

HPLC Columns





HPLC Columns

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ordering note

For assistance in selecting an HPLC column, please contact Restek Technical Service at 814-353-1300 or 800-356-1688 (ext. 4) or support@restek.com.

free literature



HPLC Tech Tips Wall Chart

Almost everything you need to remember about HPLC, condensed into 3 feet by 2 feet: mobile phase basics, buffers (types, pKa values, pH ranges, formula masses, more), miscibility and solubility chart (invaluable!), system setup and optimization, detector tips, pressure conversion factors, most-used chromatographic equations, and column storage essentials.

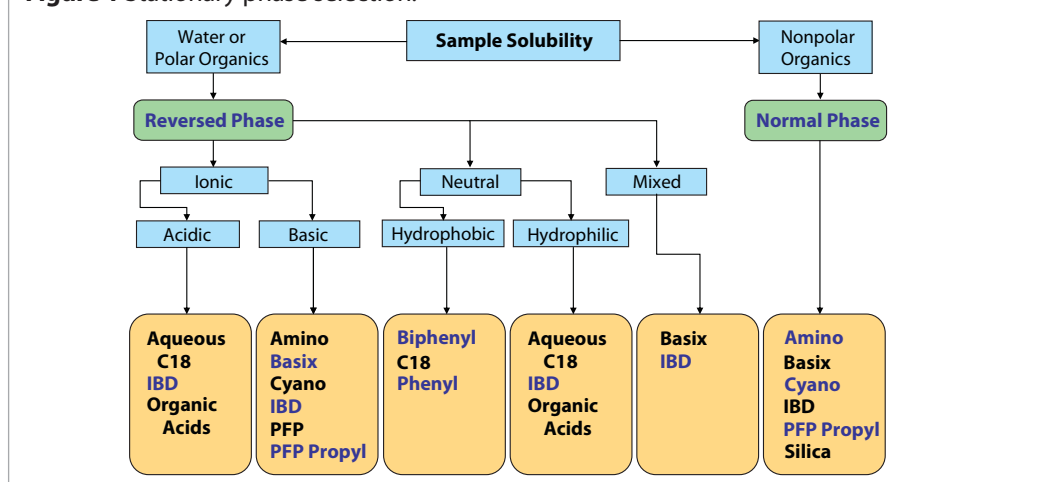
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lit. cat.# 59894A

Selecting an HPLC Column

Choosing the best column for your application requires consideration of stationary phase chemistry, retention capacity, particle size, and column dimensions. Identifying the best stationary phase for your separation is the most critical step of column selection, and your decision should be based on sample solubility and the chemical differences among the compounds of interest. Figure 1 is a handy tool for stationary phase selection.

Figure 1 Stationary phase selection.



Reversed phase columns (e.g. alkyl, phenyl, cyano) work well for water-soluble hydrophobic compounds. Some stationary phases incorporate both polar and nonpolar functionality and can be used in either reversed phase or normal phase modes (e.g. Ultra IBD, Allure® Basix, and Allure® PFP Propyl). While straight chain alkyl stationary phases (e.g. C18) are historically the most commonly used, many newer phases provide better separations. Alkyl phases are best suited for analyzing neutral compounds with a high ratio of carbon:heteroatoms where the major distinction among analytes is their hydrophobicity. However, for analyzing compounds that are highly polar, aromatic, or halogenated, nonalkyl stationary phases often provide significantly better selectivity (Figure 2).

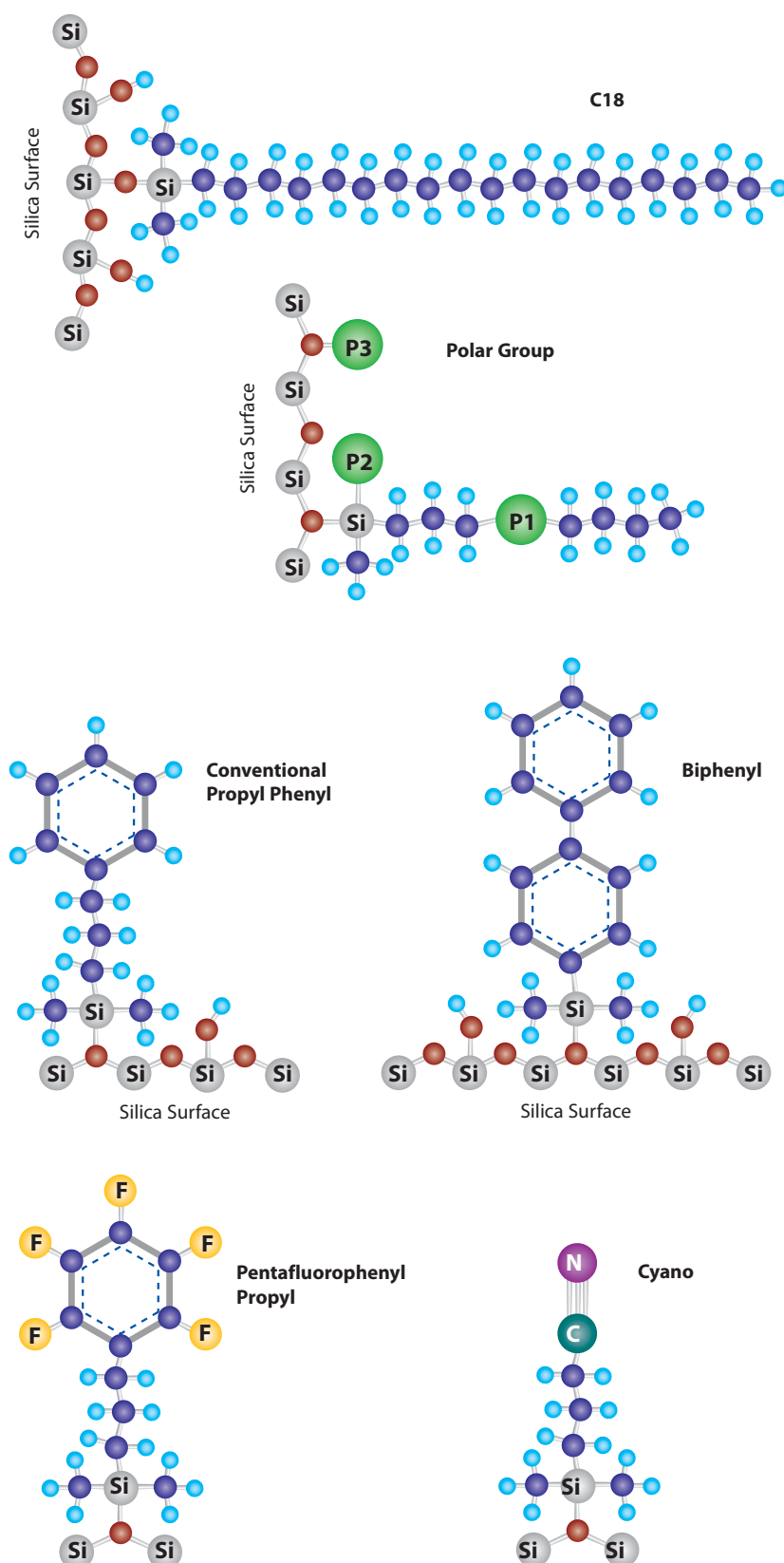
Retention capacity is another important consideration and is influenced by surface area and carbon load (% carbon in the packing material). Allure® columns were designed for maximum retention using a high density of ligands bonded to a large surface area silica. Ultra, Kromasil®, Pinnacle™ II and Pinnacle™ DB columns have the same high ligand density, but are more moderately retentive due to their lower surface areas. Surface area is inversely proportional to pore size; thus, larger pore sizes result in less retention. However, wide pore (e.g. 300Å) packings, such as Viva, are ideal when analyzing larger molecules, as a larger pore size is necessary to allow the analytes to 'fit' into the pores.

Particle size and column dimensions also influence column choice. In selecting a particle size, the primary consideration is efficiency (plates/meter) versus column pressure. A 3µm column will have approximately 50% more efficiency than a 5µm column, if all other conditions are constant for both columns. As particle size is further decreased (e.g. <2µm), theoretically, efficiencies will increase proportionally, based on the Van Deemter equation (and the usable flow rate range is much wider). Please note that column backpressure also increases as particle size decreases. Column dimensions include internal diameter and length, where the most commonly used internal diameter (ID) for HPLC columns is 4.6mm. In theory, resolution and pressure should be independent of column ID as long as flow rate is adjusted to maintain the same mobile phase linear velocity (flow rate is proportional to column cross-sectional area). Table I shows the approximate optimum flow rates for four column IDs.

Table I Approximate optimum flow rates for various analytical column IDs.

ID (mm)	5µm Particles	3µm Particles
	Optimum Flow Rate (mL/min.)	Optimum Flow Rate (mL/min.)
4.6	1.00	1.5
3.2	0.50	0.73
2.1	0.20	0.31
1.0	0.05	0.07

Figure 2 Stationary phase comparison.

**Alkyl phases (e.g. C18)**

Alkyl-based stationary phases, such as C18, are best suited for analyzing hydrophobic molecules with a high carbon:heteroatom ratio.

Alkyl phase with polar functional group

An alkyl-based stationary phase with either an embedded polar group (P1), a polar side chain (P2), or a polar end-cap (P3), has significantly greater interaction with polar compounds than a traditional alkyl phase.

Phenyl & Biphenyl phases

Phenyl stationary phases interact with compounds containing aromatic groups or unsaturated bonds through π - π interactions. The biphenyl stationary phase has even greater interaction due to the higher concentration of aromatic rings.

Cyano & Fluorinated phases

Fluorinated phases, such as the pentafluorophenyl propyl (PFP propyl), and cyano-based phases interact strongly with basic, nitrogen-containing and halogenated analytes.

Restek HPLC Column	End Cap?	Pore Size (Å)	Carbon load (%)	Applications	Chromatographic Properties	Similar Phases	USP Code	Page #
Pinnacle™ DB C18	Y	140	11	Hydrophobic C18 phase suitable for analyses of a wide range of compounds, from acidic through slightly basic.	Highly base-deactivated spherical silica manufactured by Restek. Monomeric C18 bonding.	Hypersil® BDS C18, Zorbax® Eclipse XDB-C18, Spherisorb® ODS	L1	310
Pinnacle™ DB Aqueous C18	—	140	6	Ideal for applications that require highly aqueous mobile phases, such as organic acids and water-soluble vitamins.	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	313
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.	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	310
Pinnacle™ DB PFP Propyl	Y	140	6	Exhibits excellent peak shapes for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.	Highly base-deactivated spherical silica manufactured by Restek. Unique pentafluorophenyl phase with a propyl spacer.	Discovery® HS F5	L43	312
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.	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	312
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.	Highly base-deactivated spherical silica manufactured by Restek. Cyano bonding.	Hypersil® BDS Cyano, Spherisorb® Cyano, Zorbax® Eclipse XDB-CN	L10	311
Pinnacle™ DB Phenyl	Y	140	5.3	Suitable for polar aromatic compounds, fatty acids, purines and pyrimidines.	Highly base-deactivated spherical silica manufactured by Restek. Phenyl bonding.	Hypersil® BDS Phenyl, Spherisorb® Phenyl Zorbax® Eclipse XDB-Phenyl	L11	311
Pinnacle™ DB Silica	—	140	—	Normal phase mode of separation.	Highly base-deactivated spherical silica manufactured by Restek.	—	L3	313
Pinnacle™ II C18	Y	110	13	Superior general purpose C18 for non-basic analytes.	Intermediate carbon load and surface area, suitable for a wide range of neutral to acidic compounds. Silica manufactured by Restek.	Hypersil® ODS	L1	314
Pinnacle™ II PAH	Y	110	—	Maximum resolution of polycyclic aromatic hydrocarbons.	Proprietary stationary phase; resolves 16 PAHs in US EPA Method 610. Silica manufactured by Restek.	Unique	—	314
Pinnacle™ II C8	Y	110	7	Superior general purpose C8 for non-basic analytes.	Provides shorter retention times for hydrophobic compounds than C18. Silica manufactured by Restek.	Hypersil® C8	L7	315
Pinnacle™ II Cyano	Y	110	4	Superior general purpose cyano for weakly-basic analytes. Used in either normal or reversed phase analyses.	More rugged than bare silica for normal phase analyses. Silica manufactured by Restek.	Hypersil® CPS	L10	315
Pinnacle™ II Phenyl	Y	110	6	Superior general purpose phenyl for neutral analytes.	Offers unique selectivity versus traditional alkyl chain phases, especially for aromatic compounds. Silica manufactured by Restek.	Hypersil® Phenyl	L11	316
Pinnacle™ II Amino	N	110	2	Excellent general purpose amino phase. Excellent choice for carbohydrate analysis.	Silica manufactured by Restek.	Hypersil® APS 2 Amino, Spherisorb® Amino	L8	316
Pinnacle™ II Biphenyl	Y	110	—	Multiple aromatic ring structures; excellent for explosives.	Silica manufactured by Restek. Unique biphenyl phase.	Unique	L11	317
Pinnacle™ II Silica	—	110	—	Ideal for polar analytes.	Superior value phase for normal phase separation of polar analytes. Lower retention than Ultra C18. Silica manufactured by Restek.	Hypersil® Silica	L3	317
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.	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	318
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.	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	319
Allure® AK	Y	60	—	Ideal for the analysis of aldehydes and ketones as DNPH derivatives.	Highly retentive, highly selective phase, developed specifically for the analysis of aldehydes and ketones as DNPH derivatives.	Unique	—	321
Allure® Basix	Y	60	12	Ideal for LC/MS of basic solutes. Excellent for basic pharmaceuticals or other amine-containing compounds.	Highly retentive phase for analytes containing amino functionality.	BetaMax® Base, Maxsil™ CN	L10	318
Allure® PFP Propyl	Y	60	17	Ideal for MS, ELSD, or NPD detection of nucleosides, nucleotides, purines, pyrimidines, or halogenated compounds.	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	319
Allure® Organic Acids	N	60	—	Excellent resolution of challenging organic acids.	Single 30cm column performs equally to two C18 columns in series. (AOAC Method 986.13)	Unique	—	320
Allure® Biphenyl	Y	60	23	Multiple ring structure; excellent for aromatic and unsaturated compounds. Increased retention over traditional phenyl phases.	High purity, highly retentive phase for aromatic and unsaturated compounds.	Unique	L11	320
Allure® Silica	—	60	—	Highly retentive phase for normal phase separation.	High purity, highly retentive phase for normal phase separation of polar analytes. Very high surface area.	Maxsil™ Si	L3	321
Ultra C18	Y	100	20	Ideal for anilines, barbiturates, carbonyls, fat-soluble vitamins, fatty acids, glycerides, phthalates, PTH amino acids, steroids, other acids.	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	322
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.	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	323
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.	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™	—	323
Ultra C8	Y	100	12	Selectivity and peak shape similar to Ultra C18, but less hydrophobic retention.	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	322
Ultra C4	Y	100	9	Ideal for peptides and small proteins.	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	324
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.	Exceptionally stable C1 packing resists hydrolysis, even under acidic mobile phase conditions. Least retentive reversed phase hydrocarbon packing.	Spherisorb® C1	L13	324
Ultra Cyano	Y	100	8	Excellent for basic pharmaceuticals, steroids (normal or reversed phase conditions), or other basic compounds.	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	325
Ultra Phenyl	Y	100	10	Ideal for fatty acids, polycyclic aromatic hydrocarbons, purines and pyrimidines, and polar aromatics.	High-purity, highly retentive, base-deactivated phase with alternate selectivity to hydrocarbon phases, especially for aromatic analytes.	Platinum™ Phenyl, Supelcosil™ Phenyl, Betasil® Phenyl	L11	325
Ultra Amino	N	100	2	Superior general purpose amino phase. Ideal for carbohydrates.	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	326

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.

Continued on next page...

Restek HPLC Column	End Cap?	Pore Size (Å)	Carbon load (%)	Applications
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.
Kromasil® C18	Y	100	20	A good all-purpose C18 phase for a wide range of water-soluble compounds.
Kromasil® C8	Y	100	12	Selectivity similar to Kromasil® C18, but less hydrophobic retention.
Kromasil® C4	Y	100	8	Selectivity similar to Kromasil® C18, but less hydrophobic retention.
Kromasil® C1	Y	100	—	Alternate selectivity to alkyl phases, especially for polar analytes.
Kromasil® Phenyl	Y	100	14	Ideal for aromatic compounds, PAHs, and purines/pyrimidines.
Kromasil® Amino	Y	100	1.7% nitrogen	Excellent choice for carbohydrate analysis.
Kromasil® Silica	—	100	—	Good choice for normal phase applications.
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.
pHidelity® C18	—	140	—	Hydrophobic C18 phase suitable for analyzing a wide range of compounds; enhanced stability under basic and acidic conditions.

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.

US Pharmacopoeia Cross Reference

L1	Octadecyl silane chemically bonded to porous silica or ceramic microparticles, 1.7 to 10µm in diameter, or a monolithic rod. <i>Pinnacle™ DB C18 (p. 310), Pinnacle™ DB Aqueous C18 (p. 313), Pinnacle™ II C18 (p. 314), Allure® C18 (p. 318), Allure® Aqueous C18 (p. 319), Ultra C18 (p. 322), Ultra Aqueous C18 (p. 323), Viva C18 (p. 329), Kromasil® C18 (p. 332)</i>
L3	Porous silica particles, 5 to 10µm in diameter. <i>Pinnacle™ DB Silica (p. 313), Pinnacle™ II Silica (p. 317), Allure® Silica (p. 321), Ultra Silica (p. 327), Viva Silica (p. 331), Kromasil® Silica (p. 333)</i>
L7	Octylsilane chemically bonded to totally porous silica particles, 1.7 to 10µm in diameter. <i>Pinnacle™ DB C8 (p. 310), Pinnacle™ II C8 (p. 315), Ultra C8 (p. 322), Viva C8 (p. 329), Kromasil® C8 (p. 333)</i>
L8	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 3 to 10µm in diameter. <i>Pinnacle™ II Amino (p. 316), Ultra Amino (p. 326), Kromasil® Amino (p. 333)</i>
L10	Nitrile groups chemically bonded to porous silica particles, 3 to 10µm in diameter. <i>Pinnacle™ DB Cyano (p. 311), Pinnacle™ II Cyano (p. 315), Allure® Basix (p. 318), Ultra Cyano (p. 325)</i>
L11	Phenyl groups chemically bonded to porous silica particles, 1.7 to 10µm in diameter. <i>Pinnacle™ DB Phenyl (p. 311), Pinnacle™ DB Biphenyl (p. 312), Pinnacle™ II Phenyl (p. 316), Pinnacle™ II Biphenyl (p. 317), Allure® Biphenyl (p. 320), Ultra Phenyl (p. 325), Viva Biphenyl (p. 330), Kromasil® Phenyl (p. 333)</i>
L13	Trimethylsilane chemically bonded to porous silica particles, 3 to 10µm in diameter. <i>Ultra C1 (p. 324), Kromasil® C1 (p. 333)</i>
L26	Butyl silane chemically bonded to totally porous silica particles, 3 to 10µm in diameter. <i>Ultra C4 (p.324), Viva C4 (p.330), Kromasil® C4 (p.332)</i>
L43	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 5 to 10µm in diameter. <i>Pinnacle™ DB PFP Propyl (p. 312), Allure® PFP Propyl (p. 319), Ultra PFP (p. 326), Viva PFP Propyl (p. 330)</i>

Chromatographic Properties	Similar Phases	USP Code	Page #
A pentafluorophenyl phase. Unique selectivity by interaction with functional groups of organohalogenes or other basic analytes.	Fluophase® PFP, Fluosep®-RP Phenyl, Curosil® PFP	L43	326
High purity, high surface area.	—	L3	327
Proprietary stationary phase can process up to twice as many samples per hour, compared to a conventional C18 phase.	Unique	—	327
High purity silica.	Unique	—	328
High purity phase with excellent peak shape for a wide range of compounds. Good general purpose reversed phase column.	Discovery® C18, Symmetry® C18, Hypersil® Gold C18, Luna® C18, Zorbax® C18, LiChrospher RP®-18, Inertsil® ODS-2, Develosil® C18	L1	332
High purity, reversed phase packing for a wide range of compounds.	Luna® C8, Symmetry® C8, Hypersil® Gold C8	L7	333
High purity, reversed phase packing for a wide range of compounds. Less retentive than C18 and C8.	Supelcosil™ Butyl (C4), Delta-Pak™ C4	L26	332
High purity, reversed phase packing for a wide range of compounds. Less retentive than C18, C8, and C4.	Spherisorb® C1	L13	333
High purity, base deactivated reversed phase packing. Alternate selectivity to alkyl phases.	Platinum™ Phenyl, Supelcosil™ Phenyl, Betasil® Phenyl	L11	333
High purity, base deactivated reversed phase packing. Alternate selectivity to alkyl phases.	Platinum™ Amino, Develosil® NH2	L8	333
High purity, base deactivated packing.	—	L3	333
Silica manufactured by Restek.	BioBasic® 18, Symmetry® 300 C18, Jupiter® 300 C18, Zorbax® 300 OSB C18, Synchropak® C18, 208 TP C18	L1	329
Silica manufactured by Restek.	BioBasic® 8, Zorbax® 300 OSB C8, Synchropak® C8, 208 TP C8	L7	329
Silica manufactured by Restek.	BioBasic® 4, Symmetry® 300 C4, Jupiter® 300 C4, Synchropak® C4, 208 TP C4	L26	330
Silica manufactured by Restek.	Unique	L11	330
Silica manufactured by Restek.	Unique	L43	330
Silica manufactured by Restek.	—	L3	331
Excellent stability under extreme pH conditions. True C18 selectivity in a silica-based stationary phase.	Unique	—	308

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. Particles build up on the inexpensive, replaceable frit in the filter, instead of on the permanent frit at the column inlet.



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HPLC Column Selection Guide

A useful chart to keep with your workbooks, or post on a wall. Quickly scan important characteristics of Restek HPLC columns. Includes brief, practical guidelines for choosing stationary phase, particle size, pore diameter, and column dimensions. Also includes USP designations for each phase and lists similar phases from other suppliers.

Call Restek at 800-356-1688 or 814-353-1300, ext. 5, or contact your Restek representative, to request your free copy!

lit. cat.# 59454C

New 1.9 μ m Pinnacle™ DB

Small Particle HPLC Columns

Restek's popular Pinnacle™ DB HPLC columns are now available in a <2 μ m particle size.

Ruggedness and reproducibility are guaranteed, as we control every step in the process, from base silica to bonded phase to final packed column. The silica particles are classified and selected to give an exceptionally tight distribution around 1.9 μ m, while eliminating <1 μ m particles that can contribute to a poorly packed bed. Highly base-deactivated Pinnacle™ DB stationary phases are an excellent choice when analyzing a wide range of compounds, from acidic to basic. To optimize your ultra high pressure HPLC methods, reach for Restek small particle HPLC columns!



new!

1.9 μ m Pinnacle™ DB HPLC Columns

Physical Characteristics:

particle size: 1.9 μ m
pore size: 140Å

endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Chromatographic Properties:

Highly base-deactivated spherical silica manufactured by Restek.

Length	2.1mm ID cat.#
Pinnacle™ DB C18 1.9μm Columns	
30mm	9414232
50mm	9414252
100mm	9414212
Pinnacle™ DB Silica 1.9μm Columns	
30mm	9410232
50mm	9410252
100mm	9410212
Pinnacle™ DB PFP Propyl 1.9μm Columns	
30mm	9419232
50mm	9419252
100mm	9419212
Pinnacle™ DB Biphenyl 1.9μm Columns	
30mm	9409232
50mm	9409252
100mm	9409212
Pinnacle™ DB Aqueous C18 1.9μm Columns	
30mm	9418232
50mm	9418252
100mm	9418212
Pinnacle™ DB Cyano 1.9μm Columns	
30mm	9416232
50mm	9416252
100mm	9416212

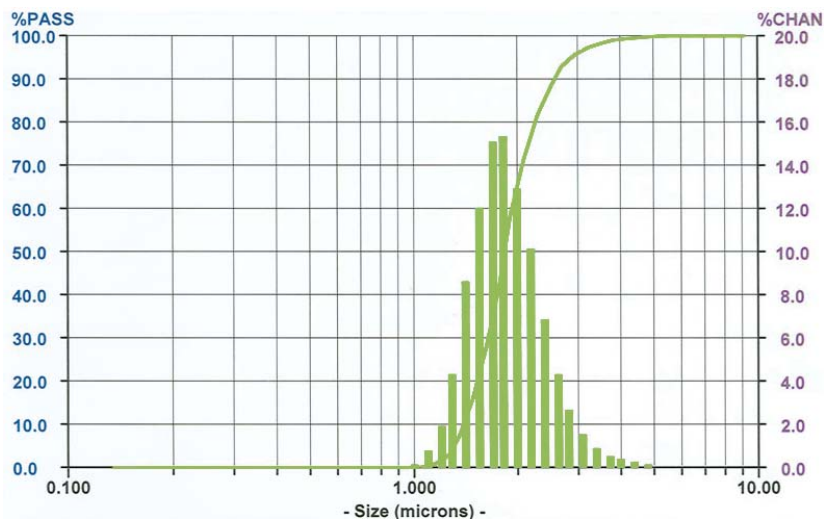
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Optimize Selectivity &
Efficiency in UHPLC
Separations

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www.restek.com.

Applications Note
lit. cat.# 580202

Figure 1 Pinnacle™ DB silica particle size distribution chart shows an exceptionally tight, symmetrical distribution around 1.9µm with no <1µm particles.



Rick Lake
Innovations Chemist
3+ years of service!

HPLC COLUMNS

Figure 2 Excellent peak symmetry and efficiency on a 1.9µm Pinnacle™ DB C18 column, using a reversed phase test mix.

Peak List:

1. uracil	3.00 mg/mL
2. benzene	0.02 mg/mL
3. naphthalene	0.50 mg/mL
4. biphenyl	0.06 mg/mL

Sample:

Inj.: 2µL HPLC Reversed Phase Test Mix #1 (cat.# 35005)
Sample diluent: water:methanol (25:75)
Sample temp.: ambient

Column:

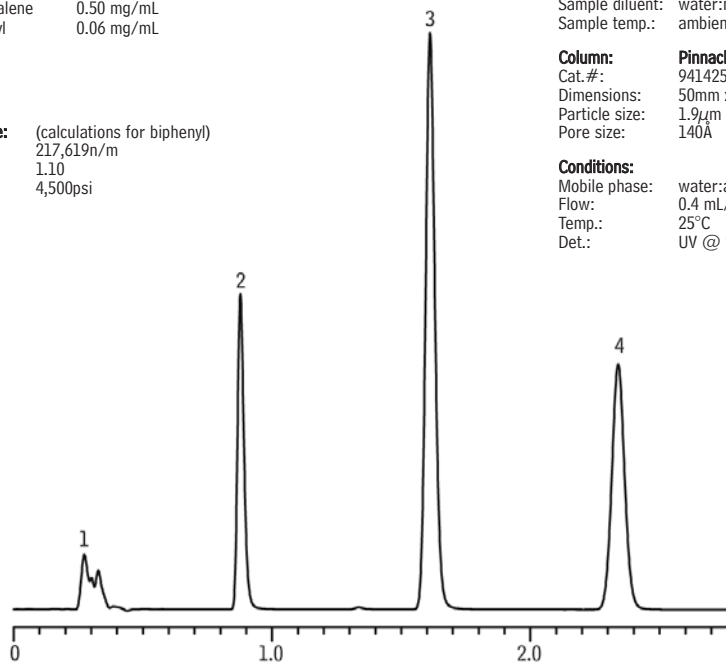
Pinnacle™ DB C18
Cat.#: 9414252
Dimensions: 50mm x 2.1mm
Particle size: 1.9µm
Pore size: 140Å

Conditions:

Mobile phase: water:acetonitrile (45:55)
Flow: 0.4 mL/min.
Temp.: 25°C
Det.: UV @ 254nm

Performance:

(calculations for biphenyl)
Efficiency: 217,619n/m
Asymmetry: 1.10
Pressure: 4,500psi



LC_EX0427

for **more info**

For more information on the small particle advantage, visit www.restek.com/uhplc.

Application	Page #
Basic Drugs	556
Serotonin Reuptake Inhibitors	552

for more info

For more information about pH stable pHidelity® HPLC Columns, review the *Restek Advantage 2007.01* at www.restek.com.

lit. cat.# 580133

pHidelity® C18 Columns

- Stable under extreme pH conditions.
- Patented technology protects the silica particle from dissolution.
- True C18 selectivity.

Restek is pleased to offer pHidelity® C18 columns, designed for analyses that require extreme pH conditions. Using technology patented by Selerity Technologies (US Patent 2005/0191503A1), pHidelity® silica-based columns have exceptional stability under aggressive pH conditions.

In pHidelity® columns, a polycarbosilane barrier layer protects the silica particle from extremely basic conditions. This layer, with multiple points of attachment to the silica particle, yields a modified surface with enhanced stability. A second layer is then attached, providing the functional group (C18). Using this approach to shield the silica surface, a highly durable stationary phase is created.

Even after 50 hours of exposure to base (pH 10) at 60°C, a pHidelity® column maintains its original column efficiency. (A decrease in column efficiency indicates the dissolution of support silica and loss from the column.) This exceptional performance ensures pHidelity® columns offer greater resolution under harsh mobile phase conditions and will continue to resolve your target compounds over a long column lifetime. A pHidelity® column also maintains a very consistent capacity factor, k' , after exposure to pH 10 and 60°C. Under extremely basic conditions, a decrease in retention time indicates loss of both support silica and bonded phase. Backpressure in the pHidelity® C18 column is very stable, indicating little or no degradation of the packing material.

The patented process used to protect the support silica in pHidelity® columns ensures more consistent retention times over the lifetime of the column.

pHidelity® C18 Columns

Physical Characteristics:

particle size: 3µm or 5µm

pore size: 140Å

pH limit: up to 12

temperature limit: 80°C

Chromatographic Properties:

Excellent stability under extreme pH conditions. True C18 selectivity in a silica-based stationary phase.

Length	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#
3µm Columns			
30mm	9579332	9579333	9579335
50mm	9579352	9579353	9579355
100mm	9579312	9579313	9579315
150mm	9579362	9579363	9579365
5µm Columns			
150mm			9579565
250mm			9579575

new!

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

Restek Capillary HPLC Columns

Physical Characteristics:

Allure® Basix:

particle size: 3µm, spherical
pore size: 60Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Allure® PFP Propyl:

particle size: 3µm, spherical
pore size: 60Å
carbon load: 17%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Ultra C18:

particle size: 3µm, spherical
pore size: 100Å
carbon load: 20%
endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C

Allure® Biphenyl:

particle size: 3µm, spherical
pore size: 60Å
carbon load: 23%
endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

Ultra Aqueous C18:

particle size: 3µm, spherical
pore size: 100Å
carbon load: 15%
endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

Viva C18:

particle size: 3µm, spherical
pore size: 300Å
carbon load: 9%
endcap: yes
pH range: 2.5 to 10
temperature limit: 80°C

Chromatographic Properties:

Available in a wide variety of stationary phases for acidic to basic compounds. Columns are suitable for small molecules using Allure® and Ultra phases and large biomolecules using Viva C18.

Length	0.3mm ID cat.#
Allure® Basix 3µm Capillary Columns	
50mm	916135B
150mm	916136B
Allure® Biphenyl 3µm Capillary Columns	
50mm	916635B
150mm	916636B
Allure® PFP Propyl 3µm Capillary Columns	
50mm	916935B
150mm	916936B
Ultra Aqueous C18 3µm Capillary Columns	
50mm	917835B
150mm	917836B
Ultra C18 3µm Capillary Columns	
50mm	917435B
150mm	917436B
Viva C18 3µm Capillary Columns	
50mm	951435B
150mm	951436B

new!



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

ordering note

Looking for another stationary phase or capillary dimension?

Please contact Restek Technical Service at 814-353-1300 or 800-356-1688 (ext. 4) or support@restek.com to inquire.



HPLC Group

Kevin Davey, Larry Peters, Terry Cressman, Randy Romesberg, Becky Wittrig, Bruce Albright, Vernon Bartlett, Frank Dorman

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.

Pinnacle™ DB C18 Columns (USP L1)**Physical Characteristics:**

particle size: 1.9µm, 3µm or 5µm, spherical endcap: yes
pore size: 140Å pH range: 2.5 to 10
carbon load: 11% temperature limit: 80°C

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.



Application	Page #
Parabens	537
Vanilla Bean Extract	541
Xanthines	558

new!

See page 306 for more information on our new 1.9µm Pinnacle™ DB columns.

also available

More chromatograms!

Visit www.restek.com.

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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

Pinnacle™ DB C8 Columns (USP L7)**Physical Characteristics:**

particle size: 3µm or 5µm, spherical endcap: yes
pore size: 140Å pH range: 2.5 to 10
carbon load: 6% temperature limit: 80°C

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 shortening analysis time, if resolution is adequate. Replaces Hypersil® BDS C8 and Pinnacle™ C8 Amine.



Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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

Pinnacle™ DB Cyano Columns (USP L10)

Physical Characteristics:

particle size: 5µm, spherical	endcap: yes
pore size: 140Å	pH range: 2.5 to 7.5
carbon load: 4%	temperature limit: 80°C



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.

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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

new!

See [page 306](#) for more information on our new 1.9µm Pinnacle™ DB columns.

HPLC COLUMNS

Pinnacle™ DB Phenyl Columns (USP L11)

Physical Characteristics:

particle range: 5µm, spherical	endcap: yes
pore size: 140Å	pH range: 2.5 to 7.5
carbon load: 5.3%	temperature limit: 80°C



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.

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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



Bruce Albright
HPLC Innovations Chemist
5+ years of service!

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

Pinnacle™ DB PFP Propyl and Biphenyl Columns

new! Pinnacle™ DB PFP Propyl Columns (USP L43)

Physical Characteristics:

particle size: 1.9µm, 3µm or 5µm, spherical endcap: yes
pore size: 140Å pH range: 2.5 to 7.5
carbon load: 6% temperature limit: 80°C

Restek
Manufactured
Silica

Application	Page #
Benzodiazepines	527

Chromatographic Properties:

Pinnacle™ DB PFP Propyl is a unique pentafluorophenyl phase with a propyl spacer, and 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.

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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

for more info

See page 306 for more information on our new 1.9µm Pinnacle™ DB columns.

new! Pinnacle™ DB Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 1.9µm, 3µm or 5µm, spherical endcap: yes
pore size: 140Å pH range: 2.5 to 7.5
carbon load: 8% temperature limit: 80°C

Restek
Manufactured
Silica

Application	Page #
Steroids	555

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.

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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



Cathy Hetrick
Northwest States Sales
Representative
3+ years of service!

Pinnacle™ DB Aqueous C18 Columns (USP L1)

Physical Characteristics:

particle size: 1.9µm, 3µm or 5µm, spherical
 pore size: 140Å
 carbon load: 6%

pH range: 2.5 to 7.5
 temperature limit: 80°C


new!

Chromatographic Properties:

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

Length	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#
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	

 for **more info**

See **page 306** for more information on our new 1.9µm Pinnacle™ DB columns.

Pinnacle™ DB Silica Columns (USP L3)

Physical Characteristics:

particle size: 1.9µm, 3µm, or 5µm, spherical
 pore size: 140Å
 carbon load: none

endcap: no
 pH range: 2.5 to 10
 temperature limit: 80°C


new!

Chromatographic Properties:

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

Length	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#
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	

1.9µm and 3µm Pinnacle™ DB Silica columns now available.

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

Pinnacle™ II C18 and PAH Columns

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)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 13%

endcap: fully endcapped
pH range: 2.5 to 10
temperature limit: 80°C

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 Length cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.0mm ID cat.#	4.6mm ID cat.#
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

Pinnacle™ II PAH Columns

Physical Characteristics:

particle size: 4µm, spherical
pore size: 110Å

endcap: fully endcapped
pH range: 2.5 to 10
temperature limit: 80°C

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 the reliable, cost-effective columns you need.



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

a plus 1 story

"The Pinnacle™ II PAH column gives an excellent separation of the 18 target PAHs that we commonly analyze. Column lifetime far exceeded our expectations—after more than 5000 injections, the columns still maintain resolution and peak shape. Other PAH columns typically had lifetimes of 2000 to 2500 injections. We actually had one Pinnacle™ II PAH column last for more than 10,000 injections!"

Norm Farmer, Technical Director, Accutest Laboratories

Application	Page #
Allicin	536
Capsaicinoids	539
Morphine Sulfate	545
Phenolic Antioxidants	536, 539

new and improved!

Pinnacle™ II PAH columns now with a 4µm particle size!

Application	Page #
PAHs	535

Pinnacle™ II C8 Columns (USP L7)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
 pore size: 110Å
 carbon load: 7%

endcap: fully endcapped
 pH range: 2.5 to 10
 temperature limit: 80°C



Chromatographic Properties:

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

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

Application	Page #
Parabens	537

Pinnacle™ II Cyano Columns (USP L10)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
 pore size: 110Å
 carbon load: 4%

endcap: fully endcapped
 pH range: 2.5 to 7.5
 temperature limit: 80°C



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.

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

Application	Page #
Corticosteroids	553
Piperine	539

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.



Emily Dillon
 International Customer
 Service Supervisor
 5+ years of service!

also available

More chromatograms!

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Pinnacle™ II Phenyl and Amino Columns

Pinnacle™ II Phenyl Columns (USP L11)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 6%

endcap: fully endcapped
pH range: 2.5 to 7.5
temperature limit: 80°C



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.

Application	Page #
Parabens	537
Sorbic & Benzoic Acids . . .	539

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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

also available

More chromatograms!

Visit www.restek.com.

Pinnacle™ II Amino Columns (USP L8)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 2%

endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C



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.

Application	Page #
Lactulose Concentrate	558
Maple Syrup	541
Sugars	541

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

Pinnacle™ II Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 5µm, spherical endcap: yes
 pore size: 110Å pH range: 2.5 to 7.5
 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.

Application	Page #
Explosives	317, 529

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

Explosives by US EPA Method 8330B on a Pinnacle™ II Biphenyl column.

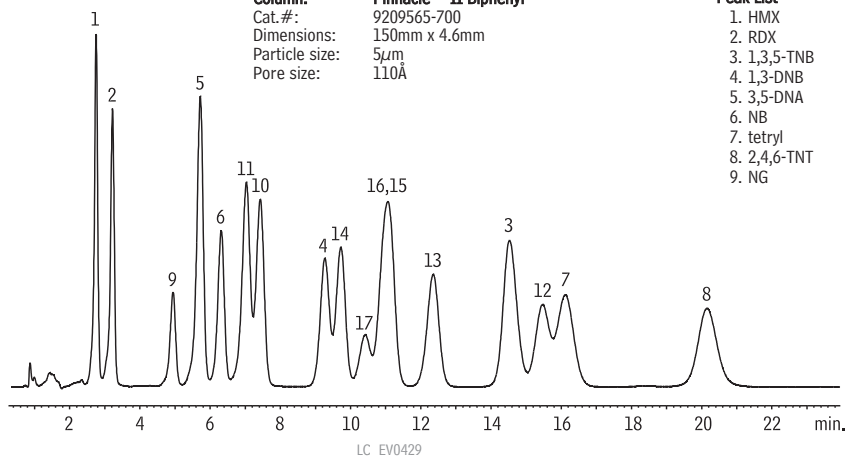
Sample: 50µg/mL each compound diluted in acetonitrile
 8330 Calibration Mix #1 (cat.# 31450)
 8330 Calibration Mix #2 (cat.# 31451)
 PETN Standard (cat.# 31600)
 3,5-dinitroaniline Reference Mix (cat.# 31661)
 Nitroglycerin Reference Mix (cat.# 31498)
 10µL

Conditions:
 Mobile phase: water:methanol (44:55 v/v)
 Flow: 1.2mL/min.
 Temp.: 30°C
 Det.: UV detection @ 210nm

Column: Pinnacle™ II Biphenyl
 Cat.#: 9209565-700
 Dimensions: 150mm x 4.6mm
 Particle size: 5µm
 Pore size: 110Å

Peak List

1. HMX	10. 2-A-4,6-DNT
2. RDX	11. 4-A-2,6-DNT
3. 1,3,5-TNB	12. 2,4-DNT
4. 1,3-DNB	13. 2,6-DNT
5. 3,5-DNA	14. 2-NT
6. NB	15. 4-NT
7. tetryl	16. 3-NT
8. 2,4,6-TNT	17. PETN
9. NG	



HPLC COLUMNS

Pinnacle™ II Silica Columns (USP L3)

Physical Characteristics:

particle size: 3µm or 5µm, spherical endcap: no
 pore size: 110Å pH range: 2.5 to 10
 carbon load: none temperature limit: 80°C



Chromatographic Properties:

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

Application	Page #
Hydrocodone Bitartrate	545
Tocopherols	536

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#
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

Application	Page #
Antibiotics	550
Herbicides	532
Pesticides	533

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Application	Page #
Acetaminophen, Narcotic Analgesics	544
Acetaminophen, Pseudoephedrine & Caffeine	559
Albuterol	553
Antiarrhythmics	546, 547
Antibiotics	550
Antidepressants	550
Herbicides	531
Ibuprofen & Pseudoephedrine	559
Sedatives	558
Steroids	556

Allure® Columns: 3µm or 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 light scattering (ELSD) and MS detectors, in which more organic solvent in the mobile phase gives better sensitivity.

Allure® C18 Columns (USP L1) Excellent Columns for LC/MS and ELSD

Physical Characteristics:

particle size: 3µm or 5µm, spherical endcap: fully endcapped
pore size: 60Å pH range: 2.5 to 7.5
carbon load: 27% 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.

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#
3µm Columns				
30mm	9164331	9164332	9164333	9164335
50mm	9164351	9164352	9164353	9164355
100mm	9164311	9164312	9164313	9164315
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® Basix Columns (USP L10) Excellent Columns for LC/MS and ELSD

Physical Characteristics:

particle size: 3µm or 5µm, spherical endcap: fully endcapped
pore size: 60Å pH range: 2.5 to 7.5
carbon load: 12% temperature limit: 80°C

Chromatographic Properties:

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

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#
3µm Columns				
30mm	9161331	9161332	9161333	9161335
50mm	9161351	9161352	9161353	9161355
100mm	9161311	9161312	9161313	9161315
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® PFP Propyl Columns (USP L43)**Excellent Columns for LC/MS and ELSD****Physical Characteristics:**

particle size: 3µm or 5µm, spherical	endcap: fully endcapped
pore size: 60Å	pH range: 2.5 to 7.5
carbon load: 17%	temperature limit: 80°C

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.

	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
Length	cat.#	cat.#	cat.#	cat.#
3µm Columns				
30mm	9169331	9169332	9169333	9169335
50mm	9169351	9169352	9169353	9169355
100mm	9169311	9169312	9169313	9169315
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® Aqueous C18 Columns (USP L1)**Excellent Columns for LC/MS and ELSD****Physical Characteristics:**

particle size: 5µm spherical	endcap: no
pore size: 60Å	pH range: 2.5 to 7.5
	temperature limit: 80°C

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.

	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
Length	cat.#	cat.#	cat.#	cat.#
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

Application	Page #
Antibiotics	549
Catecholamines	525
Cocaine, Ecgonine Methyl Ester	527
Nucleic Acid Bases	523
Opiates	526
Pesticides	533



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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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

Application	Page #
Antidepressants	551
Cannabinoids	526
Corticosteroids	553, 554
NSAIDs	557
Steroids	554, 555

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Allure® Biphenyl HPLC Columns

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Flyer
lit. cat.# 580015A

Allure® Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 3 μ m or 5 μ m, spherical
pore size: 60Å
carbon load: 23%

endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

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.

Length	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
	cat.#		cat.#		cat.#		cat.#	
3μm Columns								
30mm	9166331		9166332		9166333		9166335	
50mm	9166351		9166352		9166353		9166355	
100mm	9166311		9166312		9166313		9166315	
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® Organic Acids Columns

Physical Characteristics:

particle size: 5 μ m, spherical
pore size: 60Å

endcap: no
pH range: 2.5 to 7.5
temperature limit: 80°C

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.

Application	Page #
Carboxylic Acids	540
Fruit Juice Acids	541

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

Note: Other dimensions available on 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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

Allure® Silica Columns (USP L3)

Physical Characteristics:

particle size: 3µm or 5µm, spherical
 pore size: 60Å
 endcap: no
 pH range: 2.5 to 7.5
 temperature limit: 80°C

Chromatographic Properties:

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

Length	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#
3µm Columns								
30mm	9160331		9160332		9160333		9160335	
50mm	9160351		9160352		9160353		9160355	
100mm	9160311		9160312		9160313		9160315	
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® AK Columns

Physical Characteristics:

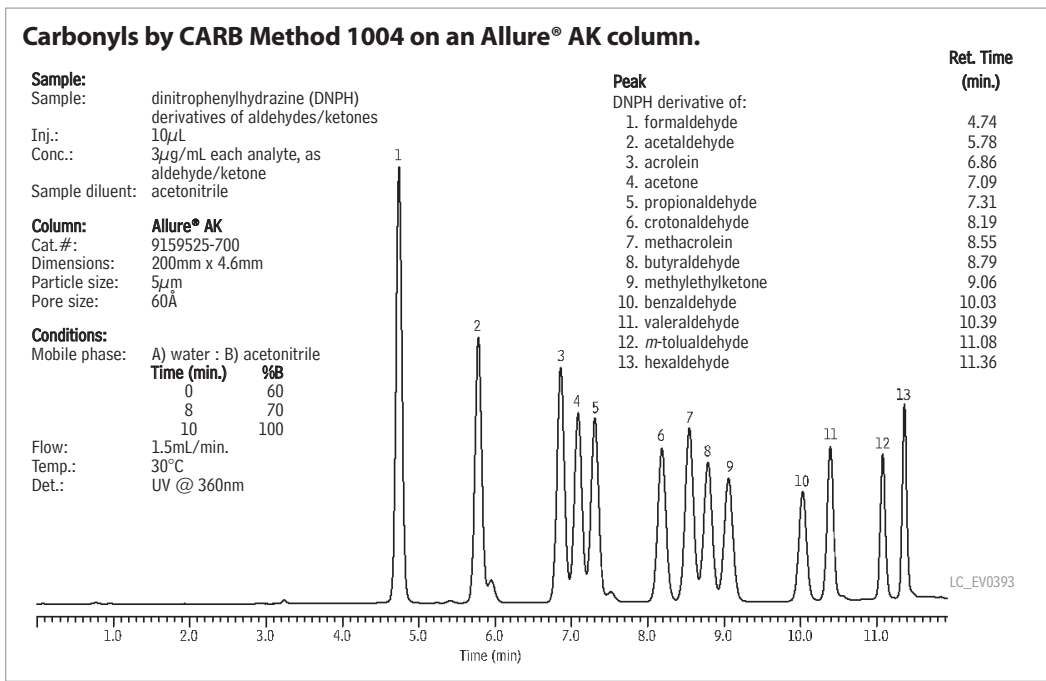
particle size: 5µm
 pore size: 60Å
 endcap: yes
 pH range: 2.5 to 7.5
 temperature limit: 80°C

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.

Application	Page #
Carbonyls	321, 528

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



Frank Dorman
 Director of Technical Development
 12+ years of service!

Application	Page #
Acetaminophen, Narcotic Analgesics	544
Aldehydes, Ketones	528
Beclomethasone	548
Corticosteroids	553
Explosives	529
Herbicides	530
Hydrocodone Bitartrate, Acetaminophen	559
Nitrofurantoin Metabolites	543
Vitamins (Fat Soluble)	538

Ultra Columns: 3 μ m or 5 μ m particles; 100 \AA 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.

Ultra C18 Columns (USP L1)

Excellent for a wide range of analyses

Physical Characteristics:

particle size: 3 μ m or 5 μ m, spherical
pore size: 100 \AA
carbon load: 20%

endcap: fully endcapped

pH range: 2.5 to 7.5

temperature limit: 80 $^{\circ}$ C

Chromatographic Properties:

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

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.0mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#	cat.#
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

Ultra C8 Columns (USP L7)

Excellent for a wide range of analyses

Physical Characteristics:

particle size: 3 μ m or 5 μ m, spherical
pore size: 100 \AA
carbon load: 12%

endcap: fully endcapped

pH range: 2.5 to 7.5

temperature limit: 80 $^{\circ}$ C

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.

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.0mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#	cat.#
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



Heather Johnson
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Ultra Aqueous C18 Columns (USP L1)

Physical Characteristics:

particle size: 3µm or 5µm, spherical endcap: no
 pore size: 100Å pH range: 2.5 to 7.5
 carbon load: 15% temperature limit: 80°C

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.

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#
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

Application	Page #
Amino Acids (Aromatics) . . .	524
Analgesics	544
Carboxylic Acids	540
Herbicides	530, 531
Phenethyl Glucosinolate . . .	536
Sudan Dyes	542

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Ultra IBD Columns

Specialized Columns for Mixed Polar and Nonpolar Compounds

Physical Characteristics:

particle size: 3µm or 5µm, spherical endcap: no
 pore size: 100Å pH range: 2.5 to 7.5
 carbon load: 12% 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.

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#
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

Application	Page #
Antiarrhythmics	546
Antibiotics	548, 550
Antidepressants	551
Cimetidine	552
Diflubenzuron (Pesticide) .	530
Glyburide	552
Nucleosides, Nucleotides, & Nucleic Acid Bases . . .	523
Vitamins (Water Soluble) . .	538

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

Ultra C4 and C1 Columns

Ultra C4 Columns (USP L26)

Physical Characteristics:

particle size: 3 μ m or 5 μ m, spherical
 pore size: 100Å
 carbon load: 9%

endcap: fully endcapped
 pH range: 2.5 to 7.5
 temperature limit: 80°C

Chromatographic Properties:

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

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#
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

Ultra C1 Columns (USP L13)

Physical Characteristics:

particle size: 3 μ m or 5 μ m, spherical
 pore size: 100Å
 carbon load: 5%

pH range: 2.5 to 7.5
 temperature limit: 80°C

Chromatographic Properties:

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

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#
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

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

also available

Application chromatograms!

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Ultra Cyano Columns (USP L10)**Physical Characteristics:**

particle size: 3µm or 5µm, spherical
 pore size: 100Å
 carbon load: 8%

endcap: fully endcapped
 pH range: 2.5 to 7.5
 temperature limit: 80°C

Application	Page #
Antiarrhythmics	545

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.

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#
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

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 7.5
 temperature limit: 80°C

Application	Page #
Guafenesin, Codeine	559

Chromatographic Properties:

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

Length	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#	cat.#
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



Vernon Bartlett
 HPLC Senior Innovations
 Chemist
 10+ years of service!

a plus 1 story

"After the disaster of 9/11, Diazald®, a highly explosive compound used in herbicide analysis, was immediately controlled by the U.S. government which made shipment impossible. Restek was instrumental in helping me to develop an isocratic HPLC method that did not require the use of Diazald®. This method is not only safer, but it saves us time and money. Thanks, Restek!"

Chris Domaradzki, Organics Manager, Environmental Testing Laboratories

Ultra Amino and PFP Columns

Ultra Amino Columns (USP L8)

Physical Characteristics:

particle size: 3 μ m or 5 μ m, spherical
 pore size: 100Å
 carbon load: 2%
 encap: no
 pH range: 2.5 to 7.5
 temperature limit: 80°C

Chromatographic Properties:

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

also available

Application chromatograms

Visit www.restek.com.

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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

Ultra PFP Columns (USP L43)

Unique Selectivity

Physical Characteristics:

particle size: 3 μ m or 5 μ m, spherical
 pore size: 100Å
 carbon load: 7%
 endcap: fully endcapped
 pH range: 2.5 to 7.5
 temperature limit: 80°C

Chromatographic Properties:

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

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
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

Application	Page #
Digitalis Extract	546
Levothyroxine	556
Purines, Pyrimidines	524



Randy Romesberg
 HPLC Senior Innovations
 Chemist
 13+ years of service!

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

Ultra Silica Columns (USP L3)**Physical Characteristics:**

particle size: 3 μ m or 5 μ m, spherical
 pore size: 100Å
 carbon load: none

endcap: no
 pH range: 2.5 to 7.5
 temperature limit: 80°C

Chromatographic Properties:

High surface area, Type B silica packing.

	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
Length	cat.#	cat.#	cat.#	cat.#
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

Ultra Carbamate Columns**Physical Characteristics:**

particle size: 3 μ m or 5 μ m, spherical
 pore size: 100Å

pH range: 2.5 to 7.5
 temperature limit: 80°C

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Application	Page #
Pesticides (Carbamates)	.532

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.

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

*For post-column derivatization/fluorescence detection applications for a 4.6mm ID column the total system dead volume, including the post-column reactor, must be less than 650 μ L. For standard post-column reactor systems, we recommend a 250mm x 4.6mm, 5 μ m column. Call Restek technical service for more information.

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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.



also **available**

We also have syringe filters!
 See **page 373**.

restek
innovation!

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

Ultra Quat Columns

Physical Characteristics:

particle size: 5 μ m, spherical
pore size: 100Å

pH range: 2.5 to 7.5
temperature limit: 80°C

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exclusive!

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.#
5 μ m Column	
150mm	9181565

Application	Page #
Paraquat, Diquat . . .	328, 534

Ultra Quat Reagent Solution

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

In water, 20mL/bottle

cat. # 32441 (ea.)

Paraquat & Diquat Calibration Mix

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

for more info

For more information about the Ultra Quat system, review the *Restek Advantage* 2004 vol. 3 at www.restek.com.

lit. cat.# 59051

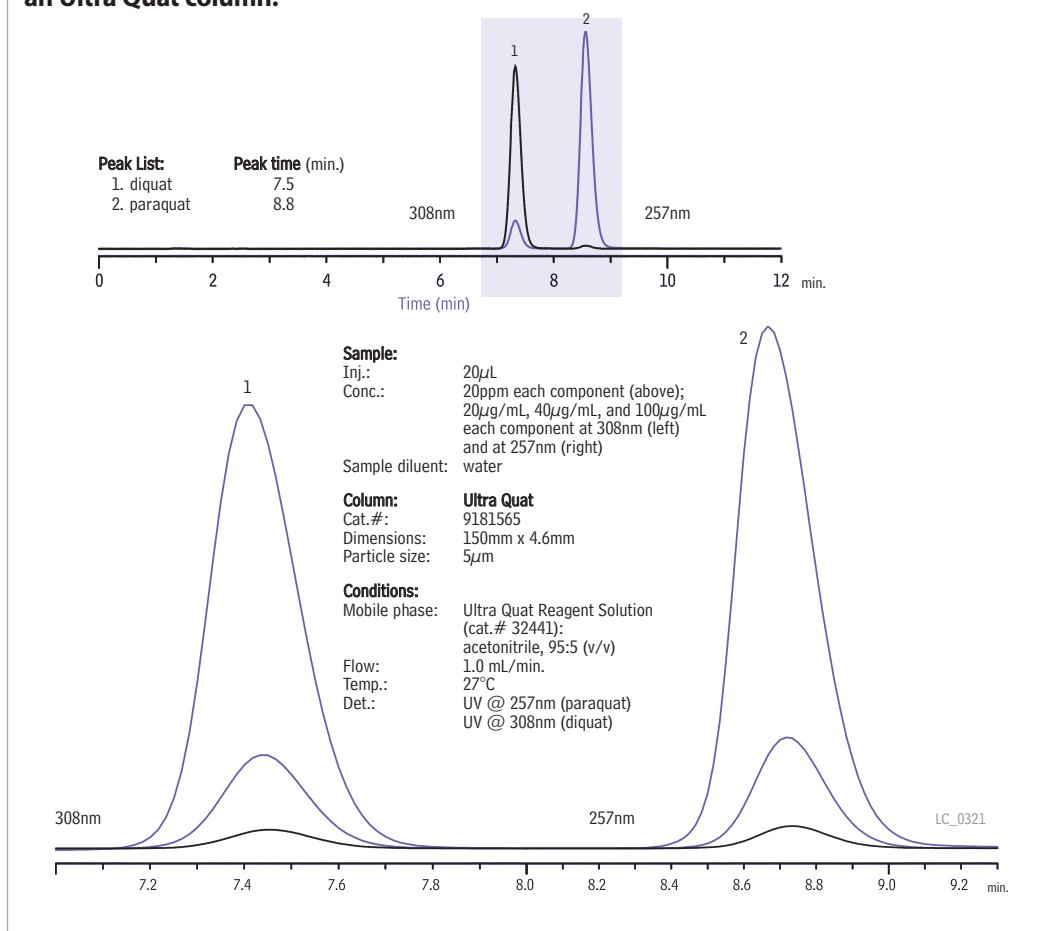
free literature

Simple, Sensitive HPLC/UV Analysis for Paraquat and Diquat

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Applications Note
lit. cat.# 580006

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



Viva Wide Pore HPLC 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 about the mean pore size, permitting a larger portion of the silica surface to play a role in the separation.

Viva C18 Columns (USP L1)

Physical Characteristics:

particle size: 3µm or 5µm, spherical endcap: yes
 pore size: 300Å pH range: 2.5 to 10
 carbon load: 9% temperature limit: 80°C

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.#	cat.#	cat.#	cat.#
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

Viva C8 Columns (USP L7)

Physical Characteristics:

particle size: 5µm, spherical endcap: yes
 pore size: 300Å pH range: 2.5 to 7.5
 carbon load: 5% temperature limit: 80°C

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.#	cat.#	cat.#	cat.#
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

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

restek innovation!

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



Application	Page #
Peptides	524
Proteins	525

ordering note

If you need another column dimension or phase, please call for a quote.

also available

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



Tawnya Childs
Customer Service
Manager

11+ years of service!

Viva C4, Biphenyl and PFP Propyl Columns



Tim Herring
Technical Service
Specialist
4+ years of service!

Viva C4 Columns (USP L26)

Physical Characteristics:

particle size: 5 μ m, spherical
pore size: 300Å
carbon load: 3.5%

endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C



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.

Length	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#
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 Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 5 μ m
pore size: 300Å
carbon load: 6.7%

endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C

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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.

Length	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#
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	

free literature

Viva Wide Pore HPLC Columns

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Flyer
lit. cat.# 59939

also available

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

Viva PFP Propyl Columns (USP L43)

Physical Characteristics:

particle size: 5 μ m, spherical
pore size: 300Å
carbon load: 5%

endcap: yes
pH range: 2.5 to 7.5
temperature limit: 80°C



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.

Length	1.0mm ID		2.1mm ID		3.2mm ID		4.6mm ID	
	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#	cat.#
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 Silica Columns (USP L3)**Physical Characteristics:**

particle size: 5 μ m, spherical
pore size: 300Å

pH range: 2.5 to 7.5
temperature limit: 80°C

**Chromatographic Properties:**

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

	1.0mm ID	2.1mm ID	3.2mm ID	4.6mm ID
Length	cat.#	cat.#	cat.#	cat.#
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

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

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

Also order an XG-XF fitting (cat.#25026 or 25062), see page 337.

For guard cartridges for these columns, see page 339.

Fast LC Method Development Kits

Fast, efficient separations in an economical cartridge format. The design allows rapid substitution of one cartridge for another. The holder is available with either standard fittings or with a universal PEEK™ tip fitting. The universal fitting gives the user the option of threading the column directly into the detector inlet, reducing system dwell volume. The cartridges are 30mm long, with either 2.1mm or 4.0mm ID. The 2.1mm and 4.0mm ID cartridges have the same outside diameter, so the holder will accept either.

Each kit includes four 3 μ m Fast LC Cartridges: Ultra C18 (USP L1), Ultra Aqueous C18 (USP L1), Ultra Cyano (USP L10), Ultra PFP (USP L43), and a Fast LC cartridge holder.

Fast LC Development Kits

Description	qty.	cat.#
Fast LC Development Kit, four 30mm x 2.1mm columns	kit	25296
Fast LC Development Kit, four 30mm x 4.0mm columns	kit	25297

3 μ m Fast LC Cartridges

Description	Length	2.1mm ID	4.0mm ID
Ultra C18 Fast LC Cartridge	30mm	91743320	91743340
Ultra Aqueous C18 Fast LC Cartridge	30mm	91783320	91783340
Ultra Cyano Fast LC Cartridge	30mm	91063320	91063340
Ultra PFP Fast LC Cartridge	30mm	91763320	91763340

Fast LC Cartridge Holders

Description	qty.	cat.#
Fast LC Cartridge Holder with PEEK™ Tip	ea.	25298
Fast LC Cartridge Holder with Standard Fittings	ea.	25299



Fast LC saves time and conserves solvent.

also available

Additional column kits and Fast LC cartridges are available. Please call for more information.

Kromasil® Chromatography Products

- Perfectly spherical, totally porous HPLC silica products from Kromasil.
- Wide range of bonded phases and particle sizes.
- Excellent chemical purity and stability, for highly efficient, reproducible separations.

Kromasil® HPLC silica products consist of highly spherical, porous particles in sizes from 3.5µm to 16µm and larger. The surface properties of the silica have been optimized, and include a narrow pore size distribution and a well-defined pore structure. For chromatographic separations, these properties ensure higher efficiencies, lower pressure drops, and excellent lot-to-lot reproducibility.

Kromasil® spherical silicas are produced using a sol-gel technique, which yields a mechanically strong particle with a large surface area (330m²/g for 100Å silica). Metal impurities are carefully monitored, as trace metals in the silica structure increase the surface acidity and can lead to tailing peaks for basic or chelating compounds. Typical metal content for Kromasil® silicas is shown in Table I.

Table I Typical chemical purity for Kromasil® spherical silicas.

Metal	Content (ppm)
Na	<20
Al	<10
Fe	<10

Values based on AAS or ICP measurements.

Kromasil® bonded phases are manufactured using monofunctional silanes, for higher surface coverage and greater reproducibility. Bonding is followed by an end-capping procedure, which further increases chemical stability.

Restek offers all Kromasil® phases, in a full range of column dimensions and silica particle sizes. A sampling of our product offering is shown here. For further information about Kromasil® products available from Restek, please contact Restek technical service at 800-356-1688, ext. 4, 814-353-1300, ext. 4, or support@restek.com

Kromasil® HPLC Columns

Physical Characteristics:

particle size: 3.5µm or 5µm, spherical
pore size: 100Å

endcap: fully endcapped
pH range: 1.5 to 10

Kromasil® C18 Columns (USP L1)

average carbon load: 20%

Length	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
3.5µm Columns			
30mm	9204332	—	9204335
50mm	9204352	—	9204355
100mm	9204312	—	9204315
150mm	9204362	—	9204365
5µm Columns			
30mm	9204532	9204533	9204535
50mm	9204552	9204553	9204555
100mm	9204512	9204513	9204515
150mm	9204562	9204563	9204565
200mm	9204522	9204523	9204525
250mm	9204572	9204573	9204575

also available

For guard cartridges for these columns, see page 339.

Kromasil® C4 Columns (USP L26)

average carbon load: 8%

Length	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
5µm Columns			
30mm	9202532	9202533	9202535
50mm	9202552	9202553	9202555
100mm	9202512	9202513	9202515
150mm	9202562	9202563	9202565
200mm	9202522	9202523	9202525
250mm	9202572	9202573	9202575

Kromasil® C8 Columns (USP L7)

average carbon load: 12%

Length	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#
3.5µm Columns			
30mm	9203332	—	9203335
50mm	9203352	—	9203355
100mm	9203312	—	9203315
150mm	9203362	—	9203365
5µm Columns			
30mm	9203532	9203533	9203535
50mm	9203552	9203553	9203555
100mm	9203512	9203513	9203515
150mm	9203562	9203563	9203565
200mm	9203522	9203523	9203525
250mm	9203572	9203573	9203575



Sean Nolan
Materials Manager
8+ years of service!

Kromasil® C1 Columns (USP L13)

Length	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#
5µm Columns			
30mm	9201532	9201533	9201535
50mm	9201552	9201553	9201555
100mm	9201512	9201513	9201515
150mm	9201562	9201563	9201565
200mm	9201522	9201523	9201525
250mm	9201572	9201573	9201575

Kromasil® Phenyl Columns (USP L11)

average carbon load: 14%

Length	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#
5µm Columns			
50mm	9205552	9205553	9205555
150mm	9205562	9205563	9205565
250mm	9205572	9205573	9205575

Kromasil® Amino Columns (USP L8)

nitrogen load: 1.7%

Length	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#
5µm Columns			
50mm	9207552	9207553	9207555
150mm	9207562	9207563	9207565
250mm	9207572	9207573	9207575

Kromasil® Silica Columns (USP L3)

Length	2.1mm ID	3.2mm ID	4.6mm ID
	cat.#	cat.#	cat.#
5µm Columns			
30mm	9200532	9200533	9200535
50mm	9200552	9200553	9200555
100mm	9200512	9200513	9200515
150mm	9200562	9200563	9200565
200mm	9200522	9200523	9200525
250mm	9200572	9200573	9200575

also available

Other Kromasil® column dimensions, phases, and particle sizes are available. Please contact Technical Service at 800-356-1688 or 814-353-1300, ext. 4, or contact your Restek representative.

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Supersize without surprise!

HPLC Prep Columns

- Easy scale-up from Restek analytical columns.
- Popular bonded phases.

Restek makes it easy to scale up your separations. We offer a wide range of semi-preparative and preparative-scale columns packed with many of our popular Ultra, Allure®, Pinnacle™ DB, and Pinnacle™ II bonded phases on a 5µm spherical silica. Other stationary phases and particle sizes are available—if you need a phase on 7µm, 10µm or 15µm particles, please call.

Pinnacle™ DB HPLC Prep Columns

Dimensions	Pinnacle™ DB C18	Pinnacle™ DB C8	Pinnacle™ DB Cyano	Pinnacle™ DB Silica
Length x ID	cat.#	cat.#	cat.#	cat.#
50 x 10mm	9414557	9413557	9416557	9410557
50 x 21.2mm	9414558	9413558	9416558	9410558
50 x 30mm	9414559	9413559	9416559	9410559
50 x 50mm	9414550	9413550	9416550	9410550
100 x 10mm	9414517	9413517	9416517	9410517
100 x 21.2mm	9414518	9413518	9416518	9410518
100 x 30mm	9414519	9413519	9416519	9410519
100 x 50mm	9414510	9413510	9416510	9410510
150 x 10mm	9414567	9413567	9416567	9410567
150 x 21.2mm	9414568	9413568	9416568	9410568
150 x 30mm	9414569	9413569	9416569	9410569
150 x 50mm	9414560	9413560	9416560	9410560
250 x 10mm	9414577	9413577	9416577	9410577
250 x 21.2mm	9414578	9413578	9416578	9410578
250 x 30mm	9414579	9413579	9416579	9410579
250 x 50mm	9414570	9413570	9416570	9410570

Pinnacle™ II HPLC Prep Columns

Dimensions	Pinnacle™ II C18	Pinnacle™ II C8	Pinnacle™ II Cyano	Pinnacle™ II Silica
Length x ID	cat.#	cat.#	cat.#	cat.#
50 x 10mm	9214557	9213557	9216557	9210557
50 x 21.2mm	9214558	9213558	9216558	9210558
50 x 30mm	9214559	9213559	9216559	9210559
50 x 50mm	9214550	9213550	9216550	9210550
100 x 10mm	9214517	9213517	9216517	9210517
100 x 21.2mm	9214518	9213518	9216518	9210518
100 x 30mm	9214519	9213519	9216519	9210519
100 x 50mm	9214510	9213510	9216510	9210510
150 x 10mm	9214567	9213567	9216567	9210567
150 x 21.2mm	9214568	9213568	9216568	9210568
150 x 30mm	9214569	9213569	9216569	9210569
150 x 50mm	9214560	9213560	9216560	9210560
250 x 10mm	9214577	9213577	9216577	9210577
250 x 21.2mm	9214578	9213578	9216578	9210578
250 x 30mm	9214579	9213579	9216579	9210579
250 x 50mm	9214570	9213570	9216570	9210570

ordering note

We strongly recommend ordering a semi-prep or prep column only after scouting 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).



Allure® HPLC Prep Columns

Dimensions Length x ID	Allure® C18 cat.#	Allure® Basix cat.#	Allure® PFP Propyl cat.#	Allure® Silica cat.#
50 x 10mm	9164557	9161557	—	9160557
50 x 21.2mm	9164558	9161558	—	9160558
50 x 30mm	9164559	9161559	—	9160559
50 x 50mm	9164550	9161550	—	9160550
100 x 10mm	9164517	9161517	—	9160517
100 x 21.2mm	9164518	9161518	—	9160518
100 x 30mm	9164519	9161519	—	9160519
100 x 50mm	9164510	9161510	—	9160510
150 x 10mm	9164567	9161567	—	9160567
150 x 21.2mm	9164568	9161568	9169568	9160568
150 x 30mm	9164569	9161569	9169569	9160569
150 x 50mm	9164560	9161560	—	9160560
250 x 10mm	9164577	9161577	—	9160577
250 x 21.2mm	9164578	9161578	—	9160578
250 x 30mm	9164579	9161579	—	9160579
250 x 50mm	9164570	9161570	—	9160570



Ultra HPLC Prep Columns

Dimensions Length x ID	Ultra C18 cat.#	Ultra Aqueous C18 cat.#	Ultra C8 cat.#	Ultra IBD cat.#	Ultra Cyano cat.#	Ultra Phenyl cat.#	Ultra PFP cat.#	Ultra Silica cat.#
50 x 10mm	9174557	9178557	9103557	9175557	9106557	9105557	9176557	9100557
50 x 21.2mm	9174558	9178558	9103558	9175558	9106558	9105558	9176558	9100558
50 x 30mm	9174559	9178559	9103559	9175559	9106559	9105559	9176559	9100559
50 x 50mm	9174550	9178550	9103550	9175550	9106550	9105550	9176550	9100550
100 x 10mm	9174517	9178517	9103517	9175517	9106517	9105517	9176517	9100517
100 x 21.2mm	9174518	9178518	9103518	9175518	9106518	9105518	9176518	9100518
100 x 30mm	9174519	9178519	9103519	9175519	9106519	9105519	9176519	9100519
100 x 50mm	9174510	9178510	9103510	9175510	9106510	9105510	9176510	9100510
150 x 10mm	9174567	9178567	9103567	9175567	9106567	9105567	9176567	9100567
150 x 21.2mm	9174568	9178568	9103568	9175568	9106568	9105568	9176568	9100568
150 x 30mm	9174569	9178569	9103569	9175569	9106569	9105569	9176569	9100569
150 x 50mm	9174560	9178560	9103560	9175560	9106560	9105560	9176560	9100560
250 x 10mm	9174577	9178577	9103577	9175577	9106577	9105577	9176577	9100577
250 x 21.2mm	9174578	9178578	9103578	9175578	9106578	9105578	9176578	9100578
250 x 30mm	9174579	9178579	9103579	9175579	9106579	9105579	9176579	9100579
250 x 50mm	9174570	9178570	9103570	9175570	9106570	9105570	9176570	9100570

Kromasil® Prep Columns

Dimensions Length x ID	Kromasil® C18 cat.#	Kromasil® C8 cat.#
50 x 10mm	9204557	9203557
50 x 21.2mm	9204558	9203558
50 x 30mm	9204559	9203559
150 x 10mm	9204567	9203567
150 x 21.2mm	9204568	9203568
150 x 30mm	9204569	9203569
250 x 10mm	9204577	9203577
250 x 21.2mm	9204578	9203578
250 x 30mm	9204579	9203579

ordering note

We strongly recommend ordering a semi-prep or prep column only after scouting 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).



Bulk Packing Materials

Use our bulk packing materials to pack your own columns!

Restek is among the small group of column manufacturers capable of producing their own high purity silica. We offer our 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.

Bulk Packing Materials

Description	min. qty.	cat.#
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
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
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
Description	qty.	cat.#
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

also available

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

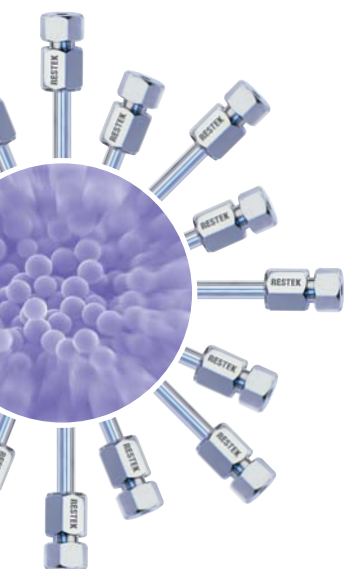
Silica Bulk Materials

Description	min. qty.	cat.#
Silica Bulk Materials		
Pinnacle™ II Silica Bulk Packing, 3 μ m	5g	92103
Pinnacle™ II Silica Bulk Packing, 5 μ m	5g	92105
Pinnacle™ DB Silica Bulk Packing, 5 μ m	5g	94105
Description	qty.	cat.#
Ultra Silica Bulk Packing, 5 μ m	10g/btl.	91005

Kromasil® Bulk Packings

- High-purity packing materials in 10 and 16 μ m.
- All Kromasil® phases available, please inquire.

Description	min. qty.	cat.#
Kromasil® 100Å Silica, 10 μ m	200g	92000
Kromasil® 100Å Silica, 16 μ m	200g	92001
Kromasil® 100Å C8, 10 μ m	200g	92030
Kromasil® 100Å C8, 16 μ m	200g	92031
Kromasil® 100Å C18, 10 μ m	200g	92040
Kromasil® 100Å C18, 16 μ m	200g	92041
Kromasil® 100Å Chiral DMB, 10 μ m	200g	92080
Kromasil® 100Å Chiral DMB, 16 μ m	200g	92081
Kromasil® 100Å Chiral TBB, 10 μ m	200g	91990
Kromasil® 100Å Chiral TBB, 16 μ m	200g	91991



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, below) and Trident guard cartridges (page 339).



Lori McGarry
Environmental
Health & Safety Officer
2+ years of service!

Description	qty.	cat.#
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, 2.0 μ m	5-pk.	25022
Replacement Cap Frits: 4mm, 0.5 μ m	5-pk.	25023
Replacement Cap Frits: 2mm, 2.0 μ m	5-pk.	25057

Trident Integral Guard System



Assembled column with Trident integral guard system



Column with Trident Integral Inlet Fitting (to order add "-700" to catalog number of column) and guard cartridge, XG-XF fitting, cap frit, and XF end fitting.



Remove the XF end fitting and install the guard cartridge in the end of the column.



Add the XG-XF fitting (order cat.# 25026 for 10mm guard cartridges, cat.# 25062 for 20mm guard cartridges).



Re-install the XF end fitting with cap frit.



The cap frit can be easily replaced if it becomes contaminated/plugged.

Trident Direct Guard Cartridge System, Cartridge Holders



Trident Direct provides three levels of protection



Trident Direct high-pressure filter
Protection against particulate matter.



Trident Direct 10mm guard cartridge holder with filter

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



Trident Direct 20mm guard cartridge holder with filter

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

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.

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

Description	qty.	cat.#
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



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.

Description	qty.	cat.#
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

*Standard porosity.



Holder for 10mm guard cartridge



Holder with filter for 10mm guard cartridge



Holder for 20mm guard cartridge



Holder with filter for 20mm guard cartridge

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)
Allure® AK	—	915950210	—	—
Allure® Basix	916150212	916150210	916150222	916150220
Allure® C18	916450212	916450210	916450222	916450220
Allure® PFP Propyl	916950212	916950210	916950222	916950220
Allure® Silica	916050212	916050210	916050222	916050220
Allure® Organic Acids	916550212	916550210	916550222	916550220
Allure® Aqueous C18	916850212	916850210	916850222	916850220
Allure® Biphenyl	916650212	916650210	916650222	916650220
pHidelity® C18	957930212	957930210	957930222	957930220
Pinnacle™ II Amino	921750212	921750210	921750222	921750220
Pinnacle™ II C8	921350212	921350210	921350222	921350220
Pinnacle™ II C18	921450212	921450210	921450222	921450220
Pinnacle™ II Cyano	921650212	921650210	921650222	921650220
Pinnacle™ II PAH	921950212	921950210	921950222	921950220
Pinnacle™ II Phenyl	921550212	921550210	921550222	921550220
Pinnacle™ II Biphenyl	—	920950210	—	920950220
Pinnacle™ II Silica	921050212	921050210	921050222	921050220
Pinnacle™ DB C8	941350212	941350210	941350222	941350220
Pinnacle™ DB C18	941450212	941450210	941450222	941450220
Pinnacle™ DB Aqueous C18	941850212	941850210	941850222	941850220
Pinnacle™ DB Biphenyl	940950212	940950210	940950222	940950220
Pinnacle™ DB PFP Propyl	941950212	941950210	941950222	941950220
Pinnacle™ DB Cyano	941650212	941650210	941650222	941650220
Pinnacle™ DB Phenyl	941550212	941550210	941550222	941550220
Pinnacle™ DB Silica	941050212	941050210	941050222	941050220
Ultra Amino	910750212	910750210	910750222	910750220
Ultra Aqueous C18	917850212	917850210	917850222	917850220
Ultra C1	910150212	910150210	910150222	910150220
Ultra C4	910250212	910250210	910250222	910250220
Ultra C8	910350212	910350210	910350222	910350220
Ultra C18	917450212	917450210	917450222	917450220
Ultra Carbamate	917750212	917750210	917750222	917750220
Ultra Cyano	910650212	910650210	910650222	910650220
Ultra IBD	917550212	917550210	917550222	917550220
Ultra PFP	917650212	917650210	917650222	917650220
Ultra Phenyl	910550212	910550210	910550222	910550220
Ultra Silica	910050212	910050210	910050222	910050220
Ultra Quat	918150212	918150210	918150222	918150220
Viva C18	951450212	951450210	951450222	951450220
Viva C8	951350212	951350210	951350222	951350220
Viva C4	951250212	951250210	951250222	951250220
Viva PFP Propyl	951950212	951950210	951950222	951950220
Viva Biphenyl	951650212	951650210	951650222	951650220
Viva Silica	951050212	951050210	951050222	951050220
Kromasil® C1	920150212	920150210	—	920150220
Kromasil® C4	920250212	920250210	—	920250220
Kromasil® C8	920350212	920350210	—	920350220
Kromasil® C18	920450212	920450210	—	920450220
Kromasil® Amino	920750212	920750210	920750222	920750220
Kromasil® Phenyl	920550212	920550210	920550222	920550220
Kromasil® Silica	920050212	920050210	—	920050220



10 & 20mm Guard Cartridges

new!



Kevin Davey
HPLC Column
Manufacturing Technician