                        |
| SymmetryPrep C <sub>18</sub> | 7.8 × 10 mm         | Guard Cartridge | 186000711 <sup>5</sup> | 7.8 × 10 mm         | Guard Cartridge | 186000713 <sup>5</sup> |
|                              | 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 <sup>2</sup> | 19 × 10 mm          | Guard Cartridge | 186000717 <sup>2</sup> |
|                              | 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              |                     |                 |                        |

|                             | Particle Size: 5 µm |                 |                        | Particle Size: 7 µm |                 |                        |
|-----------------------------|---------------------|-----------------|------------------------|---------------------|-----------------|------------------------|
| SymmetryPrep C <sub>8</sub> | 7.8 × 10 mm         | Guard Cartridge | 186000712 <sup>5</sup> | 7.8 × 10 mm         | Guard Cartridge | 186000714 <sup>5</sup> |
|                             | 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 <sup>2</sup> |
|                             | 30 × 50 mm          | Column          | 186000237              | 19 × 150 mm         | Column          | WAT066228              |
|                             | 30 × 100 mm         | Column          | 186000238              | 19 × 300 mm         | Column          | WAT066230              |
|                             |                     |                 |                        |                     |                 |                        |

|                     | Particle Size: 5 µm |                 |                        | Particle Size: 7 µm |        |           |
|---------------------|---------------------|-----------------|------------------------|---------------------|--------|-----------|
| SymmetryShield RP18 | 19 × 10 mm          | Guard Cartridge | 186001835 <sup>2</sup> | 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              |                     |        |           |

<sup>2</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

<sup>5</sup>Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

 For more information on Symmetry Analytical Columns, refer to page 161.

## Symmetry Preparative Columns and Guard Cartridges *Continued*

|                                   | Dimension           | Type            | P/N                    | Dimension           | Type   | P/N       |
|-----------------------------------|---------------------|-----------------|------------------------|---------------------|--------|-----------|
|                                   | Particle Size: 5 µm |                 |                        | Particle Size: 7 µm |        |           |
| <b>SymmetryShield RP8</b>         | 19 × 10 mm          | Guard Cartridge | 186001841 <sup>2</sup> | 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              |                     |        |           |
|                                   | Particle Size: 5 µm |                 |                        | Particle Size: 5 µm |        |           |
| <b>Symmetry300 C<sub>18</sub></b> | 19 × 10 mm          | Guard Cartridge | 186001847 <sup>2</sup> | 19 × 100 mm         | Column | 186001849 |
|                                   | 19 × 50 mm          | Column          | 186001848              | 19 × 150 mm         | Column | 186001850 |

<sup>2</sup>Requires 19 × 10 mm Cartridge Holder, p/n: 186000709.

<sup>3</sup>Requires 7.8 × 10 mm Cartridge Holder, p/n: 186000708.

## 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 Preparative Columns and Guard Cartridges

|                       | Dimension           | Type       | P/N       | Dimension            | Type       | P/N       |
|-----------------------|---------------------|------------|-----------|----------------------|------------|-----------|
|                       | Particle Size: 5 µm |            |           | Particle Size: 10 µm |            |           |
| <b>ODS1</b>           | 10 × 250 mm         | OBD Column | 186008284 | 10 × 250 mm          | OBD Column | 186008285 |
|                       | 20 × 250 mm         | Column     | PSS830695 | 20 × 250 mm          | Column     | PSS830795 |
| <b>ODS2</b>           | 10 × 250 mm         | OBD Column | 186008292 | 10 × 250 mm          | OBD Column | 186008294 |
|                       | 20 × 250 mm         | Column     | PSS831995 | 20 × 250 mm          | Column     | PSS832595 |
| <b>C<sub>8</sub></b>  | 10 × 250 mm         | OBD Column | 186008291 | 10 × 250 mm          | OBD Column | 186008297 |
|                       | 20 × 250 mm         | Column     | PSS831895 | 20 × 250 mm          | Column     | PSS832895 |
| <b>C<sub>6</sub></b>  | 10 × 250 mm         | OBD Column | 186008288 | 20 × 250 mm          | Column     | PSS833295 |
|                       | 20 × 250 mm         | Column     | PSS831095 |                      |            |           |
| <b>C<sub>1</sub></b>  | 10 × 250 mm         | OBD Column | 186008295 | 20 × 250 mm          | Column     | PSS833095 |
|                       | 20 × 250 mm         | Column     | PSS832695 |                      |            |           |
| <b>NH<sub>2</sub></b> | 10 × 250 mm         | OBD Column | 186008289 | 10 × 250 mm          | OBD Column | 186008299 |
|                       | 20 × 250 mm         | Column     | PSS831195 | 20 × 250 mm          | Column     | PSS833695 |

## Spherisorb Preparative Columns and Guard Cartridges *Continued*

|                 | Dimension                      | Type       | P/N       | Dimension                       | Type       | P/N       |
|-----------------|--------------------------------|------------|-----------|---------------------------------|------------|-----------|
|                 | Particle Size: 5 $\mu\text{m}$ |            |           | Particle Size: 10 $\mu\text{m}$ |            |           |
| Phenyl          | 10 $\times$ 250 mm             | OBD Column | 186008286 | 10 $\times$ 250 mm              | OBD Column | 186008300 |
|                 | 20 $\times$ 250 mm             | Column     | PSS830895 | 20 $\times$ 250 mm              | Column     | PSS833895 |
| CN Normal Phase | 10 $\times$ 250 mm             | OBD Column | 186008287 | 10 $\times$ 250 mm              | OBD Column | 186008298 |
|                 | 20 $\times$ 250 mm             | Column     | PSS830995 | 20 $\times$ 250 mm              | Column     | PSS833595 |
| Silica          | 10 $\times$ 250 mm             | OBD Column | 186008281 | 10 $\times$ 250 mm              | OBD Column | 186008282 |
|                 | 20 $\times$ 250 mm             | Column     | PSS830195 | 20 $\times$ 250 mm              | Column     | PSS830295 |
| SAX             | 10 $\times$ 250 mm             | OBD Column | 186008296 | 10 $\times$ 250 mm              | OBD Column | 186008301 |
|                 | 20 $\times$ 250 mm             | Column     | PSS832795 | 20 $\times$ 250 mm              | Column     | PSS833995 |
| SCX             | 10 $\times$ 250 mm             | OBD Column | 186008302 | 10 $\times$ 250 mm              | OBD Column | 186008303 |
|                 | 20 $\times$ 250 mm             | Column     | PSS837595 | 20 $\times$ 250 mm              | Column     | PSS837695 |

## Nova-Pak Preparative Columns

Nova-Pak HR, 6  $\mu\text{m}$ , ultra high-efficiency packing materials are available as shorter columns to facilitate separation, 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  $\mu\text{m}$  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

### Prep Nova-Pak HR Preparative Columns

|                       | Dimension                      | P/N       |
|-----------------------|--------------------------------|-----------|
|                       | Particle Size: 6 $\mu\text{m}$ |           |
| C <sub>18</sub> , 60Å | 3.9 $\times$ 300 mm            | WAT038500 |
|                       | 7.8 $\times$ 300 mm            | WAT025820 |
|                       | 19 $\times$ 300 mm             | WAT025822 |
| Silica, 60Å           | 3.9 $\times$ 300 mm            | WAT038501 |
|                       | 7.8 $\times$ 300 mm            | WAT025821 |
|                       | 19 $\times$ 300 mm             | WAT025823 |

 For more information on Nova-Pak Columns, refer to page 173.

## μBondapak, Bondapak, μPorasil, and Porasil Columns

The popular μBondapak C<sub>18</sub> chemistry and μPorasil silica packing materials are offered in the 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 scaled-up separations.

The preparative Bondapak HC<sub>18</sub> 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<sub>18</sub> 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 Preparative Columns

|                                | Dimension    | P/N       |
|--------------------------------|--------------|-----------|
| <b>Particle Size: 10 μm</b>    |              |           |
| C <sub>18</sub> , 125Å         | 2.1 × 300 mm | WAT086609 |
|                                | 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 |
| <b>Particle Size: 15–20 μm</b> |              |           |
|                                | 3.9 × 150 mm | WAT025875 |
|                                | 7.8 × 300 mm | WAT025832 |
|                                | 19 × 300 mm  | WAT025834 |

|          | Particle Size: 10 μm |           |
|----------|----------------------|-----------|
| CN, 125Å | 3.9 × 150 mm         | WAT086688 |
|          | 3.9 × 300 mm         | WAT084042 |
|          | 7.8 × 300 mm         | WAT084177 |

|                        | Particle Size: 10 μm |           |
|------------------------|----------------------|-----------|
| NH <sub>2</sub> , 125Å | 3.9 × 300 mm         | WAT084040 |
|                        | 7.8 × 300 mm         | WAT084178 |

|              | Particle Size: 10 μm |           |
|--------------|----------------------|-----------|
| Phenyl, 125Å | 3.9 × 150 mm         | WAT086680 |
|              | 3.9 × 300 mm         | WAT027198 |
|              | 7.8 × 300 mm         | WAT084179 |

### μPorasil/Porasil and Preparative Columns

|                                | Dimension    | P/N       |
|--------------------------------|--------------|-----------|
| <b>Particle Size: 10 μm</b>    |              |           |
| μPorasil, 125Å                 | 3.9 × 150 mm | WAT086692 |
|                                | 3.9 × 300 mm | WAT027477 |
|                                | 7.8 × 300 mm | WAT084175 |
|                                | 19 × 150 mm  | WAT091648 |
|                                | 19 × 300 mm  | WAT025829 |
| <b>Particle Size: 15–20 μm</b> |              |           |
| Porasil, 125Å                  | 3.9 × 300 mm | WAT025874 |
|                                | 19 × 300 mm  | WAT025835 |



## 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  $\mu\text{m}$  packing. The 5  $\mu\text{m}$  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 Radial Compression Column Segments and, PrepPak Cartridges\*

|                                  | Dimension    | Type        | P/N       |
|----------------------------------|--------------|-------------|-----------|
| Particle Size: 15 $\mu\text{m}$  |              |             |           |
| Delta-Pak C <sub>18</sub> , 100Å | 8.0 × 100 mm | Column      | WAT025846 |
|                                  | 25 × 100 mm  | Column      | WAT038506 |
|                                  | 25 × 10 mm   | Guard, 2/pk | WAT038520 |
|                                  | 40 × 100 mm  | Column      | WAT037688 |
|                                  | 40 × 10 mm   | Guard, 2/pk | WAT037842 |
| Delta-Pak C <sub>18</sub> , 300Å | 8.0 × 100 mm | Column      | WAT025845 |
|                                  | 25 × 100 mm  | Column      | WAT038507 |
|                                  | 25 × 10 mm   | Guard, 2/pk | WAT038522 |
|                                  | 40 × 100 mm  | Column      | WAT037692 |
|                                  | 40 × 10 mm   | Guard, 2/pk | WAT037845 |
| Delta-Pak C <sub>4</sub> , 100Å  | 8.0 × 100 mm | Column      | WAT025848 |
|                                  | 25 × 100 mm  | Column      | WAT038508 |
|                                  | 25 × 10 mm   | Guard, 2/pk | WAT038524 |
|                                  | 40 × 100 mm  | Column      | WAT037696 |
| Delta-Pak C <sub>4</sub> , 300Å  | 25 × 100 mm  | Column      | WAT038509 |
|                                  | 25 × 10 mm   | Guard, 2/pk | WAT038526 |
|                                  | 40 × 100 mm  | Column      | WAT037700 |
|                                  | 40 × 10 mm   | Guard, 2/pk | WAT037851 |

## Delta-Pak Preparative Columns

|                                  | Dimension    | P/N       |
|----------------------------------|--------------|-----------|
| Particle Size: 15 $\mu\text{m}$  |              |           |
| Delta-Pak C <sub>18</sub> , 100Å | 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 <sub>18</sub> , 300Å | 3.9 × 300 mm | WAT011802 |
|                                  | 7.8 × 300 mm | WAT011803 |
|                                  | 19 × 300 mm  | WAT011804 |
|                                  | 30 × 300 mm  | WAT011805 |
| Delta-Pak C <sub>4</sub> , 100Å  | 3.9 × 300 mm | WAT011807 |
|                                  | 7.8 × 300 mm | WAT011808 |
|                                  | 19 × 300 mm  | WAT011809 |
|                                  | 30 × 300 mm  | WAT011810 |
| Delta-Pak C <sub>4</sub> , 300Å  | 3.9 × 300 mm | WAT011812 |
|                                  | 7.8 × 300 mm | WAT011813 |
|                                  | 19 × 300 mm  | WAT011814 |
|                                  | 30 × 300 mm  | WAT011815 |

## 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  | 700009231 |

#### 19 × 10 mm Prep Guard Holder and Cartridge



#### 30 × 10 mm Prep Guard Holder and Cartridge



 For more information on Delta-Pak Columns, refer to page 174.

## 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 1 void marker, 1 acidic, 1 basic, and 1 neutral probes. | Reversed-phase       | All Purification Systems                          | <b>5 mg/mL each:</b><br>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 3 dyes.  | Reversed-phase       | All Purification Systems with Fraction Collectors | <b>3 ampoules of test mix containing:</b><br>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](http://asr.waters.com).

## Preparative Bulk Material

Waters offers various kinds of bulk packing materials for lab-to-process scale purifications. All are manufactured in accordance with our ISO 9001-certified manufacturing processes and cGMP (current Good Manufacturing Practices) guidelines, ensuring long-term reproducible material.

Bulk materials are available packaged in quantities of 100 g to 5 kg. For larger quantity purchases, inquire about pricing and availability.

### Ordering Information

#### Reversed-phase Bulk Packings

|  | Qty.  | P/N       |
|--|-------|-----------|
| <b>Particle Size: 10 µm</b>              |       |           |
| <b>XBridge BEH C<sub>18</sub>, 130Å</b>  | 1 kg  | 186008658 |
| <b>SunFire C<sub>18</sub>, 100Å</b>      | 1 kg  | 186007650 |
| <b>Particle Size: 15-20 µm</b>           |       |           |
| <b>Bondapak C<sub>18</sub>, 125Å</b>     | 100 g | WAT020739 |
|  | 1 kg  | WAT020740 |
|  | 5 kg  | WAT020741 |
| <b>Particle Size: 37-55 µm</b>           |       |           |
| <b>Bondapak HC<sub>18</sub> HA, 125Å</b> | 100 g | WAT030632 |
|  | 1 kg  | WAT030633 |
|  | 5 kg  | WAT030634 |
| <b>Particle Size: 37-55 µm</b>           |       |           |
| <b>Bondapak HC<sub>18</sub> HA, 125Å</b> | 100 g | WAT035672 |
|  | 1 kg  | WAT035674 |
|  | 5 kg  | WAT035676 |
| <b>Particle Size: 55-105 µm</b>          |       |           |
| <b>Prep C<sub>18</sub>, 125Å</b>         | 100 g | WAT020594 |
|  | 1 kg  | WAT010001 |
|  | 5 kg  | WAT020595 |
|  | 25 kg | WAT020596 |

#### Normal-phase Bulk Packings

|                                 | Qty.  | P/N       |
|---------------------------------|-------|-----------|
| <b>Particle Size: 10 µm</b>     |       |           |
| <b>µPorasil Silica, 125Å</b>    | 5 kg  | 186005791 |
| <b>Particle Size: 15-20 µm</b>  |       |           |
| <b>Porasil Silica, 125Å</b>     | 100 g | WAT020731 |
|                                 | 1 kg  | WAT020732 |
|                                 | 5 kg  | WAT020733 |
|                                 | 25 kg | WAT020734 |
| <b>Particle Size: 37-55 µm</b>  |       |           |
| <b>Prep Silica, 125Å</b>        | 100 g | WAT020721 |
|                                 | 1 kg  | WAT020722 |
|                                 | 5 kg  | WAT020723 |
|                                 | 25 kg | WAT020724 |
| <b>Particle Size: 55-105 µm</b> |       |           |
| <b>Prep Silica, 125Å</b>        | 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 unequalled 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 <sup>2</sup> /g) | Density (g/cm <sup>3</sup> ) | 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:<br>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:<br>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:<br>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:<br>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 x 100 Cartridge Holder (p/n: WAT082887)  
for 8 x 100 mm and 5 x 100 mm Radial-Pak  
Column Segments.



(p/n: WAT015814)

#### 8 x 100 Cartridge Holder, Parts, and Accessories

| Dimension   | P/N       |
|---|-----------|
| 8 x 100 Cartridge Holder  | WAT082887 |
| 8 x 100 Extension Kit (Includes 1 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.

#### PrepLC 25 mm Module, Parts, and Accessories

| Dimension  | P/N       |
|--|-----------|
| PrepLC 25 mm Module  | WAT015814 |
| PrepLC 25 mm Extension Kit (Includes 1 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 1 Extension Tube, Union, and O-rings)   | WAT022180 |
| PrepLC Scale-up Kit with Capability for 40 mm or 25 x 300 Length   |           |
| Includes: 1 - PrepLC Universal Base<br>2 - PrepLC Chambers (One each of 40 mm and 25 mm)<br>2 - PrepLC 25 mm Extension Kits<br>2 - PrepLC 40 mm Extension Kits | WAT022440 |

#### PrepLC Assembly\* 40 x 100 mm



(p/n: WAT022440)

## PrepLC Spare Parts

| Description  | P/N       |
|--|-----------|
| <b>PrepLC Universal Base Spare Parts</b>   |           |
| 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 |
| <b>PrepLC 40 mm Chamber Spare Parts</b>  |           |
| 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 (Normal-phase) Chamber, Bottom  | WAT022299 |
| O-ring (Normal-phase) Inner Connector, Top and Bottom  | WAT022297 |
| 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 |
| <b>PrepLC 25 mm Chamber Spare Parts</b>  |           |
| 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 (Normal-phase) Chamber Bottom   | WAT022298 |
| O-ring (Normal-phase) Inner Connector, Top and Bottom  | WAT022297 |
| 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)<br>(Includes Inner Connectors, Tubing, Ferrules, and Compression Screws) | WAT022400 |

\*For applications where a metal-free flow path is needed.

## RADIAL COMPRESSION MODULE CARTRIDGES

### Ordering Information



#### PrepPak Cartridges\*

|  | Dimension   | P/N       |
|--|-------------|-----------|
| <b>Particle Size: 15–20 µm</b>                         |             |           |
| Bondapak C <sub>18</sub> , 125Å                        | 47 × 300 mm | WAT091784 |
| Bondapak C <sub>18</sub> , 300Å                        | 47 × 300 mm | WAT038571 |
| <b>Particle Size: 37–55 µm</b>                         |             |           |
| Bondapak HC <sub>18</sub> HA, 125Å                     | 47 × 300 mm | WAT038570 |
| <b>Particle Size: 55–105 µm</b>                        |             |           |
| Bondapak NH <sub>2</sub> a, 125Å                       | 47 × 300 mm | WAT091631 |
| <b>Particle Size: 15 µm</b>                            |             |           |
| Delta-Pak C <sub>18</sub> , 100Å                       | 47 × 300 mm | WAT015401 |
| Delta-Pak C <sub>18</sub> , 300Å                       | 47 × 300 mm | WAT010988 |
| <b>Particle Size: 15 µm</b>                            |             |           |
| Delta-Pak C <sub>4</sub> , 100Å                        | 47 × 300 mm | WAT011633 |
| Delta-Pak C <sub>4</sub> , 300Å                        | 47 × 300 mm | WAT011669 |
| <b>Particle Size: 55–105 µm</b>                        |             |           |
| Prep C <sub>18</sub> , 125Å                            | 47 × 300 mm | WAT025876 |
| <b>Particle Size: 37–55 µm</b>                         |             |           |
| Porasil Silica (single), 125Å                          | 47 × 300 mm | WAT025853 |
| <b>Particle Size: 37–55 µm</b>                         |             |           |
| Porasil Silica (10/case), 125Å                         | 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 220.

#### Delta-Pak Radial Compression Column Segments and PrepPak Cartridges\*

|                                  | Dimension   | Type        | P/N       |
|----------------------------------|-------------|-------------|-----------|
| <b>Particle Size: 15 µm</b>      |             |             |           |
| Delta-Pak C <sub>18</sub> , 100Å | 8 × 100 mm  | Column      | WAT025846 |
|                                  | 25 × 100 mm | Column      | WAT038506 |
|                                  | 25 × 10 mm  | Guard, 2/pk | WAT038520 |
|                                  | 40 × 100 mm | Column      | WAT037688 |
|                                  | 40 × 10 mm  | Guard, 2/pk | WAT037842 |
| <b>Particle Size: 15 µm</b>      |             |             |           |
| Delta-Pak C <sub>18</sub> , 300Å | 8 × 100 mm  | Column      | WAT025845 |
|                                  | 25 × 100 mm | Column      | WAT038507 |
|                                  | 25 × 10 mm  | Guard, 2/pk | WAT038522 |
|                                  | 40 × 100 mm | Column      | WAT037692 |
|                                  | 40 × 10 mm  | Guard, 2/pk | WAT037845 |
| <b>Particle Size: 15 µm</b>      |             |             |           |
| Delta-Pak C <sub>4</sub> , 100Å  | 8 × 100 mm  | Column      | WAT025848 |
|                                  | 25 × 100 mm | Column      | WAT038508 |
|                                  | 25 × 10 mm  | Guard, 2/pk | WAT038524 |
|                                  | 40 × 100 mm | Column      | WAT037696 |
| <b>Particle Size: 15 µm</b>      |             |             |           |
| Delta-Pak C <sub>4</sub> , 300Å  | 25 × 100 mm | Column      | WAT038509 |
|                                  | 25 × 10 mm  | Guard, 2/pk | WAT038526 |
|                                  | 40 × 100 mm | Column      | WAT037700 |
|                                  | 40 × 10 mm  | Guard, 2/pk | WAT037851 |

\*All column segments and cartridges require the appropriate holder/module, see page 220.

#### Resolve Radial Compression Column Segments and PrepPak Cartridges\*

|                             | Dimension  | P/N                    |
|-----------------------------|------------|------------------------|
| <b>Particle Size: 5 µm</b>  |            |                        |
| C <sub>18</sub> , 90Å       | 8 × 100 mm | WAT084624 <sup>1</sup> |
| <b>Particle Size: 10 µm</b> |            |                        |
|                             | 5 × 100 mm | WAT084620              |
|                             | 8 × 100 mm | WAT084720              |
| <b>Particle Size: 10 µm</b> |            |                        |
| C <sub>8</sub> , 90Å        | 5 × 100 mm | WAT085672              |
|                             | 8 × 100 mm | WAT085670              |

|                             | Dimension  | P/N       |
|-----------------------------|------------|-----------|
| <b>Particle Size: 5 µm</b>  |            |           |
| Silica, 90Å                 | 8 × 100 mm | WAT084634 |
| <b>Particle Size: 10 µm</b> |            |           |
|                             | 5 × 100 mm | WAT084630 |
|                             | 8 × 100 mm | WAT084730 |
| <b>Particle Size: 10 µm</b> |            |           |
| CN, 90Å                     | 5 × 100 mm | WAT084626 |
|                             | 8 × 100 mm | WAT084636 |

<sup>1</sup>Requires 8 × 100 Cartridge Holder, p/n: WAT082887.

## Nova-Pak and Prep Nova-Pak Radial Compression Column Segments and PrepPak Cartridges

|   | Dimension  | P/N                        |
|---|------------|----------------------------|
| <b>Nova-Pak Radial-Pak Column Segments*</b> |            |                            |
|   |            | <b>Particle Size: 4 µm</b> |
| Nova-Pak C <sub>18</sub> , 60Å              | 5 × 100 mm | WAT080100                  |
|   | 8 × 100 mm | WAT086342                  |
| Nova-Pak C <sub>8</sub> , 60Å               | 5 × 100 mm | WAT035890                  |
|   | 8 × 100 mm | WAT035884                  |
| Nova-Pak Phenyl, 60Å                        | 5 × 100 mm | WAT010657                  |
|   | 8 × 100 mm | WAT010658                  |
| Nova-Pak CN HP, 60Å                         | 5 × 100 mm | WAT010224                  |
|   | 8 × 100 mm | WAT010223                  |
| Nova-Pak Silica, 60Å                        | 5 × 100 mm | WAT010986                  |
|   | 8 × 100 mm | WAT010987                  |

\*Requires 8 × 100 mm Cartridge Holder, p/n: WAT082887.

| <b>Prep Nova-Pak HR Radial-Pak Column Segments</b> |            | <b>Particle Size: 6 µm</b> |
|--|------------|----------------------------|
| Prep Nova-Pak HR C <sub>18</sub> , 60Å             | 8 × 100 mm | WAT025843                  |
| Prep Nova-Pak HR Silica, 60Å                       | 8 × 100 mm | WAT025844                  |

| <b>Prep Nova-Pak HR PrepLC 25 mm Column Segments</b> |             | <b>Particle Size: 6 µm</b> |
|--|-------------|----------------------------|
| Prep Nova-Pak HR C <sub>18</sub> , 60Å               | 25 × 100 mm | WAT038510                  |
| Prep Nova-Pak HR Silica, 60Å                         | 25 × 100 mm | WAT038511                  |

| <b>Prep Nova-Pak HR 25 × 10 Guard-Pak Inserts, 2/pk</b> |            | <b>Particle Size: 6 µm</b> |
|---|------------|----------------------------|
| Prep Nova-Pak HR C <sub>18</sub> , 60Å                  | 25 × 10 mm | WAT038528                  |
| Prep Nova-Pak HR Silica, 60Å                            | 25 × 10 mm | WAT038530                  |

| <b>Prep Nova-Pak HR PrepLC 40 mm Column Segments</b> |             | <b>Particle Size: 6 µm</b> |
|--|-------------|----------------------------|
| Prep Nova-Pak HR C <sub>18</sub> , 60Å               | 40 × 100 mm | WAT037704                  |
| Prep Nova-Pak HR Silica, 60Å                         | 40 × 100 mm | WAT037708                  |

| <b>Prep Nova-Pak HR 40 × 10 Guard-Pak Inserts, 2/pk</b> |            | <b>Particle Size: 6 µm</b> |
|---|------------|----------------------------|
| Prep Nova-Pak HR C <sub>18</sub> , 60Å                  | 40 × 10 mm | WAT037854                  |
| Prep Nova-Pak HR Silica, 60Å                            | 40 × 10 mm | WAT037857                  |



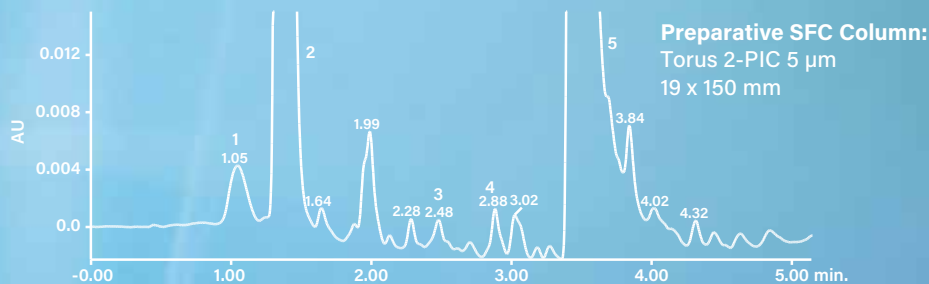
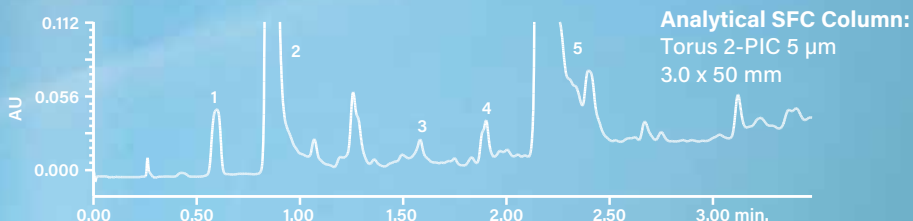
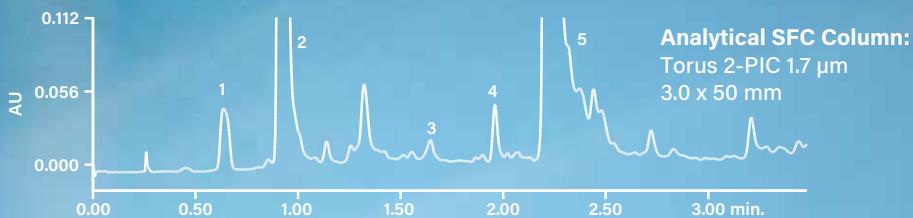
# Scale SFC from Analytical to Preparative with Torus Columns

## NEW ACHIRAL SFC COLUMNS

- Access the power of normal-phase chromatography with the ease and reliability of reversed-phase chromatography
- Rugged SFC Preparative Columns for exceptional column lifetimes
- Unequaled speed and unparalleled confidence

Torus Columns are available in four scalable chemistries:

- Torus 2-PIC 1.7  $\mu\text{m}$   $\rightarrow$  Torus 2-PIC 5  $\mu\text{m}$
- Torus DEA 1.7  $\mu\text{m}$   $\rightarrow$  Torus DEA 5  $\mu\text{m}$
- Torus DIOL 1.7  $\mu\text{m}$   $\rightarrow$  Torus DIOL 5  $\mu\text{m}$
- Torus 1-AA 1.7  $\mu\text{m}$   $\rightarrow$  Torus 1-AA 5  $\mu\text{m}$



Goldenseal Extract: 1. Canadine 2. Hydrastine 3. Isocorypalmine 4. Methyl Hydrastine 5. Berberine



SFC



See page 228 for more information.

# SFC Analytical and Preparative Columns

SFC Analytical and Preparative Columns



"Quality is everybody's responsibility."

~ Patricia Walsh, Column Manufacturing Production Manager, Wexford, Ireland

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# SFC Analytical and Preparative Columns

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

The Torus™, Trefoil®, and Viridis® Column Chemistries, combined with Waters SFC instrumentation, will enable separation scientists to better access the power of normal-phase chromatography with the ease and reliability of reversed-phase chromatography. These achiral and chiral SFC column chemistries provide the ability to handle achiral and chiral separations with unequalled speed and unparalleled confidence.



### Column Characteristics

| Column  | Particle Shape | Particle Size  | Pore Volume | Pore Size | Surface Area          | Carbon Load | Chemistry   |
|---|----------------|----------------|-------------|-----------|-----------------------|-------------|---|
| <b>Torus Analytical &amp; Preparative Achiral SFC Columns</b>   |                |                |             |           |                       |             |   |
| Torus 2-PIC   | Spherical      | 1.7, 5 µm      | 0.7 cc/g    | 130Å      | 185 m <sup>2</sup> /g | —           | 2-Picolylamine                                    |
| Torus DEA   | Spherical      | 1.7, 5 µm      | 0.7 cc/g    | 130Å      | 185 m <sup>2</sup> /g | —           | Diethylamine                                      |
| Torus DIOL  | Spherical      | 1.7, 5 µm      | 0.7 cc/g    | 130Å      | 185 m <sup>2</sup> /g | —           | Diol  |
| Torus 1-AA  | Spherical      | 1.7, 5 µm      | 0.7 cc/g    | 130Å      | 185 m <sup>2</sup> /g | —           | 1-Aminoanthracene                                 |
| <b>Trefoil Analytical Chiral SFC Column</b>                     |                |                |             |           |                       |             |   |
| 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) |
| <b>Viridis Analytical &amp; Preparative Achiral SFC Columns</b> |                |                |             |           |                       |             |   |
| Viridis BEH 2-EP  | Spherical      | 1.7, 3.5, 5 µm | 0.7 cc/g    | 130Å      | 185 m <sup>2</sup> /g | 9%          | 2-Ethylpyridine                                   |
| Viridis BEH   | Spherical      | 1.7, 3.5, 5 µm | 0.7 cc/g    | 130Å      | 185 m <sup>2</sup> /g | N/A         | Unbonded  |
| Viridis CSH Fluoro-Phenyl                                       | Spherical      | 1.7, 3.5, 5 µm | 0.7 cc/g    | 130Å      | 185 m <sup>2</sup> /g | 10%         | CSH fluoro-phenyl                                 |
| Viridis HSS C <sub>18</sub> -SB                                 | Spherical      | 1.8, 3.5 µm    | 0.7 cc/g    | 100Å      | 230 m <sup>2</sup> /g | 8.5%        | C <sub>18</sub>                                   |
| Viridis Silica 2-EP   | Spherical      | 5 µm           | 0.9 cc/g    | 100Å      | 340 m <sup>2</sup> /g | 8%          | 2-Ethylpyridine                                   |
| Viridis Silica  | Spherical      | 5 µm           | 0.9 cc/g    | 100Å      | 340 m <sup>2</sup> /g | N/A         | Unbonded  |

The use of compressed liquid CO<sub>2</sub> 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 5  $\mu\text{m}$  Preparative Columns offer:

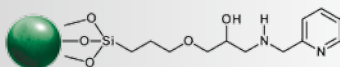
- Excellent peak shapes
- A wide range of unique selectivities with unique ligands
- Highest efficiency and QC-ready robustness
- Waters OBD Technology



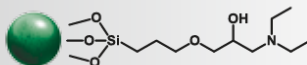
Torus Columns are designed for achiral SFC separations, offer a wide range of selectivity, excellent peak shape, and are suited for method transfer and method scale-up. Torus Columns are offered in 1.7 and 5  $\mu\text{m}$  chemistries in both analytical and preparative column formats.

The Torus Phases are based on patent-pending two-stage functionalization of ethylene bridged hybrid (BEH) particles. The initial bonding provides a hydrophilic surface that controls the retention characteristics of the sorbent, and is responsible for minimizing unwanted surface interactions, which lead to retention and selectivity changes over time. The second step of the functionalization is responsible for the individual selectivity and peak shape characteristics of each of the Torus Chemistries. The results of these steps are a series of stationary phases with broad ranging selectivities, which maintain robust chromatographic performance over the lifetime of the column.

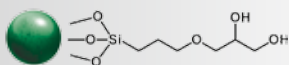
Torus 2-PIC, 1.7  $\mu\text{m}$  and 5  $\mu\text{m}$  Columns  
2-Picolylamine



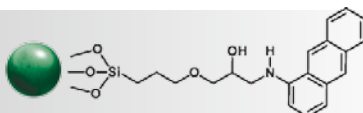
Torus DEA, 1.7  $\mu\text{m}$  and 5  $\mu\text{m}$  Columns  
Diethylamine



Torus DIOL, 1.7  $\mu\text{m}$  and 5  $\mu\text{m}$  Columns  
High Density Diol

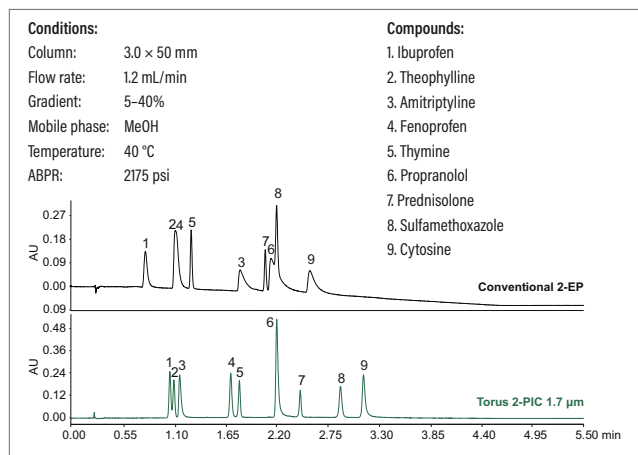


Torus 1-AA, 1.7  $\mu\text{m}$  and 5  $\mu\text{m}$  Columns  
1-Aminoanthracene



## TORUS 2-PIC (2-PICOLYLAMINE)

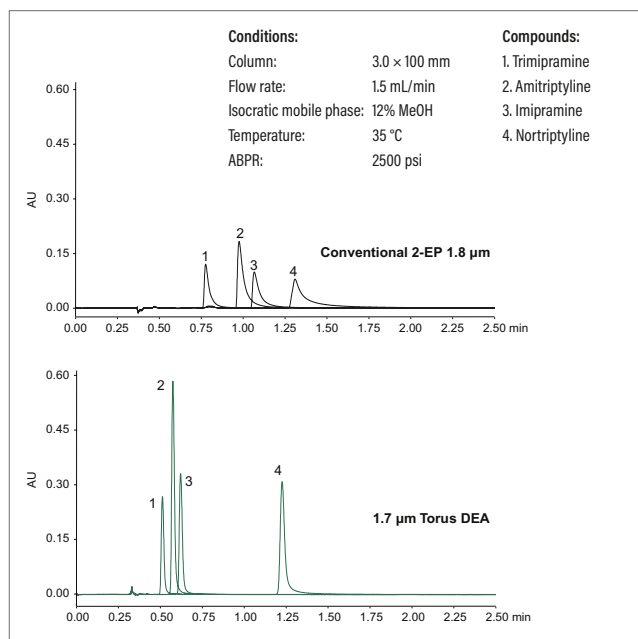
Torus 2-PIC Columns were designed for general use and are the first choice for a wide range of applications with acidic and basic compounds. The Torus 2-PIC phase demonstrates enhanced performance compared to conventional 2-ethylpyridine (2-EP), displaying improved peak shape, added retention, and novel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



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

## TORUS DEA (DIETHYLAMINE)

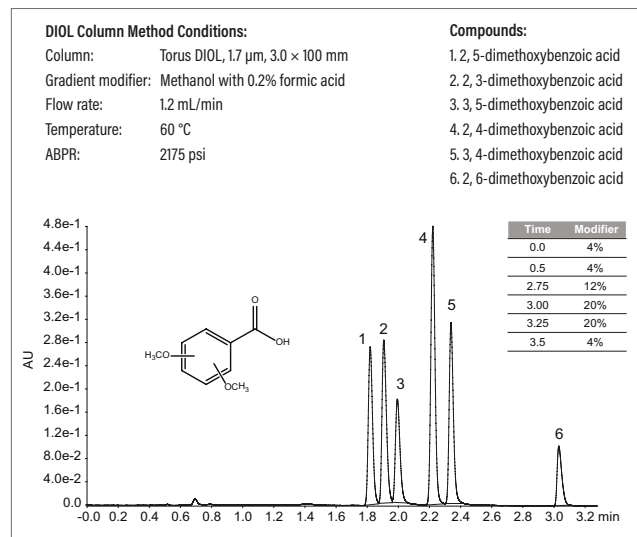
Torus DEA Columns are designed to be orthogonal to the Torus 2-PIC phase. Designed to provide superior peak shape for very strong bases, these columns provide a complementary selectivity to the 2-PIC stationary phase.



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

## TORUS 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.



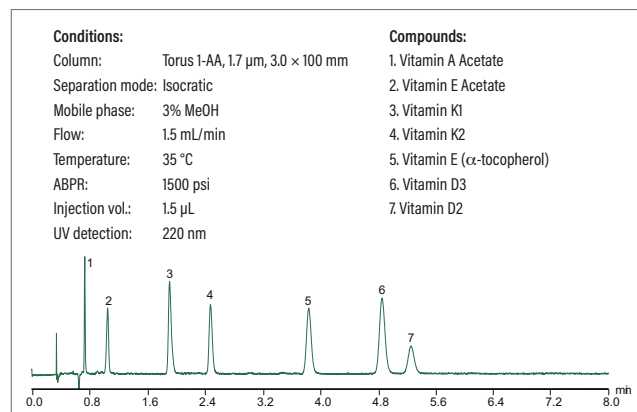
Torus DIOL Columns show good peak shapes for acidic compounds, as demonstrated by the separation of six isomeric forms of dimethoxybenzoic acid.

## TORUS 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 ( $S > 90$ ) to the 2-PIC phase, making it very useful in method development.

Torus 1-AA Columns are best used for:


- Hydrophobic (lipophilic) compounds
- Free fatty acids
- Fat-soluble vitamins
- Lipids
- Natural products
- Steroids



Torus 1-AA Column shows good peak shape and resolution of fat-soluble vitamins.

## Torus Columns for Achiral Method Development

For method development, it is crucial to have a series of columns that have significantly differing selectivities and good retentivity. The Torus Chemistries were specifically chosen to provide a breadth of selectivities for acids, bases, and neutral analytes. For more information on achiral SFC method development, visit [www.waters.com/torus](http://www.waters.com/torus) and view the webcast titled "Torus Columns for Achiral Method Development".

 Visit [www.waters.com/torus](http://www.waters.com/torus)

### Ordering Information

#### Torus Analytical Columns

|                                       | Torus 2-PIC                  | Torus DEA | Torus DIOL | Torus 1-AA |
|---------------------------------------|------------------------------|-----------|------------|------------|
| <b>Dimension</b>                      | <b>Particle Size: 1.7 µm</b> |           |            |            |
| 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  |

| <b>Dimension</b> | <b>Particle Size: 5 µm</b> |           |           |           |
|------------------|----------------------------|-----------|-----------|-----------|
| 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

| <b>Dimension</b>   | <b>Particle Size: 1.7 µm</b> |
|--|------------------------------|
| 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.

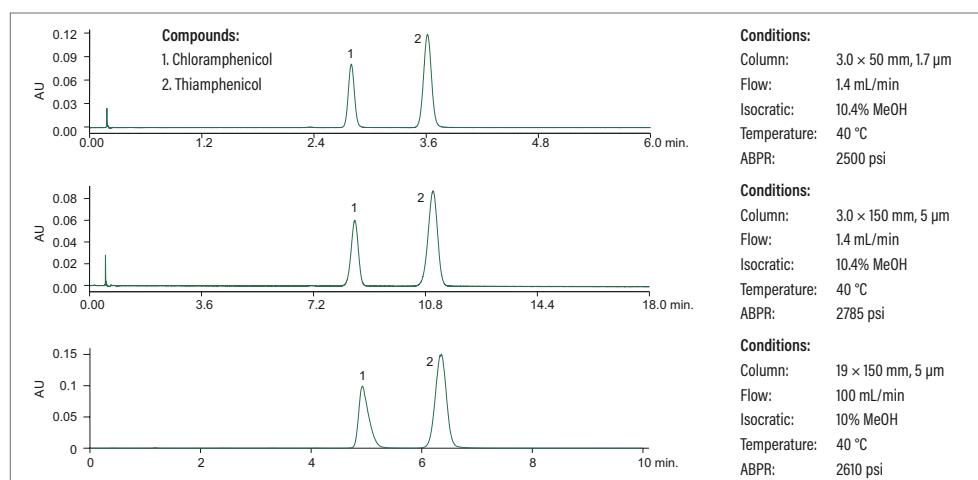
You can base a scale-up of screening methods on any of the four Torus analytical-column chemistries to perform 5  $\mu$ m Torus Preparative SFC Separations.

Torus 2-PIC 1.7  $\mu$ m Columns → Torus 2-PIC 5  $\mu$ m Preparative Columns

Torus DEA 1.7  $\mu$ m Columns → Torus DEA 5  $\mu$ m Preparative Columns

Torus DIOL 1.7  $\mu$ m Columns → Torus DIOL 5  $\mu$ m Preparative Columns

Torus 1-AA 1.7  $\mu$ m Columns → Torus 1-AA 5  $\mu$ m Preparative Columns



*Scale-up of an analytical method from a Torus 2-PIC, 1.7  $\mu$ m column of two closely related antibiotics, chloramphenicol and thiamphenicol, to a Torus 2-PIC, 5  $\mu$ m, preparative column.*

## Ordering Information

### Torus OBD Preparative Columns

|                              | Torus 2-PIC                               | Torus DIOL | Torus DEA | Torus AA  |
|------------------------------|---|------------|-----------|-----------|
| <b>Dimension</b>             | <b>Particle Size: 5 <math>\mu</math>m</b> |            |           |           |
| OBD 10 × 50 mm               | 186008581                                 | 186008598  | 186008615 | 186008632 |
| OBD 10 × 100 mm              | 186008582                                 | 186008599  | 186008616 | 186008633 |
| OBD 10 × 150 mm              | 186008583                                 | 186008600  | 186008617 | 186008634 |
| OBD 10 × 250 mm              | 186008584                                 | 186008601  | 186008618 | 186008635 |
| 19 × 10 mm Guard Cartridge*  | 186008741                                 | 186008742  | 186008743 | 186008744 |
| OBD 19 × 50 mm               | 186008585                                 | 186008602  | 186008619 | 186008636 |
| OBD 19 × 100 mm              | 186008586                                 | 186008603  | 186008620 | 186008637 |
| OBD 19 × 150 mm              | 186008587                                 | 186008604  | 186008621 | 186008638 |
| OBD 19 × 250 mm              | 186008588                                 | 186008605  | 186008622 | 186008639 |
| 30 × 10 mm Guard Cartridge** | 186008650                                 | 186008651  | 186008652 | 186008653 |
| OBD 30 × 50 mm               | 186008589                                 | 186008606  | 186008623 | 186008640 |
| OBD 30 × 75 mm               | 186008590                                 | 186008607  | 186008624 | 186008641 |
| OBD 30 × 100 mm              | 186008591                                 | 186008608  | 186008625 | 186008642 |
| OBD 30 × 150 mm              | 186008592                                 | 186008609  | 186008626 | 186008643 |
| OBD 30 × 250 mm              | 186008593                                 | 186008610  | 186008627 | 186008644 |
| OBD 50 × 50 mm               | 186008594                                 | 186008611  | 186008628 | 186008645 |
| OBD 50 × 100 mm              | 186008595                                 | 186008612  | 186008629 | 186008646 |
| OBD 50 × 150 mm              | 186008596                                 | 186008613  | 186008630 | 186008648 |
| OBD 50 × 250 mm              | 186008597                                 | 186008614  | 186008631 | 186008649 |

\* Requires 19 mm I.D. Prep Guard Holder, p/n: 186008745.

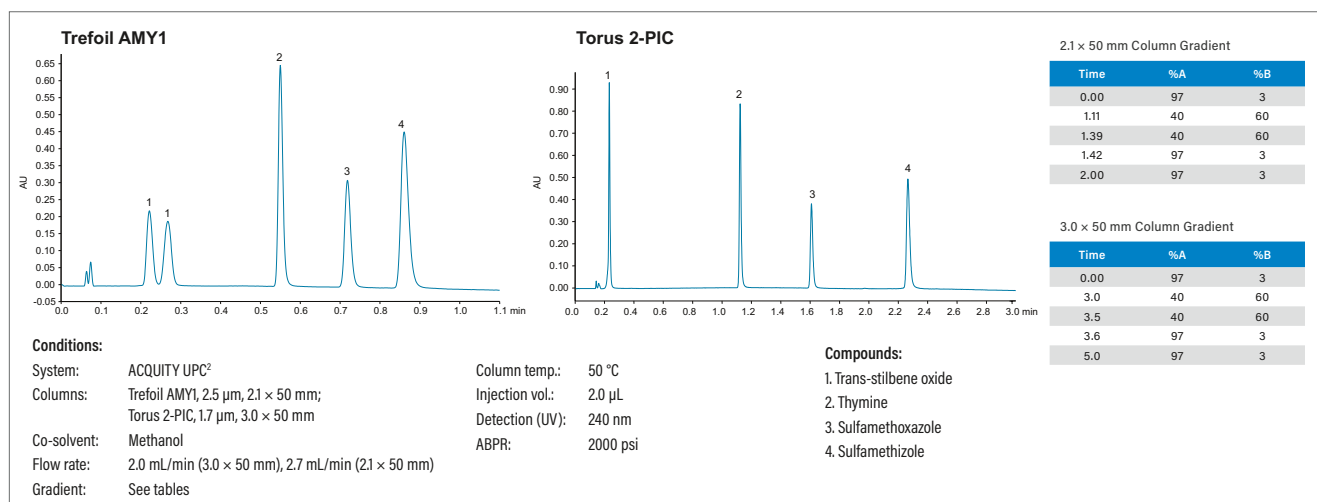
\*\* Requires 30 mm I.D. Prep Guard Holder, p/n: 186006912.



## ACQUITY UPC<sup>2</sup> System: Quality Control Reference Materials

The Quality Control Reference Materials (QC Reference Materials) for the ACQUITY UPC<sup>2</sup> 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



Single QC Reference Material for Trefoil and Torus Columns, on an ACQUITY UPC<sup>2</sup> 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       |
|--|--|---|--------------------------|--|-----------|
| UPC <sup>2</sup> QC Reference Material | Provides chromatographic performance information inclusive of mobile-phase pH for both chiral and achiral modes. | Convergence Chromatography, SFC <ul style="list-style-type: none"> <li>■ chiral</li> <li>■ achiral</li> </ul> | ACQUITY UPC <sup>2</sup> | 1. 0.50 mg/mL (+/-) trans-stilbene oxide<br>2. 0.50 mg/mL thymine<br>3. 0.50 mg/mL sulfamethoxazole<br>4. 0.50 mg/mL sulfamethizole<br><br>In a 1 mL solution of 75:25 ACN:MeOH<br>Store refrigerated 2-5 °C | 186007950 |

### Standards for SFC and ACQUITY UPC<sup>2</sup> 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 UPC<sup>2</sup> Systems

| Description                            | Contents  | P/N       |
|--|---|-----------|
| UPC <sup>2</sup> Standard Mix          | 2 mg/mL each: 3-benzoylpyridine, cortisone, 4-nitroaniline, 4,4'-biphenol in methanol, 1 mL   | 186006372 |
| UPC <sup>2</sup> 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 |
| UPC <sup>2</sup> Caffeine Standard     | 1.0 mg/mL caffeine in 2-propanol, 2 mL  | 186006614 |
| UPC <sup>2</sup> 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 |
| UPC <sup>2</sup> Flavone Standard      | 1 mg/mL in 2-propanol, 2 mL   | 186006523 |
| UPC <sup>2</sup> Flurbiprofen Standard | 1 mg/mL in 2-propanol, 2 mL   | 186006524 |
| UPC <sup>2</sup> Ibuprofen Standard    | 1 mg/mL in 2-propanol, 2 mL   | 186006521 |
| UPC <sup>2</sup> Ketoprofen Standard   | 1 mg/mL in 2-propanol, 2 mL   | 186006522 |

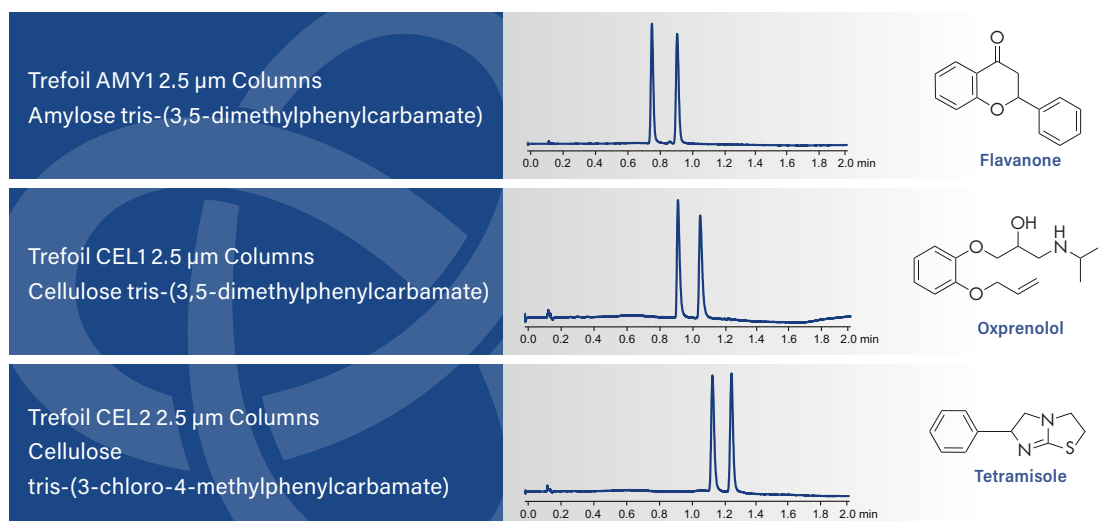
# Trefoil Columns for Chiral SFC Separations

Trefoil Columns offer:

- Optimized particle size, column dimensions, and flow rates for the ACQUITY UPC<sup>2</sup> System
- The full advantage of mass-spectrometry detection
- Faster results when following method-development protocols
- High quality, consistent, and reproducible columns



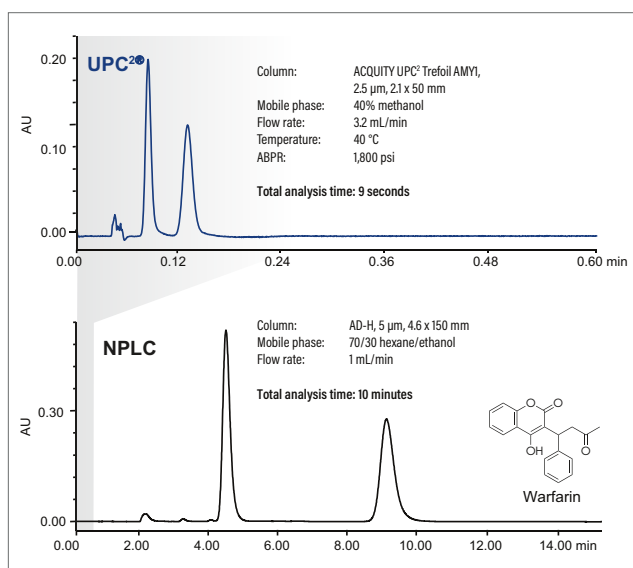
Trefoil modified polysaccharide-based stationary phases provide broad spectrum chiral selectivity. Trefoil AMY1, Trefoil CEL1, and Trefoil CEL2 Column Chemistries are complementary to each other and independently offer different retention characteristics for separating chiral compounds. Selectivity can 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 2-minute screening method.

## TRANSFER NORMAL-PHASE METHODS TO CONVERGENCE CHIRAL METHODS

Legacy normal-phase chiral methods can be easily transferred to the ACQUITY UPC<sup>2</sup> 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 of. With simple redevelopment, new cost effective methods can be obtained using inexpensive and non-toxic compressed liquid CO<sub>2</sub> as the primary mobile phase and can be coupled to mass spectrometers for greater information.

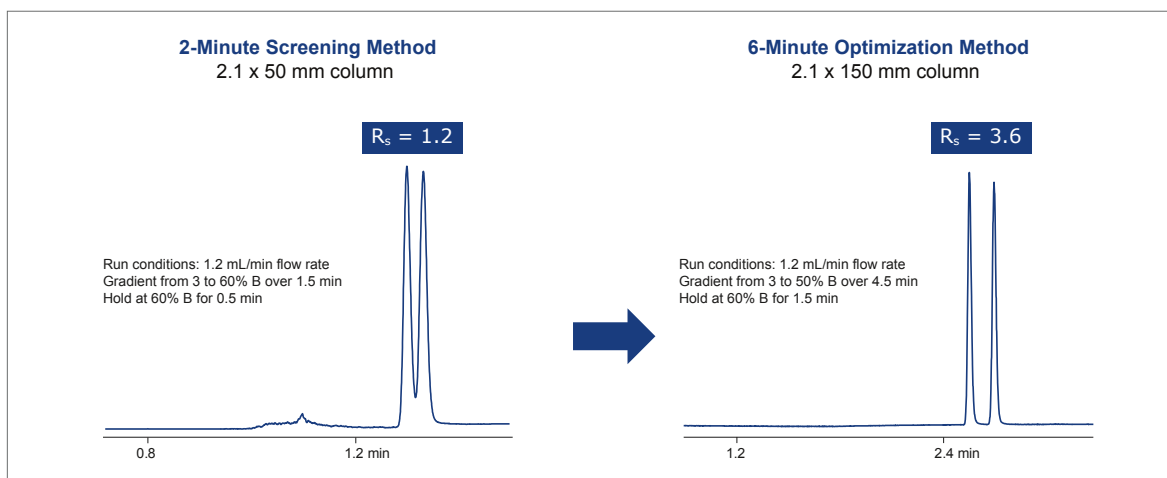


ACQUITY UPC<sup>2</sup> System with Trefoil Columns can be more than 30 times faster, use 75 times less solvent per run, and cost 100 times less per analysis.

## 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 UPC<sup>2</sup> 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 2 minutes. To view a webcast to gain information on the Trefoil Columns Method Development Strategy, please visit [www.waters.com/trefoil](http://www.waters.com/trefoil)



An example of the increased resolution expected when you transition from the two-minute screening method to the six-minute optimization method.

## Ordering Information

### Trefoil Columns

|                  | Trefoil AMY1                 | Trefoil CEL1 | Trefoil CEL2 |
|------------------|------------------------------|--------------|--------------|
| <b>Dimension</b> | <b>Particle Size: 2.5 µm</b> |              |              |
| 2.1 x 50 mm      | 186007457                    | 186007461    | 186007654    |
| 2.1 x 150 mm     | 186007458                    | 186007462    | 186007655    |
| 3.0 x 50 mm      | 186007459                    | 186007463    | 186007656    |
| 3.0 x 150 mm     | 186007460                    | 186007464    | 186007657    |

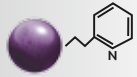

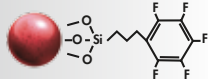
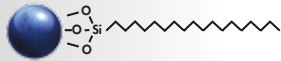
### Trefoil Column Method Development Kits



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

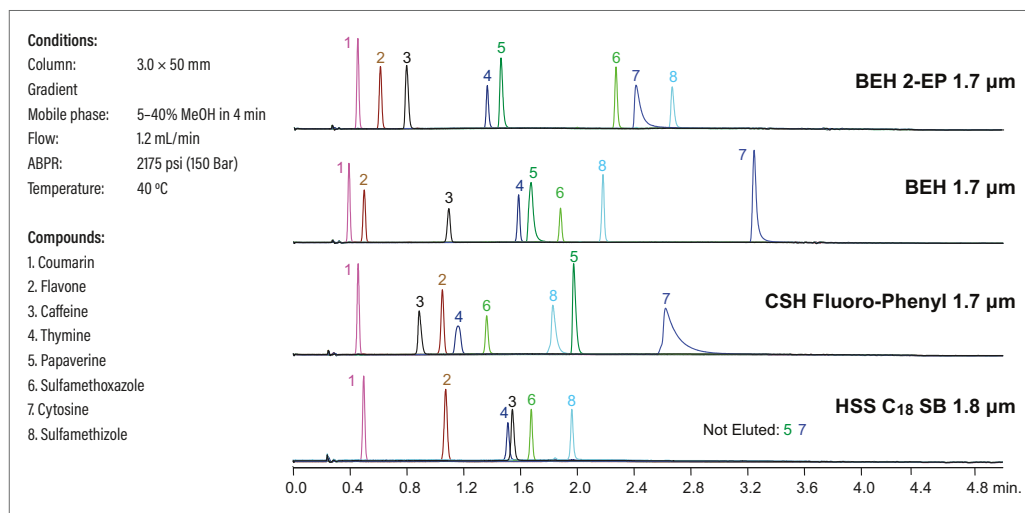
# Viridis Columns

## 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 $\mu\text{m}$ Columns<br>2-Ethylpyridine |  |
| Viridis BEH, 1.7, 3.5, and 5 $\mu\text{m}$ Columns                         |  |
| Viridis CSH Fluoro-Phenyl,<br>1.7, 3.5, and 5 $\mu\text{m}$ Columns        |  |
| Viridis HSS C <sub>18</sub> SB, 1.7, and 3.5 $\mu\text{m}$ Columns         |  |

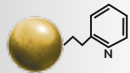






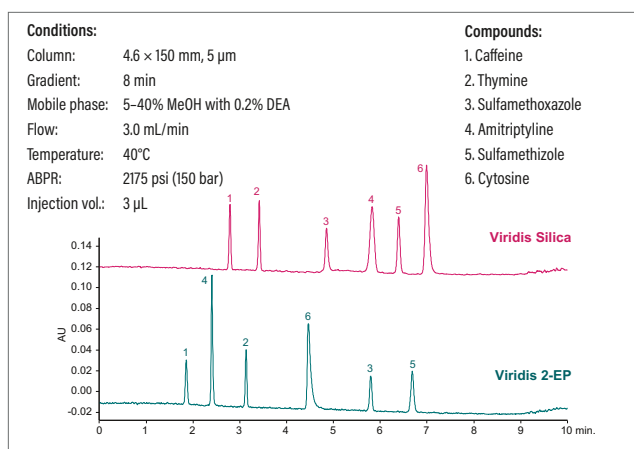
*Viridis Analytical Columns provide multiple selectivities.*

## VIRIDIS SILICA-BASED SFC COLUMNS

Based on Waters long history of chromatographic silica production, the Viridis Silica Columns are designed to be highly reproducible and predictable based on tight product specifications and very low metal content. They are available for both analytical screening and in preparative column dimensions for purification. Separation methods can be optimized and scaled up to Viridis Preparative OBD Columns.

|   |   |
|---|---|
| Viridis Silica 2-EP, 5 $\mu\text{m}$<br>2-Ethylpyridine |  |
| Viridis Silica, 5 $\mu\text{m}$                         |  |

Widely used in achiral SFC separations exhibiting good retention, peak shape, and selectivity properties both with and without the use of additives.



Viridis SFC Preparative Columns.

## Ordering Information

### Viridis BEH, CSH, and HSS 1.7 µm and 1.8 µm Columns

| Dimension                             | Viridis BEH 2-EP      | Viridis BEH | Viridis CSH Fluoro-Phenyl | Viridis HSS C <sub>18</sub> SB |
|---------------------------------------|-----------------------|-------------|---------------------------|--------------------------------|
|                                       | Particle Size: 1.7 µm |             |                           | Particle Size: 1.8 µm          |
| 2.1 x 50 mm                           | 186006576             | 186006558   | 186006567                 | 186006617                      |
| 2.1 x 75 mm                           | 186006577             | 186006559   | 186006568                 | 186006618                      |
| 2.1 x 100 mm                          | 186006578             | 186006560   | 186006569                 | 186006619                      |
| 2.1 x 150 mm                          | 186006579             | 186006561   | 186006570                 | 186006620                      |
| 3.0 x 50 mm                           | 186006580             | 186006562   | 186006571                 | 186006621                      |
| 3.0 x 75 mm                           | 186006581             | 186006563   | 186006572                 | 186006622                      |
| 3.0 x 100 mm                          | 186006582             | 186006564   | 186006573                 | 186006623                      |
| 3.0 x 150 mm                          | 186006688             | 186006686   | 186006687                 | 186006685                      |
| VanGuard Pre-column, 2.1 x 5 mm, 3/pk | 186006575             | 186006557   | 186006566                 | 186006616                      |

### Viridis BEH, CSH, and HSS 3.5 µm Columns

| Dimension                             | Viridis BEH 2-EP      | Viridis BEH | Viridis CSH Fluoro-Phenyl | Viridis HSS C <sub>18</sub> SB |
|---------------------------------------|-----------------------|-------------|---------------------------|--------------------------------|
|                                       | Particle Size: 3.5 µm |             |                           |                                |
| 2.1 x 50 mm                           | 186006652             | 186006634   | 186006643                 | 186006625                      |
| 2.1 x 75 mm                           | 186006653             | 186006635   | 186006644                 | 186006626                      |
| 2.1 x 100 mm                          | 186006654             | 186006636   | 186006645                 | 186006627                      |
| 2.1 x 150 mm                          | 186006655             | 186006637   | 186006646                 | 186006628                      |
| 3.0 x 50 mm                           | 186006656             | 186006638   | 186006647                 | 186006629                      |
| 3.0 x 75 mm                           | 186006657             | 186006639   | 186006648                 | 186006630                      |
| 3.0 x 100 mm                          | 186006658             | 186006640   | 186006649                 | 186006631                      |
| 3.0 x 150 mm                          | 186006659             | 186006641   | 186006650                 | 186006632                      |
| VanGuard Pre-column, 2.1 x 5 mm, 3/pk | 186006651             | 186006633   | 186006642                 | 186006624                      |

### Viridis Analytical SFC Columns

| Dimension    | Viridis BEH 2-EP    | Viridis BEH | Viridis CSH Fluoro-Phenyl | Viridis Silica 2-EP | Viridis Silica |
|--------------|---------------------|-------------|---------------------------|---------------------|----------------|
|              | Particle Size: 5 µm |             |                           |                     |                |
| 2.1 x 150 mm | 186006545           | 186006544   | 186006543                 | 186006542           | 186006541      |
| 3.0 x 50 mm  | 186005750           | 186005719   | 186005688                 | 186005800           | 186005804      |
| 3.0 x 100 mm | 186005751           | 186005720   | 186005689                 | 186005801           | 186005805      |
| 3.0 x 150 mm | 186005752           | 186005721   | 186005690                 | 186005802           | 186005806      |
| 3.0 x 250 mm | 186005753           | 186005722   | 186005691                 | 186005803           | 186005807      |
| 4.6 x 50 mm  | 186005754           | 186005723   | 186005692                 | 186004935           | 186004908      |
| 4.6 x 100 mm | 186005755           | 186005724   | 186005693                 | 186004936           | 186004909      |
| 4.6 x 150 mm | 186005756           | 186005725   | 186005694                 | 186004937           | 186004910      |
| 4.6 x 250 mm | 186005757           | 186005726   | 186005695                 | 186004938           | 186004911      |

## Viridis Preparative SFC Columns

|                             | Viridis BEH 2-EP           | Viridis BEH | Viridis CSH Fluoro-Phenyl | Viridis Silica 2-EP | Viridis Silica |
|-----------------------------|----------------------------|-------------|---------------------------|---------------------|----------------|
| <b>Dimension</b>            | <b>Particle Size: 5 µm</b> |             |                           |                     |                |
| 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 x 100 mm (BEH 2-EP, BEH, CSH Fluoro-Phenyl, HSS C <sub>18</sub> SB), 4/pk | 176003050 |
| Viridis Column Screening Kit, 2.1 x 50 mm (BEH 2-EP, BEH, CSH Fluoro-Phenyl, HSS C <sub>18</sub> SB), 4/pk    | 176003091 |

## Quality Control Reference Materials

| Product Name                           | Intended Use  | Chromatographic Mode  | System                   | Contents   | P/N       |
|--|---|---|--------------------------|--|-----------|
| UPC <sup>2</sup> QC Reference Material | Provides chromatographic performance information inclusive of mobile-phase pH for both chiral and achiral modes | Convergence Chromatography, SFC <ul style="list-style-type: none"> <li>■ chiral</li> <li>■ achiral</li> </ul> | ACQUITY UPC <sup>2</sup> | 1. 0.50 mg/mL (+/-) trans-stilbene oxide<br>2. 0.50 mg/mL thymine<br>3. 0.50 mg/mL sulfamethoxazole<br>4. 0.50 mg/mL sulfamethizole<br><br>In a 1 mL solution of 75:25 ACN:MeOH<br>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 |
| UPC <sup>2</sup> Standard Mix                               | 2 mg/mL each: 3-benzoylpyridine, cortisone, 4-nitroaniline, 4, 4'-biphenol in methanol, 1 mL  | 186006372 |
| UPC <sup>2</sup> 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 |
| UPC <sup>2</sup> Caffeine Standard                          | 1.0 mg/mL caffeine in 2-propanol, 2 mL  | 186006614 |
| UPC <sup>2</sup> 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 |
| UPC <sup>2</sup> Flavone Standard                           | 1 mg/mL in 2-propanol, 2 mL   | 186006523 |
| UPC <sup>2</sup> Flurbiprofen Standard                      | 1 mg/mL in 2-propanol, 2 mL   | 186006524 |
| UPC <sup>2</sup> Ibuprofen Standard                         | 1 mg/mL in 2-propanol, 2 mL   | 186006521 |
| UPC <sup>2</sup> Ketoprofen Standard                        | 1 mg/mL in 2-propanol, 2 mL   | 186006522 |

# Biomolecule Purification, Characterization, and Analyses

Biomolecule Purification, Characterization, and Analyses



"Quality is always about having a consistent product."

~ Aoife Hayes, Technical Service Manager, Wexford, Ireland



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# Biomolecule Purification, Characterization, and Analyses

## Innovative HPLC, UHPLC, and UPLC Chemistry Consumables for Bioseparations

Advances in genomics, proteomics, metabolomics, and molecular and system biology increase our understanding of biological processes. Scientific and technological progress have revolutionized the diagnosis and treatment of disease, and it continues to do so. A leading supplier of analytical instrumentation, software, chemistry products, and services and support, Waters is uniquely positioned to provide researchers the technological means to tackle substantial analytical challenges that various biomolecules present. Keenly aware of today's challenges, our scientists and engineers are committed to the relentless pursuit of innovative, intelligent, imaginative solutions that manifest themselves in a range of problem solving applications, from proteomics and biomarker discovery to the commercialization of advanced biopharmaceuticals.

We continue to develop columns and sample-preparation consumables that support the HPLC, UHPLC, UPLC, and LC-MS analysis of peptides, proteins, oligonucleotides, amino acids, and glycoprotein associated glycans. Our comprehensive family of chemistries and consumables includes these offerings:

- Peptide columns for nano, capillary, analytical, and preparative peptide applications
- Protein size-exclusion, ion-exchange, hydrophobic-interaction, hydrophilic-interaction, and reversed-phase columns for analytical HPLC, UHPLC, UPLC, and laboratory-scale purification applications
- AccQ•Tag™ Ultra chemistry, specific for Waters UPLC Amino Acid Analysis Solution as well as Pico•Tag® and AccQ•Tag chemistries for HPLC-based amino acid analyses
- Oligonucleotide columns for synthetic oligonucleotide and DNA/RNA fragment isolations and analyses
- ACQUITY UPLC Glycoprotein BEH Amide 300Å Columns for the analyses of intact glycoproteins, glycoprotein fragments, and glycopeptides
- Above columns designed and quality-control tested with relevant biomolecules to help ensure column-to-column consistency
- GlycoWorks™ *Rapi*Fluor-MS® sample preparation kits, standards, and Waters Glycan BEH Amide 130Å Columns for the analysis of released glycans
- Analytical standards and reagents consumables and kits for MS and LC-MS applications of peptides, proteins, and other biomolecules

## Amino Acids

The constituents of proteins, amino acids 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.

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 are better retained on the reversed-phase column and are, therefore, more easily separated. Most common derivatization reagents react with amines. Some react only with primary amines, but the most useful ones also react with secondary amines so that proline and hydroxyproline are also measured. In addition to improving chromatography, derivatization can render amino acids readily detectable by UV absorbance or fluorescence.

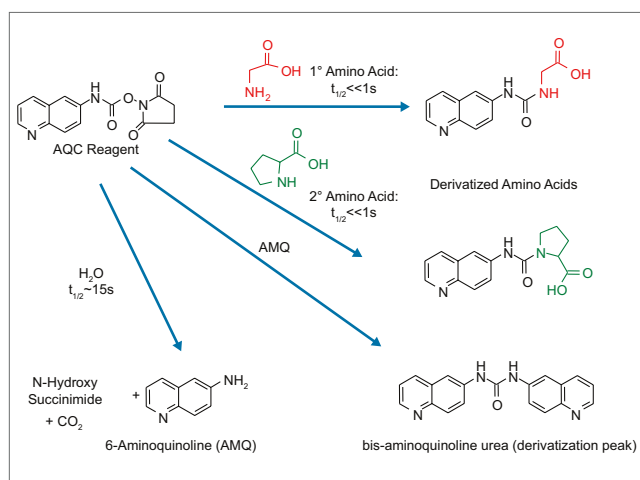
Waters offers an UPLC as well as HPLC-based method for AAA that employ pre-column derivatization and reversed-phase chromatography for accurate identification and quantitation of free or amino acids hydrolyzed from protein digests: AccQ•Tag (HPLC-based) and AccQ•Tag Ultra (UPLC-based). Hundreds of published papers report the successful application of our AccQ•Fluor pre-column chemistry for amino acid derivatization. The stable derivatized AAs are then resolved on our AccQ•Tag or AccQ•Tag Ultra C<sub>18</sub> Column with on-line detection of the resolved amino acids, using UV absorbance or fluorescence detection.

### ACCQ•TAG ULTRA DERIVATIZATION REACTION

The following steps describe the AccQ•Tag Ultra derivatization process:

- Starting material is AccQ•Tag Ultra Reagent Powder
  - 6-aminoquinolyl-N-hydroxysuccinimidyl carbamate (AQC)
  - US Patent #5,296,599 and European Patent #EP 0 533 200 B1
- AQC reacts rapidly with both primary and secondary amines
- Excess reagent reacts more slowly with water, forming 6-aminoquinoline (AMQ)
- AMQ reacts slowly with excess AQC reagent, forming a bis urea
- Derivatized amino acids are separated chromatographically from the by-products
- Requires no vacuum drying, sample prep, or extraction

#### Chemistry of the AccQ•Tag Derivatization Reaction



AccQ•Tag<sup>™</sup> Ultra  
UPLC<sup>®</sup> Amino Acid Analysis



| AccQ-Tag Method  | AccQ-Tag Ultra Chemistry Package  |
|--|---|
| Introduced 1992  | Introduced 2006   |
| <ul style="list-style-type: none"> <li>■ Designed for use with HPLC systems</li> <li>■ Suitable for protein and peptide identification and quantitation, for monitoring cell culture media, and for determining the nutritional content of foods and feeds</li> <li>■ Based on AccQ-Tag derivatization of primary and secondary amino acids</li> <li>■ Quality-control tested for use on HPLC with fluorescence detection</li> </ul> | <ul style="list-style-type: none"> <li>■ Designed specifically for use with the UPLC Amino Acid Analysis Solution</li> <li>■ AccQ-Tag Ultra Chemistry Package is part of a complete solution that includes instrument, software, and support for amino acid analysis of protein hydrolysates, cell culture media, foods, and feeds</li> <li>■ Based on AccQ-Tag derivatization of primary and secondary amino acids in aqueous conditions</li> <li>■ Reagents, columns, and eluents quality-control tested using a well defined amino acid separation and analysis</li> </ul> |

## AccQ-Tag Amino Acid Analysis Turn-Key Solution

The HPLC and UPLC-based Amino Acid Analysis Solutions are holistically designed. As such, they offer a total application solution optimized for accurate, reliable, and reproducible analyses of amino acids. These solutions bring to bear Waters extensive experience in separation science, derivatization chemistries, and information management. In doing so, they ensure accurate and precise qualitative and quantitative results. For protein characterization, cell-culture monitoring, and nutritional analysis of foods and feeds, they provide performance-qualified, rugged, and reliable methodologies that guarantee reproducible results day-to-day, instrument-to-instrument, and lab-to-lab. In addition, the mobile phases and methods are directly compatible with electrospray mass spectrometry. No adjustment is necessary to produce an MS TIC that exactly matches the UV trace.

The UPLC Amino Acid Analysis Solution comprises these elements:

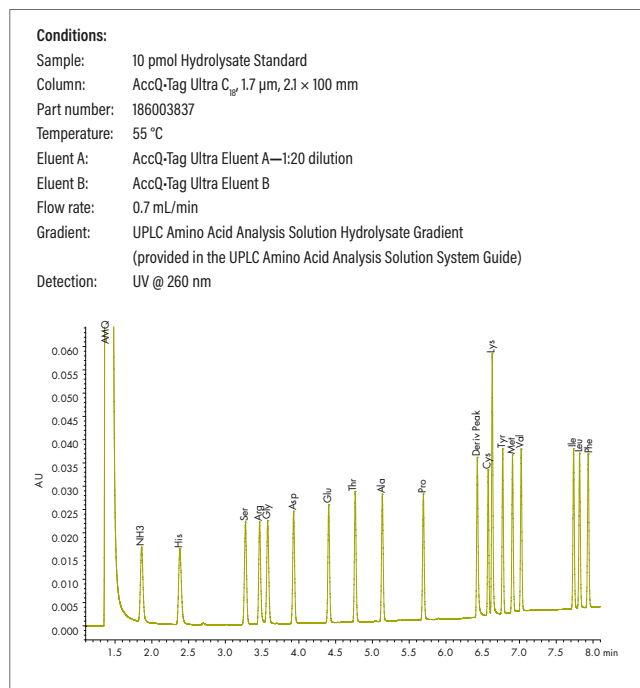
- ACQUITY UPLC (binary), ACQUITY UPLC H-Class (quaternary), or ACQUITY UPLC H-Class Bio (quaternary) System with a tunable UV detector, for enhanced chromatographic resolution and maximum-sensitivity detection
- AccQ-Tag Ultra derivatization chemistries, including quality-controlled columns, reagents, and eluents
- Empower® 2 pre-configured projects, methods, and report templates
- Installation and application training and support
- Application-specific performance qualification
- Connections INSIGHT® ISDP instrument diagnostics, to ensure continuous, consistent, and reliable operation
- Standards and kits, to validate and troubleshoot

### Accurate Amino Acid Analyses from Varied Sample Matrices

The UPLC Amino Acid Analysis Solution includes two complete methods that rely on the same instrumentation and column chemistry. The first is suitable for amino acids derived from protein hydrolysates. The second method is suitable for the larger number of free amino acids found in process samples, such as cell culture or fermentation broths.

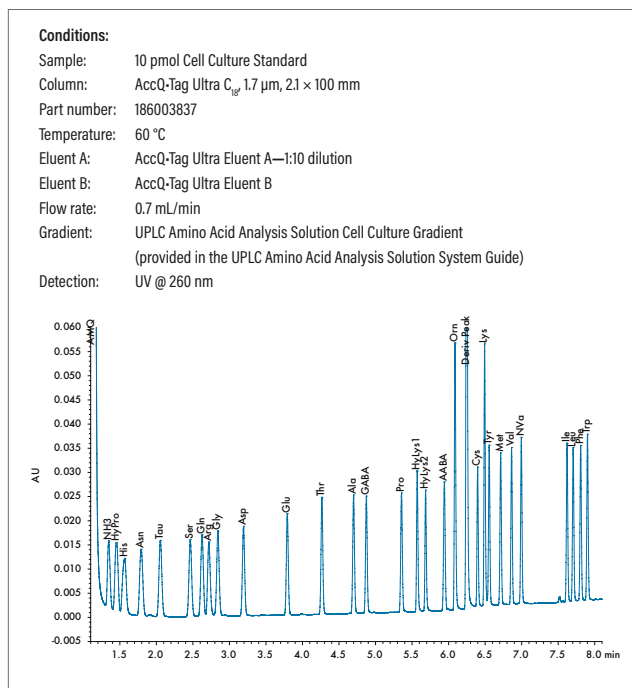
The methods differ in the dilution of the AccQ-Tag Ultra Eluent A and the temperature of the separation column. You need not adjust for pH or modify the composition of eluent A or B.

## Hydrolysate Standard 10 pmol/μL



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

## Cell Culture Standard 10 pmol/μL



Separation of the larger set of standard amino acids using the UPLC Amino Acid Analysis Solution Cell Culture Method. No modification of mobile phase pH or composition is required.

## AccQ-Tag Ultra Amino Acid Analysis Using UPLC

AccQ-Tag Ultra chemistry differs from the AccQ-Tag HPLC method described on page 246. Though the components of the two derivatization kits are identical, the UPLC-based protocol and quality-control tests are based on the actual UPLC separation and UV detection protocols. Both methods begin with the same derivatization chemistry, yet they differ in all other details. Thus their components are not interchangeable. Moreover, the AccQ-Tag Ultra C<sub>18</sub> UPLC Column differs entirely from that of the HPLC-based AccQ-Tag C<sub>18</sub> Column. The AccQ-Tag Ultra C<sub>18</sub> Column relies on our 1.7 μm hybrid-silica, BEH Technology particles, which provide excellent column efficiency and resolution. Our eCord™ Intelligent Chip Technology, which automatically records the history of the AccQ-Tag Ultra C<sub>18</sub> Column's use, is permanently attached to the column with the information being downloaded to the used ACQUITY UPLC System.

By comparison, the AccQ-Tag C<sub>18</sub> Column contains a 100% silica-based, C<sub>18</sub>-ligand, on a 4 μm particle. Each batch of material is specifically tested in the AccQ-Tag method to help ensure it will satisfactorily perform the separation. Mobile phases used with the AccQ-Tag C<sub>18</sub> HPLC Column differ from those used with AccQ-Tag Ultra method, each being optimized for its respective column and detection technique.

Compared with traditional HPLC methods, the UPLC Amino Acid Analysis Solution results in sharper as well as better resolved peaks. This improved resolution results in a rugged method where peak identification is unambiguous and quantitation simplified. The better resolution helps deliver a more reliable and accurate method. Moreover, the UPLC technology, with its significantly higher throughput (faster than HPLC by a factor of between three and five) gives rise to quicker, more informed decisions, and thus more analyses per unit time. Use of the AccQ-Tag Ultra chemistry without the rest of the application solution is not supported as an Amino Acid Analysis method.

## Ordering Information

### AccQ-Tag Ultra Amino Acid Analysis Kits and Accessories for UPLC AAA Analysis

| Description  | Qty.             | P/N       | Description   | Qty.       | P/N        |
|--|------------------|-----------|---|------------|------------|
| <b>ACQUITY UPLC AAA Application Kit</b>  |                  |           | <b>AccQ-Tag Ultra Chemistry Kit</b>   |            |            |
| This kit is intended to enable existing ACQUITY UPLC Systems for AAA applications.         |                  | 176001279 | The refill kit recharges the AccQ-Tag Ultra chemistries that are part of the application kit. As such, Waters offers it to those who already purchased the AccQ-Tag Ultra Application Solution. The kit applies to both ACQUITY UPLC and ACQUITY UPLC H-Class AAA Application Solutions. It should not be purchased as part of an initial system. |            | 176001235  |
| <b>Kit contains:</b>   |                  |           | <b>Kit includes:</b>  |            |            |
| Amino Acid Standard, Hydrolysate   | 10 × 1 mL        |           | AccQ-Tag Ultra Derivatization Kit, 250 Analyses   |            |            |
| Sample Tubes   | 4 × 72/pk        |           | AccQ-Tag Ultra C <sub>18</sub> Column, 1.7 μm, 2.1 × 100 mm   |            |            |
| Total Recovery Vials with Caps   | 3 × 100/pk       |           | AccQ-Tag Ultra Eluent A, Concentrate  | 950 mL     |            |
| Column Stabilizer Kit, 150 mm  |                  |           | AccQ-Tag Ultra Eluent B   | 950 mL     |            |
| AccQ-Tag Ultra Derivatization Kit  |                  |           | Amino Acid Standard, Hydrolysate  | 10 × 1 mL  |            |
| AccQ-Tag Ultra C <sub>18</sub> Column, 1.7 μm, 2.1 × 100 mm                                |                  |           | Sample Tubes  | 4 × 72/pk  |            |
| AccQ-Tag Ultra Eluent A, Concentrate   | 950 mL           |           | Total Recovery Vials with Caps  | 3 × 100/pk |            |
| AccQ-Tag Ultra Eluent B  | 950 mL           |           | AccQ-Tag Ultra Derivatization Kit, 250 Analyses   |            | 186003836  |
| Tube Inlet .0025 I.D. PEEK Nut PDA Assembly  |                  |           | AccQ-Tag Ultra Borate Buffer  | 5 × 6 mL   |            |
| 2 μL Sample Loop   |                  |           | AccQ-Tag Ultra Derivatization Reagent Powder  | 5 × 3 mg   |            |
| Column In-line Filter Kit  |                  |           | AccQ-Tag Ultra Reagent Diluent  | 5 × 4 mL   |            |
| UPLC AAA Solution Information Set  |                  |           | Amino Acid Standard, Hydrolysate  | 10 × 1 mL  | WAT088122  |
| UPLC AAA Application Solution Startup Tests  |                  |           | A standard mixture containing 18 amino acids (17 hydrolysate amino acids each at 2.5 mM and cystine at 1.25 mM)   |            |            |
| Cert., AAA Application and Familiarization   |                  |           | Sample Tubes  | 4 × 72/pk  | WAT007571  |
| <b>UPLC AAA H-Class Applications Kit</b>   |                  |           | Total Recovery Vials with Caps  | 3 × 100/pk | 186000384C |
| This kit is intended to enable existing ACQUITY UPLC H-Class Systems for AAA applications. |                  | 176002983 | AccQ-Tag Ultra C <sub>18</sub> Column, 1.7 μm, 2.1 × 100 mm   |            | 186003837  |
| <b>Kit includes:</b>   |                  |           | AccQ-Tag Ultra Eluent A, Concentrate  | 950 mL     | 186003838  |
| AccQ-Tag Ultra Derivatization Kit, 250 Analyses  |                  |           | AccQ-Tag Ultra Eluent B   | 950 mL     | 186003839  |
| AccQ-Tag Ultra C <sub>18</sub> Column, 1.7 μm, 2.1 × 100 mm                                |                  |           |   |            |            |
| AccQ-Tag Ultra Eluent A, Concentrate   | 950 mL           |           |   |            |            |
| AccQ-Tag Ultra Eluent B  | 950 mL           |           |   |            |            |
| Amino Acid Standard, Hydrolysate   | 10 × 1 mL        |           |   |            |            |
| Total Recovery Vials   | 3 × 100 vials/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  |                  |           |   |            |            |

The AccQ-Tag Solution is accurate and easy to use. Neutral score for aftersales as have had no need to use - website good though."

**REVIEWER:** Andy Downer  
**ORGANIZATION:** HPA (PD)



## AccQ-Tag Amino Acid Analysis Using HPLC

The HPLC-based, AccQ-Tag method requires the same pre-column derivatization step as used in the AccQ-Tag Ultra method. The AccQ-Fluor™ reagent, 6-aminoquinolyl-N-hydroxysuccinimidyl carbamate (AQC), derivatizes primary and secondary amines in a simple, single-step reaction that yields highly stable fluorescent adducts. Waters offers the AccQ-Tag method as a system package consisting of pre-packaged reagents and extensive documentation.

The AccQ-Tag Chemistry Package contains the items needed to perform as many as 250 amino acid analyses of protein and peptide hydrolysates.

### AccQ-Tag Derivatization Kit

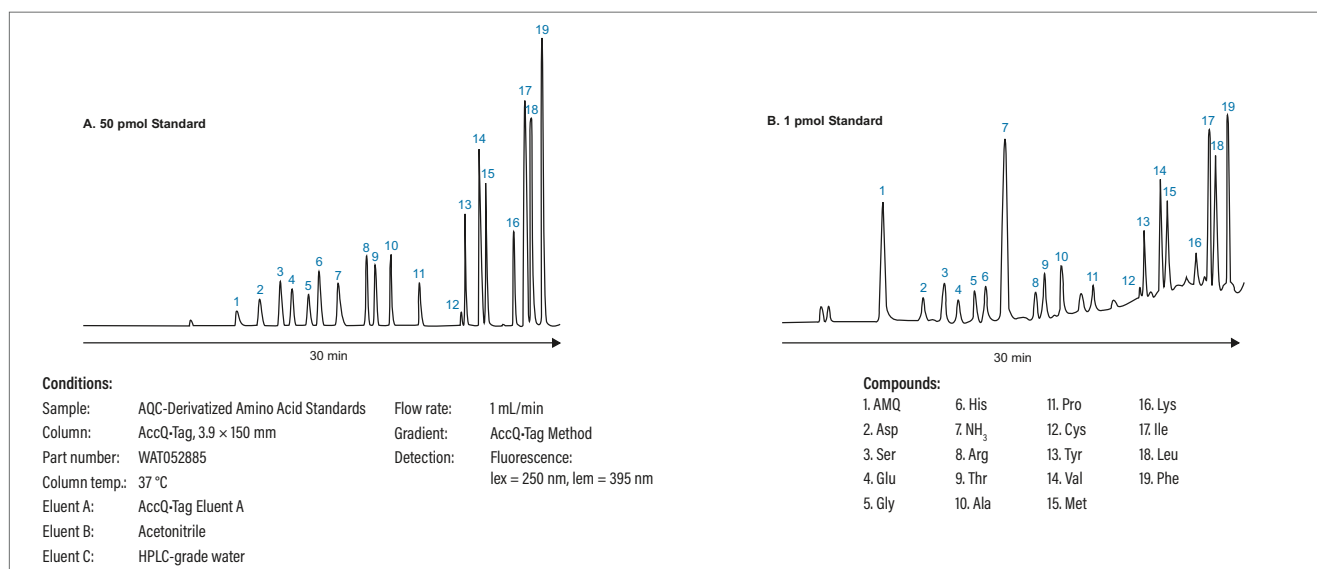
The AccQ-Tag derivatization kit contains five sets of the derivatizing reagents. Each set includes one vial of the following items:

- AccQ-Fluor borate buffer—Added to samples, the borate buffer ensures the optimum pH for derivatization
- AccQ-Fluor reagent powder—6-aminoquinolyl-N-hydroxysuccinimidyl carbamate (AQC), shipped dry, for maximum stability
- AccQ-Fluor reagent diluent—The acetonitrile diluent is used to reconstitute the reagent for derivatization

### AccQ-Tag Amino Acid Analysis Column

The AccQ-Tag C<sub>18</sub> Column is a high-efficiency HPLC column that is tested and certified for use specifically in the AccQ-Tag method. This column separates the amino acid derivatives produced by the AccQ-Fluor derivatization reaction.

AccQ-Tag Analysis of Hydrolysate Amino Acids Using p/n: WAT088122



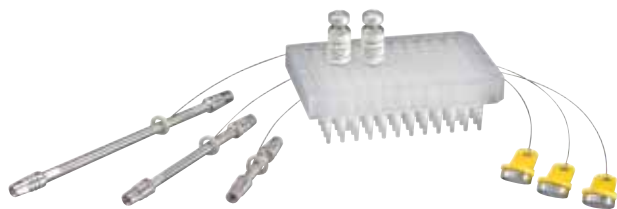
Application of the AccQ-Tag method to the analysis of hydrolysate amino acids is illustrated. The high-purity reagents provided in the AccQ-Tag Chemistry Package minimize background amino acid content (6-aminoquinoline, or AMQ), making high-sensitivity analysis possible.

## 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 for up to 250 analyses includes:  |            |           |
| AccQ-Fluor Reagent 1  | 5 × 6 mL   |           |
| AccQ-Fluor Reagent 2A   | 5 × 3 mg   |           |
| AccQ-Fluor Reagent 2B   | 5 × 3 mL   |           |
| AccQ-Tag C <sub>18</sub> Column, 3.9 × 150 mm   |            |           |
| AccQ-Tag Eluent A, Concentrate  | 2 × 1 L    |           |
| Sample Tubes  | 4 × 72/pkg |           |
| Amino Acid Standard, Hydrolysate  | 10 × 1 mL  |           |
| AccQ-Tag User Guide   |            |           |
| Amino Acid Standard, Hydrolysate  |            |           |
| A standard mixture containing 18 amino acids (17 hydrolysate amino acids, each at 2.5 mM concentration and cystine at 1.25 mM concentration). | 10 × 1 mL  | WAT088122 |
| AccQ-Tag Eluent A Concentrate   | 1 L        | WAT052890 |
| AccQ-Tag Eluent B   | 1 L        | WAT052895 |
| AccQ-Fluor Reagent Kit  |            | WAT052880 |
| <b>Kit includes:</b>  |            |           |
| 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 C <sub>18</sub> , 3.9 × 150 mm Column  |            | WAT052885 |
| AccQ-Tag User Guide   |            | WAT052874 |

# Glycans and Glycoproteins



Waters offers many robust, reproducible analytical solutions that provide complementary, information-rich data, for glycoprotein analysis.

## 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 determinations)
- Middle up/down - Subunit analysis
- Glycopeptide mapping
- Released and labeled glycan analysis
- Monosaccharide/sialic acid composition

## Column Chemistries:

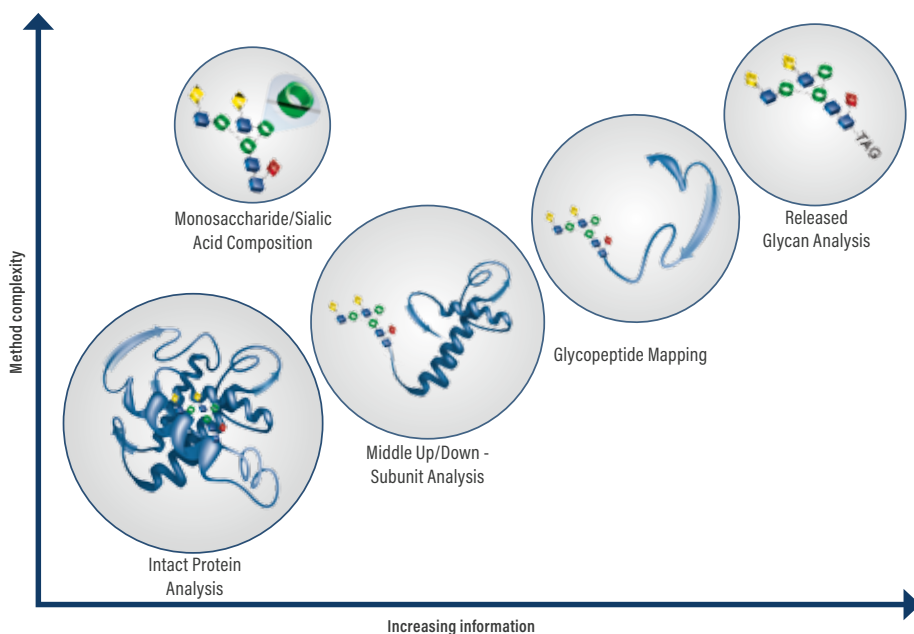
Our industry-leading UPLC Column Chemistries share the mechanical stability of our bridged-ethylene hybrid particle (i.e., BEH Technology and ligand-binding technology), to help ensure consistent column-to-column performance in validated methods. The small, 1.7  $\mu\text{m}$ , particle size of their fully porous packing material is responsible, in part, for the columns' high resolving power.

The column offerings include:

- ACQUITY UPLC Glycan BEH Amide 130 $\text{\AA}$ , 17  $\mu\text{m}$  Column, for released N-glycans
- XBridge Glycan BEH Amide 130 $\text{\AA}$ , 35  $\mu\text{m}$  and 25  $\mu\text{m}$  *XP* Columns for HPLC and UHPLC analysis of released N-glycans
- ACQUITY UPLC Glycoprotein BEH Amide 300 $\text{\AA}$ , 17  $\mu\text{m}$  Column for large biomolecules

## Sample Preparation and Standards:

The GlycoWorks Sample Preparation product line offers kits and standards for released N-glycan analyses that are fast, simple, and robust. Using one of these kits together with our *RapiFluor*-MS label produces fluorescent and mass spectrometric analyses capabilities of unprecedented sensitivity.





## HILIC FOR RELEASED N-GLYCAN ANALYSIS

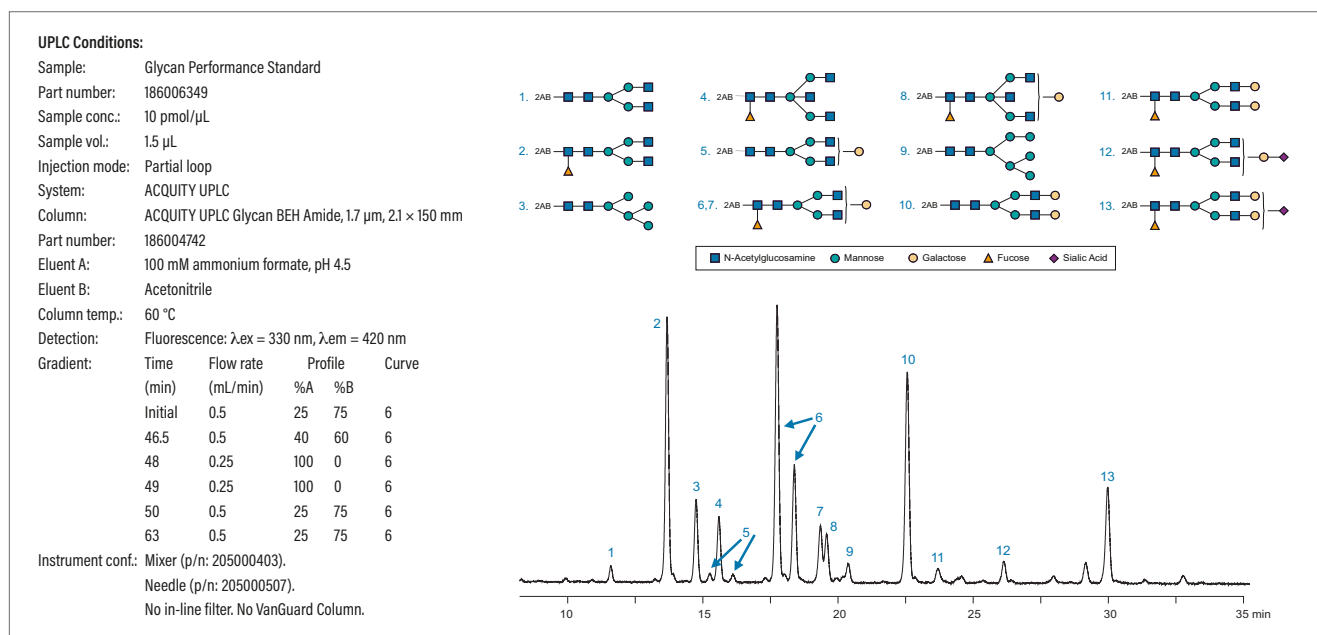
Waters ACQUITY UPLC Glycan BEH Amide 130Å, 1.7 µm Column; XBridge Glycan BEH Amide 130Å, 3.5 µm; and 2.5 µm XP HPLC and UHPLC Columns

Hydrophilic-interaction liquid chromatography (HILIC), with fluorescence detection, is a well-recognized, reliable technique that effectively separates and makes quantitation of isolated glycans possible after their derivatization with fluorescent labels. Our ACQUITY UPLC Glycan BEH Amide 130Å, 1.7 µm Column and new GlycoWorks Labeling and Sample Preparation consumables were designed for the HILIC-based separation of glycans labeled with either 2-aminobenzamide (2-AB) or with Waters *RapiFluor*-MS (RFMS) reagent. Retention of 2-AB or RFMS-labeled oligosaccharides is based on the relative hydrophilicities of each labeled species.

The columns confer these additional benefits:

- Capability to separate both neutral and charged (e.g., highly sialylated) labeled glycans using a binary gradient improve component resolution in less time, compared with existing HPLC or UHPLC methods
- Available well-defined methods for LC and LC-MS applications quality-control tested using a labeled, released N-glycan standard from the 2-AB Glycan Performance Test Standard (p/n: 186006349), to help ensure consistent batch-to-batch performance

### ACQUITY UPLC Glycan BEH Amide 130Å, 1.7 µm Column Separation of 2-AB Labeled Glycan Performance Standard



The N-linked glycans from pooled human IgG contain high mannose as well as neutral, and sialylated complex structures. The chromatogram shows 35 minutes of a one hour analysis. This challenging sample includes high mannose, bisecting GlcNAc and sialylated species.

## Ordering Information

### ACQUITY UPLC Glycan BEH Amide, 130Å Columns

|                       | Dimension    | P/N        |
|-----------------------|--------------|------------|
| Particle Size: 1.7 µm |              |            |
| BEH Amide, 130Å       | 2.1 × 5 mm   | 186004739* |
|                       | 2.1 × 50 mm  | 186004740  |
|                       | 2.1 × 100 mm | 186004741  |
|                       | 2.1 × 150 mm | 186004742  |

\*VanGuard Pre-column, 3/pk.

### ACQUITY UPLC Glycan BEH Amide, 130Å Method Validation Kits\*

|                       | Dimension    | P/N       |
|-----------------------|--------------|-----------|
| Particle Size: 1.7 µm |              |           |
| BEH Amide, 130Å       | 2.1 × 100 mm | 186004907 |

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

### XBridge BEH Glycan 130Å Columns

|                       | Dimension              | P/N                      | Dimension             | P/N                      |
|-----------------------|------------------------|--------------------------|-----------------------|--------------------------|
| Particle Size: 2.5 µm |                        |                          | Particle Size: 3.5 µm |                          |
| BEH Amide, 130Å       | 2.1 × 5 mm             | 186007262*               | 2.1 × 10 mm           | 186007505 <sup>1,2</sup> |
|                       | 2.1 × 50 mm <i>XP</i>  | 186007263                | 2.1 × 50 mm           | 186007502                |
|                       | 2.1 × 100 mm <i>XP</i> | 186007264                | 2.1 × 100 mm          | 186007503                |
|                       | 2.1 × 150 mm <i>XP</i> | 186007265                | 2.1 × 150 mm          | 186007504                |
|                       | 3.0 × 30 mm <i>XP</i>  | 186008038                | 4.6 × 20 mm           | 186007272 <sup>1,3</sup> |
|                       | 3.0 × 75 mm <i>XP</i>  | 186008039                | 4.6 × 50 mm           | 186007273                |
|                       | 3.0 × 150 mm <i>XP</i> | 186008040                | 4.6 × 100 mm          | 186007274                |
|                       | 4.6 × 20 mm            | 186007267 <sup>1,3</sup> | 4.6 × 150 mm          | 186007275                |
|                       | 4.6 × 50 mm <i>XP</i>  | 186007268                | 4.6 × 250 mm          | 186007276                |
|                       | 4.6 × 100 mm <i>XP</i> | 186007269                |                       |                          |
|                       | 4.6 × 150 mm <i>XP</i> | 186007270                |                       |                          |

\*VanGuard Pre-column, 3/pk.

<sup>1</sup> Sentry Guard Cartridge, 2/pk.

<sup>2</sup> Requires 2.1 × 10 mm Universal Sentry Guard Holder, part number WAT097958.

<sup>3</sup> Requires 4.6 × 20 mm Universal Sentry Guard Holder, part number WAT046910.

### XBridge Glycan BEH Amide 130Å Method Validation Kits\*

|                       | Dimension    | P/N       | Dimension             | P/N       |
|-----------------------|--------------|-----------|-----------------------|-----------|
| Particle Size: 2.5 µm |              |           | Particle Size: 3.5 µm |           |
| BEH Amide, 130Å       | 2.1 × 150 mm | 186007266 | 4.6 × 150 mm          | 186007277 |
|                       | 4.6 × 150 mm | 186007271 |                       |           |

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

### Standards

| Description                                   | P/N       |
|---|-----------|
| 2-AB Glycan Performance Test Standard         | 186006349 |
| RapiFluor-MS Glycan Performance Test Standard | 186007983 |

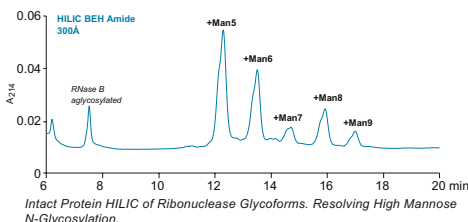
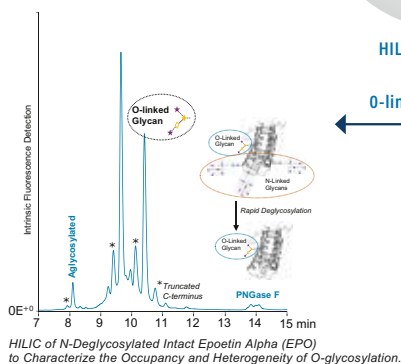
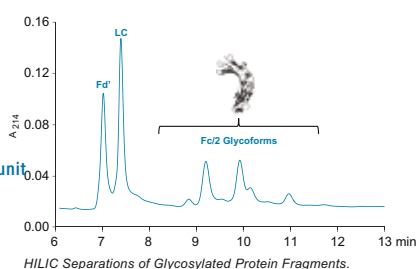
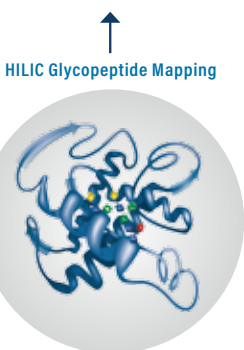
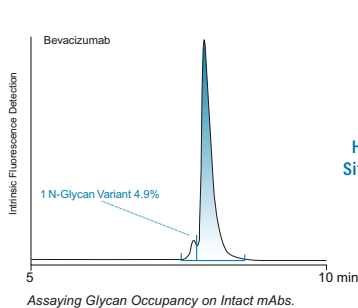
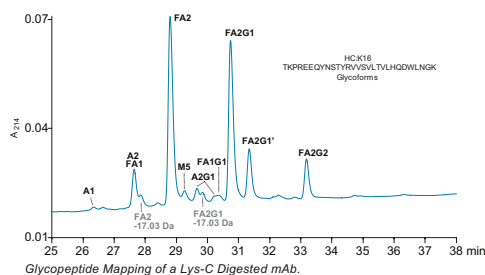
# HILIC FOR LARGE MOLECULE GLYCOPROTEIN ANALYSIS

## ACQUITY UPLC Glycoprotein BEH Amide 300Å, 1.7 µm Column

HILIC has been widely used to separate small, polar compounds. Now, with a wider pore particle, the technique can be a powerful LC-based separation method for large biomolecules, such as glycoproteins and glycopeptides. Using our ACQUITY UPLC Glycoprotein BEH Amide 300Å, 1.7 µm Column, you can obtain novel yet complementary glycan-related information about biotherapeutic proteins at the intact glycoprotein, glycoprotein subunit, or glycopeptide level.

The ACQUITY UPLC Glycoprotein BEH Amide 300Å, 1.7 µm Column includes these capabilities and features:

- Optimized wide-pore, HILIC stationary phase, for resolving intact protein or protein fragment glycoforms
- Ability to generate domain-specific glycan linkages, with or without MS detection
- Elucidation of site-specific glycan occupancy of monoclonal antibody biotherapeutics
- High resolution glycopeptide mapping without limitations brought about by peptide/glycan size or composition
- Improved resolution in separating large, released N-glycans (EPO, factor IX)
- Quality-control tested, using Waters Glycoprotein Performance Test Standard (p/n: 186008010), to help ensure consistent batch-to-batch and column-to-column performance



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

### LC Conditions:

LC system: ACQUITY UPLC H-Class Bio System  
 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<sub>18</sub>, 300Å, 1.7 µm, 2.1 × 150 mm  
 Part number: 186003687  
 Column temp.: 60 °C  
 Injection: RP injection volume: 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     |

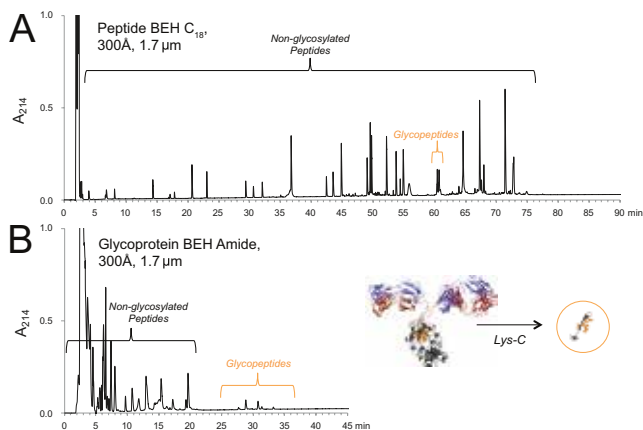
### HILIC LC Conditions:

Column: ACQUITY UPLC Glycoprotein BEH Amide, 300Å, 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:

MS system: SYNAPT® G2-S HDMS<sup>+</sup>  
 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



A traditional reversed-phase separation of the Lys-C digest using an ACQUITY UPLC Peptide BEH C<sub>18</sub>, 300Å, 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, 300Å, 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.

## Ordering Information

### ACQUITY UPLC Glycoprotein BEH Amide 300Å Columns and Kits (Includes the Glycoprotein Performance Test Standard)

|                 | Dimension             | P/N        |
|-----------------|-----------------------|------------|
|                 | Particle Size: 1.7 µm |            |
| BEH Amide, 300Å | 2.1 × 5 mm            | 176003699* |
|                 | 2.1 × 50 mm           | 176003700  |
|                 | 2.1 × 100 mm          | 176003701  |
|                 | 2.1 × 150 mm          | 176003702  |

\*VanGuard Pre-column 3/pk.

### ACQUITY UPLC Glycoprotein BEH Amide 300Å Method Validation Kits\* (Includes the Glycoprotein Performance Test Standard)

|                 | Dimension             | P/N       |
|-----------------|-----------------------|-----------|
|                 | Particle Size: 1.7 µm |           |
| BEH Amide, 300Å | 2.1 × 100 mm          | 176003703 |

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

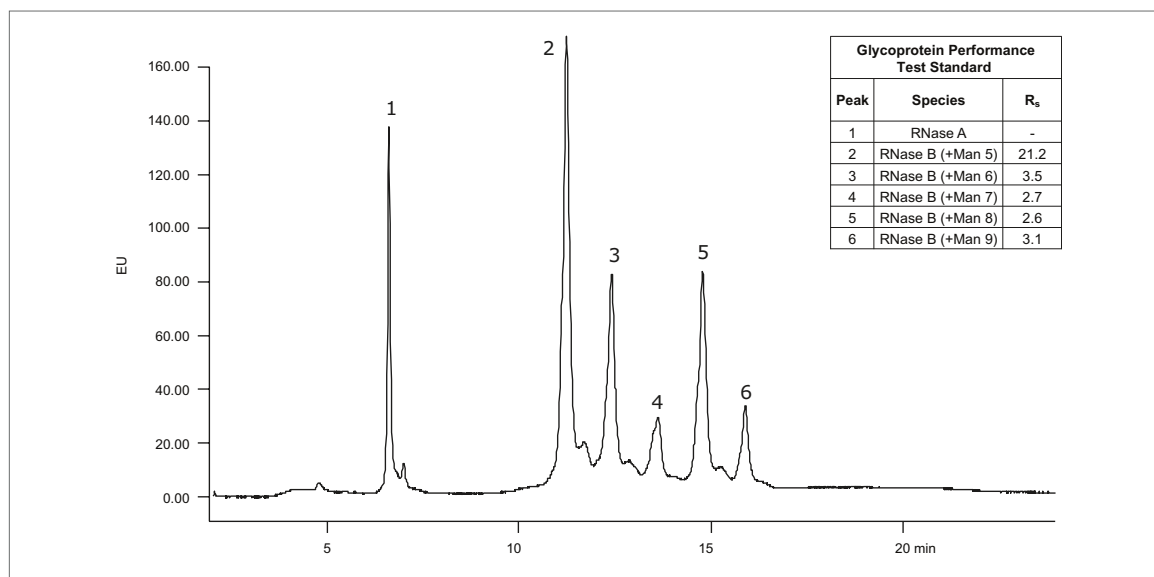
## Standards

| Description                            | P/N       |
|--|-----------|
| Glycoprotein Performance Test Standard | 186008010 |
| Intact mAb Mass Check Standard         | 186006552 |

## BENCHMARKING, METHOD DEVELOPMENT, AND TROUBLESHOOTING: GLYCOPROTEIN PERFORMANCE TEST STANDARD

### Glycoprotein Performance Test Standard

The Waters Glycoprotein Performance Test Standard is a formulation of aglycosylated and high mannose glycoforms of ribonuclease (RNase). It is intended for use as a material to condition and monitor the performance of ACQUITY UPLC Glycoprotein BEH Amide 300Å, 1.7 µm Columns.



Separation of the Glycoprotein Performance Test Standard (RNase A + RNase B glycoforms) using an ACQUITY UPLC Glycoprotein BEH Amide, 300Å, 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

#### Glycoprotein Performance Test Standard

| Description                            | Qty. | P/N       |
|--|------|-----------|
| Glycoprotein Performance Test Standard | 1/pk | 186008010 |

 Visit [www.waters.com/glycans](http://www.waters.com/glycans) to learn more.

#### APPLICATION AREA: Glycoprofiling

"Amazing product! Really simplifies the work flow (you can process 24 samples in less than half a day), extremely high sensitivity and resolution by HILIC, MS compatible - for precise assignment of glycan peaks. Also - the final sample volume of 400 µL gives the flexibility of measuring duplicates/triplicates by both HILIC and MS. It cannot be compared with 2-AB labelling, millions of times better! The price is higher than for 2-AB labelling, but the overall benefits for this product are incomparable."

REVIEWER: Gina Popa

ORGANIZATION: Abzena

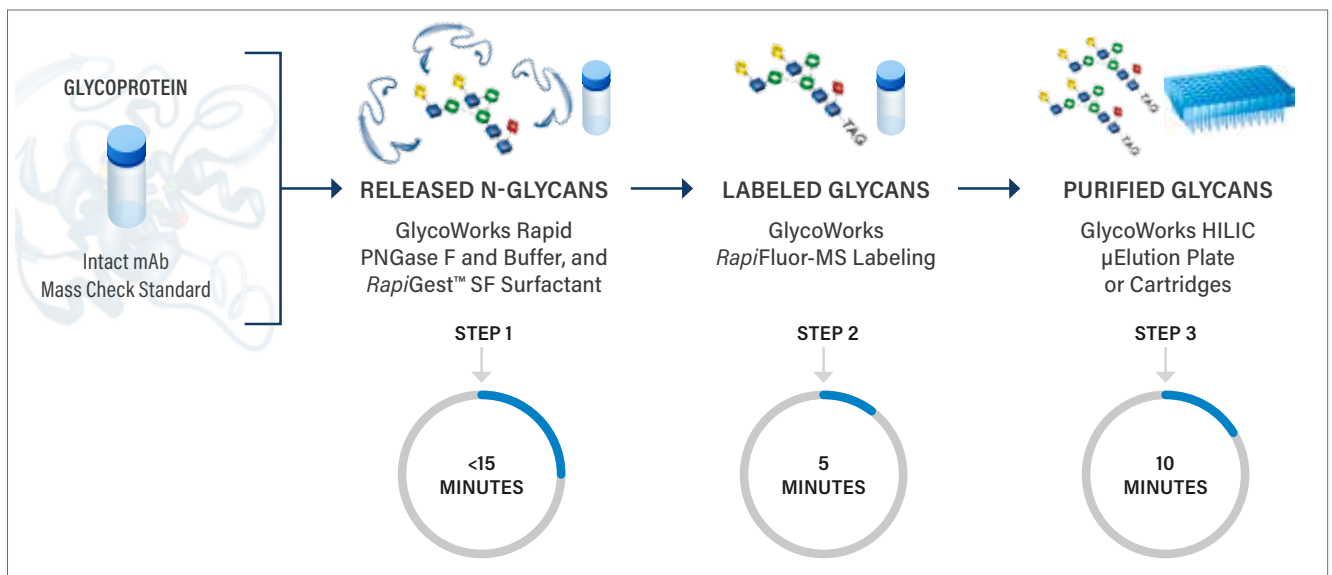


## RELEASED N-GLYCAN SAMPLE PREPARATION WITH GLYCOWORKS

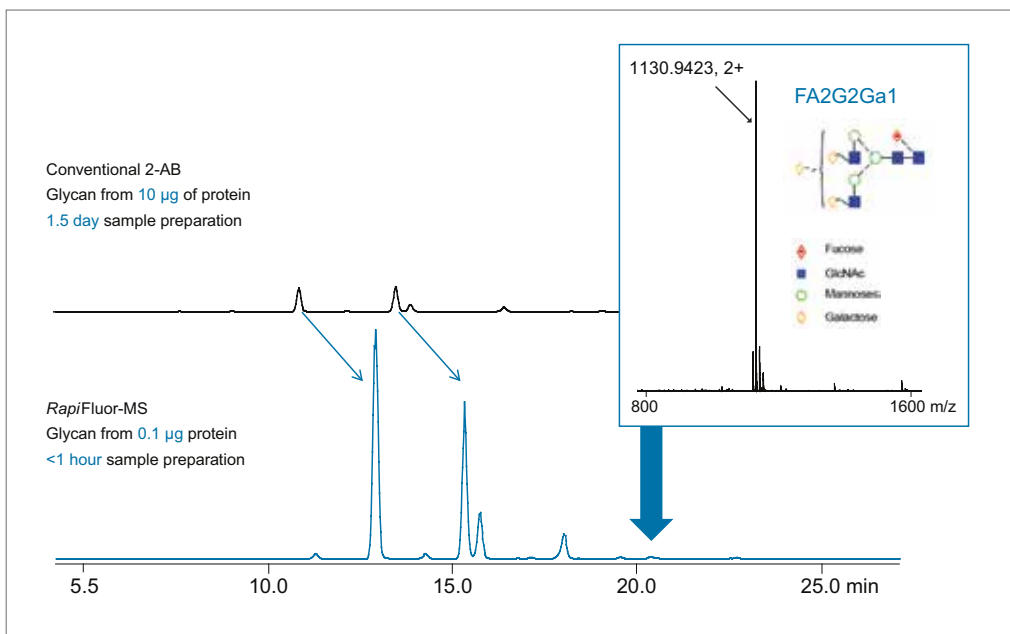
Waters GlycoWorks consumables offer a more convenient, comprehensive, and effective sample-preparation solution for glycan analysis.

- The GlycoWorks *RapiFluor*-MS N-Glycan Kit ensures easy, quick preparation of released, labeled N-glycan samples
- Streamlined protocols minimize errors and sample loss
- Greatly improved FLR and MS signal intensities help easily identify low-abundance N-linked glycans
- Complete modules for processing 96 samples with flexibility of processing between 8 and 24 samples at a time depending on laboratory demands
- Support easy training of analysts and the transferring of methods throughout an organization

### 3 Steps, as Little as 30 Minutes



### Glycan Characterization by UPLC FLR with Xevo® G2-XS QToF Mass Spectrometer



*Un-ionized form of acids and bases give most retention. Retention of neutral analytes not affected by pH.*

## Ordering Information

### GlycoWorks RapiFluor-MS Released N-Glycan Sample Preparation Kits

| Description   | P/N       |
|---|-----------|
| <b>96 Sample Kits</b>   |           |
| GlycoWorks RapiFluor-MS N-Glycan Starter Kit—96 Sample  |           |
| Kit contains these items: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module, ACQUITY UPLC Glycan BEH Amide, 130Å 1.7 µm, 2.1 × 150 Column, and Ammonium Formate Solution—Glycan Analysis                            | 176003635 |
| GlycoWorks RapiFluor-MS N-Glycan Kit—96 Sample  |           |
| Kit contains these items: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, GlycoWorks Cleanup Module, and GlycoWorks Sample Collection Module   | 176003606 |
| GlycoWorks RapiFluor-MS N-Glycan Basic Kit—96 Sample  |           |
| Kit contains: GlycoWorks Deglycosylation Module, GlycoWorks Labeling Module, and GlycoWorks Cleanup Module  | 176003910 |
| <b>24 Sample Kits</b>   |           |
| GlycoWorks RapiFluor-MS N-Glycan Starter Kit—24 sample  |           |
| Kit contains these items: GlycoWorks Deglycosylation Module (24 sample), GlycoWorks Labeling Module (24 sample), GlycoWorks Cleanup Module, GlycoWorks Sample Collection Module, ACQUITY UPLC Glycan BEH Amide 130Å, 1.7 µm, 2.1 × 150 mm Column, and Ammonium Formate Solution—Glycan Analysis | 176003712 |
| GlycoWorks RapiFluor-MS N-Glycan Kit—24 sample  |           |
| Kit contains these items: GlycoWorks Deglycosylation Module (24 sample), GlycoWorks Labeling Module (24 sample), GlycoWorks Cleanup Module, and GlycoWorks Sample Collection Module   | 176003713 |
| GlycoWorks RapiFluor-MS N-Glycan Basic Kit—24 sample  |           |
| Kit contains these items: GlycoWorks Deglycosylation Module (24 sample), GlycoWorks Labeling Module (24 sample), and GlycoWorks Cleanup Module  | 176003911 |
| GlycoWorks RapiFluor-MS N-Glycan Refill Kit—24 sample   |           |
| Refill Kit contains one of each: GlycoWorks Deglycosylation Module (25 sample) and the GlycoWorks Labeling Module (24 sample)   | 176003714 |



### RapiFluor-MS Released N-Glycan Standards and Accessories

| Description  | P/N       | Description  | P/N       |
|--|-----------|--|-----------|
| RapiFluor-MS Dextran Calibration Ladder 50 µg/vial                           | 186007982 | 96-Well Plate Extraction Manifold  | 186001831 |
| RapiFluor-MS Glycan Performance Test Standard 400 pmol total/vial            | 186007983 | Vacuum Manifold Shims** 3/set  | 186007986 |
| RapiFluor-MS High Mannose Standard   | 186008317 | Positive Pressure Manifold Spacer for the GlycoWorks RapiFluor-MS N-Glycan Kit* 1/pk | 186007987 |
| RapiFluor-MS Sialylated Glycan Performance Test Standard 400 pmol total/vial | 186008660 | Vacuum Pump 220 v/240 v 50 Hz  | 725000604 |
| Intact mAb Mass Check Standard*  | 186006552 | Positive Pressure Manifold   | 186006961 |
| Ammonium Formate Solution—Glycan Analysis 5050 mM                            | 186007081 | Modular Heat Block for 1 mL Tubes/96 wells   | 186007985 |
| GlycoWorks Rapid Buffer—5 mL   | 186008100 | ACQUITY UPLC Glycan BEH Amide, 130Å, 1.7 µm, 2.1 × 150 mm Column                     | 186004742 |
| RapiGest SF 3 mg Vial  | 186008090 |  |           |
| RapiGest SF 10 mg Vial   | 186002123 |  |           |

\* Control Standard included in kit.

\*\* Essential for kit use.

## BENCHMARKING, METHOD DEVELOPMENT, AND TROUBLESHOOTING: GLYCAN PERFORMANCE TEST STANDARDS AND DEXTRAN CALIBRATION LADDERS

### Ordering Information

#### Reductive Amination Glycan Sample Preparation Kit and Standards



| Description   | P/N       |
|---|-----------|
| GlycoWorks Reductive Amination High-throughput Prep Kit | 176003090 |
| GlycoWorks HILIC $\mu$ Elution Plate 96-well            | 186002780 |
| <i>Rapi</i> Gest SF 1 mg Vial                           | 186001860 |
| GlycoWorks Control Standard, 100 $\mu$ g Vial           | 186007033 |
| GlycoWorks Reagent Kit                                  | 186007034 |
| Manifold Waste Tray                                     | 600001282 |
| GlycoWorks Reductive Amination Single Use Prep Kit      | 176003119 |
| GlycoWorks HILIC 1 cc Cartridge (10/pk)                 | 186007080 |
| <i>Rapi</i> Gest SF 1 mg Vial                           | 186001860 |
| GlycoWorks Reagent Kit                                  | 186007034 |
| 2-AB Glycan Performance Test Standard                   | 186006349 |
| 2-AB Dextran Calibration Ladder                         | 186006841 |
| 2-AA Dextran Calibration Ladder                         | 186007279 |
| GlycoWorks HILIC 1 cc Cartridge, 20/pk                  | 186007080 |
| GlycoWorks HILIC 1 cc Flangeless Cartridge 20/pk        | 186007239 |
| GlycoWorks HILIC $\mu$ Elution Plate                    | 186002780 |
| GlycoWorks Reagent Kit                                  | 186007034 |
| GlycoWorks SPE Reagents                                 | 186007992 |
| Ammonium Formate Solution—Glycan Analysis 5050 mM       | 186007081 |



**APPLICATION AREA:** Characterization of monoclonal antibody and antibody-drug conjugate N-glycosylation

"*Rapi*Fluor-MS has provided the ability to characterize N-glycans with greater precision and confidence. It has also enabled the identification of previously unknown glycan structures and modifications, thanks to its compatibility with MS technology. Novel approaches such as *Rapi*Fluor are sometimes met with apprehension, due to lack of experience with the technology. However, *Rapi*Fluor-MS has demonstrated its utility in a number of application areas with confidence and experience continuing to grow on a weekly basis. Adoption of novel labelling technology can require extensive evaluation and comparison to legacy workflows. Information on how *Rapi*Fluor-MS compares to traditional reductive amination (2AA, 2AB, and APTS) as well as alternative separation techniques such as CE-LIF would further support *Rapi*Fluor-MS as complementary approach for glycan characterization."

**REVIEWER:** Eoin Cosgrave

**ORGANIZATION:** Seattle Genetics



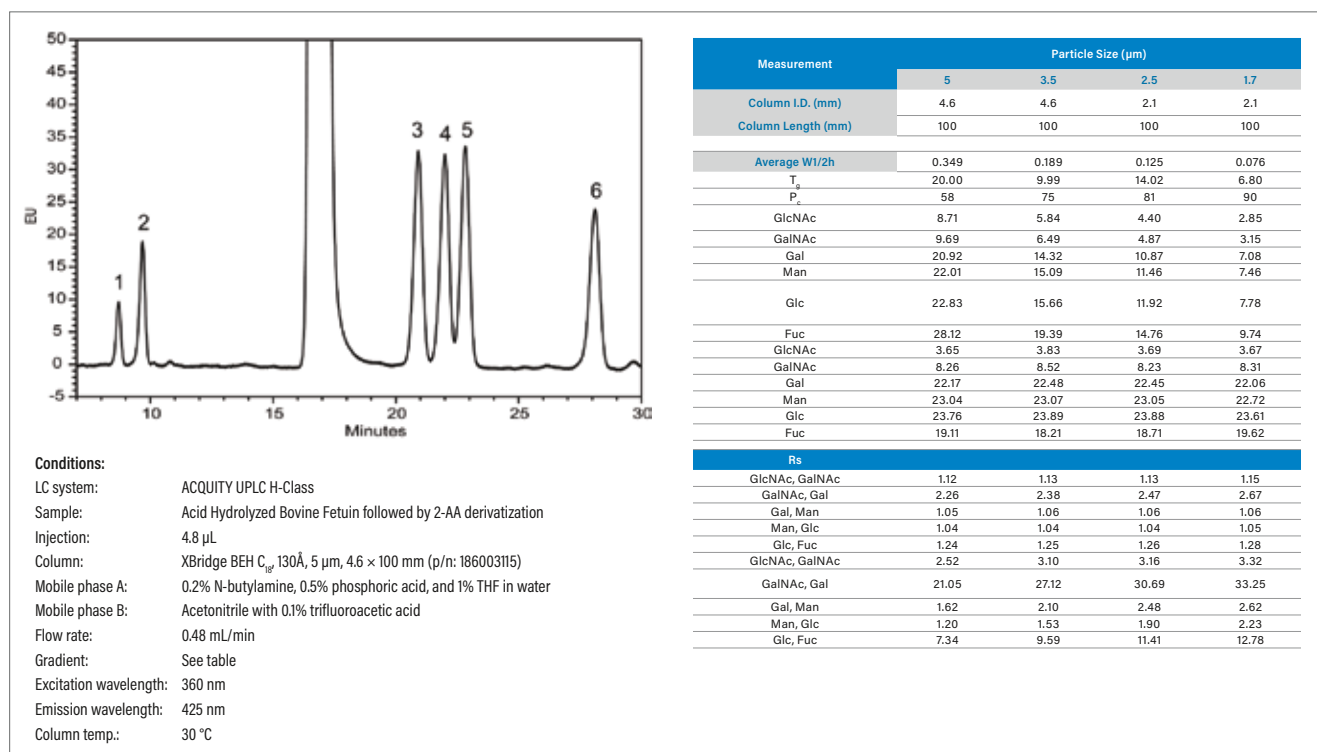


## COLUMNS FOR MONOSACCHARIDE AND SIALIC ACID ANALYSES FROM GLYCOPROTEINS

### Monosaccharide Analyses

Apart from charged sialic acid species, the primary monosaccharides found in N-linked and O-links 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 2M trifluoroacetic acid releases all of the monosaccharides; however, during hydrolysis, the N-acetyl groups on GlcNAc and GalNAc are hydrolyzed to glucosamine (GlcN) and galactosamine (GalN). Following hydrolysis, the released monosaccharides are derivatized using 2-aminobenzoic acid (2-AA), as detailed in the Waters application note: Future Proofing the Biopharmaceutical QC Laboratory: Chromatographic Scaling of HPLC Monosaccharide Analyses Using the ACQUITY UPLC H-Class Bio System (p/n: 720005255EN). As the application note explains, this method can reliably generate sensitive, high-resolution, and quantitative monosaccharide analyses independent of a laboratory's available LC instrumentation.

### HPLC-Based analyses of 2-AA Labeled Monosaccharides from Acid Hydrolyzed Bovine Fetuin

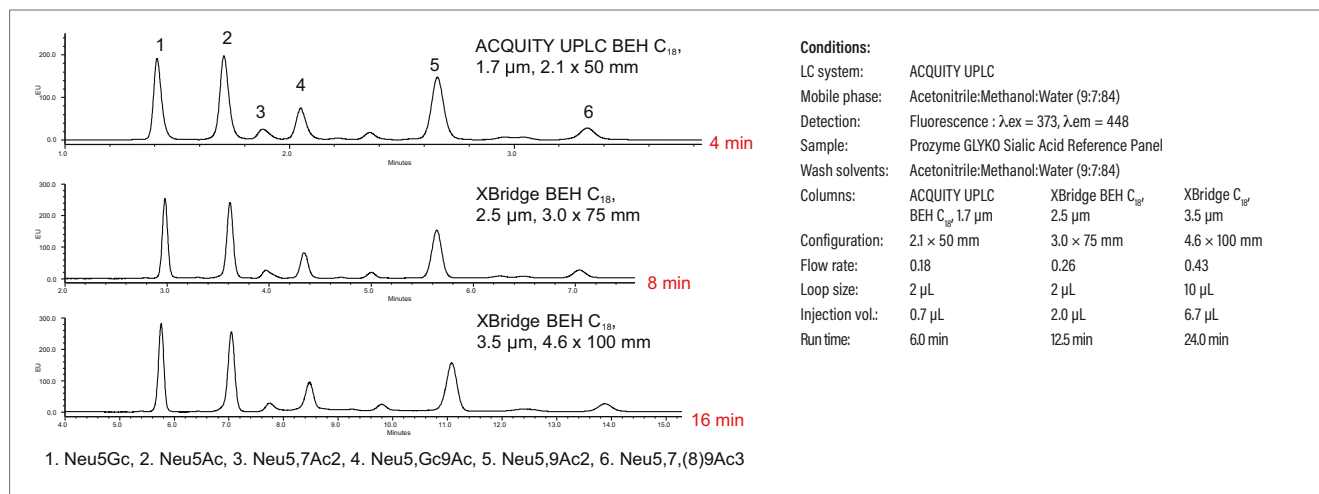


HPLC analysis of monosaccharides. A separation performed with a Waters XBridge BEH C<sub>18</sub>, 130Å, 5 µm Column as detailed in Waters Applications Note: 720005255EN. Monosaccharides are identified as follows: (1) N-acetylglucosamine (GlcNAc), (2) N-acetylgalactosamine (GalNAc), (3) Galactose (Gal), (4) Mannose (Man), (5) Glucose (Glc), and (6) Fucose (Fuc).

## 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 2 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



Geometric scaling of DMB-labeled sialic acid standards on XBridge BEH C<sub>18</sub>, 130Å, 3.5  $\mu$ m particle (bottom), 2.5  $\mu$ m particle (middle), and ACQUITY UPLC BEH C<sub>18</sub>, 130Å, 1.7  $\mu$ m particle (top).

Note the higher throughput and improved component resolution associate with the 1.7  $\mu$ m particle technology.

## Ordering Information

### ACQUITY UPLC BEH 130Å Columns

|                        | Dimension                  | P/N       |
|------------------------|----------------------------|-----------|
|                        | Particle Size: 1.7 $\mu$ m |           |
| C <sub>18</sub> , 130Å | 2.1 x 50 mm                | 186002350 |
|                        | 2.1 x 100 mm               | 186002352 |
|                        | 2.1 x 150 mm               | 186004742 |

### XBridge BEH 130Å Columns

|                        | Dimension                  | P/N       | Dimension                  | P/N       | Dimension                | P/N       |
|------------------------|----------------------------|-----------|----------------------------|-----------|--------------------------|-----------|
|                        | Particle Size: 2.5 $\mu$ m |           | Particle Size: 3.5 $\mu$ m |           | Particle Size: 5 $\mu$ m |           |
| C <sub>18</sub> , 130Å | 2.1 x 100 mm XP            | 186006031 | 2.1 x 100 mm               | 186003033 | 4.6 x 100 mm             | 186003115 |
|                        | 3.0 x 100 mm XP            | 186006035 |                            |           |                          |           |
|                        | 3.0 x 150 mm XP            | 186006710 |                            |           |                          |           |

## DNA, RNA, and Oligonucleotides

Our Oligonucleotide Separation Columns are packed with our second-generation, hybrid-silica BEH Technology particles, functionalized with C<sub>18</sub>. These columns are widely used to separate synthetic DNA and RNA species. The separation of detritylated synthetic oligonucleotide samples relies on the well established method of ion-pair, reversed-phase chromatography. In these separations, gradient elution results in the less hydrophobic species eluting prior to sequences of increasing hydrophobicities. The 1.7 µm UPLC particles or 2.5 µm HPLC/UHPLC particles available in several column dimensions, provide exceptional sample resolution and superior column life while providing the flexibility required to perform various laboratory-scale isolations.

Waters Oligonucleotide Separation Columns offer these benefits:

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

In addition, our manufacturing and quality-control testing procedures help ensure consistent batch-to-batch and column-to-column performance, regardless of application demands.

### Exceptional Resolution of Oligonucleotide Mixtures

Our ACQUITY UPLC Oligonucleotide C<sub>18</sub>, 1.7 µm Columns (designed for use with an ACQUITY UPLC System) and XBridge Oligonucleotide C<sub>18</sub>, 2.5 µm Columns are well-suited for the analysis of detritylated oligonucleotides by means of ion-pair, reversed-phase chromatography. As indicated (see figure on page 259), separations are comparable to those obtained by capillary gel electrophoresis (CGE), in terms of component resolution, yet UPLC technology significantly decreases analyses times. The ability to resolve large oligonucleotide sequences (e.g., N from N-1) is possible because of the enhanced resolving power obtained using sub-3 µm, BEH Technology particles. In addition, quantitation from failure sequences is possible by characterizing the molecular weight of the separated, target oligonucleotide product using the column in conjunction with hyphenated-mass spectrometry methods and MS-compatible eluents.



### Ordering Information

#### ACQUITY UPLC Oligonucleotide 130Å Columns\*

|                            | Dimension    | P/N       |
|----------------------------|--------------|-----------|
| Particle Size: 1.7 µm      |              |           |
| BEH C <sub>18</sub> , 130Å | 2.1 × 50 mm  | 186003949 |
|                            | 2.1 × 100 mm | 186003950 |
|                            | 2.1 × 150 mm | 186005516 |

\*For use on Waters ACQUITY UPLC Systems.

#### ACQUITY UPLC Oligonucleotide BEH 130Å Method Validation Kits\*

|                            | Dimension    | P/N       |
|----------------------------|--------------|-----------|
| Particle Size: 1.7 µm      |              |           |
| BEH C <sub>18</sub> , 130Å | 2.1 × 100 mm | 186004898 |

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

#### XBridge Oligonucleotide BEH 130Å Columns\*

|                            | Dimension   | P/N        |
|----------------------------|-------------|------------|
| Particle Size: 2.5 µm      |             |            |
| BEH C <sub>18</sub> , 130Å | 2.1 × 50 mm | 186003952  |
|                            | 4.6 × 50 mm | 186003953  |
|                            | 10 × 50 mm  | 186008212* |

\*OBD Column.

#### XBridge Oligonucleotide BEH 130Å Method Validation Kits\*

|                       | Dimension   | P/N       |
|-----------------------|-------------|-----------|
| Particle Size: 2.5 µm |             |           |
| BEH C <sub>18</sub>   | 4.6 × 50 mm | 186004906 |

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

#### APPLICATION AREA: Chromatography

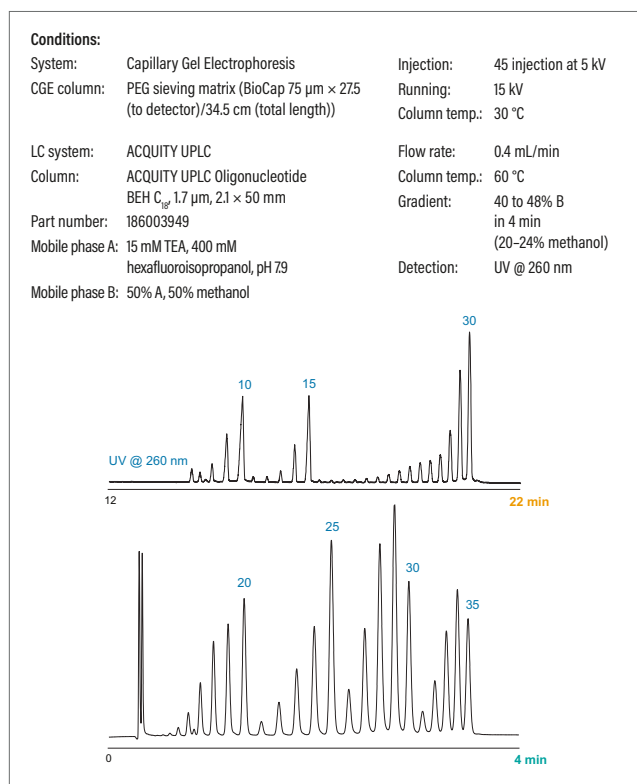
"This column has good separation and high resolution at different conditions. The new stationary phase provides for various chromatographic application. My next research I will be using it. I recommend this product to all my colleague."

REVIEWER: Berkant Kayan

ORGANIZATION: Aksaray University



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



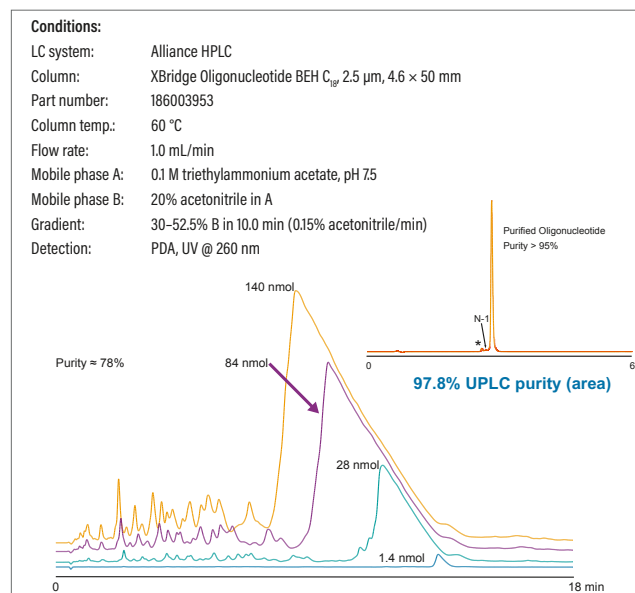
## Scalable DNA and RNAi Separations with Good Product Recovery

Our XBridge Oligonucleotide BEH  $C_{18}$ , 130Å Columns constitute the logical choice for detritylated oligonucleotide purifications, and we offer them in various dimensions to meet laboratory-scale isolation requirements. The choice of a particular 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  $\times$  50 mm column containing XBridge Oligonucleotide BEH  $C_{18}$ , 130Å, 2.5  $\mu\text{m}$  material is an excellent selection when oligonucleotide mass loads are less than or equal to 0.2  $\mu\text{mol}$ . We recommend selecting the column size appropriate for the amount of oligonucleotide sample loaded. Doing so maximizes component resolution and recovery of the target product from undesired failure sequences.

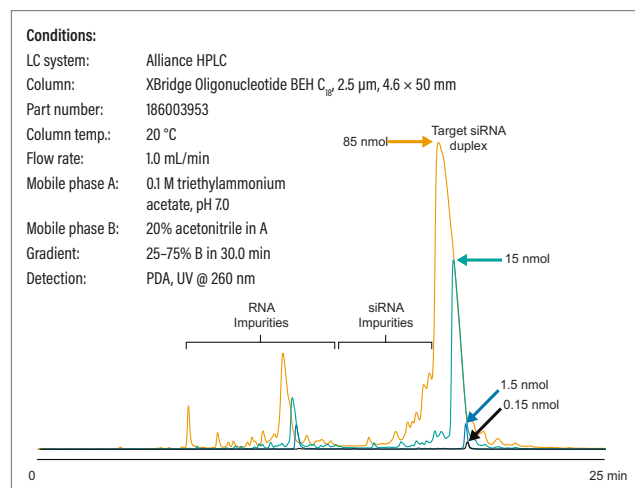
Researchers involved in gene silencing often find it necessary to work with high-purity RNA. Crude synthetic oligonucleotides used for gene knockout are typically purified. The figure below illustrates a laboratory-scale purification of 21mer RNA at various column loads. Using an oligonucleotide column chemistry and a Waters Alliance LC System, you can purify large quantities of crude, single stranded RNA. Doing so produces material of high purity (ca. 95%), with an estimated yield of 55%, based on the ratio of sample present in the collected peak area to that present in the total peak area.

In addition, XBridge Oligonucleotide Columns are well suited for 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



## Purification of siRNA Duplex from Impurities



| Dimensions         | Approx Mass Load**      | Yield*** | Flow Rate    |
|--------------------|-------------------------|----------|--------------|
| 2.1 $\times$ 50 mm | 0.04 $\mu\text{moles}$  | 0.2 mg   | 0.2 mL/min   |
| 4.6 $\times$ 50 mm | 0.20 $\mu\text{moles}$  | 1.0 mg   | 1.0 mL/min   |
| 10 $\times$ 50 mm  | 1.00 $\mu\text{moles}$  | 4.5 mg   | 4.5 mL/min   |
| 19 $\times$ 50 mm* | 4.00 $\mu\text{moles}$  | 16.0 mg  | 16.0 mL/min  |
| 30 $\times$ 50 mm* | 9.00 $\mu\text{moles}$  | 40.0 mg  | 40.0 mL/min  |
| 50 $\times$ 50 mm* | 25.00 $\mu\text{moles}$ | 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

Molecular biology methods for manipulation of DNA generally rely on restriction enzymes, polymerase-chain reaction (PCR), and sequencing techniques. Those methods usually convert genomic DNA into shorter, double-stranded DNA sequences (dsDNA) typically 100–1000 base pairs (bp) in length. Often, slab-gel or capillary electrophoresis is used to analyze or isolate the dsDNA molecules. Our ACQUITY UPLC BEH C<sub>18</sub>, 300Å Reversed-phase or Gen-Pak™ FAX Anion-exchange Columns, which are particularly well suited for various analytical and small-scale purifications, offer a practical alternative to traditional electrophoretic methods.

### Ordering Information

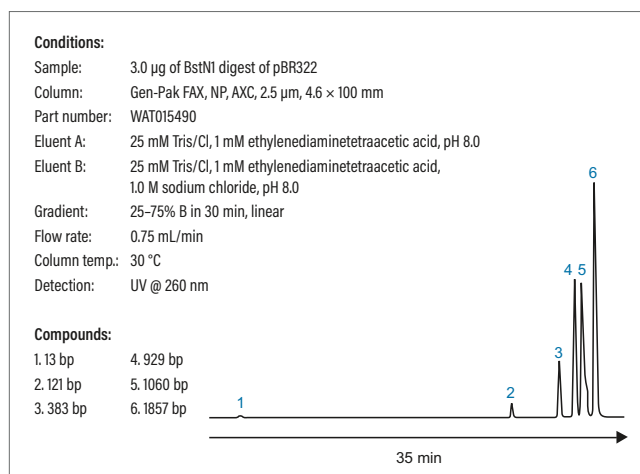
ACQUITY UPLC BEH C<sub>18</sub>, 300Å Columns for DNA/RNA Fragments

|   | Dimension             | P/N       |
|---|-----------------------|-----------|
|   | Particle Size: 1.7 µm |           |
| ACQUITY UPLC BEH C <sub>18</sub> , 300Å | 2.1 × 50 mm           | 186003685 |

## GEN-PAK FAX ANION-EXCHANGE COLUMNS

Our 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 nonporous resin, it contains 2.5 µm particles and is well-suited for analytical and micro-preparative applications.

### Separation of DNA Restriction Fragments

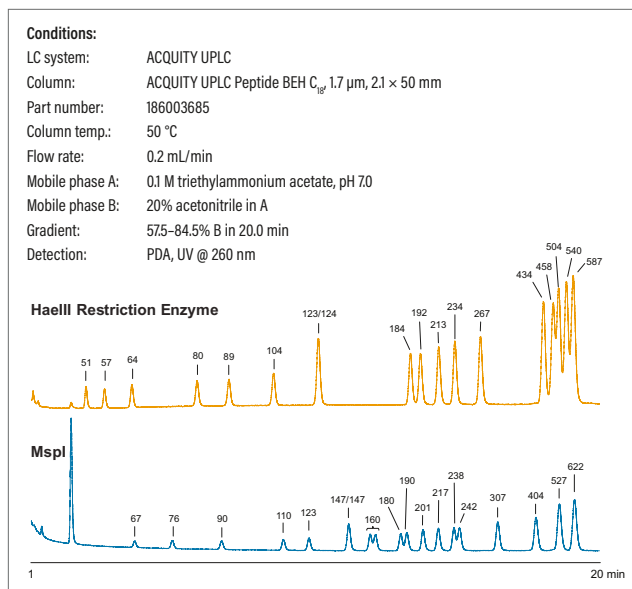


### Ordering Information

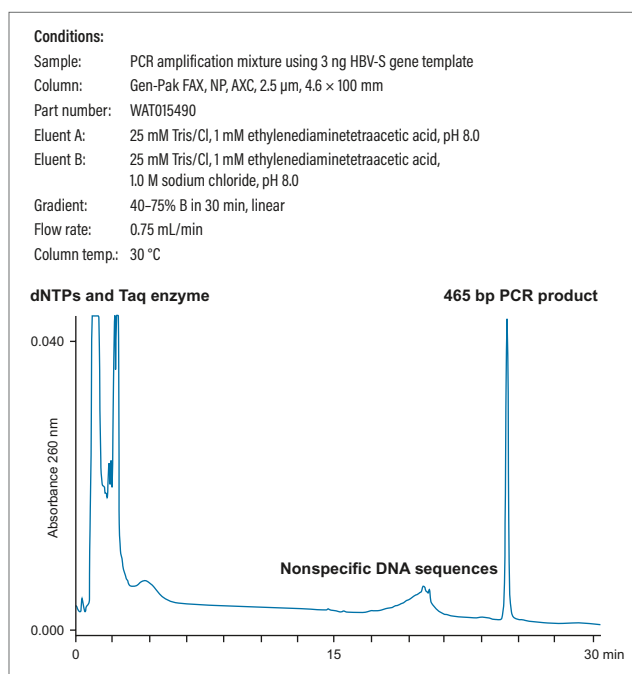
Gen-Pak FAX HPLC Column

| Description                          | Dimension    | P/N       |
|--------------------------------------|--------------|-----------|
| Gen-Pak FAX Column                   | 4.6 × 100 mm | WAT015490 |
| Gen-Pak FAX Replacement Inlet Filter | —            | WAT015715 |

## Separation of Duplex DNA Fragments: HaeIII and MspI Restriction Enzyme Digests of pBR322 Plasmid



## Chromatography of a PCR Amplification Mixture Generated using 3 ng and 1 fg of HBV S-Genome Template



## BENCHMARKING, METHOD DEVELOPMENT, AND TROUBLESHOOTING: MASSPREP OLIGONUCLEOTIDE STANDARD

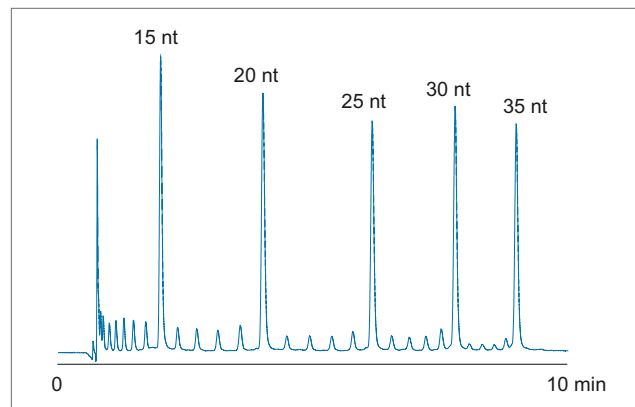


The MassPREP Oligonucleotide Standard offers these benefits:

- Eliminates staff time and reduces laboratory cost to create and test a defined mixture of synthetic oligonucleotide standards for column and/or instrument performance testing
- Each batch of MassPREP Oligonucleotide Standard is manufactured and QC tested using a stringent set of criteria to help ensure expected product consistency

The pre-packaged MassPREP Oligonucleotide Standard verifies HPLC/UPLC instrument and column performance for the analysis of synthetic oligonucleotides. Approximate equimolar amounts of oligodeoxythymidines of nucleotide (nt) length 15, 20, 25, 30, and 35 are lyophilized and packaged in 1.5-mL LC vials. The vials contain approximately 1 nmole of each oligonucleotide. They are vacuum-sealed, in foil pouches, to reduce the extent of degradation that can occur by excessive exposure to light and air.

## Separation of MassPREP Oligonucleotide Standard on ACQUITY UPLC Oligonucleotide BEH C<sub>18</sub>, 1.7 μm Column



Waters ACQUITY UPLC analysis of MassPREP Oligonucleotide Standard on an ACQUITY UPLC Oligonucleotide C<sub>18</sub>, 130Å, 1.7 μm Column. The main components are labeled. Small peaks eluting between labeled oligonucleotides are failure sequences (N-1, N-2, etc.) generated during the oligonucleotide syntheses. The ACQUITY UPLC System is equipped with a 50 μL standard mixer and a PDA detector (260 nm).

## OASIS μELUTION PLATES

### Oligonucleotide Desalting by Solid-Phase Extraction

Our Oasis μElution Plates to desalt oligonucleotides by solid-phase extraction offer these benefits:

- Removes salt prior to MS analysis
- Low elution volumes
- High sensitivity
- Sample concentrating
- High throughput



Desalting synthetic oligonucleotides is essential for MS analysis (QC, genotyping applications, and SNP analysis). Oasis μElution Plates are an excellent choice for high-throughput analyses performed with minimal sample. The Oasis μElution Plate combines patented plate design, proven chemistries, and generic protocols, permitting elution volumes as low as 25 μL. Now you can perform SPE cleanup and concentration of extremely 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-vinylpyrrolidone, the copolymer is ideally suited for this application.

## Ordering Information

### Oligonucleotide Sample Preparation Plate

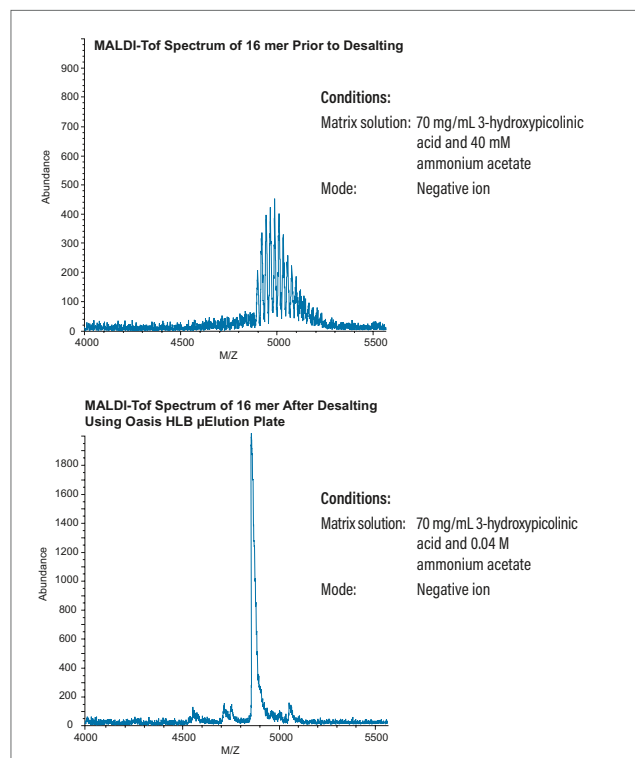
| Description                                     | P/N         |
|---|-------------|
| Oasis HLB μElution Plate (for Oligonucleotides) | 186001828BA |

## Ordering Information

### MassPREP Oligonucleotide Standard

| Description                       | Qty. | P/N       |
|-----------------------------------|------|-----------|
| MassPREP Oligonucleotide Standard | 1/pk | 186004135 |

### Effective Use of Oasis HLB for Oligonucleotide Desalting Prior to MALDI-ToF MS



## Peptide Separations

The desired separation, accurate quantitation, and correct identification of peptides, ranging from proteomic investigations to biotherapeutic mAb characterization, is challenging. To be successful, scientists acknowledge the importance of separation synergies that occur when a defined column, instrument, and method are assembled to address specific application needs.

Reversed-phase (RP) chromatography has become the separation mode of choice for many of these challenging applications. It offers relatively high resolving power and provides outstanding quantitative (UV) and qualitative (ESI-MS) information. In RP-based peptide separations, the size of the peptide as well as the hydrophobicity of the amino-acid side chains determine the elution order. Consequently, small, less hydrophobic peptide sequences elute first using a gradient of increasing organic solvent concentration.

### PEPTIDE BEH C<sub>18</sub> (130Å, 300Å), PEPTIDE CSH C<sub>18</sub> (130Å), AND PEPTIDE HSS T3 (100Å) COLUMNS

Waters Ethylene-Bridged Hybrid (BEH) and Charged Surface Hybrid (CSH) column technologies can be effectively used to generate high quality UPLC, UHPLC, or HPLC peptide separations via reversed-phase chromatography. Their effective use in either TFA- or FA-containing eluents makes them well suited for either LC or LC-MS applications. Our Peptide HSS T3 Columns are designed for separations where silica-based selectivities are desired or when increased retention of hydrophilic peptides are required.

#### Hybrid Particles



#### BEH (Ethylene-Bridged Hybrid)

Trifunctional C<sub>18</sub> 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<sub>18</sub> columns
- Two pore sizes (130Å and 300Å) provide different separation selectivities for a wide range of peptides and small proteins



#### CSH (Charged Surface Hybrid)

Trifunctional C<sub>18</sub> 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<sub>18</sub> Columns
- Optimal for separations from pH 1–5
- The 130Å pore size is best suited for compounds less than 10,000 Daltons

#### Silica Particles



#### HSS (High Strength Silica)

Trifunctional C<sub>18</sub> ligand, fully end-capped, bonded to High Strength Silica (HSS) particles.

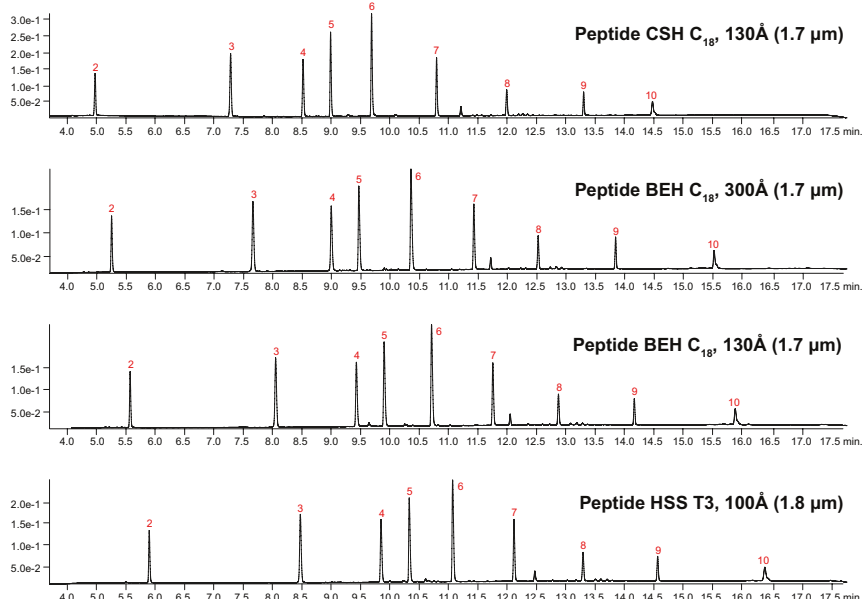
- Viable option when either the hybrid-based, Peptide BEH C<sub>18</sub> or Peptide CSH C<sub>18</sub> do not meet a specific peptide application need
- Ideal choice for the separation of small, hydrophilic peptides since retentivity is greater than that obtained using Waters hybrid-based peptide separation 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 Std Mix, p/n: 186002337, were separated on 4.6 × 150 mm columns containing Waters Peptide CSH C<sub>18</sub> 130Å (1.7 μm), Peptide BEH C<sub>18</sub> 300Å (1.7 μm), Peptide BEH C<sub>18</sub> 130Å (1.7 μm), or Peptide HSS T3 100Å (1.8 μm) UPLC-based particles on a Waters 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)



**i** See page 273 for the molecular weight, pK<sub>a</sub>, and sequence of each peptide used in this study.

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

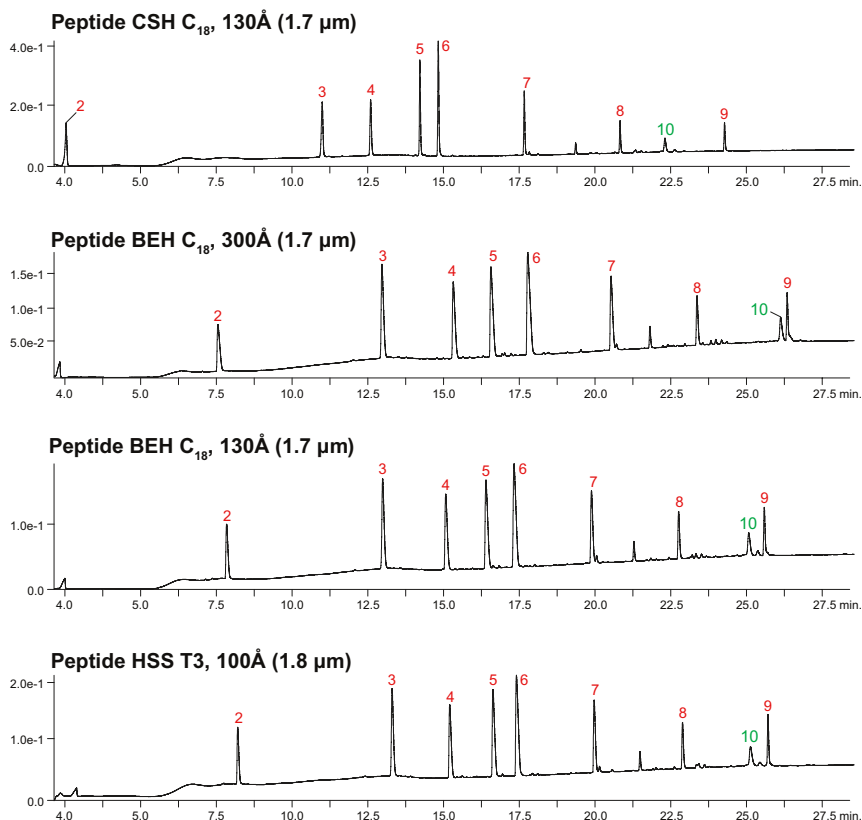
Peptides contained in Waters MassPREP Peptide Std Mix, p/n: 186002337, were separated on 4.6 × 150 mm columns containing Waters Peptide CSH C<sub>18</sub> 130Å (1.7 μm), Peptide BEH C<sub>18</sub> 300Å (1.7 μm), Peptide BEH C<sub>18</sub> 130Å (1.7 μm), or Peptide HSS T3 100Å (1.8 μm) UPLC-based particles on a Waters 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.

Notes:

1) 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





## PEPTIDE CSH C<sub>18</sub>, 130Å COLUMNS

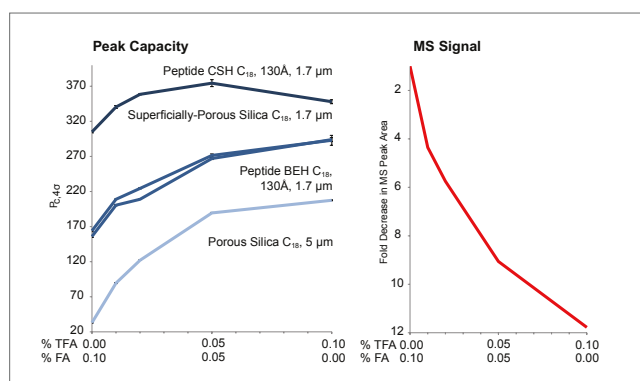
### Charged Surface Hybrid Particles Deliver Superior Peptide Separations in LC and LC-MS Applications

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<sub>18</sub>, 130Å 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 no longer 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<sub>18</sub>, 130Å 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 component, or components, of interest.

### Superior Performance in Eluents Containing Formic Acid or Trifluoroacetic Acid

Waters Peptide CSH C<sub>18</sub>, 130Å 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<sub>18</sub>, 130Å 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

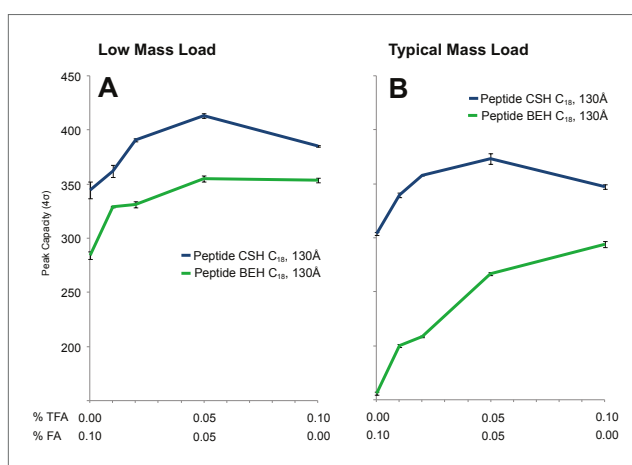


Effect of trifluoroacetic acid on peak capacity and MS signal. (A) Peak capacity as a function of acid modifier. Values were derived from two replicates. (B) Fold decrease in MS peak area as a function of acid modifier. Waters MassPREP Peptide Standard Mixture (p/n: 186002337) was used in study.

### 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<sub>18</sub>, 130Å delivers a remarkably better performance than many existing C<sub>18</sub> 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.

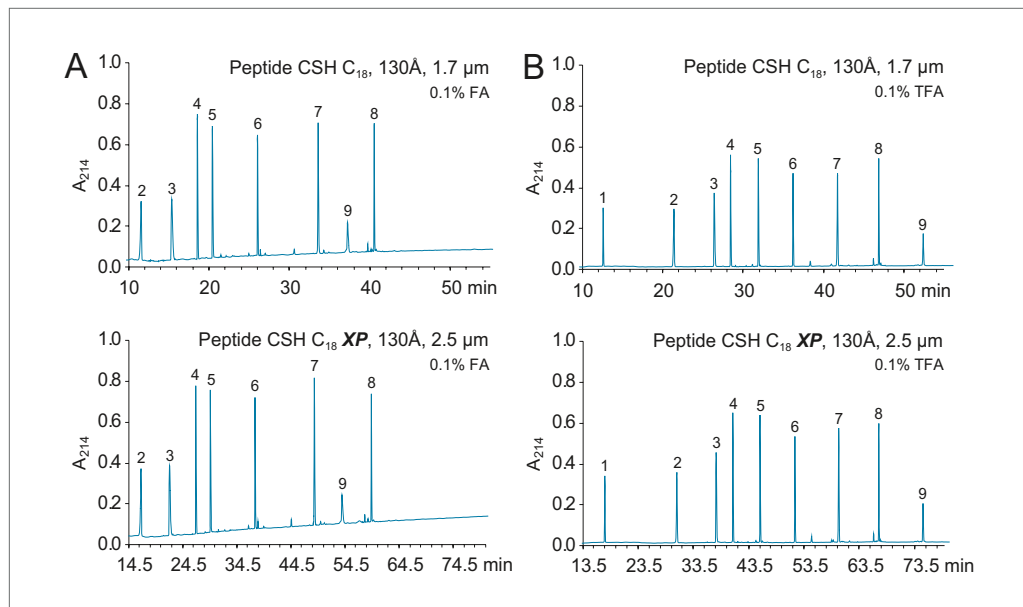
### Comparative Averaged Peptide Peak Capacities on Peptide CSH C<sub>18</sub>, 130Å vs. Peptide BEH C<sub>18</sub>, 130Å Based Columns (2.1 × 150 mm) at Two Peptide Mass Loads and Differing Concentrations of Formic Acid and Trifluoroacetic Acid



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. The recent introduction of Waters eXTended Performance (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<sub>18</sub>, 130Å, 1.7 μm Column to a Peptide CSH C<sub>18</sub>, 130Å, 2.5 μm XP Column simply by altering flow rate and gradient time. As shown below, you can readily employ CSH Technology for high peak capacity peptide separations using either HPLC, UHPLC, or UPLC instrumentation.

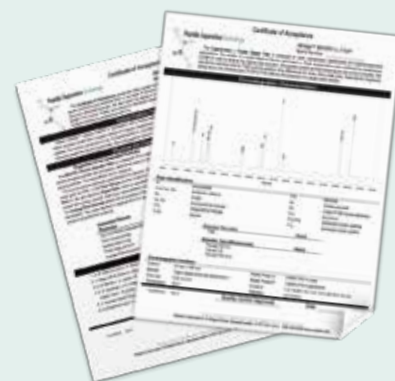
Comparative Separation of MassPREP Peptide Standard Mixture on ACQUITY UPLC Peptide CSH C<sub>18</sub>, 130Å, 1.7 µm vs. XSelect Peptide CSH C<sub>18</sub>, 130Å, 2.5 µm **XP** in Eluents Containing Formic Acid or 0.1% Trifluoroacetic Acid



Chromatograms of Waters MassPREP Peptide Standard Mixture (p/n: 186002337) obtained with (A) 0.1% formic acid and (B) 0.1% trifluoroacetic acid mobile phases. The method for the Peptide CSH C<sub>18</sub> **XP**, 130Å, 2.5 µm Column was scaled from the method for the CSH C<sub>18</sub>, 130Å, 1.7 µm Column by decreasing flow rate and increasing gradient time by a factor of 1.5. Generated back-pressure on the XSelect Peptide CSH C<sub>18</sub> **XP**, 130Å, 2.5 µm, 2.1 × 150 mm Column was 3000 psi (205 bar); back-pressure on the ACQUITY UPLC Peptide CSH C<sub>18</sub>, 130Å, 1.7 µm, 2.1 × 150 mm Column was 8000 psi (550 bar).

## Increased Assurance with Waters Peptide Columns

Waters rigorously tests each batch of our synthesized Peptide BEH C<sub>18</sub>, 130Å; Peptide BEH C<sub>18</sub>, 300Å; Peptide CSH C<sub>18</sub>, 130Å; and Peptide HSS T3 100Å 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.

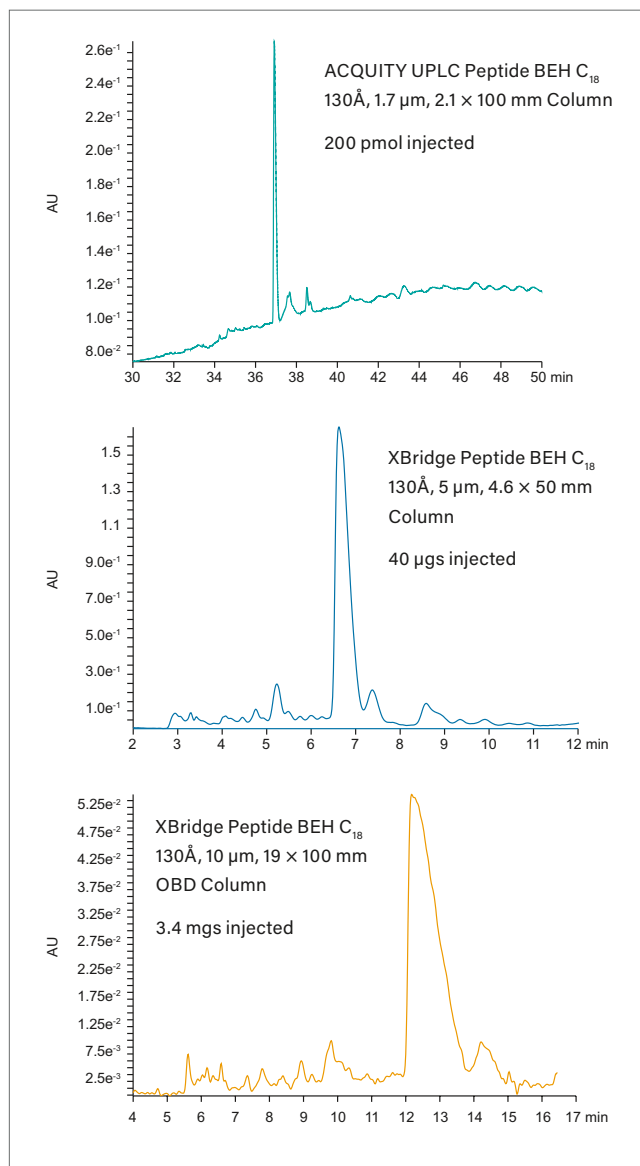


Certificate of analysis information includes a labeled chromatogram of the gradient separation of a tryptic digest of bovine cytochrome c (p/n: 186006371) using eluents that contain 0.1% formic acid. You can purchase the same protein digest test mixture to ensure the proper performance of your Peptide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

## Simplifying Column Choice for Peptide Purifications

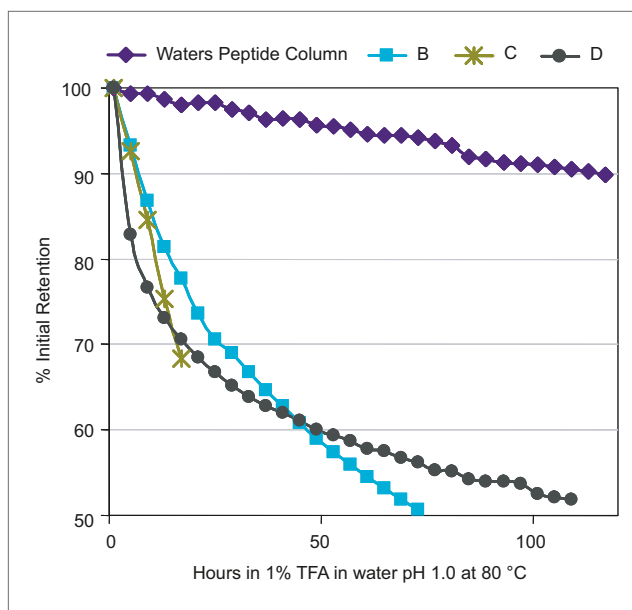
Our peptide columns are versatile. Often, a single C<sub>18</sub>-based chemistry can separate a wide range of peptides, requiring little time and expense to obtain satisfactory results. We offer peptide packings in many particle sizes and column dimensions. (See the "Peptide Preparative Column Selection Guide," below.)

### 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 µm and 10 µm |             |                            |                                 |                            |
|----------------------------------|-------------|----------------------------|---------------------------------|----------------------------|
| 130Å and 300Å                    |             |                            |                                 |                            |
| I.D. (mm)                        | Length (mm) | µmoles 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 |             |                            |                                 |                            |
|-------------------------|-------------|----------------------------|---------------------------------|----------------------------|
| 130Å and 300Å           |             |                            |                                 |                            |
| I.D. (mm)               | Length (mm) | µmoles of a Single Peptide | Weight of a Single Peptide (mg) | Typical Flow Rate (mL/min) |
| 30                      | 50          | 2.5–25                     | 5–100                           | 40–80                      |
| 30                      | 100         | 2.5–25                     | 5–100                           | 40–80                      |
| 30                      | 150         | 2.5–25                     | 5–100                           | 40–80                      |
| 30                      | 250         | 2.5–25                     | 5–100                           | 40–80                      |

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

When columns fail, they do so both physically and chemically. For columns used with low-pH mobile phases, the usual cause of abbreviated column life is hydrolysis of the bonded phase, which manifests itself as significant changes in peptide retention. Our BEH Technology Columns incorporate proprietary procedures for bonding and end-capping that yield stable bonded phases. In low-pH stability tests, BEH C<sub>18</sub> columns showed only minimal retention loss. Our patented Optimum Bed Density (OBD) Technology, developed to create packed beds that are the most stable of any available, regardless of manufacturer, ensures the physical stability of these columns. Visit [www.waters.com/OBD](http://www.waters.com/OBD) for details about OBD Technology.

### Ordering Information

#### ACQUITY UPLC Peptide BEH C<sub>18</sub> Columns

|                            | Dimension    | P/N        |
|----------------------------|--------------|------------|
| Particle Size: 1.7 µm      |              |            |
| BEH C <sub>18</sub> , 130Å | 2.1 × 5 mm   | 186003975* |
|                            | 2.1 × 50 mm  | 186003554  |
|                            | 2.1 × 100 mm | 186003555  |
|                            | 2.1 × 150 mm | 186003556  |
| Particle Size: 1.7 µm      |              |            |
| BEH C <sub>18</sub> , 300Å | 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<sub>18</sub> Method Validation Kits\*

|                            | Dimension    | P/N       |
|----------------------------|--------------|-----------|
| Particle Size: 1.7 µm      |              |           |
| BEH C <sub>18</sub> , 130Å | 2.1 × 100 mm | 186004896 |
|                            | 2.1 × 150 mm | 186006516 |
| Particle Size: 1.7 µm      |              |           |
| BEH C <sub>18</sub> , 300Å | 2.1 × 100 mm | 186004897 |
|                            | 2.1 × 150 mm | 186006516 |

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

#### In-Line Filters

| Description   | P/N       |
|---|-----------|
| In-line Filter Holder and (6) 0.2 µm Stainless Steel Replacement Filters    | 205000343 |
| 0.2 µm Stainless Steel Replacement Filters and End Nuts for 205000343, 5/pk | 700002775 |

#### XBridge Peptide BEH C<sub>18</sub> Method Validation Kits\*

|                            | Dimension             | P/N       | Dimension           | P/N       |
|----------------------------|-----------------------|-----------|---------------------|-----------|
| Particle Size: 3.5 µm      |                       |           | Particle Size: 5 µm |           |
| BEH C <sub>18</sub> , 130Å | 4.6 × 100 mm          | 186004904 | 4.6 × 100 mm        | 186005463 |
|                            | Particle Size: 3.5 µm |           | Particle Size: 5 µm |           |
| BEH C <sub>18</sub> , 300Å | 4.6 × 100 mm          | 186004905 | 4.6 × 100 mm        | 186005464 |

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

XBridge Peptide BEH C<sub>18</sub> Columns

|                            | Dimension             | P/N         | Dimension           | P/N                     | Dimension            | P/N                     |
|----------------------------|-----------------------|-------------|---------------------|-------------------------|----------------------|-------------------------|
|                            | Particle Size: 3.5 µm |             | Particle Size: 5 µm |                         | Particle Size: 10 µm |                         |
| BEH C <sub>18</sub> , 130Å | 1.0 × 50 mm           | 186003560   | 1.0 × 50 mm         | 186003571               | 4.6 × 50 mm          | 186003648               |
|                            | 1.0 × 100 mm          | 186003561   | 1.0 × 100 mm        | 186003572               | 4.6 × 100 mm         | 186003649               |
|                            | 1.0 × 150 mm          | 186003562   | 1.0 × 150 mm        | 186003573               | 4.6 × 150 mm         | 186003650               |
|                            | 2.1 × 50 mm           | 186003563   | 2.1 × 50 mm         | 186003574               | 4.6 × 250 mm         | 186003651               |
|                            | 2.1 × 100 mm          | 186003564   | 2.1 × 100 mm        | 186003575               | 10 × 10 mm           | 186004465* <sup>1</sup> |
|                            | 2.1 × 150 mm          | 186003565   | 2.1 × 150 mm        | 186003576               | 10 × 50 mm           | 186008194               |
|                            | 2.1 × 250 mm          | 186003566   | 2.1 × 250 mm        | 186003577               | 10 × 100 mm          | 186008195               |
|                            | 4.6 × 50 mm           | 186003567   | 4.6 × 50 mm         | 186003578               | 10 × 150 mm          | 186008196               |
|                            | 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* <sup>2</sup> |
|                            | 4.6 × 250 mm          | 186003570   | 4.6 × 250 mm        | 186003581               | 19 × 50 mm           | 186003656               |
|                            |                       |             | 10 × 10 mm          | 186004469* <sup>1</sup> | 19 × 150 mm          | 186003657               |
|                            |                       |             | 10 × 50 mm          | 186008186               | 19 × 250 mm          | 186003658               |
|                            |                       |             | 10 × 100 mm         | 186008187               | 30 × 10 mm           | 186006880* <sup>3</sup> |
|                            |                       |             | 10 × 150 mm         | 186008188               | 30 × 50 mm           | 186003659               |
|                            |                       |             | 10 × 250 mm         | 186008189               | 30 × 100 mm          | 186003660               |
|                            |                       |             | 19 × 10 mm          | 186004468* <sup>2</sup> | 30 × 150 mm          | 186003661               |
|                            |                       |             | 19 × 50 mm          | 186003586               | 30 × 250 mm          | 186003662               |
|                            |                       |             | 19 × 100 mm         | 186003587               |                      |                         |
|                            |                       | 19 × 150 mm | 186003945           |                         |                      |                         |

|                            | Particle Size: 3.5 µm |             | Particle Size: 5 µm |                         | Particle Size: 10 µm |                         |
|----------------------------|-----------------------|-------------|---------------------|-------------------------|----------------------|-------------------------|
| BEH C <sub>18</sub> , 300Å | 1.0 × 50 mm           | 186003604   | 1.0 × 50 mm         | 186003615               | 4.6 × 50 mm          | 186003663               |
|                            | 1.0 × 100 mm          | 186003605   | 1.0 × 100 mm        | 186003616               | 4.6 × 100 mm         | 186003664               |
|                            | 1.0 × 150 mm          | 186003606   | 1.0 × 150 mm        | 186003617               | 4.6 × 150 mm         | 186003665               |
|                            | 2.1 × 50 mm           | 186003607   | 2.1 × 50 mm         | 186003618               | 4.6 × 250 mm         | 186003666               |
|                            | 2.1 × 100 mm          | 186003608   | 2.1 × 100 mm        | 186003619               | 10 × 10 mm           | 186004467* <sup>1</sup> |
|                            | 2.1 × 150 mm          | 186003609   | 2.1 × 150 mm        | 186003620               | 10 × 50 mm           | 186008198               |
|                            | 2.1 × 250 mm          | 186003610   | 2.1 × 250 mm        | 186003621               | 10 × 100 mm          | 186008199               |
|                            | 4.6 × 50 mm           | 186003611   | 4.6 × 50 mm         | 186003622               | 10 × 150 mm          | 186008200               |
|                            | 4.6 × 100 mm          | 186003612   | 4.6 × 100 mm        | 186003623               | 10 × 250 mm          | 186008201               |
|                            | 4.6 × 150 mm          | 186003613   | 4.6 × 150 mm        | 186003624               | 19 × 10 mm           | 186004466* <sup>2</sup> |
|                            | 4.6 × 250 mm          | 186003614   | 4.6 × 250 mm        | 186003625               | 19 × 50 mm           | 186003671               |
|                            |                       |             | 10 × 10 mm          | 186004471* <sup>1</sup> | 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* <sup>1</sup> | 30 × 250 mm          | 186003677               |
|                            |                       |             | 19 × 50 mm          | 186003630               | 30 × 10 mm           | 186006882* <sup>3</sup> |
|                            |                       |             | 19 × 100 mm         | 186003631               |                      |                         |
|                            |                       | 19 × 150 mm | 186003946           |                         |                      |                         |

\*Guard Cartridge.

<sup>1</sup> Requires 10 × 10 mm Prep Guard Holder, p/n: 289000779.

<sup>2</sup> Requires 19 × 10 mm Prep Guard Holder, p/n: 186000709.

<sup>3</sup> Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

### ACQUITY UPLC Peptide CSH C<sub>18</sub> Columns and Kits

|                            | Dimension    | Column P/N | Kit P/N <sup>1</sup> |
|----------------------------|--------------|------------|----------------------|
| Particle Size: 1.7 µm      |              |            |                      |
| CSH C <sub>18</sub> , 130Å | 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            |

<sup>1</sup>Kit includes Peptide CSH C<sub>18</sub>, 130Å Column plus one vial of Cytochrome c Digestion Standard, p/n: 186006371.

### ACQUITY UPLC Peptide CSH C<sub>18</sub> Method Validation Kits\*

|                            | Dimension    | Column P/N | Kit P/N <sup>1</sup> |
|----------------------------|--------------|------------|----------------------|
| Particle Size: 1.7 µm      |              |            |                      |
| CSH C <sub>18</sub> , 130Å | 2.1 × 150 mm | 186006940  | 176003068            |

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

<sup>1</sup>Kit includes Peptide CSH C<sub>18</sub>, 130Å Column plus one vial of Cytochrome c Digestion Standard, p/n: 186006371.

### ACQUITY UPLC Peptide CSH C<sub>18</sub> VanGuard Columns

|                            | Dimension   | Column P/N | Kit P/N <sup>1</sup> |
|----------------------------|-------------|------------|----------------------|
| Particle Size: 1.7 µm      |             |            |                      |
| CSH C <sub>18</sub> , 130Å | 2.1 × 50 mm | 186006939  | 176003067            |

<sup>1</sup>Kit includes Peptide CSH C<sub>18</sub>, 130Å Column plus one vial of Cytochrome c Digestion Standard, p/n: 186006371.

## XSelect Peptide CSH C<sub>18</sub> Columns and Kits

|                                  | Dimension              | Column P/N | Kit P/N <sup>1</sup> | Dimension                  | Column P/N | Kit P/N <sup>1</sup> | Dimension           | P/N (1/pk)  |
|----------------------------------|------------------------|------------|----------------------|----------------------------|------------|----------------------|---------------------|-------------|
|                                  | Particle Size: 2.5 µm  |            |                      | Particle Size: 3.5 µm      |            |                      | Particle Size: 5 µm |             |
| <b>CSH, C<sub>18</sub>, 130Å</b> | 2.1 × 50 mm <i>XP</i>  | 186006941  | 176003069            | 2.1 × 10 mm <sup>2,4</sup> | 186006954  | 176003081            | 4.6 × 50 mm         | 186007076   |
|                                  | 2.1 × 100 mm <i>XP</i> | 186006942  | 176003070            | 2.1 × 50 mm                | 186006950  | 176003077            | 4.6 × 100 mm        | 186007077   |
|                                  | 2.1 × 150 mm <i>XP</i> | 186006943  | 176003071            | 2.1 × 100 mm               | 186006951  | 176003078            | 4.6 × 150 mm        | 186007078   |
|                                  | 4.6 × 50 mm <i>XP</i>  | 186006946  | 176003074            | 2.1 × 150 mm               | 186006952  | 176003079            | 10 × 10 mm*         | 186007015   |
|                                  | 4.6 × 100 mm <i>XP</i> | 186006947  | 176003075            | 4.6 × 20 mm <sup>3,4</sup> | 186006958  | 176003085            | 10 × 50 mm*         | 186008264   |
|                                  | 4.6 × 150 mm <i>XP</i> | 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.

<sup>1</sup> Kit includes Peptide CSH C<sub>18</sub>, 130Å Column plus one vial of Cytochrome c Digestion Standard, p/n: 186006371.

<sup>2</sup> Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.

<sup>3</sup> Requires 4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

<sup>4</sup> 2/pk.

## ACQUITY UPLC Peptide CSH C<sub>18</sub> Columns and Kits\*

|                                  | Dimension             | Column P/N | Kit P/N <sup>1</sup> | Dimension             | Column P/N | Kit P/N <sup>1</sup> |
|----------------------------------|-----------------------|------------|----------------------|-----------------------|------------|----------------------|
|                                  | Particle Size: 2.5 µm |            |                      | Particle Size: 3.5 µm |            |                      |
| <b>CSH, C<sub>18</sub>, 130Å</b> | 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 3 columns, each from a different batch.

<sup>1</sup> Kit includes Peptide CSH C<sub>18</sub>, 130Å Column plus one vial of Cytochrome c Digestion Standard, p/n: 186006371.

## XSelect Peptide CSH C<sub>18</sub> VanGuard Pre-Column

|                                  | Dimension             | Column P/N | Kit P/N <sup>1</sup> |
|----------------------------------|-----------------------|------------|----------------------|
|                                  | Particle Size: 2.5 µm |            |                      |
| <b>CSH, C<sub>18</sub>, 130Å</b> | 2.1 × 100 mm          | 186006944  | 176003072            |

<sup>1</sup> Kit includes Peptide CSH C<sub>18</sub>, 130Å Column plus 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 HSS T3 Columns and Kits

|                       | Dimension    | Column P/N | Kit P/N <sup>1</sup> |
|-----------------------|--------------|------------|----------------------|
| Particle Size: 1.8 µm |              |            |                      |
| <b>HSS T3, 100Å</b>   | 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            |

<sup>1</sup>Kit includes Peptide HSS T3 Column plus one vial of Cytochrome c Digestion Standard, p/n: 186006371.

### ACQUITY UPLC HSS T3 VanGuard Column

|                       | Dimension  | P/N       |
|-----------------------|------------|-----------|
| Particle Size: 1.8 µm |            |           |
| <b>HSS T3, 100Å</b>   | 2.1 × 5 mm | 186008757 |

### ACQUITY UPLC HSS T3 Method Validation Kits\*

|                       | Dimension    | P/N       |
|-----------------------|--------------|-----------|
| Particle Size: 1.8 µm |              |           |
| <b>HSS T3, 100Å</b>   | 2.1 × 150 mm | 186008782 |

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

### XSelect HSS T3 Columns

|                       | Dimension    | Column P/N | Kit P/N <sup>1</sup> | Dimension           | Column P/N | Kit P/N <sup>1</sup> |
|-----------------------|--------------|------------|----------------------|---------------------|------------|----------------------|
| Particle Size: 2.5 µm |              |            |                      | Particle Size: 5 µm |            |                      |
| <b>HSS T3, 100Å</b>   | 2.1 × 50 mm  | 186008758  | 176003998            | 2.1 × 50 mm         | 186008774  | 176004016            |
|                       | 2.1 × 100 mm | 186008759  | 176003999            | 2.1 × 100 mm        | 186008775  | 176004017            |
|                       | 2.1 × 150 mm | 186008760  | 176004006            | 2.1 × 150 mm        | 186008776  | 176004018            |
|                       | 4.6 × 50 mm  | 186008762  | 176004007            | 4.6 × 50 mm         | 186008778  | 176004019            |
|                       | 4.6 × 100 mm | 186008763  | 176004008            | 4.6 × 100 mm        | 186008779  | 176004020            |
|                       | 4.6 × 150 mm | 186008764  | 176004009            | 4.6 × 150 mm        | 186008780  | 176004021            |

<sup>1</sup>Kit includes Peptide HSS T3 Column plus one vial of Cytochrome c Digestion Standard, p/n: 186006371.

### XSelect HSS T3 VanGuard Columns

|                       | Dimension  | P/N                 | Dimension  | P/N       |
|-----------------------|------------|---------------------|------------|-----------|
| Particle Size: 2.5 µm |            | Particle Size: 5 µm |            |           |
| <b>HSS T3, 100Å</b>   | 2.1 × 5 mm | 186008761           | 2.1 × 5 mm | 186008777 |
|                       | 3.9 × 5 mm | 186008765           | 3.9 × 5 mm | 186008781 |

### XSelect Peptide HSS T3 Method Validation Kits\*

|                       | Dimension    | P/N                   | Dimension    | P/N                 | Dimension    | P/N       |
|-----------------------|--------------|-----------------------|--------------|---------------------|--------------|-----------|
| Particle Size: 2.5 µm |              | Particle Size: 3.5 µm |              | Particle Size: 5 µm |              |           |
| <b>HSS T3, 100Å</b>   | 2.1 × 150 mm | 186008783             | 2.1 × 150 mm | 186008785           | 2.1 × 150 mm | 186008787 |
|                       | 4.6 × 150 mm | 186008784             | 4.6 × 150 mm | 186008786           | 4.6 × 150 mm | 186008788 |

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

#### DID YOU KNOW...

HSS T3 products will be available Q1 2017.

Contact your local sales representative for more information.



## BENCHMARKING, METHOD DEVELOPMENT, AND TROUBLESHOOTING: CYTOCHROME c DIGESTION STANDARD

The Cytochrome c Digestion Standard was prepared by digesting Bovine Heart Cytochrome c (UniProt #P62894) with sequencing-grade trypsin. Recommended for benchmarking system performance, this standard is also used to quality-control test the column.



## Ordering Information

### Cytochrome c Digestion Standard

| Description                     | P/N       |
|---------------------------------|-----------|
| Cytochrome c Digestion Standard | 186006371 |

## THERAPEUTIC PEPTIDE METHOD DEVELOPMENT KIT

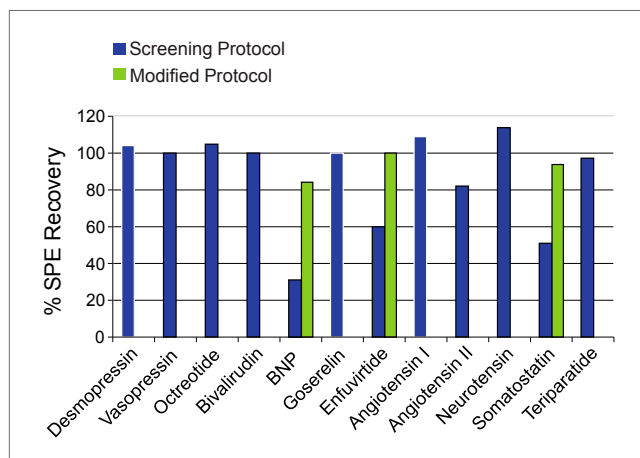
We developed the Therapeutic Peptide Method Development Kit to simplify sample preparation and also for developing LC methods for analyzing therapeutic peptides in plasma. The kit contains an Oasis Peptide  $\mu$ Elution Method Development Plate, a peptide  $C_{18}$ , 300Å reversed-phase column and the detailed screening protocol used to generate data. We also created a comprehensive method development training seminar. The seminar addresses all aspects of the method development process, from MS conditions to the final validation of a method for extracting the peptide Desmopressin from human plasma.

Our peptide columns are quality-control tested using a cytochrome c tryptic digest, helping to ensure batch-to-batch consistency in validated methods. They are ideally suited for separating a wide range of peptides: large and small, acidic and basic, hydrophilic and hydrophobic.

Visit [www.waters.com/pepkit](http://www.waters.com/pepkit) for more information, or contact your local Waters sales office.



### High Recovery of Peptides



The innovative Oasis  $\mu$ Elution Plate format allows for as much as a 15-fold increase in the concentration of sample, increasing the possibility of reaching the required sensitivity levels for bioanalytical assays. The low, 25  $\mu$ L, elution volume eliminates the need for evaporation and reconstitution, significantly reducing the potential loss of analyte by its adsorption to the walls of the collection plate, chemical instability, or both.

## Ordering Information

### Therapeutic Peptide Method Development Kits

| Description  | Qty./Box | P/N       |
|--|----------|-----------|
| UPLC Therapeutic Peptide Method Development Kit                                  |          | 176001835 |
| Oasis $\mu$ Elution Method Development Plate                                     | 1        | 186004713 |
| ACQUITY UPLC Peptide BEH $C_{18}$ , 300Å, 1.7 $\mu$ m, 2.1 $\times$ 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 $\mu$ Elution Method Development Plate                                     | 1        | 186004713 |
| XBridge Peptide BEH $C_{18}$ , 300Å, 3.5 $\mu$ m, 2.1 $\times$ 50 mm Column      | 1        | 186003607 |
| 96-well 1 mL Collection Plate and Cap Mat  | 3        | 600001043 |

#### Available Waters Products Not Included in Kit:

|  |    |           |
|--|----|-----------|
| Oasis MAX 96-well $\mu$ Elution Plate                                | 1  | 186001829 |
| Oasis WCX 96-well $\mu$ Elution 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 (includes 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 |

## BENCHMARKING, METHOD DEVELOPMENT, AND TROUBLESHOOTING: MASSPREP PEPTIDE STANDARD

The MassPREP Peptide Standard Mixture contains a void volume (VO) column marker and nine, carefully selected peptides, each with a broad range of polarities and isoelectric points. The MassPREP Peptide Standard is useful for testing UPLC and HPLC columns and systems dedicated to peptide separations.

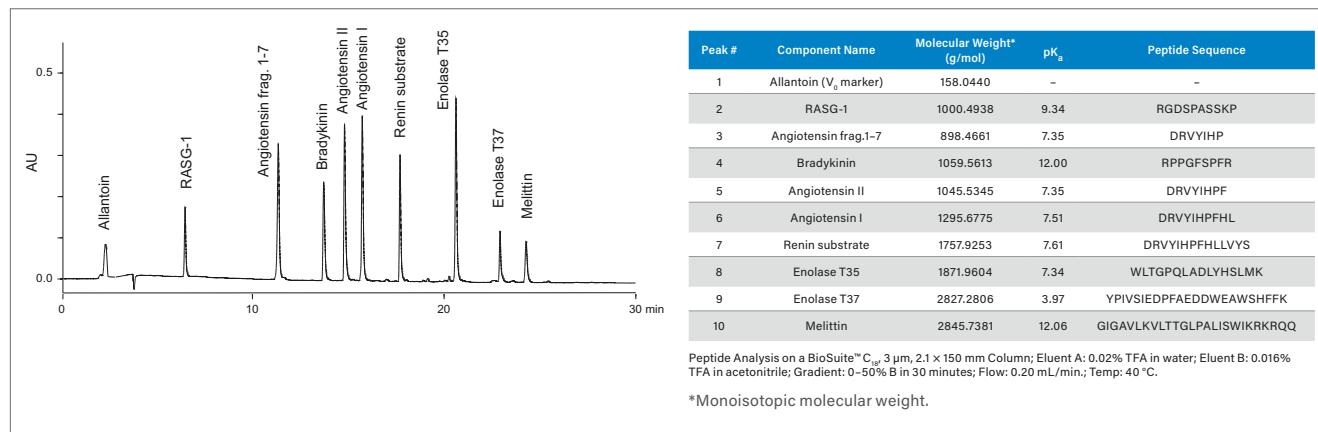


## Ordering Information

### MassPREP Peptide Standards

| Description                      | P/N       |
|----------------------------------|-----------|
| MassPREP Peptide Mixture         | 186002337 |
| MassPREP Peptide Mixture, 5/pk   | 186002338 |
| Quantitative Peptide Standard PN | 186006555 |

### Baseline HPLC Resolution of Nine Peptides Contained in MassPREP Peptide Standard Mixture



Waters offers a variety of carefully formulated, quality-control tested peptide standards that help confirm the performance of a column and LC system before you use it to analyze valuable samples.

## PHOSPHORYLATED PEPTIDE STANDARDS AND SAMPLE PREPARATION KITS

By offering the option to use pure peptides the MassPREP Phosphopeptide Standards provide you the means to exercise greater control over sample preparation. In addition, the MassPREP Phosphopeptide Enrichment Kit allows for selective enrichment of phosphopeptides from complex matrices.



## Ordering Information

### MassPREP Phosphopeptide Standards and Kits

| Description                                       | P/N       |
|---|-----------|
| MassPREP Phosphopeptide Standard Enolase          | 186003285 |
| MassPREP Enolase Digest with Phosphopeptides Mix  | 186003286 |
| MassPREP Phosphopeptide Sample Kit—Enolase        | 186003287 |
| MassPREP Phosphopeptide Enrichment Kit            | 186003864 |
| MassPREP Phosphopeptide enrichment μElution plate | 186003820 |
| MassPREP Enhancer (5 vials)                       | 186003863 |

## DELTA-PAK HPLC AND UHPLC COLUMNS

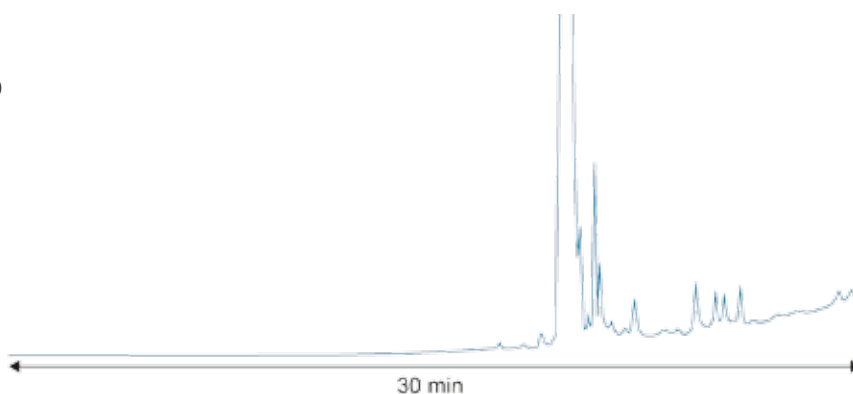
Our Delta-Pak packings are based on a highly stable 5 or 15  $\mu\text{m}$  spherical silica that is bonded and end-capped. As such, they are ideal for separating peptides, proteins, and natural products. We offer Delta-Pak packings in different pore-size materials (100 $\text{\AA}$  and 300 $\text{\AA}$ ) and with a  $\text{C}_{18}$  or  $\text{C}_4$  bonded phase. Visit [waters.com/biosep](http://waters.com/biosep) for more information.

### Synthetic Peptide Separation on Delta-Pak $\text{C}_{18}$ HPLC Column

#### Conditions:

Column: Delta-Pak  $\text{C}_{18}$  300 $\text{\AA}$ , 5  $\mu\text{m}$ , 3.9  $\times$  150 mm  
 Part number: WAT011793  
 Sample: Synthetic peptide-neurotensin (5 mg/mL)  
 Injection: 10  $\mu\text{L}$  (50  $\mu\text{g}$ )  
 Mobile phase A: Water with 0.1% trifluoroacetic acid  
 Mobile phase B: Acetonitrile with 0.1% trifluoroacetic acid  
 Gradient: 0–2 min, 5% B  
 Conditions: 2–27 min, 5–9% B, 30–31 min, 90–5% B  
 Flow rate: 1 mL/min  
 Detection: UV @ 230 nm

Note: Waters Delta-Pak  $\text{C}_{18}$  300 $\text{\AA}$  Columns (available in 5 and 15  $\mu\text{m}$  particle sizes) are well suited for the analysis and laboratory-scale isolation of synthetic peptide mixtures.



## Ordering Information

### Delta-Pak Analytical HPLC and UHPLC Columns and Guards

| Dimension                       | Type             | Particle Size   | Pore Size        | Delta-Pak $\text{C}_{18}$ | Delta-Pak $\text{C}_4$ |
|---------------------------------|------------------|-----------------|------------------|---------------------------|------------------------|
| 2.1 $\times$ 150 mm             | Column           | 5 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT023650                 | —                      |
| 3.9 $\times$ 20 mm              | Guard, 2/pk      | 5 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT046880 <sup>1</sup>    | WAT046875 <sup>1</sup> |
| 3.9 $\times$ 20 mm              | Guard, 2/pk      | 5 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT046890 <sup>1</sup>    | WAT046885 <sup>1</sup> |
| 3.9 $\times$ 20 mm              | Guard, 10/pk     | 5 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT036870 <sup>1</sup>    | —                      |
| 3.9 $\times$ 150 mm             | Column           | 5 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT011795                 | WAT011796              |
| 3.9 $\times$ 150 mm             | Cartridge, 10/pk | 5 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT036875 <sup>2</sup>    | WAT036865 <sup>2</sup> |
| 3.9 $\times$ 150 mm             | Column           | 5 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT011793                 | WAT011794              |
| Guard-Pak Holder                |                  |                 |                  |                           | WAT088141              |
| Guard-Pak In-Line Filters, 5/pk |                  |                 |                  |                           | WAT032472              |

<sup>1</sup>Requires 3.9  $\times$  20 mm/4.6  $\times$  20 mm Universal Sentry Guard Holder, p/n: WAT046910.

<sup>2</sup>Requires Guard-Pak Holder, p/n: WAT088141.

### Delta-Pak Preparative HPLC and UHPLC Guard Columns

| Dimension           | Type   | Particle Size    | Pore Size        | Delta-Pak $\text{C}_{18}$ | Delta-Pak $\text{C}_4$ |
|---------------------|--------|------------------|------------------|---------------------------|------------------------|
| 3.9 $\times$ 300 mm | Column | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT011797                 | WAT011807              |
| 3.9 $\times$ 300 mm | Column | 15 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT011802                 | WAT011812              |
| 7.8 $\times$ 300 mm | Column | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT011798                 | WAT011808              |
| 7.8 $\times$ 300 mm | Column | 15 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT011803                 | WAT011813              |
| 19 $\times$ 300 mm  | Column | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT011799                 | WAT011809              |
| 19 $\times$ 300 mm  | Column | 15 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT011804                 | WAT011814              |
| 30 $\times$ 300 mm  | Column | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT011800                 | WAT011810              |
| 30 $\times$ 300 mm  | Column | 15 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT011805                 | WAT011815              |
| 50 $\times$ 300 mm  | Column | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT011801                 | —                      |

### Delta-Pak Radial Compression Preparative HPLC and UHPLC Column Segments and PrepPak Cartridges\*

| Dimension          | Type        | Particle Size    | Pore Size        | Delta-Pak $\text{C}_{18}$ | Delta-Pak $\text{C}_4$ |
|--------------------|-------------|------------------|------------------|---------------------------|------------------------|
| 8 $\times$ 100 mm  | Column      | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT025846                 | WAT025848              |
| 8 $\times$ 100 mm  | Column      | 15 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT025845                 | —                      |
| 25 $\times$ 100 mm | Column      | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT038506                 | WAT038508              |
| 25 $\times$ 100 mm | Column      | 15 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT038507                 | WAT038509              |
| 25 $\times$ 10 mm  | Guard, 2/pk | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT038520                 | WAT038524              |
| 25 $\times$ 10 mm  | Guard, 2/pk | 15 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT038522                 | WAT038526              |
| 40 $\times$ 100 mm | Column      | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT037688                 | WAT037696              |
| 40 $\times$ 100 mm | Column      | 15 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT037692                 | WAT037700              |
| 40 $\times$ 10 mm  | Guard, 2/pk | 15 $\mu\text{m}$ | 100 $\text{\AA}$ | WAT037842                 | —                      |
| 40 $\times$ 10 mm  | Guard, 2/pk | 15 $\mu\text{m}$ | 300 $\text{\AA}$ | WAT037845                 | WAT037851              |

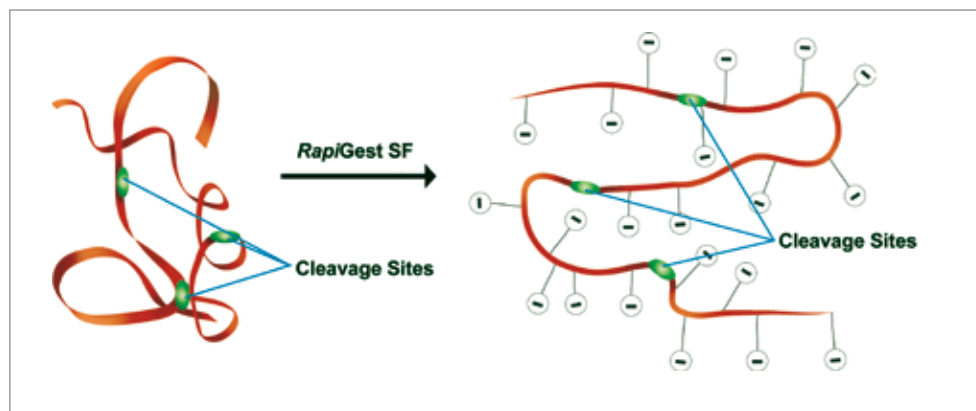
\*All column segments and cartridges require the appropriate holder/module.

## RapiGest SF SURFACTANT FOR PROTEIN DIGESTIONS

RapiGest SF (surfactant) radically enhances the speed and recovery of protein enzymatic digestions. A patented, anionic surfactant, RapiGest accelerates the production of peptides generated by proteases, such as trypsin, Asp-N, Glu-C, and Lys-C. Many hydrophobic proteins resist proteolysis because their cleavage sites are inaccessible to endoproteases. RapiGest, a mild denaturant, helps solubilize and unfold proteins, rendering them more easily cleaved without denaturing or inhibiting common proteolytic enzymes.



### How RapiGest SF Works



Waters RapiGest SF accelerates the in-solution production of peptides generated by proteases such as trypsin, Asp-N, Glu-C, and Lys-C.

### Ordering Information

#### RapiGest Surfactant

| Description                  | P/N       |
|------------------------------|-----------|
| RapiGest SF 1 mg vial        | 186001860 |
| RapiGest SF 1 mg vial (5/pk) | 186001861 |
| RapiGest SF 3 mg vial        | 186008090 |
| RapiGest SF 10 mg vial       | 186002123 |
| RapiGest SF 50 mg vial       | 186002122 |
| RapiGest SF Custom           | 186002118 |

#### DID YOU KNOW...

We offer a wide variety of quantitative peptide standards.

 Visit [asr.waters.com](http://asr.waters.com) to find out more.

## Protein Separations

Many of today's leading pharmaceutical drugs are protein based with monoclonal antibodies, biosimilars, and antibody drug conjugates leading an extensive list of internationally approved drug entities. Consequently, comprehensive LC and LC-MS protein characterization methods are necessary to help ensure the efficacy and safety of these biotherapeutics. These methods frequently involve the use of orthogonal separation techniques that include size exclusion, ion exchange, hydrophobic interaction, as well as hydrophilic interaction chromatography. HPLC methods are well recognized for their ability to resolve compounds of similar composition. However, the synergistic use of LC columns containing sub-2- $\mu\text{m}$  particles on instruments designed to maintain enhanced component resolution have resulted in the ability to generate higher quality and more detailed information.

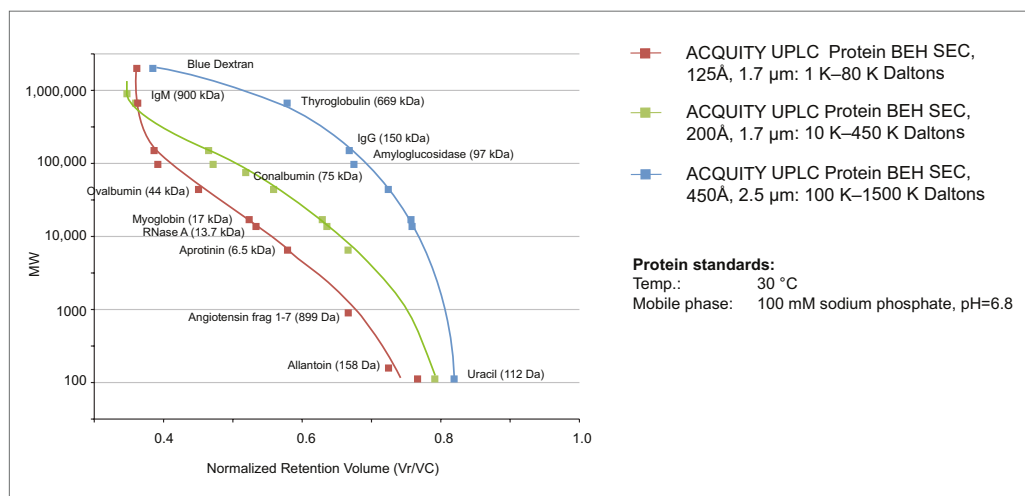
### ACQUITY UPLC SEC SYSTEM SOLUTION

The performance capabilities of our ACQUITY UPLC Technology surpasses those of traditional LC separations, proving itself a major asset in increasing the productivity of laboratories around the world. The latest addition to the application-driven, UPLC portfolio is the ACQUITY UPLC SEC System Solution, enabled by our unique ethylene-bridged-hybrid (BEH), diol-coated, particle technology. That technology offers these benefits:

- The ability to determine aggregation levels in therapeutic monoclonal antibodies as much as 10 $\times$  faster than traditional HPLC-based size-exclusion chromatography (SEC)
- A fully optimized column chemistry that significantly reduces the requirement for mobile phases of high-salt concentration
- Tested using BEH protein standards, ensuring unmatched batch-to-batch consistency and increased confidence in validated methods
- For 125 $\text{\AA}$ , 200 $\text{\AA}$ , and 450 $\text{\AA}$  SEC columns, Waters Protein Standard Mixes provide additional validation (p/n: 186006519, 186006518, and 186006842, respectively)

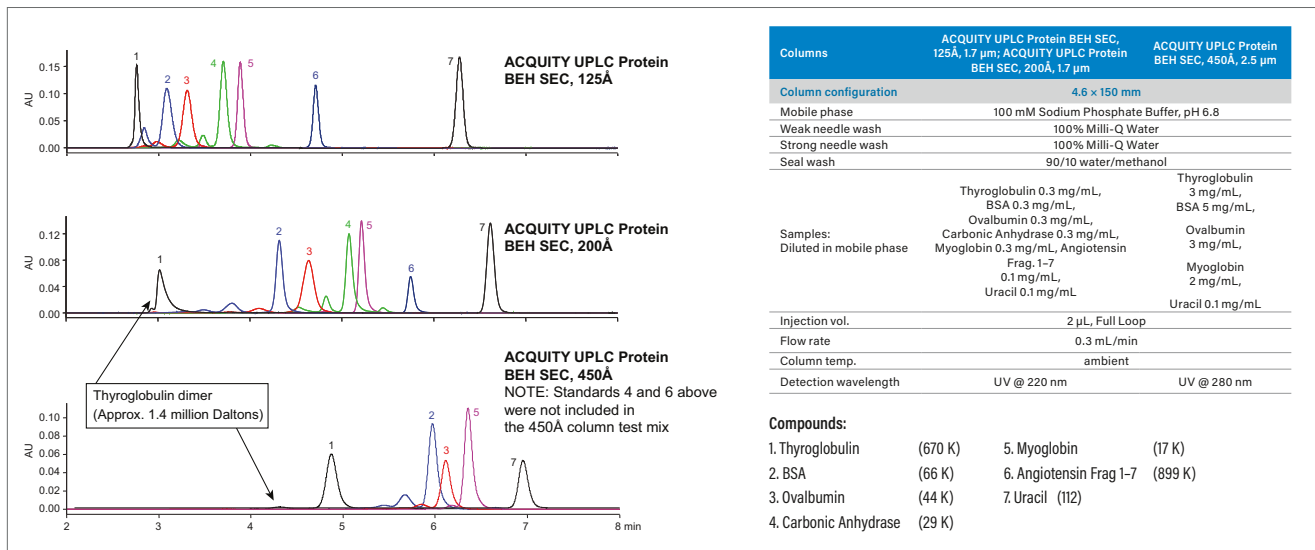
UPLC Technology improves the quality of collected data while increasing sample throughput and productivity. If you manufacture biotherapeutics or biosimilars, you can now choose the most appropriate Protein BEH SEC Column (i.e., 125 $\text{\AA}$ , 200 $\text{\AA}$ , and 450 $\text{\AA}$  pore size) to satisfy your application requirements.

### Calibration Curves on ACQUITY UPLC Protein BEH SEC, 125 $\text{\AA}$ , 200 $\text{\AA}$ , and 450 $\text{\AA}$ Columns



Size-exclusion chromatography (SEC) separates compounds according to, primarily, their relative size in solution. Calibration curves for UPLC-based SEC columns describe how various pore sizes perform with defined protein and peptides of known molecular weight.

## Separation of Protein and Peptide Standards on ACQUITY UPLC Protein BEH SEC, 125Å, 200Å, and 450Å Columns

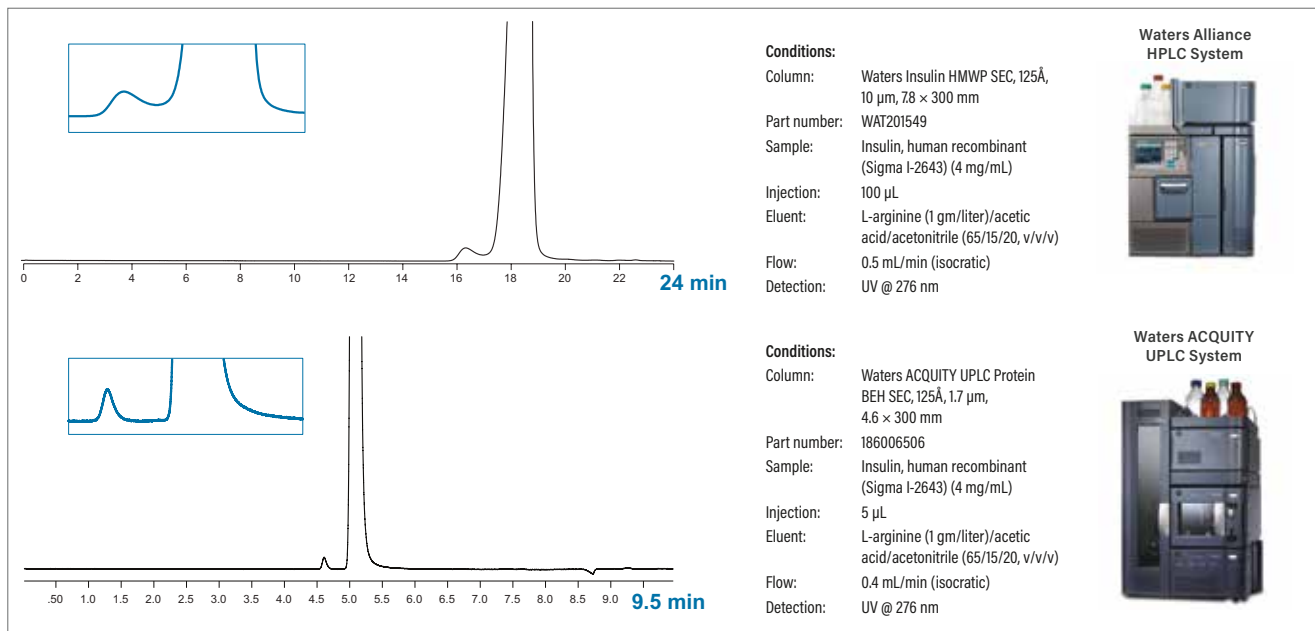


Waters offers a family of BEH-based, diol-coated SEC columns of varying pore size to address the molecular weight range of analytes to be separated.

## SEC Analysis of Insulin

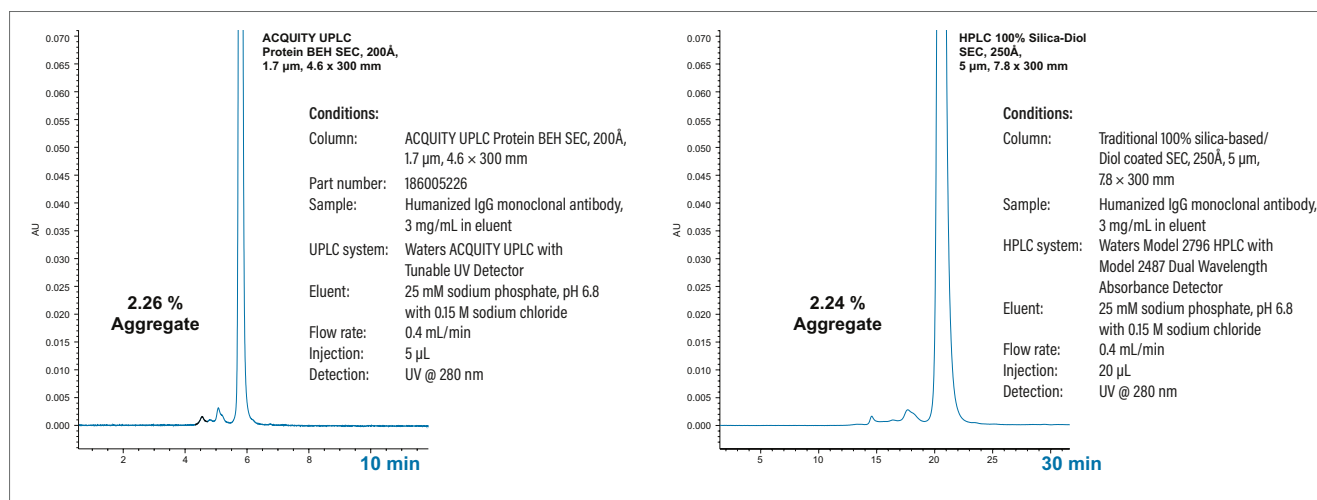
Size-exclusion chromatography is the USP and EP standard method for analyzing covalent HMW insulin in therapeutic preparations. Compared with traditional HPLC-based SEC methods, a Waters Protein BEH SEC, 125Å, 1.7 µm Column, when used with Waters UltraPerformance LC® instrumentation (shown below), significantly improves the resolution of insulin components. Moreover, it does so as it reduces analysis time and use of mobile phase.

### Insulin Analyses by Traditional HPLC-SEC vs. UPLC-SEC



Compared with traditional HPLC-based SEC technology for the analysis of earlier-eluting insulin aggregates from desired monomer species, Waters ACQUITY UPLC BEH SEC Technology demonstrates improved component resolution in less time.

## Comparative UPLC-Based SEC Benefits vs. Use of Traditional HPLC SEC for Biotherapeutic Characterization



Compared with traditional HPLC-based SEC technology, Waters ACQUITY UPLC BEH SEC Technology delivers a comparable determination of mAb aggregate vs. monomer content in significantly less time, promoting higher sample throughput.

## WATERS INSULIN HMWP HPLC AND UHPLC COLUMNS

We designed our Insulin HMWP Column for use in the manufacture and quality control of insulin products. This column is tested for its performance analyzing impurities whose molecular masses exceed that of insulin.

## Ordering Information

### Waters Insulin HMWP SEC HPLC and UHPLC Columns

| Description   | Dimension    | P/N       |
|---|--------------|-----------|
| Waters Insulin HMWP Column                                  | 7.8 x 300 mm | WAT201549 |
| Protein-Pak 125 Sentry Guard Column, 2/pk (requires holder) | 3.9 x 20 mm  | 186000926 |
| Sentry Universal Guard Column Holder                        | —            | WAT046910 |

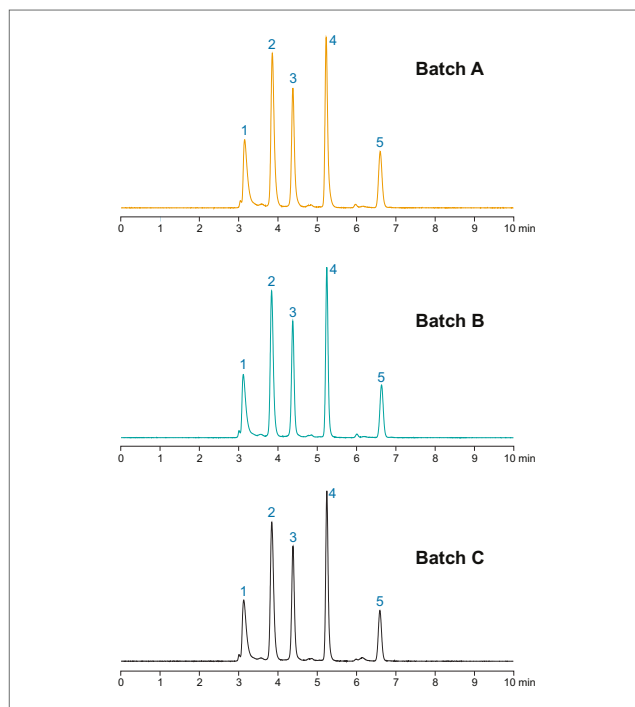
Tested to perform in the method published in PharmaEuropa Vol. 8, No. 3, September 1996.

## Stringent Manufacturing Quality Assurance Delivers Confidence in Results

We synthesize all chemistries for our ACQUITY UPLC Columns from high-quality raw materials in state-of-the-art, ISO-certified manufacturing facilities. The chemistries are extensively quality-control tested throughout their synthesis. In addition, we test each batch of Protein BEH SEC, 200Å, 1.7 µm material using relevant proteins, to help ensure batch-to-batch consistency. Thus we earn your supreme confidence in the efficacy of our columns when used for validated methods.



## Waters ISO 2001 Manufacturing and Testing Processes Help Ensure Outstanding ACQUITY UPLC Protein BEH SEC, 200Å, 1.7 µm Batch-to-Batch Reproducibility



Waters BEH Protein Standards (125Å, 200Å, and 450Å formulated mixtures) are used to in quality-control testing of our Protein BEH SEC columns, helping to ensure consistent batch-to-batch and column-to-column performance.

## Ordering Information

### ACQUITY UPLC Protein BEH SEC Columns and Kits

|                              | Dimension    | Column P/N | Kit P/N <sup>1</sup> |
|------------------------------|--------------|------------|----------------------|
| <b>Particle Size: 2.5 µm</b> |              |            |                      |
| <b>BEH SEC, 450Å</b>         | 4.6 × 150 mm | 186006851  | 176002996            |
|                              | 4.6 × 300 mm | 186006852  | 176002997            |
|                              | 4.6 × 30 mm  | 186006850* | —                    |

\*Guard column.

<sup>1</sup> Kit includes Peptide BEH SEC, 450Å Column plus one vial of BEH450 SEC Standard, p/n: 186006842.

|                              | Dimension    | Column P/N | Kit P/N <sup>1</sup> |
|------------------------------|--------------|------------|----------------------|
| <b>Particle Size: 1.7 µm</b> |              |            |                      |
| <b>BEH SEC, 200Å</b>         | 2.1 × 150 mm | 186008471  | —                    |
|                              | 4.6 × 150 mm | 186005225  | 176003904            |
|                              | 4.6 × 300 mm | 186005226  | 176003905            |
|                              | 4.6 × 30 mm  | 186005793* | —                    |

\*Guard column.

<sup>1</sup> Kit includes Peptide BEH SEC, 200Å Column plus one vial of BEH200 SEC Standard, p/n: 186006518.

|                              | Dimension    | Column P/N | Kit P/N <sup>1</sup> |
|------------------------------|--------------|------------|----------------------|
| <b>Particle Size: 1.7 µm</b> |              |            |                      |
| <b>BEH SEC, 125Å</b>         | 4.6 × 150 mm | 186006505  | 176003906            |
|                              | 4.6 × 300 mm | 186006506  | 176003907            |
|                              | 4.6 × 30 mm  | 186006504* | —                    |

\*Guard column.

<sup>1</sup> Kit includes Peptide BEH SEC, 125Å Column plus one vial of BEH125 SEC Standard, p/n: 186006519.

### Tubing

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



## XBRIDGE PROTEIN BEH SEC, 125Å, 200Å, AND 450Å COLUMNS AND PROTEIN STANDARD TEST MIXTURES

We developed our series of XBridge Protein BEH SEC, 125Å, 200Å, or 450Å, 3.5 µm Columns to complement our line of UPLC-based SEC offerings. These columns are for use with traditional HPLC-based instrumentation and methods for peptide or protein size-exclusion chromatography. The Ethylene-Bridged Hybrid (BEH)-based particle technology and diol-bonded surface coating are identical to those used for the HPLC- and UHPLC-based SEC chemistries in our UPLC-based SEC columns. Thus you can easily transfer methods based on laboratory instrumentation and component resolution or sample throughput needs.

All of Waters BEH-based SEC columns are manufactured in a cGMP, ISO 9001 certified facility that observes stringent manufacturing protocols and uses ultra-pure reagents. Each batch of manufactured material undergoes a series of standard quality-control measurements (e.g., particle and pore size distribution). Application-specific testing follows, using appropriate peptide and protein test mixtures. On every batch-approved, packed SEC column, we perform a packed-column efficiency test. The test further ensures the reproducible, batch-to-batch and column-to-column performance required for columns used in research or as part of a demanding, validated method.

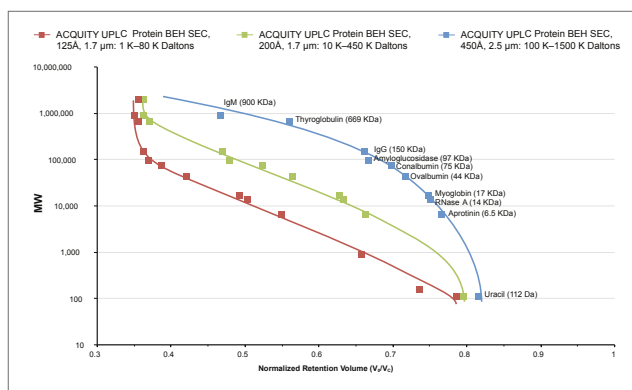


Following are some of the benefits that BEH-based SEC columns offer:

- Outstanding resolution of peptide and protein mixtures (from 1 to 1,000,000 Daltons) obtained on high-efficient, packed columns containing 35 µm particles or pores of 125Å, 200Å, or 450Å
- Compared with SEC columns containing 100% silica particles, BEH-based SEC columns are stable at pH values greater than 7. Moreover, they exhibit fewer undesired, secondary, ionic interactions between the SEC particle and a peptide or protein
- Each is shipped with Waters SEC Protein Standard Mix, to help you establish or confirm acceptable instrument and column performance

HPLC- and UHPLC-based columns complement existing UPLC-based SEC Columns, to assist in method transfers based on users' application and throughput needs

### Calibration Curves on XBridge Protein BEH SEC, 125Å, 200Å, and 450Å Columns



Size-exclusion chromatography (SEC) separates compounds based, primarily, on their relative size in solution. Calibration curves on Waters HPLC-based, SEC Columns of different pore size, using defined protein and peptides of known molecular weight, help you select the most appropriate SEC column for a specific application.

## BENCHMARKING, METHOD DEVELOPMENT, AND TROUBLESHOOTING: BEH SEC PROTEIN STANDARDS

We designed the BEH SEC Protein Standards to help benchmark sets of columns. Each standard contains carefully chosen proteins that are unique to the chemistry of the column set, a chemistry that we at Waters have incrementally and meticulously developed over many years. The standards are used as a quality control to test HPLC or UPLC columns. Thus they are an ideal choice for benchmarking a new column. Moreover, when run periodically, the standards afford you the opportunity to monitor column performance over time.



We offer standards for these columns:

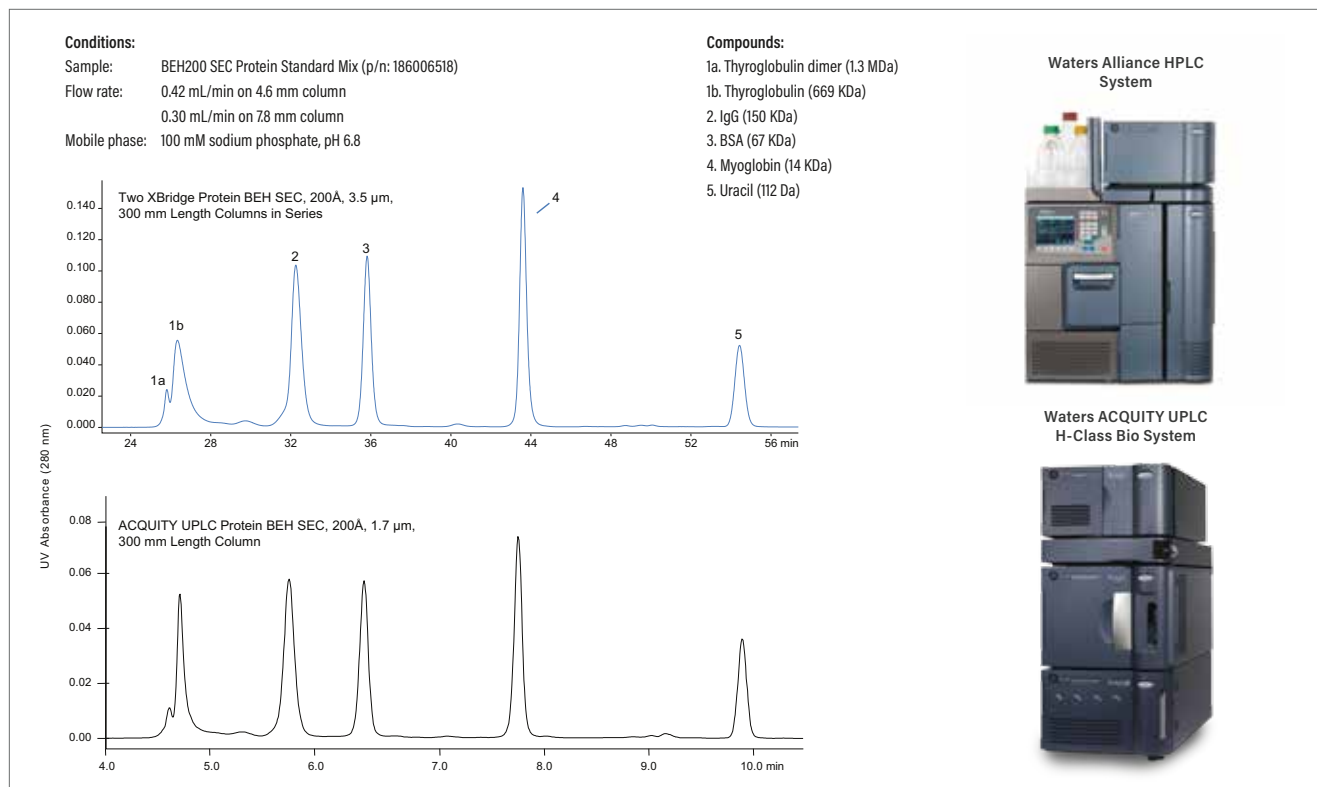
- ACQUITY UPLC and XBridge Protein BEH SEC, 125Å
- ACQUITY UPLC and XBridge Protein BEH SEC, 200Å
- ACQUITY UPLC and XBridge Protein BEH SEC, 450Å

### Ordering Information

#### ACQUITY UPLC BEH SEC Protein Standards

| Description                     | P/N       |
|---------------------------------|-----------|
| BEH125 SEC Protein Standard Mix | 186006519 |
| BEH200 SEC Protein Standard Mix | 186006518 |
| BEH450 SEC Protein Standard Mix | 186006842 |

## Scalable Separations Using UPLC- vs. HPLC-Based SEC Columns



Comparison of separations of Waters BEH200 SEC Protein Standard Mix (p/n: 186006518) on two XBridge Protein BEH SEC, 200Å, 3.5 µm HPLC Columns (300 mm length × 7.8 mm I.D.) run in series using an Alliance HPLC System (top panel) and an ACQUITY UPLC Protein BEH SEC, 200Å, 1.7 µm Column (300 mm length × 4.6 mm I.D.) using an ACQUITY UPLC H-Class Bio System (bottom panel). The flow rates were scaled, on the basis of particle diameter and column I.D., to 0.42 mL/min for the two HPLC columns run in series, and 0.3 mL/min for the UPLC column. Sample loads were also adjusted, for column volume.

## Ordering Information

### XBridge Protein BEH SEC Columns and Guard Kits

|                              | Dimension       | Kit P/N <sup>1</sup> |
|------------------------------|-----------------|----------------------|
| <b>Particle Size: 3.5 µm</b> |                 |                      |
| <b>BEH SEC, 450Å</b>         | 7.8 mm × 30 mm  | 176003597*           |
|                              | 7.8 mm × 150 mm | 176003598            |
|                              | 7.8 mm × 300 mm | 176003599            |

\*Guard column.

<sup>1</sup> Kit includes Peptide BEH SEC, 450Å Column plus one vial of BEH450 SEC Standard, p/n: 186006842.

|                              | Dimension       | Kit P/N <sup>1</sup> |
|------------------------------|-----------------|----------------------|
| <b>Particle Size: 3.5 µm</b> |                 |                      |
| <b>BEH SEC, 200Å</b>         | 7.8 mm × 30 mm  | 176003594*           |
|                              | 7.8 mm × 150 mm | 176003595            |
|                              | 7.8 mm × 300 mm | 176003596            |

\*Guard column.

<sup>1</sup> Kit includes Peptide BEH SEC, 200Å Column plus one vial of BEH200 SEC Standard, p/n: 186006518.

|                              | Dimension       | Kit P/N <sup>1</sup> |
|------------------------------|-----------------|----------------------|
| <b>Particle Size: 3.5 µm</b> |                 |                      |
| <b>BEH SEC, 125Å</b>         | 7.8 mm × 30 mm  | 176003591*           |
|                              | 7.8 mm × 150 mm | 176003592            |
|                              | 7.8 mm × 300 mm | 176003593            |

\*Guard column.

<sup>1</sup> Kit includes Peptide BEH SEC, 125Å Column plus one vial of BEH125 SEC Standard, p/n: 186006519.

### Tubing and End-fittings

| Description  | P/N       |
|--|-----------|
| Straight Connection Tubing and End-fittings for XBridge Protein BEH SEC Column | WAT022681 |
| U-Bend Connection Tubing and End-fittings for XBridge Protein BEH SEC Column   | WAT084080 |

## PROTEIN BEH C<sub>4</sub>, 300Å COLUMNS

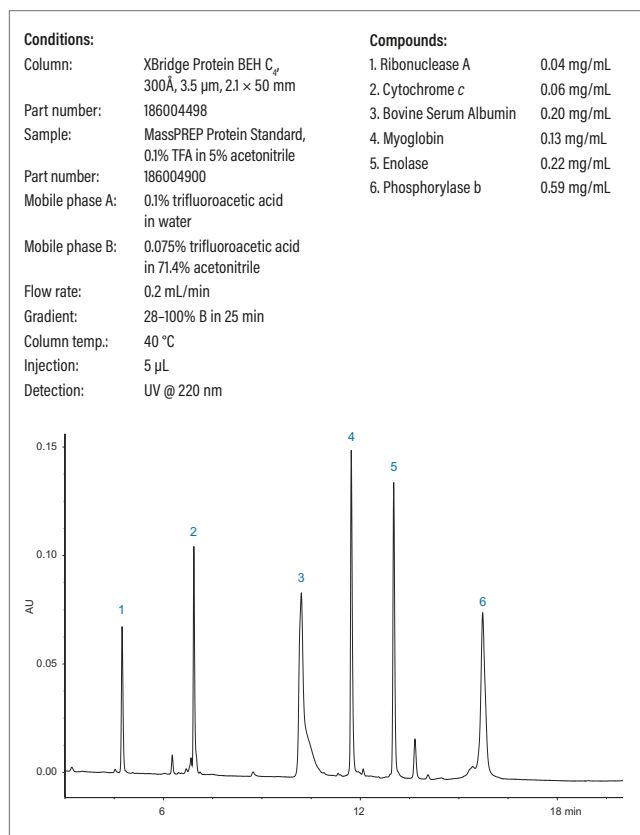
Analyzing and characterizing protein samples requires the detection of small chemical differences between large molecules. Most often, such analyses have relied on an array of analytical techniques, each sensitive to a different property of the protein. Reversed-phase HPLC has not been fully exploited in these tests. The separation of proteins often yields relatively broad, asymmetrical peaks with poor recovery and significant carryover. To address these unsatisfactory results, we designed our reversed-phase, Ethylene-bridged Hybrid (BEH Technology) Protein Separation Technology Columns specifically for the high-resolution analysis of proteins.

Our family of Protein BEH C<sub>4</sub>, 300Å Columns for protein separations offer these benefits:

- They separate proteins of various sizes, hydrophobicities, and isoelectric points
- They maximize recovery and minimize protein carryover, owing to unique chemistries
- They tolerate extreme pH and temperature
- They address instrumentation and application needs (HPLC/UHPLC 3.5 µm column and UPLC 1.7 µm column)
- They are available, as preparative columns, in 5 and 10 µm particle sizes
- They are quality-control tested with MassPREP Protein Standard Mix (p/n: 186004900)
- They are compatible for use with ESI-MS, for protein identification

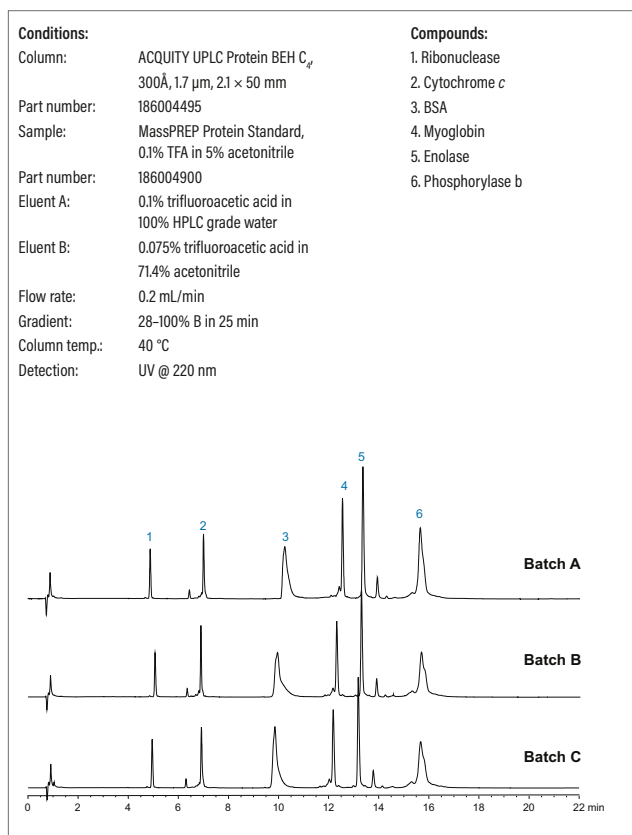


### 300Å C<sub>4</sub> Columns Developed for Protein Chromatography



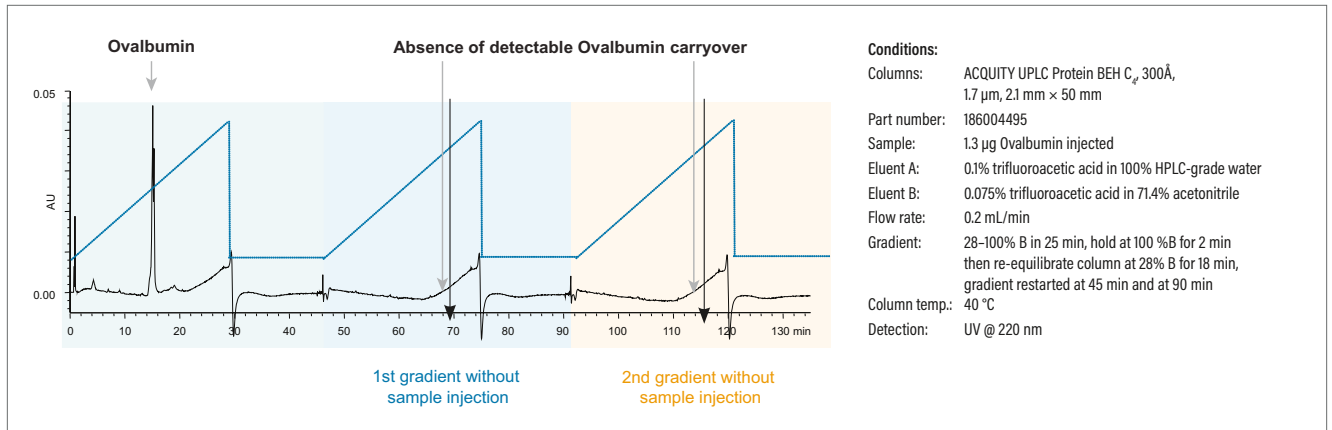
Protein BEH C<sub>4</sub>, 300Å Columns can be used with proteins of wide-ranging properties. This protein mix was chosen to represent a range of isoelectric points, molecular weights, and hydrophobicities.

### Batch-to-Batch Reproducibility



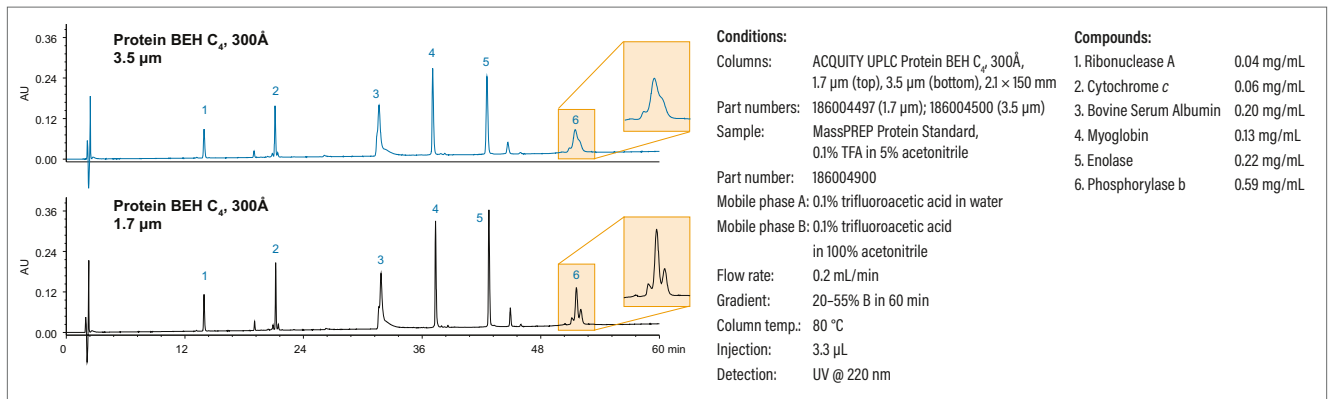
We use the MassPREP Protein Standard Mixture to quality-control test ACQUITY UPLC Protein BEH C<sub>4</sub>, 300Å Columns. The mixture helps ensure consistent batch-to-batch and column-to-column performance.

## Minimal Protein Carryover



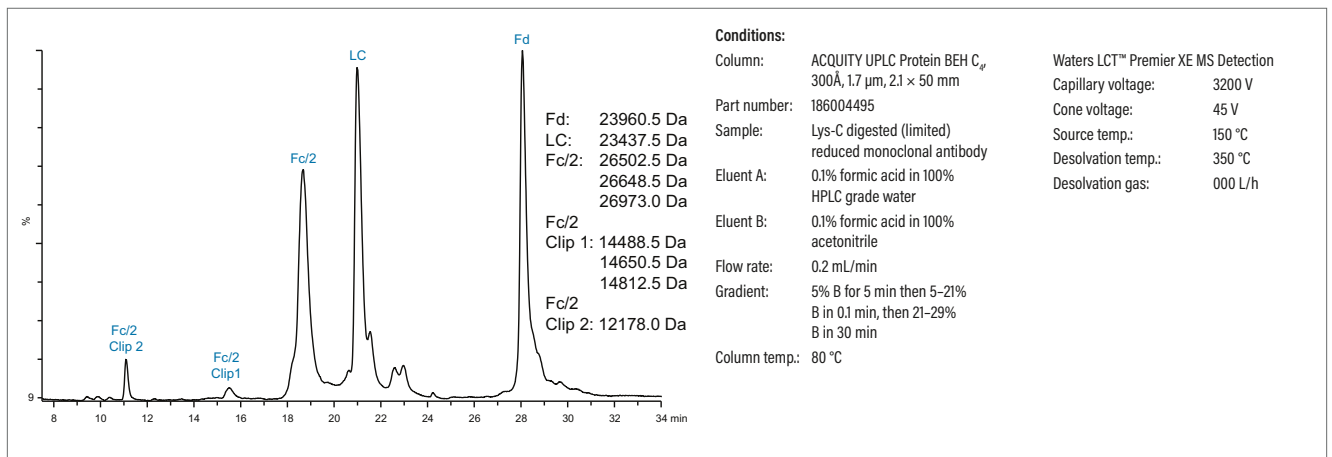
Column carryover was tested by running multiple gradients following a single injection. Protein peaks observed during the first gradient are not found in subsequent gradients.

## Improved Protein Resolution with UPLC Technology



Two separations were performed, traditional and UPLC. The traditional separation used a Protein BEH  $C_{4r}$  300Å Column packed with 3.5  $\mu\text{m}$  particles. The UPLC separation used a Protein BEH  $C_{4r}$  300Å Column packed with 1.7  $\mu\text{m}$  particles. The UPLC separation evidences sharper peaks for all proteins in the test mixture. The multiple peaks around phosphorylase, at approximately 50 minutes, attest to this improved resolution. The comparison was performed fitting both columns onto a UPLC system, to preserve the minimized band broadening. The benefits of the small-particle UPLC BEH  $C_{4r}$  300Å Column would be lost without the optimized ACQUITY UPLC System.

## Protein BEH $C_{4r}$ 300Å Columns for Protein Characterization with UPLC-MS



The large fragments obtained through LysC digestion of a monoclonal antibody can be separated on the ACQUITY UPLC Protein BEH  $C_{4r}$  300Å Column coupled directly to ESI/ToF MS for identification of the individual peptide products.

Note: ACQUITY UPLC Protein BEH  $C_{4r}$  300Å, 1.7  $\mu\text{m}$  Columns are designed for use with the ACQUITY UPLC System. The benefits of the small-particle packing in ACQUITY UPLC Protein BEH  $C_{4r}$  300Å, 1.7  $\mu\text{m}$  Columns are realized only with the low system volume and low detector dispersion of an ACQUITY UPLC System.

## BENCHMARKING, METHOD DEVELOPMENT, AND TROUBLESHOOTING: MASSPREP PROTEIN STANDARD MIX

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 an attractive intact protein validation mixture that you can use for many varied applications. The mixture is particularly useful as a benchmarking standard for ACQUITY UPLC Protein BEH C<sub>4</sub>, 300Å Columns.

| MassPREP Protein Standard Mix              |                       |                        |
|--|-----------------------|------------------------|
| Protein Sample                             | Molecular Weight (MW) | Isoelectric Point (pI) |
| Ribonuclease A, Bovine Pancrease           | 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                   |

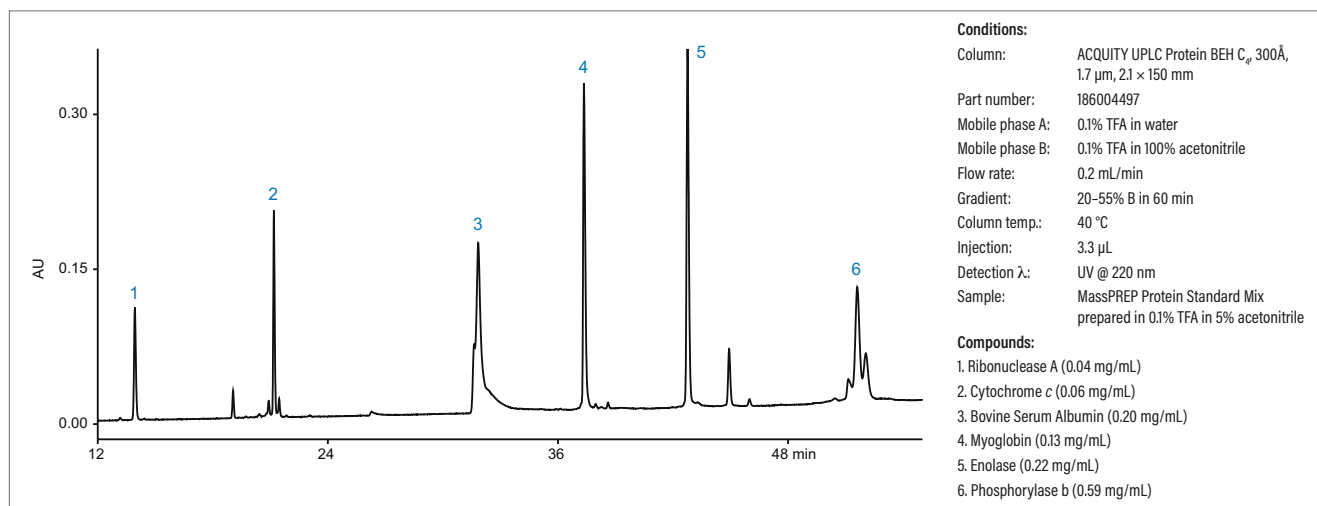
## Ordering Information

### Protein Standards

| Description                    | P/N       |
|--------------------------------|-----------|
| MassPREP Protein Standard Mix  | 186004900 |
| Intact mAb Mass Check Standard | 186006552 |



### MassPREP Protein Standard Mix on an ACQUITY UPLC Protein BEH C<sub>4</sub>, 300Å, 1.7 µm, 2.1 × 150 mm Column



Waters carefully formulated and quality-control tested MassPREP Protein Standard Mix can help you confirm adequate performance of a reversed-phase column and LC system before you analyze valuable samples.

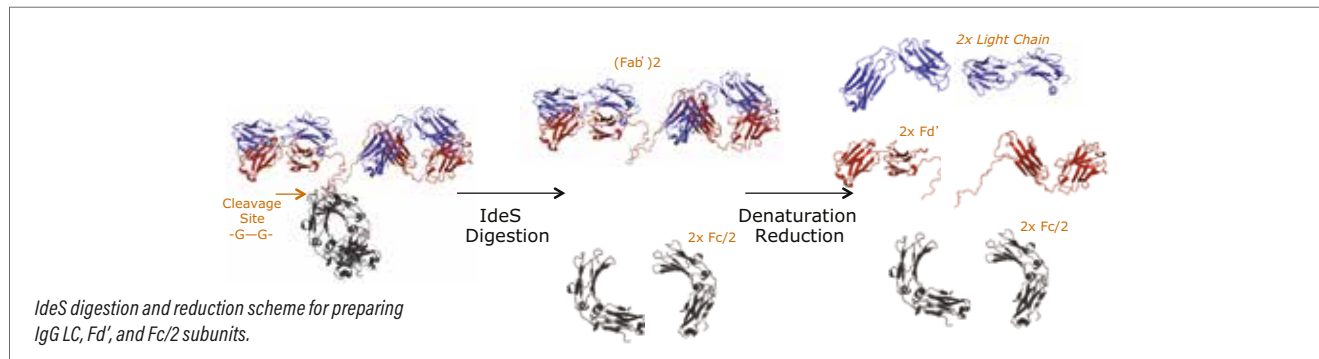
## MassPREP Protein Standard Mix Certificate of Analysis

We issue all Waters analytical standards and reagents a certificate of analysis that documents relevant, lot-specific information. We often include a chromatogram that reflects data acquired as you would when using the standard.



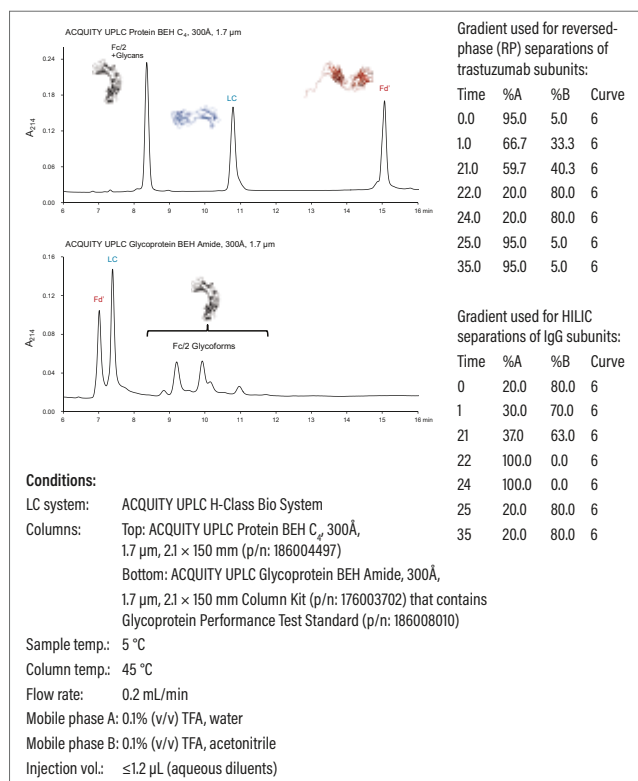
## ACQUITY UPLC GLYCOPROTEIN BEH AMIDE, 300Å COLUMN

In what is commonly referred to as a middle-up or middle-down analysis, native mAbs can be proteolyzed into subunits, facilitating their characterization. One increasingly popular way to produce subunit digests of mAbs is via the IdeS protease (immunoglobulin-degrading enzyme of *Streptococcus pyogenes*). With high fidelity, IdeS cleaves at a conserved sequence motif in the hinge region of humanized mAbs. On reduction, it cleanly produces three, 25k Da mAb fragments. These fragments are amenable to mass spectrometry and useful for localizing different attributes of therapeutic mAbs (below).

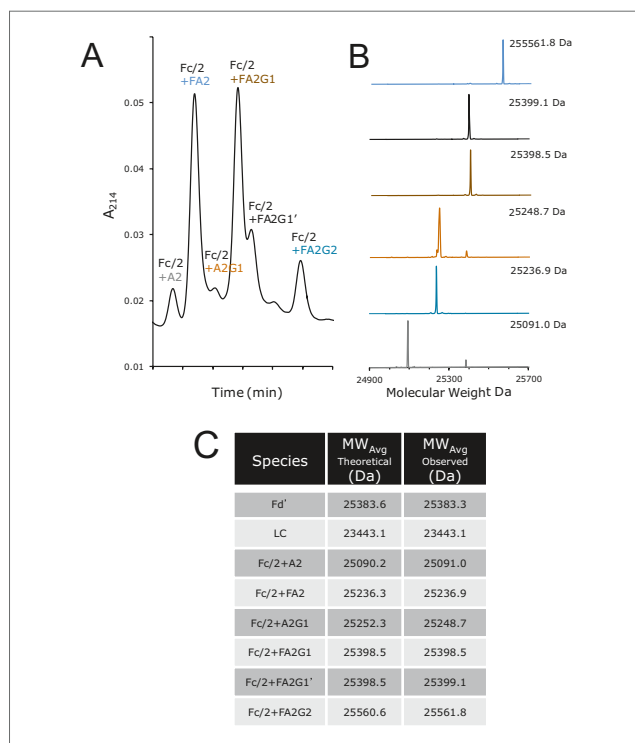


IdeS-produced subunits from different drug products exhibit diagnostic RP retention times, so IdeS digestion, combined with reversed-phase (RP) chromatography on a Waters ACQUITY UPLC Protein BEH C<sub>4</sub>, 300Å Column has been used, successfully, as a simple identity test for mAbs and fusion proteins. Note, however, that many IgG modifications more strongly elicit changes in the hydrophilicity of a mAb along with its capacity for hydrogen bonding.

Compared with the reversed-phase based separation of glycoprotein subunits, HILIC-based chromatography on Waters ACQUITY UPLC Glycoprotein BEH Amide, 300Å, 1.7 µm Columns offers additional information related to a mAb digest, as shown in the figures below.



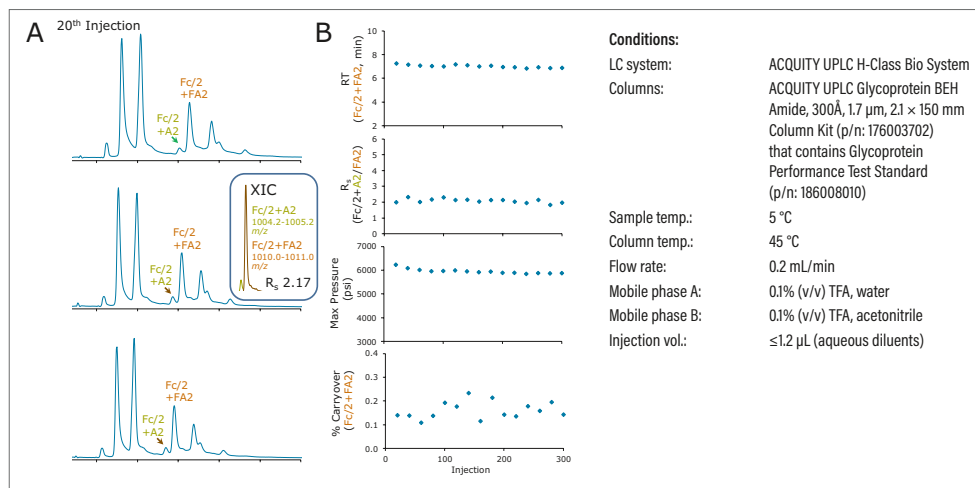
*Trastuzumab subunit separations. (A) 1 µg of reduced IdeS digested, mAb sample separated using an ACQUITY UPLC Protein BEH C<sub>4</sub>, 300Å, 1.7 µm Column (0.7 µL aqueous injection). (B) 1 µg of reduced IdeS digested, mAb sample separated using an ACQUITY UPLC Glycoprotein BEH Amide, 300Å, 1.7 µm Column (0.7 µL aqueous injection).*



*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, 300Å, 1.7 µm COLUMNS FOR PROFILING IGG SUBUNIT GLYCOFORMS

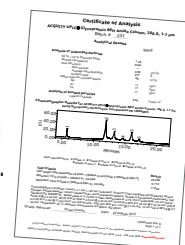
Data collected, below, from a series of 300 sequential injections of a reduced, IdeS-digested trastuzumab sample demonstrate the ability of our BEH Amide 300Å, 1.7 µm Column to accurately and consistently perform separations over time. The use scenario was potentially challenging because the reduced, IdeS-digested mAb sample contains both high concentrations of guanidine denaturant and TCEP reducing agent. Total-ion chromatograms corresponding to the 20<sup>th</sup>, 180<sup>th</sup> and 300<sup>th</sup> injections 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 20<sup>th</sup> separation using extracted-ion chromatograms (XICs). In this testing, several additional chromatographic parameters were also monitored. Those parameters included 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. Plots of these parameters underscore the consistency of the subunit separation during the column's lifetime.



*Lifetime testing of an ACQUITY UPLC Glycoprotein BEH Amide, 300Å, 1.7 µm, 2.1 × 150 mm Column for sequential injections of reduced, IdeS-digested trastuzumab. (A) Total ion chromatograms (TICs) from the 20<sup>th</sup>, 180<sup>th</sup> and 300<sup>th</sup> injections. Example extracted ion chromatograms (XICs) for Fc/2+A2 and Fc/2+FA2 that were used to measure resolution. (B) Chromatographic parameters observed during the 300 injection column lifetime test. Each panel shows results for each 20<sup>th</sup> injection, including retention time (RT) of the FA2 glycoform, Rs between A2 and FA2 glycoforms, maximum pressure during the run, and percent carryover, as measured by a repeat gradient and XICs.*

### ACQUITY UPLC Glycoprotein BEH Amide, 300Å, 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, 300Å, 1.7 µm Column offering is quality-control tested using our Glycoprotein Performance Test Standard, p/n: 186008010. We ship this standard (at no additional cost) with each column, to help benchmark method development or troubleshoot the column and instrumentation.



### Ordering Information

#### ACQUITY UPLC Glycoprotein BEH Amide, 300Å Columns and Standards

|                       | Dimension    | P/N       |
|-----------------------|--------------|-----------|
| Particle Size: 1.7 µm |              |           |
| BEH Amide, 300Å       | 2.1 × 100 mm | 176003701 |
|                       | 2.1 × 150 mm | 176003702 |

\*3/pkg with standard.

#### ACQUITY UPLC Glycoprotein BEH Amide, 300Å Method Validation Kit

|                       | Dimension | P/N        |
|-----------------------|-----------|------------|
| Particle Size: 1.7 µm |           |            |
| BEH Amide, 300Å       | 2.1 × 100 | 176003703* |

\*3/pkg with standard.

#### ACQUITY UPLC Glycoprotein BEH Amide, 300Å VanGuard Pre-Column (with standards)

|                       | Dimension   | P/N        |
|-----------------------|-------------|------------|
| Particle Size: 1.7 µm |             |            |
| BEH Amide, 300Å       | 2.1 × 5 mm  | 176003699* |
|                       | 2.1 × 50 mm | 176003700  |

#### Glycoprotein Performance Test Standard

| Description                            | P/N       |
|--|-----------|
| Glycoprotein Performance Test Standard | 186008010 |

## XBridge Protein BEH C<sub>4</sub> Columns

|                           | Dimension             | P/N       | Dimension             | P/N         | Dimension           | P/N                     | Dimension            | P/N                     |
|---------------------------|-----------------------|-----------|-----------------------|-------------|---------------------|-------------------------|----------------------|-------------------------|
|                           | Particle Size: 1.7 µm |           | Particle Size: 3.5 µm |             | Particle Size: 5 µm |                         | Particle Size: 10 µm |                         |
| BEH C <sub>4</sub> , 300Å | 1.0 × 50 mm           | 186005589 | —                     | —           | —                   | —                       | —                    | —                       |
|                           | 1.0 × 100 mm          | 186005590 | —                     | —           | —                   | —                       | —                    | —                       |
|                           | 1.0 × 150 mm          | 186005591 | —                     | —           | —                   | —                       | —                    | —                       |
|                           | 2.1 × 50 mm           | 186004495 | 2.1 × 50 mm           | 186004498   | 10 × 10 mm          | 186007305* <sup>1</sup> | 10 × 10 mm           | 186007325* <sup>1</sup> |
|                           | 2.1 × 100 mm          | 186004496 | 2.1 × 100 mm          | 186004499   | 10 × 50 mm          | 186008272               | 10 × 50 mm           | 186008276               |
|                           | 2.1 × 150 mm          | 186004497 | 2.1 × 150 mm          | 186004500   | 10 × 100 mm         | 186008273               | 10 × 100 mm          | 186008277               |
|                           |                       |           | 2.1 × 250 mm          | 186004501   | 10 × 150 mm         | 186008274               | 10 × 150 mm          | 186008278               |
|                           |                       |           | 4.6 × 50 mm           | 186004502   | 10 × 250 mm         | 186008275               | 10 × 250 mm          | 186008279               |
|                           |                       |           | 4.6 × 100 mm          | 186004503   | 19 × 10 mm          | 186007310* <sup>2</sup> | 19 × 10 mm           | 186007330* <sup>2</sup> |
|                           |                       |           | 4.6 × 150 mm          | 186004504   | 19 × 50 mm          | 186007311               | 19 × 50 mm           | 186007331               |
|                           |                       |           | 4.6 × 250 mm          | 186004505   | 19 × 100 mm         | 186007312               | 19 × 100 mm          | 186007332               |
|                           |                       |           |                       |             | 19 × 150 mm         | 186007313               | 19 × 150 mm          | 186007333               |
|                           |                       |           |                       |             | 19 × 250 mm         | 186007314               | 19 × 250 mm          | 186007334               |
|                           |                       |           |                       |             | 30 × 10 mm          | 186007315* <sup>3</sup> | 30 × 10 mm           | 186007335* <sup>3</sup> |
|                           |                       |           |                       |             | 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           | 30 × 250 mm             | 186007340            |                         |

\*Guard Cartridge.

<sup>1</sup> Requires 10 × 10 mm Prep Guard Holder, p/n: 289000779.

<sup>2</sup> Requires 19 × 10 mm Prep Guard Holder, p/n: 186000709.

<sup>3</sup> Requires 30 × 10 mm Prep Guard Holder, p/n: 186006912.

## ACQUITY UPLC Protein BEH C<sub>4</sub> VanGuard Pre-Columns

|                           | Dimension             | P/N       |
|---------------------------|-----------------------|-----------|
|                           | Particle Size: 1.7 µm |           |
| BEH C <sub>4</sub> , 300Å | 2.1 × 5 mm            | 186004623 |

## ACQUITY UPLC Protein BEH C<sub>4</sub> Method Validation Kits\*

|                           | Dimension             | P/N       |
|---------------------------|-----------------------|-----------|
|                           | Particle Size: 1.7 µm |           |
| BEH C <sub>4</sub> , 300Å | 2.1 × 100 mm          | 186004899 |
|                           | 2.1 × 150 mm          | 186006549 |

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

## XBridge Protein BEH C<sub>4</sub> Sentry Guards

|                           | Dimension             | P/N                    |
|---------------------------|-----------------------|------------------------|
|                           | Particle Size: 3.5 µm |                        |
| BEH C <sub>4</sub> , 300Å | 2.1 × 10 mm           | 186007230 <sup>1</sup> |
|                           | 4.6 × 20 mm           | 186007235 <sup>2</sup> |

<sup>1</sup> Requires 2.1 × 10 mm Universal Sentry Guard Holder, p/n: WAT097958.

<sup>2</sup> Requires 4.6 × 20 mm Universal Sentry Guard Holder, p/n: WAT046910.

## XBridge Protein BEH C<sub>4</sub> Method Validation Kits\*

|                           | Dimension             | P/N       |
|---------------------------|-----------------------|-----------|
|                           | Particle Size: 3.5 µm |           |
| BEH C <sub>4</sub> , 300Å | 4.6 × 100 mm          | 186005465 |

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

Note: ACQUITY UPLC Protein BEH C<sub>4</sub>, 300Å, 1.7 µm Columns are designed for use with the ACQUITY UPLC System. The benefits of the small particle packing in ACQUITY UPLC Protein BEH C<sub>4</sub>, 300Å, 1.7 µm Columns are only realized with the low system volume and low detector dispersion of an ACQUITY UPLC System.



## MASSPREP ON-LINE DESALTING DEVICES

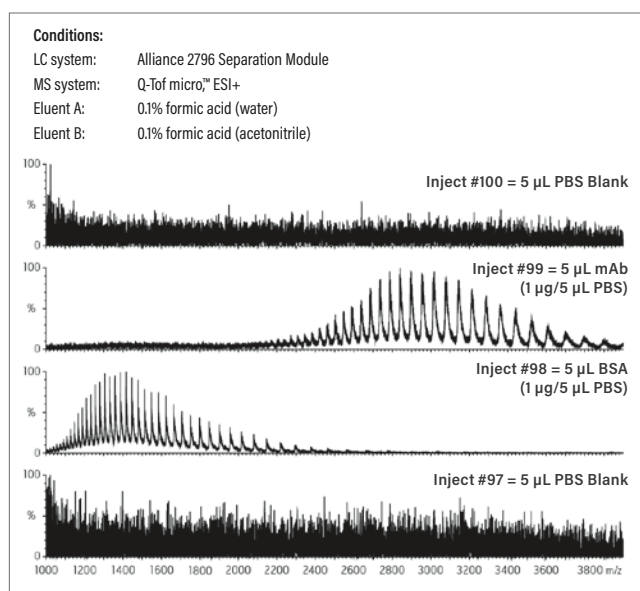
Our MassPREP On-Line Desalting Devices offer these benefits:

- Effective desalting of proteins, yielding improved LC-MS results
- Fast on-line method for high-throughput applications
- Excellent protein recoveries without detectable carryover
- Greater than 100 injections from a single cartridge



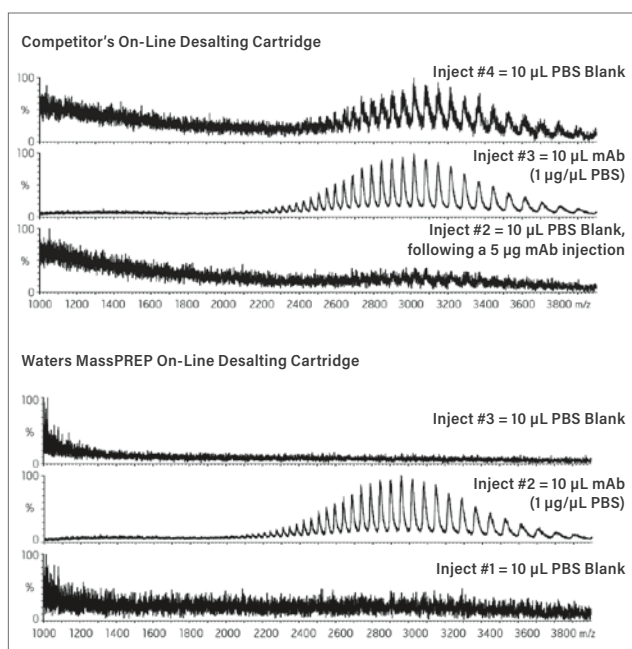
Nonvolatile salts (e.g., NaCl) can suppress ionization of intact proteins, leading to poor detection sensitivity. Consequently, you must remove these salts from the LC eluate or, alternatively, minimize their presence significantly before they are introduced into the mass spectrometer. The MassPREP on-line desalting column can effectively desalt proteins before an LC-MS analysis. The reversed-phase phenyl material contained in MassPREP on-line column successfully “traps” proteins, allowing the salts to be washed to waste before the elution of protein into the mass spectrometer. Achievable cycle times for an optimized LC-MS method are as low as four minutes for intact antibodies and 10 minutes for reduced species.

### MassPREP On-Line Desalting Cartridge (2.1 × 10 mm)



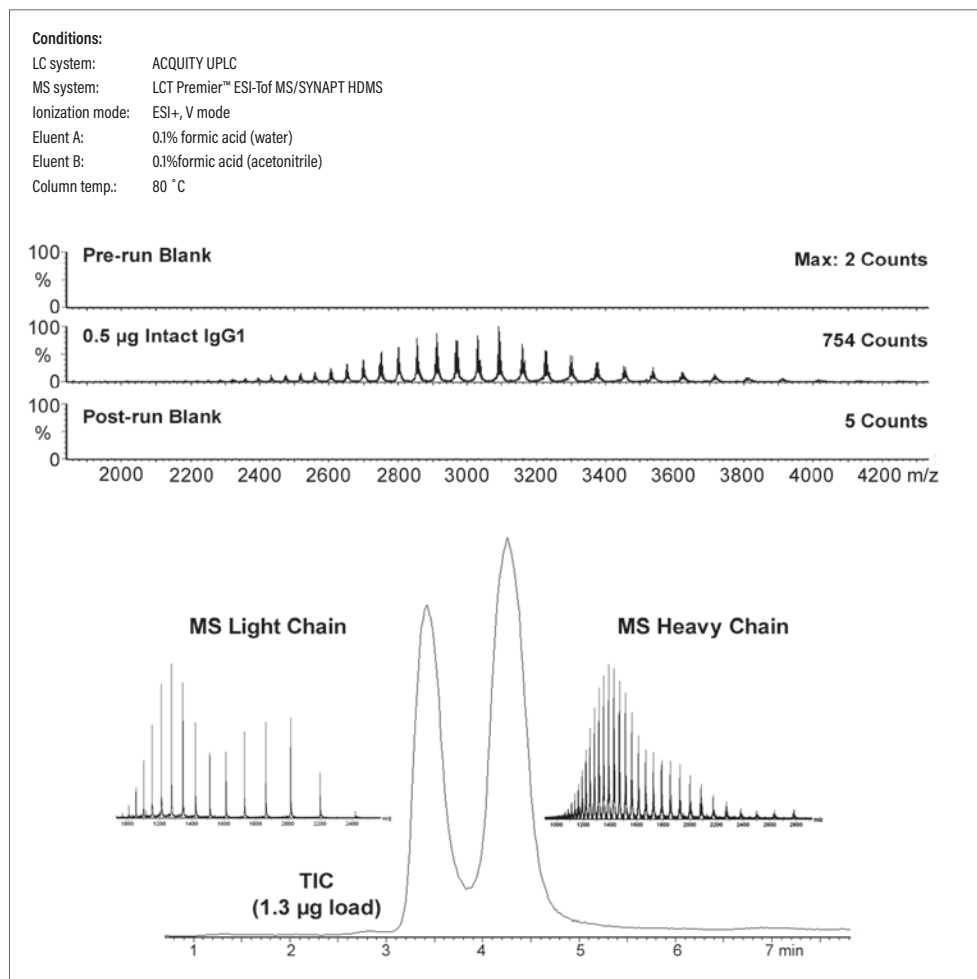
Over a series of 100 injections, satisfactory results were obtained for BSA and a mAb, as shown for injections #97-100 on a MassPREP On-line Desalting Cartridge. Reference Waters Application Note: Desalting of Proteins Using MassPREP On-line Desalting Cartridges Prior to Mass Spectrometry [2005] (p/n: 720001077EN).

### Excellent Recovery with No Detectable Carryover



Column-related carryover, from previous protein-sample injections, can compromise the integrity of collected LC-MS data. Compared with results obtained using a competitive, on-line desalting cartridge (top), the MassPREP on-line desalting cartridge (bottom) affords excellent sample recovery.

## MassPREP Micro Desalting Column (2.1 × 5 mm)



Combined ESI-ToF mass spectra of an intact IgG1 antibody from a 4-minute LC-MS analysis. The results reveal no detectable carryover following a 0.5 µg injection of the antibody.

Total ion chromatogram (TIC) from UPLC-MS analysis of light and heavy chains from a reduced IgG1 antibody. A 10-minute LC-MS run largely resolved the earlier eluting light chain from the later eluting glycosylated heavy chains.

## Ordering Information

### MassPREP On-Line Desalting Devices

| Description   | Dimension   | Qty. | P/N                     |
|---|-------------|------|-------------------------|
| MassPREP Micro Desalting Column   | 2.1 x 5 mm  | 1/pk | 186004032* <sup>1</sup> |
| MassPREP On-Line Desalting Cartridge  | 2.1 x 10 mm | 2/pk | 186002785*              |
| UPLC Intact Mass Analysis Application Kit** (Includes MassPREP Micro Desalting Column and ACQUITY Tubing Kit) | —           | 1/pk | 176001519               |

\* Reference UPLC Intact Mass Analysis Application Kit Manual, p/n: 715001664.

\*\* Required for use of MassPREP On-line Desalting Cartridge.

<sup>1</sup> Requires 2.1 x 10 mm Universal Sentry Guard Holder, p/n: WAT097958.

## IEX CATION AND ANION TEST STANDARDS

These standards are specially designed for either Cation- or Anion-Exchange Chromatography and each provide a unique set of 3 proteins found to provide good chromatographic separation based on the charge state being utilized.

## Ordering Information

### IEX Standards

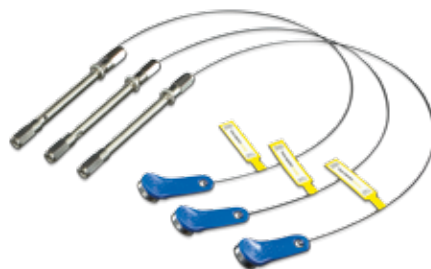
| Description              | P/N       |
|--------------------------|-----------|
| IEX Anion Test Standard  | 186006869 |
| IEX Cation Test Standard | 186006870 |

## PROTEIN-PAK HI RES ION-EXCHANGE (IEX) COLUMNS FOR ACQUITY UPLC APPLICATIONS

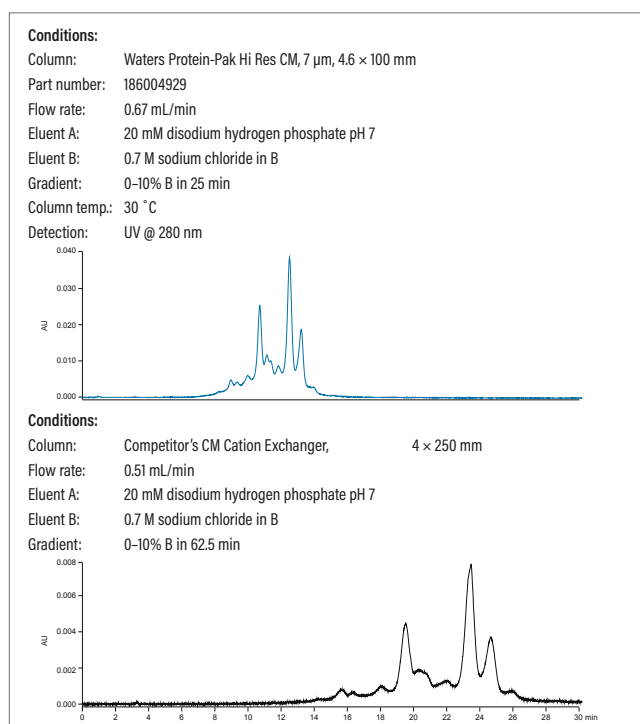
To help you characterize recombinant proteins, monoclonal antibodies, and other biological compounds, we developed our Protein-Pak™ Hi Res Ion-Exchange (IEX) Columns. The nonporous, high compound binding capacity of their particles yields outstanding resolution of charged species faster than many traditional, porous IEX offerings. In addition, we quality control test our columns using defined protein standards, to ensure consistent batch-to-batch performance.

Protein-Pak Hi Res Ion-Exchange (IEX) Columns offer these benefits:

- 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
- Nonporous, high capacity, stationary phases deliver fast separations that address high-throughput needs
- Quality-control tested using protein standards to ensure batch-to-batch consistency
- eCord enabled, to help monitor column use on ACQUITY UPLC Systems

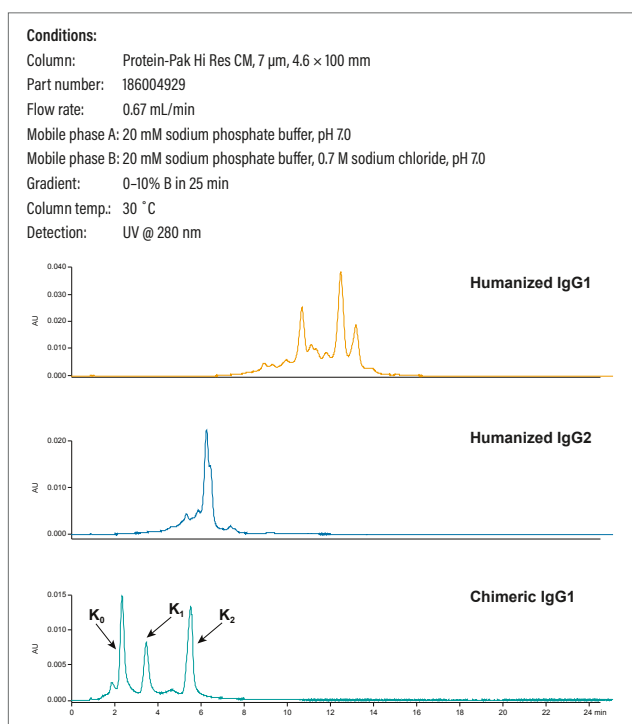


### Resolved Monoclonal Antibody (mAb) Isoform Separation



Cation-exchange chromatography is a useful tool for the characterizing and quantifying 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 the 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 could involve as little as a single amino acid change ( $K_0$  = No terminal lysines,  $K_1$  = One terminal Lysine, and  $K_2$  = Two terminal Lysines).

## Ordering Information

### Protein-Pak Hi Res UPLC Columns

| Description                      | Dimension           | P/N       |
|----------------------------------|---------------------|-----------|
| Protein-Pak Hi Res CM, 7 $\mu$ m | 4.6 $\times$ 100 mm | 186004929 |
| Protein-Pak Hi Res SP, 7 $\mu$ m | 4.6 $\times$ 100 mm | 186004930 |
| Protein-Pak Hi Res Q, 5 $\mu$ m  | 4.6 $\times$ 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.

## APPLICATION OF WATERS UPLC TECHNOLOGY FOR BIOTHERAPEUTIC CHARACTERIZATION

ACQUITY UPLC has proven itself an asset in laboratories around the world, providing the means to transcend the abilities of conventional LC separations. UPLC sets new standards in resolution, sensitivity, and throughput by being the first holistically designed system that maximizes rapid, high-resolution analyses. It has fueled hundreds of peer-reviewed papers; it helps laboratories conserve resources; and it has served the needs of regulatory agencies around the globe. ACQUITY UPLC makes your laboratory simultaneously more sustainable and more efficient.

### Manufacturing Consistency for Enhanced Assurance

The ability to perform identical high-quality separations regardless of column lot is critically important 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, helping to ensure consistent column-to-column performance.

### Novel IEX Particles Ideal for Biomolecule Characterizations

Protein-Pak Hi Res IEX Columns contain nonporous, pH-tolerant, hydrophilic particles whose surface consists of a multi-layered network of either anion (5  $\mu\text{m}$ ) or cation (7  $\mu\text{m}$ ) exchange groups. This innovative particle and bonding chemistry produces particles with greater protein loading capacities than those associated with many traditional monodisperse, nonporous resins. These columns, therefore, can resolve complex mixtures of biomolecules in comparatively brief analyses, compared with alternative porous or nonporous IEX columns.

| 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 $\mu\text{m}$      | 7 $\mu\text{m}$       | 7 $\mu\text{m}$       |
| Pore size  | Non porous           | Non porous            | Non porous            |
| Dimensions   | 4.6 $\times$ 100 mm  | 4.6 $\times$ 100 mm   | 4.6 $\times$ 100 mm   |
| Counter ion  | Cl <sup>-</sup>      | Na <sup>+</sup>       | Na <sup>+</sup>       |
| pH range   | 3–10                 | 3–10                  | 3–10                  |
| Temperature  | 10–60 °C             | 10–60 °C              | 10–60 °C              |
| pK <sub>a</sub>  | 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 milligrams/per column | 58                   | 33                    | 25                    |

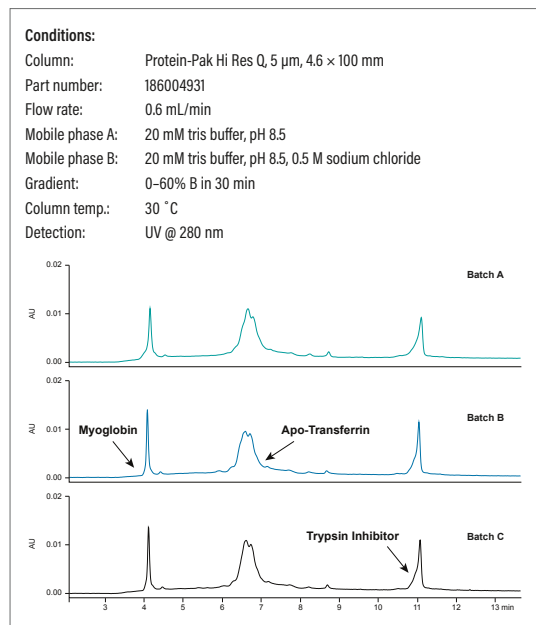
(i.e., BSA for Hi Res Q column, Lysozyme for Hi Res CM and Hi Res SP columns)\*

\*For optimal resolution of complex samples, do not exceed 20% of the column's protein binding capacity.



ACQUITY UPLC Technology for biotherapeutic characterization.

### 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.

## PROTEIN-PAK HI RES HIC COLUMN AND HIC PROTEIN STANDARD

Our Protein-Pak Hi Res HIC (Hydrophobic Interaction Chromatography) Columns contain nonporous, polymethacrylate-based particles (2.5 µm) functionalized with a butyl-ligand coating. These particles are well-suited to characterizing proteins and biotherapeutics, including monoclonal antibodies (mAb) and antibody drug conjugates (ADC).

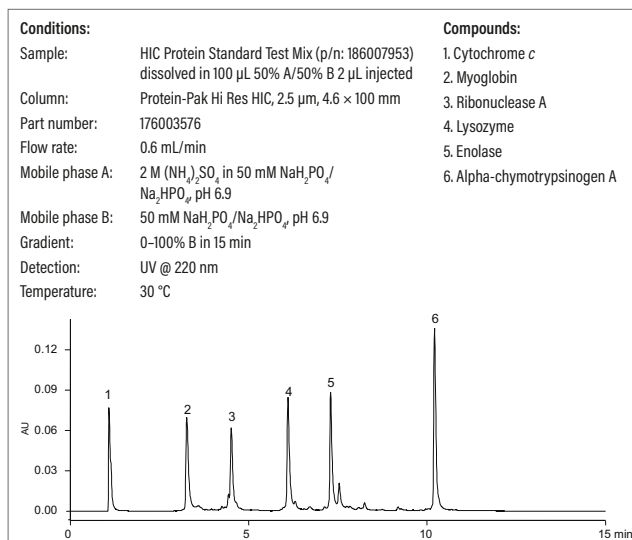
Though reversed-phase chromatography is a frequently used bioanalytical technique, HIC nevertheless offers attractive orthogonal separation advantages. In reversed-phase LC, proteins are retained by hydrophobic interaction with alkyl groups (e.g., C<sub>18</sub>) on the packing material. The butyl ligand density on our Protein-Pak Hi Res HIC Column is comparatively less, therefore, resulting in fewer protein-ligand hydrophobic interactions. Consequently, elution based on HIC is possible using gradients of decreasing salt concentration at physiological pH values. Thus, use of denaturing organic solvent eluents that are used in reversed-phase based separations (e.g., acetonitrile in 0.1% trifluoroacetic acid) can be eliminated thus allowing various biotherapeutics such as acid-labile, cysteine-linked, ADCs, to be analyzed in non-denaturing conditions.

In addition to our HIC column, Waters also offers the HIC Protein Standard Test Mix for use in verifying HPLC/UPLC instrument and/or Protein-Pak Hi Res HIC Column performance prior to the analysis of valuable samples. The standard mixture contains a carefully chosen set of six proteins that provide good chromatographic representation when used with a gradient of decreasing salt concentration. When used on a regular basis, this intact protein validation mixture helps monitor system and column performance. The Protein-Pak Hi Res HIC Column and HIC Protein Standard offer these benefits:

- Ideally suited for hydrophobic-based separations, for protein characterization using non-denaturing conditions
- Addresses high-throughput needs nonporous particles help deliver fast, efficient separations on an appropriately configured LC
- Shipped together with Waters Protein Test Standard to help ensure acceptable HIC column and instrument performance before analyzing valuable samples
- Successfully used to analyze cysteine-based, antibody drug conjugates

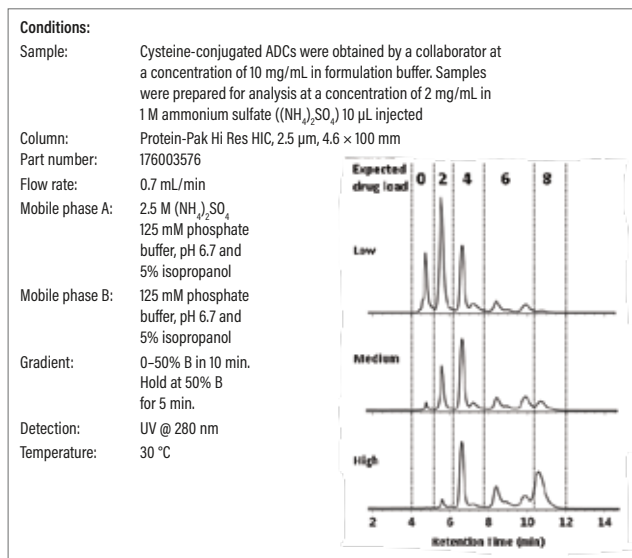


## Protein-Pak Hi Res HIC Column and HIC Protein Standard



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

## Separation of ADC Samples on Protein-Pak Hi Res HIC Column



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.

## 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 Mix | 4.6 × 100 mm | 176003576 |
| HIC Protein Test Standard  | —            | 186007953 |

## BIOSUITE HPLC COLUMNS FOR PROTEIN AND PEPTIDE SEPARATIONS

Waters BioSuite HPLC Columns for protein and peptide separations contain high-performance chemistries dedicated to the isolation, analysis, and characterization of biomolecules. Separation offerings include ion-exchange, size-exclusion, hydrophobic interaction, and reversed-phase columns and support Waters, array of LC and LC-MS systems for the characterization and lab-scale isolation of biotherapeutics and other related compounds.

- Ion-exchange, size exclusion, hydrophobic interaction, and reversed-phase column offerings
- Excellent resolution and recovery of proteins and peptides
- Available in different particle and pore sizes
- Scalable from analytical to 'lab-scale' preparative applications



### Ordering information

#### BioSuite IEX 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 Q-PEEK, 10 µm AXC   | Polymer | 4000Å     | >5,000,000  | 4.6 mm         | 50 mm  | 0.83               | 58 mg <sup>1</sup>                                       | 186002176 |
| BioSuite SP-PEEK, 7 µm CXC   | Polymer | 1300Å     | >4,000,000  | 4.6 mm         | 50 mm  | 0.83               | 58 mg <sup>2</sup>                                       | 186002182 |
| BioSuite DEAE, 2.5 µm NP AXC | Polymer | N/A       | 500   | 4.6 mm         | 35 mm  | 0.58               | 2.9 mg <sup>1</sup>                                      | 186002179 |
| BioSuite SP, 2.5 µm NP CXC   | Polymer | N/A       | 500   | 4.6 mm         | 35 mm  | 0.58               | 2.9 mg <sup>3</sup>                                      | 186002183 |
| BioSuite Q, 10 µm AXC        | Polymer | 1000Å     | 1,000,000   | 7.5 mm         | 75 mm  | 3.31               | 331 mg <sup>1</sup>                                      | 186002177 |
| BioSuite Q, 13 µm AXC        | Polymer | 1000Å     | 1,000,000   | 21.5 mm        | 150 mm | 54.45              | 5445 mg <sup>1</sup>                                     | 186002178 |
| BioSuite DEAE, 10 µm AXC     | Polymer | 1000Å     | 1,000,000   | 7.5 mm         | 75 mm  | 3.31               | 99 mg <sup>1</sup>                                       | 186002180 |
| BioSuite DEAE, 13 µm AXC     | Polymer | 1000Å     | 1,000,000   | 21.5 mm        | 150 mm | 54.45              | 1633 mg <sup>1</sup>                                     | 186002181 |
| BioSuite SP, 10 µm CXC       | Polymer | 1000Å     | 1,000,000   | 7.5 mm         | 75 mm  | 3.31               | 132 mg <sup>3</sup>                                      | 186002184 |
| BioSuite SP, 13 µm CXC       | Polymer | 1000Å     | 1,000,000   | 21.5 mm        | 150 mm | 54.45              | 2178 mg <sup>3</sup>                                     | 186002185 |
| BioSuite CM, 10 µm CXC       | Polymer | 1000Å     | 1,000,000   | 7.5 mm         | 75 mm  | 3.31               | 149 mg <sup>3</sup>                                      | 186002186 |
| BioSuite CM, 13 µm CXC       | Polymer | 1000Å     | 1,000,000   | 21.5 mm        | 150 mm | 54.45              | 2450 mg <sup>3</sup>                                     | 186002187 |

<sup>1</sup>Data generated with BSA.

<sup>2</sup>Data generated with Gamma Globulin.

<sup>3</sup>Data generated with Hemoglobin.

Note: For best resolution of complex samples, do not exceed 20% of the column's protein binding capacity.

#### BioSuite Hydrophobic-Interaction Chromatography HPLC and UHPLC Columns

| Description               | Matrix  | Diameter Width | Diameter Length | P/N       |
|---------------------------|---------|----------------|-----------------|-----------|
| BioSuite Phenyl 10 µm HIC | Polymer | 7.5 mm         | 75 mm           | 186002159 |
| BioSuite Phenyl 13 µm HIC | Polymer | 21.5 mm        | 150 mm          | 186002160 |

#### BioSuite pC<sub>18</sub> and pPhenyl HPLC and UHPLC Columns

| Description                                | Matrix  | Diameter Width | Diameter Length | P/N       |
|--|---------|----------------|-----------------|-----------|
| BioSuite pC <sub>18</sub> , 2.5 µm NP RPC  | Polymer | 4.6 mm         | 35 mm           | 186002152 |
| BioSuite pC <sub>18</sub> , 500, 7 µm RPC  | Polymer | 2.0 mm         | 150 mm          | 186002153 |
| BioSuite pC <sub>18</sub> , 500, 7 µm RPC  | Polymer | 4.6 mm         | 150 mm          | 186002154 |
| BioSuite pC <sub>18</sub> , 500, 13 µm RPC | Polymer | 21.5 mm        | 150 mm          | 186002155 |
| BioSuite pPhenyl, 1000, 10 µm RPC          | Polymer | 2.0 mm         | 75 mm           | 186002156 |
| BioSuite pPhenyl, 1000, 10 µm RPC          | Polymer | 4.6 mm         | 75 mm           | 186002157 |
| BioSuite pPhenyl, 1000, 13 µm RPC          | Polymer | 21.5 mm        | 150 mm          | 186002158 |

## 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 125Å, 4 µm UHR SEC | Silica | 4.6 mm         | 300 mm          | 4.98 mL       | Less than 8 mg/mL  | Less than 40 µL             | 186002161 |
| BioSuite 250Å, 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 125Å, 5 µm HR SEC  | Silica | 7.8 mm         | 300 mm          | 14.33 mL      | Less than 8 mg/mL  | Less than 200 µL            | 186002164 |
| BioSuite 250Å, 5 µm HR SEC  | Silica | 7.8 mm         | 300 mm          | 14.33 mL      | Less than 8 mg/mL  | Less than 200 µL            | 186002165 |
| BioSuite 450Å, 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 | 6.0 mm         | 40 mm           | —             | —  | —                           | 186002167 |
| BioSuite 125Å, 10 µm SEC    | Silica | 7.5 mm         | 300 mm          | 13.25 mL      | Less than 8 mg/mL  | Less than 200 µL            | 186002168 |
| BioSuite 125Å, 13 µm SEC    | Silica | 21.5 mm        | 300 mm          | 108.9 mL      | Less than 8 mg/mL  | Less than 1.6 mL            | 186002169 |
| BioSuite 250Å, 10 µm SEC    | Silica | 7.5 mm         | 300 mm          | 13.25 mL      | Less than 8 mg/mL  | Less than 200 µL            | 186002170 |
| BioSuite 250Å, 13 µm SEC    | Silica | 21.5 mm        | 300 mm          | 108.9 mL      | Less than 8 mg/mL  | Less than 1.6 mL            | 186002171 |
| BioSuite 450Å, 13 µm SEC    | Silica | 7.5 mm         | 300 mm          | 13.25 mL      | Less than 8 mg/mL  | Less than 200 µL            | 186002172 |
| BioSuite 450Å, 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<sub>2</sub>SO<sub>4</sub>) eluent. Useful protein mass loads will vary depending upon separation eluent, complexity of sample, and on the 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 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 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.

## Ordering Information

### Protein-Pak SEC HPLC Columns and Guards

| Steel Column   | Dimension    | MW Range       | P/N       |
|--|--------------|----------------|-----------|
| Protein-Pak 60   | 7.8 x 300 mm | 1,000–20,000   | WAT085250 |
| Protein-Pak 60   | 19 x 300 µm  | 1,000–20,000   | WAT025830 |
| Protein-Pak 125  | 7.8 x 300 mm | 2,000–80,000   | WAT084601 |
| Protein-Pak 125  | 19 x 300 mm  | 2,000–80,000   | WAT025831 |
| Protein-Pak 300SW  | 7.5 x 300 mm | 10,000–300,000 | WAT080013 |
| Protein-Pak 125 Sentry Guard Column, 3.9 x 20 mm, 2/pk (requires holder) |              |                | 186000926 |
| Sentry Universal Guard Column Holder                                     |              |                | WAT046910 |

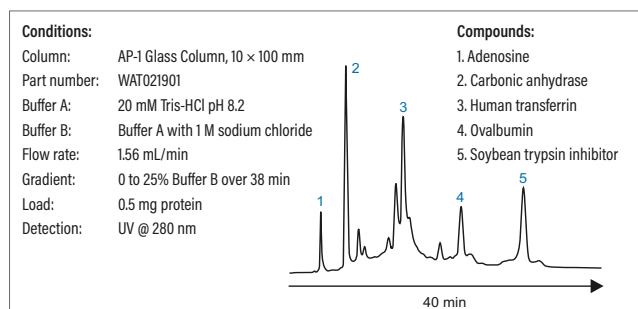
| Glass Column      | Dimension    | MW Range       | P/N       |
|-------------------|--------------|----------------|-----------|
| Protein-Pak 200SW | 8.0 x 300 mm | 500–60,000     | WAT011786 |
| Protein-Pak 300SW | 8.0 x 300 mm | 10,000–300,000 | WAT011787 |

## PROTEIN-PAK HIGH RESOLUTION (HR) ION-EXCHANGE GLASS COLUMNS

Waters Protein-Pak HR packing materials are based on rigid, hydrophilic, polymethacrylate particles with large, 1000Å pores. The naturally hydrophilic polymer reduces nonspecific adsorption, resulting in quantitative recovery of protein mass and bioactivity. Compatible with buffers in the pH range 2–12, these packings can withstand exposure to caustic solutions, such as 0.1 to 1.0 M sodium hydroxide. Likewise, they withstand exposure to 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 5 mm I.D. mini-column or in a 10 mm I.D. × 100 mm column. The 5 mm I.D. column is also available in a 50 mm length. These columns are compatible, with the use of an adapter kit, with any HPLC and FPLC system.

### 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 or laboratory-scale purification of various protein mixtures.

We offer these Protein-Pak HR ion exchangers:

- Q, a strong anion exchanger
- SP, a strong cation exchanger
- DEAE, a weak anion exchanger
- CM, a weak cation exchanger

The principal difference between weak and strong ion-exchangers lies not in their respective protein binding capacities but in their pH range of operation. The useful pH range of operation of weak ion exchangers tends to be more restricted than that of strong ion-exchangers.

| Properties of Protein-Pak HR Columns    |                               |                                  |                                |                                |
|---|-------------------------------|----------------------------------|--------------------------------|--------------------------------|
|   | Protein-Pak Q HR <sup>1</sup> | Protein-Pak DEAE HR <sup>2</sup> | Protein-Pak CM HR <sup>3</sup> | Protein-Pak SP HR <sup>4</sup> |
| 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                           |

<sup>1</sup> For best resolution do not exceed 20% of the protein binding capacity.

<sup>2</sup> 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.

<sup>3</sup> Cytochrome c in 25 mM MES pH 5.0 was used to measure protein binding capacity of Protein-Pak SP and CM HR.

<sup>4</sup> Same conditions as CM. Protein binding capacity of Protein-Pak SP 40 HR is 20 mg/mL.

### 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          | 1000Å     | 5.0 × 50 mm  | Polymeric strong anion exchanger  | WAT039575 |
|                       |               |           | 5.0 × 100 mm |                                   | WAT039630 |
|                       |               |           | 10 × 100 mm  |                                   | WAT035980 |
| Protein-Pak Q 15HR    | 15 µm         | 1000Å     | 5.0 × 50 mm  | Polymeric strong anion exchanger  | WAT039782 |
|                       |               |           | 10 × 100 mm  |                                   | WAT037663 |
| Protein-Pak DEAE 8HR  | 8 µm          | 1000Å     | 5.0 × 50 mm  | Polymeric weak anion exchanger    | WAT039791 |
|                       |               |           | 5.0 × 100 mm |                                   | WAT039783 |
|                       |               |           | 10 × 100 mm  |                                   | WAT035650 |
| Protein-Pak DEAE 15HR | 15 µm         | 1000Å     | 5.0 × 50 mm  | Polymeric weak anion exchanger    | WAT039780 |
|                       |               |           | 5.0 × 100 mm |                                   | WAT039786 |
|                       |               |           | 10 × 100 mm  |                                   | WAT038564 |
| Protein-Pak SP 8HR    | 8 µm          | 1000Å     | 5.0 × 50 mm  | Polymeric strong cation exchanger | WAT039570 |
|                       |               |           | 5.0 × 100 mm |                                   | WAT039625 |
|                       |               |           | 10 × 100 mm  |                                   | WAT035655 |
| Protein-Pak SP 15HR   | 15 µm         | 1000Å     | 10 × 100 mm  | Polymeric strong cation exchanger | WAT038567 |
| Protein-Pak CM 8HR    | 8 µm          | 1000Å     | 5.0 × 50 mm  | Polymeric weak cation exchanger   | WAT039790 |
|                       |               |           | 5.0 × 100 mm |                                   | WAT039785 |
|                       |               |           | 10 × 100 mm  |                                   | WAT035970 |
| Protein-Pak CM 15HR   | 15 µm         | 1000Å     | 5.0 × 50 mm  | Polymeric weak cation exchanger   | WAT039787 |



## ADVANCED PURIFICATION (AP) GLASS COLUMNS

Made of biocompatible glass and polymeric materials, our AP series of glass columns are 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 column packing from large-particulate contaminants. We offer, in various sizes, empty AP Glass Columns of the same design, ensuring the predictable transfer of methods among them. AP Glass Columns are compatible with both analytical and preparative HPLC and FPLC systems.



## Ordering Information

### Advanced Purification (AP) Glass Columns

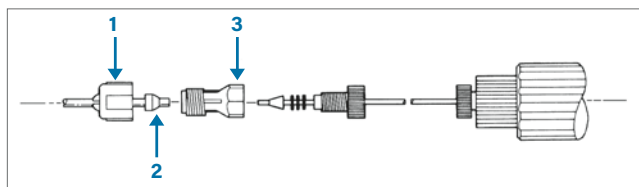
| Dimension    | Bed Volume (mL) | Flow Rate (mL/min) | Pressure Rating (psi/MPa) | P/N       |
|--------------|-----------------|--------------------|---------------------------|-----------|
| 5.0 × 50 mm  | 0.8–1.2         | 0–4                | 1500 psi/10 MPa           | WAT064-01 |
| 5.0 × 100 mm | 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 an adjustable bed height with easy-to-use coarse and fine adjustments. The AP Glass Columns are available in various dimensions.

## Ordering Information

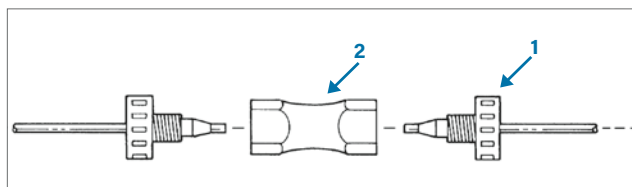
### Connection of an AP MiniColumn and an AP-1 Column to 1/8" OD Tubing



| 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  | 5.0 × 50 mm  | WAT038802 |
|   | 5.0 × 100 mm | WAT038803 |
| Column Jacket   | 5.0 × 50 mm  | WAT038804 |
|   | 5.0 × 100 mm | WAT038805 |
| Filters, 10/pk  | —            | WAT038806 |
| O-rings, 13/pk<br>(includes 10 inlet/outlet and 3 funnel) | —            | WAT038807 |
| Inlet Connector Assembly                                  | —            | WAT038800 |

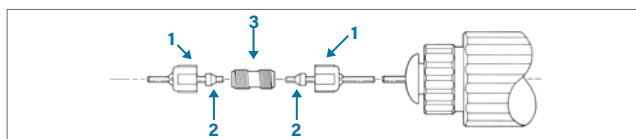


| Description  | Qty. | P/N       |
|--|------|-----------|
| 1 Compression Screw and Ferrule "Z" Fitting, Plastic | 1/pk | WAT082708 |
| 2 Union "Z" Fitting, Plastic                         | 1/pk | WAT082745 |

### 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 |
| Inlet Connector Assembly  | 10 × 600 mm | WAT021947 |
|   | —           | 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" OD Tubing

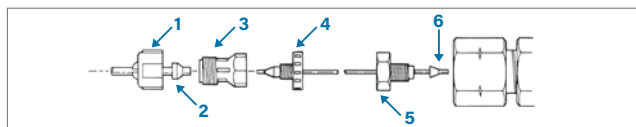


| Description                        | Qty.  | P/N       |
|------------------------------------|-------|-----------|
| 1 Collet and Nut Assembly (3/8-24) | 10/pk | WAT005138 |
| 2 Ferrule 1/8" Tube                | 10/pk | WAT005136 |
| 3 Union 3/8-24 x 3/8-24            | 1/pk  | WAT082734 |

### AP-2 Column Accessories and Spare Parts

| Description  | Dimension   | P/N       |
|--|-------------|-----------|
| Glass Tube   | 20 x 100 mm | WAT019891 |
|  | 20 x 200 mm | WAT019892 |
|  | 20 x 300 mm | WAT019893 |
|  | 20 x 100 mm | WAT027542 |
|  | 20 x 300 mm | WAT027544 |
| Plastic Shield   | 20 x 200 mm | WAT027543 |
|  | 20 x 300 mm | WAT027544 |
| 0-rings, 5/pk  | —           | WAT027528 |
| Filters, 2/pk  | —           | WAT027530 |
| Replacement Tubing (Tefzel)<br>(1/8 in. O.D. x 0.040 in. I.D. x 10 feet)<br>(3.2 mm O.D. x 1.02 mm I.D. x 3 m) | —           | WAT023344 |
| Inlet Connector Assembly   | —           | WAT027525 |
| Distributors/Inserts, 5/pk   | —           | 700004715 |

### Connection of a Protein-Pak Steel Column to 1/16" and 1/8" OD Tubing



| 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 x "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 |

### ACCELLPLUS PREPPAK CARTRIDGES (47 X 300 MM)

Economical, convenient preparative separations in the 500 mg to 10 g range. For a complete listing of Waters products for preparative chromatography, visit [www.waters.com](http://www.waters.com)

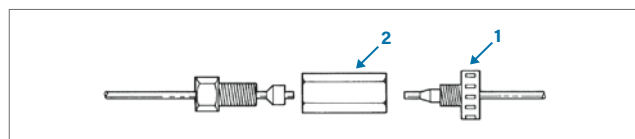
### Ordering Information

#### AccellPlus PrepPak Cartridges (47 x 300 mm)

| Description         | Particle Size | Pore Size | P/N       |
|---------------------|---------------|-----------|-----------|
| AccellPlus™ CM*     | 40 µm         | 300Å      | WAT036545 |
| PrepPak 1000 Module | —             | —         | WAT089592 |

\*Requires PrepPak 1000 Module.

### Connection of Pharmacia Fitting to 1/16" OD Tubing

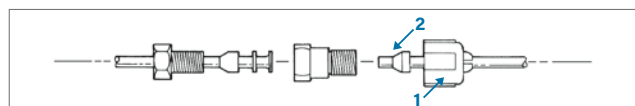


| Description  | Qty. | P/N       |
|--|------|-----------|
| 1 Compression Screw and Ferrule "Z" Fitting, Plastic | 1/pk | WAT082708 |
| 2 Union, Plastic                                     | 1/pk | WAT021951 |

### AP-5 Column Accessories and Spare Parts

| Description   | Dimension   | P/N       |
|---|-------------|-----------|
| Glass Tube  | 50 x 100 mm | WAT019876 |
|   | 50 x 200 mm | WAT019877 |
|   | 50 x 300 mm | WAT019878 |
|   | 50 x 100 mm | WAT023370 |
|   | 50 x 200 mm | WAT023371 |
| Plastic Shield  | 50 x 300 mm | WAT023372 |
|   | 50 x 600 mm | WAT023373 |
|   | 50 x 100 mm | WAT023370 |
| 0-rings, 5/pk   | —           | WAT023345 |
| Filter, 2/pk  | —           | WAT023343 |
| Replacement Tubing (Tefzel)<br>1/8 in. O.D. x 0.040 in. I.D. x 10 feet)<br>(3.2 mm O.D. x 1.02 mm I.D. x 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 1/8" or 1/16" Flanged Type Fitting to 1/8" OD Tubing



| 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 BULK PACKINGS

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

### Ordering Information

#### AccellPlus Ion-Exchange Bulk Packings

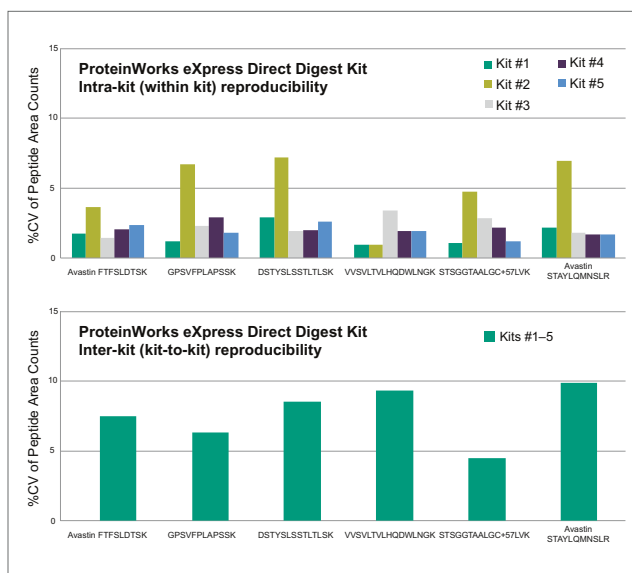
| Description      | Particle Size | Pore Size | Qty.  | P/N       |
|------------------|---------------|-----------|-------|-----------|
| AccellPlus QMA   | 40 µm         | 300Å      | 100 g | WAT010742 |
| Anion Exchanger  | —             | —         | 500 g | WAT010741 |
| AccellPlus CM    | 40 µm         | 300Å      | 100 g | WAT010740 |
| Cation Exchanger | —             | —         | 500 g | WAT010739 |

## SAMPLE PREPARATION WITH PROTEINWORKS FOR LARGE MOLECULE QUANTIFICATION

ProteinWorks™ Sample Preparation Kits enable laboratories to routinely achieve standardized, reproducible, and highly sensitive protein quantification via the surrogate peptide approach.

- Easy sample preparation for a wide variety of proteins including biomarkers and antibodies
- Pre-measured, lot-traceable reagents
- Standardized protocol that has built in flexibility for both 3 and 5 step digestion (reduction & alkylation)
- Reproducible and highly effective protein digests with the ProteinWorks Express Digest Kits
- Achieve your best sensitivity by combining the digest kits with the ProteinWorks  $\mu$ Elution SPE Cleanup Kit

Take the Variability out of your results



## Ordering Information

| Description   | P/N       |
|---|-----------|
| ProteinWorks eXpress Digest Kit<br>(for the digestion of immunopurified plasma and serum samples)   | 176003689 |
| ProteinWorks eXpress Digest Start-Up Kit<br>(eXpress Digest Kit with $\mu$ Elution SPE Cleanup Kit and Intact mAb Check Standard)               | 176003696 |
| ProteinWorks eXpress Direct Digest Kit<br>(for the direct digestion of whole, non-immunopurified plasma and serum samples)                      | 176003688 |
| ProteinWorks eXpress Direct Digest Start-Up Kit<br>(eXpress Direct Digest Kit with $\mu$ Elution SPE Cleanup Kit and Intact mAb Check Standard) | 176003695 |
| ProteinWorks $\mu$ Elution SPE Cleanup Kit (for post-digestion cleanup and sample concentration at the peptide level)                           | 186008304 |
| Intact mAb Check Standard   | 186006552 |
| Modular Heat Block for 1 mL Tubes   | 186007985 |
| ACQUITY UPLC Peptide BEH C <sub>18</sub> , 300Å, 1.7 $\mu$ m, 2.1 $\times$ 150 mm   | 186003687 |
| 96-well Sample Collection Plate, 700 $\mu$ L Round Well   | 186005837 |
| Polypropylene Cap Mat, Round Well   | 186002483 |
| 96-well Extraction Plate Vacuum Manifold  | 186001831 |
| Positive Pressure 96-Processor  | 186006961 |

Visit [www.waters.com/proteinworks](http://www.waters.com/proteinworks) to learn more.

# Size-Exclusion Chromatography Columns and Standards

Size-Exclusion Chromatography Columns and Standards



"It is rewarding walking through a lab and seeing  
a product that you helped to make."

~ Brian Nussdorfer, Process Chemist, Taunton, MA, U.S.A.

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# Size-Exclusion Chromatography Columns and Standards

For over 50 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.

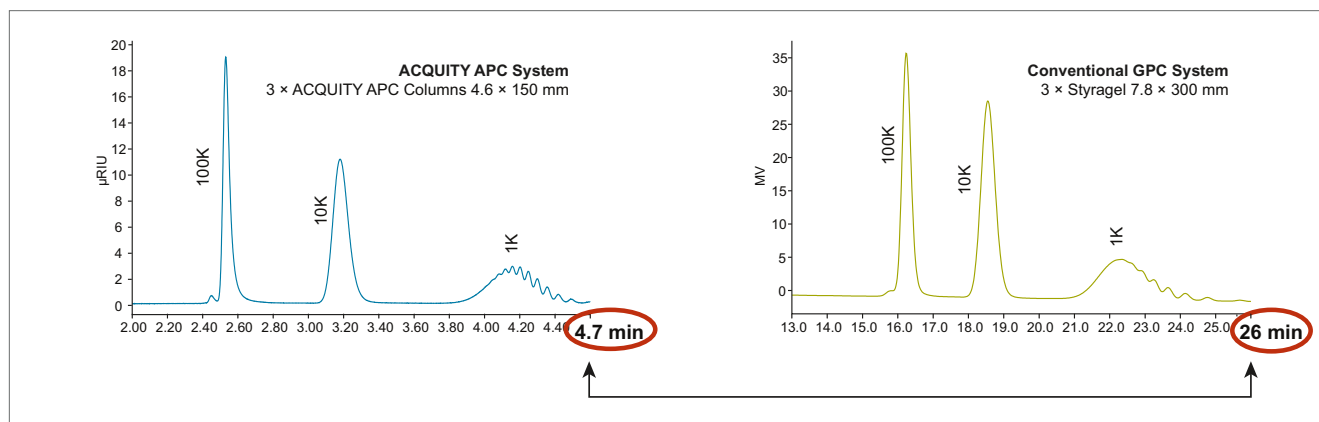
## GPC Columns for Non-Aqueous Samples

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

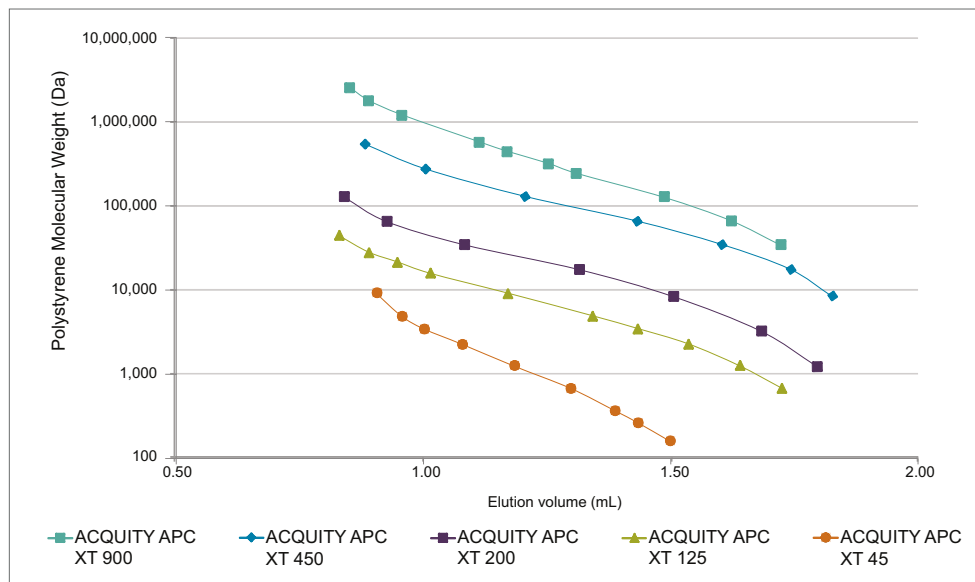
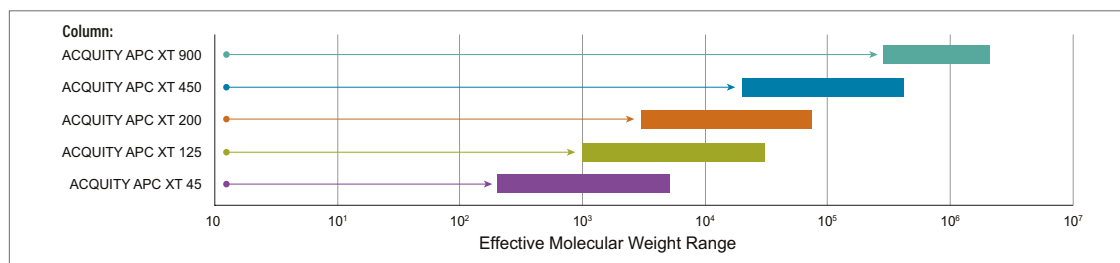
Using ACQUITY APC XT Columns, you can quantify and characterize polymer samples with accuracy and confidence while maximizing productivity. The high-performance chemistries contained in ACQUITY Advanced Polymer Chromatography® (APC™) Columns enable rapid and accurate chromatographic characterization 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 the scientist to use multiple conditions for the same column bank. This gives the chromatographer 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 x 300 mm. The same polystyrene sample was analyzed using a 3-column bank of 4.6 x 150 mm ACQUITY APC Columns (XT 45, XT 45, and XT 200). The separation used THF; 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           | P/N       | P/N       |
|-----------|---------------------|---------------|---------------|-----------|-----------|
|           |                     |               | Column Length |           |           |
|           |                     |               | 30 mm         | 75 mm     | 150 mm    |
| 45Å       | 200-5000            | 1.7 µm        | 186006992     | 186006993 | 186006995 |
| 125Å      | 1000-30,000         | 2.5 µm        | 186006997     | 186006998 | 186007000 |
| 200Å      | 3000-70,000         | 2.5 µm        | 186007002     | 186007003 | 186007005 |
| 450Å      | 20,000-400,000      | 2.5 µm        | 186007007     | 186007008 | 186007010 |
| 900Å      | 300,000-2,000,000   | 2.5 µm        | 186007252     | 186007253 | 186007254 |

\*The calibration range is based on well-characterized polystyrene standards.  
All columns are 4.6 mm I.D., maximum temperature limit 90 °C and are shipped dry.


ACQUITY APC XT Columns are shipped dry, with acetal compression plugs at the assembly's ends. If you are storing the columns wet using a strong solvating solvent, consider fitting compression plugs made of stainless steel.

### ACQUITY APC XT Fitting Compression Plug

| Description   | P/N       |
|---|-----------|
| Stainless Steel Pin Plug, 1/16 in., High Pressure, 5/pk | 700002747 |

## Waters ACQUITY APC Column Selector

Easily find column and calibration kit recommendations that fit your polymer analysis requirements.

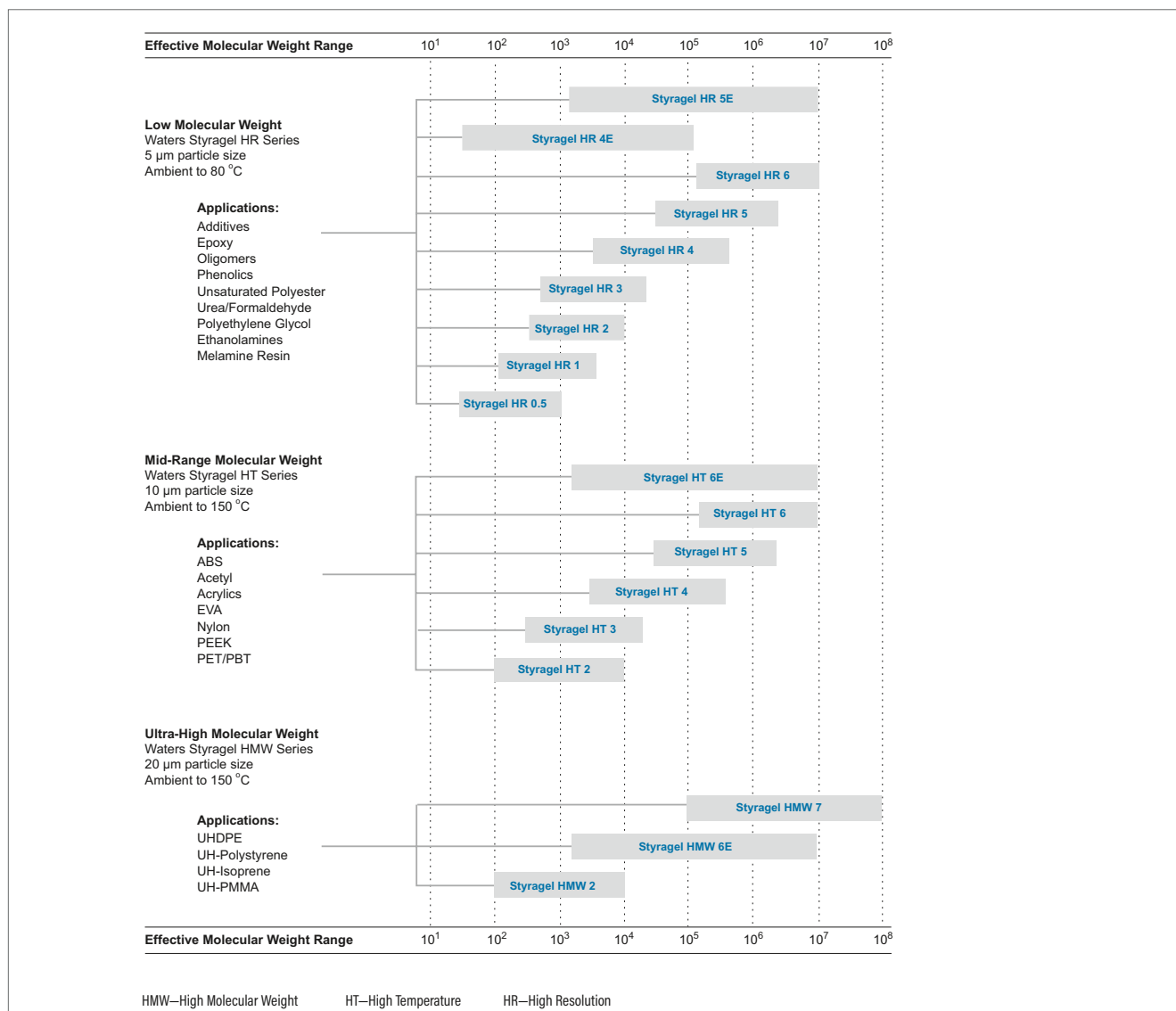
 To try this tool, go to [www.waters.com/APCselector](http://www.waters.com/APCselector)



## STYRAGEL COLUMNS SELECTION GUIDE

Waters offers a comprehensive selection of polymeric GPC Columns. Select a column or column bank that is compatible with the temperature, solvent, and polymer type analyzed. Refer to the following charts to quickly compare the molecular weight ranges for the specified columns. By connecting two or more columns in series, you extend the effective molecular-weight range, which is necessary preparation for performing increasingly complex sample analyses.

### Selection Guide

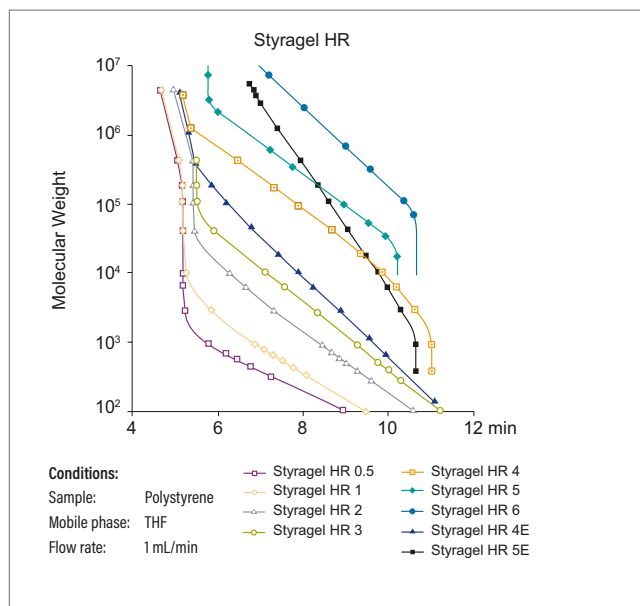




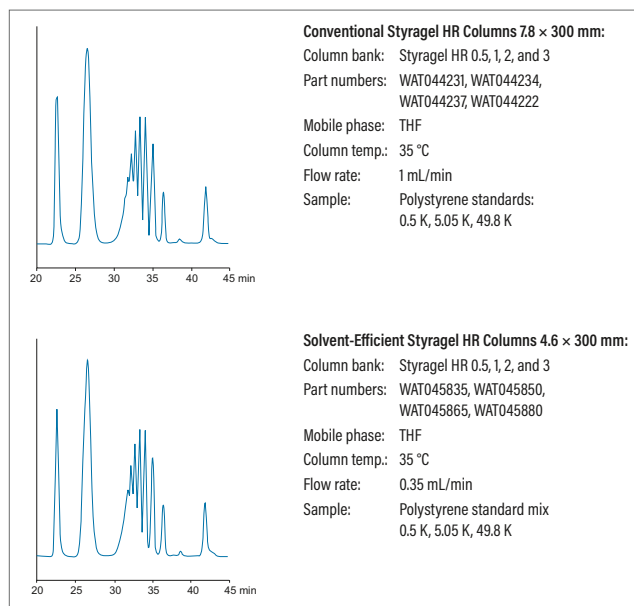
## Styragel HR (High-Resolution) Columns

Designed especially for low-molecular-weight samples, Waters Styragel HR Columns are ideal for analyzing oligomers, epoxies, and polymer additives, where high resolution is critical. Packed with rigid 5  $\mu\text{m}$  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 x 300 mm)

| Description                       | Effective MW Range | P/N       | P/N       | P/N       |
|-----------------------------------|--------------------|-----------|-----------|-----------|
|                                   |                    | THF       | DMF       | Toluene   |
| Styragel HR 0.5                   | 0-1000             | WAT044231 | WAT044232 | WAT044230 |
| Styragel HR 1                     | 100-5000           | WAT044234 | WAT044235 | WAT044233 |
| Styragel HR 2                     | 500-20,000         | WAT044237 | WAT044238 | WAT044236 |
| Styragel HR 3                     | 500-30,000         | WAT044222 | WAT044223 | WAT044221 |
| Styragel HR 4                     | 5000-600,000       | WAT044225 | WAT044226 | WAT044224 |
| Styragel HR 4E                    | 50-100,000         | WAT044240 | WAT044241 | WAT044239 |
| Styragel HR 5                     | 50,000-4,000,000   | WAT054460 | WAT054466 | WAT054464 |
| Styragel HR 5E                    | 2000-4,000,000     | WAT044228 | WAT044229 | WAT044227 |
| Styragel HR 6                     | 200,000-10,000,000 | WAT054468 | WAT054474 | WAT054470 |
| Styragel Guard Column 4.6 x 30 mm | —                  | WAT054405 | WAT054415 | WAT054410 |

## Styragel HR Columns (4.6 × 300 mm)\*

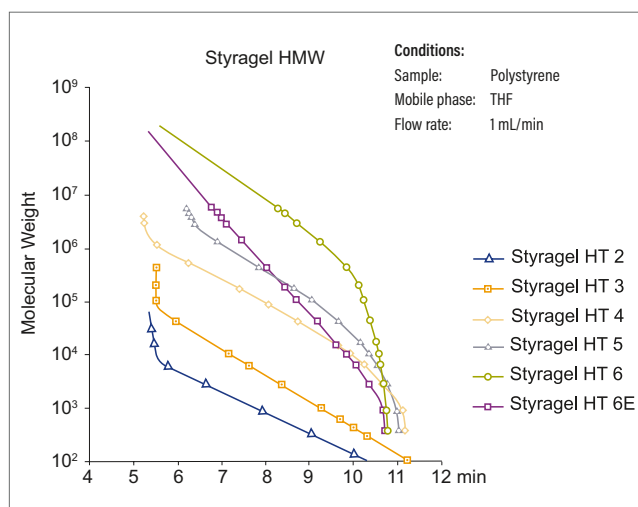
| Description     | Effective MW Range | P/N       | P/N       | P/N       |
|-----------------|--------------------|-----------|-----------|-----------|
|                 |                    | THF       | DMF       | Toluene   |
| Styragel HR 0.5 | 0-1000             | WAT045835 | WAT045840 | WAT045830 |
| Styragel HR 1   | 100-5000           | WAT045850 | WAT045855 | WAT045845 |
| Styragel HR 2   | 500-20,000         | WAT045865 | WAT045870 | WAT045860 |
| Styragel HR 3   | 500-30,000         | WAT045880 | WAT045885 | WAT045875 |
| Styragel HR 4   | 5000-600,000       | WAT045895 | WAT045900 | WAT045890 |
| Styragel HR 4E  | 50-100,000         | WAT045805 | WAT045810 | WAT045800 |
| Styragel HR 5E  | 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.

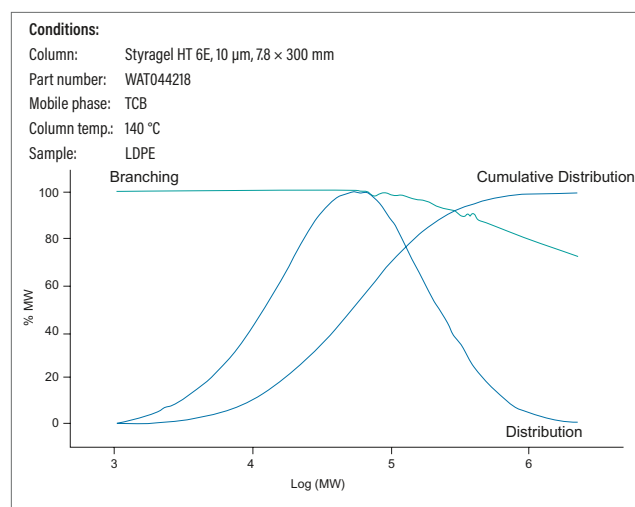
## Styragel HT (High-Temperature) Columns

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)

| Description                       | Effective MW Range | P/N       | P/N       | P/N       |
|-----------------------------------|--------------------|-----------|-----------|-----------|
|                                   |                    | THF       | DMF       | Toluene   |
| Styragel HT 2                     | 100-10,000         | WAT054475 | WAT054480 | WAT054476 |
| Styragel HT 3                     | 500-30,000         | WAT044207 | WAT044208 | WAT044206 |
| Styragel HT 4                     | 5000-600,000       | WAT044210 | WAT044211 | WAT044209 |
| Styragel HT 5                     | 50,000-4,000,000   | WAT044213 | WAT044214 | WAT044212 |
| Styragel HT 6                     | 200,000-10,000,000 | WAT044216 | WAT044217 | WAT044215 |
| Styragel HT 6E                    | 5000-10,000,000    | WAT044219 | WAT044220 | WAT044218 |
| Styragel Guard Column 4.6 × 30 mm | —                  | WAT054405 | WAT054415 | WAT054410 |

## Styragel HT Columns (4.6 × 300 mm)\*

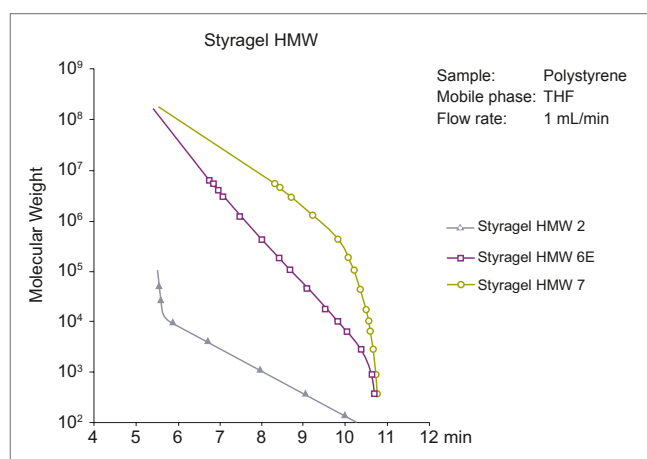
| Description    | Effective MW Range | P/N       | P/N       | P/N       |
|----------------|--------------------|-----------|-----------|-----------|
|                |                    | THF       | DMF       | Toluene   |
| Styragel HT 3  | 500–30,000         | WAT045920 | WAT045925 | WAT045915 |
| Styragel HT 4  | 5000–600,000       | WAT045935 | WAT045940 | WAT045930 |
| Styragel HT 5  | 50,000–4,000,000   | WAT045950 | WAT045955 | WAT045945 |
| Styragel HT 6  | 200,000–10,000,000 | WAT045965 | WAT045970 | WAT045960 |
| Styragel HT 6E | 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.

Calibration Curves for Waters Styragel HMW Series of High-Molecular Weight Columns



## Ordering Information

### Styragel HMW Columns (7.8 × 300 mm)

| Description                        | Effective MW Range          | P/N       | P/N       | P/N       |
|------------------------------------|-----------------------------|-----------|-----------|-----------|
|                                    |                             | THF       | DMF       | Toluene   |
| Styragel HMW 2                     | 100–10,000                  | WAT054488 | WAT054494 | WAT054490 |
| Styragel HMW 7                     | 500,000–1 × 10 <sup>8</sup> | WAT044201 | WAT044202 | WAT044200 |
| Styragel HMW 6E                    | 5000–1 × 10 <sup>7</sup>    | WAT044204 | WAT044205 | WAT044203 |
| Styragel Guard Column 4.6 × 300 mm | —                           | WAT054405 | WAT054415 | WAT054410 |

### Styragel HMW Columns (4.6 × 300 mm)\*

| Description     | Effective MW Range          | P/N       | P/N       | P/N       |
|-----------------|-----------------------------|-----------|-----------|-----------|
|                 |                             | THF       | DMF       | Toluene   |
| Styragel HMW 7  | 500,000–1 × 10 <sup>8</sup> | WAT046805 | WAT046810 | WAT046800 |
| Styragel HMW 6E | 5000–1 × 10 <sup>7</sup>    | WAT046820 | WAT046825 | WAT046815 |

\*The same high performance as our conventional Styragel HMW Columns with the added advantage of reducing your solvent consumption by two-thirds. System dead volume must be minimized for maximum column performance.

## ULTRASTYRAGEL COLUMNS

Ultrastryragel™ Preparative Columns provide high-efficiency GPC separations for compound isolation and sample cleanup. Closely related to Styragel GPC Columns, the family of Ultrastryragel 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, Ultrastryragel Preparative Column.

### Ordering Information

Ultrastryragel Columns (19 × 300 mm)

| Pore Size         | Effective MW Range | (mL/min)  | P/N       |           |
|-------------------|--------------------|-----------|-----------|-----------|
|                   |                    | Flow Rate | Toluene   | THF       |
| 100Å              | 50-1500            | 4-10      | WAT025866 | WAT025859 |
| 500Å              | 100-10,000         | 4-10      | WAT025867 | WAT025860 |
| 10 <sup>3</sup> Å | 200-30,000         | 4-10      | WAT025868 | WAT025861 |
| 10 <sup>4</sup> Å | 5000-600,000       | 4-10      | WAT025869 | WAT025862 |
| 10 <sup>5</sup> Å | 50,000-4 M         | 4-10      | WAT025870 | WAT025863 |
| 10 <sup>6</sup> Å | 200,000-10 M       | 4-10      | WAT025871 | WAT025864 |
| Linear            | 2000-4 M           | 4-10      | WAT025872 | WAT025865 |

Ultrastryragel Columns (7.8 × 300 mm)

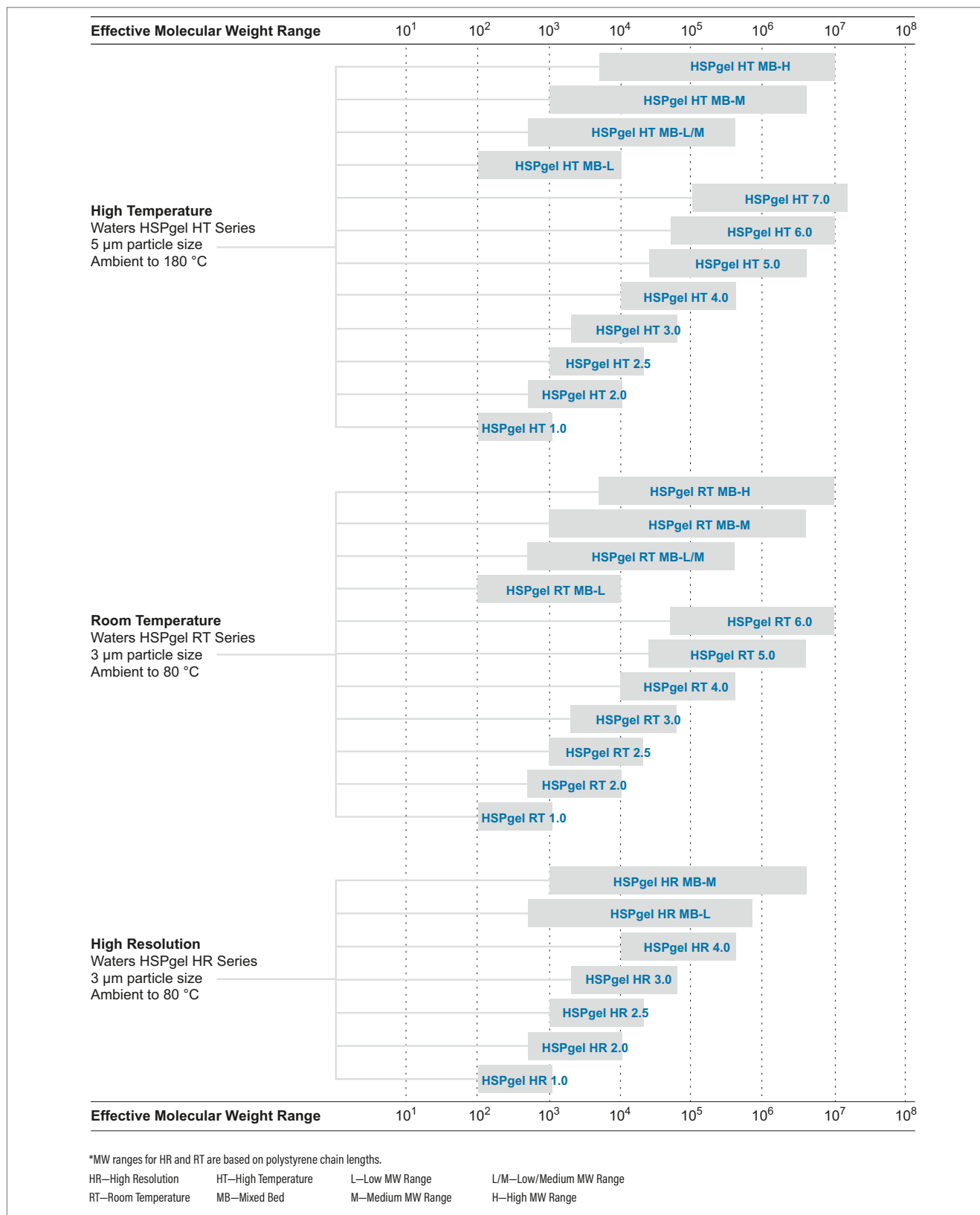
| Pore Size | Effective MW Range | P/N       |           |
|-----------|--------------------|-----------|-----------|
|           |                    | Toluene   | THF       |
| 100Å      | 50-1500            | WAT085500 | WAT010570 |
| 500Å      | 100-10,000         | WAT085501 | WAT010571 |

## 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 HR Series

The HSPgel HR series is 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  $\mu$ m, 6.0  $\times$  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 Series

The HSPgel RT series is 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  $\mu$ m, 6.0  $\times$  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 Series

The HSPgel HT series is 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 |

#### 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 Series (8 × 300 mm)

Ultra-high-efficiency columns designed for high-resolution performance, available in THF, DMF, or chloroform.

### Ordering Information

#### Shodex GPC K-800 Columns, in THF, 5 µm, 8 × 300 mm

| Description                           | Polystyrene Exclusion Limit | P/N       |
|---------------------------------------|-----------------------------|-----------|
| Shodex KF-801                         | 1500                        | WAT030697 |
| Shodex KF-802                         | 5000                        | WAT030698 |
| Shodex KF-802.5                       | 20,000                      | WAT030699 |
| Shodex KF-803                         | 70,000                      | WAT034100 |
| Shodex KF-804                         | 400,000                     | WAT034101 |
| Shodex KF-805                         | 4,000,000                   | WAT034102 |
| Shodex KF-807                         | 200,000,000                 | WAT034104 |
| Shodex KF-806M (linear)               | 40,000,000                  | WAT034105 |
| Shodex KF-G Guard (5 µm, 4.6 × 10 mm) |                             | WAT034106 |

### Shodex GPC K-800 Columns, in Chloroform, 5 µm, 8 × 300 mm

| Description                          | Polystyrene Exclusion Limit | P/N       |
|--------------------------------------|-----------------------------|-----------|
| Shodex K-802.5                       | 20,000                      | WAT034109 |
| Shodex K-803                         | 70,000                      | WAT034110 |
| Shodex K-804                         | 400,000                     | WAT034111 |
| Shodex K-805                         | 4,000,000                   | WAT034112 |
| Shodex K-G Guard (5 µm, 4.6 × 10 mm) |                             | WAT035524 |

### Shodex GPC K-800 Columns, in DMF, 5 µm, 8 × 300 mm

| Description                           | Polystyrene Exclusion Limit | P/N       |
|---------------------------------------|-----------------------------|-----------|
| Shodex KD-801                         | 2500                        | WAT034116 |
| Shodex KD-802                         | 5000                        | WAT034117 |
| Shodex KD-802.5                       | 20,000                      | WAT034118 |
| Shodex KD-803                         | 70,000                      | WAT034119 |
| Shodex KD-804                         | 400,000                     | WAT034120 |
| Shodex KD-806                         | 40,000,000                  | WAT034122 |
| Shodex KD-807                         | 200,000,000                 | WAT034123 |
| Shodex KD-806 M (linear)              | 40,000,000                  | WAT034124 |
| Shodex KD-G Guard (5 µm, 4.6 × 10 mm) |                             | WAT034125 |

### HFIP-800 Series

These columns have the same high efficiency as the K-series columns shipped in HFIP.

### Ordering Information

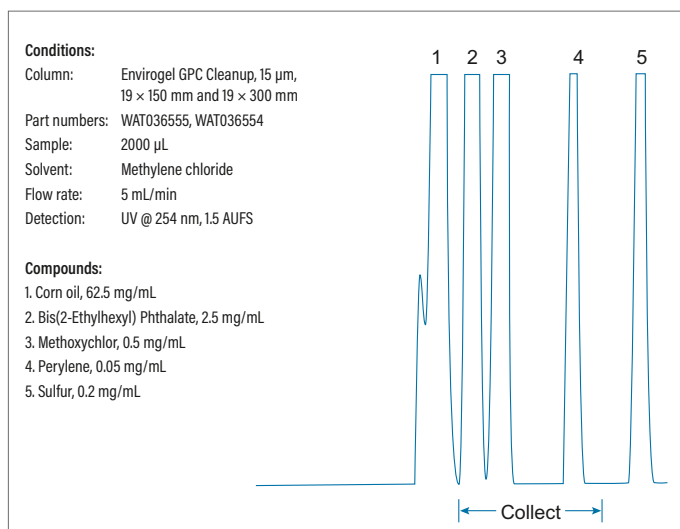
#### Shodex GPC HFIP-800 Columns, 5 µm, 8 × 300 mm

| Description                     | Polystyrene Exclusion Limit | P/N       |
|---------------------------------|-----------------------------|-----------|
| Shodex HFIP-803                 | 70,000                      | WAT035605 |
| Shodex HFIP-806M (linear)       | 40,000,000                  | WAT035611 |
| Shodex HFP-LG Guard (8 × 50 mm) | —                           | WAT035612 |

### ENVIROGEL HIGH-RESOLUTION GPC CLEANUP COLUMNS

The Envirogel™ High-Efficiency GPC Cleanup Columns remove low volatility, high-molecular-weight interferences, such as lipids and natural resins, from environmental samples, as specified in EPA Method 3640A. In the past, the cleanup procedure for environmental samples was performed on low-efficiency GPC Columns based on packing particle diameters of 37–75 µm (200–400 mesh) Bio-Beads S-X resins. The high efficiency Envirogel GPC Cleanup Columns increase the speed of this process, and simultaneously reduce solvent consumption. For optimum capacity and resolution, a 150 mm column is used in series with the 300 mm column. The use of both the 150 mm and 300 mm column provides maximum loading capacity, while the 300 mm column provides maximum throughput when used alone, plus reduced solvent consumption.

### Column Optimization





## 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 |

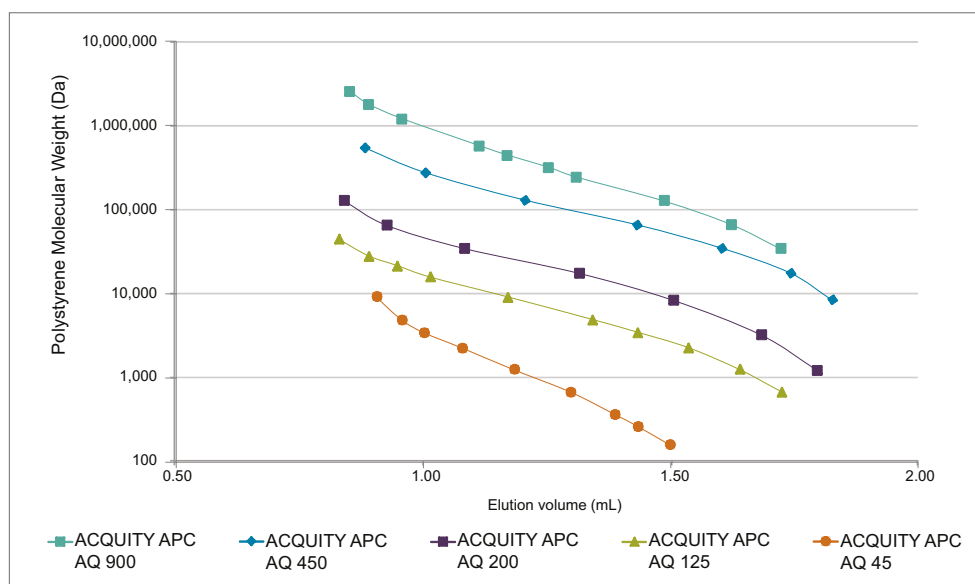
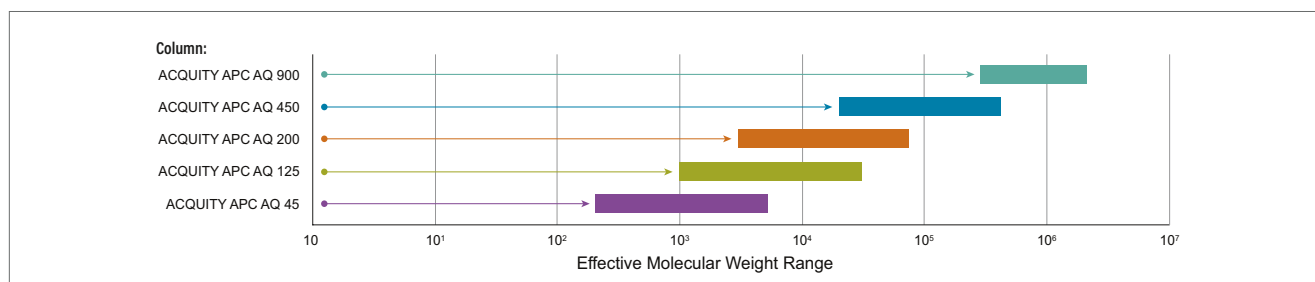
## SEC Columns

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- $\mu\text{m}$  particle technology. The advantages of this technology, detailed in the ACQUITY APC XT section on page 301, apply as well to the AQ columns.

#### ACQUITY APC AQ Column Selection Guide



Polystyrene calibration curves for ACQUITY APC AQ Columns.

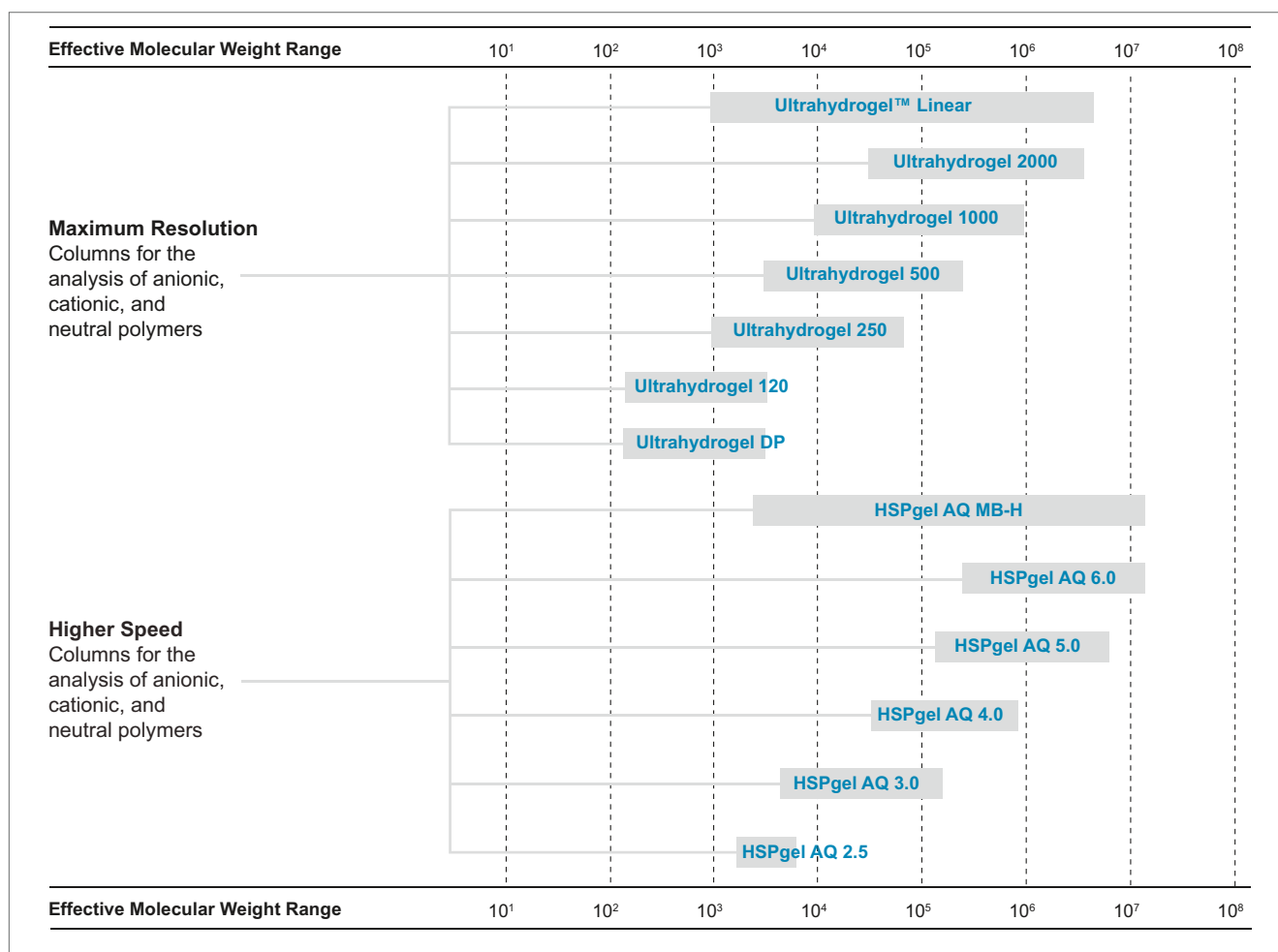
## Ordering Information

### 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    |
| 45Å       | 200–5000            | 1.7 µm        | 186006972     | 186006973 | 186006975 |
| 125Å      | 1000–30,000         | 2.5 µm        | 186006977     | 186006978 | 186006980 |
| 200Å      | 3000–70,000         | 2.5 µm        | 186006982     | 186006983 | 186006985 |
| 450Å      | 20,000–400,000      | 2.5 µm        | 186006987     | 186006988 | 186006990 |
| 900Å      | 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.

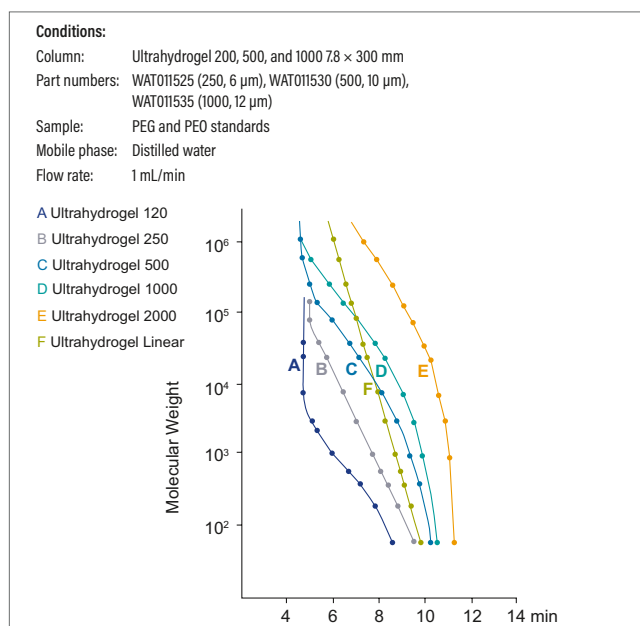
## ULTRAHYDROGEL COLUMNS

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 analyzing cationic, anionic, and amphoteric polymers.

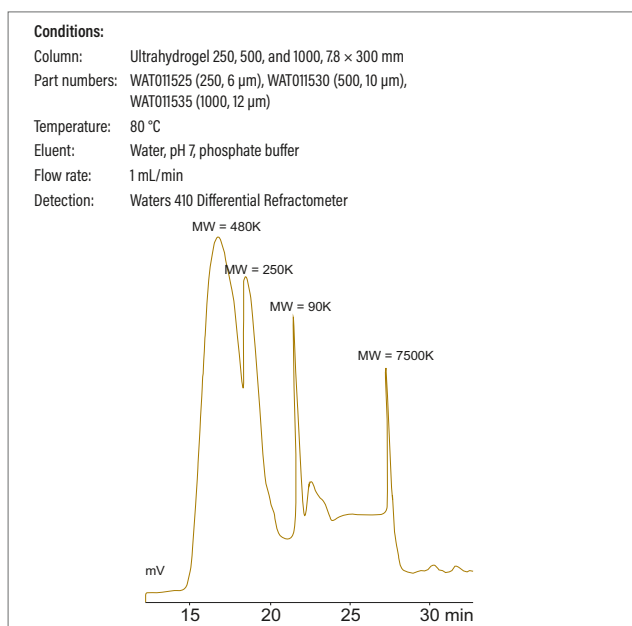
These 7.8 × 300 mm, high-resolution columns offer many advantages over conventional aqueous SEC Columns:

- 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              | 120Å      | 6 μm          | 5000            | WAT011520 |
| Ultrahydrogel 250              | 250Å      | 6 μm          | 80,000          | WAT011525 |
| Ultrahydrogel 500              | 500Å      | 10 μm         | 400,000         | WAT011530 |
| Ultrahydrogel 1000             | 1000Å     | 12 μm         | 1,000,000       | WAT011535 |
| Ultrahydrogel 2000             | 2000Å     | 12 μm         | 7,000,000       | WAT011540 |
| Ultrahydrogel Linear           | Blend     | 10 μm         | 7,000,000       | WAT011545 |
| Ultrahydrogel DP*              | 120Å      | 6 μm          | 5000            | WAT011550 |
| Ultrahydrogel DNA              | >2000Å    | 10 μm         | 10,000,000      | WAT011560 |
| Ultrahydrogel Guard Column     | N/A       | 6 μm          | N/A             | WAT011565 |
| Ultrahydrogel Guard Column DP* | N/A       | 6 μm          | N/A             | WAT011570 |

\*DP = Degree of Polymerization, choice of column when working with glucose oligomers.

## HSPgel COLUMNS

Waters HSPgel™ SEC Columns are optimized for high-speed polymer analysis in aqueous solution. HSPgel Columns reduce solvent consumption, increase throughput, and provide accurate molecular-weight data for any room-temperature analysis. The column dimensions are 6.0 × 150 mm.

### Ordering Information

#### HSPgel Columns for High-Speed SEC Analysis\*

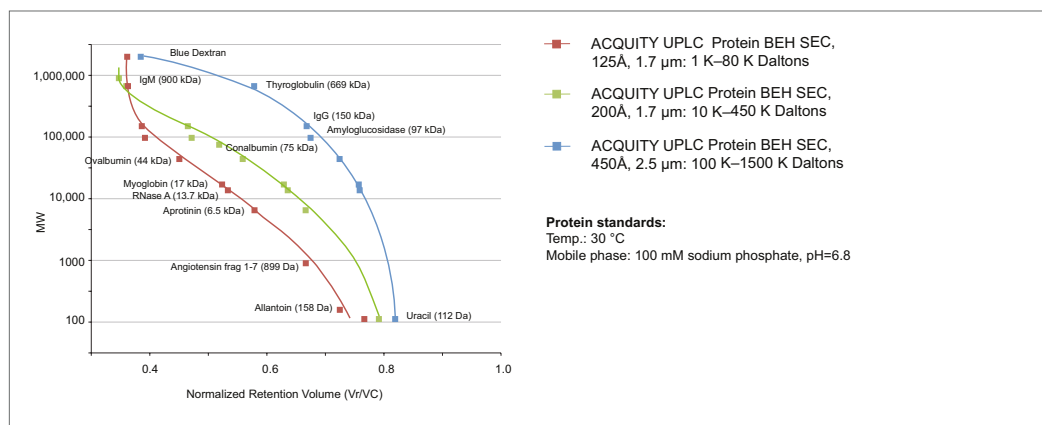
| Description    | MW Range           | Solvent | Particle Size | P/N       |
|----------------|--------------------|---------|---------------|-----------|
| HSPgel AQ 2.5  | 500–2000           | Water   | 4 µm          | 186001785 |
| HSPgel AQ 3.0  | 1000–60,000        | Water   | 4 µm          | 186001786 |
| HSPgel AQ 4.0  | 10,000–400,000     | Water   | 6 µm          | 186001787 |
| HSPgel AQ 5.0  | 50,000–4,000,000   | Water   | 7 µm          | 186001788 |
| HSPgel AQ 6.0  | 100,000–10,000,000 | Water   | 9 µm          | 186001789 |
| HSPgel AQ MB-H | 500–10,000,000     | Water   | 9 µm          | 186001790 |

\*Exclusion limits for AQ series extrapolated from highest MW PEO standard (~900,000).

## ACQUITY UPLC PROTEIN SEC COLUMNS

ACQUITY UPLC Protein SEC Columns are packed with ethylene-bridged hybrid (BEH), diol-coated particle technology. Manufacturers of biotherapeutics and biosimilars can choose the most effective pore size for their application: 125, 200, and 450 Å.

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



### Ordering Information

#### ACQUITY UPLC Protein BEH SEC 4.6 mm Column

| Pore Size                                      | MW Range        | Particle Size | Column Length |            |           |                   |                   |
|--|-----------------|---------------|---------------|------------|-----------|-------------------|-------------------|
|  |                 |               | 30 mm Guard   | 150 mm     | 300 mm    | 150 mm w/Standard | 300 mm w/Standard |
| 125 Å  | 1K - 80K Da     | 1.7 µm        | 186006504     | 186006505  | 186006506 | 176003906         | 176003907         |
| 200 Å  | 10K - 450K Da   | 1.7 µm        | 186005793     | 186005225  | 186005226 | 176003904         | 176003905         |
| 450 Å  | 100K - 1500k Da | 2.5 µm        | 186006850     | 186006851  | 186006852 | 176002996         | 176002997         |
| 125 Å  | 1K - 80K Da     | 1.7 µm        | —             | 186008471* | —         | —                 | —                 |
| ELSD outlet tubing (0.004" I.D. × 6" length)   |                 |               |               |            |           |                   | 430001562         |
| 0.005 × 1.75" SEC UPLC connection tubing, 2/pk |                 |               |               |            |           |                   | 186006613         |

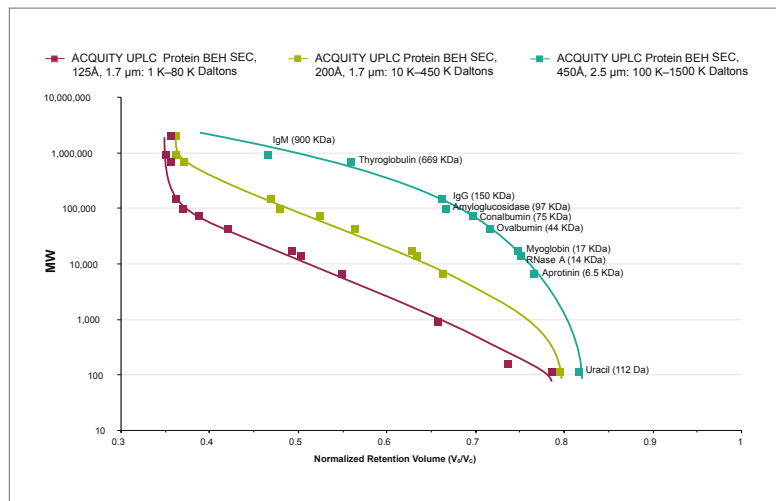
\*ACQUITY UPLC Protein BEH SEC 2.1 × 150 mm Column.

For more information on ACQUITY UPLC Protein SEC Columns, refer to page 276.

## XBRIDGE PROTEIN BEH SEC COLUMNS

XBridge Protein BEH SEC Columns are designed for use on HPLC and UHPLC instrumentation. The 3.5  $\mu\text{m}$  columns are available in 125, 200, and 450 $\text{\AA}$  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 $\text{\AA}$ , 200 $\text{\AA}$ , and 450 $\text{\AA}$ Columns



## Ordering Information

### XBridge Protein BEH SEC, 7.8 mm I.D. Columns\*



| Pore Size        | Effective MW Range* | Particle Size     | Column Length |           |           |
|------------------|---------------------|-------------------|---------------|-----------|-----------|
|                  |                     |                   | 30 mm         | 75 mm     | 150 mm    |
| 125 $\text{\AA}$ | 1K - 80K            | 3.5 $\mu\text{m}$ | 176003591     | 176003592 | 176003593 |
| 200 $\text{\AA}$ | 10K - 450K          | 3.5 $\mu\text{m}$ | 176003594     | 176003595 | 176003596 |
| 450 $\text{\AA}$ | 100K - 1500k        | 3.5 $\mu\text{m}$ | 176003597     | 176003598 | 176003599 |

Straight Connection Tubing and End-fittings for XBridge Protein BEH SEC Column

WAT022681

U-Bend Connection Tubing and End-fittings for XBridge Protein BEH SEC Column

WAT084080

\*All columns and guards include standards mix.  
SEC Protein Standards are matched to the pore size of the column.

## 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 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.

## 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       |
|--|-----------|
| <b>BEH125 SEC Protein Standard Mix</b><br>A mix of 4 proteins; Thyroglobulin, ovalbumin, ribonuclease A and uracil | 186006519 |
| <b>BEH200 SEC Protein Standard Mix</b><br>A mix of 5 proteins; Thyroglobulin, IgG, BSA, Myoglobin, Uracil          | 186006518 |
| <b>BEH450 SEC Protein Standard Mix</b><br>A mix of 5 proteins; Thyroglobulin, IgG, BSA, Myoglobin, Uracil          | 186006842 |

### Ordering Information

#### Protein-Pak SEC HPLC Columns and Guards

| Steel Column  | Dimension    | MW Range       | P/N       |
|---|--------------|----------------|-----------|
| Protein-Pak 60  | 7.8 x 300 mm | 1,000-20,000   | WAT085250 |
| Protein-Pak 60  | 19 x 300 µm  | 1,000-20,000   | WAT025830 |
| Protein-Pak 125   | 7.8 x 300 mm | 2,000-80,000   | WAT084601 |
| Protein-Pak 125   | 19 x 300 mm  | 2,000-80,000   | WAT025831 |
| Protein-Pak 300SW   | 7.5 x 300 mm | 10,000-300,000 | WAT080013 |
| Protein-Pak 125 Sentry Guard Column,<br>3.9 x 20 mm, 2/pk (requires holder) |              |                | 186000926 |
| Sentry Universal Guard Column Holder  |              |                | WAT046910 |



# Solvent Guide

The following graphic is a guide for eluents.

## Aqueous SEC Solvent Selection Guide

| Polymer  | Class                 | Eluent   |
|--|-----------------------|--|
| Polyethylene oxide<br>Polyethylene glycol<br>Polysaccharides, pullulans<br>Dextrans<br>Celluloses (water-soluble)<br>Polyvinyl alcohol<br>Polyacrylamide | Neutral               | 0.10 M Sodium nitrate                              |
| Polyvinyl pyrrolidone  | Neutral, hydrophobic  | 80:20 0.10 M Sodium nitrate/Acetonitrile           |
| Polystyrene sulfonate<br>Lignin sulfonate  | Anionic, hydrophobic  |  |
| Collagen/gelatin   | Amphoteric            |  |
| Polyacrylic acid<br>Polyalginic acid/alginate<br>Hyaluronic acid<br>Carrageenan  | Anionic               | 0.10 M Sodium nitrate                              |
| DEAE dextran<br>Polyvinylamine   | Cationic              | 0.80 M Sodium nitrate                              |
| Polyepiamine   | Cationic              | 0.10% TEA  |
| n-Acetylglucosamine  | Cationic              | 0.10 M TEA/1% Acetic acid                          |
| Polyethyleneimine<br>Poly(n-methyl-2-vinyl<br>pyridinium) I salt   | Cationic, hydrophobic | 0.50 M Sodium acetate/0.50 M Acetic acid           |
| Lysozyme<br>Chitosan   | Cationic, hydrophobic | 0.50 M Acetic acid/0.30 M Sodium sulfate           |
| Polylysine   | Cationic, hydrophobic | 5% Ammonium biphosphate/3% Acetonitrile (pH = 4.0) |
| Peptides   | Cationic, hydrophobic | 0.10% TFA/40% Acetonitrile                         |

Non-Aqueous GPC Solvent Selection Guide

| Polymer   | GPC Solvent  | Shipping Solvent                           |
|---|--|--|
| Polyisobutylene   | Toluene  | Waters Styragel Columns shipped in Toluene |
| Polybutylene<br>Chlorinated rubber<br>Polybutadiene<br>Polyisoprene<br>Polydimethylsiloxane   | Toluene/75 °C  |  |
| Chlorinated polyethylene<br>Polyethylene–Ethylacrylate<br>Polyethylene–Vinylacetone<br>Polyethylene–Methacrylic acid<br>Polyphenyleneoxide<br>Poly-4-methylpentene(1)<br>Polyethylene   | TCB/135–160 °C   |  |
| Ultra-high Molecular Weight Polyethylene<br>Polypropylene   | TCB/135–160 °C   |  |
| Polyetheretherketone<br>Polyetherketone   | Phenol/TCB 1:1/145 °C  |  |
| Polycarbonate   | Methyl chloride  |  |
| Polyglycolic acid   | gamma-Butyl lactone  |  |
| Acrylonitrile–Methylmethacrylate<br>Cellulose acetate<br>Cellulose acetate–Butyrate<br>Cellulose acetate–Propionate<br>Cellulose nitrate<br>Cellulose propionate<br>Cellulose triacetate<br>Diallyl phthalate<br>Ethyl cellulose<br>Epoxy<br>Polyester alkyd<br>Polybutene(1)<br>Polybutadiene–Styrene<br>Phenol–Formaldehyde<br>Phenol–Furfural<br>Polymethylmethacrylate<br>Polypropyleneglycol<br>Polystyrene<br>Polysulfone<br>Polyvinylacetate<br>Polyvinylbutyral<br>Polyvinylchloride<br>Polyvinylchloride–Acetate<br>Polyvinylidenechloride<br>Polyvinylformal<br>Polystyrene acrylonitrile<br>Polystyrene–Alphamethylstyrene<br>Polyester thermoset<br>Phenolics<br>Rosin acids<br>Polyglycolic acid | THF/40 °C  | Waters Styragel Columns shipped in DMF     |
| Melamine–Formaldehyde<br>Nylon (all types)<br>Polybutylene–Teraphthalate<br>Polyethylene–Teraphthalate  | Hexafluoroisopropanol + 0.075 M Sodium trifluoroacetate/55 °C or m-Cresol + 0.05 m LiBr/100 °C |  |
| Poly acrylonitrile<br>ABS (Acrylonitrile–Butadiene–Styrene)<br>ASA (Acrylic–Styrene–Acrylonitrile)<br>ABA (Acrylonitrile–Butadiene–Acrylate)<br>Carboxymethyl cellulose<br>ABS/Polycarbonate<br>Polybutadiene–Acrylonitrile<br>Polyurethane   | DMF + 0.05 m LiBr/85 °C  |  |
| Polyacetal<br>Polyoxymethylene  | DMF + 0.05 m LiBr/145 °C   | Waters Styragel Columns shipped in DMF     |
| Polyimide<br>Polyamide–imide<br>Polyetherimide<br>Polyethersulfone<br>Polyvinylidene fluoride   | N-Methyl pyrrolidone + 0.05 m LiBr/100 °C  |  |
| Polyfuran–Formaldehyde  | Dimethylacetamide/60 °C  |  |

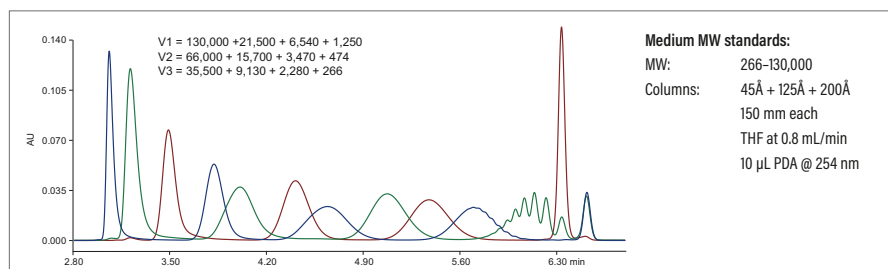


## Calibration Standards

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.

### ACQUITY APC CALIBRATION STANDARDS

ACQUITY APC Calibration Standards match the molecular-weight range of the ACQUITY APC XT Columns. These kits eliminate the need to manually prepare custom calibration mixes because they provide the correct number of data points for the targeted molecular-weight range. In addition, they reduce, by 3–5 times, the ACQUITY APC System's calibration time. With reduced calibration time, calibrations can be carried out on a more frequent basis, increasing confidence in the accuracy of results.



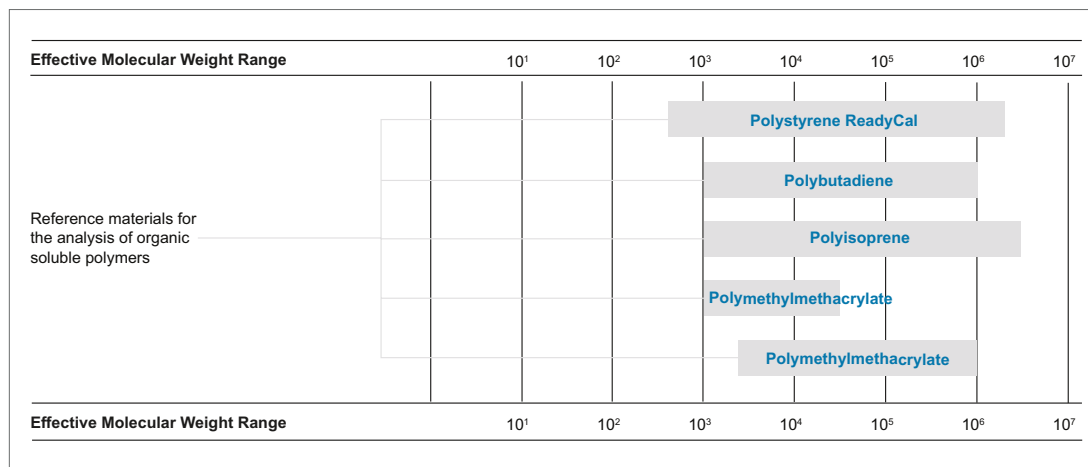
The ACQUITY APC Calibration Standards are available in both polystyrene and polymethyl methacrylate, configured as low, middle, and high-molecular-weight calibration kits. Also available are method development kits, which include the full separation range of the three kits combined.

### Ordering Information

#### ACQUITY APC Calibration Standards

| Description  | MW Range      | P/N       |
|--|---------------|-----------|
| <b>ACQUITY APC Polystyrene Low MW Calibration Kit</b><br>3 vials containing different MW ranges, Qty. 10 of each vial  | 266-15,000    | 186007539 |
| <b>ACQUITY APC Polystyrene Middle MW Calibration Kit</b><br>3 vials containing different MW ranges, Qty. 10 of each vial   | 266-130,000   | 186007540 |
| <b>ACQUITY APC Polystyrene High MW Calibration Kit</b><br>3 vials containing different MW ranges, Qty. 10 of each vial   | 266-2,500,000 | 186007541 |
| <b>ACQUITY APC Polystyrene Method Development MW Calibration Kit</b><br>9 vials containing 1 vial each of the low, middle, and high polystyrene kits                         | 266-2,500,000 | 186007542 |
| <b>ACQUITY APC Polymethyl Methacrylate Low MW Calibration Kit</b><br>3 vials containing different MW ranges, Qty. 10 of each vial  | 202-12,000    | 186007543 |
| <b>ACQUITY APC Polymethyl Methacrylate Middle MW Calibration Kit</b><br>3 vials containing different MW ranges, Qty. 10 of each vial   | 202-200,000   | 186007544 |
| <b>ACQUITY APC Polymethyl Methacrylate High MW Calibration Kit</b><br>3 vials containing different MW ranges, Qty. 10 of each vial   | 202-1,600,000 | 186007545 |
| <b>ACQUITY APC Polymethyl Methacrylate Method Development MW Calibration Kit</b><br>9 vials containing 1 vial each of the low, middle, and high polymethyl methacrylate kits | 202-1,600,000 | 186007546 |

## Non-Aqueous GPC Standards Guide



### 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       |
|--|-----------|
| <b>Polystyrene ReadyCal Standards 4 mL Kit</b>   |           |
| A complete kit of ready-to-use polystyrene calibration standards. Kit contains thirty, 4 mL autosampler vials 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 |
| <b>Polystyrene ReadyCal Standards 2 mL Kit</b>   |           |
| A complete kit of ready-to-use polystyrene calibration standards. Kit contains thirty, 2 mL autosampler vials 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 reference to known molecular-weight ranges. Polymer type and MW ranges appear in the table.

### Ordering Information

#### Polymer Specific Calibration Standards

| Description*   | P/N       |
|--|-----------|
| <b>Polybutadiene Standards Kit</b>   |           |
| 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 |
| <b>Polysoprene Standards Kit</b>   |           |
| 0.5 g/vial polysoprene 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 |
| <b>Polymethylmethacrylate Low MW Standards Kit</b>   |           |
| 0.5 g/vial polymethylmethacrylate at each molecular weight: 1000, 1700, 2500, 3500, 5000, 7000, 10,000, 13,000, 20,000, 30,000   | WAT035707 |
| <b>Polymethylmethacrylate Mid MW Standards Kit</b>   |           |
| 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 |
| <b>Polystyrene Low-Mid MW Standards Kit</b>  |           |
| 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 |
| <b>Polystyrene Mid-High MW Standards Kit</b>   |           |
| 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 |
| <b>Polystyrene Low MW Standards Kit</b>  |           |
| 0.5 g/vial polystyrene at each molecular weight: 580, 950, 1200, 1800, 2470, 3770, 5100, 7600, 12,500, 17,000  | WAT034208 |
| <b>Polystyrene Mid MW Standards Kit</b>  |           |
| 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 |
| <b>Polystyrene High MW Standards Kit</b>   |           |
| 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

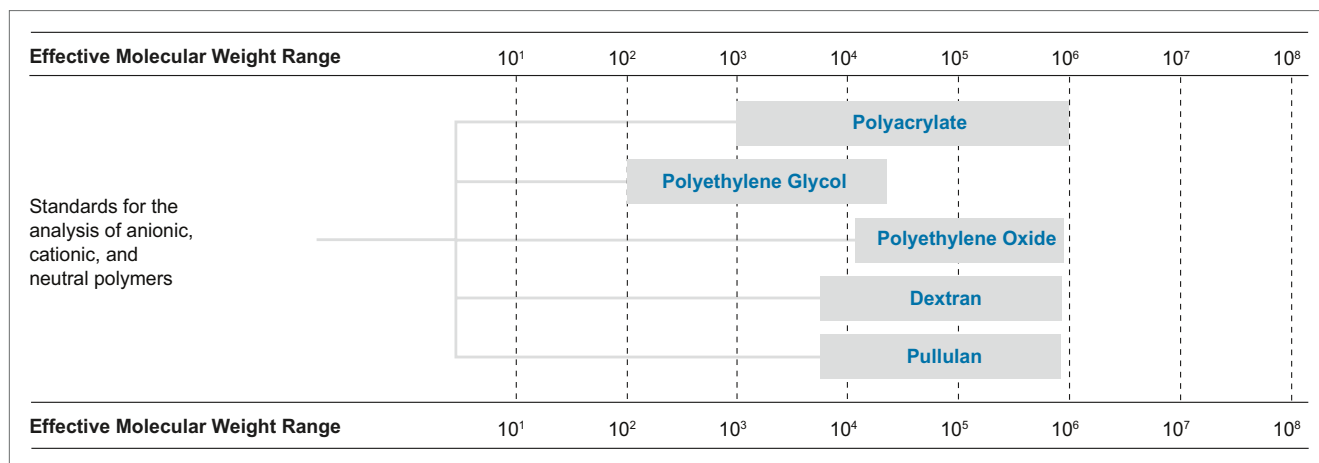
| Description*  | P/N       | Description*  | P/N       |
|---|-----------|---|-----------|
| <b>Polystyrene Standard 400</b><br>10 g/vial polystyrene, 400 MW        | WAT011590 | <b>Polystyrene Standard 430,000</b><br>5 g/vial polystyrene, 430,000 MW       | WAT011612 |
| <b>Polystyrene Standard 530</b><br>10 g/vial polystyrene, 530 MW        | WAT011592 | <b>Polystyrene Standard 780,000</b><br>5 g/vial polystyrene, 780,000 MW       | WAT011614 |
| <b>Polystyrene Standard 950</b><br>10 g/vial polystyrene, 950 MW        | WAT011594 | <b>Polystyrene Standard 1,300,000</b><br>1 g/vial polystyrene, 1,300,000 MW   | WAT011616 |
| <b>Polystyrene Standard 2800</b><br>5 g/vial polystyrene, 2800 MW       | WAT011596 | <b>Polystyrene Standard 2,800,000</b><br>1 g/vial polystyrene, 2,800,000 MW   | WAT011618 |
| <b>Polystyrene Standard 6400</b><br>5 g/vial polystyrene, 6400 MW       | WAT011598 | <b>Polystyrene Standard 3,600,000</b><br>1 g/vial polystyrene, 3,600,000 MW   | WAT011620 |
| <b>Polystyrene Standard 10,100</b><br>5 g/vial polystyrene, 10,100 MW   | WAT011600 | <b>Polystyrene Standard 4,300,000</b><br>1 g/vial polystyrene, 4,300,000 MW   | WAT011622 |
| <b>Polystyrene Standard 17,000</b><br>5 g/vial polystyrene, 17,000 MW   | WAT011602 | <b>Polystyrene Standard 5,200,000</b><br>1 g/vial polystyrene, 5,200,000 MW   | WAT011624 |
| <b>Polystyrene Standard 43,000</b><br>5 g/vial polystyrene, 43,000 MW   | WAT011604 | <b>Polystyrene Standard 6,200,000</b><br>1 g/vial polystyrene, 6,200,000 MW   | WAT011626 |
| <b>Polystyrene Standard 110,000</b><br>5 g/vial polystyrene, 110,000 MW | WAT011606 | <b>Polystyrene Standard 8,400,000</b><br>1 g/vial polystyrene, 8,400,000 MW   | WAT011628 |
| <b>Polystyrene Standard 180,000</b><br>5 g/vial polystyrene, 180,000 MW | WAT011608 | <b>Polystyrene Standard 20,000,000</b><br>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       |
|--|-----------|
| <b>Polyacrylic Acid Standards Kit</b><br>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 |
| <b>Polyethylene Glycol Standards Kit</b><br>1.0 g/vial polyethylene glycol at each molecular weight: 100, 200, 400, 600, 1000, 1500, 4300, 7000, 13,000, and 22,000                | WAT035711 |
| <b>Polyethylene Oxide Kit</b><br>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 |
| <b>Dextrans Standard</b><br>500 mg/vial dextrans at each molecular weight: 5000, 12,000, 24,000, 48,000, 148,000, 273,000, 410,000, and 750,000                                    | WAT054392 |
| <b>Pullulan Kit</b><br>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-flow and Micro-flow LC Columns

Nano-flow and Micro-flow LC Columns



"The reason we are here is to ensure the quality  
and reproducibility of the final product."

~ Dr. Gu ( Weiqiang Gu), Chemistry Technical Support Manager, Taunton, MA , U.S.A.







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# Nano-Flow and Micro-Flow LC Columns

Our nano-flow and micro-flow LC Columns fully exploit the separation power of small, sub-2- $\mu\text{m}$  particles to deliver superior chromatographic resolution.

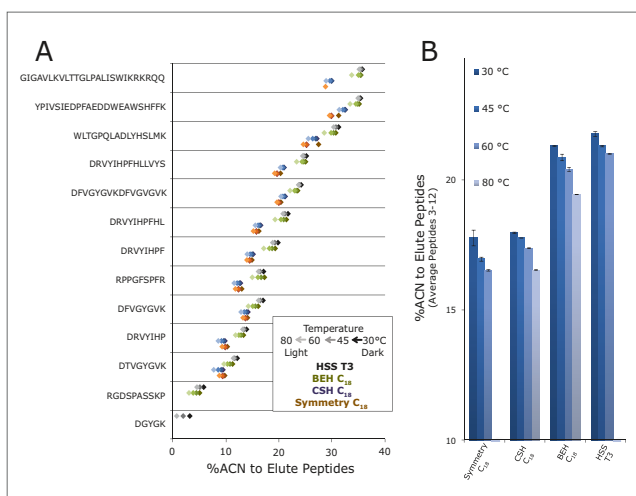
The selected stationary phases for nano-LC columns facilitate the efficiency and selectivity required for separations of complex peptide and protein separations as well as other sample-limited analyses.

| Hybrid Particles  |   | Silica-based Particles  |                   |
|---|---|---|-------------------|
|  |  |  |                   |
|  |  |  |                   |
| 130Å  | 300Å  | 130Å  | 100Å              |
| 1.7 $\mu\text{m}$   | 1.7 $\mu\text{m}$   | 1.7 $\mu\text{m}$   | 1.8 $\mu\text{m}$ |
| C <sub>18</sub>   | C <sub>18</sub> , C <sub>4</sub>  | C <sub>18</sub>   | 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

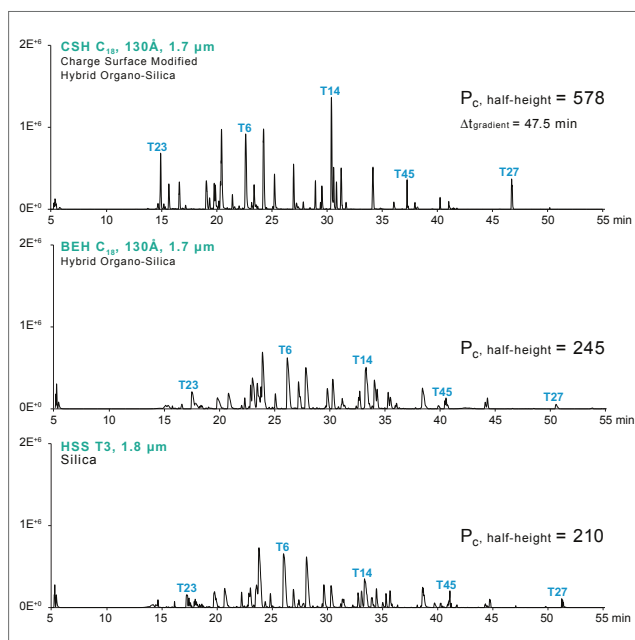


Peptide retention comparison of different stationary phases, including Symmetry Silica (the lower retention of Symmetry is used in trap-elute separations).


In nano-flow 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 the analytical column's. 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  $\mu\text{g}$ , direct injection on a 75  $\mu\text{m}$  (I.D.) column.

 For more information on Waters Particle Technology, please refer to page 75.



## Nano-flow and Micro-flow LC-MS

Nano-flow and micro-flow LC-MS is becoming 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.

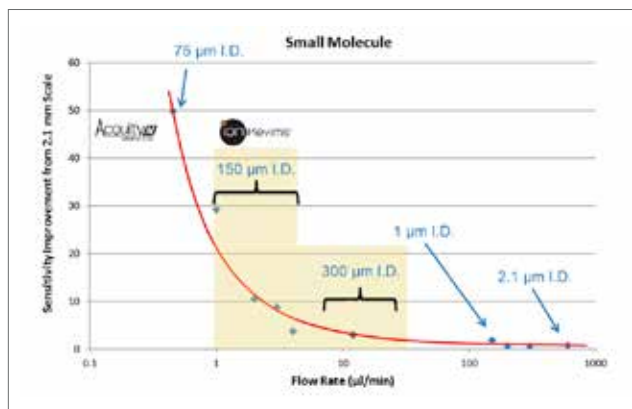
In micro flow LC-MS, the inner diameter of the separation column, and thus the flow rate of the mobile phase can dramatically alter the sensitivity of the mass spectrometry as follows:

- By increasing sampling efficiency
- By increasing ionization efficiency
- By reducing matrix effects

When performed using 75  $\mu\text{m}$  I.D. columns, nano-flow LC-MS provides a higher sensitivity increase, compared with 2.1 mm UPLC Columns. Nevertheless, 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-flow 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-flow and Micro-flow LC-MS Consumables



### nanoEase™ M/Z Columns



- Includes a 150  $\mu\text{m}$  I.D. separation channel, for highest sensitivity, and a 300  $\mu\text{m}$  I.D. channel, for high throughput analysis
- Greatly simplified micro-flow LC-MS, with fitting-free connections
- The 150  $\mu\text{m}$  I.D. iKey Separation Device demonstrates as much as 40 times the sensitivity of the 2.1 mm I.D. UPLC column
- The 300  $\mu\text{m}$  I.D. iKey, during high-throughput UPLC-cycle times, delivers as much as 6 times the sensitivity of a 2.1 mm I.D. UPLC Column
- Easy post-column addition of MS-modifier solvents
- nanoEase™ M/Z Columns with easy-to-use ZenFit® Connection Technology
- Column inner diameters range from 75 to 300  $\mu\text{m}$
- Column lengths range from 50 to 250 mm
- Trapping columns range from 180 to 300  $\mu\text{m}$  I.D.

## ionKey/MS

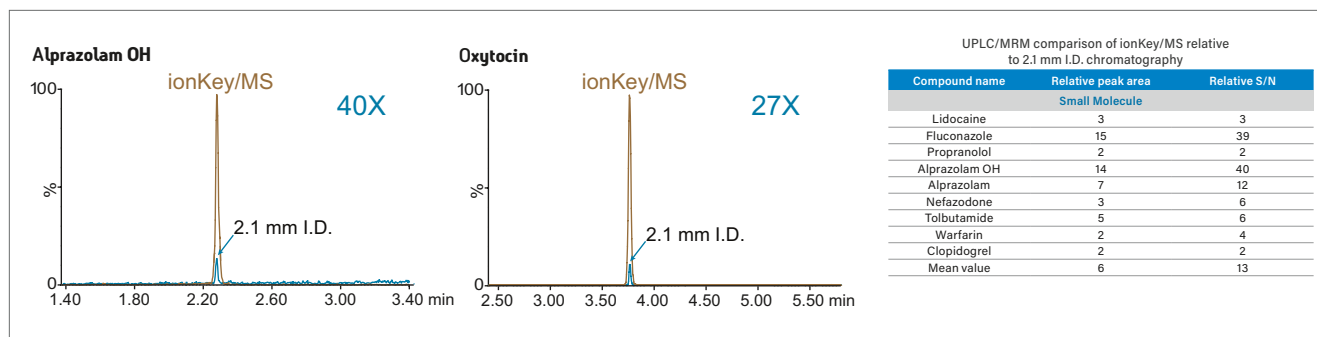
### SIMPLIFIED MICRO-FLOW LC-MS WITH ENHANCED SENSITIVITY

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.



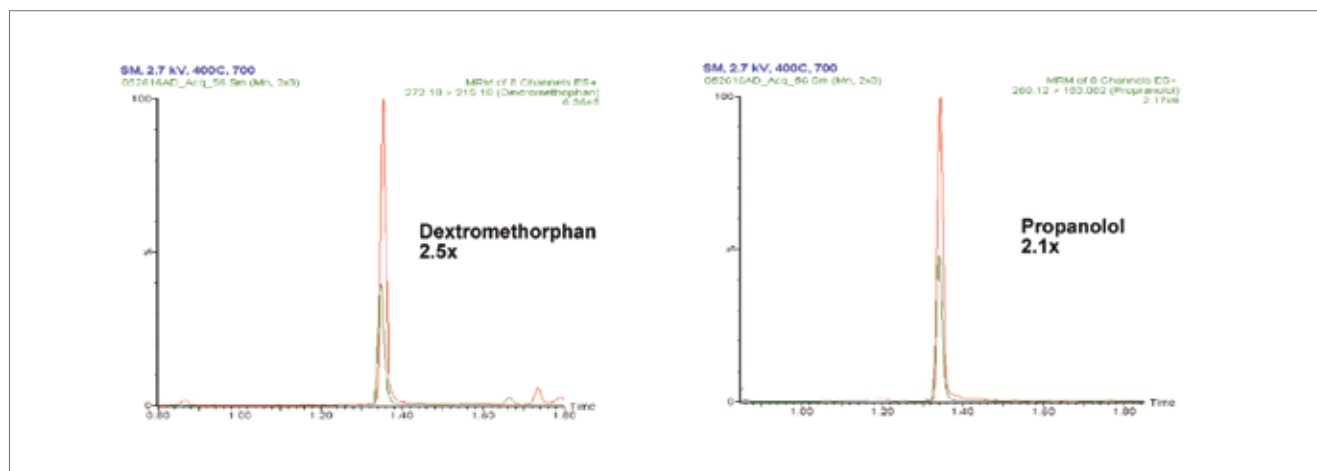
The ionKey MS System with the ACQUITY UPLC M-Class System and Xevo TQ-S Mass Spectrometer.

### 150 µm I.D. iKey: Up to 40× Increase in Sensitivity Compared to 2.1 mm UPLC LC-MS Applications



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

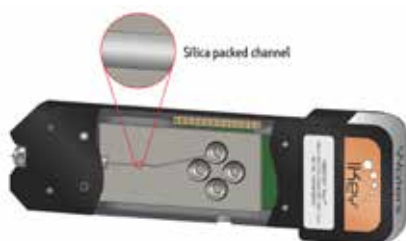


Sensitivity gains using (300 µm × 50 mm) iKey HT BEH C<sub>18</sub> Separation Device (red) compared to (2.1 mm × 50 mm) UPLC BEH C<sub>18</sub> Column (green) under identical injection volume and gradient conditions.

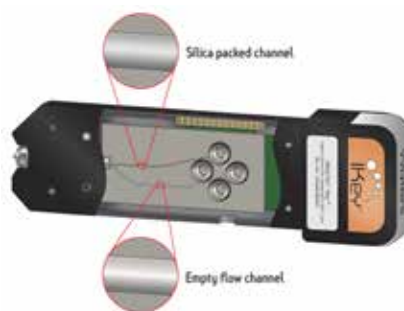
## iKey Separation Device

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)

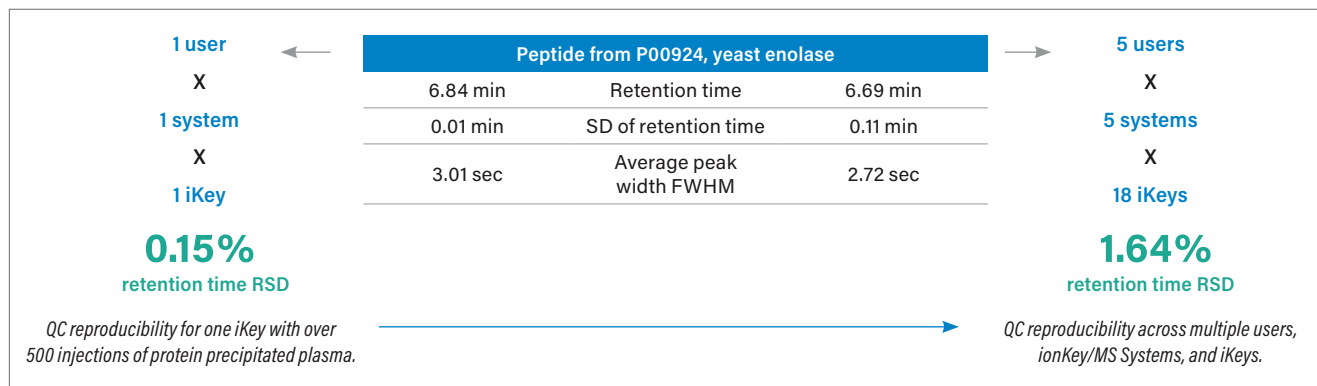


The major component of the ionKey/MS System, the iKey Separation Device performs sub-2- $\mu\text{m}$  UPLC separations, resulting in highly sensitive, efficient, micro-flow LC-MS analyses.

The iKey Separation device is available with two inner diameters: 150  $\mu\text{m}$  I.D. which provides the highest level of sensitivity, and the 300  $\mu\text{m}$  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



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 Device

|                                  | Dimension                              | P/N       |
|----------------------------------|--|-----------|
| Particle Size: 1.7 $\mu\text{m}$ |  |           |
| BEH C <sub>18</sub> , 130Å       | 150 $\mu\text{m}$ $\times$ 50 mm       | 186007256 |
|                                  | 150 $\mu\text{m}$ $\times$ 50 mm (PCA) | 186007580 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm      | 186007258 |
| CSH C <sub>18</sub> , 130Å       | 150 $\mu\text{m}$ $\times$ 50 mm       | 186007244 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm      | 186007245 |
| HSS T3, 100Å                     | 150 $\mu\text{m}$ $\times$ 50 mm       | 186007260 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm      | 186007261 |
|                                  | 300 $\mu\text{m}$ $\times$ 50 mm       | 186008727 |

### iKey Peptide Separation Devices, 1/pk

|                                  | Dimension                              | P/N       |
|----------------------------------|--|-----------|
| Particle Size: 1.7 $\mu\text{m}$ |  |           |
| BEH C <sub>18</sub> , 130Å       | 150 $\mu\text{m}$ $\times$ 50 mm       | 186006764 |
|                                  | 150 $\mu\text{m}$ $\times$ 50 mm (PCA) | 186007557 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm      | 186006766 |
| CSH C <sub>18</sub> , 130Å       | 150 $\mu\text{m}$ $\times$ 50 mm       | 186007257 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm      | 186007259 |
| BEH C <sub>18</sub> , 300Å       | 150 $\mu\text{m}$ $\times$ 50 mm       | 186006969 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm      | 186006970 |

### iKey Protein Separation Devices, 1/pk

|                                  | Dimension                         | P/N       |
|----------------------------------|-----------------------------------|-----------|
| Particle Size: 1.7 $\mu\text{m}$ |                                   |           |
| BEH C <sub>4</sub> , 300Å        | 150 $\mu\text{m}$ $\times$ 50 mm  | 186006765 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm | 186006968 |

### iKey Utility Devices

|                                     | Dimension                       | P/N       |
|-------------------------------------|---------------------------------|-----------|
| iKey Infusion Device                | 85 $\mu\text{m}$ $\times$ 50 mm | 186007049 |
| iKey Flow Injection Analysis Device | 85 $\mu\text{m}$ $\times$ 50 mm | 186007051 |
| iKey Diagnostic Device V3           | N/A                             | 186008450 |

## 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- $\mu\text{m}$  particle technology. Columns of between 75 and 300  $\mu\text{m}$  I.D. provide chromatographic separations, with flow rates between 200 nL/min and 100  $\mu\text{L}/\text{min}$ , 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.

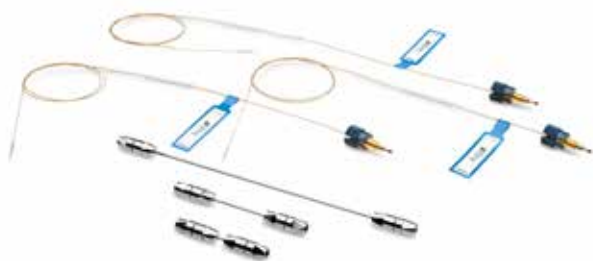
### TRAPPING COLUMNS

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  $\mu\text{m}$  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, eliminate 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 M-Class or nanoACQUITY\* UPLC Systems, equip systems with the appropriate upgrade kit (p/n: 205001681). The 300  $\mu\text{m}$  I.D. ACQUITY M-Class Columns and traps are compatible with ZenFit Connections.



**i** nanoEase M/Z Columns and ACQUITY UPLC M-Class Columns are preferred for use with the ACQUITY UPLC M-Class and nanoACQUITY UPLC Systems.

## Ordering Information

### nanoEase M/Z Peptide Columns

|                                  | Dimension                         | P/N       |
|----------------------------------|-----------------------------------|-----------|
| Particle Size: 1.7 $\mu\text{m}$ |                                   |           |
| <b>BEH C<sub>18</sub>, 130Å</b>  | 75 $\mu\text{m}$ $\times$ 100 mm  | 186008792 |
|                                  | 75 $\mu\text{m}$ $\times$ 150 mm  | 186008793 |
|                                  | 75 $\mu\text{m}$ $\times$ 200 mm  | 186008794 |
|                                  | 75 $\mu\text{m}$ $\times$ 250 mm  | 186008795 |
|                                  | 100 $\mu\text{m}$ $\times$ 100 mm | 186008796 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm | 186008797 |
| <b>BEH C<sub>18</sub>, 300Å</b>  | 75 $\mu\text{m}$ $\times$ 100 mm  | 186008798 |
|                                  | 75 $\mu\text{m}$ $\times$ 150 mm  | 186008799 |
|                                  | 75 $\mu\text{m}$ $\times$ 200 mm  | 186008800 |
|                                  | 75 $\mu\text{m}$ $\times$ 250 mm  | 186008801 |
|                                  | 100 $\mu\text{m}$ $\times$ 100 mm | 186008802 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm | 186008803 |
| <b>CSH C<sub>18</sub>, 130Å</b>  | 75 $\mu\text{m}$ $\times$ 100 mm  | 186008807 |
|                                  | 75 $\mu\text{m}$ $\times$ 150 mm  | 186008808 |
|                                  | 75 $\mu\text{m}$ $\times$ 200 mm  | 186008809 |
|                                  | 75 $\mu\text{m}$ $\times$ 250 mm  | 186008810 |
|                                  | 100 $\mu\text{m}$ $\times$ 100 mm | 186008811 |
|                                  | 150 $\mu\text{m}$ $\times$ 50 mm  | 186008812 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm | 186008813 |
|                                  | 150 $\mu\text{m}$ $\times$ 150 mm | 186008814 |

### nanoEase M/Z Protein Columns

|                                  | Dimension                         | P/N       |
|----------------------------------|-----------------------------------|-----------|
| Particle Size: 1.7 $\mu\text{m}$ |                                   |           |
| <b>BEH C<sub>4</sub>, 300Å</b>   | 75 $\mu\text{m}$ $\times$ 100 mm  | 186008804 |
|                                  | 100 $\mu\text{m}$ $\times$ 100 mm | 186008805 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm | 186008806 |

### nanoEase M/Z HSS Columns

|                                  | Dimension                         | P/N       |
|----------------------------------|-----------------------------------|-----------|
| Particle Size: 1.8 $\mu\text{m}$ |                                   |           |
| <b>HSS T3, 100Å</b>              | 75 $\mu\text{m}$ $\times$ 100 mm  | 186008815 |
|                                  | 75 $\mu\text{m}$ $\times$ 150 mm  | 186008816 |
|                                  | 75 $\mu\text{m}$ $\times$ 200 mm  | 186008817 |
|                                  | 75 $\mu\text{m}$ $\times$ 250 mm  | 186008818 |
|                                  | 100 $\mu\text{m}$ $\times$ 100 mm | 186008819 |
|                                  | 150 $\mu\text{m}$ $\times$ 100 mm | 186008820 |

### nanoEase M/Z Trap Columns\*

|                                 | Dimension      | P/N       |
|---------------------------------|----------------|-----------|
| Particle Size: 5 µm             |                |           |
| Symmetry C <sub>18</sub> , 100Å | 180 µm × 20 mm | 186008821 |

\*For 300 µm I.D. traps please refer to M-Class Trap Columns.

### ACQUITY UPLC M-Class Columns

|                       | Dimension       | P/N       |
|-----------------------|-----------------|-----------|
| Particle Size: 1.8 µm |                 |           |
| HSS T3, 100Å          | 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

|                                    | Dimension      | P/N                    |
|------------------------------------|----------------|------------------------|
| Particle Size: 5 µm                |                |                        |
| Symmetry C <sub>18</sub> , 100Å    | 180 µm × 20 mm | 186007496 <sup>4</sup> |
|                                    | 180 µm × 20 mm | 186007497 <sup>5</sup> |
|                                    | 180 µm × 20 mm | 186007500 <sup>6</sup> |
|                                    | 180 µm × 20 mm | 186007592 <sup>7</sup> |
| Symmetry C <sub>18</sub> , 100Å    | 300 µm × 25 mm | 186007499 <sup>3</sup> |
|                                    | 300 µm × 50 mm | 186007498              |
| Peptide BEH C <sub>18</sub> , 130Å | 300 µm × 50 mm | 186007471              |
| BEH C <sub>4</sub> , 300Å          | 300 µm × 50 mm | 186008470              |
| HSS T3, 100Å                       | 300 µm × 50 mm | 186008029              |

<sup>3</sup>Configuration HCP (2D).

<sup>4</sup>Configuration: 2G, V/M.

<sup>5</sup>Configuration: 2D, V/M.

<sup>6</sup>Configuration: 2G, V/V.

<sup>7</sup>Configuration: 2D, V/V.

### ACQUITY UPLC M-Class Peptide Columns

|                            | Dimension       | P/N       |
|----------------------------|-----------------|-----------|
| Particle Size: 1.7 µm      |                 |           |
| BEH C <sub>18</sub> , 130Å | 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 <sub>18</sub> , 300Å | 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 <sub>18</sub> , 130Å | 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

|                           | Dimension       | P/N       |
|---------------------------|-----------------|-----------|
| Particle Size: 1.7 µm     |                 |           |
| BEH C <sub>4</sub> , 300Å | 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

Hydrogen-deuterium exchange mass spectrometry (HDX-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 deuteriation 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.



ACQUITY UPLC M-Class System.

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

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- $\mu\text{m}$  ACQUITY UPLC Column and then eluted into a high-resolution mass spectrometer.

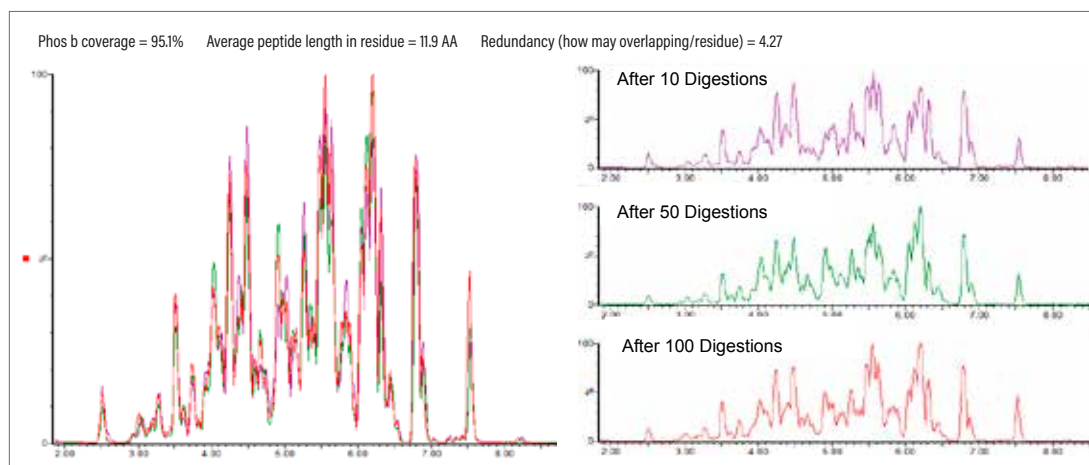
Enzymate Pepsin Online Digestion Columns, an integral part of the ACQUITY UPLC M-Class HDX System, offer these benefits:

- 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



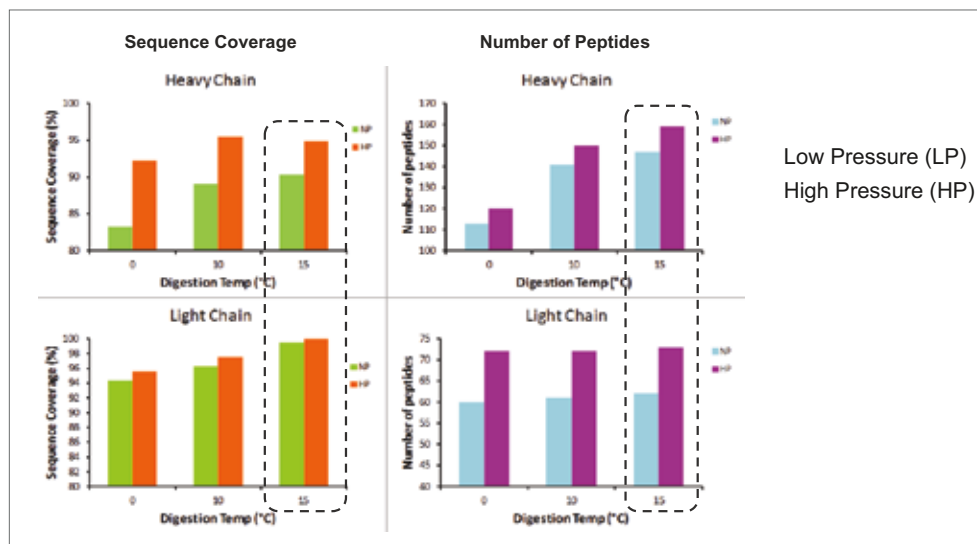
Enzymate Pepsin Online Digestion Column.

### 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 10<sup>th</sup>, 50<sup>th</sup>, and 100<sup>th</sup> 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

| Description                             | Dimension   | P/N       |
|---|-------------|-----------|
| Particle Size: 5 µm                     |             |           |
| Enzymate Pepsin Online Digestion Column | 2.1 × 30 mm | 186007233 |





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# Waters Quality Parts and Supplies

Waters Quality Parts and Supplies



"We build the quality in as the product is being made."

*~ Chris Benevides, Director of Manufacturing, Taunton/Milford, MA, U.S.A.*

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# Waters Quality Parts and Supplies

## Rely on Genuine Waters Quality Parts

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## Performance Maintenance Kits —All the Parts You Need, in One Box

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Performance maintenance protocols for Waters instruments can be obtained from our support library on **www.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

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### To Find Parts: Use Our Waters Quality Parts Locator

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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.

# NEW ACQUITY Arc System

## Ordering Information

### ACQUITY Arc QSM-R

| Description                                   | P/N       |
|---|-----------|
| Arc QSM Performance Maintenance Kit           | 201000303 |
| 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 |
| 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 30CM Column Heater and Column Heater/Cooler

| Description                                      | P/N       |
|--|-----------|
| Kit, ACQUITY Arc CM Column H/HC PPH, .005        | 205001484 |
| Kit, ACQUITY Arc 30CM 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 30CM 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 | 201000281 |
| PM Kit consists of: PerformancePLUS Lamp              |           |
| 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               | 700009330 |
| PM Kit consists of: PerformancePLUS Lamp              |           |
| 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 | 201000193 |
| PM Kit consists of: Lamp Assy                         |           |
| Parts and Accessories                                 |           |
| Low Dispersion Flow Cell for Arc 2475                 | 205001554 |

## ACQUITY UPC<sup>2</sup> System

### Ordering Information



ACQUITY UPC<sup>2</sup> System.

### ACQUITY UPC<sup>2</sup> BSM

| Description   | P/N       |
|---|-----------|
| UPC <sup>2</sup> BSM Performance Maintenance Kit                      | 201000270 |
| PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters |           |
| 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 UPC <sup>2</sup> BSM                       | 700009012 |
| Bulkhead Actuator Insulation, SFC-BSM                                 | 415001943 |
| Insulator, Actuator, Pre-chiller, SFC-BSM                             | 415001945 |
| Assy, Tube, SSV to i2V, 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 <sub>2</sub> 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 UPC <sup>2</sup> CO <sub>2</sub> Connections Kit              | 205001006 |

## ACQUITY UPC<sup>2</sup> SM-FL

| Description   | P/N       |
|---|-----------|
| UPC <sup>2</sup> SM-FL Performance Maintenance Kit  |           |
| PM Kit consists of: Syringes, Needle Assy, Injection Cartridge, 10 µL Loop, Tube Assys, and Filters | 201000271 |
| <b>Parts and Accessories</b>  |           |
| 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 UPC<sup>2</sup> Convergence Manager

| Description  | P/N       |
|--|-----------|
| Convergence Manager Performance Maintenance Kit                      |           |
| PM Kit consists of: Valve Cartridge, Pressure Regulator, and Filters | 201000272 |
| <b>Parts and Accessories</b>   |           |
| 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, Convolute, 3/8 in. I.D., Cuffed End                            | 430003142 |
| Tube, Convolute, 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 |
| <b>Parts and Accessories</b>                                  |           |
| Kit, ACQUITY UPC <sup>2</sup> , SST, .007 in. I.D. × 12.5 in. | 205001002 |
| Kit, ACQUITY UPC <sup>2</sup> , SST, .007 in. I.D. × 18.5 in. | 205001003 |
| Kit, ACQUITY UPC <sup>2</sup> , SST, .007 in. I.D. × 36.5 in. | 205001004 |
| Kit, ACQUITY UPC <sup>2</sup> CM-A 6 Column Tubing            | 205001001 |
| Kit, ACQUITY UPC <sup>2</sup> CM-A 4 Column Tubing            | 205000999 |
| Kit, ACQUITY UPC <sup>2</sup> CM-A 2 Column Tubing            | 205000986 |
| Valve Cartridge, Rotary Shear, SS                             | 700005438 |

## ACQUITY UPC<sup>2</sup> PDA Detector

| Description                                      | P/N       |
|--|-----------|
| PDA/TUV Performance Maintenance Kit              |           |
| PM Kit consists of: PerformancePLUS Lamp         | 201000273 |
| <b>Parts and Accessories</b>                     |           |
| 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 UPC <sup>2</sup> Analytical Flow Cell    | 205015037 |
| Leak Sensor Assy                                 | 205000505 |

### DID YOU KNOW...

Waters supplies standards that help you benchmark and trend APC data, enhancing productivity and increasing the accuracy of results.

 For more information, see page 320.

# ACQUITY APC System

## Ordering information

### ACQUITY APC CM-S

| Description                              | P/N       |
|--|-----------|
| CM-S Performance Maintenance Kit         | 201000282 |
| PM Kit consists of: Filters              |           |
| <b>Parts and Accessories</b>             |           |
| 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                           | 201000285 |
| PM Kit consists of: Syringe, Std Needle, Injection Cartridge and Filters |           |
| <b>Parts and Accessories</b>   |           |
| 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      | 201000273 |
| PM Kit consists of: PerformancePLUS Lamp |           |
| <b>Parts and Accessories</b>             |           |
| 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                              | 201000283 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |
| <b>Parts and Accessories</b>                                   |           |
| 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 i2V  | 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            | 201000259 |
| PM Kit consists of: Syringe, Std Needle, Injection Cartridge, and Filters |           |
| <b>Parts and Accessories</b>  |           |
| 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                         | 201000258 |
| PM Kit consists of: Syringes, Std Needle, Injection Cartridge, 10 µL Loop and Filters |           |
| <b>Parts and Accessories</b>  |           |
| 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, EXT. 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                | 201000260 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |
| <b>Parts and Accessories</b>                                   |           |
| 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 |
| Filter, Air  | 700002633 |
| Screw, Comp., 10–32, SS Gold Plated, Short, 10/pk              | 700002634 |
| <b>Parts and Accessories</b>                                   |           |
| 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 System

## Ordering Information

### ACQUITY UPLC Binary Solvent Manager

| Description   | P/N       |
|---|-----------|
| ACQUITY i2 Valve Binary Solvent Manager Performance Maintenance Kit | 201000197 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters      |           |
| ACQUITY Binary Solvent Manager Performance Maintenance Kit          | 201000173 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters      |           |

#### 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 | 201000174 |
| PM Kit consists of: Syringe, Needle, and Filters   |           |

#### 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 |
| 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 | 201000208 |
| PM Kit consists of: Filters                          |           |
| <b>Parts and Accessories</b>                         |           |
| 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   | 201000198 |
| PM Kit consists of: Injection Cartridge, 10 $\mu$ L Loop Tension Cords, and Lubricant (Relevant Syringe is ordered separately) |           |
| <b>Parts and Accessories</b>   |           |
| 10 $\mu$ L Sample Loop   | 430001326 |
| 25 $\mu$ L Syringe   | 700002705 |
| 5 $\mu$ L 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 $\mu$ L  | 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](https://www.asr.waters.com)



ACQUITY Isocratic Solvent Manager.

## ACQUITY Isocratic Solvent Manager

| Description  | P/N       |
|--|-----------|
| ACQUITY ISM Performance Maintenance Kit                        | 201000286 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |
| <b>Parts and Accessories</b>                                   |           |
| 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 <sup>2</sup>                              | 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   | 201000300 |
| PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, and Calibration Pin   |           |
| ACQUITY QDa 'KAD' STD Performance Maintenance Kit  | 201000308 |
| PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, and Calibration Pin   |           |
| ACQUITY QDa 'KAB' High Performance Maintenance Kit   | 201000301 |
| PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, Calibration Pin, and Rotary Pump Components   |           |
| ACQUITY QDa 'KAD' High Performance Maintenance Kit   | 201000309 |
| PM Kit consists of: O-rings, Seals, Filters, Aperture Disk Assy, Calibration Pin, and Rotary Pump Components   |           |
| 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.   |           |
| <b>Parts and Accessories</b>   |           |
| 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 |
| <b>Parts and Accessories</b>              |           |
| 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. x .062 O.D.       | 700009554 |

#### ACQUITY UPLC TUV Detector

| Description  | P/N       |
|--|-----------|
| ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit                                | 201000281 |
| PM Kit consists of: PerformancePLUS Lamp   |           |
| ACQUITY TUV Performance Maintenance Kit  | 201000281 |
| PM Kit consists of: PerformancePLUS Lamp<br>(for ACQUITY TUV through S/N K05UPT699N) | WAS081142 |
| <b>Parts and Accessories</b>   |           |
| Flow Cell, Std., ACQUITY TUV<br>(TUV with S/N K05UPT699N or lower)                   | 205015000 |
| Flow Cell, Low Flow, ACQUITY TUV<br>(TUV with S/N K05UPT699N or lower)               | 205015001 |
| ACQUITY UPLC I.D. Cell TUV, Analytical   | 205015033 |
| Flow Cell, High Sensitivity, 2.4 µL Vol.<br>(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                  | 201000281 |
| PM Kit consists of: PerformancePLUS Lamp                               |           |
| <b>Parts and Accessories</b>   |           |
| ACQUITY PDA, Standard Flow Cell, 10 mm, 500 nL<br>(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 | 201000193 |
| PM Kit consists of: Lamp Assy                         |           |
| <b>Parts and Accessories</b>                          |           |
| 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 ELS/ELSD Performance Maintenance Kit | 201000159 |
| PM Kit consists of: Lamp Assy                |           |
| <b>Parts and Accessories</b>                 |           |
| 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 |

## NEW Waters Fraction Manager—Analytical

| Description   | P/N       |
|---|-----------|
| Analytical Fraction Manager Performance Maintenance Kit | 201000291 |
| <b>Parts and Accessories</b>                            |           |
| 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, Convuluted, 1/4 I.D. × 72 LG                      | 700009402 |
| Tube, Convuluted, 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.

 Consult your Waters service representative to learn more.

## 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 | 201000234 |
| PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters          |           |
| <b>Parts and Accessories</b>   |           |
| 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 | 201000233 |
| PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters  |           |
| <b>Parts and Accessories</b>   |           |
| 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       |
|---|-----------|
| <b>CH30-A</b>                               |           |
| 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 |
| <b>CM-A</b>                                 |           |
| CM-A and CM-Aux Performance Maintenance Kit | 201000207 |
| PM Kit consists of: Filters                 |           |
| <b>Parts and Accessories</b>                |           |
| 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                               | 201000201 |
| PM Kit consists of: Syringe, Std Needle, Injection Cartridge, and Filters |           |
| <b>Parts and Accessories</b>  |           |
| 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 |
| <b>Parts and Accessories</b>  |           |
| 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 i2V, 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 x 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 M-Class System

## Ordering Information

### ACQUITY M-Class $\mu$ BSM/ASM

| Description   | P/N       |
|---|-----------|
| $\mu$ BSM/ASM Performance Maintenance Kit                             |           |
| PM Kit consists of: Mixer, Plungers, Check Valves, Seals, and Filters | 201000289 |
| <b>Parts and Accessories</b>  |           |
| 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 $\times$ 1.415, 2/pk                          | 700002600 |
| Support Plant, Thickened, VHP, Head                                   | 700002601 |
| Valve, Solenoid, Solvent Select                                       | 700002603 |
| Tubing, 3/16 in. O.D. $\times$ 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 M-Class $\mu$ SM-FL

| Description  | P/N       |
|--|-----------|
| $\mu$ SM-FL Performance Maintenance Kit              |           |
| PM Kit consists of: Syringes, Std Needle, and Filter | 201000290 |
| <b>Parts and Accessories</b>                         |           |
| 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 $\mu$ L                | 430002928 |
| Sample Loop, Ext. Hypo Tip, 5 $\mu$ L                | 430002936 |
| Sample Loop, Ext. Hypo Tip, 10 $\mu$ L               | 430002938 |
| Sample Loop, Ext. Hypo Tip, 1 $\mu$ L                | 430003166 |
| Syringe, 100 $\mu$ L, HP                             | 700002570 |
| Kit, I-Class PEEKsil Needle 10 $\mu$ L               | 700005926 |
| Puncture Needle, .059 O.D.                           | 700006067 |
| Tube, Vent/Drain                                     | 700009863 |
| Cart, Injection, 18 K psi, $\mu$ SM-FL               | 700009864 |

### ACQUITY M-Class TVM

| Description   | P/N       |
|---|-----------|
| Tee, MMV Nano                                       | 289004442 |
| Tube, Cap, 40 $\mu$ m $\times$ 10 in., V-V, HP      | 700009875 |
| Tube, Cap, 25 $\mu$ m $\times$ 30 in., M-M, HP      | 700009876 |
| Tube, Cap, 40 $\mu$ m $\times$ 6 in., V-V, HP       | 700009878 |
| Tube, Cap, 40 $\mu$ m $\times$ 6 in., M-V, HP       | 700009880 |
| Tube, Cap, 40 $\mu$ m $\times$ 26 in., V-V, HP      | 700009881 |
| Cap Tube, 40 $\mu$ m $\times$ 30 in., V-PT, HP      | 700009889 |
| Capillary Tubing, 40 $\mu$ m $\times$ 40 in., Inlet | 700010399 |
| Waste Tube, TVM, 31 in.                             | 700009892 |
| Cap Tube, 40 $\mu$ m $\times$ 20 in. L, M-V         | 700009894 |
| Cap Tube, 25 $\mu$ m $\times$ 20 in. L, M-V         | 700009895 |
| Assy, Waste Tube                                    | 700010401 |
| Nano Tee, #6-40 Ports                               | 700009920 |
| Tube, PEEKsil, 25 $\mu$ m $\times$ 30 in. L, M-V    | 700010040 |
| Tube, PEEKsil, 25 $\mu$ m $\times$ 50 cm. LG, V-V   | 700010042 |
| Tube, Cap w/Frit, 40 $\mu$ m $\times$ 26 in. L      | 700010059 |

# nanoACQUITY UPLC System

## Ordering Information

### nanoACQUITY High Pressure BSM/ASM

| Description   | P/N       |
|---|-----------|
| nanoACQUITY Solvent Manager Performance Maintenance Kit<br>PM Kit consists of: Plungers, Check Valves, Seals, and Filters | 201000181 |
| <b>Parts and Accessories</b>  |           |
| 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<br>PM Kit consists of: Plungers, Check Valves, Seals, and Filters | 201000182 |
| <b>Parts and Accessories</b>   |           |
| 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                           | 201000281 |
| PM Kit consists of: PerformancePLUS Deuterium Lamps                             |           |
| UPLC TUV Detector Performance Maintenance Kit (TUV with S/N through K05UPT699N) | WAS081142 |
| PM Kit consists of: PerformancePLUS Deuterium Lamps                             |           |
| <b>Parts and Accessories</b>  |           |
| TUV Flow Cell, 10 nL (TUV with S/N through K05UPT699N)                          | 205000159 |
| 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 |

## nanoACQUITY HDX Manager

| Description                                      | P/N       |
|--|-----------|
| <b>Parts and Accessories</b>                     |           |
| 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 |

### 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.

Visit [www.waters.com/parts](http://www.waters.com/parts) for more information about parts and accessories for your ACQUITY UPLC and nanoACQUITY UPLC Systems.

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



# Alliance Separations Modules

## Ordering Information

### 2695 SEPARATIONS MODULE

2690/2695 Performance Maintenance Kit



Replacement Plunger



### 2695D SEPARATIONS MODULE

2690D/2695D Separations Module 8 Needle Performance Maintenance Kit



| Description  | P/N       |
|--|-----------|
| 2690/2695 Separations Module Performance Maintenance Kit   |           |
| PM Kit consists of: Plungers, Check Valves, Seals, Filters, Needle, Syringe (250 µL), and Injector Rebuild Kit | WAT270944 |

| Description  | P/N       |
|--|-----------|
| 2695D Separations Module 8 Needle Performance Maintenance Kit* | 700000201 |
| PM Kit consists of: Dispenser Syringes, Needles, and Filters   |           |

\*Note: For proper maintenance of the 2695D, please make sure to order, PM Kit: 700000201 and PM Kit: WAT270944.

### 2795 SEPARATIONS MODULE

2795 Performance Maintenance Kit



Syringe



### 2796 SEPARATIONS MODULE



| Description  | P/N       |
|--|-----------|
| 2795 Separations Module Performance Maintenance Kit  |           |
| PM Kit consists of: Plungers, Check Valves, Seals, Filters, Needle, Syringe (500 µL), and Injector Rebuild Kit | 201000107 |

| Description  | P/N       |
|--|-----------|
| 2796 Separations Module Performance Maintenance Kit  |           |
| PM Kit consists of: Plungers, Check Valves, Seals, Filters, Needle, Syringe (500 µL), and Injector Rebuild Kit | 201000169 |

## 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. We offer two types of plungers: the standard sapphire plunger and the Performance PLUS Sapphire Plunger. We make the standard plunger according to traditional processes and methods—the same processes and methods adopted by other manufacturers. Our PerformancePLUS Sapphire Plunger, however, is unique. Its 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 the standard plunger.

### 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



### DID YOU KNOW...

We offer one-stop shopping for all your training needs. Log on to our training site at [www.waters.com/courses](http://www.waters.com/courses) for this information:

- Courses and their descriptions
- Fees
- Current course schedules
- Special offers and discounts
- Easy course registration

### Ordering Information

#### Common Parts for Alliance Systems

| Description                                     | 2690/D<br>2695/D | 2790<br>2795 | 2796 | P/N       |
|---|------------------|--------------|------|-----------|
| Plunger Oriented (Optional)                     | •                | •            | •    | WAT271067 |
| Assembly, Plunger (Standard)                    | •                | •            | •    | 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 |
| 500 µL Syringe                                  | •                | •            | •    | 700000565 |

| Description                                     | 2690/D<br>2695/D | 2790<br>2795 | 2796 | P/N       |
|---|------------------|--------------|------|-----------|
| 1000 µL Syringe                                 | •                | •            | •    | 700000611 |
| 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 |
| Inject Port                                     | •                | •            | •    | 700000383 |
| Seat, Inject Port                               | •                | •            | •    | 700000384 |
| Seal, Inject Port Washer                        | •                | •            | •    | 700000385 |
| 2790 Needle                                     | •                | •            | •    | 700000389 |
| Syringe, 100 µL                                 | •                | •            | •    | 700000564 |
| Solvent Bottle Caps, 4 L, 4/pk                  | •                | •            | •    | WAT062341 |
| Bottle Caps, 1 L, 4/pk                          | •                | •            | •    | WAT062479 |
| Sample Loop, 5 µL, PEEK                         | •                | •            | •    | 430000781 |
| Sample Loop, 50 µL, PEEK                        | •                | •            | •    | 430000762 |
| Sample Loop, 20 µL, PEEK                        | •                | •            | •    | 430000782 |
| Sample Loop, 100 µL, PEEK                       | •                | •            | •    | 430000783 |
| Sample Loop, 500 µL, PEEK                       | •                | •            | •    | 430000784 |
| Sample Loop, 2 mL, PEEK                         | •                | •            | •    | 430000785 |

# HPLC Pumps

## Ordering Information

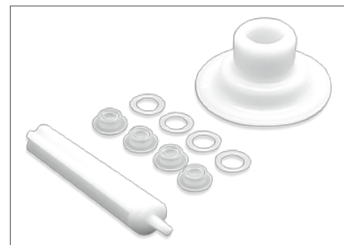
### 515 HPLC PUMP



#### 515 Performance Maintenance Kit



#### Clear-100™ Plunger Seals, 4/pk



| Description  | P/N       |
|--|-----------|
| 515 HPLC Pump Performance Maintenance Kit                      | WAT052587 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

### 1515 SERIES HPLC PUMP



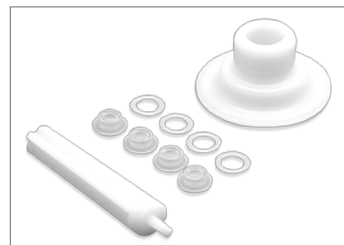
#### 1515 Performance Maintenance Kit



#### Solvent Filter



#### Clear-100 Plunger Seals, 4/pk



| Description  | P/N       |
|--|-----------|
| 1515 Series HPLC Pump Performance Maintenance Kit              | 201000113 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

### 1525 SERIES HPLC PUMP



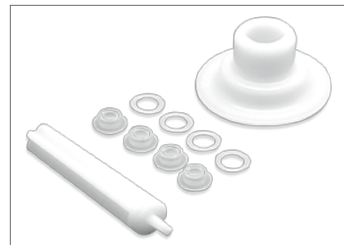
#### 1525 Performance Maintenance Kit



#### Solvent Filter



#### Clear-100™ Plunger Seals, 4/pk



| Description  | P/N       |
|--|-----------|
| 1525 Series HPLC Pumps Performance Maintenance Kit             | 201000114 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

| 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               | 201000161 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

### Common Parts for HPLC Pumps

| Description                        | 515 | 1515<br>1525 | 1525<br>Micro | Extended<br>Flow | P/N       |
|------------------------------------|-----|--------------|---------------|------------------|-----------|
| 1525 micro Seal Kit                |     |              | •             |                  | 205000202 |
| Active Seal Wash Kit<br>1525       |     | •            |               |                  | 205000251 |
| Active Seal Wash Kit<br>1525 EF    |     |              |               | •                | 205000252 |
| Active Seal Wash Kit<br>1525 micro |     |              | •             |                  | 205000250 |
| AQ Seal Repl., 2/pk                | •   | •            |               |                  | WAT025296 |
| AQ Seal Repl., 4/pk                | •   | •            |               |                  | WAT025297 |
| Plunger Seal UP30, 1/pk            |     |              |               | •                | 700002282 |
| Plunger Seal, TAN<br>(Rulon)       | •   | •            |               |                  | WAT025384 |
| Seal, Clear-100                    | •   | •            |               |                  | WAT022934 |
| Seal, Clear-100, 4/pk              | •   | •            |               |                  | WAT022946 |
| Seal, Kit Black, Replace           | •   | •            |               |                  | WAT026613 |
| Seals, Aqueous, Buffer,<br>2/pk    | •   | •            |               |                  | WAT025296 |
| Seals, Aqueous, Buffer,<br>4/pk    | •   | •            |               |                  | WAT025297 |
| 1525, Check Valve, 2/pk            |     |              | •             |                  | 700002275 |
| B and S Check Valve Kit            |     |              |               | •                | WAT088223 |
| Extended Flow<br>Update Kit        | •   |              |               | •                | WAT207119 |
| Inlet Check Valve                  |     |              |               | •                | WAT032646 |
| Inlet Check<br>Valve Housing       |     |              |               | •                | WAT060308 |
| Outlet Check Valve                 |     |              |               | •                | WAT025028 |

| Description   | 515 | 1515<br>1525 | 1525<br>Micro | Extended<br>Flow | P/N       |
|---|-----|--------------|---------------|------------------|-----------|
| Outlet Check Valve                                  |     |              |               | •                | WAT025216 |
| Outlet Check<br>Valve Housing                       |     |              |               | •                | WAT025207 |
| Outlet Check Valve<br>Rebuild Kit                   |     |              |               | •                | WAT026014 |
| PerformancePLUS<br>Cartridge with Housing,<br>2/pk  | •   | •            | •             |                  | 700000253 |
| PerformancePLUS<br>Ceramic Check<br>Valve Cartridge | •   | •            | •             |                  | 700002399 |
| PerformancePLUS Check<br>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<br>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   | 201000130 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

### 2545 QUATERNARY GRADIENT MODULE



2545Q Performance Maintenance Kit



| Description  | P/N       |
|--|-----------|
| 2545Q Performance Maintenance Kit                              | 201000199 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

### 2535 QUATERNARY GRADIENT MODULE



2535 Performance Maintenance Kit



| Description  | P/N       |
|--|-----------|
| 2535 QGM Performance Maintenance Kit                           | 201000209 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

### 2555 QUATERNARY GRADIENT MODULE



2555 Performance Maintenance Kit



| Description  | P/N       |
|--|-----------|
| 2555 QGM Performance Maintenance Kit                           | 201000210 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

## Common Parts for Gradient Modules

| Description                             | Binary     |      |      | Quaternary |  | P/N       |
|---|------------|------|------|------------|--|-----------|
|   | 2545/ 2525 | 2535 | 2555 | 2545       |  |           |
| 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 |

| Description  | Binary    |      |      | Quaternary |  | P/N       |
|--|-----------|------|------|------------|--|-----------|
|  | 2545/2525 | 2535 | 2555 | 2545       |  |           |
| 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

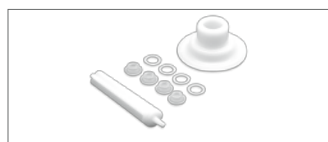
### 600E FLUID HANDLING UNIT



600E Performance Maintenance Kit



Clear-100 Plunger Seals, 4/pk



| Description  | P/N       |
|--|-----------|
| 600E Fluid Handling Unit Performance Maintenance Kit           | WAT052675 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

### 626 LC FLUID HANDLING UNIT



626 LC Performance Maintenance Kit



| Description  | P/N       |
|--|-----------|
| 626 LC Fluid Handling Unit Performance Maintenance Kit         | WAT052673 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |

### Common Parts for HPLC Pumps

| Description                       | Extended Flow | 600 | 626 | P/N       |
|-----------------------------------|---------------|-----|-----|-----------|
| AQ Seal Repl., 2/pk               |               | .   |     | WAT025296 |
| AQ Seal Repl., 4/pk               |               | .   |     | WAT025297 |
| Plunger                           | .             |     |     | WAT060304 |
| Plunger Seal                      | .             |     |     | 700002282 |
| Plunger and Wash Seal Kit (2) 626 |               |     | .   | WAT031790 |
| 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 |
| B and S Check Valve Kit           |               | .   |     | WAT088223 |
| Check Valve Cartridge             |               |     | .   | WAT024120 |
| Extended Flow Update Kit          | .             | .   |     | WAT094003 |
| Inlet Check Valve Assembly        |               | .   |     | WAT033679 |
| Inlet Check Valve Assembly        | .             |     |     | WAT060307 |
| Inlet Check Valve Housing         |               |     | .   | WAT030541 |
| Inlet Housing                     |               | .   |     | WAT025203 |
| Inlet Rebuild Kit                 |               | .   |     | WAT060495 |
| Outlet Check Valve                |               | .   |     | WAT025028 |
| Outlet Check Valve Assembly       | .             | .   |     | WAT025216 |
| Outlet Check Valve Housing        |               | .   |     | WAT025207 |
| Outlet Check Valve Housing        |               |     | .   | WAT030543 |
| Outlet Check Valve Rebuild Kit    |               | .   |     | WAT026014 |

| Description                                   | Extended Flow | 600 | 626 | P/N       |
|---|---------------|-----|-----|-----------|
| PerformancePLUS Cartridge with Housing, 2/pk  |               | .   |     | 700000253 |
| PerformancePLUS Ceramic Check Valve Cartridge |               | .   |     | 700002399 |
| PerformancePLUS Check Valve Cartridge         |               | .   |     | 700000254 |
| Assembly, Plunger Sapphire 1/8                |               | .   |     | WAT025656 |
| Oriented Plunger, 510                         |               | .   |     | WAT069511 |
| Plunger with Indicator Rod                    |               |     | .   | WAT031788 |
| Retaining Ring                                |               | .   |     | WAT025360 |
| Assembly, Solvent Filter                      |               | .   |     | WAT025531 |
| Assembly Diffuser                             |               | .   |     | WAT007272 |
| Reference Valve 600/510                       |               | .   |     | WAT026592 |
| Kit Ref. Valve Rebuild Pump                   |               | .   |     | WAT025746 |
| Syringe, 10 mL Safety                         |               | .   |     | WAT027629 |
| Priming Syringe Needle                        |               | .   |     | WAT025559 |
| Head Support Bushing                          | .             | .   |     | WAT060305 |
| Ind. Rod Kit                                  | .             | .   |     | WAT069583 |
| Fuse, 4A, 125 V, 5/pk                         |               | .   |     | WAT055631 |
| Fuse, 5A                                      |               |     | .   | WAT163-18 |
| Fuse, 0.5A, 5/pk                              |               | .   | .   | WAT022628 |
| Fuse, 1.5A, 250 V, 5/pk                       |               | .   | .   | WAT055632 |
| Fuse, 1.25A, 250 V, 5/pk                      |               | .   | .   | WAT055633 |
| Fuse, 0.8A Slo-Blo, 5/pk                      |               | .   | .   | WAT055629 |
| Fuse, 0.25A Slo-Blo for Wash Pump, 5/pk       |               | .   | .   | WAT042200 |

## REAGENT MANAGER



| Description  | P/N       |
|--|-----------|
| Reagent Manager Performance Maintenance Kit                    | 201000102 |
| PM Kit consists of: Plungers, Check Valves, Seals, and Filters |           |
| 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

### 717plus AutoSampler



| Description  | P/N       |
|--|-----------|
| 717plus AutoSampler Performance Maintenance Kit          | WAT052669 |
| PM Kit consists of: Syringe (250 µL), Needle, and Filter |           |
| <b>Parts and Accessories</b>                             |           |
| HP Valve Rebuild Kit                                     | WAT045424 |
| Syringe, 25 µL   | WAT077343 |
| Syringe, 250 µL  | WAT073109 |
| Syringe, 2500 µL   | WAT077342 |
| 48-vial Carousel   | WAT078723 |
| 96-vial Carousel   | WAT078727 |

### 2777/2777C Sample Manager

2777C Sample Manager



2777 Sample Manager



| Description  | P/N       |
|--|-----------|
| 2777/2777C Sample Manager Performance Maintenance Kit      | 201000162 |
| PM Kit consists of: Tension Cord and Lubrication Kit       |           |
| <b>Rotors List Associated with the Valco Valves</b>        |           |
| 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.

### 2707 AutoSampler



2707 Performance Maintenance Kit



| Description  | P/N       |
|--|-----------|
| 2707 Performance Maintenance Kit                                   | 201000196 |
| PM Kit consists of: Syringe (500 µL), Needle, and Rotor Seal       |           |
| 2707 Prep Performance Maintenance Kit                              | 201000306 |
| PM kit consists of: Syringe (2500 µL), Prep Needle, and Rotor Seal |           |
| <b>Parts and Accessories</b>                                       |           |
| 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  | 70000862  |
| 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 |

## 2747 AutoSampler



2747 Performance Maintenance Kit



| Description  | P/N       |
|--|-----------|
| 2747 AutoSampler Performance Maintenance Kit                 |           |
| PM Kit consists of: Syringe 1 mL, Probe, and Lubrication Kit | 201000132 |

## 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:

|                        |           |
|------------------------|-----------|
| 10 mL Reagent Syringe  | 700000471 |
| 500 µL Reagent Syringe | WAT272080 |
| 1.0 mL Reagent Syringe | WAT272617 |
| 2.5 mL Reagent Syringe | WAT272620 |
| 5.0 mL Reagent Syringe | WAT272623 |

## 2757 Sample Manager/Fraction Collector



| Description                                | P/N       |
|--|-----------|
| 96-well Microtiter Plate Holder Kit        | 205000105 |
| 4 mL Vial Holder Plate Kit                 | 205000106 |
| 2 mL Vial Holder Plate Kit                 | 205000107 |
| 13 mm Tube Holder Kit                      | 205000108 |
| Open Access 2 mL Vial Holder Kit           | 205000109 |
| Open Access 4 mL Vial Holder Kit           | 205000112 |
| Fraction Collector 18 mm Rack Kit          | 205000115 |
| Fraction Collector 13 mm Rack Kit          | 205000116 |
| Fraction Collector 16 mm Rack Kit          | 205000117 |
| Fraction Collector 25 mm Rack Kit          | 205000118 |
| Fraction Collector 28 mm Rack Kit          | 205000119 |
| Deepwell Plate Fraction Collector Rack Kit | 205000134 |

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## 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 x 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. x 9.52 mm O.D. x 5 m, 2/pk (use with prep funnel rack) | WAT037047 |
| Teflon Tubing 8 mm I.D. x 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 |

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## Detectors

### 2487 Dual-Wavelength Absorbance Detector



2487 Performance Maintenance Kit



| Description  | P/N       |
|--|-----------|
| 2487 Absorbance Detector Performance Maintenance Kit | WAS081142 |
| PM Kit consists of: PerformancePLUS Deuterium Lamp   |           |
| Parts and Accessories                                |           |
| Fuse, Lamp Power Supply, 2A micro (F1 and F2 on CPU) | WAS290423 |
| Flow Cell Rebuild Kit, 10 mm                         | WAS081346 |
| 2487 Microbore Taper Slit Flow Cell                  | WAT081159 |
| 2487 High Pressure Taper Slit Flow Cell              | WAT081321 |
| 2487 Semi-prep Taper Slit Flow Cell                  | WAT081158 |
| 2487 Inert Taper Slit Flow Cell                      | WAT081157 |
| 2487 AutoPurification Flow Cell                      | 289000614 |
| 2487 Variable Path Length Flow Cell                  | 700000923 |

### 2489 UV/Visible Dual-Wavelength Absorbance Detector



2489 Performance Maintenance Kit



| Description   | P/N       |
|---|-----------|
| ACQUITY PDA/TUV 2489/2998 Performance Maintenance Kit | 201000281 |
| PM Kit consists of: PerformancePLUS Deuterium Lamp    |           |
| 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 |

#### DID YOU KNOW...

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## 2996 Photodiode Array Detector (PDA)



2996 Performance Maintenance Kit



| Description  | P/N       |
|--|-----------|
| 2996 Photodiode Array Detector Performance Maintenance Kit | WAT052586 |
| PM Kit consists of: PerformancePLUS Deuterium Lamp         |           |
| Parts and Accessories                                      |           |
| Fuse, 4A   | WAT057337 |
| Analytical High Pressure Flow Cell Assembly, 10 mm         | WAT057460 |
| Analytical Flow Cell Assembly, 10 mm                       | WAT057919 |
| Inert Titanium Flow Cell Assembly, 10 mm                   | WAT057461 |
| Microbore Flow Cell Assembly, 3 mm                         | WAT057462 |
| Semi-prep Flow Cell Assembly, 3 mm                         | WAT057463 |
| 100 µm Aperture (Slit) Assembly                            | WAT057921 |
| 50 µm Aperture (Slit) Assembly                             | WAT057920 |

## 2998 Photodiode Array Detector (PDA)



2998 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 |
| Convuluted Tubing                                     | 430001556 |

## 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 |

## 2424/2420 Evaporative Light Scattering (ELS) Detector



2424/2420 Performance Maintenance Kit



| Description   | P/N       |
|---|-----------|
| 2424/2420 ELS Detector Performance Maintenance Kit          | 201000159 |
| PM Kit consists of: PerformancePLUS Lamp Cartridge Assembly |           |
| Parts and Accessories                                       |           |
| Drip Tray   | 415000415 |
| Vapor Trap (10 mm O.D. Bottle Trap)                         | 700000574 |

## 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 | 201000131 |
| PM Kit consists of: Xenon Lamp Assembly     |           |
| 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 |

## 432 Conductivity Detector



| Description                           | P/N       |
|---------------------------------------|-----------|
| Compression Screws and Ferrules, 5/pk | WAT025604 |
| 432 Flow Cell                         | WAT043069 |
| Power Cord                            | 442000176 |
| Union                                 | WAT097332 |

# Quadrupole Time-of-Flight Mass Spectrometers



## NEW Vion IMS Q-ToF

| Description  | P/N       |
|--|-----------|
| Vion™ IMS QToF™ Performance Maintenance Kit<br>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-Si

| Description  | P/N  |
|--|--|
| SYNAPT G2-S/G2-Si/LockSpray (Rotary) Performance Maintenance Kit     | PM Kits consist of: 201000254                            |
| SYNAPT G2-S/G2-Si/LockSpray (Scroll) Performance Maintenance Kit     | Source Components, 201000255                             |
| SYNAPT G2-S/G2-Si/NanoLockSpray (Rotary) Performance Maintenance Kit | ESI and Reference Probe Components, and Vacuum 201000256 |
| SYNAPT G2-S/G2-Si/NanoLockSpray (Scroll) Performance Maintenance Kit | Pump Components 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   |



## SYNAPT MS/HDMS

| Description   | P/N       |
|---|-----------|
| SYNAPT MS/HDMS Performance Maintenance Kit<br>PM Kit consists of: Source Components, ESI and Reference Probe Components, and Vacuum Pump Components | 201000187 |



### Xevo G2-XS QTof and Xevo G2-S QTof

| Description  |   | P/N       |
|--|---|-----------|
| Xevo G2-S LS (Rotary) Performance Maintenance Kit  | PM Kit consists of:<br>Source Components,<br>ESI and Reference Probe<br>Components, and Vacuum<br>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:<br>Source Components,<br>ESI and Reference Probe<br>Components, and Vacuum<br>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 |



### Xevo QTof

| Description  |   | P/N       |
|--|---|-----------|
| Xevo QTof LS (Rotary) Performance Maintenance Kit  | PM Kits consist of:<br>Source Components,<br>ESI and Reference Probe<br>Components, and Vacuum<br>Pump Components | 201000203 |
| Xevo QTof LS (Scroll) Performance Maintenance Kit  |   | 201000204 |
| Xevo QTof NLS (Rotary) Performance Maintenance Kit |   | 201000205 |
| Xevo QTof NLS (Scroll) Performance Maintenance Kit |   | 201000206 |
| Parts and Accessories                              |   |           |
| Outer APPI Source Service Kit                      |   | 700004730 |
| APCI Probe Service Kit                             |   | 700004673 |
| APGC Service Kit                                   |   | 700004842 |



### Q-Tof Premier

| Description                                     |   | P/N       |
|---|---|-----------|
| Q-Tof Premier™ Performance Maintenance Kit      | PM Kits consist of:<br>Source Components, ESI<br>and Reference Probe<br>Components, and Vacuum<br>Pump Components | 201000187 |
| Q-Tof Premier MALDI Performance Maintenance Kit |   | 201000187 |

# Tandem Quadrupole Mass Spectrometers



## Xevo TQ-XS

| Description  |  | P/N       |
|--|--|-----------|
| Xevo TQ-XS Performance Maintenance Kit with Chemical Kit | PM Kit consists of:<br>Source Components | 176004023 |
| <b>Parts and Accessories</b>                             |  |           |
| 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<br>Components, ESI Probe<br>Components, and Vacuum<br>Pump Components | 176002745 |
| Xevo TQ-S (Scroll) Performance Maintenance Kit with Chemical Kit |  | 176002744 |
| <b>Parts and Accessories</b>                                     |  |           |
| 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<br>Components, ESI Probe<br>Components, and Vacuum<br>Pump Components | 176003850 |
| Xevo TQ-S Micro (Scroll) Performance Maintenance Kit with Chemical Kit |  | 176003851 |
| <b>Parts and Accessories</b>   |  |           |
| 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<br>Components, ESI Probe<br>Components, and Vacuum<br>Pump Components | 176002780 |
| Xevo TQD (Scroll) Performance Maintenance Kit with Chemical Kit |  | 176002781 |
| <b>Parts and Accessories</b>                                    |  |           |
| 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 | 176002058 |
| Xevo TQ (Scroll) Performance Maintenance Kit with Chemical Kit | 176002059 |
| <b>Parts and Accessories</b>                                   |           |
| 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   | 176002064 |
| TQD (Oil Free) Performance Maintenance Kit with Chemical Kit | 176002135 |
| <b>Parts and Accessories</b>                                 |           |
| SQD/TQD ASAP Accessory                                       | 176002049 |



### Quattro Premier/Premier XE

| Description   | P/N        |
|---|------------|
| Quattro Premier™ (Rotary) Mass Spectrometer Performance Maintenance Kit with Chemical Kit | 176002053  |
| Quattro Premier (Scroll) Mass Spectrometer Performance Maintenance Kit with Chemical Kit  | 176002054  |
| <b>Parts and Accessories</b>  |            |
| IonSABRE APci Probe   | M956335DC1 |
| IonSABRE Spare Parts Kit  | M956335DC2 |
| MUX 4/5 Parts Kit   | 201000149  |
| APCI Probe Parts Kit  | 700000338  |

### Quattro micro GC



| Description   | P/N       |
|---|-----------|
| Quattro micro GC Mass Spectrometer Performance Maintenance Kit    | 201000170 |
| PM Kit consists of: Source Components, and Vacuum Pump Components |           |

### Quattro micro



| Description  | P/N       |
|--|-----------|
| Quattro micro™ Mass Spectrometer Performance Maintenance Kit with Chemical Kit | 176002050 |
| PM Kit consists of: Source Components, and Vacuum Pump Components              |           |
| <b>Parts and Accessories</b>   |           |
| MUX 4/5 Parts Kit  | 201000149 |



## Atmospheric Solids Analysis Probe (ASAP)

### INCREASE WATERS LC AND MS SYSTEM PERFORMANCE WITH COST-EFFECTIVE UPGRADES

You can extend your 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 G2-S Tof/QToF
- Xevo TQ-S micro
- Xevo G2-XS Tof/QToF
- SYNAPT G2-Si
- Xevo TQD/SQ Detector 2
- Xevo G2 Tof/QToF
- 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-Si, 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 |

## Single Quadrupole Mass Spectrometers



### 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 |



### ZQ Mass Spectrometer

| Description  |   | P/N       |
|--|---|-----------|
| ZQ Mass Spectrometer Performance Maintenance Kit with Chemical Kit | PM Kit consists of: Source Components, ESI Probe Components, and Vacuum Pump Components | 176002050 |
| APCI Probe Spare Parts Kit   |   | 700000338 |
| Parts and Accessories  |   |           |
| APCI Probe Spare Parts Kit   |   | 700000338 |

## Time-of-Flight (ToF) Mass Spectrometers



### Xevo G2-XS ToF and Xevo G2-S ToF

| Description  |   | P/N       |
|--|---|-----------|
| Xevo G2-S LS (Rotary) Performance Maintenance Kit  | PM Kits consist of:<br>Source Components,<br>ESI and Reference Probe<br>Components, and Vacuum<br>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:<br>Source Components,<br>ESI and Reference Probe<br>Components, and Vacuum<br>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 |



### LCT Premier/LCT Premier XE

| Description   |   | P/N          |
|---|---|--------------|
| LCT P/XE (Rotary) Performance Maintenance Kit with Chemical Kit | PM Kits consist of:<br>Source Components,<br>ESI and Reference Probe<br>Components, and Vacuum<br>Pump Components | 176002060    |
| LCT P/XE (Scroll) Performance Maintenance Kit with Chemical Kit |   | 176002061    |
| Parts and Accessories   |   |              |
| IonSABRE APci Probe   |   | M956513DC1-S |
| IonSABRE Spare Parts Kit  |   | 700003731    |
| MUX 4/5 Parts Kit   |   | 201000149    |



### GCT Premier

| Description  | P/N       |
|--|-----------|
| GCT Premier™ Mass Spectrometer Performance Maintenance Kit                           | 201000188 |
| PM Kit consists of: Source Components and Vacuum Pump Components                     |           |
| Parts and Accessories  |           |
| Field Ionization/Field Desorption Source Performance Maintenance Kit for GCT Premier | 201000189 |

## Magnetic Sector Mass Spectrometer



### AutoSpec/Auto Spec Premier

| Description  | P/N       |
|--|-----------|
| AutoSpec Premier Mass Spectrometer Base Performance Maintenance Kit (Rotary) | 201000245 |
| AutoSpec Premier Mass Spectrometer Base Performance Maintenance Kit (Scroll) | 201000246 |
| PM Kits consist of:<br>Vacuum Pump<br>Maintenance Components                 |           |
| 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 |

<sup>1</sup> 30 mm Stand Alone Guard/Column (end-fittings not included).

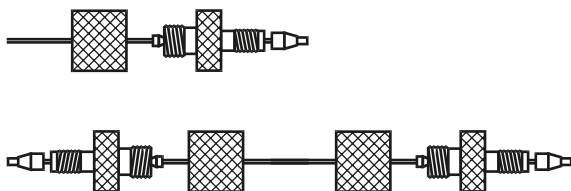
<sup>2</sup> Extended end-fitting for use with 10 mm Integral Guard, p/n: PSS614108.

<sup>3</sup> 10 mm Integral Guard Column.

<sup>4</sup> Column Coupler, p/n: PSS614102.

# SLIPFREE Connectors

## Generation HPLC Column Connector



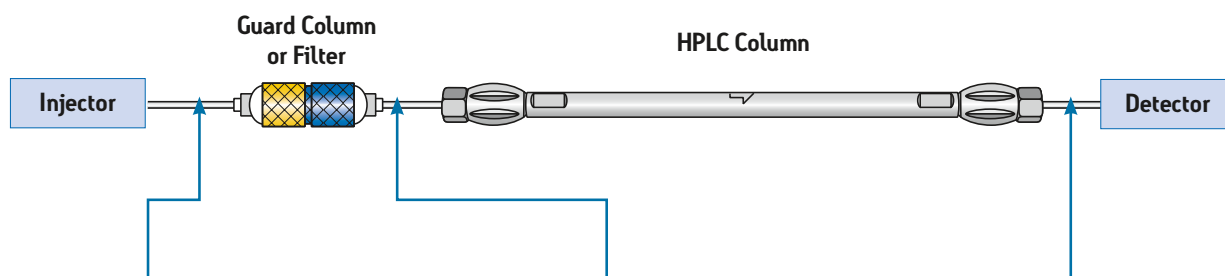
- Guarantees a void-free connection because it pushes tubing into the end-fitting (the connector is installed on the tubing at the factory)
- Fingertight to 10,000 psi—never need wrenches
- Readjusts to all column end-fittings; compatible with all tested commercially available end-fittings
- Stainless 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 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 Fittings with Double Ferrules, 1/16-inch, 10-32 Thread

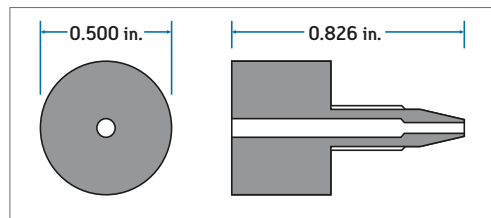
Double-ferrule fittings made of PEEK grip tubing in two places. The ferrules provide twice the holding power of single-ferrule fittings. They are ideal for use with PEEK and Tefzel tubing, which often slip when used with single-ferrule fittings. When used with stainless steel or titanium tubing, double-ferrule 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.

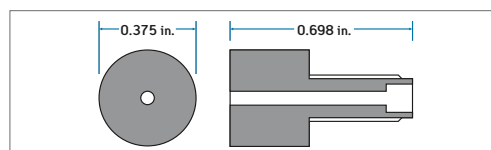
These fittings fit virtually any female 1/16-inch fitting, including Parker, Swagelok, Waters, Valco, Rheodyne, UPChurch, etc.—all with 10-32 threads.

| Description                     | P/N       |
|---------------------------------|-----------|
| PEEK Double-ferrule             | PSL613302 |
| PEEK Hex-head Nut               | PSL613324 |
| PEEK Fingertight Nut            | PSL613301 |
| Stainless Steel Fingertight Nut | PSL613325 |

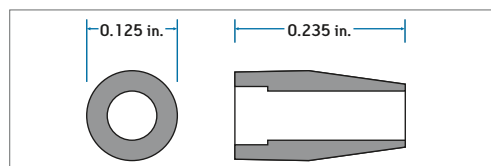
### PEEK Fingertight One-Piece Fitting



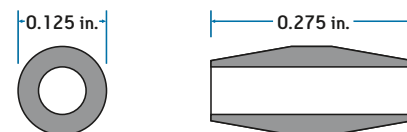
### PEEK Fingertight Two-Piece Nut



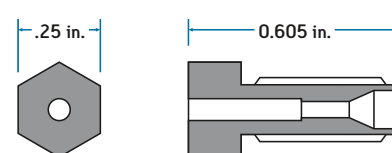
### PEEK Single Ferrule



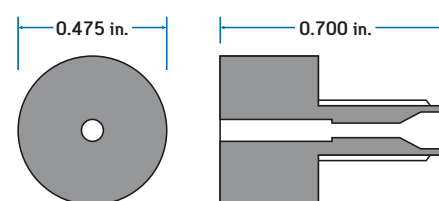
### PEEK Double-Ferrule



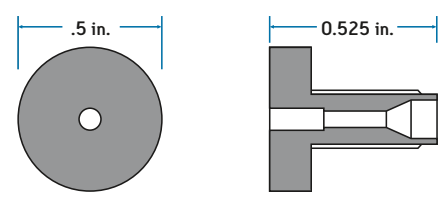
### PEEK Hex-Head Nut



### 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

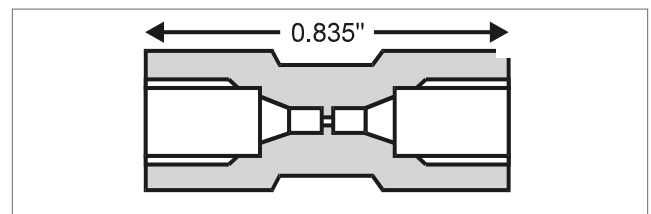
| Description  | P/N       |
|--|-----------|
| Ferrule, 01, Stainless Steel, 10/pk                                    | WAT005063 |
| Compression Screw, 0.0625 in., 10/pk                                   | WAT005070 |
| Compression Fitting Plug, Stainless Steel, 5/pk                        | WAT005079 |
| 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



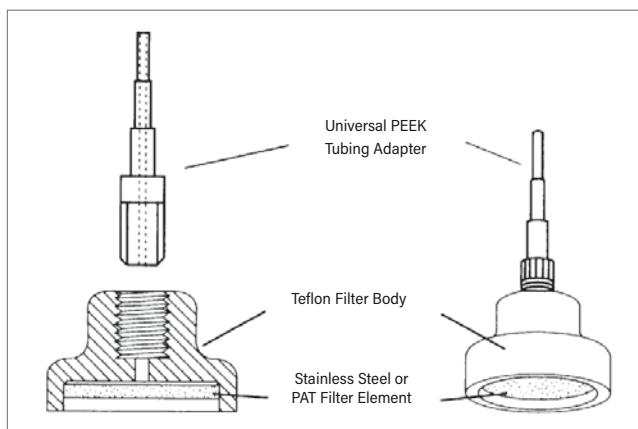
| Description  | P/N       |
|--|-----------|
| PEEK Union with 2 PEEK Fingertight Nuts and Double Ferrules 1/16 in. | PSL613312 |
| PEEK Union without Nuts and Ferrules 1/16 in.                        | PSL613313 |
| PEEK TEE with One-piece Fingertight Fitting                          | PSL613317 |
| 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

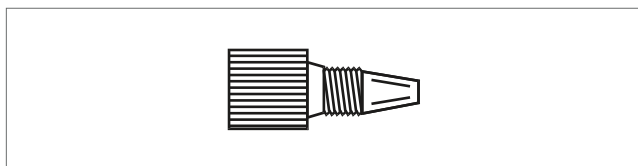
The Last Drop mobile-phase filter incorporates a flat filter element set parallel to the bottom of a reservoir. This design allows the filter to draw all but the last 2% of mobile phase from the reservoir without drawing air into the system. Last Drop filters are available with 316 L stainless steel 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

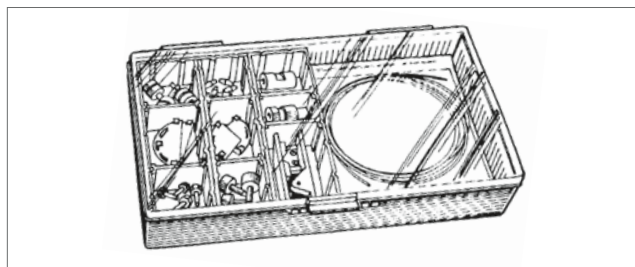
Handilok fittings can replace, without the need for tools, conventional compression fittings used with 1/16-inch tubing. Compatible with all internal fittings with a 10–32 thread, these fittings meet rigid high-pressure requirements, withstanding pressures greater than 4000 psi (280 bar).



| 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.



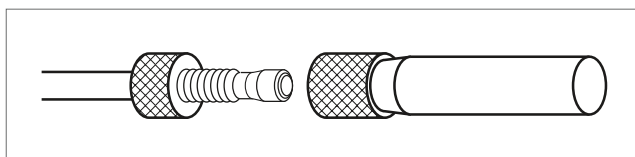
| Description      | P/N       |
|------------------|-----------|
| PEEK Starter Kit | PSL613321 |

#### 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.

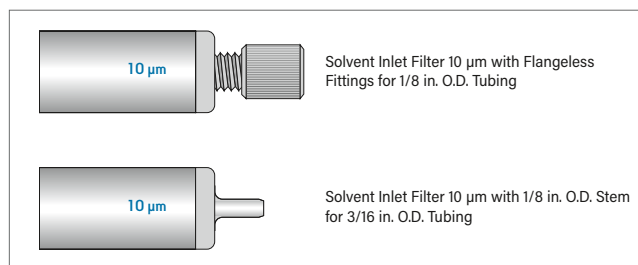


| Description                       | P/N       |
|-----------------------------------|-----------|
| Biocompatible Mobile Phase Filter | PSL901282 |

## Solvent Inlet Filters

It's good practice to always filter solvents, to avoid damaging the pump. Solvent inlet filters, with a porosity of 10  $\mu\text{m}$ , provide the necessary pump protection, and their large surface area ensures long life without pump cavitation.

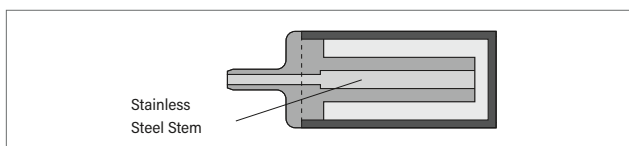
Filters should be changed periodically, depending on usage and mobile phase. Replacing the filter is easy; no tools are needed. The unique Plastictight male nut is screwed into the filter and tightened by hand. Finger tightening is sufficient; the Plastictight fitting holds without flanging.



## 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  $\mu\text{m}$  filter can easily accommodate flow rates as high as 10 mL/min.

| Description   | P/N       |
|---|-----------|
| <b>Solvent Inlet Filter Kits</b>  |           |
| Assy, Solvent Filter  | WAT025531 |
| Plastictight Fitting with Teflon Tubing<br>1/16 in. I.D. $\times$ 1/8 in. O.D. $\times$ 3 ft. | PSL613602 |
| Replacement Filter 10 $\mu\text{m}$ , 5/pk  | PSL613604 |
| <b>Solvent Inlet Filters for General Use</b>  |           |
| Solvent Inlet Filter 10 $\mu\text{m}$ with 1/16 in. O.D. Stem<br>for 1/8 in. O.D. Tubing      | PSL613570 |
| Solvent Inlet Filter 10 $\mu\text{m}$ with Flangeless Fittings<br>for 1/8 in. O.D. Tubing     | PSL613578 |
| <b>Solvent Inlet Filters for Preparative HPLC</b>   |           |
| Solvent Inlet Filter 10 $\mu\text{m}$ with 1/16 in. O.D. Stem<br>for 1/8 in. O.D. Tubing      | PSL613607 |
| Solvent Inlet Filter 10 $\mu\text{m}$ with Flangeless Fittings<br>for 1/8 in. O.D. Tubing     | PSL613608 |
| <b>Solvent Inlet Filters for Waters HPLC Systems</b>  |           |
| Solvent Inlet Filter 10 $\mu\text{m}$ with 1/8 in. O.D. Stem<br>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



"The quality of our products differentiates us from the competition.  
We take quality personally."

*~ Chris Ryan, Director of Chemistry Operations, Wexford, Ireland*

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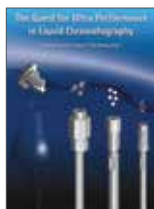
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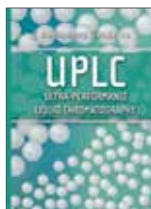


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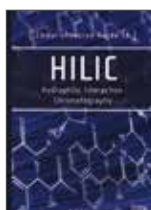


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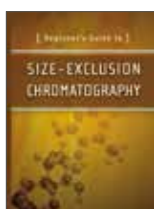


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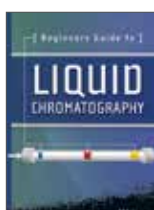


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