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.

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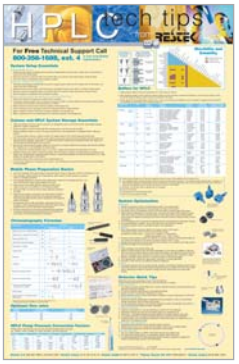


HPLC Tech Tips Wall Chart
Almost everything you need to remember about HPLC, condensed into 3 feet by 2 feet: mobile phase basics, buffers (types, pKa values, pH ranges, formula masses, more), miscibility and solubility chart (invaluable!), system setup and optimization, detector tips, pressure conversion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

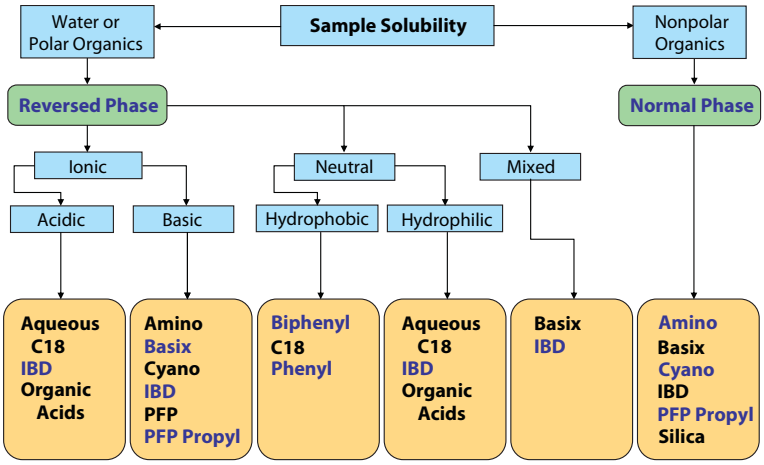
Call Restek at 800-356-1688 or 814-353-1300, ext. 5, or contact your Restek representative, to request your free copy!

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 Optimum Flow Rate (mL/min.)	3µm Particles 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

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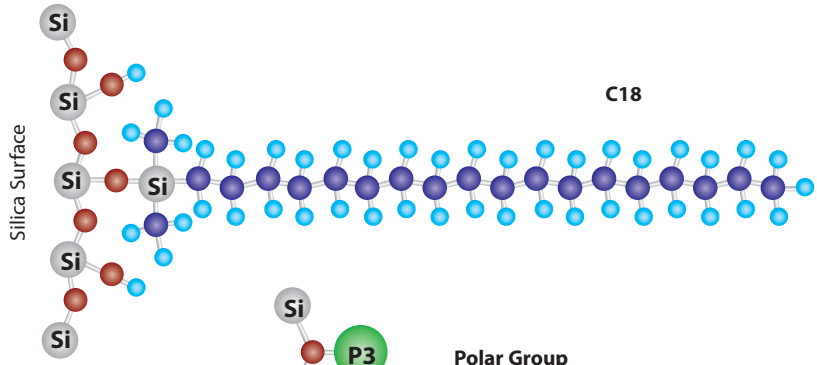
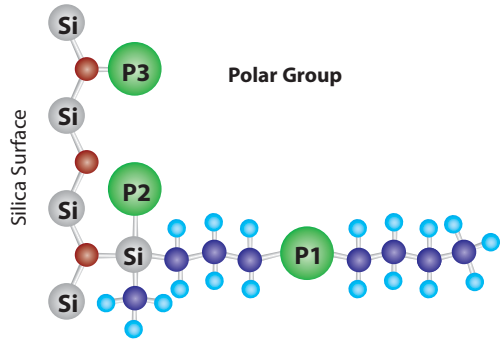
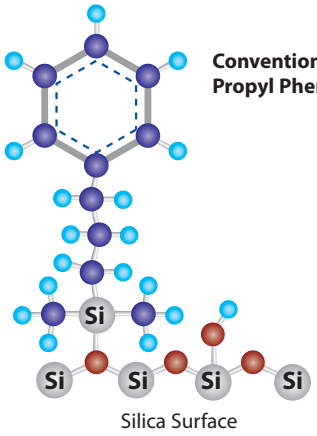
Figure 2 Stationary phase comparison.

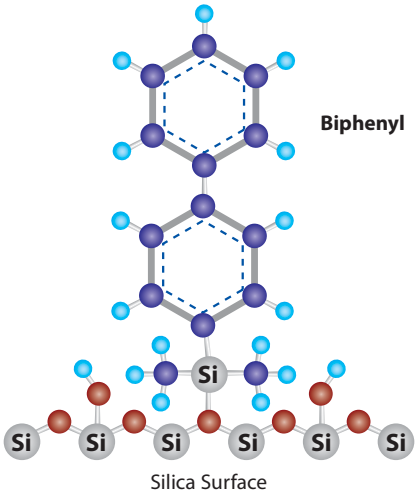


Alkyl phases (e.g. C18)
Alkyl-based stationary phases, such as C18, are best suited for analyzing hydrophobic molecules with a high carbon:heteroatom ratio.

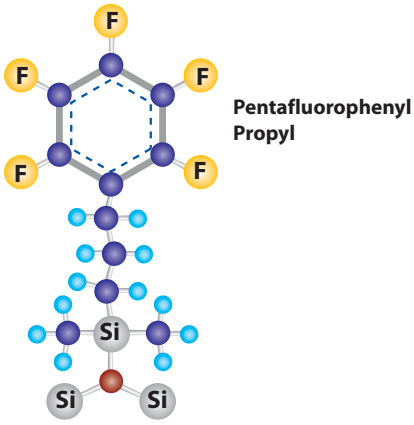


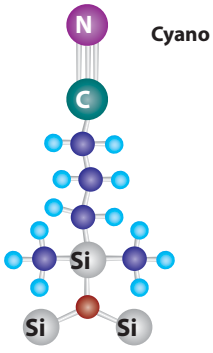
Alkyl phase with polar functional group
An alkyl-based stationary phase with either an embedded polar group (P1), a polar side chain (P2), or a polar end-cap (P3), has significantly greater interaction with polar compounds than a traditional alkyl phase.





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.

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HPLC COLUMNS

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. . .

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Physical Characteristics of HPLC Columns; USP Descriptions

Restek HPLC Column	End Cap?	Pore Size (Å)	Carbon load (%)	Applications	Chromatographic Properties	Similar Phases	USP Code	Page #
Ultra PFP	Y	100	7	Ideal for taxol and precursors, or halogenated compounds, amines, esters, or ketones.	A pentafluorophenyl phase. Unique selectivity by interaction with functional groups of organohalogens or other basic analytes.	Fluophase® PFP, Fluosep®-RP Phenyl, Curosil® PFP	L43	326
Ultra Silica	—	100	—	Ideal for normal phase applications.	High purity, high surface area.	—	L3	327
Ultra Carbamate	—	100	—	Rapid analysis of carbamates.	Proprietary stationary phase can process up to twice as many samples per hour, compared to a conventional C18 phase.	Unique	—	327
Ultra Quat	—	100	—	Proprietary phase for the analysis of paraquat and diquat and other quaternary amines.	High purity silica.	Unique	—	328
Kromasil® C18	Y	100	20	A good all-purpose C18 phase for a wide range of water-soluble compounds.	High purity phase with excellent peak shape for a wide range of compounds. Good general pupose reversed phase column.	Discovery® C18, Symmetry® C18, Hypersil® Gold C18, Luna® C18, Zorbax® C18, LiChrospher RP®-18, Inertsil® ODS-2, Develosil® C18	L1	332
Kromasil® C8	Y	100	12	Selectivity similar to Kromasil® C18, but less hydrophobic retention.	High purity, reversed phase packing for a wide range of compounds.	Luna® C8, Symmetry® C8, Hypersil® Gold C8	L7	333
Kromasil® C4	Y	100	8	Selectivity similar to Kromasil® C18, but less hydrophobic retention.	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
Kromasil® C1	Y	100	—	Alternate selectivity to alkyl phases, especially for polar analytes.	High purity, reversed phase packing for a wide range of compounds. Less retentive than C18, C8, and C4.	Spherisorb® C1	L13	333
Kromasil® Phenyl	Y	100	14	Ideal for aromatic compounds, PAHs, and purines/pyrimidines.	High purity, base deactivated reversed phase packing. Alternate selectivity to alkyl phases.	Platinum™ Phenyl, Supelcosil™ Phenyl, Betasil® Phenyl	L11	333
Kromasil® Amino	Y	100	1.7% nitrogen	Excellent choice for carbohydrate analysis.	High purity, base deactivated reversed phase packing. Alternate selectivity to alkyl phases.	Platinum™ Amino, Develosil® NH2	L8	333
Kromasil® Silica	—	100	—	Good choice for normal phase applications.	High purity, base deactivated packing.	—	L3	333
Viva Wide Pore C18	Y	300	9	Proteins and other higher molecular weight compounds.	Silica manufactured by Restek.	BioBasic® 18, Symmetry® 300 C18, Jupiter® 300 C18, Zorbax® 300 OSB C18, Synchropak® C18, 208 TP C18	L1	329
Viva Wide Pore C8	Y	300	5	Proteins and other higher molecular weight compounds. Less retentive than C18 phase.	Silica manufactured by Restek.	BioBasic® 8, Zorbax® 300 OSB C8, Synchropak® C8, 208 TP C8	L7	329
Viva Wide Pore C4	Y	300	3.5	Proteins and other higher molecular weight compounds. Less retentive than C18 and C8 phases.	Silica manufactured by Restek.	BioBasic® 4, Symmetry® 300 C4, Jupiter® 300 C4, Synchropak® C4, 208 TP C4	L26	330
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.	Silica manufactured by Restek.	Unique	L11	330
Viva Wide Pore PFP Propyl	Y	300	5	Exhibits excellent peak shape for a wide range of compounds, including nucleosides, nucleotides, and halogenated compounds.	Silica manufactured by Restek.	Unique	L43	330
Viva Wide Pore Silica	—	300	—	Normal phase applications for highly retained high molecular weight compounds.	Silica manufactured by Restek.	—	L3	331
pHidelity® C18	—	140	—	Hydrophobic C18 phase suitable for analyzing a wide range of compounds; enhanced stability under basic and acidic conditions.	Excellent stability under extreme pH conditions. True C18 selectivity in a silica-based stationary phase.	Unique	—	308

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. *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)*
L3	Porous silica particles, 5 to 10µm in diameter. *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)*
L7	Octylsilane chemically bonded to totally porous silica particles, 1.7 to 10µm in diameter. *Pinnacle™ DB C8 (p. 310), Pinnacle™ II C8 (p. 315), Ultra C8 (p. 322), Viva C8 (p. 329), Kromasil® C8 (p. 333)*
L8	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 3 to 10µm in diameter. *Pinnacle™ II Amino (p. 316), Ultra Amino (p. 326), Kromasil® Amino (p. 333)*
L10	Nitrile groups chemically bonded to porous silica particles, 3 to 10µm in diameter. *Pinnacle™ DB Cyano (p. 311), Pinnacle™ II Cyano (p. 315), Allure® Basix (p. 318), Ultra Cyano (p. 325)*
L11	Phenyl groups chemically bonded to porous silica particles, 1.7 to 10µm in diameter. *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)*
L13	Trimethylsilane chemically bonded to porous silica particles, 3 to 10µm in diameter. *Ultra C1 (p. 324), Kromasil® C1 (p. 333)*
L26	Butyl silane chemically bonded to totally porous silica particles, 3 to 10µm in diameter. *Ultra C4 (p.324), Viva C4 (p.330), Kromasil® C4 (p.332)*
L43	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 5 to 10µm in diameter. *Pinnacle™ DB PFP Propyl (p. 312), Allure® PFP Propyl (p. 319), Ultra PFP (p. 326), Viva PFP Propyl (p. 330)*

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Physical Characteristics of HPLC Columns; USP Descriptions

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 1.9µm Pinnacle™ DB

Small Particle HPLC Columns

Restek's popular Pinnacle™ DB HPLC columns are now available in a <2µm 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 1.9µm, while eliminating <1µm 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!

1.9µm Pinnacle™ DB HPLC Columns

Physical Characteristics:

particle size: 1.9µm
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

free literature

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Applications Note
lit. cat.# 580202

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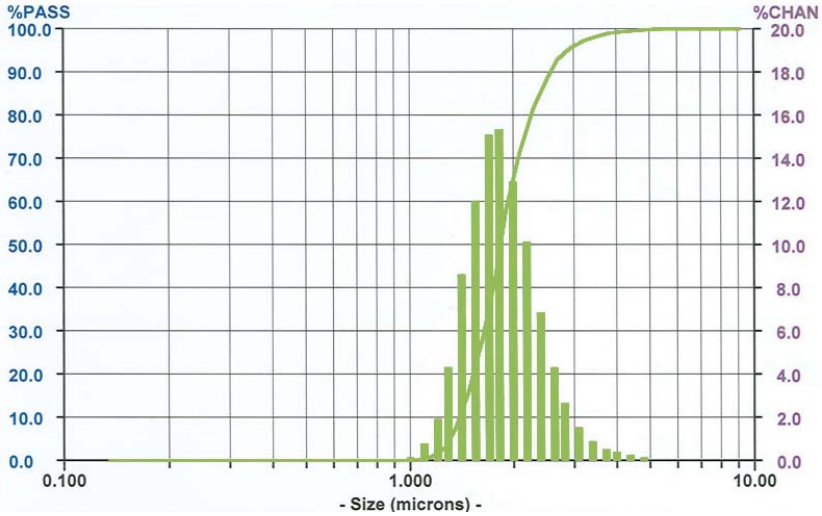
Figure 1 Pinnacle™ DB silica particle size distribution chart shows an exceptionally tight, symmetrical distribution around 1.9µm with no <1µm particles.



Rick Lake
Innovations Chemist
3+ years of service!

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

Peak List:

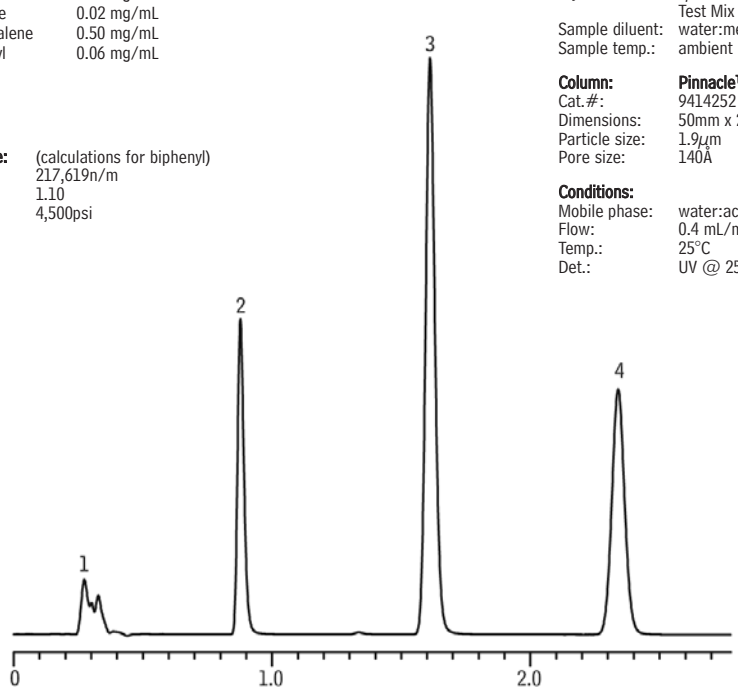
1. uracil	3.00 mg/mL
2. benzene	0.02 mg/mL
3. naphthalene	0.50 mg/mL
4. biphenyl	0.06 mg/mL

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

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



LC_EX0427

for **more** info

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

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Pinnacle™ DB C18 and C8 Columns

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.

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

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Pinnacle™ DB C18 Columns (USP L1)

Restek Manufactured Silica

Physical Characteristics:

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

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)

Restek Manufactured Silica

Physical Characteristics:

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

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Pinnacle™ DB Cyano Columns (USP L10)

Restek Manufactured Silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 140Å
carbon load: 4%
endcap: yes
pH range: 2.5 to 7.5
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.

Pinnacle™ DB Phenyl Columns (USP L11)

Restek Manufactured Silica

Physical Characteristics:

particle range: 5µm, spherical
pore size: 140Å
carbon load: 5.3%
endcap: yes
pH range: 2.5 to 7.5
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.

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Pinnacle™ DB PFP Propyl and Biphenyl Columns

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

Restek Manufactured Silica

Physical Characteristics:

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

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)

Restek Manufactured Silica

Physical Characteristics:

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

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
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Pinnacle™ DB Aqueous C18 Columns (USP L1)

Restek Manufactured Silica

new!

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

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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID 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)

Restek Manufactured Silica

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

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

new!

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.

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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)

Restek Manufactured Silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 13%
endcap: fully endcapped
pH range: 2.5 to 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.

Length	1.0mm ID 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

new and **improved!**

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

Pinnacle™ II PAH Columns

Restek Manufactured Silica

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.

Length	2.1mm ID 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

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Pinnacle™ II C8 Columns (USP L7)

Restek Manufactured Silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 7%
endcap: fully endcapped
pH range: 2.5 to 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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.0mm ID cat.#	4.6mm ID cat.#
3µm Columns					
30mm	9213331	9213332	9213333	—	9213335
50mm	9213351	9213352	9213353	—	9213355
100mm	9213311	9213312	9213313	—	9213315
5µm Columns					
30mm	9213531	9213532	9213533	—	9213535
50mm	9213551	9213552	9213553	—	9213555
100mm	9213511	9213512	9213513	9213514	9213515
150mm	9213561	9213562	9213563	9213564	9213565
200mm	9213521	9213522	9213523	—	9213525
250mm	9213571	9213572	9213573	—	9213575

Application	Page #
Parabens	537

also available

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Pinnacle™ II Cyano Columns (USP L10)

Restek Manufactured Silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 4%
endcap: fully endcapped
pH range: 2.5 to 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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID cat.#
3µm Columns				
30mm	9216331	9216332	9216333	9216335
50mm	9216351	9216352	9216353	9216355
100mm	9216311	9216312	9216313	9216315
5µm Columns				
30mm	9216531	9216532	9216533	9216535
50mm	9216551	9216552	9216553	9216555
100mm	9216511	9216512	9216513	9216515
150mm	9216561	9216562	9216563	9216565
200mm	9216521	9216522	9216523	9216525
250mm	9216571	9216572	9216573	9216575

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
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Pinnacle™ II Phenyl and Amino Columns

Pinnacle™ II Phenyl Columns (USP L11)

Restek Manufactured Silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 6%
endcap: fully endcapped
pH range: 2.5 to 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

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Pinnacle™ II Amino Columns (USP L8)

Restek Manufactured Silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: 2%
endcap: no
pH range: 2.5 to 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.

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RESTEK

Pinnacle™ II Biphenyl Columns (USP L11)

Restek Manufactured Silica

Physical Characteristics:

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

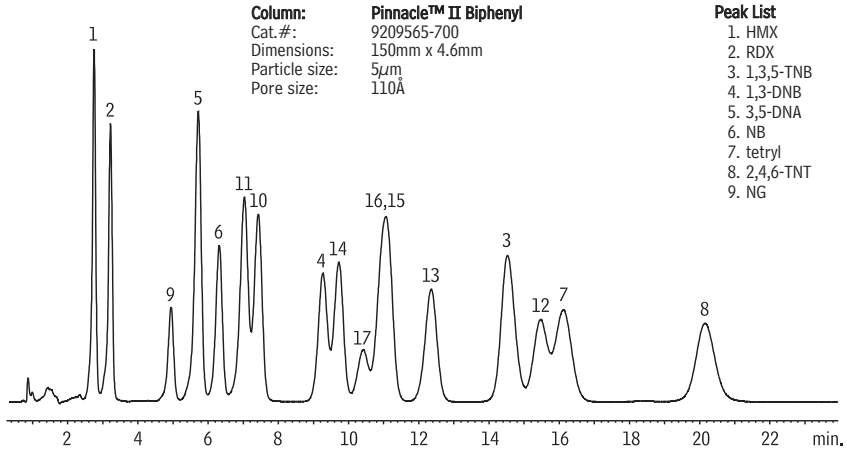
Explosives by US EPA Method 8330B on a Pinnacle™ II Biphenyl column.

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



LC_EV0429

Pinnacle™ II Silica Columns (USP L3)

Restek Manufactured Silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 110Å
carbon load: none
endcap: no
pH range: 2.5 to 10
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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID 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

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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.

Application	Page #
Antibiotics	550
Herbicides	532
Pesticides	533

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

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 60Å
carbon load: 27%
endcap: fully endcapped
pH range: 2.5 to 7.5
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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID 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

also available

More chromatograms!

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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® Basix Columns (USP L10)
Excellent Columns for LC/MS and ELSD

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 60Å
carbon load: 12%
endcap: fully endcapped
pH range: 2.5 to 7.5
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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID 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

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Allure® PFP Propyl Columns (USP L43)
Excellent Columns for LC/MS and ELSD

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 60Å
carbon load: 17%
endcap: fully endcapped
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. An excellent phase for separating nucleosides, nucleotides, purines, pyrimidines, halogenated compounds, β-blockers, and tricyclic antidepressants.

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

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

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

Physical Characteristics:

particle size: 5µm spherical
pore size: 60Å
endcap: no
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.

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

Melissa Decker
Customer Service Representative
4+ 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.

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Allure® Biphenyl and Organic Acids Columns

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

Allure® Biphenyl Columns (USP L11)

Physical Characteristics:

particle size: 3µm or 5µm, 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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID 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

free literature

Allure® Biphenyl HPLC Columns

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Flyer
lit. cat.# 580015A

Allure® Organic Acids Columns

Physical Characteristics:

particle size: 5µm, 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 cat.#	4.6mm ID 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.

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

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

Application	Page #
Carbonyls	321, 528

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

Sample:
Sample: dinitrophenylhydrazine (DNPH) derivatives of aldehydes/ketones
Inj.: 10µL
Conc.: 3µg/mL each analyte, as aldehyde/ketone
Sample diluent: acetonitrile

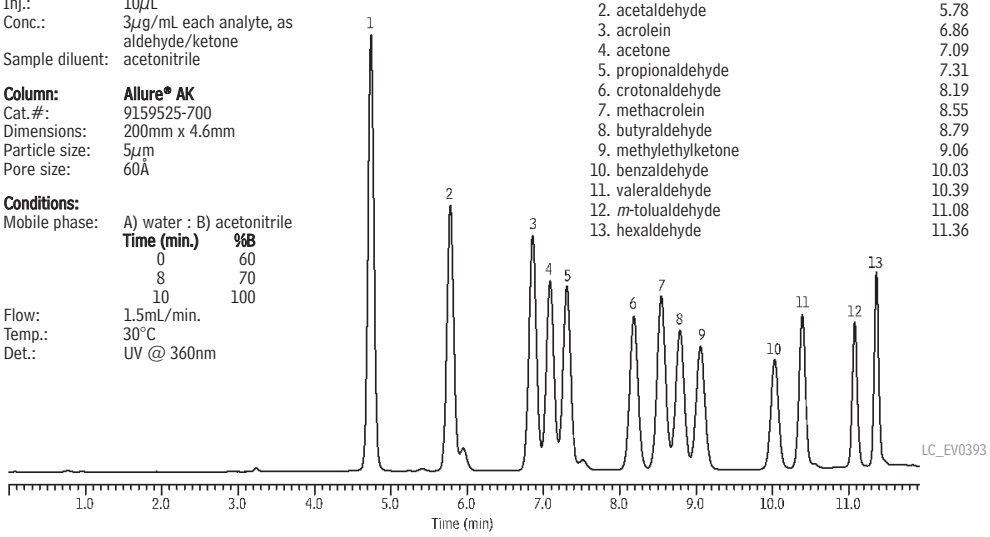
Column: Allure® AK
Cat.#: 9159525-700
Dimensions: 200mm x 4.6mm
Particle size: 5µm
Pore size: 60Å

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

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

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

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



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

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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.

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.

Viva C18 Columns (USP L1)

Restek Manufactured Silica

Physical Characteristics:

particle size: 3µm or 5µm, spherical
pore size: 300Å
carbon load: 9%
endcap: yes
pH range: 2.5 to 10
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.

Application	Page #
Peptides	524
Proteins	525

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

ordering note

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

Viva C8 Columns (USP L7)

Restek Manufactured Silica

Physical Characteristics:

particle size: 5µm, spherical
pore size: 300Å
carbon load: 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.

also available

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

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

Tawnya Childs
Customer Service Manager
11+ 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.

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Viva C4, Biphenyl and PFP Propyl Columns

Tim Herring
Technical Service Specialist
4+ years of service!

Viva C4 Columns (USP L26)

Restek Manufactured Silica

Physical Characteristics:

particle size: 5µm, 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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID 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)

restek **exclusive**!

Physical Characteristics:

particle size: 5µm
pore size: 300Å
carbon load: 6.7%
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; 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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID 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**

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

Viva PFP Propyl Columns (USP L43)

Restek Manufactured Silica

Physical Characteristics:

particle size: 5µm, 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 cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID 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)

Restek Manufactured Silica

Physical Characteristics:

particle size: 5µm, 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.

Length	1.0mm ID cat.#	2.1mm ID cat.#	3.2mm ID cat.#	4.6mm ID 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 3µm 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 saves time and conserves solvent.

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

3µm 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

also **available**

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

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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

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Kromasil® C8 Columns (USP L7)

average carbon load: 12%

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

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.

Kromasil® Phenyl Columns (USP L11)

average carbon load: 14%

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

free literature

Kromasil® Chromatography Products

Download your free copy from www.restek.com.

Flyer
lit. cat.# 580089

Kromasil® Silica Columns (USP L3)

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

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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

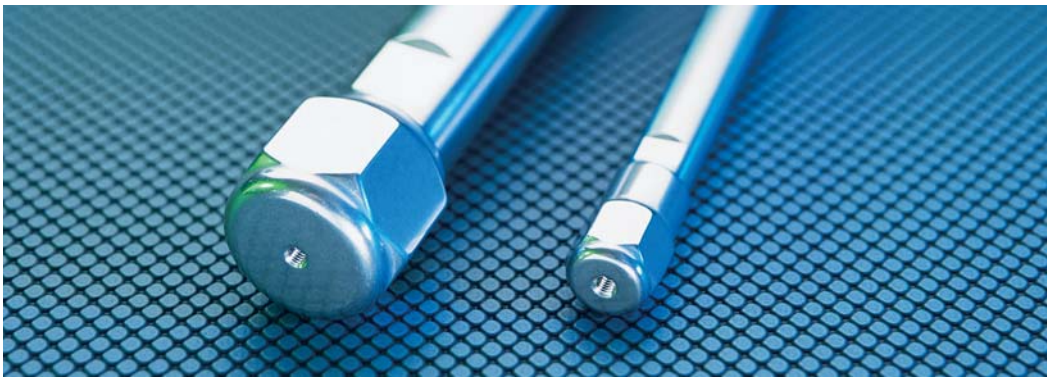
Dimensions Length x ID	Pinnacle™ DB C18 cat.#	Pinnacle™ DB C8 cat.#	Pinnacle™ DB Cyano cat.#	Pinnacle™ DB Silica cat.#
50 x 10mm	9414557	9413557	9416557	9410557
50 x 21.2mm	9414558	9413558	9416558	9410558
50 x 30mm	9414559	9413559	9416559	9410559
50 x 50mm	9414550	9413550	9416550	9410550
100 x 10mm	9414517	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

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).

Pinnacle™ II HPLC Prep Columns

Dimensions Length x ID	Pinnacle™ II C18 cat.#	Pinnacle™ II C8 cat.#	Pinnacle™ II Cyano cat.#	Pinnacle™ II Silica 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



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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

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).

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

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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

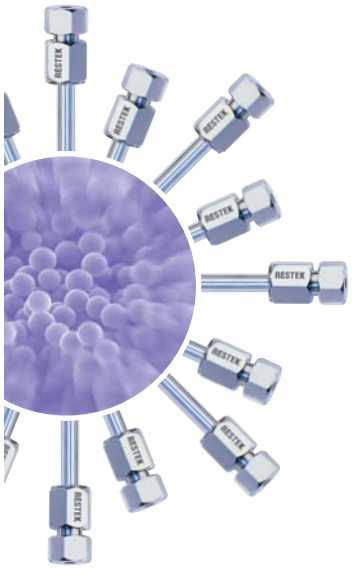
Description	min. qty.	cat.#
3µm Pinnacle™ II Bulk Packing Materials		
Pinnacle™ II C8 Bulk Packing	5g	92133
Pinnacle™ II C18 Bulk Packing	5g	92143
Pinnacle™ II Cyano Bulk Packing	5g	92163
Pinnacle™ II Phenyl Bulk Packing	5g	92153
5µm Pinnacle™ II Bulk Packing Materials		
Pinnacle™ II Amino Bulk Packing	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, 3µm	5g	92103
Pinnacle™ II Silica Bulk Packing, 5µm	5g	92105
Pinnacle™ DB Silica Bulk Packing, 5µm	5g	94105
	qty.	**cat.#**
Ultra Silica Bulk Packing, 5µm	10g/btl.	91005



Kromasil® Bulk Packings

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

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

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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.

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

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).

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, 2.0µm	5-pk.	25022
Replacement Cap Frits: 4mm, 0.5µm	5-pk.	25023
Replacement Cap Frits: 2mm, 2.0µm	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 cartidges, 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.

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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

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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

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Kevin Davey
HPLC Column Manufacturing Technician

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