Agilent HPLC Column Selection Guide

SOLUTIONS FOR SMALL MOLECULE SEPARATIONS

The Measure of Confidence

Agilent Technologies

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The largest portfolio of Fast LC columns, and a broad family of phases across all particle sizes for exceptional flexibility and scalability

Whether you are performing conventional or ultra-fast chromatography, separating biomolecules, or analyzing complex basic compounds, you can trust Agilent for the industry's highest-performing columns that deliver the fast, reproducible results you need – all engineered with Agilent's unparalleled quality and reliability.

This selection guide is primarily focused on Agilent's small molecule HPLC columns; please see publication 5990-9384EN for information about our family of biocolumns or 5990-7994EN and 5990-7995EN for more detailed information about GPC/SEC columns.

- **Poroshell 120 columns** – high efficiency and high resolution with up to 50% less pressure than sub-2 µm columns.
- **ZORBAX Rapid Resolution High Definition (RRHD) columns** – 1.8 µm columns feature improved packing processes to achieve stability up to 1200 bar for use with the Agilent 1290 Infinity LC and other UHPLC instruments and are available in more than 12 phases, plus HILIC.
- **ZORBAX Eclipse Plus columns** – C18 and C8 columns deliver superior peak shape, while the phenyl-hexyl bonded phase and C18 bonded phase for PAH separations expand selectivity options for more applications. All Eclipse Plus phases are available in Fast LC/UHPLC RRHD and RRHT columns, 1.8 µm. For scalability, the Eclipse Plus C18 phase is very similar to the Poroshell 120 EC-C18 phase.
- In addition to Poroshell 120 and RRHD columns, **ZORBAX Rapid Resolution High Throughput (RRHT) columns** are a third Fast LC option with over 140 1.8 µm columns choices. RRHT columns are available in 2.1, 3.0 and 4.6 mm ids, all with 600 bar stability.

And remember, when you choose Agilent ZORBAX LC columns, you get more than just a dependable product. You also get over 40 years of expertise – along with unmatched technical support – from the world's largest chromatography supplier. On the web, by phone or in person, Agilent helps you solve the problems that can slow you down and get in the way of your results.

Agilent 1200 Infinity Series

Push your UHPLC performance to infinite limits and run your conventional methods with confidence

Whether you need a "workhorse" LC system for routine analysis or the most sophisticated, high-resolution LC/MS system, the Agilent 1200 Infinity Series has what you're looking for.

Together with critical supplies and replacement parts, our 1200 Infinity Series LC systems deliver ultimate resolution and sensitivity, while helping you boost your separation power per time. They also ensure easy method transferability between systems – without redevelopment or revalidation.

- **Try 1.8 µm Rapid Resolution High Definition (RRHD) columns** – stable to 1200 bar – for the 1290 Infinity LC.
- **Try Eclipse Plus Rapid Resolution High Throughput (RRHT) columns** – stable to 600 bar – for the 1260 Infinity LC.

1220 Infinity LC

1260 Infinity LC

1290 Infinity LC

Agilent 1290 Infinity LC: **Infinitely more powerful**

With the Agilent 1290 Infinity LC, you're no longer limited in your choice of column dimension, particle type, mobile and stationary phase, flow rate, or pressure. That is because the 1290 Infinity LC is the first system that gives you the foundation for method transfer to or from any Agilent or non-Agilent UHPLC or HPLC system. You also get the confidence that comes with:

- The highest performance by any measure with features like active damping, microfluidic mixing, and optofluidic waveguides detection technology
- The highest flexibility for HPLC, RRLC, and UHPLC
- UHPLC productivity with HPLC service costs

Agilent 1260 Infinity LC: **Infinitely more confident**

Finally – an LC system that meets your demands for chromatographic performance while matching the constraints of your budget. The Agilent 1260 Infinity LC gives you the confidence that comes with:

- Raising the standard in analytical HPLC with a 600 bar, high-speed 80Hz detector, and up to 10x greater sensitivity
- 100% compatibility with HPLC and RRLC
- RRLC performance at an HPLC price
- Ships with a Poroshell 120 column

Agilent 1220 Infinity LC: **Infinitely more affordable**

An affordable, high quality solution that maximizes uptime, minimizes maintenance and provides the highest return on your investment. It features:

- Agilent quality – Highly affordable price
- HPLC and RRLC compatibility – 600 bar and high-speed 80Hz detector
- Integrated design – robust and easy-to-use

Sample Preparation for Chromatography

Agilent offers a complete line of sample preparation products to support LC and LC/MS applications.

The Agilent Bond Elut silica and polymeric SPE and Captiva Filtration Sample Prep family of products offer the largest choice of formats and widest range of solutions available in the market today.

Learn more at
www.agilent.com/chem/sampleprep

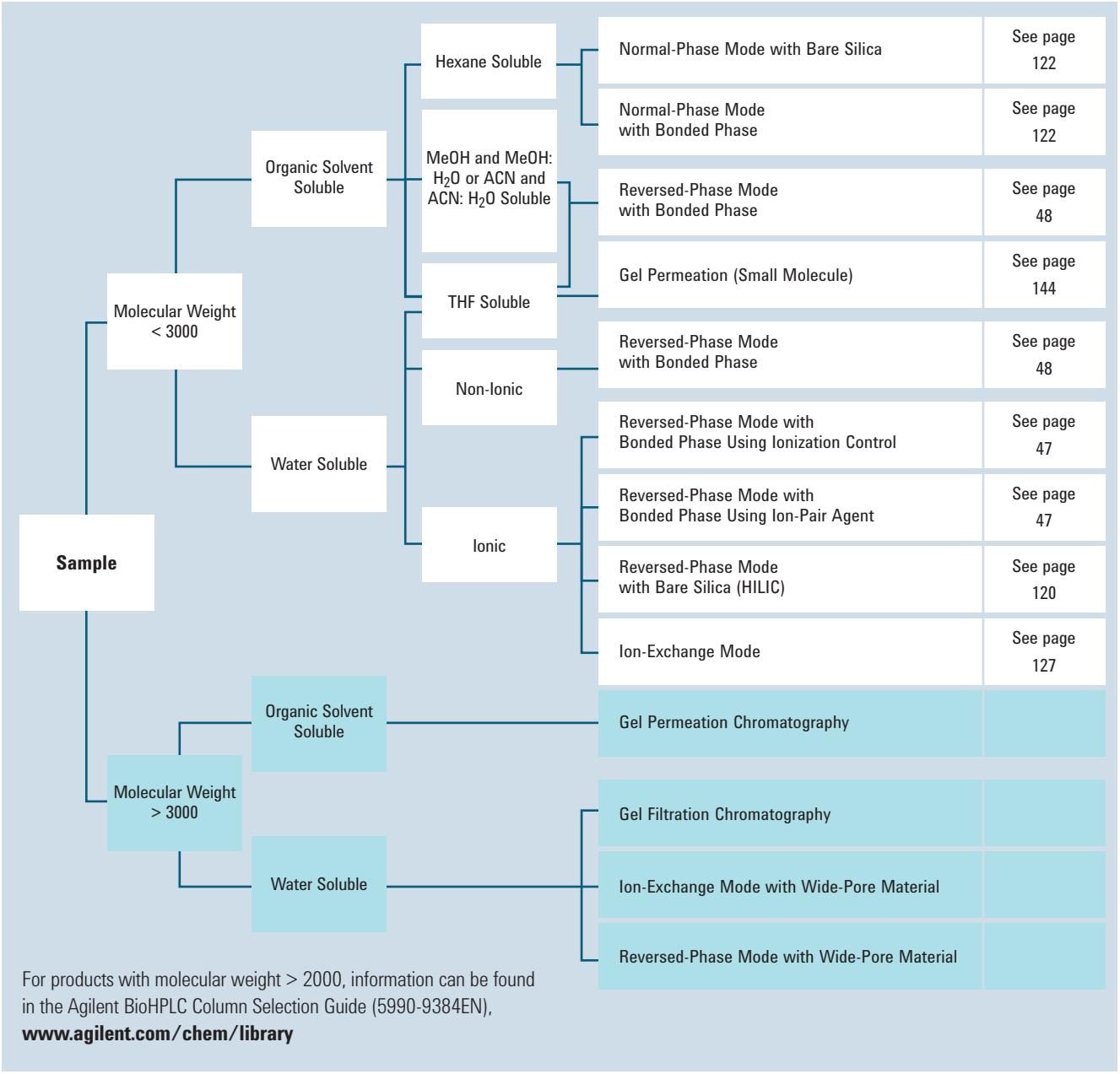
Tips & Tools

To order now, visit **www.agilent.com/chem/Infinitysupplies**

HPLC Column Selection

To use the column selection guide diagram below, simply follow the path for your analyte and mobile phase. At the far right, follow your final column selection to the pages indicated.

Please see the *2011-2012 Essential Chromatography and Spectroscopy Catalog* for a complete listing of LC columns and supplies (publication number 5990-6674EN).



Adapted with permission from "Practical HPLC Methodology and Applications," Brian A. Bidlingmeyer, John Wiley & Sons, Inc., New York, p. 109

Quick Guide to Agilent Reversed-Phase Bonded Phases

ZORBAX RP-HPLC Columns	Recommended Uses and Applications	Page No.
Poroshell 120	• Superficially porous particles for high efficiency at low pressure • Sub-2 µm efficiency with a 2.7 µm particle • Endcapped and non-endcapped C18 and C8 phases, and a variety of other phases, for selectivity optimization • Compatible with 400 bar and 600 bar LC's	27
Eclipse Plus Available in RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Excellent first choice for method development • Long life from pH 2-9 for reliable separations of basic, acidic and neutral compounds • Superior peak shape with basic compounds • High resolution and efficiency with 1.8, 3.5 and 5 µm columns • Rigorous QA/QC testing for greater long-term reproducibility	48
Eclipse XDB Available in RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Four selectivity choices for flexible method development • High performance over a wide pH range (2-9) • Good peak shape for acids, bases and neutrals • Long lifetime with eXtra Dense Bonding and double endcapping • Fast, ultra-fast, and high resolution separations using 1.8 and 3.5 µm columns • Choices from capillary to prep	57
StableBond (SB) Available in RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Basic, acidic, neutral compounds • Exceptional stability at low pH (1-2) • Use of high temperature (up to 90 °C for C18, 80 °C for C8, C3, Phenyl, CN, and Aq) and low pH as an added selectivity tool • Widest selection of bonded phases for different selectivity (C18, C8, C3, CN, Phenyl, Aq) • Uses mobile phases for LC/MS with formic acid, acetic acid, or TFA • Uses mobile phases with TFA for peptide and protein separation • Rapid separations using 1.8 and 3.5 µm columns	65

(Continued)

Tips & Tools

The LC Handbook: Guide to LC Columns and Method Development

This handy guide makes it easy to choose the right LC column, and contains plenty of tips and tricks to make your job easier and more productive (5990-7595EN).

Request a copy or download a mobile copy at
www.agilent.com/chem/lchandbook

Quick Guide to Agilent Reversed-Phase Bonded Phases

ZORBAX RP-HPLC Columns	Recommended Uses and Applications	Page No.
ZORBAX Rx Available in RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• General separation of basic, acidic and neutral compounds at low pH with different selectivity than SB columns • Rx-C8 is the same as SB-C8	73
Bonus-RP Available in Fast LC/UHPLC RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Separating basic compounds in higher aqueous mobile phases • General separation of basic, neutral, acidic compounds at mid-range pH or low pH; especially stable at low pH • Separating peptides for different selectivity • Rapid separations using 3.5 µm columns	79
Extend-C18 Available in Fast LC/UHPLC RRHD (1200 bar) and RRHT (600 bar) configurations, 1.8 µm	• Separating basic compounds above their pKa in free base form; separation of basic, acidic, neutral compounds at high pH; up to pH 11.5 • Uses ammonium hydroxide as mobile phase additive with LC/MS with small molecules or peptides • Separating at high, mid-range and low pH for selectivity changes • Rapid separations using 3.5 µm columns	75
Original ZORBAX Columns	**Recommended Uses and Applications**	**Page No.**
ZORBAX	• General separation of basic, acidic, neutral compounds at low pH with different selectivity than SB columns; higher number of active silanols than SB • "Mixed mode" separation at more neutral pH values	84
ZORBAX ODS Classic (non-endcapped)	• General separation of basic, acidic, neutral compounds at mid-range to low pH with different selectivity than SB or XDB columns	84

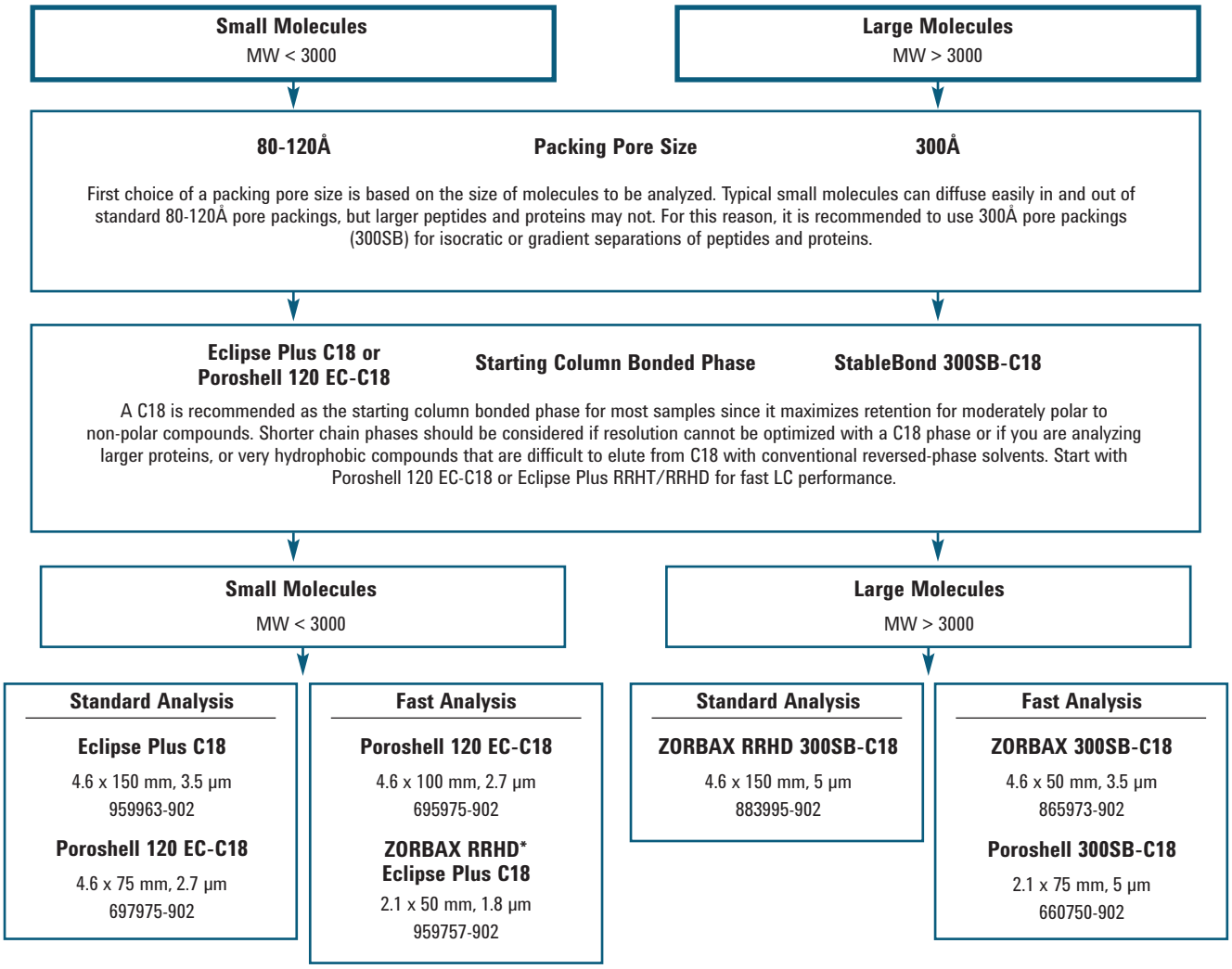
Quick Guide to Additional Agilent LC Columns Phases		
Pursuit Family	**Recommended Uses and Applications**	**Page No.**
Pursuit HPLC	• Full range of phases, including C18 and C8 • Diphenyl utilizes strong dipole-dipole hydrogen bonding and pi-pi mechanisms for different selectivity with aromatic compounds • PFP provides excellent separation of polar (halogenated) analytes and positional isomers under standard reversed-phase conditions	88
Pursuit XRs and Pursuit XRs Ultra	• Offer larger surface area and smaller pore size, in complementary phases to Pursuit family • Ultra offers stability to 600 bar, due to special hardware and loading	94
Polaris Family	**Recommended Uses and Applications**	**Page No.**
C18-A and C8-A Available in 3.0, 5.0 µm and 10 µm (C18-A only)	• C18-A and C8-A offer alternate selectivities for general polar applications • Designed with hydrogen-bond-accepting endcapping	97
Amide-C18 Available in 3.0 and 5.0 µm	• Subtle alternative selectivity due to the absence of steric protection • Utilize an embedded amide, similar to ZORBAX Bonus-RP	97
C18-Ether and C8-Ether Available in 3.0 and 5.0 µm	• Endcapped with an ether group to create a more polar surface for selectivity variation	97
Other Agilent Columns	**Recommended Uses and Applications**	**Page No.**
TC-C18(2) Available in 5 µm	• An excellent choice for mixtures of polar and non-polar compounds, including strong basic compounds	102
HC-C18(2) Available in 5 µm	• High-value, highly retentive option • Carbon load of 17% • Superior peak shape for basic compounds	102

ZORBAX Reversed-Phase HPLC Column Selection Flow Chart

For small and large molecules

Most chromatographers use reversed-phase HPLC as one of their key analysis techniques. Reversed-phase HPLC can be used to analyze ionic and nonionic analytes. Therefore this ZORBAX Column Selection Flow Chart will focus on reversed-phase columns. To more easily select a reversed-phase column for method development of small and large molecules, follow the outline on these pages.

This flow chart provides information on choosing an initial column for method development of small molecule and protein and peptide samples, and includes decisions on bonded phase and column configuration.



* First choice for use on the 1290 Infinity LC or other UHPLC instruments with 1000+ bar pressure limit.

Column and Mobile Phase Guidelines: Reversed-Phase

HPLC columns consist of two parts: the column chemistry and hardware. For the proper column chemistry, consult the catalog section for each type of bonded phase. For choosing column hardware and particle sizes, consult the section on column sizes and rapid separations, including Agilent ZORBAX Rapid Resolution HT, Solvent Saver, Capillary and PrepHT columns.

Pore Size Selection

Choose a column packing with small pore (60-120Å) if the solute molecular weight is less than about 3000. Otherwise, use column packing with the 300Å pore size.

Particle Size Selection

The typical particle size for HPLC columns is 5 µm with 3.5 µm and smaller now common in method development. If high-speed analyses or higher resolution analyses are required, packing with 1.8 µm and 2-3 µm particles can be used. Shorter columns with these particles can produce faster high-resolution separations, with the 1.8 µm particle size providing the highest efficiency and 2.7 µm superficially porous providing similar results. With 1.8, 2.7, 3.5 and 5 µm particle sizes to choose from, start with the smallest particle size for your HPLC or UHPLC – 400 bar, 600 bar, or 1200 bar – to achieve the best results.

Column Configuration

Choosing the best column size for method development has changed dramatically in the past few years. Smaller 3.0 mm id or 2.1 mm id columns are now used more than 4.6 mm id to lower solvent use and achieve compatibility with MS detectors. And shorter 50, 75 and 100 mm long columns can be a great starting choice, with longer columns used only when more resolution is needed or when 3.5 and 5 µm particle sizes are used.

Silica, Polymers and Bonded Phase

Base Material

The base material for an LC column is most often high purity silica material with totally porous particles such as that used in most Agilent columns, including ZORBAX, Pursuit, and Polaris. However, more choices are available, including polymer material with high pH stability used in PLRP-S columns and superficially porous silica particles such as those used in Poroshell 120 columns. The high purity Type B silicas, including the ZORBAX Rx-Sil used in ZORBAX Eclipse Plus, and superficially porous Poroshell 120, are an excellent first choice for most methods. Type A silicas, such as ZORBAX SIL, used in Original ZORBAX columns, are still manufactured and used in many methods.

Bonded Phase

A good first choice for bonded phase is C18 or C8, and the recommended starting column choices are Eclipse Plus C18 or Poroshell 120 EC-C18. These two choices provide excellent peak shape and can be used over the pH range 2-9, accommodating most typical LC and LC/MS mobile phases. If the sample solutes of interest are not adequately separated on these columns, CN and Phenyl columns – including Phenyl, Phenyl-Hexyl and Diphenyl – may offer significant differences in selectivity from straight-chain alkyl phases to effect the separation.

In general, larger solutes, such as proteins, are best separated on short-chain reversed-phase columns (C3, CN, C8) and peptides and small molecules are separated on longer-chain columns (C18). However, there are many cases where this conventional wisdom does not apply. For example, peptides can also be effectively separated using short-chain columns, and hydrophobic peptides can show better recovery on longer-chain phases. Therefore, it is best to initially select a phase in the middle of the hydrophobic spectrum (e.g., C8), then change to a more hydrophobic phase or more hydrophilic phase depending on initial results and solubility properties of your sample.

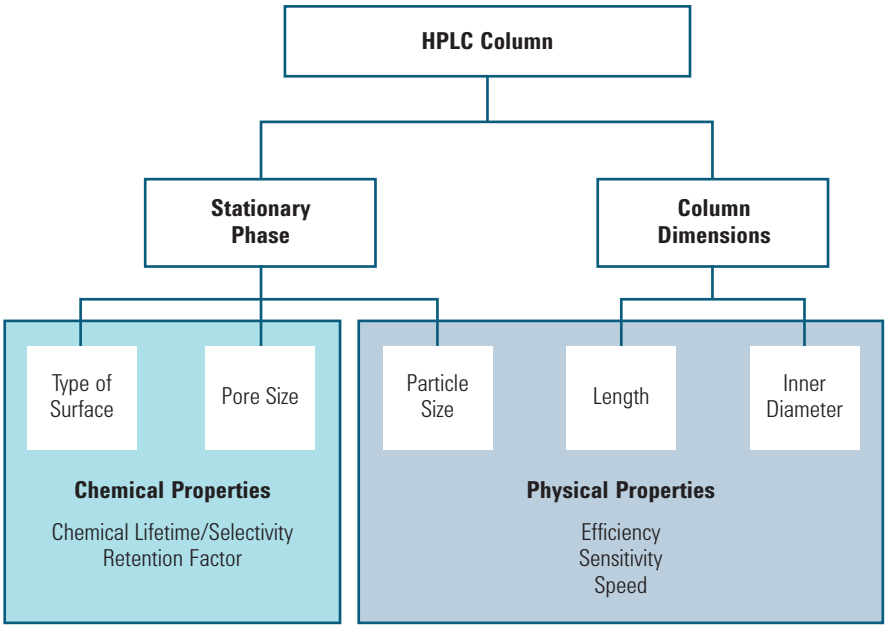
Polymers

When a column is needed that can operate at very low and very high pH, polymeric packings provide an alternative to silica-based materials. Polymeric particles are good for small-scale chromatography, particularly LC/MS, as they are chemically stable and do not leach soluble or particulate species. Reversed-phase spherical polymeric packings used in Agilent PLRP-S columns, for example, are based on a styrene/divinylbenzene copolymer with an inherently hydrophobic surface. No bonded phase is required for reversed-phase chromatography with polymeric particles. These rigid macroporous particles can be coated and derivatized to give a range of functionalities, including weak and strong cation and anion exchangers.

pH and Mobile Phase

The choice of mobile phase for a reversed-phase system starts with selecting the organic modifier. Acetonitrile is the most commonly used organic modifier. However, selectivity differences and sample retention will vary significantly among mobile phases containing acetonitrile, methanol, and tetrahydrofuran (THF). Sample solubility is likely to differ in such solvents and dictate use of a specific solvent or solvents. UV detection at certain wavelengths is not possible with certain modifiers (e.g., methanol at 200 nm).

Both pH and ionic strength of the aqueous portion of mobile phases are important parameters in developing rugged methods that are not sensitive to small variations in conditions. With ionic compounds, retention of typical species shows significant changes with pH. It is very important to control pH in such reversed-phase systems to stabilize retention and resolution. A pH between 2 and 4 generally provides the most stable conditions for retention vs. small changes in pH, and this pH is recommended for starting method development for most samples, including basic compounds and typical weak acids.



Working with LC/MS

When choosing HPLC columns for LC/MS, chromatographers often need to consider several aspects of their method and separation, typically including resolution, flow rate, and stationary phase choice. Often, for relatively simple analytes, shorter high resolution columns are the best choice. These columns allow for high throughput while maintaining high separation efficiency. Narrow bore Rapid Resolution High Definition (RRHD) for separations > 600 bar and Poroshell 120 columns (< 600 bar) offer high resolution even in shorter columns dimensions. For more difficult samples, users should seek longer column lengths.

Since many LC/MS analyses are run at lower flow rates (typically from µL/min flow rates up to 1 mL/min), moving to smaller internal diameter columns is the best choice for the user. Agilent's Solvent Saver (3.0 mm id) and narrow bore (2.1 mm id) will often result in lower solvent usage for the method, and are excellent options for high resolution and higher sensitivity than the larger id columns.

Most often, the best bonded phase choice is an endcapped C18 phase. Eclipse Plus C18 is a high performance endcapped C18 phase available in sub-2 µm RRHD and RRHT column formats. For fast high-throughput separations with LC/MS, Poroshell 120 EC-C18 is an excellent choice. Poroshell has a larger frit, so it's well suited for dirtier LC/MS samples, such as blood plasma, which may often clog columns with smaller porosity frits.

Both Eclipse Plus C18 and Poroshell 120 EC-C18 phases are stable over a wide pH range and are compatible with the volatile buffers such as acetic and formic acids.

Tips & Tools

LC Flow Rate Calculator App

This FREE Smartphone app lets you quickly adjust your flow rate to accommodate other method changes.

Download at
www.agilent.com/chem/lcapp

Transferring your method to a high efficiency column

High efficiency columns for UHPLC/Fast LC will help you increase your analytical speed and resolution. Depending on the instrument configuration you are using, you may need to make a few adjustments to get the most from these columns.

Because of their high efficiency, very narrow peaks elute from higher efficiency columns quickly. While modern HPLC instrumentation and data systems are able to capture the benefits of these particles, attention to instrumental configuration is important to get the best results.

Steps to transfer your method:

Check the specifications that came with your instrument – Your instrument may already be configured appropriately for high efficiency columns. If not, then continue.

Optimize the data collection rate for LC and LC/MS (at least 40 Hz detector with fast response time for UV) – Set the detector to the fastest setting, then to the second fastest setting and evaluate if the resolution is different.

Use a semi-micro or micro-flow cell – Smaller volume flow cells such as the semi-micro (6 mm/5 µL) or micro (3 mm/2 µL) are recommended for best performance. There are newer cartridge flow cells (e.g. the Ultra Low-Dispersion Max-Light Ultra Flow Cell, p/n G4212-60007) designed to optimize UHPLC instrument performance.

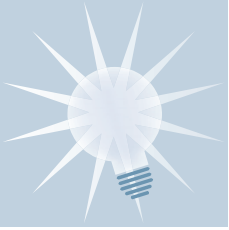
Minimize tubing volume in the instrument – Use Red (0.12 mm id) tubing instead of Green (0.17 mm id) as it has only half of the volume that the sample has to travel through. This cuts down extra column band broadening. Ensure that your connections are as short as possible. The key locations to check are:

- The autosampler needle seat
- The autosampler to the Thermal Column Compartment – or 'TCC'
- The TCC to the column
- The column to the flow cell, including the internal diameter of the integral flow cell inlet capillary

All of these specific capillaries can be ordered individually from Agilent, in the lengths you need.

Tips & Tools

For the Agilent 1290 Infinity LC, in situations requiring extremely low dead volumes, use the ultra-low dispersion kit, which includes an ultra-low dispersion flow cell and 0.8 mm id capillaries.



1200 bar removable fitting(SV), 5067-4733

Scale your gradient profile and injection volume – If using gradient elution, scale the gradient profile and injection volume to the new smaller column to quickly transfer the method and avoid overloading. For isocratic and gradient elution, make sure that you scale the injection volume to match the overall column volume.

Minimize injection sample dispersion in the column – Use an injection solvent with solvent strength that is equivalent to or weaker than the mobile phase, especially when using an isocratic method. This is good practice in general for any column, and more important with high efficiency columns.

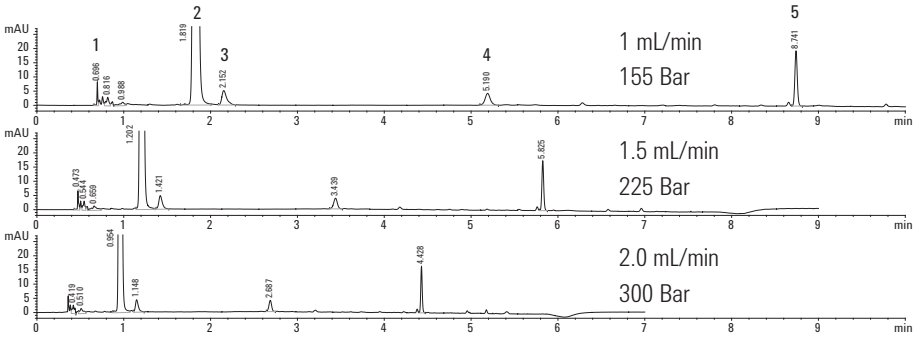
Take care to make proper connections – Agilent recommends Swagelok fittings with front and back ferrules, which give best sealing performance throughout our LC system (use this on the instrument connections, i.e. valves, heaters, etc). Polyketone fittings are highly recommended for up to 600 bar. Use this fitting (PN 5042-8957) on column connections with Poroshell 120. For RRHD columns, use Agilent's removable 1200 bar fitting (PN 5067-4733).

Optimize your flow rate – For Poroshell 120, if you're using a 2.1 mm id, the suggested starting flow rate is 0.42 mL/min; for 3.0 mm id Poroshell 120 columns, we suggest starting at 0.85 mL/min, and for 4.6 mm id, we suggest starting at 1.5 - 2 mL/min.

Fast Analysis of Cephapime and Related Impurities

Column: **Poroshell 120 EC-C18**
697975-902
4.6 x 75 mm, 2.7 µm

Detector: Agilent 1200 Series Rapid Resolution LC System



1. Impurity E
2. Cefepime
3. Impurity F
4. Impurity A
5. Impurity B

Tips & Tools

See a video that takes you through these steps at
www.agilent.com/chem/poroshell120video

Also, check out the LC Method Translator Tool at
www.agilent.com/chem/lcmethodtranslator

Agilent LC Columns Overview

Start with Poroshell 120 for Fast LC performance on any HPLC – phases align with ZORBAX family.

Poroshell 120

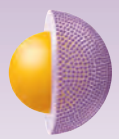
Up to 50% less pressure than sub-2 µm; a total lab productivity enhancer

1.7 µm solid core; 0.5 µm porous outer layer for a 2.7 µm particle, id's: 4.6 mm, 3.0 mm, 2.1 mm, Lengths: 30-150 mm.

New phases coming soon! Check **www.agilent.com/chem/poroshell120**

Compatible with HPLC and UHPLC instruments. Suitable for analysis of acids, bases, and neutrals. Also great for peptide mapping.

Poroshell 120 is for any lab looking for increased analytical speed and resolution with less backpressure.



SB-C18 (USP L1), SB-C8
Carbon Load: SB-C8: 4.5%

EC-C18 (USP L1), EC-C8** (USP L1),**
Phenyl-Hexyl (USP L11)
Carbon Load: Phenyl-Hexyl: 8%

****Best Phase for Method Development**

ZORBAX Family

ZORBAX Eclipse Plus**	ZORBAX StableBond	ZORBAX Eclipse XDB
RRHD: 1.8 µm, stable to 1200 bar; **RRHT:** 1.8 µm, 600 bar Prep Lengths: 30-250 mm IDs: 4.6 mm, 3.0 mm, 2.1 mm, 1.0 mm	**RRHD:** 1.8 µm, stable to 1200 bar; **RRHT:** 1.8 µm, 600 bar Lengths: 20-250 mm IDs: 4.6 mm , 3.0 mm, 2.1 mm, 1.0 mm; Prep, Capillary (C18)	**RRHD:** 1.8 µm, stable to 1200 bar; **RRHT:** 1.8 µm, 600 bar Lengths: 15-250 mm IDs: 4.6 mm, 3.0 mm, 2.1 mm, 1.0 mm; Capillary and Prep
C18 (USP L1), **C8** (USP L7), **Phenyl-Hexyl** (USP L11), **PAH** (USP L1)	**SB-C18** (USP L1), **SB-C8** (USP L7), **SB-C3** (USP L56), **SB-Phenyl** (USP L11), **SB-CN** (USP L10), **SB-Aq**	**C18** (USP L1), **C8** (USP L7), **Phenyl** (USP L11), **CN** (USP L10)
High performance and excellent peak shape with acids, bases and neutrals.	*High performance with acids, bases, and neutrals with superior lifetime at low pH.*	*Good peak shape for basic, acidic, and neutral compounds with high performance over a wide pH range (pH 2-9). eXtra Dense Bonding and double endcapping help give this column a long lifetime.*
Sample Applications **Environmental:** EPA Method 1694, Illicit and prescribed drugs in wastewater **Food Safety:** Quinolone antibiotics **Pharmaceutical:** Chloramphenicol, Simvastatin, Chrysophenol (TCM), amphetamine, ranitidine	**Sample Applications** Chemical/Industrial: Triton **Environmental:** Organic acids, pesticides in drinking water **Food Safety:** Anthocyanine, parabenes, melamine **Pharmaceutical:** Analgesics, anesthetics, traditional Chinese medicine	**Sample Applications** **Environmental:** Herbicides/pesticides, steroids in water **Food Safety:** Food colors, aromatic flavorings, mycotoxins, epoxyphenolic-based can coatings **Pharmaceutical:** Goldenseal and related alkaloids, antidepressants, triamcinolone
Double Endcapped (except PAH, which is not endcapped) Temp limit: 60 °C Pore size: 95Å Surface area: 160 m^2/g Particle sizes: 1.8, 3.5, 5 µm pH: 2.0-9.0 for C18, C8; 2.0-8.0 for PAH, Phenyl-Hexyl Carbon load: C18: 9%; C8: 7%; Phenyl-Hexyl: 9% ; PAH: 14%	**Non-Endcapped** Temp limit: 80 °C (90 °C for SB-C18) Pore size: 80Å Surface area: 180 m^2/g Particle sizes: 1.8, 3.5, 5, 7 µm pH: 1.0-8.0 (0.8-8.0 for SB-C18) Carbon Load: C18: 10%; C8: 5.5%; C3: 4%; Phenyl: 5.5%; CN: 4%, Aq: Proprietary	**Double Endcapped** Temp limit: 60 °C Pore size: 80Å Surface area: 180 m^2/g Particle sizes: 1.8, 3.5, 5, 7 µm pH: 2.0-9.0 (2.0-8.0 for CN) Carbon load: C18: 10%; C8: 7.6%; Phenyl: 7.2%; CN: 4.3%
Best all around – exceptional peak shape, efficiency, resolution, and lifetime	**Best for low pH mobile phases – great for method development**	**High performance over a wide pH range**

Pursuit/ Pursuit XRs

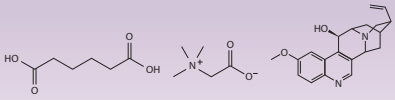
Lengths: 30-250 mm
IDs: 2.0 mm, 3.0 mm, 4.6 mm; Prep

C18 (USP L1), **C8** (USP L7), **Diphenyl** (USP L11), **PFP** (USP L43), **PAH** (USP L1), **Si** (USP L3)

Pursuit XRs offers higher loadability and Pursuit XRs Ultra is loaded for higher pressure stability.

Endcapped (except Pursuit XRs Si)
Pore Size: 200Å (Pursuit), 100Å (Pursuit XRs)
Surface area: 200 m^2/g (Pursuit); 440 m^2/g (Pursuit XRs)
Particle Sizes: 3, 5, 10 µm
pH: 2.0-9.0
Carbon Load: Pursuit C18: 12.9%; Pursuit C8: 7.4%; Pursuit Diphenyl: 7.3%; PFP: 6.3%; XRs C18: 22%; XRs Ultra C18: 23.3%; XRs C8: 15%; XRs Ultra Diphenyl: 14.6%

Reliable Selectivity Alternatives



Endcapped: EC-C18, EC-C8, Phenyl-Hexyl, Bonus-RP* (triple)
Non-endcapped: SB-C18, SB-C8* and SB-Aq
Temp Limit: 60 °C (EC-C18, EC-C8, Phenyl-Hexyl, Bonus-RP*); 80 °C (SB-C8, SB-Aq); 90 °C (SB-C18)
Pore Size: 120Å ; Surface Area: 130; pH: 2.0-8.0 (EC-C18, EC-C8, Phenyl-Hexyl);
1.0-8.0 (SB-C18, SB-C8*, SB-Aq); 2.0-9.0 (Bonus-RP*); Carbon Load: 8% (EC-C18); 7% (EC-C8)

Bonus-RP (USP L60)*
Carbon Load: 7.5%

SB-AQ
Carbon Load: Proprietary

POLAR Compounds

ZORBAX Extend-C18

RRHD: 1.8 µm, stable to 1200 bar;
RRHT: 1.8 µm, 600 bar
Prep Lengths: 20-250 mm
IDs: 4.6 mm, 3.0 mm, 2.1 mm, 1.0 mm

C18 (USP L1)

High efficiency and long life at high pH – up to pH 11.5. Improve retention, resolution and peak shape of basic compounds. High sensitivity for LC/MS separations of peptides. Unique bidendate bonding and double endcapping provides high pH stability.

Sample Applications
Environmental: EPA 8330 (explosives)
Food Safety: Aflatoxins, mycotoxins
Pharmaceutical: Antihistamines, xanthines

Double-Endcapped
Temp limit: 60 °C
Pore Size: 80Å
Surface area:
180 m^2/g

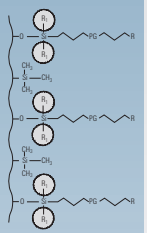
Particle sizes:
1.8, 3.5, 5 µm
pH: 2.0-11.5
Carbon load: 12.5%

A good option for separations at high pH

ZORBAX Bonus-RP

RRHD: 1.8 µm, stable to 1200 bar;
RRHT: 1.8 µm, 600 bar
Lengths: 30-250 mm
IDs: 4.6 mm, 3.0 mm, 2.1 mm, 1.0 mm; Prep

Bonus-RP (USP-L60)



Polar-embedded to improve peak shapes; for basic compounds at low and mid pH.

Sample Applications
Environmental: Triazine pesticides
Food Safety: Hydroxymethylfurfural
Pharmaceutical: Antifungal medications, anorectics, ulcer medications

Triple-Endcapped
Temp limit: 60 °C
Pore size: 80Å
Surface area:
180 m^2/g

Particle sizes:
1.8, 3.5, 5 µm
pH: 2.0-9.0
Carbon load: 9.5%

Alternative selectivity to alkyl, phenyl, cyano phases

SB-AQ

RRHD: 1.8 µm stable to 1200 bar;
RRHT: 1.8 µm, 600 bar
Lengths: 20 - 250 mm
IDs: 4.6 mm, 3.0 mm, 2.1 mm; Prep

ZORBAX SB-Aq

Propietary phase ideal for polar compounds and high aqueous conditions.

Sample Applications
Environmental: Pesticides in drinking water
Food Safety: Pesticides in food
Pharmaceutical: Water-soluble vitamins

See ZORBAX StableBond for specification and structure.

Exceptional lifetime at low pH – no endcapping

Polaris

Lengths: 30-250 mm,
(available in 3 µm and 5 µm particles)
IDs: 2.0 mm, 3.0 mm, 4.6 mm; Prep

C18-A (USP L1), **C8-A** (USP L7),
C18-Ether (USP L1), **C8-Ether** (USP L7),
Amide-C18 (USP L60),
NH2 (USP L8), **Si-A** (USP L3)

Hydrogen-bond accepting and ether group endcapping provide alternate selectivities.

Sample Applications
Environmental: Triazine pesticides
Food Safety: Hydroxymethylfurfural
Pharmaceutical: Antifungal medications, anorectics, ulcer medications

Endcapped
Pore size: 180Å
Surface Area:
200 m^2/g
Particle Sizes:
3, 5, 10 µm

pH: 2.0-9.0
Carbon load: Polaris
C18-A: 13.8%; Polaris
C8-A: 7.4%; Polaris
C18-Ether: 12.1%;
Polaris C8-Ether:
7.1%

More options for Polar Compounds

Looking for a HILIC column?

HILIC Plus is a HILIC column based on Eclipse Plus silica for excellent peak shapes

Non-bonded silica
Pore size: 95Å
Surface Area: 160 m^2/g

Particle Sizes: 1.8, 3.5 µm
pH: 0-8.0

High sensitivity for LC/MS applications and recommended for EPA 1694.

RRHD:
1.8 µm, stable to 1200 bar
Lengths: 50, 100, 150 mm

IDs: 4.6 mm (3.5 µm only),
3.0 mm, 2.1 mm

*Available summer 2012.

Method Development from pH 1-12

Start method development at low pH (pH 2-3)

With so many column choices available, how do you know where to start your method development? The recommended starting point for method development is using a buffered low pH mobile phase – around pH 2-3. Using a low pH mobile phase most often results in the best peak shape for basic compounds on silica-based columns. At low pH, the silanols on the silica are fully protonated so positively charged basic compounds do not interact strongly. The result is good peak shape. Many acidic compounds are non-charged, maximizing their retention at low pH. These observations are key advantages to method development at low pH.

For standard analytical work, start method development with acetonitrile as the mobile phase organic modifier and 20-50 mM phosphate buffer (pH 2-3) as the aqueous component for non-LC/MS applications. These conditions provide good pH control, necessary for the most reproducible analyses of ionizable compounds. For LC/MS applications formic acid or TFA are good mobile phase additives for low pH.

Optimize solvents and bonded phases at low pH

The initial method development steps may lead very quickly to a satisfactory separation. But if more optimization is needed, acetonitrile can be replaced with methanol or tetrahydrofuran and the separation re-optimized. This step may lead to a satisfactory solution, but if still more selectivity optimization is needed, the column bonded phase can be changed.

At low pH there are many bonded phase choices available for optimization. These include the Eclipse Plus phases as well as the Eclipse XDB family with C18, C8, Phenyl and CN. Alternate choices include five different StableBond bonded phases: SB-C18, SB-C8, SB-Phenyl, SB-CN, and SB-C3. For polar analytes, try Bonus-RP, SB-Aq or the Polaris family, including C18-A, C8-A, C18-Ether and Amide-C18 phases.

It may be necessary at low pH to improve the retention of acidic compounds. For these situations, lower the pH even further, down to pH 1-2, and use StableBond columns. These columns provide the greatest stability at very low pH and provide many selectivity options for achieving the highest resolution separations.

Tips & Tools

LC Method Translator

Use this online tool to quickly factor in changes to column length, diameter, flow rate, and more – and to calculate method adjustments. This is particularly useful for gradient methods.

To download, go to **www.agilent.com/chem/lcmethodtranslator**

Choose Agilent ZORBAX Eclipse Plus or Poroshell 120 for method development at mid pH (4-9)

There are some samples that may not be resolved at low pH or may have better solubility and stability at mid pH. The Eclipse Plus C18 and Poroshell 120 EC-C18 columns can be used at the mid pH range for method development. The Eclipse Plus column is stable to pH 9 so it is equally reliable at mid pH. These double endcapped columns have two key advantages – good peak shape at low and mid pH, as well as sufficient bonded phase density to protect the column from silica degradation from pH 6-9.

At mid pH, basic compounds (e.g., amines) may still have a positive charge and the silanols on the silica surface may have a negative charge. Therefore covering as many silanols as possible leads to the best peak shape at mid pH. This makes the Eclipse Plus C18 the best starting choice for a column at mid pH. Phosphate buffer is usually the first choice for mobile phase modifier at pH 7 because its buffer range is pH 6.1-8.1. A second choice for mid pH is acetate buffer since it buffers from pH 3.8-5.8 and its volatility makes it a good choice for LC/MS compatibility.

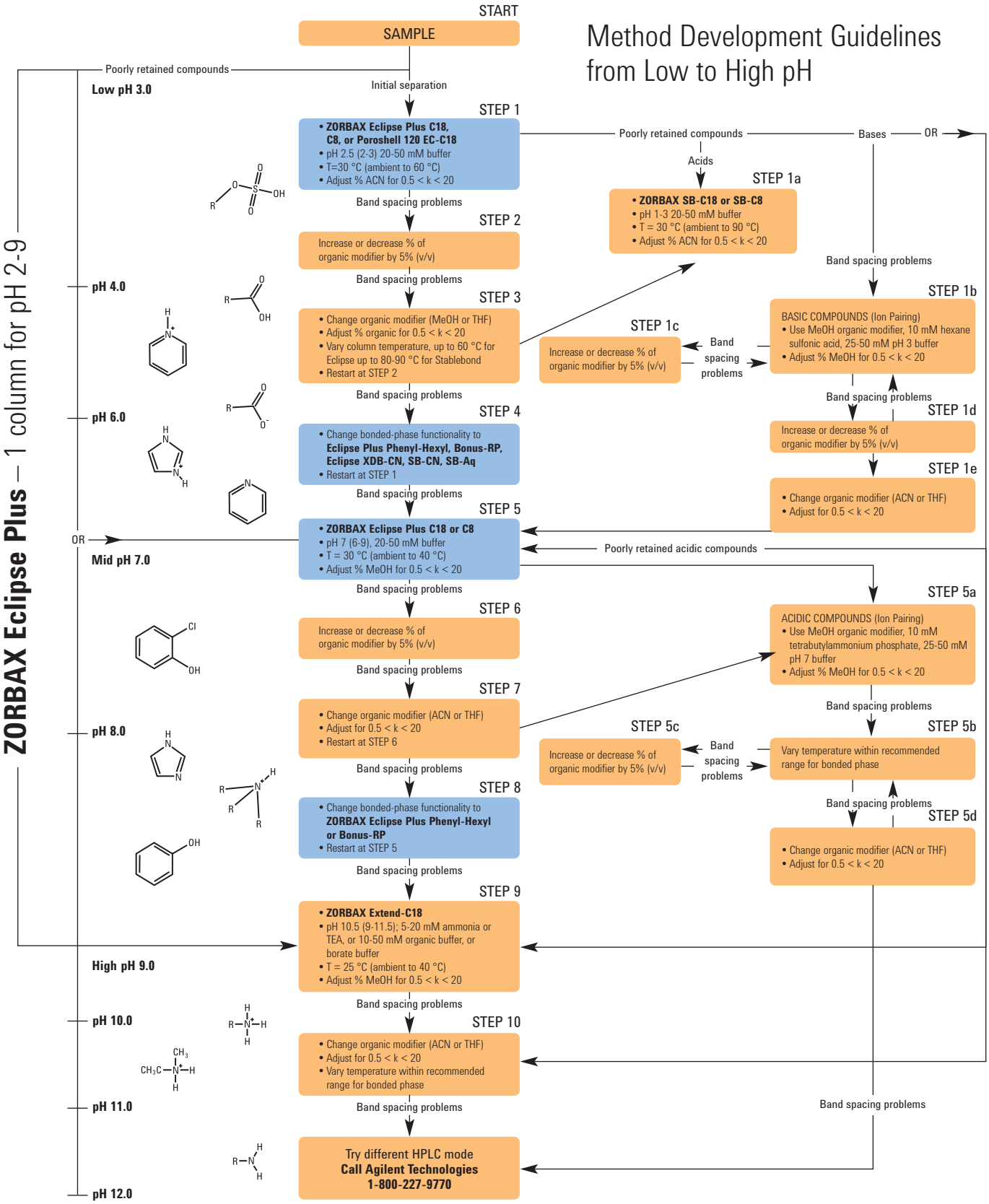
Choose Agilent ZORBAX Extend-C18 columns for method development at high pH (pH 9-12)

At low or mid pH, some separations of basic compounds may still not have enough retention or the desired selectivity. For these samples, high pH separations may be appropriate. Until recently, high pH separations on silica-based columns were avoided because of short column lifetimes, due to dissolution of the underlying silica gel. Special bonded phases such as the ZORBAX Extend-C18, can protect the silica from dissolution, so that a reasonable column lifetime can be achieved and the selectivity advantages of high pH can be explored.

The mobile phase buffer choices at high pH with the Extend-C18 column are organic buffers like triethylamine and ammonium hydroxide. These buffers are best used with methanol as the organic modifier to extend the column lifetime at high pH. Another good option to consider when working with high pH and PLRP-S columns, which are made from a polymeric material.

Easy, Reliable pH Testing

Agilent offers a full line of pH meters and electrodes (beginning May, 2012). Designed for chromatographers, these pH meters offer intuitive user design and exceptional ruggedness for your lab. Learn more at **www.agilent.com/chem/AgilentpH**


Method Development Guidelines from Low to High pH
ZORBAX Eclipse Plus – 1 column for pH 2-9
START
SAMPLE
Poorly retained compounds
Low pH 3.0
Initial separation
STEP 1
• ZORBAX Eclipse Plus C18, C8, or Poroshell 120 EC-C18
• pH 2.5 (2-3) 20-50 mM buffer
• T=30 °C (ambient to 60 °C)
• Adjust % ACN for 0.5 < k < 20
Band spacing problems
STEP 2
Increase or decrease % of organic modifier by 5% (v/v)
Band spacing problems
STEP 3
• Change organic modifier (MeOH or THF)
• Adjust % organic for 0.5 < k < 20
• Vary column temperature, up to 60 °C for Eclipse up to 80-90 °C for Stablebond
• Restart at STEP 2
Band spacing problems
STEP 4
• Change bonded-phase functionality to Eclipse Plus Phenyl-Hexyl, Bonus-RP, Eclipse XDB-CN, SB-CN, SB-Aq
• Restart at STEP 1
Band spacing problems
STEP 5
• ZORBAX Eclipse Plus C18 or C8
• pH 7 (6-9), 20-50 mM buffer
• T = 30 °C (ambient to 40 °C)
• Adjust % MeOH for 0.5 < k < 20
Band spacing problems
STEP 6
Increase or decrease % of organic modifier by 5% (v/v)
Band spacing problems
STEP 7
• Change organic modifier (ACN or THF)
• Adjust for 0.5 < k < 20
• Restart at STEP 6
Band spacing problems
STEP 8
• Change bonded-phase functionality to ZORBAX Eclipse Plus Phenyl-Hexyl or Bonus-RP
• Restart at STEP 5
Band spacing problems
STEP 9
• ZORBAX Extend-C18
• pH 10.5 (9-11.5); 5-20 mM ammonia or TEA, or 10-50 mM organic buffer, or borate buffer
• T = 25 °C (ambient to 40 °C)
• Adjust % MeOH for 0.5 < k < 20
Band spacing problems
STEP 10
• Change organic modifier (ACN or THF)
• Adjust for 0.5 < k < 20
• Vary temperature within recommended range for bonded phase
Band spacing problems
Try different HPLC mode
Call Agilent Technologies
1-800-227-9770
pH 4.0
pH 6.0
OR
Mid pH 7.0
pH 8.0
High pH 9.0
pH 10.0
pH 11.0
pH 12.0
Poorly retained compounds
Acids
STEP 1a
• ZORBAX SB-C18 or SB-C8
• pH 1-3 20-50 mM buffer
• T = 30 °C (ambient to 90 °C)
• Adjust % ACN for 0.5 < k < 20
Band spacing problems
Bases
OR
STEP 1b
BASIC COMPOUNDS (Ion Pairing)
• Use MeOH organic modifier, 10 mM hexane sulfonic acid, 25-50 mM pH 3 buffer
• Adjust % MeOH for 0.5 < k < 20
Band spacing problems
STEP 1c
Increase or decrease % of organic modifier by 5% (v/v)
Band spacing problems
STEP 1d
Increase or decrease % of organic modifier by 5% (v/v)
STEP 1e
• Change organic modifier (ACN or THF)
• Adjust for 0.5 < k < 20
Poorly retained acidic compounds
STEP 5a
ACIDIC COMPOUNDS (Ion Pairing)
• Use MeOH organic modifier, 10 mM tetrabutylammonium phosphate, 25-50 mM pH 7 buffer
• Adjust % MeOH for 0.5 < k < 20
Band spacing problems
STEP 5b
Vary temperature within recommended range for bonded phase
Band spacing problems
STEP 5c
Increase or decrease % of organic modifier by 5% (v/v)
Band spacing problems
STEP 5d
• Change organic modifier (ACN or THF)
• Adjust for 0.5 < k < 20
Band spacing problems

GUARD COLUMNS

The Value of Guard Columns

Guard columns can help extend the life of your analytical column. Choosing to use guard columns can help reduce operating expenses, by reducing the frequency of analytical column replacement.

The guard column prevents damage caused by particulate matter and strongly adsorbed material. To maintain an adequate capacity for sample impurities, choose a guard column with an internal diameter similar to the column internal diameter. Ideally, the packing of the guard column should be the same as the analytical column so that the chromatography of the analytical column is not altered.

Guard columns contribute to the separation, so you should include a guard column inline during method development.

Agilent UHPLC guards (coming second half 2012) provide protection for high-efficiency Poroshell 120 and ZORBAX RRHD and RRHT columns, without reducing performance. Part numbers for all guard columns are incorporated into the different product family tables.

Judging when to replace a guard column can be difficult. As a rough guide, if plate number, pressure or resolution change by more than 10%, the guard column probably needs replacing. You will need to make a judgment call on how often to replace your guard columns based on your application type. It is always preferable to change the guard column sooner rather than later.

Cartridge Selection Guide

Icon*	Type of Cartridge	Features	Benefits
AC	Agilent HPLC Cartridge	Can reverse collets in the end fitting to add guard cartridges	Inexpensive Extends column lifetime Permits rapid column changes Can use 2, 3, 4 and 4.6 mm cartridges
		Cartridges have a unique filter and sieve at each end	Helps prevent blockage
ZGC	ZORBAX Guard Cartridge: Standalone system	High efficiency, standalone, low-dead-volume cartridge	Seals up to 400 bar
		Polymeric cartridge designed for leak-tight seals against metal surfaces	No gaskets required More solvent-resistant than PEEK
		Reusable fittings	Adapt for connections to 1/16 in LC fittings
RR	ZORBAX Rapid Resolution and Rapid Resolution HT Cartridge Columns: 3.5 µm and 1.8 µm packings, standalone system	For high throughput LC/MS, LC/MS/MS and combinatorial separations	
		Packed with Eclipse XDB for pH use from 2-9 Packed with StableBond for low pH use	For all analyte types Low bleed
		Sold individually or as three-packs	
P	ZORBAX Semi-Preparative Guard HPLC Hardware Kit: Standalone system	Easy, low-dead-volume assembly	Seals up to 2000 psi (135 bar, 13.5 MPa)
		Tubing (polyphenylene sulfone) designed for leak-tight seals against metal surfaces	No gaskets required
		Reusable fittings	Adapt for connections to 1/16 in LC fittings
PI	ZORBAX and Agilent Prep Preparative Cartridge Column and Guard HPLC System: Standalone and integral hardware options	Easy, low-dead-volume assembly	Extends column lifetime
		Reusable fittings	Permits rapid column changes
		Hardware options for integral and external guards	Can use with 21.2 and 30 mm id columns
PL	Polymeric Analytical Column and Guard Cartridge	High efficiency	Inexpensive
		Low dead volume	Rapid cartridge changes
		Reusable holder	Extends column lifetime
CS	ChromSep Column Hardware: Complete systems and replacement cartridges	Easy, no-dead-volume assembly	Economical format No tools required Modular flexibility
MG	MetaGuard Column Hardware: Complete systems and replacement cartridges	Easy, no-dead-volume assembly	Economical format No tools required Modular flexibility
UG	Agilent UHPLC for Fast LC	Requires no special hardware – connects right to the analytical column	Extends column lifetime without impacting performance
		Available in matching phases for Poroshell 120, RRHD and RRHT columns	

*Look for these icons to help you select the proper guard cartridges and columns.

Cartridge/Guard Cartridge Systems Compatibility Guide*

Icon	Column Type	Guard Cartridge Holder	ID (mm)	Phases
AC	Cartridge column cartridge holder 5021-1845 	Guard cartridge (internal system) cartridge holder 5021-1845 	2.0 3.0 4.0 4.6	LiChrospher Nucleosil Purospher Superspher ZORBAX
ZGC	Standard fitting 	Column guard cartridge (standalone) cartridge holder 820999-901 	2.1 3.0 4.6	ZORBAX
RR	Rapid Resolution cartridge holder 820555-901 	No guard cartridge holder	4.6	ZORBAX
P	Semi-preparative column 	Semi-prep guard cartridge (standalone) cartridge holder 840140-901 	9.4	ZORBAX

*Standalone guard cartridges fit all cartridge and standard fitting columns available from Agilent. All columns without icons are standard fitting columns.

(Continued)

Cartridge/Guard Cartridge Systems Compatibility Guide*

Icon	Column Type	Guard Cartridge Holder	ID (mm)	Phases
PI	PrepHT	Guard cartridge 820444-901 	21.2	ZORBAX Agilent Prep
PL	Analytical 	Guard cartridge holder (PL1310-0016) and PLRP-S guard cartridges, 2/pk (PL1612-1801) 	3.0	PLRP-S
MG	Single replacement column 	No guard cartridge holder	1.0 2.0 4.6	Pursuit Pursuit XRs Polaris phases
UG	Single replacement column 		2.1 3.0 4.6	Poroshell 120: EC-C18 EC-C8 SB-C18 Phenyl-Hexyl Sub-2 µm: Eclipse Plus C18 Eclipse XDB-C18 SB-C18 SB-C8

*Standalone guard cartridges fit all cartridge and standard fitting columns available from Agilent. All columns without icons are standard fitting columns.

Fast Columns for Reversed-Phase HPLC/UHPLC

The past decade has seen a steady increase in the efficiency and speed of chromatography, starting with smaller particle sizes, that enable higher resolution, and continuing with new technological advances in particle design – superficially porous particles – that enable these same resolution enhancements with lower backpressure.

Designed especially for high-productivity analysis (Fast LC), Agilent ZORBAX and Poroshell columns are the best first choice for any analysis, because they give you:

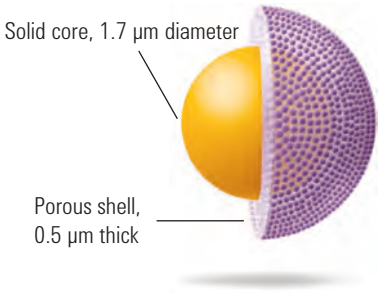
- The productivity you need to stay ahead of your competition: technological advances like sub-2 µm particles and superficially porous Poroshell 120 columns deliver increased speed and resolution.
- Flexibility and method scalability from lab to lab and around the world – for small molecule and biomolecule analyses.
- Unbeatable chromatographic performance: ZORBAX silica – the base silica used for all ZORBAX and Poroshell 120 columns – is ultra-pure, very strong, and highly uniform for ultimate reliability.
- The broadest range of phases and column configurations to suit your specific application needs.

Tips & Tools

VHP Fittings

Agilent's 1200 bar removable fitting (for 1/16 in od capillaries) consists of a stainless steel screw, an internal stainless steel ferrule and a front ferrule in PEEK. The fitting can be used throughout the flow path, but because it can be re-used without losing tightness, it is especially suitable for the connection between the heat exchanger and the column. This new and improved fitting replaces the standard stainless steel Swagelok fitting which was not removable. The Very High Pressure (VHP) fitting is available in three sizes – short (p/n 5067-4733), long (p/n 5067-4738) and extra long (p/n5067-4739). The short fitting is the one that is most commonly used, and will be appropriate 90% of the time. In some cases, if using columns with longer nuts, a longer fitting will be needed.

Recommendations for Fast LC Columns		
Your Lab Situation	**Agilent Recommends**	**Rationale**
You're using both UHPLC (1000+ bar) and HPLC instruments (e.g. Agilent 1290 Infinity LC and 1260 Infinity LC – 600 bar)	1. Poroshell 120 2. ZORBAX RRHD 1.8 µm	Poroshell 120 is an easy column to use on both instrument types. ZORBAX RRHD will help you optimize the capabilities of the 1290 Infinity LC for UHPLC.
Only 400 – 600 bar HPLCs – Agilent 1200s, Agilent 1100s (400 bar) as well as the 1220 Infinity LC or 1260 Infinity LC (600 bar)	1. Poroshell 120 2. ZORBAX Eclipse Plus 3.5 µm and 5 µm	With Poroshell 120, you can enhance the performance of older 400-bar instruments, and also get even better performance from newer 600 bar UHPLC instruments. For established methods that you can't transfer, the ZORBAX Eclipse Plus column will provide exceptional peak shape and performance.
A mix of UHPLC instruments (Agilent 1290 Infinity LC, other 1000+ bar instruments) and some HPLC instruments (e.g. 1200 LC)	1. ZORBAX RRHD 1.8 µm 2. Poroshell 120	ZORBAX RRHD can deliver optimum performance on all these instruments. Poroshell 120 can be used on the 600 bar instruments to optimize their performance.



Poroshell 120

- High efficiency and high resolution, with up to 50% less backpressure than sub-2 µm columns
- 2 µm frit, for rugged performance with dirty samples
- Compatible with 400 bar and 600 bar LCs, as well as UHPLC instruments
- An expanding family of bonded phases to align with the ZORBAX Family, for reliable scalability
- Excellent selectivity and peak shapes
- Designed for exceptional reproducibility

Agilent Poroshell 120 columns are a 2.7 µm particle with a 1.7 µm solid core and 0.5 µm porous outer layer. This small particle size provides high efficiency, similar to sub-2 µm columns, but with 40-50% less pressure. These high efficiency, high resolution columns can be used on any type of LC. The porous outer layer and solid core limit diffusion distance and improve separation speed while the narrow particle size distribution improves efficiency and resolution. The columns can support high pressure and multiple columns can be used for the highest resolution and efficiency possible. The same principles are used in Poroshell 300 columns, ideal for fast, high resolution separations of biomolecules.

Column Specifications

Bonded Phase	Pore Size	Temp. Limits	pH Range	Endcapped	Carbon Load
EC-C18	120Å	60 °C	2.0-8.0	Double	10%
EC-C8	120Å	60 °C	2.0-8.0	Double	5%
Phenyl-Hexyl	120Å	60 °C	2.0-8.0	Double	9%
SB-C18	120Å	90 °C	1.0-8.0	No	8%
SB-C8*	120Å	80 °C	1.0-8.0	No	5.5%
ZORBAX SB-Aq	120Å	80 °C	1.0-8.0	No	Proprietary
Bonus-RP*	120Å	60 °C	2.0-9.0	Triple	9.5%

Specifications represent typical values only.

*Available in second half 2012.

Tips & Tools

Watch the Poroshell 120 Method Transfer Video to learn how easy it is to transfer existing methods to Poroshell 120 at **www.agilent.com/chem/poroshell120video**

Poroshell 120
(Maximum pressure: 600 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	EC-C18 USP L1	EC-C8 USP L7	Phenyl-Hexyl USP L11	SB-C18 USP L1	SB-C8 USP L7*	SB-Aq	Bonus-RP USP L60*
	Analytical	4.6 x 150	2.7	693975-902	693975-906	693975-912	683975-902	683975-906	683975-914	693968-901
	Analytical	4.6 x 100	2.7	695975-902	695975-906	695975-912	685975-902	685975-906	685975-914	695968-901
	Analytical	4.6 x 75	2.7	697975-902	697975-906		687975-902			
	Analytical	4.6 x 50	2.7	699975-902	699975-906	699975-912	689975-902	689975-906	689975-914	699968-901
	Analytical	4.6 x 30	2.7	691975-902	691975-906		681975-902			
UG	UHPLC Guard, 600 bar*	4.6 x 5	2.7	820750-911	820750-913	820750-914	820750-912			
	Solvent Saver	3.0 x 150	2.7	693975-302	693975-306	693975-312	683975-302	683975-306	683975-314	693968-301
	Solvent Saver	3.0 x 100	2.7	695975-302	695975-306	695975-312	685975-302	685975-306	685975-314	695968-301
	Solvent Saver	3.0 x 75	2.7	697975-302	697975-306		687975-302			
	Solvent Saver	3.0 x 50	2.7	699975-302	699975-306	699975-312	689975-302	689975-306	689975-314	699968-301
	Solvent Saver	3.0 x 30	2.7	691975-302	691975-306		681975-302			
UG	UHPLC Guard, 600 bar*	3.0 x 5	2.7	823750-911	823750-913	823750-914	823750-912			
	Narrow Bore	2.1 x 150	2.7	693775-902	693775-906	693775-912	683775-902	683775-906	683775-914	693768-901
	Narrow Bore	2.1 x 100	2.7	695775-902	695775-906	695775-912	685775-902	685775-906	685775-914	695768-901
	Narrow Bore	2.1 x 75	2.7	697775-902	697775-906		687775-902			
	Narrow Bore	2.1 x 50	2.7	699775-902	699775-906	699775-912	689775-902	689775-906	689775-914	699768-901
	Narrow Bore	2.1 x 30	2.7	691775-902	691775-906		681775-902			
UG	UHPLC Guard, 600 bar*	2.1 x 5	2.7	821725-911	821725-913	821725-914	821725-912			

*Available in second half 2012.

Environmental phenols on Poroshell 120

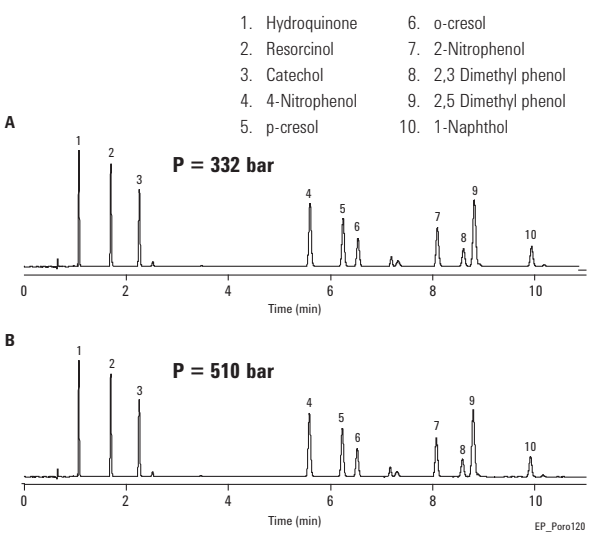
Column A: **Poroshell 120 EC-C18**
695975-902
4.6 x 100 mm, 2.7 µm

Column B: **Eclipse Plus C18**
959964-902
4.6 x 100 mm, 1.8 µm

Gradient: A: Water 0.1% formic acid
B: Acetonitrile 0.1% formic acid
2 mL/min
Initial: 8% B
10 min: 30% B

Detector: 275 nm, 2 mm flow cell
Injection: 10 µL
Agilent 1200 SL 40 °C
No pulse damper
No mixer 3 µL heater

Poroshell 120 provides sub-2 µm like efficiency at lower pressure.



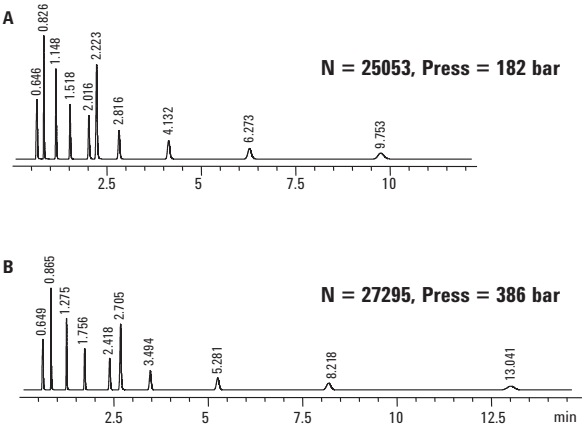
UHPLC efficiency at HPLC pressures

Column A: **Poroshell 120 EC-C18**
695975-302
3.0 x 100 mm, 2.7 µm

Column B: **Eclipse Plus C18**
959964-302
3.0 x 100 mm, 1.8 µm

Mobile Phase: 60% Acetonitrile:40% water
Flow Rate: 0.58 mL/min
Temperature: 26 °C
Injection Volume: 4 µL

Detector: DAD Sig = 254,4 nm
Ref = 360,100 nm
Sample: RRLC checkout sample (PN 5188-6529) spiked w/50 µL 2 mg/mL thiourea in water/acetonitrile (65:35)



For this sample of neutral alkylphenones, the Poroshell 120 column delivered >90% of the efficiency attained by the 1.8 µm column. Also note that the pressure on the Poroshell 120 column is about 50% of the pressure on the 1.8 µm column.

HPLC separation of 12 phenols performed in just 5 minutes – and under 400 bar – using an Agilent Poroshell 120 EC-C18 column

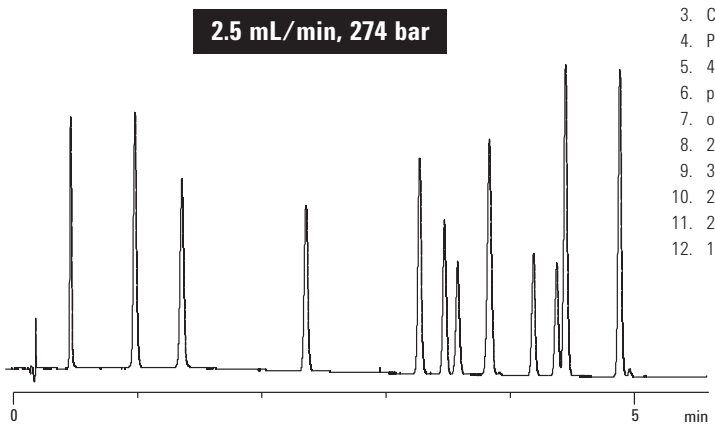
Column: **Poroshell 120 EC-C18**
699975-902
4.6 x 50 mm, 2.7 µm

Mobile Phase: Solvent A: Water with 0.1% formic acid
Solvent B: Acetonitrile

Gradient: 5% B in 0.8 min
60% B in 6.8 min
1200 SL controlled temperature
at 25 °C 2 mm flow cell

Importantly, the flow rate was kept to 2.5 mL/min, reducing the amount of mobile phase consumed per analysis to about 15 mL.

Agilent Poroshell 120 gives high efficiency, high resolution separations quickly at HPLC pressures.



1. Hydroquinone
2. Resourcinol
3. Catechol
4. Phenol
5. 4-Nitrophenol
6. p-cresol
7. o-cresol
8. 2-Nitrophenol
9. 3,4 di methyl phenol
10. 2,3 di methyl phenol
11. 2,5 di methyl phenol
12. 1-napthol

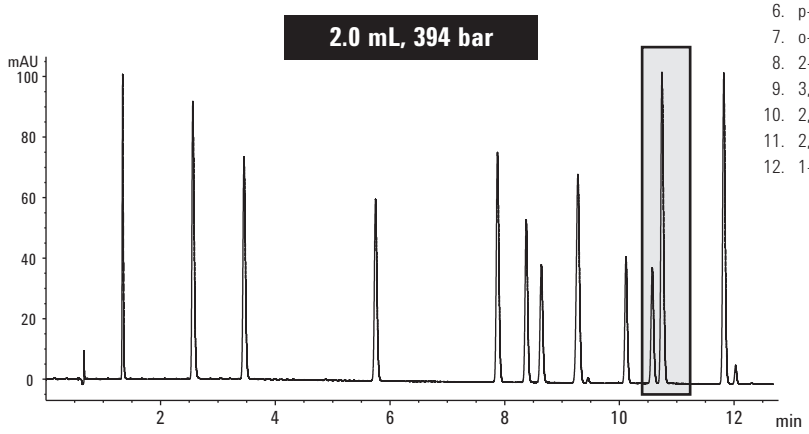
12 phenols analyzed using a longer (4.6 x 100 mm) Agilent Poroshell 120 EC-C18 column

Column: **Poroshell 120 EC-C18**
695975-902
4.6 x 100 mm, 2.7 µm

Mobile Phase: Solvent A: Water with 0.1% formic acid
Solvent B: Acetonitrile

Gradient: 5% B in 2 min
60% B in 17 min
1200 RRLC SL controlled temperature
at 25 °C 2 mm flow cell

By reducing the flow rate to 2.0 mL/min, the pressure was kept to less than 400 bar improving the separation of a late-eluting peak pair (highlighted) with only a minor increase in analysis time. This separation can be achieved using HPLC or, if a higher flow rate is desired, a UHPLC.



1. Hydroquinone
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8. 2-Nitrophenol
9. 3,4 di methyl phenol
10. 2,3 di methyl phenol
11. 2,5 di methyl phenol
12. 1-napthol

Poroshell 120 EC-C18 for fast UHPLC separations

Column: **Poroshell 120 EC-C18**
695975-302
3.0 x 100 mm, 2.7 µm

Mobile Phase: 65% A: 0.2% Formic acid
35% B: Methanol
Isocratic

Flow Rate: Varies

Temperature: 26 °C

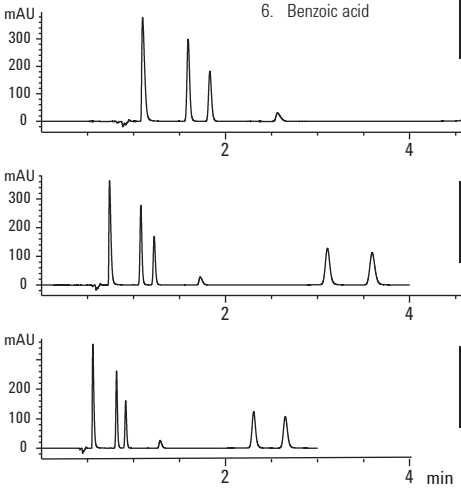
Detector: Sig = 220, 4 nm, Ref = Off

This example shows a fast separation using a mobile phase that generates higher pressures. In the top chromatogram, a 3.0 mm id column was used, with a flow rate of 0.5 mL/min and a pressure below 400 bar – making this a typical LC separation.

Although the top separation was fast (just under 6 minutes), the middle and bottom chromatograms show that you can reduce run times to under 3 minutes by increasing the flow rate. These faster analyses will take your pressure to 400-560 bar; look to the Agilent 1200 Infinity Series flexible upgrade options to help you take advantage of UHPLC capabilities.

More viscous solvents like methanol can be used at HPLC or UHPLC pressures.

1. Saccharin
2. Caffeine
3. P-hydroxybenzoic acid
4. Aspartame
5. Dehydroacetic acid
6. Benzoic acid



Tips & Tools

Fast LC performance comes from the right instruments, columns and connections. Order your copy of the *Capillary and Fittings Selection Guide* (5991-0121EN)
www.agilent.com/chem/getguides

ZORBAX Rapid Resolution High Definition 1.8 µm

- High pressure (1200 bar) columns for optimum results with the 1290 Infinity LC or other UHPLC instruments
- 1.8 µm particles deliver maximum resolution for the most defined separations
- Available in 12 ZORBAX phases, including Eclipse Plus C18 for superior peak shape, ZORBAX StableBond C18 for low pH stability Bonus-RP, Eclipse PAH, Eclipse Plus Phenyl-Hexyl and Extend-C18
- Also available in HILIC Plus
- Achieve the same selectivity on 3.5 and 5 µm ZORBAX columns with the same bonded phase for compatibility with any LC

ZORBAX Rapid Resolution High Definition (RRHD) columns are an expansion of the ZORBAX 1.8 µm particle column line. The new RRHD columns use improved packing processes to achieve stability up to 1200 bar for use with the Agilent 1290 Infinity LC or other UHPLC instruments. RRHD 1.8 µm columns are available in 50, 100 and 150 mm lengths for fast or high resolution – truly high definition – separations of your most complex samples.

ZORBAX RRHD Column Specifications

Bonded Phase	Pore Size	Surface Area	pH Range	End-capped
ZORBAX Eclipse Plus C18	95Å	160 m^2/g	2.0-9.0	Double
ZORBAX Eclipse Plus C8	95Å	160 m^2/g	2.0-9.0	Double
ZORBAX Eclipse Plus Phenyl-Hexyl	95Å	160 m^2/g	2.0-9.0	Double
ZORBAX Eclipse XDB-C18	80Å	180 m^2/g	2.0-9.0	Double
ZORBAX Extend-C18	80Å	180 m^2/g	2.0-11.5**	Double
ZORBAX Bonus RP	80Å	180 m^2/g	2.0-9.0	Triple
ZORBAX StableBond SB-C18	80Å	180 m^2/g	1.0-8.0*	No
ZORBAX StableBond SB-C8	80Å	180 m^2/g	1.0-8.0*	No
ZORBAX StableBond SB-Phenyl	80Å	180 m^2/g	1.0-8.0*	No
ZORBAX StableBond SB-CN	80Å	180 m^2/g	1.0-8.0*	No
ZORBAX StableBond SB-Aq	80Å	180 m^2/g	1.0-8.0*	No
ZORBAX Eclipse PAH	95Å	160 m^2/g	2.0-8.0	No
ZORBAX HILIC Plus	95Å	160 m^2/g	0.0-8.0	No
ZORBAX StableBond 300SB-C8	300Å	45 m^2/g	1.0-8.0*	No
ZORBAX StableBond 300SB-C18	300Å	45 m^2/g	1.0-8.0*	No

* StableBond columns are designed for optimal use at low pH. At pH >6, highest column stability for all silica based columns is obtained by operating at temperatures <40 °C and using lower buffer concentrations – 10-20 mM or organic buffers. 300SB-C18 may be used up to 90 °C. For pH 6-8, select the Eclipse Plus C18 column.

** Temperature limits are 60 °C up to pH 8, 40 °C from pH 8-11.5.

Separation of licorice root on RRHD columns

Column A: **ZORBAX RRHD SB-C18**
857700-902
2.1 x 50 mm, 1.8 µm

Column B: **858700-902**
2.1 x 100 mm, 1.8 µm

Column C: **859700-902**
2.1 x 150 mm, 1.8 µm

Mobile Phase: 10-100% B/30 min
A: 0.1% Formic acid (fa)
B: Acetonitrile with 0.1% fa

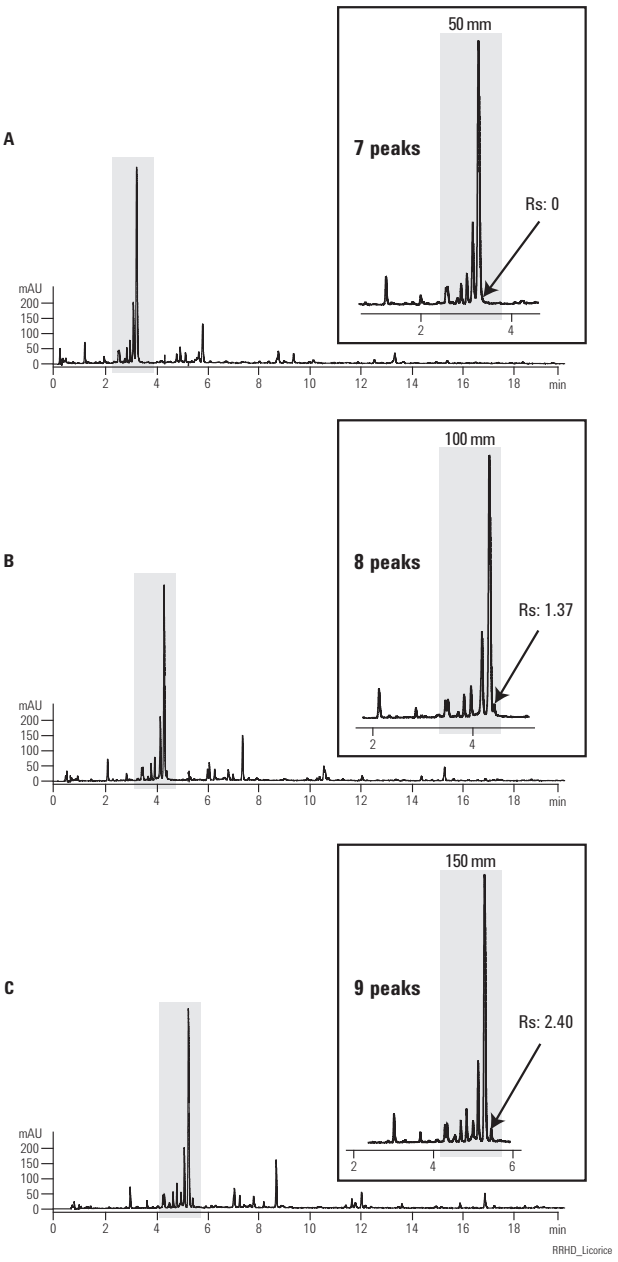
Flow Rate: F = 0.4 mL/min

Gradient: 30 minute gradient on each length

Temperature: Ambient

Detector: 280 nm UV

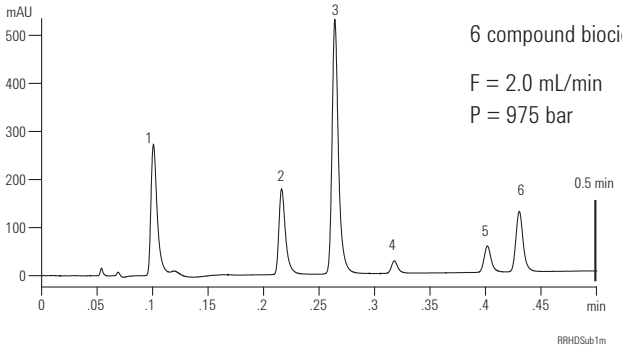
Instrument: 1290 Infinity LC



Sub 1 minute separations with RRHD columns

Column: **ZORBAX RRHD SB-C18**
857700-902
2.1 x 50 mm, 1.8 µm

Gradient: H_2O (0.05% trifluoroacetic acid)/10-40% ACN/1 min
Temperature: 60 °C
Injection Volume: 0.5 µL x 100 ppm each
Detector Wavelength: 275 nm
Data Rate: 160 Hz



6 compound biocide mix in 0.5 min

F = 2.0 mL/min
P = 975 bar

1. 2-methyl-4-isothiazolin-3-one
2. 5-chloro-2-methyl-4-isothiazolin-3-one
3. Carbendazim
4. Benzisothiiazol-3(2H)-one
5. 2-phenoxyethanol
6. Methylparaben

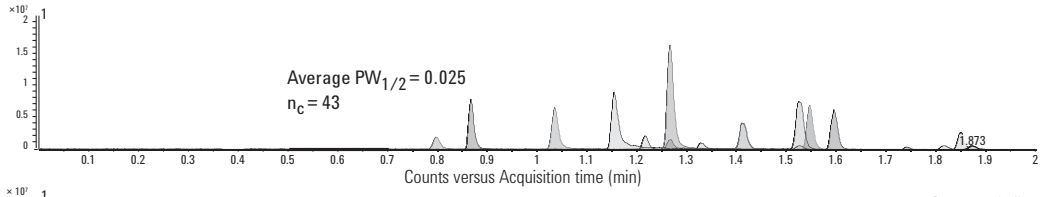
New levels of sensitivity and resolution

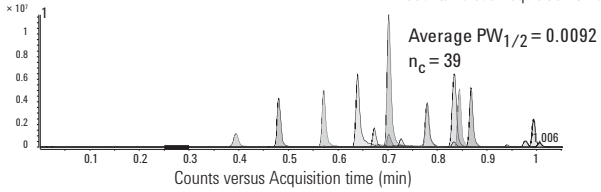
Column: **ZORBAX RRHD**
959758-302
3.0 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD**
959757-302
3.0 x 50 mm, 1.8 µm

Ion Source: 360 °C, 12 L/min. 50 psi, 3500 V.
Mobile Phase: A: 0.2% Formic acid in water
B: ACN

Temperature: Ambient, no temperature control (approx 24 °C)
Detector: Agilent 1290 Infinity LC with 6410 MS/MS
Sample: 20 µL (10 µL for 50 mm column) of 1 µg/mL standard





Compounds (in elution order) with identifying mass:

1. Acetaminophen, m/z 109
2. Caffeine, m/z 194
3. 2-acetamidophenol, m/z 109
4. Acetanilide, m/z 135
5. Acetylsalicylic acid, m/z 120
6. Phenacetin, m/z 179
7. Salicylic acid, m/z 120
8. Sulindac, m/z 356
9. Piroxicam, m/z 332
10. Tolmetin, m/z 257
11. Ketoprofen, m/z 254
12. Diflunisal, m/z 332
13. Diclofenac, m/z 235
14. Celecoxib, m/z 351
15. Ibuprofen, m/z 160

By transferring your method to an Agilent RRHD column, you can enhance resolution for difficult analyses – allowing you to save time by using shorter columns without compromising performance.

A comparison of Agilent ZORBAX Eclipse Plus C18 columns with RRHD Eclipse Plus C18 columns. Scaling gradient methods according to column volume preserves selectivity during method transfer. The RRHD column saves analytical time without sacrificing performance.

Selectivity comparison: C18 columns

Column: **ZORBAX RRHD Eclipse Plus C18**
959758-902
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD Eclipse XDB-C18**
981758-902
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD Extend-C18**
758700-902
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD SB-C18**
858700-902
2.1 x 100 mm, 1.8 µm

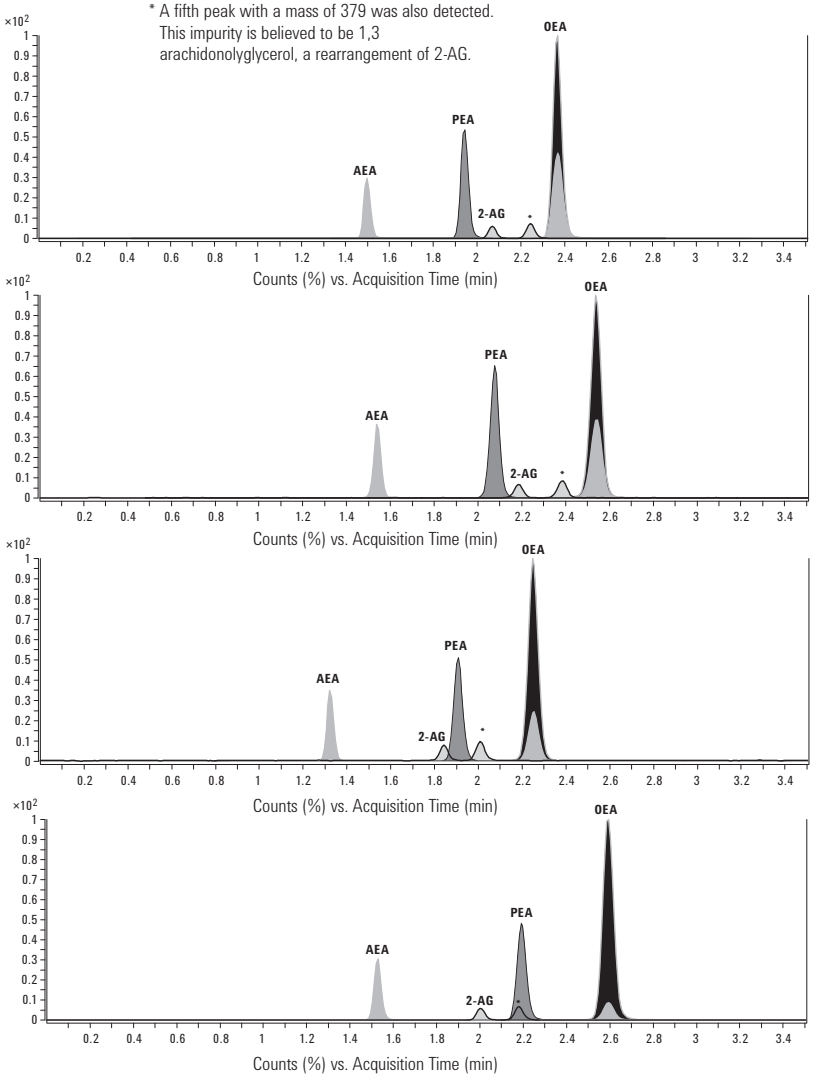
Mobile Phase:	A: 0.1% HCOOH in H_2O (30%) B: 0.1% HCOOH in CH_3CN (70%)
Flow Rate:	1 mL/min, isocratic
Temperature:	30 ºC
Sample:	1 µL
MS2 Scan:	290-390, ESI positive mode, scan time: 500, fragmentor: 135 V; drying gas: 12 L/min, 325 ºC; nebulizer pressure: 35 psig; capillary voltage: 3000

Selectivity differences are due to subtle, yet important variations, such as bonding type, endcapping, or the amount and type of silanols on the silica. Other factors that influence selectivity include mobile phase composition, temperature, and pH. (Note that these factors are identical in the following example.)

Here we compared the selectivity of four Agilent ZORBAX RRHD C18 columns using an endocannabinoid analysis method.

1. Anadamine (AEA), m/z 348
2. Palmitoylethanolamide (PEA), m/z PEA
3. 2-arachinoylglycerol (2-AG), m/z 379*
4. Oleoylethanolamide (OEA), m/z 326

* A fifth peak with a mass of 379 was also detected. This impurity is believed to be 1,3 arachidonolyglycerol, a rearrangement of 2-AG.



Tips & Tools

For full details, see Agilent pub # 5990-7166EN, **www.agilent.com/chem/library**

Selectivity comparison: Phenyl columns

Column: **ZORBAX RRHD Eclipse Plus C18**
959758-902
2.1 x 100 mm, 1.8 µm

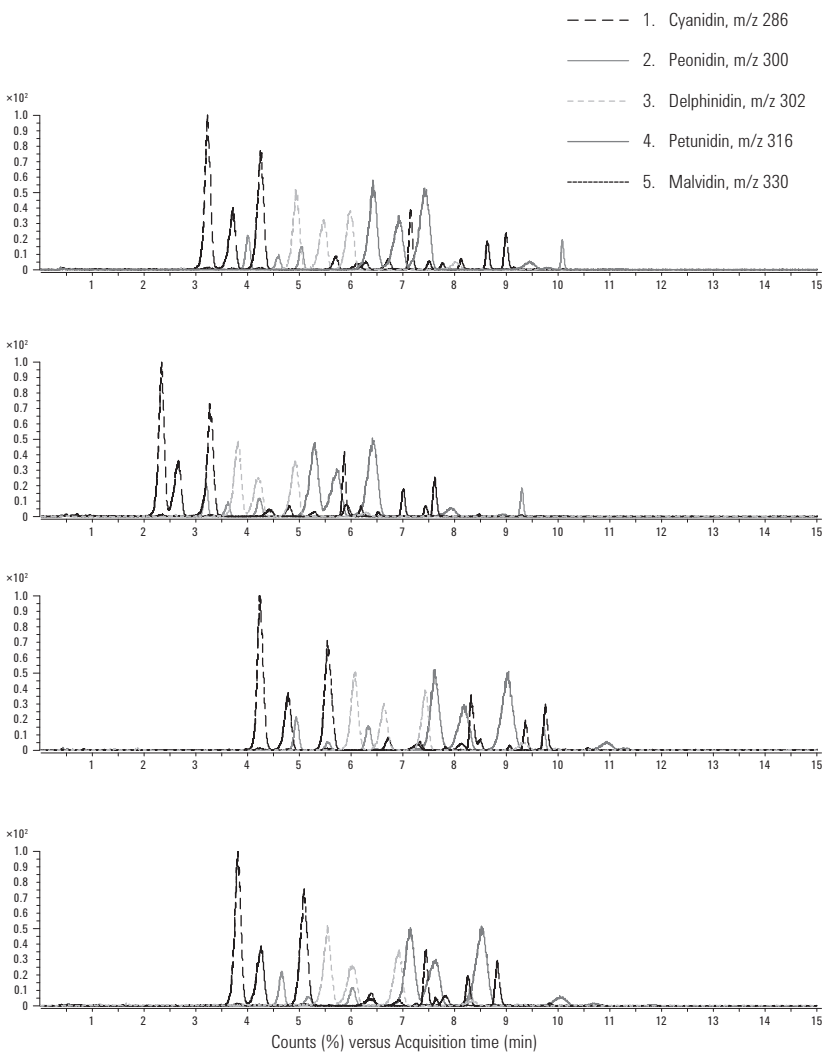
Column: **ZORBAX RRHD Eclipse Plus Phenyl-Hexyl**
959758-912
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD SB-Aq**
858700-914
2.1 x 100 mm, 1.8 µm

Column: **ZORBAX RRHD SB-Phenyl**
858700-912
2.1 x 100 mm, 1.8 µm

Mobile Phase:	A: 5% HCOOH in H_2O B: CH_3CN
Flow Rate:	0.65 mL/min
Gradient:	10-50% B in 15 min
Temperature:	30 ºC
MS2 Scan:	ESI +, 200-1000

Extracted ion chromatograms from LC/MS scan data of blueberry anthocyanins.



Tips & Tools

For full details, see Agilent pub # 5990-8470EN, **www.agilent.com/chem/library**

Rapid Resolution HD Columns for High Pressure Use (Maximum Pressure: 1200 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	Eclipse Plus Phenyl-Hexyl USP L11
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	959759-302	959759-306	
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	959758-302	959758-306	959758-312
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	959757-302	959757-306	959757-312
UG	UHPLC Guard, 1200 bar*	3.0 x 5	1.8	823750-901		
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	959759-902	959759-906	959759-912
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	959758-902	959758-906	959758-912
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	959757-902	959757-906	959757-912
UG	UHPLC Guard, 1200 bar*	2.1 x 5	1.8	821725-901		

*Available late 2012.

Rapid Resolution HD Columns for High Pressure Use (Maximum Pressure: 1200 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-Phenyl USP L11	SB-Aq
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	859700-302	859700-306			
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	858700-302	858700-306	858700-305	858700-905	858700-314
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	857700-302	857700-306	857700-305	857700-312	857700-314
UG	UHPLC Guard, 1200 bar*	3.0 x 5	1.8	823750-902	823750-904			
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	859700-902	859700-906	859700-905	859700-912	859700-914
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	858700-902	858700-906	858700-905	858700-912	858700-914
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	857700-902	857700-906	857700-905	857700-912	857700-914
UG	UHPLC Guard, 1200 bar*	2.1 x 5	1.8	821725-902	821725-904			

*Available late 2012.

Rapid Resolution HD Columns for High Pressure Use (Maximum Pressure: 1200 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	Extend-C18 USP L1	Eclipse XDB-C18 USP L1	HILIC Plus
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	759700-302	981759-302	
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	758700-302	981758-302	959758-301
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	757700-302	981757-302	959757-301
UG	UHPLC Guard, 1200 bar*	3.0 x 5	1.8		823750-903	
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	759700-902	981759-902	959759-901
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	758700-902	981758-902	959758-901
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	757700-902	981757-902	959757-901
UG	UHPLC Guard, 1200 bar*	2.1 x 5	1.8		821725-903	

*Available late 2012.

ZORBAX Rapid Resolution High Throughput 1.8 µm

- High pressure (600 bar) columns for ultra high speed or maximum resolution analyses with Rapid Resolution HT columns packed with totally porous, 1.8 µm packings
- Carefully engineered particles deliver maximum resolution at 25% less pressure than other sub-2 µm materials
- Reduce analysis time by up to 95%
- Develop HPLC methods more quickly
- Securely transfer conventional methods with over 140 RRHT column choices
- Analyze complex samples on shorter columns faster and maximize peak capacity
- Matching selectivity in 3.5, 5 and 7 µm particle sizes for complete method scalability
- Short (50 mm long and less) column can be used on some conventional LCs

Agilent ZORBAX Rapid Resolution HT (1.8 µm) columns use a totally porous, 1.8 µm particle to provide maximum resolution in fast, ultra-fast and high resolution analyses. You can reduce analysis time by up to 95% in comparison to 250 mm length columns. With more than 140 RRHT column choices, including the high performance ZORBAX Eclipse Plus and many other ZORBAX column choices (Eclipse XDB, StableBond, Extend, Bonus-RP), methods can be developed quickly or securely transferred to a smaller particle size column with no loss in resolution. The small particle size provides double the efficiency of a 3.5 µm column in the same column length, providing the highest efficiency and resolution possible. This permits the analysis of complex samples on shorter columns with the highest resolution and peak capacity. The 1.8 µm Rapid Resolution HT columns take high-speed, high-resolution HPLC to a new level.

The 600 bar columns can be used with the Agilent1260 Infinity LC System up to this high pressure limit. In addition, the shorter columns can be used on many other LC's, including the Agilent 1200 Rapid Resolution LC System.

Rapid Resolution HT (RRHT) provides double the efficiency of Rapid Resolution columns

Column A: **ZORBAX RRHT SB-C18**
835975-902
4.6 x 50 mm, 3.5 µm

Column B: **ZORBAX RRHT SB-C18**
827975-902
4.6 x 50 mm, 1.8 µm

Mobile Phase: 25% Water, 75% MeOH

Flow Rate: 1.5 mL/min

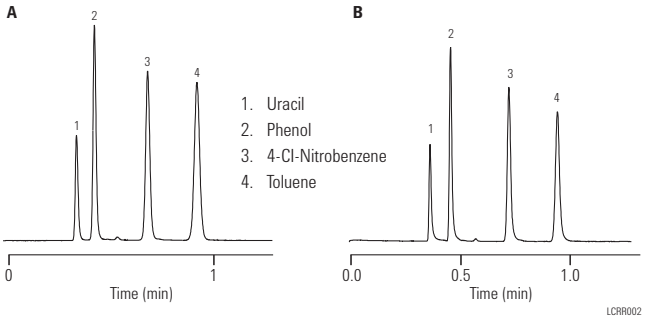
Temperature: Ambient

Detector: 254 nm

This figure shows that Rapid Resolution HT columns can provide double the efficiency of a 3.5 µm column in the same column length. This high efficiency can be used for very high-resolution, high throughput analyses.

Plates (N)	
1.	3476
2.	4585
3.	5673
4.	6180

Plates (N)	
1.	6560
2.	8958
3.	11508
4.	12266



Increase peak capacity with RRHT columns

Column A: **Eclipse RRHT XDB-C8**
928700-906
2.1 x 100 mm, 1.8 µm

Column B: **Eclipse XDB-C18**
961753-902
2.1 x 100 mm, 3.5 µm

Mobile Phase: A: H_2O
B: ACN

Peak capacity: A: 461
B: 343

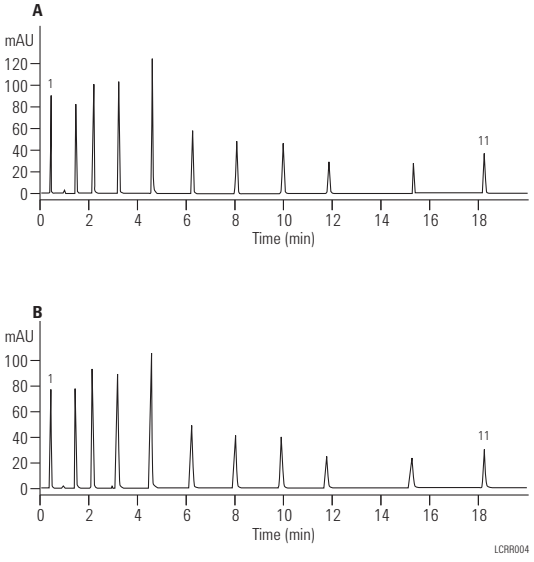
Flow Rate: 0.5 mL/min

Gradient: 0.0 min 50% B
20.0 min 100% B

Temperature: 40 °C

Detector: UV 254 nm

Sample: Alkylphenones



1. Uracil
2. C_3-Alkylphenone
3. C_4-Alkylphenone
4. C_5-Alkylphenone
5. C_6-Alkylphenone
6. C_7-Alkylphenone
7. C_8-Alkylphenone
8. C_9-Alkylphenone
9. C_{10}-Alkylphenone
10. C_{12}-Alkylphenone
11. C_{14}-Alkylphenone

Reduce analysis time dramatically with Rapid Resolution HT columns

Column A: **Eclipse XDB-C18**
990967-902
4.6 x 250 mm, 5 µm

Column B: **Eclipse XDB-C18**
963967-902
4.6 x 150 mm, 3.5 µm

Column C: **Eclipse XDB-C18**
966967-902
4.6 x 75 mm, 3.5 µm

Column D: **ZORBAX Eclipse XDB-C18**
935967-902
4.6 x 50 mm, 3.5 µm

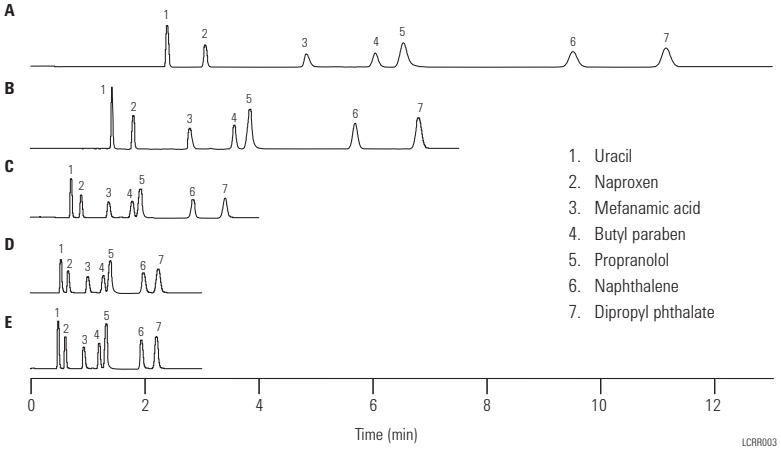
Column E: **Eclipse RRHT XDB-C18**
925975-902
4.6 x 50 mm, 1.8 µm

Mobile Phase: 73% MeOH:27% 20 mM Phosphate Buffer, pH 7.0

Flow Rate: 1 mL/min

Temperature: Ambient

Detector: 254 nm



This figure shows the dramatic reduction in analysis time made possible by using Rapid Resolution HT columns. Chromatogram A shows a separation that takes 11.5 minutes on a 25 cm, 5 µm column. Rapid Resolution (3.5 µm) columns, shown in chromatogram B and C, reduce analysis time substantially, but with a slight compromise in resolution. The Rapid Resolution HT column reduces analysis time to 2.2 minutes, an 80% reduction, while still maintaining baseline resolution.

Long lifetime of RRHT columns at elevated temperatures

Column: **ZORBAX RRHT SB-C18**
827700-902
2.1 x 50 mm, 1.8 µm

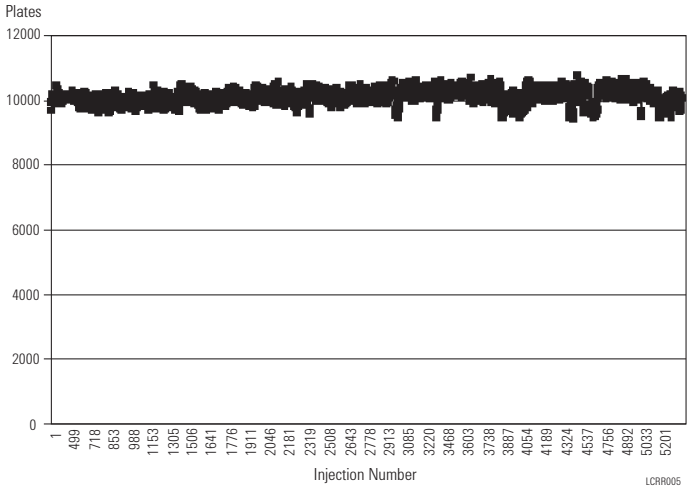
Mobile Phase: A: 60% H_2O
B: 40% ACN

Flow Rate: 1 mL/min

Temperature: 80 °C

Detector: UV 254 nm

Sample: QC test mix



Comparison of efficiencies – Rapid Resolution High Definition (RRHD)/ RRHT (1.8 µm) and Rapid Resolution (3.5 µm) columns

Column Length (mm)	Poroshell 120	Resolving Power N (3.5 µm)*	Resolving Power N (1.8 µm)
High Resolution			
150	32,000	21,000	32,500
100	21,000	14,000	24,000
75	16,000	10,500	17,000**
Ultra Fast			
50	11,000	7,000	12,000
30	5,500	4,200	6,000
20	—	—	3,500
15	—	2,100	2,500
Resolution α $N^{1/2}$			

*5 µm HPLC columns of the same length have 40% fewer plates (N-value); 4.6 mm id

**Available as a custom column

Data is based on 4.6 mm id columns

Agilent rack for LC systems, 5001-3726

Tips & Tools

The LC Rack from Agilent can help you reduce capillary lengths and minimize extra-column volume. It also protects your instrument and enables you to switch out modules as needed.

Rapid Resolution HT Columns for High Pressure Use (Maximum Pressure: 600 bar, 9000 psi)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	Eclipse Plus Phenyl-Hexyl USP L11	Eclipse PAH USP L1	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7	Extend-C18 USP L1
	Rapid Resolution HT, 600 bar	4.6 x 150	1.8	959994-902						
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	959964-902	959964-906	959964-912	959964-918	928975-902		728975-902
	Rapid Resolution HT, 600 bar	4.6 x 75	1.8	959951-902						
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	959941-902	959941-906	959941-912	959941-918	927975-902	927975-906	727975-902
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	959931-902	959931-906	959931-912	959931-918	924975-902	924975-906	724975-902
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8					926975-902	926975-906	726975-902
UG	UHPLC Guard, 600 bar*	4.6 x 5	1.8	820750-901				820750-903		
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	959964-302	959964-306	959964-312		928975-302		728975-302
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	959941-302	959941-306	959941-312		927975-302	927975-306	727975-302
	Solvent Saver HT, 600 bar	3.0 x 30	1.8					924975-302	924975-306	724975-302
	Solvent Saver HT, 600 bar	3.0 x 20	1.8					926975-302	926975-306	726975-302
UG	UHPLC Guard, 1200 bar*	3.0 x 5	1.8	823750-901				823750-903		
	Narrow Bore RRHT, 600 bar	2.1 x 150	1.8	959794-902						
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	959764-902	959764-906	959764-912	959764-918	928700-902	928700-906	728700-902
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	959741-902	959741-906	959741-912	959741-918	927700-902	927700-906	727700-902
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	959731-902	959731-906	959731-912		924700-902	924700-906	724700-902
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8					926700-902	926700-906	726700-902
UG	UHPLC Guard, 1200 bar*	2.1 x 5	1.8	821725-901				821725-903		

*Available late 2012.

Rapid Resolution HT Columns for High Pressure Use (Maximum Pressure: 600 bar, 9000 psi)

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-Phenyl USP L11	SB-CN USP L10	SB-Aq	Rx-SIL USP L3	Bonus-RP USP L60
	Rapid Resolution HT, 600 bar	4.6 x 150	1.8	829975-902	829975-906	829975-912	829975-905	829975-914		
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828975-902	828975-906	828975-912	828975-905	828975-914	828975-901	828668-901
	Rapid Resolution HT, 600 bar	4.6 x 75	1.8		830975-906					830668-901
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827975-902	827975-906	827975-912	827975-905	827975-914	827975-901	827668-901
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	824975-902	824975-906	824975-912	824975-905	824975-914		
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8	826975-902	826975-906					
UG	UHPLC Guard, 600 bar*	4.6 x 5	1.8	820750-902	820750-904					
	Solvent Saver HT, 600 bar	3.0 x 150	1.8	829975-302	829975-306	829975-312	829975-305			
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	828975-302	828975-306	828975-312	828975-305	828975-314	828975-301	828668-301
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	827975-302	827975-306	827975-312	827975-305	827975-314	827975-301	827668-301
	Solvent Saver HT, 600 bar	3.0 x 30	1.8	824975-302	824975-306		824975-305			
	Solvent Saver HT, 600 bar	3.0 x 20	1.8	826975-302	826975-306					
UG	UHPLC Guard, 1200 bar*	3.0 x 5	1.8	823750-902	823750-904					
	Narrow Bore RRHT, 600 bar	2.1 x 150	1.8	820700-902	820700-906	820700-912	820700-905			
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	828700-902	828700-906	828700-912	828700-905	828700-914	828700-901	828768-901
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	827700-902	827700-906	827700-912	827700-905	827700-914	827700-901	827768-901
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	824700-902	824700-906	824700-912	824700-905	824700-914		
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8	826700-902	826700-906					
UG	UHPLC Guard, 1200 bar*	2.1 x 5	1.8	821725-902	821725-904					

*Available late 2012.

Rapid Resolution HT Columns and Cartridges (Maximum Pressure: 400 bar, 6000 psi)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7	SB-C18 USP L1	SB-C8 USP L7	Extend-C18 USP L1
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	922975-902	922975-906	922975-902	822975-906	722975-902
	Rapid Resolution HT, 3/pk, 600 bar	4.6 x 50	1.8	922975-932		922975-932		
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	922700-902		922700-902		
	Narrow Bore RRHT, 3/pk, 600 bar	2.1 x 50	1.8	922700-932		922700-932		
Rapid Resolution HT Cartridges (require hardware kit 820555-901)								
RR	Rapid Resolution HT Cartridge	4.6 x 50	1.8	925975-902		825975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 50	1.8	925975-932		825975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 50	1.8	925700-902		825700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 50	1.8	925700-932		825700-932		
RR	Rapid Resolution HT Cartridge	4.6 x 30	1.8	923975-902		823975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 30	1.8	923975-932		823975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 30	1.8	923700-902		823700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 30	1.8	923700-932		823700-932		
RR	Rapid Resolution HT Cartridge	4.6 x 15	1.8	921975-902		821975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 15	1.8	921975-932		821975-932		
RR	Rapid Resolution HT Cartridge	2.1 x 15	1.8	921700-902		821700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 15	1.8	921700-932		821700-932		
RR	Hardware Kit for RR and RRHT Cartridges			820555-901		820555-901		

Agilent Guards for UHPLC

- High performance guard columns for Fast LC columns
- Two formats – one for Poroshell 120 columns, stable to 600 bar, RRHD columns, 1.8 µm (stable to 1200 bar), and RRHT columns, 1.8 µm (stable to 600 bar)

Agilent UHPLC Guards are high performance guards designed by Agilent for its Fast LC columns families. Agilent UHPLC Guards use easy-to-install hardware that fits directly on the end of the column; no extra hardware is needed. They are sold in packages of three.

Agilent UHPLC Guards extend the lifetime of analytical columns without diminishing performance.

UHPLC Guard Columns*

ZORBAX RRHD columns, 1.8 µm (1200 bar) and ZORBAX RRHT columns, 1.8 µm (600 bar) and Poroshell 120, 2.7 µm (600 bar)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse XDB-C18 USP L1	SB-C18 USP L1	SB-C8 USP L7
UG	UHPLC Guard, 1200 bar	2.1 x 5	1.8	821725-901	821725-903	821725-902	821725-904
UG	UHPLC Guard, 1200 bar	3.0 x 5	1.8	823750-901	823750-903	823750-902	823750-904
UG	UHPLC Guard, 600 bar	4.6 x 5	1.8	820750-901	820750-903	820750-902	820750-904

Poroshell 120 Columns

Hardware	Description	Size (mm)	Particle Size (µm)	EC-C18 USP L1	EC-C8 USP L7	Phenyl-Hexyl USP L11	SB-C8 USP L7
UG	UHPLC Guard, 600 bar	2.1 x 5	2.7	821725-911	821725-913	821725-914	821725-912
UG	UHPLC Guard, 600 bar	3.0 x 5	2.7	823750-911	823750-913	823750-914	823750-912
UG	UHPLC Guard, 600 bar	4.6 x 5	2.7	820750-911	820750-913	820750-914	820750-912

*Available late 2012.

Other Columns for Reversed-Phase Analytical HPLC

Achieve excellent peak shape and resolution every time – leveraging the industry's broadest selection of reversed-phase columns

Whether you are using Fast LC or working with more conventional HPLC applications, Agilent's LC family offers you a range of phases and selectivities to help you perfect your separation.

The ZORBAX Family of phases scales readily to Fast LC columns in the Rapid Resolution High Throughput (RRHT) and Rapid Resolution High Definition (RRHD) families and Poroshell 120 columns (see previous section, page 25).

In this section, we'll provide overviews of other key analytical columns from Agilent:

ZORBAX Rapid Resolution, 3.5 µm, configurations are an ideal choice for initial method development, providing increased sample throughput for any application when compared to 5 µm columns.

ZORBAX Solvent Saver 3.0 mm id column configurations provide 60% mobile phase reduction over 4.6 mm id columns.

ZORBAX Eclipse Plus HPLC columns are designed to reliably produce superior peak shapes for basic compounds, and are available across all ZORBAX column configurations.

More than 13 additional ZORBAX phases including StableBond, Eclipse PAH, Eclipse XDB, ZORBAX Rx, Extend-C18, Bonus-Rx and Original ZORBAX columns – in total, more than 1400 configurations for reliable scalability and method transfer.

ZORBAX Method Development kits contain three columns for the price of two! Each as a different bonded phase for optimizing selectivity.

ZORBAX Method Validation kits – choose as many columns as you need (or as few) to make method validation easier and less expensive.

Pursuit, Pursuit XRs and Pursuit XRs Ultra columns provide alternate selectivities to the ZORBAX family.

Polaris Columns provide polar-modified phases for routine polar applications.

Other Columns for Reversed-Phase Analytical HPLC.

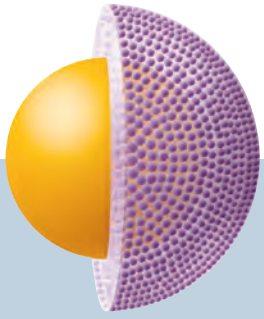
ZORBAX Eclipse Plus

- The ideal column for method development - excellent results for a wide range of compounds
- High level of performance – peak shape, efficiency, resolution, and lifetime – with all sample types: acids, bases and neutrals
- Superior reproducibility with more rigorous QA/QC testing
- Improved, patented silica manufacturing with start-to-finish product control
- Available in 1.8, 3.5 and 5 µm particle sizes for all analytical, high resolution, and fast LC analyses

Agilent ZORBAX Eclipse Plus columns provide the ultimate in performance for silica-based columns. Peak shape is excellent for the most challenging basic compounds, improving efficiency and resolution with these sample types. These results are achieved by improvements in the silica manufacturing and bonding technology, which is completely controlled by Agilent.

Because of their high level of performance, Eclipse Plus columns are the ideal first choice for method development of all samples. If you need to achieve fast method development and superior productivity, then choose a column with high-resolution 1.8 µm particles. For standard methods, conventional 5 µm and Rapid Resolution 3.5 µm columns are your best choice. With all particle sizes, easy method transfer is possible.

With more rigorous QA and QC testing, column lot-to-lot reproducibility is also improved, resulting in long-term reliable results for all analyses.



Tips & Tools

The EC-C18, EC-C8 and Phenyl-Hexyl phases on Poroshell 120 are very similar to Eclipse Plus C18, Eclipse Plus C8 and Eclipse Plus Phenyl-Hexyl phases.

Turn to page 27.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range*	Endcapped	Carbon Load
ZORBAX Eclipse Plus C18	95Å	160 m^2/g	60 °C	2.0-9.0	Double	9%
ZORBAX Eclipse Plus C8	95Å	160 m^2/g	60 °C	2.0-9.0	Double	7%
ZORBAX Eclipse PAH	95Å	160 m^2/g	60 °C	2.0-8.0	No	14%
ZORBAX Eclipse Plus Phenyl-Hexyl	95Å	160 m^2/g	60 °C	2.0-8.0	Double	9%

Specifications represent typical values only.

*Column lifetime will be reduced significantly at pH >7 and temperature >40 °C. At pH 6-9, highest column stability for all silica based columns is obtained by operating at temperatures <40 °C and using lower buffer concentrations in range of 0.01-0.02 M, especially with phosphate and carbonate buffers.

ZORBAX Eclipse Plus: Best peak shape in the industry without tailing

Column: **Eclipse Plus C18 959996-902 4.6 x 100 mm, 5 µm**

Mobile Phase: A: 60% Water B: 40% Acetonitrile

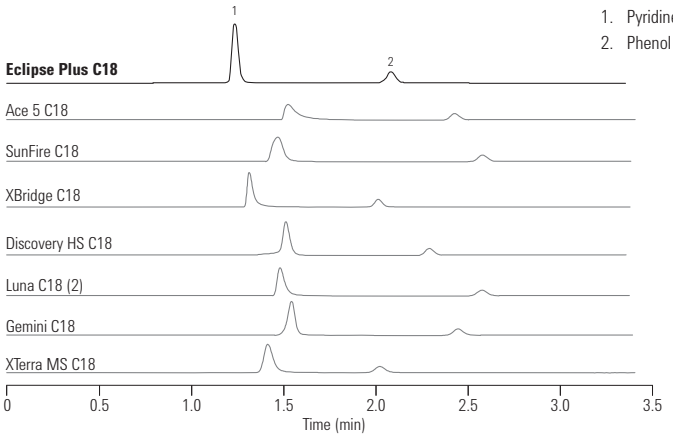
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV 254 nm

Publication: 5989-4934EN

Sample: Pyridine, Phenol



Peak shape and efficiency are better with ZORBAX Eclipse Plus

Column A: **XBridge C18, 4.6 x 150 mm, 5 µm**

Column B: **Eclipse Plus C18 959993-902 4.6 x 150 mm, 5 µm**

Mobile Phase: A: 0.1% Formic acid B: 0.1% Formic acid in ACN

Flow Rate: 1.0 mL/min

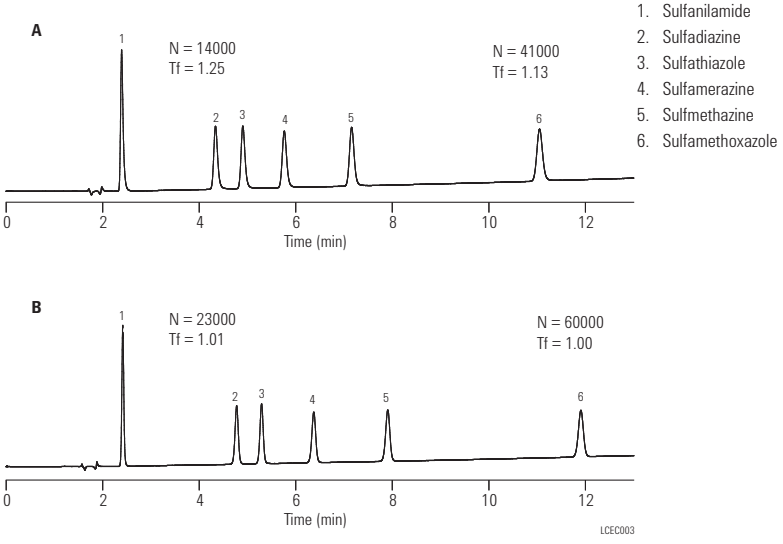
Gradient: 0.0 min 10% B 15 min 30% B

Temperature: 40 °C

Detector: UV 254 nm

Publication: 5989-4934EN

Sample: Sulfonamides



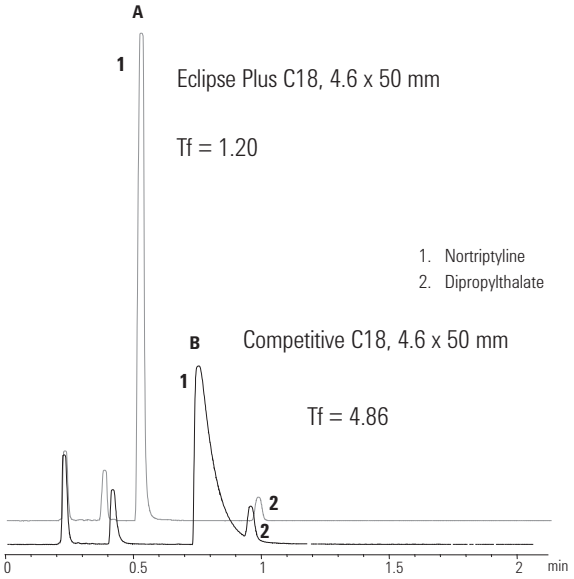
Eliminate tailing and maximize resolution with Eclipse Plus Columns

Column A: **Eclipse Plus C18, 4.6 x 50 mm**

Column B: **Competitive C18, 4.6 x 50 mm**

Mobile Phase: 65% ACN:35% 25 mM phosphate buffer (pH 7.4)

Superior peak shape and better selectivity with Eclipse Plus means more resolution, easier quantitation and better results in your separations.



Eclipse Plus C18 vs. C8

Column A: **Eclipse Plus C18 4.6 x 50 mm, 5 µm**

Column B: **Eclipse Plus C8 4.6 x 50 mm, 5 µm**

Mobile Phase: Water: acetonitrile (30:70)

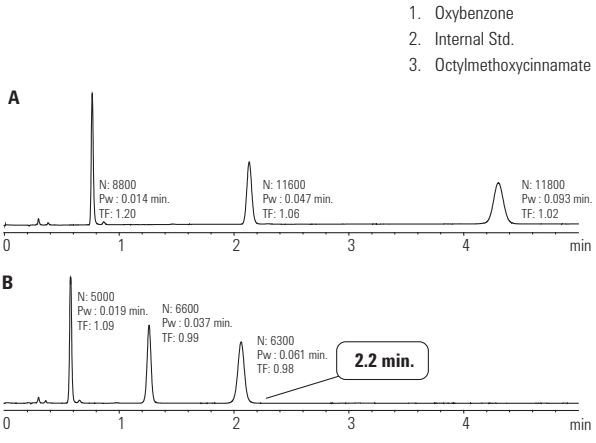
Flow Rate: 2.0 mL/min

Temperature: 30 °C

Detector: UV 230 nm

Sample: Lip balm extract in ACN (melted at 100 °C ACN , cooled and 0.45 µm filtered)

Less retention can save significant time – the C8 is a good choice here.



Rapid analysis of an analgesic tablet, selectivity differences at pH 2 and pH 7

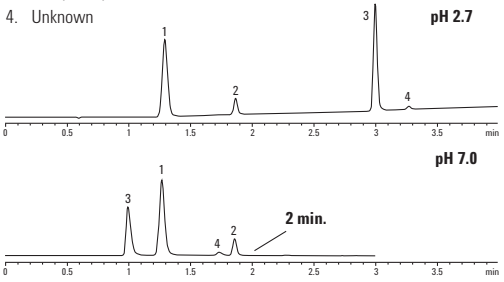
Column: **Eclipse Plus C8**
959946-906
4.6 x 50 mm, 5 µm

Gradient: 10-60% B/3 min
pH 2.7: A: 0.1% Formic acid B: 0.1% fa in ACN
pH 7.0: A: 20 mM Na phosphate B: ACN

Sample: generic Excedrin tablet

Both Eclipse Plus C18 and C8 can be used over a wide pH range to optimize selectivity or analysis time.

1. Acetaminophen
2. Caffeine
3. Acetylsalicylic acid
4. Unknown



Eclipse Plus C8 is less retentive than Eclipse Plus C18

Column A: **Eclipse Plus C8**
959996-906
4.6 x 100 mm, 5 µm

Column B: **Eclipse Plus C18**
959996-902
4.6 x 100 mm, 5 µm

Mobile Phase: 80% Methanol 8 mM (total) K_2HPO_4 pH 7

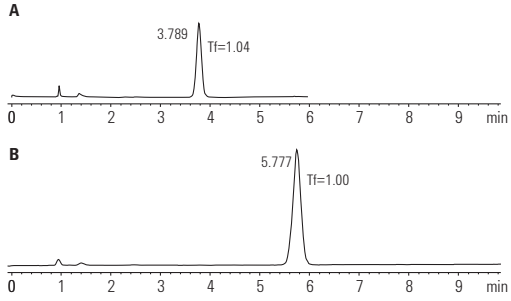
Flow Rate: 1.0 mL/min

Detector: UV 215 nm

Sample: Amitriptyline 0.05 µg/µL (0.5 µL injection)

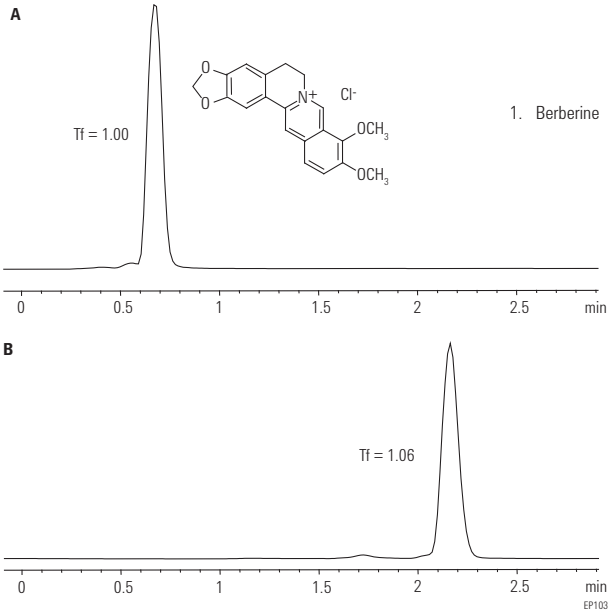
A C8 column is typically selected because it will retain less than a C18 column, reducing analysis time.

The Eclipse Plus C8 column shows the same behavior with excellent peak shape on difficult basic compounds.



Fast and ultra-fast analysis of basic compounds on Eclipse Plus

Column A:	**Eclipse Plus C18 959941-902 4.6 x 50 mm, 1.8 µm**
Column B:	**Eclipse Plus C18 959993-902 4.6 x 150 mm, 5 µm**
Mobile Phase:	A: 50% 8 mM K_2HPO_4, pH 7 B: 50% ACN
Flow Rate:	1.0 mL/min
Temperature:	Ambient
Detector:	UV 254 nm
Publication:	5989-4934EN
Sample:	Berberine, 0.4 mg/mL, 2 µL



ZORBAX Eclipse Plus

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	Eclipse Plus Phenyl-Hexyl USP L11	Eclipse PAH USP L1
	Analytical	4.6 x 250	5	959990-902	959990-906	959990-912	959990-918
	Analytical	4.6 x 150	5	959993-902	959993-906	959993-912	959993-918
	Analytical	4.6 x 100	5	959996-902	959996-906	959996-912	959996-918
	Analytical	4.6 x 50	5	959946-902	959946-906		
	Rapid Resolution	4.6 x 150	3.5	959963-902	959963-906	959963-912	959963-918
	Rapid Resolution	4.6 x 100	3.5	959961-902	959961-906	959961-912	959961-918
	Rapid Resolution	4.6 x 75	3.5	959933-902	959933-906	959933-912	
	Rapid Resolution	4.6 x 50	3.5	959943-902	959943-906	959943-912	959943-918
	Rapid Resolution	4.6 x 30	3.5	959936-902	959936-906	959936-912	
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	959964-902	959964-906	959964-912	959964-918
	Rapid Resolution HT, 600 bar	4.6 x 75	1.8	959951-902			
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	959941-902	959941-906	959941-912	959941-918
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	959931-902	959931-906	959931-912	959931-918
UG	UHPLC Guard, 1200 bar*	4.6 x 5	1.8	820750-901			
	Solvent Saver	3.0 x 250	5				959990-318
	Solvent Saver	3.0 x 150	5	959993-302	959993-306		
	Solvent Saver Plus	3.0 x 150	3.5	959963-302	959963-306	959963-312	
	Solvent Saver Plus	3.0 x 100	3.5	959961-302	959961-306	959961-312	
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	959759-302	959759-306		
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	959758-302	959758-306		
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	959757-302	959757-306		

*Available late 2012.

(Continued)

ZORBAX Eclipse Plus

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse Plus C18 USP L1	Eclipse Plus C8 USP L7	Eclipse Plus Phenyl-Hexyl USP L11	Eclipse PAH USP L1
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	959964-302	959964-306	959964-312	
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	959941-302	959941-306	959941-312	
UG	UHPLC Guard, 1200 bar*	3.0 x 5	1.8	823750-901			
	Narrow Bore	2.1 x 250	5				959790-918
	Narrow Bore	2.1 x 150	5	959701-902	959701-906	959701-912	959701-918
	Narrow Bore	2.1 x 50	5	959746-902	959746-906		
	Narrow Bore RR	2.1 x 150	3.5	959763-902	959763-906	959763-912	
	Narrow Bore RR	2.1 x 100	3.5	959793-902	959793-906	959793-912	959793-918
	Narrow Bore RR	2.1 x 50	3.5	959743-902	959743-906	959743-912	
	Narrow Bore RR	2.1 x 30	3.5	959733-902	959733-906	959733-912	
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	959759-902	959759-906		
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	959758-902	959758-906		
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	959757-902	959757-906		
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	959764-902	959764-906	959764-912	959764-918
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	959741-902	959741-906	959741-912	959741-918
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	959731-902	959731-906	959731-912	
UG	UHPLC Guard, 1200 bar*	2.1 x 5	1.8	821725-901			
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-936	820950-937	820950-938	820950-939
ZGC	Guard Cartridges, 4/pk	2.1 x 12.5	5	821125-936	821125-937	821125-938	821125-939
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901

*Available late 2012.

ZORBAX Eclipse PAH

- High resolution separation of 16 PAHs in EPA Method 610
- Extensive range of particle sizes (1.8, 3.5 and 5 µm) and sizes for fast and high resolution separations
- Each batch of material is specifically tested with PAHs for maximum reproducibility under expected operating conditions
- Excellent performance using the high quality, improved silica of Eclipse Plus columns
- Good for applications requiring "shape selectivity" or the separation of geometric isomers

Agilent ZORBAX Eclipse PAH columns are recommended for the separation of polycyclic aromatic hydrocarbons. PAHs are considered priority pollutants and the analysis of these potentially carcinogenic compounds in water, soil and food is of major importance. Eclipse PAH columns separate all 16 PAHS in EPA method 610 quickly and with high resolution.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range	Endcapped	Carbon Load
ZORBAX Eclipse PAH	95Å	160 m^2/g	60 °C	2.0-8.0	No	14%

Specifications represent typical values only.

High resolution and fast analysis on RRHT Eclipse PAH column

Column: **Eclipse PAH**
959941-918
4.6 x 50 mm, 1.8 µm

Mobile Phase: A: Water; B: Acetonitrile

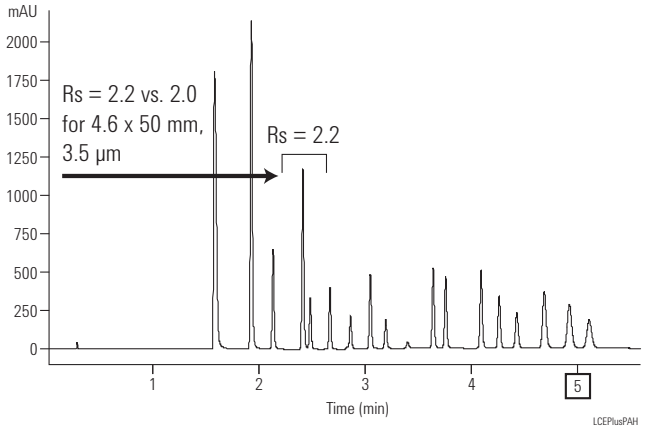
Gradient:

Time (Min)	% B
0.00	40
3.5	100
5.2	100
5.5	40
6.5	40

Flow Rate: 2.0 mL/min

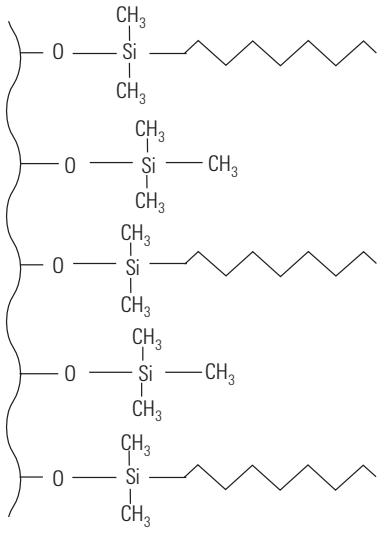
Temperature: 25 ºC

Detector: DAD 220, 4 nm No Ref. DAD Stop Time = 6.0 min
Stop Time = 7.0



ZORBAX Eclipse PAH

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse PAH USP L1
	Analytical	4.6 x 250	5	959990-918
	Analytical	4.6 x 150	5	959993-918
	Analytical	4.6 x 100	5	959996-918
	Rapid Resolution	4.6 x 150	3.5	959963-918
	Rapid Resolution	4.6 x 100	3.5	959961-918
	Rapid Resolution	4.6 x 50	3.5	959943-918
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	959964-918
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	959941-918
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	959931-918
	Solvent Saver	3.0 x 250	5	959990-318
	Narrow Bore	2.1 x 250	5	959790-918
	Narrow Bore	2.1 x 150	5	959701-918
	Narrow Bore RR	2.1 x 100	3.5	959793-918
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	959764-918
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	959741-918
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-939
ZGC	Guard Cartridges, 4/pk	2.1 x 12.5	5	821125-939
ZGC	Guard Hardware Kit			820999-901



eXtra Densely Bonded and Double Endcapped Eclipse XDB Bonded Phase

ZORBAX Eclipse XDB

- Four selectivity choices for method development optimization
- Good peak shape for basic, acidic and neutral compounds
- High performance over a wide pH range – pH 2-9
- Particle sizes from 1.8 to 7 µm
- Long lifetime with eXtra Dense Bonding and double endcapping

Agilent ZORBAX Eclipse XDB columns – C18, C8, Phenyl and CN – provide four bonded phase choices for method development optimization. These columns provide good peak shape over a wide pH range (2-9) for additional method development flexibility with one family of columns. Eclipse XDB columns can be used for method development at low pH (2-3) and the same column can be used for method development in the mid pH (6-8) region. In the mid pH region residual silanols are more active and tailing interactions are more likely. To overcome these interactions, Eclipse XDB columns are eXtra Densely Bonded and double endcapped through a proprietary process to cover as many active silanols as possible. The result is superior peak shape of basic compounds from pH 2-9. Eclipse XDB columns are available in 1.8, 3.5, 5 and 7 µm particle sizes for high speed, high resolution, analytical and prep scale separations.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range*	Endcapped	Carbon Load
ZORBAX Eclipse XDB-C18	80Å	180 m^2/g	60 °C	2.0-9.0	Double	10%
ZORBAX Eclipse XDB-C8	80Å	180 m^2/g	60 °C	2.0-9.0	Double	7.6%
ZORBAX Eclipse XDB-Phenyl	80Å	180 m^2/g	60 °C	2.0-9.0	Double	7.2%
ZORBAX Eclipse XDB-CN	80Å	180 m^2/g	60 °C	2.0-8.0	Double	4.3%

Specifications represent typical values only.

*Eclipse XDB columns are designed for operation over a wide pH range.At pH 6-9, highest columns stability for all silica based columns is achieved by operating at temperatures <40 °C and using low buffer concentrations in the range of 0.01-0.02 M.

Good peak shape over a wide pH range with ZORBAX Eclipse XDB

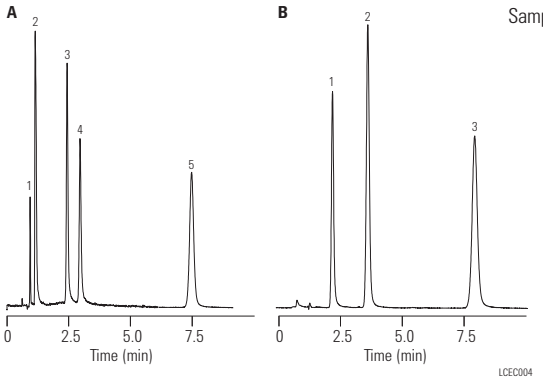
Column: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

Mobile Phase: A: pH 3.0 75% 25 mM phosphate buffer 25% ACN
B: pH 7.0 90% 20 mM phosphate 10% ACN

Flow Rate: 1.5 mL/min

Temperature: 40 °C

ZORBAX Eclipse XDB columns provide good peak shape over a wide pH range and are an excellent choice for method development from pH 2-9.



Sample: A:
1. Maleate
2. Doxylamine
3. Chlorpheniramine
4. Triprolidine
5. Diphenhydramine

B:
1. Procainamide
2. N-acetylprocainamide
3. N-propionylprocainamide

Column stability testing at pH 3 and 60 °C

Column: **ZORBAX SB-C8**
883975-906
4.6 x 150 mm, 5 µm

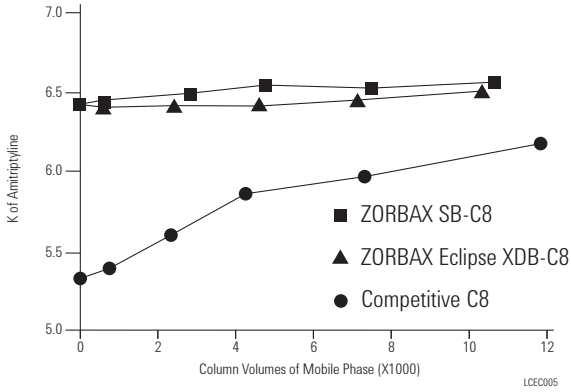
Column: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

Mobile Phase: Purge Conditions:
70% 50 mM NaAc-HCl, pH 3.0
30% ACN
Retention Test Conditions:
65% Methanol
35% Water

Flow Rate: 1.0 mL/min

Temperature: 60 °C

Sample: Tricyclic antidepressants



Eclipse XDB columns are stable over a wide pH range. At low pH an Eclipse endcapped column is extremely stable and shows equivalent stability to a non-endcapped column, SB-C8, at pH 3. The columns were purged with a pH 3 mobile phase at 60°C. Then they were tested with a strongly basic compound to determine if the endcapping or bonded phase had been hydrolyzed from the silica surface. The Eclipse XDB column was very stable, as shown by the consistency of the retention of amitriptyline over the 12,000 column volumes of the test. Another endcapped column shows less stability under these same conditions.

Column stability testing at pH 7.0

Column A: **Competitive C8**
SIL-type
After 1826 Column Volumes

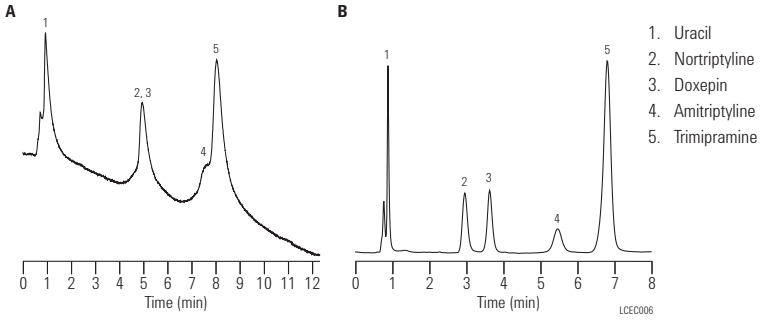
Column B: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm
Sol-type
After 1843 Column Volumes

Mobile Phase: 60% ACN
40% 250 mM Phosphate Buffer, pH 7.0

Flow Rate: 1.5 mL/min

Temperature: 60 °C

Sample: Tricyclic antidepressants



Double endcapping, dense bonding and the durable Rx-Sil particles (sol-type) combine to provide long lifetime at pH 7 when compared to single endcapped sil-gel columns used here. The conditions used for this test – high temperature (60°C) and high salt concentration (250 mM), accelerate the dissolution of silica, causing premature failure of the sil-gel type column.

Selectivity changes for basic compounds with Eclipse XDB and StableBond

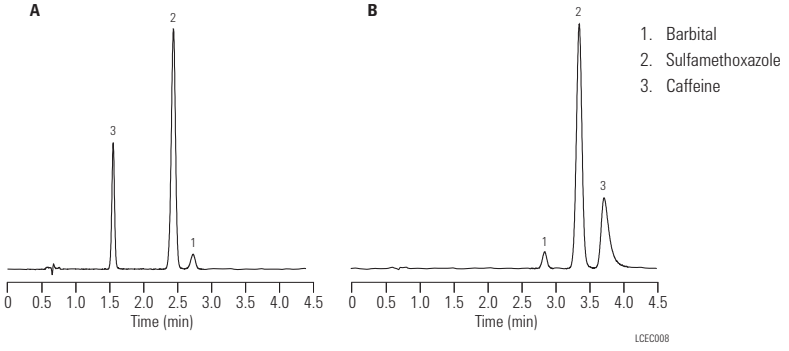
Column A: **Eclipse XDB-C8**
966967-906
4.6 x 75 mm, 3.5 µm

Column B: **ZORBAX Rx/SB-C8**
866953-906
4.6 x 75 mm, 3.5 µm

Mobile Phase: 70% 25 mM NaH_2PO_4, pH 3.0
30% Methanol

Flow Rate: 1.0 mL/min

Temperature: 35 °C



Eclipse XDB and StableBond columns are based on the same silica but have different bonding and endcapping. Therefore, they can have very different selectivity for the same sample under the same conditions, as this example shows.

Optimize separations with Eclipse XDB selectivity options

Column A: **Eclipse XDB-Phenyl**
963967-912
4.6 x 150 mm, 3.5 µm

Column B: **Eclipse XDB-C8**
963967-906
4.6 x 150 mm, 3.5 µm

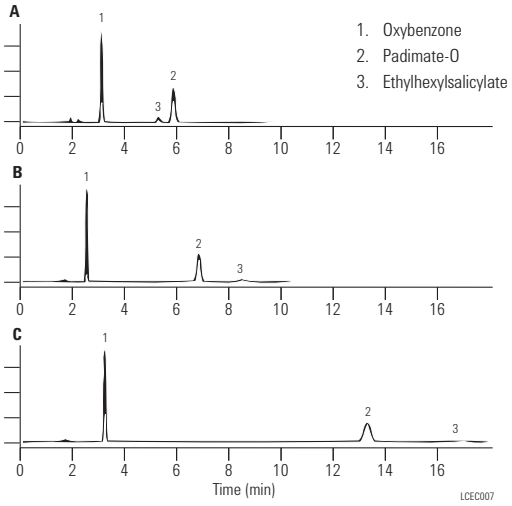
Column C: **Eclipse XDB-C18**
963967-902
4.6 x 150 mm, 3.5 µm

Mobile Phase: 15% H_2O:85% MeOH

Flow Rate: 1.0 mL/min

Temperature: 35 °C

Sample: Sunscreens



This separation of sunscreens on all three Eclipse XDB bonded phases – C18, C8 and Phenyl – shows that different bonded phases can be used to optimize a separation. While all three bonded phases provide an adequate separation, the Eclipse XDB-Phenyl provides a different peak elution order and a much shorter overall analysis time. All three bonded phases also provide excellent peak shape with no mobile phase additives.

Selectivity for urea pesticides

Column A: **Eclipse XDB-C18**
993967-902
4.6 x 150 mm, 5 µm

Column B: **Eclipse XDB-CN**
993967-905
4.6 x 150 mm, 5 µm

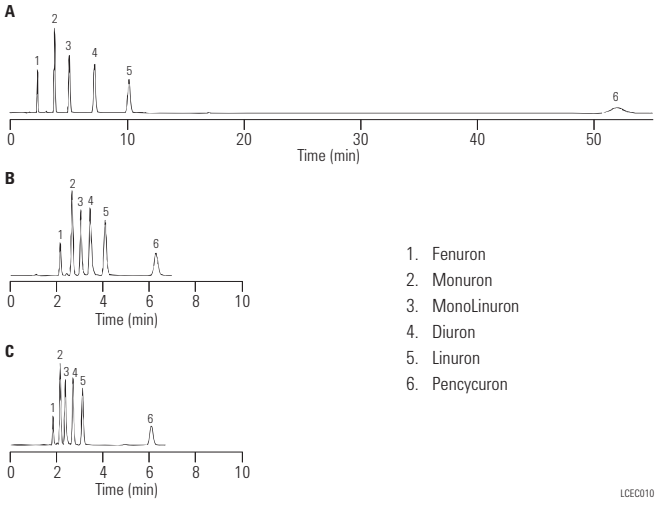
Column C: **Eclipse XDB-C18**
993967-902
4.6 x 150 mm, 5 µm

Mobile Phase: A. 60:40 MeOH:Water
B. 60:40 MeOH:Water
C. 77:23 MeOH:Water

Flow Rate: 1.0 mL/min

Temperature: 25 °C

Sample: Urea pesticides



The Eclipse XDB-CN column reduces retention time and provides good selectivity for Urea pesticides when compared to an Eclipse XDB-C18 column.

ZORBAX Eclipse XDB

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7	Eclipse XDB-Phenyl USP L11	Eclipse XDB-CN USP L10
Standard Columns (no special hardware required)							
	Semi-Preparative	9.4 x 250	5	990967-202	990967-206		
	Analytical	4.6 x 250	5	990967-902	990967-906	990967-912	990967-905
	Analytical	4.6 x 150	5	993967-902	993967-906	993967-912	993967-905
	Analytical	4.6 x 50	5	946975-902	946975-906		
	Rapid Resolution	4.6 x 150	3.5	963967-902	963967-906	963967-912	963967-905
	Rapid Resolution	4.6 x 100	3.5	961967-902	961967-906		961967-905
	Rapid Resolution	4.6 x 75	3.5	966967-902	966967-906	966967-912	966967-905
	Rapid Resolution	4.6 x 50	3.5	935967-902	935967-906	935967-912	
	Rapid Resolution	4.6 x 30	3.5	934967-902	934967-906		
	Rapid Resolution	4.6 x 20	3.5	932967-902	932967-906		
UG	UHPLC Guard, 1200 bar*	4.6 x 5	1.8	820750-903			
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	928975-902	928975-906		
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	927975-902	927975-906		
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	924975-902	924975-906		
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8	926975-902	926975-906		
	Solvent Saver	3.0 x 250	5	990967-302	990967-306	990967-312	990967-305
	Solvent Saver	3.0 x 150	5	993967-302	993967-306	993967-312	993967-305
	Solvent Saver Plus	3.0 x 150	3.5	963954-302	963954-306	963954-312	963954-305
	Solvent Saver Plus	3.0 x 100	3.5	961967-302	961967-306	961967-312	
	Solvent Saver Plus	3.0 x 75	3.5	966954-302			
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	981759-302			
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	981758-302			
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	981757-302			
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	928975-302	928975-306		
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	927975-302	927975-306		
	Solvent Saver HT, 600 bar	3.0 x 30	1.8	924975-302	924975-306		
	Solvent Saver HT, 600 bar	3.0 x 20	1.8	926975-302	926975-306		
UG	UHPLC Guard, 1200 bar*	3.0 x 5	1.8	823750-903			
	Narrow Bore	2.1 x 150	5	993700-902	993700-906	993700-912	993700-905
	Narrow Bore	2.1 x 50	5	960967-902	960967-906	960967-912	960967-905

Unless indicated, column pressure limit is 400 bar.

*Available late 2012.

(Continued)

ZORBAX Eclipse XDB

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7	Eclipse XDB-Phenyl USP L11	Eclipse XDB-CN USP L10
Standard Columns (no special hardware required)							
	Narrow Bore RR	2.1 x 150	3.5	930990-902	930990-906		
	Narrow Bore RR	2.1 x 100	3.5	961753-902	961753-906		961753-905
	Narrow Bore RR	2.1 x 75	3.5	966735-902			
	Narrow Bore RR	2.1 x 50	3.5	971700-902	971700-906		
	Narrow Bore RR	2.1 x 30	3.5	974700-902	974700-906		
	Narrow Bore RR	2.1 x 20	3.5	972700-902	972700-906		
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	981759-902			
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	981758-902			
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	981757-902			
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	928700-902	928700-906		
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	927700-902	927700-906		
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	924700-902	924700-906		
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8	926700-902	926700-906		
UG	UHPLC Guard, 1200 bar*	2.1 x 5	1.8	821725-903			
	MicroBore RR	1.0 x 150	3.5	963600-902	963600-906		
	MicroBore RR	1.0 x 50	3.5	965600-902	965600-906		
	MicroBore RR	1.0 x 30	3.5	961600-902	961600-906		
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5921	5185-5921		
P	Guard Cartridge	9.4 x 15	5	820675-112	820675-112	820675-112	820675-112
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-925	820950-926	820950-927	820950-935
ZGC	Guard Cartridges, 4/pk	2.1 x 12.5	5	821125-926	821125-926	821125-926	821125-935
P	Guard Hardware Kit			840140-901	840140-901	840140-901	840140-901
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)							
PI	PrepHT Cartridge	21.2 x 250	7	977250-102	977250-106		
PI	PrepHT Cartridge	21.2 x 150	7	977150-102	977150-106		
PI	PrepHT Cartridge	21.2 x 150	5	970150-902	970150-906		
PI	PrepHT Cartridge	21.2 x 100	5	970100-902	970100-906		
PI	PrepHT Cartridge	21.2 x 50	5	970050-902	970050-906		
PI	PrepHT Guard Cartridge	17.0 x 7.5	5	820212-925	820212-926		
PI	Guard Cartridge Hardware			820444-901	820444-901		
PI	PrepHT Endfittings, 2/pk			820400-901	820400-901		

Unless indicated, column pressure limit is 400 bar.

*Available late 2012.

ZORBAX Eclipse XDB

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7
Agilent Cartridge Columns (require hardware kit 5021-1845)					
AC	Analytical	4.6 x 250	5	7995118-585	7995108-585
AC	Analytical	4.6 x 150	5	7995118-595	7995108-595
AC	Rapid Resolution	4.6 x 75	3.5	7995118-344	7995108-344
AC	Solvent Saver Plus	3.0 x 75	3.5	7995230-344	
AC	Guard Cartridges, 10/pk	4.0 x 4	5	7995118-504	7995118-504
AC	Cartridge Holder			5021-1845	5021-1845
Standard Columns (no special hardware required)					
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	922975-902	922975-906
	Rapid Resolution HT, 3/pk, 600 bar	4.6 x 50	1.8	922975-932	
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	922700-902	
	Narrow Bore RRHT, 3/pk, 600 bar	2.1 x 50	1.8	922700-932	
Rapid Resolution HT Cartridges (require hardware kit 820555-901)					
RR	Rapid Resolution Cartridge	4.6 x 30	3.5	933975-902	933975-906
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 30	3.5	933975-932	933975-936
RR	Rapid Resolution Cartridge	4.6 x 15	3.5	931975-902	931975-906
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 15	3.5	931975-932	931975-936
RR	Rapid Resolution Cartridge	2.1 x 30	3.5	973700-902	973700-906
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 30	3.5	973700-932	973700-936
RR	Rapid Resolution Cartridge	2.1 x 15	3.5	975700-902	975700-906
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 15	3.5	975700-932	975700-936
RR	Rapid Resolution HT Cartridge, 600 bar	4.6 x 50	1.8	925975-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 600 bar	4.6 x 50	1.8	925975-932	
RR	Rapid Resolution HT Cartridge, 600 bar	4.6 x 30	1.8	923975-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 600 bar	4.6 x 30	1.8	923975-932	

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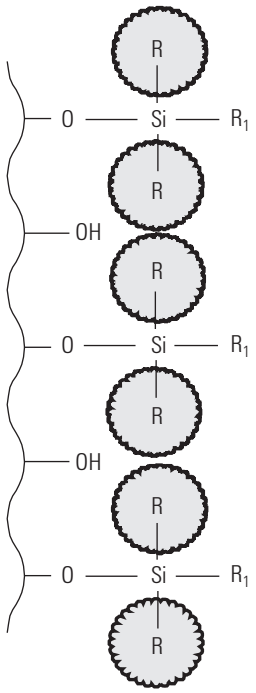
ZORBAX Eclipse XDB

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7
Rapid Resolution HT Cartridges (require hardware kit 820555-901)					
RR	Rapid Resolution HT Cartridge, 600 bar	4.6 x 15	1.8	921975-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 600 bar	4.6 x 15	1.8	921975-932	
RR	Rapid Resolution HT Cartridge, 600 bar	2.1 x 50	1.8	925700-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 600 bar	2.1 x 50	1.8	925700-932	
RR	Rapid Resolution HT Cartridge, 600 bar	2.1 x 30	1.8	923700-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 600 bar	2.1 x 30	1.8	923700-932	
RR	Rapid Resolution HT Cartridge, 600 bar	2.1 x 15	1.8	921700-902	
RR	Rapid Resolution HT Cartridge, 3/pk, 600 bar	2.1 x 15	1.8	921700-932	
RR	Hardware Kit for RR and RRHT Cartridges			820555-901	
Capillary Glass-lined Columns					
	Capillary	0.5 x 250	5	5064-8286	
	Capillary	0.5 x 150	5	5064-8287	
	Capillary RR	0.5 x 150	3.5	5064-8288	
	Capillary RR	0.5 x 35	3.5	5064-8298	
	Capillary	0.3 x 250	5	5064-8269	
	Capillary	0.3 x 150	5	5064-8291	
	Capillary RR	0.3 x 150	3.5	5064-8271	
	Capillary	0.5 x 35	5	5064-8296	
	Capillary	0.3 x 35	5	5064-8297	



Sterically Protected StableBond Bonded Phase

ZORBAX 80Å StableBond

- Longest column lifetime and best reproducibility for low pH separations – down to pH 1
- Patented stable column chemistry allows use at high temperature and low pH without degradation
- Six different bonded phases provide broad selectivity – SB-C18, SB-C8, SB-CN, SB-Phenyl, SB-C3, and SB-Aq
- High purity (Type B) silica for good peak shape

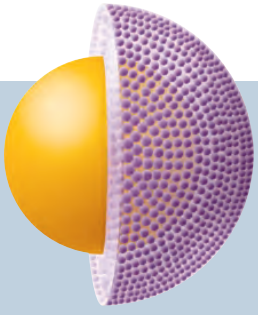
Agilent ZORBAX StableBond columns use patented, unique, nonfunctional silanes with bulky diisobutyl (SB-C18) or diisopropyl (SB-C8, SB-C3, SB-Phenyl, SB-CN, and SB-Aq) side chain groups that sterically protect the key siloxane bond to the silica surface from hydrolytic attack at low pH. StableBond packing materials are not endcapped in order to provide exceptional stability and to maximize lifetime and reproducibility under acidic mobile phase conditions. The high purity, low acidity silica provides excellent peak shape with acidic, basic and neutral compounds making StableBond columns an excellent choice for low pH method development. ZORBAX StableBond columns are compatible with all common mobile phases, including very high aqueous mobile phases.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range*	Endcapped	Carbon Load
ZORBAX SB-C18	80Å	180 m^2/g	90 °C	0.8-8.0	No	10%
ZORBAX SB-C8	80Å	180 m^2/g	80 °C	1.0-8.0	No	5.5%
ZORBAX SB-C3	80Å	180 m^2/g	80 °C	1.0-8.0	No	4%
ZORBAX SB-Phenyl	80Å	180 m^2/g	80 °C	1.0-8.0	No	5.5%
ZORBAX SB-CN	80Å	180 m^2/g	80 °C	1.0-8.0	No	4%
ZORBAX SB-Aq	80Å	180 m^2/g	80 °C	1.0-8.0	No	proprietary

Specifications represent typical values only.

*StableBond columns are designed for optimal use at low pH. At pH 6-8, highest column stability for all silica-based columns is obtained by operating at temperatures <40 °C and using lower buffer concentrations in the range of 0.01-0.02 M. At mid-range pH, Eclipse Plus, Eclipse XDB and Bonus-RP are recommended.



Tips & Tools

ZORBAX StableBond SB-C18, SB-C8 and SB-Aq phases are also available on Poroshell 120.

Turn to page 27.

StableBond SB-C18 shows excellent stability at low pH and high temperature (pH 0.8, 90 °C)

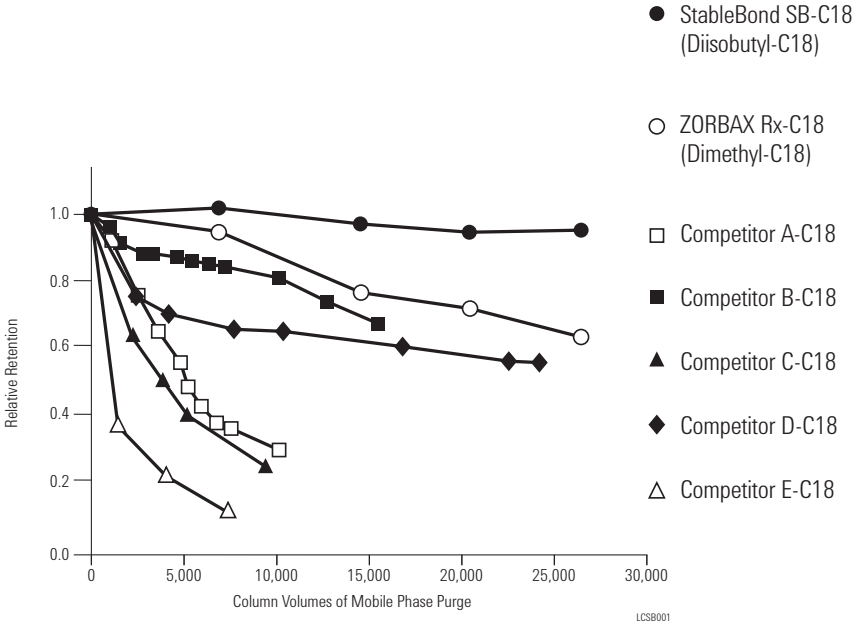
Column: **ZORBAX SB-C18**
883975-902
4.6 x 150 mm, 5 µm

Column: **ZORBAX Rx-C18**
883967-902
4.6 x 150 mm, 5 µm

Mobile Phase: 50% Methanol/50% Water with 1.0% TFA
Test Solute: Toluene

Temperature: 90 °C

As an indicator of column breakdown, retention time of toluene was measured after purging the column with mobile phase. Only the StableBond SB-C18 is unchanged after three working months of use under these very low pH (0.8) and high temperature (90 °C) conditions. ZORBAX Rx-C18 also provides a stable matrix, and can be used as an alternative selectivity to StableBond SB-C18.



Shorter chain ZORBAX SB-CN is also stable at low pH (pH 2.0, 50 °C)

Column: **ZORBAX SB-CN**
883975-905
4.6 x 150 mm, 5 µm

Mobile Phase: 0.1% TFA, pH 2:ACN

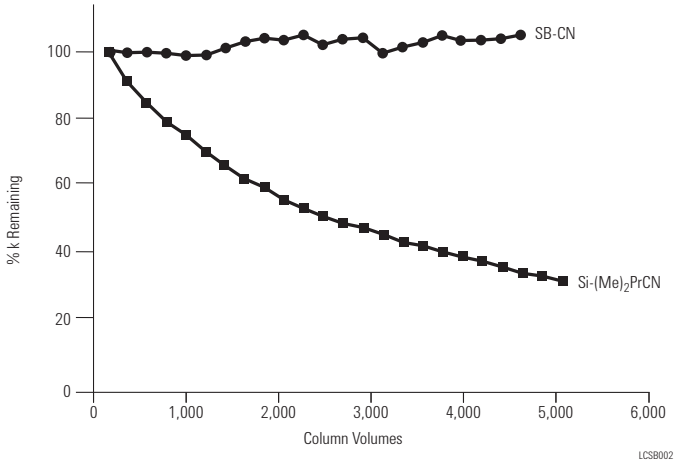
Flow Rate: 1 mL/min

Gradient: 0-100% ACN

Temperature: 50 °C

Sample: 1-phenylheptane @ 50% AC/50% water with 0.1% TFA

ZORBAX StableBond SB-CN and other short chain StableBond bonded phases are also exceptionally stable at low pH. Conventional dimethyl CN and similar bonded phases lack this stability.



SB-CN optimizes retention and resolution

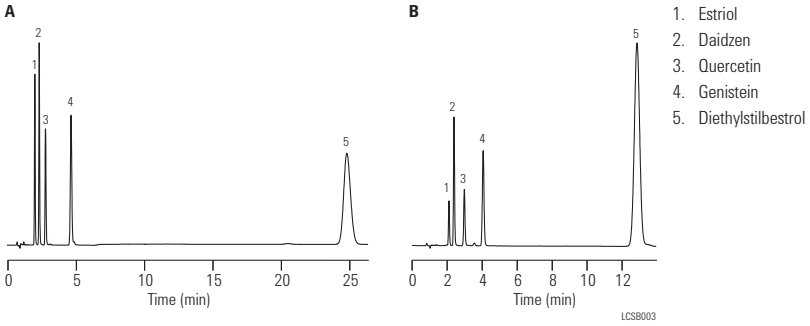
Column A: **ZORBAX SB-C18**
866953-902
4.6 x 75 mm, 3.5 µm

Column B: **ZORBAX SB-CN**
866953-905
4.6 x 75 mm, 3.5 µm

Mobile Phase: 30% ACN
70% 25mM NaH_2PO_4, pH 2.5

Flow Rate: 1.0 mL/min

Temperature: 35 °C



The SB-CN column is used here to reduce analysis time by 50%. The retention of the most hydrophobic analyte is cut in half. At the same time retention of the more polar, early eluting peaks increases slightly.

Five different bonded phases provide selectivity options

Column A: **ZORBAX SB-C18**
883975-902
4.6 x 150 mm, 5 µm

Column B: **ZORBAX SB-C8**
883975-906
4.6 x 150 mm, 5 µm

Column C: **ZORBAX SB-C3**
883975-909
4.6 x 150 mm, 5 µm

Column D: **ZORBAX SB-Phenyl**
883975-912
4.6 x 150 mm, 5 µm

Column E: **ZORBAX SB-CN**
883975-905
4.6 x 150 mm, 5 µm

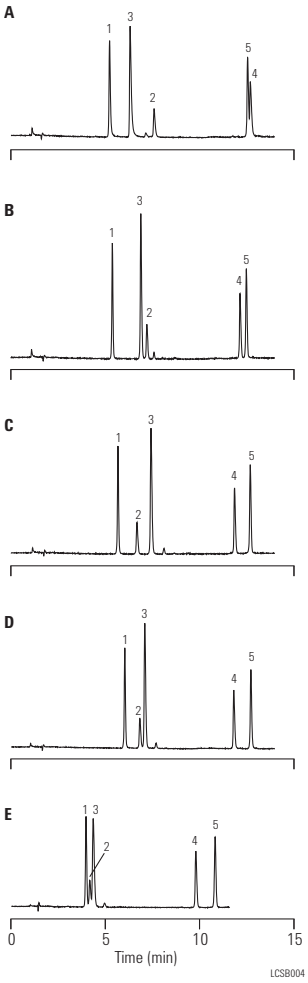
Mobile Phase: 0-100% B in 18.8 min
A: 50 mM NaH_2PO_4,
pH 2.5 in 95% H_2O / 5% ACN
B: 50 mM NaH_2PO_4,
pH 2.5 in 47% H_2O / 53% ACN

Flow Rate: 1.0 mL/min

Temperature: 26 °C

Detector: 254 nm

SB-C3 is just one of the five different StableBond selectivity choices. In this example, optimum resolution is obtained with SB-C3. All are based on the same high purity Rx-SIL. Selectivity changes are therefore dependent only on the bonded phases, making method development more reliable.



ZORBAX 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11	SB-Aq
Standard Columns (no special hardware required)									
	Semi-Preparative	9.4 x 250	5	880975-202	880967-201	880975-205	880975-209	880975-212	
	Semi-Preparative	9.4 x 150	5	883975-202					
	Semi-Preparative	9.4 x 100	5	884975-202					
	Semi-Preparative	9.4 x 50	5	846975-202					
	Analytical	4.6 x 250	5	880975-902	880975-906	880975-905	880975-909	880975-912	880975-914
	Analytical	4.6 x 150	5	883975-902	883975-906	883975-905	883975-909	883975-912	883975-914
	Analytical	4.6 x 50	5	846975-902	846975-906				846975-914
	Rapid Resolution	4.6 x 250	3.5	884950-567					
	Rapid Resolution	4.6 x 150	3.5	863953-902	863953-906	863953-905		863953-912	863953-914
	Rapid Resolution	4.6 x 100	3.5	861953-902	861953-906	861953-905		861953-912	861953-914
	Rapid Resolution	4.6 x 75	3.5	866953-902	866953-906	866953-905		866953-912	866953-914
	Rapid Resolution	4.6 x 50	3.5	835975-902	835975-906	835975-905		835975-912	835975-914
	Rapid Resolution	4.6 x 30	3.5	834975-902	834975-906				
	Rapid Resolution	4.6 x 20	3.5	832975-902	832975-906				
	Rapid Resolution HT, 600 bar	4.6 x 150	1.8	829975-902	829975-906	829975-905		829975-912	829975-914
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828975-902	828975-906	828975-905		828975-912	828975-914
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827975-902	827975-906	827975-905		827975-912	827975-914
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	824975-902	824975-906	824975-905		824975-912	824975-914
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8	826975-902	826975-906				
UG	UHPLC Guard, 600 bar*	4.6 x 5	1.8	820750-902	820750-904				
	Solvent Saver	3.0 x 250	5	880975-302	880975-306	880975-305	880975-309	880975-312	880975-314
	Solvent Saver	3.0 x 150	5	883975-302	883975-306	883975-305	883975-309	883975-312	883975-314
	Solvent Saver Plus	3.0 x 150	3.5	863954-302	863954-306	863954-305		863954-312	863954-314
	Solvent Saver Plus	3.0 x 100	3.5	861954-302	861954-306	861954-305	861954-309	861954-312	861954-314
	Solvent Saver Plus	3.0 x 75	3.5	866953-302					

Unless indicated, column pressure limit is 400 bar.

*Available late 2012.

(Continued)

ZORBAX 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11	SB-Aq
Standard Columns (no special hardware required)									
	Solvent Saver RRHD, 1200 bar	3.0 x 150	1.8	859700-302	859700-306				
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	858700-302	858700-306	858700-305		858700-312	
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	857700-302	857700-306	857700-305		857700-312	
	Solvent Saver HT, 600 bar	3.0 x 150	1.8	829975-302	829975-306	829975-305		829975-312	
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	828975-302	828975-306	828975-305	828975-309	828975-312	828975-314
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	827975-302	827975-306	827975-305			
	Solvent Saver HT, 600 bar	3.0 x 30	1.8	824975-302	824975-306	824975-305		827975-312	827975-314
	Solvent Saver HT, 600 bar	3.0 x 20	1.8	826975-302	826975-306				
UG	UHPLC Guard, 1200 bar*	3.0 x 5	1.8	823750-902	823750-904				
	Narrow Bore	2.1 x 150	5	883700-922	883700-906	883700-905	883700-909	883700-912	
	Narrow Bore	2.1 x 50	5	860975-902	860975-906	860975-905	860975-909	860975-912	860975-914
	Narrow Bore RR	2.1 x 150	3.5	830990-902	830990-906				830990-914
	Narrow Bore RR	2.1 x 100	3.5	861753-902	861753-906	861753-905		861753-912	861753-914
	Narrow Bore RR	2.1 x 75	3.5	866735-902					
	Narrow Bore RR	2.1 x 50	3.5	871700-902	871700-906				871700-914
	Narrow Bore RR	2.1 x 30	3.5	874700-902	874700-906				
	Narrow Bore RR	2.1 x 20	3.5	872700-902	872700-906				
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	859700-902	859700-906	859700-905		859700-912	
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	858700-902	858700-906	858700-905		858700-912	
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	857700-902	857700-906	857700-905		857700-912	

Unless indicated, column pressure limit is 400 bar.

*Available late 2012.

(Continued)

ZORBAX 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-CN USP L10	SB-C3 USP L56	SB-Phenyl USP L11	SB-Aq
Standard Columns (no special hardware required)									
	Narrow Bore RRHT, 600 bar	2.1 x 150	1.8	820700-902	820700-906	820700-905		820700-912	
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	828700-902	828700-906	828700-905		828700-912	828700-914
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	827700-902	827700-906	827700-905		827700-912	827700-914
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	824700-902	824700-906	824700-905		824700-912	824700-914
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8	826700-902	826700-906				
UG	UHPLC Guard, 1200 bar*	2.1 x 5	1.8	821725-902	821725-904				
	MicroBore RR	1.0 x 150	3.5	863600-902	863600-906	863600-905			
	MicroBore RR	1.0 x 50	3.5	865600-902	865600-906				
	MicroBore RR	1.0 x 30	3.5	861600-902	861600-906				
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5920	5185-5920				
P	Guard Cartridge, 2/pk	9.4 x 15	7	820675-115	820675-115	820675-124	820675-124	820675-115	
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-920	820950-915	820950-916	820950-922	820950-917	820950-933
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-915	821125-915	821125-924	821125-924	821125-915	821125-933
P	Guard Hardware Kit	9.4 x 15	0	840140-901	840140-901	840140-901	840140-901	840140-901	
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901	820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)									
PI	PrepHT Cartridge	21.2 x 250	7	877250-102	877250-106	877250-105		877250-112	877250-114
PI	PrepHT Cartridge	21.2 x 150	7	877150-102	877150-106				877150-114
PI	PrepHT Cartridge	21.2 x 150	5	870150-902	870150-906				870150-914
PI	PrepHT Cartridge	21.2 x 100	5	870100-902	870100-906				870100-914
PI	PrepHT Cartridge	21.2 x 50	5	870050-902	870050-906				870050-914
PI	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-920	820212-915	820212-915		820212-915	820212-933
	Guard Cartridge Hardware			820444-901	820444-901	820444-901	820444-901	820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901	820400-901	820400-901

Unless indicated, column pressure limit is 400 bar.

*Available late 2012.

ZORBAX 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-Phenyl USP L11
Agilent Cartridge Columns (require hardware kit 5021-1845)						
AC	Analytical	4.6 x 250	5	7995218-585	7995208-585	
AC	Analytical	4.6 x 150	5	7995218-595	7995208-595	
AC	Rapid Resolution	4.6 x 75	3.5	7995218-344	7995208-344	
AC	Guard Cartridges, 10/pk	4.0 x 4	5	7995118-504	7995118-504	
AC	Cartridge Holder			5021-1845	5021-1845	
Standard Columns (no special hardware required)						
AC	Rapid Resolution HT	4.6 x 50	1.8	822975-902	822975-906	
AC	Rapid Resolution HT, 3/pk	4.6 x 50	1.8	822975-932		
AC	Narrow Bore RRHT	2.1 x 50	1.8	822700-902		
AC	Narrow Bore RRHT, 3/pk	2.1 x 50	1.8	822700-932		
Rapid Resolution Cartridges (require hardware kit 820555-901)						
RR	Rapid Resolution Cartridge	4.6 x 30	3.5	833975-902	833975-906	833975-912
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 30	3.5	833975-932	833975-936	
RR	Rapid Resolution Cartridge	4.6 x 15	3.5	831975-902	831975-906	
RR	Rapid Resolution Cartridge, 3/pk	4.6 x 15	3.5	831975-932	831975-936	
RR	Rapid Resolution Cartridge	2.1 x 30	3.5	873700-902	873700-906	
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 30	3.5	873700-932	873700-936	
RR	Rapid Resolution Cartridge	2.1 x 15	3.5	875700-902	875700-906	
RR	Rapid Resolution Cartridge, 3/pk	2.1 x 15	3.5	875700-932	875700-936	
Rapid Resolution HT Cartridges (require hardware kit 820555-901)						
RR	Rapid Resolution HT Cartridge	4.6 x 50	1.8	825975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 50	1.8	825975-932		
RR	Rapid Resolution HT Cartridge	4.6 x 30	1.8	823975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 30	1.8	823975-932		
RR	Rapid Resolution HT Cartridge	4.6 x 15	1.8	821975-902		
RR	Rapid Resolution HT Cartridge, 3/pk	4.6 x 15	1.8	821975-932		

(Continued)

ZORBAX 80Å StableBond

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-Phenyl USP L11
Rapid Resolution HT Cartridges (require hardware kit 820555-901)						
RR	Rapid Resolution HT Cartridge	2.1 x 50	1.8	825700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 50	1.8	825700-932		
RR	Rapid Resolution HT Cartridge	2.1 x 30	1.8	823700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 30	1.8	823700-932		
RR	Rapid Resolution HT Cartridge	2.1 x 15	1.8	821700-902		
RR	Rapid Resolution HT Cartridge, 3/pk	2.1 x 15	1.8	821700-932		
RR	Hardware Kit for RR and RRHT Cartridges			820555-901		

ZORBAX 80Å StableBond

Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1
Capillary Glass-lined Columns			
Capillary	0.5 x 250	5	5064-8258
Capillary	0.5 x 150	5	5064-8256
Capillary	0.5 x 35	5	5064-8254
Capillary RR	0.5 x 150	3.5	5064-8262
Capillary RR	0.5 x 35	3.5	5064-8260
Capillary	0.3 x 250	5	5064-8257
Capillary	0.3 x 150	5	5064-8255
Capillary	0.3 x 35	5	5064-8253
Capillary RR	0.3 x 150	3.5	5064-8261

ZORBAX Rx

- Recommended for alternate selectivity at low pH relative to Eclipse XDB-C18 and StableBond SB-C18; for higher temperature applications, StableBond is recommended
- Higher carbon load than SB-C18 columns (12% vs. 10%).
- High stability and good peak shape for low pH applications (up to pH 8)
- Manufactured using dimethyloctadecylsilane and non-endcapped
- Same product as SB-C8

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range*	Endcapped	Carbon Load
ZORBAX Rx-C18	80Å	180 m^2/g	60 °C	2.0-8.0	No	12%
ZORBAX Rx-C8	80Å	180 m^2/g	80 °C	1.0-8.0	No	5.5%

Specifications represent typical values only.

*At pH 6-9 highest column stability for all silica based columns is obtained by operating at temperatures <40 °C and using lower buffer concentrations in the range of 0.01-0.02 M.

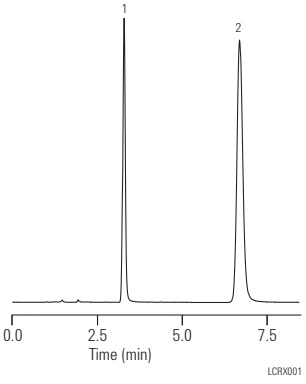
Analysis of diazepam on Rx-C18

Column: **ZORBAX Rx-C18**
880967-302
3.0 x 250 mm, 5 µm

Mobile Phase: 35% H_2O:65% MeOH

Flow Rate: 0.5 mL/min

An Rx-C18 column is used for this USP analysis of diazepam and the internal standard ethylparaben. The Solvent Saver 3.0 mm ID Rx-C18 column reduces solvent usage by 60% over what would be used if the analysis was done on a 4.6 x 250 mm column.

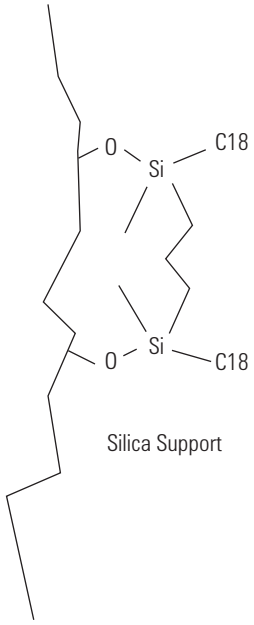


1. Ethylparaben
2. Diazepam

ZORBAX Rx

Hardware	Description	Size (mm)	Particle Size (µm)	Rx-C18 USP L1	Rx-C8 USP L7*
	Semi-Preparative	9.4 x 250	5	880967-202	880967-201
	Analytical	4.6 x 250	5	880967-902	880967-901
	Analytical	4.6 x 150	5	883967-902	883967-901
	Rapid Resolution	4.6 x 150	3.5	863967-902	
	Rapid Resolution	4.6 x 100	3.5	861967-902	
	Rapid Resolution	4.6 x 75	3.5	866967-902	
	Solvent Saver	3.0 x 250	5	880967-302	
	Solvent Saver	3.0 x 150	5	883967-302	
	Solvent Saver Plus	3.0 x 150	3.5	863967-302	
	Solvent Saver Plus	3.0 x 100	3.5	861967-302	
	Narrow Bore	2.1 x 150	5	883700-902	
	Narrow Bore RR	2.1 x 100	3.5	861767-902	
P	Guard Cartridge, 2/pk	9.4 x 15	7	820675-115	820675-115
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-914	820950-913
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-915	821125-915
P	Guard Hardware Kit	9.4 x 15		840140-901	840140-901
ZGC	Guard Hardware Kit			820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)					
PI	PrepHT Cartridge	21.2 x 250	7	877967-102	
PI	PrepHT Cartridge	21.2 x 150	7		
PI	PrepHT Cartridge	21.2 x 150	5		
PI	PrepHT Cartridge	21.2 x 100	5		
PI	PrepHT Cartridge	21.2 x 50	5		
PI	PrepHT Guard Cartridge, 2/pk		5	820212-914	820212-915
PI	Guard Cartridge Hardware			820444-901	820444-901
PI	PrepHT Endfittings, 2/pk			820400-901	820400-901

*Rx-C8 is the same product as SB-C8. For other sizes and configurations, see the ZORBAX StableBond section.



Novel Bidentate C18-C18 Bonding for Extend C-18 Bonded Phase

ZORBAX 80Å Extend-C18

- High efficiency and long life at high pH – up to pH 11.5
- Unique bidentate bonding and double endcapping provides high pH stability
- More efficiency and better peak shape than polymer-based columns
- Improve retention, resolution and peak shape of basic compounds
- High sensitivity for LC/MS separations of peptides

The Agilent ZORBAX Extend-C18 column uses a novel bidentate C18-C18 bonding technology to make it possible to develop high-resolution separations at high pH with a silica-based column. At high pH, non-charged basic compounds will not interact with the underlying silica. The result is high efficiency separations with superior peak shape and improved resolution. High pH separations are also the best choice for compounds that are more stable or more soluble in high pH solutions. Some of the mobile phase buffer options for high pH include triethylamine, pyrrolidine, glycine, borate and ammonium hydroxide. Ammonium hydroxide at pH 10.5 is an excellent mobile phase modifier for the LC/MS of peptides and small molecules with improved sensitivity compared with TFA containing mobile phase at low pH. The Extend-C18 column is stable from pH 2-11.5 with good peak shape for all types of compounds. Extend-C18 columns also provide an additional selectivity choice at low pH.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range**	Endcapped	Carbon Load
ZORBAX Extend-C18	80Å	180 m^2/g	60 °C	2.0-11.5	Double	12.5%

Specifications represent typical values only.

*Temperature limits are 60 °C up to pH 8, 40 °C from pH 8-11.5.

**Above pH 6 highest column stability for all silica based columns is obtained by reducing the operating temperature to 40 °C or below and using lower buffer concentrations (0.01-0.02 M) or organic buffers.

Tips & Tools

Always use Agilent Certified Lamps for Best LC Performance

Agilent detector lamps are built to the tightest specifications and quality standards. They are designed to increase light intensity and decrease noise, which improves chromatographic results. Agilent rigorously tests its lamps for lowest lamp-to-lamp variability. Trust Agilent lamps for robust, long-lasting performance and lower cost of ownership. To learn more, visit **www.agilent.com/chem/lamps**

Basic antihistamines on Extend-C18 at high pH

Column: **ZORBAX Extend-C18**
773450-902
4.6 x 150 mm, 5 µm

Mobile Phase: pH 7:
30% 20 mM Na_2HPO_4 70% MeOH
pH 11:
30% 20 mM TEA 70% MeOH

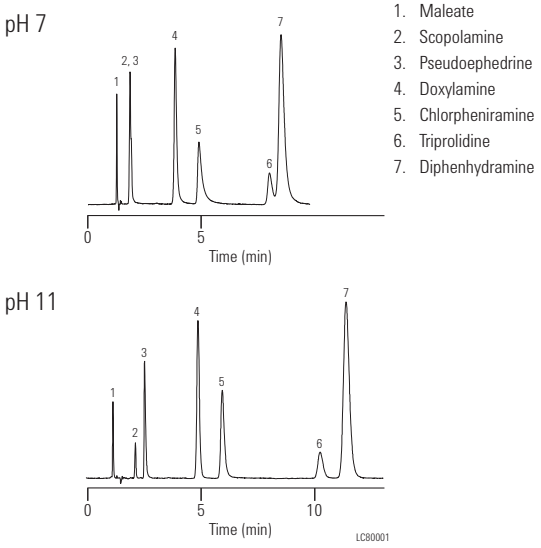
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 254 nm

Sample: Antihistamines

Pseudoephedrine and scopolamine are difficult to retain at low and mid pH. Pseudoephedrine is often analyzed by ion exchange methods. The Extend-C18 column retains these compounds in a noncharged form at high pH and improves resolution.



1. Maleate
2. Scopolamine
3. Pseudoephedrine
4. Doxylamine
5. Chlorpheniramine
6. Triprolidine
7. Diphenhydramine

Long life at high pH with Extend-C18

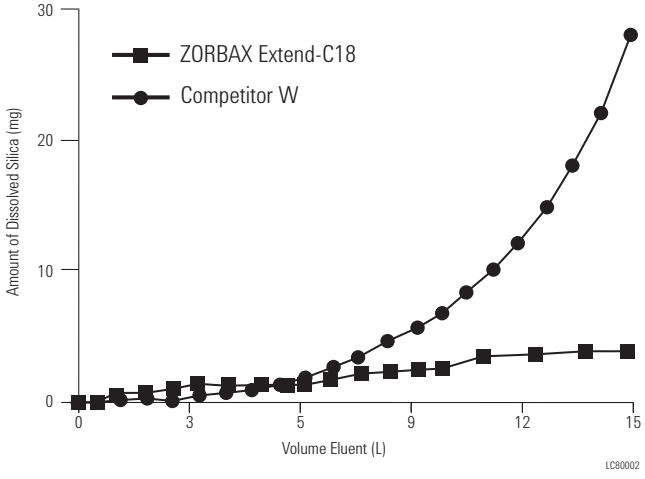
Column: **ZORBAX Extend-C18**
773450-902
4.6 x 150 mm, 5 µm

Mobile Phase: 20% Methanol
80% 0.1 M Carbonate buffer, pH 10.0

Flow Rate: 1.0 mL/min

Temperature: Ambient

At high pH, columns will fail due to silica dissolution. The example here shows extended lifetime of ZORBAX Extend-C18 at high pH in comparison to competitor W. This was measured by the amount of dissolved silica.



Extend-C18 provides good peak shape at low pH

Column: **ZORBAX Extend-C18**
773450-902
4.6 x 150 mm, 5 µm

Mobile Phase: 80% 25 mM NaH_2PO_4, pH 3.0
20% Methanol

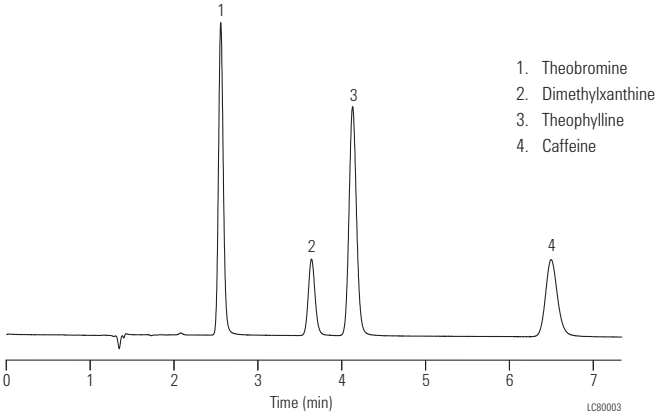
Flow Rate: 1.0 mL/min

Temperature: 35 °C

Detector: 254 nm

Sample: Basic Compounds

These basic compounds are separated on the Extend-C18 at low pH with excellent peak shape. The Extend-C18 column can be used at high and low pH.



ZORBAX 80Å Extend-C18

Hardware	Description	Size (mm)	Particle Size (µm)	Extend-C18 USP L1
Standard Columns (no special hardware required)				
	Analytical	4.6 x 250	5	770450-902
	Analytical	4.6 x 150	5	773450-902
	Analytical	4.6 x 50	5	746450-902
	Rapid Resolution	4.6 x 150	3.5	763953-902
	Rapid Resolution	4.6 x 100	3.5	764953-902
	Rapid Resolution	4.6 x 75	3.5	766953-902
	Rapid Resolution	4.6 x 50	3.5	735953-902
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	728975-902
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	727975-902
	Rapid Resolution HT, 600 bar	4.6 x 30	1.8	724975-902
	Rapid Resolution HT, 600 bar	4.6 x 20	1.8	726975-902
	Solvent Saver	3.0 x 250	5	770450-302
	Solvent Saver	3.0 x 150	5	773450-302
	Solvent Saver Plus	3.0 x 150	3.5	763954-302
	Solvent Saver Plus	3.0 x 100	3.5	764953-302
	Solvent Saver Plus	3.0 x 50	3.5	735954-302

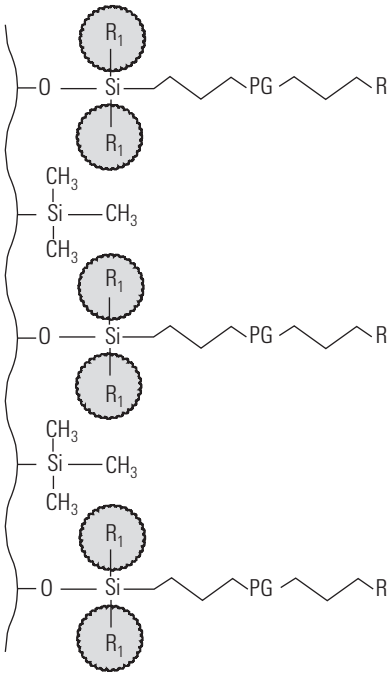
Unless indicated, column pressure limit is 400 bar.

(Continued)

ZORBAX 80Å Extend-C18

Hardware	Description	Size (mm)	Particle Size (µm)	Extend-C18 USP L1
Standard Columns (no special hardware required)				
	Solvent Saver RRHD, 1200 bar	3.0 x 100	1.8	758700-302
	Solvent Saver RRHD, 1200 bar	3.0 x 50	1.8	757700-302
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	728975-302
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	727975-302
	Solvent Saver HT, 600 bar	3.0 x 30	1.8	724975-302
	Solvent Saver HT, 600 bar	3.0 x 20	1.8	726975-302
	Narrow Bore	2.1 x 150	5	773700-902
	Narrow Bore	2.1 x 50	5	760450-902
	Narrow Bore RR	2.1 x 100	3.5	761753-902
	Narrow Bore RR	2.1 x 50	3.5	735700-902
	Narrow Bore RRHD, 1200 bar	2.1 x 150	1.8	759700-902
	Narrow Bore RRHD, 1200 bar	2.1 x 100	1.8	758700-902
	Narrow Bore RRHD, 1200 bar	2.1 x 50	1.8	757700-902
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	728700-902
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	727700-902
	Narrow Bore RRHT, 600 bar	2.1 x 30	1.8	724700-902
	Narrow Bore RRHT, 600 bar	2.1 x 20	1.8	726700-902
	MicroBore RR	1.0 x 150	3.5	763600-902
	MicroBore RR	1.0 x 50	3.5	765600-902
	MicroBore RR	1.0 x 30	3.5	761600-902
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5923
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-930
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-930
ZGC	Guard Hardware Kit			820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)				
PI	PrepHT Cartridge	21.2 x 150	5	770150-902
PI	PrepHT	21.2 x 100	5	770100-902
PI	PrepHT	21.2 x 50	5	770050-902
PI	PrepHT Endfittings, 2/pk			820400-901
PI	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-930
PI	Guard Cartridge Hardware			820444-901

Unless indicated, column pressure limit is 400 bar.



Unique, Polar Alkyl Bonus-RP Bonded Phase

ZORBAX Bonus-RP

- Excellent peak shape for challenging basic compounds at low and mid pH
- Unique reversed-phase selectivity
- Novel bonding technology with embedded polar group and steric protection
- Usable in 100% aqueous mobile phases

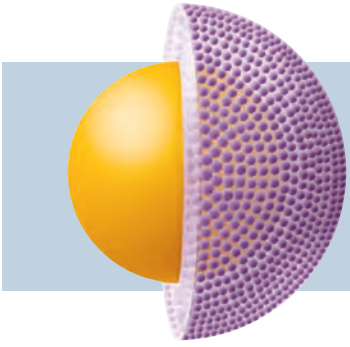
The Agilent ZORBAX Bonus-RP column has a polar amide group embedded in a long alkyl chain. This novel bonding reduces interactions between basic compounds and the silica support, improving peak shape for the most difficult basic compounds. Peak shape and column lifetime are further improved by triple endcapping. In addition, diisopropyl side groups provide steric protection against acid hydrolysis for good lifetime at low pH. The Bonus-RP column provides an alternate selectivity to C18 and C8 alkyl bonded phases.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits*	pH Range	Endcapped	Carbon Load
ZORBAX Bonus-RP	80Å	180 m^2/g	60 °C	2.0-9.0	Triple	9.5%

Specifications represent typical values only.

*Temperature limits are 60 °C up to pH 8, 40 °C from pH 8-9.



Tips & Tools

ZORBAX Bonus-RP is also available on Poroshell 120.

Turn to page 27.

Improved peak shape of basic compounds using Bonus-RP

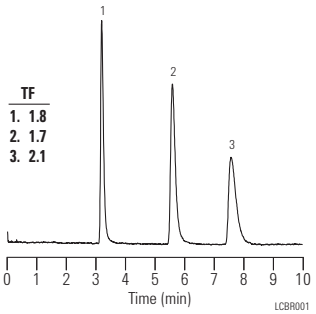
Column: **Alkyl-C8**
4.6 x 150 mm, 5 µm

Mobile Phase: 75% 25 mM NH_4OAc, pH 5.5
25% ACN

Flow Rate: 1.5 mL/min

Temperature: 40 °C

Detector: 254 nm



1. Doxylamine
2. Chlorpheniramine
3. Triprolidine

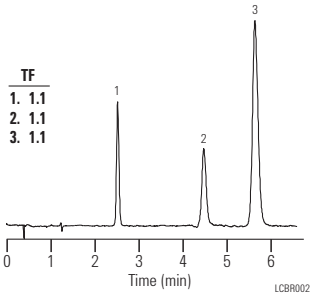
Column: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Mobile Phase: 80% 25 mM NH_4OAc, pH 5.5
20% ACN

Flow Rate: 1.5 mL/min

Temperature: 40 °C

Detector: 254 nm



1. Doxylamine
2. Chlorpheniramine
3. Triprolidine

Bonus-RP eliminates peak tailing of these basic compounds in comparison to a typical alkyl C8 bonded phase. In the mid-pH region, residual silanols can interact more strongly with basic compounds to cause peak tailing. The polar group in the Bonus-RP bonded phase eliminates peak tailing of these basic compounds by reducing interactions with residual silanols.

ZORBAX Bonus-RP is stable at low and mid pH

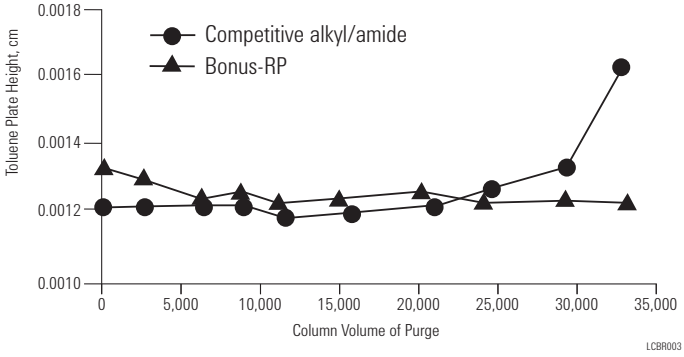
Column: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Mobile Phase: 60% 25 mM
Phosphate Buffer,
pH 7.0:40% ACN

Flow Rate: 1.5 mL/min

Temperature: 23 °C

Triple endcapping of Bonus-RP enhances stability at pH 7. Each 10,000 column volume is equivalent to approximately one working month.



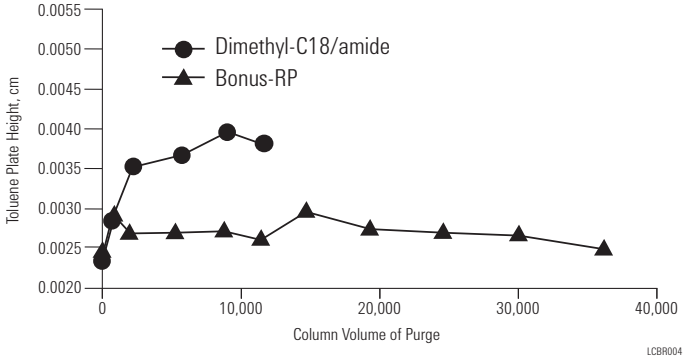
Dimethyl-C18/amide, Bonus-RP

Column: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Mobile Phase: Aging:
50% MeOH
50% 0.1% TFA
Test:
80% MeOH
20% H_2O

Flow Rate: 1.0 mL/min

Temperature: Aging:
60 °C
Test:
23 °C



Sterically protecting side groups provide good low pH stability and longer column lifetime than similar polar alkyl bonded phases.

ZORBAX Bonus-RP provides unique selectivity

Column A: **ZORBAX Bonus-RP**
883668-901
4.6 x 150 mm, 5 µm

Column B: **Eclipse XDB-C8**
993967-906
4.6 x 150 mm, 5 µm

Mobile Phase: 75% 25 mM Na Citrate, pH 6
25% MeOH

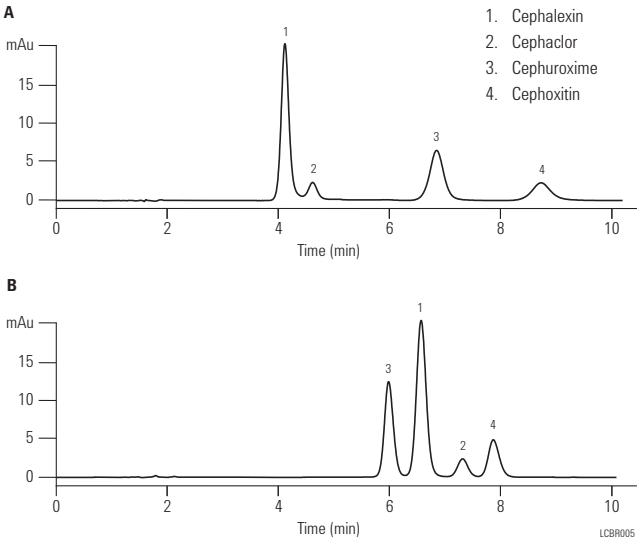
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 254 nm

Sample: 3 µL
Cephalosporins

Peak elution order can change dramatically when using Bonus-RP. In this example, the elution order of the first three peaks changes.



ZORBAX Bonus-RP

Hardware	Description	Size (mm)	Particle Size (µm)	Bonus-RP USP L60
Standard Columns (no special hardware required)				
	Analytical	4.6 x 250	5	880668-901
	Analytical	4.6 x 150	5	883668-901
	Rapid Resolution	4.6 x 250	3.5	884950-577
	Rapid Resolution	4.6 x 150	3.5	863668-901
	Rapid Resolution	4.6 x 100	3.5	864668-901
	Rapid Resolution	4.6 x 75	3.5	866668-901
	Rapid Resolution	4.6 x 50	3.5	835668-901
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828668-901
	Rapid Resolution HT, 600 bar	4.6 x 75	1.8	830668-901
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827668-901
	Solvent Saver	3.0 x 250	5	880668-301
	Solvent Saver	3.0 x 150	5	883668-301
	Solvent Saver Plus	3.0 x 150	3.5	863668-301
	Solvent Saver Plus	3.0 x 100	3.5	864668-301
	Solvent Saver HT, 600 bar	3.0 x 100	1.8	828668-301
	Solvent Saver HT, 600 bar	3.0 x 50	1.8	827668-301
	Rapid Resolution HD, 1200 bar	2.1 x 150	1.8	859768-901
	Rapid Resolution HD, 1200 bar	2.1 x 100	1.8	858768-901
	Rapid Resolution HD, 1200 bar	2.1 x 50	1.8	857768-901
	Narrow Bore	2.1 x 150	5	883725-901
	Narrow Bore	2.1 x 50	5	861971-901

(Continued)

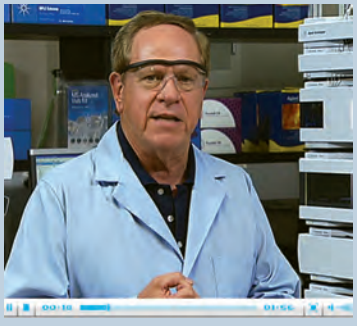
Tips & Tools

For a full list of all the phases available for Fast LC/UHPLC, see the Fast LC Section on page 25

ZORBAX Bonus-RP

Hardware	Description	Size (mm)	Particle Size (µm)	Bonus-RP USP L60
Standard Columns (no special hardware required)				
	Narrow Bore RR	2.1 x 150	3.5	863700-901
	Narrow Bore RR	2.1 x 100	3.5	861768-901
	Narrow Bore RR	2.1 x 50	3.5	861700-901
	Narrow Bore RRHT, 600 bar	2.1 x 100	1.8	828768-901
	Narrow Bore RRHT, 600 bar	2.1 x 50	1.8	827768-901
	MicroBore RR	1.0 x 150	3.5	863608-901
	MicroBore RR	1.0 x 50	3.5	865608-901
	MicroBore RR	1.0 x 30	3.5	861608-901
	MicroBore Guard, 3/pk	1.0 x 17	5	5185-5922
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-928
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-928
ZGC	Guard Hardware Kit			820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)				
PL	PrepHT Cartridge	21.2 x 250	7	878250-101
PL	PrepHT Cartridge	21.2 x 150	7	878150-101
PL	PrepHT Cartridge	21.2 x 150	5	868150-901
PL	PrepHT Cartridge	21.2 x 100	5	868100-901
PL	PrepHT Cartridge	21.2 x 50	5	868050-901
PL	PrepHT Endfittings, 2/pk			820400-901
PL	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-928
PL	Guard Cartridge Hardware			820444-901

Unless indicated, column pressure limit is 400 bar.



Tips & Tools

Watch LC troubleshooting videos featuring Agilent chromatographic experts at **www.agilent.com/chem/lctroubleshooting**

ZORBAX Original Reversed-Phase Columns

Agilent Original ZORBAX columns are made with Type A silica and are useful for many applications of acidic or neutral compounds. These columns have a higher activity level and are therefore useful for separating isomers (e.g. cis-trans, geometric) or other compounds where silanol activity enhances selectivity. These columns are used in many established methods.

ZORBAX Original Reversed-Phase Columns

Hardware	Description	Size (mm)	Particle Size (µm)	ODS (C18) USP L1	C8 USP L7	Phenyl USP L11	CN USP L10	TMS USP L13
Standard Columns (no special hardware required)								
	Semi-Preparative	9.4 x 250	5	880952-202	880952-206			
	Analytical (Endcapped)	4.6 x 250	5	880952-702	880952-706	880952-712	884950-507	880952-710
	Analytical (Non-endcapped)	4.6 x 250	5	884950-543				
	Analytical	4.6 x 150	5	883952-702	883952-706	883952-712	884950-526	883952-710
	Solvent Saver	3.0 x 250	5	880952-302				
	Solvent Saver	3.0 x 150	5	883952-302				
Guard Columns (hardware required)								
P	Guard Cartridge, 2/pk	9.4 x 15	7	820675-115	820675-115	820675-115	820675-124	
ZGC	Guard Cartridge, 4/pk	4.6 x 12.5	5	820950-902	820950-906	820950-912	820950-905	820950-924
P	Guard Hardware Kit			840140-901	840140-901	840140-901	840140-901	840140-901
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)								
PI	PrepHT Cartridge	21.2 x 250	7	877952-102	877952-106		877952-105	
PI	PrepHT Endfittings, 2/pk			820400-901	820400-901		820400-901	

Kits for Analytical HPLC

ZORBAX Method Development Kits

Agilent offers a series of kits that allow for fast method development at an attractive price. Each kit contains 3 columns. Six new kits have been added and are recommended for use with the new Agilent Automated Method Development LC. Several of these kits contain Rapid Resolution HT (1.8 µm) columns in a variety of bonded phases for easy method optimization and several kits contain Rapid Resolution (3.5 µm) columns in the same variety of bonded phases. These kits contain some of the Eclipse Plus family of columns for excellent peak shape and optimum performance with a wide variety of compounds.

ZORBAX Method Development Kits
Recommended for use with the Agilent Automated Method Development LC System

Description	Part No.
Rapid Resolution HT (RRHT) Selectivity Method Development Kit, 2.1 mm id Includes 2.1 x 50 mm, 1.8 µm, 600 bar columns: one each Eclipse Plus C18, Eclipse Plus Phenyl-Hexyl and Bonus-RP	5190-1431
Rapid Resolution HT (RRHT) pH Method Development Kit, 2.1 mm id Includes 2.1 x 50 mm, 1.8 µm, 600 bar columns: one each Eclipse Plus C18, SB-C18 and Extend-C18	5190-1432
Rapid Resolution HT (RRHT) Selectivity Method Development Kit, 4.6 mm id Includes 4.6 x 50 mm, 1.8 µm, 600 bar columns: one each Eclipse Plus C18, Eclipse Plus Phenyl-Hexyl and Bonus-RP	5190-1433
Rapid Resolution HT (RRHT) pH Method Development Kit, 4.6 mm id Includes 4.6 x 50 mm, 1.8 µm, 600 bar columns: one each Eclipse Plus C18, SB-C18 and Extend-C18	5190-1434
Rapid Resolution Selectivity Method Development Kit, 4.6 mm id Includes 4.6 x 100 mm, 3.5 µm columns: one each Eclipse Plus C18, Eclipse Plus Phenyl-Hexyl and Bonus-RP	5190-1435
Rapid Resolution pH Method Development Kit, 4.6 mm id Includes 4.6 x 100 mm, 3.5 µm columns: one each Eclipse Plus C18, SB-C18 and Extend-C18	5190-1436

ZORBAX Method Development Kits

Description	Part No.
StableBond Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: SB-C18, SB-CN and SB-Phenyl phases	5183-4624
Fast StableBond Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: SB-C18, SB-CN and SB-Phenyl phases	5183-4625
Eclipse XDB Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: XDB-C18, XDB-C8, XDB-Phenyl phases	5183-4626
Fast Eclipse XDB Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: XDB-C18, XDB-C8 and XDB-Phenyl phases	5183-4627
pH Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: SB-C18, XDB-C18 and Extend-C18 phases	5185-5807
Fast pH Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: SB-C18, XDB-C18 and Extend-C18 phases	5185-5808
Aqueous Method Development Kit Includes 4.6 x 150 mm, 5 µm columns; one each: SB-Aq, Bonus RP and SB-C18	5185-5809
Fast Aqueous Method Development Kit Includes 4.6 x 75 mm, 3.5 µm columns; one each: SB-Aq, Bonus RP and SB-C18	5185-5810

ZORBAX Cartridge Column Starter Kits

Hardware	Description	Part No.
AC	ZORBAX C18 Kit Includes one 4.6 x 150 mm, 5 µm Eclipse XDB-C18 column; one 4.6 x 150 mm, 5 µm StableBond C18 column; cartridge holder; mounting tool; replacement filter (2/pk); and open-end wrench	5183-2021
AC	ZORBAX C8 Kit Includes one 4.6 x 150 mm, 5 µm Eclipse XDB-C8 column; one 4.6 x 150 mm, 5 µm StableBond C8 column; cartridge holder; mounting tool; replacement filter (2/pk); and open-end wrench	5183-2022

ZORBAX Method Validation Kits

ZORBAX Method Validation Kits are supplied to customers who need the same HPLC column type (bonded phase, particle size, configuration) but from different manufacturing lots. To request columns from different lots, contact Agilent Technologies or your local Agilent Authorized Distributor using the following procedure:

- Request Validation Kits (columns from different lots) by using Part Number 899999-888
- Indicate the Part Number of the current column you are using
- Indicate the Lot Number of the current column you are using
- Indicate the number of additional columns needed from different lots (example: you have a current column and may need two additional lots)
- Please fax your request to **(302) 993-5354** or email to **cag_sales-na@agilent.com**. You will receive a quote from your Customer Service Representative within 1-2 business days. Delivery of your method validation kit is usually 3 weeks or less from the time your order is placed, depending on lot availability.

Custom HPLC Column Ordering

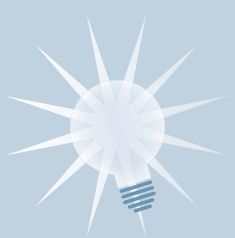
Columns not listed can be easily ordered using the following procedure:

- Request a Special Products Quotation (SPQ) using Part Number 899999-999
- Indicate column dimensions (example: 4.6 x 50 mm); bonded phase type (example: StableBond C3); particle size (example: 5 µm); and pore size (example: 80Å)
- Please fax your request to **(302) 993-5354** or email to **cag_sales-na@agilent.com**. You will receive a quote from your Customer Service Representative within 1-2 business days. Delivery of your custom column is usually 3 weeks or less from the time your order is placed, depending on lot availability.

Custom columns are priced with a minimal surcharge over the price of stocked columns.

Tips & Tools

Request custom LC columns online at
www.agilent.com/chem/customlccol



Pursuit HPLC Columns

Beginning in drug discovery and drug metabolism, Pursuit columns are ideal for analyzing lead compounds and biological samples. The column's performance is due to the unique combination of advanced bonding chemistry and ultra-high purity silica. These factors combine to provide rapid separations with excellent first time resolution and symmetrical peaks for polar compounds, whether at pH 1.5 or 10. Additionally, the need for ion pairing agents such as TFA is often eliminated, thus maximizing the performance of single and parallel multi-channel LC/MS systems.

Culminating in QC, Pursuit is ideal for implementing dependable trouble-free analysis of raw materials and approved drugs. Rigorous control and validation of each step in the manufacturing process ensures column reproducibility. With Pursuit, your laboratory can spend its energy on producing results.

Special columns, such as Pursuit PFP (for very polar compounds) and Pursuit PAH (environmental), give you the extra selectivities you need for your most challenging applications.

Pursuit

For LC/MS and high throughput applications. Built on the larger 200Å pore size silica, high ligand density delivers up to 40% faster separations without sacrificing resolution. This is accomplished by optimizing mass transfer with the larger pore size.

Pursuit XRs

For performance in analytical R&D, QC and preparative applications. Combining high ligand density with a 100Å pore size, high surface area silica, Pursuit XRs columns are designed to increase productivity, as they offer maximum loadability, excellent stability and easy scalability while maintaining superior resolution.

Pursuit XRs Ultra

For the ultimate in speed and good resolution on any instrument, we designed the Pursuit XRs Ultra around an optimized 2.8 µm particle and an advanced packing procedure. Now you can decrease your run time while maintaining resolution. Lower backpressure allows high flow rates to be used, and the 2.8 µm particles of ultra-pure silica delivers 10-15% higher efficiency than 3 µm columns.

Tricyclic antidepressants and benzodiazepines

Column: **Pursuit XRs C18**
A6000150X046
4.6 x 150 mm, 5 µm

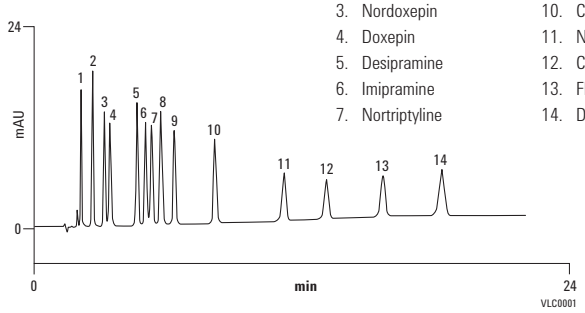
Mobile Phase: A: Water+0.1% HCOOH
B: MeCN+0.1% HCOOH

Gradient: 30-40% B in 15 min, hold at 40% B for 15 min

Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: UV, 254 nm



1. 7-Aminoclonazepam
2. 7-Aminoflunitrazepam
3. Nordoxepin
4. Doxepin
5. Desipramine
6. Imipramine
7. Nortriptyline
8. Amitriptyline
9. Trimipramine
10. Clomipramine
11. Nordiazepam
12. Clonazepam
13. Flunitrazepam
14. Diazepam

Mechanical stability of Pursuit XRs

Column: **Pursuit XRs C18**
A6000050X020
2.0 x 50 mm, 5 µm

Sample: DMSO mix

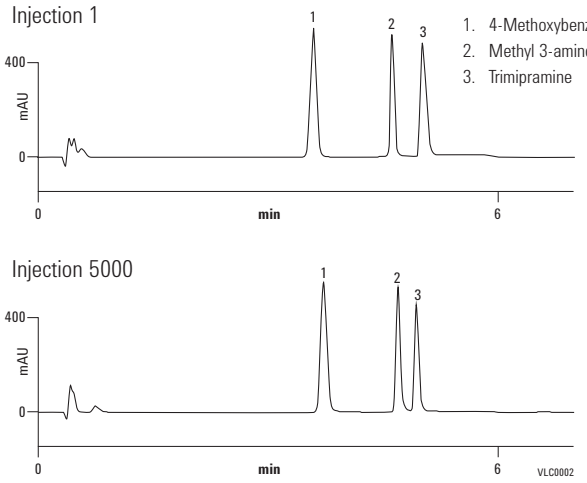
Mobile Phase: A: MeOH:water, 10:90 + 0.1% HCOOH
B: MeOH:water, 90:10 + 0.1% HCOOH

Gradient: 0-100% B in 3 min,
back to 0% B in 0.5 min,
hold at 0% B for 3.5 min

Flow Rate: 0.4 mL/min

Temperature: Ambient

Detector: UV, 254 nm



1. 4-Methoxybenzenesulfonamide
2. Methyl 3-aminothiophene-2-carboxylate
3. Trimipramine

Antifungals

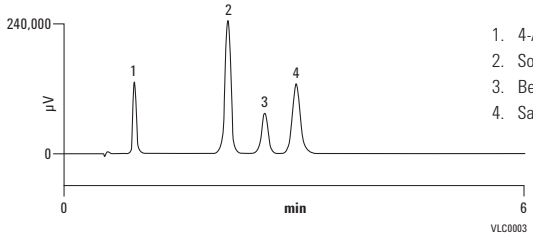
Column: **Pursuit XRs Ultra 2.8 Diphenyl**
A7521050X020
2.0 x 50 mm, 2.8 µm

Mobile Phase: Water+0.1% HCOOH:MeCN+0.1% HCOOH, 80:20

Flow Rate: 0.4 mL/min

Temperature: Ambient

Detector: UV, 254 nm



1. 4-Aminobenzoic acid
2. Sorbic acid
3. Benzoic acid
4. Salicylic acid

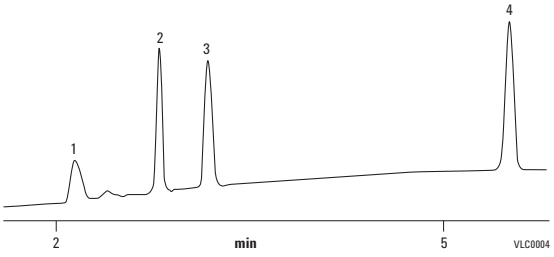
Liquid chromatography phase test mixture (LPTM) on Pursuit C8

Column: **Pursuit C8**
A3031050X020
2.0 x 50 mm, 3 µm

Mobile Phase: A: 0.05% HCOOH in water
B: 0.05% HCOOH in MeCN

Flow Rate: 0.6 mL/min

Detector: UV, 220 nm



1. Aspartame
2. Cortisone
3. Reserpine
4. Dioctyl phthalate

Adrenocorticosteroids on Pursuit PFP and C18

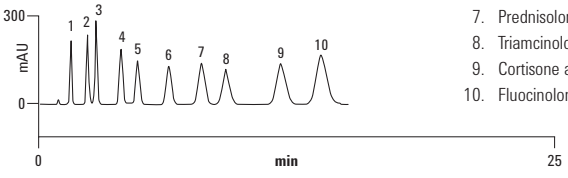
Mobile Phase: MeCN:water, 22.5:77.5

Flow Rate: 1.5 mL/min

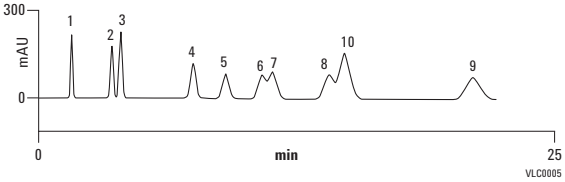
Temperature: Ambient

Detector: UV, 240 nm

Pursuit PFP



Pursuit C18



1. Triamcinolone
2. Prednisolone
3. Cortisone
4. Methylprednisolone
5. Corticosterone
6. Beclomethasone
7. Prednisolone acetate
8. Triamcinolone acetonide
9. Cortisone acetate
10. Fluocinolone acetonide

Pursuit HPLC Columns

Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit Diphenyl	Pursuit PFP	Pursuit PAH USP L1
50.0 x 250	10	A3002250X500	A3032250X500			
21.2 x 250	10	A3002250X212	A3032250X212			
21.2 x 150	10	A3002150X212				
21.2 x 250	5	A3000250X212			A3050250X212	
21.2 x 150	5	A3000150X212			A3050150X212	
21.2 x 100	5			A3040100X212		
10.0 x 250	10	A3002250X100	A3032250X100			
10.0 x 150	5	A3000150X100			A3050150X100	
10.0 x 250	5	A3000250X100	A3030250X100		A3050250X100	
4.6 x 250	10	A3002250X046	A3032250X046			
4.6 x 150	10	A3002150X046	A3032150X046			
4.6 x 100	10	A3002100X046	A3032100X046			
4.6 x 250	5	A3000250X046	A3030250X046	A3040250X046	A3050250X046	A7000250X046
4.6 x 150	5	A3000150X046	A3030150X046	A3040150X046	A3050150X046	A7000150X046
4.6 x 100	5	A3000100X046	A3030100X046	A3040100X046	A3050100X046	
4.6 x 50	5	A3000050X046	A3030150X046	A3040050X046	A3050050X046	
4.6 x 250	3	A3001250X046	A3031250X046	A3041250X046	A3051250X046	
4.6 x 150	3	A3001150X046	A3031150X046	A3041150X046	A3051150X046	
4.6 x 100	3	A3001100X046	A3031100X046	A3041100X046	A3051100X046	A7001100X046
4.6 x 50	3	A3001050X046		A3041050X046	A3051050X046	
4.6 x 30	3	A3001030X046				
4.0 x 250	5	A3000250X040				
4.0 x 125	5	A3000125X040				
3.9 x 300	10	A3002300X039				
3.9 x 300	5	A3000300X039				
3.9 x 150	5	A3000150X039				
3.0 x 250	5	A3000250X030		A3040250X030		
3.0 x 150	5	A3000150X030		A3040150X030	A3050150X030	
3.0 x 100	5	A3000100X030			A3050100X030	
3.0 x 250	3	A3001250X030				
3.0 x 150	3	A3001150X030		A3041150X030	A3051150X030	
3.0 x 100	3	A3001100X030		A3041100X030	A3051100X030	A7001100X030

(Continued)

Pursuit HPLC Columns

Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit Diphenyl	Pursuit PFP	Pursuit PAH USP L1
3.0 x 50	3	A3001050X030		A3041050X030	A3051050X030	
2.0 x 250	5	A3000250X020				
2.0 x 150	5	A3000150X020	A3030150X020	A3040150X020		
2.0 x 100	5	A3000100X020	A3030100X020	A3040100X020	A3050100X020	
2.0 x 50	5	A3000050X020	A3030050X020	A3040050X020	A3050050X020	
2.0 x 30	5	A3000030X020		A3040030X020	A3050030X020	
2.0 x 20	5	A3000020X020			A3050020X020	
2.0 x 250	3	A3001250X020		A3041250X020		
2.0 x 200	3			A3041200X020		
2.0 x 150	3	A3001150X020	A3031150X020	A3041150X020	A3051150X020	
2.0 x 100	3	A3001100X020	A3031100X020	A3041100X020	A3051100X020	A7001100X020
2.0 x 50	3	A3001050X020	A3031050X020	A3041050X020	A3051050X020	
2.0 x 30	3	A3001030X020	A3031030X020	A3041030X020	A3051030X020	
2.0 x 20	3	A3001020X020		A3041020X020	A3051020X020	

Pursuit ChromSep Complete Cartridge Systems

Hardware	Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit PAH USP L1
CS	4.6 x 250	5	A3000250C046	A3030250C046	A7000250C046
CS	4.6 x 250	3		A3031250C046	
CS	4.6 x 150	5	A3000150C046	A3030150C046	A7000150C046
CS	4.6 x 100	5	A3000100C046	A3030100C046	
CS	4.6 x 150	3	A3001150C046	A3031150C046	A7001150C046
CS	4.6 x 100	3	A3001100C046	A3031100C046	A7001100C046
CS	4.6 x 50	3	A3001050C046		
CS	3.0 x 250	5	A3000250C030		
CS	3.0 x 150	5	A3000150C030		
CS	3.0 x 100	5	A3000100C030		A7000100C030
CS	3.0 x 150	3	A3001150C030		
CS	3.0 x 100	3	A3001100C030		
CS	2.0 x 250	5	A3000250C020		
CS	2.0 x 150	5	A3000150C020	A3030150C020	
CS	2.0 x 100	5	A3000100C020		
CS	2.0 x 150	3	A3001150C020		
CS	2.0 x 100	3	A3001100C020		
CS	2.0 x 50	3	A3001050C020		

Pursuit ChromSep Replacement Cartridges

Hardware	Size (mm)	Particle Size (µm)	Unit	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit PAH USP L1
CS	4.6 x 250	5				A7000250R046
			3/pk			A7000250T046
CS	4.6 x 150	5		A3000150R046	A3030150R046	A7000150R046
			3/pk	A3000150T046	A3030150T046	A7000150T046
CS	4.6 x 150	3			A3031150R046	A7001150R046
			3/pk		A3031150T046	A7001150T046
CS	4.6 x 100	3				A7001100R046
			3/pk			A7001100T046
CS	4.6 x 50	3		A3001050R046		
			3/pk	A3001050T046		
CS	3.0 x 150	5		A3000150R030		
			3/pk	A3000150T030		
CS	3.0 x 100	5		A3000100R030		A7000100R030
			3/pk	A3000100T030		A7000100T030
CS	3.0 x 150	3		A3001150R030		
			3/pk	A3001150T030		
CS	3.0 x 100	3		A3001100R030		A7001100R030
			3/pk	A3001100T030		A7001100T030
CS	2.0 x 50	3			A3031050R020	
			3/pk		A3031050T020	

MetaGuard Columns, 3/pk

Hardware	ID (mm)	Particle Size (µm)	Pursuit C18	Pursuit C8	Pursuit DP	Pursuit PFP
MG	4.6	10	A3002MG			
MG	2.0	10	A3002MG2			
MG	4.6	5	A3000MG	A3030MG	A3040MG	A3050MG
MG	2.0	5	A3000MG2	A3030MG2	A3040MG2	A3050MG2
MG	1.0	5	A3000MG1		A3040MG1	
MG	4.6	3	A3001MG	A3031MG	A3041MG	A3051MG
MG	2.0	3	A3001MG2	A3031MG2	A3041MG2	A3051MG2
MG	1.0	3			A3041MG1	

Pursuit XRs HPLC Columns

Size (mm)	Particle Size (µm)	Pursuit XRs C18 USP L1	Pursuit XRs C8 USP L7	Pursuit XRs Diphenyl	Pursuit XRs Si USP L3
50.0 x 250	10	A6002250X500		A6002250X500	A6004250X500
30.0 x 250	5	A6000250X300			A6004250X300
30.0 x 150	5	A6000150X300		A6020150X300	
30.0 x 100	5	A6000100X300			
30.0 x 50	5	A6000050X300			
21.2 x 250	10	A6002250X212	A6012250X212		A6004250X212
21.2 x 250	5	A6000250X212		A6020250X212	
21.2 x 150	5	A6000150X212			
21.2 x 100	5	A6000100X212		A6020100X212	
21.2 x 50	5	A6000050X212			
21.2 x 30	5	A6000030X212			
10.0 x 250	10	A6002250X100			A6004250X100
10.0 x 250	5	A6000250X100		A6020250X100	
10.0 x 150	5	A6000150X100			
10.0 x 50	5	A6000050X100			
10.0 x 150	3			A6021150X100	
4.6 x 250	10	A6002250X046			A6004250X046
4.6 x 50	10	A6002050X046S			
4.6 x 250	5	A6000250X046	A6010250X046	A6020250X046	
4.6 x 150	5	A6000150X046	A6010150X046	A6020150X046	
4.6 x 100	5	A6000100X046	A6010100X046	A6020100X046	A6006100X046
4.6 x 50	5	A6000050X046		A6020050X046	A6006050X046
4.6 x 250	3	A6001250X046		A6021250X046	
4.6 x 150	3	A6001150X046	A6010150X046	A6021150X046	
4.6 x 100	3	A6001100X046	A6011100X046	A6021100X046	A6005100X046
4.6 x 50	3	A6001050X046	A6011050X046	A6021050X046	A6005050X046
4.6 x 30	3	A6001030X046		A6021030X046	
4.0 x 250	5	A6000250X040	A6010250X040		
4.0 x 150	5	A6000150X040	A6010150X040		
3.0 x 250	5	A6000250X030	A6010250X030	A6020250X030	
3.0 x 150	5	A6000150X030	A6010150X030	A6020150X030	
3.0 x 100	5	A6000100X030	A6010100X030	A6020100X030	

(Continued)

Pursuit XRs HPLC Columns

Size (mm)	Particle Size (µm)	Pursuit XRs C18 USP L1	Pursuit XRs C8 USP L7	Pursuit XRs Diphenyl	Pursuit XRs Si USP L3
3.0 x 150	3	A6001150X030	A6011150X030	A6021150X030	
3.0 x 100	3	A6001100X030	A6011100X030	A6021100X030	
3.0 x 50	3	A6001050X030	A6011050X030	A6021050X030	
3.0 x 30	3	A6001030X030			
2.1 x 100	5				A6006100X021
2.0 x 250	5	A6000250X020		A6020250X020	
2.0 x 150	5	A6000150X020	A6010150X020	A6020150X020	
2.0 x 100	5	A6000100X020	A6010100X020		
2.0 x 50	5	A6000050X020	A6010050X020	A6020050X020	
2.0 x 30	5	A6000030X020			
2.0 x 250	3	A6001250X020		A6021250X020	
2.0 x 150	3	A6001150X020	A6011150X020	A6021150X020	
2.0 x 100	3	A6001100X020	A6011100X020	A6021100X020	
2.0 x 50	3	A6001050X020	A6011050X020	A6021050X020	A6005050X020
2.0 x 30	3			A6021030X020	
2.0 x 20	3	A6001020X020			
1.0 x 150	3	A6001150X010			
1.0 x 100	3	A6001100X010		A6021100X010	

MetaGuard Columns, 3/pk

Hardware	ID (mm)	Particle Size (µm)	Pursuit XRs C18	Pursuit XRs Si	Pursuit XRs C8	Pursuit XRs Dp	Pursuit PAH
MG	4.6	10	A6002MG	A6004MG			
MG	4.6	5	A6000MG		A6010MG	A6020MG	
MG	3.0	5					A7000MG3
MG	2.0	5	A6000MG2		A6010MG2	A6020MG2	
MG	4.6	3	A6001MG		A6011MG	A6021MG	
MG	3.0	3					A7001MG3
MG	2.0	3	A6001MG2		A6011MG2	A6021MG2	A6001MG2

Pursuit XRs Ultra HPLC Columns

Size (mm)	Particle Size (µm)	Pursuit XRs Ultra C18	Pursuit XRs Ultra C8	Pursuit XRs Ultra Diphenyl
3.0 x 150	2.8	A7501150X030	A7511150X030	
3.0 x 100	2.8	A7501100X030		
2.0 x 150	2.8	A7501150X020		
2.0 x 100	2.8	A7501100X020	A7511100X020	A7521100X020
2.0 x 50	2.8	A7501050X020	A7511050X020	A7521050X020
2.0 x 30	2.8	A7501030X020	A7511030X020	A7521030X020

Polaris HPLC Columns

In areas like drug discovery where target compounds are increasingly polar, it is critical to have a reversed-phase column that performs well under aqueous conditions. Retention is critical, but cannot come with troublesome secondary interactions. Likewise, phase collapse and shifting retention times need to be avoided. The answer is our Polaris line of polar-modified columns.

From the collapse-resistant pore structure of our base silica, to the "wettability" engineered into the bonded phases, Polaris columns have been designed for high aqueous conditions. The combination of high phase density bonding, ultra pure silica, and silanol shielding leads to excellent peak shape among polar-modified columns.

As a family, Polaris offers a variety of polar modifications in both C18 and C8 chemistries.

Polaris C18-A

Polaris C18-A is the best starting place for separations where the benefits of polar-modified columns are desired. The polar modifications of C18-A help it avoid poor peak shape and retention issues in low organic conditions.

Polaris C8-A

Polaris C8-A offers an alternative selectivity to standard C8 phases and has a lower hydrophobicity than Polaris C18-A, making it ideal for polar samples, or faster overall analysis times.

Polaris C18-Ether

Polaris C18-Ether offers an alternative selectivity to Polaris C18-A and standard C18 phases, and typically delivers increased retention of polar compounds away from the void volume.

Polaris C8-Ether

Polaris C8-Ether offers an alternative selectivity to Polaris C8-A with particular utility for hydrogen bonding compounds.

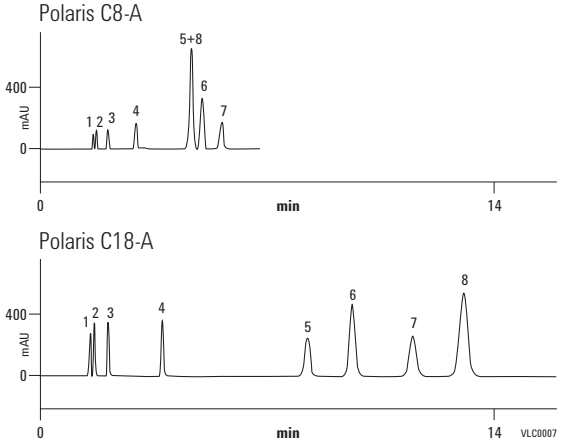
Column Specifications

Bonded Phase	Pore Size	Surface Area	Carbon Load	Endcapped	Pore Volume	Ligand Coverage
Polaris C18-A	180Å	200 m^2/g	13.8%	Yes	1.1 cm^3/g	3.9 µmol/m^2
Polaris C8-A	180Å	200 m^2/g	7.4%	Yes	1.1 cm^3/g	4.8 µmol/m^2
Polaris C18-Ether	180Å	200 m^2/g	12.1%	Yes	1.1 cm^3/g	3.3 µmol/m^2
Polaris C8-Ether	180Å	200 m^2/g	7.1%	Yes	1.1 cm^3/g	4.5 µmol/m^2
Polaris Amide C18	180Å	200 m^2/g	15%	Yes	1.1 cm^3/g	4.4 µmol/m^2
Polaris NH2	180Å	200 m^2/g	5.5%	Amide	1.1 cm^3/g	3.8 µmol/m^2
Polaris Si-A	180Å	200 m^2/g	N/A	N/A	1.1 cm^3/g	N/A

Specifications represent typical values only.

Selectivity test mix for Polaris columns

Mobile Phase: MeCN:water 70:30
Flow Rate: 1.0 mL/min
Temperature: Ambient
Detector: UV, 254 nm

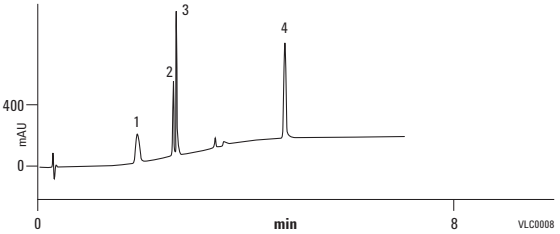


1. Uracil
2. Caffeine
3. Phenol
4. Toluene
5. Butylbenzene
6. o-Terphenyl
7. Amylbenzene
8. Triphenylene

LC/MS performance test mix for Polaris C8-A

Column: Polaris C8-A
A2011030X030
3.0 x 30 mm, 3 µm

Mobile Phase: A: Water+0.05% HCOOH
B: MeCN+0.05% HCOOH
Gradient: 5-90% B in 3 min and hold for 4 min
Flow Rate: 0.6 mL/min
Temperature: Ambient
Detector: UV, 220 nm



1. Aspartame
2. Cortisone
3. Reserpine
4. Dioctyl phthalate

Polaris HPLC Columns

Size (mm)	Particle Size (µm)	Polaris C18-A	Polaris C8-A	Polaris C18-Ether	Polaris C8-Ether	Polaris Amide C18	Polaris NH2	Polaris Si-A
10.0 x 250	5					A2006250X100		
50.0 x 250	10	A2002250X500						A2004250X500
30.0 x 100	5	A2000100X300						
30.0 x 3.0	3					A2007030X030		
21.2 x 250	10	A2002250X212				A2008250X212		A2004250X212
21.2 x 250	5	A2000250X212	A2010250X212	A2020250X212	A2030250X212	A2006250X212	A2013250X212	A2003250X212
21.2 x 150	5	A2000150X212						A2003150X046
21.2 x 100	5	A2000100X212						
21.2 x 50	5							A2003050X212
10.0 x 250	5	A2000250X100		A2020250X100	A2030250X100	A2008250X100	A2013250X100	
10.0 x 50	3			A2021050X100				
4.6 x 250	10	A2002250X046						A2003250X046
4.6 x 250	5	A2000250X046	A2010250X046	A2020250X046	A2030250X046	A2006250X046	A2013250X046	
4.6 x 200	5	A2000200X046						
4.6 x 150	5	A2000150X046	A2010150X046	A2020150X046	A2030150X046	A2006150X046	A2013150X046	A2003150X046
4.6 x 100	5	A2000100X046	A2010100X046			A2006100X046	A2013100X046	A2003100X046
4.6 x 50	5	A2000050X046		A2020050X046		A2006050X046	A2013050X046	A2003050X046
4.6 x 30	5	A2000030X046						
4.6 x 250	3	A2001250X046		A2021250X046	A2031250X046	A2007250X046	A2014250X046	A2005250X046
4.6 x 150	3	A2001150X046	A2011150X046			A2007150X046	A2014150X046	A2005150X046
4.6 x 100	3	A2001100X046	A2011100X046			A2007100X046	A2014100X046	A2005100X046
4.6 x 75	3	A2001075X046	A2011075X046					
4.6 x 50	3	A2001050X046		A2021050X046	A2031050X046	A2007050X046	A2014050X046	A2005050X046
4.6 x 30	3	A2001030X046						
4.0 x 250	5	A2000250X040	A2010250X040	A2020250X040	A2030250X040		A2013250X040	A2003250X040
4.0 x 150	5	A2000150X040	A2010150X040	A2020150X040	A2030150X040		A2013150X040	A2003150X040
4.0 x 125	5	A2000125X040	A2010125X040	A2020125X040	A2030125X040		A2013125X040	A2003125X040
3.0 x 250	5	A2000250X030	A2010250X030	A2020250X030	A2030250X030	A2006250X030	A2013250X030	A2005250X046
3.0 x 150	5	A2000150X030	A2010150X030	A2020150X030	A2030150X030	A2006150X030	A2013150X030	A2003150X030
3.0 x 100	5	A2000100X030	A2010100X030	A2020100X030	A2030100X030	A2006100X030	A2013100X030	A2003100X030
3.0 x 50	5	A2000050X030						A2003050X030

(Continued)

Polaris HPLC Columns

Size (mm)	Particle Size (µm)	Polaris C18-A	Polaris C8-A	Polaris C18-Ether	Polaris C8-Ether	Polaris Amide C18	Polaris NH2	Polaris Si-A
3.0 x 250	3	A2001250X030				A2007250X030	A2014250X030	A2003250X030
3.0 x 200	3	A2001200X030						
3.0 x 150	3	A2001150X030		A2021150X030		A2007150X030	A2014150X030	A2005150X030
3.0 x 100	3	A2001100X030				A2007100X030	A2014100X030	A2005100X030
3.0 x 50	3	A2001050X030		A2021050X030	A2031050X030	A2007050X030	A2014050X030	A2005050X030
3.0 x 30	3	A2001030X030	A2011030X030					
2.0 x 250	5	A2000250X020		A2020250X020	A2030250X020	A2006250X020	A2013250X020	A2003250X020
2.0 x 150	5	A2000150X020	A2010150X020	A2020150X020	A2030150X020	A2006150X020	A2013150X020	A2003150X020
2.0 x 100	5	A2000100X020				A2006100X020	A2013100X020	A2003100X020
2.0 x 50	5	A2000050X020	A2010050X020	A2020050X020	A2030050X020	A2006050X020	A2013050X020	A2003050X020
2.0 x 30	5	A2000030X020				A2006030X020	A2013030X020	A2003030X020
2.0 x 20	5	A2000020X020					A2013020X020	A2003020X020
2.0 x 250	3	A2001250X020	A2011250X020	A2021250X020	A2031250X020	A2007250X020	A2014250X020	A2005250X020
2.0 x 150	3	A2001150X020	A2011150X020	A2021150X020	A2031150X020	A2007150X020	A2014150X020	A2005150X020
2.0 x 100	3	A2001100X020		A2021100X020	A2031100X020	A2007100X020	A2014100X020	A2005100X020
2.0 x 75	3			A2021075X020				
2.0 x 50	3	A2001050X020	A2011050X020	A2021050X020	A2031050X020	A2007050X020	A2014050X020	A2005050X020
2.0 x 30	3	A2001030X020		A2021050X020		A2007030X020	A2014030X020	A2005030X020
2.0 x 20	3	A2001020X020					A2014020X020	A2005020X020

Polaris ChromSep Complete Cartridge Systems

Hardware	Size (mm)	Particle Size (µm)	Polaris C18-A
CS	4.6 x 250	5	A2000250C046
CS	4.6 x 150	5	A2000150C046
CS	4.6 x 100	5	A2000100C046
CS	4.6 x 250	3	A2001250C046
CS	4.6 x 150	3	A2001150C046
CS	3.0 x 250	5	A2000250C030
CS	3.0 x 100	5	A2000100C030
CS	2.0 x 100	5	A2000100C020
CS	2.0 x 150	3	A2001150C020
CS	2.0 x 100	3	A2001100C020
CS	2.0 x 50	3	A2001050C020

MetaGuard Columns

Hardware	Dimensions	Particle Size (µm)	Polaris C18-A	Polaris Si-A	Polaris Amide C18	Polaris C8-A	Polaris NH2	Polaris C18-Ether	Polaris C8-Ether	Polaris C18-B
MG	4.6	10	A2002MG	A2004MG						
MG	2.0	10		A2004MG2	A2008MG2					
MG	4.6	5	A2000MG	A2003MG	A2006MG	A2010MG	A2013MG	A2020MG	A2030MG	A2040MG
MG	2.0	5	A2000MG2	A2003MG2	A2006MG2	A2010MG2	A2013MG2	A2020MG2		A2040MG2
MG	4.6	3	A2001MG	A2005MG	A2007MG	A2011MG	A2014MG	A2021MG		A2040MG
MG	2.0	3	A2011MG2	A2005MG2	A2007MG2	A2011MG2	A2014MG2	A2021MG2	A2031MG2	A2041MG2
MG	1.0	3	A2001MG1							

Polaris ChromSep Replacement Cartridges

Hardware	Size (mm)	Particle Size (µm)	Unit	Polaris C18-A
CS	4.6 x 250	5		A2000250R046
			3/pk	A2000250T046
CS	4.6 x 150	5		A2000150R046
			3/pk	A2000150T046
CS	4.6 x 100	5		A2000100R046
			3/pk	A2000100T046
CS	4.6 x 150	3		A2001150R046
			3/pk	A2001150T046
CS	4.6 x 100	3		A2001100R046
			3/pk	A2001100T046
CS	3.0 x 150	5		A2000150R030
			3/pk	A2000150T030
CS	3.0 x 100	5		A2000100R030
			3/pk	A2000100T030
CS	3.0 x 100	3		A2001100R030
			3/pk	A2001100T030
CS	2.0 x 150	3		A2001150R020
			3/pk	A2001150T020
CS	2.0 x 50	3		A2001050R020
			3/pk	A2001050T020

Agilent TC-C18(2) and HC-C18(2)

For cost-conscious chromatographers who need traditional LC columns and don't need the individual testing of ZORBAX, Pursuit or Polaris columns, the Agilent TC(2)/HC(2) columns provide an alternative.

TC-C18(2)

Agilent TC-C18(2) is the ideal choice for complex natural product extract samples, traditional medicines and environmental samples or any sample where you need to analyze mixtures of polar and non-polar compounds, including strong basic compounds.

- Lower carbon load – 12%
- Ideal for polar compounds and gradient separations that start at low % organic or cover a wide organic range
- Good choice for samples dissolved in water, or mostly water
- Use with most common mobile phases, including formic acid, acetic acid, trifluoroacetic acid (TFA) and phosphate buffers with acetonitrile and methanol as the organic modifiers
- Excellent performance from pH 2-8

HC-C18(2)

Agilent HC-C18(2) is a more retentive C18 with a higher carbon load. An excellent value alternative to other high carbon load columns, it also provides superior peak shape for basic compounds.

- Higher carbon load – 17% – provides greater retention for moderately polar and non-polar compounds
- Ideal for non-polar compounds and separations that start at mid-level % organic (at least greater than 10% organic)
- Good choice for industrial samples or samples dissolved in organic/mostly organic solvents
- Stable over a very wide pH range (2-9) for maximum flexibility

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range*	Endcapped	Carbon Load
TC-C18 (2)	170Å	290 m^2/g	60 °C	2.0-8.0	Yes	12%
HC-C18 (2)	170Å	290 m^2/g	60 °C	2.0-9.0	Yes	17%

Specifications represent typical values only.

Agilent HC-C18(2) and TC-C18(2)

Description	Size (mm)	Particle Size (µm)	Part No.
Agilent HC-C18(2)	4.6 x 250	5	588905-902
Agilent HC-C18(2)	4.6 x 150	5	588915-902
Agilent TC-C18(2)	4.6 x 250	5	588925-902
Agilent TC-C18(2)	4.6 x 150	5	588935-902
Agilent HC-C18(2) guards, 2/pk	4.6 x 12.5	5	520518-904
Agilent TC-C18(2) guards, 2/pk	4.6 x 12.5	5	520518-905
Guard Hardware Kit			820999-901

PLRP-S HPLC Columns

- Contain durable and resilient polymer particles that deliver reproducible results over longer lifetimes
- Thermally and chemically stable
- Comply with USP L21 designation
- Used in bioscience, chemical, clinical research, energy, environmental, food and agriculture, material science and pharmaceutical industries
- Pore sizes (100Å-4000Å) for separations of small molecules to large complexes and polynucleotides

The PLRP-S family of columns consists of a range of pore sizes and particle sizes, all with identical chemistry and fundamental adsorptive characteristics. The particles are inherently hydrophobic, therefore no bonded phase, alkyl ligand is required for reversed-phase separations. This gives a highly reproducible material that is free from silanols and heavy metal ions. Columns within the extensive product range are suitable for nano/capillary separations, including both bottom-up and top-down proteomics, analytical separations, and preparative purifications. In addition, process columns can be packed with bulk media.

Column Specifications	
pH Range	1-14
Buffer Content	Unlimited
Organic Modifier	1-100%
Temperature Limits	200 °C
Maximum Pressure	5-8 µm: 3000 psi (210 bar)
	3 µm: 4000 psi (300 bar)

PLRP-S Applications	
Pore Size	**Application**
100Å	Small molecules/synthetic biomolecules
300Å	Recombinant peptides/proteins
1000Å	Large proteins
4000Å	DNA/high speed

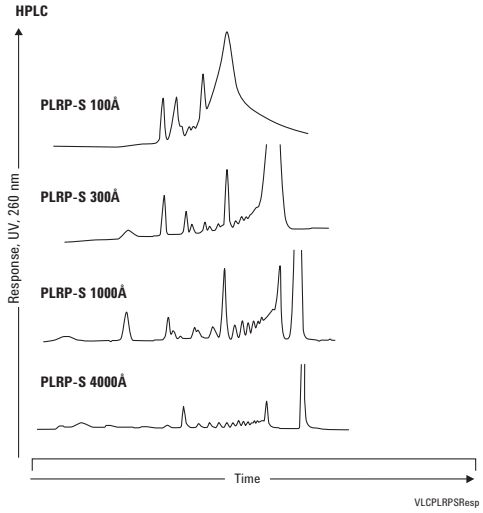
HPLC of 25 bp DNA ladder

Column: **PLRP-S, 2.1 x 150 mm**

Mobile Phase: A: 0.1 M TEAA
B: 0.1 M TEAA in 50% water:50% ACN

Flow Rate: 200 µL/min

Gradient: 12.5-50% B in 150 min



Polyethylene glycols

Column: **PLRP-S 100Å**
PL1111-3500
4.6 x 150 mm, 5 µm

Mobile Phase: A: Water
B: ACN

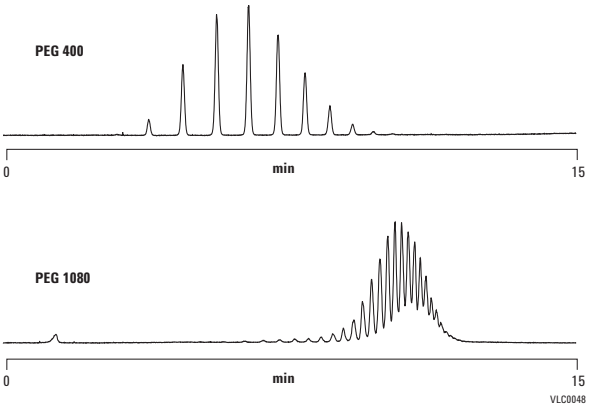
Gradient: 10-30% B in 12 min, held at 30% B for 3 min

Flow Rate: 1.0 mL/min

Injection Volume: 10 µL

Sample Conc: 1 mg/mL

Detector: ELS (neb=50 °C, evap=70 °C, gas=1.6 SLM)



Exploiting chemical stability – NH_4OH concentration

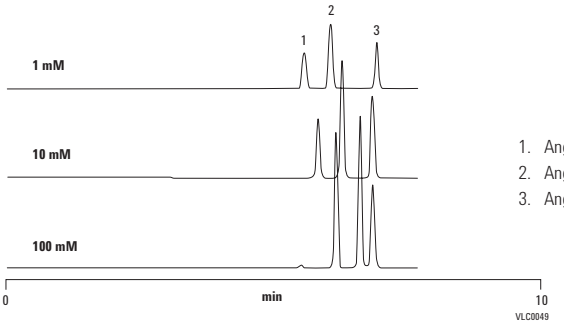
Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

Mobile Phase: A: NH_4OH (various mM) in water
B: NH_4OH (various mM) in ACN

Gradient: Linear 10-100% B in 15 min

Flow Rate: 1.0 mL/min

Detector: ELS (neb=80 °C, evap=85 °C, gas=1.0 SLM)



1. Angiotensin II
2. Angiotensin I
3. Angiotensin III

Alberta Peptide Institute test mix

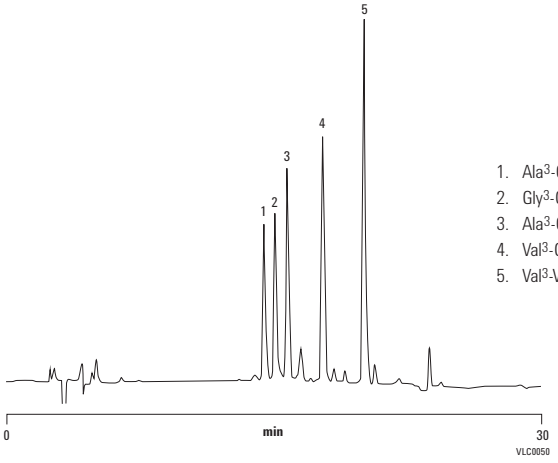
Column: **PLRP-S 100Å**
PL1512-5500
4.6 x 250 mm, 5 µm

Mobile Phase: A: 0.1% TFA in 99% water:1% ACN
B: 0.1% TFA in 70% water:30% ACN

Gradient: 0-100% B in 30 min

Flow Rate: 1.0 mL/min

Detector: UV, 220 nm



1. Ala^3-Gly^4 (free amino)
2. Gly^3-Gly^4 (Nα-acetylated)
3. Ala^3-Gly^4 (Nα-acetylated)
4. Val^3-Gly^4 (Nα-acetylated)
5. Val^3-Val^4 (Nα-acetylated)

Large fibrous proteins

Column: **PLRP-S 300Å**
PL1512-3801
4.6 x 150 mm, 8 µm

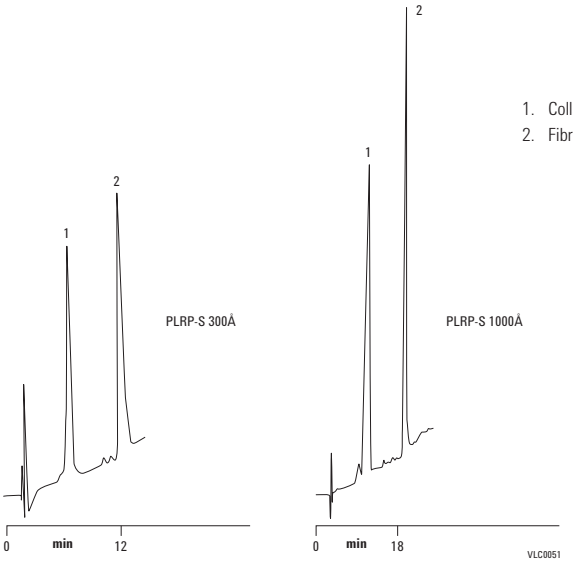
Column: **PLRP-S 1000Å**
PL1512-3802
4.6 x 150 mm, 8 µm

Mobile Phase: A: 0.25% TFA in water
B: 0.25% TFA in 5% water:95% ACN

Flow Rate: 1.0 mL/min

Gradient: 20-60% B in 15 min

Detector: UV, 220 nm



1. Collagen (120,000 MW)
2. Fibrinogen (340,000 MW)

PLRP-S HPLC Columns

Hardware	Size (mm)	Particle Size (µm)	PLRP-S 100Å USP L21	PLRP-S 300Å USP L21	PLRP-S 1000Å USP L21	PLRP-S 4000Å USP L21
	4.6 x 250	8	PL1512-5800	PL1512-5801	PL1512-5802	
	4.6 x 150	8	PL1512-3800	PL1512-3801	PL1512-3802	PL1512-3803
	4.6 x 50	8		PL1512-1801	PL1512-1802	PL1512-1803
	4.6 x 250	5	PL1512-5500	PL1512-5501		
	4.6 x 150	5	PL1111-3500	PL1512-3501		
	4.6 x 50	5	PL1512-1500	PL1512-1501	PL1512-1502	PL1512-1503
	4.6 x 150	3	PL1512-3300	PL1512-3301		
	4.6 x 50	3	PL1512-1300	PL1512-1301		
	2.1 x 250	8		PL1912-5801		
	2.1 x 150	8		PL1912-3801	PL1912-3802	PL1912-3803
	2.1 x 50	8		PL1912-1801	PL1912-1802	PL1912-1803
	2.1 x 250	5	PL1912-5500	PL1912-5501		
	2.1 x 150	5	PL1912-3500	PL1912-3501		
	2.1 x 50	5	PL1912-1500	PL1912-1501	PL1912-1502	PL1912-1503
	2.1 x 150	3	PL1912-3300	PL1912-3301		
	2.1 x 50	3	PL1912-1300	PL1912-1301		
PL	PLRP-S Guard Cartridges for 5 x 3 mm, 2/pk		PL1612-1801	PL1612-1801	PL1612-1801	PL1612-1801
PL	Guard Cartridge holder for 3.0 x 5.0 mm cartridges		PL1310-0016	PL1310-0016	PL1310-0016	PL1310-0016

COLUMNS FOR PREPARATIVE HPLC

Flexible, cost-effective options for scaling and prep

Whether you are scaling up a routine analytical method, or maintaining precise separations throughout every phase of production, Agilent can help you rise to the challenge.

- Agilent Prep LC columns are a cost-effective prep solution designed for high loadability to purify milligram to gram quantities of product
- ZORBAX Prep HT are designed for rapid scale-up from the ZORBAX family of phases
- Scalable prep columns are also available for Pursuit and Polaris columns
- Bulk materials are available for all phases and can be ordered through Agilent's Custom Ordering Process, **www.agilent.com/chem/customlc**

Agilent Prep LC Columns

- High loadability for maximum sample purification
- Easy scalability from 4.6 up to 50 mm id for rapid method development
- High throughput 21.2 mm id cartridges for fast purification
- Exceptional column stability and loadability up to pH 10

Agilent Prep LC columns are designed for high loadability to purify milligram to gram quantities of products. Preparative sized columns are available in 21.2, 30, and 50 mm internal diameters with lengths ranging from 50-250 mm. Columns are available in 5 and 10 µm particle sizes with very high efficiency in every dimension. These column choices accommodate almost every preparative sample.

Agilent Prep 21.2 mm id columns are available with Agilent's Preparative Cartridge Hardware. This reliable cartridge hardware makes it simple to use columns with different lengths to increase sample load. Guard columns are easily integrated onto these columns, providing superior protection of the analysis column. Analytical size 4.6 mm id scalar columns are available for method development and optimization prior to scaling up to larger columns. Bulk material is also available.

Agilent Prep columns are available in a C18 bonded phase suitable for purification of a wide variety of non-polar and polar compounds. Unbonded silica columns are also available.

Column Specifications

Bonded Phase	Pore Size	Surface Area	Temp. Limits	pH Range	Endcapped	Carbon Load
C18	100Å	400 m^2/g	60 °C*	2.0-10.0	Single	24%
Silica	100Å	400 m^2/g	**	1.0-8.0	N/A	N/A

Specifications represent typical values only.

*Temperature limits are 60 °C up to pH 8, 40 °C from pH 8-10.

**Temperature limits for bare silica are determined by the pH of the mobile phase.

Superior loadability on Agilent Prep C18 with basic compounds

Column: **Agilent Prep C18 443905-902 4.6 x 150 mm, 5 µm**

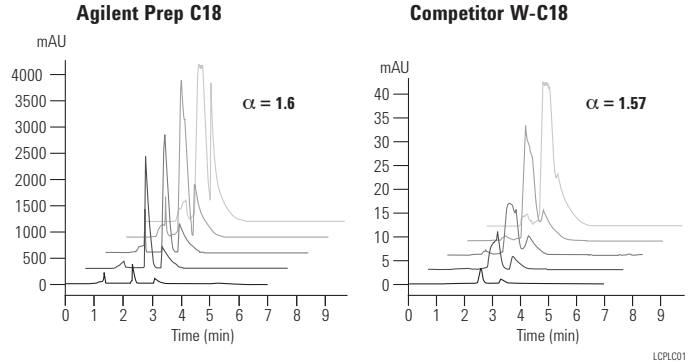
Mobile Phase: 50% 0.1%TFA:50% ACN

Flow Rate: 1 mL/min

Sample: 10 µL

Doxepin/Amitriptyline

0.5-50 mg/mL



Agilent Prep columns show better resolution and loadability than competitor columns.

Steroids: Easy scalability using Agilent Prep columns

Column A: **Agilent Prep C18 443905-102 21.2 x 150 mm, 5 µm**

Column B: **Agilent Prep C18 443905-102 21.2 x 150 mm, 5 µm**

Column C: **Agilent Prep C18 443905-102 21.2 x 150 mm, 5 µm**

Column D: **Agilent Prep C18 413910-502 50.0 x 150 mm, 10 µm**

Mobile Phase: 55% Water:45% ACN

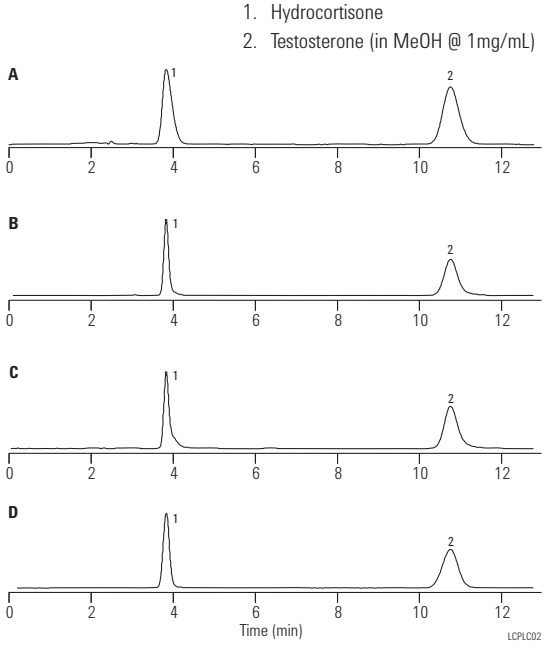
Flow Rate: 0.7 mL/min
14.87 mL/min
29.77 mL/min
85.37 mL/min

Temperature: Ambient

Detector: 240 nm

Sample: 2 µL
42.4 µL
170 µL
488 µL

Agilent Prep C18 shows excellent scalability, making method transfer simple and predictable.



Agilent Prep LC Columns

Hardware	Description	Size (mm)	Particle Size (µm)	C18	Silica
Standard Columns (no special hardware required)					
	Scalar	4.6 x 250	10	440910-902	440910-901
	Scalar	4.6 x 150	10	443910-902	443910-901
	Scalar	4.6 x 100	10	449910-902	
	Scalar	4.6 x 250	5	440905-902	440905-901
	Scalar	4.6 x 150	5	443905-902	443905-901
	Scalar	4.6 x 100	5	449905-902	449905-901
	Scalar	4.6 x 50	5	446905-902	446905-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)*					
PI	PrepHT	21.2 x 250	10	410910-102	410910-101
PI	PrepHT	21.2 x 150	10	413910-102	413910-101
PI	PrepHT	21.2 x 50	10	446910-102	
PI	PrepHT	21.2 x 150	5	443905-102	443905-101
PI	PrepHT	21.2 x 100	5	449905-102	449905-101
PI	PrepHT	21.2 x 50	5	446905-102	446905-101
PI	PrepHT Endfittings, 2/pk			820400-901	820400-901
Standard Columns (no special hardware required)					
	Prep 30	30.0 x 250	10	410910-302	410910-301
	Prep 30	30.0 x 150	10	413910-302	413910-301
	Prep 30	30.0 x 100	10	419910-302	419910-301
	Prep 30	30.0 x 100	5	449905-302	449905-301
	Prep 30	30.0 x 50	5	446905-302	446905-301
	Prep 50	50.0 x 250	10	410910-502	410910-501
	Prep 50	50.0 x 150	10	413910-502	413910-501
	Prep 50	50.0 x 100	10	419910-502	419910-501
	Prep 50	50.0 x 100	5	449905-502	449905-501
Guard Columns (hardware required)					
PI	PrepHT Guard Cartridges, 2/pk	21.2 x 10	10	420212-902	420212-901
PI	Guard Cartridge Hardware			820444-901	820444-901
PI	PrepHT External Guard Hardware Kit			420420-901	420420-901
	Bulk Packing (1 kg)		10	420910-902	420910-901

*All PrepHT cartridge columns require hardware kit P/N 820400-901. If a guard column is desired for the 21.2 mm id columns, the PrepHT Guard Hardware Kit, P/N 820444-901, is also required. If the guard column is used on a 30 mm id column then the external guard column hardware kit, P/N 420420-901, is required.

ZORBAX PrepHT

- Easy scale-up from analytical to preparative scale with ZORBAX phases
- Fast preparative separations, up to 2000 mg
- 5 to 7 µm particles for high efficiency and high yield
- Easy to install finger-tight connections seal up to 5000 psi/350 bar
- Use to maintain selectivity of the analytical phase in your prep separations

High purity, high recovery and high throughput can be easily achieved with Agilent ZORBAX PrepHT columns. These are available in a variety of bonded phases – Eclipse XDB, StableBond, Bonus-RP, and Extend-C18 – for optimized resolution and loadability under any conditions.

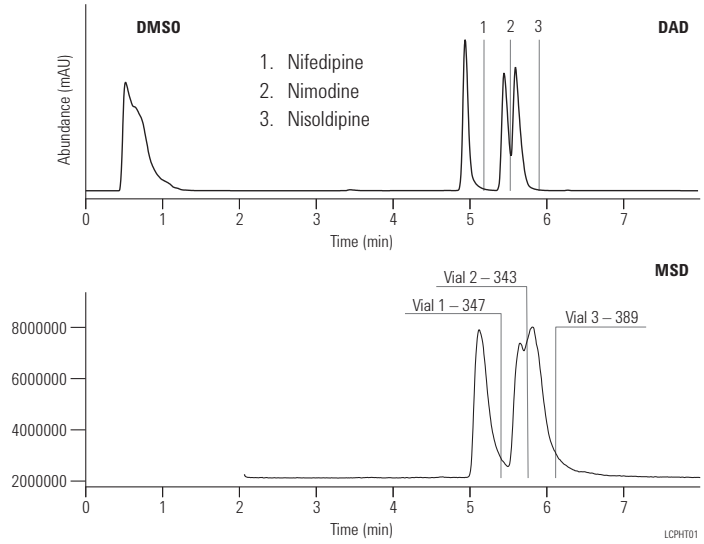
ZORBAX PrepHT columns are packed with 5 and 7 µm particle sizes for very high resolution. The high resolution allows high loadability, high yield, and high purity of compounds. The larger diameter columns and mechanically stronger ZORBAX particles allow for flow rates up to 100 mL/min, thus increasing throughput.

ZORBAX PrepHT columns are designed for rapid scale-up from analytical to preparative scale without losing resolution. For complex separations on larger columns (21.2 mm id, 150 mm length and longer), Agilent has carefully chosen the 7 µm particle size to achieve a balance between high efficiency and high loadability.

High purity and high recovery with ZORBAX PrepHT columns

Sample: Antianginal drugs

Mass-based fraction collection using ZORBAX SB-C18 column shows high purity and high recovery of each compound (Application Note publication number 5988-7113EN). The separation of the three antianginal drugs was successfully done in a single run with high recovery and >90% purity. Separations up to 2000 mg are possible depending on the complexity of separation.



	Amount Nifedipine [mg]	Amount Nifmodipine [mg]	Amount Nifsoldipine [mg]		
Fraction 1	18.90	0.11	0.16	Purity Nifedipine	98.6%
Fraction 2	0.29	17.66	0.77	Purity Nifmodipine	94.4%
Fraction 3	0.49	1.66	18.36	Purity Nifsoldipine	89.5%
Recovery [mg]	19.68	19.43	19.29		
Recovery [%]	101.3	102.0	101.9		

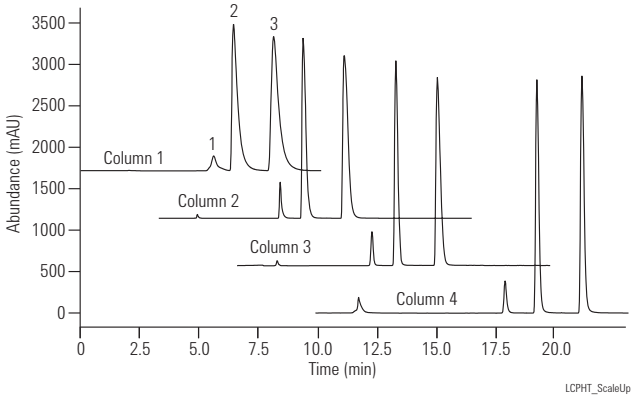
ZORBAX PrepHT columns are designed for rapid scale-up from analytical to preparative scale without losing resolution. For complex separations for larger columns (21.2 mm id and higher, 150 mm length and higher), Agilent has carefully chosen the 7 µm particle size to achieve a balance between high efficiency and high loadability.

Scale-up from analytical to prep ZORBAX SB-C18 columns using the same pump

Column	Size	Flow (mL/min)	Injection (µL)	Detector Cell	Part No.
Column 1	50 x 150 mm	100	2200	0.3 mm quartz	Custom Column
Column 2	21.2 x 150 mm	18	400	0.3 mm quartz	877150-102
Column 3	9.4 x 150 mm	3.5	80	0.3 mm quartz	883975-202
Column 4	4.6 x 150 mm	0.85	2.0	3 mm SST	883975-902

Using the same 1100 pump, a scale-up from 4.6 mm to 50 mm id was possible without any loss of resolution. This increases throughput by reducing the time required for redeveloping and adjusting the method.

Scale-up to PrepHT



1. Theobromine
2. Theophylline
3. Caffeine

ZORBAX PrepHT 80ÅStableBond (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	SB-C18 USP L1	SB-C8 USP L7	SB-Aq	SB-CN USP L10	SB-Phenyl USP L11
PI	PrepHT Cartridge	21.2 x 250	7	877250-102	877250-106	877250-114	877250-105	877250-112
PI	PrepHT Cartridge	21.2 x 150	7	877150-102	877150-106	877150-114		
PI	PrepHT Cartridge	21.2 x 150	5	870150-902	870150-906	870150-914		
PI	PrepHT Cartridge	21.2 x 100	5	870100-902	870100-906	870100-914		
PI	PrepHT Cartridge	21.2 x 50	5	870050-902	870050-906	870050-914		
PI	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-920	820212-915	820212-933	820212-933	820212-915

ZORBAX PrepHT 300ÅStableBond (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	300SB-C18 USP L1	300SB-C8 USP L7	300SB-C3 USP L56	300SB-CN USP L10
PI	PrepHT Cartridge	21.2 x 250	7	897250-102	897250-106	897250-109	897250-105
PI	PrepHT Cartridge	21.2 x 150	7	897150-102	897150-106	897150-109	
PI	PrepHT Cartridge	21.2 x 150	5	895150-902	895150-906	895150-909	
PI	PrepHT Cartridge	21.2 x 100	5	895100-902	895100-906	895100-909	
PI	PrepHT Cartridge	21.2 x 50	5	895050-902	895050-906	895050-909	
PI	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-921	820212-918	820212-924	820212-924
	Guard Cartridge Hardware Includes guard column end fitting, polymeric seal, and seal insertion tool (seal holder and seal pusher)			820444-901	820444-901	820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901

ZORBAX PrepHT Original (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	ODS (C18) USP L1	C8 USP L7	CN USP L10	NH2 USP L8	SIL USP L3
PI	PrepHT Cartridge	21.2 x 250	7	877952-102	877952-106	877952-105	877952-108	877952-101
	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	820400-901	820400-901

ZORBAX PrepHT Eclipse XDB (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	Eclipse XDB-C18 USP L1	Eclipse XDB-C8 USP L7
PI	PrepHT Cartridge	21.2 x 250	7	977250-102	977250-106
PI	PrepHT Cartridge	21.2 x 150	7	977150-102	977150-106
PI	PrepHT Cartridge	21.2 x 150	5	970150-902	970150-906
PI	PrepHT Cartridge	21.2 x 100	5	970100-902	970100-906
PI	PrepHT Cartridge	21.2 x 50	5	970050-902	970050-906
PI	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-925	820212-926
	Guard Cartridge Hardware Includes guard column end fitting, polymeric seal, and seal insertion tool (seal holder and seal pusher)			820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901

ZORBAX PrepHT Bonus-RP and Extend-C18 (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	Bonus-RP USP L60	Extend-C18 USP L1
PI	PrepHT Cartridge	21.2 x 250	7	878250-101	
PI	PrepHT Cartridge	21.2 x 150	7	878150-101	
PI	PrepHT Cartridge	21.2 x 150	5	868150-901	770150-902
PI	PrepHT Cartridge	21.2 x 100	5	868100-901	770100-902
PI	PrepHT Cartridge	21.2 x 50	5	868050-901	770050-902
PI	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-928	820212-930
	Guard Cartridge Hardware Includes guard column end fitting, polymeric seal, and seal insertion tool (seal holder and seal pusher)			820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901

ZORBAX PrepHT Rx-SIL (require hardware 820400-901)

Hardware	Description	Size (mm)	Particle Size (µm)	Rx-SIL USP L3	Rx-C18 USP L1
PI	PrepHT Cartridge	21.2 x 250	7	877250-101	
PI	PrepHT Cartridge	21.2 x 250	7		877967-102
PI	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-919	820212-914
	Guard Cartridge Hardware Includes guard column end fitting, polymeric seal, and seal insertion tool (seal holder and seal pusher)			820444-901	820444-901
	PrepHT Endfittings, 2/pk			820400-901	820400-901

ZORBAX PrepHT Accessories

Hardware	Description	Part No.
PI	Guard Cartridge Hardware	820444-901
PI	PrepHT Endfittings, 2/pk	820400-901
PI	Replacement Seals	820385-901

Pursuit and Pursuit XRs Prep

- Prep-scalable columns for Pursuit and Pursuit XRs columns
- Particle sizes to 10 µm and column diameters up to 50 mm
- High surface area silica

Pursuit and Pursuit XRs Prep columns are designed for high loadability with a high surface area.

Natural products – capsaicin and dihydrocapsaicin on Pursuit XRs C18

Column A: **Pursuit XRs C18**
A6001150X046
4.6 x 150 mm, 3 µm

Column B: **Pursuit XRs C18**
A6000150X046
4.6 x 150 mm, 5 µm

Column C: **Pursuit XRs C18**
A3002150X046
4.6 x 150 mm, 10 µm

Mobile Phase: $CH_3CH:H_20$ - 70:30

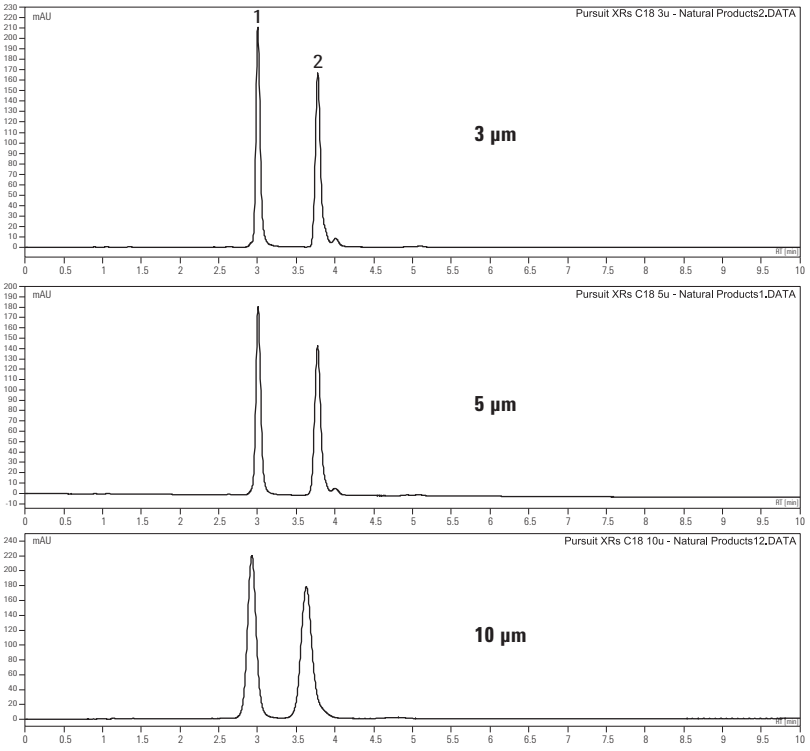
Flow Rate: 1.0 mL/min

Temperature: Ambient

Detector: 220 nm

Sample: 1. Capsaicin
2. Dihydrocapsaicin

Demonstrating an easy, linear scale-up of natural products from Pursuit XRs C18 3 µm and 5 µm analytical columns to a 10 µm preparative column.



Agilent Pursuit Prep Columns

Size (mm)	Particle Size (µm)	Pursuit C18 USP L1	Pursuit C8 USP L7	Pursuit Diphenyl	Pursuit PFP
10.0 x 250	5	A3000250X100	A3030250X100	A3040250X100	A3050250X100
10.0 x 250	10	A6002250X100	A3032250X100		
21.2 x 250	10	A6002250X212			
21.2 x 250	10	A6002250X212	A3032250X212		

Agilent Pursuit XRs Prep Columns

Size (mm)	Particle Size (µm)	Pursuit XRs C18 USP L1	Pursuit XRs C8 USP L7	Pursuit XRs Diphenyl	Pursuit XRs Si USP L3
21.2 x 250	10	A6002250X212			A6004250X212
21.2 x 250	5	A6000250X212		A6020250X212	
21.2 x 150	5	A6000150X212	A6010150X212		
21.2 x 100	5	A6000100X212	A6010100X212	A6020100X212	
21.2 x 50	5	A6000050X212			
30.0 x 250	10	A6002250X300			A6004250X300
30.0 x 150	10	A6002150X300			
30.0 x 250	5	A6000250X300	A6010250X300		
30.0 x 150	5	A6000150X300			
30.0 x 100	5	A6000100X300			
50.0 x 250	10	A6002250X500		A6022250X500	A6004250X500

Polaris Prep Columns

- Prep-scalable columns for Polaris phases
- 10.0 and 21.2 mm ids available, with particles up to 10 µm

Scale-up from analytical to prep

Column A: **Polaris C18-A**
A2001050X046
4.6 x 50 mm, 3 µm

Column B: **Polaris C18-A**
A2000050X046
4.6 x 50 mm, 5 µm

Column C: **Custom column**

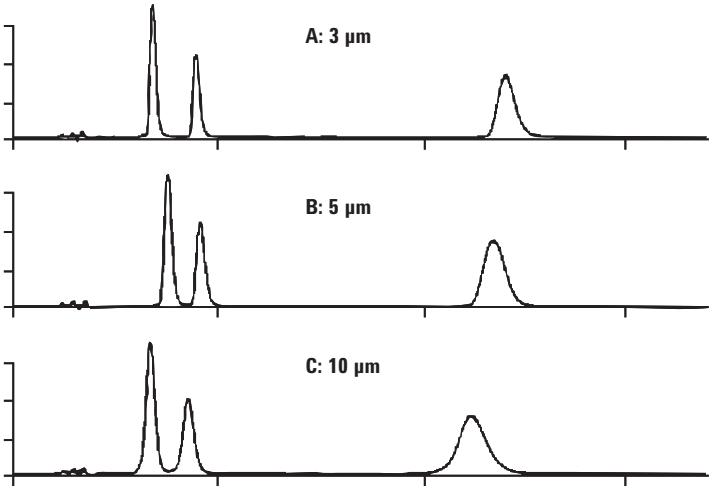
Mobile Phase: A: H_20 + 0.1% NH_40H, pH 10.0 (25 mM)
B: CH_3CN
A:B 65:35

Flow Rate: 1.0 mL/min

Temperature: 40 °C

Detector: 215 nm

Sample: 1. Pindolol
2. Metroprolol
3. Propranolol



Polaris Prep Columns

Size (mm)	Particle Size (µm)	Polaris C18-A	Polaris C18-Ether	Polaris Amide C18	Polaris Si-A	Polaris C8-A	Polaris C8-Ether	Polaris NH2
10.0 x 250	5	A2000250X100	A2020250X100	A2006250X100		A2010250X100	A2030250X100	A2013250X100
21.2 x 250	5	A2000250X212	A2030250X212		A2003250X212	A2010250X212		A2013250X212
21.2 x 250	10	A2002250X212			A2004250X212			

COLUMNS FOR OTHER HPLC TECHNIQUES

Reproducible results for Normal Phase, GPC, SEC and beyond

Agilent's extended family of HPLC columns support every technique, providing you with the Agilent quality you depend on for every application.

- ZORBAX HILIC Plus – good retention of small, polar analytes and high sensitivity for LC/MS – in Fast LC 1.8 µm options
- ZORBAX normal phase columns – bonded and non-bonded silica packings
- ZORBAX ion-exchange columns – based on rugged ZORBAX Silica, stable from pH 2-7
- Hi-Plex columns for carbohydrate analysis – ligand-exchange columns
- Agilent GPC/SEC columns and calibrants – a complete family of products for the analysis of natural and synthetic polymers
- Ultron ES Chiral columns – with two complimentary protein-based chiral stationary phases – are an excellent choice for enantiomeric separations. Ideal for many pharmacological applications.

ZORBAX HILIC Plus

- HILIC column for good retention of small, polar analytes
- Based on Eclipse Plus silica for excellent peak shape
- High sensitivity for LC/MS applications
- Recommended for EPA Method 1694

Agilent ZORBAX HILIC Plus columns are for use in hydrophilic interaction chromatography (HILIC) applications, which are typically used for the retention and resolution of small polar compounds. HILIC Plus columns are non-bonded silica columns based on the high performance silica used in ZORBAX Eclipse Plus columns. This silica provides excellent peak shape, critical for many polar, basic analytes. These columns ship prepared for use in HILIC mode – containing acetonitrile:water – in order to reduce the extensive equilibration typically required for HILIC separations. HILIC Plus columns are available in a 3.5 µm particle size for high resolution and in 2.1 and 4.6 mm id for compatibility with mass spectrometers or with standard UV detectors.

Column Specifications

Phase	Pore Size	Surface Area	pH Range
Non-bonded silica	95Å	160 m^2/g	0-8.0

Specifications represent typical values only.

Separation of group 4 analytes in EPA 1694 on ZORBAX HILIC Plus column

Column: **ZORBAX HILIC Plus**
959793-901
2.1 x 100 mm, 3.5 µm

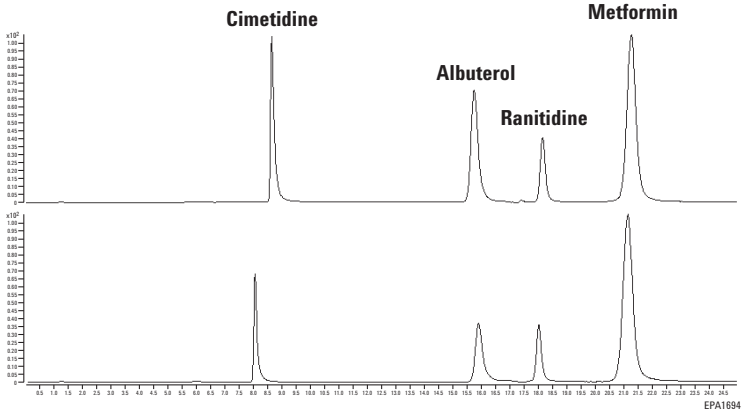
Mobile Phase: 90% Acetontrile:10% Water

Flow Rate: 0.25 mL/min

Gradient: Linear gradient to 55% acetonitrile in 7 min
Held at 55%

Temperature: 25 °C

Duplicate runs for column USCJP0004;
10 min equilibration between two runs



ZORBAX HILIC Plus

Description	Size (mm)	Particle Size (µm)	Part No.
Analytical	4.6 x 100	3.5	959961-901
Analytical	4.6 x 50	3.5	959943-901
Narrow Bore	2.1 x 100	3.5	959793-901
Narrow Bore	2.1 x 50	3.5	959743-901

Normal-Phase Columns

ZORBAX Normal-Phase Columns

For normal-phase chromatography, the Agilent ZORBAX product line offers a choice of bonded and non-bonded silica packings.

ZORBAX Rx-SIL

- Made from highly pure (> 99.995%) porous silica microspheres (pore size is the space between the solid silica microparticles)
- Available in 1.8 and 5 µm particle sizes
- Stronger than other silica types
- Less acidic than ZORBAX-SIL, lower metal content
- Low acidity and low metal content make ZORBAX Rx-SIL ideal for normal-phase separation of polar compounds that exhibit poor peak symmetry on more acidic silica
- Useful for very hydrophilic compounds with high organic mobile phases in HILIC mode

ZORBAX Eclipse XDB-CN

- Made from highly pure Rx-SIL
- Excellent choice for normal-phase applications with basic compounds
- Equilibrates more rapidly than ZORBAX Rx-SIL and is used for many of the same normal-phase applications

ZORBAX CN

- Cyanopropyldimethylsilane monolayer bonded to ZORBAX SIL
- Equilibrates more rapidly than ZORBAX SIL, and used for many of the same normal-phase applications
- Less prone to fouling and less water sensitive than silica

Polaris NH2

- Available in 3 µm, 5 µm, and 10 µm sizes
- Polar-modified with silanol shielding
- Designed for high-aqueous conditions

Pursuit XRs Si

- 100Å silica for higher surface area and good loadability
- 14.6% carbon load
- Available in 3 µm, 5 µm and 10 µm

Tips & Tools

Pursuit XRs Silica is another choice for normal-phase chromatography.
For more information, see page 88

ZORBAX NH2

- Amino-propyl silane phase bonded to ZORBAX SIL
- Used for normal-phase and weak anion-exchange, and reversed-phase HPLC of polar compounds
- Vitamins A and D are separated in the normal-phase mode
- Carbohydrates and sugars are separated in the reversed-phase mode

Column Specifications

Phase	Pore Size	Surface Area	pH Range	Endcapped	Carbon Load
ZORBAX Rx-SIL	80Å	180 m^2/g	0-8.0	No	
ZORBAX Eclipse XDB-CN	80Å	180 m^2/g	2.0-8.0	Yes	4.3%
ZORBAX SIL	70Å	300 m^2/g	0-8.0	No	
ZORBAX CN	70Å	300 m^2/g	2.0-7.0	Yes	7%
ZORBAX NH_2	70Å	300 m^2/g	2.0-7.0	Yes	4%

High resolution normal-phase separation of octylphenoxy ethanol surfactant on ZORBAX CN

Column: **ZORBAX CN**
880952-705
4.6 x 250 mm, 5 µm

Mobile Phase: Primary: Heptane
Secondary: 2-Methoxyethanol/Isopropanol (50/50)

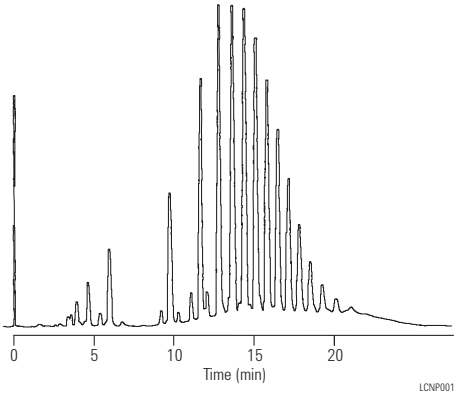
Flow Rate: 2 mL/min

Gradient: 2-20% Secondary in 10 min, Linear Hold at 20%

Temperature: 50 °C

Detector: 278 nm

Sample: Octylphenoxy (polyethylene oxy)
Ethanol Surfactant (n= 10)



Normal-Phase Columns Based on ZORBAX Rx-SIL

Hardware	Description	Size (mm)	Particle Size (µm)	Rx-SIL USP L3	Eclipse XDB-CN USP L10
Standard Columns (no special hardware required)					
	Semi-Prep	9.4 x 250	5	880975-201	
	Analytical	4.6 x 250	5	880975-901	990967-905*
	Analytical	4.6 x 150	5	883975-901	993967-905*
	Rapid Resolution HT, 600 bar	4.6 x 100	1.8	828975-901	
	Rapid Resolution HT, 600 bar	4.6 x 50	1.8	827975-902	
	Rapid Resolution HT, 600 bar	3.0 x 100	1.8	828975-301	
	Rapid Resolution HT, 600 bar	3.0 x 50	1.8	827975-301	
	Narrow Bore	2.1 x 150	5	883700-901	993700-905*
	Rapid Resolution HT, 600 bar	2.1 x 100	1.8	828700-901	
	Rapid Resolution HT, 600 bar	2.1 x 50	1.8	827700-901	
Guard Columns (hardware required)					
P	Guard Cartridge, 2/pk	9.4 x 15	5	820675-119	
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-919	820950-935
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5	821125-919	821125-935
P	Guard Hardware Kit	9.4 x 15		840140-901	
ZGC	Guard Hardware Kit			820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)					
PI	PrepHT Cartridge	21.2 x 250	7	877250-101	
PI	PrepHT Cartridge	21.2 x 250	7		
PI	PrepHT Endfittings, 2/pk			820400-901	
PI	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5	820212-919	
PI	Guard Cartridge Hardware			820444-901	

*These columns ship containing reversed-phase solvents. Flush with isopropanol before using normal-phase solvents. These columns can also be used in HILIC mode.

Normal-Phase Columns Based on ZORBAX Original SIL

Hardware	Description	Size (mm)	Particle Size (µm)	SIL USP L3	CN USP L10	NH2 USP L8	Carbohydrate Analysis*
Standard Columns (no special hardware required)							
	Semi-Prep	9.4 x 250	5	880952-201	880952-205	880952-208	
	Analytical	4.6 x 250	5	880952-701	880952-705	880952-708	840300-908
	Analytical	4.6 x 150	5	883952-701	883952-705	883952-708	843300-908
	Narrow Bore	2.1 x 50	5			860700-708	
Guard Columns (hardware required)							
P	Guard Cartridge, 2/pk	9.4 x 15	5	820675-119	820675-111	820675-111	
ZGC	Guard Cartridges, 4/pk	4.6 x 12.5	5	820950-901	820950-905	820950-908	820950-908
ZGC	Guard Cartridge, 4/pk	2.1 x 12.5	5				
P	Guard Hardware Kit	9.4 x 15		840140-901	840140-901	840140-901	
ZGC	Guard Hardware Kit			820999-901	820999-901	820999-901	820999-901
PrepHT Cartridge Columns (require endfittings kit 820400-901)							
PT	PrepHT Cartridge	21.2 x 250	7	877952-101			
PT	PrepHT Cartridge	21.2 x 250	7		877952-105	877952-108	
PT	PrepHT Endfittings, 2/pk			820400-901	820400-901	820400-901	
PT	PrepHT Guard Cartridge, 2/pk	17.0 x 7.5	5				
PT	Guard Cartridge Hardware			820444-901			

*Columns ship in acetonitrile:water and are tested with a mix of sugars.

Ion-Exchange Columns

ZORBAX Ion-Exchange Columns – SAX and SCX

- ZORBAX SAX and 300SCX columns are based on rugged ZORBAX silica
- Stable from pH 2-7
- Provide high efficiency, rapid separations
- Compatible with organic mobile phase modifiers

Agilent ZORBAX Strong Ion-Exchange columns are available as both Strong Anion-Exchange (SAX) and Strong Cation-Exchange (300SCX) columns. Each column is packed with bonded, 5 µm, spherical silica particles for optimum efficiency.

ZORBAX SAX packing has a permanently bonded quaternary amine. A trifunctional organo-silane reagent is used in producing this packing to maximize its stability with aqueous mobile phases. This column is ideal for separation of water-soluble compounds such as aromatic and aliphatic carboxylic acids and sulfonic acids.

ZORBAX SCX packing has 300Å pore size silica particles chemically bonded to an aromatic sulfonic acid group. This column is used for separations of basic, water-soluble compounds and bio-molecules.

Column Specifications

Bonded Phase	Pore Size	Surface Area	pH Range	Functionality	Max Pressure
ZORBAX SAX	70Å	300 m^2/g	2.0-7.0	Quaternary amine	350 bar
ZORBAX 300SCX	300Å	50 m^2/g	2.0-7.0	Sulfonic acid	350 bar

Specifications represent typical values only.

Cough/cold remedies on ZORBAX 300SCX

Column: **ZORBAX 300SCX**
880952-704
4.6 x 250 mm, 5 µm

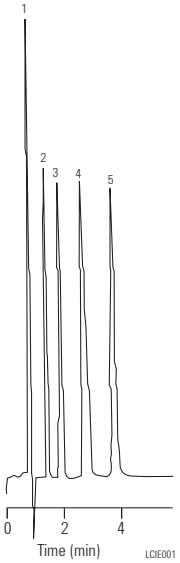
Mobile Phase: 100 mM NaH_2PO_4 (pH 6.5)

Flow Rate: 3 mL/min

Temperature: 20 °C

Detector: 210 nm

Sample: Cold remedies



1. Pyrilamine
2. Theophylline
3. Glyceryl Guaicolate
4. Caffeine
5. Phenylephrine

ZORBAX Ion-Exchange Columns – SAX and SCX

Description	Size (mm)	Particle Size (µm)	SAX	300SCX
Semi-preparative	9.4 x 250	5	880952-203	880952-204
Analytical	4.6 x 250	5	880952-703	880952-704
Analytical	4.6 x 250	5		880952-714*
Analytical	4.6 x 150	5	883952-703	883952-704
Analytical	4.6 x 150	5		883952-714*
Analytical	4.6 x 50	5		846952-704
Solvent Saver	3.0 x 50	5		860700-304
Narrow Bore	2.1 x 150	5		883700-704
Narrow Bore	2.1 x 150	5		883700-714*
Narrow Bore	2.1 x 50	5		860700-704
Guard Hardware Kit			820999-901	820999-901

*These columns have been modified to provide less retention, for those who desire that in their application.

Hi-Plex Columns for Carbohydrate Analysis

- Agilent's recommended column for accurate, low-pressure analysis of typical carbohydrates, providing leading-edge features for reliable quantitative and qualitative analysis
- Enable reduced column operating pressures for repeatable performance and longer column life
- Wide range of ligand counter ions and column configurations meet requirements of challenging organic applications
- Simplified HPLC system requirements through isocratic separation capabilities; excellent batch-to-batch reproducibility for ultimate confidence in your results
- Can be used with water or diluted acid as an eluent
- Available in 8 µm and 10 µm particle sizes in a range of choices for USP media types – L17, L19, L34 and L58

The least complicated LC methods for detecting sugars, sugar alcohols and organic acids call for ligand-exhange columns with a simple mobile phase. However, the wide particle size distribution of conventional resins can lead to high backpressures and reduced productivity.

Hi-Plex columns are engineered with monidisperse sulfonated particles, creating a high-performance media uniquely suited to stringent USP methods for analyzing carbohydrates, alcohols and organic acids. Unlike the ZORBAX NH2 column used for carbohydrate analysis with an acetonitrile:water mobile phase, Hi-Plex ligand-exchange columns provide more resolution for mono- and disaccharides due to the interaction of the hydroxyl groups with the metal ion associated with the cation-exchange functionality of the sulfonic acid group.

Column Specifications

Bonded Phase	Temperature Range	Flow Rate (mL/min)	Eluent
Hi-Plex Ca	80-90 °C	0.6	Water
Hi-Plex Ca USP L19	80-90 °C	0.3	Water
Hi-Plex Pb	70-90 °C	0.6	Water
Hi-Plex H for carbohydrates	60-70 °C	0.6	Water
Hi-Plex H for organic acids	40-60 °C	0.6	Dilute Acid
Hi-Plex Ca (Duo)	80-90 °C	0.6	Water
Hi-Plex K	80-90 °C	0.6	Water
Hi-Plex Na (Octo)	80-90 °C	0.6	Water, Sodium Hydroxide
Hi-Plex Na	80-90 °C	0.3	Water

Hi-Plex Column Selection

USP methods specify the type of HPLC media and column dimensions which should be used for the analysis. The Hi-Plex product range has four materials that comply with USP definitions.

Media Type L17

Strong cation-exchange resin consisting of sulfonated, cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 7 to 11 µm in diameter – Hi-Plex H.

Media Type L19

Strong cation-exchange resin consisting of sulfonated, cross-linked styrene-divinylbenzene copolymer in the calcium form, 9 µm in diameter – Hi-Plex Ca and Hi-Plex Ca (Duo).

Media Type L34

Strong cation-exchange resin consisting of sulfonated, cross-linked styrene-divinylbenzene copolymer in the lead form, about 9 µm in diameter – Hi-Plex Pb.

Media Type L58

Strong cation-exchange resin consisting of sulfonated, cross-linked styrene-divinylbenzene copolymer in the sodium form, 6 to 30 µm diameter – Hi-Plex Na and Hi-Plex Na (Octo).

In addition to the standard column sizes, the media is also packed in specific column dimensions for different USP methods, including sugar alcohol analysis.

For some application areas there are several column options, and the choice of the most appropriate Hi-Plex media will depend on sample matrix and exact carbohydrate composition.

Hi-Plex Column Selection	
Application Area	**Recommended Column**
USP Methods Specifying L17 Media	Hi-Plex H
USP Methods Specifying L19 Media	Hi-Plex Ca and Hi-Plex Ca (Duo)
USP Methods Specifying L34 Media	Hi-Plex Pb
USP Methods Specifying L58 Media	Hi-Plex Na and Hi-Plex Na (Octo)
Mono- and Disaccharides	Hi-Plex Ca
	Hi-Plex Pb
	Hi-Plex H
	Hi-Plex Na (Octo)
Anomer Separations	Hi-Plex Ca
Organic Acids	Hi-Plex H
Alcohols	Hi-Plex Ca
	Hi-Plex K
	Hi-Plex H
	Hi-Plex Pb
Adulteration of Food and Beverages	Hi-Plex Ca and Hi-Plex Pb
Food Additives	Hi-Plex Ca and Hi-Plex Pb
Dairy Products	Hi-Plex Ca and Hi-Plex H
Sweetened Dairy Products	Hi-Plex Pb
Confectionery	Hi-Plex Ca and Hi-Plex Pb
Fruit Juice	Hi-Plex Ca
Wine	Hi-Plex H
Wood Pulp Hydrolysates (cellulose/hemi-cellulose)	Hi-Plex Pb
Fermentation Monitoring	Hi-Plex H
Oligosaccharides	Hi-Plex Na
Samples with High Salt Content (molasses)	Hi-Plex Na (Octo)
Oligosaccharides <Dp5 with Monosaccharides	Hi-Plex Ca (Duo)
Corn Syrups	Hi-Plex Na

Analysis of fruit juice

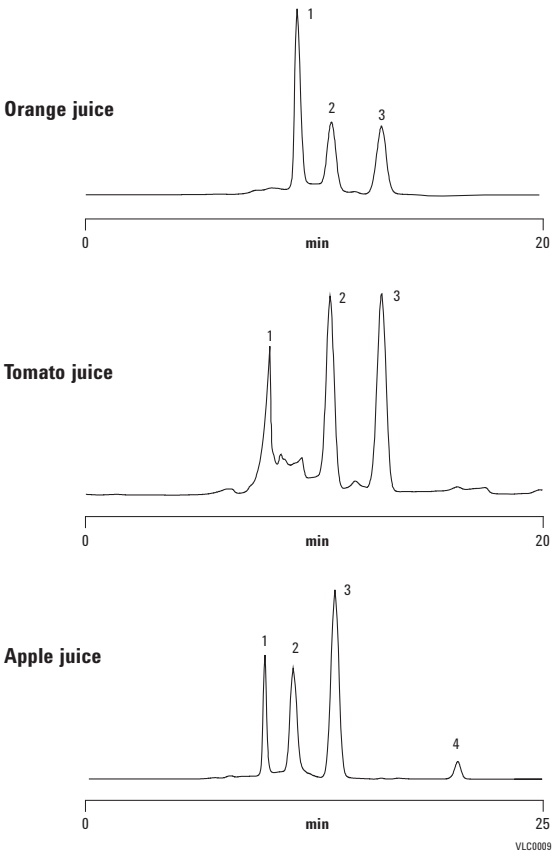
Column: **Hi-Plex Ca**
PL1170-6810
7.7 x 300 mm, 8 µm

Mobile Phase: Water

Flow Rate: 0.6 mL/min

Temperature: 85 °C

Detector: RI



1. Sucrose
2. Glocose
3. Fructose
4. Sorbitol

Organic acid analysis

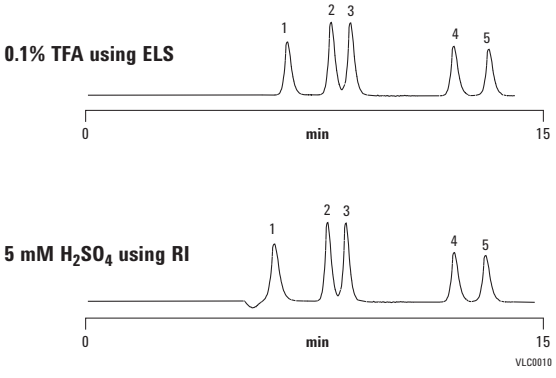
Column: **Hi-Plex H**
PL1170-6830
7.7 x 300 mm, 8 µm

Mobile Phase: Water with acid as specified

Flow Rate: 0.6 mL/min

Temperature: 60 °C

Detector: ELS (neb=80 °C, evap=90 °C, gas=0.7 SLM), RI

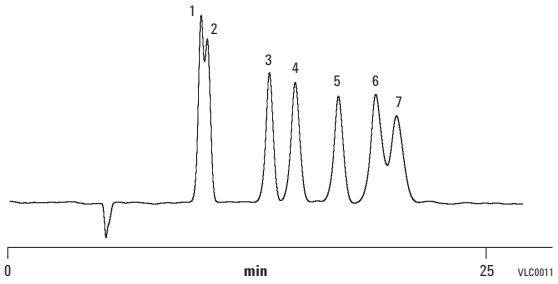


1. Oxalic acid
2. Citric acid
3. Tartaric acid
4. Succinic acid
5. Lactic acid

USP methods for sugar alcohols

Column: **Hi-Plex Ca USP L19**
PL1570-5810
4.0 x 250 mm, 8 µm

Mobile Phase: Water
Flow Rate: 0.3 mL/min
Temperature: 60 °C
Detector: RI

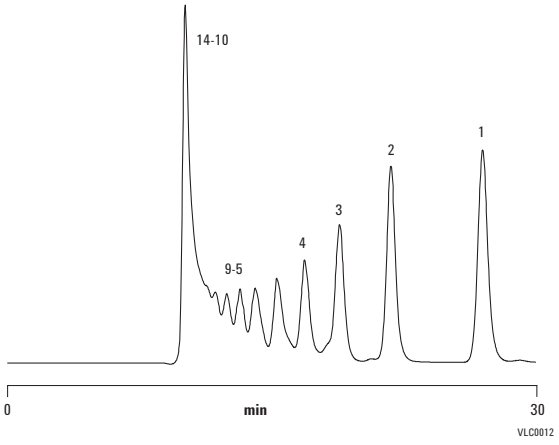


1. Iso-erythritol
2. Adonitol
3. Arabitol
4. Mannitol
5. Xylitol
6. Dulcitol
7. Sorbitol

Corn syrup, Hi-Plex

Column: **Hi-Plex Na**
PL1171-6140
7.7 x 300 mm, 10 µm

Mobile Phase: Water
Pressure: 11 bar
Flow Rate: 0.3 mL/min
Temperature: 80 °C
Detector: RI

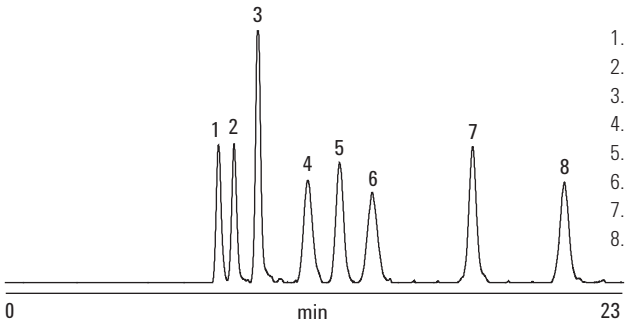


1. Dp1
2. Dp2
3. Dp3
4. Dp4
5. Dp5
6. Dp6
7. Dp7
8. Dp8
9. Dp9
10. Dp10
11. Dp11
12. Dp12
13. Dp13
14. Dp14

Analysis of sweeteners on Hi-Plex Ca columns

Column: **Hi-Plex Ca**
PL1170-6810
7.7 x 300 mm, 8 µm

Mobile Phase:	Water
Flow Rate:	0.6 mL/min
Temperature:	85 °C
Detector:	ELSD



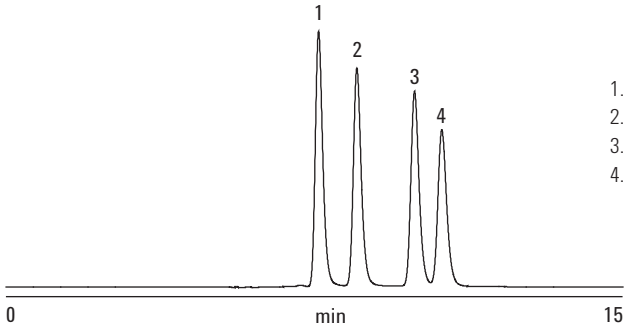
1. Stachyose
2. Raffinose
3. Sucrose
4. Glucose
5. Galactose
6. Fructose
7. Mannitol
8. Sorbitol

Hi-Plex Ca columns are ideal for analyzing most sweeteners, including glucose and fructose (monosaccharides), sucrose (disaccharide), and mannitol and sorbitol (sugar alcohols).

Analysis of carbohydates on Hi-Plex H columns

Column: **Hi-Plex H**
PL1170-6830
7.7 x 300 mm, 8 µm

Mobile Phase:	Water
Flow Rate:	0.6 mL/min
Temperature:	70 °C
Detector:	RI



1. Maltotriose
2. Lactose
3. Glucose
4. Fructose

For carbohydrate analysis of samples containing high levels of organic acids, Hi-Plex H columns deliver sharp, reproducible peaks. Note, however, that some sugars (such as raffinose) can undergo acid hydrolysis even when water is used as the eluent.

Analysis of sugars with high sodium matrix

Column: **Hi-Plex Na (Octo)**
PL1170-6840
7.7 x 300 mm, 8 µm

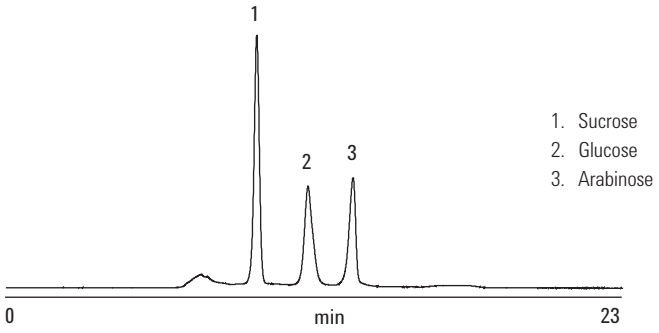
Mobile Phase: 0.015 M NaOH

Flow Rate: 0.6 mL/min

Temperature: 85 °C

Detector: RI

Food products containing high levels of sodium ions are best analyzed with Hi-Plex Na (Octo) columns. This saves time when sodium hydroxide is used as the eluent with PAD, because it eliminates the need for the post-column addition of sodium hydroxide.



USP method for sorbitol

Column: **Hi-Plex Pb USP L34**
PL1170-2820
7.7 x 100 mm, 8 µm

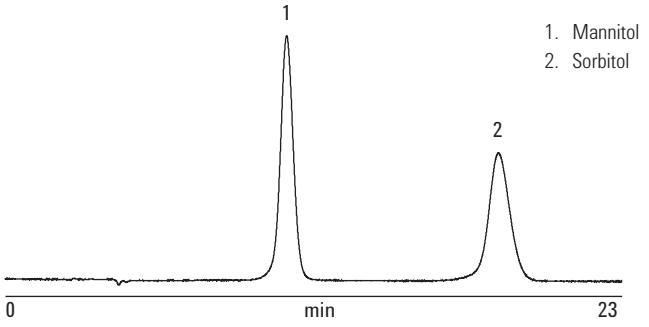
Mobile Phase: Water

Flow Rate: 0.7 mL/min

Temperature: 50 °C

Detector: RI

USP method for sorbitol – a sugar alcohol and alternative sweetener – using mannitol as the internal standard. Hi-Plex Pb columns are recommended for alcoholic drinks that also contain glycerol, as well as sweetened dairybased food products.



Hi-Plex Columns for Carbohydrate Analysis

Description	Size (mm)	Particle Size (µm)	Crosslink Content (%)	Counter Ion	Part No.
Hi-Plex Ca USP L19	4.0 x 250	8	8	Ca^{2+}	PL1570-5810
Hi-Plex Ca (Duo)	6.5 x 300	8	8	Ca^{2+}	PL1F70-6850
Hi-Plex Ca	7.7 x 300	8	8	Ca^{2+}	PL1170-6810
Hi-Plex Pb USP L34	7.7 x 100	8	8	Pb^{2+}	PL1170-2820
Hi-Plex Pb	7.7 x 300	8	8	Pb^{2+}	PL1170-6820
Hi-Plex K	7.7 x 300	8	8	K^{+}	PL1170-6860
Hi-Plex H	6.5 x 300	8	8	H^{+}	PL1F70-6830
Hi-Plex H	7.7 x 300	8	8	H^{+}	PL1170-6830
Hi-Plex H USP L17	7.7 x 100	8	8	H^{+}	PL1170-2823
Hi-Plex Na	7.7 x 300	10	4	Na^{+}	PL1171-6140
Hi-Plex Na (Octo)	7.7 x 300	8	8	Na^{+}	PL1170-6840

Hi-Plex Guard Columns

Description	Size (mm)	Particle Size (µm)	Crosslink Content (%)	Counter Ion	Part No.
Hi-Plex Ca	7.7 x 50	8	8	Ca^{2+}	PL1170-1810
Hi-Plex Ca (Duo)	7.7 x 50	8	8	Ca^{2+}	PL1170-1850
Hi-Plex Pb	7.7 x 50	8	8	Pb^{2+}	PL1170-1820
Hi-Plex K	7.7 x 50	8	8	K^{+}	PL1170-1860
Hi-Plex H	7.7 x 50	8	8	H^{+}	PL1170-1830
Hi-Plex Na	7.7 x 50	10	4	Na^{+}	PL1171-1140
Hi-Plex Na (Octo)	7.5 x 50	8	8	Na^{+}	PL1170-1840

Hi-Plex Guard Cartridges, 2/pk

Description	Size (mm)	Particle Size (µm)	Crosslink Content (%)	Counter Ion	Part No.
Hi-Plex Ca	3.0 x 5.0	8	8	Ca^{2+}	PL1670-0810
Hi-Plex Ca (Duo)	3.0 x 5.0	8	8	Ca^{2+}	PL1670-0850
Hi-Plex Pb	3.0 x 5.0	8	8	Pb^{2+}	PL1670-0820
Hi-Plex K	3.0 x 5.0	8	8	K^{+}	PL1670-0860
Hi-Plex H	3.0 x 5.0	8	8	H^{+}	PL1670-0830
Hi-Plex Na	3.0 x 5.0	10	4	Na^{+}	PL1671-0140
Hi-Plex Na (Octo)	3.0 x 5.0	8	8	Na^{+}	PL1670-0840
Guard Cartridge holder for 3.0 x 5.0 mm cartridges					PL1310-0016

GPC/SEC Columns and Calibrants

- A full portfolio of products for analysis of synthetic and natural polymers
- A wide selection of polymer standards to cover the range of applications in organic and water based solvents
- PL aquagel-OH-series, for aqueous SEC separations, and PLgel, for polymer applications, are available in mixed and individual pore sizes across a range of particle sizes, to cover the full spectrum of molecular weights
- Prep scale columns are available, along with narrow bore columns and columns designed for specific applications

Gel permeation chromatography (GPC) and size exclusion chromatography (SEC) are names applied to the most popular technique for measuring the molecular weight distribution of natural and synthetic polymers, a property that affects many of the physical parameters of materials such as strength, toughness and chemical resistance. GPC and SEC are liquid chromatographic techniques that separate individual polymer chains on the basis of their size in solution and not on their chemistry. Gel permeation chromatography (GPC) is the name used to describe the analysis of polymers in organic solvents, such as tetrahydrofuran. Size exclusion chromatography (SEC) is the name used to describe the analysis of polymers in water and water-based solvents, such as buffer solutions. GPC/SEC is the only established method for obtaining a comprehensive understanding of a polymer's molecular weight distribution.

Tips & Tools

For information on SEC columns for proteins please view the BioHPLC Column Selection Guide (5990-6384EN)

www.agilent.com/chem/library

Tips & Tools

Further information can be found in the Aqueous and polar GPC/SEC columns product guide: (5990-7995EN)

www.agilent.com/chem/library

Tips & Tools

Further information can be found in the Aqueous and polar GPC/SEC columns product guide: (5990-7994EN)

www.agilent.com/chem/library

GPC/SEC Columns

The key to successful GPC/SEC separations is the correct choice of columns. The comprehensive range of Agilent products for GPC/SEC has been designed to cover virtually all polymer analysis application areas, and to make selection for the correct column, solvent and calibration standard fast and reliable.

Agilent's PLgel GPC series of columns are for polymer applications using organic solvents. PLgel is a highly cross-linked, porous polysterine/divinylbenzene matrix, which is recognized as a market leader in GPC column technology. PLgel materials have high pore volume and high-efficiency to maximize resolution. Their unequalled solvent compatability makes for easy transfer between polar and non-polar eluents, and outstanding physical rigidity provides extended lifetimes that maximize downtime. For more information and full ordering details, see Agilent publication 5990-7994EN.

Agilent's PL aquagel-OH series of columns provide a chemically and physically stable matrix for reliable aqueous SEC separations. The columns are packed with macroporous copolymer beads with an extremely hydrophilic polyhydroxyl functionality. The "neutral" surface and the capability to operate across a wide range of eluent conditions provide for high performance analyses of compounds with neutral, ionic and hydrophobic moieties, alone or in combination. PL aquagel-OH is available for analytical and preparative applications. For more information and full ordering details, see Agilent publication 5990-7995EN.

Tips & Tools

Further information can be found in the GPC/SEC standards product guide: (5990-7996EN)

www.agilent.com/chem/library

Polymer standards for GPC/SEC

Agilent manufactures the highest quality polymer standards with extremely narrow polydispersity and the widest molecular weight range commercially available. These quality polymer standards are supplied with extensive characterization data utilizing a variety of independent techniques (e.g. light scattering and viscometry) and high performance GPC to verify polydispersity and assign the peak molecular weight (Mp).

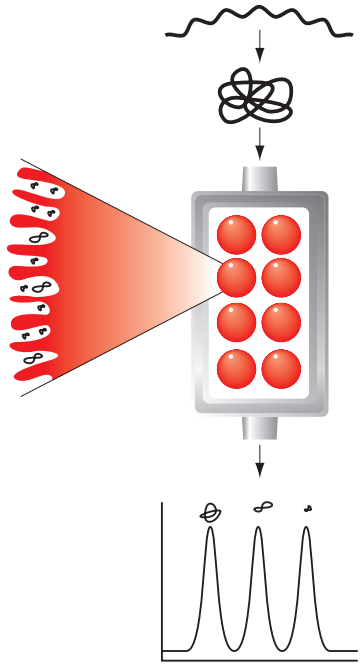
EasiVial – for organic and aqueous calibration. EasiVial is the fastest and most convenient method to deliver an accurate 12-point column calibration. EasiVial eliminates tedious weight procedures for improved calibration accuracy and reduces solvent dispensing to limit risks associated with handling solvents.

EasiCal – for organic solvents. EasiCal packs are pre-prepared for a no-fuss process. Two different combs, each with ten detachable spatulas, support a mixture of five polymer standards. The cost-effective format is designed to save money.

Standard kits and individuals - an extensive range of polymer standard kits of different chemistries designed to match specific column sets are available, as well as individual standards in various pack sizes. For more details about Agilent's calibration standards for GPC/SEC, see the GPC/SEC standards product guide – publication 5990-7996EN.

How GPC/SEC works:

- Polymer molecules dissolve in solution to form spherical coils with size dependent on molecular weight
- The polymer coils are introduced to eluent flowing through the column
- Columns are packed with insoluble porous beads with well-defined pore structure
- The size of pores is similar to that of the polymer coils
- The polymer coils diffuse in and out of the pores
- Result is elution based on size – large coils first, smaller coils last
- Size separation converted to molecular weight separation by use of a calibration curve constructed by the use of polymer standards



Key

- Smaller coils can access many pores
- Larger coils can access few pores
- Very large coils access very few pores

Mechanisms of GPC and SEC

Recommendations for setting up a GPC/SEC system

The following questions will help you find the recommended columns and standards for any given application, as well as system parameters such as injection volumes.

Choosing an eluent for GPC/SEC

Question	Answer	Recommendation	Comments
1. What is the sample soluble in?	Water or water buffer with up to 50% methanol	Agilent PL aquagel-OH	Best choice for water-based applications but cannot accommodate organics apart from methanol up to 50%
Many polymers are only soluble in a small number of solvents. This is the key question when developing methods for analyzing polymers. The solvents mentioned here are all common eluents employed in GPC/SEC.	Typical organic solvent such as THF, chloroform, toluene	Agilent PLgel or Agilent PlusPore	PLgel are the workhorse columns, PlusPore columns are an alternative
	Organic/water mixtures or polar organics such as, DMF, NMP	Agilent PolarGel	PolarGel is a smaller column range than PLgel or PL aquagel-OH columns but is suited to mixtures of organics and water

Tips & Tools

More information on GPC/SEC instrumentation and systems is a click away. We have a variety of application notes, data sheets and brochures available from Agilent for free.

To learn more, visit **www.agilent.com/chem/gpc**

Choosing a column for GPC/SEC

Columns shown in bold are the best initial choice

Question	Answer	Recommendation	Comments
2. What is the expected molecular weight? *It may seem strange to ask this question, but in GPC/SEC the resolution of a column is related to the resolving range. Knowing something of the expected molecular weight of a sample helps to choose the best column that will give optimum results.*	High (up to several millions)	Aqueous solvents PL aquagel-OH MIXED-H 8 µm or combination of PL aquagel-OH 40 and 60 15 µm	The 15 µm column combination is best only where sample viscosity is very high, otherwise 8 µm columns give greater resolution
		Organic solvents PLgel 10 µm MIXED-B or PLgel 20 µm MIXED-A	The PLgel MIXED-A column resolves higher than the PLgel MIXED-B but at lower efficiency due to larger particle size
		Mixed solvents PolarGel	No PolarGel column available for this molecular weight range. Contact your local GPC/SEC expert for advice
	Intermediate (up to hundreds of thousands)	Aqueous solvents PL aquagel-OH MIXED-M 8 µm	A wide-ranging column that covers most water-soluble polymers
		Organic solvents PLgel 5 µm MIXED-C or PLgel 5 µm MIXED-D, PolyPore or ResiPore	The PLgel columns are the most widely applicable for the majority of applications; PolyPore and ResiPore columns are alternatives
		Mixed solvents PolarGel-M	Covers most applications
	Low (up to tens of thousands)	Aqueous solvents Combination of PL aquagel-OH 40 and PL aquagel-OH 30 8 µm	These two columns in a combined set cover the low end of the molecular weight range
		Organic solvents PLgel 3 µm MIXED-E or MesoPore	The PLgel column provides high resolution and is designed for low molecular weight applications; the MesoPore column is an alternative
		Mixed solvents PolarGel-L	For low molecular weight applications
	Very low (a few thousand)	Aqueous solvents PL aquagel-OH 20 5 µm	This high-performance column gives high resolution at low molecular weight
		Organic solvents OligoPore or PLgel 3 µm 100Å	The OligoPore column is less prone to dispersion than the PLgel column, but both work well
		Mixed solvents PLgel	No PolarGel column covers this range so use PLgel columns as alternatives
	Unknown	Aqueous solvents PL aquagel-OH MIXED-M 8 µm	Covers the molecular weight ranges of most polymer samples
		Organic solvents PLgel 5 µm MIXED-C or PolyPore	This PLgel column is the most widely applicable for the majority of applications
		Mixed solvents PolarGel-M	Covers the majority of applications

Setting up the GPC/SEC system

Question	Answer	Recommendation	Comments
3. How many columns to use? *The greater the particle size of the media in the column (which is dependent on the expected molecular weight of the samples), the lower the resolution and the more columns are required to maintain the quality of the results. For higher molecular weight samples, larger particles are necessary to reduce the danger of shear degradation of samples during analysis.*	Depends on the particle size of the columns	Particle size 20 µm use 4 columns Particle size 13 µm use 3 columns Particle size 10 µm use 3 columns Particle size 8 µm use 2 columns Particle size 5 µm use 2 columns Particle size 3 µm use 2 columns	Increased number of columns required for large particle sizes to make up for low efficiencies

Question	Answer	Recommendation	Comments
4. What size injection volume? *The injection volume required is dependent on the particle size of the column – smaller particles need lower injection volumes to minimize dead volume. Larger injection volumes allow the introduction of high molecular weight samples at lower concentrations, reducing viscosity and ensuring a quality chromatogram is obtained.*	Depends on the particle size of the columns	Particle size 20 µm use 200 µL injection Particle size 13 µm use 200 µL injection Particle size 10 µm use 200 µL injection Particle size 5 µm use 100 to 200 µL injection Particle size 3 µm use 20 µL injection	Smaller particle sizes require smaller loops to minimize band broadening

What standards should I use?

Standards shown in bold are the best initial choice

Question	Answer	Recommendation	Comments
5. What is the eluent? *Standards are polymers, so the choice of standard mainly reflects solubility in the chosen eluents.*	Water or water buffer with up to 50% methanol	Polyethylene glycol (PEG)/oxide (PEO) or polysaccharides (SAC)	These standards perform in all water-based systems in convenient Agilent EasiVial format
	Typical organic solvent such as THF, chloroform, toluene	Polystyrene (PS) or polymethylmethacrylate (PMMA)	Polystyrene is the most commonly used standard in convenient EasiVial format
	Organic/water mixtures or polar organics such as DMF, NMP	Polyethylene glycol/oxide or polymethylmethacrylate	Polar standards perform well

(Continued)

What standards should I use?

Question	Answer	Recommendation	Comments
6. What format of standards are recommended?	For the quickest and simplest approach where accurate concentrations are not required	Easiest option – EasiVial or Agilent EasiCal	Simple to use, EasiVial preferred before EasiCal because of the wider choice of polymer types
Different formats of standards are available depending on customer preference.	If accurate concentrations are required	Accurate concentrations required – EasiVial or individual standards	Both formats allow accurate sample concentrations, EasiVials are simpler to use

Typical polymer molecular weights

If you are unsure of the molecular weight of your sample, the table below shows some approximate molecular weight ranges for common polymers, which will help you select the right column for your application.

Polymer Type	Typical molecular weight of polymer	Typical polydispersity[1] of polymer
Polymers from free radical synthesis	High (up to several million) Intermediate (up to hundreds of thousands)	~ 2
Polymers from ionic synthesis	Intermediate (up to hundreds of thousands) Low (up to tens of thousands)	~ 1.01
Polymers from addition synthesis	Intermediate (up to hundreds of thousands) Low (up to tens of thousands)	~ 2
Polymers from controlled radical polymerization	Low (up to tens of thousands) Very low (a few thousand)	~ 1.1 to 1.5
Polyolefins	Intermediate (up to hundreds of thousands) High (up to several million)	~ 2 to 200
Acrylates	Intermediate (up to hundreds of thousands) High (up to several million)	~ 2
Small molecule additives	Very low (a few thousand)	1
Pre-polymers	Low (up to tens of thousands) Very low (a few thousand)	~ 2 to 10
Resins	Low (up to tens of thousands) Very low (a few thousand)	~ 2 to 10
Natural biopolymers such as polysaccharides	Intermediate (up to hundreds of thousands) High (up to several million)	~ 2 to 10
Rubbers	Intermediate (up to hundreds of thousands) High (up to several million)	~ 2 to 10
Biodegradable polymers	Intermediate (up to hundreds of thousands) Low (up to tens of thousands)	~ 1.1 to 2

[1] Polydispersity is a measure of the distribution of molecular mass of a polymer

Agilent 1260 Infinity GPC/SEC System

Agilent 1260 Infinity GPC/SEC Multi Detector Suite

Agilent GPC/SEC Analysis Systems

For easy and reliable polymer characterization, turn to the Agilent 1260 Infinity GPC/SEC Analysis System. The isocratic solvent delivery system provides the constant, stable flow rate that is essential to maintain the high resolution of the GPC/SEC column. And with its high flow precision and excellent temperature stability, you can be confident of the highest accuracy and precision for your molecular weight determinations.

The Agilent 1260 Infinity GPC/SEC Multi Detector Suite (MDS) with light scattering, refractive index and viscometry detectors, brings advanced analysis to your laboratory. This high-end system provides not only accurate molecular weight data independent of the chemistry of the standards, but also gives insight into the size and shape of the polymer.

Organic GPC columns

Description	Size (mm)	MW Range (g/mol)	Part No.
PLgel 20 µm MIXED-A	7.5 x 300	2,000-40,000,000	PL1110-6200
PLgel 20 µm MIXED-A LS	7.5 x 300	2,000-40,000,000	PL1110-6200LS*
PLgel 10 µm MIXED-B	7.5 x 300	500-10,000,000	PL1110-6100
PLgel 10 µm MIXED-B LS	7.5 x 300	500-10,000,000	PL1110-6100LS*
PLgel 5 µm MIXED-C	7.5 x 300	200-2,000,000	PL1110-6500
PLgel 5 µm MIXED-D	7.5 x 300	200-400,000	PL1110-6504
PLgel 3 µm MIXED-E	7.5 x 300	up to 30,000	PL1110-6300
PLgel 3 µm 100Å	7.5 x 300	up to 4,000	PL1110-6320
PolyPore	7.5 x 300	200-2,000,000	PL1113-6500
ResiPore	7.5 x 300	200-400,000	PL1113-6300
MesoPore	7.5 x 300	up to 25,000	PL1113-6325
OligoPore	7.5 x 300	up to 4,500	PL1113-6520

* Low shedding for light scattering applications

Mixed Solvent GPC columns

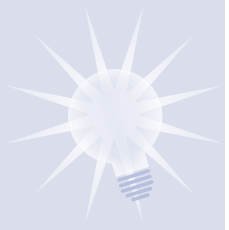
Description	Size (mm)	MW Range (g/mol) (PEG/PEO)	Part No.
PolarGel-M	7.5 x 300	up to 700,000	PL1117-6800
PolarGel-L	7.5 x 300	up to 30,000	PL1117-6830

Aqueous GPC/SEC columns

Description	Size (mm)	MW Range (g/mol) (PEG/PEO)	Guaranteed Efficiency (p/m)	Part No.
PL aquagel-OH 60 15 µm	7.5 x 300	200,000-> 10,000,000	> 15,000	PL1149-6260
PL aquagel-OH 40 15 µm	7.5 x 300	10,000-200,000	> 15,000	PL1149-6240
PL aquagel-OH MIXED-H 8 µm	7.5 x 300	100-10,000,000	> 35,000	PL1149-6800
PL aquagel-OH MIXED-M 8 µm	7.5 x 300	> 600,000	> 35,000	PL1149-6801
PL aquagel-OH 60 8 µm	7.5 x 300	200,000-> 10,000,000	> 35,000	PL1149-6860
PL aquagel-OH 50 8 µm	7.5 x 300	50,000-1,000,000	> 35,000	PL1149-6850
PL aquagel-OH 40 8 µm	7.5 x 300	10,000-200,000	> 35,000	PL1149-6840
PL aquagel-OH 30 8 µm	7.5 x 300	100-30,000	> 35,000	PL1120-6830
PL aquagel-OH 20 5 µm	7.5 x 300	100-10,000	> 5,000	PL1120-6520

Tips & Tools

For a full list of GPC/SEC columns, go to
www.agilent.com/chem/gpcsec



EasiVial Pre-weighed Calibration Kits

Description	Range of Nominal Mp (g/mol)	Vial Volume (mL)	Unit	Kit Contents	Part No.
EasiVial PEG/PEO	100-1,200,000	2	30/pk		PL2080-0201
EasiVial PEG	106-35,000	2	30/pk		PL2070-0201
Polyethylene glycol calibration kit, PEG-10	106-20,000			10 x 0.5 g	PL2070-0100
Polyethylene oxide calibration kit, PEO-10	20,000-1,000,000			10 x 0.2 g	PL2080-0101
Polyethylene oxide calibration kit, SAC-10	180-700,000			10 x 0.2 g	PL2090-0100
Polyacrylic acid calibration kit, PAA-10	1,000-1,000,000			10 x 0.2 g	PL2140-0100
EasiVial PS-H calibration kit	162-6,000,000	2	30/pk		PL2010-0201
EasiVial PS-M calibration kit	162-400,000	2	30/pk		PL2010-0301
EasiVial PEG/PEO calibration kit	100-1,200,000	4	30/pk		PL2080-0200
EasiVial PS-L calibration kit	162-40,000	2	30/pk		PL2010-0401
Polystyrene PS-1 calibration kit	580-7,500,000		1/pk		PL2010-0501
Polystyrene PS-2 calibration kit	580-400,000		1/pk		PL2010-0601
Polystyrene calibration kit, S-H-10	300,000-15,000,000			10 x 0.5 g	PL2010-0103
Polystyrene calibration kit, S-H2-10	1,000-15,000,000			10 x 0.5 g	PL2010-0104
Polystyrene calibration kit, S-M-10	580-3,000,000			10 x 0.5 g	PL2010-0100
Polystyrene calibration kit, S-M2-10	580-300,000			10 x 0.5 g	PL2010-0102
Polystyrene calibration kit, S-L-10	162-20,000			10 x 0.5 g	PL2010-0101
Polystyrene calibration kit, S-L2-10	162-4,500			10 x 0.5 g	PL2010-0105
Polymethylmethacrylate calibration kit, M-M-10	1,000-1,500,000			10 x 0.5 g	PL2020-0101
Polymethylmethacrylate calibration kit, M-L-10	600-50,000			10 x 0.5 g	PL2020-0100

All the above polymer types are also available as nominal molecular weights

Tips & Tools

For a full list of calibration standards, go to
www.agilent.com/chem/gpcsec

Chiral HPLC Columns

Ultron ES Chiral Columns

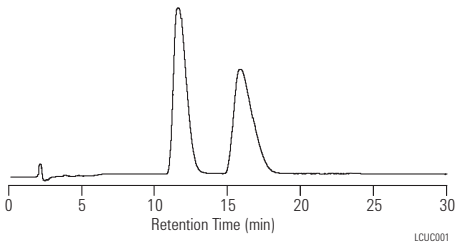
- Direct racemic separations without derivatization
- Use Ultron ES-OVM as the USP L57 choice and to separate enantiomers of acidic and basic pharmaceuticals, such as hexobarbital, ibuprofen, and profenamine
- Ultron ES-Pepsin Chiral columns are best suited to separate basic compounds that are difficult to separate with other chiral columns
- ES-OVM and ES-Pepsin columns contain 120Å, 5 µm silica particles bonded with an ovomucoid protein and pepsin protein, respectively
- Both types of chiral columns are usable with reversed-phase mobile phases such as acetonitrile or ethanol and phosphate buffer

Ultron ES Chiral columns are immobilized protein columns that feature numerous chiral recognition sites for enantiomeric separations of dozens of chiral compounds. They are engineered with two complementary protein-based chiral stationary phases, making them an excellent choice for the HPLC separation of enantiomers without derivatization – including a growing number of drug substances of interest.

Separation of Enantiomers of Fluoxetine (Prozac)

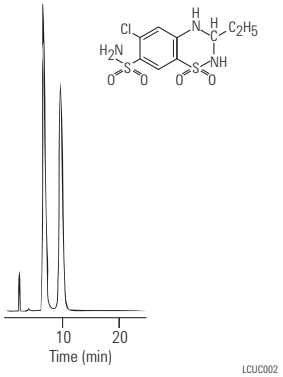
Column:	**Ultron ES-OVM Chiral 702111651 4.6 x 150 mm, 5 µm**
Mobile Phase:	25:75 (v/v) EtOH/20 mM KH_2PO_4, pH 5.5 (adjusted with NaOH)
Temperature:	Ambient
Detector:	UV (225 nm)
Sample:	Mixture Fluoxetine (Prozac) entantiomers

Courtesy of D. S. Risley and V. S. Sharp of Lilly Research Laboratories, Eli Lilly and Co.



Separation of ethiazide (diuretic drug) on Ultron ES-OVM column

Column:	**Ultron ES-OVM Chiral 702111651 4.6 x 150 mm, 5 µm**
Mobile Phase:	20 mM KH_2PO_4 (pH 4.6)
Flow Rate:	1 mL/min
Temperature:	25 °C
Detector:	220 nm



Chiral Separation of Warfarin Enantiomers R and S Limit of Quantitation %RSD at 100 fg/mL

Column:	**Ultron ES-OVM Chiral 702111610 2.0 x 150 mm, 5 µm**
Temperature:	30°C
Injection Volume:	5 µL
Autosampler Temperature:	10 °C
Needle Wash:	Flush port (50:25:25 H_2O, IPA:MeOH:H_2O, 5 seconds)
Mobile Phase:	83% A = H_2O + 5mM Ammonium Formate 17% B = ACN
Flow Rate:	0.5 mL/min Stop time: 7.0 min
MS Conditions:	Agilent 6410A Triple Quadrupole LC/MS/MS with MultiMode Source
Ion Mode:	ESI, Negative

Source Conditions

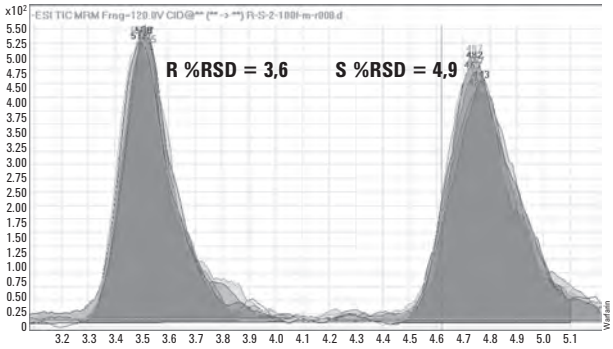
Capillary Voltage:	2000 V
Drying Gas (nitrogen):	5 L/min
Drying Gas Temperature:	300 °C
Nebulizer Gas (nitrogen):	40 psi
Vaporizer:	200 °C

Product Ion Scan

Mass Range:	50-500 m/z
Scan Speed:	500 msec

MRM acquisition (Q1 peak width = 1.2 and Q2 peak width = 0.70 amu)

Delta EMV:	1000V



Counts vs. Acquisition Time

Ultron ES Chiral Columns

Description	Size (mm)	Particle Size (µm)	ES-OVM USP L57	ES-Pepsin
Semi-Prep	10.0 x 150	5	722111723	
Analytical	4.6 x 250	10	724111653	
Analytical	4.6 x 150	5	702111651	822111651
Analytical, with Guard	4.6 x 150	5	702111651A	822111631A
Narrow Bore	2.0 x 150	5	702111610	
Guard Column	4.0 x 10	5	712111630	832111630

Tips & Tools

Flash chromatography is a low-cost, low efficiency alternative to traditional high efficiency preparative chromatography, typically used as a first stage clean-up process during chemical synthesis. For more information on Agilent's high performance preparative LC solutions, please see page 108.

FLASH CHROMATOGRAPHY

- Isolate compounds from synthesis mixtures quickly and easily
- Maximize compound purity and recovery with superior purification columns
- Enhance gradient accuracy with solid loading system

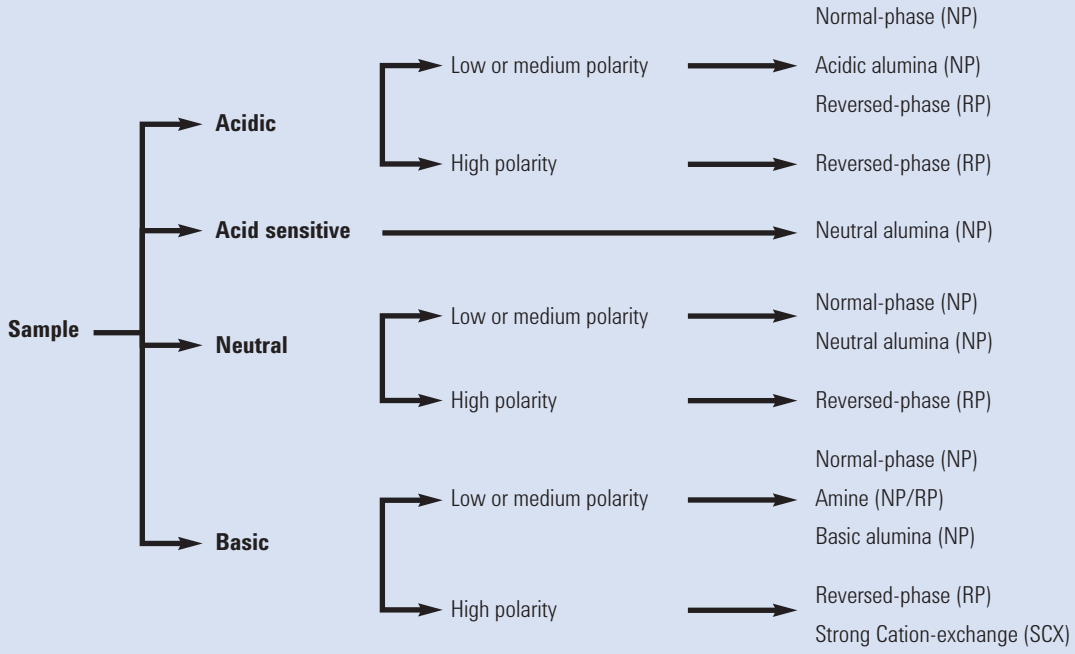
Flash chromatography is an economical and simple to use technique for isolating compounds of interest from crude reaction mixtures. Columns for flash are typically single use items designed for efficient use in a dedicated Flash system. In these columns every element has been thought out, custom designed and carefully manufactured for excellent purification performance, time after time.

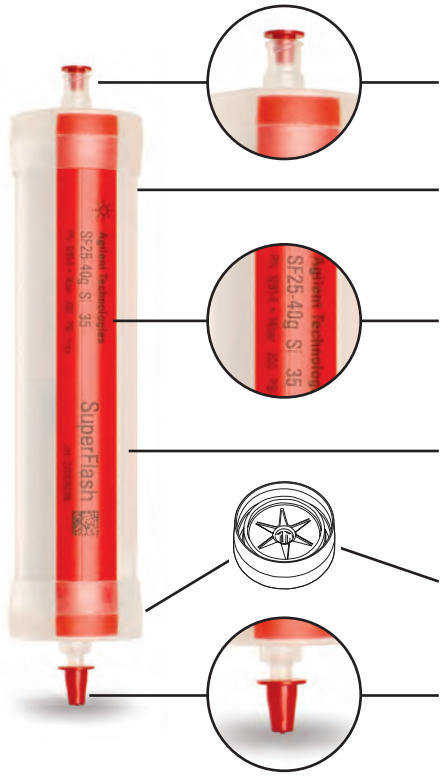
SuperFlash Purification Columns

- Sixteen standard sizes plus customized sizes for a wide application range
- Optimized dimensions for high speed, high loading and high resolution needs
- Convenient clear flat packaging to allow easy storage of columns and a simple indication of stock levels

Each element of the SuperFlash compound purification column, with our proprietary technologies, delivers optimal performance, offering maximum recovery of high purity compounds. Our columns, available with Si 50 and Si 35 normal-phase silicas, and C18, PLRP-S and SCX for reversed-phase and ion-exchange applications as well as aluminas for sensitive samples, eliminate the common problems of poorly designed columns such as leakage, size limitations, complicated connections or poor compound separation. Instead, you receive a cost-effective, high performance disposable column specifically designed for delivering convenient, efficient separations.

Media selection





Standard Female Luer Lock

Easily connects to any system or to a DASi injection cartridge.

Unitized Construction

Patent pending unitized construction hermetically seals the column into a single unit to eliminate leaking up to 200 psi.

Identification Stripe

Solvent proof (laser etched/no ink) red stripe includes data on column specifications and helpful information for reordering. Normal-phase columns have a red stripe, while reversed-phase columns have a blue stripe.

Solvent Resistant Column Body

The column body and cap design use a material that does not swell, warp or crack under prolonged solvent contact.

Dispersion Channels

Load sample evenly onto the column.

Standard Male Luer Lock

Male luer outlet attaches to any system.

Solvent Polarity

Polarity Index at 20 °C		Solvent
Non-polar	0.0	Heptane
	0.0	Hexane
	0.0	Pentane
	0.2	Cyclohexane
	1.0	Trichloroethylene
	1.6	Carbon tetrachloride
	2.8	di-Ethyl ether
	3.1	Dichloromethane
	3.9	Propan-2-ol
	4.0	Propan-1-ol
	4.0	Tetrahydrofuran
	4.1	Chloroform
	5.1	Acetone
	5.1	Methanol
	5.2	Ethanol
	5.8	Acetonitrile
Polar	9.0	Water

SuperFlash Notes

This information applies to the following SuperFlash ordering tables.

- Maximum pressure for all columns is 14 bar (200 psi).
- Obey pressure maximum limits marked on every column. Confirm the instrument has been set to the appropriate maximum pressure before attaching column.
- Dimensions are for sorbent bed diameter x overall column length.
- Flow rates up to 40% higher than the recommended normal operating flow rates may be used to reduce equilibration times.
- Sample loading values are suggested. Results may vary with specific samples.

Normal-phase (NP)

SuperFlash Si 50

Model	Diameter x Length (mm)	Particle Size (µm)	Flow Rate (mL/min)	Sample Load	Unit	Part No.
SF10 - 4 g	14.2 x 95	50	18	40 - 400 mg	8/pk	AX1368-8
SF10 - 8 g	14.2 x 136	50	18	80 - 800 mg	8/pk	AX1403-8
SF15 - 12 g	20.8 x 112	50	30	120 mg - 1.2 g	7/pk	AX1369-7
SF15 - 24 g	20.8 x 175	50	30	240 mg - 2.4 g	7/pk	AX1404-7
SF25 - 40 g	28.2 x 164	50	40	400 mg - 4 g	6/pk	AX1281-6
SF25 - 60 g	28.2 x 214	50	40	600 mg - 6 g	6/pk	AX1212-6
SF25 - 80 g	28.2 x 280	50	40	800 mg - 8 g	6/pk	AX1213-6
SF25 - 120 g	28.2 x 388	50	40	1.2 - 12 g	6/pk	AX1214-6
SF25 - 160 g	28.2 x 507	50	40	1.6 - 16 g	6/pk	AX1215-6
SF40 - 80 g	40.6 x 158	50	85	800 mg - 8 g	4/pk	AX1356-4
SF40 - 120 g	40.6 x 202	50	85	1.2 - 11.5 g	4/pk	AX1216-4
SF40 - 150 g	40.6 x 257	50	85	1.5 - 15 g	4/pk	AX1217-4
SF40 - 240 g	40.6 x 371	50	85	2.4 - 24 g	4/pk	AX1218-4
SF65 - 200 g	66 x 156	50	100	2 - 20 g	3/pk	AX1357-3
SF65 - 400 g	66 x 256	50	100	4 - 40 g	3/pk	AX1219-3
SF65 - 600 g	66 x 365	50	100	6 - 60 g	3/pk	AX1220-3

SuperFlash Si 35

Model	Diameter x Length (mm)	Particle Size (µm)	Flow Rate (mL/min)	Sample Load	Unit	Part No.
SF10 - 4 g	14.2 x 95	35	18	40 - 400 mg	8/pk	AX1370-8
SF10 - 8 g	14.2 x 136	35	18	80 - 800 mg	8/pk	AX1407-8
SF15 - 12 g	20.8 x 112	35	30	120 mg - 1.2 g	7/pk	AX1371-7
SF15 - 24 g	20.8 x 175	35	30	240 mg - 2.4 g	7/pk	AX1408-7
SF25 - 40 g	28.2 x 164	35	40	400 mg - 4 g	6/pk	AX1393-6
SF25 - 60 g	28.2 x 215	35	40	600 mg - 6 g	6/pk	AX1292-6
SF25 - 80 g	28.2 x 280	35	40	800 mg - 8 g	6/pk	AX1293-6
SF25 - 120 g	28.2 x 388	35	40	1.2 - 12 g	6/pk	AX1294-6
SF25 -160 g	40.6 x 507	35	40	1.6 - 16 g	6/pk	AX1295-6
SF40 - 80 g	40.6 x 158	35	85	800 mg - 8 g	4/pk	AX1405-4
SF40 - 115 g	40.6 x 202	35	85	1.2 - 11.5 g	4/pk	AX1296-4
SF40 - 150 g	40.6 x 257	35	85	1.5 - 15 g	4/pk	AX1297-4
SF40 - 240 g	40.6 x 371	35	85	2.4 - 24 g	4/pk	AX1298-4
SF65 - 200 g	66 x 156	35	100	2 - 20 g	3/pk	AX1406-3
SF65 - 400 g	66 x 256	35	100	4 - 40 g	3/pk	AX1299-3
SF65 - 600 g	66 x 365	35	100	6 - 60 g	3/pk	AX1300-3

SuperFlash Aminopropyl – NH2

Model	Diameter x Length (mm)	Particle Size (µm)	Flow Rate (mL/min)	Unit	Part No.
SF10 - 5 g	14.2 x 96	40	18	1/pk	AX1374-1
SF10 - 10 g	14.2 x 136	40	18	1/pk	AX1511-1
SF15 - 15 g	20.8 x 113	40	30	1/pk	AX1375-1
SF15 - 30 g	20.8 x 174	40	30	1/pk	AX1512-1
SF25 - 50 g	28.2 x 163	40	40	1/pk	AX1311-1
SF25 - 75 g	28.2 x 220	40	40	1/pk	AX1376-1
SF25 - 100 g	28.2 x 277	40	40	1/pk	AX1377-1
SF25 - 150 g	28.2 x 391	40	40	1/pk	AX1378-1
SF25 -200 g	28.2 x 506	40	40	1/pk	AX1379-1
SF40 - 100 g	40.6 x 159	40	85	1/pk	AX1380-1
SF40 - 150 g	40.6 x 207	40	85	1/pk	AX1316-1
SF40 - 200 g	40.6 x 255	40	85	1/pk	AX1317-1
SF40 - 300 g	40.6 x 379	40	85	1/pk	AX1381-1
SF65 - 250 g	66 x 157	40	100	1/pk	AX1382-1
SF65 - 500 g	66 x 262	40	100	1/pk	AX1319-1
SF65 - 750 g	66 x 365	40	100	1/pk	AX1383-1

Strong Cation-exchange (SCX)

SuperFlash SCX

Model	Diameter x Length (mm)	Particle Size (µm)	Flow Rate (mL/min)	Unit	Part No.
SF10 - 5 g	14.2 x 49	50	18	8/pk	AX2130-8
SF10 - 8 g	14.2 x 81	50	18	8/pk	AX2135-8
SF15 - 14 g	20.8 x 63	50	30	7/pk	AX2140-7
SF15 - 25 g	20.8 x 114	50	30	7/pk	AX2145-7
SF25 - 45 g	28.2 x 114	50	40	6/pk	AX2150-6
SF25 - 70 g	28.2 x 186	50	40	6/pk	AX2155-6
SF25 - 80 g	28.2 x 206	50	40	6/pk	AX2160-6
SF25 - 120 g	28.2 x 308	50	40	6/pk	AX2165-6
SF25 - 160 g	28.2 x 414	50	40	6/pk	AX2170-6
SF40 - 80 g	40.6 x 99	50	85	4/pk	AX2175-4
SF40 - 125 g	40.6 x 153	50	85	4/pk	AX2180-4
SF40 - 160 g	40.6 x 208	50	85	4/pk	AX2185-4
SF40 - 245 g	40.6 x 299	50	85	4/pk	AX2190-4
SF65 - 250 g	66 x 118	50	100	3/pk	AX2195-3
SF65 - 440 g	66 x 204	50	100	3/pk	AX2200-3
SF65 - 650 g	66 x 302	50	100	3/pk	AX2205-3

Reversed-phase (RP)

SuperFlash PLRP-S

Model	Diameter x Length (mm)	Particle Size (µm)	Flow Rate (mL/min)	Sample Load	Unit	Part No.
SF10 - 2.5 g	14.2 x 95	50	12	15 - 60 mg	1/pk	AX2250-1
SF10 - 4 g	14.2 x 127	50	12	25 - 100 mg	1/pk	AX2255-1
SF15 - 7 g	20.8 x 112	50	20	41 - 167 mg	1/pk	AX2260-1
SF15 - 13 g	20.8 x 163	50	20	75 - 300 mg	1/pk	AX2265-1
SF25 - 24 g	28.2 x 163	50	30	138 - 500 mg	1/pk	AX2270-1
SF25 - 38 g	28.2 x 235	50	30	188 - 750 mg	1/pk	AX2275-1
SF25 - 42 g	28.2 x 255	50	30	250 mg - 1 g	1/pk	AX2280-1
SF25 - 63 g	28.2 x 357	50	30	375 mg - 1.5 g	1/pk	AX2285-1
SF25 - 85 g	28.2 x 463	50	30	500 mg - 2 g	1/pk	AX2290-1
SF40 - 42 g	40.6 x 148	50	50	250 mg - 1 g	1/pk	AX2295-1
SF40 - 65 g	40.6 x 202	50	50	375 mg - 1.5 g	1/pk	AX2300-1
SF40 - 90 g	40.6 x 257	50	50	500 mg - 2 g	1/pk	AX2305-1
SF40 - 130 g	40.6 x 348	50	50	750 mg - 3 g	1/pk	AX2310-1
SF65 - 133 g	66 x 170	50	65	750 mg - 3 g	1/pk	AX2315-1
SF65 - 230 g	66 x 256	50	65	1.4 - 5.4 g	1/pk	AX2320-1
SF65 - 340 g	66 x 354	50	65	2 - 8 g	1/pk	AX2325-1

SuperFlash C18

Model	Diameter x Length (mm)	Particle Size (µm)	Flow Rate (mL/min)	Sample Load	Unit	Part No.
SF10 - 5 g	14.2 x 95	50	12	15 - 60 mg	1/pk	AX1372-1
SF10 - 10 g	14.2 x 127	50	12	25 - 100 mg	1/pk	AX1409-1
SF15 - 16 g	20.8 x 112	50	20	41 - 167 mg	1/pk	AX1373-1
SF15 - 30 g	20.8 x 163	50	20	75 - 300 mg	1/pk	AX1410-1
SF25 - 55 g	28.2 x 163	50	30	138 - 500 mg	1/pk	AX1394-1
SF25 - 75 g	28.2 x 235	50	30	188 - 750 mg	1/pk	AX1302-1
SF25 - 100 g	28.2 x 255	50	30	250 mg - 1 g	1/pk	AX1303-1
SF25 - 150 g	28.2 x 357	50	30	375 mg - 1.5 g	1/pk	AX1304-1
SF25 - 200 g	28.2 x 463	50	30	500 mg - 2 g	1/pk	AX1305-1
SF40 - 100 g	40.6 x 148	50	50	250 mg - 1 g	1/pk	AX1411-1
SF40 - 150 g	40.6 x 202	50	50	375 mg - 1.5 g	1/pk	AX1306-1
SF40 - 205 g	40.6 x 257	50	50	500 mg - 2 g	1/pk	AX1307-1
SF40 - 300 g	40.6 x 348	50	50	750 mg - 3 g	1/pk	AX1308-1
SF65 - 300 g	66 x 172	50	65	750 mg - 3 g	1/pk	AX1412-1
SF65 - 540 g	66 x 256	50	65	1.4 - 5.4 g	1/pk	AX1309-1
SF65 - 800 g	66 x 354	50	65	2 - 8 g	1/pk	AX1310-1

Normal-phase (NP) Alumina

SuperFlash Alumina

Model	Diameter x Length (mm)	Particle Size (µm)	Sample Load	Unit	Alumina Neutral	Alumina Acidic	Alumina Basic
SF10 - 8 g	14.2 x 95	125	80 - 400 mg	8/pk	AX1448-8	AX1474-8	AX1450-8
SF10 - 16 g	14.2 x 136	125	150 - 750 mg	8/pk	AX1477-8	AX1494-8	AX1476-8
SF15 - 24 g	20.8 x 112	125	230 mg - 1.2 g	7/pk	AX1466-7	AX1495-7	AX1467-7
SF15 - 48 g	20.8 x 175	125	450 mg - 2.2 g	7/pk	AX1468-7	AX1496-7	AX1469-7
SF25 - 80 g	28.2 x 163	125	750 mg - 2.2 g	6/pk	AX1449-6	AX1497-6	AX1478-6
SF25 - 120 g	28.2 x 215	125	1.1 - 5.5 g	6/pk	AX1481-6	AX1498-6	AX1480-6
SF25 - 160 g	28.2 x 280	125	1.5 - 7.5 g	6/pk	AX1483-6	AX1499-6	AX1482-6
SF25 - 240 g	28.2 x 388	125	2.2 - 11 g	6/pk	AX1462-6	AX1500-6	AX1464-6
SF25 - 320 g	28.2 x 507	125	3 - 15 g	6/pk	AX1485-6	AX1501-6	AX1484-6
SF40 - 160 g	40.6 x 158	125	1.5 - 7.5 g	4/pk	AX1487-4	AX1502-4	AX1486-4
SF40 - 230 g	40.6 x 214	125	2.2 - 11 g	4/pk	AX1489-4	AX1503-4	AX1488-4
SF40 - 300 g	40.6 x 256	125	2.8 - 10 g	4/pk	AX1438-4	AX1504-4	AX1437-4
SF40 - 480 g	40.6 x 388	125	4.5 - 22.5 g	4/pk	AX1473-4	AX1505-4	AX1479-4
SF65 - 400 g	66 x 157	125	3.7 - 18.5 g	3/pk	AX1463-3	AX1506-3	AX1465-3
SF65 - 800 g	66 x 262	125	7.5 - 37.5 g	3/pk	AX1491-3	AX1507-3	AX1490-3
SF65 - 1200 g	66 x 365	125	11.2 - 56 g	3/pk	AX1493-3	AX1508-3	AX1492-3

Flash F75/F150 Cartridges

- Available in a variety of sizes for development systems
- Convenient sorbents to meet your needs
- Consistent packing for less channelling and fraction dilution

If you regularly purify more than a few grams of compound, Flash F75/F150 cartridges deliver the convenience and compatibility you need. The cartridges are packed with silica for normal-phase separations and silica C18 for reversed-phase purifications. For development scale they are available in different bed diameters and bed masses to provide solutions for a range of sample sizes.

Flash F75 Cartridges

Model	Sorbent	Unit	Part No.
F75S - 200 g	Si 50	2/pk	AX0346-2
F75S - 200 g	Si 50	10/pk	AX0346-10
F75S - 200 g	Si 35	2/pk	AX1363-2
F75S - 200 g	Si 35	10/pk	AX1363-10
F75S - 300 g	C18	1/pk	AX0349-1
F75M - 400 g	Si 50	2/pk	AX0347-2
F75M - 400 g	Si 35	10/pk	AX0347-10
F75M - 400 g	Si 35	2/pk	AX1364-2
F75M - 400 g	Si 35	10/pk	AX1364-10
F75M - 600 g	C18	1/pk	AX0350-1
F75L - 800 g	Si 50	2/pk	AX0348-2
F75L - 800 g	Si 50	10/pk	AX0348-10
F75L - 800 g	Si 35	2/pk	AX1352-2
F75L - 800 g	Si 35	10/pk	AX1352-10
F75L - 1.2 kg	C18	1/pk	AX0351-1
F75XL - 1.6 kg	Si 50	2/pk	AX1178-2

Flash F150 Cartridges

Model	Sorbent	Unit	Part No.
F150M - 2.5 kg	Si 50	2/pk	AX0355-2
F150M - 2.5 kg	Si 50	10/pk	AX0355-10
F150M - 2.5 kg	Si 35	2/pk	AX1360-2
F150M - 2.5 kg	Si 35	10/pk	AX1360-10
F150M - 3.9 kg	C18	1/pk	AX0357-1
F150L - 5 kg	Si 50	2/pk	AX0356-2
F150L - 5 kg	Si 50	10/pk	AX0356-10
F150L - 5 kg	Si 35	2/pk	AX1361-2
F150L - 5 kg	Si 35	10/pk	AX1361-10
F150L - 9 kg	C18	1/pk	AX0414-1

DASi Sample Loading Module

- For even loading of low solubility and high viscosity compounds
- Modules are available in three sizes to match your sample needs
- Adjustable plunger eliminates dead volume and maintains gradient accuracy
- Provides security as a guard column for high-cost, specialty-sorbent columns

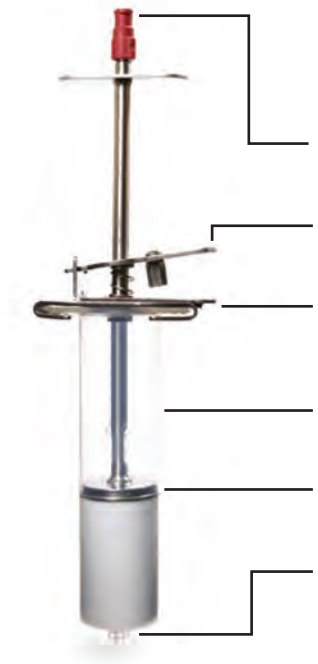
DASi Module Kits

Description	Part No.
DASi 12 module kit Includes five empty cartridges and two Si 50, 5 g packed cartridges	AX1238-1
DASi 35 module kit Includes five empty cartridges, two Si 50, 5 g packed cartridges and two Si 50, 10 g packed cartridges	AX1237-1
DASi 65 module kit Includes five empty cartridges, two Si 50, 5 g packed cartridges, two Si 50, 15 g packed cartridges and two Si 50, 25 g packed cartridges	AX1236-1
DASi 12, 35 and 65 module kit	AX1239-1

Each module kit contains plunger assembly and appropriate DASi Si Cartridge Sampler Kit

DASi Si Cartridge Sampler Pack

Description	Part No.
DASi 12 cartridge sampler pack	AX1266-1
DASi 35 cartridge sampler pack	AX1263-1
DASi 65 cartridge sampler pack	AX1252-1



DASi Module (showing one pre-packed cartridge)

Standard Female Luer Lock
Easily connect the DASi to any system with a female Luer lock top fitting.

Patent Pending Locking Mechanism
Easily push piston down. Assembly will remain in position until released.

Adjustable Plunger Head
Eliminates dead volume to maintain the superior gradient accuracy of the 971-FP instrument (especially important for DCM/methanol solvent combination).

Sample Cartridge
Solvent compatible cartridge body does not swell, warp, or crack under prolonged solvent contact.

Dispersion Channels
Distribute solvent evenly on the sample bed for tight, thin separation bands.

Standard Male Luer Lock
Male Luer outlet attaches to any system or to the top of a SuperFlash column.

Instrumentation for Flash Purification: the 971-FP

- Excellent purification performance of UV-active compounds at different wavelengths
- Eliminates uncontrolled sample loss to ensure sample security and retention
- Method-guiding functionality optimizes solvent, column and gradient options to increase efficiency and flexibility
- Ready-to-Run technology reduces downtime

The 971-FP system enhances productivity through its ready-to-run technology that eliminates warmup time, performs self diagnostics to ensure proper operation, supplies helpful navigation run/start software and introduces walk-away start features like system auto-prime and sample auto-inject. The instrument incorporates the latest compound separation innovations, and contains new sample security and retention technology.

Solutions

Description	Part No.
971-FP multiple wavelength UV flash chromatography workstation Includes advanced features pack (AFP)	AX1600-1
971-FP single wavelength UV flash chromatography workstation	AX1605-1

Instrument Supplies

Agilent offers several accessories to support the 971-FP, including a Multi-column Controller to connect additional stations for uninterrupted column operation. The Advanced Feature Package (AFP) offers uninterrupted solvent supply, waste level monitoring and feedback, Guide Me functionality and dynamic run queues for multi-column control capacity. A high-speed processor and advanced operating software are integral to the AFP. The integral fume enclosure traps solvent fumes for use in areas without hoods (requires a 4 in or greater exhaust ventilation connection), and the solvent bottle safety tray provides additional support of storing 4 L solvent bottles.

Instrument Supplies

Description	Part No.
MCC2 – Multi-column controller	AX1426-1
Advanced feature package (AFP)	AX1440-1
Integral fume enclosure	AX1429-1
Solvent bottle safety tray	AX1441-1

Accessory Racks

A variety of accessory racks for the 971-FP, all with radio frequency identification (RFID), is available.

Accessory Racks

Description	Part No.
13 x 100 mm rack, holds 90 tubes	AX1442-1
16 x 100 mm rack, holds 60 tubes	AX1443-1
16 x 150 mm rack, holds 60 tubes	AX1444-1
18 x 150 mm rack, holds 40 tubes	AX1446-1
25 x 150 mm rack, holds 24 tubes	AX1447-1

Agilent's Specialty Particle Development and Manufacturing Center

AGILENT SPECIALTY PARTICLES

Agilent partners with pharmaceutical clients in the development and manufacture of polymer particles, activated surfaces and immobilized ligands.

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Specialty Particles for Drug Discovery and Development

Agilent's specialty particles group offers expertise in solid phase peptide and oligonucleotide synthesis.

- Agilent StratoSpheres particles provide a wide range of activities – catalyst and reactant scavenging, oxidizing, reducing and coupling reagents, phosphine-mediated chemistry, and more.

The innovation and value our team provides helps ensure candidates are modified and optimized, leading to seamless pilot and scaled-up production.

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Scavengers and Resins for Solution Phase Synthesis

- Scavenger Resins remove specific undesirable species by filtration or SPE; the target compound remains in solution.
- Agilent expertise includes metal scavengers for removal of palladium, platinum, and other metal residues, and scavengers for nucleophiles and electrophiles, acids and bases, aldehydes and ketones, amines, and more
- Polymer Supported Reagents replace conventional solution phase reagents; any excess or by-product can simply be removed by filtration or SPE. Agilent reagent can be used for many types of reactions including Amidation, oxidation of alcohols to carbonyls and coupling reactions.

We welcome the opportunity to discuss your specific needs and our potential solutions.

APPENDICES

Quick Guide to USP Designations for HPLC Columns

The US Pharmacopeia (USP) is a standard source for many pharmaceutical methods. The USP specifies columns by packing materials rather than by manufacturer. The USP has updated its L1 definitions. Listed below you will see the most recent definitions and columns that apply and can be found in this column selection guide. Rapid Resolution High Throughput (RRHT) columns are now choices in the L1, L7, and L11 categories.

For a complete listing of USP Designations, see *Agilent's 2011-2012 Essential Chromatography and Spectroscopy Catalog*, publication number 5990-6874EN.

USP Designations

USP Method	USP Packing Materials	Column	Particle Size (µm)	Pore Size (Å)
L1	Octadecyl silane chemically bonded to porous silica or ceramic microparticles, 1.5 to 10 µm in diameter, or a monolithic rod	Poroshell 120 EC-C18	2.7	120
		Poroshell 120 SB-C18	2.7	120
		ZORBAX Eclipse Plus C18	1.8, 3.5, 5	95
		ZORBAX Eclipse XDB-C18	1.8, 3.5, 5, 7	80
		ZORBAX StableBond SB-C18	1.8, 3.5, 5, 7	80, 300
		ZORBAX Rx-C18	3.5, 5	80
		ZORBAX Extend-C18	1.8, 3.5, 5, 7	80, 300
		ZORBAX ODS	3.5, 5, 7	70
		ZORBAX ODS classic	5	70
		Pursuit XRs C18	3, 5, 10	100
		Pursuit C18	3, 5, 10	200
		Pursuit C18-A	3, 5, 10	180
		Polaris C18-Ether	3, 5	200
		SepTech ST60 C18	10	60
		SepTech ST150 C18	10	150
L3	Porous silica particles, 5 to 10 µm in diameter, or a monolithic silica rod	ZORBAX SIL	5	70
		ZORBAX Rx-SIL	3.5, 5	80, 300
		Pursuit XRs Si	3, 5, 10	100
		Polaris Si-A	5, 10	180
L7	Octylsilane chemically bonded to totally porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod	Poroshell 120 EC-C18	2.7	120
		ZORBAX Eclipse Plus C8	1.8, 3.5, 5	95
		ZORBAX Eclipse XDB-C8	1.8, 3.5, 5, 7	80
		ZORBAX SB-C8	1.8, 3.5, 5, 7	80, 300
		ZORBAX Rx-C8	1.8, 3.5, 5, 7	80
		ZORBAX C8	5	70
		Pursuit XRs C8	3, 5, 10	100
		Pursuit C8	3, 5, 10	200
		Polaris C8-A	3, 5	180
		Polaris C8-Ether	3, 5	200

(Continued)

USP Designations

USP Method	USP Packing Materials	Column	Particle Size (µm)	Pore Size (Å)
L8	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 3 to 10 µm in diameter	ZORBAX NH2	5	70
		Polaris NH2	5	180
L9	Irregular or spherical, totally porous silica gel having a chemically bonded, strongly acidic cation-exchange coating, 3 to 10 µm in diameter	ZORBAX SCX	5 spherical	300
L10	Nitrile groups chemically bonded to porous silica particles, 3 to 10 µm in diameter	ZORBAX CN	5	70
		ZORBAX SB-CN	3.5, 5	80, 300
		ZORBAX Eclipse XDB-CN	3.5, 5	80
L11	Phenyl groups chemically bonded to porous silica particles, 1.5 to 10 µm in diameter	ZORBAX Eclipse XDB Phenyl	5	70
		ZORBAX Eclipse Plus Phenyl-Hexyl	1.8, 3.5, 5	95
		ZORBAX Phenyl	3.5	80
		Pursuit XRs DiPhenyl	3, 5, 10	100
		Pursuit DiPhenyl	3, 5, 10	200
L13	Trimethylsilane chemically bonded to porous silica particles, 3 to 10 µm in diameter	ZORBAX TMS	5	70
L14	Silica gel having a chemically bonded, strongly basic quaternary ammonium anion-exchange coating, 5 to 10 µm in diameter	ZORBAX SAX	5	70
		IonoSpher A	5	120
L17	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 7 to 11 µm in diameter	Hi-Plex H	8	N/A
L19	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the calcium form, 9 µm in diameter	Hi-Plex Ca	8	N/A
		Hi-Plex Ca (Duo)	8	N/A
L20	Dihydroxypropane groups chemically bonded to porous silica particles, 3 to 10 µm in diameter	LiChrospher Diol	5	N/A

(Continued)

USP Designations

USP Method	USP Packing Materials	Column	Particle Size (µm)	Pore Size (Å)
L21	A rigid spherical styrenedivinylbenzene copolymer, 5 to 10 µm in diameter	PLRP-S	3, 5, 8, 10, 10-15, 15-20, 50	100
		PLRP-S	3, 5, 8, 10, 10-15, 15-20, 50	300
		PLRP-S	5, 8, 10, 30, 50	1000
		PLRP-S	5, 8, 10, 30, 50	4000
		PLgel	3, 5, 10, 20	50, 100, 500, 103, 105, 105, 106, MIXED
L22	A cation-exchange resin made of porous polystyrene gel with sulfonic acid groups, about 10 µm in size	Hi-Plex H	8	N/A
L25	Packing having the capacity to separate compounds with a MW range from 1,000 to 5,000 da (as determined by the polyethylene oxide), applied to neutral, anionic and cationic water-soluble polymers. A polymethacrylate resin base, crosslinked with polyhydroxylated ether (surface contained some residual carboxyl functional gruops) was found suitable	PL aquagel-OH	5, 8	30
L33	Packing having the capacity to separate dextrons by molecular size over a range of 4,000 to 500,000 da. It is spherical, silica-based, and processed to provide pH stability	ZORBAX GF-250	4	150
		Bio SEC-3	3	100, 150, 300
		Bio SEC-5	5	100, 150, 300, 500, 1000, 2000
		ProSEC	5	300
L34	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the lead form, about 9 µm in diameter	Hi-Plex Pb	8	N/A
L35	A zirconium-stabilized spherical silica packing with a hydrophilic (diol-type) molecular monolayer bonded phase having a pore size of 150Å	ZORBAX GF-250	4	150, 300
		ZORBAX GF-450	6	

(Continued)

USP Designations

USP Method	USP Packing Materials	Column	Particle Size (µm)	Pore Size (Å)
L43	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 5 to 10 µm in diameter	Pursuit PFP	3, 5	200
L45	Beta cyclodextrin bonded to porous silica particles, 5 to 10 µm in diameter	ChiraDex Chiral	5	100
L50	Multifunction resin with reversed-phase retention and strong anion-exhange functionalities. The resin consists of ethylvinylbenzene, 55% cross-linked with divinylbenzene copolymer, 3 to 15 µm in diameter, and a surface area of not less than 350 m^2 per g. Substrate is coated with quarternary ammonium functionalized latex particles consisting of styrene cross-linked with divinylbenzene	ZORBAX 300SCX	5	300
L52	Weak cation-exchange resin made of porous silica with sulfopropyl groups, 5 to 10 µm in diameter	IonSpher C	5	120
L53	Weak cation-exchange resin consisting of ethylvinylbenzene, 55% crosslinked with divinylbenzene copolymer, 3 to 15 µm diameter. Substrate is surface grafted with carboxylic acid and/or phosphoric acid functionalized monomers. Capacity not less than 400 µEq/column	Bio SAX	3, 5, 10	300
L56	Propyl silane chemically bonded to totally porous silica particles, 3 to 10 µm in diameter	SB-C3	3, 5	80
L57	A chiral-recognition protein, ovomucoid, chemically bonded to silica particles, about 5 µm in diameter, with a pore size of 120Å	Ultron ES-OVM	5	120
L58	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the sodium form, about 6 to 30 µm in diameter	Hi-Plex Na Hi-Plex Na (Octo)	10 8	N/A N/A
L60	Spherical, porous silica gel, 10 µm in diameter, the surface of which has been covalently modified with alkyl amide groups and endcapped	Bonus-RP Polaris Amide-C18	1.8, 3.5, 5 3, 5	80 180

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