

[UHPLC COLUMNS]

Improve productivity with
modern UHPLC column technology



Waters
THE SCIENCE OF WHAT'S POSSIBLE.®

UHPLC COLUMNS

Replicate separations without compromise

The vast majority of commercially available LC columns today cannot take advantage of the performance benefits of modern UHPLC instrumentation.

Waters has a dedicated selection of UHPLC columns, including CORTECS and eXtended Performance [XP] columns, to provide you with capabilities that will surpass your current and future analytical challenges.

Why limit your choice of column options and hamper your ability to fully develop the potential of your analytical laboratory?



CORTECS[®]
COLUMNS



HSS
HIGH STRENGTH SILICA

CORTECS

C₁₈⁺

C₁₈

T3

Shield RP18

C₈

Phenyl

HILIC

XBridge

BEH C₁₈

BEH C₈

BEH Shield RP18

BEH Phenyl

BEH HILIC

BEH Amide

XSelect

CSH C₁₈

CSH Phenyl-Hexyl

CSH Fluoro-Phenyl

HSS C₁₈

HSS C₁₈ SB

HSS T3

HSS PFP

HSS CN

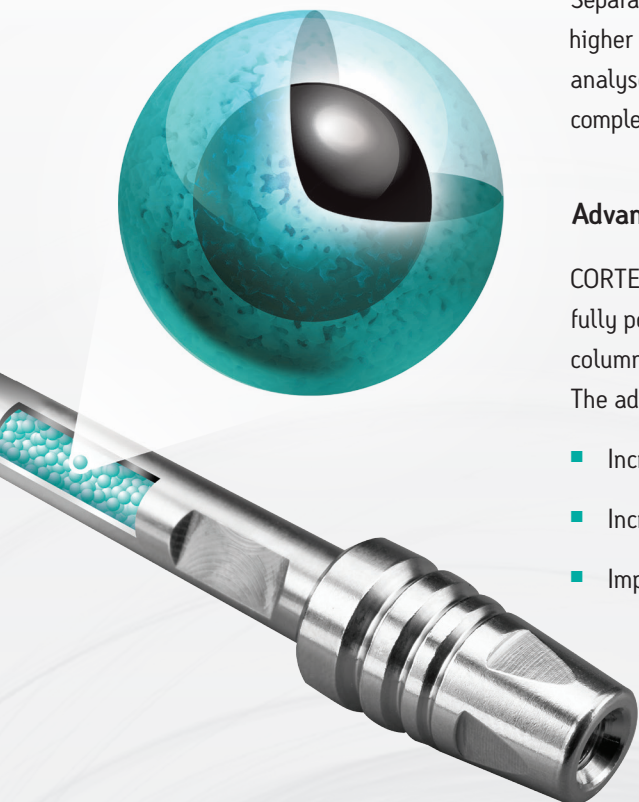
The Solid-Core particle that maximizes UHPLC separation performance

Separation scientists continue to search for new ways to increase separation efficiency, higher resolution separations, and greater throughput for their chromatographic analyses. CORTECS[®] Solid-Core Particle Columns were developed specifically to deliver complementary performance and compatibility with low dispersion UHPLC instrumentation.

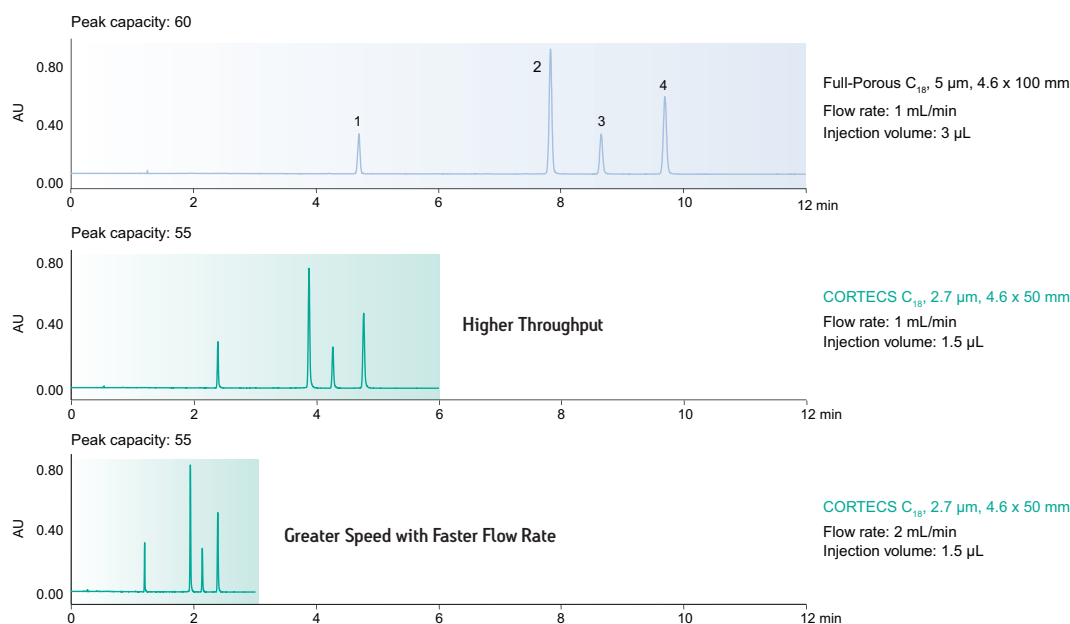
Advantages of reducing operational backpressure

CORTECS 2.7 μm Columns reduce operational backpressure by 25% when compared to fully porous packing materials of similar particle sizes. This provides the ability to use columns packed with smaller particles to improve efficiency and separation performance. The advantages of lower operational backpressure allow scientists to:

- Increase resolution using longer columns
- Increase mobile phase flow to improve throughput
- Improve separation performance on HPLC and UHPLC instrumentation



Increased Throughput and Speed using CORTECS C₁₈ 2.7 μm Columns



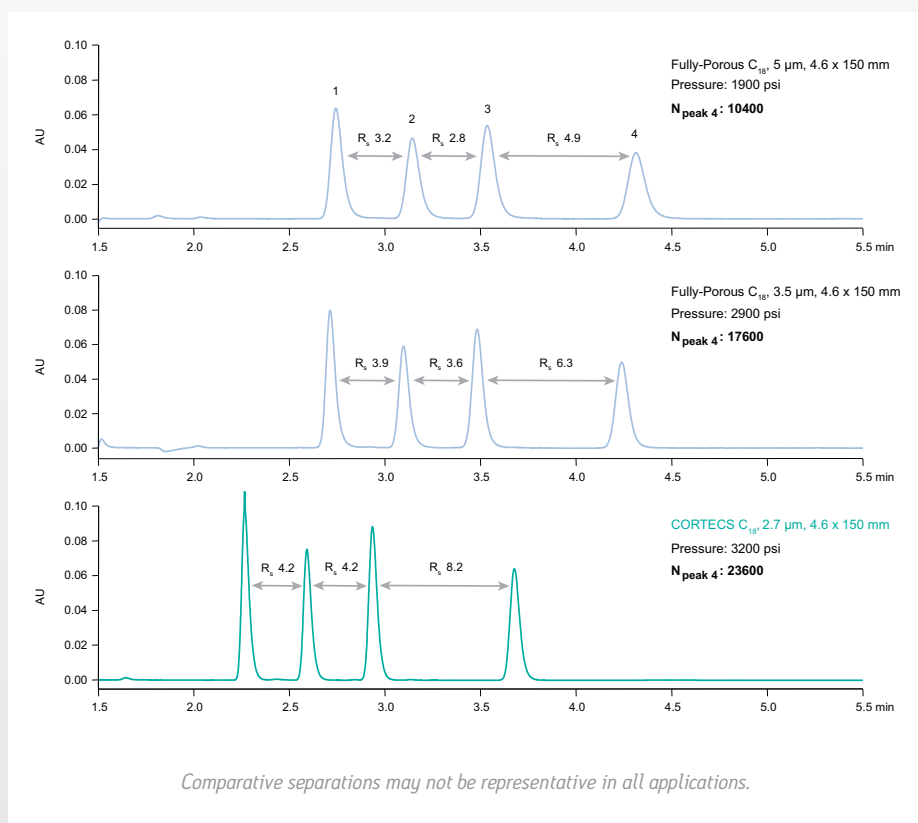
Comparative separations may not be representative in all applications.

CORTECS 2.7 μm Columns support faster UHPLC flow rates at reduced backpressure to improve sample throughput 5-fold compared to a conventional 5 μm HPLC column.

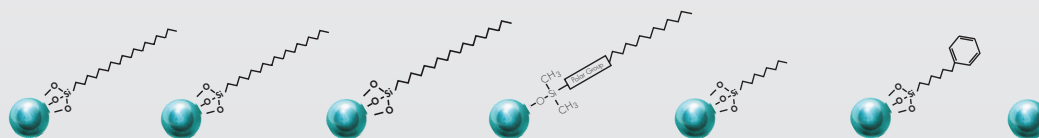
Increased Efficiency

Increasing efficiency adds flexibility to chromatographic method development and optimization. When compared to traditional 3.5 μm and 5 μm based column packing materials, CORTECS 2.7 μm Columns provide more efficient separations using the same column configuration and instrument conditions. For complex samples, this added resolution and column efficiency saves time and reduces the effort required to resolve co-eluting peaks.

Increased Efficiency and Resolution for Estradiols with CORTECS C₁₈, 2.7 μm Columns



The benefit of increased efficiency of CORTECS 2.7 μm Columns can be fully utilized and be within the operational pressure limits of existing HPLC and UHPLC instrumentation.



CORTECS	C ₁₈ +	C ₁₈	T3	Shield RP18	C ₈	Phenyl	HILIC
Ligand Type	Trifunctional C ₁₈	Trifunctional C ₁₈	Trifunctional C ₁₈	Monofunctional Embedded Polar	Trifunctional C ₈	Trifunctional C ₆ Phenyl	None
Ligand Density*	2.4 $\mu\text{mol}/\text{m}^2$	2.7 $\mu\text{mol}/\text{m}^2$	1.6 $\mu\text{mol}/\text{m}^2$	3.2 $\mu\text{mol}/\text{m}^2$	3.4 $\mu\text{mol}/\text{m}^2$	3.2 $\mu\text{mol}/\text{m}^2$	n/a
Carbon Load*	5.7%	6.6%	4.7%	6.4%	4.5%	5.9%	unbonded
Endcap Style	proprietary	proprietary	proprietary	proprietary	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 Charge Modification	+	none	none	none	none	none	none
USP Classification	L1	L1	L1	L1	L7	L11	L3

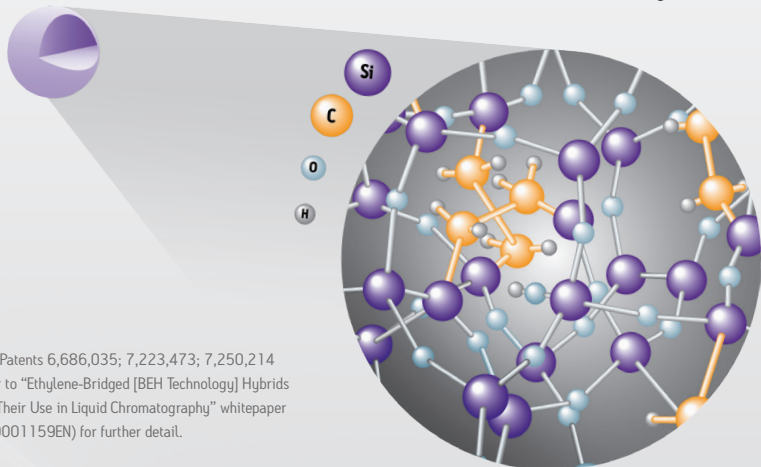
All CORTECS Columns are available in UPLC particle sizes.

* Expected or approximate values.



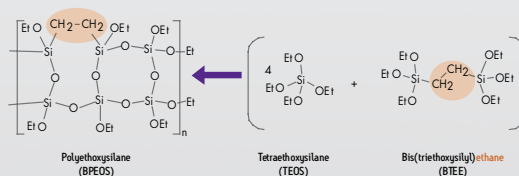
Based on BEH Technology

XBridge® BEH (Ethylene-Bridged Hybrid) Columns are known industry-wide as the standard for rugged and repeatable LC column performance. Within the complete range of fully scalable particle sizes, XBridge BEH 2.5 µm *XP* [e*X*tended *P*erformance] Columns allow you to maximize efficiency and retention for all HPLC and UHPLC separation conditions.



BEH Technology™

Particle Synthesis

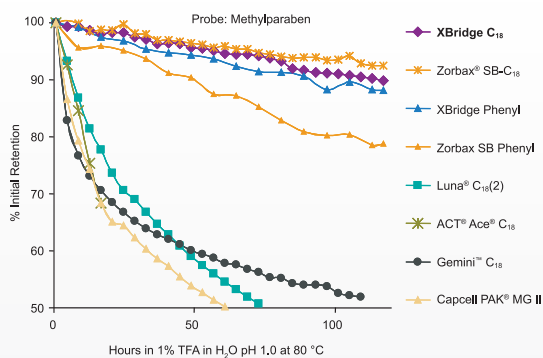


* US Patents 6,686,035; 7,223,473; 7,250,214
Refer to "Ethylene-Bridged [BEH Technology] Hybrids and Their Use in Liquid Chromatography" whitepaper (720001159EN) for further detail.

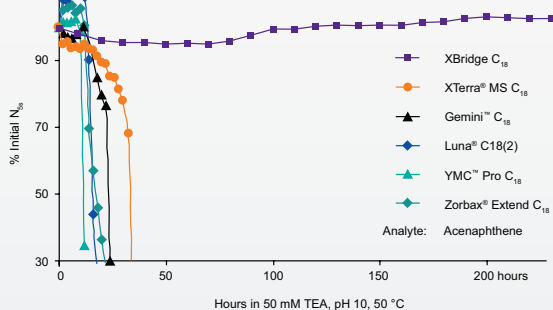
Compatible With Extended Mobile Phase pH

XBridge BEH Columns offer pH stability that is higher than any other commercially available chromatographic phase. Unlike traditional columns that claim pH resistance, XBridge 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.

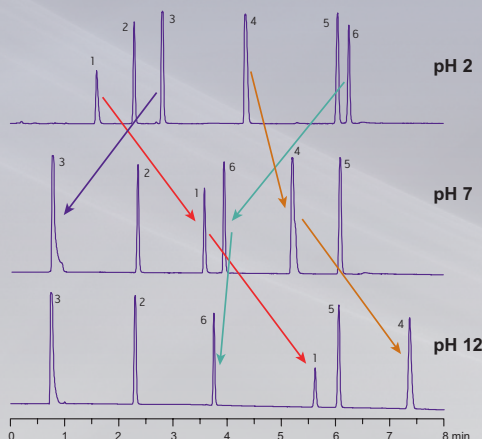
Low pH Stability



High pH Stability



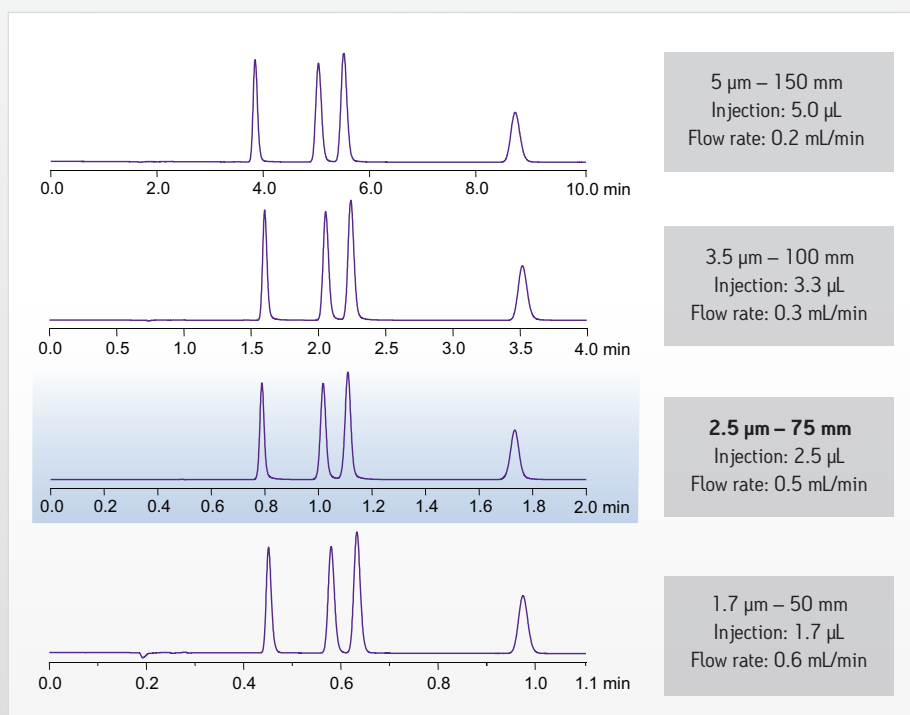
Mobile phase pH is a powerful tool to enhance analyte retention. In general, acidic components (green) are more retained at low pH, basic analytes are more retained at high pH (red/yellow) while neutrals (peak 2) are largely unaffected.



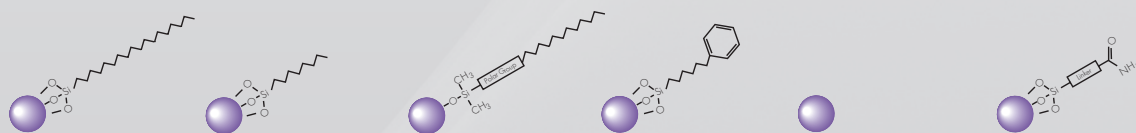
Rigorous testing of a XBridge C₁₈ HPLC Column under the extremes of mobile phase pH. XBridge BEH Columns show very little degradation in chromatographic performance and redefine the expectation for column performance.

Predictable Method Scaling

Maintaining resolution with speed presents the most common challenge for chromatographers. This is even more evident for higher efficiency UHPLC separations. When streamlining methods or developing quicker assays for increased throughput, any loss in information is unacceptable. For this reason, Waters developed 2.5 μm **XP** [eXtended Performance] columns that use a common base particle for seamless method scalability from 1.7 to 10 μm particle sizes. XBridge BEH **XP** Columns improve the performance for all HPLC instrumentation and are fully optimized to take advantage of low dispersion UHPLC chromatographic systems.



Based upon identical manufacturing processes, XBridge BEH, XBridge BEH **XP**, and ACQUITY BEH Particle Technology differs only by particle size allowing for seamless method scaling and the fastest route to an optimized LC method.



XBridge	C ₁₈	C ₈	Shield RP18	Phenyl	HILIC	Amide
Ligand Type	Trifunctional C ₁₈	Trifunctional C ₈	Monofunctional Embedded Polar	Trifunctional Phenyl-Hexyl	Unbonded	Amide
Ligand Density*	3.1 $\mu\text{mol}/\text{m}^2$	3.2 $\mu\text{mol}/\text{m}^2$	3.3 $\mu\text{mol}/\text{m}^2$	3.0 $\mu\text{mol}/\text{m}^2$	n/a	7.5 $\mu\text{mol}/\text{m}^2$
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
Pore Diameter*	130 Å	130 Å	130 Å	130 Å	130 Å	130 Å
Surface Area*	185 m^2/g	185 m^2/g	185 m^2/g	185 m^2/g	185 m^2/g	185 m^2/g
Particle Size	2.5, 3.5, 5, 10 μm	2.5, 3.5, 5, 10 μm	2.5, 3.5, 5, 10 μm	2.5, 3.5, 5 μm	2.5, 3.5, 5 μm	2.5, 3.5 μm
USP Classification	L1	L7	L1	L11	L3	—

All XBridge Columns are available in UPLC particle sizes.

* Expected or approximate values.

Columns that maximize separation selectivity are one of the most powerful tools a method developer has to influence chromatographic behavior. The carefully chosen bonded ligands used for XSelect® HSS *XP* and XSelect CSH™ *XP* Columns redefine the definition of broadly selective phases that are tailored for modern UHPLC separations. With a selection of 2 base particle technologies combined with 8 selectivity-optimized bonded phases, XSelect Columns help you develop methods faster.

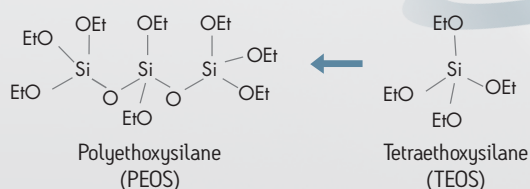
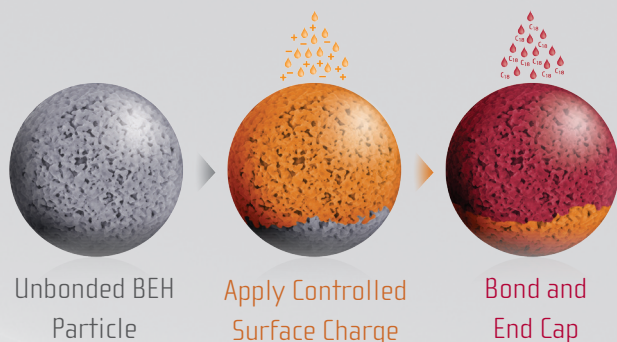


Charged Surface Hybrid (CSH) Technology

Waters has been at the forefront of chromatographic materials science for the last 50 years. Recent stationary-phase innovations include ultra-pure silica for improved peak shape for basic compounds; optimized pore properties and bonded phase coverage for polar compound retention and aqueous mobile-phase compatibility; and most importantly, innovative hybrid particle technology that revolutionized chromatographic scalability from HPLC, UHPLC, and UPLC® system platforms. These advances have empowered separation scientists in almost every industry to realize the business and scientific benefits of this transformative technology combination.

Charged Surface Hybrid (CSH) Technology is the next evolution of 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 whitepaper “Charged Surface Hybrid (CSH) Technology and Its Use in Liquid Chromatography” (720003929EN).

The Charged-Surface Particle



High Strength Silica (HSS) Technology

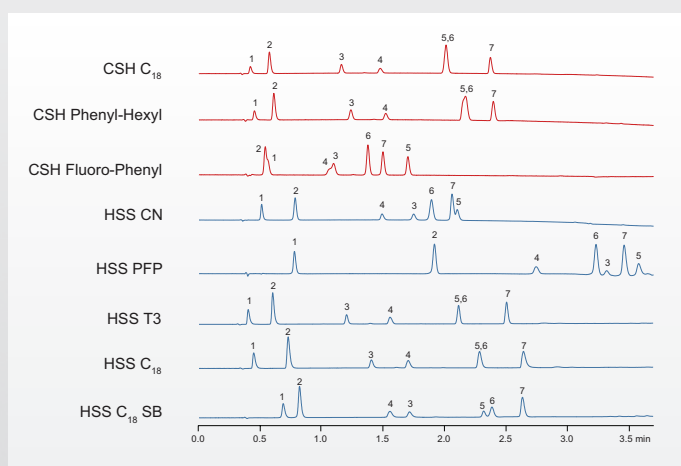
Waters understands the role that the particle substrate plays in chromatographic selectivity and retentivity: no single particle substrate can meet every chromatographic challenge. Further, the same ligand bonded to different substrates can yield vastly different chromatographic results. High Strength Silica [HSS] Technology was developed specifically to complement the chromatographic performance of the more hydrophobic BEH and CSH Particles. When compared to the ethylene-bridge-containing BEH and CSH Particles, the higher silanophilicity of the (100% silica) HSS Particle offers chromatographers significant advantages including increased polar compound retention and significantly different selectivity. Additionally, as its name implies, the HSS Particle was designed and synthesized to possess the mechanical strength to operate at pressures up to 18,000 psi (1240 Bar).

Reproducibility and transferability are the cornerstones of BEH, CSH, and HSS Particle Technologies. With these key strengths in mind, the 2.5-, 3.5- and 5-µm XSelect HSS HPLC and *XP* Columns are seamlessly scalable and possess the same chemical and physical characteristics as the 1.8 µm ACQUITY UPLC HSS Particle.

Enhancing Selectivity

Uniquely chosen ligands, combined with highly active base particles, provide a separation mechanism that promotes diversity in analyte retention and selectivity. It is this combination of substrate and bonding that creates the dramatic separations that are developed on XSelect **XP** Columns. Experienced chromatographers realize the value in choosing an effective stationary phase to solve a specific chromatographic challenge. In these cases, having a more direct column choice can save valuable time and effort when developing a chromatographic assay.

XSelect Columns Provide Diverse Analyte Selectivity

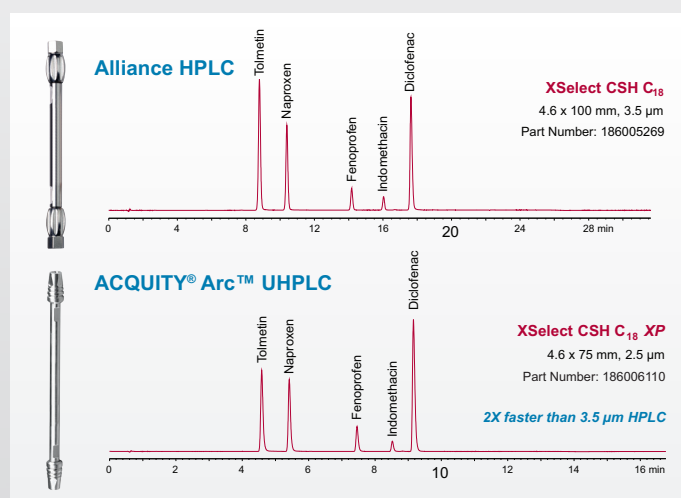


Observed selectivity differences for a mixture of basic analytes. Compounds: [1] aminopyrazine, [2] pindolol, [3] quinine, [4] labetalol, [5] verapamil, [6] diltiazem, [7] amitriptyline.



Extending UHPLC Performance

Reducing the cost per analysis continues to be an industry wide directive. Developing more efficient separations that fully benefit from smaller particle technology is the most effective approach that laboratories use to increase throughput and productivity. For existing LC methods that routinely use 3.5 μm or 5 μm HPLC columns, transitioning to smaller particle columns is often misunderstood and is overlooked as an option. Highly reproducible XSelect HSS and XSelect CSH Columns are available in configurations that maintain a constant column length to particle size (L/d_p) ratio. Scaling chromatographic methods for UHPLC has never been more straightforward.



HPLC methods are effectively and reproducibly scaled to UHPLC using an XSelect CSH **XP** Column without changing the result from the original method.

XSelect	CSH C_{18}	CSH Phenyl-Hexyl	CSH Fluoro-Phenyl	HSS T3	HSS C_{18}	HSS C_{18} SB	HSS PFP	HSS CN
Ligand Type	Trifunctional C_{18}	Trifunctional C_6 Phenyl	Trifunctional Pentafluoro-phenyl	Trifunctional C_{18}	Trifunctional C_{18}	Trifunctional C_{18}	Trifunctional Pentafluoro-phenyl	Monofunctional Cyano-Propyl
Ligand Density*	2.3 $\mu\text{mol}/\text{m}^2$	2.3 $\mu\text{mol}/\text{m}^2$	2.3 $\mu\text{mol}/\text{m}^2$	1.6 $\mu\text{mol}/\text{m}^2$	3.2 $\mu\text{mol}/\text{m}^2$	1.6 $\mu\text{mol}/\text{m}^2$	3.2 $\mu\text{mol}/\text{m}^2$	2.0 $\mu\text{mol}/\text{m}^2$
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
Pore Diameter*	130 Å	130 Å	130 Å	100 Å	100 Å	100 Å	100 Å	100 Å
Surface Area*	185 m^2/g	185 m^2/g	185 m^2/g	230 m^2/g	230 m^2/g	230 m^2/g	230 m^2/g	230 m^2/g
Particle Size	2.5, 3.5, 5, 10 μm	2.5, 3.5, 5 μm	2.5, 3.5, 5 μm	2.5, 3.5, 5 μm	2.5, 3.5, 5 μm	2.5, 3.5, 5 μm	2.5, 3.5, 5 μm	2.5, 3.5, 5 μm
USP Classification	L1	L11	L43	L1	L1	L1	L43	L10

All XSelect Columns are available in UPLC particle sizes (ACQUITY UPLC CSH 1.7 μm and ACQUITY UPLC HSS 1.8 μm).

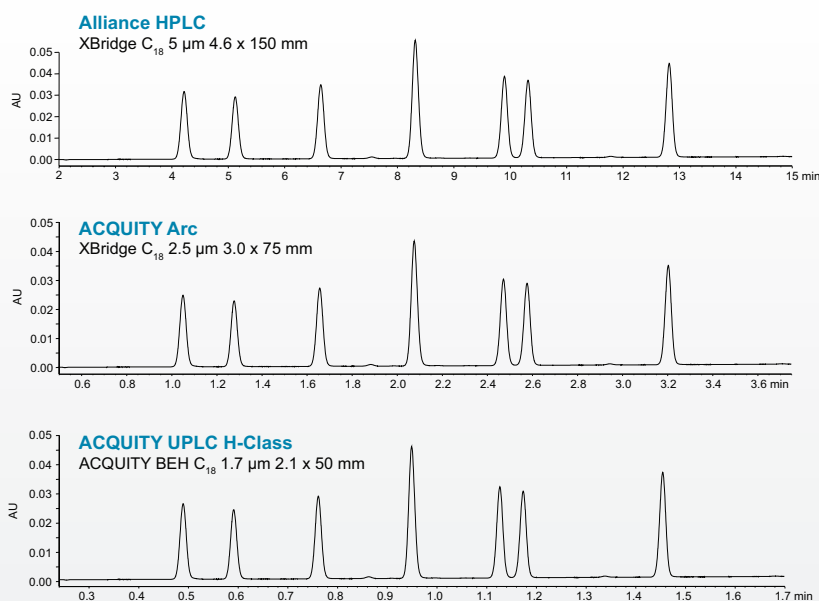
* Expected or approximate values.



Column Configurations for UHPLC

All XBridge and XSelect eXtended Performance [XP] Columns and CORTECS 2.7 μm Columns are designed to maximize asset utilization for existing HPLC, UHPLC, or UPLC systems, allowing faster, greener, and more sustainable separations that are adaptable to any modern chromatographic platform.

The combination of column configuration and the ACQUITY Arc System gives the ideal solution to accommodate methods from any LC platform from HPLC, UHPLC, or UPLC. The ACQUITY Arc System provides the flexibility to maximize productivity through efficient and rapid 2.5 μm –2.7 μm UHPLC separations, or to accommodate larger 3 μm –5 μm HPLC particles.



A Serious Problem for UHPLC: System Dispersion

System dispersion is inherent in any chromatographic instrumentation and it is cumulative from connecting tubing, sample valves, flow cells, and in column end-fittings. The result is sample peak broadening through dilution that begins with the injector and ends at the detector out flow. As column particle size is reduced, or the internal diameter and length of the column decreases, the potential for peak broadening in a non-optimized LC system increases.

The full benefit of higher efficiency UHPLC columns can only be realized if the system dispersion does not substantially degrade the column performance. For smaller particle columns, resolution increases as a result of narrower peak widths. The narrower peaks resulting from highly efficient UHPLC columns and hardware are more susceptible to extra-column dispersion. As a result, the optimum column configuration is highly dependent on the dispersion of the LC system.

Column Selection Guide



Alliance HPLC



ACQUITY Arc



ACQUITY H-Class

System	HPLC	UHPLC	UPLC
Particle size	3.5 μm , 5 μm	2.x μm	<2 μm
Routine pressure	<4000 psi	<10000 psi	<18000 psi (I-Class)
Column I.D.	4.6 mm (3.0 mm)	3.0 mm (2.1 mm)	2.1 mm (1.0 mm)
Column length	75–250 mm	50–100 mm	\leq 150 mm

Optimized column dimension matched to Waters LC Systems.

Ideal Column Configurations for Any LC System

Instrument bandspread is one of the most practical LC instrument parameters to determine when transferring LC methods. Knowing the result of this simple measurement gives the separation scientist the ability to develop compatible methods that are independent of the LC instrument manufacturer. The following table gives recommendations on column configuration based on nominal instrument bandspread values.

System	Bandspread*	Recommended Column Particle Sizes and I.D.s
Shimadzu Prominence UFLC	41 μL	XBridge 3.5, 5 μm
Alliance 2695 HPLC	29 μL	XSelect 3.5, 5 μm
Agilent 1260 UHPLC (600 bar)	28 μL	CORTECS 2.7 μm 3.0–4.6 mm I.D.
Thermo Accela UHPLC	21 μL	XBridge 2.5, 5 μm
Agilent 1290 UHPLC (1200 bar)	17 μL	XSelect 2.5, 5 μm CORTECS 2.7 μm 3.0 mm I.D.
ACQUITY Arc	23 μL	XBridge 2.5, 5 μm XSelect 2.5, 5 μm CORTECS 2.7 μm 3.0 mm I.D.
ACQUITY UPLC	12 μL	ACQUITY BEH 1.7 μm
ACQUITY UPLC H-Class w/ Column Manager	12 μL	ACQUITY CSH 1.7 μm
ACQUITY UPLC H-Class	9 μL	CORTECS 1.6 μm 2.1 mm I.D.
ACQUITY UPLC I-Class (FTN)	7.5 μL	ACQUITY BEH 1.7 μm
ACQUITY UPLC I-Class (FL)	5.5 μL	ACQUITY CSH 1.7 μm ACQUITY HSS 1.8 μm CORTECS 1.6 μm 1.0–2.1 mm I.D.

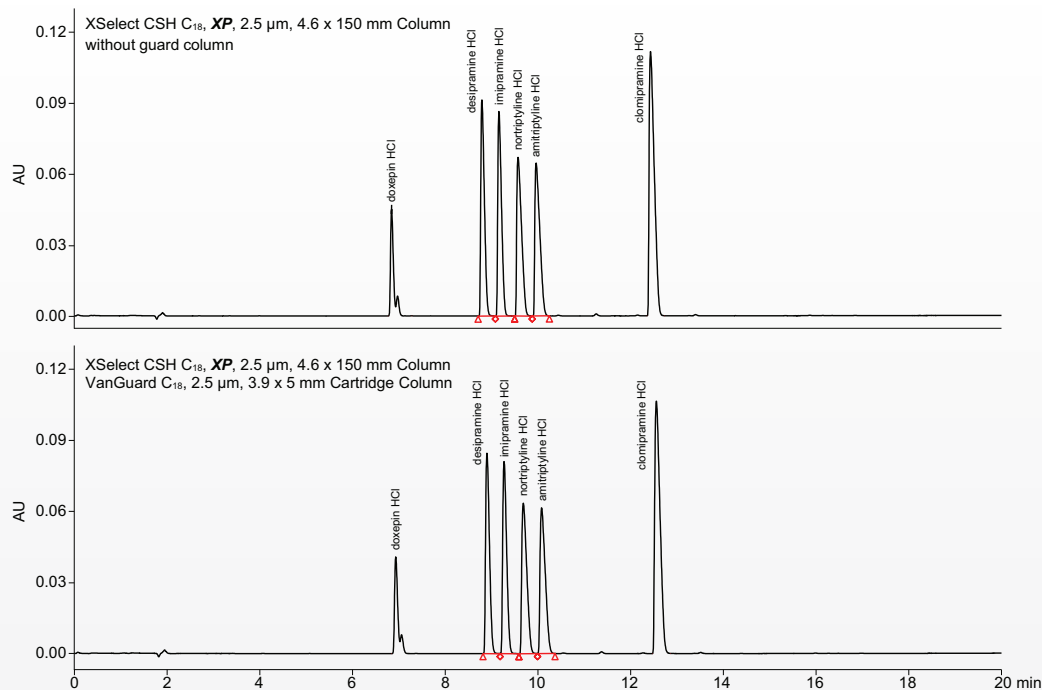
Note: The provided data is for reference only and is based on nominal values for unmodified systems. Any adjustment to the plumbing, connectivity, and configuration of the system will change the instrument bandspread and will influence the resulting chromatography.

VanGuard™ Cartridge Columns are a universal solution to extend all UHPLC column lifetime. Simply replace the cartridge instead of your more expensive analytical column to regenerate the original separation performance. The reusable holder is designed with an adjustable ferrule so that it can be attached to any column inlet. Available in a wide variety of particle sizes and stationary phases, VanGuard Column Protection products help by:



- Removing particulates and chemical contamination
- Maintaining UHPLC separation efficiency
- Providing cost effective column protection

Minimal Chromatographic Effects with VanGuard Cartridges



Critical Compound Pair	USP Resolution	
	Without VanGuard Cartridge	With VanGuard Cartridge
1. Desipramine-Imipramine	2.4	2.3
2. Imipramine-Nortriptyline	2.3	2.2
3. Nortriptyline-Amitriptyline	1.9	1.9

Mobile phase A: 0.1 % formic acid in water
 Mobile phase B: 0.1 % formic acid in acetonitrile
 Gradient:

Time (min)	Flow rate (mL/min)	%A	%B
0.0	1.0	80	20
11.0	1.0	55	45
12.0	1.0	55	45

Column temp.: 40 °C
 Concentration: 50 µg/mL
 Injection volume: 15 µL

Economical VanGuard Cartridge Columns can be used to extend analytical column lifetime without compromise to separation performance.

TruView™ LCMS CERTIFIED



Certified Vials

Waters offers a complete line of vials for all manufactures of LC instrumentation. TruView™ LCMS Certified Vials are the premium choice for UHPLC 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 UHPLC 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 chromatographic analysis is 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 for individual standards and reference materials for calibration, qualification, and tuning of instruments and detectors, please visit asr.waters.com.



Ordering Information



CORTECS Columns								
Dimension	Particle size	C ₁₈	C ₁₈ +	T3	Shield RP18	C ₈	Phenyl	HILIC
2.1 x 30 mm	2.7 µm	186007364	186007394	186008481	186008661	186008348	186008318	186007379
2.1 x 50 mm	2.7 µm	186007365	186007395	186008482	186008662	186008349	186008319	186007380
2.1 x 75 mm	2.7 µm	186007366	186007396	186008483	186008663	186008350	186008320	186007381
2.1 x 100 mm	2.7 µm	186007367	186007397	186008484	186008664	186008351	186008321	186007382
2.1 x 150 mm	2.7 µm	186007368	186007398	186008485	186008665	186008352	186008322	186007383
3.0 x 30 mm	2.7 µm	186007369	186007399	186008486	186008671	186008358	186008328	186007384
3.0 x 50 mm	2.7 µm	186007370	186007400	186008487	186008672	186008359	186008329	186007385
3.0 x 75 mm	2.7 µm	186007371	186007401	186008488	186008673	186008360	186008330	186007386
3.0 x 100 mm	2.7 µm	186007372	186007402	186008489	186008674	186008361	186008331	186007387
3.0 x 150 mm	2.7 µm	186007373	186007403	186008490	186008675	186008362	186008332	186007388
4.6 x 30 mm	2.7 µm	186007374	186007404	186008491	186008681	186008368	186008338	186007389
4.6 x 50 mm	2.7 µm	186007375	186007405	186008492	186008682	186008369	186008339	186007390
4.6 x 75 mm	2.7 µm	186007376	186007406	186008493	186008683	186008370	186008340	186007391
4.6 x 100 mm	2.7 µm	186007377	186007407	186008494	186008684	186008371	186008341	186007392
4.6 x 150 mm	2.7 µm	186007378	186007408	186008495	186008685	186008372	186008342	186007393



XBridge BEH XP Analytical Columns							
Dimension	Particle size	C ₁₈	Shield RP18	C ₈	Phenyl	HILIC	Amide
2.1 x 30 mm	2.5 µm	186006028	186006715	186006040	186006064	186006076	186006088
2.1 x 50 mm	2.5 µm	186006029	186006052	186006041	186006065	186006077	186006089
2.1 x 75 mm	2.5 µm	186006030	186006053	186006042	186006066	186006078	186006090
2.1 x 100 mm	2.5 µm	186006031	186006054	186006043	186006067	186006079	186006091
2.1 x 150 mm	2.5 µm	186006709	186006055	186006712	186006718	186006721	186006724
3.0 x 30 mm	2.5 µm	186006032	186006716	186006044	186006068	186006080	186006092
3.0 x 50 mm	2.5 µm	186006033	186006056	186006045	186006069	186006081	186006093
3.0 x 75 mm	2.5 µm	186006034	186006057	186006046	186006070	186006082	186006094
3.0 x 100 mm	2.5 µm	186006035	186006058	186006047	186006071	186006083	186006095
3.0 x 150 mm	2.5 µm	186006710	186006059	186006713	186006719	186006722	186006725
4.6 x 30 mm	2.5 µm	186006036	186006717	186006048	186006072	186006084	186006096
4.6 x 50 mm	2.5 µm	186006037	186006060	186006049	186006073	186006085	186006097
4.6 x 75 mm	2.5 µm	186006038	186006061	186006050	186006074	186006086	186006098
4.6 x 100 mm	2.5 µm	186006039	186006062	186006051	186006075	186006087	186006099
4.6 x 150 mm	2.5 µm	186006711	186006063	186006714	186006720	186006723	186006726

XSelect CSH and HSS XP Analytical Columns

Dimension	Particle size	CSH C ₁₈	CSH Fluoro-Phenyl	CSH Phenyl-Hexyl	HSS C ₁₈	HSS C ₁₈ SB	HSS T3	HSS PFP	HSS CN
2.1 x 30 mm	2.5 µm	186006100	186006112	186006124	186006136	186006160	186006148	186006172	186006184
2.1 x 50 mm	2.5 µm	186006101	186006113	186006125	186006137	186006161	186006149	186006173	186006185
2.1 x 75 mm	2.5 µm	186006102	186006114	186006126	186006138	186006162	186006150	186006174	186006186
2.1 x 100 mm	2.5 µm	186006103	186006115	186006127	186006139	186006163	186006151	186006175	186006187
2.1 x 150 mm	2.5 µm	186006727	186006730	186006733	186006736	186006742	186006739	186006745	186006748
3.0 x 30 mm	2.5 µm	186006104	186006116	186006128	186006140	186006164	186006152	186006176	186006188
3.0 x 50 mm	2.5 µm	186006105	186006117	186006129	186006141	186006165	186006153	186006177	186006189
3.0 x 75 mm	2.5 µm	186006106	186006118	186006130	186006142	186006166	186006154	186006178	186006190
3.0 x 100 mm	2.5 µm	186006107	186006119	186006131	186006143	186006167	186006155	186006179	186006191
3.0 x 150 mm	2.5 µm	186006728	186006731	186006734	186006737	186006743	186006740	186006746	186006749
4.6 x 30 mm	2.5 µm	186006108	186006120	186006132	186006144	186006168	186006156	186006180	186006192
4.6 x 50 mm	2.5 µm	186006109	186006121	186006133	186006145	186006169	186006157	186006181	186006193
4.6 x 75 mm	2.5 µm	186006110	186006122	186006134	186006146	186006170	186006158	186006182	186006194
4.6 x 100 mm	2.5 µm	186006111	186006123	186006135	186006147	186006171	186006159	186006183	186006195
4.6 x 150 mm	2.5 µm	186006729	186006732	186006735	186006738	186006744	186006741	186006747	186006750

CORTECS VanGuard Cartridges

Dimension	Particle size	C ₁₈	C ₁₈ +	T3	Shield RP18	C ₈	Phenyl	HILIC
2.1 x 5 mm	2.7 µm	186007682	186007685	186008506	186008712	186008421	186008418	186007688
3.9 x 5 mm	2.7 µm	186007684	186007687	186008507	186008711	186008422	186008419	186007690

XBridge VanGuard Cartridges

Dimension	Particle size	C ₁₈	C ₈	Shield RP18	Phenyl	HILIC	Amide
2.1 x 5 mm	2.5 µm	186007772	186007781	186007808	186007799	186007790	186007763
2.1 x 5 mm	3.5 µm	186007766	186007775	186007802	186007793	186007784	186007757
2.1 x 5 mm	5 µm	186007769	186007778	186007805	186007796	186007787	186007760
3.9 x 5 mm	2.5 µm	186007774	186007783	186007810	186007801	186007792	186007765
3.9 x 5 mm	3.5 µm	186007768	186007777	186007804	186007795	186007786	186007759
3.9 x 5 mm	5 µm	186007771	186007780	186007807	186007798	186007789	186007762

XSelect VanGuard Cartridges

Dimension	Particle size	CSH C ₁₈	CSH Phenyl-Hexyl	CSH Fluoro-Phenyl	HSS T3	HSS C ₁₈	HSS C ₁₈ SB	HSS PFP	HS CN
2.1 x 5 mm	2.5 µm	186007817	186007839	186007827	186007884	186007857	186007848	186007875	186007866
2.1 x 5 mm	3.5 µm	186007811	186007830	186007820	186007878	186007851	186007842	186007869	186007860
2.1 x 5 mm	5 µm	186007814	186007836	186007824	186007881	186007854	186007845	186007872	186007863
3.9 x 5 mm	2.5 µm	186007819	186007841	186007829	186007886	186007859	186007850	186007877	186007868
3.9 x 5 mm	3.5 µm	186007813	186007832	186007822	186007880	186007853	186007844	186007871	186007862
3.9 x 5 mm	5 µm	186007816	186007838	186007826	186007883	186007856	186007847	186007874	186007865

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