



HICHROM

Chromatography Columns and Supplies

LC COLUMNS
ES Industries

Catalogue 9

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ES Industries, based in the north-east of the USA, have been manufacturing HPLC columns for over 30 years. A number of their more popular products are discussed.

Epic®

- Ultra high purity spherical silica
- High density bonding
- Microbore to preparative dimensions

Epic® is ES Industries' newest range of HPLC columns, based on high density bonded monomeric phases produced through a proprietary bonding process. The Epic series is compatible with a wide range of organic modifiers and buffers and stable over a wide pH range.

Whereas the Epic C18-MS phase is specifically designed for LC-MS, Epic C18-SD is a super dense, highly hydrophobic and exceptionally inert phase for the analysis of both acids and bases. Epic Polar can be used with 100% aqueous eluents and is suitable for the analysis of polar analytes.

Epic Phases

Epic Phase	Particle Size (µm)	Pore Size (Å)	Surface Area (m ² /g)	Carbon Load (%)	pH Range
C8	1.8, 3, 5, 10	120	230	10	1 - 10
C18	1.8, 3, 5, 10	120	230	18	1 - 10
C18-MS	1.8, 3, 5, 10	120	350	22	1 - 10
C18-SD	1.8, 3, 5, 10	120	350	24	1 - 10
C4-SD	1.8, 3, 5, 10	120	350	8	1 - 10
Polar	1.8, 3, 5, 10	120	230	18	1 - 10
PFP-LB	1.8, 3, 5, 10	120	230	N/A	1 - 10
FO-LB	1.8, 3, 5, 10	120	230	N/A	1 - 10
HILIC-HC	1.8, 3, 5, 10	120	350	N/A	1 - 10
Phenyl-Hexyl	1.8, 3, 5, 10	120	350	17	1.5 - 10
SCX	1.8, 3, 5, 10	120	230	N/A	1 - 10

The **Epic PFP-LB** phase is bonded with pentafluorophenyl groups and is ideal for LC-MS, due to low bleed and stabilised baseline. It is suitable for the separation of aromatics, polar compounds, halogenated compounds, isomers and natural products.

The **Epic FO-LB** is a similarly baseline stabilised, alkyl perfluorinated C8 phase, which is well suited to the analysis of halogenated analytes and lipophilic compounds.

Epic HILIC-HC (High Capacity) is designed for the LC-MS analysis of polar compounds. It is composed of a polyhydroxylated polymer, coated and bound to silica. This composition provides hydroxyl levels that are well above conventional diol type stationary phases. Figure 1 illustrates the retention of uracil and cytosine on this HILIC column.

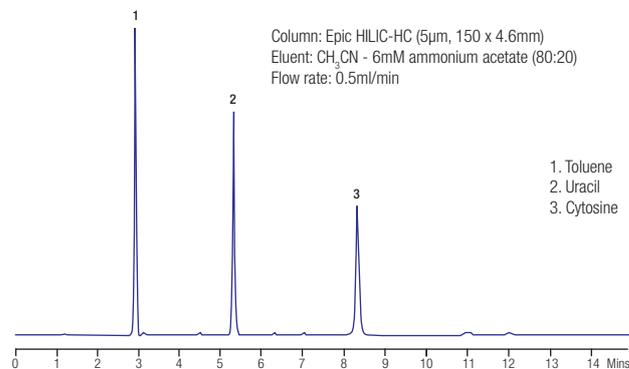


Figure 1. Epic HILIC-HC for retention of uracil and cytosine

Ordering Information

5µm Epic Phase ¹	Column Dimensions ² (mm)				Guard Cartridges ³ (5/pk)
	50 x 4.6	100 x 4.6	150 x 4.6	250 x 4.6	
	£287	£305	£335	£364	£221
C8	115291-EC8	125291-EC8	135291-EC8	155291-EC8	300101-EC8
C18	115291-EC18	125291-EC18	135291-EC18	155291-EC18	300101-EC18
C18-MS	115291-EC18-MS	125291-EC18-MS	135291-EC18-MS	155291-EC18-MS	300101-EC18-MS
C18-SD	115291-EC18-SD	125291-EC18-SD	135291-EC18-SD	155291-EC18-SD	300101-EC18-SD
C4-SD	115291-EC4-SD	125291-EC4-SD	135291-EC4-SD	155291-EC4-SD	300101-EC4-SD (POA)
Polar	115291-EPO	125291-EPO	135291-EPO	155291-EPO	300101-EPO
PFP-LB	115291-EPFP-LB	125291-EPFP-LB	135291-EPFP-LB	155291-EPFP-LB	300101-EPFP-LB
FO-LB	115291-EFO-LB	125291-EFO-LB	135291-EFO-LB	155291-EFO-LB	300101-EFO-LB
HILIC-HC	115291-EHIC	125291-EHIC	135291-EHIC	155291-EHIC	300101-EHIC
Phenyl-Hexyl	115291-EPHX	125291-EPHX	135291-EPHX	155291-EPHX	300101-EPHX (POA)
SCX	115291-ESCX (POA)	125291-ESCX (POA)	135291-ESCX (POA)	155291-ESCX (POA)	300101-ESCX (POA)

¹ Other particle sizes available

² Other column dimensions available

³ Use with guard cartridge holder 300100 (E87) and column coupler 300106 (E92)

Please contact Hichrom for ordering information for alternative particle sizes or column dimensions.

AquaSep™

- Separates polar compounds with 100% aqueous eluents
- Rapid re-equilibration with gradients (0-100%)
- No ion-pairing reagents required
- Patented single step bonding

AquaSep Phase

Particle Size (µm)	3, 5
Pore Size (Å)	100
Surface Area (m ² /g)	450
Carbon Load (%)	16
pH Range	2 - 8

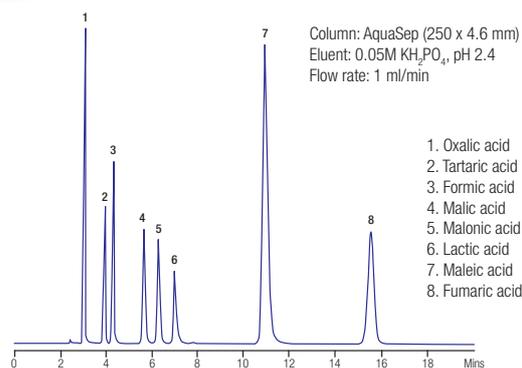


Figure 2. Separation of organic acids

AquaSep™ was developed using patented technology for use with high aqueous content eluents. In order to obtain high aqueous stability and maximum hydrophobic interaction, AquaSep contains an ether linkage near the point of attachment to the silica base. This allows water to penetrate the surface and prevents 'phase collapse'. AquaSep can retain highly water soluble compounds such as small organic acids (Figure 2).

Ordering Information¹

AquaSep Particle Size (µm)	Length (mm)	Internal Diameter ² (mm)			Price
		2.0	3.2	4.6	
3	50	112121-AQS	11d121-AQS	115121-AQS	£305
3	100	122121-AQS	12d121-AQS	125121-AQS	£335
3	150	132121-AQS	13d121-AQS	135121-AQS	£364
5	50	112221-AQS	11d221-AQS	115221-AQS	£287
5	100	122221-AQS	12d221-AQS	125221-AQS	£305
5	150	132221-AQS	13d221-AQS	135221-AQS	£335
5	250	152221-AQS	15d221-AQS	155221-AQS	£364

¹ Other dimensions available

² Use with guard cartridge 300101-AQS (£221), guard cartridge holder 300100 (£87) and column coupler 300106 (£92)

FluoroSep™-RP

FluoroSep™-RP is a family of reversed-phase fluorinated ligands bonded to high efficiency silica. FluoroSep-RP columns may be used with all reversed-phase eluents, buffers and ion-pairing reagents. The phases are stable from pH 2 to 8 and may be heated to 80°C. Three phases are available. The wide pore 300Å FluoroSep-RP Propyl is suitable for the separation of proteins and peptides.

FluoroSep-RP Phases

Phase	Functional Group	Particle Size (µm)	Pore Size (Å)	Surface Area (m ² /g)	pH Range
Phenyl (FSP)	Pentafluorophenyl	3, 5	60	350 (FSP), 450 (FSP/HS)	2 - 8
Octyl (FO)	Perfluorooctyl	5	60	450	2 - 8
Propyl (FP)	Perfluoropropyl	5	300	120	2 - 8

FluoroSep-RP Phenyl (FSP) is used for the separation of closely related geometrical isomers, particularly aromatic compounds, halogenated compounds, conjugated systems and epimers. A high surface area FSP/HS material is also available.

FluoroSep-RP Octyl (FO) contains monomerically bonded perfluorooctyl groups and is used for many pharmaceutical separations. The fluorinated octyl shows retention similar to that of standard C8 phases, but with unique selectivity.

FluoroSep-RP Propyl (FP) is a short chain phase used for the separation of proteins, peptides and other related compounds. It is compatible with all standard buffers used in peptide work, including low TFA eluents.

Ordering Information

FluoroSep-RP Phase	Column Dimensions ¹ (mm)				Guard Cartridge ² (5/pkg) (10 x 3.2mm)
	50 x 4.6	100 x 4.6	150 x 4.6	250 x 4.6	
3µm	£305	£335	£364	-	£221
Phenyl	115111-FSP	125111-FSP	135111-FSP	-	300101-FSP
Phenyl/HS	115111-FSP/HS	125111-FSP/HS	135111-FSP/HS	-	300101-FSP/HS
5µm	£287	£305	£335	£364	£221
Phenyl	115211-FSP	125211-FSP	135211-FSP	155211-FSP	300101-FSP
Phenyl/HS	115211-FSP/HS	125211-FSP/HS	135211-FSP/HS	155211-FSP/HS	300101-FSP/HS
	£291	£309	£338	£368	-
Octyl	115211-FO	125211-FO	135211-FO	155211-FO	-
Propyl	115231-FP	125231-FP	135231-FP	155231-FP	-

¹ Other dimensions available

² Use with guard cartridge holder 300100 (£87) and column coupler 300106 (£92)

GammaBond™ Alumina

- Spherical porous alumina core
- Stable from pH 1.3 to 12
- Unique selectivity
- GammaBond RP-1 used for USP method L29

GammaBond™ Alumina is a family of exceptionally stable alumina-based HPLC columns designed to provide high efficiency and unique selectivity for extreme pH applications.

GammaBond Phase	Particle Shape and Size	Particle Size (µm)	Pore Size (Å)	pH Range
Alumina	Spherical alumina	5	130	1.3 - 12
RP-1	Spherical alumina	5	80	1.3 - 12

GammaBond Alumina is manufactured by bonding a polymer to a highly stable porous spherical 5µm 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 eluent from pH 1.3 to pH 12, and any desired buffer system or additive. GammaBond RP-1 is a low load polybutadiene coated alumina, which exhibits both reversed-phase and ion-exchange characteristics, a useful combination in many separations. This phase is used for USP method L29.

Ordering Information

GammaBond Phase	Column Length (mm)	Internal Diameter ¹ (mm)			Price
		2.0	3.2	4.6	
Alumina	50	112281-AL	11d281-AL	115281-AL	£338
Alumina	100	122281-AL	12d281-AL	125281-AL	£357
Alumina	150	132281-AL	13d281-AL	135281-AL	£390
Alumina	250	152281-AL	15d281-AL	155281-AL	£427
Alumina RP-1	50	112271-ARP1	11d271-ARP1	115271-ARP1	£480
Alumina RP-1	100	122271-ARP1	12d271-ARP1	125271-ARP1	£597
Alumina RP-1	150	132271-ARP1	13d271-ARP1	135271-ARP1	£688
Alumina RP-1	250	152271-ARP1	15d271-ARP1	155271-ARP1	£778

¹ Other dimensions available

Chromegabond®

Chromegabond® columns manufactured by ES Industries constitute a wide range of bonded phases, some being exclusive to ES Industries. Spherical porous silica supports are available in 3, 5 or 10µm particle sizes with pore diameters ranging from 60 to 1000Å. A selection of the available phases is summarised below, with ordering information for 250 x 4.6mm i.d. columns. Please contact Hichrom for details of additional phases and for ordering information for alternative dimension columns.

Chromegabond Phase (5µm)				Chromegabond Phase (5µm)			
Code	Description	Ordering Information ²		Code	Description	Ordering Information ²	
		Catalogue No.	Price			Catalogue No.	Price
BAS-C18	Octadecyl	155291-BAS-C18	£364	CN-BD	Diisopropyl Cyano	155211-CN-BD	£327
BAS-C8	Octyl	155291-BAS-C8	£364	CN-HS	CN with higher surface area	155211-CN/HS	£327
BAS-CN	Cyano	155291-BAS-CN	£364	C18-AI	C18 with amide linkage	155211-C18-AI	£327
BAS-P	Phenyl	155291-BAS-P	£364	D/RP	Diol for RP	155221-D/RP ¹	£327
HC-C18	Dense C18	155221-HC-C18	£364	A/RP	Amino for RP	155221-A/RP ¹	£327
TMS	C1	155211-TMS	£302	DA/RP	Diamine for RP	155211-DA/RP	£327
C2	Dimethyl	155211-C2	£302	TA/RP	Triamine for RP	155211-TA/RP	£327
C4	n-Butyl	155211-C4	£302	PSC	C8/C18	155221-PSC	£364
C6	n-Hexyl	155211-C6	£302	C22	C22	155221-C22	£364
MC-CC6	Cyclohexyl, endcapped	155211-MC-CC6	£342	LS	Fluorinated C18	155201-LS	£364
C8	Octyl, non-endcapped	155221-C8	£302	LS/HS	Fluorinated C18	155221-LS/HS	£364
C18	Octadecyl, non-endcapped	155221-C18	£302	ODS-PI	Polar embedded C18	155291-ODS-PI	£364
MC18	Octadecyl, endcapped	155221-MC18 ¹	£302	NPI	Monoalcohol – for natural product isolation	155211-NPI	£412
WC18E	Octadecyl	155271-WC18E	POA	NO2	Nitro	155221-NO2	£327
AP	Alkyl Phenyl	155221-AP ¹	£302	A/CN	Mixed amino/cyano	155211-A/CN	£327
C8-BD	Diisopropyl C8	155211-C8-BD	£327	RingSep	For petroleum product applications	155211-RS	£595
C18-BD	Diisopropyl C18	155211-C18-BD	£327	DNAP	For petroleum product applications	155211-DNAP	£522
P-BD	Diisopropyl Phenyl	155211-P-BD	£327	Silver/SI	For petroleum product applications	155211-AG/SI	£327

¹ 100Å pore size – other pore sizes available

² Ordering information is for 250 x 4.6mm i.d. columns. Other dimensions available. Please enquire for details

ES Industries SFC Columns

ES Industries offer a range of phases specifically designed for SFC separations. These GreenSep™ phases have proved to show superior separation, selectivity, peak shape and loading capacity compared to conventional normal-phase HPLC materials adapted for SFC (eg. amino, cyano, diol). The general features and ordering information for 250 x 4.6mm i.d. columns are highlighted below. All of these materials are also available in semi-preparative (10mm and 15mm i.d.) and preparative (20mm, 30mm and 50mm i.d.) dimensions. ES Industries also offer a range of Chromegabond® SFC phases, including Amine HD, Cyano HS and Diol HD.

Phase (5µm)	Pore Size (Å)	Features	Ordering Information (250 x 4.6mm) ¹	
			Catalogue No.	Price
GreenSep™ Phase				
Ethylpyridine	120	Good for strongly basic compounds without use of additives	155291-GS-PYE	£393
Amino Phenyl	120	Normal phase mixed mode. Separation of amines, alcohols and acids without use of additives	155291-GS-APH	£393
Nitro	120	Useful for separation of geometrical isomers and diastereomers, also compounds containing aromatic groups, polarisable electrons and conjugate systems. Strong charge transfer mechanism	155291-GS-N02	£393
Pyridyl Amide	120	Separation of compounds functionalized with both amine bases and acidic groups. Does not require addition of TFA or amine modifier	155291-GS-PYA	£393
DEAP (Diethylaminopropyl)	120	Shows greater selectivity, superior peak shapes and increased loading capacity than conventional amino phases. Amine additives not required	155291-GS-DEAP	£393
PFP	120	Separation of geometrical isomers and diastereomers. Recommended for compounds containing aromatic groups, polarisable electrons and conjugate systems. Also suitable for halogenated compounds	155291-GS-PFP	£393
Basic	120	Based on imidazole chemistry. Good retention of amine-containing basic compounds	155291-GS-BC	£393
Silica	120	Ultra high purity silica specifically designed for SFC	155291-GS-SI	£393
Chromegabond® Phase				
Amine HD	100	High loading for preparative applications	155221-A/HD-SFC	£357
Cyano HS	60	High surface area and high loading capacity	155211-CN/HS-SFC	£357
Diol HD	60	High density diol bonding for high loading capacity	155211-D/HD-SFC	POA

¹ Other dimensions available

GreenSep Guard Column System

GreenSep GCS is a new guard column system developed specifically for use with preparative SFC columns. Hardware specially designed for SFC is employed and is packaged with a high performance coupler for attachment to the SFC column. GreenSep GCS is packed with highly deactivated, high performance silica particles and is designed to maintain the chromatographic integrity of the system. Four sizes are available, depending on the diameter of the preparative column. Please enquire with Hichrom for ordering details.

Column: GreenSep Ethylpyridine (5µm, 150 x 4.6mm)
Eluent: 5-50% Gradient CO₂:CH₃OH
Flow rate: 2.35ml/min
Temperature: 35°C

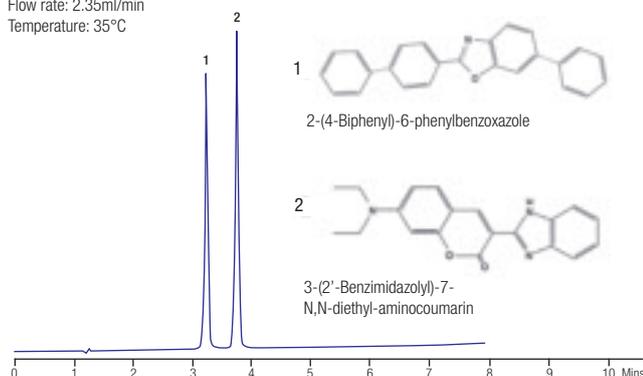


Figure 3. SFC of basic compounds

Column: GreenSep Pyridyl Amide (5µm, 150 x 4.6mm)
Eluent: 5-50% Gradient CO₂:CH₃OH
Flow rate: 2.35ml/min
Temperature: 35°C

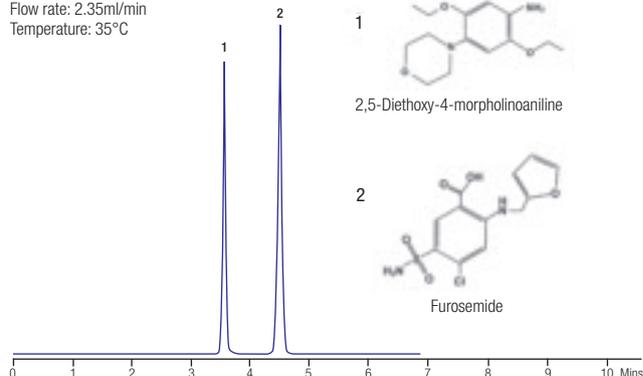


Figure 4. SFC of basic and acidic compounds