HPLC Columns

Selecting an LC Column

Column Dimensions

Particle Size and Column Length

When choosing a column, the first two parameters that should be considered are the particle diameter and column length. These two parameters are the major contributors to separation efficiency (N), also known as theoretical plates. The number of theoretical plates is directly proportional to the length of the column over the diameter of the particle.

Equation 1 The resolution equation defines variables affecting separations.

$$R = 1/4 \sqrt{N} \times (k'/k'+1) \times (\alpha - 1/\alpha)$$

Efficiency — Retention capacity — Selectivity

Particle Diameter

Particle diameter (dp), is commonly expressed in micrometers (µm), and has an inverse relationship to the efficiency of the separation. As the particle diameter decreases, the efficiency of the separation increases proportionately. If all other parameters remain equal, a 3 µm particle diameter offers an approximate 60% increase in efficiency over a 5 µm particle, and a 1.9 µm particle diameter offers an additional 60% over a 3 µm particle. System backpressure also increases proportionally as particle size decreases. Selecting the proper particle diameter is a way of controlling separation efficiency, and even analysis speed, but is limited by the pressure capabilities of the system. Often, particle diameters are determined by instrumentation. Table I is a guideline for selecting the optimal particle size, based upon pressure capability for common mobile phases.

Table I Emperically determined maximum pressures exhibited for acetonitrile and methanol gradients for various particle sizes and flow rates

Bold blue numbers represent optimal linear velocity for the given particle size and ID. For longer column lengths, the approximate pressure corresponds to the increase in column length. A 2-fold increase in column length yields a 2-fold increase in back pressure.

Flow rate (mL/min.)	Pressure (psi) Acetonitrile @ 25°C			Flow rate (mL/min.)	Pressure (psi) Methanol @ 25°C		
	1.9µm	2.2µm	3µm		1.9µm	2.2µm	3µm
0.2	2436	1755	1045	0.2	3198	2304	1371
0.3	3655	2633	**1567**	0.3	4797	3455	**2057**
0.4	4873	3510	2090	0.4	6395	4607	2743
0.5	6091	**4388**	2612	0.5	7994	**5759**	3429
0.55	**6700**	4826	2873	0.55	**8794**	6335	3771
0.6	7309	5265	3135	0.6	9593	6911	4114
0.7	8527	6143	3657	0.7	11192	8062	4800
0.8	9745	7020	4180	0.8	12791	9214	5486
0.9	10964	7898	4702	0.9	14390	10366	6171
1	12182	8775	5224	1	15989	11518	6857

Data are for 2.1 x 50 mm columns using a gradient of 5% B to 95% B (A: water, B: organic solvent). See Table II for optimal flow rates for alternate column internal diameters.

When choosing a particle diameter, it is not recommended to operate significantly below the optimal linear velocity, as losses in efficiency can be observed due to axial dispersion. As a quick estimate of particle diameter usability, check the optimal linear velocity for the organic solvent used and ensure maximum pressures observed are within the pressure specifications of your instrument. Please note that these are maximum pressures observed during gradient analyses. Isocratic mobile phases of lesser viscosity will operate with less back pressure.

Column Length

Column length (L) directly relates to efficiency. Increasing column length increases efficiency. It is important to note that column length is not an ideal way to increase resolution. Doubling the column length yields only a 1.4x gain in resolution (efficiency is a square root term in the resolution equation), while doubling both analysis time and system backpressure. Shorter column lengths are suitable for fast gradients and higher sample throughput, while longer column lengths are more suitable for higher peak capacity and shallow gradients.

Column Internal Diameter

Column internal diameter (ID) is the inner diameter of the column hardware holding the packing material, and is commonly expressed in millimeters (mm). Column ID is ultimately related to efficiency and flow rate through the van Deemter equation. This chromatographic concept relates column efficiency (often called band broadening) to linear velocity. Linear velocity is the distance mobile phase travels per unit time, while flow rate is the volume of mobile phase per unit time. A specific linear velocity has a flow rate that is dependent upon the internal diameter of the column. As column ID is lowered, a lower flow rate is needed to maintain the same linear velocity. Flow rate is the volume of mobile phase needed to create the desired liner velocity. It is important to note that as particle size decreases, optimal linear velocity increases. Columns with smaller particle sizes, namely 1.9 and 2.2 µm, are capable of running much higher flow rates and therefore creating higher sample throughput. Table II (next page) can be used to find the optimal flow rate, as it relates to particle size and internal diameter, and is a good starting point for method development.

Table II Optimal flow rates for various particle diameters and column internal diameters.

Column ID (mm)	Optimal flow rate (mL/min.)			
	1.9 µm dp	2.2 µm dp	3µm dp	5 µm dp
4.6			1.50	1.00
3.2			0.73	0.50
3.0	1.12	1.00	0.65	0.40
2.1	0.55	0.47	0.31	0.20
1.0			0.07	0.05

System volume, or extra column volume, also affects efficiency. As extra column volume increases, lower efficiency is experienced as band broadening increases. Typically, column IDs less than 3.0 mm, considered narrow bore columns, require systems with minimized extra column volume. Table III defines the classification of columns according to internal diameter or bore. Another contributor to overall system volume and column ID choice is the system delay volume. Delay volume is the volume contained between the pumps and the column, often including the mixing chamber and injection valve. Delay volume is especially significant during gradient analysis. Narrow bore columns often require lower flow rates, and these lower flow rates will not sweep the delay volume in high volume systems quickly. This extends analysis time and creates an increased gradient lag time. For fast gradient analysis and LC/MS, narrow bore columns and systems with low extra column volume are recommended.

Table III Common classifications for LC columns by internal diameter.

Classification	Internal Diameter
Capillary	<1.0 mm ID
Micro bore	1.0 mm ID
Narrow bore	2.1-3.0 mm ID
Standard bore	3.2-4.6 mm ID
Semi-prep	10 to 21.2 mm ID
Prep	30 to 50 mm ID

Physical Characteristics

Silica Type

The physical characteristics of the support material can be selected to control retention and peak shape. The base silica, commonly porous spherical particles, used in the manufacturing of the column can first be selected by type, namely Type A, Type B, or Base Deactivated. Type B silica is typically higher in purity and provides limited silanol activity. When analyzing basic compounds, especially without the use of mobile phase modifiers, Type B silica is recommended for more symmetric peak shape. Type A and Base Deactivated silica are recommended for acidic, neutral, and slightly basic compounds.

Another criterion for choosing a column line is the porosity of the silica. The pore size, or pore diameter, which is commonly expressed in Å, is the average diameter of the silica pores. This relates inversely to available surface area. Smaller pore volumes create a larger surface area in a given particle and, therefore, can be used to control the amount of stationary phase bonded to the particle.

The carbon load, or % carbon in the packing material, is the measure of the amount, or load, of stationary phase. Carbon load directly affects retention. Higher carbon loads typically result in higher retention characteristics. Figure 1 illustrates the relative retention capacities of commercially available columns for hydrophobic compounds. Allure® columns were designed for maximum retention of small molecules by utilizing high carbon load, surface area, and ligand density. In contrast, Viva columns, considered wide pore, have a large pore diameter and are used for the analysis of larger molecules as commonly seen in biological separations. Table IV summarizes the physical characteristics and recommended uses for Restek column lines.

Silica columns commonly have a temperature limit of 80 °C. Increased temperature can be used to decrease mobile phase viscosity and, therefore, lower the back pressure of a

Table IV Physical characteristics and recommended uses for Restek columns, based on silica lines.

Column Line	Pore Size (Å)	Surface Area (m^2/g)	Carbon Load Range* (%)	Usage
Allure	60	450	12–27	Very high retention (highest retention available) High purity 5 µm particle size only
Ultra II	100	300	11–19	High retention High purity Full range particle size - 1.9, 2.2, 3 and 5 µm for UHPLC and HPLC
Ultra	100	300	2–20	High retention High purity 3 and 5 µm particle size only
Pinnacle II	110	180	2–13	Moderate retention Acidic Type A (not for RP analyses of bases) 3 and 5 µm particle size only
Pinnacle DB	140	150	4–11	Moderate retention Base deactivated silica 1.9, 3 and 5 µm particle sizes
Viva	300	100	3.5–9	Low retention Wide-pore silica for biological separations

*Ranges are based on phases available for each silica line. See column product listings for more specific information.

system. It is important to note that while altering the temperature of a separation can lower back pressure, it also lowers retention and can change selectivity. pH can also be used to control the selectivity and retention of ionizable compounds. Acid-base equilibrium can be employed to directly affect the retention characteristics of acidic and basic compounds, mainly in reversed phase chromatography (RPC). The pH limit of most silica columns is between 2 and 8.

Stationary Phases

Stationary phase, or the specific chemical ligand bonded to the silica support, plays a primary role in resolving compounds. Through selectivity, the major contributor to resolution, a stationary phase can control the retention characteristics of the solutes. Identifying the appropriate stationary phase can greatly ease method development and create less need for mobile phase additives. The decision tree in Figure 2 (next page) can help analysts select appropriate stationary phases, based upon analyte solubility and polarity. Liquid chromatography employs specific modes of separation which are denoted by the polarity distinction between the stationary and mobile phases; the most common are reversed phase, normal phase and HILIC.

Reversed phase chromatography (RPC) consists of a nonpolar stationary phase and a polar mobile phase. RPC is the most commonly used mode and works well for the analysis of water-soluble hydrophobic compounds. The most common types of columns used in RPC are alkyls (most often a C18, also known as octadecyl or ODS). End-capping is often employed in reversed phase columns. End-capping refers to the dense bonding or modification of the silica surface to further limit silanol activity. This acts to provide better peak symmetry, especially for basic compounds. Alternate ligands and bonding chemistries can be applied to RPC columns to incorporate phenyl, cyano, amino, and other polar groups into the stationary phase, providing alternate selectivity to a C18.

Normal phase chromatography (NPC), named because it was the first type of liquid chromatography, not for being more common, employs a polar stationary phase and a nonpolar mobile phase. NPC is suited for the analysis of fat soluble compounds and can also provide more selectivity for positional isomers than is commonly observed in RPC. Bare silica columns are most commonly used for NPC. Other phases for NPC include cyano and amino.

Hydrophilic Interaction Chromatography (HILIC) employs a polar stationary phase and a less polar mobile phase. HILIC differentiates itself from RPC and NPC as it uses traditional NPC stationary phases and RPC mobile phases. HILIC is recommended for the analysis of very polar compounds, often having negative log P values, and for analysis by LC/MS. Bare silica, cyano and amino columns are also commonly used in HILIC mode. Some stationary phases, like IBD, PFP propyl and cyano, incorporate both nonpolar and polar functionality and can be used in multiple or mixed-mode separation mechanisms.

Restek stationary phases and recommended uses are presented in Figure 3 (page 149). For additional help selecting a column, contact Restek at **support@restek.com** or call your local Restek representative.

Figure 1 Relative retention capabilities of commercially available columns for hydrophobic compounds.

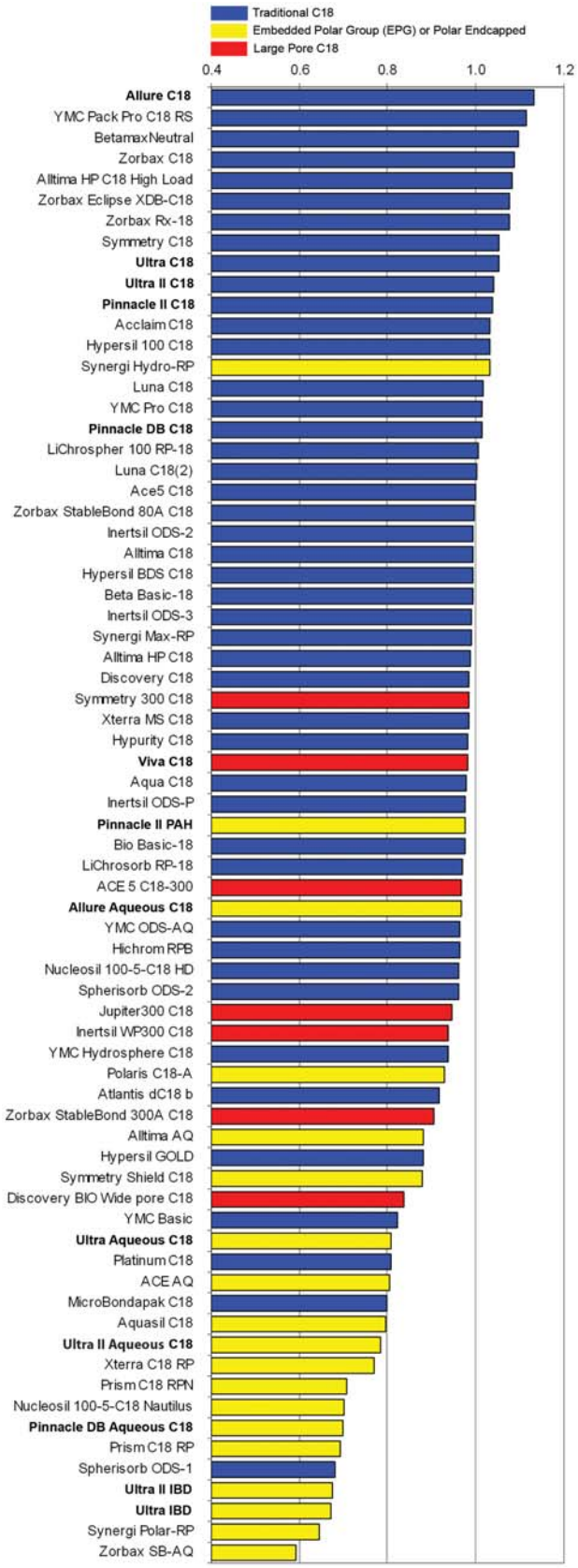
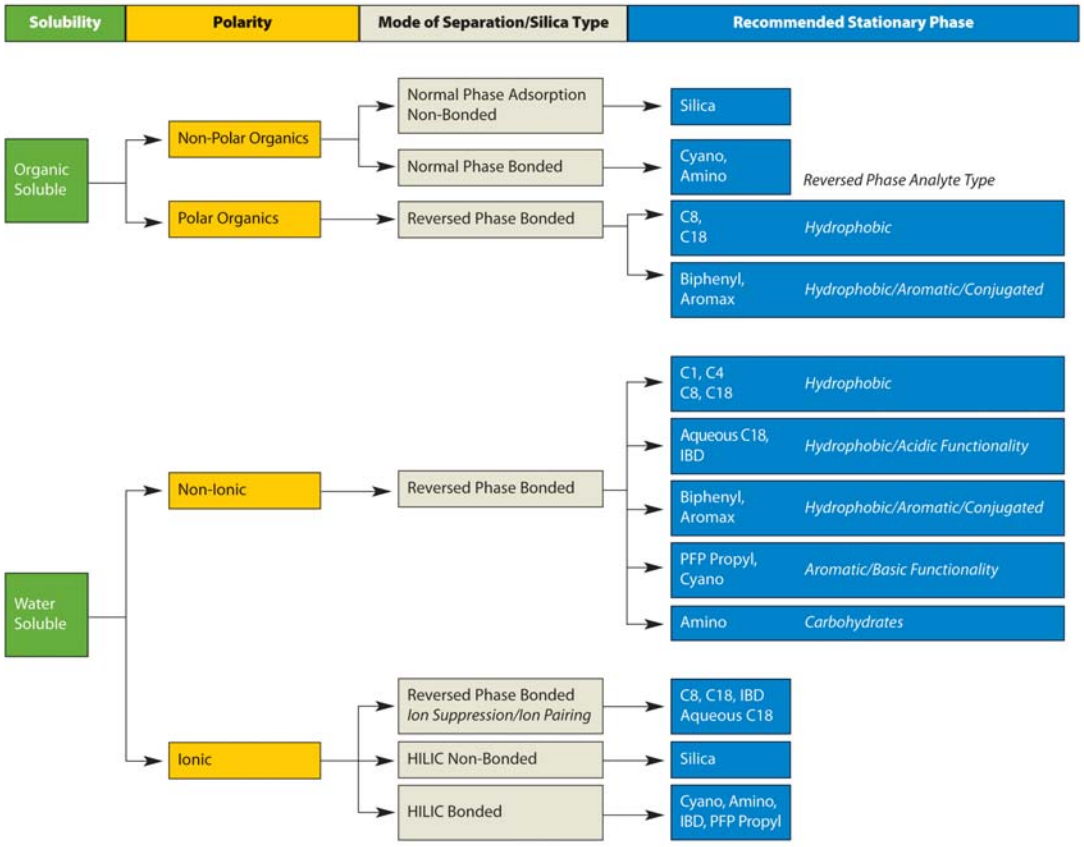


Figure 2 Decision tree for LC mode of separation and column selection.



Solvent Miscibility and Solubility

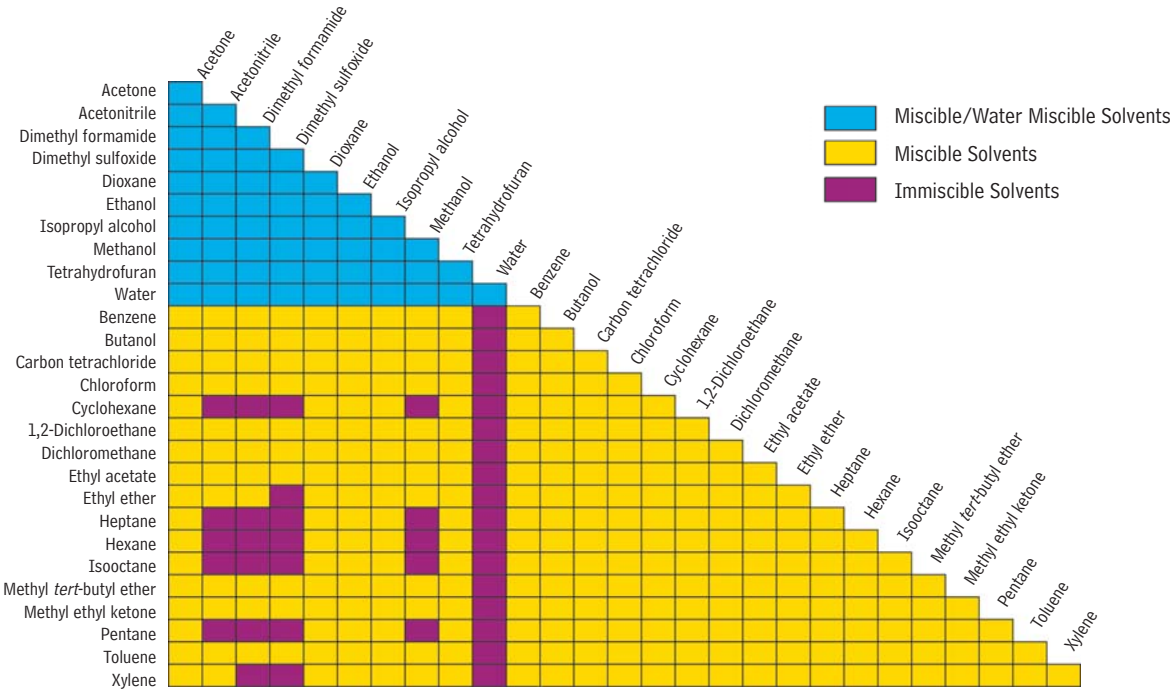
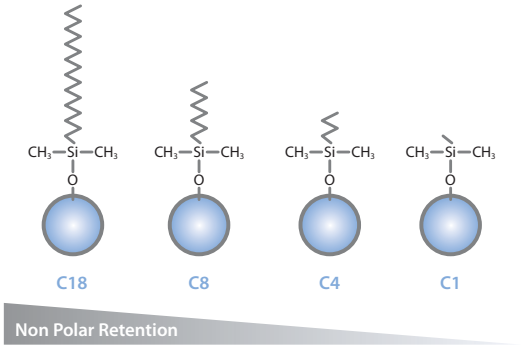


Figure 3 Restek stationary phases and recommended uses.

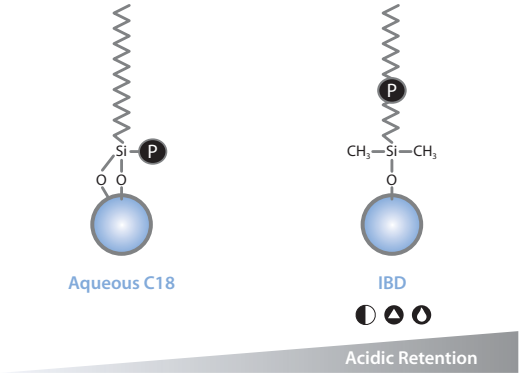
Alkyl Phases

- General purpose reversed phase columns rely on dispersive interaction to separate molecules.
- Elution order is hydrophilic to hydrophobic; increased chain length increases retention.



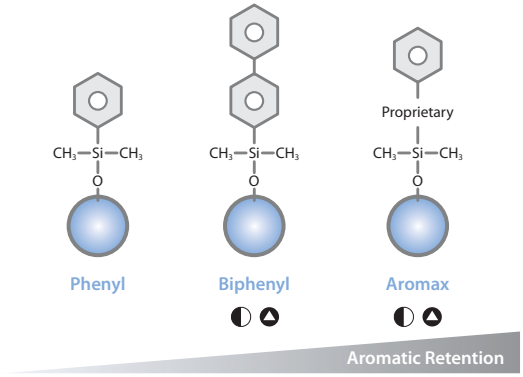
Modified Alkyl Phases

- Alkyl phases with modified bonding chemistry to increase polarity.
- Columns are compatible with 100% aqueous mobile phases.
- Rely on dispersive interaction with additional hydrogen bonding.
- Aqueous columns show balanced retention and are a great starting point for method development.
- Polar embedded IBD columns provide good peak symmetry for bases and offer orthogonal selectivity to a C18.
- IBD phases are capable of mixed mode mechanisms and can operate in both reversed phase and HILIC modes.



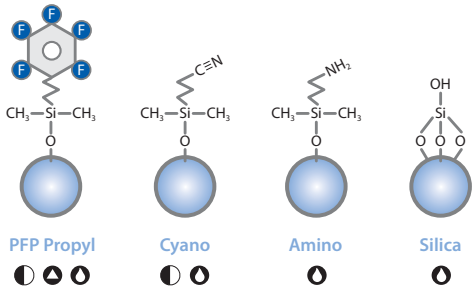
Phenyl Phases

- Phenyl columns rely on dispersive and pi-pi (π-π) interactions.
- Enhanced retention and selectivity are seen with aromatic, conjugated molecules, and compounds containing electron withdrawing ring substituents.
- Biphenyl and Aromax columns show more interaction and greater aromatic retention and selectivity, relative to conventional phenyl and phenyl-hexyl phases.



Polar Phases

- Polar phases rely on aromatic and dipole interactions.
- Cyano and PFP Propyl phases show increased retention for aromatic compounds and charged bases.
- PFP Propyl phases are commonly used for increased retention of ionic and basic compounds.
- Amino columns are commonly used for the analysis of saccharides.
- Silica columns are used for normal phase and HILIC separations.



Legend

orthogonal selectivity to a C18 | good choice for LC/MS | HILIC compatible

HPLC Pump Pressure Conversion Table

Pressure	psi	atm	kg/cm²	torr	kPa	bar	inches Hg
1 psi =	1	0.068	0.0703	51.713	6.8948	0.06895	2.0359
1 atm =	14.696	1	1.0332	760	101.32	1.0133	29.921
1 kg/cm² =	14.223	0.967	1	735.5	98.06	0.9806	28.958
1 torr =	0.0193	0.00132	0.00136	1	0.1330	0.00133	0.0394
1 kPa =	0.1450	0.00987	0.0102	7.52	1	0.0100	0.2962
1 bar =	14.5038	0.9869	1.0197	751.88	100	1	29.5300
1 in Hg =	0.49612	0.0334	0.0345	25.400	3.376	0.03376	1

Multiply units in the left-most column by the conversion factors listed in the columns to the right.
e.g., 10 psi x 0.068 = 0.68atm
10 bar x 29.5300 = 295.300 inches Hg

Physical Characteristics

Restek HPLC Column	End Cap?	Pore Size (Å)	Carbon load (%)	Applications
Ultra II C18	Y	100	19	Ideal for anilines, barbiturates, carbonyls, fat-soluble vitamins, fatty acids, glycerides, phthalates, PTH amino acids, steroids, other acids.
Ultra II Aqueous C18	N	100	15	Ideal for analyses that require >90% water in the mobile phase. Excellent for highly water soluble or poorly organic soluble compounds. Excellent for water-soluble vitamins and organic acids.
Ultra II C8	Y	100	12	Selectivity and peak shape similar to Ultra C18, but less hydrophobic retention.
Ultra II Biphenyl	Y	100	15	Excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.
Ultra II Aromax	Y	100	17	Alternative to Biphenyl when more retention is required.
Ultra II IBD	N	100	12	A polar group assists in deactivating surface silanols and contributes to unique separation selectivities for acids, bases, zwitterions, and other polar compounds.
Ultra II PFP Propyl	Y	100	11	Highly retentive for basic analytes. An excellent phase for separating nucleosides, nucleotides, purines, pyrimidines, and halogenated compounds.
Ultra II Silica	N	100	0	Ideal for normal phase applications.
Ultra II Carbamate	N	100	15	Rapid analysis of carbamates.
Ultra II Quat	Y	100	12	Proprietary phase for the analysis of paraquat and diquat and other quaternary amines.
Pinnacle DB C18	Y	140	11	Hydrophobic C18 phase suitable for analyses of a wide range of compounds, from acidic through slightly basic.
Pinnacle DB Aqueous C18	—	140	6	Ideal for applications that require highly aqueous mobile phases, such as organic acids and water-soluble vitamins.
Pinnacle DB C8	Y	140	6	Applications similar to Pinnacle DB C18, but with less hydrophobic retention. Less retention can be useful for shortening analysis time, if resolution is adequate.
Pinnacle DB PFP Propyl	Y	140	6	Exhibits excellent peak shapes for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.
Pinnacle DB Biphenyl	Y	140	8	Excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.
Pinnacle DB Cyano	Y	140	4	Suitable for a wide range of compounds, from acidic through slightly basic. Also useful for confirmation of analyses on a C18 or C8 column. Can be used in normal phase or reversed phase mode of separation.
Pinnacle DB Phenyl	Y	140	5.3	Suitable for polar aromatic compounds, fatty acids, purines and pyrimidines.
Pinnacle DB Silica	—	140	—	Normal phase mode of separation.
Pinnacle DB IBD	Y	140	—	A polar group assists in deactivating surface silanols and contributes to unique separation selectivities for acids, bases, zwitterions, and other polar compounds.
Pinnacle DB PAH	Y	140	—	Ideal for polycyclic aromatic hydrocarbons.
Pinnacle II C18	Y	110	13	Superior general purpose C18 for non-basic analytes.
Pinnacle II PAH	Y	110	—	Maximum resolution of polycyclic aromatic hydrocarbons.
Pinnacle II C8	Y	110	7	Superior general purpose C8 for non-basic analytes.
Pinnacle II Cyano	Y	110	4	Superior general purpose cyano for weakly-basic analytes. Used in either normal or reversed phase analyses.
Pinnacle II Phenyl	Y	110	6	Superior general purpose phenyl for neutral analytes.
Pinnacle II Amino	N	110	2	Excellent general purpose amino phase. Excellent choice for carbohydrate analysis.
Pinnacle II Biphenyl	Y	110	—	Multiple aromatic ring structures; excellent for explosives.
Pinnacle II Silica	—	110	—	Ideal for polar analytes.
Allure C18	Y	60	27	Ideal for MS and light-scattering detection of neutral to slightly polar solutes. Separates basic compounds, showing good deactivation; excellent for explosives or steroids.
Allure Aqueous C18	N	60	—	Ideal for analyses that require >90% water in the mobile phase. Excellent for highly water soluble or poorly organic soluble compounds. Excellent for water-soluble vitamins and organic acids. More retention than Ultra Aqueous columns.
Allure AK	Y	60	—	Ideal for the analysis of aldehydes and ketones as DNPH derivatives.
Allure Basix	Y	60	12	Ideal for LC/MS of basic solutes. Excellent for basic pharmaceuticals or other amine-containing compounds.
Allure PFP Propyl	Y	60	17	Ideal for MS, ELSD, or NPD detection of nucleosides, nucleotides, purines, pyrimidines, or halogenated compounds.
Allure Organic Acids	N	60	—	Excellent resolution of challenging organic acids.

pH ranges and temperature limits: see product listings on pages listed here.
Column lifetime will be shorter when operating at pH and/or temperature extremes.

Chromatographic Properties	Similar Phases	USP Code	Page #
A very retentive, high-purity phase that exhibits excellent peak shape for a wide range of compounds. Recommended as a general purpose reversed phase column.	Discovery C18, Symmetry C18, Hypersil Gold C18, Luna C18, Zorbax C18, Kromasil C18, LiChrospher RP-18, Inertsil ODS-2, Develosil C18	L1	157
Highly retentive and selective for reversed phase separations of polar analytes. Highly base deactivated. Compatible with highly aqueous (up to 100%) mobile phases.	AQUA C18, Aquasil C18, Hypersil Gold AQ, YMC ODS-Aq	L1	159
Very retentive, high-purity, base-deactivated reversed phase packing that exhibits excellent peak shape for a wide range of compounds.	Luna C8, Symmetry C8, Hypersil Gold C8	L7	158
A unique reversed phase material that exhibits both increased retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases.	Unique	L11	160
A unique reversed phase material that exhibits superior retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases.	Unique	L11	161
One of a group of intrinsically base-deactivated (IBD) phases, with a polar group within, or intrinsic to, the alkyl bonded phase. Provides unique selectivity and high level of base deactivation while reducing or eliminating the need for mobile phase additives.	SymmetryShield, Discovery ABZ & ABZ+, Prism	L68	162
A pentafluorophenyl with a propyl spacer.	Fluophase PFP, Discovery HS F5	L43	163
High purity, high surface area.	—	L3	164
Proprietary stationary phase can process up to twice as many samples per hour, compared to a conventional C18 phase.	Unique	—	165
High purity silica.	Unique	—	165
Highly base-deactivated spherical silica manufactured by Restek. Monomeric C18 bonding.	Hypersil BDS C18, Zorbax Eclipse XDB-C18, Spherisorb ODS	L1	166
Highly selective phase for polar analytes. Compatible with highly aqueous (up to 100%) mobile phases. Silica manufactured by Restek.	Aquasil C18, AQUA C18, Hypersil Gold AQ, YMC ODS-Aq	L1	171
Highly base-deactivated spherical silica manufactured by Restek. Monomeric C8 bonding. Similar to Pinnacle DB C18, but the shorter alkyl chain provides less hydrophobic retention.	Hypersil BDS C8, Spherisorb C8	L7	167
Highly base-deactivated spherical silica manufactured by Restek. Unique pentafluorophenyl phase with a propyl spacer.	Discovery HS F5	L43	169
Highly base-deactivated spherical silica manufactured by Restek. Unique reversed phase material that displays both increased retention and selectivity for aromatic and/or unsaturated compounds when compared to conventional alkyl and phenyl phases.	Unique	L11	170
Highly base-deactivated spherical silica manufactured by Restek. Cyano bonding.	Hypersil BDS Cyano, Spherisorb Cyano, Zorbax Eclipse XDB-CN	L10	168
Highly base-deactivated spherical silica manufactured by Restek. Phenyl bonding.	Hypersil BDS Phenyl, Spherisorb Phenyl Zorbax Eclipse XDB-Phenyl	L11	168
Highly base-deactivated spherical silica manufactured by Restek.	—	L3	172
One of a group of intrinsically base-deactivated (IBD) phases, with a polar group within, or intrinsic to, the alkyl bonded phase. Provides unique selectivity and high level of base deactivation while reducing or eliminating the need for mobile phase additives.	Unique	L68	171
Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons.	Unique	—	172
Intermediate carbon load and surface area, suitable for a wide range of neutral to acidic compounds. Silica manufactured by Restek.	Hypersil ODS	L1	173
Proprietary stationary phase; resolves 16 PAHs in US EPA Method 610. Silica manufactured by Restek.	Unique	—	174
Provides shorter retention times for hydrophobic compounds than C18. Silica manufactured by Restek.	Hypersil C8	L7	174
More rugged than bare silica for normal phase analyses. Silica manufactured by Restek.	Hypersil CPS	L10	175
Offers unique selectivity versus traditional alkyl chain phases, especially for aromatic compounds. Silica manufactured by Restek.	Hypersil Phenyl	L11	175
Silica manufactured by Restek.	Hypersil APS 2 Amino, Spherisorb Amino	L8	176
Silica manufactured by Restek. Unique biphenyl phase.	Unique	L11	176
Superior value phase for normal phase separation of polar analytes. Lower retention than Ultra C18. Silica manufactured by Restek.	Hypersil Silica	L3	177
Most retentive phase for hydrophobic and slightly polar analytes. Mobile phase containing higher percentage of organic modifier contributes to higher sensitivity in ESI-based LC/MS.	Ultracarb C18, BetaMax Neutral, Discovery C18	L1	178
Highly retentive and selective for reversed phase separations of polar analytes. Highly base deactivated. Compatible with highly aqueous (up to 100%) mobile phases.	Unique	L1	179
Highly retentive, highly selective phase, developed specifically for the analysis of aldehydes and ketones as DNPH derivatives.	Unique	—	181
Highly retentive phase for analytes containing amino functionality.	BetaMax Base, Maxsil CN	L10	178
A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. Excellent for beta-blockers, halogenated compounds, nucleosides, nucleotides, pyridines, pyrimidines, tricyclic antidepressants.	Discovery HS F5	L43	179
Single 30cm column performs equally to two C18 columns in series. (AOAC Method 986.13)	Unique	—	180

Continued on next page. . .

Physical Characteristics

Restek HPLC Column	End Cap?	Pore Size (Å)	Carbon load (%)	Applications
Allure Biphenyl	Y	60	23	Multiple ring structure; excellent for aromatic and unsaturated compounds. Increased retention over traditional phenyl phases.
Allure Silica	—	60	—	Highly retentive phase for normal phase separation.
Ultra C18	Y	100	20	Ideal for anilines, barbiturates, carbonyls, fat-soluble vitamins, fatty acids, glycerides, phthalates, PTH amino acids, steroids, other acids.
Ultra Aqueous C18	N	100	15	Ideal for analyses that require >90% water in the mobile phase. Excellent for highly water soluble or poorly organic soluble compounds. Excellent for water-soluble vitamins and organic acids.
Ultra IBD	N	100	12	A polar group assists in deactivating surface silanols and contributes to unique separation selectivities for acids, bases, zwitterions, and other polar compounds.
Ultra C8	Y	100	12	Selectivity and peak shape similar to Ultra C18, but less hydrophobic retention.
Ultra C4	Y	100	9	Ideal for peptides and small proteins.
Ultra C1	—	100	5	Alternative selectivity to Ultra C18 or C8 columns, especially for polar analytes. Shortest chain alkyl phase available for reversed phase separations.
Ultra Cyano	Y	100	8	Excellent for basic pharmaceuticals, steroids (normal or reversed phase conditions), or other basic compounds.
Ultra Phenyl	Y	100	10	Ideal for fatty acids, polycyclic aromatic hydrocarbons, purines and pyrimidines, and polar aromatics.
Ultra Amino	N	100	2	Superior general purpose amino phase. Ideal for carbohydrates.
Ultra PFP	Y	100	7	Ideal for taxol and precursors, or halogenated compounds, amines, esters, or ketones.
Ultra Silica	—	100	—	Ideal for normal phase applications.
Ultra Carbamate	—	100	—	Rapid analysis of carbamates.
Ultra Quat	—	100	—	Proprietary phase for the analysis of paraquat and diquat and other quaternary amines.
Viva Wide Pore C18	Y	300	9	Proteins and other higher molecular weight compounds.
Viva Wide Pore C8	Y	300	5	Proteins and other higher molecular weight compounds. Less retentive than C18 phase.
Viva Wide Pore C4	Y	300	3.5	Proteins and other higher molecular weight compounds. Less retentive than C18 and C8 phases.
Viva Wide Pore Biphenyl	Y	300	6.7	Exhibits excellent peak shape for a wide range of compounds; ideal for large molecule and biomolecule assays.
Viva Wide Pore PFP Propyl	Y	300	5	Exhibits excellent peak shape for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.
Viva Wide Pore Silica	—	300	—	Normal phase applications for highly retained high molecular weight compounds.

pH ranges and temperature limits: see product listings on pages listed here.
Column lifetime will be shorter when operating at pH and/or temperature extremes.

tech tip

Managing High Backpressure

High backpressure is one of the most common problems encountered in HPLC analyses. Normal column backpressure is observed after a new column has been installed and equilibrated with mobile phase. Unfortunately, this pressure often will increase as the column is used because particles collect on the column inlet frit. These particles can be sample impurities, mobile phase contaminants, or materials from the injector or autosampler rotor seal.

In addition to increasing backpressure, particles on the frit can cause split peaks, peak tailing, and, eventually, over-pressure shut-down. In some circumstances, these problems can be corrected by back-flushing the column. However, in many cases the result is an unusable column.

To minimize backpressure problems, all samples and mobile phase solvents must be filtered before use, and rotor seals should be changed on a routine basis. Along with these preventive measures, it is advisable to use precolumn filters such as the Trident guard column protection system, pages 196-198. Particles build up on the inexpensive, replaceable frit in the filter, instead of on the permanent frit at the column inlet.

Chromatographic Properties	Similar Phases	USP Code	Page #
High purity, highly retentive phase for aromatic and unsaturated compounds.	Unique	L11	180
High purity, highly retentive phase for normal phase separation of polar analytes. Very high surface area.	Maxsil Si	L3	181
A very retentive, high-purity phase that exhibits excellent peak shape for a wide range of compounds. Recommended as a general purpose reversed phase column.	Discovery C18, Symmetry C18, Hypersil Gold C18, Luna C18, Zorbax C18, Kromasil C18, LiChrospher RP-18, Inertsil ODS-2, Develosil C18	L1	182
Highly retentive and selective for reversed phase separations of polar analytes. Highly base deactivated. Compatible with highly aqueous (up to 100%) mobile phases.	AQUA C18, Aquasil C18, Hypersil Gold AQ, YMC ODS-Aq	L1	183
One of a group of intrinsically base-deactivated (IBD) phases, with a polar group within, or intrinsic to, the alkyl bonded phase. Provides unique selectivity and high level of base deactivation while reducing or eliminating the need for mobile phase additives.	SymmetryShield, Discovery ABZ & ABZ+, Prism	L68	184
Very retentive, high-purity, base-deactivated reversed phase packing that exhibits excellent peak shape for a wide range of compounds.	Luna C8, Symmetry C8, Hypersil Gold C8	L7	183
Exceptionally stable C4 packing, with high bonding coverage and silanol base-deactivation. Exhibits shorter retention than C18 or C8 phases.	Supelcosil Butyl (C4), Delta-Pak C4	L26	184
Exceptionally stable C1 packing resists hydrolysis, even under acidic mobile phase conditions. Least retentive reversed phase hydrocarbon packing.	Spherisorb C1	L13	185
High-purity cyano phase with reduced silanol activity. Often a better choice than C18 for basic pharmaceuticals. Cyano is the most stable bonded phase for normal phase mode.	Platinum CN, Develosil Cyano, Luna CN, Hypersil Gold CN	L10	185
High-purity, highly retentive, base-deactivated phase with alternate selectivity to hydrocarbon phases, especially for aromatic analytes.	Platinum Phenyl, Supelcosil Phenyl, Betasil Phenyl	L11	186
Recommended for normal phase analyses of mono- and disaccharides and other similar compounds. Can also serve as a weak anion exchanger, with aqueous buffers.	Platinum Amino, Develosil NH2	L8	186
A pentafluorophenyl phase. Unique selectivity by interaction with functional groups of organohalogens or other basic analytes.	Fluophase PFP, Fluosep-RP Phenyl, Curosil PFP	L43	187
High purity, high surface area.	—	L3	188
Proprietary stationary phase can process up to twice as many samples per hour, compared to a conventional C18 phase.	Unique	—	188
High purity silica.	Unique	—	189
Silica manufactured by Restek.	BioBasic 18, Symmetry 300 C18, Jupiter 300 C18, Zorbax 300 OSB C18, Synchropak C18, 208 TP C18	L1	190
Silica manufactured by Restek.	BioBasic 8, Zorbax 300 OSB C8, Synchropak C8, 208 TP C8	L7	191
Silica manufactured by Restek.	BioBasic 4, Symmetry 300 C4, Jupiter 300 C4, Synchropak C4, 208 TP C4	L26	191
Silica manufactured by Restek.	Unique	L11	192
Silica manufactured by Restek.	Unique	L43	192
Silica manufactured by Restek.	—	L3	193

US Pharmacopeia Cross Reference

L1	Octadecyl silane chemically bonded to porous silica or ceramic microparticles, 1.7 to 10µm in diameter, or a monolithic rod. *Ultra II C18 (p. 157), Ultra II Aqueous C18 (p. 159), Pinnacle DB C18 (p. 166), Pinnacle DB Aqueous C18 (p. 171), Pinnacle II C18 (p. 173), Allure C18 (p. 178), Allure Aqueous C18 (p. 179), Ultra C18 (p. 182), Ultra Aqueous C18 (p. 183), Viva C18 (p. 190)*
L3	Porous silica particles, 5 to 10µm in diameter. *Ultra II Silica (p. 164), Pinnacle DB Silica (p. 172), Pinnacle II Silica (p. 177), Allure Silica (p. 181), Ultra Silica (p. 188), Viva Silica (p. 193)*
L7	Octylsilane chemically bonded to totally porous silica particles, 1.7 to 10µm in diameter. *Ultra II C8 (p. 158), Pinnacle DB C8 (p. 167), Pinnacle II C8 (p. 174), Ultra C8 (p. 183), Viva C8 (p. 191)*
L8	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 3 to 10µm in diameter. *Pinnacle II Amino (p. 176), Ultra Amino (p. 186)*
L10	Nitrile groups chemically bonded to porous silica particles, 3 to 10µm in diameter. *Pinnacle DB Cyano (p. 168), Pinnacle II Cyano (p. 175), Allure Basix (p. 178), Ultra Cyano (p. 185)*
L11	Phenyl groups chemically bonded to porous silica particles, 1.7 to 10µm in diameter. *Ultra II Aromax (p. 161), Ultra II Biphenyl (p. 160), Pinnacle DB Phenyl (p. 168), Pinnacle DB Biphenyl (p. 170), Pinnacle II Phenyl (p. 175), Pinnacle II Biphenyl (p. 176), Allure Biphenyl (p. 180), Ultra Phenyl (p. 186), Viva Biphenyl (p. 192)*
L13	Trimethylsilane chemically bonded to porous silica particles, 3 to 10µm in diameter. *Ultra C1 (p. 185)*
L26	Butyl silane chemically bonded to totally porous silica particles, 3 to 10µm in diameter. *Ultra C4 (p.184), Viva C4 (p.191)*
L43	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 5 to 10µm in diameter. *Ultra II PFP Propyl (p. 163), Pinnacle DB PFP Propyl (p. 169), Allure PFP Propyl (p. 179), Ultra PFP (p. 187), Viva PFP Propyl (p. 192)*
L68	Spherical, porous silica, 100µm or less in diameter, the surface of which has been covalently modified with alkyl amide groups and not end capped. *Ultra II IBD (p. 162), Pinnacle DB IBD (p. 171), Ultra IBD (p. 184)*

RESTEK USLC™

Ultra Selective Liquid Chromatography™

USLC™ is the directed application of selectivity—the most influential factor affecting resolution—to optimize separations and improve method performance. Restek has extensively studied reversed phase selectivity to provide practicing chromatographers with the most effective and widest range of USLC™ stationary phase chemistries available.

Selectivity Drives Separations

By understanding and controlling selectivity through USLC™, chromatographers have the best opportunity for fast, effective analyte resolution.

One of the most significant challenges in method development is finding the proper stationary and mobile phase chemistry for a particular separation. As sample complexity increases, achieving adequate resolution between matrix components and target analytes becomes more difficult. Despite recent advancements in column format, such as sub-2 micron packings and pellicular particles, resolution can still be difficult to obtain because, while these formats can increase chromatographic efficiency and analysis speed, they do not significantly influence resolution. Selectivity, as shown in Equation 1, is the single most powerful factor affecting resolution, and it is largely dependent upon stationary phase composition.

Real Diversity in Phase Chemistry

Restek columns offer the widest range of selectivities available on a single column line. More choices mean optimized separations and more robust methods.

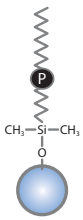
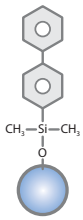
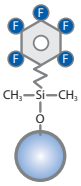
While numerous bonded phases are available for reversed phase chromatography, many are similar and offer only moderate changes in retention (e.g. C8 and C18), rather than significant differences in selectivity. Method development is less laborious and time-consuming when using a full range of column selectivities, including orthogonal phase chemistries like polar embedded, phenyl, and fluorophenyl columns. Restek has led the development of unique USLC™ phases across these phase classes in order to provide chromatographers with a more effective range of column selectivities and innovative column chemistries for method development. The phases shown in Figure 1 provide the widest range of reversed phase selectivity available on any column line, and can be used to guide the least understood and most practically significant part of method development—proper column selection.

Equation 1 Selectivity drives resolution—USLC™ considers column selectivity during method development, resulting in fast, effective separations.

$$R = 1/4\sqrt{N} \times (k'/k'+1) \times (\alpha - 1/\alpha)$$

Efficiency *Retention capacity* *Selectivity*

Figure 1 Restek offers the widest range of unique column chemistries to aid in fast, easy method development.

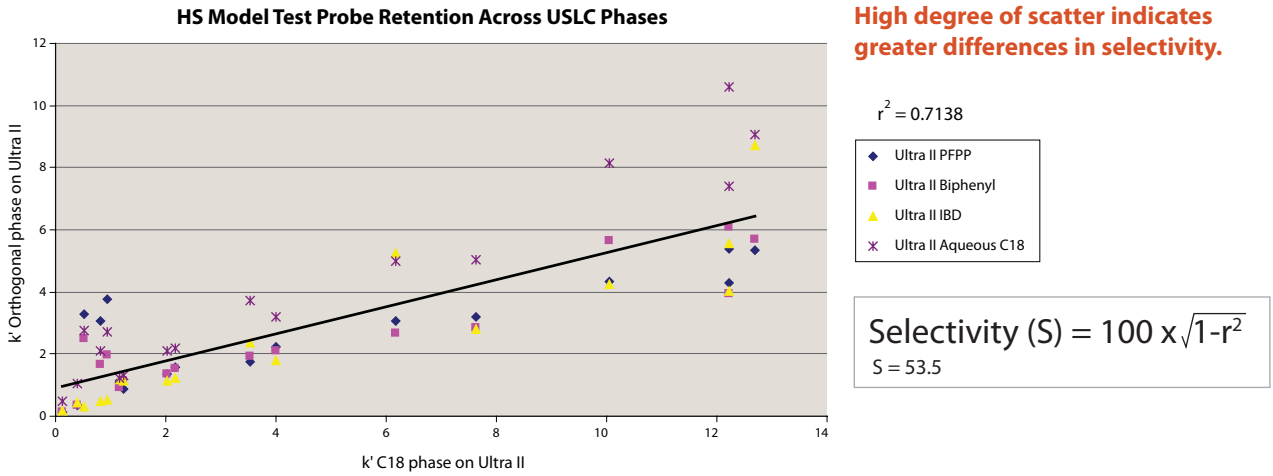
Restek phase (column class)	**Aqueous C18** (alkyl)	**IBD** (polar embedded)	**Biphenyl** (phenyl)	**PFP Propyl** (fluorophenyl)
				
Ligand type	Proprietary polar modified and functionally bonded C18	Proprietary polar functional embedded alkyl	Unique Biphenyl	Proprietary end-capped pentafluorophenyl propyl
Characteristics and uses	• C18 phase for balanced retention of multiple solute types. • Compatible with up to 100% aqueous mobile phases.	• Enhanced retention of polar acids. • Moderate retention of both acidic and basic solutes.	• Increased retention of aromatic, unsaturated, conjugated solutes, or solutes containing an electron withdrawing ring substituent. • Enhanced retention and selectivity when used with methanolic mobile phases.	• Increased retention of protonated bases and solutes containing aromatic moieties.

Evaluating and Extending Selectivity

Restek leads the industry in USLC™ phase diversity because optimal differences in selectivity are built in during the research and development of our bonded phases.

The diversity in selectivity provided by USLC™ columns can be demonstrated empirically using the hydrophobic-subtraction (HS) model [1]. This model is a novel procedure for characterizing selectivity that uses test probes to define the solute and stationary phase interactions in reversed phase separations. Restek is leading the commercial application of this model by implementing it in the research and development of USLC™ bonded phases. To evaluate phase selectivity using the hydrophobic-subtraction model, the retention characteristics of the solute probes are compared across different phases on the same silica base. In this approach, the range of selectivity is indicated by the degree of scatter along the regression line; high correlations indicate similarity and low correlations represent changes in selectivity across phases (Figure 2). The difference in selectivity across columns can then be quantified based on the correlation by calculating the selectivity (S) statistic for the comparison [2].

Figure 2 Restek has extended the selectivity range for reversed phase separations as illustrated by the hydrophobic-subtraction model and corresponding selectivity (S) value.



USLC™ Columns: Selectivity Choices Optimize Separations

Restek USLC™ columns offer the widest range of selectivities available and are an integral part of successful method development (Figure 3). Ideal for column switching systems, these columns provide the orthogonal separations needed to create optimal resolution and robust methods. Combining USLC™ phases with a suitable column format gives practicing chromatographers the most powerful tool available for successful method development.

Figure 3: Restek offers the widest range of selective phases available on any column line.

	Column Line						
Common Reversed Phase Column Type	**Restek Ultra II** 1.9, 2.2, 3, 5 and 10µm	**Waters Acquity CSH** 1.7, 3.5 and 5 µm	**Waters Acquity HSS** 1.8, 3.5 and 5 µm	**Waters Acquity BEH** 1.7, 2.5, 3.5, 5 and 10 µm	**Phenomenex Kinetex** 1.7 and 2.6 µm	**Agilent Zorbax RRHD** 1.8, 3.5 and 5 µm	**Agilent Poroshell 120** 2.7 µm
Alkyl (C18 and C8)	●	●	●	●	●	●	●
Phenyl	●	●		●			
Polar Embedded Alkyl	●						
Fluorophenyl	●	●			●		

References (Not available from Restek.)
[1] L.R. Snyder, J.W. Dolan, P.W. Carr, J. Chromatogr. A 1060 (2004) 77.
[2] U.D. Neue, J.E. O'Gara, A. Mendez, J. Chromatogr. A 1127 (2006) 161.

We're here to help!

To discuss the right selectivity for your separation or to find a comparable column, **contact us at support@restek.com or 800-356-1688.**

Combine Speed and Selectivity with Ultra II® UHPLC and HPLC Columns

- **Ultra Selectivity** - Widest variety of stationary phases and selectivity of any HPLC and UHPLC column line.
- **Ultra Utility** - Full range of particle sizes for use on any HPLC or UHPLC system.
- **Ultra Reproducibility** – 100% Restek manufactured silica for column-to column reproducibility.
- **Ultra Scalability** – Both HPLC and UHPLC columns manufactured from identical silica support to allow reliable scaling of methods across systems.

Ultra II® LC Columns

NEW!

Excellent choice
for method development using column switching systems and systematic Quality by Design approaches

Available Particle Sizes:
- 1.9µm for UHPLC
- 2.2µm for UFLC and RRLC
- 3µm, 5µm, & 10µm for HPLC

Get UHPLC Speed at HPLC Prices!

Restek lets you speed up analyses without paying a premium.
Compare today and save!

Widest Selectivity Available of Any HPLC & UHPLC Column Line!

Available Phases	Phase Description
Ultra II C18	Inert and rugged reversed phase octadecyl.
Ultra II C8	Inert and rugged general purpose.
Ultra II Aqueous C18	Uniquely modified alkyl for balanced retention and improved mobile phase compatibility, relative to a conventional C18.
Ultra II IBD	Unique polar embedded alkyl for symmetry of bases and increased retention of acids. Orthogonal selectivity to a C18.
Ultra II Biphenyl	Unique Biphenyl phase for enhanced retention and selectivity compared to phenyl and phenyl hexyl phases. Orthogonal selectivity to a C18.
Ultra II Aromax	Proprietary phenyl phase for maximum aromatic selectivity and retention. Orthogonal selectivity to a C18.
Ultra II PFP Propyl	Pentafluorophenyl phase for increased retention of basic compounds. Orthogonal selectivity to a C18.
Ultra II Silica	General purpose silica column for normal phase and HILIC separations.
Ultra II Carbamate	Specifically designed for carbamate analysis.
Ultra II Quat	Ideal for the analysis of paraquat and diquat or other quaternary amines.

Innovative phase developed by Restek!

Ultra II® C18 Columns (USP L1)

Chromatographic Properties:

A retentive, highly pure material that exhibits excellent peak shape for a wide range of compounds. This is a robust and very reproducible general-purpose reversed phase column.

Restek manufactured silica

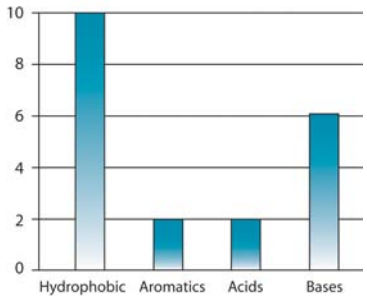
NEW!

Physical Characteristics:

particle size: 1.9µm, 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 19%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9604232		960423E			
50mm			9604252		960425E			
100mm			9604212		960421E			
2.2µm Columns								
30mm			9604832		960483E			
50mm			9604852		960485E			
100mm			9604812		960481E			
3µm Columns								
30mm	9604331	$404	9604332		960433E		9604335	
50mm	9604351	$404	9604352		960435E		9604355	
100mm	9604311	$435	9604312		960431E		9604315	
150mm	9604361	$466	9604362		960436E		9604365	
5µm Columns								
30mm	9604531	$378	9604532		960453E		9604535	
50mm	9604551	$378	9604552		960455E		9604555	
100mm	9604511	$404	9604512		960451E		9604515	
150mm	9604561	$435	9604562		960456E		9604565	
200mm	9604521	$466	9604522		960452E		9604525	
250mm	9604571	$492	9604572		960457E		9604575	

Ultra II® C18 Retention Profile



Ultra II® C18 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra II C18 Guard Cartridge	960450212	960450210	960450222	960450220	

Page #
vitamins 733

Ultra II® C18 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9604557		9604558		9604559		9604550	
100mm	9604517		9604518		9604519		9604510	
150mm	9604567		9604568		9604569		9604560	
250mm	9604577		9604578		9604579		9604570	

Available in 10µm particle size upon request.

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

also **available**

Bulk Packing Materials
See page 194.

Restek manufactured silica

NEW!

Ultra II® C8 Columns (USP L7)

Chromatographic Properties:

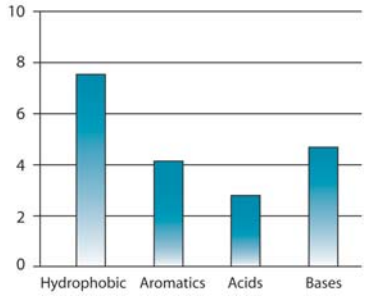
A retentive, high-purity, base-deactivated reversed phase packing that exhibits excellent peak shape for a wide range of compounds. Less retention for neutral, hydrophobic compounds, compared to the Ultra II® C18 column.

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9603331		9603332		960333E		9603335	
50mm	9603351		9603352		960335E		9603355	
100mm	9603311		9603312		960331E		9603315	
150mm	9603361		9603362		960336E		9603365	
5µm Columns								
30mm	9603531		9603532		960353E		9603535	
50mm	9603551		9603552		960355E		9603555	
100mm	9603511		9603512		960351E		9603515	
150mm	9603561		9603562		960356E		9603565	
200mm	9603521		9603522		960352E		9603525	
250mm	9603571		9603572		960357E		9603575	

Ultra II® C8 Retention Profile



Ultra II® C8 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra II C8 Guard Cartridge	960350212	960350210	960350222	960350220	

Ultra II® C8 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9603557		9603558		9603559		9603550	
100mm	9603517		9603518		9603519		9603510	
150mm	9603567		9603568		9603569		9603560	
250mm	9603577		9603578		9603579		9603570	

Available in 10µm particle size upon request.

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

Ultra II® Aqueous C18 Columns (USP L1)

Chromatographic Properties:

Highly retentive and selective for reversed phase separations of polar analytes. Highly base-deactivated. Compatible with highly aqueous (up to 100%) mobile phases.

Restek manufactured silica

NEW!

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9608331	$424	9608332	$398	960833E		9608335	
50mm	9608351	$424	9608352	$398	960835E		9608355	
100mm	9608311	$455	9608312	$430	960831E		9608315	
150mm	9608361	$518	9608362	$502	960836E		9608365	
5µm Columns								
30mm	9608531	$393	9608532	$373	960853E		9608535	
50mm	9608551	$393	9608552	$373	960855E		9608555	
100mm	9608511	$414	9608512	$398	960851E		9608515	
150mm	9608561	$455	9608562	$430	960856E		9608565	
200mm	9608521	$486	9608522	$461	960852E		9608525	
250mm	9608571	$512	9608572	$492	960857E		9608575	

Ultra II® Aqueous C18 Guard Cartridges

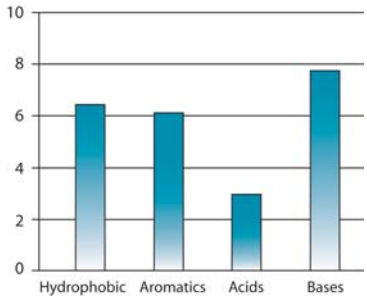
Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra II Aqueous C18 Guard Cartridge	960850212	960850210	960850222	960850220	$145

Ultra II® Aqueous C18 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9608557		9608558		9608559		9608550	
100mm	9608517		9608518		9608519		9608510	
150mm	9608567		9608568		9608569		9608560	
250mm	9608577		9608578		9608579		9608570	

Available in 10µm particle size upon request.

Ultra II® Aqueous C18 Retention Profile



Supersize without surprise!

ordering **note**

We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot re-use a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns (except in cases of our error).

Restek manufactured silica

NEW!

Ultra II® Biphenyl Columns (USP L11)

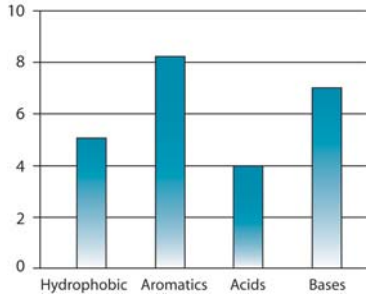
Chromatographic Properties:

A unique reversed phase material that exhibits both increased retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases. This is a great alternative to a C18 column when alternative selectivity is desired. An excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.

Physical Characteristics:

particle size: 1.9µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Ultra II® Biphenyl Retention Profile



	1.0mm ID		2.1mm ID		3.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9609232		960923E			
50mm			9609252		960925E			
100mm			9609212		960921E			
3µm Columns								
30mm	9609331		9609332		960933E		9609335	
50mm	9609351		9609352		960935E		9609355	
100mm	9609311		9609312		960931E		9609315	
150mm	9609361		9609362		960936E		9609365	
5µm Columns								
30mm	9609531		9609532		960953E		9609535	
50mm	9609551		9609552		960955E		9609555	
100mm	9609511		9609512		960951E		9609515	
150mm	9609561		9609562		960956E		9609565	
200mm	9609521		9609522		960952E		9609525	
250mm	9609571		9609572		960957E		9609575	

Ultra II® Biphenyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra II Biphenyl Guard Cartridge	960950212	960950210	960950222	960950220	$145

Ultra II® Biphenyl HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9609557		9609558		9609559		9609550	
100mm	9609517		9609518		9609519		9609510	
150mm	9609567		9609568		9609569		9609560	
250mm	9609577		9609578		9609579		9609570	

Available in 10µm particle size upon request.

Page #

Ultra II® Aromax Columns (USP L11)

Chromatographic Properties:

Ultra II® Aromax is a unique reversed phase material that exhibits superior retention and selectivity for aromatic and/or unsaturated compounds, compared to conventional alkyl and phenyl phases. This column is a great alternative to our Biphenyl phase when increased retention is required. A very suitable choice for analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.

Restek manufactured silica

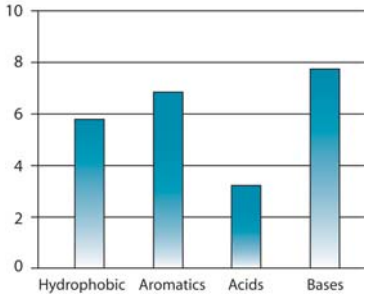
NEW!

Physical Characteristics:

particle size: 1.9µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 17%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9607232		960723E			
50mm			9607252		960725E			
100mm			9607212		960721E			
3µm Columns								
30mm	9607331		9607332		960733E		9607335	
50mm	9607351		9607352		960735E		9607355	
100mm	9607311		9607312		960731E		9607315	
150mm	9607361		9607362		960736E		9607365	
5µm Columns								
30mm	9607531		9607532		960753E		9607535	
50mm	9607551		9607552		960755E		9607555	
100mm	9607511		9607512		960751E		9607515	
150mm	9607561		9607562		960756E		9607565	
200mm	9607521		9607522		960752E		9607525	
250mm	9607571		9607572		960757E		9607575	

Ultra II® Aromax Retention Profile



Ultra II® Aromax Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra II Aromax Guard Cartridge	960750212	960750210	960750222	960750220	$145

Ultra II® Aromax HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9607557		9607558		9607559		9607550	
100mm	9607517		9607518		9607519		9607510	
150mm	9607567		9607568		9607569		9607560	
250mm	9607577		9607578		9607579		9607570	

Available in 10µm particle size upon request.

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

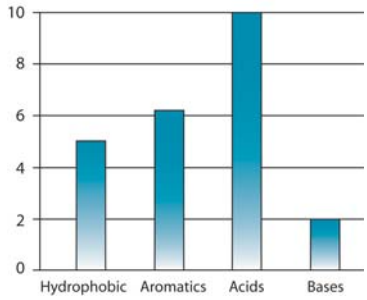
Restek manufactured silica

NEW!

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Ultra II® IBD Retention Profile



Ultra II® IBD Columns

Chromatographic Properties:

An intrinsically base-deactivated (IBD) phase, containing a polar group within, or intrinsic to, the hydrocarbon bonded phase. Unique selectivity and high level of base deactivation, while reducing or eliminating the need for mobile phase additives. Great for mixed polar and nonpolar compounds.

	1.0mm ID		2.1mm ID		3.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9605331		9605332		960533E		9605335	
50mm	9605351		9605352		960535E		9605355	
100mm	9605311		9605312		960531E		9605315	
150mm	9605361		9605362		960536E		9605365	
5µm Columns								
30mm	9605531		9605532		960553E		9605535	
50mm	9605551		9605552		960555E		9605555	
100mm	9605511		9605512		960551E		9605515	
150mm	9605561		9605562		960556E		9605565	
200mm	9605521		9605522		960552E		9605525	
250mm	9605571		9605572		960557E		9605575	

Ultra II® IBD Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra II IBD Guard Cartridge	960550212	960550210	960550222	960550220	$145

Ultra II® IBD HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9605557		9605558		9605559		9605550	
100mm	9605517		9605518		9605519		9605510	
150mm	9605567		9605568		9605569		9605560	
250mm	9605577		9605578		9605579		9605570	

Available in 10µm particle size upon request.

Supersize without surprise!

ordering **note**

We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot re-use a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns (except in cases of our error).

Ultra II® PFP Propyl Columns (USP L43)

Chromatographic Properties:

A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. An excellent phase for separating nucleosides, nucleotides, purines, pyrimidines, and halogenated compounds.

Restek manufactured silica

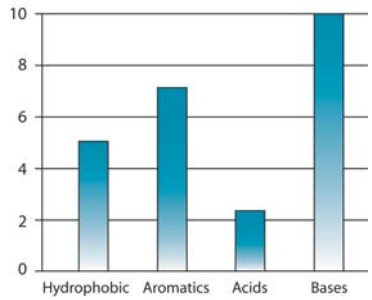
NEW!

Physical Characteristics:

particle size: 1.9µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 11%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9606232		960623E			
50mm			9606252		960625E			
100mm			9606212		960621E			
3µm Columns								
30mm	9606331		9606332		960633E		9606335	
50mm	9606351		9606352		960635E		9606355	
100mm	9606311		9606312		960631E		9606315	
150mm	9606361		9606362		960636E		9606365	
5µm Columns								
30mm	9606531		9606532		960653E		9606535	
50mm	9606551		9606552		960655E		9606555	
100mm	9606511		9606512		960651E		9606515	
150mm	9606561		9606562		960656E		9606565	
200mm	9606521		9606522		960652E		9606525	
250mm	9606571		9606572		960657E		9606575	

Ultra II® PFP Propyl Retention Profile



Ultra II® PFP Propyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra II PFP Propyl Guard Cartridge	960650212	960650210	960650222	960650220	$145

Ultra II® PFP Propyl HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9606557		9606558		9606559		9606550	
100mm	9606517		9606518		9606519		9606510	
150mm	9606567		9606568		9606569		9606560	
250mm	9606577		9606578		9606579		9606570	

Available in 10µm particle size upon request.

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

Restek manufactured silica

NEW!

Ultra II® Silica Columns (USP L3)

Chromatographic Properties:

High surface area. Type B silica packing.

Physical Characteristics:

particle size: 1.9µm, 2.2µm, 3µm or 5µm, spherical
pore size: 100Å
carbon load: 0%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9600232		960023E			
50mm			9600252		960025E			
100mm			9600212					
2.2µm Columns								
30mm			9600832		960083E			
50mm			9600852		960085E			
100mm			9600812		960081E			
3µm Columns								
30mm	9600331		9600332		960033E		9600335	
50mm	9600351		9600352		960035E		9600355	
100mm	9600311		9600312		960031E		9600315	
150mm	9600361		9600362		960036E		9600365	
5µm Columns								
30mm	9600531		9600532		960053E		9600535	
50mm	9600551		9600552		960055E		9600555	
100mm	9600511		9600512		960051E		9600515	
150mm	9600561		9600562		960056E		9600565	
200mm	9600521		9600522		960052E		9600525	
250mm	9600571		9600572		960057E		9600575	

Ultra II® Silica Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra II Silica Guard Cartridge	960050212	960050210	960050222	960050220	$145

also **available**

Bulk Packing Materials
See page 194.

Ultra II® Silica HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9600557		9600558		9600559		9600550	
100mm	9600517		9600518		9600519		9600510	
150mm	9600567		9600568		9600569		9600560	
250mm	9600577		9600578		9600579		9600570	

Available in 10µm particle size upon request.

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

Ultra II® Carbamate Columns

Chromatographic Properties:

Specifically designed for carbamates analysis. The unique packing separates 10 target carbamates in just 7 minutes, and is compatible with fluorescence or LC/MS detection. This improved run time will boost productivity and sample throughput, while reducing solvent usage and disposal expenses.

Restek manufactured silica

NEW!

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9611331		9611332		961133E		9611335	
50mm	9611351		9611352		961135E		9611355	
100mm	9611311		9611312		961131E		9611315	
150mm	9611361		9611362		961136E		9611365	
5µm Columns								
30mm	9611531		9611532		961153E		9611535	
50mm	9611551		9611552		961155E		9611555	
100mm	9611511		9611512		961151E		9611515	
150mm	9611561		9611562		961156E		9611565	
200mm	9611521		9611522		961152E		9611525	
250mm	9611571		9611572		961157E		9611575	

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food contaminants 719
pesticides (carbamates) 719

Ultra II® Carbamate Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra II Carbamate Guard Cartridge	961150212	961150210	961150222	961150220	$145

Ultra II® Carbamate HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9611557		9611558		9611559		9611550	
100mm	9611517		9611518		9611519		9611510	
150mm	9611567		9611568		9611569		9611560	
250mm	9611577		9611578		9611579		9611570	

Available in 10µm particle size upon request.

Ultra II® Quat Columns

Chromatographic Properties:

Ideal for the analysis of paraquat and diquat or other quaternary amines when used with Ultra Quat reagent solution mobile phase additive (cat.# 32441).

Restek manufactured silica

NEW!

Physical Characteristics:

particle size: 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

	4.6mm ID	
Length	cat.#	price
5µm Column		
150mm	9612565	

Pinnacle® DB Columns: 1.9, 3, or 5µm particle sizes; 140Å pore size

Prepared using a highly base-deactivated silica support; ideal for analyses of basic compounds, or bases mixed with acids/neutrals. Silica manufactured at Restek, for total control of quality and reproducibility.

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 11%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® DB C18 Columns (USP L1)

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Monomeric C18 bonding. Hydrophobic C18 phase suitable for analyses of a wide range of compounds, from acidic through slightly basic. Replaces Hypersil® BDS C18 and Pinnacle® ODS Amine.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9414232					
50mm			9414252					
100mm			9414212					
3µm Columns								
30mm	9414331		9414332		9414333		9414335	
50mm	9414351		9414352		9414353		9414355	
100mm	9414311		9414312		9414313		9414315	
5µm Columns								
30mm	9414531		9414532		9414533		9414535	
50mm	9414551		9414552		9414553		9414555	
100mm	9414511		9414512		9414513		9414515	
150mm	9414561		9414562		9414563		9414565	
200mm	9414521		9414522		9414523		9414525	
250mm	9414571		9414572		9414573		9414575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® DB C18 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle DB C18 Guard Cartridge	941450212	941450210	941450222	941450220	$148

Pinnacle® DB C18 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9414557		9414558		9414559		9414550	
100mm	9414517		9414518		9414519		9414510	
150mm	9414567		9414568		9414569		9414560	
250mm	9414577		9414578		9414579		9414570	

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

Pinnacle® DB C8 Columns (USP L7)

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Monomeric C8 bonding. Similar to Pinnacle® DB C18, but the shorter alkyl chain provides less hydrophobic retention. Less retention can be useful for reducing analysis time, if resolution is adequate. Replaces Hypersil® BDS C8 and Pinnacle® C8 Amine.

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 6%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9413232					
50mm			9413252					
100mm			9413212					
3µm Columns								
30mm	9413331		9413332		9413333		9413335	
50mm	9413351		9413352		9413353		9413355	
100mm	9413311		9413312		9413313		9413315	
5µm Columns								
30mm	9413531		9413532		9413533		9413535	
50mm	9413551		9413552		9413553		9413555	
100mm	9413511		9413512		9413513		9413515	
150mm	9413561		9413562		9413563		9413565	
200mm	9413521		9413522		9413523		9413525	
250mm	9413571		9413572		9413573		9413575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® DB C8 Guard Cartridges

Guard Cartridges	3-pk. (1.0 x 2.1mm)	3-pk. (1.0 x 4.0mm)	2-pk. (2.0 x 2.1mm)	2-pk. (2.0 x 4.0mm)	price
Pinnacle DB C8 Guard Cartridge	941350212	941350210	941350222	941350220	$148

Pinnacle® DB C8 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9413557		9413558		9413559		9413550	
100mm	9413517		9413518		9413519		9413510	
150mm	9413567		9413568		9413569		9413560	
250mm	9413577		9413578		9413579		9413570	


Anthony Hahn, Customer Service

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

Monday–Friday 8:00 a.m.–6:00 p.m. ET

Fax: 814-353-1309—24-hours a day

Online: www.restek.com—24-hours a day

Outside the U.S.

Contact your Restek representative:
Refer to our list on pages 4-5 or visit our website at www.restek.com

Restek manufactured silica

Physical Characteristics:
particle size: 1.9µm or 5µm, spherical
pore size: 140Å
carbon load: 4%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® DB Cyano Columns (USP L10)

Chromatographic Properties:
Highly base-deactivated spherical silica manufactured by Restek. Cyano bonding. Suitable for analyses of a wide range of compounds, from acidic through slightly basic. Also useful for confirmation of analyses on a C18 or C8 column. Can be used in normal phase or reversed phase mode of separation. Replaces Hypersil® BDS Cyano and Pinnacle® Cyano Amine.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9416232					
50mm			9416252					
100mm			9416212					
5µm Columns								
30mm	9416531		9416532		9416533		9416535	
50mm	9416551		9416552		9416553		9416555	
100mm	9416511		9416512		9416513		9416515	
150mm	9416561		9416562		9416563		9416565	
200mm	9416521		9416522		9416523		9416525	
250mm	9416571		9416572		9416573		9416575	

also **available**

Bulk Packing Materials
See page 194.

Pinnacle® DB Cyano Guard Cartridges

Guard Cartridges	3-pk. (1.0 x 2.1mm)	3-pk. (1.0 x 4.0mm)	2-pk. (2.0 x 2.1mm)	2-pk. (2.0 x 4.0mm)	price
Pinnacle DB Cyano Guard Cartridge	941650212	941650210	941650222	941650220	

Pinnacle® DB Cyano HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9416557		9416558		9416559		9416550	
100mm	9416517		9416518		9416519		9416510	
150mm	9416567		9416568		9416569		9416560	
250mm	9416577		9416578		9416579		9416570	

Restek manufactured silica

Physical Characteristics:
particle range: 5µm, spherical
pore size: 140Å
carbon load: 5.3%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® DB Phenyl Columns (USP L11)

Chromatographic Properties:
Highly base-deactivated spherical silica manufactured by Restek. Pinnacle® DB Phenyl columns offer alternate selectivity to straight chain hydrocarbon phases, especially for aromatic analytes. Replaces Hypersil® BDS Phenyl and Pinnacle® Phenyl Amine.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9415531		9415532		9415533		9415535	
50mm	9415551		9415552		9415553		9415555	
100mm	9415511		9415512		9415513		9415515	
150mm	9415561		9415562		9415563		9415565	
200mm	9415521		9415522		9415523		9415525	
250mm	9415571		9415572		9415573		9415575	

Pinnacle® DB Phenyl Guard Cartridges

Guard Cartridges	3-pk. (1.0 x 2.1mm)	3-pk. (1.0 x 4.0mm)	2-pk. (2.0 x 2.1mm)	2-pk. (2.0 x 4.0mm)	price
Pinnacle DB Phenyl Guard Cartridge	941550212	941550210	941550222	941550220	

Pinnacle® DB PFP Propyl Columns (USP L43)

Chromatographic Properties:

Pinnacle® DB PFP Propyl, a unique pentafluorophenyl phase with a propyl spacer, uses a highly base-deactivated spherical silica manufactured by Restek. This highly base-deactivated packing exhibits excellent peak shapes for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 6%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9419232					
50mm			9419252					
100mm			9419212					
3µm Columns								
30mm	9419331		9419332		9419333		9419335	
50mm	9419351		9419352		9419353		9419355	
100mm	9419311		9419312		9419313		9419315	
150mm	9419361		9419362		9419363		9419365	
5µm Columns								
30mm	9419531		9419532		9419533		9419535	
50mm	9419551		9419552		9419553		9419555	
100mm	9419511		9419512		9419513		9419515	
150mm	9419561		9419562		9419563		9419565	
200mm	9419521		9419522		9419523		9419525	
250mm	9419571		9419572		9419573		9419575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® DB PFP Propyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle DB PFP Propyl Guard Cartridge	941950212	941950210	941950222	941950220	

Pinnacle® DB PFP Propyl HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9419557		9419558		9419559		9419550	
100mm	9419517		9419518		9419519		9419510	
150mm	9419567		9419568		9419569		9419560	
250mm	9419577		9419578		9419579		9419570	

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 8%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® DB Biphenyl Columns (USP L11)

Chromatographic Properties:

Pinnacle® DB Biphenyl is a unique reversed phase material that displays both increased retention and selectivity for aromatic and/or unsaturated compounds when compared to conventional alkyl and phenyl phases. Highly base-deactivated spherical silica manufactured by Restek. An excellent choice for the analysis of steroids, tetracyclines, drug metabolites, and other compounds that contain some degree of unsaturation.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9409232					
50mm			9409252					
100mm			9409212					
3µm Columns								
30mm	9409331		9409332		9409333		9409335	
50mm	9409351		9409352		9409353		9409355	
100mm	9409311		9409312		9409313		9409315	
150mm	9409361		9409362		9409363		9409365	
5µm Columns								
30mm	9409531		9409532		9409533		9409535	
50mm	9409551		9409552		9409553		9409555	
100mm	9409511		9409512		9409513		9409515	
150mm	9409561		9409562		9409563		9409565	
200mm	9409521		9409522		9409523		9409525	
250mm	9409571		9409572		9409573		9409575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® DB Biphenyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle DB Biphenyl Guard Cartridge	940950212	940950210	940950222	940950220	$148

Pinnacle® DB Biphenyl HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9409557		9409558		9409559		9409550	
100mm	9409517		9409518		9409519		9409510	
150mm	9409567		9409568		9409569		9409560	
250mm	9409577		9409578		9409579		9409570	

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

Pinnacle® DB Aqueous C18 Columns (USP L1)

Chromatographic Properties:

Highly selective phase for polar analytes. Compatible with highly aqueous (up to 100%) mobile phases. Silica manufactured by Restek.

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
carbon load: 6%
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9418232					
50mm			9418252					
100mm			9418212					
3µm Columns								
30mm	9418331		9418332		9418333		9418335	
50mm	9418351		9418352		9418353		9418355	
100mm	9418311		9418312		9418313		9418315	
150mm	9418361		9418362		9418363		9418365	
5µm Columns								
30mm	9418531		9418532		9418533		9418535	
50mm	9418551		9418552		9418553		9418555	
100mm	9418511		9418512		9418513		9418515	
150mm	9418561		9418562		9418563		9418565	
200mm	9418521		9418522		9418523		9418525	
250mm	9418571		9418572		9418573		9418575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

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Pinnacle® DB Aqueous C18 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle DB Aqueous C18 Guard Cartridge	941850212	941850210	941850222	941850220	

Pinnacle® DB Aqueous C18 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9418557		9418558		9418559		9418550	
100mm	9418517		9418518		9418519		9418510	
150mm	9418567		9418568		9418569		9418560	
250mm	9418577		9418578		9418579		9418570	

Pinnacle® DB IBD UHPLC Columns

Chromatographic Properties:

An intrinsically base-deactivated (IBD) phase, containing a polar group within, or intrinsic to, the hydrocarbon bonded phase. Unique selectivity and a high level of base deactivation, while reducing or eliminating the need for mobile phase additives.

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm
pore size: 140Å
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

	2.1mm ID	
Length	cat.#	price
1.9µm Columns		
30mm	9425232	
50mm	9425252	
100mm	9425212	

Pinnacle® DB IBD HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9425557		9425558		9425559		9425550	
100mm	9425517		9425518		9425519		9425510	
150mm	9425567		9425568		9425569		9425560	
250mm	9425577		9425578		9425579		9425570	

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
pore size: 140Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® DB Silica Columns (USP L3)

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek. Useful for normal phase separations. Replaces Hypersil® BDS and Pinnacle® Amine.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
1.9µm Columns								
30mm			9410232					
50mm			9410252					
100mm			9410212					
3µm Columns								
30mm	9410331		9410332		9410333		9410335	
50mm	9410351		9410352		9410353		9410355	
100mm	9410311		9410312		9410313		9410315	
150mm	9410361		9410362		9410363		9410365	
5µm Columns								
30mm	9410531		9410532		9410533		9410535	
50mm	9410551		9410552		9410553		9410555	
100mm	9410511		9410512		9410513		9410515	
150mm	9410561		9410562		9410563		9410565	
200mm	9410521		9410522		9410523		9410525	
250mm	9410571		9410572		9410573		9410575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

also available

HPLC Syringes
See pages 285-289.

Pinnacle® DB Silica Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle DB Silica Guard Cartridge	941050212	941050210	941050222	941050220	

Pinnacle® DB Silica HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9410557		9410558		9410559		9410550	
100mm	9410517		9410518		9410519		9410510	
150mm	9410567		9410568		9410569		9410560	
250mm	9410577		9410578		9410579		9410570	

Pinnacle® DB PAH UHPLC Columns

- Complete resolution of EPA 610 PAHs in less than 4 minutes.
- Greatly reduces run times, increasing sample throughput.

Chromatographic Properties:

Specifically designed to resolve complex mixtures of polycyclic aromatic hydrocarbons.

Restek manufactured silica

Physical Characteristics:

particle size: 1.9µm
pore size: 140Å
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

	2.1mm ID	
Length	cat.#	price
1.9µm Columns		
30mm	9470232	
50mm	9470252	
100mm	9470212	

Pinnacle® II Columns: 3µm or 5µm particles; 110Å pore size

Silica manufactured at Restek, for total control of quality and reproducibility. Excellent replacement for the original Hypersil® material. Physical and chromatographic properties similar to our original Pinnacle® materials, but with greater lot-to-lot uniformity.

Pinnacle® II C18 Columns (USP L1)

Chromatographic Properties:

Excellent choice as a general purpose C18 column. Intermediate carbon loading and surface area, suitable for a wide range of acidic to neutral hydrophobic compounds. Replaces Hypersil® ODS and Pinnacle® C18.

	1.0mm ID		2.1mm ID		3.2mm ID		4.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns										
30mm	9214331		9214332		9214333				9214335	
50mm	9214351		9214352		9214353				9214355	
100mm	9214311		9214312		9214313				9214315	
5µm Columns										
30mm	9214531		9214532		9214533				9214535	
50mm	9214551		9214552		9214553				9214555	
100mm	9214511		9214512		9214513		9214514		9214515	
150mm	9214561		9214562		9214563		9214564		9214565	
200mm	9214521		9214522		9214523				9214525	
250mm	9214571		9214572		9214573				9214575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 13%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® II C18 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle II C18 Guard Cartridge	921450212	921450210	921450222	921450220	

Pinnacle® II C18 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9214557		9214558		9214559		9214550	
100mm	9214517		9214518		9214519		9214510	
150mm	9214567		9214568		9214569		9214560	
250mm	9214577		9214578		9214579		9214570	

Pinnacle® II PAH Columns

Restek manufactured silica

Physical Characteristics:

particle size: 4µm, spherical
pore size: 110Å
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

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polycyclic aromatic hydrocarbons 717

Chromatographic Properties:

Developed specifically for challenging analyses of polycyclic aromatic hydrocarbons. The Pinnacle® II PAH stationary phase incorporates a proprietary C18 bonding that enables unique shape selectivity to resolve to baseline all 16 PAHs listed in US EPA Method 610. Every lot of Pinnacle® II PAH bonded phase material is tested to ensure baseline resolution of the Method 610 PAHs, using a simple water/acetonitrile mobile phase gradient. Further, because we make Pinnacle® II PAH columns using our own silica, we have greater control over quality and reproducibility. Replaces Pinnacle® PAH columns. If you are analyzing PAHs, Pinnacle® II PAH columns are a reliable, cost-effective choice.

	2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price
4µm Columns						
50mm	9219452		9219453		9219455	
100mm	9219412		9219413		9219415	
150mm	9219462		9219463		9219465	
200mm	9219422		9219423		9219425	
250mm	9219472		9219473		9219475	

Pinnacle® II PAH Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle II PAH Guard Cartridge	921950212	921950210	921950222	921950220	

Pinnacle® II C8 Columns (USP L7)

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 7%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Chromatographic Properties:

Reliable performance and symmetric peaks for neutral to acidic compounds. Provides shorter retention times for hydrophobic compounds, compared to C18 phases. Replaces Hypersil® C8 and Pinnacle® C8.

	1.0mm ID		2.1mm ID		3.2mm ID		4.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns										
30mm	9213331		9213332		9213333				9213335	
50mm	9213351		9213352		9213353				9213355	
100mm	9213311		9213312		9213313				9213315	
5µm Columns										
30mm	9213531		9213532		9213533				9213535	
50mm	9213551		9213552		9213553				9213555	
100mm	9213511		9213512		9213513		9213514		9213515	
150mm	9213561		9213562		9213563		9213564		9213565	
200mm	9213521		9213522		9213523				9213525	
250mm	9213571		9213572		9213573				9213575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® II C8 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle II C8 Guard Cartridge	921350212	921350210	921350222	921350220	

Pinnacle® II C8 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9213557		9213558		9213559		9213550	
100mm	9213517		9213518		9213519		9213510	
150mm	9213567		9213568		9213569		9213560	
250mm	9213577		9213578		9213579		9213570	

Pinnacle® II Cyano Columns (USP L10)

Chromatographic Properties:

Can be used in either reversed phase or normal phase mode. More rugged than bare silica for normal phase applications. Replaces Hypersil® Cyano and Pinnacle® CN.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9216331		9216332		9216333		9216335	
50mm	9216351		9216352		9216353		9216355	
100mm	9216311		9216312		9216313		9216315	
5µm Columns								
30mm	9216531		9216532		9216533		9216535	
50mm	9216551		9216552		9216553		9216555	
100mm	9216511		9216512		9216513		9216515	
150mm	9216561		9216562		9216563		9216565	
200mm	9216521		9216522		9216523		9216525	
250mm	9216571		9216572		9216573		9216575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 4%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

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Pinnacle® II Cyano Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle II Cyano Guard Cartridge	921650212	921650210	921650222	921650220	$148

Pinnacle® II Cyano HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9216557		9216558		9216559		9216550	
100mm	9216517		9216518		9216519		9216510	
150mm	9216567		9216568		9216569		9216560	
250mm	9216577		9216578		9216579		9216570	

also **available**

Bulk Packing Materials
See page 194.

Pinnacle® II Phenyl Columns (USP L11)

Chromatographic Properties:

The Pinnacle® II Phenyl phase offers unique selectivity versus traditional alkyl chain phases, especially for aromatic compounds. Replaces Hypersil® Phenyl and Pinnacle® Phenyl.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9215331		9215332		9215333		9215335	
50mm	9215351		9215352		9215353		9215355	
100mm	9215311		9215312		9215313		9215315	
5µm Columns								
30mm	9215531		9215532		9215533		9215535	
50mm	9215551		9215552		9215553		9215555	
100mm	9215511		9215512		9215513		9215515	
150mm	9215561		9215562		9215563		9215565	
200mm	9215521		9215522		9215523		9215525	
250mm	9215571		9215572		9215573		9215575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 6%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Pinnacle® II Phenyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle II Phenyl Guard Cartridge	921550212	921550210	921550222	921550220	

Pinnacle® II Amino Columns (USP L8)

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 2%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

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sugars 727

Chromatographic Properties:

HPLC analysis using an amino-based stationary phase is the most popular technique for routine analyses of simple sugars, using isocratic elution (e.g., acetonitrile:water, 75:25) and a refractive index detector (RID) or an evaporative light scattering detector (ELSD). The Pinnacle® II Amino column is ideal for mono- and disaccharide analyses. Replaces Hypersil® Amino and Pinnacle® Amino.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9217331		9217332		9217333		9217335	
50mm	9217351		9217352		9217353		9217355	
100mm	9217311		9217312		9217313		9217315	
5µm Columns								
30mm	9217531		9217532		9217533		9217535	
50mm	9217551		9217552		9217553		9217555	
100mm	9217511		9217512		9217513		9217515	
150mm	9217561		9217562		9217563		9217565	
200mm	9217521		9217522		9217523		9217525	
250mm	9217571		9217572		9217573		9217575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® II Amino Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle II Amino Guard Cartridge	921750212	921750210	921750222	921750220	

Pinnacle® II Biphenyl Columns (USP L11)

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 110Å
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

Chromatographic Properties:

The Pinnacle® II Biphenyl phase offers alternate selectivity to straight-chain hydrocarbon phases, and enhanced selectivity and retention for unsaturated compounds, compared to traditional phenyl phases. An excellent confirmation column for explosive compounds, as in EPA method 8330.

	4.6mm ID	
Length	cat.#	price
5µm Column		
150mm	9209565	
250mm	9209575	

Pinnacle® II Biphenyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 4.0mm)	2-pk. (20 x 4.0mm)	price
Pinnacle II Biphenyl Guard Cartridge	920950210	920950220	

Pinnacle® II Silica Columns (USP L3)

Chromatographic Properties:

Good general purpose packing for normal phase separations. Moderate surface area. Replaces Hypersil® and Pinnacle® Silica.

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9210331		9210332		9210333		9210335	
50mm	9210351		9210352		9210353		9210355	
100mm	9210311		9210312		9210313		9210315	
5µm Columns								
30mm	9210531		9210532		9210533		9210535	
50mm	9210551		9210552		9210553		9210555	
100mm	9210511		9210512		9210513		9210515	
150mm	9210561		9210562		9210563		9210565	
200mm	9210521		9210522		9210523		9210525	
250mm	9210571		9210572		9210573		9210575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Pinnacle® II Silica Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Pinnacle II Silica Guard Cartridge	921050212	921050210	921050222	921050220	

Pinnacle® II Silica HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9210557		9210558		9210559		9210550	
100mm	9210517		9210518		9210519		9210510	
150mm	9210567		9210568		9210569		9210560	
250mm	9210577		9210578		9210579		9210570	

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

also **available**

HPLC Syringes

See pages 346-349.

Allure® Columns: 5µm particles; 60Å pore size

Small pore size in a high-purity, Type B silica provides a large surface area. High carbon loads, highly retentive. An excellent choice for evaporative light scattering (ELSD) and MS detectors, in which more organic solvent in the mobile phase gives better sensitivity.

Allure® C18 Columns (USP L1)

Physical Characteristics:
particle size: 5µm, spherical
pore size: 60Å
carbon load: 27%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Chromatographic Properties:
Most retentive of our alkyl stationary phases due to large surface area of the base silica and high-density bondings. Provides excellent peak shapes for a wide range of compounds.

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	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9164531		9164532		9164533		9164535	
50mm	9164551		9164552		9164553		9164555	
100mm	9164511		9164512		9164513		9164515	
150mm	9164561		9164562		9164563		9164565	
200mm	9164521		9164522		9164523		9164525	
250mm	9164571		9164572		9164573		9164575	

Allure® C18 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Allure C18 Guard Cartridge	916450212	916450210	916450222	916450220	$148

Allure® C18 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9164557		9164558		9164559		9164550	
100mm	9164517		9164518		9164519		9164510	
150mm	9164567		9164568		9164569		9164560	
250mm	9164577		9164578		9164579		9164570	

Allure® Basix Columns (USP L10)

Physical Characteristics:
particle size: 5µm, spherical
pore size: 60Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Chromatographic Properties:
Highly retentive propyl cyano phase. Excellent choice for basic compounds and for analytes containing amine group functionality.

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	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9161531		9161532		9161533		9161535	
50mm	9161551		9161552		9161553		9161555	
100mm	9161511		9161512		9161513		9161515	
150mm	9161561		9161562		9161563		9161565	
200mm	9161521		9161522		9161523		9161525	
250mm	9161571		9161572		9161573		9161575	

Allure® Basix Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Allure Basix Guard Cartridge	916150212	916150210	916150222	916150220	

Allure® Basix HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9161557		9161558		9161559		9161550	
100mm	9161517		9161518		9161519		9161510	
150mm	9161567		9161568		9161569		9161560	
250mm	9161577		9161578		9161579		9161570	

also **available**

Bulk Packing Materials
See page 194.

Allure® PFP Propyl Columns (USP L43)

Chromatographic Properties:

A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. An excellent phase for separating nucleosides, nucleotides, purines, pyrimidines, halogenated compounds, β-blockers, and tricyclic antidepressants.

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
carbon load: 17%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9169531		9169532		9169533		9169535	
50mm	9169551		9169552		9169553		9169555	
100mm	9169511		9169512		9169513		9169515	
150mm	9169561		9169562		9169563		9169565	
200mm	9169521		9169522		9169523		9169525	
250mm	9169571		9169572		9169573		9169575	

Allure® PFP Propyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Allure PFP Propyl Guard Cartridge	916950212	916950210	916950222	916950220	

Allure® PFP Propyl HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9169557		9169558		9169559		9169550	
100mm	9169517		9169518		9169519		9169510	
150mm	9169567		9169568		9169569		9169560	
250mm	9169577		9169578		9169579		9169570	

Allure® Aqueous C18 Columns (USP L1)

Chromatographic Properties:

Highly retentive and selective phase for separating polar analytes, including polar acidic compounds. Compatible with highly aqueous (up to 100%) mobile phases. Highly base deactivated. An excellent choice when analyzing a wide range of compounds, as in LC/MS screening methods.

Physical Characteristics:

particle size: 5µm spherical
pore size: 60Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9168531		9168532		9168533		9168535	
50mm	9168551		9168552		9168553		9168555	
100mm	9168511		9168512		9168513		9168515	
150mm	9168561		9168562		9168563		9168565	
200mm	9168521		9168522		9168523		9168525	
250mm	9168571		9168572		9168573		9168575	

Allure® Aqueous C18 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Allure Aqueous C18 Guard Cartridge	916850212	916850210	916850222	916850220	

Allure® Biphenyl Columns (USP L11)

Physical Characteristics:
particle size: 5µm, spherical
pore size: 60Å
carbon load: 23%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

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corticosteroids 741
steroids 742

Chromatographic Properties:
Highly retentive and selective for aromatic and unsaturated compounds. Increased retention and selectivity, compared to phenyl phases. Excellent selectivity for steroids, tetracyclines, explosives, and other unsaturated compounds.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9166531		9166532		9166533		9166535	
50mm	9166551		9166552		9166553		9166555	
100mm	9166511		9166512		9166513		9166515	
150mm	9166561		9166562		9166563		9166565	
200mm	9166521		9166522		9166523		9166525	
250mm	9166571		9166572		9166573		9166575	

Allure® Biphenyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Allure Biphenyl Guard Cartridge	916650212	916650210	916650222	916650220	$148

Allure® Biphenyl HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9166557		9166558		9166559		9166550	
100mm	9166517		9166518		9166519		9166510	
150mm	9166567		9166568		9166569		9166560	
250mm	9166577		9166578		9166579		9166570	

Allure® Organic Acids Columns

Physical Characteristics:
particle size: 5µm, spherical
pore size: 60Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

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fruit juice acids 531

Chromatographic Properties:
Allure® Organic Acids columns provide enhanced retention and selectivity for polar organic acids, allowing the separation to be performed on a single 30cm column. An Allure® Organic Acids column effectively resolves key organic acids such as tartaric and quinic acids, using the chromatographic conditions specified in AOAC method 986.13. Retention is stable and reproducible, even with the 100% aqueous mobile phase specified in the AOAC method.

	3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price
5µm Column				
150mm	9165563	$586	9165565	
250mm			9165575	
300mm			9165585	

Note: Other dimensions available on request.

Allure® Organic Acids Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Allure Organic Acids Guard Cartridge	916550212	916550210	916550222	916550220	

Allure® Silica Columns (USP L3)

Chromatographic Properties:

Highly retentive phase for normal phase separations. Very high surface area, Type B silica packing.

Physical Characteristics:

particle size: 5µm, spherical
pore size: 60Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9160531		9160532		9160533		9160535	
50mm	9160551		9160552		9160553		9160555	
100mm	9160511		9160512		9160513		9160515	
150mm	9160561		9160562		9160563		9160565	
200mm	9160521		9160522		9160523		9160525	
250mm	9160571		9160572		9160573		9160575	

Allure® Silica Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Allure Silica Guard Cartridge	916050212	916050210	916050222	916050220	

Allure® Silica HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9160557		9160558		9160559		9160550	
100mm	9160517		9160518		9160519		9160510	
150mm	9160567		9160568		9160569		9160560	
250mm	9160577		9160578		9160579		9160570	

Allure® AK Columns

Chromatographic Properties:

This highly retentive, highly selective phase, unique to Restek, was developed specifically for the analysis of aldehydes and ketones as DNPH derivatives. Allure® AK is a reversed phase HPLC material that has the unique ability to separate all thirteen carbonyl compounds specified in California Air Resources Board (CARB) Method # 1004, using a simple acetonitrile/water gradient, in less than 15 minutes. Other columns require long analysis times or the use of tetrahydrofuran.

Physical Characteristics:

particle size: 5µm
pore size: 60Å
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

	3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price
5µm Columns with Trident Integral Inlet Fittings				
200mm	9159523-700	$601	9159525-700	

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carbonyls 710

Allure® AK Guard Cartridge

Guard Cartridges	3-pk. (10 x 4.0mm)	price
Allure AK Guard Cartridge	915950210	

Carbonyls by CARB Method 1004 on an Allure® AK column.

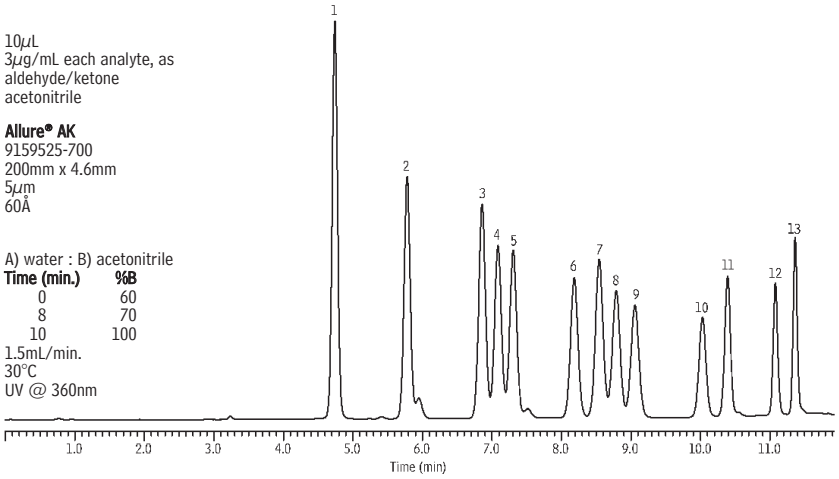
Sample:
Inj.: 10µL
Conc.: 3µg/mL each analyte, as aldehyde/ketone
Sample diluent: acetonitrile

Column: Allure® AK
Cat.#: 9159525-700
Dimensions: 200mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

Conditions:
Mobile phase: A) water : B) acetonitrile

Time (min.)	%B
0	60
8	70
10	100

Flow: 1.5mL/min.
Temp.: 30°C
Det.: UV @ 360nm



Peak	Ret. Time (min.)
DNPH derivatives of:	
1. formaldehyde	4.74
2. acetaldehyde	5.78
3. acrolein	6.86
4. acetone	7.09
5. propionaldehyde	7.31
6. crotonaldehyde	8.19
7. methacrolein	8.55
8. butyraldehyde	8.79
9. methylethylketone	9.06
10. benzaldehyde	10.03
11. valeraldehyde	10.39
12. *m*-tolualdehyde	11.08
13. hexaldehyde	11.36

LC_EV0393

Ultra Columns: 3µm or 5µm particles; 100Å pore size

Our broadest selection of stationary phases, including unique phases. High density bondings, for maximum retention. High-purity, Type B silica gives excellent peak shapes for a wide range of compounds.

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 20%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Ultra C18 Columns (USP L1)

Chromatographic Properties:

A retentive, high-purity packing that exhibits excellent peak shape for a wide range of compounds. Excellent general-purpose reversed phase column.

	1.0mm ID		2.1mm ID		3.2mm ID		4.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns										
30mm	9174331		9174332		9174333				9174335	
50mm	9174351		9174352		9174353				9174355	
100mm	9174311		9174312		9174313				9174315	
5µm Columns										
30mm	9174531		9174532		9174533				9174535	
50mm	9174551		9174552		9174553				9174555	
100mm	9174511		9174512		9174513		9174514		9174515	
150mm	9174561		9174562		9174563		9174564		9174565	
200mm	9174521		9174522		9174523				9174525	
250mm	9174571		9174572		9174573				9174575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra C18 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra C18 Guard Cartridge	917450212	917450210	917450222	917450220	$148

Ultra C18 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9174557		9174558		9174559		9174550	
100mm	9174517		9174518		9174519		9174510	
150mm	9174567		9174568		9174569		9174560	
250mm	9174577		9174578		9174579		9174570	

also available

Capillary HPLC Columns
www.restek.com

- High quality, Restek manufactured packing materials.
- Superior packing technology ensures rugged, reproducible columns.
- Wide range of phases and dimensions available—please inquire.

ordering note

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

Ultra C8 Columns (USP L7)

Chromatographic Properties:

A retentive, high-purity, base-deactivated reversed phase packing that exhibits excellent peak shape for a wide range of compounds. Less retention for neutral, hydrophobic compounds, compared to the Ultra C18 column.

	1.0mm ID		2.1mm ID		3.2mm ID		4.0mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns										
30mm	9103331		9103332		9103333				9103335	
50mm	9103351		9103352		9103353				9103355	
100mm	9103311		9103312		9103313				9103315	
5µm Columns										
30mm	9103531		9103532		9103533				9103535	
50mm	9103551		9103552		9103553				9103555	
100mm	9103511		9103512		9103513		9103514		9103515	
150mm	9103561		9103562		9103563		9103564		9103565	
200mm	9103521		9103522		9103523				9103525	
250mm	9103571		9103572		9103573				9103575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra C8 Guard Cartridges

Guard Cartridges	3-pk. (1.0 x 2.1mm)	3-pk. (1.0 x 4.0mm)	2-pk. (2.0 x 2.1mm)	2-pk. (2.0 x 4.0mm)	price
Ultra C8 Guard Cartridge	910350212	910350210	910350222	910350220	

Ultra C8 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9103557		9103558		9103559		9103550	
100mm	9103517		9103518		9103519		9103510	
150mm	9103567		9103568		9103569		9103560	
250mm	9103577		9103578		9103579		9103570	

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

also available

Capillary HPLC Columns

www.restek.com

- High quality, Restek manufactured packing materials.
- Superior packing technology ensures rugged, reproducible columns.
- Wide range of phases and dimensions available—please inquire.

Ultra Aqueous C18 Columns (USP L1)

Chromatographic Properties:

Highly retentive and selective for reversed phase separations of polar analytes. Highly base-deactivated. Compatible with highly aqueous (up to 100%) mobile phases.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9178331		9178332		9178333		9178335	
50mm	9178351		9178352		9178353		9178355	
100mm	9178311		9178312		9178313		9178315	
5µm Columns								
30mm	9178531		9178532		9178533		9178535	
50mm	9178551		9178552		9178553		9178555	
100mm	9178511		9178512		9178513		9178515	
150mm	9178561		9178562		9178563		9178565	
200mm	9178521		9178522		9178523		9178525	
250mm	9178571		9178572		9178573		9178575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra Aqueous C18 Guard Cartridges

Guard Cartridges	3-pk. (1.0 x 2.1mm)	3-pk. (1.0 x 4.0mm)	2-pk. (2.0 x 2.1mm)	2-pk. (2.0 x 4.0mm)	price
Ultra Aqueous C18 Guard Cartridge	917850212	917850210	917850222	917850220	$148

Ultra Aqueous C18 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9178557		9178558		9178559		9178550	
100mm	9178517		9178518		9178519		9178510	
150mm	9178567		9178568		9178569		9178560	
250mm	9178577		9178578		9178579		9178570	

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Ultra IBD Columns

Physical Characteristics:
particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 12%
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Chromatographic Properties:
An intrinsically base-deactivated (IBD) phase, containing a polar group within, or intrinsic to, the hydrocarbon bonded phase. Unique selectivity and a high level of base deactivation, while reducing or eliminating the need for mobile phase additives.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9175331		9175332		9175333		9175335	
50mm	9175351		9175352		9175353		9175355	
100mm	9175311		9175312		9175313		9175315	
5µm Columns								
30mm	9175531		9175532		9175533		9175535	
50mm	9175551		9175552		9175553		9175555	
100mm	9175511		9175512		9175513		9175515	
150mm	9175561		9175562		9175563		9175565	
200mm	9175521		9175522		9175523		9175525	
250mm	9175571		9175572		9175573		9175575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra IBD Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra IBD Guard Cartridge	917550212	917550210	917550222	917550220	$148

Ultra IBD HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9175557		9175558		9175559		9175550	
100mm	9175517		9175518		9175519		9175510	
150mm	9175567		9175568		9175569		9175560	
250mm	9175577		9175578		9175579		9175570	

Ultra C4 Columns (USP L26)

Physical Characteristics:
particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 9%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

Chromatographic Properties:
Exceptionally stable C4 packing, with high bonding coverage and base deactivation. Less retention than C18 or C8 phases.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9102331		9102332		9102333		9102335	
50mm	9102351		9102352		9102353		9102355	
100mm	9102311		9102312		9102313		9102315	
5µm Columns								
30mm	9102531		9102532		9102533		9102535	
50mm	9102551		9102552		9102553		9102555	
100mm	9102511		9102512		9102513		9102515	
150mm	9102561		9102562		9102563		9102565	
200mm	9102521		9102522		9102523		9102525	
250mm	9102571		9102572		9102573		9102575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra C4 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra C4 Guard Cartridge	910250212	910250210	910250222	910250220	

Ultra C1 Columns (USP L13)

Chromatographic Properties:

Exceptionally stable C1 phase. Least retentive reversed phase hydrocarbon packing.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9101331		9101332		9101333		9101335	
50mm	9101351		9101352		9101353		9101355	
100mm	9101311		9101312		9101313		9101315	
5µm Columns								
30mm	9101531		9101532		9101533		9101535	
50mm	9101551		9101552		9101553		9101555	
100mm	9101511		9101512		9101513		9101515	
150mm	9101561		9101562		9101563		9101565	
200mm	9101521		9101522		9101523		9101525	
250mm	9101571		9101572		9101573		9101575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 5%
pH range: 2.5 to 8
temperature limit: 80°C

Ultra C1 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra C1 Guard Cartridge	910150212	910150210	910150222	910150220	

also available

HPLC Syringes

See pages 346-349.

Ultra Cyano Columns (USP L10)

Chromatographic Properties:

High-purity cyano phase with few silanol sites. Often a better choice than C18 phases for basic pharmaceuticals, especially regarding peak shape and selectivity. Cyano phases are more rugged than bare silica for normal phase analyses because they are less sensitive to small amounts of water in the mobile phase.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9106331		9106332		9106333		9106335	
50mm	9106351		9106352		9106353		9106355	
100mm	9106311		9106312		9106313		9106315	
5µm Columns								
30mm	9106531		9106532		9106533		9106535	
50mm	9106551		9106552		9106553		9106555	
100mm	9106511		9106512		9106513		9106515	
150mm	9106561		9106562		9106563		9106565	
200mm	9106521		9106522		9106523		9106525	
250mm	9106571		9106572		9106573		9106575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 8%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

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Ultra Cyano Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra Cyano Guard Cartridge	910650212	910650210	910650222	910650220	$148

Ultra Cyano HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9106557		9106558		9106559		9106550	
100mm	9106517		9106518		9106519		9106510	
150mm	9106567		9106568		9106569		9106560	
250mm	9106577		9106578		9106579		9106570	

ordering note

We strongly recommend ordering a semi-prep or prep column only after evaluating the desired separation on an equivalent analytical-scale column. Because we cannot re-use a column or the silica it contains once it has left our facility, we cannot accept returns of large-scale columns (except in cases of our error).

Ultra Phenyl Columns (USP L11)

Physical Characteristics:
particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 10%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

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guaifenesin, codeine 743

Chromatographic Properties:
High-purity, highly retentive, base-deactivated phase with alternative selectivity to straight chain hydrocarbon phases, especially for aromatic analytes.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9105331		9105332		9105333		9105335	
50mm	9105351		9105352		9105353		9105355	
100mm	9105311		9105312		9105313		9105315	
5µm Columns								
30mm	9105531		9105532		9105533		9105535	
50mm	9105551		9105552		9105553		9105555	
100mm	9105511		9105512		9105513		9105515	
150mm	9105561		9105562		9105563		9105565	
200mm	9105521		9105522		9105523		9105525	
250mm	9105571		9105572		9105573		9105575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra Phenyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra Phenyl Guard Cartridge	910550212	910550210	910550222	910550220	

Ultra Phenyl HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9105557		9105558		9105559		9105550	
100mm	9105517		9105518		9105519		9105510	
150mm	9105567		9105568		9105569		9105560	
250mm	9105577		9105578		9105579		9105570	

Ultra Amino Columns (USP L8)

Physical Characteristics:
particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 2%
encap: no
pH range: 2.5 to 8
temperature limit: 80°C

Chromatographic Properties:
Recommended for normal phase analyses of mono- and disaccharides, or similar compounds.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9107331		9107332		9107333		9107335	
50mm	9107351		9107352		9107353		9107355	
100mm	9107311		9107312		9107313		9107315	
5µm Columns								
30mm	9107531		9107532		9107533		9107535	
50mm	9107551		9107552		9107553		9107555	
100mm	9107511		9107512		9107513		9107515	
150mm	9107561		9107562		9107563		9107565	
200mm	9107521		9107522		9107523		9107525	
250mm	9107571		9107572		9107573		9107575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

also **available**

Bulk Packing Materials
See page 194.

Ultra Amino Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra Amino Guard Cartridge	910750212	910750210	910750222	910750220	

Ultra PFP Columns (USP L43)

Chromatographic Properties:

A pentafluorophenyl phase. Unique selectivity for compounds containing organohalogens or other basic functional groups.

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 100Å
carbon load: 7%
endcap: fully endcapped
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9176331		9176332		9176333		9176335	
50mm	9176351		9176352		9176353		9176355	
100mm	9176311		9176312		9176313		9176315	
5µm Columns								
30mm	9176531		9176532		9176533		9176535	
50mm	9176551		9176552		9176553		9176555	
100mm	9176511		9176512		9176513		9176515	
150mm	9176561		9176562		9176563		9176565	
200mm	9176521		9176522		9176523		9176525	
250mm	9176571		9176572		9176573		9176575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

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purines, pyrimidines 745

Ultra PFP Guard Cartridges

Guard Cartridges	3-pk. (1.0 x 2.1mm)	3-pk. (1.0 x 4.0mm)	2-pk. (2.0 x 2.1mm)	2-pk. (2.0 x 4.0mm)	price
Ultra PFP Guard Cartridge	917650212	917650210	917650222	917650220	

Ultra PFP HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9176557		9176558		9176559		9176550	
100mm	9176517		9176518		9176519		9176510	
150mm	9176567		9176568		9176569		9176560	
250mm	9176577		9176578		9176579		9176570	

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

Chromatogram Search Tool

Search by compound name, synonym, CAS # or keyword

www.restek.com/chromatograms

Ultra Silica Columns (USP L3)

Physical Characteristics:
particle size: 3µm or 5µm, spherical
pore size: 100Å
endcap: no
pH range: 2.5 to 8
temperature limit: 80°C

Chromatographic Properties:
High surface area, Type B silica packing.

Length	1.0mm ID cat.#	1.0mm ID price	2.1mm ID cat.#	2.1mm ID price	3.2mm ID cat.#	3.2mm ID price	4.6mm ID cat.#	4.6mm ID price
3µm Columns								
30mm	9100331		9100332		9100333		9100335	
50mm	9100351		9100352		9100353		9100355	
100mm	9100311		9100312		9100313		9100315	
5µm Columns								
30mm	9100531		9100532		9100533		9100535	
50mm	9100551		9100552		9100553		9100555	
100mm	9100511		9100512		9100513		9100515	
150mm	9100561		9100562		9100563		9100565	
200mm	9100521		9100522		9100523		9100525	
250mm	9100571		9100572		9100573		9100575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Ultra Silica Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra Silica Guard Cartridge	910050212	910050210	910050222	910050220	

Ultra Silica HPLC Prep Columns

Length	10mm ID cat.#	10mm ID price	21.2mm ID cat.#	21.2mm ID price	30mm ID cat.#	30mm ID price	50mm ID cat.#	50mm ID price
5µm Columns								
50mm	9100557		9100558		9100559		9100550	
100mm	9100517		9100518		9100519		9100510	
150mm	9100567		9100568		9100569		9100560	
250mm	9100577		9100578		9100579		9100570	

also **available**

We also have syringe filters!
See **page 399**.

restek **exclusive**!

Physical Characteristics:
particle size: 3µm or 5µm, spherical
pore size: 100Å
pH range: 2.5 to 8
temperature limit: 80°C

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food contaminants (carbamates) 719

restek **innovation**!

Faster analyses and reduced solvent use!
An Ultra Carbamate column can process as many as 3 to 4 samples per hour, versus less than 2 samples per hour on a general-purpose C18 column.

Ultra Carbamate Columns

Chromatographic Properties:
Restek chemists developed the Ultra Carbamate column specifically for carbamates analysis. The unique packing separates 10 target carbamates in just over 10 minutes. The column is compatible with fluorescence or LC/MS detection.* An Ultra Carbamate column can process as many as 3 to 4 samples per hour, versus less than 2 samples per hour on a general-purpose C18 column. In addition to increased sample throughput, this much faster analysis will significantly reduce solvent usage—and the costs of disposing of solvent waste.

Length	1.0mm ID cat.#	1.0mm ID price	2.1mm ID cat.#	2.1mm ID price	3.2mm ID cat.#	3.2mm ID price	4.0mm ID cat.#	4.0mm ID price	4.6mm ID cat.#	4.6mm ID price
3µm Columns										
50mm	9177351		9177352		9177353		9177354	$491	9177355	
100mm	9177311		9177312		9177313				9177315	
5µm Columns										
250mm									9177575	$485

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

*For post-column derivatization/fluorescence detection applications using a 4.6mm ID column, the total system dead volume, including the post-column reactor, must be less than 650µL. For standard post-column reactor systems, we recommend a 250mm x 4.6mm, 5µm column. Contact Restek technical service or your Restek representative for more information.

Ultra Carbamate Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra Carbamate Guard Cartridge	917750212	917750210	917750222	917750220	

Ultra Quat Columns

Chromatographic Properties:

A retentive, high-purity, base deactivated reversed phase packing. Ideal for the analysis of paraquat and diquat or other quaternary amines when used with Ultra Quat Reagent Solution mobile phase additive (cat.# 32441).

Length	4.6mm ID cat.#	price
5µm Column		
150mm	9181565	

Ultra Quat Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Ultra Quat Guard Cartridge	918150212	918150210	918150222	918150220	

Ultra Quat Reagent Solution

Use with Ultra Quat HPLC column. Dilute to 1 liter water, per instructions.

In water, 20mL/bottle
cat. # 32441 (ea.) $54

Paraquat & Diquat Calibration Mix

diquat dibromide paraquat dichloride
1,000µg/mL each in water, 1mL/ampul
cat. # 32437 (ea.) $28

restek **innovation**!

An Ultra Quat column and Ultra Quat Reagent Solution eliminate the need for ion pairing reagents in paraquat/diquat analysis.

restek **exclusive**!

Physical Characteristics:

particle size: 5µm, spherical
pore size: 100Å
pH range: 2.5 to 8
temperature limit: 80°C

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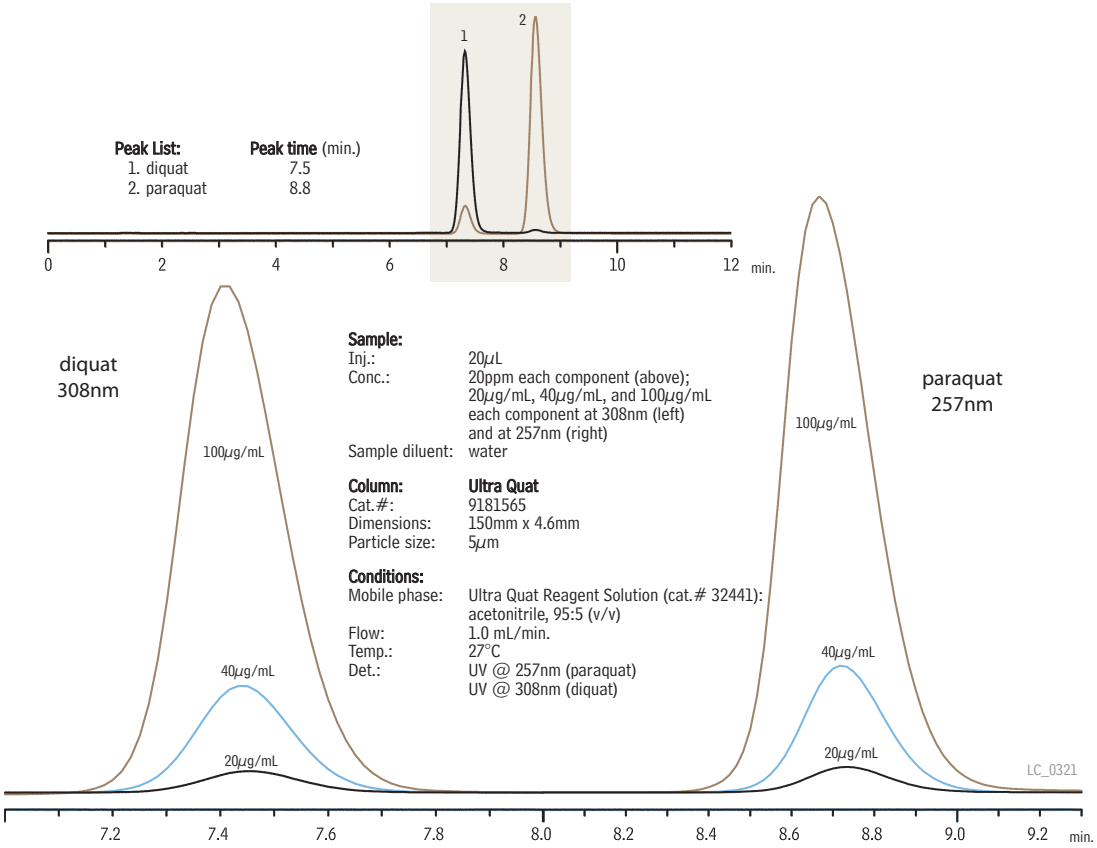
free literature

Simple, Sensitive HPLC/UV Analysis for Paraquat and Diquat

Download your free copy from **www.restek.com**

lit. cat.# 580006

Consistent resolution, retention times, and peak symmetry for paraquat and diquat on an Ultra Quat column.



restek **innovation**!

Viva silica has a narrow distribution around the mean pore size, permitting a larger portion of the silica surface to play a role in the separation of large molecules and biomolecules.

Viva Wide Pore Columns: 3µm or 5µm particles; 300Å pore size

- Excellent for separating peptides or proteins.
- Rugged, spherical particles, with 300Å pore size.
- High proportion of pore/surface area available to large molecules.

Viva columns are based on a wide pore material we designed for optimal large molecule separations. In developing Viva silica, we found that although many commercial wide-pore silicas meet the standard 300Å mean pore size, most have very broad distributions about this mean, with a significant portion of their pore volume falling below 150Å. This means a large portion of the surface area is unavailable to larger molecules. Viva columns have a narrow distribution around the mean pore size, permitting a larger portion of the silica surface to play a role in the separation.

Restek manufactured silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 300Å
carbon load: 9%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

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Viva C18 Columns (USP L1)

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds. Excellent general-purpose column for analyzing large molecules and biomolecules.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
3µm Columns								
30mm	9514331		9514332		9514333		9514335	
50mm	9514351		9514352		9514353		9514355	
100mm	9514311		9514312		9514313		9514315	
150mm	9514361		9514362		9514363		9514365	
5µm Columns								
30mm	9514531		9514532		9514533		9514535	
50mm	9514551		9514552		9514553		9514555	
100mm	9514511		9514512		9514513		9514515	
150mm	9514561		9514562		9514563		9514565	
200mm	9514521		9514522		9514523		9514525	
250mm	9514571		9514572		9514573		9514575	

3.0mm ID available on request for 3µm particle applications above 4,000 psi (275 Bar).

Viva C18 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Viva C18 Guard Cartridge	951450212	951450210	951450222	951450220	

Viva C18 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9514557		9514558		9514559		9514550	
100mm	9514517		9514518		9514519		9514510	
150mm	9514567		9514568		9514569		9514560	
250mm	9514577		9514578		9514579		9514570	

also **available**

Capillary HPLC Columns
www.restek.com

- High quality, Restek manufactured packing materials.
- Superior packing technology ensures rugged, reproducible columns.
- Wide range of phases and dimensions available—please inquire.

Viva C8 Columns (USP L7)

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds. Less retention in reversed phase assays than Viva C18.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9513531		9513532		9513533		9513535	
50mm	9513551		9513552		9513553		9513555	
100mm	9513511		9513512		9513513		9513515	
150mm	9513561		9513562		9513563		9513565	
200mm	9513521		9513522		9513523		9513525	
250mm	9513571		9513572		9513573		9513575	

Viva C8 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Viva C8 Guard Cartridge	951350212	951350210	951350222	951350220	

Viva C8 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9513557		9513558		9513559		9513550	
100mm	9513517		9513518		9513519		9513510	
150mm	9513567		9513568		9513569		9513560	
250mm	9513577		9513578		9513579		9513570	

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
carbon load: 5%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

also available

3µm particles are available for all Viva phases—please inquire.

Viva C4 Columns (USP L26)

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds. Less retention in reversed phase assays than Viva C18 or Viva C8.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9512531		9512532		9512533		9512535	
50mm	9512551		9512552		9512553		9512555	
100mm	9512511		9512512		9512513		9512515	
150mm	9512561		9512562		9512563		9512565	
200mm	9512521		9512522		9512523		9512525	
250mm	9512571		9512572		9512573		9512575	

Viva C4 Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Viva C4 Guard Cartridge	951250212	951250210	951250222	951250220	

Viva C4 HPLC Prep Columns

	10mm ID		21.2mm ID		30mm ID		50mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
50mm	9512557		9512558		9512559		9512550	
100mm	9512517		9512518		9512519		9512510	
150mm	9512567		9512568		9512569		9512560	
250mm	9512577		9512578		9512579		9512570	

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
carbon load: 3.5%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

ordering note

Other column dimensions and phases are available. Please call for a quote.

free literature

Viva Wide Pore HPLC Columns

Download your free copy from **www.restek.com**

lit. cat# 59939

restek **exclusive**!

Physical Characteristics:

particle size: 5µm
pore size: 300Å
carbon load: 6.7%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

also **available**

3µm particles are available for all Viva phases—please inquire.

Viva Biphenyl Columns (USP L11)

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds; ideal for large molecule and biomolecule assays. Highly retentive and selective phase for aromatic and unsaturated compounds, with increased retention, relative to phenyl phases.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9516531		9516532		9516533		9516535	
50mm	9516551		9516552		9516553		9516555	
100mm	9516511		9516512		9516513		9516515	
150mm	9516561		9516562		9516563		9516565	
200mm	9516521		9516522		9516523		9516525	
250mm	9516571		9516572		9516573		9516575	

Viva Biphenyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Viva Biphenyl Guard Cartridge	951650212	951650210	951650222	951650220	

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
carbon load: 5%
endcap: yes
pH range: 2.5 to 8
temperature limit: 80°C

Viva PFP Propyl Columns (USP L43)

Chromatographic Properties:

A pentafluorophenyl phase with a propyl spacer. Highly retentive for basic analytes. Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9519531		9519532		9519533		9519535	
50mm	9519551		9519552		9519553		9519555	
100mm	9519511		9519512		9519513		9519515	
150mm	9519561		9519562		9519563		9519565	
200mm	9519521		9519522		9519523		9519525	
250mm	9519571		9519572		9519573		9519575	

Viva PFP Propyl Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Viva PFP Propyl Guard Cartridge	951950212	951950210	951950222	951950220	

also **available**

Looking for HPLC syringes?

See pages 346-349.

Viva Silica Columns (USP L3)

Chromatographic Properties:

Highly base-deactivated wide pore packing that exhibits excellent peak shape for a wide range of compounds in normal phase separations.

Restek manufactured silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
pH range: 2.5 to 8
temperature limit: 80°C

	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
Length	cat.#	price	cat.#	price	cat.#	price	cat.#	price
5µm Columns								
30mm	9510531		9510532		9510533		9510535	
50mm	9510551		9510552		9510553		9510555	
100mm	9510511		9510512		9510513		9510515	
150mm	9510561		9510562		9510563		9510565	
200mm	9510521		9510522		9510523		9510525	
250mm	9510571		9510572		9510573		9510575	

Viva Silica Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Viva Silica Guard Cartridge	951050212	951050210	951050222	951050220	

ordering **note**

To order a 2.1mm, 3.2mm, or 4.6mm ID column with a Trident Integral Inlet Fitting, add "-700" to the catalog number for the column.

Nominal additional charge $15.00

Example: 100mm x 4.6mm ID Ultra C18 column with Trident Integral Inlet Fitting: 9174315-700

Also order an XG-XF fitting (10mm: cat.#25026 or 20mm: 25062), see page 196.

Chromatogram Search Tool

Search by compound name, synonym, CAS # or keyword

www.restek.com/chromatograms

Bulk Packing Materials

Use our bulk packing materials to pack your own columns!

- Prepare your own columns in conventional or custom dimensions.
- Consistent, high-quality materials.

Restek is among the small group of column manufacturers capable of producing their own high purity silica. We offer our Ultra II®, Pinnacle® II and Pinnacle® DB silica and bonded phases in bulk. Pinnacle® II is an excellent replacement for Hypersil® silica. Pinnacle® DB is a highly base-deactivated material for analyses of basic compounds and an excellent alternative to Hypersil® BDS silica. Bonded phases from our Ultra, Allure®, and Viva lines also are available in bulk.

Our extensive QC program ensures the high quality and reproducibility of these silicas. Each lot of material is tested for mean particle size and distribution, pore diameter, surface area, and total metals analysis. You can be confident that you are getting consistent, high-quality product.

Use these materials for easy scale up to preparative scale chromatography, or for packing your own columns.

NEW!

Description	min. qty.	cat.#	5-99 grams	100-499 grams	500-999 grams	≥1000 grams
3µm Ultra II Bulk Packing Materials						
Ultra II C18 Bulk Packing	5g	96043				
Ultra II C8 Bulk Packing	5g	96033				
Ultra II Silica Bulk Packing	5g	96003				
5µm Ultra II Bulk Packing Materials						
Ultra II C18 Bulk Packing	5g	96045				
Ultra II C8 Bulk Packing	5g	96035				
Ultra II Silica Bulk Packing	5g	96005				
5µm Pinnacle DB Bulk Packing Materials						
Pinnacle DB C18 Bulk Packing	5g	94145				
Pinnacle DB C8 Bulk Packing	5g	94135				
Pinnacle DB Cyano Bulk Packing	5g	94165				
Pinnacle DB Silica Bulk Packing	5g	94105				
3µm Pinnacle II Bulk Packing Materials						
Pinnacle II C8 Bulk Packing	5g	92133				
Pinnacle II C18 Bulk Packing	5g	92143				
Pinnacle II Cyano Bulk Packing	5g	92163				
Pinnacle II Phenyl Bulk Packing	5g	92153				
Pinnacle II Silica Bulk Packing	5g	92103				
5µm Pinnacle II Bulk Packing Materials						
Pinnacle II Amino Bulk Packing	5g	92175				
Pinnacle II C8 Bulk Packing	5g	92135				
Pinnacle II C18 Bulk Packing	5g	92145				
Pinnacle II Cyano Bulk Packing	5g	92165				
Pinnacle II Phenyl Bulk Packing	5g	92155				
Pinnacle II Silica Bulk Packing	5g	92105				

also available

Restek Pack in a Box Kit: HPLC Column Packing System
See page 351.

Description	qty.	cat.#	1-9 bottles	10-49 bottles	50-99 bottles	≥100 bottles
5µm Ultra Bulk Packing Materials						
Ultra C1 Bulk Packing	10g/btl.	91015				
Ultra C4 Bulk Packing	10g/btl.	91025				
Ultra C8 Bulk Packing	10g/btl.	91035				
Ultra C18 Bulk Packing	10g/btl.	91745				
Ultra Amino Bulk Packing	10g/btl.	91075				
Ultra Cyano Bulk Packing	10g/btl.	91065				
Ultra Phenyl Bulk Packing	10g/btl.	91055				
Ultra Silica Bulk Packing	10g/btl.	91005				

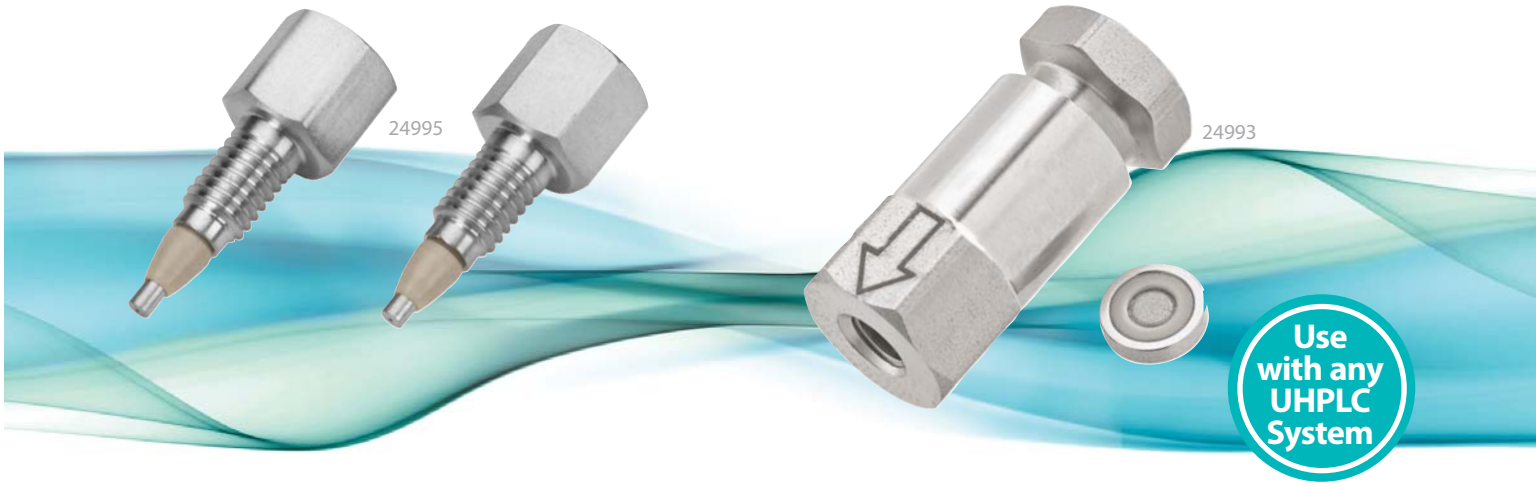
also available

Other stationary phases and particle sizes are available; please inquire.

NEW!

Protect your column with UltraShield and UltraLine UHPLC Filters

A cost-effective way to extend the lifetime of any UHPLC column, without sacrificing UHPLC performance.



UltraShield UHPLC PreColumn Filter

- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Universal fit—connects easily to any brand column.
- Leak-tight to 15,000 psi (1034 bar).
- 0.5 µm titanium filter in stainless steel body with PEEK ferrule.

Specifications:

Inlet/Outlet:	Female/Male 10-32
Port Geometry:	Parker ($^{1}/_{16}$ CPI)
Material:	Stainless Steel, PEEK ferrule
Filter:	0.5 µm Titanium
Pressure Rating:	15,000 psig (1054 bar)
Wrench Flat:	$^{5}/_{16}$"

Description	qty.	cat.#	price
UltraShield UHPLC PreColumn Filter	ea.	24995	$50
UltraShield UHPLC PreColumn Filter	5-pk.	24996	$190
UltraShield UHPLC PreColumn Filter	10-pk.	24997	$360

UltraLine UHPLC In-Line Filter

- In-line design installs easily with standard fittings.
- Cost-effective protection for UHPLC systems.
- Reliable way to extend column lifetime.
- Leak-tight to 15,000 psi (1034 bar).
- Replaceable 0.5 µm stainless steel filter in stainless steel body.

Specifications:

Inlet/Outlet:	Female/Female 10-32
Port Geometry:	Parker ($^{1}/_{16}$ CPI)
Material:	Stainless Steel housing
Filter:	0.5 µm Stainless Steel, 0.125" W x 0.062" T, 5 µL volume
Pressure Rating:	15,000 psig (1054 bar)
Wrench Flat:	$^{3}/_{8}$"

Description	qty.	cat.#	price
UltraLine UHPLC In-Line Filter (In-Line Assembly with Filter)	ea.	24993	$125
UltraLine Replacement Filters	5-pk.	24994	$60

Shannon Rishell, Customer Service

Restek Customer Service

In the U.S.

Call: 800-356-1688 (ext. 3) or 814-353-1300 (ext. 3)

Monday–Friday 8:00 a.m.–6:00 p.m. ET

Fax: 814-353-1309—24-hours a day

Online: www.restek.com—24-hours a day

Outside the U.S.

Contact your Restek representative: Refer to our list on pages 4-5 or visit our website at www.restek.com

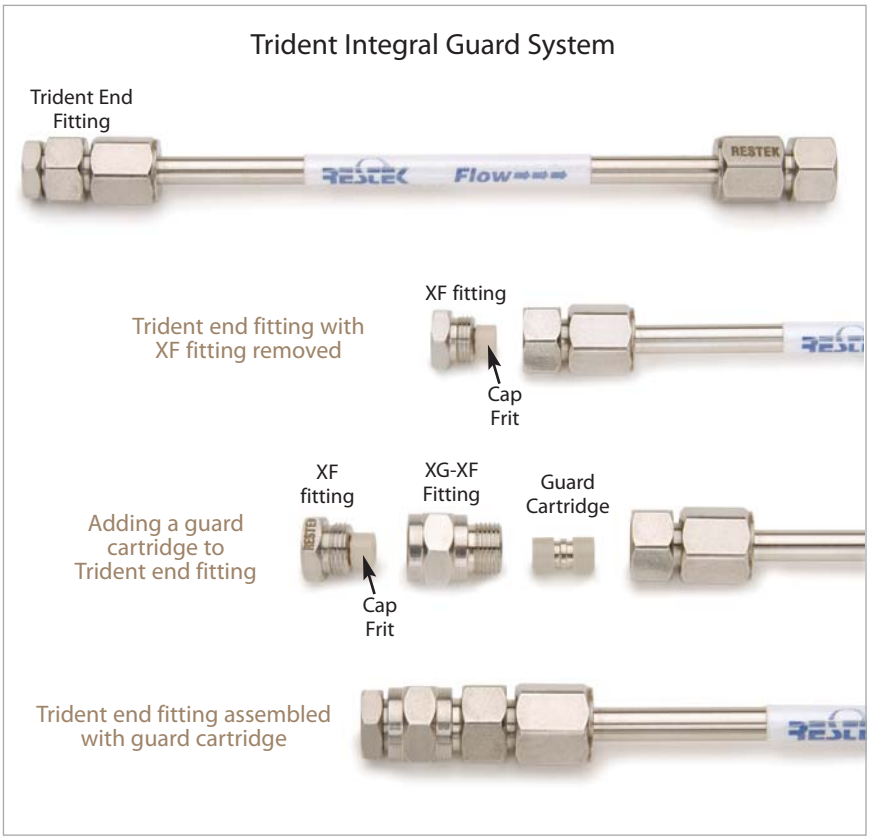
Restek's Exclusive Trident Integral System

- Convenient and economical leak-free guard cartridge system, extremely easy to install.
- Versatile configuration protects against all levels of contamination.
- Integral design eliminates troublesome tubing connections.

The system's foundation consists of the analytical column configured with our exclusive Trident end fitting and XF fitting. This configuration contains the standard internal frit as well as a replaceable cap frit, which easily can be changed without disturbing the packed bed. Changing the external frit can reverse the effects of accumulated particles, such as high backpressure or peak distortion. To obtain this basic configuration, simply order any Restek HPLC column, and add the suffix -700 to the catalog number for the column. (Nominal additional charge.)

For maximum protection against contaminants and particulate matter, the system can be configured with an integral guard cartridge holder (XG-XF), a guard cartridge, and a replaceable external frit. To obtain this configuration, simply order any Restek HPLC column, add the suffix -700 to the catalog number for the column, and order the appropriate XG-XF male fitting (cat.# 25026 or 25062) and Trident guard cartridges. See page 198.

Description	qty.	cat.#	price
XG-XF Fitting for 10mm Guard Cartridge	ea.	25026	
XG-XF Fitting for 20mm Guard Cartridge	ea.	25062	
Replacement XF Filter Fitting	ea.	25024	
Replacement Cap Frits: 4mm 2.0µm	5-pk.	25022	
Replacement Cap Frits: 4mm 0.5µm	5-pk.	25023	
Replacement Cap Frits: 2mm 2.0µm	5-pk.	25057	
Replacement Cap Frits: 2mm 0.5µm	5-pk.	25990	



Trident Direct Guard Cartridge System

Easy to Use, Low Dead Volume—The Ultimate Combination of Convenience and Column Protection

Unlike "one size fits all" guard systems, the Trident Direct system gives you the power to select the right level of protection for your analysis. The system offers three levels of protection and guard cartridges in four dimensions, with a variety of bonded phases to match your analytical column. The economical, leak-free cartridge design provides an unprecedented combination of convenience, economy, and reliability. The foundation of the Trident Direct system is a reusable direct connect holder that easily attaches to any HPLC column using CPI- or Waters-style end fittings.* The system is available in configurations to match different protection level needs: in-line filter, in-line filter with holder for 10mm guard cartridge, and in-line filter with holder for 20mm guard cartridge. The guard cartridges are available in 2.1 and 4.0mm ID and are interchangeable within the appropriate length holder.

25082
Protection against particulate matter.

25084
Protection against particulate matter and moderate protection against irreversibly adsorbed compounds.

25086
Protection against particulate matter and maximum protection against irreversibly adsorbed compounds.

Description	qty.	cat.#	price
High-pressure filter	ea.	25082	
10mm guard cartridge holder without filter	ea.	25083	
10mm guard cartridge holder with filter	ea.	25084	
20mm guard cartridge holder without filter	ea.	25085	
20mm guard cartridge holder with filter	ea.	25086	
Connection tip for Waters-style end fittings	ea.	25088	
PEEK tip standard fittings	ea.	25087	
Replacement Cap Frits: 4mm 2.0µm	5-pk.	25022	
Replacement Cap Frits: 4mm 0.5µm	5-pk.	25023	
Replacement Cap Frits: 2mm 2.0µm	5-pk.	25057	
Replacement Cap Frits: 2mm 0.5µm	5-pk.	25990	

*The standard PEEK tip in Trident Direct systems is compatible with Parker, Upchurch Scientific, Valco, and other CPI-style fittings. To use Trident Direct systems with Waters-style end fittings, replace the tip with cat.# 25088.

Trident Direct 10mm guard cartridge holder with filter

Components

Assembled

Installed onto column

Cap frits

Trident HPLC In-Line Guard Cartridge Holders

A Trident in-line guard cartridge holder can be used with almost any HPLC column by connecting it with a short piece of 1/16" tubing, appropriate nuts and ferrules, or finger-tight fittings. The system can be used with Restek columns, or with columns from other manufacturers. Holders are available for either 10mm or 20mm guard cartridges. Either size can be purchased with or without a prefilter, which provides added protection against the particles that can shorten the lifetime of the guard cartridge.

25021

25040

25061

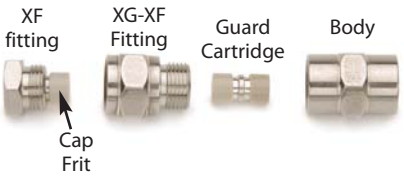
25060

Description	qty.	cat.#	price
Holder for 10mm guard cartridge	ea.	25021	
Holder with filter for 10mm guard cartridge	ea.	25040	
Holder for 20mm guard cartridge	ea.	25061	
Holder with filter for 20mm guard cartridge	ea.	25060	
Replacement Cap Frits: 4mm 2.0µm**	5-pk.	25022	
Replacement Cap Frits: 4mm 0.5µm	5-pk.	25023	
Replacement Cap Frits: 2mm 2.0µm**	5-pk.	25057	
Replacement Cap Frits: 2mm 0.5µm	5-pk.	25990	

**Standard porosity.

Trident In-Line 10mm guard cartridge holder with filter

Components



Assembled

Installed onto column

10 & 20 mm Guard Cartridges

Trident HPLC Guard Cartridges

Guard Cartridges	3-pk. (10 x 2.1mm)	3-pk. (10 x 4.0mm)	2-pk. (20 x 2.1mm)	2-pk. (20 x 4.0mm)	price
Allure AK Guard Cartridge	—	915950210	—	—	
Allure Basix Guard Cartridge	916150212	916150210	916150222	916150220	
Allure C18 Guard Cartridge	916450212	916450210	916450222	916450220	
Allure PFP Propyl Guard Cartridge	916950212	916950210	916950222	916950220	
Allure Silica Guard Cartridge	916050212	916050210	916050222	916050220	
Allure Organic Acids Guard Cartridge	916550212	916550210	916550222	916550220	
Allure Aqueous C18 Guard Cartridge	916850212	916850210	916850222	916850220	
Allure Biphenyl Guard Cartridge	916650212	916650210	916650222	916650220	
Pinnacle II Amino Guard Cartridge	921750212	921750210	921750222	921750220	
Pinnacle II C8 Guard Cartridge	921350212	921350210	921350222	921350220	
Pinnacle II C18 Guard Cartridge	921450212	921450210	921450222	921450220	
Pinnacle II Cyano Guard Cartridge	921650212	921650210	921650222	921650220	
Pinnacle II PAH Guard Cartridge	921950212	921950210	921950222	921950220	
Pinnacle II Phenyl Guard Cartridge	921550212	921550210	921550222	921550220	
Pinnacle II Biphenyl Guard Cartridge	—	920950210	—	920950220	
Pinnacle II Silica Guard Cartridge	921050212	921050210	921050222	921050220	
Pinnacle DB C8 Guard Cartridge	941350212	941350210	941350222	941350220	
Pinnacle DB C18 Guard Cartridge	941450212	941450210	941450222	941450220	
Pinnacle DB Aqueous C18 Guard Cartridge	941850212	941850210	941850222	941850220	
Pinnacle DB Biphenyl Guard Cartridge	940950212	940950210	940950222	940950220	
Pinnacle DB PFP Propyl Guard Cartridge	941950212	941950210	941950222	941950220	
Pinnacle DB Cyano Guard Cartridge	941650212	941650210	941650222	941650220	
Pinnacle DB Phenyl Guard Cartridge	941550212	941550210	941550222	941550220	
Pinnacle DB Silica Guard Cartridge	941050212	941050210	941050222	941050220	
Ultra II Aromax Guard Cartridge	960750212	960750210	960750222	960750220	
Ultra II Biphenyl Guard Cartridge	960950212	960950210	960950222	960950220	
Ultra II C8 Guard Cartridge	960350212	960350210	960350222	960350220	
Ultra II C18 Guard Cartridge	960450212	960450210	960450222	960450220	
Ultra II Aqueous C18 Guard Cartridge	960850212	960850210	960850222	960850220	
Ultra II Carbamate Guard Cartridge	961150212	961150210	961150222	961150220	
Ultra II IBD Guard Cartridge	960550212	960550210	960550222	960550220	
Ultra II PFP Propyl Guard Cartridge	960650212	960650210	960650222	960650220	
Ultra II Silica Guard Cartridge	960050212	960050210	960050222	960050220	
Ultra Amino Guard Cartridge	910750212	910750210	910750222	910750220	
Ultra Aqueous C18 Guard Cartridge	917850212	917850210	917850222	917850220	
Ultra C1 Guard Cartridge	910150212	910150210	910150222	910150220	
Ultra C4 Guard Cartridge	910250212	910250210	910250222	910250220	
Ultra C8 Guard Cartridge	910350212	910350210	910350222	910350220	
Ultra C18 Guard Cartridge	917450212	917450210	917450222	917450220	
Ultra Carbamate Guard Cartridge	917750212	917750210	917750222	917750220	
Ultra Cyano Guard Cartridge	910650212	910650210	910650222	910650220	
Ultra IBD Guard Cartridge	917550212	917550210	917550222	917550220	
Ultra PFP Guard Cartridge	917650212	917650210	917650222	917650220	
Ultra Phenyl Guard Cartridge	910550212	910550210	910550222	910550220	
Ultra Silica Guard Cartridge	910050212	910050210	910050222	910050220	
Ultra Quat Guard Cartridge	918150212	918150210	918150222	918150220	
Viva C18 Guard Cartridge	951450212	951450210	951450222	951450220	
Viva C8 Guard Cartridge	951350212	951350210	951350222	951350220	
Viva C4 Guard Cartridge	951250212	951250210	951250222	951250220	
Viva PFP Propyl Guard Cartridge	951950212	951950210	951950222	951950220	
Viva Biphenyl Guard Cartridge	951650212	951650210	951650222	951650220	
Viva Silica Guard Cartridge	951050212	951050210	951050222	951050220	

HPLC Normal Phase Test Mix #1 (4 components)

Routine analysis using this mix can assist in determining the need to perform column and/or system maintenance.

benzene	1.00mg/mL	benzyl alcohol	3.00
benzaldehyde	0.04	4-methoxybenzyl alcohol	2.00

In hexane, 1mL/ampul

cat. # 35004 (ea.) $33

No data pack available.

HPLC Reversed Phase Test Mix #1 (4 components)

Routine analysis using this mix can assist in determining the need to perform column and/or system maintenance.

benzene	3.00mg/mL	naphthalene	0.50
uracil	0.02	biphenyl	0.06

In methanol:water (75:25), 1mL/ampul

cat. # 35005 (ea.) $33

No data pack available.

HPLC Performance Test Mix (5 components)

The National Institute of Standards and Technology (NIST) has formulated a mixture that is highly effective for characterizing HPLC columns for efficiency, void volume, methylene selectivity, retentiveness, and activity toward chelators and organic bases. Results can be used for column classification, for column selection, for monitoring column performance over time, or for quality control. We test our material against the NIST 870 standard.

amitriptyline hydrochloride	2,800µg/mL	quinizarin	94
ethylbenzene	1,700	toluene	1,400
		uracil	28

In methanol, 1mL/ampul

cat. # 31699 (ea.)

Carbohydrate HPLC Performance Check Mix (5 components)

Performance qualification (PQ) determines the precision of the HPLC system. Our performance check mix for HPLC/RI consists of five simple sugars in varied concentrations. We prepare the reference material in water, lyophilize it, and pack it dry for enhanced stability.

glucose	2.0mg	maltose	4.5
fructose	2.1	sucrose	4.0
lactose	4.4		

Dry components in 4mL screw-cap vial. Reconstitute in 1mL acetonitrile:water (75:25) to 2.0, 2.1, 4.4, 4.5, 4.0mg/mL, respectively.

cat. # 31809 (ea.) $33

No data pack available.

HPLC OQ Linearity Test Mix Kit

Linear detector responses to concentration variations are an important part of operation qualification (OQ) for HPLC instruments. Our kit of five aqueous solutions of caffeine can be used to generate simple plots of UV response versus concentration. Certificate of Analysis includes caffeine concentration, calculated variance in preparing each mixture, a linearity plot, and coefficient of determination (r^2) for the linear plot.

Caffeine at 5, 25, 125, 250, 500µg/mL in water in a five ampul kit.

cat. # 31805 (kit)

No data pack available.
Quantity discounts not available.

Ultra Quat Reagent Solution

Use with Ultra Quat HPLC column. Dilute to 1 liter, per instructions.

In water, 20mL/bottle

cat. # 32441 (ea.)