

[ UPLC COLUMNS ]

INCREASE SPEED, SENSITIVITY, AND RESOLUTION  
WITH UPLC COLUMN TECHNOLOGY



Waters  
THE SCIENCE OF WHAT'S POSSIBLE.®

## Performance Matters

UltraPerformance Liquid Chromatography (UPLC®) combines the advances made in both instrumentation and column technology that enables you, the analytical scientist, to achieve dramatic increases in resolution, speed, and sensitivity. This holistic approach, which involves simultaneous innovations in both particle technology and instrument design, allows you to meet and overcome the challenges in your analytical laboratory in order to make you more successful and productive.

**HSS**  
HIGH STRENGTH SILICA

**CORTECS**®  
COLUMNS

  
**BEH Technology™**

## Small Molecule Separations

BEH C<sub>18</sub>BEH C<sub>8</sub>

BEH Shield RP18

BEH Phenyl

BEH HILIC

BEH Amide

HSS T3

HSS C<sub>18</sub>HSS C<sub>18</sub> SB

HSS PFP

HSS Cyano

CSH C<sub>18</sub>

CSH Fluoro-Phenyl

CSH Phenyl-Hexyl

CORTECS® C<sub>18</sub>+CORTECS C<sub>18</sub>

CORTECS T3

CORTECS Shield RP18

CORTECS C<sub>8</sub>

CORTECS Phenyl

CORTECS HILIC

## Bioseparations\*

AccQ-Tag™ Ultra C<sub>18</sub>

Glycan BEH Amide 130Å

Glycoprotein BEH Amide 300Å

Oligonucleotide BEH C<sub>18</sub>Peptide BEH C<sub>18</sub> 130ÅPeptide BEH C<sub>18</sub> 300ÅPeptide CSH C<sub>18</sub> 130Å

Peptide HSS T3 100Å

Protein BEH C<sub>4</sub> 300Å

Protein BEH SEC 125Å

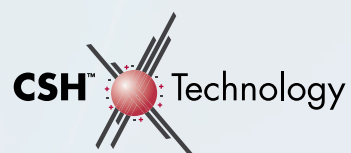
Protein BEH SEC 200Å

Protein BEH SEC 450Å

\* For more information on our Bioseparations line of columns, please see Waters Biomolecule Purification, Characterization, and Analyses Catalog 720002148EN.

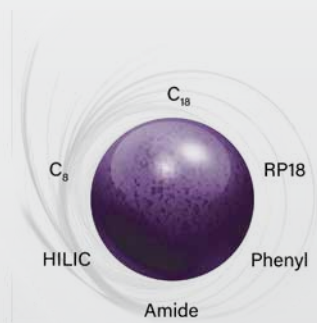
## Efficiency Gains

Reducing the particle size of the packing material and utilizing solid-core particle technology improves the resolution of a chromatographic separation due to the increase in column efficiency these particles provide. However, the efficiency gains of these particles can only be realized when using low dispersive ACQUITY® UPLC Instrumentation. The ACQUITY UPLC System has removed the dispersion barrier, enabling narrow bore columns packed with smaller particles (1.6–1.8 µm) to reach their maximum performance.



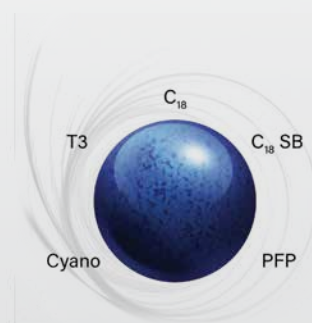
## Premier UPLC Particle Technologies

When choosing an ACQUITY UPLC Column for your application, understanding the attributes of the base particle will help narrow down your column selection choices. Waters offers four premium sub-2- $\mu\text{m}$  particle technologies that provide their own unique chromatographic benefits. Whether you are looking for superior pH stability, maximum retentivity, improved peak shape, or ultimate efficiency, there is a UPLC particle technology engineered to suit your needs. Combining these unique base particles with a wide range of bonded phases maximizes selectivity choices which is crucial for fast, efficient method development. No matter what your separation challenge, there is an ACQUITY UPLC Column that is fit-for-purpose in your laboratory.



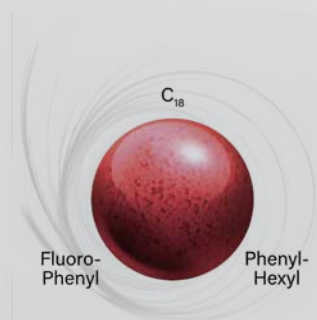
### BEH Technology

- Good universal column choice for a wide variety of compounds
- Exceptional peak shape for basic analytes at elevated pH
- Stable across a wide pH range
- Stable at high temperatures



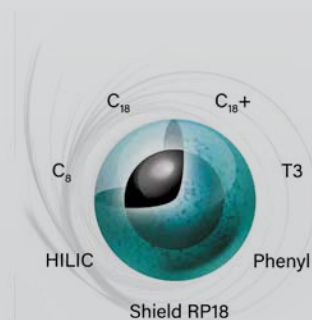
### HSS Technology

- Increased retentivity over hybrid materials
- Widest selectivity space with C<sub>18</sub>, T3, C<sub>18</sub> SB, Cyano, and PFP chemistries
- High strength silica (HSS) for mechanical stability



### CSH Technology

- Excellent peak shape for basic compounds under acidic, low ionic strength conditions
- Excellent MS performance with formic acid as a mobile phase modifier
- Fast pH switching and column equilibration



### CORTECS Solid-Core Technology

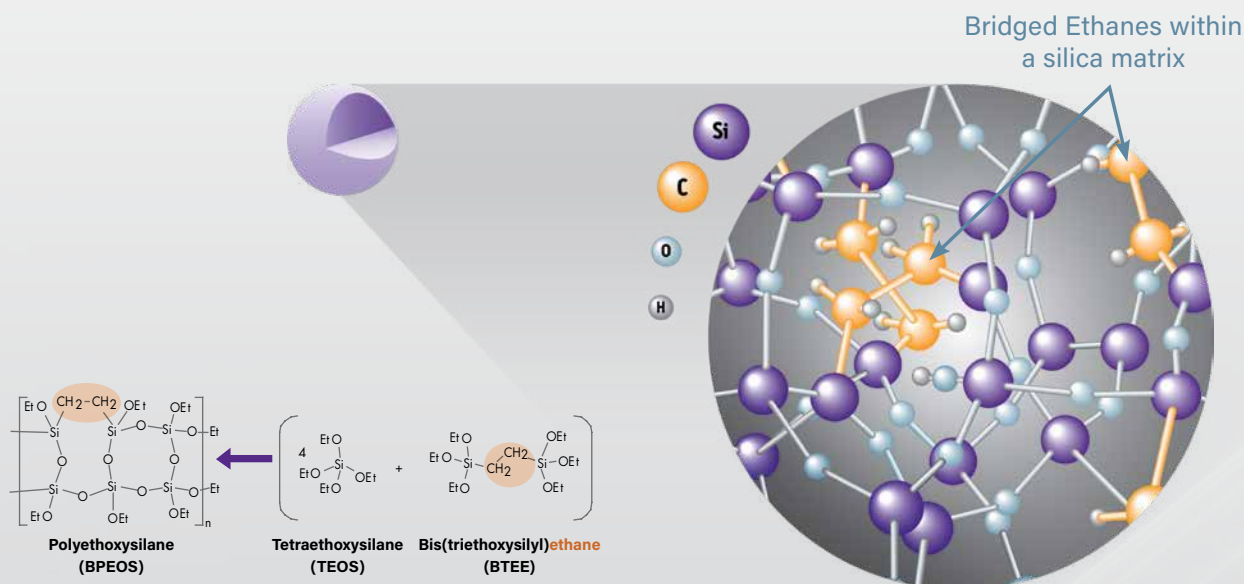
- Maximum efficiency
- Increased sample throughput\*
- Lower column backpressure\*

\* compared to fully porous particles of equivalent size

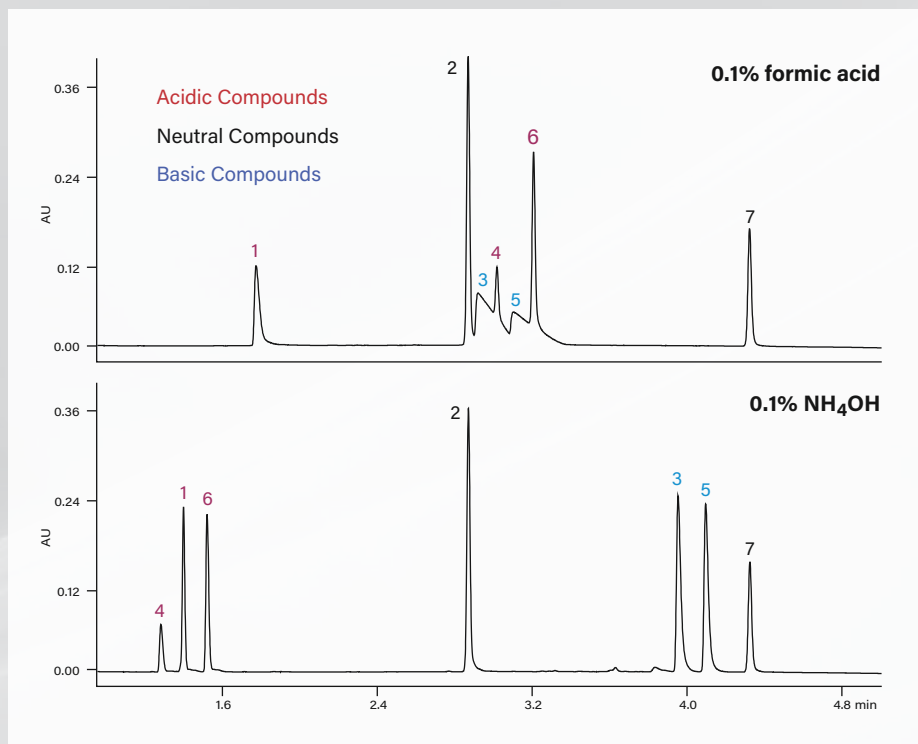


# Ethylene Bridged Hybrid (BEH) Particle Technology

ACQUITY UPLC BEH 1.7  $\mu\text{m}$  fully porous columns provide superior analyte peak shape, efficiency, and chemical stability to any separation. ACQUITY UPLC BEH Columns are available in both reversed-phase and HILIC separation modes, with chemistries that provide selectivities for a wide range of compounds. With the ruggedness to operate at extreme pH conditions, ACQUITY UPLC BEH Columns enable the separation scientist the ability to use a wide pH range to influence retention, selectivity, and sensitivity for ionizable compounds.



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



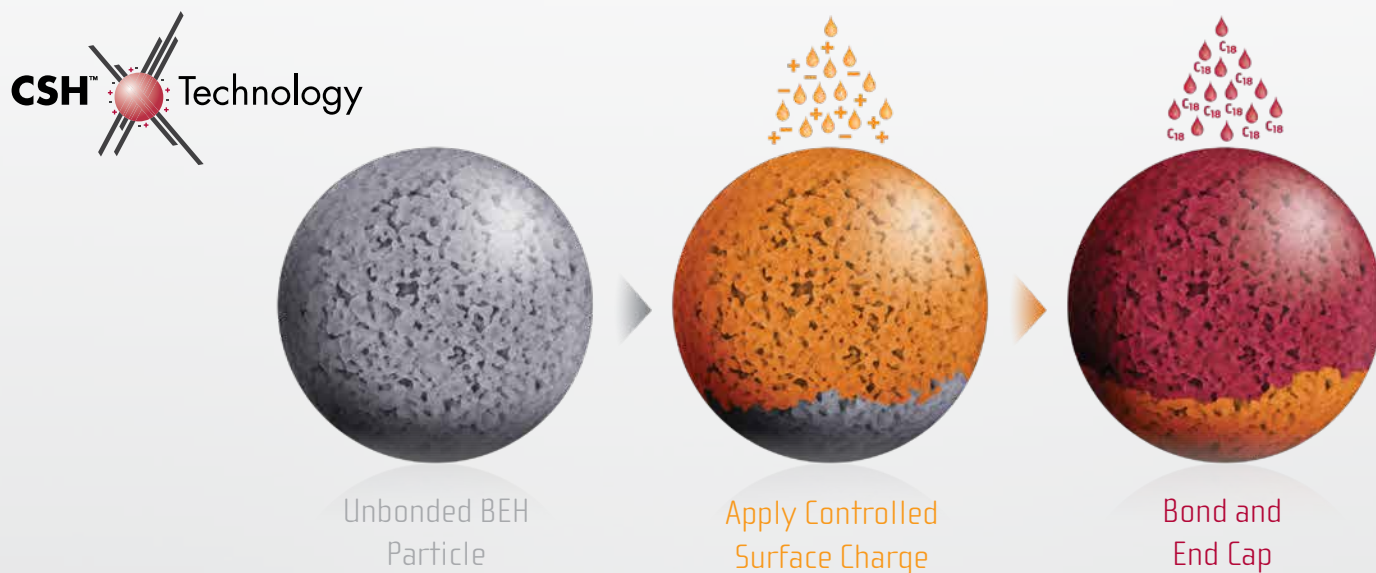
ACQUITY UPLC BEH (Ethylene-Bridged Hybrid) Columns are known industry-wide as the standard for rugged and repeatable LC column performance. ACQUITY UPLC BEH Columns offer pH stability that is higher than any other commercially available chromatographic phase. Unlike traditional columns that claim pH resistance, ACQUITY UPLC BEH Columns can be used at the extremes of mobile phase pH (1-12) to enhance retention and specificity for complex samples that include mixtures of acidic, basic, and neutral analytes.



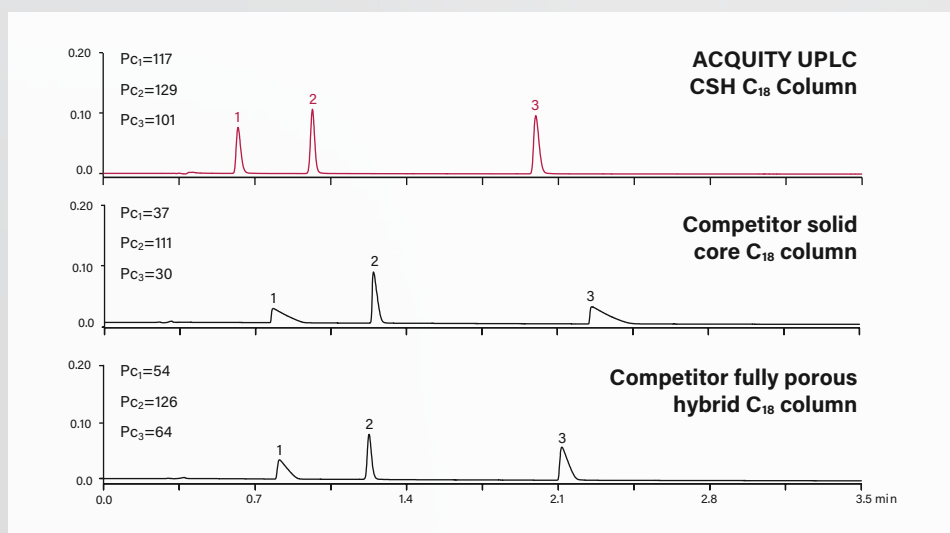
Mobile phase pH is a powerful tool in manipulating separations as well as improving peak shape. At low pH, acidic compounds (red) are more retained, and at high pH, basic compounds (blue) are more retained. Neutral compounds (black) are unaffected by changes in pH. Also notice at high pH, the peak shape for the basic analytes is significantly improved.

## Charged Surface Hybrid (CSH) Particle Technology

ACQUITY UPLC CSH™ 1.7 µm fully porous columns provide superior peak shape for basic analytes when using low ionic strength acidic mobile phases (e.g. 0.1% formic acid). With CSH Technology, the controlled low-level positive surface charge provides exceptional peak shape for basic analytes which can be achieved without the use of ion pairing reagents. Typically reversed-phase bonded phases have poor peak shape for basic compounds in formic acid even at analytical mass loads. Built on the rugged Ethylene Bridged Hybrid (BEH) particle, ACQUITY UPLC CSH phases can withstand the toughest operating conditions.



CSH Technology is the next evolution of Hybrid particle technology. CSH Technology dramatically improves virtually all facets of LC column performance in acidic, low ionic strength mobile phases that are commonly used in the chromatographic laboratory. For further details please refer to white paper "Charged Surface Hybrid (CSH) Technology and Its Use in Liquid Chromatography" ([720003929EN](#)).



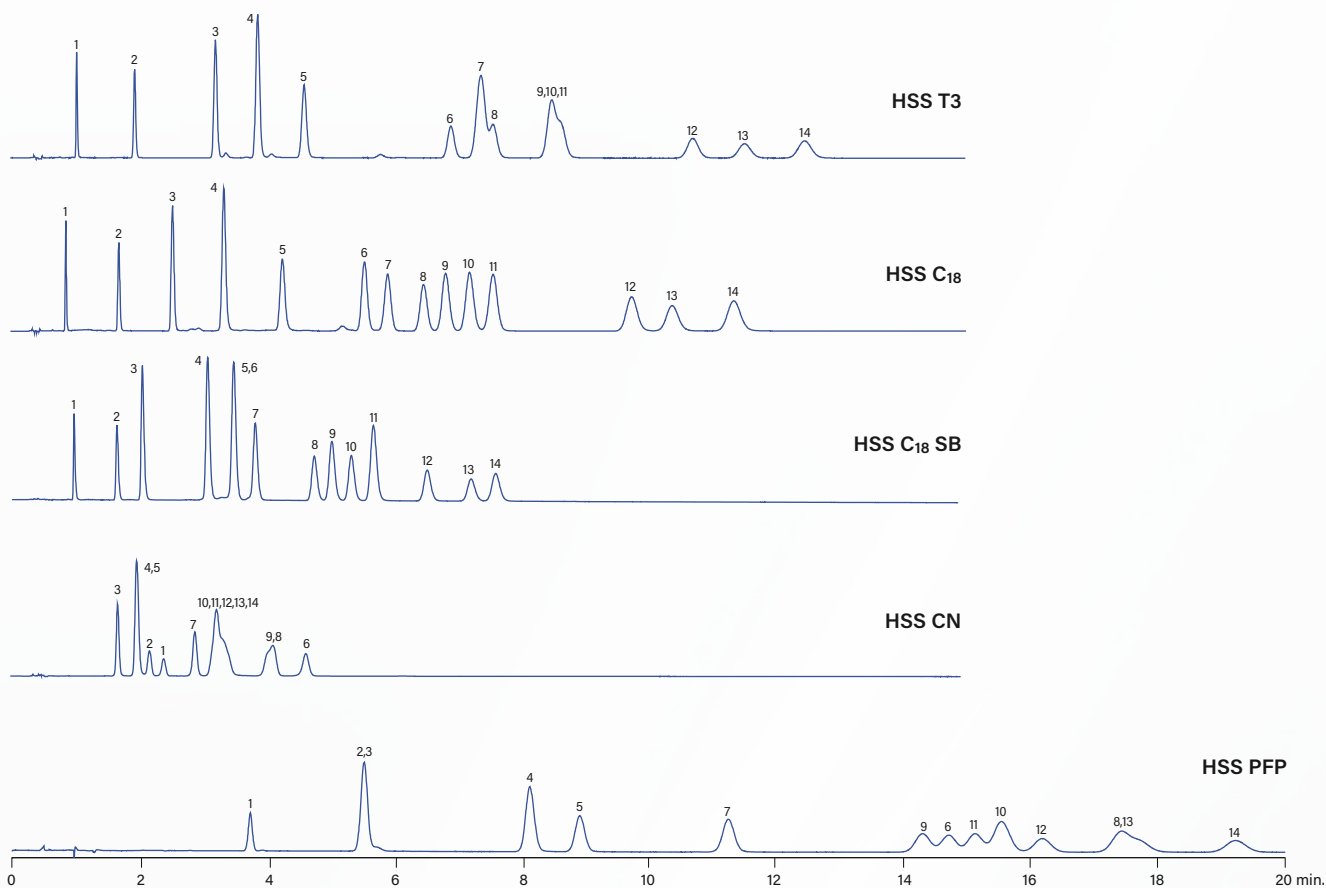
Comparison of peak shape and peak capacity (Pc) for bases on three 2.1 x 50 mm C<sub>18</sub> columns. Gradient: A: 0.1% formic acid in water; B: acetonitrile; 15–65% B linear in 4.6 minutes. Temperature: 30 °C. Flow rate: 0.4 mL/min. Sample: 2 µL injection. Detection: 260 nm. Analytes: 1) metoprolol tartrate (200 ng/µL), 2) papaverine (10 ng/µL), 3) amitriptyline (50 ng/µL). System: ACQUITY UPLC.

# High Strength Silica (HSS) Particle Technology

ACQUITY UPLC HSS 1.8  $\mu\text{m}$  fully porous columns provide expected silica particle like performance to the UPLC family. The HSS particles' high surface area, and lower pore volume provide increased retentivity over the hybrid particles. This robust particle technology is available in five uniquely different bonded phases, which truly maximize the selectivity space. The wide array of bonded phases associated with ACQUITY UPLC HSS Columns enable traditional hydrophobic reversed-phase interactions along with dipole-dipole interactions, aromatic interactions, and hydrogen bonding interactions.

Columns: 2.1 x 100 mm  
Mobile phase: 72% water/28% methanol (v/v)  
Flow rate: 0.5 mL/min  
Injection vol.: 5.0  $\mu\text{L}$   
Sample conc.: 10  $\mu\text{g/mL}$   
Temperature: 50  $^{\circ}\text{C}$   
Detection: UV @ 254 nm  
Sampling rate: 20 pts/sec  
Time constant: 0.1 min  
Instrument: ACQUITY UPLC with PDA Detector

Compounds [EPA 8330 Standard Mixture]:  
1. HMX  
2. RDX  
3. 1,3,5-Trinitrobenzene  
4. 1,3-Dinitrobenzene  
5. Nitrobenzene  
6. Tetryl  
7. 2,4,6-Trinitrotoluene  
8. 2-Amino-4,6-Dinitrotoluene  
9. 4-Amino-2,6-Dinitrotoluene  
10. 2,4-Dinitrotoluene  
11. 2,6-Dinitrotoluene  
12. 2-Nitrotoluene  
13. 4-Nitrotoluene  
14. 3-Nitrotoluene

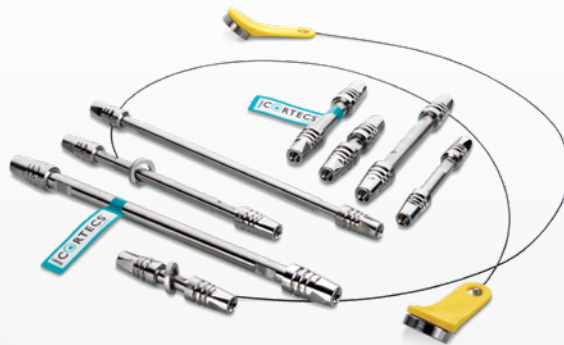


ACQUITY UPLC HSS Columns offer scientists maximum retention and the widest selectivity space with five unique and differentiated bonded phases.

**HSS**  
HIGH STRENGTH SILICA

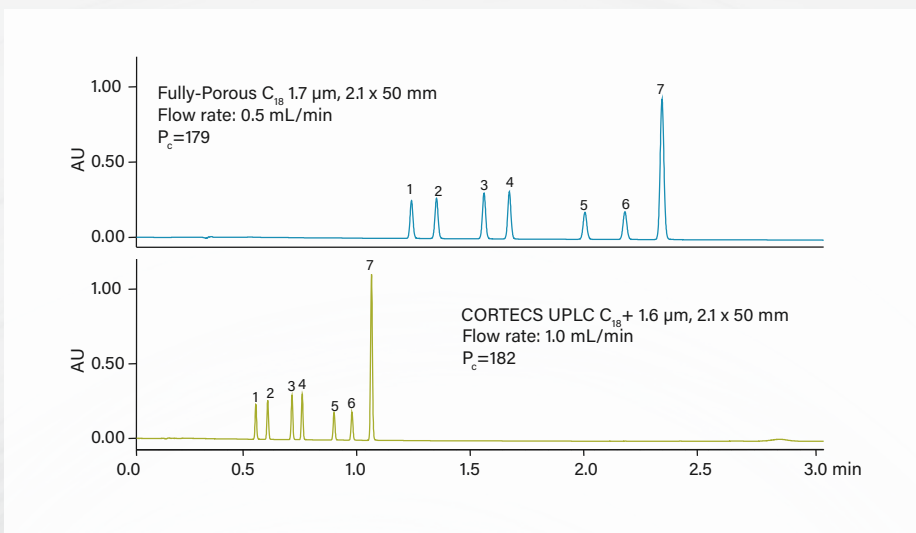
## CORTECS Solid-Core Particle Technology

CORTECS UPLC 1.6  $\mu\text{m}$  solid-core Columns set the bar for ultimate chromatographic performance. The sub-2- $\mu\text{m}$  solid-core particle technology provides the highest efficiencies when coupled with low dispersion UPLC instrumentation. CORTECS UPLC 1.6  $\mu\text{m}$  Columns are available in both reversed-phase and HILIC, with seven different chemistries to give you the flexibility to rapidly separate a wide range of compounds. These solid-core columns produce sharper, narrower peaks when compared to fully porous particles of similar size; making these columns the best column choice for increased resolution, speed, and sensitivity.



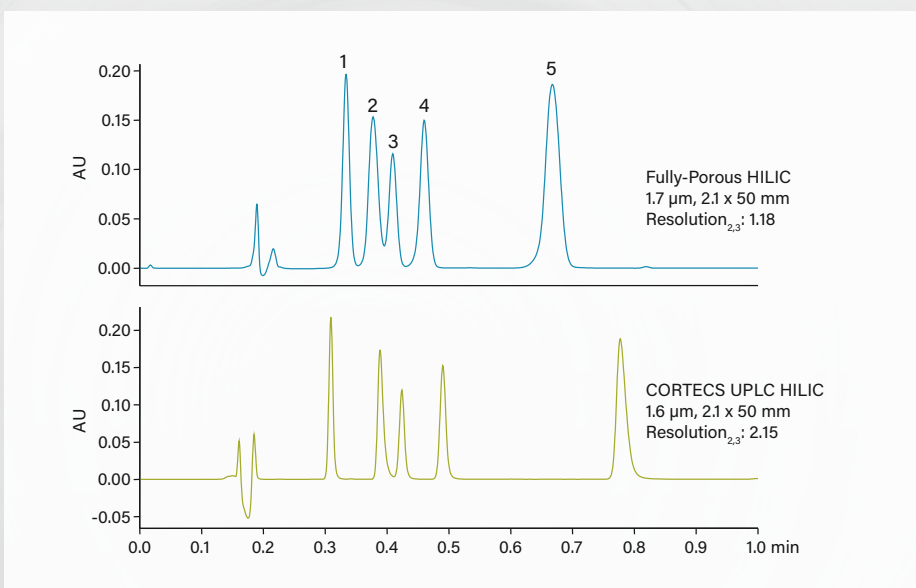
**CORTECS**<sup>®</sup>  
COLUMNS

### Increased sample throughput



Separation of sulfa drugs, demonstrating the higher throughput capabilities of the CORTECS UPLC Columns. Compounds: 1) sulfathiazole, 2) sulfamerazine, 3) sulfamethazine, 4) sulfamethoxypyridazine, 5) sulfachloropyridazine, 6) sulfamethoxazole, and 7) sulfasoxazole. Peak capacity calculated using the equation  $P_c = 1 + (t_g/P_w)$  where  $t_g$  equals gradient time, and  $P_w$  equals average peak width.

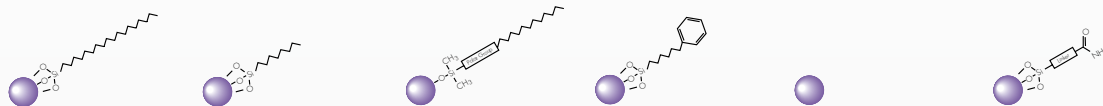
### Increased resolution



Separation of local anesthetics by HILIC, demonstrating the improved resolution using a CORTECS UPLC HILIC Column. Compounds: 1) lidocaine, 2) butacaine, 3) tetracaine, 4) procaine, and 5) procainamide.



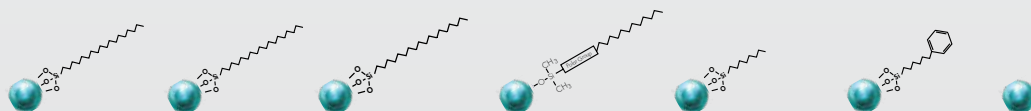
# UPLC Column Characteristics



ACQUITY	C <sub>18</sub>	C <sub>8</sub>	Shield RP18	Phenyl	HILIC	Amide
Ligand density*	3.1 μmol/m <sup>2</sup>	3.2 μmol/m <sup>2</sup>	3.3 μmol/m <sup>2</sup>	3.0 μmol/m <sup>2</sup>	n/a	7.5 μmol/m <sup>2</sup>
Carbon load*	18%	13%	17%	15%	unbonded	12%
Endcap style	proprietary	proprietary	TMS	proprietary	n/a	none
pH range	1–12	1–12	2–11	1–12	1–9	2–11
Low pH temp. limit	80 °C	60 °C	50 °C	80 °C	45 °C	90 °C
High pH temp. limit	60 °C	60 °C	45 °C	60 °C	45 °C	90 °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	185 m <sup>2</sup> /g	185 m <sup>2</sup> /g
USP classification	L1	L7	L1	L11	L3	L68



ACQUITY	CSH C <sub>18</sub>	CSH Phenyl-Hexyl	CSH Fluoro-Phenyl	HSS T3	HSS C <sub>18</sub>	HSS C <sub>18</sub> SB	HSS PFP	HSS CN
Ligand density*	2.3 μmol/m <sup>2</sup>	2.3 μmol/m <sup>2</sup>	2.3 μmol/m <sup>2</sup>	1.6 μmol/m <sup>2</sup>	3.2 μmol/m <sup>2</sup>	1.6 μmol/m <sup>2</sup>	3.2 μmol/m <sup>2</sup>	2.0 μmol/m <sup>2</sup>
Carbon load*	15%	14%	10%	11%	15%	8%	7%	5%
Endcap style	proprietary	proprietary	none	proprietary	proprietary	none	none	none
pH range	1–11	1–11	1–8	2–8	1–8	2–8	2–8	2–8
Low pH temp. limit	80 °C	80 °C	60 °C	45 °C	45 °C	45 °C	45 °C	45 °C
High pH temp. limit	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C
Surface area*	185 m <sup>2</sup> /g	185 m <sup>2</sup> /g	185 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	230 m <sup>2</sup> /g
USP classification	L1	L11	L43	L1	L1	L1	L43	L10



CORTECS	C <sub>18</sub> +	C <sub>18</sub>	T3	Shield RP18	C <sub>8</sub>	Phenyl	HILIC
Ligand density*	2.4 μmol/m <sup>2</sup>	2.7 μmol/m <sup>2</sup>	1.6 μmol/m <sup>2</sup>	3.2 μmol/m <sup>2</sup>	3.4 μmol/m <sup>2</sup>	3.2 μmol/m <sup>2</sup>	n/a
Carbon load*	5.7%	6.6%	4.7%	6.4%	4.5%	5.9%	unbonded
Endcap style	proprietary	proprietary	proprietary	TMS	proprietary	proprietary	n/a
pH range	2–8	2–8	2–8	2–8	2–8	2–8	1–5
Low pH temp. limit	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C
High pH temp. limit	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C
Surface area	100 m <sup>2</sup> /g	100 m <sup>2</sup> /g	100 m <sup>2</sup> /g	100 m <sup>2</sup> /g	100 m <sup>2</sup> /g	100 m <sup>2</sup> /g	100 m <sup>2</sup> /g
USP classification	L1	L1	L1	L1	L7	L11	L3

\* Expected or approximate values.

## Innovative Column Technology

Although directly influenced by the dispersion [bandsread] of the LC instrumentation, the heart of the chromatographic separation lies within the column. In addition to a wide variety of available column selectivities to accommodate different sample types, a significant degree of manufacturing innovation is necessary to yield the performance expected from UPLC Column Technology: impactful resolution and sensitivity, improved productivity, unmatched reproducibility, as well as exceptional mechanical and chemical stability.

In efforts to achieve these performance attributes, ground-breaking manufacturing procedures for particle synthesis, mechanical engineering, software development, and column manufacturing were devised.

### Engineering

- Ultra-low dispersion hardware
- Innovative frit technology

### Column manufacturing

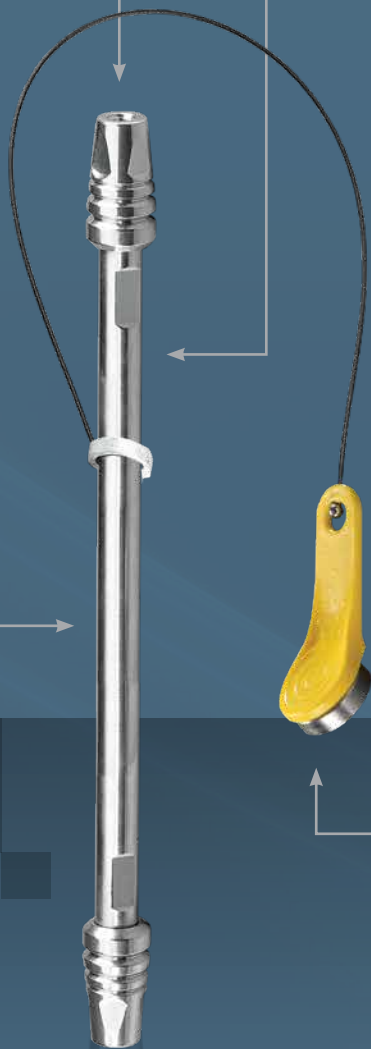
- Mechanically stable beds at pressures up to 18,000 psi [1241 bar]
- Advanced column packing methodologies and equipment
- Ultra-low dispersion column test stations

### Bulk synthesis

- Mechanically tolerant particles
- Advanced particle sizing technology
- Sustained batch-to-batch selectivity
- Sustained selectivity across UPLC, UHPLC, and HPLC particle sizes
- High efficiency, sub-2- $\mu\text{m}$  particles

### Traceability

- Electronic column usage management via eCord™ Intelligent Chip Technology
- Tracks history of column's performance and usage over lifetime of the column
- Tethered to the column to ensure permanent accessibility to column history



# UPLC Column Protection – VanGuard Pre-Columns

Contamination resulting from the analysis of samples present within complex matrices, or that are particulate-laden, may result in reduced column lifetime if not properly addressed. VanGuard™ Pre-Columns are ideally suited for the physical and chemical protection of ACQUITY UPLC Columns.

Directly compatible with UPLC pressures up to 18,000 psi [1241 bar], this ultra-low dispersion direct connect guard column is specifically engineered to preserve the lifetime of an ACQUITY UPLC Column without negatively impacting its separation performance.

\* US Patents 9,724,621; 8,449,769

**VANGUARD™**  
PRE-COLUMNS



## Key features and benefits of VanGuard Pre-Columns

FEATURE	BENEFIT
First pre-column for UPLC applications	Guaranteed compatibility with pressures up to 18,000 psi
Ultra-low volume design	Minimal chromatography effects
Manufactured using UPLC Column hardware, particles, and chemistries	Superior UPLC Column protection and performance
Connects directly to UPLC Column	Leaks and connection voids are eliminated

## Minimal chromatographic effects with VanGuard Pre-Columns

### LC conditions:

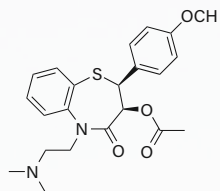
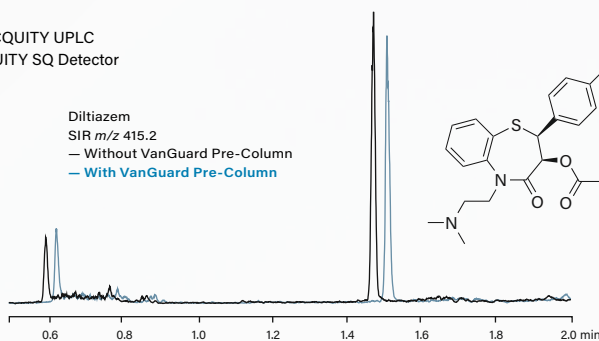
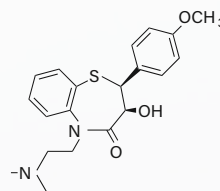
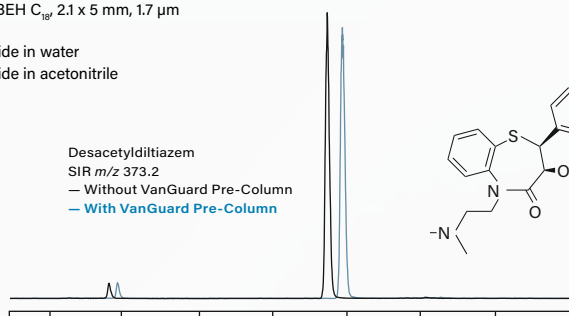
Column: ACQUITY UPLC BEH C<sub>18</sub>, 2.1 x 50 mm, 1.7 μm  
 Part number: 186002350  
 Pre-Column: VanGuard Pre-Column, BEH C<sub>18</sub>, 2.1 x 5 mm, 1.7 μm  
 Part number: 186003975  
 Mobile phase A: 0.2% ammonium hydroxide in water  
 Mobile phase B: 0.2% ammonium hydroxide in acetonitrile  
 Flow rate: 0.8 mL/min  
 Gradient:

Time (min)	%A	%B
0.0	95	5
2.0	5	95
2.5	5	95
2.6	95	5
3.0	95	5

Injection volume: 2 μL  
 Column temp.: 40 °C  
 Detection: UV @ 254 nm  
 Sampling rate: 40 pts/sec  
 Time constant: 0.05  
 Instrument: ACQUITY UPLC with ACQUITY UPLC TUV Detector and ACQUITY SQ Detector

### ACQUITY SQ Detector

ES+  
 Capillary: 3.5 kV  
 Cone: 35 V  
 Source temp.: 150 °C  
 Desolvation temp.: 500 °C  
 Cone gas flow: 50 L/Hr  
 Desolvation gas flow: 850 L/Hr  
 SIR: 373.2 m/z, 415.2 m/z  
 MS interscan delay: 0.005 sec  
 Dwell: 0.005 sec



### Protein precipitation procedure

- Spike plasma with 500 ng/mL of diltiazem and desacetyldiltiazem
- Take 200 μL of spiked plasma and add to 1.5 mL centrifuge tube
- Add 600 μL of acetonitrile to the centrifuge tube containing the spiked plasma
- Centrifuge for 10 minutes at 13,000 RPM
- Take 650 μL of supernatant and evaporate to dryness with nitrogen
- Reconstitute with 400 μL of a 50:50 MeOH:H<sub>2</sub>O solution (results in a 203.1 ng/mL conc.)



VanGuard Pre-Columns are uniquely designed to protect and prolong ACQUITY UPLC Column performance while contributing minimal chromatographic effects.

## TruView™ LCMS CERTIFIED



## Certified Vials

Waters offers a complete line of vials for all LC instrumentation. TruView™ LCMS Certified Vials are the premium choice for UPLC methods and they are the only vials in the industry that are tested for stringent dimension tolerances, UV and MS cleanliness, and polar analyte adsorption. Proprietary manufacturing processes limit the concentration of free ions on the glass surface, which significantly reduces analyte adsorption. Choosing a Waters Certified Vial provides consistent UPLC instrument operation without downtime due to mechanical failure such as injector needle damage or chemical contamination due to leaching from the glass, cap, or septum.

### Dimensional, chemical cleanliness, and adsorption test results

Attribute	Test	Result
Glass	Borosilicate, Type 1, Class A, 33 Expansion Glass	Pass
Dimensional Tests	Height	Pass
	Diameter	Pass
	Bottom Thickness	Pass
	Neck/Thread	Pass
Cap and Septum	Dimension	Pass
	Sealing	Pass
	Cleanliness	Pass
UV Test	LC-UV	Pass
pH Test	pH of Water	6.5
	pH in Vial	6.8
Adsorption Test	UPLC-MS/MS (MRM)	Pass
MS Scan Cleanliness Test	MS Scan	Pass

## Analytical Standards and Reagents

Quality standards and reagents play an integral role in achieving optimal performance and compliance using analytical instrumentation. Leading laboratories trust Waters to help them establish and document the performance of their LC instrumentation. Waters offers a broad range of calibration products and Quality Control (QC) Reference Materials to help you:

- Evaluate your system's ability to perform your assay
- Perform a wide range of testing from set up to calibration
- Monitor daily system proficiency and assay confidence
- Produce inter- and intra-laboratory reproducibility

Since chromatography can be complex and is dependent on many different variables, such as mobile phase composition, column type, and detection method, Waters has formulated specific mixtures of QC Reference Materials to test a variety of separation parameters. For more information on individual standards and reference materials for calibration, qualification, and tuning of instruments and detectors, please visit [asr.waters.com](http://asr.waters.com).





## Ordering Information



CORTECS UPLC Columns								
Dimension	Particle size	C <sub>18</sub> +	C <sub>18</sub>	T3	Shield RP18	C <sub>8</sub>	Phenyl	HILIC
2.1 x 30 mm	1.6 µm	186007113	186007092	186008496	186008691	186008398	186008378	186007103
2.1 x 50 mm	1.6 µm	186007114	186007093	186008497	186008692	186008399	186008379	186007104
2.1 x 75 mm	1.6 µm	186007115	186007094	186008498	186008693	186008400	186008380	186007105
2.1 x 100 mm	1.6 µm	186007116	186007095	186008499	186008694	186008401	186008381	186007106
2.1 x 150 mm	1.6 µm	186007117	186007096	186008500	186008695	186008402	186008382	186007107
3.0 x 30 mm	1.6 µm	186007118	186007097	186008501	186008701	186008408	186008388	186007108
3.0 x 50 mm	1.6 µm	186007119	186007098	186008502	186008702	186008409	186008389	186007109
3.0 x 75 mm	1.6 µm	186007120	186007099	186008503	186008703	186008410	186008390	186007110
3.0 x 100 mm	1.6 µm	186007121	186007100	186008504	186008704	186008411	186008391	186007111
3.0 x 150 mm	1.6 µm	186007122	186007102	186008505	186008705	186008412	186008392	186007112



ACQUITY UPLC BEH Columns							
Dimension	Particle size	C <sub>18</sub>	Shield RP18	C <sub>8</sub>	Phenyl	HILIC	Amide
1.0 x 50 mm	1.7 µm	186002344	186002851	186002875	186002882	186003457	186004848
1.0 x 100 mm	1.7 µm	186002346	186002852	186002876	186002883	186003458	186004849
1.0 x 150 mm	1.7 µm	186002347	186003373	186003374	186003375	186003459	186004850
2.1 x 30 mm	1.7 µm	186002349	186003909	186003910	186003911	—	186004839
2.1 x 50 mm	1.7 µm	186002350	186002853	186002877	186002884	186003460	186004800
2.1 x 75 mm	1.7 µm	186005604	186005605	186005606	186005607	186005608	186005657
2.1 x 100 mm	1.7 µm	186002352	186002854	186002878	186002885	186003461	186004801
2.1 x 150 mm	1.7 µm	186002353	186003376	186003377	186003378	186003462	186004802
3.0 x 30 mm	1.7 µm	186004659	186004667	186004663	186004671	—	186004803
3.0 x 50 mm	1.7 µm	186004660	186004668	186004664	186004672	186004675	186004804
3.0 x 75 mm	1.7 µm	186005609	186005610	186005661	186005612	186005613	186005658
3.0 x 100 mm	1.7 µm	186004661	186004669	186004665	186004673	186004676	186004805
3.0 x 150 mm	1.7 µm	186004690	186004670	186004666	186004674	186004677	186004806



ACQUITY UPLC CSH Columns				
Dimension	Particle size	C <sub>18</sub>	Fluoro-Phenyl	Phenyl-Hexyl
1.0 x 50 mm	1.7 µm	186005292	186005349	186005404
1.0 x 100 mm	1.7 µm	186005293	186005347	186005402
1.0 x 150 mm	1.7 µm	186005294	186005348	186005403
2.1 x 30 mm	1.7 µm	186005295	186005350	186005405
2.1 x 50 mm	1.7 µm	186005296	186005351	186005406
2.1 x 75 mm	1.7 µm	186005620	186005622	186005621
2.1 x 100 mm	1.7 µm	186005297	186005352	186005407
2.1 x 150 mm	1.7 µm	186005298	186005353	186005408
3.0 x 30 mm	1.7 µm	186005299	186005354	186005409
3.0 x 50 mm	1.7 µm	186005300	186005355	186005410
3.0 x 75 mm	1.7 µm	186005623	186005625	186005624
3.0 x 100 mm	1.7 µm	186005301	186005356	186005411
3.0 x 150 mm	1.7 µm	186005302	186005357	186005412



ACQUITY UPLC HSS Columns						
Dimension	Particle size	T3	C <sub>18</sub>	C <sub>18</sub> SB	Cyano	PFP
1.0 x 50 mm	1.8 µm	186003535	186003529	186004114	186005982	186005961
1.0 x 100 mm	1.8 µm	186003536	186003530	186004115	186005983	186005962
1.0 x 150 mm	1.8 µm	186003537	186003531	186004116	186005984	186005963
2.1 x 30 mm	1.8 µm	186003944	186003987	186004117	186005985	186005964
2.1 x 50 mm	1.8 µm	186003538	186003532	186004118	186005986	186005965
2.1 x 75 mm	1.8 µm	186005614	186005615	186005616	186005987	186005966
2.1 x 100 mm	1.8 µm	186003539	186003533	186004119	186005988	186005967
2.1 x 150 mm	1.8 µm	186003540	186003534	186004120	186005989	186005968
3.0 x 30 mm	1.8 µm	186004678	186004682	186004686	186005990	186005969
3.0 x 50 mm	1.8 µm	186004679	186004683	186004687	186005991	186005970
3.0 x 75 mm	1.8 µm	186005617	186005618	186005619	186005992	186005971
3.0 x 100 mm	1.8 µm	186004680	186004684	186004826	186005993	186005972
3.0 x 150 mm	1.8 µm	186004681	186004685	186004689	186005994	186005973



ACQUITY UPLC CSH VanGuard Pre-Columns

Dimension	Particle size	C <sub>18</sub>	Fluoro-Phenyl	Phenyl-Hexyl
2.1 x 5 mm	1.7 µm	186005303	186005358	186005413

ACQUITY UPLC BEH VanGuard Pre-Columns

Dimension	Particle size	C <sub>18</sub>	Shield RP18	C <sub>8</sub>	Phenyl	HILIC	Amide
2.1 x 5 mm	1.7 µm	186003975	186003977	186003978	186003979	186003980	186004799

ACQUITY UPLC HSS VanGuard Pre-Columns

Dimension	Particle size	T3	C <sub>18</sub>	C <sub>18</sub> SB	Cyano	PFP
2.1 x 5 mm	1.8 µm	186003976	186003981	186004136	186005995	186005974

CORTECS UPLC VanGuard Pre-Columns

Dimension	Particle size	C <sub>18</sub> +	C <sub>18</sub>	C <sub>8</sub>	HILIC	Phenyl
2.1 x 5 mm	1.6 µm	186007125	186007123	186008423	186007124	186008420

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**Waters Corporation**

34 Maple Street

Milford, MA 01757 U.S.A.

T: 1 508 478 2000

F: 1 508 872 1990

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