UPLC COLUMNS AND CONSUMABLES

TABLE OF CONTENTS

Introduction 111
- UPLC Columns 111
- Waters UPLC Particle Technology 111

CORTECS UPLC 1.6 µm Columns 112
- CORTECS UPLC C_{18}+ Columns 112
- CORTECS UPLC C_{18} Columns 113
- CORTECS UPLC HILIC Columns 113

ACQUITY UPLC CSH Columns 116
- ACQUITY UPLC CSH C_{18} Columns 116
- ACQUITY UPLC CSH Fluoro-Phenyl Columns 117
- ACQUITY UPLC CSH Phenyl-Hexyl Columns 117

ACQUITY UPLC BEH Columns 118
- ACQUITY UPLC BEH C_{18} and C_8 Columns 118
- ACQUITY UPLC BEH Shield RP18 Columns 118
- ACQUITY UPLC BEH Phenyl Columns 118
- ACQUITY UPLC BEH HILIC Columns 118

ACQUITY UPLC BEH Amide Columns 120
- Hydrophilic-Interaction Chromatography 120

ACQUITY UPLC HSS Columns 122
- ACQUITY UPLC HSS C_{18} 122
- ACQUITY UPLC HSS C_{18} SB 122
- ACQUITY UPLC HSS T3 122
- ACQUITY UPLC HSS Cyano 122
- ACQUITY UPLC HSS PFP 122
- ACQUITY UPLC Columns Selectivity Choices 123

VanGuard Pre-Columns 124

UPLC Column Kits 125
- Transfer Between LC Technology Platforms with Ease 125

INTRODUCTION

UPLC Columns

In 2004, separation science was revolutionized with the introduction of Ultra Performance Liquid Chromatography (UPLC Technology). Significant advances in instrumentation and column technology were made to achieve dramatic increases in resolution, speed, and sensitivity in liquid chromatography. For the first time, a holistic approach involving simultaneous innovations in particle technology and instrument design was endeavored to meet and overcome the challenges of the analytical laboratory. This was done in order to make analytical scientists more successful and businesses more profitable and productive.

For more than four decades, reducing stationary-phase particle size has been exploited to improve chromatographic separation efficiency. Until recently, LC technology had reached a plateau in which the benefits of reducing particle size could not be fully realized due to the negative influence of instrument band spreading and limited pressure range. The ACQUITY UPLC System has removed those barriers, enabling columns packed with smaller particles (1.6–1.8 µm) to reach their theoretical performance, while precisely delivering mobile phase at pressures up to 18,000 psi (1241 bar), thus providing a new level of chromatographic performance.

The Waters UPLC Column family continues to evolve and expand, now including 8 particle substrates (CORTECS, BEH 125Å, 130Å, 200Å, 300Å, and 450Å, HSS, and CSH™) and 24 chemistries which are scalable between HPLC and UPLC particle sizes. Additionally, 9 application-directed UPLC chemistries for SEC, amino acid analysis, proteins, peptides, oligonucleotides, and glycan analysis are available. With a number of selectivity choices for both small molecule and biopharmaceutical applications, Waters has a UPLC Column solution to meet your application needs.

Waters UPLC Particle Technology

CORTECS Solid-Core Particles

The CORTECS UPLC 1.6 µm solid-core particle is the newest addition to the Waters family of sub-2-µm particle offerings. Built on a silica-based, solid-core particle platform, CORTECS 1.6 µm particles are designed to achieve the highest levels of efficiency, especially when paired with low-dispersion instrumentation. CORTECS UPLC 1.6 µm Columns enable chromatographers to achieve greater resolution and peak capacity for complex analysis, faster throughput, and increased sensitivity.

Charged Surface Hybrid (CSH) Particles

The 1.7 µm Charged Surface Hybrid (CSH) particle is Waters third-generation hybrid particle technology. Based on Waters BEH particle technology, CSH particles incorporate a low level surface charge, designed to improve sample loadability and peak asymmetry in low-ionic-strength mobile phases, while maintaining the mechanical and chemical stability inherent in BEH particle technology.

Ethylene Bridged Hybrid (BEH) Particles

The 1.7 µm BEH particle is one of the key enablers behind UPLC Technology. It is available in 5 different pore sizes (125Å, 130Å, 200Å, 300Å, and 450Å) and several bonded phases for reversed-phase and hydrophilic-interaction chromatography and is applicable from small molecule to large biopharmaceutical analysis. Due to the intrinsic chemical stability of hybrid particle technology, a wider usable pH range (1–12) can be employed, enabling a versatile and robust separation technology for method development.

High Strength Silica (HSS) Particles

High pore volume HPLC particles do not possess the mechanical stability necessary to withstand the high pressures inherent of UPLC separations. This mechanical limitation led Waters material scientists to develop a new silica particle designed for high mechanical stability and appropriate morphology necessary to provide long column lifetimes and UPLC efficiencies at high pressures. The 1.8 µm High Strength Silica (HSS) particle is the first and only 100% silica particle designed, tested, and intended for use in applications up to 18,000 psi (1241 bar).

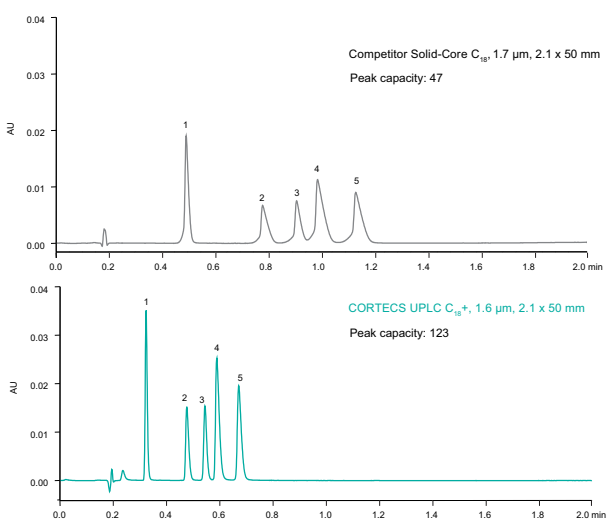
	Particle Type	Particle Size	Maximum Rated Pressure	Pore Diameter/Volume	Surface Area	Available Chemistries	pH Range
CORTECS COLUMNS	Solid Core	1.6 µm	18,000 psi (1241 bar)	90Å/0.26 mL/g	100 m^2/g	C_{18}+, C_{18}, HILIC	C_{18}+, C_{18} (2–8); HILIC (1–5)
CSH Technology	Charged Surface Hybrid (CSH)	1.7 µm	18,000 psi (1241 bar)	130Å/0.7 mL/g	185 m^2/g	C_{18}, Phenyl-Hexyl, Fluoro-Phenyl	C_{18}, Phenyl-Hexyl (1–11); Fluoro-Phenyl (1–8)
BEH Technology	Ethylene Bridged Hybrid (BEH)	—	—	125Å/0.7 mL/g	398 m^2/g	Diol	Diol (1–8)
		—	—	130Å/0.7 mL/g	185 m^2/g	C_{18}, C_8, Shield RP18, Phenyl, HILIC, Amide	C_{18}, C_8, Phenyl (1–12); RP18, Amide (2–11); HILIC (1–9)
		1.7 µm	18,000 psi (1241 bar)	200Å/0.7 mL/g	216 m^2/g	Diol	Diol (1–8)
		—	—	300Å/0.7 mL/g	90 m^2/g	C_{18}, C_4	C_{18} (1–12); C_4 (1–10)
		2.5 µm	—	BEH 450Å/0.7 mL/g	80 m^2/g	Diol	Diol (1–8)
HSS HIGH STRENGTH SILICA	High-Strength Silica (HSS)	1.8 µm	18,000 psi (1241 bar)	100Å/0.7 mL/g	230 m^2/g	C_{18}, T3, C_{18} SB, Cyano, PFP	C_{18} (1–8); T3, C_{18} SB, Cyano, PFP (2–8)

CORTECS UPLC 1.6 µm COLUMNS

CORTECS UPLC C_{18}+ Columns

The greatest benefit of Charged Surface Hybrid (CSH Technology), is improved peak shape and loading capacity for basic analytes using low-ionic strength, acidic-mobile phases. C_{18}+, similar to CSH Technology, imparts a low-level positive charge to the CORTECS particle surface which enables the use of low-ionic strength formic acid mobile phases in place of ion-pairing reagents like trifluoroacetic acid.

Improved Peak Shape of Basic Analytes with CORTECS UPLC C_{18}+ Columns



Comparative separations may not be representative in all applications.

Column:	CORTECS UPLC C_{18}+, 1.6 µm, 2.1 x 50 mm (p/n: 186007114)
	Competitor Solid-Core C_{18}, 1.7 µm, 2.1 x 50 mm
System:	ACQUITY UPLC H-Class with ACQUITY PDA
Mobile phase A:	0.1% formic acid in water
Mobile phase B:	0.1% formic acid in acetonitrile
Gradient:	28–35% B over 3 minutes
Flow rate:	0.6 mL/min
Injection volume:	1.0 µL
Column temp.:	40 °C
Detection:	UV at 254 nm
Sample concentration:	10 µg/mL

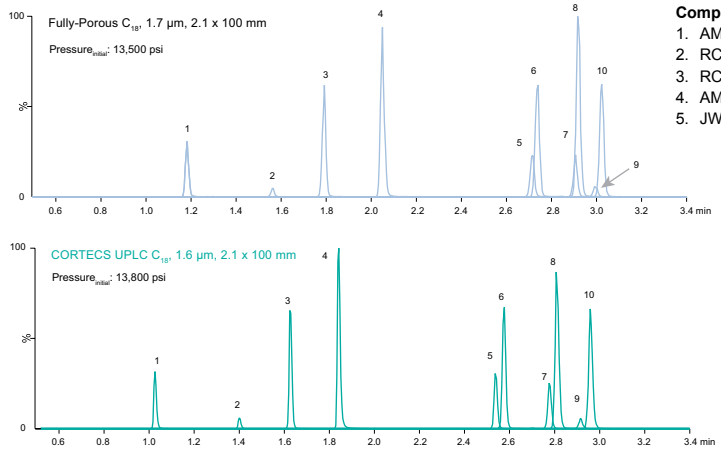
Compounds:
1. Nordoxepin
2. Protriptyline
3. Nortriptyline
4. Amitriptyline
5. Trimipramine

Improved peak shape of basic compounds using a CORTECS UPLC C_{18}+ Column, compared to a competitor C_{18} solid-core particle column results in much higher peak capacity for the CORTECS UPLC Column separation using the same method conditions.

CORTECS UPLC C_{18} Columns

Most chromatographers choose C_{18} ligands for their excellent retention and stability. The CORTECS C_{18} material is a traditional C_{18} bonded phase that exhibits balanced retention of acids, bases, and neutrals at low- and mid-range pH, and provide superb efficiency, resolution, and retention for complex analyte mixtures.

Greater Resolution for Synthetic Cannabinoids on a CORTECS UPLC C_{18} Column



Compounds:

1. AM 2223
2. RCS-4, M10
3. RCS-4, M11
4. AM 1248
5. JWH-073 4-butanoic acid metabolite
6. JWH-073 4-hydroxybutyl metabolite
7. JWH-018 5-pentanoic acid metabolite
8. JWH-073 (+/-) 3-hydroxybutyl metabolite
9. JWH--10 50hydroxypentyl metabolite
10. JWH-018 (+/-) 4-hydroxypentyl metabolite

System:	ACQUITY UPLC
Column:	CORTECS UPLC C_{18}, 1.6 µm, 2.1 x 100 mm (p/n: 186007095)
Column temp.:	30 °C
Injection volume:	10 µL
Flow rate:	0.6 mL/min
Mobile phase A:	0.1% formic acid in Milli-Q® water
Mobile phase B:	0.1% formic acid in acetonitrile

Gradient:

Time (min)	%A	%B	Curve
Initial	70	30	–
2.0	50	50	6
3.0	50	50	6
7.0	10	90	6
7.2	70	30	6
8.0	70	30	6

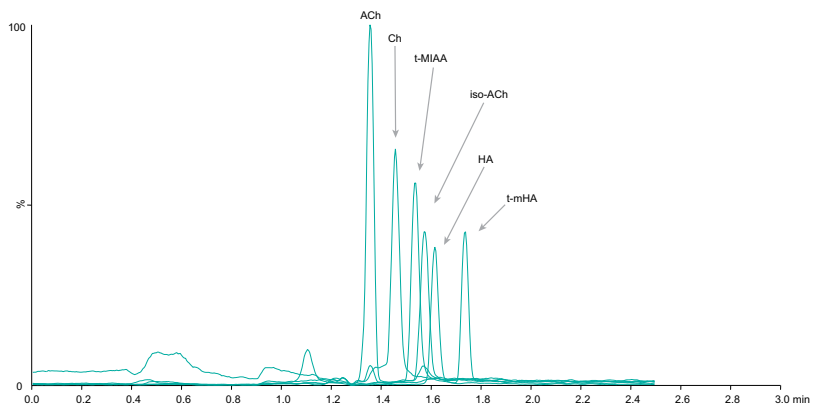
Comparative separations may not be representative in all applications.

UPLC-MS/MS analysis of synthetic cannabinoids and metabolites at 10 ng/mL using a CORTECS UPLC C_{18} Column, compared to a fully-porous C_{18}, 1.7 µm, 2.1 x 100 mm column at 0.6 mL/min. The analysis was performed on an ACQUITY UPLC System with a Xevo® TQD Mass Spectrometer, using the same method for both columns. Co-elution is evident on the fully-porous column for peaks 5/6, 7/8 and 9/10 (isobaric), but these are sufficiently resolved for quantitation on the CORTECS UPLC C_{18}, 1.6 µm Column.

CORTECS UPLC HILIC Columns

Hydrophilic-interaction chromatography (HILIC) is a separation mode that can be used to improve the retention of extremely polar analytes. CORTECS UPLC HILIC Columns are unbonded solid-core particles specifically designed for this application. HILIC uses mobile phases with a high concentration of organic solvent which enables effective desolvation of analytes in the MS source, resulting in improved MS response and sensitivity.

Retention and Resolution of Neurotransmitters on CORTECS UPLC HILIC Column



System:	ACQUITY UPLC
Column:	CORTECS UPLC HILIC, 1.6 µm, 2.1 mm x 100 mm, (p/n: 186007106)
Mobile phase A:	100 mM ammonium formate, pH 3
Mobile phase B:	Acetonitrile

Gradient:

Time (min)	%A	%B	Curve
Initial	10	90	–
0.75	40	60	6
1.00	40	60	6
1.25	70	30	6
1.90	10	90	11

Flow rate:	0.5 mL/min
Column temp.:	45 °C
Sample temp.:	6 °C
Injection volume:	10 µL
Run time:	2.5 min

UPLC-MS/MS analysis of neurotransmitters at 280–1100 pg/mL in artificial cerebrospinal fluid (aCSF) using a CORTECS UPLC HILIC, 1.6 µm, 2.1 x 100 mm Column and a Xevo TQ-S Mass Spectrometer. These compounds are highly polar and will typically be poorly retained in reversed-phase LC.

CORTECS UPLC Columns

Chemistry	Particle Size	Dimension	Part No. 1/pk	Part No. 3/pk
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 30 mm	186007113	176003166
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 50 mm	186007114	176003167
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 75 mm	186007115	176003168
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 100 mm	186007116	176003169
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 150 mm	186007117	176003170
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 30 mm	186007118	176003171
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 50 mm	186007119	176003172
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 75 mm	186007120	176003173
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 100 mm	186007121	176003174
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 150 mm	186007122	176003175
CORTECS UPLC C_{18}	1.6 µm	2.1 x 30 mm	186007092	176003146
CORTECS UPLC C_{18}	1.6 µm	2.1 x 50 mm	186007093	176003147
CORTECS UPLC C_{18}	1.6 µm	2.1 x 75 mm	186007094	176003148
CORTECS UPLC C_{18}	1.6 µm	2.1 x 100 mm	186007095	176003149
CORTECS UPLC C_{18}	1.6 µm	2.1 x 150 mm	186007096	176003150
CORTECS UPLC C_{18}	1.6 µm	3.0 x 30 mm	186007097	176003151
CORTECS UPLC C_{18}	1.6 µm	3.0 x 50 mm	186007098	176003152
CORTECS UPLC C_{18}	1.6 µm	3.0 x 75 mm	186007099	176003153
CORTECS UPLC C_{18}	1.6 µm	3.0 x 100 mm	186007100	176003154
CORTECS UPLC C_{18}	1.6 µm	3.0 x 150 mm	186007102	176003155
CORTECS UPLC HILIC	1.6 µm	2.1 x 30 mm	186007103	176003156
CORTECS UPLC HILIC	1.6 µm	2.1 x 50 mm	186007104	176003157
CORTECS UPLC HILIC	1.6 µm	2.1 x 75 mm	186007105	176003158
CORTECS UPLC HILIC	1.6 µm	2.1 x 100 mm	186007106	176003159
CORTECS UPLC HILIC	1.6 µm	2.1 x 150 mm	186007107	176003160
CORTECS UPLC HILIC	1.6 µm	3.0 x 30 mm	186007108	176003161
CORTECS UPLC HILIC	1.6 µm	3.0 x 50 mm	186007109	176003162
CORTECS UPLC HILIC	1.6 µm	3.0 x 75 mm	186007110	176003163
CORTECS UPLC HILIC	1.6 µm	3.0 x 100 mm	186007111	176003164
CORTECS UPLC HILIC	1.6 µm	3.0 x 150 mm	186007112	176003165

CORTECS UPLC Columns Method Validation Kits (MVK)*

Chemistry	Particle Size	Dimension	Part No.
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 30 mm	186007176
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 50 mm	186007177
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 75 mm	186007178
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 100 mm	186007179
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 150 mm	186007180
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 30 mm	186007181
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 50 mm	186007182
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 75 mm	186007183
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 100 mm	186007184
CORTECS UPLC C_{18}+	1.6 µm	3.0 x 150 mm	186007185
CORTECS UPLC C_{18}	1.6 µm	2.1 x 30 mm	186007156
CORTECS UPLC C_{18}	1.6 µm	2.1 x 50 mm	186007157
CORTECS UPLC C_{18}	1.6 µm	2.1 x 75 mm	186007158
CORTECS UPLC C_{18}	1.6 µm	2.1 x 100 mm	186007159
CORTECS UPLC C_{18}	1.6 µm	2.1 x 150 mm	186007160
CORTECS UPLC C_{18}	1.6 µm	3.0 x 30 mm	186007161
CORTECS UPLC C_{18}	1.6 µm	3.0 x 50 mm	186007162
CORTECS UPLC C_{18}	1.6 µm	3.0 x 75 mm	186007163
CORTECS UPLC C_{18}	1.6 µm	3.0 x 100 mm	186007164
CORTECS UPLC C_{18}	1.6 µm	3.0 x 150 mm	186007165
CORTECS UPLC HILIC	1.6 µm	2.1 x 30 mm	186007166
CORTECS UPLC HILIC	1.6 µm	2.1 x 50 mm	186007167
CORTECS UPLC HILIC	1.6 µm	2.1 x 75 mm	186007168
CORTECS UPLC HILIC	1.6 µm	2.1 x 100 mm	186007169
CORTECS UPLC HILIC	1.6 µm	2.1 x 150 mm	186007170
CORTECS UPLC HILIC	1.6 µm	3.0 x 30 mm	186007171
CORTECS UPLC HILIC	1.6 µm	3.0 x 50 mm	186007172
CORTECS UPLC HILIC	1.6 µm	3.0 x 75 mm	186007173
CORTECS UPLC HILIC	1.6 µm	3.0 x 100 mm	186007174
CORTECS UPLC HILIC	1.6 µm	3.0 x 150 mm	186007175

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

VanGuard™ Pre-Columns (Guard Columns) 3/pk

Chemistry	Particle Size	Dimension	Part No.
CORTECS UPLC C_{18}+	1.6 µm	2.1 x 5 mm	186007125
CORTECS UPLC C_{18}	1.6 µm	2.1 x 5 mm	186007123
CORTECS UPLC HILIC	1.6 µm	2.1 x 5 mm	186007124

Did you know...

CORTECS Solid-Core Columns are also available with 2.7 µm particles for HPLC and UHPLC systems.

For more information, see page 148

Quality Control Reference Materials (QCRMs)

Product Name	Intended Use	Chromatographic Mode	Systems	Contents	Part No.
Neutrals QCRM	Provides chromatographic performance information independent of mobile phase pH using 3 neutral probes.	Reversed-phase	All UPLC/HPLC with UV detection	▪ 10 µL/mL acetone, 0.25 mg/mL naphthalene, 0.4 mg/mL acenaphthene ▪ In a 2 mL solution of 50/50 acetonitrile/water ▪ Store at room temperature	186006360
Reversed-Phase QCRM	Provides chromatographic performance information inclusive of mobile phase pH using 1 void marker, 3 neutral, 1 acidic, 2 basic probes.	Reversed-phase	All UPLC/HPLC with UV detection	▪ 0.016 mg/mL uracil, 0.02 mg/mL butyl paraben, 0.06 mg/mL naphthalene, 0.4 mg/mL propranolol, 0.34 mg/mL dipropylphthalate, 0.2 mg/mL acenaphthene, 0.1 mg/mL amitriptyline ▪ In a 2 mL solution of 65/35 methanol/20 mM K_2HPO_4 buffer pH 7 ▪ Store at room temperature	186006363
HILIC QCRM	Provides chromatographic performance information inclusive of mobile phase pH in HILIC mode using 1 void marker, 1 polar neutral, 2 polar basic probes	HILIC	All UPLC/HPLC with UV detection, 0.0037 mg/mL Thymine, 0.0037 mg/mL Adenine, 0.0077 mg/mL Cytosine	▪ 0.0190 mg/mL acenaphthene, 0.0037 mg/mL thymine, 0.0037 mg/mL adenine ,0.0077 mg/mL cytosine ▪ In a 1 mL solution of 20/80 acetonitrile/water ▪ Store refrigerated 2–5 °C upon arrival	186007226
QDa QCRM	Provides chromatographic and ACQUITY QDa Mass Detector information using a 9 component mixture to cover a wide range of *m/z* in ESI (+-) in an optimized concentration for this detector. This solution contains 2 critical pairs to measure chromatographic performance.	Reversed-phase	All UPLC/HPLC with ACQUITY QDa Detector	▪ 100.0 µg/mL acetaminophen, 45.0 µg/mL caffeine, 50.0 µg/mL sulfaguanidine, 10.0 µg/mL, sulfadimethoxine, 25.0 µg/mL val-tyr-val, 6.0 µg/mL verapamil, 6.0 µg/mL terfenadine, 25.0 µg/mL leucine-enkephalin, 19.0 µg/mL reserpine ▪ In a 1 mL solution of 23.5% LC-MS acetonitrile, 76.5% LC-MS water, 0.007% formic acid ▪ Store refrigerated 2–5 °C	186007345
Quad LCMS QCRM	Provides chromatographic and quadrupole mass spectrometer information using an 8 component mixture to cover a wide range of *m/z* in ESI (+-) in an optimized concentration. This solution contains 1 critical pair to measure chromatographic performance.	Reversed-phase	All UPLC/HPLC with Quadrupole MS	▪ 8 component mix including: 100 µg/mL acetaminophen ,50 µg/mL sulfaguanidine, 10 µg/mL sulfadimethoxine, 25 µg/mL val,-tyr,-val, 6 µg/mL verapamil, 6 µg/mL terfenadine, 25 µg/mL leucine- enkephalin, 18 µg/mL reserpine ▪ In a 1 mL solution of 19%/81% acetonitrile/water 0.008% formic acid ▪ Store refrigerated 2–5 °C upon arrival	186007362
LCMS QCRM	Provides chromatographic and high performance mass spectrometer information using a 9 component mixture in an optimized concentration. This solution contains 2 critical pairs to measure chromatographic performance.	Reversed-phase	All UPLC/HPLC with high performance MS	▪ 9 component mix including: 10.0 µg/mL acetaminophen, 1.5 µg/mL caffeine, 5.0 µg/mL sulfaguanidine, 1.0 µg/mL sulfadimethoxine, 2.5 µg/mL val-tyr-val, 0.2 µg/mL verapamil, 0.2 µg/mL terfenadine, 2.5 µg/mL leucine-enkephalin, 0.6 µg/mL reserpine ▪ In a 500 µL solution of 5.7% acetonitrile/94.3% water ▪ Store refrigerated 2–5 °C upon arrival	186006963

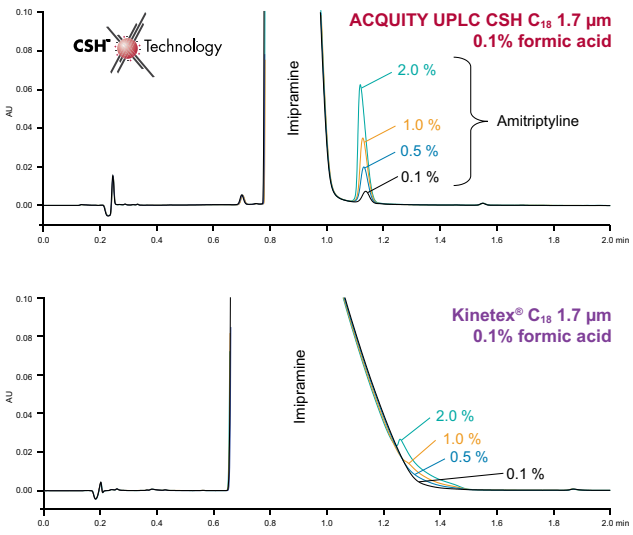
For a full list of Waters Analytical Standards and Reagents, visit **asr.waters.com**

ACQUITY UPLC CSH COLUMNS

ACQUITY UPLC CSH C_{18} Columns

The ACQUITY UPLC CSH C_{18} Columns overcome the poor peak shape encountered with most modern C_{18} columns in low ionic strength mobile phases (*i.e.*, 0.1% formic acid) due to low loading capacity. With a controlled, low-level positive surface charge, ACQUITY UPLC CSH C_{18} provides industry-leading peak shape for basic compounds without the need for ion-pairing reagents.

Trace Impurity Separation



LC Conditions

Columns:	ACQUITY UPLC CSH C_{18}, 1.7 µm, 2.1 x 50 mm, Kinetex C_{18}, 1.7 µm, 2.1 x 50 mm
Part number:	186005296
Mobile phase A:	Water
Mobile phase B:	Acetonitrile
Mobile phase C:	2% formic acid in water

Gradient:

Time (min)	Flow (mL/min)	Profile %A	%B	%C	Curve
0.6	70	25	5	Initial	Initial
2.0	0.6	60	35	5	6
3.0	0.6	0	95	5	6
3.1	0.6	70	25	5	6
5.0	0.6	70	25	5	6

Injection vol.:	5 µL
Sample diluent:	Water
Sample conc.:	Imipramine: 0.5 mg/mL; amitriptyline as indicated (% of imipramine)
Column temp.:	40 °C
Strong wash:	50/50 acetonitrile/water
Weak wash:	50/50 acetonitrile/water
Detection:	UV @ 254 nm
Sampling rate:	20 points/sec
Filter time Constant:	0.1 sec
System:	ACQUITY UPLC H-Class with ACQUITY UPLC PDA and ACQUITY SQ Detector

MS Conditions

Capillary:	3.0 kV (ES+)
Cone:	30 V
Extractor:	3 V
Desolv. temp.:	350 °C
Source temp.:	120 °C
Desolv gas:	800 L/hr
Scan range:	100 to 600 *m/z*
Scan rate:	5000 Da/sec

Comparative separations may not be representative of all applications.

ACQUITY UPLC CSH Columns

Chemistry	Particle Size	Dimension	Part No. 1/pk	Part No. 3/pk
CSH C_{18}	1.7 µm	1.0 x 50 mm	186005292	176002136
CSH C_{18}	1.7 µm	1.0 x 100 mm	186005293	176002137
CSH C_{18}	1.7 µm	1.0 x 150 mm	186005294	176002138
CSH C_{18}	1.7 µm	2.1 x 30 mm	186005295	176002139
CSH C_{18}	1.7 µm	2.1 x 50 mm	186005296	176002140
CSH C_{18}	1.7 µm	2.1 x 75 mm	186005620	—
CSH C_{18}	1.7 µm	2.1 x 100 mm	186005297	176002141
CSH C_{18}	1.7 µm	2.1 x 150 mm	186005298	176002142
CSH C_{18}	1.7 µm	3.0 x 30 mm	186005299	176002143
CSH C_{18}	1.7 µm	3.0 x 50 mm	186005300	176002144
CSH C_{18}	1.7 µm	3.0 x 75 mm	186005623	—
CSH C_{18}	1.7 µm	3.0 x 100 mm	186005301	176002145
CSH C_{18}	1.7 µm	3.0 x 150 mm	186005302	176002146
CSH Fluoro-Phenyl	1.7 µm	1.0 x 50 mm	186005349	176002150
CSH Fluoro-Phenyl	1.7 µm	1.0 x 100 mm	186005347	176002148
CSH Fluoro-Phenyl	1.7 µm	1.0 x 150 mm	186005348	176002149
CSH Fluoro-Phenyl	1.7 µm	2.1 x 30 mm	186005350	176002151
CSH Fluoro-Phenyl	1.7 µm	2.1 x 50 mm	186005351	176002152
CSH Fluoro-Phenyl	1.7 µm	2.1 x 75 mm	186005622	—
CSH Fluoro-Phenyl	1.7 µm	2.1 x 100 mm	186005352	176002153
CSH Fluoro-Phenyl	1.7 µm	2.1 x 150 mm	186005353	176002154
CSH Fluoro-Phenyl	1.7 µm	3.0 x 30 mm	186005354	176002155
CSH Fluoro-Phenyl	1.7 µm	3.0 x 50 mm	186005355	176002156
CSH Fluoro-Phenyl	1.7 µm	3.0 x 75 mm	186005625	—
CSH Fluoro-Phenyl	1.7 µm	3.0 x 100 mm	186005356	176002157
CSH Fluoro-Phenyl	1.7 µm	3.0 x 150 mm	186005357	176002158
CSH Phenyl-Hexyl	1.7 µm	1.0 x 50 mm	186005404	176002161
CSH Phenyl-Hexyl	1.7 µm	1.0 x 100 mm	186005402	176002159
CSH Phenyl-Hexyl	1.7 µm	1.0 x 150 mm	186005403	176002160
CSH Phenyl-Hexyl	1.7 µm	2.1 x 30 mm	186005405	176002162
CSH Phenyl-Hexyl	1.7 µm	2.1 x 50 mm	186005406	176002163
CSH Phenyl-Hexyl	1.7 µm	2.1 x 75 mm	186005621	—
CSH Phenyl-Hexyl	1.7 µm	2.1 x 100 mm	186005407	176002164
CSH Phenyl-Hexyl	1.7 µm	2.1 x 150 mm	186005408	176002165
CSH Phenyl-Hexyl	1.7 µm	3.0 x 30 mm	186005409	176002166
CSH Phenyl-Hexyl	1.7 µm	3.0 x 50 mm	186005410	176002167
CSH Phenyl-Hexyl	1.7 µm	3.0 x 75 mm	186005624	—
CSH Phenyl-Hexyl	1.7 µm	3.0 x 100 mm	186005411	176002168
CSH Phenyl-Hexyl	1.7 µm	3.0 x 150 mm	186005412	176002169

ACQUITY UPLC CSH Fluoro-Phenyl Columns

One of the challenges in designing stationary phases with large selectivity differences is maintaining an acceptable level of batch-to-batch reproducibility. Many commercially available columns with unique selectivities suffer from significant variability, particularly phases bonded with a pentafluorophenyl (PFP) ligand.

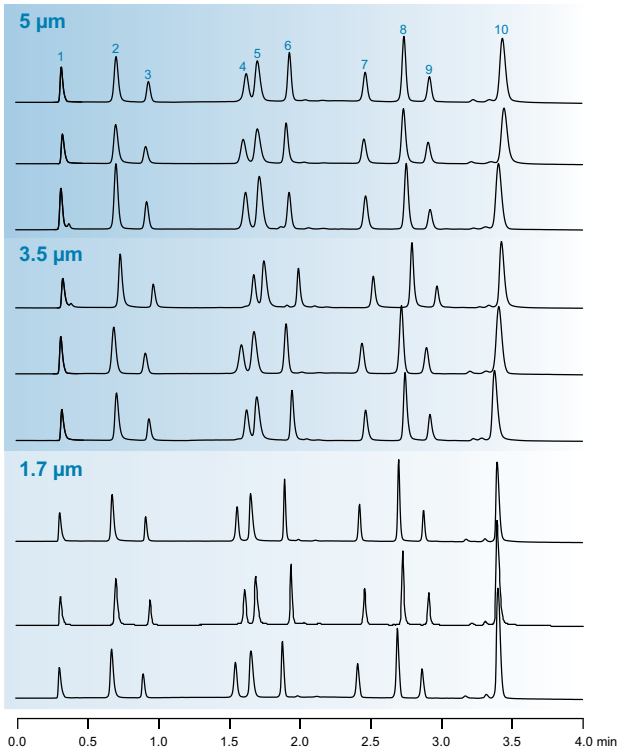
The 1.7 µm ACQUITY UPLC CSH Fluoro-Phenyl Columns overcome this limitation due to the CSH Technology bonding process. This process not only yields exceptional batch-to-batch reproducibility, but sustained selectivity across particle sizes with its HPLC analog, XSelect CSH Fluoro-Phenyl (available in 2.5, 3.5, and 5 µm particle sizes).

Reproducibility and Scalability of ACQUITY UPLC CSH Fluoro-Phenyl (1.7 µm) and XSelect CSH Fluoro-Phenyl (3.5, 5 µm) Columns

Columns:	ACQUITY UPLC CSH Fluoro-Phenyl, 1.7 µm, 2.1 x 50 mm XSelect CSH Fluoro-Phenyl, 3.5 and 5 µm, 2.1 x 50 mm
Part numbers:	186005351 (1.7 µm), 186005310 (3.5 µm), 186005329 (5 µm)
Gradient A:	15.4 mM ammonium formate, pH 3
Gradient B:	Acetonitrile 5 to 90% B linear in 5 minutes
Column temp.:	30 °C
Injection vol.:	5 µL
Detection:	UV @ 254 nm
Flow rate:	0.5 mL/min
System:	ACQUITY UPLC

Compounds:
1. Thiourea
2. Resorcinol
3. Metoprolol
4. 3-Nitrophenol
5. 2-Chlorobenzoic acid
6. Amitriptyline
7. Diethylphthalate
8. Fenoprofen
9. Dipropylphthalate
10. Pyrenesulfonic acid

ACQUITY UPLC and XSelect CSH Fluoro-Phenyl



ACQUITY UPLC CSH Phenyl-Hexyl Columns

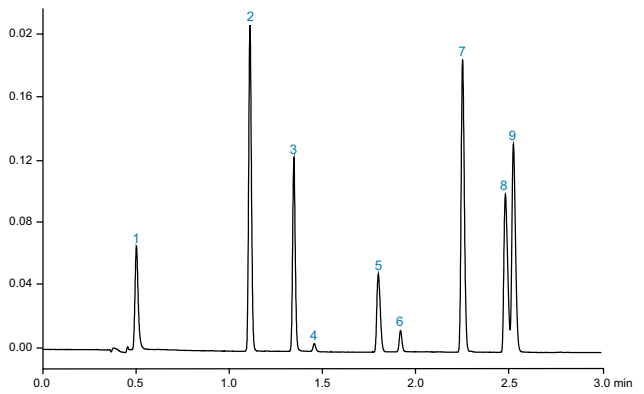
ACQUITY UPLC CSH Phenyl-Hexyl Columns provide complementary selectivity compared to straight-chain-alkyl C_{18} columns, particularly for aromatic species.

With a controlled, low-level positive surface charge, ACQUITY UPLC CSH Phenyl-Hexyl Columns provide industry-leading peak shape for basic analytes in low-pH mobile phases.

Fast Separation of Basic Drugs on an ACQUITY UPLC CSH Phenyl-Hexyl Column

Column:	ACQUITY UPLC CSH Phenyl-Hexyl, 1.7 µm, 2.1 x 50 mm
Part number:	186005406
Mobile p A:	10 mM ammonium formate, pH 3
Mobile phase B:	Acetonitrile; 5 to 55% B
Gradient:	Linear in 3 minutes
Injection vol.:	4 µL
Column temp.:	30 °C
Detection:	UV @ 260 nm
System:	ACQUITY UPLC with ACQUITY UPLC PDA

Compounds:
1. Aminopyrazine
2. Pindolol
3. Quinine
4. Quinine impurity
5. Labetalol
6. Diltiazem impurity
7. Diltiazem
8. Verapamil
9. Amitriptyline



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You can request Certificates of Analysis on our website?

Go to: www.waters.com and look for "Request Certificate of Analysis" under "Services and Support".

ACQUITY UPLC BEH COLUMNS

ACQUITY UPLC BEH C_{18} and C_8 Columns

Providing unprecedented levels of peak asymmetry, efficiency and chemical stability, the 1.7 µm ACQUITY UPLC BEH C_{18} and C_8 Columns are versatile, high-performance separation columns suitable for a diverse range of analytes. With the ability to operate between pH 1–12, these trifunctionally-bonded alkyl columns can employ the power of pH to impact the retention, selectivity, and sensitivity of ionizable compounds while delivering exceptional low- and high-pH stability.

ACQUITY UPLC BEH Shield RP18 Columns

ACQUITY UPLC BEH Shield RP18 Columns incorporate a hydrophilic carbamate group within a C_{18} chain to produce exceptional peak shape for basic compounds. They also provide alternate selectivity, compared to straight-chain-alkyl columns.

ACQUITY UPLC BEH Phenyl Columns

ACQUITY UPLC BEH Phenyl Columns incorporate a trifunctionally bonded phenyl-hexyl ligand to provide industry-leading pH stability, batch-to-batch reproducibility and exceptional peak shape compared to other commercially available phenyl columns. They are designed to provide complementary selectivity to straight-chain-alkyl columns, particularly for analytes containing aromatic rings.

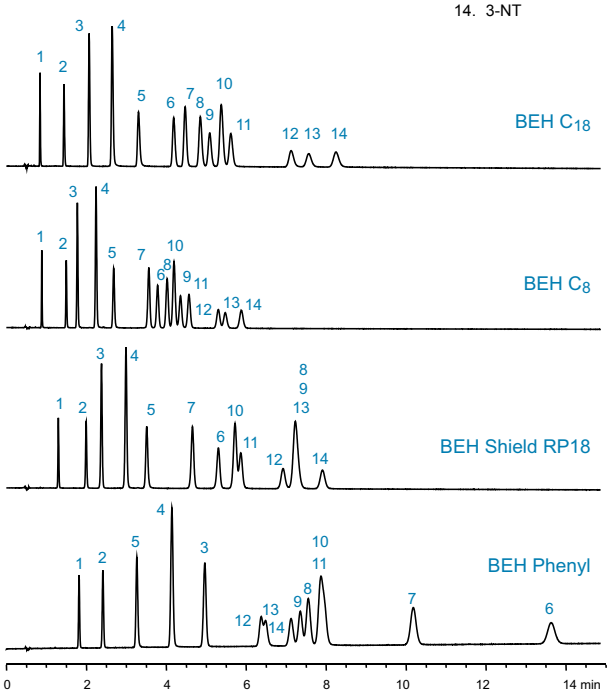
ACQUITY UPLC BEH HILIC Columns

ACQUITY UPLC BEH HILIC Columns utilize an unbonded BEH particle to improve the retention of very polar species, as well as provide an orthogonal separation mode for mixtures of polar and ionizable compounds.

Separation of Explosives on ACQUITY UPLC BEH Columns

Column:	ACQUITY UPLC BEH, 1.7 µm, 2.1 x 100 mm
Part numbers:	186002352 (C_{18}), 186002878 (C_8), 186002854 (RP18), 186002885 (Phenyl)
Mobile phase A:	Water
Mobile phase B:	Methanol
Flow rate:	0.5 mL/min
Isocratic mobile Phase composition:	72% A; 28% B
Injection vol.:	5 µL
Sample conc.:	10 µg/mL
Column temp.:	50 °C
Detection:	UV @ 254 nm
System:	ACQUITY UPLC with PDA Detector

Compounds:
1. HMX
2. RDX
3. 1,3,5-TNB
4. 1,3-DNB
5. 5NB
6. Tetryl
7. TNT
8. 2-Am-4,6 DNT
9. 4-Am-2,6 DNT
10. 2,4 DNT
11. 2,6-DNT
12. 2-NT
13. 4-NT
14. 3-NT



These columns are optimized and tested to produce efficient, reproducible separations under UPLC HILIC conditions and are designed to overcome chemical stability, a major weakness of HILIC stationary phases. The rugged BEH particle's wide usable pH range overcomes this chemical instability and results in long column lifetimes.

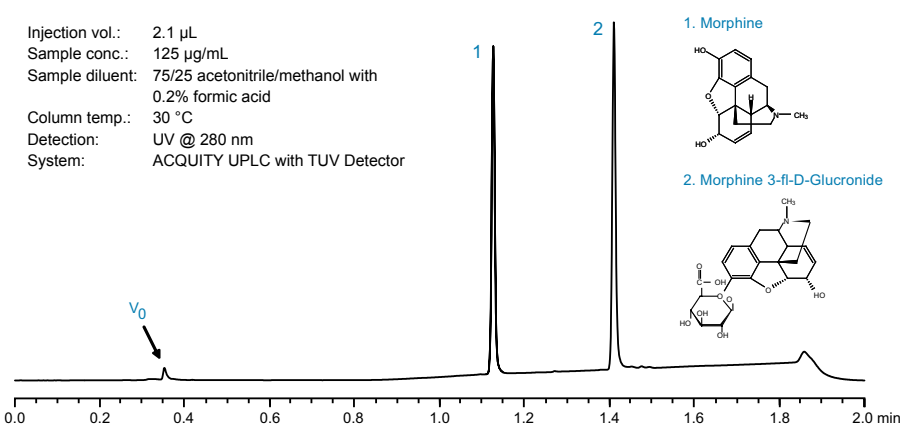
Separation of Very Polar Bases using ACQUITY UPLC BEH HILIC Columns

Column:	ACQUITY UPLC BEH HILIC, 1.7 µm, 2.1 x 100 mm
Part number:	186003461
Mobile phase A:	10 mM ammonium formate, 0.2% formic acid in 50/50 acetonitrile/water
Mobile phase B:	10 mM ammonium formate, 0.2% formic acid in 90/10 acetonitrile/water
Flow rate:	0.788 mL/min

Gradient:

Time (min)	Profile %A	%B
0.00	0.1	99.9
0.37	0.1	99.9
1.46	99.9	0.1
1.50	0.1	99.9
2.00	0.1	99.9

Injection vol.:	2.1 µL
Sample conc.:	125 µg/mL
Sample diluent:	75/25 acetonitrile/methanol with 0.2% formic acid
Column temp.:	30 °C
Detection:	UV @ 280 nm
System:	ACQUITY UPLC with TUV Detector



ACQUITY UPLC BEH Columns

Chemistry	Particle Size	Dimension	Part No. 1/pk	Part No. 3/pk
BEH C_{18}	1.7 µm	1.0 x 50 mm	186002344	176000861
BEH C_{18}	1.7 µm	1.0 x 100 mm	186002346	176000862
BEH C_{18}	1.7 µm	1.0 x 150 mm	186002347	176001044
BEH C_{18}	1.7 µm	2.1 x 30 mm	186002349	176001304
BEH C_{18}	1.7 µm	2.1 x 50 mm	186002350	176000863
BEH C_{18}	1.7 µm	2.1 x 75 mm	186005604	—
BEH C_{18}	1.7 µm	2.1 x 100 mm	186002352	176000864
BEH C_{18}	1.7 µm	2.1 x 150 mm	186002353	176001048
BEH C_{18}	1.7 µm	3.0 x 30 mm	186004659	176001794
BEH C_{18}	1.7 µm	3.0 x 50 mm	186004660	176001795
BEH C_{18}	1.7 µm	3.0 x 75 mm	186005609	—
BEH C_{18}	1.7 µm	3.0 x 100 mm	186004661	176001796
BEH C_{18}	1.7 µm	3.0 x 150 mm	186004690	176001797
BEH Shield RP18	1.7 µm	1.0 x 50 mm	186002851	176000874
BEH Shield RP18	1.7 µm	1.0 x 100 mm	186002852	176000875
BEH Shield RP18	1.7 µm	1.0 x 150 mm	186003373	176001045
BEH Shield RP18	1.7 µm	2.1 x 30 mm	186003909	176001309
BEH Shield RP18	1.7 µm	2.1 x 50 mm	186002853	176000876
BEH Shield RP18	1.7 µm	2.1 x 75 mm	186005605	—
BEH Shield RP18	1.7 µm	2.1 x 100 mm	186002854	176000877
BEH Shield RP18	1.7 µm	2.1 x 150 mm	186003376	176001049
BEH Shield RP18	1.7 µm	3.0 x 30 mm	186004667	176001802
BEH Shield RP18	1.7 µm	3.0 x 50 mm	186004668	176001803
BEH Shield RP18	1.7 µm	3.0 x 75 mm	186005610	—
BEH Shield RP18	1.7 µm	3.0 x 100 mm	186004669	176001804
BEH Shield RP18	1.7 µm	3.0 x 150 mm	186004670	176001805
BEH C_8	1.7 µm	1.0 x 50 mm	186002875	176000882
BEH C_8	1.7 µm	1.0 x 100 mm	186002876	176000883
BEH C_8	1.7 µm	1.0 x 150 mm	186003374	176001046
BEH C_8	1.7 µm	2.1 x 30 mm	186003910	176001310
BEH C_8	1.7 µm	2.1 x 50 mm	186002877	176000884
BEH C_8	1.7 µm	2.1 x 75 mm	186005606	—
BEH C_8	1.7 µm	2.1 x 100 mm	186002878	176000885
BEH C_8	1.7 µm	2.1 x 150 mm	186003377	176001050
BEH C_8	1.7 µm	3.0 x 30 mm	186004663	176001798
BEH C_8	1.7 µm	3.0 x 50 mm	186004664	176001799
BEH C_8	1.7 µm	3.0 x 75 mm	186005611	—
BEH C_8	1.7 µm	3.0 x 100 mm	186004665	176001800
BEH C_8	1.7 µm	3.0 x 150 mm	186004666	176001801
BEH Phenyl	1.7 µm	1.0 x 50 mm	186002882	176000905
BEH Phenyl	1.7 µm	1.0 x 100 mm	186002883	176000906
BEH Phenyl	1.7 µm	1.0 x 150 mm	186003375	176001047
BEH Phenyl	1.7 µm	2.1 x 30 mm	186003911	176001311
BEH Phenyl	1.7 µm	2.1 x 50 mm	186002884	176000907
BEH Phenyl	1.7 µm	2.1 x 75 mm	186005607	—
BEH Phenyl	1.7 µm	2.1 x 100 mm	186002885	176000908
BEH Phenyl	1.7 µm	2.1 x 150 mm	186003378	176001051
BEH Phenyl	1.7 µm	3.0 x 30 mm	186004671	176001806
BEH Phenyl	1.7 µm	3.0 x 50 mm	186004672	176001807
BEH Phenyl	1.7 µm	3.0 x 75 mm	186005612	—
BEH Phenyl	1.7 µm	3.0 x 100 mm	186004673	176001808
BEH Phenyl	1.7 µm	3.0 x 150 mm	186004674	176001809

ACQUITY UPLC BEH AMIDE COLUMNS

Hydrophilic-Interaction Chromatography

Since 2003, Waters has developed innovative stationary phases for hydrophilic-interaction chromatography (HILIC) to overcome the challenge of retaining and separating extremely polar compounds. Based on Waters novel BEH particle technology, ACQUITY UPLC BEH Amide Columns utilize a chemically stable, trifunctionally-bonded amide phase, enabling a new dimension in stability and versatility for HILIC separations.

Designed to retain polar analytes and metabolites that are too polar to retain by reversed-phase (RP) chromatography, ACQUITY UPLC BEH Amide Columns facilitate the use of a wide range of mobile-phase pH (2–11) to facilitate the exceptional retention of polar analytes spanning a wide range in polarity, structural moiety, and pK_a.

In addition to enhanced retention of polar compounds, ACQUITY UPLC BEH Amide Columns provide increased mass spectrometry response, direct compatibility with sample preparation eluates (PPT, LLE, and SPE) as well as orthogonal selectivity compared to reversed-phase materials, making HILIC an attractive alternative separation technique.

Carbohydrate Analysis

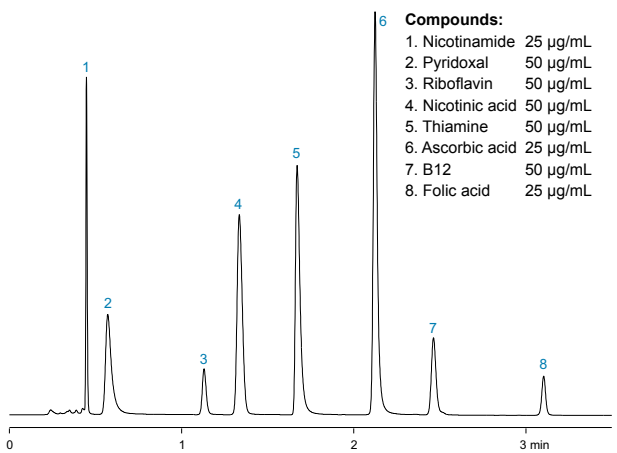
One of the most abundant and diverse classes of compounds analyzed by HILIC are carbohydrates (*e.g.*, monosaccharides, disaccharides, oligosaccharides, and polysaccharides).

ACQUITY UPLC BEH Amide Columns are exceptional tools for the analysis of carbohydrates, providing the following benefits:

- The 1.7 µm particle size enables high resolution and high speed analysis of carbohydrates in complex sample matrices while maintaining or improving chromatographic resolution.
- Increased chemical stability enables the use of high pH and high temperature to collapse reducing sugar anomers, shorten analysis times, and improve MS detection.
- BEH particle technology, in combination with a trifunctionally-bonded amide phase, provides exceptional column lifetime, thus improving assay robustness.
- Unlike amine-based columns used for carbohydrate analysis, the ACQUITY UPLC BEH Amide Column is not susceptible to Schiff-base formation, thus improving quantitation accuracy.
- High pH mobile-phase compatibility facilitates MS detection without the need for derivatization, post column addition, or complexing with a metal cation, thus dramatically simplifying sample pre-treatment before LC-MS analysis and improving assay sensitivity.

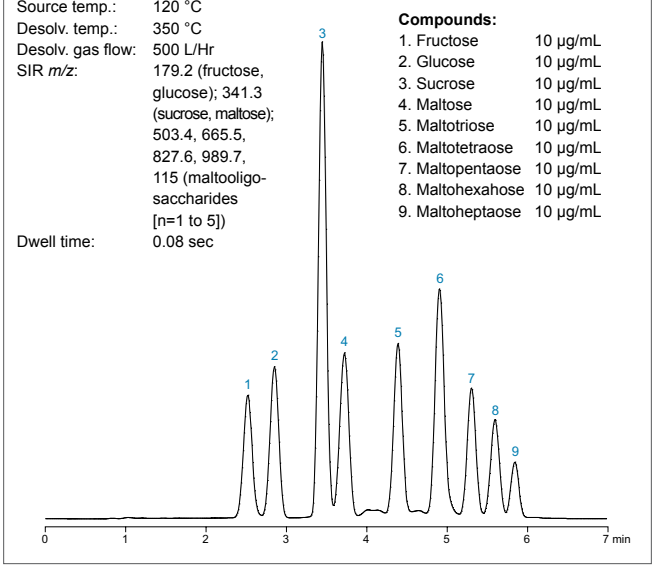
Separation of Water Soluble Vitamins

Column:	ACQUITY UPLC BEH Amide, 1.7 µm, 2.1 x 50 mm
Part number:	186004800
Mobile phase A:	50/50 acetonitrile/water with 10 mM ammonium acetate and 0.04% ammonium hydroxide, pH 9.0
Mobile phase B:	90/10 acetonitrile/water with 10 mM ammonium acetate and 0.04% ammonium hydroxide, pH 9.0
Flow rate:	0.5 mL/min
Gradient:	Time (min) / Profile %A %B: 0.00 0.1 99.9; 3.50 70.0 30.0; 3.51 0.1 99.9; 7.50 0.1 99.9
Injection vol.:	5.0 µL (PLNO)
Sample diluent:	75/25 acetonitrile/methanol with 0.2% formic acid
Column temp.:	30 °C
Weak needle wash:	95/5 acetonitrile/water
Detection:	UV @ 265 nm
Sampling rate:	20 points/sec
Filter time constant:	Normal
System:	ACQUITY UPLC with ACQUITY UPLC PDA Detector



UPLC-MS Analysis of Saccharides

Column:	ACQUITY UPLC BEH Amide, 1.7 µm, 2.1 x 50 mm
Part number:	186004800
Mobile phase A:	30/70 acetonitrile/water with 0.10% ammonium hydroxide
Mobile phase B:	80/20 acetonitrile/water with 0.10% ammonium hydroxide
Flow rate:	0.17 mL/min
Gradient:	Time (min) / Profile %A %B: Initial 0 100; 5.00 60 40; 5.01 0 100
Injection vol.:	0.7 µL (PLNO)
Sample diluent:	50/50 acetonitrile/water
Column temp.:	35 °C
Needle wash:	75/25 acetonitrile/water
System:	ACQUITY UPLC with ACQUITY UPLC TQD Dectector
Ionization mode:	ES-
Capillary:	2.8 kV
Cone voltage:	25 V
Source temp.:	120 °C
Desolv. temp.:	350 °C
Desolv. gas flow:	500 L/Hr
SIR *m/z*:	179.2 (fructose, glucose); 341.3 (sucrose, maltose); 503.4, 665.5, 827.6, 989.7, 115 (maltooligosaccharides [n=1 to 5])
Dwell time:	0.08 sec



ACQUITY UPLC BEH HILIC Columns				
Chemistry	Particle Size	Dimension	Part No. 1/pk	Part No. 3/pk
BEH HILIC	1.7 µm	1.0 x 50 mm	186003457	176001089
BEH HILIC	1.7 µm	1.0 x 100 mm	186003458	176001090
BEH HILIC	1.7 µm	1.0 x 150 mm	186003459	176001091
BEH HILIC	1.7 µm	2.1 x 50 mm	186003460	176001092
BEH HILIC	1.7 µm	2.1 x 75 mm	186005608	—
BEH HILIC	1.7 µm	2.1 x 100 mm	186003461	176001093
BEH HILIC	1.7 µm	2.1 x 150 mm	186003462	176001094
BEH HILIC	1.7 µm	3.0 x 50 mm	186004675	176001810
BEH HILIC	1.7 µm	3.0 x 75 mm	186005613	—
BEH HILIC	1.7 µm	3.0 x 100 mm	186004676	176001811
BEH HILIC	1.7 µm	3.0 x 150 mm	186004677	176001812

ACQUITY UPLC BEH Amide Columns				
Chemistry	Particle Size	Dimension	Part No. 1/pk	Part No. 3/pk
BEH Amide	1.7 µm	1.0 x 50 mm	186004848	176001914
BEH Amide	1.7 µm	1.0 x 100 mm	186004849	176001915
BEH Amide	1.7 µm	1.0 x 150 mm	186004850	176001916
BEH Amide	1.7 µm	2.1 x 30 mm	186004839	176001906
BEH Amide	1.7 µm	2.1 x 50 mm	186004800	176001907
BEH Amide	1.7 µm	2.1 x 75 mm	186005657	—
BEH Amide	1.7 µm	2.1 x 100 mm	186004801	176001908
BEH Amide	1.7 µm	2.1 x 150 mm	186004802	176001909
BEH Amide	1.7 µm	3.0 x 30 mm	186004803	176001910
BEH Amide	1.7 µm	3.0 x 50 mm	186004804	176001911
BEH Amide	1.7 µm	3.0 x 75 mm	186005658	—
BEH Amide	1.7 µm	3.0 x 100 mm	186004805	176001912
BEH Amide	1.7 µm	3.0 x 150 mm	186004806	176001913

Waters Carbohydrate Method Selection Tool

This online tool recommends the best method conditions in just four easy steps.

To try the selection tool, visit
www.waters.com/amidemethod

Beginner's Guide to UPLC

The "Beginners Guide to UPLC", is a 52-page book designed to provide new, existing, and potential UPLC users the ability to understand how UPLC Technology works, how to be successful with it, and how it can provide impactful results within organizations.

Quest for Ultra Performance in Liquid Chromatography

"The Quest for Ultra Performance in Liquid Chromatography", a 54-page book, presents a brief review of the origin and history of LC, showing how early the concepts of ultra performance were recognized and how many decades it took to reduce them to practice.

Comprehensive Guide to HILIC (Hydrophilic Interaction Chromatography)

This 72-page technology primer is designed to provide the reader with the basic insight of how to be successful with hydrophilic interaction chromatography by understanding how the technique works, the parameters that impact retention and selectivity, as well as the practical considerations necessary to successfully implement HILIC within a chromatographic strategy.

www.waters.com/primers

ACQUITY UPLC HSS COLUMNS

ACQUITY UPLC HSS C_{18}

The ACQUITY UPLC HSS C_{18} chemistry is an ultra-performance, general-purpose C_{18} bonded phase that provides superior peak shape for bases, increased retention (*vs.* ACQUITY UPLC BEH C_{18} Columns), and extremely long column lifetimes at low pH. The selectivities and retention observed with HSS C_{18} Columns will resemble that of most modern, fully endcapped silica-based C_{18} HPLC Columns.

ACQUITY UPLC HSS C_{18} SB

The ACQUITY UPLC HSS C_{18} SB (Selectivity for Bases) chemistry is an unendcapped C_{18} bonded phase that was designed specifically to be 'different' in terms of selectivity. The HSS C_{18} SB chemistry is optimized for low pH method development applications and provides alternate selectivities, especially for basic compounds, as compared to most modern, fully endcapped C_{18} chemistries.

ACQUITY UPLC HSS T3

ACQUITY UPLC HSS T3 Columns are designed to solve a common problem facing separations scientists: retaining small, water soluble, polar organic molecules. The HSS T3 chemistry is an aqueous mobile phase compatible C_{18} bonded phase designed to retain and separate polar organic compounds, much like Atlantis T3 HPLC Columns.

Caffeic Acid Derivatives Separations on ACQUITY UPLC HSS Columns

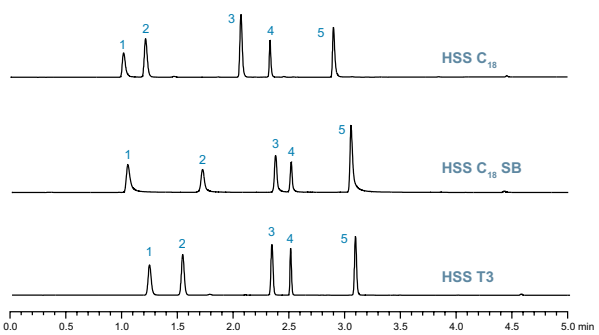
Columns: ACQUITY UPLC HSS, 1.8 µm, 2.1 x 50 mm
Part numbers: 186003532 (HSS C_{18}); 186004118 (HSS C_{18} SB); 186003538 (HSS T3)
Mobile phase A: 0.1% trifluoroacetic acid in water
Mobile phase B: 0.08% trifluoroacetic acid in acetronitrile
Flow rate: 0.5 mL/min

Gradient:

Time (min)	Profile %A	%B	Curve
0.0	92	8	6
0.1	92	8	6
4.45	50	50	7
4.86	10	90	6
5.0	92	8	6
6.0	92	8	6

Compounds:
1. Caftaric acid
2. Chlorogenic acid
3. Cynarin
4. Echinacoside
5. Cichoric acid

Injection vol.: 1.0 µL
Sample diluent: 50/50 water/methanol with 0.05% trifluoroacetic acid
Sample conc.: 100 µg/mL
Column temp.: 40 °C
Detection: UV @ 330 nm
System: ACQUITY UPLC with ACQUITY UPLC TUV Detector



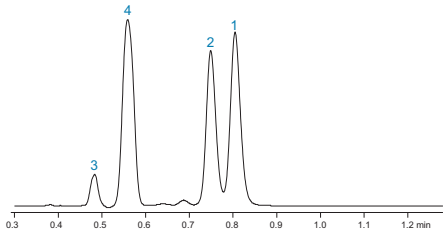
ACQUITY UPLC HSS Cyano

ACQUITY UPLC HSS Cyano Columns are ideally suited for the increased retention of basic compounds while providing exceptional peak shape and column lifetime in low pH mobile phases. The propyl cyano ligand used for HSS Cyano Columns provide low hydrophobicity for the rapid analysis of hydrophobic analytes and has the flexibility to be used for both reversed-phase and normal-phase chromatography.

Analysis of Steroids by Both Normal Phase and Reversed Phase

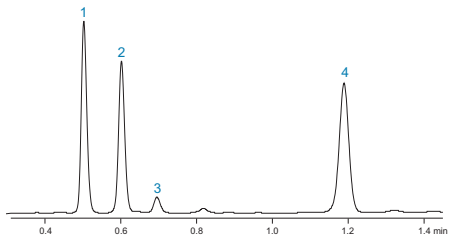
Normal Phase

Compounds:
1. Hydrocortisone
2. Corticosterone
3. β-Estradiol
4. Progesterone



Reversed Phase

Compounds:
1. Hydrocortisone
2. Corticosterone
3. β-Estradiol
4. Progesterone

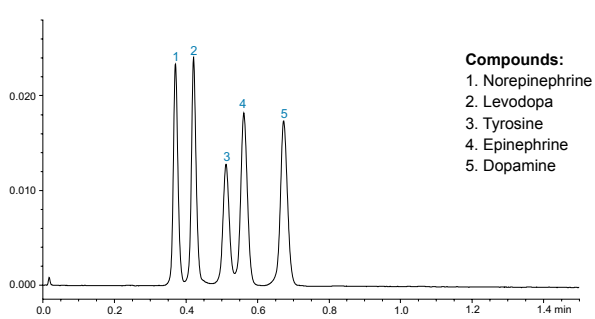


ACQUITY UPLC HSS PFP

ACQUITY UPLC HSS PFP Columns provide method development scientists with unique and powerful selectivity tools compared to straight-chain-alkyl columns. Pentafluorophenyl (PFP) ligands provide multiple retention mechanisms that include: hydrogen bonding, dipole-dipole interaction, aromatic (π-π), and hydrophobic (reversed-phase) retention that can be useful, particularly when trying to separate isomeric, aromatic, or halogenated compounds.

Analysis of Biogenic Amines

Column: ACQUITY UPLC HSS PFP, 1.8 µm, 2.1 x 50 mm
Part number: 186005965
Mobile phase: 10 mM ammonium formate in water, pH 3.0
Flow rate: 0.58 mL/min
Injection vol.: 0.7 µL
Column temp.: 35 °C
Detection: UV @ 266
Sample conc.: 50 µg/ml
Needle wash: 50/50 acetonitrile/water
System: ACQUITY UPLC H-Class with ACQUITY UPLC PDA Detector



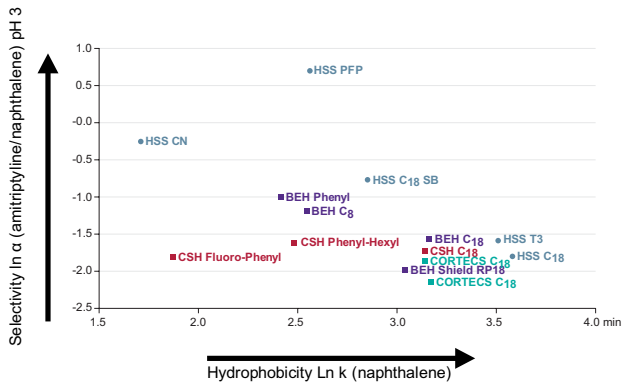
Compounds:
1. Norepinephrine
2. Levodopa
3. Tyrosine
4. Epinephrine
5. Dopamine

ACQUITY UPLC Columns Selectivity Choices

UPLC Technology improves chromatographic resolution by maximizing system efficiency. This is achieved by minimizing the dispersion contribution of the LC system in combination with the use of sub-2-µm column chemistries run at their optimal linear velocities. In addition to utilizing small, sub-2-µm particles, resolution can also be improved by utilizing different stationary-phase ligands to alter selectivity.

By combining ultra-efficient particle technology, low dispersion instrumentation and different column ligands, chromatographers can efficiently and effectively develop robust methods faster than ever before.

Low pH UPLC Selectivities



35% MeCN/65% 15.4 mM $HCOONH_4$, pH 3.0

Waters offers the most comprehensive and advanced offering of UPLC particle substrates and column technologies.

ACQUITY UPLC HSS Columns

Chemistry	Particle Size	Dimension	Part No. 1/pk	Part No. 3/pk
HSS T3	1.8 µm	1.0 x 50 mm	186003535	176001127
HSS T3	1.8 µm	1.0 x 100 mm	186003536	176001129
HSS T3	1.8 µm	1.0 x 150 mm	186003537	176001130
HSS T3	1.8 µm	2.1 x 30 mm	186003944	176001375
HSS T3	1.8 µm	2.1 x 50 mm	186003538	176001131
HSS T3	1.8 µm	2.1 x 75 mm	186005614	—
HSS T3	1.8 µm	2.1 x 100 mm	186003539	176001132
HSS T3	1.8 µm	2.1 x 150 mm	186003540	176001133
HSS T3	1.8 µm	3.0 x 30 mm	186004678	176001813
HSS T3	1.8 µm	3.0 x 50 mm	186004679	176001814
HSS T3	1.8 µm	3.0 x 75 mm	186005617	—
HSS T3	1.8 µm	3.0 x 100 mm	186004680	176001815
HSS T3	1.8 µm	3.0 x 150 mm	186004681	176001816
HSS C_{18}	1.8 µm	1.0 x 50 mm	186003529	176001121
HSS C_{18}	1.8 µm	1.0 x 100 mm	186003530	176001122
HSS C_{18}	1.8 µm	1.0 x 150 mm	186003531	176001123
HSS C_{18}	1.8 µm	2.1 x 30 mm	186003987	176001398
HSS C_{18}	1.8 µm	2.1 x 50 mm	186003532	176001124
HSS C_{18}	1.8 µm	2.1 x 75 mm	186005615	—
HSS C_{18}	1.8 µm	2.1 x 100 mm	186003533	176001125
HSS C_{18}	1.8 µm	2.1 x 150 mm	186003534	176001126
HSS C_{18}	1.8 µm	3.0 x 30 mm	186004682	176001817
HSS C_{18}	1.8 µm	3.0 x 50 mm	186004683	176001818
HSS C_{18}	1.8 µm	3.0 x 75 mm	186005618	—
HSS C_{18}	1.8 µm	3.0 x 100 mm	186004684	176001819
HSS C_{18}	1.8 µm	3.0 x 150 mm	186004685	176001820
HSS C_{18} SB	1.8 µm	1.0 x 50 mm	186004114	176001556
HSS C_{18} SB	1.8 µm	1.0 x 100 mm	186004115	176001557
HSS C_{18} SB	1.8 µm	1.0 x 150 mm	186004116	176001558
HSS C_{18} SB	1.8 µm	2.1 x 30 mm	186004117	176001559
HSS C_{18} SB	1.8 µm	2.1 x 50 mm	186004118	176001560
HSS C_{18} SB	1.8 µm	2.1 x 75 mm	186005616	—
HSS C_{18} SB	1.8 µm	2.1 x 100 mm	186004119	176001561
HSS C_{18} SB	1.8 µm	2.1 x 150 mm	186004120	176001562
HSS C_{18} SB	1.8 µm	3.0 x 30 mm	186004686	176001821
HSS C_{18} SB	1.8 µm	3.0 x 50 mm	186004687	176001822
HSS C_{18} SB	1.8 µm	3.0 x 75 mm	186005619	—
HSS C_{18} SB	1.8 µm	3.0 x 100 mm	186004826	176001823
HSS C_{18} SB	1.8 µm	3.0 x 150 mm	186004689	176001824
HSS Cyano	1.8 µm	1.0 x 50 mm	186005982	176002703
HSS Cyano	1.8 µm	1.0 x 100 mm	186005983	176002704
HSS Cyano	1.8 µm	1.0 x 150 mm	186005984	176002705
HSS Cyano	1.8 µm	2.1 x 30 mm	186005985	176002706
HSS Cyano	1.8 µm	2.1 x 50 mm	186005986	176002707
HSS Cyano	1.8 µm	2.1 x 75 mm	186005987	176002708
HSS Cyano	1.8 µm	2.1 x 100 mm	186005988	176002709
HSS Cyano	1.8 µm	2.1 x 150 mm	186005989	176002710
HSS Cyano	1.8 µm	3.0 x 30 mm	186005990	176002711
HSS Cyano	1.8 µm	3.0 x 50 mm	186005991	176002712
HSS Cyano	1.8 µm	3.0 x 75 mm	186005992	176002713
HSS Cyano	1.8 µm	3.0 x 100 mm	186005993	176002714
HSS Cyano	1.8 µm	3.0 x 150 mm	186005994	176002715
HSS PFP	1.8 µm	1.0 x 50 mm	186005961	176002690
HSS PFP	1.8 µm	1.0 x 100 mm	186005962	176002691
HSS PFP	1.8 µm	1.0 x 150 mm	186005963	176002692
HSS PFP	1.8 µm	2.1 x 30 mm	186005964	176002693
HSS PFP	1.8 µm	2.1 x 50 mm	186005965	176002694
HSS PFP	1.8 µm	2.1 x 75 mm	186005966	176002695
HSS PFP	1.8 µm	2.1 x 100 mm	186005967	176002696
HSS PFP	1.8 µm	2.1 x 150 mm	186005968	176002697
HSS PFP	1.8 µm	3.0 x 30 mm	186005969	176002698
HSS PFP	1.8 µm	3.0 x 50 mm	186005970	176002699
HSS PFP	1.8 µm	3.0 x 75 mm	186005971	176002700
HSS PFP	1.8 µm	3.0 x 100 mm	186005972	176002701
HSS PFP	1.8 µm	3.0 x 150 mm	186005973	176002702

VanGuard PRE-COLUMNS

VANGUARD™ PRE-COLUMNS

Separation scientists working in demanding application areas (*i.e.*, bioanalysis, food and beverage, natural products, environmental, and industrial chemicals) analyze complex, unpredictable, and challenging samples on a routine basis. These types of samples can have a negative impact on column lifetimes when appropriate sample preparation/cleanup procedures are not implemented. VanGuard Pre-columns are designed for these types of application areas where chemical and/or particulate contamination can shorten the lifetime of a UPLC column.

VanGuard Pre-columns are the result of over two years of product development and are the first guard column devices designed for routine use at pressures up to 18,000 psi (1241 bar) in applications run on the ACQUITY UPLC System. VanGuard Pre-columns feature a 2.1 mm I.D. x 5 mm length, ultra-low volume design which efficiently protects UPLC Column performance. This patent-pending design does not compromise the UPLC holistic design approach to higher efficiency, greater resolution, and increased throughput since the same ACQUITY UPLC Column stationary phases and column frits are used in VanGuard Pre-columns. Since the VanGuard Pre-column connects directly to the inlet of the ACQUITY UPLC Column, extra column volumes are minimized and mobile-phase leaks due to additional connections are all but eliminated.

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
Patent-pending, 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

VanGuard Pre-Columns (Guard Columns)

Chemistry	Particle Size	Dimension	Part No. 3/pk
CORTECS C_{18}+	1.6 µm	2.1 x 5 mm	186007125
CORTECS C_{18}	1.6 µm	2.1 x 5 mm	186007123
CORTECS HILIC	1.6 µm	2.1 x 5 mm	186007124
CSH C_{18}	1.7 µm	2.1 x 5 mm	186005303
CSH Fluoro-Phenyl	1.7 µm	2.1 x 5 mm	186005358
CSH Phenyl-Hexyl	1.7 µm	2.1 x 5 mm	186005413
BEH C_{18}	1.7 µm	2.1 x 5 mm	186003975
BEH Shield RP18	1.7 µm	2.1 x 5 mm	186003977
BEH C_8	1.7 µm	2.1 x 5 mm	186003978
BEH Phenyl	1.7 µm	2.1 x 5 mm	186003979
BEH HILIC	1.7 µm	2.1 x 5 mm	186003980
BEH Amide	1.7 µm	2.1 x 5 mm	186004799
HSS C_{18}	1.8 µm	2.1 x 5 mm	186003981
HSS C_{18} SB	1.8 µm	2.1 x 5 mm	186004136
HSS T3	1.8 µm	2.1 x 5 mm	186003976
HSS PFP	1.8 µm	2.1 x 5 mm	186005974
HSS Cyano	1.8 µm	2.1 x 5 mm	186005995

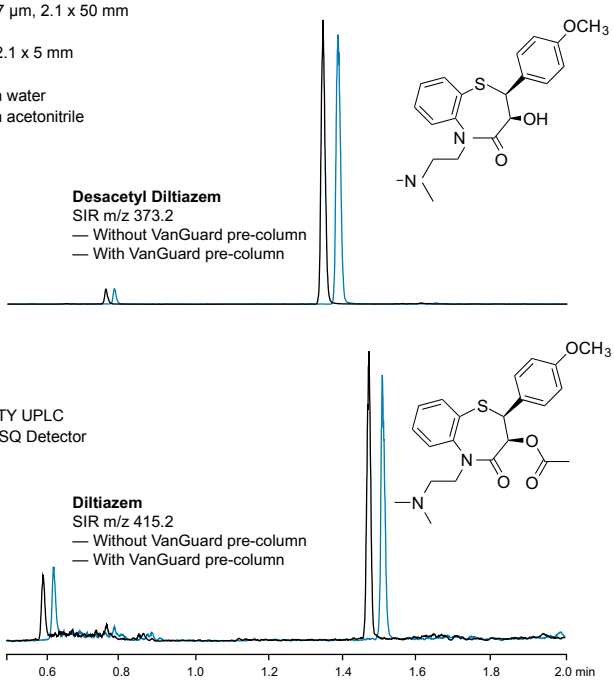
Minimal Chromatographic Effects with VanGuard Pre-Columns

Column: ACQUITY UPLC BEH C_{18}, 1.7 µm, 2.1 x 50 mm
Part number: 186002350
Pre-column: VanGuard BEH C_{18}, 1.7 µm, 2.1 x 5 mm
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 vol.: 2 µL
Column temp.: 40 °C
Detection: UV @ 254 nm
Sampling rate: 40 pts/sec
Time constant: 0.05
System: 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
Desolv. temp.: 500 °C
Cone gas flow: 50 L/hr
Desolv. gas flow: 850 L/hr
SIR: 373.2 *m/z*, 415.2 *m/z*
MS interscan delay: 0.005 sec
Dwell time: 0.005 sec



Protein Precipitation Procedure

Spike plasma with 500 ng/mL of diltiazem and desacetyl diltiazem

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 13000 RPM

Take 650 µL of supernatent and evaporate to dryness with nitrogen

Reconstitute with 400 µL of a 50:50 MeOH:H_2O solution (results in a 203.125 ng/mL conc.)

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

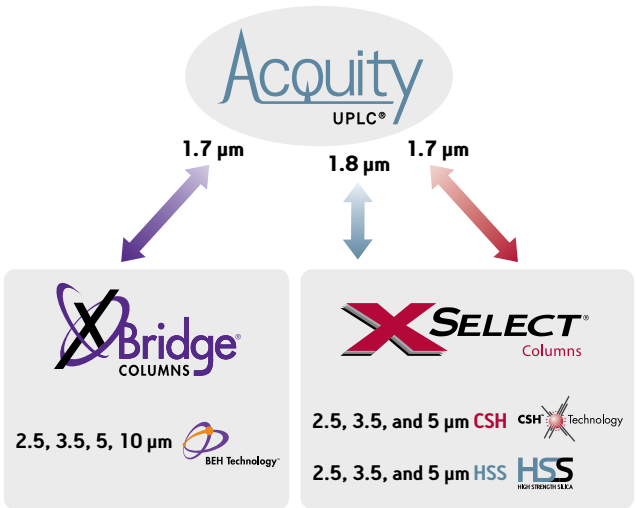
UPLC COLUMN KITS

Transfer Between LC Technology Platforms with Ease

More and more organizations have realized the benefits of improved productivity, higher data quality, and lower cost per sample, as well as faster time-to-market, inherent in assays that utilize UPLC Technology. The ACQUITY UPLC H-Class System is a result of this paradigm shift, enabling the efficacy of a method to be preserved as it is transferred between LC platforms.

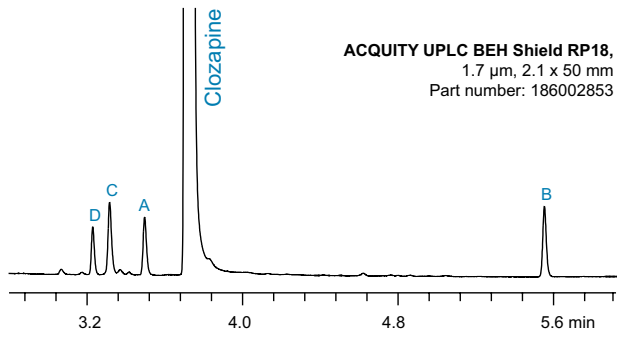
In addition to the proper geometric scaling of all method parameters, the successful transfer of an analytical method requires the preservation of chromatographic column selectivity and resolving power, regardless of particle size.

Waters industry-leading manufacturing processes not only ensures unprecedented batch-to-batch reproducibility, but also sustained selectivity between HPLC and UPLC particle sizes. Method Transfer kits leverage this capability, enabling the successful transfer of methods from one LC platform to another.

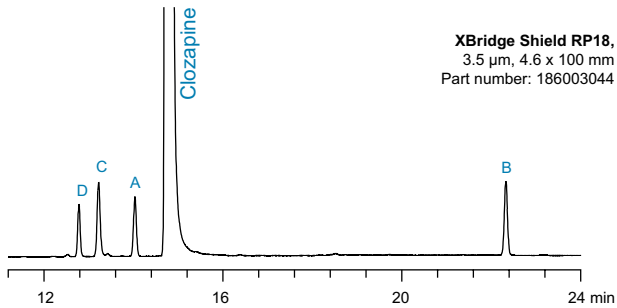


ACQUITY UPLC H-Class System

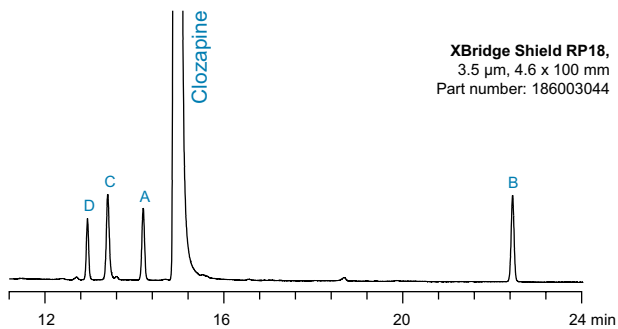
UPLC Separation on ACQUITY UPLC H-Class System



HPLC Separation on Alliance HPLC System



HPLC Separation on ACQUITY UPLC H-Class System



A separation of clozapine and its related compounds is used to demonstrate the exceptional scalability between different size chromatographic particles and instrument platforms to facilitate a successful method transfer.

Retention Time Relative to Clozapine					
Separation Mode	System	Impurity D	Impurity C	Impurity A	Impurity B
UPLC	ACQUITY UPLC H-Class	0.867	0.890	0.939	1.500
HPLC	Alliance 2695	0.865	0.895	0.950	1.513
HPLC	ACQUITY UPLC H-Class	0.867	0.898	0.951	1.507

Take the Guesswork Out of Method Transfer

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.

* Each kit contains one UPLC Column and one HPLC Column. The ACQUITY UPLC Columns Calculator can be downloaded from the ACQUITY UPLC Online Community at www.waters.com/myuplc

Develop Methods with Ease

With a seemingly endless number of method parameters to try, developing a new chromatographic method can be an overwhelming and time-consuming experience. Essential to any method development strategy is finding a suitable column that delivers the desired separation while resulting in a robust and reliable separation.

Waters Method Development Kits consist of several UPLC Columns, encompassing a broad range in selectivity, to accommodate your method development approach and enable methods to be developed efficiently and effectively.

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

Ensure Method Robustness

The reproducibility of the chromatographic column has a critical impact on the long term reliability and robustness of an analytical method, yet its reproducibility lies completely outside the user's control.

With exceptional batch-to-batch and column-to-column reproducibility, Waters well-established particle and column manufacturing process control provides confidence in the long-term reliability of your analytical method. ACQUITY UPLC Method Validation Kits include three batches of chromatographic media (derived from different base particles) to judge the quality, reliability, and consistency of your chromatographic method.

Did you know...

Waters now offers Suitability Standards to help benchmark and trend analytical system performance, offering solutions for all of Waters column brands.

For more information visit the Analytical Standards and Reagents eCatalog at asr.waters.com

ACQUITY UPLC Method Development Kits

Package Name	Qty.	Chemistries	Particle Size(s)	Dimension	Part No.
Maximum Selectivity UPLC Method Development Kit	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C_{18} SB	CSH: 1.7 µm; HSS: 1.8 µm	2.1 x 50 mm	176002123
Maximum Selectivity UPLC Method Development Kit	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C_{18} SB	CSH: 1.7 µm; HSS: 1.8 µm	2.1 x 100 mm	176002124
Maximum Selectivity UPLC Method Development Kit	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C_{18} SB	CSH: 1.7 µm; HSS: 1.8 µm	3.0 x 50 mm	176002125
Maximum Selectivity UPLC Method Development Kit	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, HSS C_{18} SB	CSH: 1.7 µm; HSS: 1.8 µm	3.0 x 100 mm	176002126
High and Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	BEH: 1.7 µm	2.1 x 50 mm	176001042
High and Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	BEH: 1.7 µm	2.1 x 100 mm	176001043
High and Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	BEH: 1.7 µm	3.0 x 50 mm	176001881
High and Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH C_{18}, BEH C_8, BEH Shield RP18, BEH Phenyl	BEH: 1.7 µm	3.0 x 100 mm	176001882
UPLC Method Development Kit	4/pk	BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 50 mm	176001603
UPLC Method Development Kit	4/pk	BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 100 mm	176001604
UPLC Method Development Kit	4/pk	BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 50 mm	176001883
UPLC Method Development Kit	4/pk	BEH C_{18}, BEH Shield RP18, BEH Phenyl, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 100 mm	176001884
L1 UPLC Columns Kit	4/pk	BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 50 mm	176001605
L1 UPLC Columns Kit	4/pk	BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 100 mm	176001606
L1 UPLC Columns Kit	4/pk	BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 50 mm	176001885
L1 UPLC Columns Kit	4/pk	BEH C_{18}, BEH Shield RP18, HSS C_{18}, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 100 mm	176001886
Mass Spec UPLC Columns Kit	4/pk	BEH C_{18}, HSS C_{18}, HSS C_{18} SB, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 50 mm	176001607
Mass Spec UPLC Columns Kit	4/pk	BEH C_{18}, HSS C_{18}, HSS C_{18} SB, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 100 mm	176001608
Mass Spec UPLC Columns Kit	4/pk	BEH C_{18}, HSS C_{18}, HSS C_{18} SB, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 50 mm	176001887
Mass Spec UPLC Columns Kit	4/pk	BEH C_{18}, HSS C_{18}, HSS C_{18} SB, HSS T3	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 100 mm	176001888
Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 50 mm	176001609
Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 100 mm	176001610
Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 50 mm	176001889
Low pH, Widest Selectivities UPLC Columns Kit	4/pk	BEH Shield RP18, BEH Phenyl, HSS C_{18}, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 100 mm	176001890
Maximum Selectivity RP and HILIC Method Development Kit	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, BEH Amide	CSH: 1.7 µm; BEH: 1.7 µm	2.1 x 50 mm	176002127
Maximum Selectivity RP and HILIC Method Development Kit	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, BEH Amide	CSH: 1.7 µm; BEH: 1.7 µm	2.1 x 100 mm	176002128
Maximum Selectivity RP and HILIC Method Development Kit	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, BEH Amide	CSH: 1.7 µm; BEH: 1.7 µm	3.0 x 50 mm	176002129
Maximum Selectivity RP and HILIC Method Development Kit	4/pk	CSH C_{18}, CSH Phenyl-Hexyl, CSH Fluoro-Phenyl, BEH Amide	CSH: 1.7 µm; BEH: 1.7 µm	3.0 x 100 mm	176002130
UPLC RP and HILIC Method Development Kit	4/pk	BEH C_{18}, BEH Shield RP18, BEH Amide, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 50 mm	176001959
UPLC RP and HILIC Method Development Kit	4/pk	BEH C_{18}, BEH Shield RP18, BEH Amide, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	2.1 x 100 mm	176001960
UPLC RP and HILIC Method Development Kit	4/pk	BEH C_{18}, BEH Shield RP18, BEH Amide, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 50 mm	176001961
UPLC RP and HILIC Method Development Kit	4/pk	BEH C_{18}, BEH Shield RP18, BEH Amide, HSS C_{18} SB	BEH: 1.7 µm; HSS: 1.8 µm	3.0 x 100 mm	176001962
UPLC HILIC Method Development Kit	2/pk	BEH Amide, BEH HILIC	BEH: 1.7 µm	2.1 x 50 mm	176001963
UPLC HILIC Method Development Kit	2/pk	BEH Amide, BEH HILIC	BEH: 1.7 µm	2.1 x 100 mm	176001964
UPLC HILIC Method Development Kit	2/pk	BEH Amide, BEH HILIC	BEH: 1.7 µm	3.0 x 50 mm	176001965
UPLC HILIC Method Development Kit	2/pk	BEH Amide, BEH HILIC	BEH: 1.7 µm	3.0 x 100 mm	176001966

ACQUITY UPLC Method Transfer Kits*

Package Name	UPLC Column 2.1 mm I.D.	HPLC Column 4.6 mm I.D.	Part No.
CSH C_{18} 1.7↔5 µm Method Transfer Kit	50 mm, 1.7 µm	150 mm, 5 µm	186005529
CSH Phenyl-Hexyl 1.7↔5 µm Method Transfer Kit	50 mm, 1.7 µm	150 mm, 5 µm	186005530
CSH Fluoro-Phenyl 1.7↔5 µm Method Transfer Kit	50 mm, 1.7 µm	150 mm, 5 µm	186005531
BEH C_{18} 1.7↔5 µm Method Transfer Kit	50 mm, 1.7 µm	150 mm, 5 µm	186004958
BEH Shield RP18 1.7↔5 µm Method Transfer Kit	50 mm, 1.7 µm	150 mm, 5 µm	186004959
BEH HILIC 1.7↔5 µm Method Transfer Kit	50 mm, 1.7 µm	150 mm, 5 µm	186004960
HSS C_{18} 1.8↔5 µm Method Transfer Kit	50 mm, 1.8 µm	150 mm, 5 µm	186004961
HSS T3 1.8↔5 µm Method Transfer Kit	50 mm, 1.8 µm	150 mm, 5 µm	186004962
HSS C_{18} SB 1.8↔5 µm Method Transfer Kit	50 mm, 1.8 µm	150 mm, 5 µm	186004963
CSH C_{18} 1.7↔3.5 µm Method Transfer Kit	50 mm, 1.7 µm	100 mm, 3.5 µm	186005532
CSH Phenyl-Hexyl 1.7↔3.5 µm Method Transfer Kit	50 mm, 1.7 µm	100 mm, 3.5 µm	186005533
CSH Fluoro-Phenyl 1.7↔3.5 µm Method Transfer Kit	50 mm, 1.7 µm	100 mm, 3.5 µm	186005534
BEH C_{18} 1.7↔3.5 µm Method Transfer Kit	50 mm, 1.7 µm	100 mm, 3.5 µm	186004964
BEH Shield RP18 1.7↔3.5 µm Method Transfer Kit	50 mm, 1.7 µm	100 mm, 3.5 µm	186004965
BEH HILIC 1.7↔3.5 µm Method Transfer Kit	50 mm, 1.7 µm	100 mm, 3.5 µm	186004966
BEH Amide 1.7↔3.5 µm Method Transfer Kit	50 mm, 1.7 µm	100 mm, 3.5 µm	186004967
HSS C_{18} 1.8↔3.5 µm Method Transfer Kit	50 mm, 1.8 µm	100 mm, 3.5 µm	186004968
HSS T3 1.8↔3.5 µm Method Transfer Kit	50 mm, 1.8 µm	100 mm, 3.5 µm	186004969
HSS C_{18} SB 1.8↔3.5 µm Method Transfer Kit	50 mm, 1.8 µm	100 mm, 3.5 µm	186004970

*Each kit contains one UPLC Column and one HPLC Column. The ACQUITY UPLC Columns Calculator can be downloaded from the ACQUITY UPLC Online Community at www.waters.com/myuplc

ACQUITY UPLC Method Transfer Kits*

Package Name	UPLC Column 2.1 mm I.D.	HPLC Column 4.6 mm I.D.	Part No.
CSH C_{18} 1.7↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.7 µm	150 mm, 3.5 µm	186005535
CSH Phenyl-Hexyl 1.7↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.7 µm	150 mm, 3.5 µm	186005536
CSH Fluoro-Phenyl 1.7↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.7 µm	150 mm, 3.5 µm	186005537
BEH C_{18} 1.7↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.7 µm	150 mm, 3.5 µm	186004971
BEH Shield RP18 1.7↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.7 µm	150 mm, 3.5 µm	186004972
BEH HILIC 1.7↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.7 µm	150 mm, 3.5 µm	186004973
BEH Amide 1.7↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.7 µm	150 mm, 3.5 µm	186004974
HSS C_{18} 1.8↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.8 µm	150 mm, 3.5 µm	186004975
HSS T3 1.8↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.8 µm	150 mm, 3.5 µm	186004976
HSS C_{18} SB 1.8↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.8 µm	150 mm, 3.5 µm	186004977
HSS Cyano 1.8↔5 µm Method Transfer Kit	50 mm, 1.8 µm	150 mm, 5 µm	186006000
HSS PFP 1.8↔5 µm Method Transfer Kit	50 mm, 1.8 µm	150 mm, 5 µm	186005979
HSS Cyano 1.8↔3.5 µm Method Transfer Kit	50 mm, 1.8 µm	100 mm, 3.5 µm	186006001
HSS PFP 1.8↔3.5 µm Method Transfer Kit	50 mm, 1.8 µm	100 mm, 3.5 µm	186005980
HSS Cyano 1.8↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.8 µm	150 mm, 3.5 µm	186006002
HSS PFP 1.8↔3.5 µm High Rs Method Transfer Kit	100 mm, 1.8 µm	150 mm, 3.5 µm	186005981

Waters Electronic Column Selectivity Chart

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ACQUITY UPLC Method Validation Kits*

Chemistry	Particle Size	Column Length	Part No. 2.1 mm I.D.	Part No. 3.0 mm I.D.
CSH C_{18}	1.7 µm	50 mm	186005571	186005573
CSH C_{18}	1.7 µm	100 mm	186005572	186005574
CSH C_{18}	1.7 µm	150 mm	186006016	—
CSH Phenyl-Hexyl	1.7 µm	50 mm	186005579	186005581
CSH Phenyl-Hexyl	1.7 µm	100 mm	186005580	186005582
CSH Phenyl-Hexyl	1.7 µm	150 mm	186006017	—
CSH Fluoro-Phenyl	1.7 µm	50 mm	186005575	186005577
CSH Fluoro-Phenyl	1.7 µm	100 mm	186005576	186005578
CSH Fluoro-Phenyl	1.7 µm	150 mm	186006018	—
BEH C_{18}	1.7 µm	50 mm	186004044	186004691
BEH C_{18}	1.7 µm	100 mm	186004045	186004692
BEH C_{18}	1.7 µm	150 mm	186006019	—
BEH C_8	1.7 µm	50 mm	186004046	186004693
BEH C_8	1.7 µm	100 mm	186004047	186004694
BEH C_8	1.7 µm	150 mm	186006020	—
BEH Shield RP18	1.7 µm	50 mm	186004048	186004695
BEH Shield RP18	1.7 µm	100 mm	186004049	186004696
BEH Shield RP18	1.7 µm	150 mm	186006021	—
BEH Phenyl	1.7 µm	50 mm	186004050	186004697
BEH Phenyl	1.7 µm	100 mm	186004052	186004698
BEH Phenyl	1.7 µm	150 mm	186006022	—
BEH HILIC	1.7 µm	50 mm	186004053	186004699
BEH HILIC	1.7 µm	100 mm	186004054	186004700
BEH HILIC	1.7 µm	150 mm	186006023	—
BEH Amide	1.7 µm	50 mm	186004807	186004809
BEH Amide	1.7 µm	100 mm	186004808	186004810
BEH Amide	1.7 µm	150 mm	186006024	—
HSS T3	1.8 µm	50 mm	186004055	186004701
HSS T3	1.8 µm	100 mm	186004056	186004702
HSS T3	1.8 µm	150 mm	186006025	—
HSS C_{18}	1.8 µm	50 mm	186004057	186004703
HSS C_{18}	1.8 µm	100 mm	186004058	186004704
HSS C_{18}	1.8 µm	150 mm	186006026	—
HSS C_{18} SB	1.8 µm	50 mm	186004137	186004705
HSS C_{18} SB	1.8 µm	100 mm	186004138	186004709
HSS C_{18} SB	1.8 µm	150 mm	186006027	—
HSS Cyano	1.8 µm	50 mm	186005996	186005998
HSS Cyano	1.8 µm	100 mm	186005997	186005999
HSS PFP	1.8 µm	50 mm	186005975	186005977
HSS PFP	1.8 µm	100 mm	186005976	186005978

*Each kit contains 3 columns from 3 different batches of material.

ACQUITY UPLC Columns In-Line Filter Unit

Description	Part No.
In-Line Filter Holder and Six 0.2 µm Stainless Steel Replacement Filters	205000343
Five 0.2 µm Stainless Steel Replacement Filters and End Nuts for 205000343	700002775

ACQUITY UPLC Columns Replacement Parts

Description	Part No.
Three 0.2 µm Inlet/Outlet Frits for 3.0 mm I.D. UPLC Columns	700004790
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 3.0 mm I.D. UPLC Column	700004792
One Outlet End Nut for 3.0 mm I.D. UPLC Column	700004791
One Inlet End Nut for 2.1 mm I.D. UPLC Column	700003779
One Outlet End Nut for 2.1 mm I.D. UPLC Column	700003780
One Inlet End Nut for 1.0 mm I.D. UPLC Column	700003777
One Outlet End Nut for 1.0 mm I.D. UPLC Column	700003778

For information on the e*X*tended *P*erformance [*XP*] 2.5 µm Columns which are compatible with UPLC Technology, see page 152