pharmaceutical • environmental • chemical

INDUSTRIES

HPLC Separations

ES Industries

Leaders in Innovative HPLC Column Technology for Over 20 Years

- *A premium high efficiency, high reproducibility HPLC column manufacturer*
- *The widest range of packing materials available from a single source with over 20 years consistent production*
- *Comprehensive technical assistance and method development service*
- *Extensive capabilities to produce state-of-the-art bonded phase chemistries*
- *Reserved lot service to maintain maximum reproducibility*
- *System suitability service to customer specifications established on pretested columns*
- *Worldwide service and support*

ES Industries offers the HPLC chromatographer an important source for high performance bonded phases and packing materials. The Chromegabond® materials produced at our New Jersey facility represent the state-of-the-art in bonding chemistry technology. These Chromegabond phases were developed to provide unique performance characteristics to enable the most demanding separations. The product range offers virtually all silica chemistry techniques and selectivities available today.

Chromega™ HPLC columns are expertly produced to ensure the highest levels of performance, durability, and quality. These stable columns offer excellent reproducibility, maximum efficiencies, high capacity, and high permeability. Column hardware components are selected from only the highest quality available. Columns are offered in sizes from microbore to preparative production scale dimensions.

ES Industries also produces high quality packed columns for a wide variety of commercial tradename packings in a number of column formats.

We invite you to review our new column listings for your HPLC column needs.

ES Industries HPLC Column Services

Method Development and Technical Support

ES Industries will provide method development assistance and comprehensive technical support for your HPLC application. In order to help fine tune your analysis, our experienced staff will analyze your sample in our laboratory, make suggestions, and answer any questions. Call ES Industries' Technical Support at 1-800/356-6140.

Wide Range of Column Sizes

ES Industries offers virtually all of our Chromegabond packings as well as listed commercial materials packed in any column length and dimension, both in stainless steel and metal-free biocompatible.

Analytical sizes, include 0.05 mm and 1.0 mm I.D. microbore, and 2.0 mm, 3.0 mm, 4.6 mm, 5.0 mm, and 7.5 mm standard columns. Particle sizes range in 3 µ, 5 µ, and 10 µ supports.

In semi-preparative columns, ES Industries offers 9.6 mm, 20 mm and 40 mm I.D. for scaling up separations to 1 gram quantities. These are usually in 5 µ and 10 µ supports.

For preparative scale separations, large particle sizes are available in bulk for most chemistries. The same bonding chemistry techniques are used to provide a highly consistent product. These can also be provided in kilo amounts. Please inquire for pricing and availability.

Column Compliance

In order to provide HPLC columns that meet system suitability criteria, ES Industries will pretest columns to customer specifications. This is especially useful for quality control applications and analyses being performed at multiple locations. Pretested columns offer the highest degree of quality control for lot to lot compliance in the industry. To establish test specifications and protocol, call ES Industries Technical Support at 1-800/356-6140.

Table of Contents

ES INDUSTRIES Ordering Information

ES Industries offers a wide range of columns and packings to provide the chromatographer different sizes and selectivities necessary to solve difficult separation problems. Catalog numbers and prices for the most popular size columns are listed with every specific product. ES Industries can pack a variety of column dimensions, and has a flexible catalog numbering system (see page 5). If necessary our staff can aid you in assigning the numbers for your specific needs. For technical assistance please call 1-800/356-6140.

How to Order

For convenient ordering, use our toll-free number:
1-800/356-6140

Or fax your order to:
1-609/753-8484

Or mail your order to:
ES Industries, 701 South Route 73
West Berlin, NJ 08091-2621

When you order, be sure to include:

Purchase order number

Your billing address

Your shipping address

Our catalog number and the product description

Your name and telephone number

ES Industries accepts VISA, Mastercard, and American Express

Terms

We welcome all orders of any size.

We do not require a confirming purchase order. If a confirming order is sent, it should be clearly marked as confirming to avoid duplication.

Terms of payment are net 30 days.

Orders are shipped via UPS common carrier unless otherwise instructed, F.O.B. shipping point.

Prices are subject to change without notice. We will provide special quotations on quantities larger than those listed in this catalog.

Returns

Returns of any products must be authorized in advance.

Please contact ES Industries for a return authorization number and forwarding instructions. All claims must be made within 60 days of shipping. Report shipping damage to the carrier.

Keep containers and packaging materials until inspection has been made.

Warranty

ES Industries products are warranted to be free from defects in material and workmanship. We will replace, without cost, any materials which carry such defects.

ES Industries products are not warranted against misuse.

If you have a question regarding a specific ES Industries product, please call our toll free technical support line for assistance, 1-800/356-6140. All other warranties, express or implied, including, but not limited to, the implied warranty of merchantability, fitness for a particular use or any other matter are disclaimed.

ES Industries products are intended for laboratory or manufacturing use only, and are not intended for diagnostic, clinical, food purposes, or home use.

Information presented in this catalog is correct and reliable to the best of our knowledge and belief, but is not guaranteed to be so.

ES Industries shall not, under any circumstances, be held liable for any incidental, consequential or compensatory damage arising from the use of, or in conjunction with its products. The maximum liability which can be assumed by ES Industries shall be limited to the invoice price of the product.

Discounts

ES Industries offer discounts to corporate accounts who are high volume purchasers of ES Industries columns and media. Discounts are also available for simultaneous purchase of a large number of identical items with a single purchase order. Government institutions are eligible for a special discount irrespective of volume. Call ES Industries for details and conditions.

How to Order Special Columns

Packed HPLC Columns

1. Column Type

The first digit in the catalog number will indicate column type. Select the appropriate number corresponding to desired column type.

(1) Stainless Steel

(2) Glass Lined Stainless Steel

(3) PEEK™

2. Column Length

The second digit in the catalog number will indicate column length. Select the appropriate number or letter corresponding to desired column length.

(1) 5 cm

(2) 10 cm

(3) 15 cm

(4) 20 cm

(5) 25 cm

(6) 30 cm

(7) 50 cm

(9) 7.5 cm

(0) 12.5 cm

(A) 3.5 cm

3. Column Diameter (I.D.)

Column diameter (I.D.) will be indicated by the third digit. Select the appropriate number or letter corresponding to desired column I.D.

(a) 0.5 mm

(b) 0.75 mm

(c) 45 mm

(d) 3.2 mm

(1) 1.0 mm

(2) 2.0 mm

(3) 3.0 mm

(4) 4.0 mm

(5) 4.6 mm

(6) 5.0 mm

(7) 9.6 mm

(8) 23 mm

(9) 7.5 mm

4. Particle Size

Packing support particle size will be indicated by the fourth digit. Select the appropriate number corresponding to desired particle size.

(1) 3 µ

(2) 5 µ

(3) 10 µ

(4) 7 µ

(5) 12 µ

(6) 13 µ

(7) 16 µ

(8) 4 µ

5. Pore Diameter

Pore diameter will be indicated by the fifth digit. Select the appropriate number corresponding to desired pore diameter.

(1) 60 A

(2) 100 A

(3) 300 A

(4) 500 A

(5) 1000 A

(6) 4000 A

(7) 80 A

(8) 130 A

(9) 120 A

(0) 180 A

(A) 200 A

6. Fitting Type

End fittings are indicated by the sixth digit. Select the appropriate number corresponding to desired end fitting type.

(1) Inverted female compression

(3) Waters inverted compression

(M) Modular

7. Bonded Phase

Please specify bonded phase at the end of the catalog number. If other than Chromegabond®, indicated brand name after bonded phase.

Example: A stainless steel, 25 cm long, 4.6 mm I.D. column with a 60 A pore diameter and Waters fitting packed with Chromegabond MC18 on a 5 µ particle: **Cat. No. 155213-MC18**

Biocompatible and SFC Columns

For columns being used in biosensitive or SFC applications, be sure to specify (2) glass lined stainless steel column or (3) PEEK material and indicate BC for biocompatible or SF for Super Critical Fluid prior to catalog number.

Example: A biocompatible, glass lined stainless steel, 25 cm x 4.0 mm (I.D.) HPLC column with a 60 A pore diameter and Waters fitting, packed with MC18 on a 5 µ particle: **Cat. No. BC254213-MC18.**

Threaded Modular Columns

ES Industries threaded modular columns are available in all column sizes. Please replace last digit (1) with M in catalog number.

Example: A WR-C18, 5µm, 250 x 4.6 mm modular column: **Cat. No. 15529M-WR-C18.**

Premier Base Deactivated Phases

- *Most comprehensive array of base deactivated columns available*
- *State-of-the-art base deactivation bonding technologies*
- *Columns for highly aqueous mobile phases*
- *Ultra-high purity silica*

ES Industries has developed a series of premier reversed phase base deactivated columns using innovative state-of-the-art bonding technologies. The necessity of multiple base deactivated technologies became apparent after extensive experimental investigation confirmed that no single base deactivation technology is universally applicable to the analysis of all basic and acidic compounds. In light of this information, we developed different base deactivated bonding technologies to provide a tailored solution for difficult chromatography applications.

All Chromegabond® base deactivated phases use an ultra-high purity (99.999%) metal-free spherical silica support. In addition all Chromegabond base deactivated phases are manufactured with specially purified reagents and are extensively washed using HPLC grade solvents.

To aid the HPLC chromatographer in the selection of the most suitable column for their application we have included a brief description of each unique Chromegabond base deactivated phase. A detailed description for each Chromegabond base deactivated column is contained on the proceeding pages.

Chromegabond WR (Wide Range)

Chromegabond WR, C8, and C18 are highly base deactivated phases produced via a proprietary two step bonding process using multiple endcapping technology. These products, as a result of our special bonding treatment, are highly hydrophobic and exceptionally inert for the analysis of both acids and bases. Chromegabond WR columns are available in 3 micron particles.

AquaSep

AquaSep has been developed using patented technology for use with highly aqueous mobile phases, including 100% aqueous. Our patented bonding chemistry allows the bonded C8 chains to remain fully extended in the mobile phase even under highly aqueous conditions. AquaSep can retain highly water soluble compounds such as small organic acids, water soluble vitamins and low molecular weight polar compounds. It can eliminate the need for ion-pairing reagents.

ProTec-RP

ProTec-RP columns enable the analysis of basic compounds without the use of amine modified mobile phases. This phase incorporates embedded amide groups into a hydrocarbon backbone producing a highly base deactivated column. Our tests of any currently available base deactivated column have shown that ProTec columns produce the best peak shape for any amine containing compounds. ProTec C18 is available in 3 micron particles.

Chromegabond BAS

Chromegabond BAS (Basic) C8, C18, phenyl or cyano is prepared using the same bonding technology and ultra high purity silica as AquaSep columns, but in a lower surface area silica.

It exhibits good high aqueous stability and excellent base deactivation characteristics. The Chromegabond BAS series of phases are available in 3 micron particles.

Chromegabond HC-C18

Chromegabond HC (high carbon) contains 22% of monomerically bonded carbon producing a highly retentive ODS column. Chromegabond HC columns are useful for compounds that are incompatible with 100% aqueous mobile phases (%Organic less than 10%), but are difficult to retain or have low retention on traditional ODS columns (Carbon = 14 - 19%). Three micron columns of Chromegabond HC are highly efficient and rugged.

Chromegabond® WR (Wide Range)

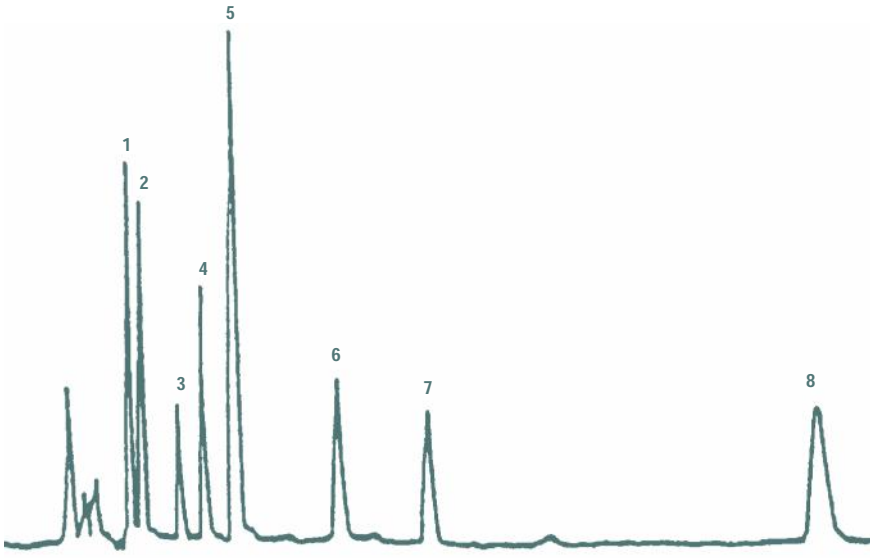
- For the analysis of both basic and acidic compounds
- Deactivated using our proprietary endcapping technology
- C8 and C18 stationary phases
- Highly efficient columns packed with either 3 or 5 micron particles

Chromegabond WR is a highly base deactivated phase that is produced via a two step process. The first step involves bonding monomerically either C8 or C18 alkyl chains to an ultra high purity synthetically produced spherical silica. The second step utilizes a proprietary multiple endcapping bonding process that produces highly base deactivated columns. This state-of-the-art bonding procedure uses mixtures of C2 and C4 alkyl silanes to react with residual silanol groups. Unlike the traditional TMS endcapping, the C2 and C4 groups are much more resistant to degradation by acidic and basic mobile phase compositions. The WR product can be used over the pH range of 2-8. The Chromegabond WR product, as a result of our special bonding treatment, is highly hydrophobic and exceptionally inert for the analysis of both acids and bases. It is useful for the separation of molecules that contain polar groups along with hydrophobic groups. The 3 micron Chromegabond WR columns are highly efficient and exhibit theoretical plate measurements of between 160,000 to 170,000 plates/meter. Both Chromegabond WR C8 and C18 are bonded to the same type of ultra high purity silica.

Chromegabond WR C8:
pore size = 120° A;
surface area = 350 m^2/gram;
Carbon = 9%; pH range 2-8

Chromegabond WR C18:
pore size = 120° A;
surface area = 350 m^2/gram;
Carbon = 16%; pH range 2-8

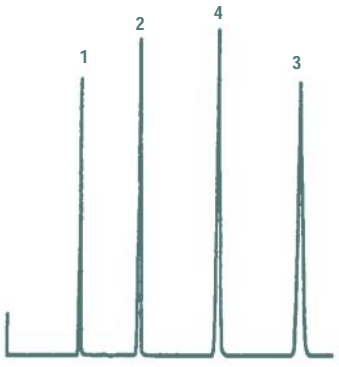
All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.



Anthracyclinone Ring System Compounds

Column: Chromegabond WR-C18, 250 x 4.6 mm ID 5 µ
Catalog No.: 155291-WR-C18
Conditions: Fluoroscence detection–
Excitation wavelength 480 nm, Emission wavelength 560 nm
Flow rate: 1 mL/min.
Mobile phase: 32% Acetonitrile/68% 60 nM Na_2HPO_4/30 nM citric acid, pH 4.6

1. Doxorubicinol
2. Epirubicinol
3. 7-OH-Doxorubicin agylcone
4. Doxorubicin
5. Epirubicin
6. 7-OH Doxorubicinol aglycone
7. Daunorubicin
8. 7-Deoxy doxorubicin aglycone

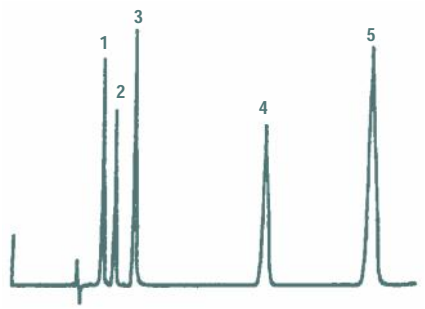


Substituted Anilines and Phenol

Column: Chromegabond WR-C18, 250 x 4.6 mm ID, 5 µ
Catalog No.: 155291-WR-C18
Chromatographic conditions: UV 254 nm
Flow rate: 1 mL/min.
Mobile phase: 70% Acetonitrile 30% Water

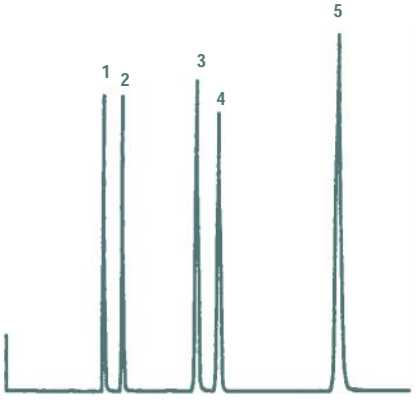
1. Phenol
2. Dimethylaniline
3. Diethylaniline
4. Di-N-Butyl Phthalate

Chromegabond WR (Wide Range)



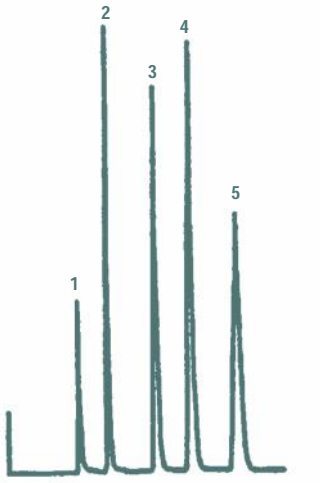
Drug Related Molecules

Column: Chromegabond WR-C18, 250 x 4.6 mm ID 5 µ
Catalog No.: 155291-WR-C18
Chromatographic conditions: UV 254 nm
Flow rate: 1 mL/min.
Mobile phase: 70% Methanol/30% 4 mM KH_2PO_4, pH = 3
1. Acetylsalicylic acid
2. p-Acetophenetidide
3. Salicyclic acid
4. Phenylbutazone
5. Indomethacin



Anilines and Neutrals

Column: Chromegabond WR-C18, 250 x 4.6 mm ID 5 µ
Catalog No.: 155291-WR-C18
Chromatographic conditions: UV 254 nm
Flow rate: 1 mL/min.
Mobile phase: 65% Acetonitrile 35% Water
1. Aniline
2. Dimethyl Phthalate
3. Dimethylaniline
4. Toluene
5. Diethylaniline



Analysis of Basic Drug Mixture

Column: Chromegabond WR-C8, 250 x 4.6 mm ID, 5 µ
Catalog No.: 155291-WR-C8
Chromatographic conditions: UV 254 nm
Flow rate: 1 mL/min.
Mobile phase: 10% Acetonitrile, 90% 50 mM KH_2PO_4
1. Unretained Peak
2. Chlorpheniramine
3. Procainamide
4. Amiloride
5. N-acetylprocainamide

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
WR-C18	3	50	115191-WR-C18	114191-WR-C18	11d191-WR-C18	112191-WR-C18
WR-C18	3	100	125191-WR-C18	124191-WR-C18	12d191-WR-C18	122191-WR-C18
WR-C18	3	150	135191-WR-C18	134191-WR-C18	13d191-WR-C18	132191-WR-C18
WR-C18	5	50	115291-WR-C18	114291-WR-C18	11d291-WR-C18	112291-WR-C18
WR-C18	5	100	125291-WR-C18	124291-WR-C18	12d291-WR-C18	122291-WR-C18
WR-C18	5	150	135291-WR-C18	134291-WR-C18	13d291-WR-C18	132291-WR-C18
WR-C18	5	250	155291-WR-C18	154291-WR-C18	15d291-WR-C18	152291-WR-C18
WR-C8	3	50	115191-WR-C8	114191-WR-C8	11d191-WR-C8	112191-WR-C8
WR-C8	3	100	125191-WR-C8	124191-WR-C8	12d191-WR-C8	122191-WR-C8
WR-C8	3	150	135191-WR-C8	134191-WR-C8	13d191-WR-C8	132191-WR-C8
WR-C8	5	50	115291-WR-C8	114291-WR-C8	11d291-WR-C8	112291-WR-C8
WR-C8	5	100	125291-WR-C8	124291-WR-C8	12d291-WR-C8	122291-WR-C8
WR-C8	5	150	135291-WR-C8	134291-WR-C8	13d291-WR-C8	132291-WR-C8
WR-C8	5	250	155291-WR-C8	154291-WR-C8	15d291-WR-C8	152291-WR-C8

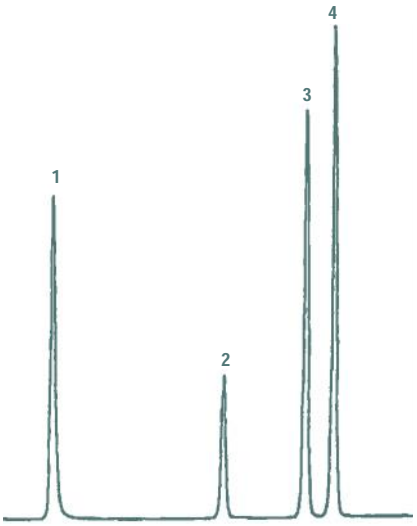
AquaSep

- Chromatograph polar compounds with pure aqueous mobile phases
- Rapid re-equilibration with gradients
- No ion-pairing reagents required for highly polar compounds
- Extremely high carbon load

AquaSep has been developed using patented technology for use with highly aqueous mobile phases, including 100% aqueous. Our patented bonding chemistry allows the bonded C8 chains to remain fully extended in the mobile phase even under highly aqueous conditions. To obtain high aqueous stability and maximum hydrophobic interaction AquaSep relies on a specially developed silane which is bonded to ultra high purity synthetically produced spherical silica. This silane contains an ether linkage placed near the point of attachment to the silica base particle. This ether group is polar enough to allow water to penetrate and hydrate the silica surface preventing the self association of the hydrophobic C8 chains. This layer of hydration permits the maximum interaction of the C8 chains with the analytes of interest and prevents any phase collapse. AquaSep can retain highly water soluble compounds such as small organic acids, water soluble vitamins and low molecular weight polar compounds. It can eliminate the need for ion-pairing reagents.

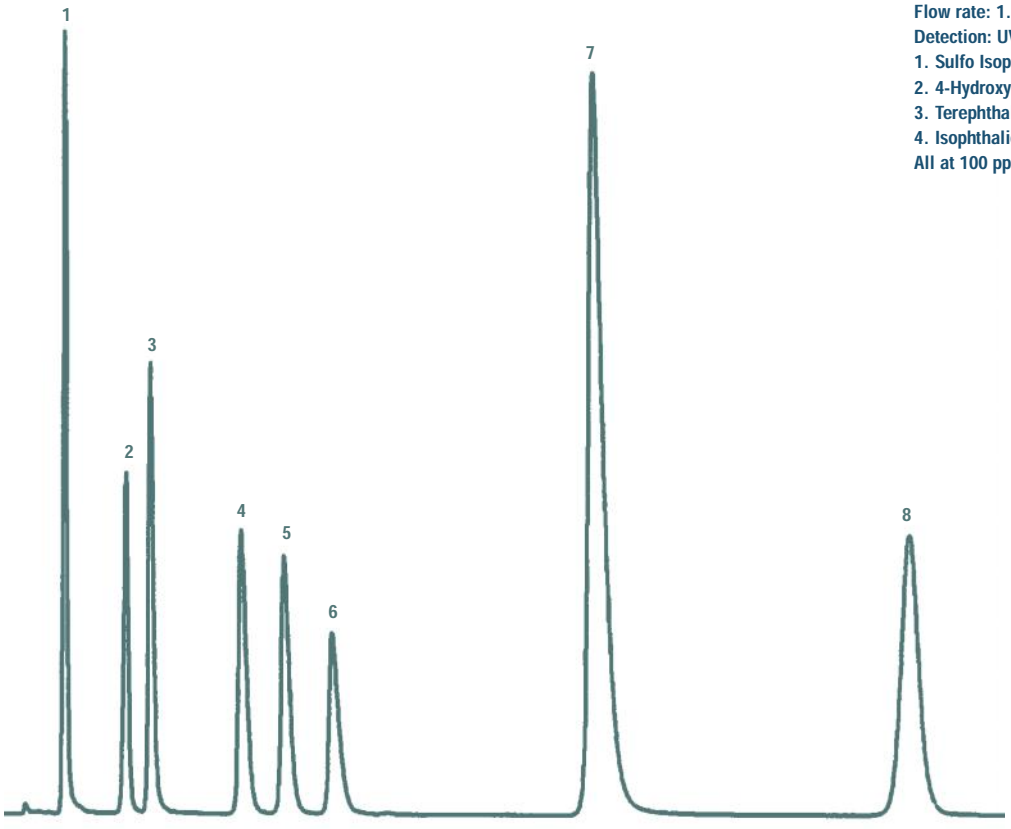
AquaSep: pore size = 100° A; surface area = 450 m^2/gram; Carbon = 16%; pH range 2-8

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.



Aromatic Acids

Column: AquaSep 150 x 4.6 mm
Eluent: Gradient 0% to 45%B in 30 minutes, A= 0.08% Phosphoris acid in water, B=Acetonitrile
Flow rate: 1.5 mL/min.
Detection: UV @ 225 nm
1. Sulfo Isophthalic Acid
2. 4-Hydroxybenzoic Acid
3. Terephthalic Acid
4. Isophthalic Acid
All at 100 ppm each

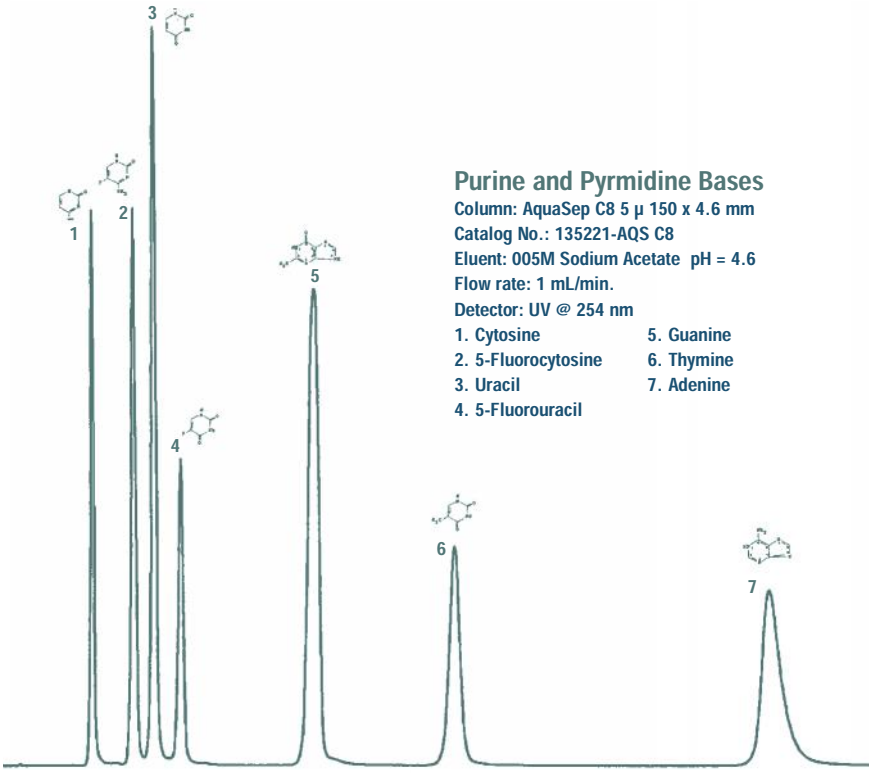


Organic Acids

Column: AquaSep C8 5 µ 250 x 4.6mm
Catalog No.: 155221-AQS C8
Eluent: 0.05M KH_2PO_4 pH = 2.4
Flow rate: 1 mL/min.
Detector: UV @ 210 nm

1. Oxalic acid	**5. Malonic acid**
2. Tartaric acid	**6. Lactic acid**
3. Formic acid	**7. Maleic acid**
4. Malic acid	**8. Fumaric acid**

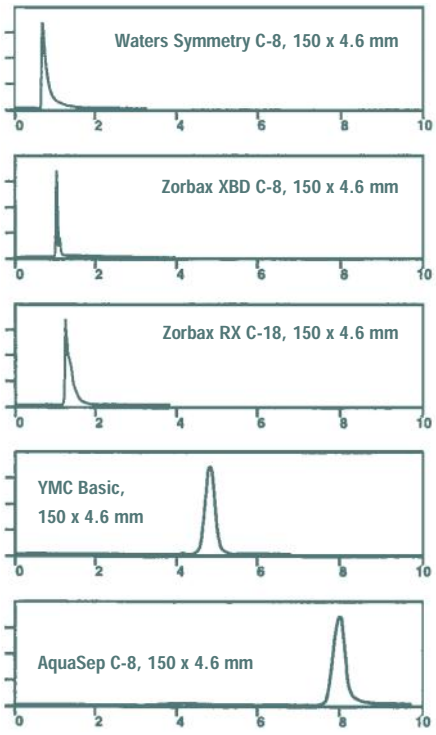
AquaSep



Purine and Pyrmidine Bases

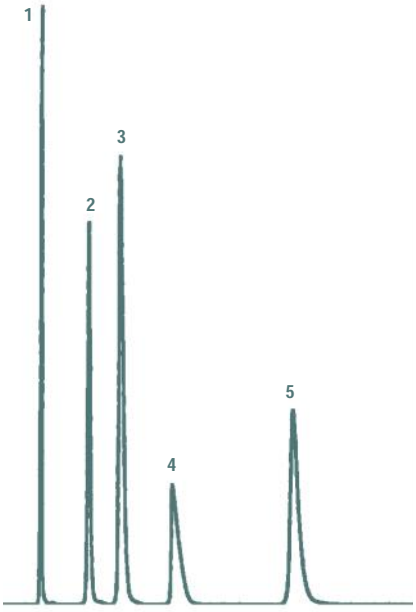
Column: AquaSep C8 5 µ 150 x 4.6 mm
Catalog No.: 135221-AQS C8
Eluent: 005M Sodium Acetate pH = 4.6
Flow rate: 1 mL/min.
Detector: UV @ 254 nm

1. Cytosine
2. 5-Fluorocytosine
3. Uracil
4. 5-Fluorouracil
5. Guanine
6. Thymine
7. Adenine



Thiamine

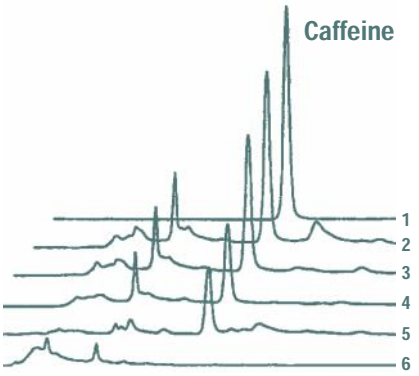
Column: AquaSep C8 5 µ 150 x 4.6 mm
Catalog No.: 135221-AQS C8
Eluent: 0.1% Acetic Acid
Flow rate: 1 mL/min.
Detector: UV @ 254 nm



Water Soluble Vitamins

Column: AquaSep C8 5 µ 150 x 4.6 mm
Catalog No.: 135221-AQS C8
Eluent: 0.05M Sodium Acetate pH = 4.6
Flow rate: 1 mL/min.
Detector: UV @ 254 nm

1. Vitamin C (Ascorbic Acid)
2. Nicotinic Acid
3. Thiamine
4. Pyridoxine
5. Niacinamide



Brewed Tea (Injected neat)

Column: AquaSep 150 x 4.6 mm
Eluent: 20:80 Aetonitrile: Water pH 3 Phosphate buffer
Flow rate: 1 mL/min.
Detector: UV @ 254 nm

1. Caffeine Standard 400 ug/mL
2. Darjeeling Loose Tea
3. "Lipton"
4. Celestial Seasonings "Morning Thunder"
5. Bancha Eden "Green Tea"
6. Celestial Seasonings Herbal Tea "Red Zinger"

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
AquaSep	5	50	115221-AQS	114221-AQS	11d221-AQS	112221-AQS
AquaSep	5	100	125221-AQS	124221-AQS	12d221-AQS	122221-AQS
AquaSep	5	150	135221-AQS	134221-AQS	13d221-AQS	132221-AQS
AquaSep	5	250	155221-AQS	135221-AQS	15d221-AQS	152221-AQS

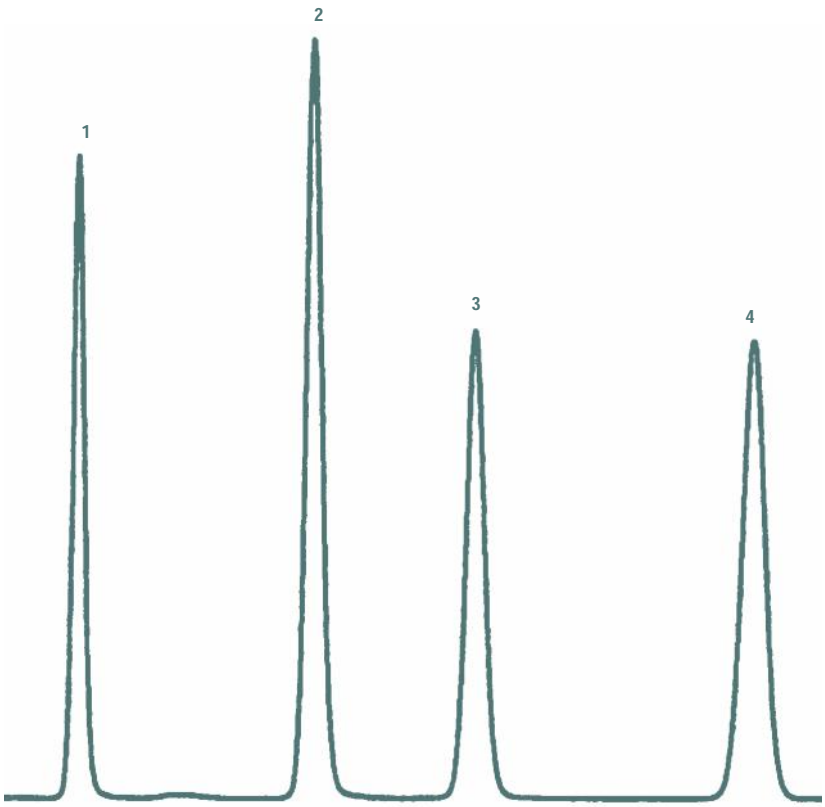
ProTec-RP

- Excellent peak shapes for strongly basic compounds
- Use simple buffers at low ionic strength
- Unique embedded amide chemistry
- Available as a C8, C18, or Phenyl

ProTec-RP columns enable the analysis of basic compounds without the use of amine modified mobile phases. This phase incorporates embedded amide groups into a hydrocarbon backbone producing a highly base deactivated column. This column is excellent for compounds containing amine groups. ProTec-RP can often produce better peak shapes for amine compounds than Chromegabond® WR. ProTec is completely resistant to phase collapse because of the incorporation of the embedded polar amide groups. It should be noted that ProTec does not retain polar molecules as well as AquaSep. Our tests of any currently available base deactivated column have shown that ProTec columns produce the best peak shape for any amine containing compounds.

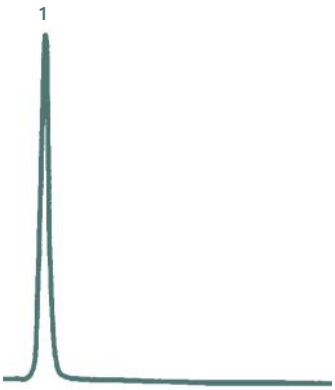
ProTec: pore size = 100° A; surface area = 250 g^2/m; Carbon: C18 = 14%, C8 = 5%, Phenyl = 5%; pH range = 2-8

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.



Tricyclic Antidepressants

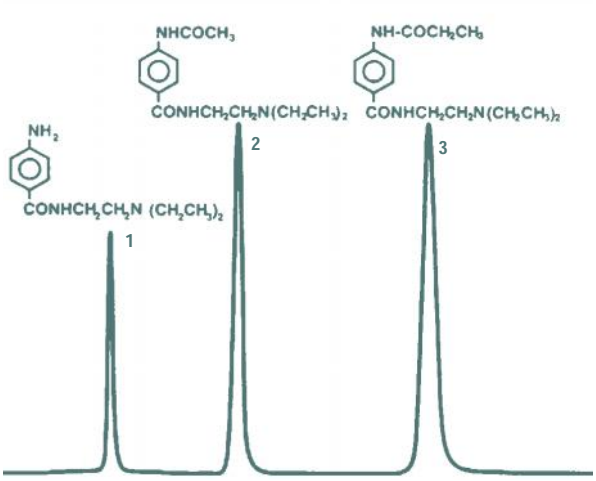
Column: ProTec C18 150 x 4.6 mm
Eluent: 40% Acetonitrile/60% Water
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Doxepin
2. Imipramine
3. Amitriptyline
4. Trimipramine



Antihistamines

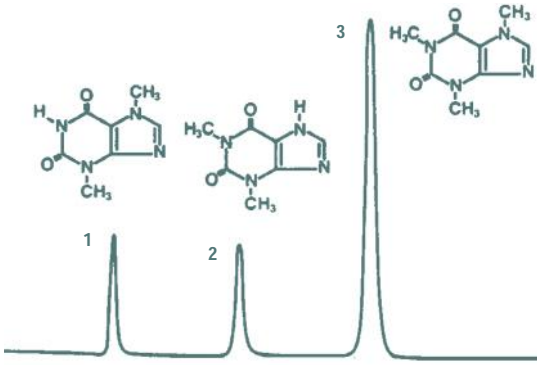
Column: ProTec C18 (15 cm x 4.6 mm)
Mobile phase: 20:60 Acetonitrile: Water (50mM KH_2 PO_4 at pH = 5.5)
Flow rate: 1 mL/min.
Pressure: 110 bar
Detection: UV @ 254 nm
1. Chlorpheniramine, TF = 1.2

ProTec-RP



Antiarrhythmics

Column: ProTec C18 (15 cm x 4.6 mm)
Mobile phase: 20:80 Methanol:Water (50 mm Tartaric/NH_3 at pH = 5.5)
Flow rate: 2 mL/min.
Pressure: 135 bar
Detection: UV @ 254 nm
1. Procalnamide TF = 1.3
2. N-acetylprocainamide TF = 1.1
3. N-proprorylprocalnamide TF = 1.1



Cardiac Stimulants

Column: ProTec C18 (15 cm x 4.6 mm)
Mobile Phase: 20:80 Methanol: Water (50 mM Tartaric/NH_3 at pH = 5.5)
Flow rate: 1 mL/min.
Pressure: 135 bar
Detection: UV @ 254 nm
1. Theobromine, TF = 1.2
2. Theophyline, TF = 1.1
3. Caffeine, TF = 1.0

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
ProTec C18	3	50	115121-PC18	114121-PC18	11d121-PC18	112121-PC18
ProTec C18	3	100	125121-PC18	124121-PC18	12d121-PC18	122121-PC18
ProTec C18	3	150	135121-PC18	134121-PC18	13d121-PC18	132121-PC18
ProTec C18	5	50	115221-PC18	114221-PC18	11d221-PC18	112221-PC18
ProTec C18	5	100	125221-PC18	124221-PC18	12d221-PC18	122221-PC18
ProTec C18	5	150	135221-PC18	134221-PC18	13d221-PC18	132221-PC18
ProTec C18	5	250	155221-PC18	135221-PC18	15d221-PC18	152221-PC18
ProTec C8	5	50	115221-PC8	114221-PC8	11d221-PC8	112221-PC8
ProTec C8	5	100	125221-PC8	124221-PC8	12d221-PC8	122221-PC8
ProTec C8	5	150	135221-PC8	134221-PC8	13d221-PC8	132221-PC8
ProTec C8	5	250	155221-PC8	135221-PC8	15d221-PC8	152221-PC8
ProTec Phenyl	5	50	115221-PPh	114221-PPh	11d221-PPh	112221-PPh
ProTec Phenyl	5	100	125221-PPh	124221-PPh	12d221-PPh	122221-PPh
ProTec Phenyl	5	150	135221-PPh	134221-PPh	13d221-PPh	132221-PPh
ProTec Phenyl	5	250	155221-PPh	135221-PPh	15d221-PPh	152221-PPh

Chromegabond® BAS

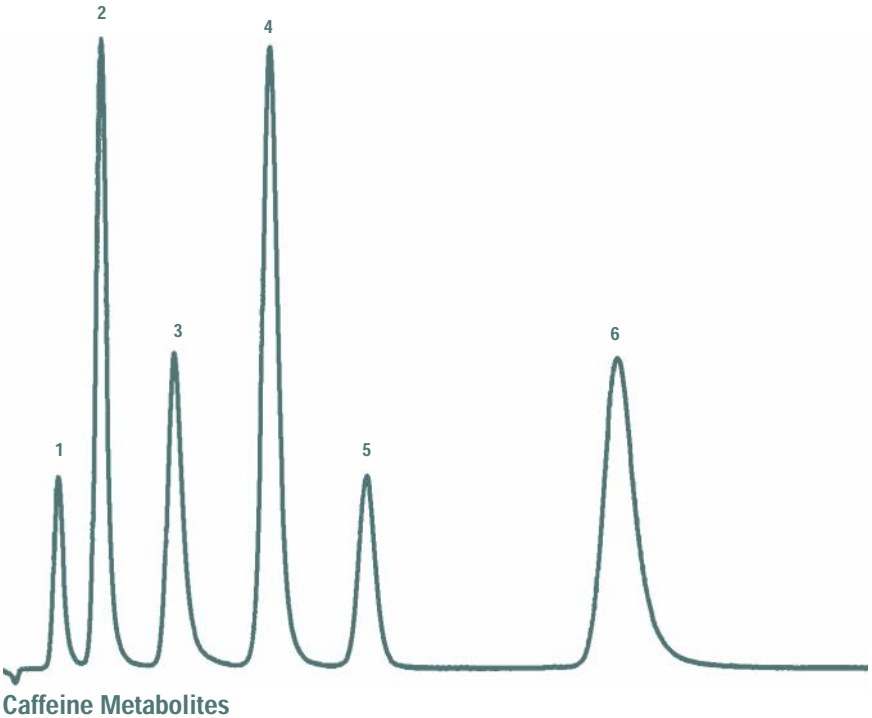
- Proven patented technology
- Base deactivation and excellent high aqueous stability
- Available as a C8, C18, Phenyl, and Cyano
- Highly efficient columns packed with either 3 or 5 micron particles

Chromegabond BAS (Basic) C8, C18, Phenyl, or Cyano is prepared using the same bonding technology and ultra high purity silica as AquaSep columns, but in a lower surface area silica.

In addition, it is available in a 3 micron particle size. It exhibits high aqueous stability and excellent base deactivation characteristics. Unfortunately, it does not retain low molecular polar compounds as well as AquaSep.

Chromegabond BAS: pore size = 120° A;
surface area = 180 g^2/m;
Carbon: C18 = 12%, C8 = 8%,
Phenyl = 5%, Cyano = 4%;
pH range = 2-8

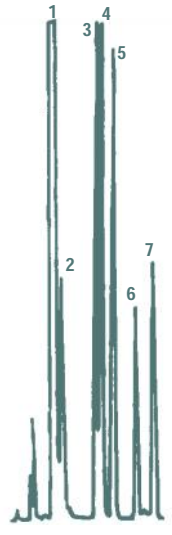
All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.



Caffeine Metabolites

Column: Chromegabond BAS-C8 150 x 4.6 mm 5 µ
Eluent: 5% Acetonitrile/95% Water
Flow rate: 1 mL/min.
Detection: UV @ 254 nm

1. Methylxanthine
2. Theobromine
3. 1,3 Dimethyl uric acid
4. 1,7 Dimethyl xanthine
5. Theophylline
6. 1,7 Dimethyl uric acid

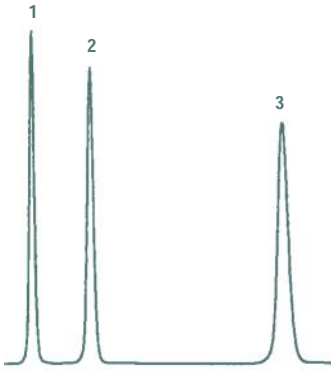


Aromatic Hydrocarbons

Column: 15 cm x 4.6 mm
Packing: Chromegabond BAS Phenyl 3µ
Mobile phase: 85% Methanol, 15% Water
Flow rate: 0.8 mL/min.
Detection: 254 nm

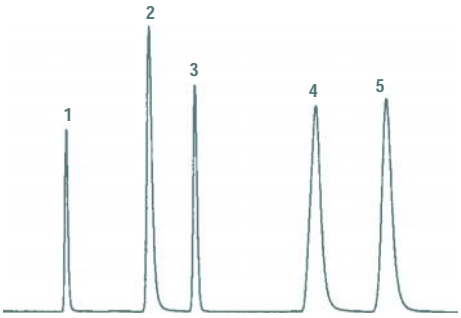
1. Toluene
2. Naphtalene
3. Phenanthrene
4. Anthracene
5. Fluorene
6. Fluoranthene
7. Pyrene

Chromegabond® BAS



Alkylbenzoic Acids

Column: Chromegabond BAS-C18 150 x 4.6 mm 3 µ
Eluent: 80% Acetonitrile/20% 10 nM Sodium phosphate pH = 3.2
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. 4-butyl benzoic acid
2. 4-hexyl benzoic acid
3. 4-octyl benzoic acid



Highly Basic Compounds

Column: Chromegabond BAS-C18 250 x .46 mm ID
Eluent: 80% Methanol/20% Potassium phosphate 25 nM; pH = 6
Flow rate: 1 mL/min.
Detection: UV @ 215 nm
1. Norephedrine
2. Nortriptyline
3. Toluene
4. Imipromine
5. Amitriptyline

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
BAS-C18	3	50	115191-BAS-C18	114191-BAS-C18	11d191-BAS-C18	112191-BAS-C18
BAS-C18	3	100	125191-BAS-C18	124191-BAS-C18	12d191-BAS-C18	122191-BAS-C18
BAS-C18	3	150	135191-BAS-C18	134191-BAS-C18	13d191-BAS-C18	132191-BAS-C18
BAS-C8	3	50	115191-BAS-C8	114191-BAS-C8	11d191-BAS-C8	112191-BAS-C8
BAS-C8	3	100	125191-BAS-C8	124191-BAS-C8	12d191-BAS-C8	122191-BAS-C8
BAS-C8	3	150	135191-BAS-C8	134191-BAS-C8	13d191-BAS-C8	132191-BAS-C8
BAS-P	3	50	115191-BAS-P	114191-BAS-P	11d191-BAS-P	112191-BAS-P
BAS-P	3	100	125191-BAS-P	124191-BAS-P	12d191-BAS-P	122191-BAS-P
BAS-P	3	150	135191-BAS-P	134191-BAS-P	13d191-BAS-P	132191-BAS-P
BAS-CN	3	50	115191-BAS-CN	114191-BAS-CN	11d191-BAS-CN	112191-BAS-CN
BAS-CN	3	100	125191-BAS-CN	124191-BAS-CN	12d191-BAS-CN	122191-BAS-CN
BAS-CN	3	150	135191-BAS-CN	134191-BAS-CN	13d191-BAS-CN	132191-BAS-CN
BAS-C18	5	50	115291-BAS-C18	114291-BAS-C18	11d291-BAS-C18	112291-BAS-C18
BAS-C18	5	100	125291-BAS-C18	124291-BAS-C18	12d291-BAS-C18	122291-BAS-C18
BAS-C18	5	150	135291-BAS-C18	134291-BAS-C18	13d291-BAS-C18	132291-BAS-C18
BAS-C18	5	250	155291-BAS-C18	154291-BAS-C18	15d291-BAS-C18	152291-BAS-C18
BAS-C8	5	50	115291-BAS-C8	114291-BAS-C8	11d291-BAS-C8	112291-BAS-C8
BAS-C8	5	100	125291-BAS-C8	124291-BAS-C8	12d291-BAS-C8	122291-BAS-C8
BAS-C8	5	150	135291-BAS-C8	134291-BAS-C8	13d291-BAS-C8	132291-BAS-C8
BAS-C8	5	250	155291-BAS-C8	154291-BAS-C8	15d291-BAS-C8	152291-BAS-C8
BAS-P	5	50	115291-BAS-P	114291-BAS-P	11d291-BAS-P	112291-BAS-P
BAS-P	5	100	125291-BAS-P	124291-BAS-P	12d291-BAS-P	122291-BAS-P
BAS-P	5	150	135291-BAS-P	134291-BAS-P	13d291-BAS-P	132291-BAS-P
BAS-P	5	250	155291-BAS-P	154291-BAS-P	15d291-BAS-P	152291-BAS-P
BAS-CN	5	50	115291-BAS-CN	114291-BAS-CN	11d291-BAS-CN	112291-BAS-CN
BAS-CN	5	100	125291-BAS-CN	124291-BAS-CN	12d291-BAS-CN	122291-BAS-CN
BAS-CN	5	150	135291-BAS-CN	134291-BAS-CN	13d291-BAS-CN	132291-BAS-CN
BAS-CN	5	250	155291-BAS-CN	154291-BAS-CN	15d291-BAS-CN	152291-BAS-CN

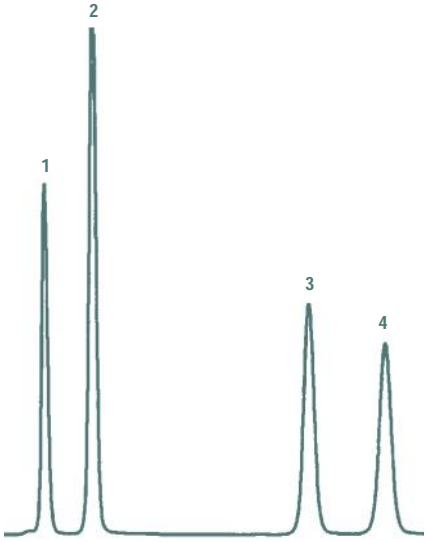
Chromegabond HC-C18

- ODS stationary phase with 22% bonded carbon
- Excellent for difficult to retain compounds
- Dense ODS coverage
- Highly efficient columns packed with either 3 or 5 micron particles

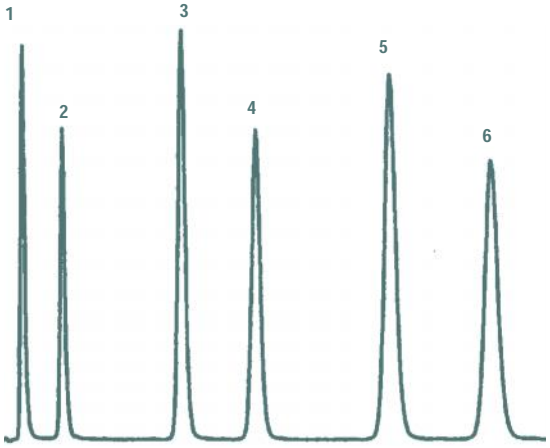
All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

Chromegabond HC (high carbon) contains 22% of monomerically bonded carbon producing a highly retentive ODS column. This dense high carbon coverage forms an hydrophobic shield and prevents interaction with underlying silica support. Chromegabond HC is nonendcapped, extremely stable and can be used with a wide variety of mobile phase compositions. Unfortunately, Chromegabond HC columns are subject to phase collapse under highly aqueous mobile phase conditions (Organic compositions of less than 10%). Chromegabond HC columns are useful for compounds that are incompatible with 100% aqueous mobile phases (%Organic less than 10%), but are difficult to retain or have low retention on traditional ODS columns (Carbon = 14-19%). The 3 micron Chromegabond HC columns are highly efficient and exhibit theoretical plate measurements of between 160,000 to 170,000 plates/meter.

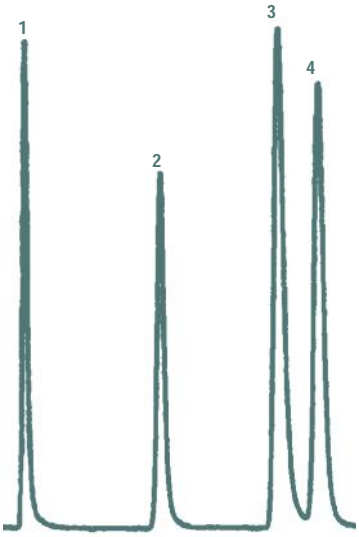
Chromegabond HC-C18:
pore size = 100° A;
surface area = 350 g^2/m; Carbon = 22%;
pH range = 2-8



Aromatic Acids
Column: Chromegabond HC-C18 150 x 4.6 mm ID
Eluent: 20% Acetonitrile/80% Water 01.% TFA
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Phenylacetic acid
2. Benzoic acid
3. o-toluic acid
4. p-toluic acid



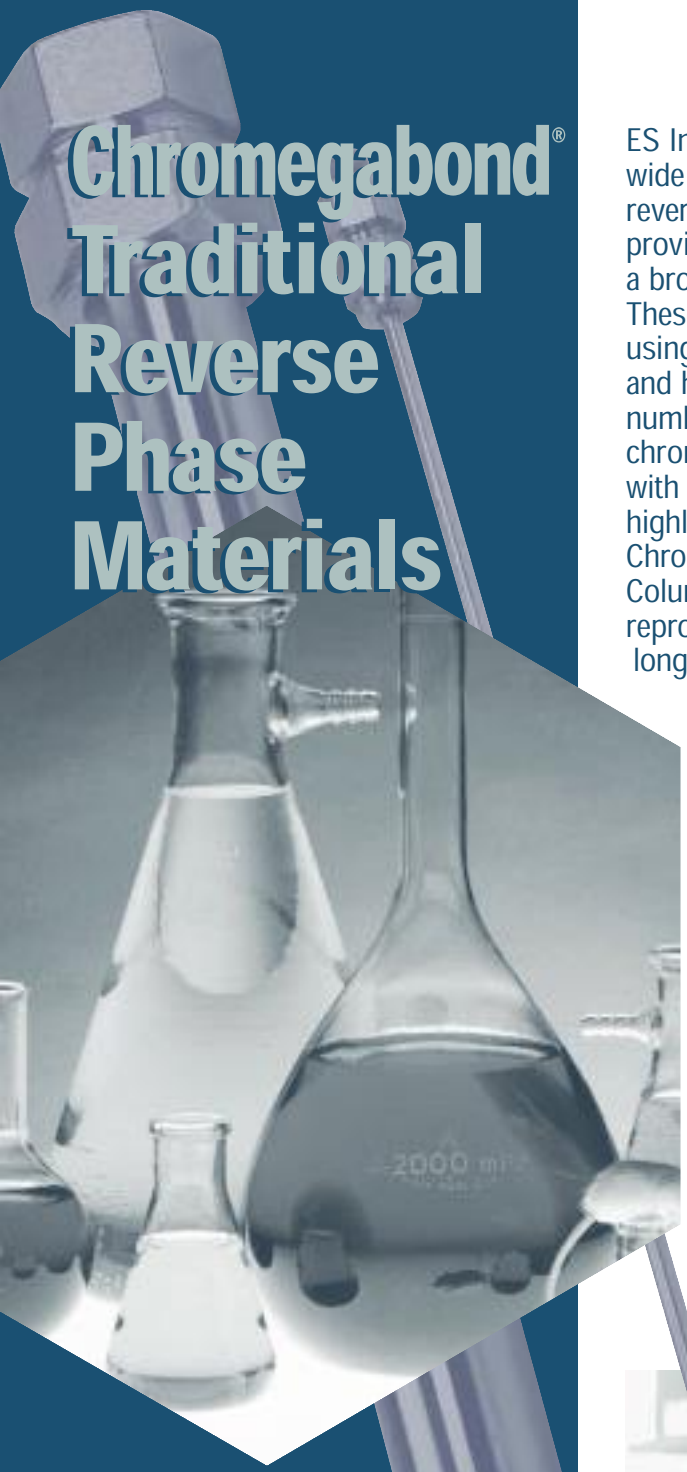
Substituted Anilines
Column: Chromegabond HC-C18 150 x 4.6 mm 3 µ
Eluent: 48% Methanol/52% 10 nM sodium phosphate pH = 2.5
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. p-anisidine
2. m-toluidine
3. 3-aminobenzonitrile
4. 4-chloroaniline
5. 3-chloroaniline
6. 2-chloroaniline



Acids and Bases
Column: Chromegabond HC-C18 150 x 4.6 mm
Eluent: 50% Methanol/50% Buffer 100 nM H_3PO_4 pH = 2.4
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. p-Amino benzoic acid
2. o-Amino benzoic acid
3. p-Hydroxybenzoic acid
4. Benzyl Alcohol

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
High Carbon ODS	3	50	115121-HC-C18	114121-HC-C18	11d121-HC-C18	112121-HC-C18
High Carbon ODS	3	100	125121-HC-C18	124121-HC-C18	12d121-HC-C18	122121-HC-C18
High Carbon ODS	3	150	135121-HC-C18	134121-HC-C18	13d121-HC-C18	132121-HC-C18
High Carbon ODS	5	50	115221-HC-C18	114221-HC-C18	11d221-HC-C18	112221-HC-C18
High Carbon ODS	5	100	125221-HC-C18	124221-HC-C18	12d221-HC-C18	122221-HC-C18
High Carbon ODS	5	150	135221-HC-C18	134221-HC-C18	13d221-HC-C18	132221-HC-C18
High Carbon ODS	5	250	155221-HC-C18	135221-HC-C18	15d221-HC-C18	152221-HC-C18

Chromegabond® Traditional Reverse Phase Materials



ES Industries has developed a wide range of Chromegabond reverse phase columns to provide the means of separating a broad range of compounds. These phases are manufactured using established procedures and have been produced for a number of years to provide the chromatographer/QC chemist with continuous stream of highly reproducible columns. Chromegabond Reverse Phase Columns provide superior, reproducible separations and long column life with excellent peak symmetry. We have listed only the most popular sizes, however, all of the listed phases are available in any column dimensions that may be required.

- *A wide range of phases available*
- *Available in 3, 5, and 10 micron particles and in a variety of pore sizes up to 4000 A*
- *Made under well established reproducible manufacturing processes*
- *Column sizes from microbore to preparative*

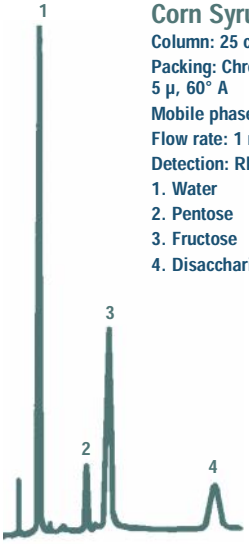
Description of Traditional Reverse Phases

Phase	Phase Description	Preferred Application
TMS (C1)	Tri-Methyl	Low-polarity, separation of mixtures with differing retention
C2	Dimethyl	Retention times on this phase are much shorter than other RP phases
C3	n-Propyl	Same as C2, but more stable
C4	n-butyl	Separation of peptides and proteins
C6	n-hexyl	Even coverage, very suitable for mobile phase additives
MC-CC6 endcapped	Cyclohexyl	Cyclohexyl but endcapped to making it more suitable for polar solutes. Extremely useful for herbicides and other related compounds
C8	n-octyl	Reversed phase and ion-pairing chromatography. Moderately to highly polar (water soluble) compounds such as small peptides, proteins, steroids, nucleosides, and pharmaceuticals
MC-8 endcapped	n-octyl	Same as C8 but endcapped to make it more suitable for polar solutes
C18	Octadecyl	Nonpolar to moderately polar compounds such as fatty acids, clycerides, polyaromatic hydrocarbons, esters, fat-soluble vitamins, steroids, prostaglandins and pharmaceuticals.
MC-18 endcapped	Octadecyl	Same as C18 but endcapped to make it more suitable for acids and bases
AP	Alkyl Phenyl	Moderately polar compounds. Retention characteristics are similar to C8 packing, but with different selectivity for polycyclic aromatic hydrocarbons, polar aromatics and fatty acids.
C8-BD	Diisopropyl/Octyl	Same as C8, but highly base deactivated using steric shielding
C18-BD	Diisopropyl/Octadecyl	Same as C18, but highly base deactivated using steric shielding
P-BD	Dissopropyl/Phenyl	Same as AP, but highly base deactivated using steric shielding
CN	Cyano	Offers different selectivity than C8, C18, and Phenyl
CN-BD	Dissopropyl/Cyano	Same as CN, but highly base deactivated using steric shielding
CN-HS	Cyano	Same as CN, but higher surface area
C18-AI	Octadecyl with amide linkage	Use for the separation of weak acids
D/RP	Diol	Diol for reverse phase
A/RP	Amino	NH_2 amine for reverse phase, used for sugars
DA/RP	Diamine	Diamine for reverse phase
TA/RP	Triamine	Triamine for reverse phase

Specification for Traditional Reverse Phases

I= Irregular S= Spherical

Phase Code	Phase Description	Particle Size (µ)	Pore A Diameter	Particle Type	%C	Surface Area m^2/g	End-capped
TMS	Trimethyl	3	60	S	-	475	No
(C1)		5	60	S	-	475	No
		10	60	S	-	475	No
		5	300	S	-	120	No
		5	500	S	-	40	No
C2	Dimethyl	5	60	I	-	480	No
		10	60	I	-	480	No
C3	n-Propyl	5	60	S	-	220	No
C4	n-Butyl	3	60	S	-	475	No
		5	60	S	-	475	No
		10	60	S	-	475	No

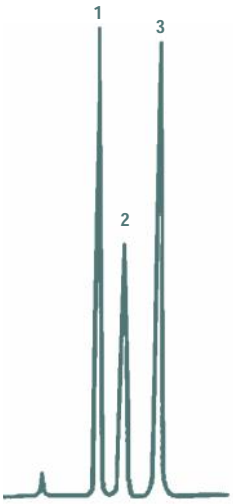


Corn Syrup
Column: 25 cm x 4.6 mm
Packing: Chromegabond Diamine, 5 µ, 60° A
Mobile phase: 80/20 CH_3CN/H_20
Flow rate: 1 mL/min.
Detection: RI
1. Water
2. Pentose
3. Fructose
4. Disaccharide

Description	Particle Size (µ)	Pore Size (mm)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
TMS	3	60	50	115111-TMS	114111-TMS	11d111-TMS	112111-TMS
TMS	3	60	100	125111-TMS	124111-TMS	12d111-TMS	122111-TMS
TMS	3	60	150	135111-TMS	134111-TMS	13d111-TMS	132111-TMS
TMS	5	60	50	115211-TMS	114211-TMS	11d211-TMS	112211-TMS
TMS	5	60	100	125211-TMS	124211-TMS	12d211-TMS	122211-TMS
TMS	5	60	150	135211-TMS	134211-TMS	13d211-TMS	132211-TMS
TMS	5	60	250	155211-TMS	154211-TMS	15d211-TMS	152211-TMS
TMS	5	300	50	115231-TMS	114231-TMS	11d231-TMS	112231-TMS
TMS	5	300	100	125231-TMS	124231-TMS	12d231-TMS	122231-TMS
TMS	5	300	150	135231-TMS	134231-TMS	13d231-TMS	132231-TMS
TMS	5	300	250	155231-TMS	154231-TMS	15d231-TMS	152231-TMS
TMS	5	500	50	115241-TMS	114241-TMS	11d241-TMS	112241-TMS
TMS	5	500	100	125241-TMS	124241-TMS	12d241-TMS	122241-TMS
TMS	5	500	150	135241-TMS	134241-TMS	13d241-TMS	132241-TMS
TMS	5	500	250	155241-TMS	154241-TMS	15d241-TMS	152241-TMS
Dimethyl	5	60	50	115211-C2	114211-C2	11d211-C2	112211-C2
Dimethyl	5	60	100	125211-C2	124211-C2	12d211-C2	122211-C2
Dimethyl	5	60	150	135211-C2	134211-C2	13d211-C2	132211-C2
Dimethyl	5	60	250	155211-C2	154211-C2	15d211-C2	152211-C2
Dimethyl	10	60	50	115311-C2	114311-C2	11d311-C2	112311-C2
Dimethyl	10	60	100	125311-C2	124311-C2	12d311-C2	122311-C2
Dimethyl	10	60	150	135311-C2	134311-C2	13d311-C2	132311-C2
Dimethyl	10	60	250	155311-C2	154311-C2	15d311-C2	152311-C2
Dimethyl	10	60	300	165311-C2	164311-C2	16d311-C2	162311-C2
n-Propyl	5	60	50	115211-C3	114211-C3	11d211-C3	112211-C3
n-Propyl	5	60	100	125211-C3	124211-C3	12d211-C3	122211-C3
n-Propyl	5	60	150	135211-C3	134211-C3	13d211-C3	132211-C3
n-Propyl	5	60	250	155211-C3	154211-C3	15d211-C3	152211-C3
n-Butyl	3	60	50	115111-C4	114111-C4	11d111-C4	112111-C4
n-Butyl	3	60	100	125111-C4	124111-C4	12d111-C4	122111-C4
n-Butyl	3	60	150	135111-C4	134111-C4	13d111-C4	132111-C4
n-Butyl	5	60	50	115211-C4	114211-C4	11d211-C4	112211-C4
n-Butyl	5	60	100	125211-C4	124211-C4	12d211-C4	122211-C4
n-Butyl	5	60	150	135211-C4	134211-C4	13d211-C4	132211-C4
n-Butyl	5	60	250	155211-C4	154211-C4	15d211-C4	152211-C4

I= Irregular S= Spherical

Phase Code	Phase Description	Particle Size (µ)	Pore A Diameter	Particle Type	%C	Surface Area m²/g	End-capped
C4	n-Butyl	3	60	S	-	475	No
		5	300	S	-	120	Yes
		5	500	S	-	40	Yes
		5	1000	S	-	30	Yes
		5	4000	S	-	10	Yes
C6	n-Hexyl	3	60	S	6	220	No
		5	60	S	6	220	No
		10	60	S	6	220	No
MC-CC6 (endcapped)	Cyclohexyl	3	60	S	7	475	Yes
		5	60	S	7	475	Yes
		10	60	S	7	475	Yes
C8 (nonendcapped)	n-Octyl	5	100	I	8	300	No
		10	100	I	8	300	No



p-Hydroxybenzoates
Column: 150 mm x 4.6mm
Packing: Chromegabond TMS
Mobile phase: 45/54/1 Acetonitrile/Water/Acetic Acid
Flow rate: 0.9 mL/min.
1. Methyl-p-hydroxy benzoate
2. Ethyl-p-hydroxy benzoate
3. Propyl-p-hydroxy benzoate

Description	Particle Size (µ)	Pore Size (mm)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
n-Butyl	5	300	50	115231-C4	114231-C4	11d231-C4	112231-C4
n-Butyl	5	300	100	125231-C4	124231-C4	12d231-C4	122231-C4
n-Butyl	5	300	150	135231-C4	134231-C4	13d231-C4	132231-C4
n-Butyl	5	300	250	155231-C4	154231-C4	15d231-C4	152231-C4
n-Butyl	5	500	50	115241-C4	114241-C4	11d241-C4	112241-C4
n-Butyl	5	500	100	125241-C4	124241-C4	12d241-C4	122241-C4
n-Butyl	5	500	150	135241-C4	134241-C4	13d241-C4	132241-C4
n-Butyl	5	500	250	155241-C4	154241-C4	15d241-C4	152241-C4
n-Butyl	5	1000	50	115251-C4	114251-C4	11d251-C4	112251-C4
n-Butyl	5	1000	100	125251-C4	124251-C4	12d251-C4	122251-C4
n-Butyl	5	1000	150	135251-C4	134251-C4	13d251-C4	132251-C4
n-Butyl	5	1000	250	155251-C4	154251-C4	15d251-C4	152251-C4
n-Butyl	5	4000	50	115261-C4	114261-C4	11d261-C4	112261-C4
n-Butyl	5	4000	100	125261-C4	124261-C4	12d261-C4	122261-C4
n-Butyl	5	4000	150	135261-C4	134261-C4	13d261-C4	132261-C4
n-Butyl	5	4000	250	155261-C4	154261-C4	15d261-C4	152261-C4
n-Hexyl	3	60	50	115111-C6	114111-C6	11d111-C6	112111-C6
n-Hexyl	3	60	100	125111-C6	124111-C6	12d111-C6	122111-C6
n-Hexyl	3	60	150	135111-C6	134111-C6	13d111-C6	132111-C6
n-Hexyl	5	60	50	115211-C6	114211-C6	11d211-C6	112211-C6
n-Hexyl	5	60	100	125211-C6	124211-C6	12d211-C6	122211-C6
n-Hexyl	5	60	150	135211-C6	134211-C6	13d211-C6	132211-C6
n-Hexyl	5	60	250	155211-C6	154211-C6	15d211-C6	152211-C6
Cyclohexyl	5	60	50	115211-MC-CC6	114211-MC-CC6	11d211-MC-CC6	112211-MC-CC6
Cyclohexyl	5	60	100	125211-MC-CC6	124211-MC-CC6	12d211-MC-CC6	122211-MC-CC6
Cyclohexyl	5	60	150	135211-MC-CC6	134211-MC-CC6	13d211-MC-CC6	132211-MC-CC6
Cyclohexyl	5	60	250	155211-MC-CC6	154211-MC-CC6	15d211-MC-CC6	152211-MC-CC6
n-Octyl	5	100	50	115221-C8	114221-C8	11d221-C8	112221-C8
n-Octyl	5	100	100	125221-C8	124221-C8	12d221-C8	122221-C8
n-Octyl	5	100	150	135221-C8	134221-C8	13d221-C8	132221-C8
n-Octyl	5	100	250	155221-C8	154221-C8	15d221-C8	152221-C8
n-Octyl	10	100	50	115321-C8	114321-C8	11d321-C8	112321-C8
n-Octyl	10	100	100	125321-C8	124321-C8	12d321-C8	122321-C8
n-Octyl	10	100	150	135321-C8	134221-C8	13d321-C8	132321-C8
n-Octyl	10	100	250	155321-C8	154221-C8	15d321-C8	152321-C8
n-Octyl	10	100	300	165321-C8	164321-C8	16d321-C8	162321-C8

Specification for Traditional Reverse Phases

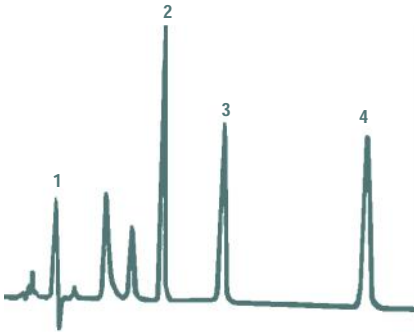
I= Irregular S= Spherical

Phase Code	Phase Description	Particle Size (µ)	Pore A Diameter	Particle Type	%C	Surface Area m^2/g	End-capped
MC-8	n-Octyl	3	60	S	9	475	Yes
(endcapped)		5	60	S	9	475	Yes
		10	60	S	9	475	Yes
		3	80	S	7	200	Yes
		5	80	S	7	200	Yes
		10	80	S	7	200	Yes
		3	100	S	7	190	Yes
		5	100	S	7	190	Yes
		10	100	S	7	190	Yes
		5	300	S	-	120	Yes
		5	500	S	-	40	Yes
C-18	n-Octadecyl	5	100	I	16	300	No
(nonendcapped)		10	100	I	16	300	No

Description	Particle Size (µ)	Pore Size (mm)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
n-Octyl EC	3	60	50	115111-MC8	114111-MC8	11d111-MC8	112111-MC8
n-Octyl EC	3	60	100	125111-MC8	124111-MC8	12d111-MC8	122111-MC8
n-Octyl EC	3	60	150	135111-MC8	134111-MC8	13d111-MC8	132111-MC8
n-Octyl EC	5	60	50	115211-MC8	114211-MC8	11d211-MC8	112211-MC8
n-Octyl EC	5	60	100	125211-MC8	124211-MC8	12d211-MC8	122211-MC8
n-Octyl EC	5	60	150	135211-MC8	134211-MC8	13d211-MC8	132211-MC8
n-Octyl EC	5	60	250	155211-MC8	154211-MC8	15d211-MC8	152211-MC8
n-Octyl EC	3	80	50	115171-MC8	114171-MC8	11d171-MC8	112171-MC8
n-Octyl EC	3	80	100	125171-MC8	124171-MC8	12d171-MC8	122171-MC8
n-Octyl EC	3	80	150	135171-MC8	134171-MC8	13d171-MC8	132171-MC8
n-Octyl EC	5	80	50	115271-MC8	114271-MC8	11d271-MC8	112271-MC8
n-Octyl EC	5	80	100	125271-MC8	124271-MC8	12d271-MC8	122271-MC8
n-Octyl EC	5	80	150	135271-MC8	134271-MC8	13d271-MC8	132271-MC8
n-Octyl EC	5	80	250	155271-MC8	154271-MC8	15d271-MC8	152271-MC8
n-Octyl EC	3	100	50	115121-MC8	114121-MC8	11d121-MC8	112121-MC8
n-Octyl EC	3	100	100	125121-MC8	124121-MC8	12d121-MC8	122121-MC8
n-Octyl EC	3	100	150	135121-MC8	134121-MC8	13d121-MC8	132121-MC8
n-Octyl EC	5	100	50	115221-MC8	114221-MC8	11d221-MC8	112221-MC8
n-Octyl EC	5	100	100	125221-MC8	124221-MC8	12d221-MC8	122221-MC8
n-Octyl EC	5	100	150	135221-MC8	134221-MC8	13d221-MC8	132221-MC8
n-Octyl EC	5	100	250	155221-MC8	154221-MC8	15d221-MC8	152221-MC8
n-Octyl EC	5	300	50	115231-MC8	114231-MC8	11d231-MC8	112231-MC8
n-Octyl EC	5	300	100	125231-MC8	124231-MC8	12d231-MC8	122231-MC8
n-Octyl EC	5	300	150	135231-MC8	134231-MC8	13d231-MC8	132231-MC8
n-Octyl EC	5	300	250	155231-MC8	154231-MC8	15d231-MC8	152231-MC8
n-Octyl EC	5	500	50	115241-MC8	114241-MC8	11d241-MC8	112241-MC8
n-Octyl EC	5	500	100	125241-MC8	124241-MC8	12d241-MC8	122241-MC8
n-Octyl EC	5	500	150	135241-MC8	134241-MC8	13d241-MC8	132241-MC8
n-Octyl EC	5	500	250	155241-MC8	154241-MC8	15d241-MC8	152241-MC8
Octadecyl	5	100	50	115221-C18	114221-C18	11d221-C18	112221-C18
Octadecyl	5	100	100	125221-C18	124221-C18	12d221-C18	122221-C18
Octadecyl	5	100	150	135221-C18	134221-C18	13d221-C18	132221-C18
Octadecyl	5	100	250	155221-C18	154221-C18	15d221-C18	152221-C18
Octadecyl	10	100	50	115321-C18	114321-C18	11d321-C18	112321-C18
Octadecyl	10	100	100	125321-C18	124321-C18	12d321-C18	122321-C18
Octadecyl	10	100	150	135321-C18	134221-C18	13d321-C18	132321-C18
Octadecyl	10	100	250	155321-C18	154221-C18	15d321-C18	152321-C18
Octadecyl	10	100	300	165321-C18	164321-C18	16d321-C18	162321-C18

I= Irregular S= Spherical

Phase Code	Phase Description	Particle Size (µ)	Pore A Diameter	Particle Type	%C	Surface Area m^2/g	End-capped
MC-18	n-Octadecyl	3	60	S	11	220	Yes
(endcapped)		5	60	S	11	220	Yes
		10	60	I	17	480	Yes
		5	60	HS	18	475	Yes
		3	80	S	10	200	Yes
		5	80	S	10	200	Yes
		10	80	S	10	200	Yes
		3	100	S	10	190	Yes
		5	100	S	10	190	Yes
		10	100	S	10	190	Yes
		5	300	S	6	120	Yes
		5	500	S	-	40	Yes



Pharmaceutical Stabilizers

Column: 25 cm x 4.6 mm
Packing: Alkyl Phenyl, 5 µ, 60° A
Mobile phase: 730 parts 0.25 M sodium phosphate buffer, pH 2.80/270 parts acetonitrile
Flow rate: 1 mL/min.
Detection: 210 nm

1. p-Toluene Sulfonic Acid
2. Benzyl Alcohol
3. Benzoic Acid
4. Benzaldehyde

Description	Particle Size (µ)	Pore Size (mm)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Octadecyl EC	3	60	50	115111-MC18	114111-MC18	11d111-MC18	112111-MC18
Octadecyl EC	3	60	100	125111-MC18	124111-MC18	12d111-MC18	122111-MC18
Octadecyl EC	3	60	150	135111-MC18	134111-MC18	13d111-MC18	132111-MC18
Octadecyl EC	5	60	50	115211-MC18	114211-MC18	11d211-MC18	112211-MC18
Octadecyl EC	5	60	100	125211-MC18	124211-MC18	12d211-MC18	122211-MC18
Octadecyl EC	5	60	150	135211-MC18	134211-MC18	13d211-MC18	132211-MC18
Octadecyl EC	5	60	250	155211-MC18	154211-MC18	15d211-MC18	152211-MC18
Octadecyl EC	10	60	50	115311-MC18	114311-MC18	11d311-MC18	112311-MC18
Octadecyl EC	10	60	100	125311-MC18	124311-MC18	12d311-MC18	122311-MC18
Octadecyl EC	10	60	150	135311-MC18	134311-MC18	13d311-MC18	132311-MC18
Octadecyl EC	10	60	250	155311-MC18	154311-MC18	15d311-MC18	152311-MC18
Octadecyl EC	10	60	300	165311-MC18	164311-MC18	16d311-MC18	162311-MC18
Octadecyl EC	3	80	50	115171-MC18	114171-MC18	11d171-MC18	112171-MC18
Octadecyl EC	3	80	100	125171-MC18	124171-MC18	12d171-MC18	122171-MC18
Octadecyl EC	3	80	150	135171-MC18	134171-MC18	13d171-MC18	132171-MC18
Octadecyl EC	5	80	50	115271-MC18	114271-MC18	11d271-MC18	112271-MC18
Octadecyl EC	5	80	100	125271-MC18	124271-MC18	12d271-MC18	122271-MC18
Octadecyl EC	5	80	150	135271-MC18	134271-MC18	13d271-MC18	132271-MC18
Octadecyl EC	5	80	250	155271-MC18	154271-MC18	15d271-MC18	152271-MC18
Octadecyl EC	3	100	50	115121-MC18	114121-MC18	11d121-MC18	112121-MC18
Octadecyl EC	3	100	100	125121-MC18	124121-MC18	12d121-MC18	122121-MC18
Octadecyl EC	3	100	150	135121-MC18	134121-MC18	13d121-MC18	132121-MC18
Octadecyl EC	5	100	50	115221-MC18	114221-MC18	11d221-MC18	112221-MC18
Octadecyl EC	5	100	100	125221-MC18	124221-MC18	12d221-MC18	122221-MC18
Octadecyl EC	5	100	150	135221-MC18	134221-MC18	13d221-MC18	132221-MC18
Octadecyl EC	5	100	250	155221-MC18	154221-MC18	15d221-MC18	152221-MC18
Octadecyl EC	5	300	50	115231-MC18	114231-MC18	11d231-MC18	112231-MC18
Octadecyl EC	5	300	100	125231-MC18	124231-MC18	12d231-MC18	122231-MC18
Octadecyl EC	5	300	150	135231-MC18	134231-MC18	13d231-MC18	132231-MC18
Octadecyl EC	5	300	250	155231-MC18	154231-MC18	15d231-MC18	152231-MC18
Octadecyl EC	5	500	50	115241-MC18	114241-MC18	11d241-MC18	112241-MC18
Octadecyl EC	5	500	100	125241-MC18	124241-MC18	12d241-MC18	122241-MC18
Octadecyl EC	5	500	150	135241-MC18	134241-MC18	13d241-MC18	132241-MC18
Octadecyl EC	5	500	250	155241-MC18	154241-MC18	15d241-MC18	152241-MC18
Octadecyl EC	5	1000	50	115251-MC18	114251-MC18	11d251-MC18	112251-MC18
Octadecyl EC	5	1000	100	125251-MC18	124251-MC18	12d251-MC18	122251-MC18
Octadecyl EC	5	1000	150	135251-MC18	134251-MC18	13d251-MC18	132251-MC18
Octadecyl EC	5	1000	250	155251-MC18	154251-MC18	15d251-MC18	152251-MC18

Specification for Traditional Reverse Phases

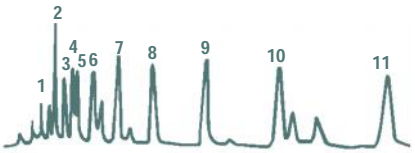
= Irregular S= Spherical

Phase Code	Phase Description	Particle Size (µ)	Pore A Diameter	Particle Type	%C	Surface Area m^2/g	End-capped
MC-18	n-Octadecyl	5	1000	S	-	30	Yes
(endcapped)		5	4000	S	-	10	Yes
AP	Alkyl	3	60	S	9	475	No
	Phenyl	5	60	S	9	475	No
		10	60	S	9	475	No
		3	80	S	6	200	No
		5	80	S	6	200	No
		10	80	S	6	200	No
		3	100	S	5	190	No
		5	100	S	5	190	No
		10	100	S	5	190	No
		5	300	S	-	120	No
		5	500	S	-	40	No

Description	Particle Size (µ)	Pore Size (mm)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Octadecyl EC	5	4000	50	115261-MC18	114261-MC18	11d261-MC18	112261-MC18
Octadecyl EC	5	4000	100	125261-MC18	124261-MC18	12d261-MC18	122261-MC18
Octadecyl EC	5	4000	150	135261-MC18	134261-MC18	13d261-MC18	132261-MC18
Octadecyl EC	5	4000	250	155261-MC18	155261-MC18	15d261-MC18	152261-MC18
Alkyl Phenyl	3	60	50	115111-AP	114111-AP	11d111-AP	112111-AP
Alkyl Phenyl	3	60	100	125111-AP	124111-AP	12d111-AP	122111-AP
Alkyl Phenyl	3	60	150	135111-AP	134111-AP	13d111-AP	132111-AP
Alkyl Phenyl	5	60	50	115211-AP	114211-AP	11d211-AP	112211-AP
Alkyl Phenyl	5	60	100	125211-AP	124211-AP	12d211-AP	122211-AP
Alkyl Phenyl	5	60	150	135211-AP	134211-AP	13d211-AP	132211-AP
Alkyl Phenyl	5	60	250	155211-AP	154211-AP	15d211-AP	152211-AP
Alkyl Phenyl	10	60	50	115311-AP	114311-AP	11d311-AP	112311-AP
Alkyl Phenyl	10	60	100	125311-AP	124311-AP	12d311-AP	122311-AP
Alkyl Phenyl	10	60	150	135311-AP	134311-AP	13d311-AP	132311-AP
Alkyl Phenyl	10	60	250	155311-AP	154311-AP	15d311-AP	152311-AP
Alkyl Phenyl	10	60	300	165311-AP	164311-AP	16d311-AP	162311-AP
Alkyl Phenyl	3	80	50	115171-AP	114171-AP	11d171-AP	112171-AP
Alkyl Phenyl	3	80	100	125171-AP	124171-AP	12d171-AP	122171-AP
Alkyl Phenyl	3	80	150	135171-AP	134171-AP	13d171-AP	132171-AP
Alkyl Phenyl	5	80	50	115271-AP	114271-AP	11d271-AP	112271-AP
Alkyl Phenyl	5	80	100	125271-AP	124271-AP	12d271-AP	122271-AP
Alkyl Phenyl	5	80	150	135271-AP	134271-AP	13d271-AP	132271-AP
Alkyl Phenyl	5	80	250	155271-AP	154271-AP	15d271-AP	152271-AP
Alkyl Phenyl	3	100	50	115121-AP	114121-AP	11d121-AP	112121-AP
Alkyl Phenyl	3	100	100	125121-AP	124121-AP	12d121-AP	122121-AP
Alkyl Phenyl	3	100	150	135121-AP	134121-AP	13d121-AP	132121-AP
Alkyl Phenyl	5	100	50	115221-AP	114221-AP	11d221-AP	112221-AP
Alkyl Phenyl	5	100	100	125221-AP	124221-AP	12d221-AP	122221-AP
Alkyl Phenyl	5	100	150	135221-AP	134221-AP	13d221-AP	132221-AP
Alkyl Phenyl	5	100	250	155221-AP	154221-AP	15d221-AP	152221-AP
Alkyl Phenyl	5	300	50	115231-AP	114231-AP	11d231-AP	112231-AP
Alkyl Phenyl	5	300	100	125231-AP	124231-AP	12d231-AP	122231-AP
Alkyl Phenyl	5	300	150	135231-AP	134231-AP	13d231-AP	132231-AP
Alkyl Phenyl	5	300	250	155231-AP	154231-AP	15d231-AP	152231-AP
Alkyl Phenyl	5	500	50	115241-AP	114241-AP	11d241-AP	112241-AP
Alkyl Phenyl	5	500	100	125241-AP	124241-AP	12d241-AP	122241-AP
Alkyl Phenyl	5	500	150	135241-AP	134241-AP	13d241-AP	132241-AP
Alkyl Phenyl	5	500	250	155241-AP	154241-AP	15d241-AP	152241-AP

I= Irregular S= Spherical

Phase Code	Phase Description	Particle Size (µ)	Pore A Diameter	Particle Type	%C	Surface Area m^2/g	End-capped
C8-BD	Octyl	3	60	S	12	475	No
		5	60	S	12	475	No
		10	60	S	12	475	No
C18-BD	Octadecyl	3	60	S	18	475	No
		5	60	S	18	475	No
		10	60	S	18	475	No
P-BD	Phenyl	3	60	S	7	475	No
		5	60	S	7	475	No
		10	60	S	7	475	No
CN-BD	Cyano	3	60	S	-	475	No
		5	60	S	-	475	No
		10	60	S	-	475	No
C18-AI	Acid Interaction	3	60	S	12	220	No
		5	60	S	12	220	No



Aromatic Hydrocarbons

Column: 25 cm x 1.0 mm
Packing: Chromegabond MC-18 5 µ, 60° A
Mobile phase: 80% Methanol, 20% Water
Flow rate: .05 mL/min.

1. Benzene
2. Toluene
3. Ethylbenzene
4. i-Propylbenzene
5. n-Propylbenzene
6. n-Butybenzene
7. n-Pentylbenzene
8. n-Hexylbenzene
9. n-Heptylbenzene
10. n-Octylbenzene
11. n-Nonylbenzene

Description	Particle Size (µ)	Pore Size (mm)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
n-Octyl BD	3	60	50	115111-C8-BD	114111-C8-BD	11d111-C8-BD	112111-C8-BD
n-Octyl BD	3	60	100	125111-C8-BD	124111-C8-BD	12d111-C8-BD	122111-C8-BD
n-Octyl BD	3	60	150	135111-C8-BD	134111-C8-BD	13d111-C8-BD	132111-C8-BD
n-Octyl BD	5	100	50	115221-C8-BD	114221-C8-BD	11d221-C8-BD	112221-C8-BD
n-Octyl BD	5	100	100	125221-C8-BD	124221-C8-BD	12d221-C8-BD	122221-C8-BD
n-Octyl BD	5	100	150	135221-C8-BD	134221-C8-BD	13d221-C8-BD	132221-C8-BD
n-Octyl BD	5	100	250	155221-C8-BD	154221-C8-BD	15d221-C8-BD	152221-C8-BD
ODS-BD	3	60	50	115111-C18-BD	114111-C18-BD	11d111-C18-BD	112111-C18-BD
ODS-BD	3	60	100	125111-C18-BD	124111-C18-BD	12d111-C18-BD	122111-C18-BD
ODS-BD	3	60	150	135111-C18-BD	134111-C18-BD	13d111-C18-BD	132111-C18-BD
ODS-BD	5	100	50	115221-C18-BD	114221-C18-BD	11d221-C18-BD	112221-C18-BD
ODS-BD	5	100	100	125221-C18-BD	124221-C18-BD	12d221-C18-BD	122221-C18-BD
ODS-BD	5	100	150	135221-C18-BD	134221-C18-BD	13d221-C18-BD	132221-C18-BD
ODS-BD	5	100	250	155221-C18-BD	154221-C18-BD	15d221-C18-BD	152221-C18-BD
Phenyl BD	3	60	50	115111-P-BD	114111-P-BD	11d111-P-BD	112111-P-BD
Phenyl BD	3	60	100	125111-P-BD	124111-P-BD	12d111-P-BD	122111-P-BD
Phenyl BD	3	60	150	135111-P-BD	134111-P-BD	13d111-P-BD	132111-P-BD
Phenyl BD	5	100	50	115221-P-BD	114221-P-BD	11d221-P-BD	112221-P-BD
Phenyl BD	5	100	100	125221-P-BD	124221-P-BD	12d221-P-BD	122221-P-BD
Phenyl BD	5	100	150	135221-P-BD	134221-P-BD	13d221-P-BD	132221-P-BD
Phenyl BD	5	100	250	155221-P-BD	154221-P-BD	15d221-P-BD	152221-P-BD
Cyano BD	3	60	50	115111-CN-BD	114111-CN-BD	11d111-CN-BD	112111-CN-BD
Cyano BD	3	60	100	125111-CN-BD	124111-CN-BD	12d111-CN-BD	122111-CN-BD
Cyano BD	3	60	150	135111-CN-BD	134111-CN-BD	13d111-CN-BD	132111-CN-BD
Cyano BD	5	100	50	115221-CN-BD	114221-CN-BD	11d221-CN-BD	112221-CN-BD
Cyano BD	5	100	100	125221-CN-BD	124221-CN-BD	12d221-CN-BD	122221-CN-BD
Cyano BD	5	100	150	135221-CN-BD	134221-CN-BD	13d221-CN-BD	132221-CN-BD
Cyano BD	5	100	250	155221-CN-BD	154221-CN-BD	15d221-CN-BD	152221-CN-BD
ODS AI	3	60	50	115111-C18-AI	114111-C18-AI	11d111-C18-AI	112111-C18-AI
ODS AI	3	60	100	125111-C18-AI	124111-C18-AI	12d111-C18-AI	122111-C18-AI
ODS AI	3	60	150	135111-C18-AI	134111-C18-AI	13d111-C18-AI	132111-C18-AI
ODS AI	5	60	50	115211-C18-AI	114211-C18-AI	11d211-C18-AI	112211-C18-AI
ODS AI	5	60	100	125211-C18-AI	124211-C18-AI	12d211-C18-AI	122211-C18-AI
ODS AI	5	60	150	135211-C18-AI	134211-C18-AI	13d211-C18-AI	132211-C18-AI
ODS AI	5	60	250	155211-C18-AI	154211-C18-AI	15d211-C18-AI	152211-C18-AI

Specification for Traditional Reverse Phases

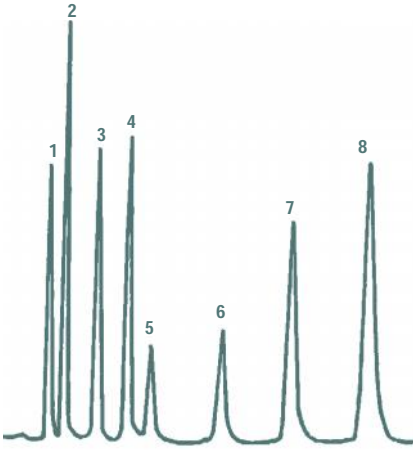
I= Irregular S= Spherical

Phase Code	Phase Description	Particle Size (µ)	Pore A Diameter	Particle Type	%C	Surface Area m^2/g	End-capped
CN	Cyano	3	60	S	-	475	No
		5	60	S	-	475	No
		10	60	S	-	475	No
		5	300	S	-	120	No
		10	300	S	-	120	No
CN/HS	Cyano	3	60	S	-	550	No
		5	60	S	-	550	No
D/RP	Diol	3	60	S	-	475	No
		5	60	S	-	475	No
		10	60	S	-	475	No
		3	100	S	-	330	No
		5	100	S	-	330	No
		10	100	S	-	330	No
		5	300	S	-	120	No

Description	Particle Size (µ)	Pore Size (mm)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Cyano	3	60	50	115111-CN	114111-CN	11d111-CN	112111-CN
Cyano	3	60	100	125111-CN	124111-CN	12d111-CN	122111-CN
Cyano	3	60	150	135111-CN	134111-CN	13d111-CN	132111-CN
Cyano	5	60	50	115211-CN	114211-CN	11d211-CN	112211-CN
Cyano	5	60	100	125211-CN	124211-CN	12d211-CN	122211-CN
Cyano	5	60	150	135211-CN	134211-CN	13d211-CN	132211-CN
Cyano	5	60	250	155211-CN	154211-CN	15d211-CN	152211-CN
Cyano	5	300	50	115231-CN	114231-CN	11d231-CN	112231-CN
Cyano	5	300	100	125231-CN	124231-CN	12d231-CN	122231-CN
Cyano	5	300	150	135231-CN	134231-CN	13d231-CN	132231-CN
Cyano	5	300	250	155231-CN	154231-CN	15d231-CN	152231-CN
Cyano HS	3	60	50	115111-CN/HS	114111-CN/HS	11d111-CN/HS	112111-CN/HS
Cyano HS	3	60	100	125111-CN/HS	124111-CN/HS	12d111-CN/HS	122111-CN/HS
Cyano HS	3	60	150	135111-CN/HS	134111-CN/HS	13d111-CN/HS	132111-CN/HS
Cyano HS	5	60	50	115211-CN/HS	114211-CN/HS	11d211-CN/HS	112211-CN/HS
Cyano HS	5	60	100	125211-CN/HS	124211-CN/HS	12d211-CN/HS	122211-CN/HS
Cyano HS	5	60	150	135211-CN/HS	134211-CN/HS	13d211-CN/HS	132211-CN/HS
Cyano HS	5	60	250	155211-CN/HS	154211-CN/HS	15d211-CN/HS	152211-CN/HS
Diol RP	3	60	50	115111-D/RP	114111-D/RP	11d111-D/RP	112111-D/RP
Diol RP	3	60	100	125111-D/RP	124111-D/RP	12d111-D/RP	122111-D/RP
Diol RP	3	60	150	135111-D/RP	134111-D/RP	13d111-D/RP	132111-D/RP
Diol RP	5	60	50	115211-D/RP	114211-D/RP	11d211-D/RP	112211-D/RP
Diol RP	5	60	100	125211-D/RP	124211-D/RP	12d211-D/RP	122211-D/RP
Diol RP	5	60	150	135211-D/RP	134211-D/RP	13d211-D/RP	132211-D/RP
Diol RP	5	60	250	155211-D/RP	154211-D/RP	15d211-D/RP	152211-D/RP
Diol RP	3	100	50	115121-D/RP	114121-D/RP	11d121-D/RP	112121-D/RP
Diol RP	3	100	100	125121-D/RP	124121-D/RP	12d121-D/RP	122121-D/RP
Diol RP	3	100	150	135121-D/RP	134121-D/RP	13d121-D/RP	132121-D/RP
Diol RP	5	100	50	115221-D/RP	114221-D/RP	11d221-D/RP	112221-D/RP
Diol RP	5	100	100	125221-D/RP	124221-D/RP	12d221-D/RP	122221-D/RP
Diol RP	5	100	150	135221-D/RP	134221-D/RP	13d221-D/RP	132221-D/RP
Diol RP	5	100	250	155221-D/RP	154221-D/RP	15d221-D/RP	152221-D/RP
Diol RP	5	300	50	115231-D/RP	114231-D/RP	11d231-D/RP	112231-D/RP
Diol RP	5	300	100	125231-D/RP	124231-D/RP	12d231-D/RP	122231-D/RP
Diol RP	5	300	150	135231-D/RP	134231-D/RP	13d231-D/RP	132231-D/RP
Diol RP	5	300	250	155231-D/RP	154231-D/RP	15d231-D/RP	152231-D/RP

I= Irregular S= Spherical

Phase Code	Phase Description	Particle Size (µ)	Pore A Diameter	Particle Type	%C	Surface Area m²/g	End-capped
D/RP	Diol	5	500	S	-	40	No
		5	1000	S	-	30	No
		5	4000	S	-	10	No
A/RP	Amine	3	60	S	-	475	No
		5	60	S	-	475	No
		10	60	I	-	480	No
		5	100	S	-	330	No
		10	100	S	-	330	No
		5	300	S	-	120	No
		5	500	S	-	40	No
		5	1000	S	-	30	No
DA/RP	Diamine	5	60	S	-	475	No
		10	60	I	-	480	No
TA/RP	Triamine	5	60	S	-	475	No
		10	60	I	-	480	No



Aromatic Ketones

Column: 100 mm x 4.6 mm
Packing: Chromegabond MC-8
Mobile phase: 60% Methanol/40% Water
Flow rate: 1 mL/min.

1. Benzamide
2. Benzyl Alcohol
3. Acetophenone
4. Methyl Benzoate
5. Phenetole
6. Napthalene
7. Benzophenone
8. Biphenyl

Description	Particle Size (µ)	Pore Size (mm)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Diol RP	5	500	50	115241-D/RP	114241-D/RP	11d241-D/RP	112241-D/RP
Diol RP	5	500	100	125241-D/RP	124241-D/RP	12d241-D/RP	122241-D/RP
Diol RP	5	500	150	135241-D/RP	134241-D/RP	13d241-D/RP	132241-D/RP
Diol RP	5	500	250	155241-D/RP	154241-D/RP	15d241-D/RP	152241-D/RP
Diol RP	5	1000	50	115251-D/RP	114251-D/RP	11d251-D/RP	112251-D/RP
Diol RP	5	1000	100	125251-D/RP	124251-D/RP	12d251-D/RP	122251-D/RP
Diol RP	5	1000	150	135251-D/RP	134251-D/RP	13d251-D/RP	132251-D/RP
Diol RP	5	1000	250	155251-D/RP	154251-D/RP	15d251-D/RP	152251-D/RP
Diol RP	5	4000	50	115261-D/RP	114261-D/RP	11d261-D/RP	112261-D/RP
Diol RP	5	4000	100	125261-D/RP	124261-D/RP	12d261-D/RP	122261-D/RP
Diol RP	5	4000	150	135261-D/RP	134261-D/RP	13d261-D/RP	132261-D/RP
Diol RP	5	4000	250	155261-D/RP	155261-D/RP	15d261-D/RP	152261-D/RP
Amine RP	3	60	50	115111-A/RP	114111-A/RP	11d111-A/RP	112111-A/RP
Amine RP	3	60	100	125111-A/RP	124111-A/RP	12d111-A/RP	122111-A/RP
Amine RP	3	60	150	135111-A/RP	134111-A/RP	13d111-A/RP	132111-A/RP
Amine RP	5	60	50	115211-A/RP	114211-A/RP	11d211-A/RP	112211-A/RP
Amine RP	5	60	100	125211-A/RP	124211-A/RP	12d211-A/RP	122211-A/RP
Amine RP	5	60	150	135211-A/RP	134211-A/RP	13d211-A/RP	132211-A/RP
Amine RP	5	60	250	155211-A/RP	154211-A/RP	15d211-A/RP	152211-A/RP
Amine RP	5	100	50	115221-A/RP	114221-A/RP	11d221-A/RP	112221-A/RP
Amine RP	5	100	100	125221-A/RP	124221-A/RP	12d221-A/RP	122221-A/RP
Amine RP	5	100	150	135221-A/RP	134221-A/RP	13d221-A/RP	132221-A/RP
Amine RP	5	100	250	155221-A/RP	154221-A/RP	15d221-A/RP	152221-A/RP
Amine RP	5	300	50	115231-A/RP	114231-A/RP	11d231-A/RP	112231-A/RP
Amine RP	5	300	100	125231-A/RP	124231-A/RP	12d231-A/RP	122231-A/RP
Amine RP	5	300	150	135231-A/RP	134231-A/RP	13d231-A/RP	132231-A/RP
Amine RP	5	300	250	155231-A/RP	154231-A/RP	15d231-A/RP	152231-A/RP
Diamine RP	5	60	50	115211-DA/RP	114211-DA/RP	11d211-DA/RP	112211-DA/RP
Diamine RP	5	60	100	125211-DA/RP	124211-DA/RP	12d211-DA/RP	122211-DA/RP
Diamine RP	5	60	150	135211-DA/RP	134211-DA/RP	13d211-DA/RP	132211-DA/RP
Diamine RP	5	60	250	155211-DA/RP	154211-DA/RP	15d211-DA/RP	152211-DA/RP
Triamine RP	5	60	50	115211-TA/RP	114211-TA/RP	11d211-TA/RP	112211-TA/RP
Triamine RP	5	60	100	125211-TA/RP	124211-TA/RP	12d211-TA/RP	122211-TA/RP
Triamine RP	5	60	150	135211-TA/RP	134211-TA/RP	13d211-TA/RP	132211-TA/RP
Triamine RP	5	60	250	155211-TA/RP	154211-TA/RP	15d211-TA/RP	152211-TA/RP

Chromegabond Selectivity Enhanced Reverse Phase Columns

- *Unique reverse phase HPLC column chemistries*
- *Fluorine containing bonded phases*
- *Phases developed specifically for pharmaceutical separations*
- *Alumina based reversed phase columns for high pH mobile phases*

ES Industries has developed a series of selectivity enhanced reverse phase columns containing unique stationary phases and support materials. These columns incorporate stationary phases that have extraordinary retention properties that provide the chromatographer with another tool to solve difficult separation problems. In addition, we have extended the pH range (1-13) for many of our reversed phase products using alumina based support materials. To familiarize the chromatographer with these unique products we have included a brief summary of each product. A detailed description of each product can be found on the proceeding pages.

FluoroSep-RP Phenyl (FSP)

FluoroSep-RP Phenyl (FSP) contains monomerically bonded pentafluorophenyl groups. The pentafluorophenyl groups interact with analytes via pi-pi electron retention process. This phase is useful for the separation of halogen containing compounds, aromatics, conjugated systems and epimers. These electron interactions are found in many natural product mixtures.

FluoroSep-RP Octyl (FO)

FluoroSep-RP Octyl (FO) contains monomerically bonded perfluorooctyl groups. This phase has enhanced selectivity for halogenated compounds.

FluoroSep-RP Propyl (FP)

FluoroSep-RP Propyl (FP) contains monomerically bonded perfluoropropyl groups. FP is a high efficiency short chain phase used for the separation of proteins, peptides, and other related compounds of medicinal/biological interest.

Chromegabond PSC

Chromegabond PSC (pharmaceutical separation column) is prepared by using a mixture of C8 and C18 groups. The Chromegabond PSC is a versatile column that can be used for pharmaceutical applications requiring either a C8 or C18. This column is similar to other columns with extended polar selectivity but with significantly more carbon.

Chromegabond C22

Chromegabond C22 is a highly retentive stationary phase in which hydrocarbon C22 groups are bonded to an ultra-high purity support. The Chromegabond C22 is ideally suited for the separation of triglycerides, PAHs and steroids.

GammaBond™ Alumina

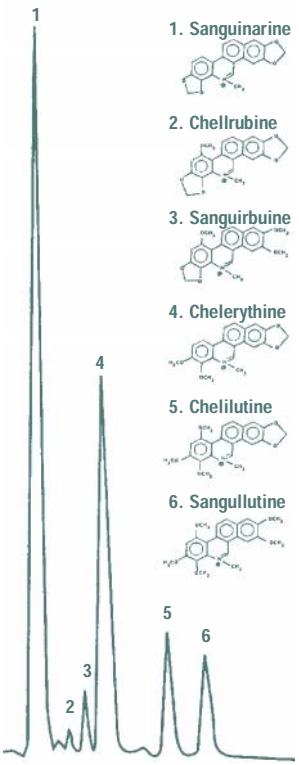
GammaBond Alumina is a family of exceptionally stable alumina-based HPLC columns designed for extreme pH applications to provide high efficiency and unique selectivity. GammaBond Alumina is manufactured by bonding a polymer to a highly stable porous spherical alumina particle. The ES Industries GammaBond reversed phase columns may be used with any mobile phase from pH 1.3 to pH 12, and any desired buffer system or additive. The GammaBond RP1 column is used for USP method L-29.

FluoroSep-RP Phenyl (FSP)

- High resolution performance for difficult separations
- Unique reverse phase interaction
- Durable over a wide range of pH and temperatures
- High quality alternative to Phenyl columns
- Available in 3 micron particles

FluoroSep-RP Phenyl (FSP) contains monomerically bonded pentafluorophenyl groups. The pentafluorophenyl groups interact with analytes via pi-pi electron retention process. This phase is useful for the separation of halogen containing compounds, aromatics, conjugated systems, and epimers. These electron interactions are found in many natural product mixtures. The pentafluorophenyl group is bound to the same ultra high purity silica as we use in Chromegabond WR. Chromegabond FSP is considerably more stable than Phenyl columns under acidic conditions. FSP is available in 3 and 5 micron particle sizes.

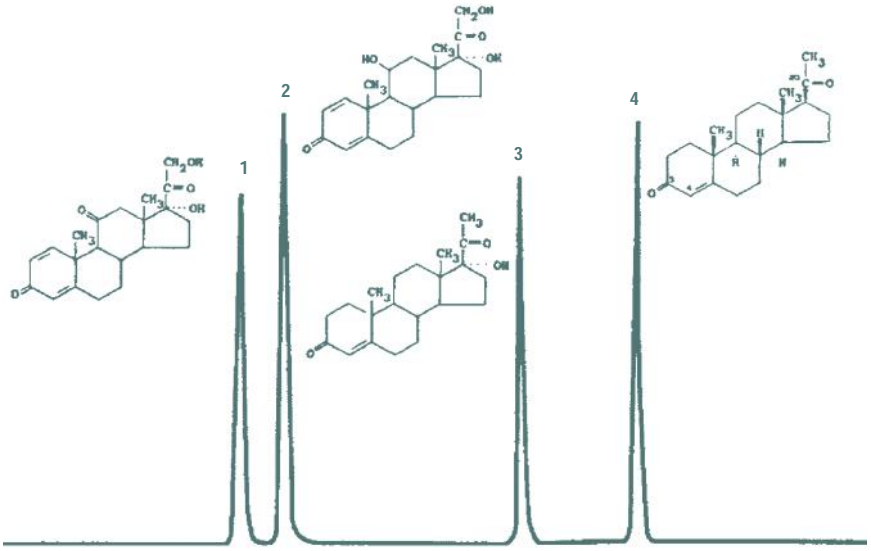
FluoroSep-RP Phenyl (FSP):
pore size = 60° A;
surface area = 350 g^2/m;
FSP/HS surface area = 450 g^2/m;
pH range = 2-8



Blood Root Extract

Column: FluoroSep-RP Phenyl 5 µ 60° A, 25 cm x 4.6 mm
Mobile phase: 5545 0.1% H_3PO_4/CH_3/CN
Flow rate: 2 mL/min.
Pressure: 205 bar
Column temperature: 23°C
Detection: 280 nm x 0.2
Injection volume: 20 uL

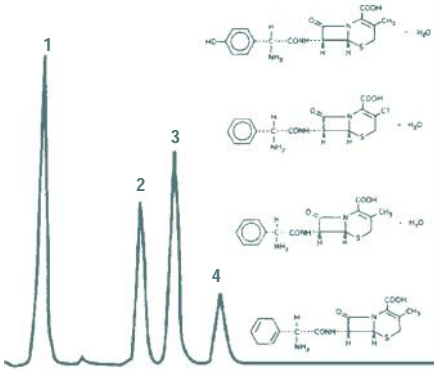
1. Sanguinarine	4. Chelerythine
2. Chellrubine	5. Chelilutine
3. Sanguirbuine	6. Sangullutine



Steroids

Column: FluoroSep-RP Phenyl (FSP) 5 µ 60 A 25 cm x 4.6 mm
Mobile phase: Acetonitrile:Water Gradient 40-80% Acetonitrile, 0-6 min. 2 min. hold
Flow rate: 1 mL/min.
Pressure: 96 bar
Detection: UV @ 254 nm

1. Prednisone	3. a-hydroxyprogesterone
2. Prednisolone	4. Progesterone

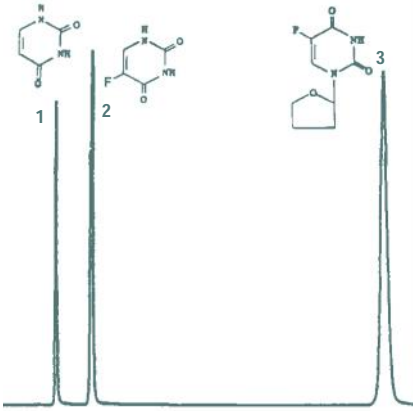


Cephalosporin Antibiotics

Column: FluoroSep-RP Phenyl (FSP) 5 µ 60° A, 25 cm x 4.6 mm
Mobile phase: Acetonitrile: pH 4 acetate buffer 12:8
Flow rate: 1 mL/min.
Pressure: 103 bar
Detection: UV @ 260 nm

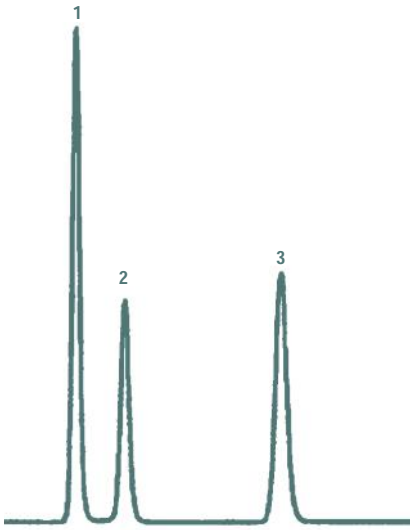
1. Cefadroxil	3. Cephalexin
2. Cefaclor	4. Cephradine

FluoroSep-RP Phenyl (FSP)



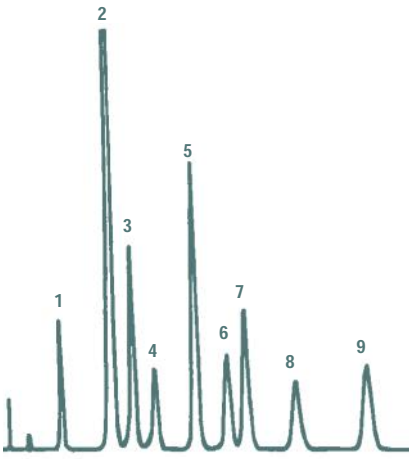
Uracil and Fluorouracil

Column: FluoroSep Phenyl (FSP)
150 x 4.6 mm 3 µ
Eluent: 90% Water/10% Acetonitrile 20 nm
Potassium Phosphate, pH = 7.0
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Uracil
2. 5-fluorouracil
3. Ftorafur



Nitroaromatic Compounds

Column: FluoroSep-RP Phenyl (FSP) 150 x 4.6 mm
Eluent: 70:30 Mathanol:Water
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Nitrobenzene
2. 2,6 Dinitrotoluene
3. 2,4 Dinitrotoluene



Vanillin Analogs

Column: 15 cm x 4.6 mm
Packing: FluoroSep-RP Phenyl (FSP) 3 µ
Mobile phase: 35/65 Methanol/0.1% H_3PO_4
Flow rate: 1 mL/min.
Detection: 254 nm
Temperature: 25°C
1. Vanillyl Alcohol
2. Vanillic Acid
3. p-Hydroxybenzoic Acid
4. Syringic Acid
5. Vanillin
6. Syringaldehyde
7. Acetovanillone
8. Acetosyringone
9. Ethyl Vanillin

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Perfluorophenyl	3	50	115121-FSP	114121-FSP	11d121-FSP	112121-FSP
Perfluorophenyl	3	100	125121-FSP	124121-FSP	12d121-FSP	122121-FSP
Perfluorophenyl	3	150	135121-FSP	134121-FSP	13d121-FSP	132121-FSP
Perfluorophenyl	5	50	115221-FSP	114221-FSP	11d221-FSP	112221-FSP
Perfluorophenyl	5	100	125221-FSP	124221-FSP	12d221-FSP	122221-FSP
Perfluorophenyl	5	150	135221-FSP	134221-FSP	13d221-FSP	132221-FSP
Perfluorophenyl	5	250	155221-FSP	154221-FSP	15d221-FSP	152221-FSP
Perfluorophenyl HS	5	50	115221-FSP/HS	114221-FSP/HS	11d121-FSP/HS	112121-FSP/HS
Perfluorophenyl HS	5	100	125221-FSP/HS	124221-FSP/HS	12d121-FSP/HS	122121-FSP/HS
Perfluorophenyl HS	5	150	135221-FSP/HS	134221-FSP/HS	13d121-FSP/HS	132121-FSP/HS
Perfluorophenyl HS	5	250	155221-FSP/HS	154221-FSP/HS	15d221-FSP/HS	152221-FSP/HS

FluoroSep-RP Octyl (FO) and FluoroSep-RP Propyl (FP)

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

- High resolution performance for difficult separations
- Durable over a wide range of pH
- FO provides a different interaction than hydrocarbon n-octyl
- FP is exceptional for protein and peptide separations

FluoroSep-RP Octyl (FO)

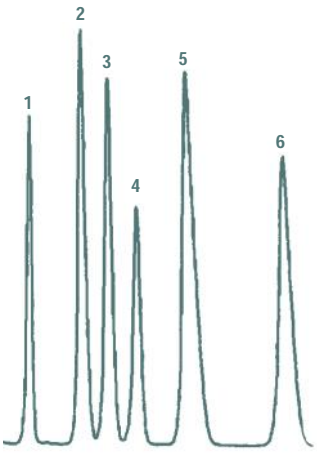
FluoroSep-RP Octyl (FO) contains monomerically bonded perfluorooctyl groups. The fluorinated octyl has retention similar to that of standard C8 phases, but with very remarkable selectivity for the most demanding separations, including enhanced selectivity for halogenated compounds.

FluoroSep-RP Octyl (FO): pore size = 60° A; surface area = 450 g^2/m; pH range = 2-8.

FluoroSep-RP Propyl (FP)

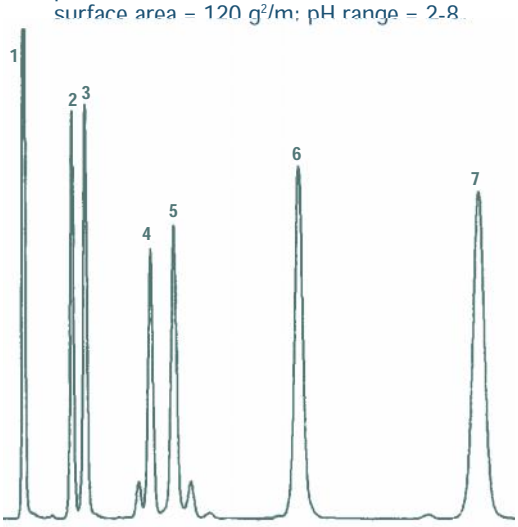
FluoroSep-RP Propyl (FP) contains monomerically bonded perfluoropropyl groups. FP is high efficiency short chain phase used for the separation of proteins, peptides, and other related compounds of medicinal/biological interest.

FluoroSep-RP Propyl (FP):
pore size = 300° A;
surface area = 120 g^2/m; pH range = 2-8



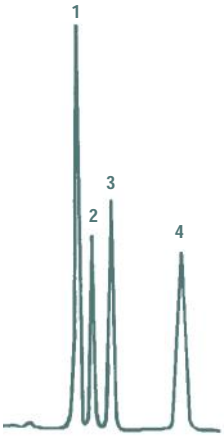
Difluorophenol

Column: FluoroSep Octyl 5 µ 4.6 mm x 15 cm
75/25 Water/Acetonitrile
25 mM Acetate buffer, pH = 4.3
1. 2,6-Difluorophenol
2. 2,4-Difluorophenol
3. 2,5-Difluorophenol
4. 2,3-Difluorophenol
5. 3,4-Difluorophenol
6. 3,5-Difluorophenol



Phenoxyacid Herbicides

Column: FluoroSep Octyl 5 µ 4.6 mm x 15 cm
65/35 Water/Acetonitrile
25 mM Phosphate pH = 3
25 mM Sodlium Perchlorate
1. Phenoxyacetic acid
2. o-chlorophenoxyacetic acid
3. p-chlorophenoxyacetic acid
4. 2,3-dichloropheoxyacetic acid
5. 2,4-dichlorophenoxyacetic acid
6. 2,4,5-trichloropheoxy acetic acid
7. 2,4,5-trichlorophenoxypropionic



Fluoroaromatics

Column: 30 cm x 4.6 mm
Packing: FluoroSep-RP FO
Mobile phase: 60% Methanol, 40% Water
Flow rate: 2 mL/min.
1. Dinitrofluoroenzene
2. Benzene
3. Fluoronapthalene
4. 3-Fluoro-4-Nitrotoluene

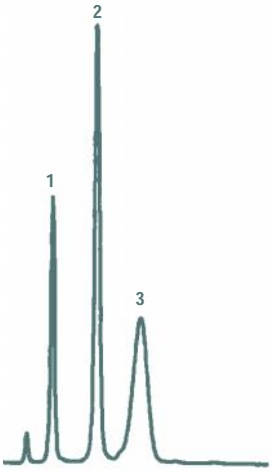
Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Perfluorooctyl	5	50	115221-FO	114221-FO	11d221-FO	112221-FO
Perfluorooctyl	5	100	125221-FO	124221-FO	12d221-FO	122221-FO
Perfluorooctyl	5	150	135221-FO	134221-FO	13d221-FO	132221-FO
Perfluorooctyl	5	250	155221-FO	154221-FO	15d221-FO	152221-FO
Perfluoropropyl	5	50	115211-FP	114211-FP	11d211-FP	112211-FP
Perfluoropropyl	5	100	125211-FP	124211-FP	12d211-FP	122211-FP
Perfluoropropyl	5	150	135211-FP	134211-FP	13d211-FP	132211-FP
Perfluoropropyl	5	250	155211-FP	154211-FP	15d211-FP	152211-FP

Chromegabond® PSC

- Unique C8/C18 combination stationary phase
- Versatile column for many pharmaceutical applications
- Excellent column for gradient applications
- Highly efficient columns packed with either 3 or 5 micron particles
- Extended polar selectivity

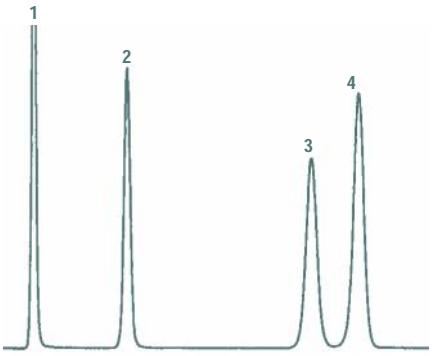
Chromegabond PSC (pharmaceutical separation column) is prepared by using a mixture of C8 and C18 groups. In addition to this unique bonding arrangement, PSC columns incorporate technology that we have developed which enables us to tightly control the level of residual silanol groups. We utilize this technology to produce PSC columns with a tightly controlled number of residual silanol groups. These columns are able to retain both highly polar and hydrophobic compounds. The Chromegabond PSC is a versatile column that can be used for applications requiring either a C8 or C18. This column is similar to other columns with extended polar selectivity but with significantly more carbon.

Chromegabond PSC: pore size = 100° A; surface area = 350 g^2/m; Carbon = 14%; pH range = 2-8.



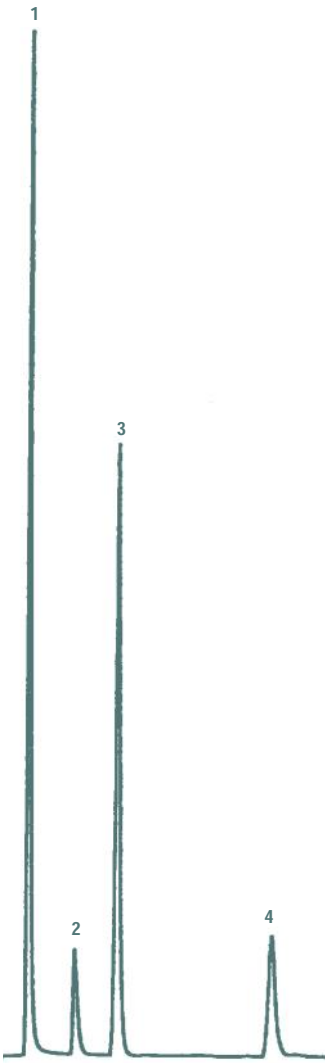
Antibiotics

Column: Chromegabond PSC 150 x 4.6 mm
Eluent: 40% Methanol/60%
100 mM Sodium phosphate, pH = 6.25
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Tetracycline
2. Methacycline
3. Doxycycline



Stimulants

Column: Chromegabond PSC 150 x 4.6 mm 5 µ
Eluent: 5% Acetonitrile/95% Potassium dihydrogen phosphate 20 mM, pH = 7.0
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Uracil
2. Theobromine
3. Theobromine
4. Theophylline



Pharmaceuticals

Column: Chromegabond PSC 150 mm x 4.6 mm
Eluent: 20% Acetonitrile/90% 0.05M KH_2PO_4 pH = 3.2
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Procainamide HCL
2. (+)-Ψ-Ephedrine HCL
3. Acetaminophen
4. Caffeine

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Octyl/ODS	3	50	115121-PSC	114121-PSC	11d121-PSC	112121-PSC
Octyl/ODS	3	100	125121-PSC	124121-PSC	12d121-PSC	122121-PSC
Octyl/ODS	3	150	135121-PSC	134121-PSC	13d121-PSC	132121-PSC
Octyl/ODS	5	50	115221-PSC	114221-PSC	11d221-PSC	112221-PSC
Octyl/ODS	5	100	125221-PSC	124221-PSC	12d221-PSC	122221-PSC
Octyl/ODS	5	150	135221-PSC	134221-PSC	13d221-PSC	132221-PSC
Octyl/ODS	5	250	155221-PSC	154221-PSC	15d221-PSC	152221-PSC

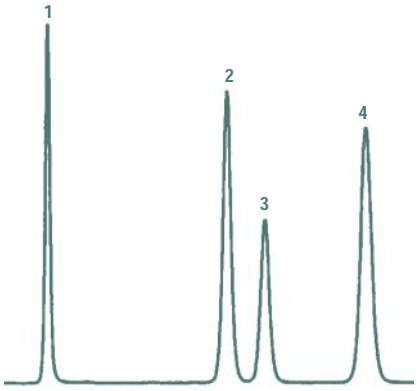
Chromegabond® C22

- Unique bonded C22 group
- Highly retentive for reverse phase chromatography
- Useful for PAHs, triglycerides, and steroids
- Highly durable

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

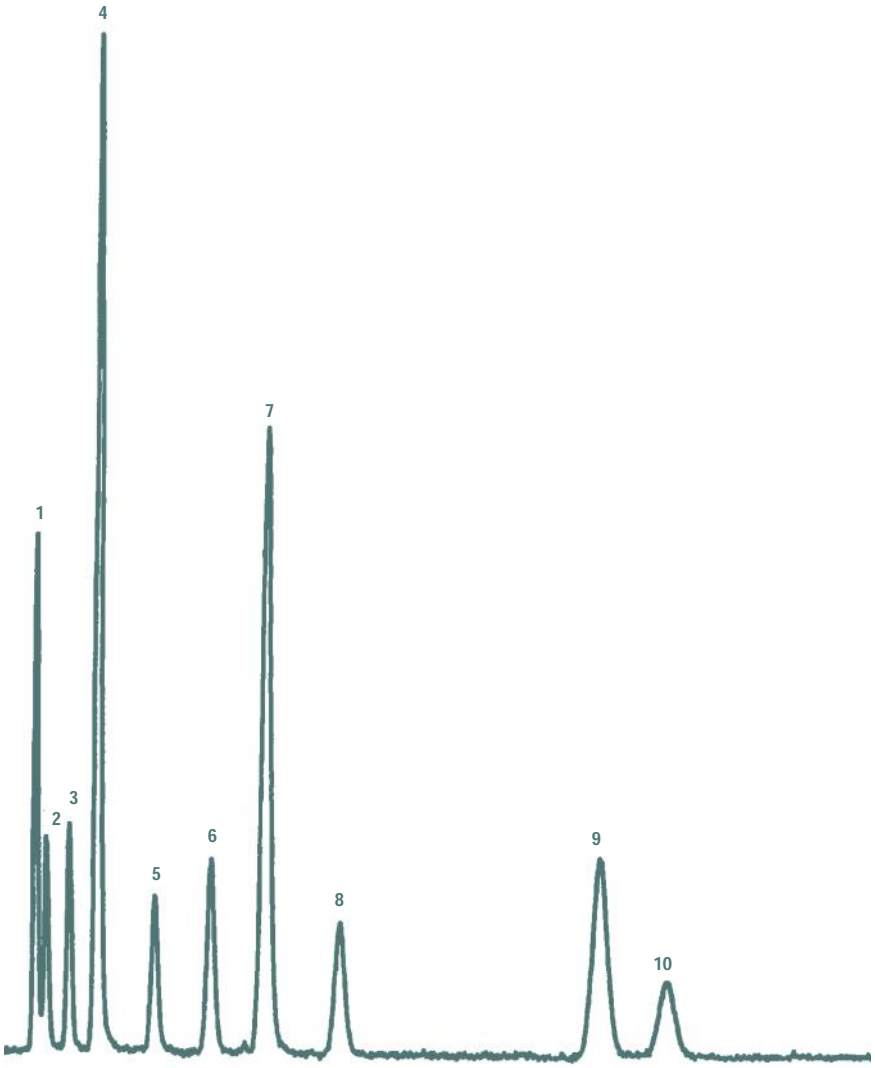
Chromegabond C22 is a highly retentive stationary phase in which hydrocarbon C22 groups are bonded to an ultra-high purity support. The C22 is monomerical bound and is nonendcapped allowing this stationary to be used under wide variety of mobile phase compositions. This phase exhibits even greater hydrophobic interaction than the Chromegabond HC column. The Chromegabond C22 is ideally suited for the separation of triglycerides, PAHs, and steroids.

Chromegabond C22: pore size = 100° A; surface area = 350 g^2/m; Carbon = 22%; pH range = 2-8.



Phenol Mixture

Column: Chromegabond C22 100 x 4.6 mm
Eluent: 30% Acetonitrile/70% Water 0.1% TFA
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Phenol
2. 2-Chlorophenol
3. 4-Nitrophenol
4. 3,5-Dimethylphenol



PAH Mixture

Column: Chromegabond C22 150 x 4.6 mm 5 µ
Mobile Phase: 80/20 ACN/Water
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
Injection Volume: 5 µl

1. Fluorene
2. Acenaphthene
3. Phenanthrene
4. Anthracene
5. Fluoranthene
6. Pyrene
7. Triphenylene
8. Benz (a) Anthracene
9. Benzo (b) Fluoranthene
10. Benzo (k) Fluoranthene

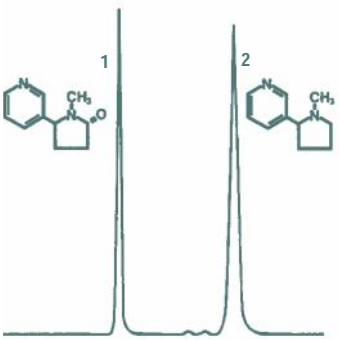
Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
n-C22	5	50	115221-C22	114221-C22	11d221-C22	112221-C22
n-C22	5	100	125221-C22	124221-C22	12d221-C22	122221-C22
n-C22	5	150	135221-C22	134221-C22	13d221-C22	132221-C22
n-C22	5	250	155221-C22	154221-C22	15d221-C22	152221-C22

GammaBond™ Alumina

- Stable from pH 1.3 to 12
- Efficiencies to compete with the best silica based columns
- Available in low load RP-1 and octyl based RP-8
- GammaBond RP-1 is used for USP method L29

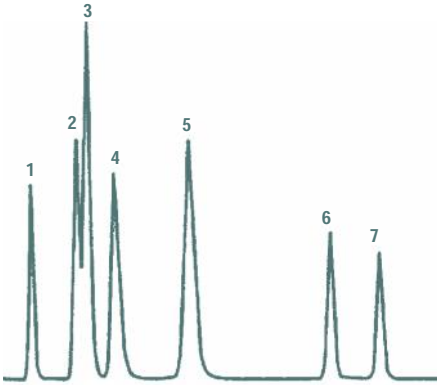
GammaBond Alumina is a family of exceptionally stable alumina-based HPLC columns designed for extreme pH applications to provide high efficiency and unique selectivity. GammaBond Alumina is manufactured by bonding a polymer to a highly stable porous spherical 5 µm alumina particle. This proprietary manufacturing process yields polymer-coated packings with the same high efficiency as traditional silica columns, but with all the advantages of alumina. The ES Industries' GammaBond reversed phase columns may be used with any mobile phase from pH 1.3 to pH 12, and any desired buffer system or additive. GammaBond Alumina is available in two stationary phase types: GammaBond RP-1 and RP-8. Gammabond RP-1 is a low load polybutadiene coated alumina. This phase is used for USP method L-29. GammaBond RP-8 is an alumina based polysiloxane polymer to which n-octyl groups are appended.

GammaBond Alumina (RP1 or RP8): pore size = 80° A; pH range = 1.3-12.



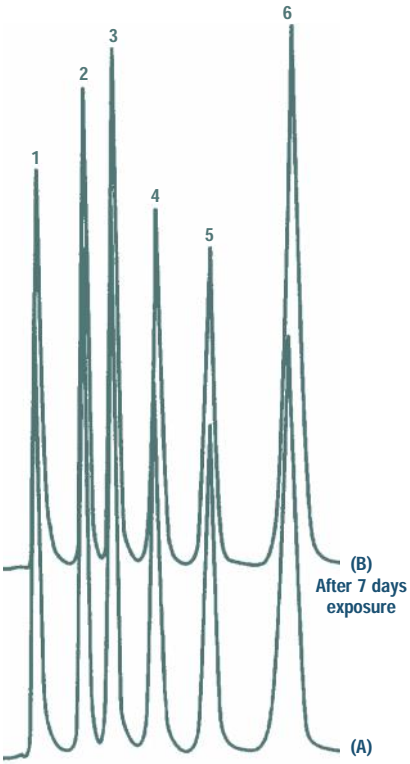
Alkyloids

Column: GammaBond RP-2 (15 cm x 4.6 mm)
Mobile phase: 90:10 Water:Acetonitrile 25 mm Borate Buffer pH = 12.0
Flow rate: 1 mL/min.
Temperature: 25°C
1. Cotinine
2. Nicotine



Long Term Base Test

Column: GammaBond RP-1 5 µ (15 cm x 4.6 mm)
Mobile phase: Acetonitrile: pH 9.3 Borate Buffer 10:90 with gradient to 30:70 from 4-8 minutes
Flow rate: 1 mL/min.
1. Simazine
2. Atrazine
3. Simetryn
4. Prometon
5. Ametryn
6. Prometryn
7. Terbutryn



Acid Stability

Column: GammaBond RP-1 (15 cm x 4.6 mm)
Mobile phase: 90:10 Water:Acetonitrile pH = 1.3 (H_3PO_4)
Flow rate: 1 mL/min.
Temperature: 25°C
1. Nicotinic Acid
2. Furyl Acrylic Acid
3. 4-Nitrophenol
4. Hydrocinnamic Aid
5. Methyl Benzoate
6. Indole-3-propionic Acid

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Polybutadiene RP-1	5	50	115271-ARP1	114271-ARP1	11d271-ARP1	112271-ARP1
Polybutadiene RP-1	5	100	125271-ARP1	124271-ARP1	12d271-ARP1	122271-ARP1
Polybutadiene RP-1	5	150	135271-ARP1	134271-ARP1	13d271-ARP1	132271-ARP1
Polybutadiene RP-1	5	250	155271-ARP1	154271-ARP1	15d271-ARP1	152271-ARP1
Polybutadiene RP-8	5	50	115271-ARP8	114271-ARP8	11d271-ARP8	112271-ARP1
Polybutadiene RP-8	5	100	125271-ARP8	124271-ARP8	12d271-ARP8	122271-ARP1
Polybutadiene RP-8	5	150	135271-ARP8	134271-ARP8	13d271-ARP8	132271-ARP1
Polybutadiene RP-8	5	250	155271-ARP8	154271-ARP8	15d271-ARP8	152271-ARP1

Chiral Columns

- Bonded phenylglycine and leucine
- Bonded tartar amide
- Protein bond BSA columns
- Bonded cyclodextrins
- Competitive prices
- Analytical, guard, and preparative

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

The application of HPLC to the analysis of chiral substances is increasing rapidly. This is particularly important in the pharmaceutical industry where information on enantiomeric composition is being required. In many biological processes the activity of one isomer can be contrasted with the inactivity or even harmful effect of the other. ES Industries offer several different types of chiral stationary phases to handle the wide variety of chiral separation problems.

Phenylglycine and Leucine Phases

ES Industries offers either optically active phenylglycine or leucine derivative bonded to the silica surface (Pirkle types). Since these optically active compounds are chemically bound to the silica surface there is no restriction on the polarity of the mobile phase.

Tartramide Phase

ES Industries offers a unique stationary phase that incorporates a chiral dintrophenyltartramide moiety linked through a propyl spacer group bonded to the silica surface. This is particular useful in separating agrochemical and like molecules.

Phenylglycine and Leucine

Description	Particle Size (µ)	Pore Size (A)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)	Price
D-phenylglycine	5	100	50	115221-CHR-D-PG	114221-CHR-D-PG	11d221-CHR-D-PG	112221-CHR-D-PG	Call
D-phenylglycine	5	100	100	125221-CHR-D-PG	124221-CHR-D-PG	12d221-CHR-D-PG	122221-CHR-D-PG	Call
D-phenylglycine	5	100	150	135221-CHR-D-PG	134221-CHR-D-PG	13d221-CHR-D-PG	132221-CHR-D-PG	Call
D-phenylglycine	5	100	250	155221-CHR-D-PG	154221-CHR-D-PG	15d221-CHR-D-PG	152221-CHR-D-PG	Call
L-phenylglycine	5	100	50	115221-CHR-L-PG	114221-CHR-L-PG	11d221-CHR-L-PG	112221-CHR-L-PG	Call
L-phenylglycine	5	100	100	125221-CHR-L-PG	124221-CHR-L-PG	12d221-CHR-L-PG	122221-CHR-L-PG	Call
L-phenylglycine	5	100	150	135221-CHR-L-PG	134221-CHR-L-PG	13d221-CHR-L-PG	132221-CHR-L-PG	Call
L-phenylglycine	5	100	250	155221-CHR-L-PG	154221-CHR-L-PG	15d221-CHR-L-PG	152221-CHR-L-PG	Call
DL-phenylglycine	5	100	50	115221-CHR-DL-PG	114221-CHR-DL-PG	11d221-CHR-DL-PG	112221-CHR-DL-PG	Call
DL-phenylglycine	5	100	100	125221-CHR-DL-PG	124221-CHR-DL-PG	12d221-CHR-DL-PG	122221-CHR-DL-PG	Call
DL-phenylglycine	5	100	150	135221-CHR-DL-PG	134221-CHR-DL-PG	13d221-CHR-DL-PG	132221-CHR-DL-PG	Call
DL-phenylglycine	5	100	250	155221-CHR-DL-PG	154221-CHR-DL-PG	15d221-CHR-DL-PG	152221-CHR-DL-PG	Call
L-Leucine	5	100	50	115221-CHR-L-LEU	114221-CHR-L-LEU	11d221-CHR-L-LEU	112221-CHR-L-LEU	Call
L-Leucine	5	100	100	125221-CHR-L-LEU	124221-CHR-L-LEU	12d221-CHR-L-LEU	122221-CHR-L-LEU	Call
L-Leucine	5	100	150	135221-CHR-L-LEU	134221-CHR-L-LEU	13d221-CHR-L-LEU	132221-CHR-L-LEU	Call
L-Leucine	5	100	250	155221-CHR-L-LEU	154221-CHR-L-LEU	15d221-CHR-L-LEU	152221-CHR-L-LEU	Call

Tartramide

Description	Particle Size (µ)	Pore Size (A)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)	Price
Tartramide	5	100	50	115221-CHR-TA	114221-CHR-TA	11d221-CHR-TA	112221-CHR-TA	Call
Tartramide	5	100	100	125221-CHR-TA	124221-CHR-TA	12d221-CHR-TA	122221-CHR-TA	Call
Tartramide	5	100	150	135221-CHR-TA	134221-CHR-TA	13d221-CHR-TA	132221-CHR-TA	Call
Tartramide	5	100	250	155221-CHR-TA	154221-CHR-TA	15d221-CHR-TA	152221-CHR-TA	Call

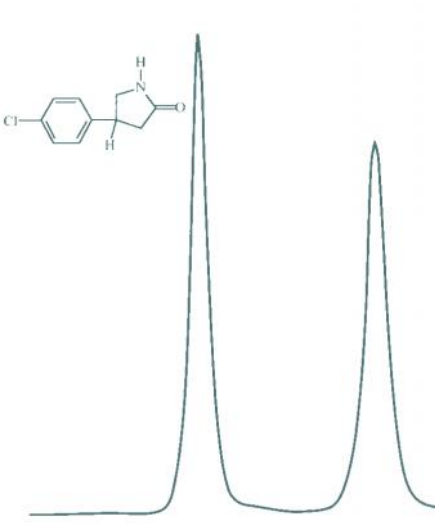
Chiral Columns

Kromasil Tartar Amide Phases

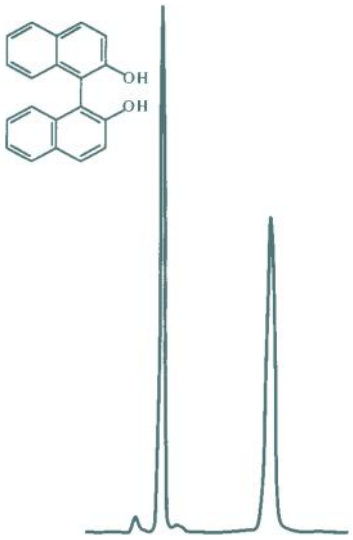
ES Industries is able to offer chiral network polymers covalently bonded to Kromasil. Kromasil CHI-DMB contains the chiral monomer O,O'-bis [3,5-dimethylbenzoyl]-N,N'-diallyl-L-tartar diamide and Kromasil CHI-TBB contains the chiral monomer O,O'-bis [4-tert-butylbenzoyl]-N,N' diallyl-L-tartar diamide. Both monomers are reacted with a multifunctional hydrosilane yielding a network polymer incorporating the bifunctional C2-symmetric chiral selector.

Resolvosil™ BSA

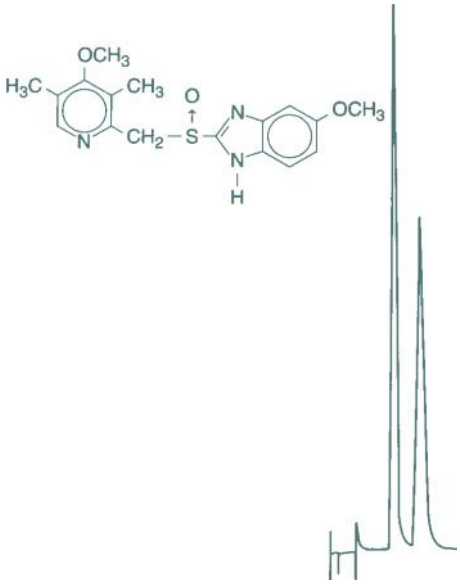
ES Industries is able to offer a chiral stationary phase of Resolvosil BSA (Bovine serum albumin) covalently bonded to silica. The main advantages of the Resolvosil are its high selectivity in combination with the ease by which retention can be regulated by small changes in the mobile phase composition. Resolvosil has been used to separate chiral mixtures of amino acids, aromatic sulphoxides, barbiturates and beta blockers. Resolvosil BSA is available in two pore sizes 100° A (BSA-7; low capacity) and 300° A (BSA-7PX; high capacity).



Baclophenlactam
Column: Kromasil CHI-TBB, 4.6 x 250 mm, 5 µ
Mobile phase: Hexane/2-propanol 95/5
Flow rate: 2 mL/min.



Binaphtol
Column: Kromasil CHI-DMB, 4.6 x 250 mm, 5 µ
Mobile phase: Hexane/2-propanol 95/5
Flow rate: 2 mL/min.



Optical Isomers of Omeprazole
Column: ET 150/4 Resolvosil BSA-7, 150 x 4 mm ID
Mobile phase: 0.05 M phosphate buffer, pH 7.9 + 2% propanol-1
Flow rate: 1 mL/min.

Kromasil Tartar Amide

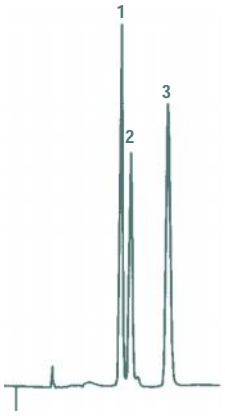
Description	Particle Size (µ)	Pore Size (A)	Length (mm)	Standard-bore P/N (4.6 mm)	Price
DMB	5	100	250	155221-KR-DMB	Call
TBB	5	100	250	155221-KR-TBB	Call

Resolvosil™ BSA

Description	Particle Size (µ)	Pore Size (A)	Length (mm)	Standard-bore P/N (4.0 mm)	Price
BSA-7	7	100	150	134421-MN-BSA-7	Call
BSA-7PX	7	300	150	134431-MN-BSA-7PX	Call

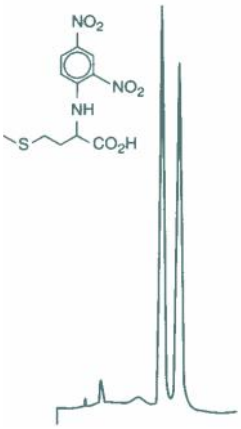
Nucleodex™

ES Industries is able to offer a chiral columns based on a cyclodextrin chiral selectors. These cyclodextrins are covalently bonded to the silica matrix via a spacer, resulting in hydrolytically stable adsorbent. Cyclodextrins are cyclic oligosaccharides consisting of glucose units. They are formed by degradation of starch by bacillus macerans or bacillus circulans under action of cyclodextringly-cosyltransferase. Nucleodex is available in different types, Beta-OH, Alpha-PM, Beta-PM and Gamma-PM. Beta-cyclodextrin contains seven glucose units and cavity opening of 7.5 A. Beta-OH contains Beta-cyclodextrin with free hydroxy groups and Beta-PM contains permethylated hydroxy groups. Alpha-cyclodextrin contains six glucose units and a smaller opening than the Beta type. The Gamma-cyclodextrin contains eight glucose units and the larger opening than the Beta type. Nucleodex columns have been used for the chiral separation of phenols, barbiturates and steroids.



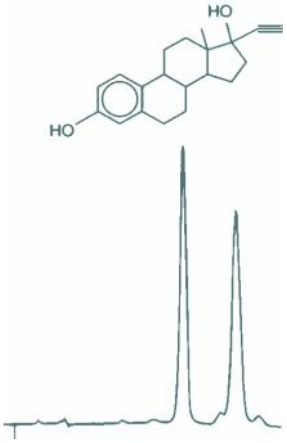
o-, m-, and p-Cresol

Column: Nucleodex β-OH
Mobile phase: 50:50 Water:MeOH
Flow rate: 0.7 mL/min.
1. o-cresol
2. m-cresol
3. p-cresol



DNP-D, L-Methionine

Column: Nucleodex β-OH
Mobile phase: 40:60 MeOH:50 mM NaH_2PO_4, pH = 7
Flow rate: 0.7 mL/min.



Ethinylestradiol

Column: Nucleodex β-PM
Mobile phase: 70:30 MeOH:0.1% TEAA, pH = 4
Flow rate: 0.7 mL/min.

Nucleodex™

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.0 mm)	Price
Beta-OH	5	200	144221-MN-B-OH	Call
Beta-PM	5	200	144221-MN-B-PM	Call
Alpha-PM	5	200	144221-MN-A-PM	Call
Gamma-OPM	5	200	144221-MN-G-PM	Call

Method Development Column Library Series

ES Industries works closely with chromatographers that are active in the fields of pharmaceutical, environmental, food products, nutritional, natural products, and petroleum chemistries. From these relationships we have developed a series of column kits that are extremely useful for HPLC method development work. These kits contain column chemistries that provide the chromatographer with state-of-the-art separation solutions for difficult to solve problems. Detailed descriptions for each of the column chemistries contained in the Library Series can be found on pages 6 and 27. Each kit is available in two column lengths– 5 or 15 cm.

Premier Base Deactivated Reverse Phase Column Method Development Kit 5 micron (PBD-LIB5)

Includes one each of the following:

- WR C8
- WR C18
- PSC
- AquaSep
- BAS C18
- HC-C18
- ProTec C18

Length (cm)	P/N
5	PBD-LIB5-5
15	PBD-LIB5-15

Premier Base Deactivated Reverse Phase Column Method Development Kit 3 micron (PBD-LIB3)

Includes one each of the following:

- WR C8
- WR C18
- BAS C18
- HC-C18
- ProTec C18

Length (cm)	P/N
5	PBD-LIB3-5
15	PBD-LIB3-15

Premier Reverse Phase Column Method Development Kit 5 micron (P-LIB5)

Includes one each of the following:

- WR C8
- WR C18
- PSC
- AquaSep
- BAS C18
- HC-C18
- ProTec C18
- FSP/HS

Length (cm)	P/N
5	P-LIB5-5
15	P-LIB5-15

Premier Reverse Phase Column Method Development Kit 3 micron (P-LIB3)

Includes one each of the following:

- WR C8
- WR C18
- BAS C18
- HC-C18
- ProTec C18
- FSP

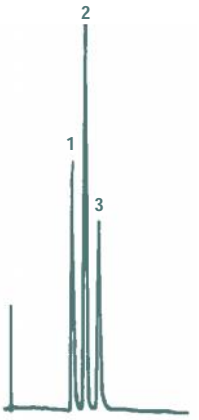
Length (cm)	P/N
5	P-LIB3-5
15	P-LIB3-15

Ion Exchange Phases

- Ideal for difficult to separate ionic compounds
- Useful for water soluble compounds
- Available in weak anion, strong anion, strong cation, and weak cation phases

Ion Exchange HPLC provides the method of choice for ionic compounds that fail to separate on reverse phase columns by ion suppression or paired ion methodologies. Ion Exchange HPLC Columns can provide interesting selectivities for aromatic compounds and nucleotides and are ideal for aqueous soluble compounds.

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.



Phenylenediamine Isomers

Column: 15 cm x 4.6 mm
Packing: Chromegabond RP-SCX
Mobile phase: 90/10 A/B A-IM H_3PO_4 adjusted to pH 3.2 with NH_4OH B-CH_3OH
Flow rate: 1 mL/min.
Detection: 254 nm
1. p-Phenylenediamine
2. m-Phenylenediamine
3. o-Phenylenediamine

Aromatic Carboxylic Acids

Column: 25 cm x 4.6 mm
Packing: Chromegabond RP-SAX 5 µ 60 A
Mobile phase: 90% Water (pH 2.6), 10% Methanol
Flow rate: 1.5 mL/min.
1. Nictotinic Acid
2. Benzoic Acid
3. o-Toluic Acid
4. m-Toulic Acid

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
SCX	5	50	115211-SCX	114211-SCX	11d211-SCX	112211-SCX
SCX	5	100	125211-SCX	124211-SCX	12d211-SCX	122211-SCX
SCX	5	150	135211-SCX	134211-SCX	13d211-SCX	132211-SCX
SCX	5	250	155211-SCX	154211-SCX	15d211-SCX	152211-SCX
RP-SCX	5	50	115211-RP-SCX	114211-RP-SCX	11d211-RP-SCX	112211-RP-SCX
RP-SCX	5	100	125211-RP-SCX	124211-RP-SCX	12d211-RP-SCX	122211-RP-SCX
RP-SCX	5	150	135211-RP-SCX	134211-RP-SCX	13d211-RP-SCX	132211-RP-SCX
RP-SCX	5	250	155211-RP-SCX	154211-RP-SCX	15d211-RP-SCX	152211-RP-SCX
SAX	5	50	115211-SAX	114211-SAX	11d211-SAX	112211-SAX
SAX	5	100	125211-SAX	124211-SAX	12d211-SAX	122211-SAX
SAX	5	150	135211-SAX	134211-SAX	13d211-SAX	132211-SAX
SAX	5	250	155211-SAX	154211-SAX	15d211-SAX	152211-SAX
RP-SAX	5	50	115211-RP-SAX	114211-RP-SAX	11d211-RP-SAX	112211-RP-SAX
RP-SAX	5	100	125211-RP-SAX	124211-RP-SAX	12d211-RP-SAX	122211-RP-SAX
RP-SAX	5	150	135211-RP-SAX	134211-RP-SAX	13d211-RP-SAX	132211-RP-SAX
RP-SAX	5	250	155211-RP-SAX	154211-RP-SAX	15d211-RP-SAX	152211-RP-SAX
M-WAX	5	50	115211-M-WAX	114211-M-WAX	11d211-M-WAX	112211-M-WAX
M-WAX	5	100	125211-M-WAX	124211-M-WAX	12d211-M-WAX	122211-M-WAX
M-WAX	5	150	135211-M-WAX	134211-M-WAX	13d211-M-WAX	132211-M-WAX
M-WAX	5	250	155211-M-WAX	154211-M-WAX	15d211-M-WAX	152211-M-WAX
D-WAX	5	50	115211-D-WAX	114211-D-WAX	11d211-D-WAX	112211-D-WAX
D-WAX	5	100	125211-D-WAX	124211-D-WAX	12d211-D-WAX	122211-D-WAX
D-WAX	5	150	135211-D-WAX	134211-D-WAX	13d211-D-WAX	132211-D-WAX
D-WAX	5	250	155211-D-WAX	154211-D-WAX	15d211-D-WAX	152211-D-WAX
T-WAX	5	50	115211-T-WAX	114211-T-WAX	11d211-T-WAX	112211-T-WAX
T-WAX	5	100	125211-T-WAX	124211-T-WAX	12d211-T-WAX	122211-T-WAX
T-WAX	5	150	135211-T-WAX	134211-T-WAX	13d211-T-WAX	132211-T-WAX
T-WAX	5	250	155211-T-WAX	154211-T-WAX	15d211-T-WAX	152211-T-WAX

Chromegabond® Normal Phase HPLC

ES Industries offers a wide variety of columns for normal phase HPLC including polar bonded and adsorption phases. In addition, we have been innovators in developing several new stationary phases for normal phase chromatography such as NPI which is used for natural product isolation. We have also developed a series of columns for the analysis of complex petroleum samples, such as DNAP and RingSep.

- *A wide variety of columns for normal phase HPLC*
- *Polar bonded phases*
- *Adsorption columns*
- *Columns specifically developed for natural product isolation*
- *Columns developed specifically for petroleum applications*

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

Polar Bonded Phases

- Ideal for compounds soluble in nonaqueous solvents
- Can provide high resolution separation for geometrical and positional isomers
- Can be scaled up for preparative chromatography
- A wide range of bonded phase types available

ES Industries manufactures Polar Bonded materials for Normal Phase HPLC that are compatible with most organic solvents. These phases often give more reproducible separations than adsorption silica columns. All our Polar Bonded phases are produced on ultra-high purity silica.

Description of Polar Bonded Phases

Phase	Phase Description	Preferred Application
A	Amino (NH_2)	Amino packing separates polar compounds such as substituted anilines, esters, and chlorinated pesticides
DA	Diamine	Same as amino but greater concentration of amino groups
TA	Triamine	Even higher loading of amino groups than diamine
D	Diol	Less polar than unmodified silica. Can produce better peak shapes than silica.
CN	Cyano (CN)	Cyano separates many of the same polar compounds as unmodified silica.
CN/HS	Cyano	Same as cyano but higher surface area
A/CN	Amino/Cyano	A mixed cyano-amino phase may be used as an alternative to cyano phases
NO_2	Nitro	Separation of compounds with double bonds, e.g. aromatic compounds

Phase	Phase Description	Particle Size (µ)	Pore A Volume	Particle Type	Surface Area
A	Amine	3	60	S	475
		5	60	S	475
		10	60	I	480
		5	100	S	330
		10	100	S	330
		5	300	S	120
		5	500	S	40
		5	1000	S	30
DA	Diamine	5	60	S	475
		10	60	I	480
TA	Triamine	5	60	S	475
		10	60	I	485

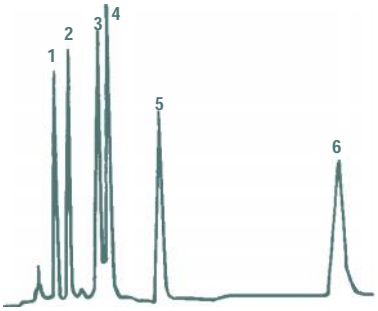
Description	Particle Size (µ)	Pore Size	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Amine	3	60	50	115111-A	114111-A	11d111-A	112111-A
Amine	3	60	100	125111-A	124111-A	12d111-A	122111-A
Amine	3	60	150	135111-A	134111-A	13d111-A	132111-A
Amine	5	60	50	115211-A	114211-A	11d211-A	112211-A
Amine	5	60	100	125211-A	124211-A	12d211-A	122211-A
Amine	5	60	150	135211-A	134211-A	13d211-A	132211-A
Amine	5	60	250	155211-A	154211-A	15d211-A	152211-A
Amine	10	60	50	115311-A	114311-A	11d311-A	112311-A
Amine	10	60	100	125311-A	124311-A	12d311-A	122311-A
Amine	10	60	150	135311-A	134311-A	13d311-A	132311-A
Amine	10	60	250	155311-A	154311-A	15d311-A	152311-A
Amine	10	60	300	165311-A	164311-A	16d311-A	162311-A
Amine	5	100	50	115221-A	114221-A	11d221-A	112221-A
Amine	5	100	100	125221-A	124221-A	12d221-A	122221-A
Amine	5	100	150	135221-A	134221-A	13d221-A	132221-A
Amine	5	100	250	155221-A	154221-A	15d221-A	152221-A
Amine	10	100	50	115321-A	114321-A	11d321-A	112321-A
Amine	10	100	100	125321-A	124321-A	12d321-A	122321-A
Amine	10	100	150	135321-A	134221-A	13d321-A	132321-A
Amine	10	100	250	155321-A	154221-A	15d321-A	152321-A
Amine	10	100	300	165321-A	164321-A	16d321-A	162321-A
Amine	5	300	50	115231-A	114231-A	11d231-A	112231-A
Amine	5	300	100	125231-A	124231-A	12d231-A	122231-A
Amine	5	300	150	135231-A	134231-A	13d231-A	132231-A
Amine	5	300	250	155231-A	154231-A	15d231-A	152231-A
Amine	10	300	50	115331-A	114331-A	11d331-A	112331-A
Amine	10	300	100	125331-A	124331-A	12d331-A	122331-A
Amine	10	300	150	135331-A	134331-A	13d331-A	132331-A
Amine	10	300	250	155331-A	154331-A	15d331-A	152331-A
Amine	10	300	300	164331-A	164331-A	16d331-A	162331-A
Diamine	5	60	50	115211-DA	114211-DA	11d211-DA	112211-DA
Diamine	5	60	100	125211-DA	124211-DA	12d211-DA	122211-DA
Diamine	5	60	150	135211-DA	134211-DA	13d211-DA	132211-DA
Diamine	5	60	250	155211-DA	154211-DA	15d211-DA	152211-DA
Diamine	10	60	50	115311-DA	114311-DA	11d311-DA	112311-DA
Diamine	10	60	100	125311-DA	124311-DA	12d311-DA	122311-DA
Diamine	10	60	150	135311-DA	134211-DA	13d311-DA	132311-DA
Diamine	10	60	250	155311-DA	154211-DA	15d311-DA	152311-DA
Diamine	10	60	300	165311-DA	164311-DA	16d311-DA	162311-DA
Triamine	5	60	50	115211-TA	114211-TA	11d211-TA	112211-TA
Triamine	5	60	100	125211-TA	124211-TA	12d211-TA	122211-TA
Triamine	5	60	150	135211-TA	134211-TA	13d211-TA	132211-TA
Triamine	5	60	250	155211-TA	154211-TA	15d211-TA	152211-TA
Triamine	10	60	50	115311-TA	114311-TA	11d311-TA	112311-TA
Triamine	10	60	100	125311-TA	124311-TA	12d311-TA	122311-TA
Triamine	10	60	150	135311-TA	134211-TA	13d311-TA	132311-TA
Triamine	10	60	250	155311-TA	154211-TA	15d311-TA	152311-TA
Triamine	10	60	300	165311-TA	164311-TA	16d311-TA	162311-TA

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

Phase	Phase Description	Particle Size (µ)	Pore A Volume	Particle Type	Surface Area
D	Diol	3	60	S	475
		5	60	S	475
		10	60	S	475
		3	100	S	330
		5	100	S	330
		10	100	S	330
		5	300	S	120
		5	500	S	40
		5	1000	S	30
		5	4000	S	10
CN	Cyano (Nitrile)	3	60	S	475
		5	60	S	475
		10	60	S	475

Description	Particle Size (µ)	Pore Size	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Diol	3	60	50	115111-D	114111-D	11d111-D	112111-D
Diol	3	60	100	125111-D	124111-D	12d111-D	122111-D
Diol	3	60	150	135111-D	134111-D	13d111-D	132111-D
Diol	5	60	50	115211-D	114211-D	11d211-D	112211-D
Diol	5	60	100	125211-D	124211-D	12d211-D	122211-D
Diol	5	60	150	135211-D	134211-D	13d211-D	132211-D
Diol	5	60	250	155211-D	154211-D	15d211-D	152211-D
Diol	10	60	50	115311-D	114311-D	11d311-D	112311-D
Diol	10	60	100	125311-D	124311-D	12d311-D	122311-D
Diol	10	60	150	135311-D	134311-D	13d311-D	132311-D
Diol	10	60	250	155311-D	154311-D	15d311-D	152311-D
Diol	10	60	300	165311-D	164311-D	16d311-D	162311-D
Diol	3	100	50	115121-D	114121-D	11d121-D	112121-D
Diol	3	100	100	125121-D	124121-D	12d121-D	122121-D
Diol	3	100	150	135121-D	134121-D	13d121-D	132121-D
Diol	5	100	50	115221-D	114221-D	11d221-D	112221-D
Diol	5	100	100	125221-D	124221-D	12d221-D	122221-D
Diol	5	100	150	135221-D	134221-D	13d221-D	132221-D
Diol	5	100	250	155221-D	154221-D	15d221-D	152221-D
Diol	10	100	50	115321-D	114321-D	11d321-D	112321-D
Diol	10	100	100	125321-D	124321-D	12d321-D	122321-D
Diol	10	100	150	135321-D	134221-D	13d321-D	132321-D
Diol	10	100	250	155321-D	154221-D	15d321-D	152321-D
Diol	10	100	300	165321-D	164321-D	16d321-D	162321-D
Diol	5	300	50	115231-D	114231-D	11d231-D	112231-D
Diol	5	300	100	125231-D	124231-D	12d231-D	122231-D
Diol	5	300	150	135231-D	134231-D	13d231-D	132231-D
Diol	5	300	250	155231-D	154231-D	15d231-D	152231-D
Diol	10	300	50	115331-D	114331-D	11d331-D	112331-D
Diol	10	300	100	125331-D	124331-D	12d331-D	122331-D
Diol	10	300	150	135331-D	134331-D	13d331-D	132331-D
Diol	10	300	250	155331-D	154331-D	15d331-D	152331-D
Diol	10	300	300	164331-D	164331-D	16d331-D	162331-D
Cyano	3	60	50	115111-CN	114111-CN	11d111-CN	112111-CN
Cyano	3	60	100	125111-CN	124111-CN	12d111-CN	122111-CN
Cyano	3	60	150	135111-CN	134111-CN	13d111-CN	132111-CN
Cyano	5	60	50	115211-CN	114211-CN	11d211-CN	112211-CN
Cyano	5	60	100	125211-CN	124211-CN	12d211-CN	122211-CN
Cyano	5	60	150	135211-CN	134211-CN	13d211-CN	132211-CN
Cyano	5	60	250	155211-CN	154211-CN	15d211-CN	152211-CN
Cyano	10	60	50	115311-CN	114311-CN	11d311-CN	112311-CN
Cyano	10	60	100	125311-CN	124311-CN	12d311-CN	122311-CN
Cyano	10	60	150	135311-CN	134311-CN	13d311-CN	132311-CN
Cyano	10	60	250	155311-CN	154311-CN	15d311-CN	152311-CN
Cyano	10	60	300	165311-CN	164311-CN	16d311-CN	162311-CN

Phase	Phase Description	Particle Size (µ)	Pore A Volume	Particle Type	Surface Area
CN	Cyano (Nitrile)	5	300	S	120
		10	300	S	120
CN/HS	Cyano	3	60	S	550
		5	60	S	550
A/CN	Amino/Cyano	5	60	S	375
		10	60	S	375
NO_2	Nitro	5	100	S	330
		10	100	S	330



Lubricating Oil Additives

Column: 250 mm x 4.6 mm
Packing: Chromegabond Amino
Mobile phase: Isohydric Heptane 0.21% Isopropanol
Flow rate: 1.6 mL/min.
Detection: UV 210 nm
1. Di-(4-Octylphenyl) amine
2. 4-Octylphenyl-α-Naphthylamine
3. Phenyl-α-Naphtylamine
4. 4-Octylphenyl-β-Naphthylamine
5. Phenyl-β-Naphthylamine
6. p-Tricresylphosphate

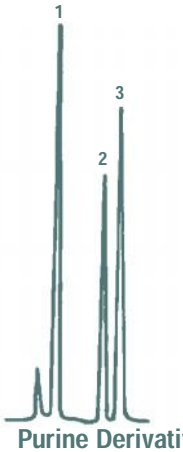
Description	Particle Size (µ)	Pore Size	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Cyano	3	100	50	115121-CN	114121-CN	11d121-CN	112121-CN
Cyano	3	100	100	125121-CN	124121-CN	12d121-CN	122121-CN
Cyano	3	100	150	135121-CN	134121-CN	13d121-CN	132121-CN
Cyano	5	100	50	115221-CN	114221-CN	11d221-CN	112221-CN
Cyano	5	100	100	125221-CN	124221-CN	12d221-CN	122221-CN
Cyano	5	100	150	135221-CN	134221-CN	13d221-CN	132221-CN
Cyano	5	100	250	155221-CN	154221-CN	15d221-CN	152221-CN
Cyano	10	100	50	115321-CN	114321-CN	11d321-CN	112321-CN
Cyano	10	100	100	125321-CN	124321-CN	12d321-CN	122321-CN
Cyano	10	100	150	135321-CN	134221-CN	13d321-CN	132321-CN
Cyano	10	100	250	155321-CN	154221-CN	15d321-CN	152321-CN
Cyano	10	100	300	165321-CN	164321-CN	16d321-CN	162321-CN
Cyano	5	300	50	115231-CN	114231-CN	11d231-CN	112231-CN
Cyano	5	300	100	125231-CN	124231-CN	12d231-CN	122231-CN
Cyano	5	300	150	135231-CN	134231-CN	13d231-CN	132231-CN
Cyano	5	300	250	155231-CN	154231-CN	15d231-CN	152231-CN
Cyano	10	300	50	115331-CN	114331-CN	11d331-CN	112331-CN
Cyano	10	300	100	125331-CN	124331-CN	12d331-CN	122331-CN
Cyano	10	300	150	135331-CN	134331-CN	13d331-CN	132331-CN
Cyano	10	300	250	155331-CN	154331-CN	15d331-CN	152331-CN
Cyano	10	300	300	164331-CN	164331-CN	16d331-CN	162331-CN
Cyano HS	5	60	50	115211-CN/HS	114211-CN/HS	11d211-CN/HS	112211-CN/HS
Cyano HS	5	60	100	125211-CN/HS	124211-CN/HS	12d211-CN/HS	122211-CN/HS
Cyano HS	5	60	150	135211-CN/HS	134211-CN/HS	13d211-CN/HS	132211-CN/HS
Cyano HS	5	60	250	155211-CN/HS	154211-CN/HS	15d211-CN/HS	152211-CN/HS
Cyano HS	10	60	50	115311-CN/HS	114311-CN/HS	11d311-CN/HS	112311-CN/HS
Cyano HS	10	60	100	125311-CN/HS	124311-CN/HS	12d311-CN/HS	122311-CN/HS
Cyano HS	10	60	150	135311-CN/HS	134311-CN/HS	13d311-CN/HS	132311-CN/HS
Cyano HS	10	60	250	155311-CN/HS	154311-CN/HS	15d311-CN/HS	152311-CN/HS
Cyano HS	10	60	300	165311-CN/HS	164311-CN/HS	16d311-CN/HS	162311-CN/HS
Nitro	5	60	50	115211-NO2	114211-NO2	11d211-NO2	112211-NO2
Nitro	5	60	100	125211-NO2	124211-NO2	12d211-NO2	122211-NO2
Nitro	5	60	150	135211-NO2	134211-NO2	13d211-NO2	132211-NO2
Nitro	5	60	250	155211-NO2	154211-NO2	15d211-NO2	152211-NO2
Nitro	10	60	50	115311-NO2	114311-NO2	11d311-NO2	112311-NO2
Nitro	10	60	100	125311-NO2	124311-NO2	12d311-NO2	122311-NO2
Nitro	10	60	150	135311-NO2	134311-NO2	13d311-NO2	132311-NO2
Nitro	10	60	250	155311-NO2	154311-NO2	15d311-NO2	152311-NO2
Nitro	10	60	300	165311-NO2	164311-NO2	16d311-NO2	162311-NO2
Amino/cyano	5	60	50	115211-A/CN	114211-A/CN	11d211-A/CN	112211-A/CN
Amino/cyano	5	60	100	125211-A/CN	124211-A/CN	12d211-A/CN	122211-A/CN
Amino/cyano	5	60	150	135211-A/CN	134211-A/CN	13d211-A/CN	132211-A/CN
Amino/cyano	5	60	250	155211-A/CN	154211-A/CN	15d211-A/CN	152211-A/CN

Chromegasorb™ and Chromegasphere™ Adsorption Phases

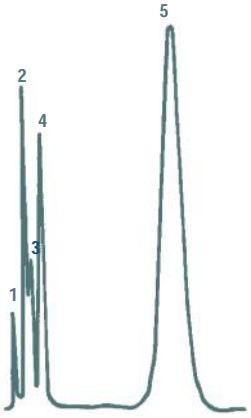
- Ideal for geometrical and positional isomer separations
- High loading capacities provide excellent preparative separations
- Translate TLC solvent systems directly to silica HPLC methods
- Available in 60, 80, 100, 300, 500, 1000, and 4000 A pore diameters

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

ES Industries Silica HPLC Columns provide excellent adsorption separations. TLC solvent systems translate directly to adsorption HPLC Columns and the highloading capacities permit preparative scale separations. All spherical silica particles are metal free and are ultra-high purity.



Purine Derivatives
Column: 25 cm x 4.6 mm
Packing: SI-60 5 µ
Flow rate: 0.8 mL/min
Mobile phase: 4.7% Methanol, 1.7% Water, 93.6% Methylene Chloride
1. Caffeine
2. Theophyline
3. Theobromine



Vitamins
Column: 30 cm x 4.6 mm
Packing: Chromegasorb SI-100 5 µ
Flow rate: 6 mL/min.
Mobile phase: Iso-octane
1. β-Carotene (provitamin A)
2. Retinol Acetate (vitamin A)
3. α-Tocopherol Acetate (vitamin E)
4. Metadione (vitamin K_3)
5. Calciferol (vitamin D_3)

Base Material	Available Particle Type	Pore Diameter (A)	Particle Sizes (µ)	Surface Area (BET)m^2/g
Silica	Irregular (Chromegasorb)	SI-60	5, 10	500
Silica	Irregular (Chromegasorb)	SI-100	5, 10	300
Silica	Spherical (Chromegasphere)	SI-60	3, 5, 10	500
Silica	Spherical (Chromegasphere)	SI-60/HS	5, 10	550
Silica	Spherical (Chromegasphere)	SI-80	3, 5, 10	400
Silica	Spherical (Chromegasphere)	SI-100	3, 5, 10	300
Silica	Spherical (Chromegasphere)	Si-100/HS	3, 5, 10	350
Silica	Spherical (Chromegasphere)	SI-300	5, 10	100
Silica	Spherical (Chromegasphere)	SI-500	5, 10	35
Silica	Spherical (Chromegasphere)	SI-1000	5, 10	25
Silica	Spherical (Chromegasphere)	SI-4000	5, 10	10
Alumina	Spherical	130	5, 10	95
SI/AL	Spherical Silica/Alumina	60/130	5, 10	350

Chromegasorb™ and Chromegasphere™ Adsorption Phases

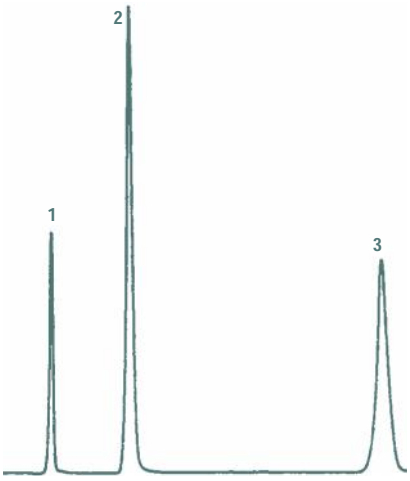
Description	Particle Size (µ)	Pore Size	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Silica	3	60	50	115111-SI60	114111-SI60	11d111-SI60	112111-SI60
Silica	3	60	100	125111-SI60	124111-SI60	12d111-SI60	122111-SI60
Silica	3	60	150	135111-SI60	134111-SI60	13d111-SI60	132111-SI60
Silica	5	60	50	115211-SI60	114211-SI60	11d211-SI60	112211-SI60
Silica	5	60	100	125211-SI60	124211-SI60	12d211-SI60	122211-SI60
Silica	5	60	150	135211-SI60	134211-SI60	13d211-SI60	132211-SI60
Silica	5	60	250	155211-SI60	154211-SI60	15d211-SI60	152211-SI60
Silica	10	60	50	115311-SI60	114311-SI60	11d311-SI60	112311-SI60
Silica	10	60	100	125311-SI60	124311-SI60	12d311-SI60	122311-SI60
Silica	10	60	150	135311-SI60	134311-SI60	13d311-SI60	132311-SI60
Silica	10	60	250	155311-SI60	154311-SI60	15d311-SI60	152311-SI60
Silica	10	60	300	165311-SI60	164311-SI60	16d311-SI60	162311-SI60
Silica HS	5	60	50	115211-SI60/HS	114211-SI60/HS	11d211-SI60/HS	112211-SI60/HS
Silica HS	5	60	100	125211-SI60/HS	124211-SI60/HS	12d211-SI60/HS	122211-SI60/HS
Silica HS	5	60	150	135211-SI60/HS	134211-SI60/HS	13d211-SI60/HS	132211-SI60/HS
Silica HS	5	60	250	155211-SI60/HS	154211-SI60/HS	15d211-SI60/HS	152211-SI60/HS
Silica HS	10	60	50	115311-SI60/HS	114311-SI60/HS	11d311-SI60/HS	112311-SI60/HS
Silica HS	10	60	100	125311-SI60/HS	124311-SI60/HS	12d311-SI60/HS	122311-SI60/HS
Silica HS	10	60	150	135311-SI60/HS	134311-SI60/HS	13d311-SI60/HS	132311-SI60/HS
Silica HS	10	60	250	155311-SI60/HS	154311-SI60/HS	15d311-SI60/HS	152311-SI60/HS
Silica HS	10	60	300	165311-SI60/HS	164311-SI60/HS	16d311-SI60/HS	162311-SI60/HS
Silica irregular	5	60	50	115211-SI60/I	114211-SI60/I	11d211-SI60/I	112211-SI60/I
Silica irregular	5	60	100	125211-SI60/I	124211-SI60/I	12d211-SI60/I	122211-SI60/I
Silica irregular	5	60	150	135211-SI60/I	134211-SI60/I	13d211-SI60/I	132211-SI60/I
Silica irregular	5	60	250	155211-SI60/I	154211-SI60/I	15d211-SI60/I	152211-SI60/I
Silica irregular	10	60	50	115311-SI60/I	114311-SI60/I	11d311-SI60/I	112311-SI60/I
Silica irregular	10	60	100	125311-SI60/I	124311-SI60/I	12d311-SI60/I	122311-SI60/I
Silica irregular	10	60	150	135311-SI60/I	134311-SI60/I	13d311-SI60/I	132311-SI60/I
Silica irregular	10	60	250	155311-SI60/I	154311-SI60/I	15d311-SI60/I	152311-SI60/I
Silica irregular	10	60	300	165311-SI60/I	164311-SI60/I	16d311-SI60/I	162311-SI60/I
Silica	3	80	50	115171-SI80	114171-SI80	11d171-SI80	112171-SI80
Silica	3	80	100	125171-SI80	124171-SI80	12d171-SI80	122171-SI80
Silica	3	80	150	135171-SI80	134171-SI80	13d171-SI80	132171-SI80
Silica	5	80	50	115271-SI80	114271-SI80	11d271-SI80	112271-SI80
Silica	5	80	100	125271-SI80	124271-SI80	12d271-SI80	122271-SI80
Silica	5	80	150	135271-SI80	134271-SI80	13d271-SI80	132271-SI80
Silica	5	80	250	155271-SI80	154271-SI80	15d271-SI80	152271-SI80
Silica	10	80	50	115371-SI80	114371-SI80	11d371-SI80	112371-SI80
Silica	10	80	100	125371-SI80	124371-SI80	12d371-SI80	122371-SI80
Silica	10	80	150	135371-SI80	134371-SI80	13d371-SI80	132371-SI80
Silica	10	80	250	155371-SI80	154371-SI80	15d371-SI80	152371-SI80
Silica	10	80	300	165371-SI80	164371-SI80	16d371-SI80	162371-SI80
Silica	3	100	50	115121-SI100	114121-SI100	11d121-SI100	112121-SI100
Silica	3	100	100	125121-SI100	124121-SI100	12d121-SI100	122121-SI100
Silica	3	100	150	135121-SI100	134121-SI100	13d121-SI100	132121-SI100
Silica	5	100	50	115221-SI100	114221-SI100	11d221-SI100	112221-SI100
Silica	5	100	100	125221-SI100	124221-SI100	12d221-SI100	122221-SI100
Silica	5	100	150	135221-SI100	134221-SI100	13d221-SI100	132221-SI100
Silica	5	100	250	155221-SI100	154221-SI100	15d221-SI100	152221-SI100
Silica	10	100	50	115321-SI100	114321-SI100	11d321-SI100	112321-SI100
Silica	10	100	100	125321-SI100	124321-SI100	12d321-SI100	122321-SI100
Silica	10	100	150	135321-SI100	134221-SI100	13d321-SI100	132321-SI100
Silica	10	100	250	155321-SI100	154221-SI100	15d321-SI100	152321-SI100
Silica	10	100	300	165321-SI100	164321-SI100	16d321-SI100	162321-SI100
Silica HS	3	100	50	115121-SI100/HS	114121-SI100/HS	11d121-SI100/HS	112121-SI100/HS
Silica HS	3	100	100	125121-SI100/HS	124121-SI100/HS	12d121-SI100/HS	122121-SI100/HS
Silica HS	3	100	150	135121-SI100/HS	134121-SI100/HS	13d121-SI100/HS	132121-SI100/HS
Silica HS	5	100	50	115221-SI100/HS	114221-SI100/HS	11d221-SI100/HS	112221-SI100/HS

Description	Particle Size (µ)	Pore Size	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
Silica HS	5	100	100	125221-SI100/HS	124221-SI100/HS	12d221-SI100/HS	122221-SI100/HS
Silica HS	5	100	150	135221-SI100/HS	134221-SI100/HS	13d221-SI100/HS	132221-SI100/HS
Silica HS	5	100	250	155221-SI100/HS	154221-SI100/HS	15d221-SI100/HS	152221-SI100/HS
Silica HS	10	100	50	115321-SI100/HS	114321-SI100/HS	11d321-SI100/HS	112321-SI100/HS
Silica HS	10	100	100	125321-SI100/HS	124321-SI100/HS	12d321-SI100/HS	122321-SI100/HS
Silica HS	10	100	150	135321-SI100/HS	134221-SI100/HS	13d321-SI100/HS	132321-SI100/HS
Silica HS	10	100	250	155321-SI100/HS	154221-SI100/HS	15d321-SI100/HS	152321-SI100/HS
Silica HS	10	100	300	165321-SI100/HS	164321-SI100/HS	16d321-SI100/HS	162321-SI100/HS
Silica irregular	5	100	50	115221-SI100/I	114221-SI100/I	11d221-SI100/I	112221-SI100/I
Silica irregular	5	100	100	125221-SI100/I	124221-SI100/I	12d221-SI100/I	122221-SI100/I
Silica irregular	5	100	150	135221-SI100/I	134221-SI100/I	13d221-SI100/I	132221-SI100/I
Silica irregular	5	100	250	155221-SI100/I	154221-SI100/I	15d221-SI100/I	152221-SI100/I
Silica irregular	10	100	50	115321-SI100/I	114321-SI100/I	11d321-SI100/I	112321-SI100/I
Silica irregular	10	100	100	125321-SI100/I	124321-SI100/I	12d321-SI100/I	122321-SI100/I
Silica irregular	10	100	150	135321-SI100/I	134221-SI100/I	13d321-SI100/I	132321-SI100/I
Silica irregular	10	100	250	155321-SI100/I	154221-SI100/I	15d321-SI100/I	152321-SI100/I
Silica irregular	10	100	300	165321-SI100/I	164321-SI100/I	16d321-SI100/I	162321-SI100/I
Silica	3	120	50	115191-SI120	114191-SI120	11d191-SI120	112191-SI120
Silica	3	120	100	125191-SI120	124191-SI120	12d191-SI120	122191-SI120
Silica	3	120	150	135191-SI120	134191-SI120	13d191-SI120	132191-SI120
Silica	5	120	50	115291-SI120	114291-SI120	11d291-SI120	112291-SI120
Silica	5	120	100	125291-SI120	124291-SI120	12d291-SI120	122291-SI120
Silica	5	120	150	135291-SI120	134291-SI120	13d291-SI120	132291-SI120
Silica	5	120	250	155291-SI120	154291-SI120	15d291-SI120	152291-SI120
Silica	10	120	50	115391-SI120	114391-SI120	11d391-SI120	112391-SI120
Silica	10	120	100	125391-SI120	124391-SI120	12d391-SI120	122391-SI120
Silica	10	120	150	135391-SI120	134391-SI120	13d391-SI120	132391-SI120
Silica	10	120	250	155391-SI120	154391-SI120	15d391-SI120	152391-SI120
Silica	10	120	300	165391-SI120	164391-SI120	16d391-SI120	162391-SI120
Silica	5	300	50	115231-SI300	114231-SI300	11d231-SI300	112231-SI300
Silica	5	300	100	125231-SI300	124231-SI300	12d231-SI300	122231-SI300
Silica	5	300	150	135231-SI300	134231-SI300	13d231-SI300	132231-SI300
Silica	5	300	250	155231-SI300	154231-SI300	15d231-SI300	152231-SI300
Silica	10	300	50	115331-SI300	114331-SI300	11d331-SI300	112331-SI300
Silica	10	300	100	125331-SI300	124331-SI300	12d331-SI300	122331-SI300
Silica	10	300	150	135331-SI300	134331-SI300	13d331-SI300	132331-SI300
Silica	10	300	250	155331-SI300	154331-SI300	15d331-SI300	152331-SI300
Silica	10	300	300	165331-SI300	164331-SI300	16d331-SI300	162331-SI300
Silica	5	500	50	115241-SI500	114241-SI500	11d241-SI500	112241-SI500
Silica	5	500	100	125241-SI500	124241-SI500	12d241-SI500	122241-SI500
Silica	5	500	150	135241-SI500	134241-SI500	13d241-SI500	132241-SI500
Silica	5	500	250	155241-SI500	154241-SI500	15d241-SI500	152241-SI500
Silica	5	1000	50	115251-SI1000	114251-SI1000	11d251-SI1000	112251-SI1000
Silica	5	1000	100	125251-SI1000	124251-SI1000	12d251-SI1000	122251-SI1000
Silica	5	1000	150	135251-SI1000	134251-SI1000	13d251-SI1000	132251-SI1000
Silica	5	1000	250	155251-SI1000	154251-SI1000	15d251-SI1000	152251-SI1000
Silica	5	4000	50	115261-SI4000	114261-SI4000	11d261-SI4000	112261-SI4000
Silica	5	4000	100	125261-SI4000	124261-SI4000	12d261-SI4000	122261-SI4000
Silica	5	4000	150	135261-SI4000	134261-SI4000	13d261-SI4000	132261-SI4000
Silica	5	4000	250	155261-SI4000	155261-SI4000	15d261-SI4000	152261-SI4000
Alumina	5	130	50	115281-AL	114281-AL	11d281-AL	112281-AL
Alumina	5	130	100	125281-AL	124281-AL	12d281-AL	122281-AL
Alumina	5	130	150	135281-AL	134281-AL	13d281-AL	132281-AL
Alumina	5	130	250	155281-AL	154281-AL	15d281-AL	152281-AL
Silica/Alumina	5	60	50	115211-SI/AL	114211-SI/AL	11d211-SI/AL	112211-SI/AL
Silica/Alumina	5	60	100	125211-SI/AL	124211-SI/AL	12d211-SI/AL	122211-SI/AL
Silica/Alumina	5	60	150	135211-SI/AL	134211-SI/AL	13d211-SI/AL	132211-SI/AL
Silica/Alumina	5	60	250	155211-SI/AL	154211-SI/AL	15d211-SI/AL	152211-SI/AL

Chromegabond® NPI (Natural Product Isolation)

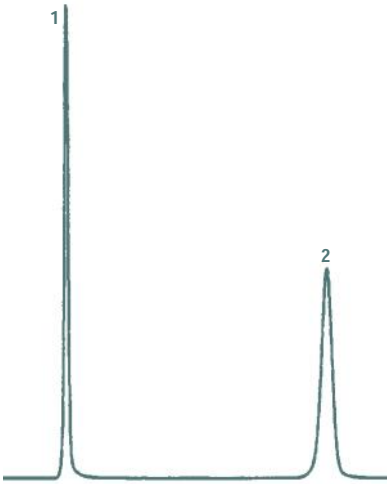
- Bonded monoalcohol functionality
- Available in large particle diameters for preparative chromatography
- Bonded phase alternative to silica gel
- Useful for natural product separations

Chromegabond NPI is a polar bonded column for normal phase chromatography. This new phase is produced by bonding a monoalcohol to ultra-high purity silica. This phase provides similar selectivity to silica gel but is considerably less active. Relative to analysis using silica gel, peak shapes are greatly improved and irreversible adsorption is minimal. The selectivity is similar to coated polyvinyl alcohol packings, however, unlike these coated packings the NPI chemistry can be bonded to large diameter particles for preparative columns. The Chromegabond NPI column also exhibits different selectivity other than polar bonded columns such as diol and cyano. An NPI column is very useful for separation and isolation of compounds found in natural products. In addition, it is useful in the separation of steroids and fat-soluble vitamins.



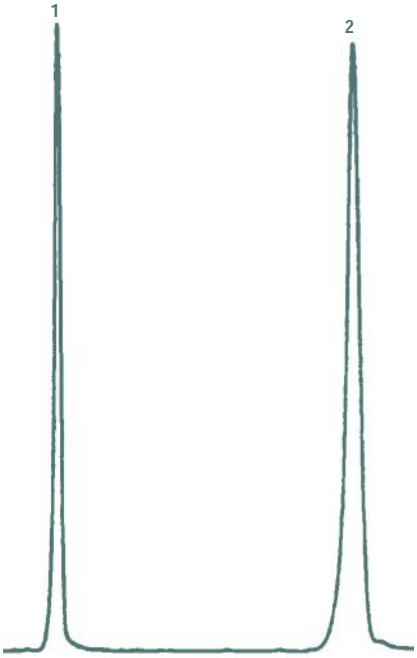
Phenols and Alcohol

Column: Chromegabond NPI 150 x 4.6 mm
Eluent: 80/20 Hexane/Ethyl Acetate
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Phenol
2. Benzyl Alcohol
3. 4-Nitrophenol



Steroids

Column: Chromegabond NPI 150 x 4.6 mm
Eluent: 80% Isooctane/20% Isopropanol
Flow rate: 1 mL/min.
Detection: UV @ 254 nm
1. Progesterone
2. Prednisone



Fat-Soluble Vitamins

1. Vitamin A
2. Vitamin E acetate

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
NPI	5	50	115211-NPI	114211-NPI	11d211-NPI	112211-NPI
NPI	5	100	125211-NPI	124211-NPI	12d211-NPI	122211-NPI
NPI	5	150	135211-NPI	134211-NPI	13d211-NPI	132211-NPI
NPI	5	250	155211-NPI	154211-NPI	15d211-NPI	152211-NPI

Description	Particle Size (µ)	Length (mm)	Semi-preparative P/N (9.6 mm)	Price	Preparative P/N (23 mm)	Price
NPI	5	50	117211-NPI	Call	118211-NPI	Call
NPI	5	100	127211-NPI	Call	128211-NPI	Call
NPI	5	150	137211-NPI	Call	138211-NPI	Call
NPI	5	250	157211-NPI	Call	158211-NPI	Call

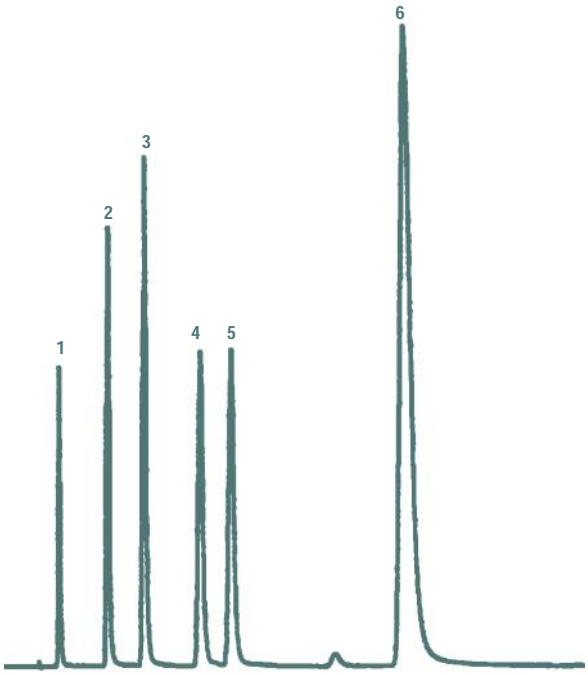
All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

HPLC Columns for Petroleum Products

- A wide variety of high quality reverse and normal phase columns
- RingSep for separation of aromatic compounds by ring number
- Silver impregnated silica
- Available in large particle diameters for preparative chromatography

At ES Industries we have developed several HPLC columns designed specifically to handle complex petroleum samples. These products include RingSep, DNAP, and silver impregnated silica. These specialty products, along with our complete line of high quality reverse and normal phase products, provide the petroleum chemist with a powerful arsenal to handle difficult applications.

One of the most exciting breakthroughs in HPLC columns for petroleum analysis was the development of the ES Industries RingSep column. The RingSep column was developed specifically for the separation of aromatic compounds by ring number. This column has been optimized to ensure the accurate analysis of aromatic ring distribution. The RingSep column is particularly useful in several areas including petroleum refining, petrochemical production, alkyl aromatic detergent products, and environmental analysis. The RingSep column is also produced in a special version for ASTM Method D5186 for SFC analysis of diesel fuels.



Petroleum Compounds
Column: RingSep 150 x 4.6 mm 5 µ
Eluent: Hexane
Flow rate: 2 mL/min.
Detection: UV @ 254 nm
1. Toluene
2. Naphthalene
3. Fluorene
4. Dibenzothiophene
5. Phenanthrene
6. Pyrene

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
RingSep	5	50	115211-RS	114211-RS	11d211-RS	112211-RS
RingSep	5	100	125211-RS	124211-RS	12d211-RS	122211-RS
RingSep	5	150	135211-RS	134211-RS	13d211-RS	132211-RS
RingSep	5	250	155211-RS	154211-RS	15d211-RS	152211-RS
DNAP	5	50	115211-DNAP	114211-DNAP	11d211-DNAP	112211-DNAP
DNAP	5	100	125211-DNAP	124211-DNAP	12d211-DNAP	122211-DNAP
DNAP	5	150	135211-DNAP	134211-DNAP	13d211-DNAP	132211-DNAP
DNAP	5	250	155211-DNAP	154211-DNAP	15d211-DNAP	152211-DNAP
Silver/SI	5	50	115211-AG/SI	114211-AG/SI	11d211-AG/SI	112211-AG/SI
Silver/SI	5	100	125211-AG/SI	124211-AG/SI	12d211-AG/SI	122211-AG/SI
Silver/SI	5	150	135211-AG/SI	134211-AG/SI	13d211-AG/SI	132211-AG/SI
Silver/SI	5	250	155211-AG/SI	154211-AG/SI	15d211-AG/SI	152211-AG/SI

Specialty Columns & Column Kits

- *HPLC columns developed to accommodate unique application requirements*
- *High throughput method development column kits for combinatorial chemistry analysis*
- *High efficiency, high reproducibility column kits for LC-MS*

ES Industries specializes in providing HPLC solutions for unique application requirements. In this section you will find information on columns and column kits that have been developed to accommodate such applications. As with all of our products, if you don't see what you need please call us at 1-800/356-6140. We will make every effort to assist you.

Chromegapore Molecular Size Exclusion Phases

Chromegapore size exclusion columns are available in derivatized silica, TMS, and Diol bonded phases. Chromegapore packings can be packed into columns of various dimensions but the 25 cm x 7.5 mm column is highly recommended for most applications.

Chromegaprep Preparative HPLC Columns

ES Industries Chromegaprep columns come in a variety of particle sizes, pore sizes, and stationary phases. These highly efficient preparative columns are compatible with today's chemistries and analytical methodology.

Biocompatible HPLC Columns

For those researchers concerned with samples that are sensitive to metals, ES Industries offers any of our available HPLC materials packed in a completely biocompatible HPLC column. These biocompatible columns are available with glass lined tubes, metal-free PEEK fittings/frits or titanium fittings/frits.

Supercritical Fluid Columns (SFC)

Many of the packings manufactured by ES Industries are now being used in SFC. At ES Industries we have worked with SFC instrument manufacturers to design column hardware and develop packing technology specifically for use with SFC.

CombiSep™ - Combinatorial Chemistry HPLC Columns

ES Industries developed CombiSep columns to meet rapid screening demands of high throughput combinatorial chemistry analysis. These columns are designed to provide for the analysis of large volume of samples without compromising chromatographic efficiency or column performance.

LC-MS Columns

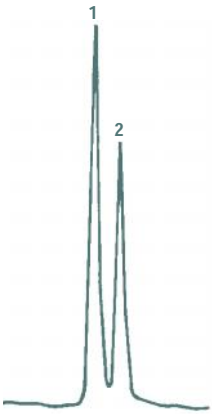
ES Industries has developed columns specifically optimized for LC-MS analysis which exhibit high efficiencies and excellent reproducibility, two characteristics essential for high performance LC-MS. In addition, we have developed several column kits specifically for LC-MS. The packings in these kits are carefully selected to meet the high performance demands of LC-MS.

Chromegapore Molecular Size Exclusion Phases

- Silica based supports
- Six pore sizes–60, 100, 300, 500, 1000, and 4000 A
- Three packings–Diol, Silica, and TMS to accommodate both aqueous and organic soluble samples

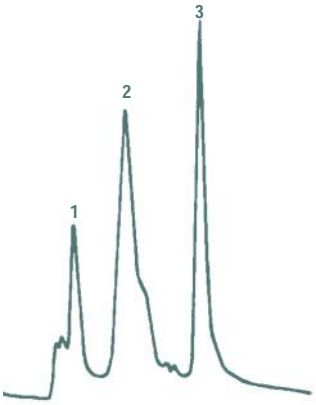
Chromegapore size exclusion columns are available in derivatized silica, TMS, and Diol bonded phases. Silica and TMS Chromegapore columns are recommended for the analysis of polymers that are organic soluble. Chromegapore Diol columns are recommended for samples that are water soluble, such as proteins, peptides, and water soluble synthetic polymers. Chromegapore packings can be packed into columns of various dimensions but the 25 cm x 7.5 mm column is highly recommended for most applications.

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.



Polymers

Column: 30 cm x 4.6 mm
Packing: 1 Chromegapore MSE-SI-100; 1 Chromegapore MSE-SI-500; 1 Chromegapore MSE-SI-1000
Mobile phase: THF
Flow rate: 1.5 mL/min.
1. Polystyrene 37,000 MW
2. Polystyrene 2,700 MW



Serum Proteins

Column: 25 cm x 7.8 mm
Packing: Chromegapore Diol 5 µ, 300 A
Mobile phase: 0.1 M Phosphate Buffer + 0.1 M Morpholine, pH = 7
Flow rate: 1 mL/min.
Detection: 280 nm
1. Human IgM (MW-900,000)
2. Human IgG (MW-160,000)
3. Leu-enkephalin (MW-500)

Description	Particle Size (µ)	Pore Size	Length (mm)	Standard-bore P/N (4.6 mm)	Price	Standard-bore P/N (7.5 mm)
MSE-60-SI	5	60	300	165211-MSE60	$350.00	169211-MSE60
MSE-100-SI	5	100	300	165221-MSE100	350.00	169221-MSE100
MSE-300-SI	5	300	300	165231-MSE300	350.00	169231-MSE300
MSE-500-SI	5	500	300	165241-MSE500	350.00	169241-MSE500
MSE-1000-SI	5	1000	300	165251-MSE1000	350.00	169251-MSE1000
MSE-4000-SI	5	4000	300	165261-MSE4000	350.00	169261-MSE4000
MSE-TMS60	5	60	300	165211-MSET60	350.00	169211-MSET60
MSE-TMS100	5	100	300	165221-MSET100	350.00	169221-MSET100
MSE-TMS300	5	300	300	165231-MSET300	350.00	169231-MSET300
MSE-TMS500	5	500	300	165241-MSET500	350.00	169241-MSET500
MSE-TMS1000	5	1000	300	165251-MSET1000	350.00	169251-MSET1000
MSE-TMS4000	5	4000	300	165261-MSET4000	350.00	169261-MSET4000
MSE-Diol60	5	60	300	165211-MSED60	350.00	169211-MSED60
MSE-Diol100	5	100	300	165221-MSED100	350.00	169221-MSED100
MSE-Diol300	5	300	300	165231-MSED300	350.00	169231-MSED300
MSE-Diol500	5	500	300	165241-MSED500	350.00	169241-MSED500
MSE-Diol1000	5	1000	300	165251-MSED1000	350.00	169251-MSED1000
MSE-Diol4000	5	4000	300	165261-MSED4000	350.00	169261-MSED4000

Chromegaprep Preparative HPLC Columns

- High efficiencies provide excellent compatibility with analytical methodology
- Individually packed and tested
- Available in a wide variety of particle sizes

ES Industries Chromegaprep columns come in a variety of particle sizes, pore sizes, and stationary phases. These highly efficient preparative columns are compatible with today's chemistries and analytical methodology. They are the same high quality as the Chromega™ analytical columns and allow the efficient transfer of methodologies from analytical columns to preparative columns.

Chromegaprep columns are available in packing materials from 3 to 60 µm particles. Semipreparative columns are supplied in a 9.6 mm I.D. and in lengths of 5 to 50 cm. Preparative size columns are available in 1˝ and 2˝ O.D. design.

Any question concerning the use or purchase of Chromegaprep columns, please call 1-800/356-6140.

Biocompatible HPLC Columns

- Available in all phases
- Completely metal free and inert
- Ideal for biological or ion chromatography applications

For those researchers concerned wtih samples that are sensitive to metals, ES Industries offers any of our available HPLC materials packed in a completely biocompatible HPLC column. These biocompatible columns are available with glass lined tubes, metal-free PEEK fittings/frits or titanium fittings/frits.

It is known that certain proteins can become denatured when contacting stainless steel which can render the molecule biologically inactive. When doing ion chromatography there is also the potential problem of sample recovery and the harsh mobile phase effects on system components and durability.

ES Industries biocompatible HPLC columns will not alter or absorb biological compounds and are compatible with any manufacturers' HPLC system.

Please call 1-800/356-6140 for specific ordering information on biocompatible HPLC columns.

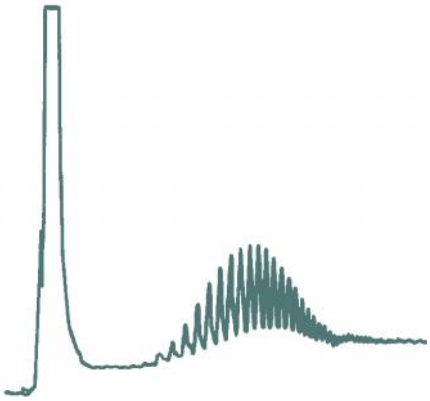
Supercritical Fluid Columns (SFC)

- Available in microbore sizes from 0.5 - 2.0 mm
- Available in standard HPLC dimensions
- Column hardware specially designed to withstand higher temperatures
- Available in a wide variety of stationary phases

Many of the packings manufactured by ES Industries are now being used in SFC. Specifically, silica, alumina, SI/AL, RingSep, DNAP, FluoroSep RP-phenyl, FluoroSep RP-fluorooctyl, cyano, amine, and diol. At ES Industries we have worked with SFC instrument manufacturers to design column hardware and develop packing technology specifically for use with SFC.

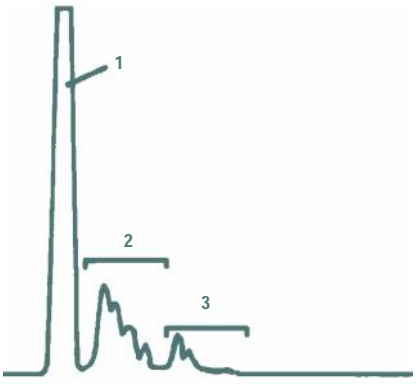
For more information on the use of ES Industries SFC packed columns please call 1-800/356-6140.

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.



Perfluorinated Polyalkylethers MW 3000-7000

Column: 10 cm x 1.0 mm
Packing: FluoroSep-RP Octyl (FO)
Mobile phase: Carbon Dioxide
Oven temperature: 140°C
Pressure: Multilinear
Detection: FID 400°C



Jet Fuel

Column: 25 cm x 2.0 mm
Packing: Chromegaspher Silica 5 µ 60 A
Mobile phase: Carbon Dioxide
Oven temperature: 30°C
Detection: FID 350°C
1. Saturates
2. 1-Ring Aromatics
3. 2-Ring romatics

CombiSep™ – Combinatorial Chemistry HPLC Columns

- Columns optimized for rapid throughput
- Premier base deactivated columns that do not require buffers or amine modifiers
- Highly reproducible and rugged stationary phase chemistries
- Manufactured to be easily scaled up to preparative column dimensions

ES Industries developed CombiSep columns to meet rapid screening demands of high throughput combinatorial chemistry analysis. These columns are designed to provide for the analysis of large volume of samples without compromising chromatographic efficiency or column performance. CombiSep columns provide extraordinary analysis speed and are able to respond to flow rate changes, solvent changes, and varying sample compositions. CombiSep are completely optimized to deliver high efficiency and short analysis using small particle technology. All CombiSep columns are easily scaled up to preparative column dimensions.

We have developed CombiSep kits to meet the requirements for rapid combinatorial chemistry screening. These column chemistries provide the highest level of performance possible for combinatorial chemistry applications. For complete optimization we offer CombiSep method development kit in two column lengths - 3.5 or 5 cm. The stationary phases selected and the technical reasons why these columns were included in our CombiSep kit are important. Each column chemistry in the CombiSep method development kit is carefully selected to met the most stringent requirements for high throughput combinatorial chemistry screening. Each stationary phase chemistry found in the kit is briefly described as follows:

Chromegabond® WR (Wide Range)

Chromegabond WR is a highly base deactivated phase that is produced via a two step process. The first step involves bonding monomerically either C8 or C18 alkyl chains to an ultra high purity synthetically produced spherical silica. The second step utilizes a proprietary multiple endcapping bonding process that produces highly base deactivated columns. This state-of-the-art bonding procedure uses mixtures of C2 and C4 alkyl silanes to react with residual silanol groups. Unlike the traditional TMS endcapping the C2 and C4 groups are much more resistant to degradation by acidic and basic mobile phase compositions. The WR product can be used over the pH range of 2-8. The Chromegabond WR product, as a result of our special bonding treatment, is highly hydrophobic and exceptionally inert for the analysis of both acids and bases. It is useful for the separation of molecules that contain polar groups along with hydrophobic groups. The 3 micron Chromegabond WR columns are highly efficient and exhibit theoretical plate measurements of between 160,000 to 170,000 plates/meter.

ProTec-RP

ProTec -RP columns enable the analysis of basic compounds without the use of amine modified mobile phases. This phase incorporates embedded amide groups into a hydrocarbon backbone producing a highly base deactivated column. This column is excellent for compounds containing amine groups. ProTec-RP can often produce better peak shapes for amine compounds than Chromegabond WR. ProTec is completely resistant to phase collapse because of the incorporation of the embedded polar amide groups. Our tests of any currently available base deactivated column have shown that ProTec columns produce the best peak shape for any amine containing compounds.

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

CombiSep Method Development Kit #1
Catalog No. CS-MDK1, Price: $775.00

Includes one each of the following columns.
All are 3 micron particles and 5 cm x 4.6 mm columns.

- WR-C8
- WR-C18
- ProTec C18

CombiSep Kit

Contains three of the same columns listed above.

Phase	Catalog Number
WR-C8	CS-WRC8-5
WR-C18	CS-WRC18-5
ProTec-C18	CS-PC18-5

CombiSep Method Development Kit #2
Catalog No. CS-MDK2, Price: $695.00

Includes one each of the following columns.
All are 3 micron particles and 3.5 cm x 4.6 mm columns.

- WR-C8
- WR-C18
- ProTec C18

CombiSep Kit

Contains three of the same columns listed above.

Phase	Catalog Number
WR-C8	CS-WRC8-3.5
WR-C18	CS-WRC18-3.5
ProTec-C18	CS-PC18-3.5

CombiSep Columns for Preparative Chromatography

All are 5 cm x 23 mm columns.

Phase	Catalog Number
WR-C8	118221-WRC8-CS
WR-C18	118221-WRC18-CS
ProTec C18	118221-PC18-CS

LC-MS Columns

- Small diameter columns with high efficiencies for enhanced sensitivity
- Premier base deactivated columns that do not require buffers or amine modifiers
- AquaSep for highly aqueous mobile phases
- Highly reproducible and rugged stationary phase chemistries

ES Industries has developed columns specifically optimized for LC-MS analysis which exhibit high efficiencies and excellent reproducibility, two characteristics essential for high performance LC-MS. While any of our column products may be purchased for LC-MS applications we have developed several column kits specifically for LC-MS. The packings in these kits are carefully selected to meet the high performance demands of LC-MS. Detailed descriptions of each column chemistry contained in the kits are found on pages 6 and 27. The use of each column chemistry for a particular sample, mobile phase composition or matrix can be briefly categorized as follows:

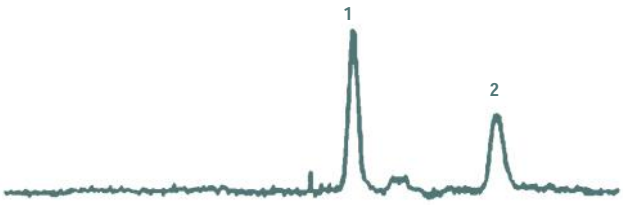
WR-C8 or WR-C18 are a base deactivated column that can analyze both acidic and basic compounds that contain some nonpolar functionality. This column should be used with mobile phases containing at least 10% organic solvent.

ProTec C18 is a base deactivated column that enables the analysis of basic compounds without the use of amine modified mobile phases. This column is excellent for compounds containing amine groups. ProTec-RP can often produce better peak shapes for amine compounds than Chromegabond WR and can be used with 100% aqueous mobile phases.

AquaSep has been developed using patented technology for use with highly aqueous mobile phases, including 100% aqueous. Our patented bonding chemistry allows the bonded C8 chains to remain fully extended in the mobile phase even under highly aqueous conditions. AquaSep can retain highly water soluble compounds such as small organic acids, water soluble vitamins, and low molecular weight polar compounds. It can eliminate the need for ion-pairing reagents.

FluoroSep-RP Phenyl (FSP) contains monomerically bonded pentafluorophenyl groups. The pentafluorophenyl groups interact with analytes via pi-pi electron retention process. This phase is useful for the separation of halogen containing compounds, aromatics, conjugated systems, and epimers. These electron interactions are found in many natural product mixtures.

ES Industries LC-MS Kits contain column dimensions (5 cm x 2 mm) that are designed to deliver maximum sensitivity and rapid analysis.



Retinoic Acids in Human Plasma
Column: 1.0 mm x 25 cm
Packing: Diol 60 A 5 µ
Mobile phase: 15% Toluene in Hexane
Flow rate: 50 ul/min.
Detection: Mass Spec - Negative CI
1. Cis-Retinoic Acid
2. Trans-Retinoic Acid

Premier Base Deactivated Mass Spec Kit #1
Catalog No. PBD5-MS1

All columns are 5 cm x 2 mm. Includes one each of the following columns:

WR-C8	5 micron
WR-C18	5 micron
ProTec C18	5 micron
AquaSep	5 micron

Premier Base Deactivated Mass Spec Kit #2
Catalog No. PBD3-MS2

All columns are 5 cm x 2 mm. Includes one each of the following columns:

WR-C8	3 micron
ProTec C18	3 micron
AquaSep	5 micron

Premier Base Deactivated Mass Spec Kit #3
Catalog No. PBD5-MS3

All columns are 5 cm x 2 mm. Includes one each of the following columns:

WR-C8	5 micron
WR-C18	5 micron
AquaSep	5 micron

Premier Base Deactivated Mass Spec Kit #4
Catalog No. PBD3-MS4

All columns are 5 cm x 2 mm. Includes one each of the following columns:

WR-C8	3 micron
WR-C18	3 micron
AquaSep	5 micron

Premier Method Development Mass Spec Kit #5
Catalog No. PBD5-MS5

All columns are 5 cm x 2 mm. Includes one each of the following columns:

WR-C8	5 micron
WR-C18	5 micron
FSP	5 micron
AquaSep	5 micron

Premier Method Development Mass Spec Kit #6
Catalog No. PBD3-MS6

All columns are 5 cm x 2 mm. Includes one each of the following columns:

WR-C8	3 micron
WR-C18	3 micron
FSP	3 micron
AquaSep	5 micron

Commercial Trade Name HPLC Column Products

- *Unsurpassable column efficiency/performance with competitive pricing*
- *Over 20 years supplying high quality commercial trade name columns*
- *Available in standard analytical, minibore, microbore, and preparative column dimensions*
- *Reserve lots available*

ES Industries has supplied high quality commercial trade name HPLC columns for over twenty years. Over that time we have developed a depth of experience in packing these trade name materials in a variety of column formats. At our New Jersey facility we inventory a wide selection and large quantities of these products to provide our customers with a continuous source of columns for all their analysis requirements. In addition, we are able to reserve specific lots of commercial packings to meet the demands of high performance HPLC methods.

Our technical staff is extremely knowledgeable in the bonding, column preparation, limitations, and applications for trade name packing materials. We can provide detailed answers to questions concerning commercial column products, advise the chromatographer on the best material for their particular application, or suggest a possible column substitute.

All of our commercial trade name columns meet extremely high quality standards for column efficiency, lifetime, and reproducibility. Our quality control requirements for these products are stringent, so you receive the highest quality, most reproducible columns possible. These high quality products are supplied at very competitive prices.

We are able to supply columns of the following commercial trade name packings:

- Exsil®
- Hypersil®
- Inertsil®
- Kromasil®
- LiChrosorb®
- LiChrospher®
- Nucleosil®
- Polygosil®
- Partisil®
- Waters Spherisorb®

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

Zorbax® Equivalent HPLC Columns

- Equivalent selectivity, retentions, and peak symmetry to Zorbax HPLC columns
- All standard chemistries available in both 3 µ and 5 µ particle sizes
- Competitive pricing
- All popular column format sizes

ES Industries manufactures a complete line of chemistries to match traditional Zorbax reverse phase and normal phase products. Available in either 3 µ or 5 µ, these materials offer the chromatographer an alternative source to Zorbax selectivities at competitive prices. System suitability specifications can be provided by ES Industries with these columns.

Phases Available

- ODS
- Phenyl
- Silica
- Octyl
- TMS
- Amino

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
C18	3	50	115171-ZC18	114171-ZC18	11d171-ZC18	112171-ZC18
C18	3	100	125171-ZC18	124171-ZC18	12d171-ZC18	122171-ZC18
C18	3	150	135171-ZC18	134171-ZC18	13d171-ZC18	132171-ZC18
C18	5	50	115271-ZC18	114271-ZC18	11d271-ZC18	112271-ZC18
C18	5	100	125271-ZC18	124271-ZC18	12d271-ZC18	122271-ZC18
C18	5	150	135271-ZC18	134271-ZC18	13d271-ZC18	132271-ZC18
C18	5	250	155271-ZC18	154271-ZC18	15d271-ZC18	152271-ZC18
C8	3	50	115171-ZC8	114171-ZC8	11d171-ZC8	112171-ZC8
C8	3	100	125171-ZC8	124171-ZC8	12d171-ZC8	122171-ZC8
C8	3	150	135171-ZC8	134171-ZC8	13d171-ZC8	132171-ZC8
C8	5	50	115271-ZC8	114271-ZC8	11d271-ZC8	112271-ZC8
C8	5	100	125271-ZC8	124271-ZC8	12d271-ZC8	122271-ZC8
C8	5	150	135271-ZC8	134271-ZC8	13d271-ZC8	132271-ZC8
C8	5	250	155271-ZC8	154271-ZC8	15d271-ZC8	152271-ZC8
Phenyl	3	50	115171-ZP	114171-ZP	11d171-ZP	112171-ZP
Phenyl	3	100	125171-ZP	124171-ZP	12d171-ZP	122171-ZP
Phenyl	3	150	135171-ZP	134171-ZP	13d171-ZP	132171-ZP
Phenyl	5	50	115271-ZP	114271-ZP	11d271-ZP	112271-ZP
Phenyl	5	100	125271-ZP	124271-ZP	12d271-ZP	122271-ZP
Phenyl	5	150	135271-ZP	134271-ZP	13d271-ZP	132271-ZP
Phenyl	5	250	155271-ZP	154271-ZP	15d271-ZP	152271-ZP

µBondapak™ Equivalent HPLC Columns

- Equivalent selectivity and peak symmetry to Waters' µBondapak chemistries
- Excellent batch-to-batch reproducibility
- Alternative to existing USP methodology
- Available in both 5 µ and 10 µ particle sizes

ES Industries has developed a series of chemistries to closely match the performance of Waters' µBondapak columns. These materials are available in both the standard µBondapak 10 µ particle size as well as a 5 µ size for both shorter run times and higher efficiencies. Most methodologies on µBondapak HPLC columns can be transferred to these products without modification, including USP applications. System suitability specifications can be provided by ES Industries with these columns.

Phases Available

- ODS
- Amino
- Cyano
- Phenyl

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (3.9 mm)
C18	5	100	125291-WC18E	124291-WC18E
C18	5	150	135291-WC18E	134291-WC18E
C18	5	250	155291-WC18E	154291-WC18E
C18	10	150	135391-WC18E	134391-WC18E
C18	10	250	155391-WC18E	154391-WC18E
C18	10	300	165391-WC18E	164391-WC18E

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

Exsil®

- Many years of silica and bonding experience
- Alternative to traditional spherical HPLC materials such as Spherisorb®
- Available in 3 micron particles
- High quality cost effective solution for many HPLC applications
- Manufactured under stringent controls
- Superior column performance

Exsil, manufactured by Exmere UK, has many years of silica and bonding experience and is now firmly established as a useful alternative to the traditional spherical HPLC materials, such as Spherisorb. Exsil is a spherical uniform totally porous silica designed for use in conventional HPLC in both analytical and preparative modes. Exsil is manufactured by a novel process using advanced technology which ensures total batch-to-batch reproducibility. ES Industries has supplied extremely efficient and reproducible Exsil packing columns for a number of years. We carry a complete and extensive inventory of all Exsil packings, in addition to strict quality control guidelines for all our Exsil packed columns.

Exsil is available in two pore sizes:

90 and 100 A.

Four particle sizes:

3 µm–for high resolution, high efficiency, and fast separations

5 µm–the established choice for conventional analytical columns

10 µm–good resolution with high permeability

15 µm–preparative grade with characteristics analogous to smaller particles allowing predictable scale-up

A wide selection of bonded phases is available to match a variety of analytical separations.

Exsil - Nitrile

A moderately polar phase for either normal or reverse phase. It is particularly useful in separations requiring gradient elution due to its rapid equilibration with mobile phases

Exsil - Octyl

For reverse phase separation of solutes of moderate polarity and for rapid analysis

Exsil - ODS

The standard material for reverse phase separations.

Exsil - ODS-AB

An ODS material that is more deactivated than the standard ODS for use with acidic, neutral, or basic compounds without buffer or additive restrictions between pH 2 and 7.

Exsil ODS-B

A highly base deactivated ODS material for the analysis of basic and neutral compounds.

Exsil SAX

A strong anion exchanger capable of separations of the highest efficiency, comparable with those usually associated with reverse phase chromatography.

Exsil SCX

A strong cation exchanger for the separation of cationic species and ligand exchange.

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
C18	3	50	115121-EXC18	114121-EXC18	11d121-EXC18	112121-EXC18
C18	3	100	125121-EXC18	124121-EXC18	12d121-EXC18	122121-EXC18
C18	3	150	135121-EXC18	134121-EXC18	13d121-EXC18	132121-EXC18
C18	5	50	115221-EXC18	114221-EXC18	11d221-EXC18	112221-EXC18
C18	5	100	125221-EXC18	124221-EXC18	12d221-EXC18	122221-EXC18
C18	5	150	135221-EXC18	134221-EXC18	13d221-EXC18	132221-EXC18
C18	5	250	155221-EXC18	154221-EXC18	15d221-EXC18	152221-EXC18
ODS-B	5	50	115221-EXODS-B	114221-EXODS-B	11d221-EXODS-B	112221-EXODS-B
ODS-B	5	100	125221-EXODS-B	124221-EXODS-B	12d221-EXODS-B	122221-EXODS-B
ODS-B	5	150	135221-EXODS-B	134221-EXODS-B	13d221-EXODS-B	132221-EXODS-B
ODS-B	5	250	155221-EXODS-B	154221-EXODS-B	15d221-EXODS-B	152221-EXODS-B
C8	3	50	115121-EXC8	114121-EXC8	11d121-EXC8	112121-EXC8
C8	3	100	125121-EXC8	124121-EXC8	12d121-EXC8	122121-EXC8
C8	3	150	135121-EXC8	134121-EXC8	13d121-EXC8	132121-EXC8
C8	5	50	115221-EXC8	114221-EXC8	11d221-EXC8	112221-EXC8
C8	5	100	125221-EXC8	124221-EXC8	12d221-EXC8	122221-EXC8
C8	5	150	135221-EXC8	134221-EXC8	13d221-EXC8	132221-EXC8
C8	5	250	155221-EXC8	154221-EXC8	15d221-EXC8	152221-EXC8

Hypersil®

- Low batch-to-batch variation
- 3, 5, and 10 µm particles
- A wide range of bonded phases available with tight particle and pore size distribution
- Highest quality Hypersil columns available

For over 18 years Hypersil has been manufactured under strict guidelines and standards. Hypersil is a porous, spherical silica available in three particle sizes (3, 5, and 10 µm). It has both a tight particle size and pore size distribution. It is manufactured with one of the lowest batch-to-batch variations in the industry. A wide variety of bonded phases are available and are stock at our New Jersey facility. We have over 18 years of experience in packing the best Hypersil columns in the industry.

Packing	Functionality	Description
Hypersil Silica	Silica	Spherical 100 A, 120 A, and 300 A pore
ODS Hypersil	C18 (ODS)	Endcapped
MOS Hypersil-1	C8	Not endcapped
MOS Hypersil-2	C8	Endcapped
SAS Hypersil	C1	Trimethyl reversed phase
Butyl Hypersil	C4	Stable short chain phase
Phenyl Hypersil-1	Aromatic C6	Not endcapped
Phenyl Hypersil-2	Aromatic C6	Endcapped
CPS Hypersil-1	CN	Not endcapped
CPS Hypersil-2	CN	Endcapped
APS Hypersil-1	NH_2	Amino phase
APS Hypersil-2	NH_2	Amino phase
SAX Hypersil	NR4+	Endcapped, ion exchange
BDS Hypersil	C18, C8, CN, & Phenyl	Deactivated to reduce silanol activity

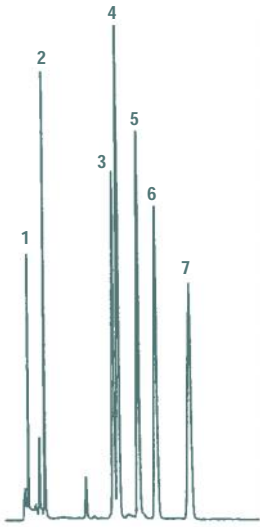
Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
C18	3	50	115191-HODS	114191-HODS	11d191-HODS	112191-HODS
C18	3	100	125191-HODS	124191-HODS	12d191-HODS	122191-HODS
C18	3	150	135191-HODS	134191-HODS	13d191-HODS	132191-HODS
C18	5	50	115291-HODS	114291-HODS	11d291-HODS	112291-HODS
C18	5	100	125291-HODS	124291-HODS	12d291-HODS	122291-HODS
C18	5	150	135291-HODS	134291-HODS	13d291-HODS	132291-HODS
C18	5	250	155291-HODS	154291-HODS	15d291-HODS	152291-HODS
C8	3	50	115191-HMOS	114191-HMOS	11d191-HMOS	112191-HMOS
C8	3	100	125191-HMOS	124191-HMOS	12d191-HMOS	122191-HMOS
C8	3	150	135191-HMOS	134191-HMOS	13d191-HMOS	132191-HMOS
C8	5	50	115291-HMOS	114291-HMOS	11d291-HMOS	112291-HMOS
C8	5	100	125291-HMOS	124291-HMOS	12d291-HMOS	122291-HMOS
C8	5	150	135291-HMOS	134291-HMOS	13d291-HMOS	132291-HMOS
C8	5	250	155291-HMOS	154291-HMOS	15d291-HMOS	152291-HMOS
Phenyl	3	50	115191-HP	114191-HP	11d191-HP	112191-HP
Phenyl	3	100	125191-HP	124191-HP	12d191-HP	122191-HP
Phenyl	3	150	135191-HP	134191-HP	13d191-HP	132191-HP
Phenyl	5	50	115291-HP	114291-HP	11d291-HP	112291-HP
Phenyl	5	100	125291-HP	124291-HP	12d291-HP	122291-HP
Phenyl	5	150	135291-HP	134291-HP	13d291-HP	132291-HP
Phenyl	5	250	155291-HP	154291-HP	15d291-HP	152291-HP
BDSC18	3	50	115191-BDSC18	114191-BDSC18	11d191-BDSC18	112191-BDSC18
BDSC18	3	100	125191-BDSC18	124191-BDSC18	12d191-BDSC18	122191-BDSC18
BDSC18	3	150	135191-BDSC18	134191-BDSC18	13d191-BDSC18	132191-BDSC18
BDSC18	5	50	115291-BDSC18	114291-BDSC18	11d291-BDSC18	112291-BDSC18
BDSC18	5	100	125291-BDSC18	124291-BDSC18	12d291-BDSC18	122291-BDSC18
BDSC18	5	150	135291-BDSC18	134291-BDSC18	13d291-BDSC18	132291-BDSC18
BDSC18	5	250	155291-BDSC18	154291-BDSC18	15d291-BDSC18	152291-BDSC18
BDSC8	3	50	115191-BDSC8	114191-BDSC8	11d191-BDSC8	112191-BDSC8
BDSC8	3	100	125191-BDSC8	124191-BDSC8	12d191-BDSC8	122191-BDSC8
BDSC8	3	150	135191-BDSC8	134191-BDSC8	13d191-BDSC8	132191-BDSC8
BDSC8	5	50	115291-BDSC8	114291-BDSC8	11d291-BDSC8	112291-BDSC8
BDSC8	5	100	125291-BDSC8	124291-BDSC8	12d291-BDSC8	122291-BDSC8
BDSC8	5	150	135291-BDSC8	134291-BDSC8	13d291-BDSC8	132291-BDSC8
BDSC8	5	250	155291-BDSC8	154291-BDSC8	15d291-BDSC8	152291-BDSC8

Inertsil®

- Phases bonded to high purity silica
- Extremely rugged
- No modifiers required
- Extensive quality control testing
- Highly quality columns packed by ES Industries

Inertsil packings, manufactured by GL Sciences, Japan, provide excellent performance for a wide range of compounds. A high purity silica manufacturing process, produces spherical silica particles and unique bonding chemistries are able to produce extremely low levels of silanol interference. Columns made with these packings yield excellent chromatographic performance for polar compounds–especially basic drugs and organic acids.

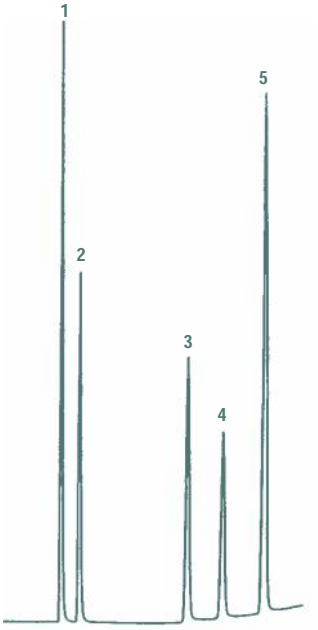
ES Industries manufacturing technology yields the highest maximum efficiency and the best peak symmetries for Inertsil packed columns. Retention times, peak symmetry, and plate counts are carefully checked for each Inertsil column produced and a copy of the test chromatogram is supplied with each column.



Fat Soluble Vitamins

Column: Inertsil ODS-2, 250 x 4.6 mm ID 5 µ
Catalog No.: 155211-IN-ODS-2
Flow rate: 1 mL/min.
Mobile phase: CH_3CN/MeOH 75/25

1. Vitamin K_3
2. Vitamin A
3. Vitamin D_2
4. Vitamin D_3
5. Vitamin E
6. Vitamin E acetate
7. Vitamin K_1



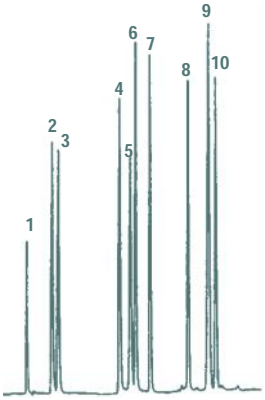
Components of Cold Drugs

Column: Inertsil ODS-2, 150 x 4.6 mm ID 5 µ
Catalog No.: 135211-IN-ODS-2
Flow rate: 1 mL/min.
Mobile phase: A: 0.1% H_3PO_4 in 30% CH_3OH
B: 0.1% H_3PO_4 in 80% CH_3OH
A (15 min) B

1. Acetoaminophen
2. Caffeine
3. Ethanzamide
4. Bucetin
5. Acetyl salicylic acid

Physical Characteristics for Inertsil Packings

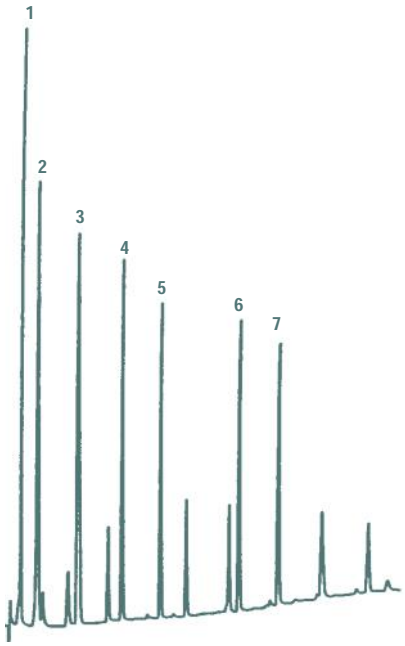
Product Description	Shape	Surface Area (m^2/g)	Pore Diameter (A)	Size (µm)	Carbon (%)	End-capped
Inertsil ODS-3 (C18)	Spherical	450	100	3, 5	15	Y
Inertsil ODS-2 (C18)	Spherical	320	150	5	18.5	Y
Inertsil C8	Spherical	320	150	5	10.5	Y
Inertsil Phenyl	Spherical	320	150	5	10	Y



Water Soluble Vitamins

Column: Inertsil ODS-2, 150 x 4.6 mm ID 5 µ
Catalog No.: 135211-IN-ODS-2
Flow rate: 1 mL/min.
Mobile phase: A: IPCC-05 + 0.1% H_3PO_4
B: IPCC-05 + 0.1% H_3PO_4 in 80% CH_3CN
A/B 97.5/2.5 (20 min) 50/50
IPCC-05: Pentanesulfonate Na

1. L-ascorbic acid
2. Nicotinic acid
3. Nicotinamide
4. Pyridoxal
5. Pyridoxamine
6. Pyridoxine
7. Thiamine
8. Folic acid
9. Cyanocobalamine
10. Riboflavin



Dicarboxylic Acids

Column: Inertsil ODS-2, 150 x 4.6 mm ID 5 µ
Catalog No.: 135211-IN-ODS-2
Flow rate: 1 mL/min.
Mobile phase: A: CH_3CN/ 0.1% H_3PO_4 = 2/98
B: CH_3CN/ 0.1% H_3PO_4 = 45/55
A (25 min) B

1. Malonic acid
2. Succinic acid
3. Glutaric acid
4. Adipic acid
5. Pimelic acid
6. Azelaic acid
7. Sebacic acid

Serotonin in Bananas

Column: Inertsil ODS-2, 150 x 4.6 mm ID 5 µ
Catalog No.: 135211-IN-ODS-2
Flow rate: 1 mL/min.
Mobile phase: CH_3CN/ 20 nM IPCC-08 + 40 nM KH_2PO_4, pH 3.5, H_3PO_4 = 11.5/88.5

1. DL-Tryptophan
2. Serotonin (5-Hydroxy Tryptamine)

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
ODS	5	50	115211-IN-ODS	114211-IN-ODS	11d211-IN-ODS	112211-IN-ODS
ODS	5	100	125211-IN-ODS	124211-IN-ODS	12d211-IN-ODS	122211-IN-ODS
ODS	5	150	135211-IN-ODS	134211-IN-ODS	13d211-IN-ODS	132211-IN-ODS
ODS	5	250	155211-IN-ODS	154211-IN-ODS	15d211-IN-ODS	152211-IN-ODS
ODS2	5	50	115211-IN-ODS2	114211-IN-ODS2	11d211-IN-ODS2	112211-IN-ODS2
ODS2	5	100	125211-IN-ODS2	124211-IN-ODS2	12d211-IN-ODS2	122211-IN-ODS2
ODS2	5	150	135211-IN-ODS2	134211-IN-ODS2	13d211-IN-ODS2	132211-IN-ODS2
ODS2	5	250	155211-IN-ODS2	154211-IN-ODS2	15d211-IN-ODS2	152211-IN-ODS2
C8	5	50	115211-IN-C8	114211-IN-C8	11d211-IN-C8	112211-IN-C8
C8	5	100	125211-IN-C8	124211-IN-C8	12d211-IN-C8	122211-IN-C8
C8	5	150	135211-IN-C8	134211-IN-C8	13d211-IN-C8	132211-IN-C8
C8	5	250	155211-IN-C8	154211-IN-C8	15d211-IN-C8	152211-IN-C8
Phenyl	5	50	115211-IN-P	114211-IN-P	11d211-IN-P	112211-IN-P
Phenyl	5	100	125211-IN-P	124211-IN-P	12d211-IN-P	122211-IN-P
Phenyl	5	150	135211-IN-P	134211-IN-P	13d211-IN-P	132211-IN-P
Phenyl	5	250	155211-IN-P	154211-IN-P	15d211-IN-P	152211-IN-P

Kromasil®

- Designed for ease of scale-up to preparative size columns
- High loadability
- Ultra-high purity spherical silica
- Superior durability
- ES Industries manufactures extremely high quality columns packed with Kromasil

Kromasil is manufactured by Eka Nobel, Sweden. It has been designed for both analytical and preparative scale liquid chromatography applications and is available in six particle sizes ranging from 3.5um to 16 um. A choice of particle size enables the chromatographer to optimize a separation in the most economic manner. Kromasil's spherical uniform particles have a narrow pore size distribution and a unique surface chemistry. They give high chromatographic performance in both large and small scale applications.
ES Industries has an extensive amount of experience in providing the best quality Kromasil packed columns in the industry.

Properties of Kromasil Silicas

Particle Size µm	3.5, 5, 7, 10, 13, 16
Pore Diameter A	100
Pore Diameter Range A (80%)	75-125
Surface Area BET m^2/g	340
Pore Volume BET mL/g	0.9
Sodium	25 ppm
Aluminum	25 ppm
Iron	25 ppm

% Carbon Loading of Bonded Kromasil Phases

Material	Carbon %
Kromasil 100-C1	4.7
Kromasil 100-C4	8.0
Kromasil 100-C8	12.0
Kromasil 100-C18	19.0
Kromasil 100-NH_2	1.5% Nitrogen
Kromasil 100-CHI-DMB	14.5
Kromasil 100-CHI-TBB	15.0

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
C18	3.5	50	115221-KC18	114221-KC18	11d221-KC18	112121-KC18
C18	3.5	100	125121-KC18	124221-KC18	12d221-KC18	122121-KC18
C18	3.5	150	135121-KC18	134221-KC18	13d221-KC18	132121-KC18
C18	5	50	115221-KC18	114221-KC18	11d221-KC18	112221-KC18
C18	5	100	125221-KC18	124221-KC18	12d221-KC18	122221-KC18
C18	5	150	135221-KC18	134221-KC18	13d221-KC18	132221-KC18
C18	5	250	155221-KC18	154221-KC18	15d221-KC18	152221-KC18
C8	5	50	115221-KC8	114221-KC8	11d221-KC8	112221-KC8
C8	5	100	125221-KC8	124221-KC8	12d221-KC8	122221-KC8
C8	5	150	135221-KC8	134221-KC8	13d221-KC8	132221-KC8
C8	5	250	155221-KC8	154221-KC8	15d221-KC8	152221-KC8

LiChrosorb® and LiChrospher®

- LiChrosorb high quality irregular silica
- A wide range of bonded phases
- High surface coverage

LiChrosorb and LiChrospher, manufactured by E. Merck, Germany for over 25 years and well documented in the literature. LiChrosorb is a high quality irregular silica with a high surface area and excellent loadability. LiChrospher is ultra-high purity spherical silica with very high surface area and outstanding loadability. Both LiChrosorb and LiChrospher are offered in a wide range of bonded phases. ES Industries has over 20 years of experience in packing high performance columns of LiChrosorb and LiChrospher. We maintain a complete inventory of all these packings at our facility.

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

Properties of LiChrosorb and LiChrospher Silicas

	LiChrosorb		LiChrospher	
	Si60	Si100	Si60	Si100
Particle Size (um)	5, 10	5, 10	5	5
Surface Area (m^2/g)	490	300	650	450
Pore Diameter A	60	100	60	100
Shape	Irregular	Irregular	Spherical	Spherical

Characteristics of LiChrosorb and LiChrospher Packing Materials

Material	Functional Group	% Carbon	Pore Diameter (A)	Particle Size (µm)
LiChrosorb Si-60	Unbonded	-	60	5
LiChrosorb Si-100	Unbonded	-	100	5
LiChrosorb RP18	C18	17	100	5, 10
LiChrosorb RP8	C8	10	60	5, 10
LiChrosorb NH_2	NH_2	4	100	5, 10
LiChrosorb CN	CN	7	100	5, 10
LiChrosorb Diol	OH	8	100	5, 10
LiChrospher Si-60	Unbonded	-	60	5
LiChrospher Si-100	Unbonded	-	100	5
LiChrospher RP18	C18	21	100	5
LiChrospher RP18 endcapped	C8	12.5	100	5
LiChrospher NH_2	NH_2	4.5	100	5
LiChrospher CN	CN	-	100	5
LiChrospher Diol	OH	8.3	100	5

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
RP-18	5	50	115221-RP-18	114221-RP-18	11d221-RP-18	112221-RP-18
RP-18	5	100	125221-RP-18	124221-RP-18	12d221-RP-18	122221-RP-18
RP-18	5	150	135221-RP-18	134221-RP-18	13d221-RP-18	132221-RP-18
RP-18	5	250	155221-RP-18	154221-RP-18	15d221-RP-18	152221-RP-18
RP-8	5	50	115221-RP-8	114221-RP-8	11d221-RP-8	112221-RP-8
RP-8	5	100	125221-RP-8	124221-RP-8	12d221-RP-8	122221-RP-8
RP-8	5	150	135221-RP-8	134221-RP-8	13d221-RP-8	132221-RP-8
RP-8	5	250	155221-RP-8	154221-RP-8	15d221-RP-8	152221-RP-8
RP-18S	5	50	115221-RP-18S	114221-RP-18S	11d221-RP-18S	112221-RP-18S
RP-18S	5	100	125221-RP-18S	124221-RP-18S	12d221-RP-18S	122221-RP-18S
RP-18S	5	150	135221-RP-18S	134221-RP-18S	13d221-RP-18S	132221-RP-18S
RP-18S	5	250	155221-RP-18S	154221-RP-18S	15d221-RP-18S	152221-RP-18S
RP-8S	5	50	115221-RP-8S	114221-RP-8S	11d221-RP-8S	112221-RP-8S
RP-8S	5	100	125221-RP-8S	124221-RP-8S	12d221-RP-8S	122221-RP-8S
RP-8S	5	150	135221-RP-8S	134221-RP-8S	13d221-RP-8S	132221-RP-8S
RP-8S	5	250	155221-RP-8S	154221-RP-8S	15d221-RP-8S	152221-RP-8S
RP-18E	5	50	115221-RP-18E	114221-RP-18E	11d221-RP-18E	112221-RP-18E
RP-18E	5	100	125221-RP-18E	124221-RP-18E	12d221-RP-18E	122221-RP-18E
RP-18E	5	150	135221-RP-18E	134221-RP-18E	13d221-RP-18E	132221-RP-18E
RP-18E	5	250	155221-RP-18E	154221-RP-18E	15d221-RP-18E	152221-RP-18E
RP-8E	5	50	115221-RP-8E	114221-RP-8E	11d221-RP-8E	112221-RP-8E
RP-8E	5	100	125221-RP-8E	124221-RP-8E	12d221-RP-8E	122221-RP-8E
RP-8E	5	150	135221-RP-8E	134221-RP-8E	13d221-RP-8E	132221-RP-8E
RP-8E	5	250	155221-RP-8E	154221-RP-8E	15d221-RP-8E	152221-RP-8E

Polygosil®

- Finest high quality irregular silica available
- High surface area
- Superior durability
- High loadability
- ES Industries has over 20 years of experience in packing high performance columns of Polygosil

Polygosil, manufactured by Macherey-Nagel, Germany, is a high quality pure irregular silica.

It has a high surface area and excellent loadability. Polygosil has superior durability and is the finest irregular silica available. ES Industries has over 20 years of experience in packing high performance columns of Polygosil.

Summary of Polygosil Chemically Bonded Phases

Type of Modification	Functional Group	Pore Diameter (A)	Particle Size µm
C8	Octyl	60	5, 7, 10, 25-40, 40-63
C18	Octadecyl	60, 300, 500, 100	5, 7, 10, 25-40, 40-63 (100 only 5, 7, 10)
C4	Butyl	300, 500	7, 25-40, 40-63
CN	Cyano (Nitrile)	60	5, 10
NO_2	Nitro	60	5, 10
NH_2	Amino	60	5, 10
$N(CH_3)_2$	Dimethylamino	60	5, 10

Nucleosil®

- High purity spherical silica available in a wide range of pore sizes and particle sizes
- Wide range of bonded phases including uniquely bonded groups
- One of the most widely cited HPLC packings
- Well characterized and reproducible packings
- ES Industries manufactures the highest quality Nucleosil columns available

Nucleosil, manufactured by Macherey-Nagel, Germany, is spherical totally porous silica available in a wide range of pore sizes and particle sizes. Nucleosil is supplied in a wide range of bonded phases including uniquely bonded groups such as dimethyl amino. It has been cited extensively in the literature and is very well regarded in the chromatography community. Nucleosil is well characterized and reproducible. ES Industries has extensive experience with Nucleosil packings and manufactures the highest quality Nucleosil columns available.

Properties of Nucleosil 100 and 120 silicas

	Nucleosil 100	Nucleosil 120
Pore Diameter A	100	120
Pore Volume mL/g	1.0	0.65
Surface Area BET m^2/g	350	200
Pressure Stability psi	8,500 3	11,500 ca 3
Particle Size	5	5 + 1.5
Range µm	7 10	7 + 1.5 10 + 1.5
Approximate pH Stability	1 - 9	1 - 9

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

Summary of Nucleosil chemically bonded phases

Type of Modification	Functional Group	Pore Diameter (A)	Particle Size (µm)	Preferred Application
C8	Ooctyl	100 120	5 3, 5, 10	Reversed phase and ion-pairing chromatography. Moderately to highly polar (water soluble) compounds such as small peptides and proteins, steroids, nucleosides, polar pharmaceuticals, etc.
C18	Octadecyl	100 120	3, 5, 10 3, 5, 10	Reversed phase and ion-pairing chromatography. Nonpolar to moderately polar compounds such as fatty acids, glycerides, polynuclear aromatic hydrocarbons, esters (phthalates), fat-soluble vitamins, steroids, prostaglandins, PTH amino acids, etc.
C18-AB	Octadecy	100	5	Base deactivated reverse phase
C18-HD	Octadecyl	100	5	Highly base deactivated reverse phase for amines
C6H5	Phenyl	120	7	Reversed phase and ion-pairing chromatography. Moderately polar compounds. Retention characteristics are similar to C8 packing, but with different selectivity for polycyclic aromatic hydrocarbons, polar aromatics, fatty acids, etc.
CN	Cyano (Nitrile)	100 120	5 7	Normal and reversed phase chromatography. In normal phase with relatively nonpolar solvents, the CN packing separates many of the same polar compounds as unmodified silica. Due to its rapid equilibration, the CN packing is much more suitable than unmodified silica for gradient separations. In reversed phase chromatography the CN packing offers different selectivity than C18, C8, and phenyl packings.
NO_2	Nitro	100	5	Separation of compounds with double bonds, e. g. aromatic compounds in general, preferably polycyclic aromatic hydrocarbons.
NH_2	Amino	100 120	5 7	The NH_2 packing is a multipurpose product with excellent chromatographic utility in three different modes: normal phase, weak anion exchange, and reversed phase of polar compounds such as carbohydrates. In normal phase (using hexane, CH_2CH_2 and isopropanol as mobile phases) the NH_2 packing separates polar compounds such as substituted anilines, esters, chlorinated pesticides, etc. Anions and organic acids are analyzed in the ion exchange mode using common buffers (e.g. acetates, phosphates) in conjunction with organic modifiers (e.g. acetonitrile).
$N(CH_3)_2$	Dimethyl-amino	100	5	Anion exchanger, weakly basic. This packing can be used in the same way as the Amino packing.
OH	Diol	100	7	Normal and reversed phase chromatography. The Diol packing is less polar than unmodified silica and very easily wettable with water separation of peptides and proteins.
Protect I	C8	100	5	Base deactivated polar yet produces good peak shapes for amines
SA	Sulfonic	100	5, 10	Ion exchange chromatography. Cation exchanger, strongly acidic.
SB	Quaternary ammonium	100	5, 10	Ion echange chromatography. Anion exchanger, strongly basic.

Nucleosil continued

Description	Particle Size (µ)	Pore Size	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
C18	3	100	50	115121-NC18	114121-NC18	11d121-NC18	112121-NC18
C18	3	100	100	125121-NC18	124121-NC18	12d121-NC18	122121-NC18
C18	3	100	150	135121-NC18	134121-NC18	13d121-NC18	132121-NC18
C18	5	100	50	115221-NC18	114221-NC18	11d221-NC18	112221-NC18
C18	5	100	100	125221-NC18	124221-NC18	12d221-NC18	122221-NC18
C18	5	100	150	135221-NC18	134221-NC18	13d221-NC18	132221-NC18
C18	5	100	250	155221-NC18	154221-NC18	15d221-NC18	152221-NC18
C18	3	120	50	115191-NC18	114191-NC18	11d191-NC18	112191-NC18
C18	3	120	100	125191-NC18	124191-NC18	12d191-NC18	122191-NC18
C18	3	120	150	135191-NC18	134191-NC18	13d191-NC18	132191-NC18
C18	5	120	50	115291-NC18	114291-NC18	11d291-NC18	112291-NC18
C18	5	120	100	125291-NC18	124291-NC18	12d291-NC18	122291-NC18
C18	5	120	150	135291-NC18	134291-NC18	13d291-NC18	132291-NC18
C18	5	120	250	155291-NC18	154291-NC18	15d291-NC18	152291-NC18
C18-AB	5	100	50	115221-NC18-AB	114221-NC18-AB	11d221-NC18-AB	112221-NC18-AB
C18-AB	5	100	100	125221-NC18-AB	124221-NC18-AB	12d221-NC18-AB	122221-NC18-AB
C18-AB	5	100	150	135221-NC18-AB	134221-NC18-AB	13d221-NC18-AB	132221-NC18-AB
C18-AB	5	100	250	155221-NC18-AB	154221-NC18-AB	15d221-NC18-AB	152221-NC18-AB
C18-HD	3	100	50	115121-NC18-HD	114121-NC18-HD	11d121-NC18-HD	112121-NC18-HD
C18-HD	3	100	100	125121-NC18-HD	124121-NC18-HD	12d121-NC18-HD	122121-NC18-HD
C18-HD	3	100	150	135121-NC18-HD	134121-NC18-HD	13d121-NC18-HD	132121-NC18-HD
C18-HD	5	100	50	115221-NC18-HD	114221-NC18-HD	11d221-NC18-HD	112221-NC18-HD
C18-HD	5	100	100	125221-NC18-HD	124221-NC18-HD	12d221-NC18-HD	122221-NC18-HD
C18-HD	5	100	150	135221-NC18-HD	134221-NC18-HD	13d221-NC18-HD	132221-NC18-HD
C18-HD	5	100	250	155221-NC18-HD	154221-NC18-HD	15d221-NC18-HD	152221-NC18-HD
C8	5	100	50	115221-NC8	114221-NC8	11d221-NC8	112221-NC8
C8	5	100	100	125221-NC8	124221-NC8	12d221-NC8	122221-NC8
C8	5	100	150	135221-NC8	134221-NC8	13d221-NC8	132221-NC8
C8	5	100	250	155221-NC8	154221-NC8	15d221-NC8	152221-NC8
C8	3	120	50	115191-NC8	114191-NC8	11d191-NC8	112191-NC8
C8	3	120	100	125191-NC8	124191-NC8	12d191-NC8	122191-NC8
C8	3	120	150	135191-NC8	134191-NC8	13d191-NC8	132191-NC8
C8	5	120	50	115291-NC8	114291-NC8	11d291-NC8	112291-NC8
C8	5	120	100	125291-NC8	124291-NC8	12d291-NC8	122291-NC8
C8	5	120	150	135291-NC8	134291-NC8	13d291-NC8	132291-NC8
C8	5	120	250	155291-NC8	154291-NC8	15d291-NC8	152291-NC8
C8-HD	5	100	50	115221-NC8-HD	114221-NC8-HD	11d221-NC8-HD	112221-NC8-HD
C8-HD	5	100	100	125221-NC8-HD	124221-NC8-HD	12d221-NC8-HD	122221-NC8-HD
C8-HD	5	100	150	135221-NC8-HD	134221-NC8-HD	13d221-NC8-HD	132221-NC8-HD
C8-HD	5	100	250	155221-NC8-HD	154221-NC8-HD	15d221-NC8-HD	152221-NC8-HD
Phenyl	5	100	50	115221-NCP	114221-NCP	11d221-NCP	112221-NCP
Phenyl	5	100	100	125221-NCP	124221-NCP	12d221-NCP	122221-NCP
Phenyl	5	100	150	135221-NCP	134221-NCP	13d221-NCP	132221-NCP
Phenyl	5	100	250	155221-NCP	154221-NCP	15d221-NCP	152221-NCP
Protect I	5	100	50	115221-Protect I	114221-Protect I	11d221-Protect I	112221-Protect I
Protect I	5	100	100	125221-Protect I	124221-Protect I	12d221-Protect I	122221-Protect I
Protect I	5	100	150	135221-Protect I	134221-Protect I	13d221-Protect I	132221-Protect I
Protect I	5	100	250	155221-Protect I	154221-Protect I	15d221-Protect I	152221-Protect I

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

Partisil®

- Established trade name for over 20 years
- High quality irregular silica
- Manufactured under stringent controls
- Highest quality Partisil columns available

Partisil, manufactured by Whatman, is a high quality irregular silica. It has been manufactured under stringent controls for over 20 years and is cited in many established applications. We have over 20 years of experience in packing the best Partisil columns in the industry.

Characteristics of Partisil Materials

Material	Functional Group	Material Classification	Specifications	Applications
Partisil silica	Unbonded	Silica	Surface area 350 m^2/g Pore size 85A	Polar compounds
Partisil	Octadecyl	Reverse phase	Polymeric 10.5% carbon load fully endcapped	Wide range covering ODS-3 pharmaceuticals, food, environmental pollutants, natural products.
Partisil ODS-2	Octadecyl	Reverse phase	Polymeric 15% carbon load 25% residual silanols	Preparative work, separation optimization
Partisil ODS	Octadecyl	Reverse or normal phase	Polymeric 15% carbon load 50% residual silanols	In reverse phase mode, samples with significant water solubility
Partisil C8	Octyl	Reverse phase	Monomeric 9% carbon load endcapped	Separation of antibiotics and Ion pair chromatography.
Partisil PAC	Aminol Cyano	Polar bonded phase	As silica	Normal phase weak anion exchange and reverse phase. Extremely fast equilibration. Ideal for gradient elution. Carbohydrate analysis.
Partisil SAX	Quaternary	Strong anion exchange phase	pH range 1.5 to 7.5 up to 70°C	Nucleotides
Partisil SCX	Sulfonic	Strong cation exchange phase	pH range 1.5 to 7.5 up to 70°C	Nucleic acids, amino acids, polyamines, drugs. Ligand exchange when loaded with metal cations

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
C18	5	50	115221-PODS	114221-PODS	11d221-PODS	112221-PODS
C18	5	100	125221-PODS	124221-PODS	12d221-PODS	122221-PODS
C18	5	150	135221-PODS	134221-PODS	13d221-PODS	132221-PODS
C18	5	250	155221-PODS	154221-PODS	15d221-PODS	152221-PODS
C18	5	50	115221-PODS2	114221-PODS2	11d221-PODS2	112221-PODS2
C18	5	100	125221-PODS2	124221-PODS2	12d221-PODS2	122221-PODS2
C18	5	150	135221-PODS2	134221-PODS2	13d221-PODS2	132221-PODS2
C18	5	250	155221-PODS2	154221-PODS2	15d221-PODS2	152221-PODS2
C18	5	50	115221-PODS3	114221-PODS3	11d221-PODS3	112221-PODS3
C18	5	100	125221-PODS3	124221-PODS3	12d221-PODS3	122221-PODS3
C18	5	150	135221-PODS3	134221-PODS3	13d221-PODS3	132221-PODS3
C18	5	250	155221-PODS3	154221-PODS3	15d221-PODS3	152221-PODS3
C8	5	50	115221-P8	114221-P8	11d221-P8	112221-P8
C8	5	100	125221-P8	124221-P8	12d221-P8	122221-P8
C8	5	150	135221-P8	134221-P8	13d221-P8	132221-P8
C8	5	250	155221-P8	154221-P8	15d221-P8	152221-P8

Waters Spherisorb®

- Wide range of chemistries
- Widely used HPLC packing material
- Tight particle size and pore size distribution
- ES Industries produces high quality efficient columns packed with Waters Spherisorb

Waters Spherisorb, manufactured by Waters, is a high spherical silica. It has been available for a number of years and is widely used for HPLC methods. Waters Spherisorb is manufactured to a tight particle size and pore size distribution specification. All ES Industries packed columns of Water Spherisorb undergo extensive quality control testing. We provide the finest Waters Spherisorb packed columns available.

Spherisorb Packing Materials

Materials	Functional Group	Material Classification	Particle Size (µm)
Spherisorb S3W	Unbonded	Silica	3
Spherisorb S3ODS1	C18	Reverse Phase	3
Spherisorb S3ODS2	C18	Reverse Phase	3
Spherisorb S3C8	C8	Reverse Phase	3
Spherisorb S3C6	C6	Reverse Phase	3
Spherisorb S3C1	C1	Reverse Phase	3
Spherisorb S3P	Phenyl	Reverse Phase	3
Spherisorb S3CN	CN	Polar Bonded Phase	3
Spherisorb S3NH2	NH_2	Polar Bonded Phase	3
Spherisorb S5W	Unbonded	Silica	5
Spherisorb S5ODS1	C18	Reverse Phaes	5
Spherisorb S5ODS2	C18	Reverse Phase	5
Spherisorb S5C8	C8	Reverse Phase	5
Spherisorb S5C6	C6	Reverse Phase	5
Spherisorb S5C1	C1	Reverse Phase	5
Spherisorb S5P	Phenyl	Reverse Phase	5
Spherisorb S5CN	CN	Polar Bonded Phase	5
Spherisorb S5NH2	NH_2	Polar Bonded Phase	5
Spherisorb S5SAX	NR_4	Strong Ion Exchange Phase	5
Spherisorb S5SCX	SO_3H	Strong ion Exchange Phase	5
Spherisorb S10W	Unbonded	Silica	10
Spherisorb S10 ODS1	C18	Reverse Phase	10
Spherisorb S10 ODS 2	C18	Reverse Phase	10
Spherisorb S10 C8	C8	Reverse Phase	10
Spherisorb S10 C6	C6	Reverse Phase	10
Spherisorb S10 C1	C1	Reverse Phase	10
Spherisorb S10 P	Phenyl	Reverse Phase	10
Spherisorb S10 CN	CN	Polar Bonded Phase	10
Spherisorb S10 NH2	NH_2	Polar Bonded Phase	10
Spherisorb S10 SAX	SAX	Strong Ion Exchange Phase	10

Description	Particle Size (µ)	Length (mm)	Standard-bore P/N (4.6 mm)	Standard-bore P/N (4.0 mm)	Small-bore P/N (3.2 mm)	Small-bore P/N (2.0 mm)
C18	3	50	115171-S3ODS-1	114171-S3ODS-1	11d171-S3ODS-1	112171-S3ODS-1
C18	3	100	125171-S3ODS-1	124171-S3ODS-1	12d171-S3ODS-1	122171-S3ODS-1
C18	3	150	135171-S3ODS-1	134171-S3ODS-1	13d171-S3ODS-1	132171-S3ODS-1
C18	5	50	115271-S5ODS-1	114271-S5ODS-1	11d271-S5ODS-1	112271-S5ODS-1
C18	5	100	125271-S5ODS-1	124271-S5ODS-1	12d271-S5ODS-1	122271-S5ODS-1
C18	5	150	135271-S5ODS-1	134271-S5ODS-1	13d271-S5ODS-1	132271-S5ODS-1
C18	5	250	155271-S5ODS-1	154271-S5ODS-1	15d271-S5ODS-1	152271-S5ODS-1
C18	3	50	115171-S3ODS-2	114171-S3ODS-2	11d171-S3ODS-2	112171-S3ODS-2
C18	3	100	125171-S3ODS-2	124171-S3ODS-2	12d171-S3ODS-2	122171-S3ODS-2
C18	3	150	135171-S3ODS-2	134171-S3ODS-2	13d171-S3ODS-2	132171-S3ODS-2
C18	5	50	115271-S5ODS-2	114271-S5ODS-2	11d271-S5ODS-2	112271-S5ODS-2
C18	5	100	125271-S5ODS-2	124271-S5ODS-2	12d271-S5ODS-2	122271-S5ODS-2
C18	5	150	135271-S5ODS-2	134271-S5ODS-2	13d271-S5ODS-2	132271-S5ODS-2
C18	5	250	155271-S5ODS-2	154271-S5ODS-2	15d271-S5ODS-2	152271-S5ODS-2
C8	3	50	115171-S3C8	114171-S3C8	11d171-S3C8	112171-S3C8
C8	3	100	125171-S3C8	124171-S3C8	12d171-S3C8	122171-S3C8
C8	3	150	135171-S3C8	134171-S3C8	13d171-S3C8	132171-S3C8
C8	5	50	115271-S5C8	114271-S5C8	11d271-S5C8	112271-S5C8
C8	5	100	125271-S5C8	124271-S5C8	12d271-S5C8	122271-S5C8
C8	5	150	135271-S5C8	134271-S5C8	13d271-S5C8	132271-S5C8
C8	5	250	155271-S5C8	154271-S5C8	15d271-S5C8	152271-S5C8
Phenyl	3	50	115171-S3P	114171-S3P	11d171-S3P	112171-S3P
Phenyl	3	100	125171-S3P	124171-S3P	12d171-S3P	122171-S3P
Phenyl	3	150	135171-S3P	134171-S3P	13d171-S3P	132171-S3P
Phenyl	5	50	115271-S5P	114271-S5P	11d271-S5P	112271-S5P
Phenyl	5	100	125271-S5P	124271-S5P	12d271-S5P	122271-S5P
Phenyl	5	150	135271-S5P	134271-S5P	13d271-S5P	132271-S5P
Phenyl	5	250	155271-S5P	154271-S5P	15d271-S5P	152271-S5P

ZirChrom™ Columns

- Zirconia particles offer extreme inertness and stability
- pH range 0-14
- No swelling or shrinking associated with polymer materials
- Over eight different chemistries including reverse phase and high capacity ion exchange

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

ZirChrom Separations, Inc. offers a novel line of zirconia particles for HPLC. Available in a porous 3 µ size, these materials show extreme chemical and thermal stability in a pH range of 0-14. Since there is no silanol interaction, these materials exhibit no tailing on pharmaceutical amines and offer unique selectivities. The ZirChrom-CARB is a useful alternative to Hypercarb® selectivities, and the ZirChrom PBD offers standard reverse phase interaction. The ion exchangers offer high capacity compared to silica.

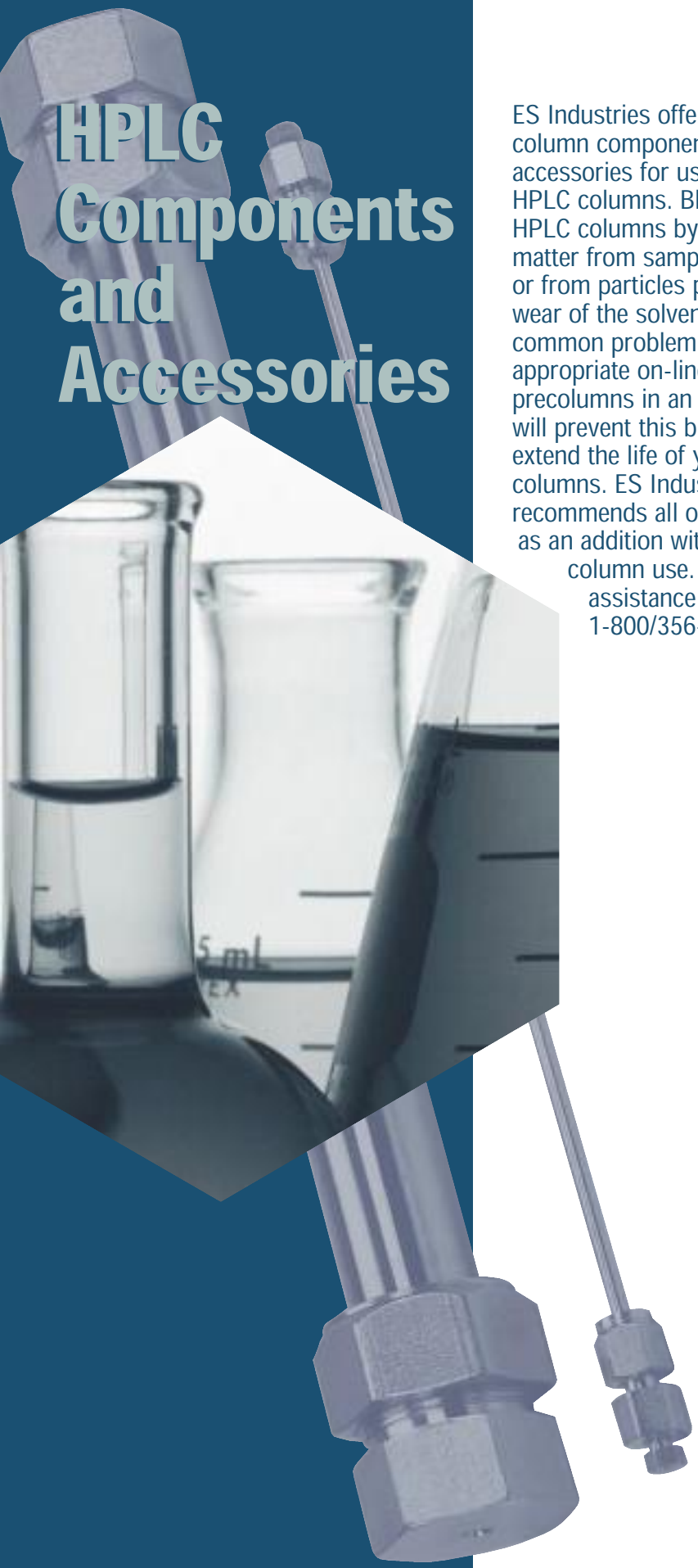
ZirChrom Analytical HPLC Columns

Part Number	Packing	Column Dimensions (mm I.D.)
ZRO1-1046	ZirChrom-CARB	100 x 4.6
ZRO1-1546	ZirChrom-CARB	150 x 4.6
ZRO1-1021	ZirChrom-CARB	100 x 2.1
ZRO1-1521	ZirChrom-CARB	150 x 2.1
ZRO2-1046	ZirChrom-PHASE	100 x 4.6
ZRO2-1546	ZirChrom-PHASE	150 x 4.6
ZRO2-1021	ZirChrom-PHASE	100 x 2.1
ZRO2-1521	ZirChrom-PHASE	150 x 2.1
ZRO3-1046	ZirChrom-PBD	100 x 4.6
ZRO3-1546	ZirChrom-PBD	150 x 4.6
ZRO3-1021	ZirChrom-PBD	100 x 2.1
ZRO3-1521	ZirChrom-PBD	150 x 2.1
ZRO4-1046	ZirChrom-WCX	100 x 4.6
ZRO4-1546	ZirChrom-WCX	150 x 4.6
ZRO4-1021	ZirChrom-WCX	100 x 2.1
ZRO4-1521	ZirChrom-WCX	150 x 2.1
ZRO5-1046	ZirChrom-WAX	100 x 4.6
ZRO5-1546	ZirChrom-WAX	150 x 4.6
ZRO5-1021	ZirChrom-WAX	100 x 2.1
ZRO5-1521	ZirChrom-WAX	150 x 2.1
ZRO6-1046	ZirChrom-SAX	100 x 4.6
ZRO6-1546	ZirChrom-SAX	150 x 4.6
ZRO6-1021	ZirChrom-SAX	100 x 2.1
ZRO6-1521	ZirChrom-SAX	150 x 2.1
ZRO7-1046	ZirChrom-SHAX	100 x 4.6
ZRO7-1546	ZirChrom-SHAX	150 x 4.6
ZRO7-1021	ZirChrom-SHAX	100 x 2.1
ZRO7-1521	ZirChrom-SHAX	150 x 2.1
ZRO8-1046	ZirChrom-PEZ	100 x 4.6
ZRO8-1546	ZirChrom-PEZ	150 x 4.6
ZRO8-1021	ZirChrom-PEZ	100 x 2.1
ZRO8-1521	ZirChrom-PEZ	150 x 2.1

ZirChrom™ Product Specifications

Part Number	Packing	Mode	Pore A Diameter	Surface Area	% Carbon	Meq/g	pH Range	Temperature Limit (°C)
ZRO1	ZirChrom-CARB	Reversed Phase	300	30			0-14	200
ZRO2	ZirChrom-PHASE	Normal Phase	300	30			0-14	200
ZRO3	ZirChrom-PBD	Reversed Phase	300	30	3		0-14	200
ZRO4	ZirChrom-WCX	Weak Cation Exchange	300	30	1.3	0.05	1-10	50
ZRO5	ZirChrom-WAX	Weak Anion Exchange	300	30	1.5	0.2	3-9	50
ZRO6	ZirChrom-SAX	Strong Anion Exchange	300	30		0.6	1-12	80
ZRO7	ZirChrom-SHAX	Strong Anion Exchange	300	30			1-12	80
ZRO8	ZirChrom-PEZ	Cation Exchange	300	30			1-10	80

HPLC Components and Accessories



ES Industries offers HPLC column components and accessories for use with your HPLC columns. Blockage of HPLC columns by particulate matter from sample and solvent, or from particles produced by wear of the solvent pump is a common problem. The use of appropriate on-line filters and precolumns in an HPLC system will prevent this blockage and extend the life of your HPLC columns. ES Industries recommends all of these items as an addition with your HPLC column use. For technical assistance please call 1-800/356-6140.

HPLC Guard Column Cartridges (Prepacked)

ES Industries guard column cartridges offer excellent protection for your analytical column. Adding a guard column to your HPLC system extends the life of your analytical column (up to 400%). Placed between the injector and the analytical column, the guard column traps components that would otherwise irreversibly contaminate the stationary phase of the analytical column. Guard columns also buffer against the effects of aggressive mobile phases.

Guard column cartridge packing should exactly match the analytical column. They add capacity to your system and ensure no adverse chemical influence on sensitive separations. Using a guard column packed with a stationary phase different from that in the analytical column will provide selective elimination of specific compounds.

ES Industries guard column cartridges are packed by a high performance slurry method and will not reduce system performance. They are easy to use and can be changed in seconds. They are available in analytical (3.2 mm I.D., 2 mm I.D. and 1 mm I.D.) and semi-preparative (10 mm I.D.) sizes. A bio-compatible system is also available for broad chemical resistance and low biological binding.

Catalog No.	Description
300100	Analytical 316 Stainless Steel Cartridge Holder (3. 2 mm)
300101	Pack of 5 Analytical New Guard Column Cartridges (3.2 mm) (Please specify packing material)
300120	Semi-Preparative 316 Stainless Steel Cartridge Holder
300121	Pack of 3, Semi-Preparative New Guard Cartridges
300130	Bio-Compatible Analytical Cartridge Holder
300131	Pack of 5, Biocompatible New Guard Cartridges
300102	Analytical Guard Cartridge (2.0 mm)
300103	Pack of 5 Analytical Cartridges (2.0 mm) (Please specify packing)
300104	Microbore Guard Cartridge (1.0 mm)
300105	Packed Microbore Guard Cartridge (1.0 mm) (Please specify packing)

HPLC Guard Columns (Prepacked)

ES Industries offers any size guard column (standard columns) prepacked with the material requested. These specialty guard columns are available in microbore, minibore, and semi-preparative sizes to suit the particular application. It is highly recommended to use prep guard columns with both semi-preparative and preparative columns. Please call for technical assistance for a specialty guard column 1-800/356-6140.

2 mm I.D x 2 cm Guard Column Kit

HPLC users find this column quite easy to pack and extremely economical. The narrow-bore short column causes only a slight pressure increase and no detectable theoretical plate loss when used with a 4.6 mm column. The 2 micron frits are easy to change, prolonging the guard column's life. A 3 gram bottle of packing material will pack 30 guard columns. Each kit contains two guard columns, a package of ten 2 µm frits and one packing funnel.

Catalog No.	Description
400050	Guard Column Kit
400010	Precolumn
400020	Funnel
400040	Adapter for Slurry Packing
400021	0.5 µm Replaceable Frit (Pkg. 10)
400011	2 µ Replaceable Frit (Pkg. 10)
400012	2 µ Titanium Replaceable Frit (Pkg. 10)

Ultra Low Volume Guard Column Kit

This 1 mm I.D. x 2 cm guard column is ideal for microbore chromatography. The total volume of .15 µl insures maximum column efficiency and column protection. The column can easily be dry-packed using the specially designed funnel. A 3 gram bottle of packing material will pack this column over 120 times. Each kit contains two guard columns, a package of 100 .5 µ frits and a packing funnel.

Catalog Number	Description
400060	Low Volume Guard Column Kit
400070	Low Volume Guard Column
400080	Funnel
400090	Replaceable Frits 2 µ (Pkg. 10)
400091	Replaceable Frits 0.5 µ
400100	Adapter for Slurry Packing

Packing Material for ES Industries Guard Columns

Any large particle material produced by ES Industries will work very well in these self-packing guard columns. The unit can be taken apart and repacked in minutes, the 2 cm and 2 mm I.D. has only a 0.6 µl dead volume for minimal detectable effect. These are some of the more popular bonded phases*.

Catalog Number	Description
400500	3 g Chromega™ SI 60, 25-40 µ
400510	3 g Chromegabond® C-18, 25-40 µ
400520	3 g Chromegabond C-8, 25-40 µ
400530	3 g Chromegabond C-2, 25-40 µ
400540	3 g Chromegabond NH2, 25-40 µ
400550	3 g Chromegabond CN, 25-40 µ

*Please call for other types of packing material

Silica Saturator Column Kit

A Silica Saturation Column is a means to saturate your alkaline mobile phase with silicate ions prior to entering an analytical or preparative column. Only your mobile phase, not your chromatography, will be affected since the saturator column is installed before the injector. Mobile phase saturation with silicate ions protects your analytical column from aggressive mobile phases. ES Industries offers as standard a 15 cm x 4.6 mm silica saturation column kit consisting of an empty column, 2 µ frits, and 10 grams of 40-63 µ silica for this purpose. However, there are applications where materials other than silica should be used. Please call for technical assistance.

Catalog Number	Description
300100S	Silica Saturator Column Kit
300101S	Empty Column 15 cm x 4.6 mm
300102S	2 µ Frit (2 ea.)
300103S	10 grams 40-63 µ Silica

HPLC Precolumn Filter

Protect your HPLC columns from particles that can increase back pressure and degrade a column. The ES Industries Precolumn Filter with replaceable frit offers a simple, convenient, and effective means of protection which will lengthen the life of your HPLC column. Available with either 0.5 or 2 µ stainless steel frit with a Kel-F® ring.

Catalog Number	Description
300010	Precolumn Filter with 2 µ frit (each)
300020	Precolumn Filter with 0.5 µ frit (each)
300011	Replaceable Frit (.062" dia.) (2 µ) (Pkg.10)
300021	Replaceable Frit (.062" dia.) (0.5 µ) (Pkg.10)
300022	Replaceable Frit (.094" dia.) (0.5 µ) (Pkg. 10)
300023	Precolumn Filter 2 µ frit (each) (Ultra-low dead volume)
300024	Precolumn Filter 0.5 µ frit (each) (Ultra-low dead volume)

Column Couplers

- Inexpensive
- Low dead volume
- No loss of column efficiency
- Fingertight

Low cost efficient method of attaching HPLC columns to guard columns, precolumn filters, etc.

Catalog Number	Description
ES9302	2 Fingertights, .007" I.D., 316SS tube
ES9303	2 Fingertights, .010" I.D., PEEK Tube

Universal Coupler

- Low dead volume
- For column to column connection
- Column to guard or prefilter

Universal coupler for small length connection, very handy and practical.

Catalog Number	Description
300106	Coupler, .005", PEEK Tube

316 Stainless Steel HPLC Frits

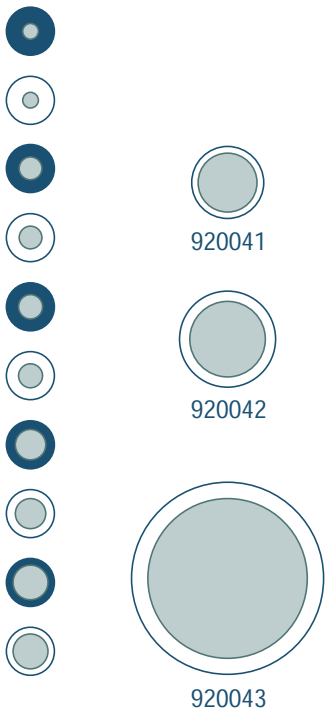
ES Industries offers the finest HPLC stainless steel frits available for a variety of column sizes and dimensions. These frits are available in both 0.5 micron and 2.0 micron porosity.

0.032" and 0.062" Thick Stainless Steel Frits with PEEK Sealing Rings

Catalog Number	Thickness (inches)	Column OD (inches)	Column ID (mm)	Frit (micron)
920021	0.032	.250	2.1	0.5
920022	0.062	.250	2.1	0.5
920023	0.032	.250	2.1	2.0
920024	0.062	.250	2.1	2.0
920025	0.032	.250	3.0	0.5
920026	0.062	.250	3.0	0.5
920027	0.032	.250	3.0	2.0
920028	0.062	.250	3.0	2.0
920029	0.032	.250	3.2	0.5
920030	0.062	.250	3.2	0.5
920031	0.032	.250	3.2	2.0
920032	0.062	.250	3.2	2.0
920033	0.032	.250	4.0	0.5
920034	0.062	.250	4.0	0.5
920035	0.032	.250	4.0	2.0
920036	0.062	.250	4.0	2.0
920037	0.032	.250	4.6	0.5
920038	0.062	.250	4.6	0.5
920039	0.032	.250	4.6	2.0
920040	0.062	.250	4.6	2.0
920041	0.062	.375	7.8	2.0
920042	0.062	.500	10.0	2.0
920043	0.062	1.000	21.1	2.0

Please inquire for all frit types available.

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.



920041

920042

920043

Biocompatible HPLC Frits

ES Industries offers biocompatible HPLC frits in two materials, PEEK and Titanium. These frits are available in both .5 µ and 2 µ porosity. Please inquire for a specific application need.

0.062" Thick PEEK Frits with PEEK Sealing Rings

Catalog Number	Column OD (inches)	Column ID (mm)	Frit Micron
920113	.250	2.1	0.5
920114	.250	2.1	2.0
920115	.250	3.0	0.5
920116	.250	3.0	2.0
920117	.250	4.6	0.5
920118	.250	4.6	2.0
920119	.750	10.0	2.0

Titanium Frits

Catalog Number	Column OD (inches)	Column ID (mm)	Frit Micron
920111	.250	4.6	2.0
920112	.250	3.2	2.0
920113	.250	2.1	2.0

Fingertight Fittings

ES Industries offers a variety of Fingertight fittings for different HPLC applications. They are used with any 1/16" female fittings, and do not crimp to tubing, which allow reuse of the Fingertight in any other fitting.

The universal Fingertight fittings are ideal for use at the inlet and outlet of a column. You can change a column without changing fittings, adding column adaptors, or cutting tubing.

Catalog Number	Material
930011	PEEK 10-32
930012	PEEK 10-32
930013	PEEK 10-32
930014	PEEK 10-32
930015	Kel-F® 10-32
930016	(X-long) PEEK 10-32
930017	(X-long) PEEK 10-32
930018	PEEK 10-32 w/PEEK Ferrule
930019	Delrin 10-32 w/PEEK Ferrule 1/16"
930020	PEEK
930021	Delrin 10-32
930022	Delrin 10-32
930023	Delrin Ex-Long 10-32

LC Connectors

- Adjust to any 10-32 port
- Void-free connections guaranteed
- Reduce column change over time
- Color-coded for easy identification of I.D. size
- Fingertight to 10,000 psi

LC connectors provide void-free, fingertight connections in all 10-32 ports, regardless of manufacturer. Precision-manufactured, these connectors guarantee connections to be leak-free at any pressure up to 10,000 psi.

Our single connector is recommended for use between the injector valve and column. Double connectors are recommended for column coupling or anywhere within the LC system where connections are frequently made.

Every connector is shipped assembled and included precut color-coded capillary tubing and the appropriate fittings.

Choose the right diameter for your application.

I.D. (inches)	Color	Application
0.007	Black	4.6 mm I.D. columns or smaller
0.010	Blue	Routine work
0.020	Yellow	Pre-injection, semi-prep, and prep

Single Connectors

Catalog Number	Description
9376	6 cm x 0.007 I.D.
9371	10 cm x 0.007 I.D.
9372	20 cm x 0.007 I.D.
9373	30 cm x 0.007 I.D.
9316	6 cm x 0.010 I.D.
9311	10 cm x 0.010 I.D.
9312	20 cm x 0.010 I.D.
9313	30 cm x 0.010 I.D.
9326	6 cm x 0.020 I.D.
9321	10 cm x 0.020 I.D.
9322	20 cm x 0.020 I.D.
9323	30 cm x 0.020 I.D.

LC Connectors

Catalog Number	Description
9476	6 cm x 0.007 I.D.
9471	10 cm x 0.007 I.D.
9472	20 cm x 0.007 I.D.
9473	30 cm x 0.007 I.D.
9416	6 cm x 0.010 I.D.
9411	10 cm x 0.010 I.D.
9412	20 cm x 0.010 I.D.
9413	30 cm x 0.010 I.D.
9426	6 cm x 0.020 I.D.
9421	10 cm x 0.020 I.D.
9422	20 cm x 0.020 I.D.
9423	30 cm x 0.020 I.D.

Spare Parts

Catalog Number	Description
9130-F	Vespel ferrule
9130-B	Compression nut
9130-N	Locking nut

Note: Connectors can be supplied with PEEK ring on compression nut.
Call customer service for more information.

All dimensions and lengths available for microbore 1.0 mm, semi-preparative, preparative, specialty sizes, and threaded modular column, please refer to page 5.

USP Column Specification Listing and Index

	USP Packings	ES Industries Equivalent Column	Page
L1	Octadecyl silane chemically bonded to porous silica or ceramic microparticles, 3 to 10 µ in diameter	Chromegabond® WR-C18	7
L3	Porous silica microparticles, 5 to 10 µ in diameter	Chromegasphere	43
L7	Octyl silane chemically bonded to totally porous silica gel support, 10 µ in diameter	Chromegabond WR-C8	7
L8	An essentially monomolecular layer of aminoproply-silane chemically bonded to totally porous silica gel support, 10 µ in diameter	Chromegabond Amino	25
L9	10 µ irregular totally porous silica gel having a chemically bonded, strongly acidic cation exchange coating	Chromegabond P-SCX	37
L10	Nitrile groups chemically bonded to porous silica microparticles, 3 to 10 µ in diameter	Chromegabond CN	24
L11	Phenyl groups chemically bonded to porous silica microparticles, 5 to 10 µ in diameter	Chromegabond P-BD	23
L13	Trimethylsilane chemically bonded to porous silica microparticles, 3 to 10 µ in diameter.	Chromegabond C1	18
L14	Silica gel, 10 µ in diameter, having a chemically bonded, strongly basic quaternary ammonium anion exchange coating.	Chromegabond SAX	37
L15	Hexyl silane chemically bonded to totally porous silica particles, 3 to 10 µ in diameter.	Chromegabond C6	19
L16	Dimethyl silane chemically bonded to totally porous silica particles, 5 to 10 µ in diameter.	Chromegabond C2	18
L18	Amino and cyano groups chemically bonded to porous silica particles, 5 to 10 µ in diameter.	Chromegabond A/CN	42
L20	Dihydroxypropane groups chemically bonded to porous silica particles, 5 to 10 µ in diameter.	Chromegabond Diol	24
L26	Butyl silane chemically bonded to totally porous silica particles, 5 to 10 µ in diameter.	Chromegabond C4	19
L28	A multifunctional support, which consists of a high purity, 100 A, spherical silica substrate that has been bonded with anionic (amine) functionally in addition to a conventional reversed phase C8 functionality.	ProTec C8	11
L29	Gamma alumina, reversed phase, low carbon percentage by weight, alumina-based polybutadiene spherical particles, 5 µ diameter with a pore diameter of 80 A.	Gammabond™ ARP-1	32
L30	Ethyl silane chemically bonded to a totally porous silica particle, 3 to 10 µ in diameter.	Chromegabond C2-E	18

ES INDUSTRIES

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