



**Thermo Scientific**  
Chromatography Columns  
and Consumables 2014-2015

Your world of  
**chromatography**

**Thermo**  
SCIENTIFIC

# predictability



## LC Columns and Accessories

As a leader in LC column technology including silica, polymer and porous graphitic carbon manufacturing, bonded phase production and column packing for over 35 years, you can rely on the quality of Thermo Scientific HPLC products. Here we showcase our latest and most comprehensive range of innovative columns, accessories and equipment for fast LC, analytical HPLC and biomolecule separations.

## Section Contents

Introduction . . . . .	<b>4-001</b>	LC Accessories . . . . .	<b>4-158</b>
Column Selection . . . . .	<b>4-002</b>	LC Equipment . . . . .	<b>4-186</b>
Column Protection . . . . .	<b>4-016</b>	LC Reagents . . . . .	<b>4-193</b>
Columns for Fast and Analytical LC . . . . .	<b>4-022</b>	LC and LC-MS Instrument Parts . . . . .	<b>4-209</b>
Columns for Biomolecules . . . . .	<b>4-110</b>	Technical Information . . . . .	<b>4-231</b>

## Featured Products

### Accucore Columns

Ultimate core performance - speed and selectivity combined

» **PAGE 4-042**



### Synchronis Columns

Consistent, reproducible separations, column after column, time after time

» **PAGE 4-074**



### Hypersil GOLD Columns

Outstanding peak shape for your separations

» **PAGE 4-024**



### MABPac Columns

Unrivalled resolution and efficiency in the analysis of protein variants

» **PAGE 4-126**



### Acclaim PepMap Columns

The standard for peptide separations in proteomics

» **PAGE 4-149**



### Viper Connectors

Simple, dead volume free plumbing of HPLC and UHPLC systems

» **PAGE 4-158**





# LC Column Selection

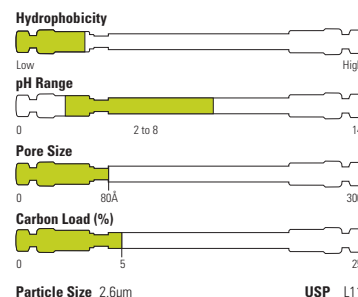
Information in the following section will help you make an informed decision on the appropriate HPLC column for your application, based on stationary phase use, analyte properties, LC-MS requirements or USP specifications. You will also find a useful table of Thermo Scientific phases with specifications, as well as recommended Thermo Scientific alternatives for other popular columns.

Refer to the **Advanced User Graphic (AUG)** on the corresponding product page (illustrated to the right) for more help and information on general purpose column selection.

The AUG will show you Hydrophobicity which gives the relative retention on the column. Generally, the higher the hydrophobicity, the greater the retention of neutral compounds and the higher the organic content in the mobile phase. A lower value indicates a need for higher aqueous mobile phases to achieve comparable retention and resolution. The recommended pH Range for the column is illustrated, outside of which column lifetimes will diminish.

The Pore Size is shown, with larger pore size columns being more applicable to larger analytes such as proteins or peptides. The percentage Carbon Load is related to the hydrophobicity. Below the icon, you will see the particle sizes available, as well as the USP code. These graphics are designed to allow you to quickly compare the main characteristics of multiple stationary phases, allowing you to choose quickly the most appropriate stationary phase for your analysis.

For additional help in column selection, please see the back cover to contact our expert Technical Support and tap into our expertise to help make the best choice for your application.



Advanced User Graphic (AUG)

## Common HPLC Phases and Their Uses

Common Name	Alternative Name	Functional Group	Normal Phase	Reverse Phase	Ion Exchange	HILIC	Application
Silica	Silica	-OH	•			•	Non-polar and moderately polar organic compounds.
C1	SAS	-(CH <sub>3</sub> ) <sub>3</sub>		•			Least retentive of all alkyl group bonded phases for non-polar solutes. Typically used for moderately polar and multi-functional compounds.
C4	Butyl	-C <sub>4</sub> H <sub>9</sub>		•			Shorter retention than C8, C18. Separation of peptides and proteins.
C8	MOS	-C <sub>8</sub> H <sub>17</sub>		•			Less retentive than C18; normally used for small peptides and proteins, pharmaceuticals, steroids, environmental samples.
C18	ODS	-C <sub>18</sub> H <sub>37</sub>		•			Most retentive of the alkyl-bonded phases. Used widely for pharmaceuticals, steroids, fatty acids, phthalates, environmental etc.
Cyano	CPS, CN	-(CH <sub>2</sub> ) <sub>3</sub> CN	•	•			Unique selectivity for polar compounds, more suitable than base silica for normal phase gradient separations. When used in reversed phase, the selectivity is different to that of the C8 and C18 phases. Useful for a wide range of pharmaceutical applications and for mixtures of very different solutes.
Amino	APS	-(CH <sub>2</sub> ) <sub>3</sub> NH <sub>2</sub>	•	•	•	•	<b>HILIC:</b> Carbohydrate analysis and other polar compounds. <b>Weak anion exchange:</b> anions and organic acids. <b>Normal Phase:</b> Alternative selectivity to silica. Good for aromatics.
Phenyl		-(CH <sub>2</sub> ) <sub>2</sub> C <sub>6</sub> H <sub>5</sub>		•			Aromatic compounds and moderately polar compounds.
Pentafluorophenyl	PFP	-C <sub>6</sub> F <sub>5</sub>		•			Extra selectivity and retention for halogenated, polar compounds and isomers.
Diol		-(CH <sub>2</sub> ) <sub>20</sub> CH <sub>2</sub> (CH <sub>2</sub> OH) <sub>2</sub>	•	•		•	<b>Reversed Phase:</b> Proteins, peptides. <b>Normal Phase:</b> Similar selectivity to silica, but less polar.
SCX	Strong Cation Exchanger	-RSO <sub>3</sub> H-			•		Organic bases.
SAX	Strong Anion Exchanger	-RN+(CH <sub>3</sub> ) <sub>3</sub>			•		Organic acids, nucleotides and nucleosides.
AX	Anion Exchanger Polyethyleneimine (PEI)	-(CH <sub>2</sub> CH <sub>2</sub> NH) <sub>n</sub>			•		Organic acids, nucleotides and oligonucleotides.
Porous graphitic carbon	PGC	100% carbon	•	•			Particularly useful for the separation of highly polar compounds that are difficult to retain using conventional silica based columns; separation of structurally similar compounds (e.g., isomers, diastereoisomers).



# HPLC Stationary Phase Column Selection

Before beginning a new analysis, consider the physical and chemical properties of the analyte(s), the mode of analysis and how the analyte(s) will interact with the surface of the chromatographic phase. To aid column selection, the following guide may be useful.

## Non-polar

Analyte Solubility	Analyte Chemical Properties		Mode of Separation	Recommended Phase	
Polar solvents	Acidic	$pK_a > 2$	Anion exchange / Reversed-phase mixed mode	Acclaim Mixed-Mode WAX-1	4-069
				Acclaim Trinity P1	4-091
	Neutral	Non-polar	Reversed phase	Accucore C18	4-045
				Accucore RP-MS	4-044
				Accucore C8	4-046
				Accucore C30	4-052
				Accucore Phenyl-Hexyl	4-049
				Acclaim 120 C18	4-061
				Acclaim 120 C8	4-062
				Acclaim C30	4-064
				Acclaim Phenyl-1	4-063
				Hypersil GOLD	4-026
				Hypersil GOLD C8	4-027
				Hypersil GOLD C4	4-028
	Synchronis C18	4-075			
	Synchronis C8	4-076			
	Moderately-polar		Reversed phase	Accucore aQ	4-047
				Accucore Polar Premium	4-048
				Accucore PFP	4-051
				Accucore Phenyl-X	4-050
Acclaim PolarAdvantage				4-065	
Acclaim PolarAdvantage II				4-066	
Hypersil GOLD aQ				4-029	
Hypersil GOLD PFP				4-030	
Basic	$pK_a < 10$	Reversed phase	Accucore C18	4-045	
			Accucore RP-MS	4-044	
			Accucore C8	4-046	
			Accucore C30	4-052	
			Accucore Phenyl-Hexyl	4-049	
			Acclaim 120 C18	4-061	
			Acclaim 120 C8	4-062	
			Acclaim C30	4-064	
			Acclaim Phenyl-1	4-063	
			Hypersil GOLD	4-026	
Hypersil GOLD C8	4-027				
Hypersil GOLD C4	4-028				
Synchronis C18	4-075				
Synchronis C8	4-076				
		Cation exchange / Reversed-phase mixed mode	Acclaim Mixed-Mode WCX-1	4-070	
			Acclaim Trinity P1	4-091	

## HPLC Stationary Phase Column Selection *continued*

Polar				
Analyte Solubility	Analyte Chemical Properties		Mode of Separation	Recommended Phase
Polar solvents	Acidic	$pK_a < 2$	Polar retention effect on graphite	Hypercarb <b>4-084</b>
			Anion exchange	Hypersil GOLD AX <b>4-034</b> Hypersil GOLD SAX <b>4-035</b>
			HILIC	Accucore Urea-HILIC <b>4-054</b>
				Accucore 150-Amide-HILIC <b>4-146</b>
				Acclaim HILIC-10 <b>4-067</b> Synchronis HILIC <b>4-081</b>
			Neutral	
	HILIC	Accucore HILIC <b>4-053</b>		
		Acclaim Mixed-Mode HILIC-1 <b>4-068</b>		
		Acclaim Mixed-Mode WAX-1 <b>4-069</b>		
		Acclaim Mixed-Mode WCX-1 <b>4-070</b>		
		Acclaim Trinity P1 <b>4-091</b> Hypersil GOLD Amino <b>4-033</b> Hypersil GOLD HILIC <b>4-037</b> Synchronis Amino <b>4-079</b> Synchronis HILIC <b>4-081</b>		
	Basic	$pK_a > 10$	Polar retention effect on graphite	Hypercarb <b>4-084</b>
Cation exchange			Acclaim Mixed-Mode WCX-1 <b>4-070</b> Acclaim Trinity P1 <b>4-091</b>	
HILIC			Accucore Urea-HILIC <b>4-054</b>	
			Accucore 150-Amide-HILIC <b>4-146</b>	
			Acclaim HILIC-10 <b>4-067</b> Synchronis HILIC <b>4-081</b>	
Non-polar solvents				Normal phase
	Hypersil GOLD CN <b>4-032</b>			
	Hypersil GOLD Silica <b>4-036</b>			
	Synchronis Amino <b>4-079</b>			
	Synchronis Silica <b>4-080</b>			

The above table recommends columns for the separation of small molecule analytes. Column recommendations for the separation of biomolecules can be found in the table on page **4-111**

## Column Format Selection for LC-MS

The Thermo Scientific range offers a broad array of column designs and stationary phases optimized for LC-MS applications. Use the following table to help you choose your column format to best meet your application needs. A variety of HPLC column hardware configurations are available, designed to give superior results for high speed, high sensitivity, high efficiency and convenience. A wide range of particle and monolithic stationary phases allows choices for optimized selectivity.

### Column Hardware Selection for LC-MS

LC-MS Application	Column Hardware Design	Description
High throughput analysis	Javelin HTS columns	Direct-connection columns Slim design, 20mm length, 1mm to 4.6mm ID
High sensitivity analysis	Acclaim PepMap nano, capillary and micro columns	Nano, capillary and micro columns 0.075mm to 1mm ID; 50 to 250mm length nanoViper format offers fingertight dead volume free connection to 1000 bar
Proteomics analysis	EASY-Spray columns	Combined column/emitter design with nanoViper connection. Heated flexible silica columns 50µm and 75µm ID; 150 to 500mm length
	Acclaim PepMap nano columns, Accucore nano columns, nanoViper	nanoViper offers fingertight dead volume free connection to 1000 bar Flexible silica columns 50µm and 75µm ID; 50 to 500mm length Trap column 20mm x 100µm ID
	Acclaim PepMap nano columns, classic	Flexible silica columns 50µm and 75µm ID; 50 to 500mm length Trap column 20mm x 100µm ID
	EASY-Column	Flexible silica columns 100mm x 75µm Trap column 20mm x 100µm ID
	PepSwift monolithic columns	Flexible fused silica columns, nanoViper connections 100µm to 500µm ID, 50 to 250mm length Trap columns 5mm x 200µm ID

Various HPLC columns, throughout this LC section, can also be used for LC-MS application. Typical flow rates and MS source compatibility for these columns are shown in the table on the next page





## Column Selection for LC-MS *continued*

### Packed column selection for LC-MS

Analyte Molecular Weight	Sample Polarity	Interface Ionization	Relative Sensitivity	Column ID (mm)	Flow Rate (µL/min)	Column Hardware	
< 1000 Da	Low	APCI	Low	4.6, 4.0, 3.0	2000 – 200	Javelin HTS, Analytical	
			High	2.1, 1.0	200 – 50	Analytical, Javelin HTS	
	Medium	APCI	Low	4.6, 4.0, 3.0	2000 – 200	Javelin HTS, Analytical	
			High	2.1, 1.0	200 – 50	Analytical, Javelin HTS	
		ESI	Low	2.1, 1.0	200 – 50	Analytical, Javelin HTS	
			High	1.0 – 0.3 0.2 – 0.05	50 – 5 2 – 0.2	Acclaim PepMap (RSLC) capillary and micro EASY-Spray column, EASY-Column, Acclaim PepMap (RSLC) nano, Accucore nano	
	High (or ionizable)	ESI	Low	2.1, 1.0	200 – 50	Analytical, Javelin HTS	
			High	1.0 – 0.3 0.2 – 0.05	50 – 5 2 – 0.2	Acclaim PepMap (RSLC) capillary and micro EASY-Spray column, EASY-Column, Acclaim PepMap (RSLC) nano, Accucore nano	
		> 1000 Da	ESI	Low	2.1, 1.0	200 – 50	Analytical, Javelin HTS
				High	1.0 – 0.3 0.2 – 0.05	50 – 5 2 – 0.2	Acclaim PepMap (RSLC) capillary and micro EASY-Spray column, EASY-Column, Acclaim PepMap (RSLC) nano, Accucore nano

### Monolith columns for LC-MS

Analyte Molecular Weight	Column ID (mm)	Flow Rate (µL/min)	Column Hardware
< 1000 Da	0.1, 0.2, 0.5	0.7 – 25	PepSwift Monolith
> 1000 Da	1.0	40 – 200	ProSwift Monolith

ProSwift is also available in larger IDs for high throughput applications.

## HPLC Column Selection by U.S. Pharmacopeia Specifications\*

USP Code	Description	Recommended Phase	Page
<b>L1</b>	Octadecyl silane (C18) chemically bonded to porous or ceramic microparticles, 1.5 to 10µm in diameter, or a monolithic rod	Acclaim 120 C18	<b>4-061</b>
		Acclaim 300 C18	<b>4-142</b>
		Accucore C18	<b>4-045</b>
		Accucore aQ	<b>4-047</b>
		Accucore 150-C18	<b>4-144</b>
		Accucore XL C18	<b>4-056</b>
		BioBasic 18	<b>4-140</b>
		Hypersil GOLD	<b>4-026</b>
		Hypersil GOLD aQ	<b>4-029</b>
		Acclaim PepMap 100 C18	<b>4-149</b>
		Synchronis C18	<b>4-075</b>
		Synchronis aQ	<b>4-077</b>
<b>L3</b>	Porous silica particles, 1.5 to 10µm in diameter, or a monolithic rod	Accucore HILIC	<b>4-053</b>
		Hypersil GOLD Silica	<b>4-036</b>
		Synchronis Silica	<b>4-080</b>
<b>L7</b>	Octyl silane chemically bonded to totally or superficially porous silica particles, 1.5 to 10µm in diameter, or a monolithic rod	Acclaim 120 C8	<b>4-061</b>
		Accucore C8	<b>4-046</b>
		Accucore XL C8	<b>4-057</b>
		BioBasic 8	<b>4-140</b>
		Hypersil GOLD C8	<b>4-027</b>
		Acclaim PepMap 100 C8	<b>4-150</b>
<b>L8</b>	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 1.5 to 10µm in diameter	Hypersil GOLD Amino	<b>4-033</b>
		Synchronis Amino	<b>4-079</b>
<b>L10</b>	Nitrile groups chemically bonded to porous silica particles, 1.5 to 10µm in diameter	Hypersil GOLD CN	<b>4-032</b>
<b>L11</b>	Phenyl groups chemically bonded to porous silica particles, 1.5 to 10µm in diameter	Accucore Phenyl-Hexyl	<b>4-049</b>
		Hypersil GOLD Phenyl	<b>4-031</b>
		Synchronis Phenyl	<b>4-078</b>
<b>L13</b>	Trimethylsilane chemically bonded to porous silica particles, 3 to 10µm in diameter	BETASIL C1	Inquire
		Hypersil SAS	<b>4-107</b>
<b>L14</b>	Silica gel having a chemically bonded, strongly basic quaternary ammonium anion exchange coating, 5 to 10µm in diameter	Hypersil GOLD SAX	<b>4-035</b>
		Hypersil SAX	<b>4-109</b>
<b>L15</b>	Hexylsilane (C6) chemically bonded to totally porous silica particles, 3 to 10µm in diameter	BETASIL C6	Inquire

HPLC Column Selection by U.S. Pharmacopeia Specifications\* *continued*

USP Code	Description	Recommended Phase	Page
<b>L17</b>	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 6 to 12µm in diameter	HyperREZ XP Carbohydrate H <sup>+</sup>	<b>4-156</b>
		HyperREZ XP Organic Acids	<b>4-156</b>
<b>L19</b>	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the calcium form, about 9µm in diameter	HyperREZ XP Carbohydrate Ca <sup>2+</sup>	<b>4-156</b>
		HyperREZ XP Sugar Alcohols	<b>4-156</b>
<b>L20</b>	Dihydroxypropane groups chemically bonded to porous silica or hybrid particles, 1.5 to 10µm in diameter	BETASIL Diol	Inquire
<b>L26</b>	Butyl silane chemically bonded to totally porous silica particles, 1.5 to 10µm in diameter	Accucore 150-C4	<b>4-145</b>
		BioBasic 4	<b>4-140</b>
		Hypersil GOLD C4	<b>4-028</b>
		Acclaim PepMap 300 C4	<b>4-149</b>
<b>L33</b>	Packing having the capacity to separate dextrans by molecular size over a range of 4,000 to 500,000 daltons. It is spherical, silica-based, and processed to provide pH stability	BioBasic SEC 120	<b>4-139</b>
		BioBasic SEC 300	<b>4-139</b>
		BioBasic SEC 1000	<b>4-139</b>
		MABPac SEC-1	<b>4-129</b>
<b>L34</b>	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the lead form, 7 to 9µm in diameter	HyperREZ XP Carbohydrate Pb <sup>2+</sup>	<b>4-156</b>
<b>L43</b>	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 1.5 to 10µm in diameter	Accucore PFP	<b>4-051</b>
		Hypersil GOLD PFP	<b>4-030</b>
<b>L46</b>	Polystyrene/divinylbenzene substrate agglomerated with quaternary amine functionalized latex beads about 9 to 11µm in diameter	OmniPac PAX-100	<b>4-103</b>
<b>L50</b>	Multifunction resin with reverse-phase retention and strong anion-exchange functionalities. The resin consists of ethylvinylbenzene, 55% cross-linked with divinylbenzene copolymer, 3 to 15µm in diameter, and a surface area of not less than 350m <sup>2</sup> per g. Substrate is coated with quaternary ammonium functionalized latex particles consisting of styrene cross-linked with divinylbenzene	OmniPac PAX-500	<b>4-103</b>
<b>L52</b>	A strong cation exchange resin made of porous silica with sulfopropyl groups 5 to 10µm in diameter	BioBasic SCX	<b>4-141</b>
<b>L58</b>	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the sodium form, about 6 to 30µm in diameter	HyperREZ XP Carbohydrate Na <sup>+</sup>	<b>4-156</b>
<b>L59</b>	Packing for the size exclusion separation of proteins (separation by molecular weight) over the range of 5 to 7,000 kDa. The packing is spherical, 1.5 to 10µm, silica or hybrid packing with a hydrophilic coating	BioBasic SEC 300 (5µm)	<b>4-139</b>
		MABPac SEC-1	<b>4-129</b>
<b>L60</b>	Spherical, porous silica gel, 10µm or less in diameter, the surface of which has been covalently modified with alkyl amide groups and endcapped	Acclaim PolarAdvantage	<b>4-065</b>
		Acclaim PolarAdvantage II	<b>4-066</b>
		Accucore Polar Premium	<b>4-048</b>
<b>L62</b>	C30 silane bonded phase on a fully porous spherical silica, 3 to 15µm in diameter	Acclaim C30	<b>4-064</b>
		Accucore C30	<b>4-052</b>
<b>L78</b>	A silane ligand that consists of both reversed-phase (an alkyl chain longer than C8) and anion-exchange (primary, secondary, tertiary or quaternary amino groups) functional groups chemically bonded to porous or non-porous or ceramic micro-particles, 1.0 to 50µm in diameter or a monolithic rod	Acclaim Mixed-Mode WAX-1	<b>4-069</b>

\*These are the recommended Thermo Scientific HPLC columns for various USP categories although other columns for each category are also available.



## Thermo Scientific HPLC Phases

The tables below list Thermo Scientific HPLC sorbents offered for small molecules separations.

For Thermo Scientific phases for the separations of biomolecules see page 4-112.

Please also refer to the Advanced User Graphic (AUG) for each HPLC phase on the pages indicated.

Phase	Particle Type	Particle Size (µm)	Pore Size (Å)	Nominal Surface Area (m <sup>2</sup> /g)	% Carbon	Endcapping	USP Code	Phase Code	Page
<b>Acclaim Phases</b>									
120 C18	Spherical, fully porous silica	2.2, 3, 5	120	300	18	Yes	L1	–	<b>4-061</b>
300 C18	Spherical, fully porous silica	3	300	100	8	Yes	L1	–	<b>4-142</b>
120 C8	Spherical, fully porous silica	2.2, 3, 5	120	300	11	Yes	L7	–	<b>4-062</b>
Phenyl-1	Spherical, fully porous silica	3	120	300	13	Yes	L11	–	<b>4-063</b>
C30	Spherical, fully porous silica	3, 5	200	200	13	Proprietary	L62	–	<b>4-064</b>
PA	Spherical, fully porous silica	2.2, 3, 5	120	300	16	Yes	L60	–	<b>4-065</b>
PA II	Spherical, fully porous silica	2.2, 3, 5	120	300	16	Yes	L60	–	<b>4-066</b>
HILIC-10	Spherical, fully porous silica	3	120	300	8	Yes	–	–	<b>4-067</b>
Trinity P1	Nano polymer silica hybrid	3	300	100	–	Proprietary	–	–	<b>4-091</b>
Trinity P2	Nano polymer silica hybrid	3	300	100	–	Proprietary	–	–	<b>4-092</b>
Trinity Q1	Nano polymer silica hybrid	3	300	300	–	Proprietary	–	–	<b>4-099</b>
Mixed Mode HILIC-1	Spherical, fully porous silica	3	120	300	–	Proprietary	–	–	<b>4-068</b>
Mixed Mode WAX-1	Spherical, fully porous silica	3, 5	120	300	–	Proprietary	–	–	<b>4-069</b>
Mixed Mode WCX-1	Spherical, fully porous silica	3, 5	120	300	–	Proprietary	L78	–	<b>4-070</b>
Organic Acid	Spherical, fully porous silica	3, 5	120	300	–	Yes	–	–	<b>4-093</b>
Surfactant	Spherical, fully porous silica	3, 5	120	300	–	Yes	–	–	<b>4-094</b>
Surfactant Plus	Spherical, fully porous silica	3, 5	120	300	–	Yes	–	–	<b>4-095</b>
Explosives	Spherical, fully porous silica	3, 5	120	300	–	Yes	–	–	<b>4-097</b>
Carbamate	Spherical, fully porous silica	3, 5	120	300	–	Yes	–	–	<b>4-100</b>
Carbonyl C18	Spherical, fully porous silica	2.2	120	300	–	Yes	–	–	<b>4-101</b>
SEC	Spherical, resin	5, 7	300	1000	–	–	–	–	<b>4-088</b>
<b>Accucore Phases</b>									
RP-MS	Spherical, solid core silica	2.6	80	130	7	Yes	–	176	<b>4-044</b>
C18	Spherical, solid core silica	2.6	80	130	9	Yes	L1	171	<b>4-045</b>
C8	Spherical, solid core silica	2.6	80	130	5	Yes	L7	172	<b>4-046</b>
aQ	Spherical, solid core silica	2.6	80	130	9	Polar	L1	173	<b>4-047</b>
Polar Premium	Spherical, solid core silica	2.6	150	90	8	Yes	L60	280	<b>4-048</b>
Phenyl-Hexyl	Spherical, solid core silica	2.6	80	130	5	Yes	L11	179	<b>4-049</b>
Phenyl-X	Spherical, solid core silica	2.6	80	130	6	Yes	–	279	<b>4-050</b>
PFP	Spherical, solid core silica	2.6	80	130	5	Yes	L43	174	<b>4-051</b>
C30	Spherical, solid core silica	2.6	150	90	5	Yes	L62	278	<b>4-052</b>
HILIC	Spherical, solid core silica	2.6	80	130	–	–	L3	175	<b>4-053</b>
Urea-HILIC	Spherical, solid core silica	2.6	80	130	–	–	–	277	<b>4-054</b>
<b>Accucore XL Phases</b>									
C18	Spherical, solid core silica	4	80	90	7	Yes	L1	741	<b>4-056</b>
C8	Spherical, solid core silica	4	80	90	4	Yes	L7	742	<b>4-057</b>

## Thermo Scientific HPLC Phases *continued*

Phase	Particle Type	Particle Size (µm)	Pore Size (Å)	Nominal Surface Area (m <sup>2</sup> /g)	% Carbon	Endcapping	USP Code	Phase Code	Page
<b>Hypercarb Phase</b>									
Hypercarb	Spherical, porous graphitic carbon	3, 5	250	120	100	–	–	350	<b>4-084</b>
<b>Hypersil Phases</b>									
ODS (C18)	Spherical, fully porous silica	3, 5	120	170	10	Yes	L1	301	<b>4-106</b>
ODS-2 (C18)	Spherical, fully porous silica	3, 5	80	220	11	Yes	L1	316	<b>4-107</b>
MOS (C8)	Spherical, fully porous silica	3, 5	120	170	6.5	No	L7	302	<b>4-107</b>
MOS-2 (C8)	Spherical, fully porous silica	5	120	170	6.5	Yes	L7	303	<b>4-107</b>
SAS (C1)	Spherical, fully porous silica	5	120	170	2.5	Yes	L13	305	<b>4-107</b>
Phenyl	Spherical, fully porous silica	5	120	170	5	No	L11	309	<b>4-108</b>
Phenyl-2	Spherical, fully porous silica	5	120	170	5	Yes	L11	319	<b>4-108</b>
CPS	Spherical, fully porous silica	3, 5	120	170	4	No	L10	308	<b>4-108</b>
CPS-2	Spherical, fully porous silica	5	120	170	4	Yes	L10	318	<b>4-108</b>
APS-2	Spherical, fully porous silica	3, 5	120	170	1.9	No	L8	307	<b>4-108</b>
Silica	Spherical, fully porous silica	3, 5	120	170	–	–	L3	300	<b>4-109</b>
SAX	Spherical, fully porous silica	5	120	170	2.5	Yes	L14	341	<b>4-109</b>
<b>Hypersil BDS Phases</b>									
C18	Spherical, fully porous silica	2.4, 3, 5	130	170	11	Yes	L1	281	<b>4-105</b>
C8	Spherical, fully porous silica	2.4, 3, 5	130	170	7	Yes	L7	282	<b>4-105</b>
Phenyl	Spherical, fully porous silica	3, 5	130	170	5	Yes	L11	289	<b>4-105</b>
Cyano	Spherical, fully porous silica	3, 5	130	170	4	Yes	L10	288	<b>4-105</b>
<b>Hypersil GOLD Phases</b>									
C18 selectivity	Spherical, fully porous silica	1.9, 3, 5, 12	175	220	10	Yes	L1	250	<b>4-026</b>
C8	Spherical, fully porous silica	1.9, 3, 5	175	220	8	Yes	L7	252	<b>4-027</b>
C4	Spherical, fully porous silica	1.9, 3, 5	175	220	5	Yes	L26	255	<b>4-028</b>
aQ	Spherical, fully porous silica	1.9, 3, 5	175	220	12	Polar	L1	253	<b>4-029</b>
PFP	Spherical, fully porous silica	1.9, 3, 5	175	220	8	Yes	L43	254	<b>4-030</b>
Phenyl	Spherical, fully porous silica	1.9, 3, 5	175	220	8.5	Yes	L11	259	<b>4-031</b>
CN (Cyano)	Spherical, fully porous silica	1.9, 3, 5	175	220	4	Yes	L10	258	<b>4-032</b>
Amino	Spherical, fully porous silica	1.9, 3, 5	175	220	2	Yes	L8	257	<b>4-033</b>
AX	Spherical, fully porous silica	1.9, 3, 5	175	220	6	No	–	261	<b>4-034</b>
SAX	Spherical, fully porous silica	1.9, 3, 5	175	220	2.5	Yes	L14	263	<b>4-035</b>
Silica	Spherical, fully porous silica	1.9, 3, 5	175	220	–	–	L3	251	<b>4-036</b>
HILIC	Spherical, fully porous silica	1.9, 3, 5	175	220	6	No	–	265	<b>4-037</b>
<b>Hypersil Green Phase</b>									
PAH	Spherical, fully porous silica	3, 5	120	170	13.5	Yes	–	311	<b>4-102</b>
<b>Synchronis Phases</b>									
C18	Spherical, fully porous silica	1.7, 3, 5	100	320	16	Yes	L1	971	<b>4-075</b>
C8	Spherical, fully porous silica	1.7, 3, 5	100	320	10	Yes	L7	972	<b>4-076</b>
aQ	Spherical, fully porous silica	1.7, 3, 5	100	320	19	Polar	L1	973	<b>4-077</b>
Phenyl	Spherical, fully porous silica	1.7, 3, 5	100	320	11	Yes	L11	979	<b>4-078</b>
Amino	Spherical, fully porous silica	1.7, 3, 5	100	320	4	Yes	L8	977	<b>4-079</b>
Silica	Spherical, fully porous silica	1.7, 3, 5	100	320	–	–	L3	970	<b>4-080</b>
HILIC	Spherical, fully porous silica	1.7, 3, 5	100	320	5	–	–	975	<b>4-081</b>

## HPLC Column Selection by Manufacturer

To find a suitable Thermo Scientific alternative to another manufacturer's columns, refer to the selection guide below. The Thermo Scientific alternative phases are selected based on a combination of physical and chemical similarities as well as mode of retention. These alternatives are not guaranteed to

provide the same retention or selectivity, but should be suitably similar in character to allow a similar or improved separation to be achieved with some method optimization. The user should refer to the individual phase information to ensure that the characteristics of the alternative match the requirements of their separation.

The following table is not complete in terms of manufacturer or products offered. Although every effort is made to ensure that the product information provided is as accurate as possible, some errors may occur in collation and transcription. We cannot accept any responsibility for the use of the following information.

Phase	Manufacturer	Pore Size (Å)	Area (m <sup>2</sup> /g)	% Carbon	Recommended Thermo Scientific Alternative	Page
ACE C18	ACT	100	300	15.5	Synchronis C18	<b>4-075</b>
ACE C8	ACT	100	300	9	Synchronis C8	<b>4-076</b>
ACE Phenyl	ACT	100	300	9.5	Synchronis Phenyl	<b>4-078</b>
ACE AQ	ACT	100	300	14	Synchronis aQ	<b>4-077</b>
ACE C18-300	ACT	300	100	9	BioBasic 18	<b>4-140</b>
ACE C8-300	ACT	300	100	5	BioBasic 8	<b>4-140</b>
ACE C4-300	ACT	300	100	2.6	BioBasic 4	<b>4-140</b>
ACQUITY UPLC™ BEH HILIC	Waters	130	185	–	Hypersil GOLD Silica (1.9µm)	<b>4-036</b>
ACQUITY UPLC HSS C18	Waters	100	230	15	Hypersil GOLD (1.9µm)	<b>4-026</b>
ACQUITY UPLC BEH C18	Waters	130	185	18	Hypersil GOLD (1.9µm)	<b>4-026</b>
ACQUITY UPLC BEH C8	Waters	130	185	13	Hypersil GOLD C8 (1.9µm)	<b>4-027</b>
ACQUITY UPLC BEH Phenyl	Waters	130	185	15	Hypersil GOLD Phenyl (1.9µm)	<b>4-031</b>
ACQUITY UPLC HSS T3	Waters	100	230	11	Hypersil GOLD aQ (1.9µm)	<b>4-029</b>
Aeris PEPTIDE XB-C18	Phenomenex	100	200	–	Accucore 150-C18	<b>4-144</b>
Aeris WIDEPOR XB-C18	Phenomenex	200	25	–	Accucore 150-C18	<b>4-144</b>
Aeris WIDEPOR XB-C8	Phenomenex	200	25	–	Accucore 150-C4	<b>4-145</b>
Aeris WIDEPOR XB-C4	Phenomenex	200	25	–	Accucore 150-C4	<b>4-145</b>
Alltima™ HP C18	Grace	190	200	12	Hypersil GOLD	<b>4-026</b>
Alltima HP C18 AQ	Grace	100	450	20	Hypersil GOLD aQ	<b>4-029</b>
Alltima HP C18 HiLoad	Grace	100	450	24	Synchronis C18	<b>4-075</b>
Alltima HP C8	Grace	190	200	8	Hypersil GOLD C8	<b>4-027</b>
Alltima HP CN	Grace	190	200	4	Hypersil GOLD CN	<b>4-032</b>
Alltima HP Silica	Grace	190	200	–	Hypersil GOLD Silica	<b>4-036</b>
Aminex™ HPX42C	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate Ca <sup>2+</sup>	<b>4-156</b>
Aminex HPX72S	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate H <sup>+</sup>	<b>4-156</b>
Aminex HPX87C	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate Ca <sup>2+</sup>	<b>4-156</b>
Aminex HPX87H	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate H <sup>+</sup>	<b>4-156</b>
Aminex HPX87N	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate Na <sup>+</sup>	<b>4-156</b>
Aminex HPX87P	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate Pb <sup>2+</sup>	<b>4-156</b>
AQUA™ C18	Phenomenex	125	320	15	Hypersil GOLD aQ	<b>4-029</b>
Ascentis™ C18	Supelco	100	450	25	Synchronis C18	<b>4-075</b>
Ascentis C8	Supelco	100	450	15	Synchronis C8	<b>4-076</b>
Ascentis Express C18	Supelco	90	150	–	Accucore C18	<b>4-045</b>
Ascentis Express C8	Supelco	90	150	–	Accucore C8	<b>4-046</b>
Ascentis Express F5	Supelco	90	150	–	Accucore PFP	<b>4-051</b>
Ascentis Express HILIC	Supelco	90	150	–	Accucore HILIC	<b>4-053</b>
Ascentis Express Phenyl-Hexyl	Supelco	90	150	–	Accucore Phenyl-Hexyl	<b>4-049</b>
Ascentis Express RP-Amide	Supelco	90	150	–	Accucore Polar Premium	<b>4-048</b>
Ascentis Express Peptide ES-C18	Supelco	160	80	–	Accucore 150-C18	<b>4-144</b>
Ascentis Phenyl	Supelco	100	450	19	Synchronis Phenyl	<b>4-078</b>



HPLC Column Selection by Manufacturer *continued*

Phase	Manufacturer	Pore Size (Å)	Area (m <sup>2</sup> /g)	% Carbon	Recommended Thermo Scientific Alternative	Page
Atlantis™ dC18	Waters	100	330	12	Acclaim Polar Advantage II	<b>4-066</b>
Atlantis T3	Waters	100	300	14	Hypersil GOLD	<b>4-026</b>
Atlantis HILIC Silica	Waters	100	300	–	Hypersil GOLD Silica	<b>4-036</b>
Atlantis dC18	Waters	100	330	12	Hypersil GOLD aQ	<b>4-029</b>
Capcell Core C18	Shiseido	90	150	7	Accucore C18	<b>4-045</b>
Capcell Pak C18 AQ	Shiseido	120	300	11	Acclaim Polar Advantage II	<b>4-066</b>
Cortecs C18	Waters	90	100	6.6	Accucore C18	<b>4-045</b>
Cortecs C18+	Waters	90	100	5.7	Accucore Polar Premium	<b>4-048</b>
Cortecs HILIC	Waters	90	100	–	Accucore HILIC	<b>4-053</b>
Discovery™ BIO Wide Pore C18	Supelco	300	–	–	BioBasic 18	<b>4-140</b>
Discovery BIO Wide Pore C8	Supelco	300	–	–	BioBasic 8	<b>4-140</b>
Discovery C18	Supelco	180	200	14	Hypersil GOLD	<b>4-026</b>
Discovery C8	Supelco	180	200	–	Hypersil GOLD C8	<b>4-027</b>
Discovery Cyano	Supelco	180	200	–	Hypersil GOLD CN	<b>4-032</b>
Gemini™ C18	Phenomenex	110	375	14	Hypersil GOLD	<b>4-026</b>
Halo C18	AMT	90	150	–	Accucore C18	<b>4-045</b>
Halo C8	AMT	90	150	–	Accucore C8	<b>4-046</b>
Halo HILIC	AMT	90	150	–	Accucore HILIC	<b>4-053</b>
Halo PFP	AMT	90	150	–	Accucore PFP	<b>4-051</b>
Halo Phenyl-Hexyl	AMT	90	150	–	Accucore Phenyl-Hexyl	<b>4-049</b>
Halo RP-Amide	AMT	90	150	–	Accucore Polar Premium	<b>4-048</b>
HALO Peptide ES-C18	AMT	160	80	–	Accucore 150-C18	<b>4-144</b>
Inertsil™ C4	GL Sciences	150	320	8	Hypersil GOLD C4	<b>4-028</b>
Inertsil C8	GL Sciences	150	320	11	Synchronis C8	<b>4-076</b>
Inertsil ODS3V	GL Sciences	100	450	15	Synchronis C18	<b>4-075</b>
Inertsil Phenyl	GL Sciences	150	320	10	Synchronis Phenyl	<b>4-078</b>
Inertsil Silica	GL Sciences	150	320	–	Synchronis Silica	<b>4-080</b>
J'Sphere M80	YMC	80	–	14	Acclaim Polar Advantage II	<b>4-066</b>
Jupiter™ C18	Phenomenex	300	170	13	BioBasic 18	<b>4-140</b>
Jupiter C4	Phenomenex	300	170	5	BioBasic C4	<b>4-140</b>
Kinetex C18	Phenomenex	100	–	12	Accucore C18	<b>4-045</b>
Kinetex C8	Phenomenex	100	–	10	Accucore C8	<b>4-046</b>
Kinetex HILIC	Phenomenex	100	–	–	Accucore HILIC	<b>4-053</b>
Kinetex PFP	Phenomenex	100	–	9	Accucore PFP	<b>4-051</b>
Kinetex Phenyl-Hexyl	Phenomenex	100	–	–	Accucore Phenyl-Hexyl	<b>4-049</b>
Kinetex XB-C18	Phenomenex	100	–	12	Accucore C18	<b>4-045</b>
Kromasil C18	Akzo-Nobel	100	340	19	Synchronis C18	<b>4-075</b>
Kromasil C4	Akzo-Nobel	100	340	8	Hypersil GOLD C4	<b>4-028</b>
Kromasil Silica	Akzo-Nobel	100	340	–	Synchronis Silica	<b>4-080</b>
LiChrospher™ CN	Merck	100	350	7	Hypersil GOLD CN	<b>4-032</b>
LiChrospher Diol	Merck	100	350	–	BETASIL Diol	Inquire
LiChrospher NH <sub>2</sub>	Merck	100	350	5	Synchronis Amino	<b>4-079</b>
LiChrospher RP 18	Merck	100	350	21	Synchronis C18	<b>4-075</b>
LiChrospher RP-18e	Merck	100	350	22	Synchronis C18	<b>4-075</b>
LiChrospher RP-8	Merck	100	350	13	Synchronis C8	<b>4-076</b>
LiChrospher RP-8e	Merck	100	350	13	Synchronis C8	<b>4-076</b>
Luna™ C18 (2)	Phenomenex	100	400	18	Synchronis C18	<b>4-075</b>
Luna C8 (2)	Phenomenex	100	400	14	Synchronis C8	<b>4-076</b>
Luna CN	Phenomenex	100	400	–	Hypersil GOLD CN	<b>4-032</b>
Luna HILIC	Phenomenex	200	200	5.7	BETASIL Diol	Inquire
Luna NH <sub>2</sub>	Phenomenex	100	400	10	Synchronis Amino	<b>4-079</b>
Luna PFP (2)	Phenomenex	100	400	5.7	Hypersil GOLD PFP	<b>4-030</b>

Phase	Manufacturer	Pore Size (Å)	Area (m <sup>2</sup> /g)	% Carbon	Recommended Thermo Scientific Alternative	Page
Luna SCX	Phenomenex	100	400	–	BioBasic SCX	<b>4-141</b>
Luna Silica (2)	Phenomenex	100	400	–	Synchronis Silica	<b>4-080</b>
μBondapak™ C18	Waters	125	330	10	Hypersil GOLD	<b>4-026</b>
μBondapak CN	Waters	125	330	–	Hypersil GOLD CN	<b>4-032</b>
μBondapak NH <sub>2</sub>	Waters	125	330	4	Hypersil APS-2	<b>4-108</b>
μBondapak Phenyl	Waters	125	330	–	Hypersil GOLD Phenyl	<b>4-031</b>
Nova-Pak™ (HR) C18	Waters	60	120	7	Hypersil GOLD	<b>4-026</b>
Nova-Pak C8	Waters	60	120	–	Hypersil GOLD C8	<b>4-027</b>
Nova-Pak CN	Waters	60	120	–	Hypersil GOLD CN	<b>4-032</b>
Nova-Pak Phenyl	Waters	60	120	5	Hypersil GOLD Phenyl	<b>4-031</b>
Nova-Pak Silica	Waters	60	120	–	Hypersil GOLD Silica	<b>4-036</b>
NUCLEODUR™ C18 EC	Macherey-Nagel	110	340	18	Synchronis C18	<b>4-075</b>
NUCLEODUR C18 Gravity	Macherey-Nagel	110	340	18	Synchronis C18	<b>4-075</b>
NUCLEODUR CN	Macherey-Nagel	110	340	7	Hypersil GOLD CN	<b>4-032</b>
NUCLEODUR Pyramid	Macherey-Nagel	110	340	14	Synchronis aQ	<b>4-077</b>
Nucleoshell™ RP 18	Macherey-Nagel	90	130	7.5	Accucore C18	<b>4-045</b>
Nucleoshell Phenyl-Hexyl	Macherey-Nagel	90	130	4.5	Accucore Phenyl-Hexyl	<b>4-049</b>
Nucleoshell PFP	Macherey-Nagel	90	130	3	Accucore PFP	<b>4-051</b>
Nucleosil™ 100 C18	Macherey-Nagel	100	350	17	Synchronis C18	<b>4-075</b>
Nucleosil 100 C18 AB	Macherey-Nagel	100	350	24	Synchronis C18	<b>4-075</b>
Nucleosil 100 C <sub>6</sub> H <sub>5</sub>	Macherey-Nagel	100	350	–	Synchronis Phenyl	<b>4-078</b>
Nucleosil 100 C8	Macherey-Nagel	100	350	9	Synchronis C8	<b>4-076</b>
Nucleosil 100 CN	Macherey-Nagel	100	350	–	Hypersil GOLD CN	<b>4-032</b>
Nucleosil 100 N(CH <sub>3</sub> ) <sub>2</sub>	Macherey-Nagel	100	350	–	Hypersil SAX	<b>4-109</b>
Nucleosil 100 NH <sub>2</sub>	Macherey-Nagel	100	350	4	Synchronis Amino	<b>4-079</b>
Nucleosil 100 OH	Macherey-Nagel	100	350	–	BETASIL Diol	Inquire
Nucleosil 100 SA	Macherey-Nagel	100	350	7	BioBasic SCX	<b>4-141</b>
Nucleosil 100 SB	Macherey-Nagel	100	350	10	Hypersil GOLD SAX	<b>4-035</b>
Nucleosil 300 C18	Macherey-Nagel	300	100	7	BioBasic 18	<b>4-140</b>
Nucleosil 300 C4	Macherey-Nagel	300	100	–	BioBasic 4	<b>4-140</b>
Nucleosil 300 C <sub>6</sub> H <sub>5</sub>	Macherey-Nagel	300	100	–	BioBasic Phenyl	Inquire
Nucleosil 300 C8	Macherey-Nagel	300	100	–	BioBasic 8	<b>4-140</b>
Nucleosil 300 CN	Macherey-Nagel	300	100	–	BioBasic CN	Inquire
Pinnacle™ C1	Restek	120	170	2	Hypersil SAS	<b>4-107</b>
Pinnacle C18	Restek	120	170	10	Hypersil GOLD	<b>4-026</b>
Pinnacle C4	Restek	120	170	4	Hypersil GOLD C4	<b>4-028</b>
Pinnacle CN	Restek	120	170	5	Hypersil GOLD CN	<b>4-032</b>
Pinnacle DB C18	Restek	140	–	11	Hypersil GOLD	<b>4-026</b>
Pinnacle DB C18 1.9μm	Restek	140	–	11	Hypersil GOLD (1.9μm)	<b>4-026</b>
Pinnacle DB C8	Restek	140	–	6	Hypersil GOLD C8	<b>4-027</b>
Pinnacle DB Cyano	Restek	140	–	4	Hypersil GOLD CN	<b>4-032</b>
Pinnacle DB Phenyl	Restek	140	–	5	Hypersil GOLD Phenyl	<b>4-031</b>
Pinnacle IBD	Restek	120	170	–	Hypersil GOLD	<b>4-026</b>
Pinnacle NH <sub>2</sub>	Restek	120	170	2	Hypersil GOLD Amino	<b>4-033</b>
Pinnacle Phenyl	Restek	120	170	5	Hypersil GOLD Phenyl	<b>4-031</b>
Pinnacle SAX	Restek	120	170	3	Hypersil GOLD SAX	<b>4-035</b>
Pinnacle Silica	Restek	120	170	–	Hypersil GOLD Silica	<b>4-036</b>
Pinnacle Ultra C18	Restek	100	–	20	Synchronis C18	<b>4-075</b>
Pinnacle Wide Pore C4	Restek	300	–	2	BioBasic 4	<b>4-140</b>
Poroshell™ 120 EC-C18	Agilent	120	120	8	Accucore C18	<b>4-045</b>
Poroshell 120 EC-C8	Agilent	120	120	5	Accucore C8	<b>4-046</b>
Poroshell 120 SB-C18	Agilent	120	120	7.5	Accucore C18	<b>4-045</b>
Poroshell 120 SB-Aq	Agilent	120	130	–	Accucore aQ	<b>4-047</b>

HPLC Column Selection by Manufacturer *continued*

Phase	Manufacturer	Pore Size (Å)	Area (m <sup>2</sup> /g)	% Carbon	Recommended Thermo Scientific Alternative	Page
Poroshell 120 Phenyl-Hexyl	Agilent	120	130	9	Accucore Phenyl-Hexyl	<b>4-049</b>
Poroshell 120 Bonus-RP	Agilent	120	130	9.5	Accucore Polar Premium	<b>4-048</b>
Poroshell SB-C18	Agilent	300	45	2.8	Accucore 150-C18	<b>4-144</b>
Poroshell Extend-C18	Agilent	300	45	4	Accucore 150-C18	<b>4-144</b>
Poroshell 300 SB-C8	Agilent	300	45	1.5	Accucore 150-C4	<b>4-145</b>
Poroshell 300 SB-C3	Agilent	300	45	1.1	Accucore 150-C4	<b>4-145</b>
Primesep™	SieLC	–	–	–	Acclaim Mixed-Mode Columns	<b>4-068</b>
Prodigy™ C8	Phenomenex	150	310	13	Synchronis C8	<b>4-076</b>
Prodigy ODS2	Phenomenex	150	310	18	Synchronis C18	<b>4-075</b>
Prodigy ODS-3	Phenomenex	100	450	16	Synchronis C18	<b>4-075</b>
Prodigy ODS-3V	Phenomenex	100	450	16	Hypersil GOLD	<b>4-026</b>
Prodigy Phenyl-3	Phenomenex	100	450	10	Synchronis Phenyl	<b>4-078</b>
Purospher™ RP-18	Merck	60	500	–	Hypersil GOLD	<b>4-026</b>
Purospher STAR-8e	Merck	120	300	–	Hypersil GOLD C8	<b>4-027</b>
Purospher STAR RP-18e	Merck	120	300	–	Hypersil GOLD	<b>4-026</b>
Waters™ Spherisorb™ C1	Waters	80	200	2	Hypersil SAS	<b>4-107</b>
Waters Spherisorb C6	Waters	80	200	5	BETASIL C6	Inquire
Waters Spherisorb C8	Waters	80	200	6	Hypersil GOLD C8	<b>4-027</b>
Waters Spherisorb CN	Waters	80	200	3	Hypersil GOLD CN	<b>4-032</b>
Waters Spherisorb NH <sub>2</sub>	Waters	80	200	2	Hypersil APS-2	<b>4-108</b>
Waters Spherisorb ODS1	Waters	80	200	6	Hypersil GOLD	<b>4-026</b>
Waters Spherisorb ODS2	Waters	80	200	12	Hypersil GOLD	<b>4-026</b>
Waters Spherisorb ODSB	Waters	80	200	12	Hypersil GOLD	<b>4-026</b>
Waters Spherisorb Phenyl	Waters	80	200	3	Hypersil GOLD Phenyl	<b>4-031</b>
Waters Spherisorb SAX	Waters	80	200	–	Hypersil SAX	<b>4-109</b>
Waters Spherisorb SCX	Waters	80	200	–	BioBasic SCX	<b>4-141</b>
Waters Spherisorb W (silica)	Waters	80	200	–	Hypersil GOLD Silica	<b>4-036</b>
SunFire™ C18	Waters	90	340	16	Synchronis C18	<b>4-075</b>
SunFire C8	Waters	90	340	16	Synchronis C8	<b>4-076</b>
SunShell™ C18	ChromaNik	90	150	7	Accucore C18	<b>4-045</b>
SunShell C8	ChromaNik	90	150	4.5	Accucore C8	<b>4-046</b>
SunShell PFP	ChromaNik	90	150	4.5	Accucore PFP	<b>4-051</b>
Supelcosil™ LC-1	Supelco	120	170	–	Hypersil SAS	<b>4-107</b>
Supelcosil LC-18	Supelco	120	170	11	Hypersil GOLD	<b>4-026</b>
Supelcosil LC-18DB	Supelco	120	170	11	Hypersil GOLD	<b>4-026</b>
Supelcosil LC-8	Supelco	120	170	–	Hypersil GOLD C8	<b>4-027</b>
Supelcosil LC-CN	Supelco	120	170	–	Hypersil GOLD CN	<b>4-032</b>
Supelcosil LC-NH <sub>2</sub>	Supelco	120	170	–	Hypersil GOLD Amino	<b>4-033</b>
Supelcosil LC-Si	Supelco	120	170	–	Hypersil GOLD Silica	<b>4-036</b>
Symmetry™ C18	Waters	100	335	19	Synchronis C18	<b>4-075</b>
Symmetry C8	Waters	100	335	12	Synchronis C8	<b>4-076</b>
Synergi™ Hydro-RP	Phenomenex	80	475	19	Synchronis aQ	<b>4-077</b>
TSKgel™ G2000SW (incl XL)	Tosoh	125	–	–	BioBasic SEC 120	<b>4-139</b>
TSKgel Octyl-80TS	Tosoh	80	200	11	Hypersil GOLD C8	<b>4-027</b>
TSKgel ODS-120A	Tosoh	120	200	22	Hypersil GOLD	<b>4-026</b>
TSKgel ODS-120T	Tosoh	120	200	22	Synchronis C18	<b>4-075</b>
TSKgel ODS-80TM	Tosoh	80	200	15	Hypersil GOLD	<b>4-026</b>
TSKgel Super Octyl	Tosoh	110	–	5	Hypersil GOLD C8	<b>4-027</b>
TSKgel Super ODS	Tosoh	110	–	8	Hypersil GOLD	<b>4-026</b>
TSKgel Super Phenyl	Tosoh	110	–	3	Hypersil GOLD Phenyl	<b>4-031</b>
TSKgel SuperSW3000	Tosoh	250	–	–	BioBasic SEC 300	<b>4-139</b>



Phase	Manufacturer	Pore Size (Å)	Area (m <sup>2</sup> /g)	% Carbon	Recommended Thermo Scientific Alternative	Page
Vydac™ 201SP C18	Grace	90	–	–	Hypersil GOLD	<b>4-026</b>
Vydac 201SP Selectapore 90M C18	Grace	90	250	–	Hypersil GOLD	<b>4-026</b>
Vydac 201TP C18	Grace	300	–	–	BioBasic 18	<b>4-140</b>
Vydac 202TP C18	Grace	300	–	–	BioBasic 18	<b>4-140</b>
Vydac 208TP C8	Grace	300	–	–	BioBasic 8	<b>4-140</b>
Vydac 214TP	Grace	300	–	–	BioBasic 4	<b>4-140</b>
Vydac 218TP	Grace	300	–	–	BioBasic 18	<b>4-140</b>
Vydac 218WP Selectapore 300M C18	Grace	300	70	–	BioBasic 18	<b>4-140</b>
XBridge™ C18	Waters	–	–	–	Hypersil GOLD	<b>4-026</b>
XBridge C8	Waters	–	–	–	Hypersil GOLD C8	<b>4-027</b>
XBridge HILIC	Waters	130	185	–	Hypersil GOLD Silica	<b>4-036</b>
XBridge Phenyl	Waters	–	–	–	Hypersil GOLD Phenyl	<b>4-031</b>
XTerra™ MS C18	Waters	125	180	16	Hypersil GOLD	<b>4-026</b>
XTerra MS C8	Waters	125	180	12	Hypersil GOLD C8	<b>4-027</b>
YMCbasic™	YMC	–	–	–	Hypersil GOLD C8	<b>4-027</b>
YMC-Pack™ C4	YMC	120	300	7	HyPURITY C4	<b>4-109</b>
YMC-Pack C8	YMC	120	300	10	Acclaim C8	<b>4-062</b>
YMC-Pack CN	YMC	120	300	7	Hypersil GOLD CN	<b>4-032</b>
YMC-Pack Diol	YMC	120	300	–	BETASIL Diol	Inquire
YMC-Pack NH <sub>2</sub>	YMC	120	–	–	Hypersil GOLD Amino	<b>4-033</b>
YMC-Pack ODS AQ	YMC	120	300	16	Synchrionis aQ	<b>4-077</b>
YMC-Pack ODS-A	YMC	120	300	17	Synchrionis C18	<b>4-075</b>
YMC-Pack ODS-A	YMC	300	150	6	BioBasic 18	<b>4-140</b>
YMC-Pack Phenyl	YMC	120	300	9	Synchrionis Phenyl	<b>4-078</b>
YMC-Pack Pro C18	YMC	120	350	16	Synchrionis C18	<b>4-075</b>
YMC-Pack Silica	YMC	120	–	–	Synchrionis Silica	<b>4-080</b>
YMC-Pack TMS (C1)	YMC	120	300	4	BETASIL C1	Inquire
Zorbax™ Eclipse XDB C18	Agilent	80	180	10	Hypersil GOLD	<b>4-026</b>
Zorbax Eclipse XDB C8	Agilent	80	180	8	Hypersil GOLD C8	<b>4-027</b>
Zorbax Eclipse XDB Phenyl	Agilent	80	180	8	Hypersil GOLD Phenyl	<b>4-031</b>
Zorbax Eclipse Plus C18	Agilent	95	160	8	Hypersil GOLD	<b>4-026</b>
Zorbax Eclipse Plus C8	Agilent	95	160	6	Hypersil GOLD C8	<b>4-027</b>
Zorbax RRHT Eclipse Plus C18	Agilent	95	160	8	Hypersil GOLD (1.9µm)	<b>4-026</b>
Zorbax RRHT Eclipse Plus C8	Agilent	95	160	6	Hypersil GOLD C8 (1.9µm)	<b>4-027</b>
Zorbax RRHT Eclipse XDB-C18	Agilent	80	180	10	Hypersil GOLD (1.9µm)	<b>4-026</b>
Zorbax RRHT Eclipse XDB-C8	Agilent	80	180	7.5	Hypersil GOLD C8 (1.9µm)	<b>4-027</b>
Zorbax RRHT SB-CN	Agilent	80	180	4	Hypersil GOLD CN (1.9µm)	<b>4-032</b>
Zorbax SB Aq	Agilent	80	180	–	Hypersil GOLD aQ	<b>4-029</b>
Zorbax SB C18	Agilent	80	180	10	Hypersil GOLD	<b>4-026</b>
Zorbax SB C18	Agilent	300	45	3	BioBasic 18	<b>4-140</b>
Zorbax SB C8	Agilent	80	180	6	Hypersil GOLD C8	<b>4-027</b>
Zorbax SB C8	Agilent	300	45	2	BioBasic 8	<b>4-140</b>
Zorbax SB CN	Agilent	80	180	4	Hypersil GOLD CN	<b>4-032</b>
Zorbax SB Phenyl	Agilent	80	180	6	Hypersil GOLD Phenyl	<b>4-031</b>

# Thermo Scientific LC Columns

## Column Protection

Extend column lifetime and improve performance

- Guards and filters to protect your analytical column
- Economical extension of column lifetime
- Multiple formats for optimum performance and efficiency
- Drop-in designs for quick and easy guard and filter replacement
- UHPLC Filter cartridges and holder to protect Hypersil GOLD 1.9µm columns



To extend the lifetime and performance of your analytical and preparative columns, we recommend that they be protected from contamination by sample and solvent debris and interferences from the sample matrix. The most cost-effective and efficient way of trapping these unwanted system components is by use of a filter or packed guards. Column performance should not be affected by adding a guard or filter unit to the HPLC system. The chromatogram shown demonstrates how the column's chromatographic performance is unaffected by the addition of a guard unit during the analysis of procainamides.

### Guard and Filter Selection

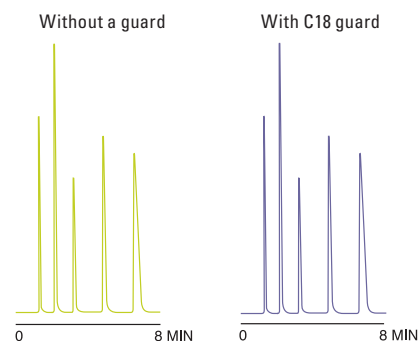
Guard columns are positioned between the injector and the analytical column, removing strongly adsorbed sample components before the sample reaches the analytical column. The simple rule of thumb in guard selection is to choose one that matches your analytical column. The internal diameters should match as closely as possible, and the packing material should

be the same particle size and chemistry as the analytical column. If a guard cartridge system is used, the replacement of the packed cartridges should be simple and fast.

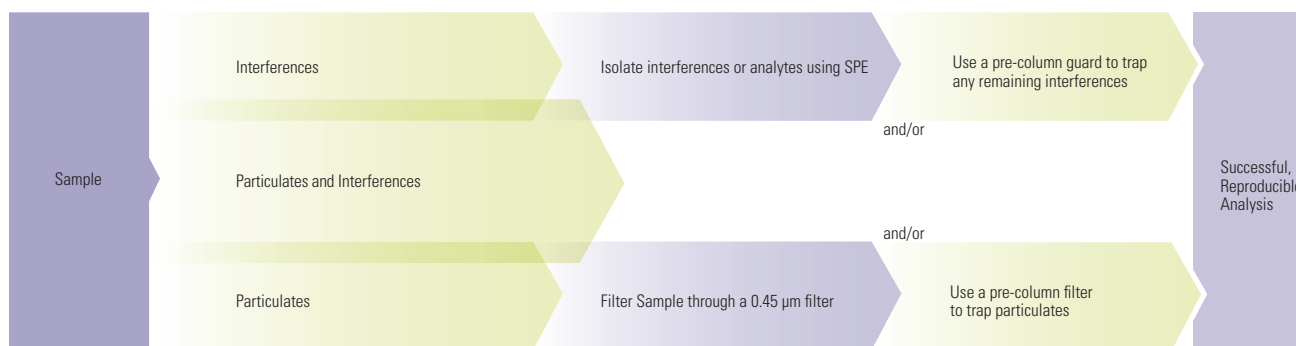
Pre-column filters are positioned between the solvent inlet filter and the column inlet. They are designed to trap particulate matter from the fluid path. They do not remove sample interferences or contaminants that are dissolved in the fluid path. These units are designed to be wholly disposable or have replaceable filters in a re-useable holder.

Replaceable 0.2µm Thermo Scientific UHPLC filter cartridges protect Hypersil GOLD 1.9µm and Synchronis 1.7µm columns against particles, enhancing column lifetime. Its low dead volume design maintains chromatographic performance without degrading peak shape and causes minimal efficiency loss through dispersion. The UHPLC filter adds a minimal increase in backpressure, so can be fitted to any length column.

### Analytes: Procainamides



Peak resolution and shape are unaffected by the addition of a guard column



Choosing a guard or filter based on sample make-up

## Drop-in Guard Cartridges

Drop-in guard cartridges offer convenience, economy and effective protection for extending column lifetime

- The 10mm design offers maximum protection with minimal increase in retention
- Fit Thermo Scientific™ UNIGUARD™ direct connection and stand alone holders



### Drop-in Guard Cartridges Ordering Guide

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0/4.6mm ID	Quantity
<b>Hypersil GOLD</b>						
3	10	<b>25003-011001</b>	<b>25003-012101</b>	<b>25003-013001</b>	<b>25003-014001</b>	4 Pack
5	10	<b>25005-011001</b>	<b>25005-012101</b>	<b>25005-013001</b>	<b>25005-014001</b>	4 Pack
<b>Hypersil GOLD C8</b>						
3	10	<b>25203-011001</b>	<b>25203-012101</b>	<b>25203-013001</b>	<b>25203-014001</b>	4 Pack
5	10	<b>25205-011001</b>	<b>25205-012101</b>	<b>25205-013001</b>	<b>25205-014001</b>	4 Pack
<b>Hypersil GOLD aQ</b>						
3	10	<b>25303-011001</b>	<b>25303-012101</b>	<b>25303-013001</b>	<b>25303-014001</b>	4 Pack
5	10	<b>25305-011001</b>	<b>25305-012101</b>	<b>25305-013001</b>	<b>25305-014001</b>	4 Pack
<b>Hypersil GOLD PFP</b>						
3	10	<b>25403-011001</b>	<b>25403-012101</b>	<b>25403-013001</b>	<b>25403-014001</b>	4 Pack
5	10	<b>25405-011001</b>	<b>25405-012101</b>	<b>25405-013001</b>	<b>25405-014001</b>	4 Pack
<b>Hypersil GOLD CN</b>						
3	10	<b>25803-011001</b>	<b>25803-012101</b>	<b>25803-013001</b>	<b>25803-014001</b>	4 Pack
5	10	<b>25805-011001</b>	<b>25805-012101</b>	<b>25805-013001</b>	<b>25805-014001</b>	4 Pack
<b>Hypersil GOLD Phenyl</b>						
3	10	<b>25903-011001</b>	<b>25903-012101</b>	<b>25903-013001</b>	<b>25903-014001</b>	4 Pack
5	10	<b>25905-011001</b>	<b>25905-012101</b>	<b>25905-013001</b>	<b>25905-014001</b>	4 Pack
<b>Accucore XL C18</b>						
4	10	–	<b>74104-012101</b>	<b>74104-013001</b>	<b>74104-014001</b>	4 Pack
<b>Accucore XL C8</b>						
4	10	–	<b>74204-012101</b>	<b>74204-013001</b>	<b>74204-014001</b>	4 Pack
<b>Syncronis C18</b>						
5	10	–	<b>97105-012101</b>	<b>97105-013001</b>	<b>97105-014001</b>	4 Pack
<b>Syncronis C8</b>						
5	10	–	<b>97205-012101</b>	<b>97205-013001</b>	<b>97205-014001</b>	4 Pack
<b>Syncronis aQ</b>						
5	10	–	<b>97305-012101</b>	<b>97305-013001</b>	<b>97305-014001</b>	4 Pack
<b>Syncronis Phenyl</b>						
5	10	–	<b>97905-012101</b>	<b>97905-013001</b>	<b>97905-014001</b>	4 Pack
<b>Hypercarb</b>						
3	10	<b>35003-011001</b>	<b>35003-012101</b>	<b>35003-013001</b>	<b>35003-014001</b>	2 Pack
5	10	<b>35005-011001</b>	<b>35005-012101</b>	<b>35005-013001</b>	<b>35005-014001</b>	2 Pack

This table provides a sample of the guard cartridges for the most popular Thermo Scientific HPLC stationary phases. Drop-in guard cartridges are available in other Thermo Scientific phases. For information on guard cartridges for other Thermo Scientific phases, please consult the appropriate section of the catalogue or contact Customer Services for more information.

## Defender Guard Cartridges

Thermo Scientific™ Defender™ Guard Cartridges have been designed specifically to work with high speed, high efficiency separations.

### Accucore Defender Guard Cartridges (4/pk) Ordering Guide

Description	Particle Size (µm)	Length (mm)	2.1mm ID	Description	Particle Size (µm)	Length (mm)	2.1mm ID
Accucore RP-MS	2.6	10	<b>17626-012105</b>	Accucore PFP	2.6	10	<b>17426-012105</b>
Accucore C18	2.6	10	<b>17126-012105</b>	Accucore C30	2.6	10	<b>27826-012105</b>
Accucore C8	2.6	10	<b>17226-012105</b>	Accucore HILIC	2.6	10	<b>17526-012105</b>
Accucore aQ	2.6	10	<b>17326-012105</b>	Accucore Urea-HILIC	2.6	10	<b>27726-012105</b>
Accucore Polar Premium	2.6	10	<b>28026-012105</b>	Accucore 150-C18	2.6	10	<b>16126-012105</b>
Accucore Phenyl-Hexyl	2.6	10	<b>17926-012105</b>	Accucore 150-C4	2.6	10	<b>16526-012105</b>
Accucore Phenyl-X	2.6	10	<b>27926-012105</b>	Accucore 150-Amide-HILIC	2.6	10	<b>16726-012105</b>

Other guard column dimension are available in some Accucore phases. Please call your local Customer Service for more information.

## UNIGUARD Direct-Connection Guard Cartridge Holders

Reusable, stainless steel guard cartridge holders that match directly to the analytical column inlet – eliminating requirement for extra fittings

- With PEEK 1/16in male outlet that fits most columns
- 1/16in female inlet can be used with various standard fittings

### UNIGUARD Direct-Connection Guard Cartridge Holders Ordering Guide

Description	1.0mm ID	2.1mm ID	3.0mm ID	4.0/4.6mm ID	Quantity
UNIGUARD Drop-In /Defender Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each
Standard Replacement Tip	<b>850-RT</b>	<b>850-RT</b>	<b>850-RT</b>	<b>850-RT</b>	1 Each
Waters Columns Replacement Tip	<b>850-WT</b>	<b>850-WT</b>	<b>850-WT</b>	<b>850-WT</b>	1 Each



## Acclaim Guards Cartridges

Thermo Scientific™ Acclaim™ Guard Cartridges are available in the same packing and internal diameters as the Acclaim analytical column chemistries. A re-usable holder allows for easy cartridge replacement; extending the life of the analytical column.

## Acclaim Guard Cartridges Ordering Guide

### Acclaim Guard Cartridge Ordering Guide (2/pk)

Particle Size (µm)	Length (mm)	ID (mm)	120 C18	120 C8	Polar Advantage	Polar Advantage II	C30	Mixed-Mode HILIC-1	Mixed-Mode WAX-1	Mixed-Mode WCX-1
5	10	2.1	<b>069689</b>	<b>069688</b>	<b>069691</b>	<b>069692</b>	<b>075722</b>	<b>069694</b>	<b>069686</b>	<b>085455</b>
		3.0	<b>071981</b>	<b>071979</b>	<b>071983</b>	<b>071985</b>	<b>075721</b>	<b>071913</b>	<b>071909</b>	<b>071911</b>
		4.6	<b>069695</b>	<b>069696</b>	<b>069698</b>	<b>069699</b>	<b>075720</b>	<b>069706</b>	<b>069704</b>	<b>069705</b>

### Acclaim Guard Cartridge Ordering Guide (2/pk) continued

Description	Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
Phenyl-1	3	10	<b>079934</b>	<b>071974</b>	<b>071973</b>
HILIC-10	5	10	<b>074263</b>	<b>074261</b>	<b>074262</b>

### Acclaim Specialty Column Guard Cartridge Ordering Guide (2/pk)

Description	Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
Acclaim Trinity P1	3	10	<b>071391</b>	<b>071390</b>	–
Acclaim Trinity P2	3	10	<b>085435</b>	<b>085436</b>	–
Acclaim Trinity Q1	5	10	<b>079719</b>	<b>079720</b>	–
Acclaim Organic Acid	5	10	–	<b>071987</b>	<b>069700</b>
Acclaim Surfactant Plus	5	10	<b>082773</b>	<b>078959</b>	<b>078960</b>
Acclaim Surfactant	5	10	<b>069693</b>	<b>071991</b>	<b>069701</b>
Acclaim Explosives E1	5	10	–	–	<b>069702</b>
Acclaim Explosives E2	5	10	–	<b>071989</b>	<b>069703</b>
Acclaim Carbamate	5	10	<b>072930</b>	<b>072929</b>	<b>072928</b>
Acclaim Carbonyl C18	5	10	<b>079012</b>	<b>079013</b>	<b>079014</b>

### Acclaim Guard Holder Ordering Guide

Format	Cat. No.
Acclaim Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>



## Javelin Direct-Connection Column Filters

One-piece filter protects HPLC systems

- Direct-connection design for maximum efficiency
- Replace entire disposable filter unit for easy changes
- Recommended for use as dedicated filters for a column rather than the HPLC system
- 1/16in CPI tip attaches directly to HPLC column inlet without tubing or wrenches
- 0.5µm porosity



### Javelin Direct-Connection Column Filter Ordering Guide

Description	2.1mm ID	3.0mm ID	4.0/4.6mm ID	Quantity
Javelin Column Filter	<b>88200</b>	<b>88700</b>	<b>88400</b>	4 Pack

## ColumnSaver Precolumn Filters

Filter mesh size 2µm

### ColumnSaver Precolumn Filters Ordering Guide

Filter Mesh Size (µm)	Cat. No	Quantity
2	<b>60140-412</b>	10 Pack

## UNIFILTER Direct-Connection HPLC Filter Systems

Quickly replaced for minimal down time

- Replaceable 0.5µm drop-in filter enhances column lifetime and improved performance
- Holder attached directly to the inlet of your analytical system for maximum convenience



### UNIFILTER Direct-Connection HPLC Filter Systems Ordering Guide

Description	2.1/3.0mm ID	4.0/4.6mm ID	Quantity
UNIFILTER Direct Connection Holder	<b>27002</b>	<b>27000</b>	1 Each
Replacement Filter, 0.5µm	<b>22016</b>	<b>22150</b>	1 Each
Replacement Filter, 0.5µm	<b>22017</b>	<b>22155</b>	5 Pack
Replacement Tip, CPI, Standard	<b>850-RT</b>	<b>850-RT</b>	1 Each
Replacement Tip, Waters End-fitting	<b>850-WT</b>	<b>850-WT</b>	1 Each

## UHPLC Filter

Column protection for Hypersil GOLD 1.9µm and Synchronis 1.7µm columns without compromising performance

- Low volume filter cartridge design
- Maintain peak shape
- Minimal efficiency loss through dispersion



### UHPLC Filter Ordering Guide






Description	Cat. No.	Quantity
UHPLC Direct Connect Filter Holder	<b>27006</b>	1 Each
2.1mm ID Replacement Filter Cartridge, 0.2µm	<b>22180</b>	5 Pack
1.0mm ID Replacement Filter Cartridge, 0.2µm	<b>22185</b>	5 Pack



# Thermo Scientific Columns for Fast and Analytical HPLC

The Thermo Scientific LC column portfolio offers a comprehensive range of high quality options for fast and analytical HPLC.

The table below shows our major column families with details of relative hydrophobicity, key attributes and how the attributes are achieved. Use this table and the information in the subsequent catalogue pages to find the best Thermo Scientific LC columns for your separation needs.

Hydrophobicity		Key Attribute	Achieved through
Low	<b>Accucore Columns</b> Page 4-042 	Ultimate Performance	<ul style="list-style-type: none"> <li>• 2.6 and 4µm solid core silica particles</li> <li>• Core Enhanced Technology</li> </ul>
	<b>Hypersil GOLD Columns</b> Page 4-024 	Selectivity & Peak Shape	<ul style="list-style-type: none"> <li>• 1.9, 3, 5 and 12µm ultra-high purity silica particles</li> <li>• Wide range of conventional phases</li> </ul>
Medium/High	<b>Acclaim Columns</b> Page 4-060 	Traditional, Speciality & Application Specific	<ul style="list-style-type: none"> <li>• 2.2, 3 and 5µm ultra-pure silica particles</li> <li>• Innovative and unique bonded phases</li> </ul>
High	<b>Synchronis Columns</b> Page 4-074 	Ruggedness & Reproducibility	<ul style="list-style-type: none"> <li>• 1.7, 3 and 5µm high surface area silica particles</li> <li>• Dense bonding, double endcapping, rigorous testing</li> </ul>
Very High	<b>Hypercarb Columns</b> Page 4-084 	Extended Separation Capabilities	<ul style="list-style-type: none"> <li>• 3 and 5µm 100% porous graphitic carbon particles</li> <li>• Polar retention effect on graphite (PREG)</li> </ul>



## Principles of Fast LC

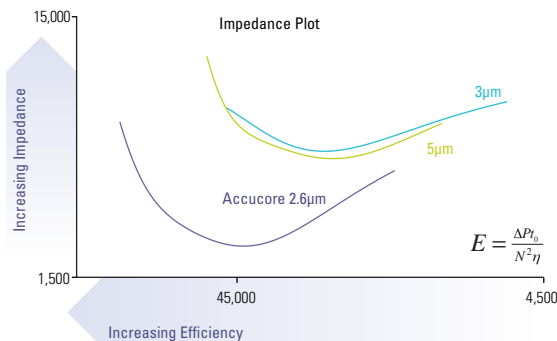
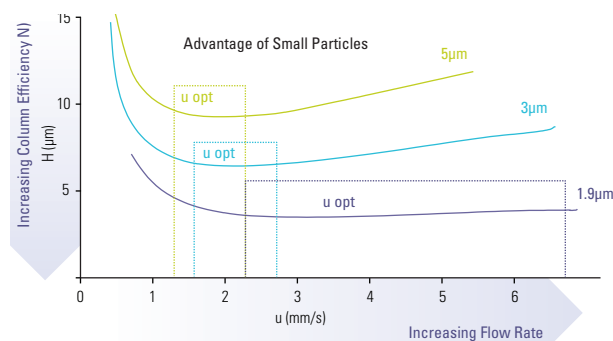
### Effect of particle size and type

It is now well established that columns packed with smaller diameter particles generate higher efficiencies over a wider range of flow rates than larger particle columns – as shown in the plot below.

An alternative to small diameter particles is the Core Enhanced Technology used in Accucore HPLC columns. As shown in the impedance plot below, Accucore columns generate higher efficiencies in shorter times than columns packed with 5µm or 3µm particles and does so at low backpressures.

$$E = \frac{\Delta P t_0}{N^2 \eta}$$

- E Impedance
- ΔP Backpressure
- t<sub>0</sub> Retention time of unretained peak
- N Efficiency
- η Mobile phase viscosity



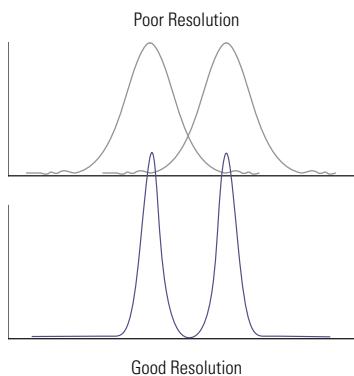
### Speed and Resolution

The general chromatographic resolution equation shows that resolution is directly proportional to efficiency. High efficiencies across a wider range of linear velocities mean that shorter columns and/or faster flow rates can be used to increase the speed of separations without sacrificing resolution.

The resolution equation also shows that a wide range of different bonded phases, each offering a different selectivity, is a useful way to improve resolution.

$$R_s = \frac{1}{4} \frac{(\alpha - 1)}{\alpha} \sqrt{N} \frac{k'}{1 + k'}$$

- α Selectivity
- N Efficiency
- k' Capacity factor



### Peak Capacity

As an alternative to speeding up analysis the excellent resolution offered by high efficiency columns can also be used to improve complex separations through an increase in peak capacity – the number of peaks that can be separated in a given gradient time.

$$n_c = 1 + \left( \frac{t_g}{W} \right)$$

- n<sub>c</sub> Peak capacity
- t<sub>g</sub> Gradient time
- W Peak width (10% height)

### Sensitivity

According to the formula shown below, sensitivity is increased in high efficiency separations by increasing the concentration of the peak and thus the detector signal to noise ratio.

$$c_{max} \propto \frac{\sqrt{N} V_i}{L d_c^2 (1 + k')}$$

- c<sub>max</sub> Concentration at peak apex
- N Efficiency
- V<sub>i</sub> Injection volume
- L Column length
- d<sub>c</sub> Column internal diameter
- k' Capacity factor

### Miniaturization

The sensitivity formula also shows that peak concentration can be increased through the use of shorter columns and more importantly, with narrower column internal diameters.

When transferring a method to a different column geometry adjustments must be made to the following parameters:

- Flow Rate
- Injection Volume
- Gradient Profile

A convenient method transfer tool is available at the Chromatography Resource Center ([www.thermoscientific.com/crc](http://www.thermoscientific.com/crc)).

### Optimization

In order to preserve high efficiency, and therefore resolution and sensitivity, the HPLC system in use should be optimized to reduce any potential causes of peak broadening. See page 4-231 for details of this optimization.

# Thermo Scientific Hypersil GOLD HPLC Columns

Outstanding peak shape for your separations

- Excellent peak symmetry
- Narrow peaks for outstanding efficiency
- Increased sensitivity and improved resolution
- Variety of chemistries
- 1.9 to 12µm particles



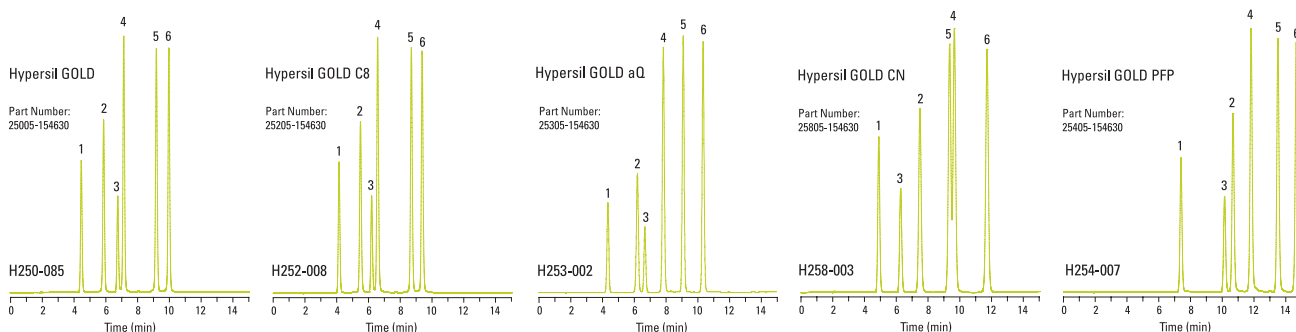
Thermo Scientific™ Hypersil GOLD™ columns are exceptionally reproducible for reliable chromatography, column after column. This allows the user to be confident that assays developed with Hypersil GOLD columns will be robust and stable for the life of the assay, making them an ideal choice for new method development. Built on more than 35 years of experience in product development and manufacturing of HPLC media and columns, we successfully continue to extend the capabilities of this state-of-the-art family of columns, designed for improved chromatography. Hypersil GOLD columns are manufactured in ISO 9001:2008 accredited laboratories under strict protocols using a robust manufacturing procedure and extensive quality control testing.

## Improved Selectivity, Resolution and Productivity

Hypersil GOLD columns are available in an array of chemistries to optimize separations and maximize productivity:

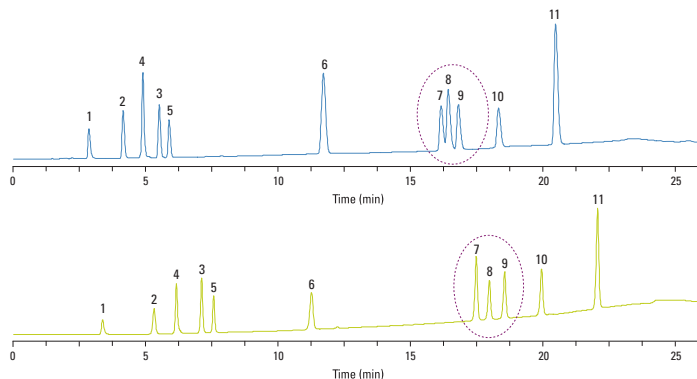
- **Hypersil GOLD** offers outstanding peak shape using generic gradients with C18 selectivity
- **Hypersil GOLD C8** offers similar selectivity but with less retention
- **Hypersil GOLD aQ** can be used for challenging reverse phase separations employing highly aqueous mobile phases
- **Hypersil GOLD PFP** can offer alternative selectivity in reverse phase applications
- **Hypersil GOLD Phenyl** offers alternative selectivity and is particularly suitable for aromatic and moderately polar compounds
- **Hypersil GOLD CN** can be used for both reversed and normal phase separations
- **Hypersil GOLD C4** has short alkyl chain length, low hydrophobicity column for less retention
- **Hypersil GOLD Amino** demonstrates excellent chromatographic properties in three modes: weak anion exchange, reversed phase and normal phase.
- **Hypersil GOLD AX** can be used to separate proteins, peptides, other anionic species and polar molecules
- **Hypersil GOLD SAX** is a highly stable silica-based quarternary amine strong anion exchange column, designed for aqueous mobile phase
- **Hypersil GOLD Silica** is a powerful and efficient tool in the chromatography of non-polar and moderately polar organic compounds by normal phase
- **Hypersil GOLD HILIC** columns retain polar analytes that are problematic using reversed phase columns

These chemistries offer alternative selectivities in the same column family, providing enhanced retention or changes in elution order for flexibility in method development. Each phase is made with the same care and attention to quality that defines all Thermo Scientific columns.



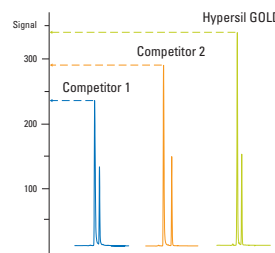
### Hypersil GOLD, 5µm, 150 x 4.6mm

Mobile Phase:	A: H <sub>2</sub> O + 0.1% Formic acid B: MeOH + 0.1% Formic acid
Gradient:	20 to 50% B in 15 min
Flow Rate:	1mL/min
Detection:	UV at 280nm
Temperature:	25°C
Sample:	1. Catechin 2. Epigallocatechin Gallate 3. Epicatechin 4. Gallicocatechin Gallate 5. Epicatechin Gallate 6. Catechin Gallate



**Competitor C18 column**

**Hypersil GOLD column**



The improved peak symmetry provides additional peak height to increase sensitivity of analysis of trace components.

Resolution of analytes is improved using a Hypersil GOLD column.  
Data courtesy of M. Euerby, AstraZeneca, Charmwood, UK.

### Solutions for High Throughput Screening, Capillary to Preparative Analysis

Hypersil GOLD columns are available in particle sizes and column designs to meet all separation needs, including improved resolution, enhanced sensitivity and faster analyses. From 1.9µm to 12µm particles, Hypersil GOLD columns offer chromatographic solutions with consistent separations and performance. Specialized hardware includes Thermo Scientific™ KAPPA™ capillary columns, PicoFrit™ and IntegraFrit nanobore columns, Thermo Scientific™ Javelin™ HTS direct-connection columns and Thermo Scientific™ DASH™ HTS columns, designed for high throughput screening.

### Improved Sensitivity

Good peak shape means greater sensitivity. When peaks exhibit tailing, peak height is reduced causing the sensitivity of the analysis to be compromised. The more symmetrical the chromatographic peaks, the more confidence you derive from your data. Using Hypersil GOLD columns, peak height is enhanced and peak integration calculations are optimized.

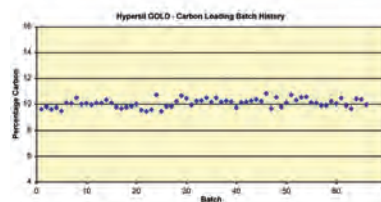
Enhanced peak height can be particularly critical when low concentrations of an analyte are present, for example in an impurity assay. The increase in sensitivity gained with the Hypersil GOLD columns over competitor C18 columns is illustrated above.

### Enhanced Resolution

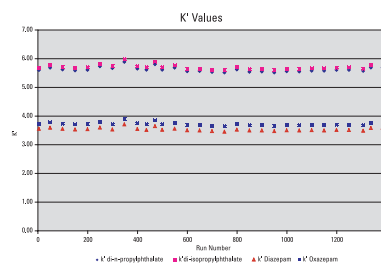
Robust assay development requires a clear definition of resolution expectations. Narrow symmetrical chromatographic peaks ensure that optimum resolution is achieved. Obtaining narrow peak widths is especially challenging for basic pharmaceutical compounds. The figure above shows how Hypersil GOLD columns provide excellent resolution between critical pairs, aiding in separation of closely related species.

### pH Stability

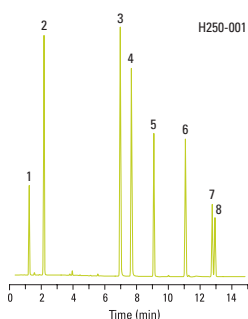
Hypersil GOLD columns are well suited to extended pH applications. Hypersil GOLD columns have been shown to produce robust assays at high pH. At low pH, excellent column stability and reproducibility are illustrated.



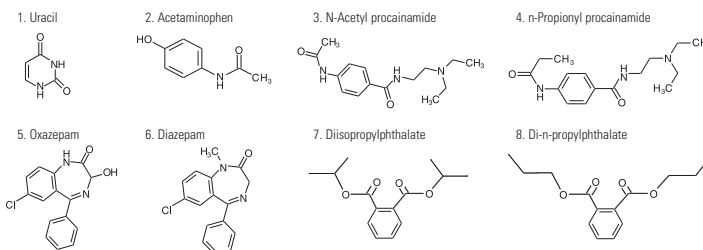
Excellent reproducibility is illustrated with the percent carbon on the Hypersil GOLD media



Stability of Hypersil GOLD columns at low pH. No loss of retention after 28L of mobile phase in 19.5 days of analysis.



**H250-001**  
**Dimensions:** 5µm, 150 x 4.6mm  
**Part Number:** 25005-154630  
**Mobile Phase:** A: 0.1% ammonia pH 10.6  
B: MeOH + 0.1% ammonia  
**Gradient:** 5 – 100% B in 15 min  
**Flow:** 1.0mL/min  
**Injection:** 10µL  
**Detection:** UV at 254nm  
**Temperature:** 30°C

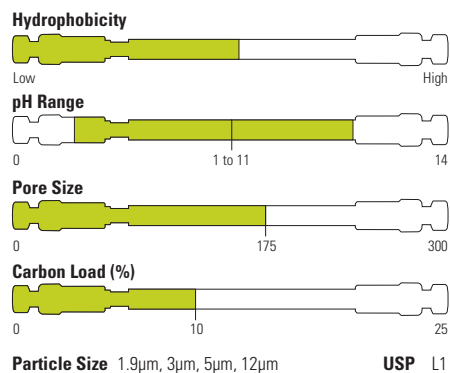


High pH stability assay (pH 10.6) of Hypersil GOLD columns

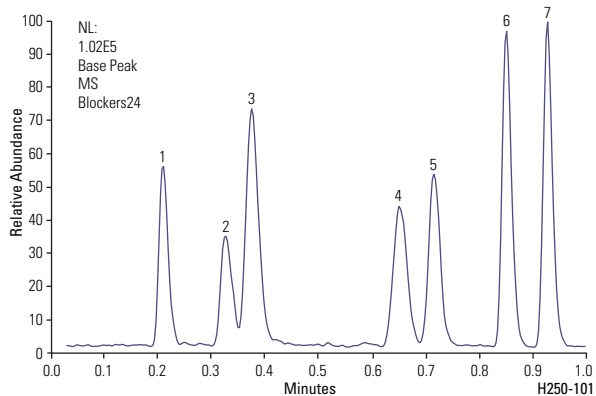
## Hypersil GOLD

Endcapped, ultrapure, silica-based columns with exceptional peak shape and resolution for HPLC and LC/MS

- Significant reduction in peak tailing while retaining C18 selectivity
- Excellent resolution, efficiency and sensitivity
- Confidence in the accuracy and quality of analytical data



### Seven β-blockers in 1 minute



**Column: 1.9µm Hypersil GOLD 20 x 2.1mm**

**Part Number: 25002-022130**

Mobile phase: A – H<sub>2</sub>O+0.1%formic acid

B – MeCN+0.1%formic acid

Gradient: 15 to 100% B in 1min

Flow rate: 0.5ml/min

Temperature: 30°C

Detection: +ESI

System: Thermo Scientific™Surveyor™ MSQ

Analytes:

1. Atenolol

2. Nadolol

3. Pindolol

4. Timolol

5. Metoprolol

6. Oxprenolol

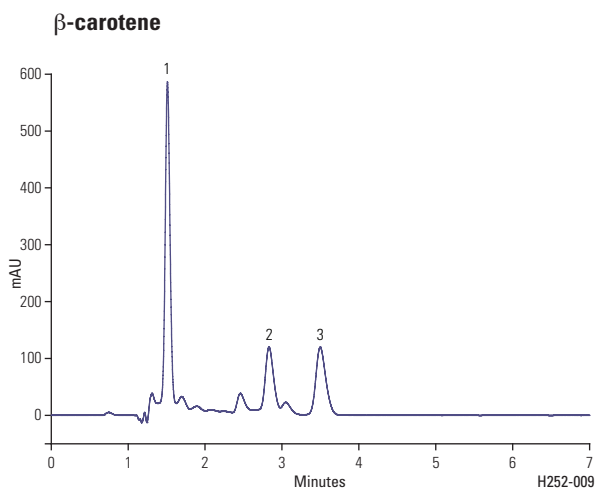
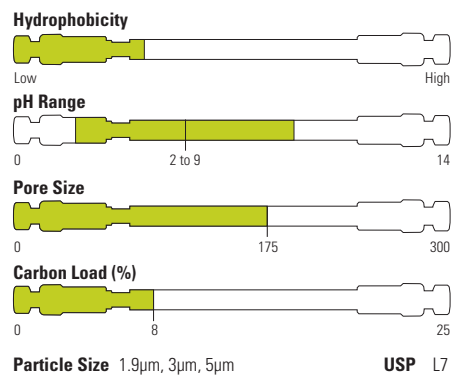
7. Propranolol



## Hypersil GOLD C8

Recommended for analytes with medium hydrophobicity or when a less hydrophobic phase is required to obtain optimum retention

- Similar selectivity to C18 columns but with reduced retention
- Lower hydrophobicity, allowing compounds to elute quicker
- Faster separations
- Excellent peak shape
- High efficiency
- Outstanding sensitivity



**Column: Hypersil GOLD C8, 5µm, 150 x 4.6mm**

**Part Number: 25205-154630**

Mobile phase: MeOH

Flow rate: 1.5mL/min

Temperature: 25°C

Detection: UV @ 450 nm

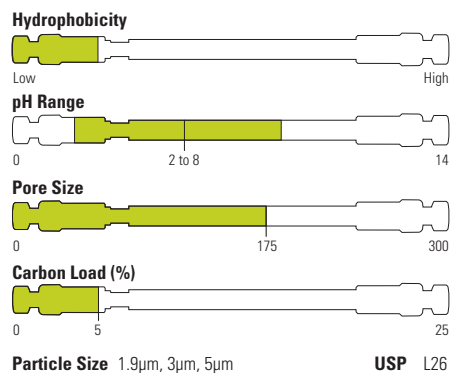
Analytes: 1. Lutein  
2. Lycopene  
3. β-Carotene



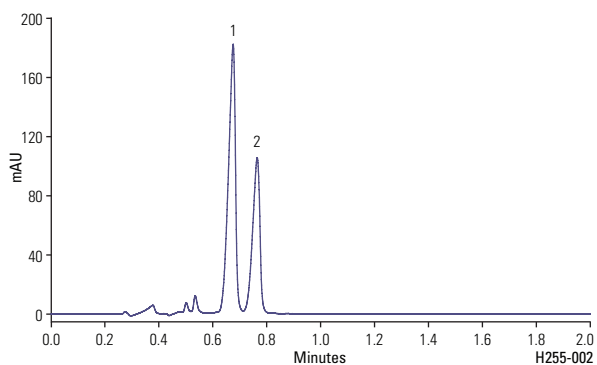
## Hypersil GOLD C4

Lower hydrophobicity than C18 or C8 recommended for very hydrophobic analytes

- Lower hydrophobicity
- Faster separations
- Excellent peak shape
- High efficiency
- Outstanding sensitivity



### Fatty acids



**Column: Hypersil GOLD C4 1.9µm, 100 x 2.1mm**

**Part Number: 25502-102130**

Mobile phase: H<sub>2</sub>O / MeCN (20:80)

Flow rate: 0.55mL/min

Temperature: 30°C

Detection: 200 nm

Injection volume: 1µL

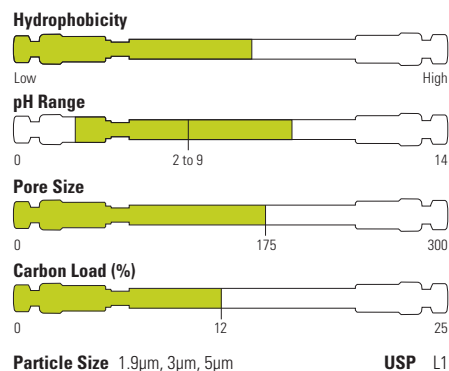
Sample: 1. Linolenic acid

2. Linoleic acid

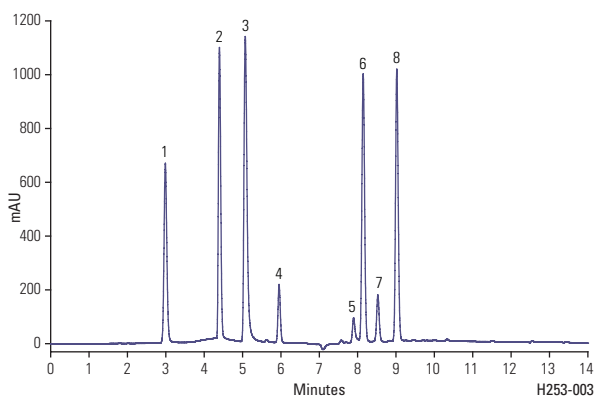
## Hypersil GOLD aQ

Hypersil GOLD aQ polar endcapped C18 columns provide a controlled interaction mechanism by which polar analytes can be retained and resolved

- Polar endcapped C18 phase for alternative selectivity
- Retention and resolution of polar analytes
- Excellent peak shape
- Stable in 100% aqueous mobile phases



### Water soluble vitamins



**Column: Hypersil GOLD aQ, 5µm, 150 x 4.6mm**  
**Part Number: 25305-154630**

Mobile phase: A: 50 mM KH<sub>2</sub>PO<sub>4</sub>, pH 3.5  
B: MeOH

Gradient: 0 – 100% B in 15 min

Flow Rate: 1mL/min

Detection: UV @ 205nm

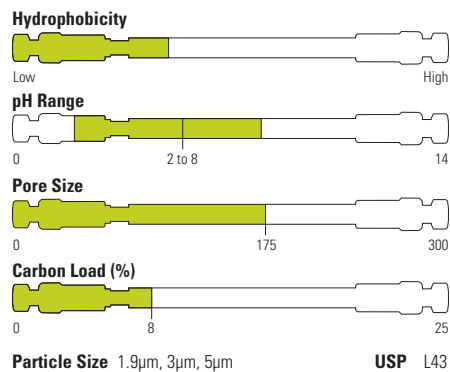
Sample:

1. Vitamin B1 (thiamine)
2. Vitamin B6 (pyridoxine)
3. Vitamin B3 (nicotinamide)
4. Vitamin B5 (pantothenic acid)
5. Folic Acid
6. Vitamin B12 (cyanocobalamin)
7. Vitamin H (biotin)
8. Vitamin B2 (riboflavin)

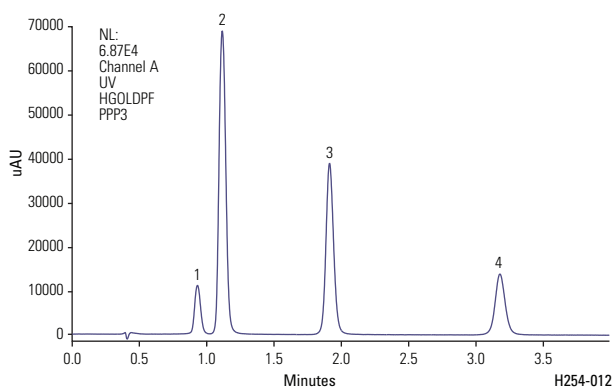
## Hypersil GOLD PFP

Introduction of a fluorine group into the stationary phase causes significant changes in solute-stationary phase interaction

- The fluorine atoms around the phenyl ring enhance pi-pi interactions with aromatic molecules
- Alternative selectivity to C18
- Extra retention for halogenated species
- Selectivity for non-halogenated polar compounds
- Excellent peak shape and sensitivity



### Polyphenols



**Column: Hypersil GOLD PFP 1.9µm, 50 x 2.1mm**  
**Part Number: 25402-052130**

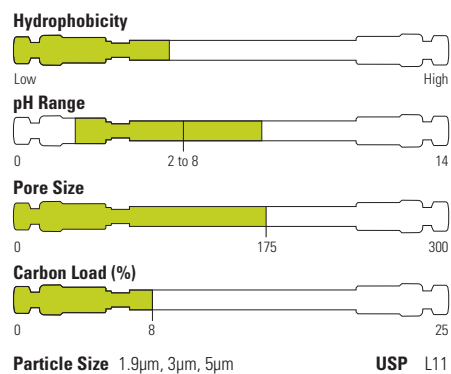
Mobile phase:	0.1% Acetic Acid
Flow rate:	0.5mL/min
Temperature:	25°C
Detection:	UV @ 280nm (2µL Flow Cell)
Injection Volume:	0.5µL
Sample:	1. Pyrogallol 2. Hydroquinone 3. Resorcinol 4. Phenol



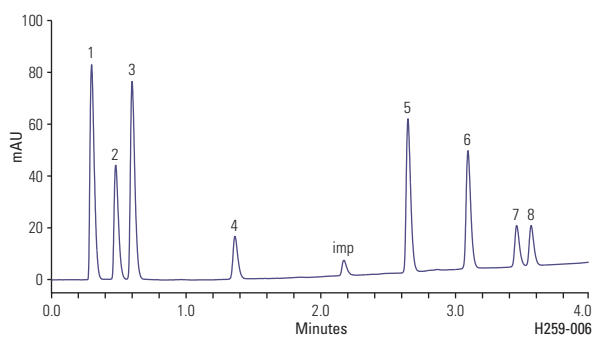
## Hypersil GOLD Phenyl

Contains a C4 linker which allows for superior alignment of the phenyl ring with aromatic molecules

- Enhanced pi-pi interactions with aromatics
- Moderate hydrophobicity
- Outstanding peak shape and sensitivity



### Antidepressants



#### Column: Hypersil GOLD Phenyl 1.9µm, 50 x 2.1mm

Part Number: 25902-052130

Mobile phase: A – 0.1% Formic acid

B – 0.1% Formic acid in MeCN

Gradient: 10 – 60% B in 3.4mins, 60 - 90% B in 0.24 min

Flow rate: 0.5mL/min

Temperature: 60°C

Injection Volume: 0.7µL

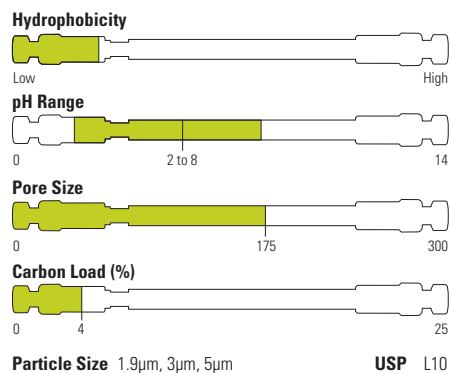
Detection: UV @ 225 and 254 nm

Analytes:  
1. Uracil  
2. Acetaminophen  
3. p-Hydroxybenzoic acid  
4. o-Hydroxybenzoic acid  
5. Oxazepam  
6. Diazepam  
7. Di-isopropyl phthalate  
8. Di-n-propyl phthalate

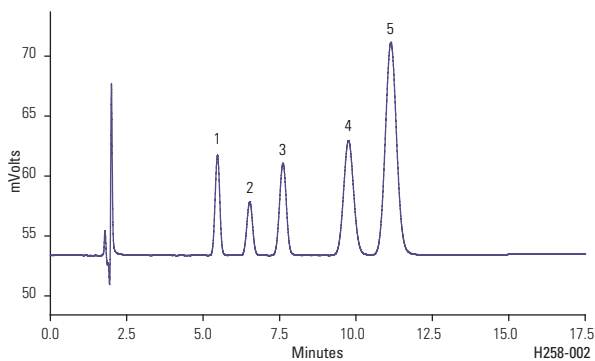
## Hypersil GOLD CN

Hypersil GOLD CN columns can be used for both normal phase and reversed phase separations

- Provide alternative selectivity with lower hydrophobicity
- Excellent peak shape
- Outstanding sensitivity
- Less retention for faster analysis



### Organic acids



**Column: Hypersil GOLD CN, 5µm, 150 x 4.6mm**  
**Part Number: 25805-154630**

Mobile Phase:	A: 25 mM KH <sub>2</sub> PO <sub>4</sub> , pH2 B: MeOH
Isocratic:	95% A: 5% B
Flow Rate:	1.5mL/min
Temperature:	25°C
Detection:	UV @ 230nm
Sample:	1. 4-Fluorobenzoic 2. o-Toluic Acid 3. p-Toluic Acid 4. 2,4,6-Trimethylbenzoic Acid 5. 2,5-Dimethylbenzoic Acid

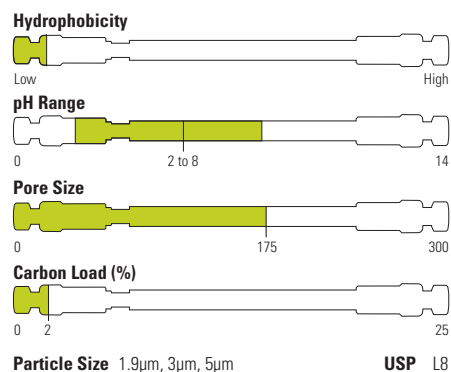




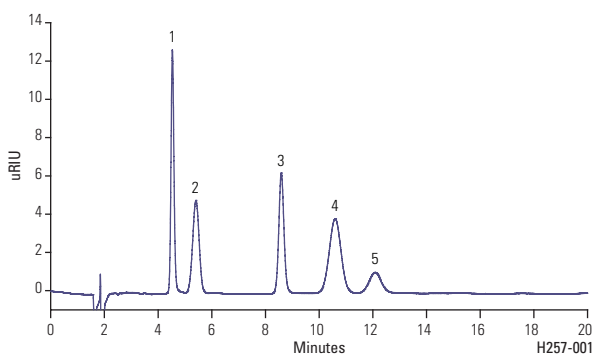
## Hypersil GOLD Amino

A high performance aminopropyl phase that gives excellent chromatographic properties in three modes: weak anion exchange, reversed phase and normal phase

- Retains anions and organic acids in weak anion exchange
- Excellent for carbohydrate analysis in reversed phase
- Alternative selectivity to silica columns in normal phase chromatography
- Outstanding peak shape and sensitivity



### Sugars



**Column: Hypersil GOLD Amino, 5µm, 150 x 4.6mm**

**Part Number: 25705-154630**

Mobile Phase: MeCN/Water (80:20)

Flow Rate: 1.2mL/min

Temperature: 35°C

Detection: RI

Injection volume: 20 µL

Sample:

1. Fructose

2. Glucose

3. Sucrose

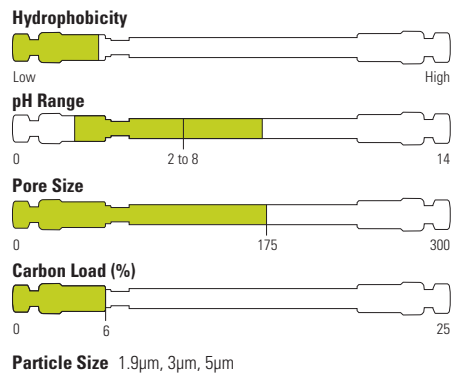
4. Maltose

5. Lactose

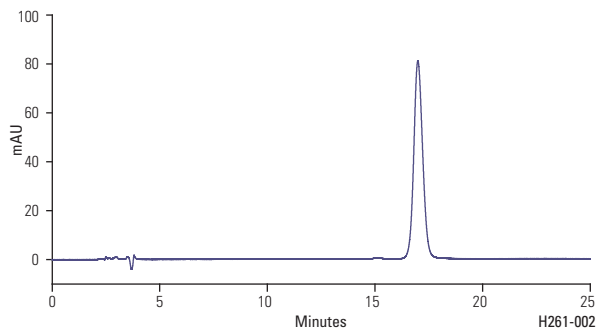
## Hypersil GOLD AX

A novel polymeric amine ligand bonded to highly pure base deactivated silica

- Weak anion exchange phase for multiple charged species
- Suitable for HILIC retention and separation of highly polar molecules
- Higher efficiency than polymer based ion exchange columns
- Outstanding peak shape and selectivity



### Vitamin C



**Column: Hypersil GOLD AX, 5µm, 100 x 4.6mm**

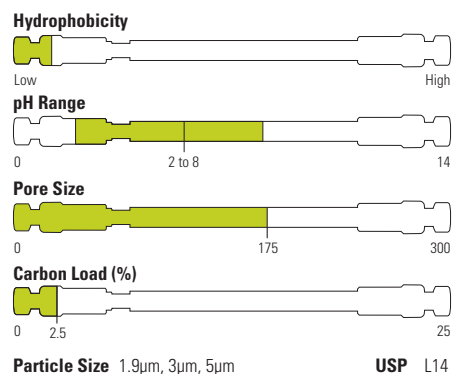
**Part Number: 26105-104630**

Mobile Phase:	100 mM Ammonium Acetate pH 6.8/ MeCN (30:70)
Flow Rate:	0.5mL/min
Temperature:	30°C
Detection:	UV @ 240nm
Injection volume:	50µL

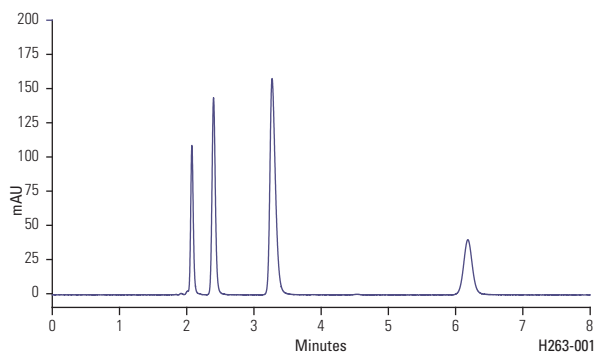
## Hypersil GOLD SAX

A highly stable quaternary amine strong anion exchange column for aqueous and low pH mobile phases

- High stability to aqueous and low pH mobile phases
- Ideally suited to the analysis of smaller organic molecules including nucleotides and organic acids
- Outstanding peak shape and sensitivity



### Monophosphates



**Column: Hypersil GOLD SAX, 5µm, 150 x 4.6mm**

**Part Number: 26105-154630**

Mobile Phase: Aqueous  $\text{KH}_2\text{PO}_4$  (50 mM, pH 3)

Flow Rate: 1.0 mL min<sup>-1</sup>

Temperature: 40°C

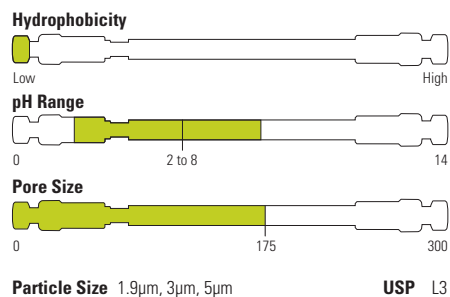
Detection: UV @ 254nm

Injection volume: 10µL

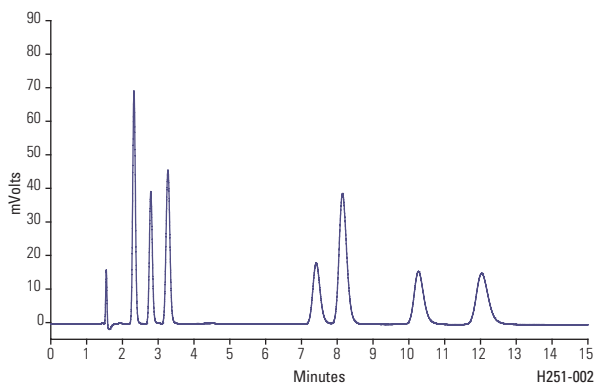
## Hypersil GOLD Silica

Unbonded, highly pure base deactivated silica media that is the backbone of the Hypersil GOLD range of columns

- Highly pure base deactivated silica media
- Outstanding peak shape and sensitivity



### Steroids



**Column: Hypersil GOLD Silica, 5µm, 150 x 4.6mm**

**Part Number: 25105-154630**

Mobile Phase: 19:1 (v/v) n-C6H14/EtOH

Flow Rate: 1.5mL min<sup>-1</sup>

Temperature: 30°C

Detection: UV @ 254nm

Injection volume: 5µL

Sample: 1. Progesterone

2. 21-Hydroxyprogesterone-21-acetate

3. 17-a-Hydroxyprogesterone

4. Cortisone

5. 11-a-Hydroxyprogesterone

6. Corticosterone

7. Hydrocortisone

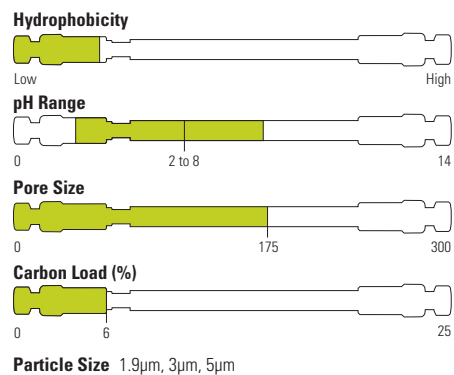
The Hypersil GOLD web page contains the latest news, applications and downloads for the Hypersil GOLD HPLC column range. Visit: [www.thermoscientific.com/hypersilgold](http://www.thermoscientific.com/hypersilgold)



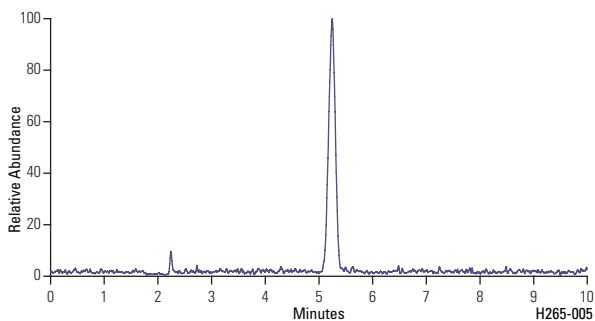
## Hypersil GOLD HILIC

Hypersil GOLD HILIC retains and separates polar analytes that are problematic using reversed phase columns

- Alternative selectivity to C18
- Improved sensitivity for MS detection
- Alternative to ion-pair or derivatisation
- Outstanding peak shape and selectivity



### Urea



**Column: Hypersil GOLD HILIC, 5µm, 150 x 4.6mm**

**Part Number: 26505-154630**

Mobile Phase: H<sub>2</sub>O/MeCN (10:90)  
+ 0.1% formic acid

Flow Rate: 0.6mL/min

Temperature: 30°C

Detection: +ESI

Injection volume: 1µL (made up in mobile phase)

Sample: 1. Urea



# Hypersil GOLD Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	GOLD	C8	aQ	PPF		
1.9	UHPLC Column	20	2.1	25002-022130	25202-022130	25302-022130	25402-022130		
			3.0	25002-031030	—	—	—		
			2.1	25002-032130	25202-032130	25302-032130	25402-032130		
		50	1.0	25002-051030	25202-051030	25302-051030	25402-051030		
			2.1	25002-052130	25202-052130	25302-052130	25402-052130		
			3.0	25002-053030	25202-053030	25302-053030	25402-053030		
			4.6	25002-054630	25202-054630	25302-054630	25402-054630		
		100	1.0	25002-101030	25202-101030	25302-101030	25402-101030		
			2.1	25002-102130	25202-102130	25302-102130	25402-102130		
			3.0	25002-103030	25202-103030	25302-103030	25402-103030		
		150	2.1	25002-152130	25202-152130	25302-152130	25402-152130		
		200	2.1	25002-202130	25202-202130	25302-202130	25402-202130		
		3	Drop-in Guard (4/pk)	10	1.0	25003-011001	25203-011001	25303-011001	25403-011001
					2.1	25003-012101	25203-012101	25303-012101	25403-012101
3.0	25003-013001				25203-013001	25303-013001	25403-013001		
4.0/4.6	25003-014001				25203-014001	25303-014001	25403-014001		
HPLC Column	30		2.1	25003-032130	25203-032130	25303-032130	25403-032130		
			3.0	25003-033030	25203-033030	25303-033030	25403-033030		
			4.6	25003-034630	25203-034630	25303-034630	25403-034630		
			50	2.1	25003-052130	25203-052130	25303-052130	25403-052130	
				3.0	25003-053030	25203-053030	25303-053030	25403-053030	
				4.0	25003-054030	25203-054030	25303-054030	25403-054030	
	100		4.6	25003-054630	25203-054630	25303-054630	25403-054630		
			1.0	25003-101030	25203-101030	25303-101030	25403-101030		
			2.1	25003-102130	25203-102130	25303-102130	25403-102130		
			3.0	25003-103030	25203-103030	25303-103030	25403-103030		
	150		4.0	25003-104030	25203-104030	25303-104030	25403-104030		
			4.6	25003-104630	25203-104630	25303-104630	25403-104630		
			1.0	25003-151030	25203-151030	25303-151030	25403-151030		
			2.1	25003-152130	25203-152130	25303-152130	25403-152130		
			3.0	25003-153030	25203-153030	25303-153030	25403-153030		
			4.0	25003-154030	25203-154030	25303-154030	25403-154030		
	5		Drop-in Guard (4/pk)	10	2.1	25005-012101	25205-012101	25305-012101	25405-012101
					3.0	25005-013001	25205-013001	25305-013001	25405-013001
					4.0/4.6	25005-014001	25205-014001	25305-014001	25405-014001
					HPLC Column	30	2.1	25005-032130	—
			3.0	25005-033030			—	—	—
			4.6	25005-034630			—	—	—
			50	2.1		25005-052130	25205-052130	25305-052130	25405-052130
				3.0		25005-053030	25205-053030	25305-053030	25405-053030
				4.6		25005-054630	25205-054630	25305-054630	25405-054630
			100	2.1	25005-102130	25205-102130	25305-102130	25405-102130	
3.0		25005-103030		25205-103030	25305-103030	25405-103030			
4.6		25005-104630		25205-104630	25305-104630	25405-104630			
150		2.1	25005-152130	25205-152130	25305-152130	25405-152130			
		3.0	25005-153030	25205-153030	25305-153030	25405-153030			
		4.0	25005-154030	25205-154030	25305-154030	25405-154030			
		4.6	25005-154630	25205-154630	25305-154630	25405-154630			
250	2.1	25005-252130	25205-252130	25305-252130	25405-252130				
	3.0	25005-253030	25205-253030	25305-253030	25405-253030				
	4.0	25005-254030	25205-254030	25305-254030	25405-254030				
	4.6	25005-254630	25205-254630	25305-254630	25405-254630				

C4	Phenyl	CN	Amino	AX	SAX	Silica	HILIC
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
25502-052130	25902-052130	25802-052130	25702-052130	26102-052130	26302-052130	25102-052130	26502-052130
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
25502-102130	25902-102130	25802-102130	25702-102130	26102-102130	26302-102130	25102-102130	26502-102130
-	-	-	-	-	-	-	-
25502-152130	25902-152130	25802-152130	25702-152130	26102-152130	26302-152130	25102-152130	26502-152130
25502-202130	25902-202130	25802-202130	25702-202130	26102-202130	26302-202130	25102-202130	26502-202130
25503-011001	25903-011001	25803-011001	25703-011001	26103-011001	26303-011001	25103-011001	26503-011001
25503-012101	25903-012101	25803-012101	25703-012101	26103-012101	26303-012101	25103-012101	26503-012101
25503-013001	25903-013001	25803-013001	25703-013001	26103-013001	26303-013001	25103-013001	26503-013001
25503-014001	25903-014001	25803-014001	25703-014001	26103-014001	26303-014001	25103-014001	26503-014001
25503-032130	25903-032130	25803-032130	25703-032130	26103-032130	26303-032130	25103-032130	26503-032130
-	-	-	-	-	-	-	-
25503-034630	25903-034630	25803-034630	25703-034630	26103-034630	26303-034630	25103-034630	26503-034630
25503-052130	25903-052130	25803-052130	25703-052130	26103-052130	26303-052130	25103-052130	26503-052130
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
25503-102130	25903-102130	25803-102130	25703-102130	26103-102130	26303-102130	25103-102130	26503-102130
25503-103030	25903-103030	25803-103030	25703-103030	26103-103030	26303-103030	25103-103030	26503-103030
-	-	-	-	-	-	-	-
25503-104630	25903-104630	25803-104630	25703-104630	26103-104630	26303-104630	25103-104630	26503-104630
25503-151030	25903-151030	25803-151030	25703-151030	26103-151030	26303-151030	25103-151030	26503-151030
25503-152130	25903-152130	25803-152130	25703-152130	26103-152130	26303-152130	25103-152130	26503-152130
25503-153030	25903-153030	25803-153030	25703-153030	26103-153030	26303-153030	25103-153030	26503-153030
-	-	-	-	-	-	-	-
25503-154630	25903-154630	25803-154630	25703-154630	26103-154630	26303-154630	25103-154630	26503-154630
25505-012101	25905-012101	25805-012101	25705-012101	26105-012101	26305-012101	25105-012101	26505-012101
25505-013001	25905-013001	25805-013001	25705-013001	26105-013001	26305-013001	25105-013001	26505-013001
25505-014001	25905-014001	25805-014001	25705-014001	26105-014001	26305-014001	25105-014001	26505-014001
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
25505-052130	25905-052130	25805-052130	25705-052130	26105-052130	26305-052130	25105-052130	26505-052130
-	-	-	-	-	-	-	-
25505-054630	25905-054630	25805-054630	25705-054630	26105-054630	26305-054630	25105-054630	26505-054630
25505-102130	25905-102130	25805-102130	25705-102130	26105-102130	26305-102130	25105-102130	26505-102130
25505-103030	25905-103030	25805-103030	25705-103030	26105-103030	26305-103030	25105-103030	26505-103030
25505-104630	25905-104630	25805-104630	25705-104630	26105-104630	26305-104630	25105-104630	26505-104630
25505-152130	25905-152130	25805-152130	25705-152130	26105-152130	26305-152130	25105-152130	26505-152130
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
25505-154630	25905-154630	25805-154630	25705-154630	26105-154630	26305-154630	25105-154630	26505-154630
25505-252130	25905-252130	25805-252130	25705-252130	26105-252130	26305-252130	25105-252130	26505-252130
25505-253030	25905-253030	25805-253030	25705-253030	26105-253030	26305-253030	25105-253030	26505-253030
25505-254030	25905-254030	25805-254030	25705-254030	26105-254030	26305-254030	25105-254030	26505-254030
25505-254630	25905-254630	25805-254630	25705-254630	26105-254630	26305-254630	25105-254630	26505-254630

## Hypersil GOLD Ordering Guide *continued*

Format	Length (mm)	ID (mm)	Cat. No.
UNIGUARD Guard Cartridge Holder	10	1.0	<b>851-00</b>
		2.1	<b>852-00</b>
		3.0	<b>852-00</b>
		4.0/4.6	<b>850-00</b>

Particle Size (µm)	Format	Length (mm)	ID (mm)	GOLD
1.9	Javelin HTS Column (3/pk)	10	2.1	<b>25002-012135</b>
5	Javelin HTS Column (3/pk)	20	4.0	<b>25005-024035</b>

Particle Size (µm)	Format	Length (mm)	ID (mm)	GOLD	aQ	PPF	
5	Preparative Guard Cartridge (3/pk)	10	10	<b>25005-019023</b>	<b>25305-019023</b>	<b>25405-019023</b>	
			20	<b>25005-019223</b>	<b>25305-019223</b>	<b>25405-019223</b>	
	Preparative HPLC Column	50	10	10	<b>25005-059070</b>	<b>25305-059070</b>	<b>25405-059070</b>
				21	<b>25005-059270</b>	<b>25305-059270</b>	<b>25405-059270</b>
				30	<b>25005-059370</b>	<b>25305-059370</b>	<b>25405-059370</b>
				50	<b>25005-059570</b>	<b>25305-059570</b>	<b>25405-059570</b>
	100	10	10	<b>25005-109070</b>	<b>25305-109070</b>	<b>25405-109070</b>	
			21	<b>25005-109270</b>	<b>25305-109270</b>	<b>25405-109270</b>	
			30	<b>25005-109370</b>	<b>25305-109370</b>	<b>25405-109370</b>	
			50	<b>25005-109570</b>	<b>25305-109570</b>	<b>25405-109570</b>	
	150	10	10	<b>25005-159070</b>	<b>25305-159070</b>	<b>25405-159070</b>	
			21	<b>25005-159270</b>	<b>25305-159270</b>	<b>25405-159270</b>	
			30	<b>25005-159370</b>	<b>25305-159370</b>	<b>25405-159370</b>	
			50	<b>25005-159570</b>	<b>25305-159570</b>	<b>25405-159570</b>	
	250	10	10	<b>25005-259070</b>	<b>25305-259070</b>	<b>25405-259070</b>	
			21	<b>25005-259270</b>	<b>25305-259270</b>	<b>25405-259270</b>	
			30	<b>25005-259370</b>	<b>25305-259370</b>	<b>25405-259370</b>	
			50	<b>25005-259570</b>	<b>25305-259570</b>	<b>25405-259570</b>	
	12	Preparative Guard Cartridge (3/pk)	10	10	<b>25012-019023</b>	–	–
				20	<b>25012-019223</b>	–	–
Preparative HPLC Column		50	10	10	<b>25012-059070</b>	–	–
				21	<b>25012-059270</b>	–	–
				30	<b>25012-059370</b>	–	–
				50	<b>25012-059570</b>	–	–
100		10	10	<b>25012-109070</b>	–	–	
			21	<b>25012-109270</b>	–	–	
			30	<b>25012-109370</b>	–	–	
			50	<b>25012-109570</b>	–	–	
150		10	10	<b>25012-159070</b>	–	–	
			21	<b>25012-159270</b>	–	–	
			30	<b>25012-159370</b>	–	–	
			50	<b>25012-159570</b>	–	–	
250		10	10	<b>25012-259070</b>	–	–	
			21	<b>25012-259270</b>	–	–	
			30	<b>25012-259370</b>	–	–	
			50	<b>25012-259570</b>	–	–	

Format	Length (mm)	ID (mm)	Cat. No.
Preparative Guard Cartridge Holder	10	10	<b>C-1000</b>
		20	<b>854-00</b>



# Thermo Scientific Accucore HPLC Columns

Ultimate Core Performance – Speed and Selectivity Combined

Founded on state-of-the-art Core Enhanced Technology™ and utilizing vast experience in phase bonding and packing, Thermo Scientific™ Accucore™ HPLC columns provide a unique chromatography solution to enhance laboratory workflow and efficiency. Available in a wide range of stationary phase selectivities and compatible with almost any instrument, these columns provide an excellent return on investment.

Containing solid core particles, which are engineered to a diameter of 2.6µm and a very narrow particle size distribution; Accucore HPLC columns allows high speed, high resolution separation, with back pressures significantly lower than those associated with UHPLC. Eleven different stationary phases bonded using advanced technology and packed with highly controlled automated processes result in highly reproducible, rugged columns that offer a wide range of selectivities to meet all your separation needs.



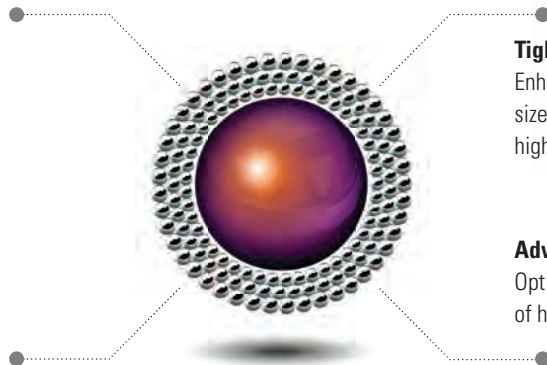
## The key components of Core Enhanced Technology

### Solid Core Particles

With a solid central core and porous outer layer, these particles generate high speed, high resolution separations without excessive backpressure

### Automated Packing Process

Enhanced automated procedures ensure that all columns are packed with the highest quality



### Tight Control of Particle Diameter

Enhanced selection process keeps particle size distribution to a minimum and produces high efficiency columns

### Advanced Bonding Technology

Optimized phase bonding creates a series of high coverage, robust phases



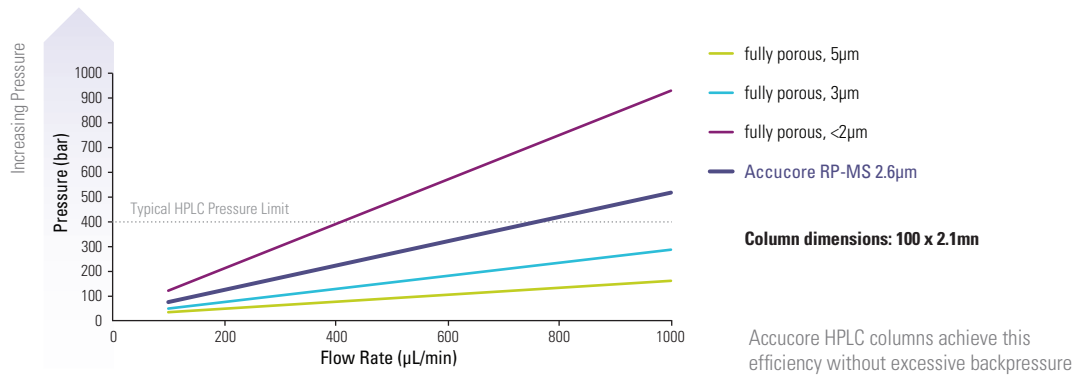
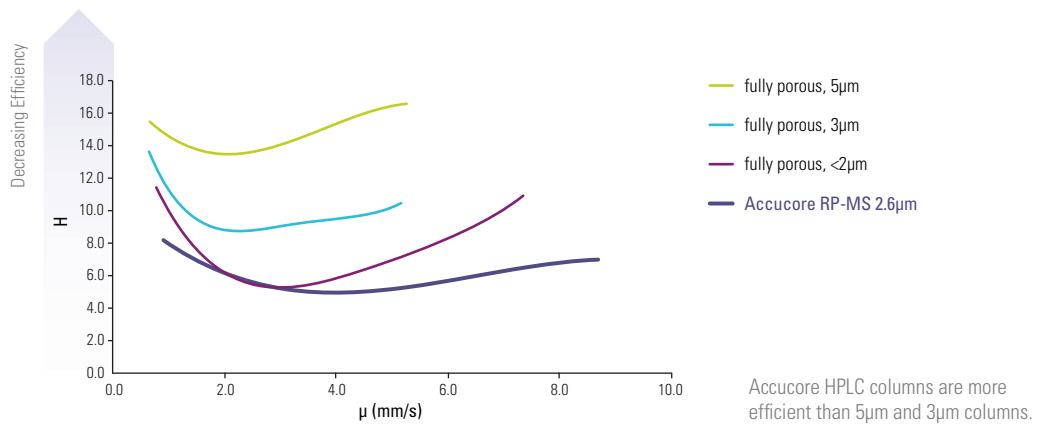
View product information and application notes

*The Accucore web page contains the latest news, applications and downloads for the Accucore HPLC column range.*

*Visit it at:*

**[www.thermoscientific.com/accucore](http://www.thermoscientific.com/accucore)**





**Accucore 2.6 $\mu$ m HPLC Columns Optimum Conditions and Ratings**

Column ID (mm)	Optimum Flow Rate	Maximum Inj. Volume	Backpressure Rating	Temperature Rating
2.1	400 $\mu$ L/min	1 $\mu$ L	1000 bar	70°C
3.0	800 $\mu$ L/min	3 $\mu$ L	1000 bar	70°C
4.6	1800 $\mu$ L/min	5 $\mu$ L	1000 bar	70°C



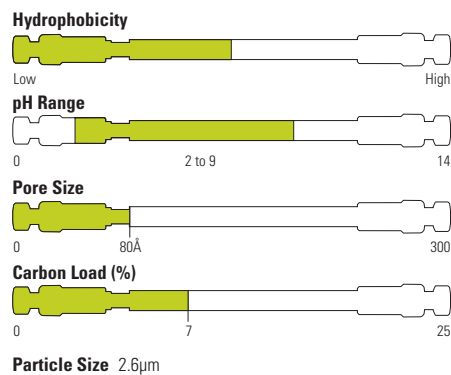
## Accucore RP-MS

- Optimized for MS detection
- Excellent peak shapes
- Excellent combination of speed and efficiency

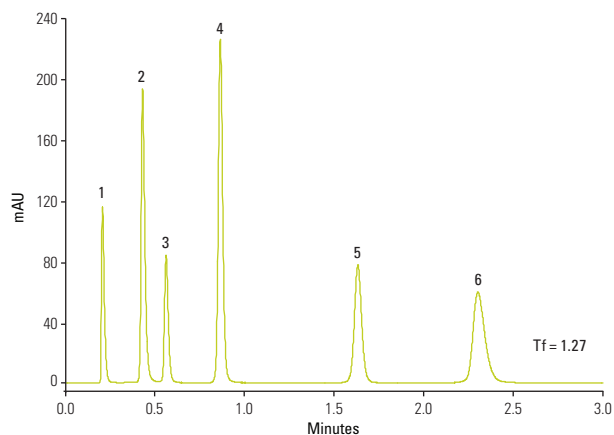
Accucore RP-MS uses an optimized alkyl chain length for more effective coverage of the silica surface. This coverage results in a significant reduction in non-hydrophobic interactions and thus highly efficient peaks with very low tailing.

RP-MS offers slightly lower retention than C18 and this combined with high efficiencies and low peak tailing make this the phase of choice for use with MS detection.

The selectivity offered by Accucore RP-MS matches that of C18 columns.



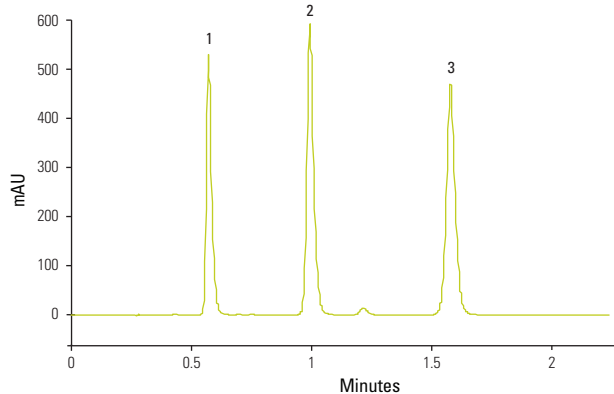
### Bases



#### Accucore RP-MS 2.6μm, 50mm x 2.1mm

Mobile phase:	65% Methanol / 35% 25mM Potassium Phosphate pH7.0
Flow rate:	500μL/min
Temperature:	30°C
Detection:	UV at 215nm
Injection volume:	1μL
Back pressure:	232 bar
Analytes:	1. Uracil 2. Propranolol 3. Butylparaben 4. Naphthalene 5. Acenaphthene 6. Amitriptyline

### Testosterones



#### Accucore RP-MS 2.6μm, 100mm x 2.1mm

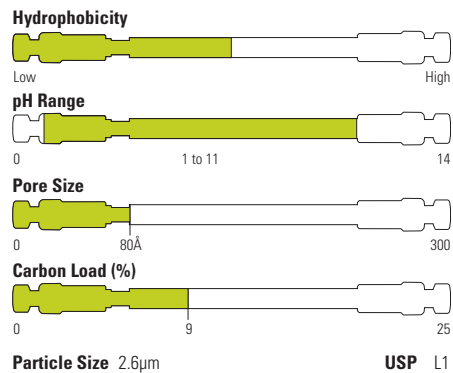
Mobile phase:	60:40 (v/v) Water / Acetonitrile
Flow rate:	0.6mL/min
Temperature:	40°C
Detection:	UV at 254nm
Injection volume:	1μL
Analytes:	1. 11-Ketotestosterone 2. 19-Nortestosterone (Nandrolone) 3. Epitestosterone

## Accucore C18

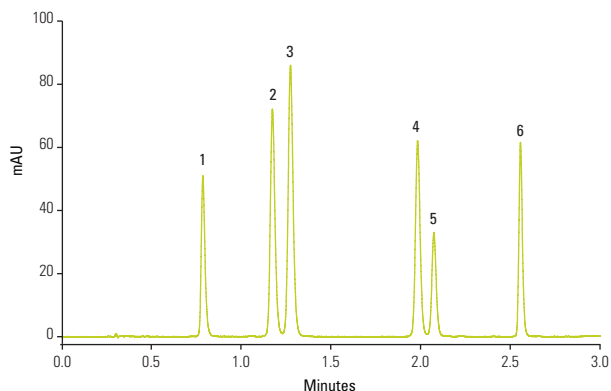
- Optimum retention of non-polar compounds
- Hydrophobic interaction mechanism
- Separates a broad range of analytes

The carbon loading of Accucore C18 phase provides high retention of non-polar analytes via a predominantly hydrophobic interaction mechanism.

The highly retentive nature of Accucore C18 phase means that it can be used to separate a broad range of analytes.



### Triazines



#### Accucore C18 2.6µm, 50mm x 2.1mm

Mobile phase: A – Water ; B – Acetonitrile

Gradient:	Time (min)	%B
	1.0	35
	2.5	70

Flow rate: 600µL/min

Temperature: 25°C

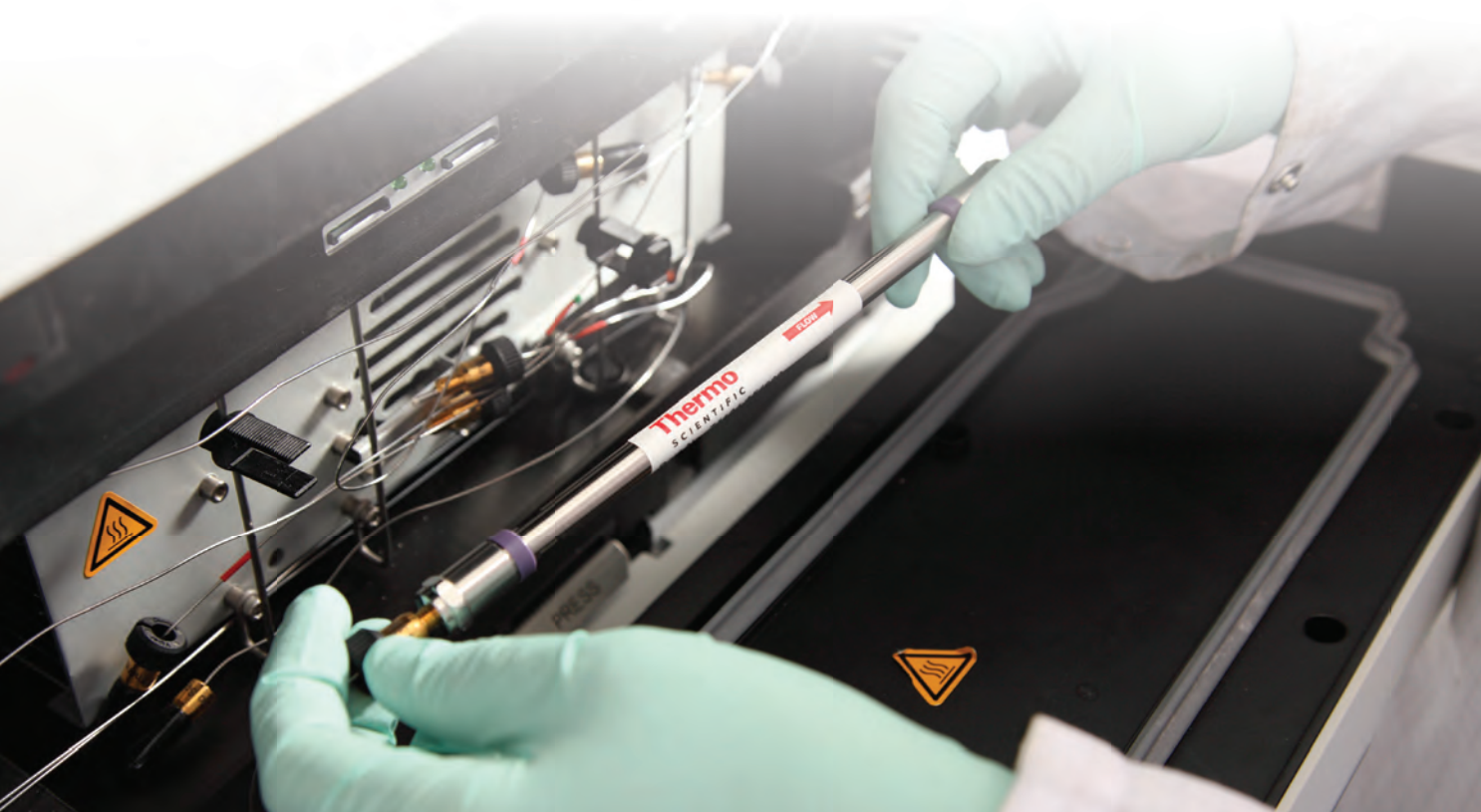
Detection: UV at 280nm

Injection volume: 2µL

Backpressure: 298 bar

Analytes:

1. Simazine
2. Simetryn
3. Atrazine
4. Ametryn
5. Propazine
6. Prometryn

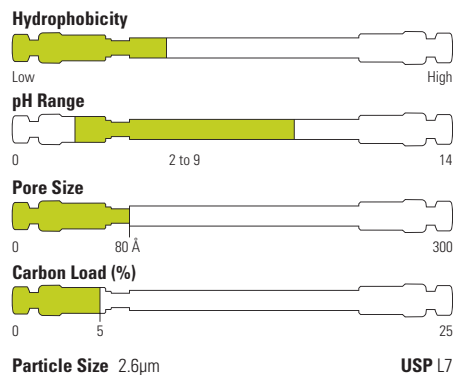


## Accucore C8

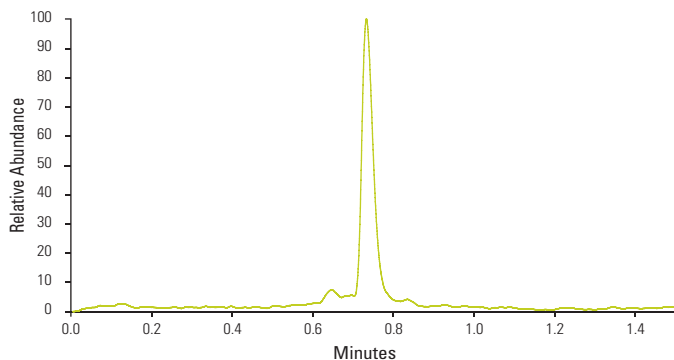
- Lower hydrophobic retention
- Complementary steric selectivity to C18
- Low levels of secondary interactions
- Recommended for moderately polar analytes

Accucore C8 HPLC columns offer lower hydrophobic retention than columns packed with longer alkyl chain length material, such as C18, and are therefore recommended for analytes with medium hydrophobicity or when a less hydrophobic phase provides optimum retention.

The low levels of secondary interactions demonstrated in the phase characterization are the result of excellent bonded phase coverage and allow users of Accucore C8 HPLC columns to benefit from excellent peak shapes.



### Testosterone



#### Accucore C8 2.6µm, 50 x 2.1mm

Mobile phase A:	water + 0.1% formic acid
Mobile phase B:	acetonitrile + 0.1% formic acid
Gradient:	5–95 % B in 0.8 minutes
Flow:	1500 µL/min
Temperature:	60 °C
Injection:	5µL
Detection:	ESI-MS/MS %RSD Peak area

Retention time (tR /min)	0.73
%RSD tR	0.22
%RSD Area	3.01

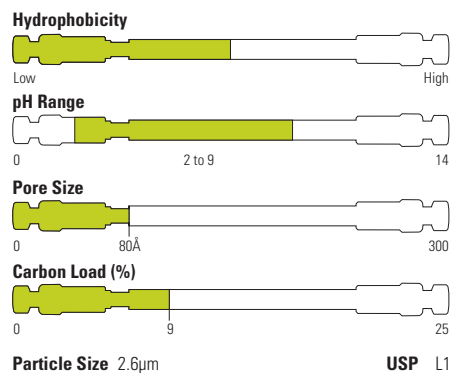
Data from six injections.

## Accucore aQ

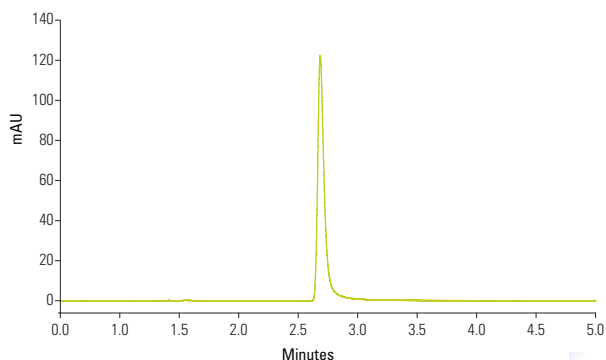
- Retention and resolution of polar analytes
- Polar endcapped C18 stationary phase for alternative selectivity
- Ideal for highly aqueous mobile phases

The polar functional group used to endcap Accucore aQ phase provides an additional controlled interaction mechanism by which polar compounds can be retained and resolved, making Accucore aQ phase ideal for the quantitative analysis of trace levels of polar analytes.

The wettability of reversed phase media can be increased by the introduction of polar functional groups. The polar endcapping of Accucore aQ media also makes it usable in 100% aqueous mobile phases without the risk of loss of performance or poor stability.



### Lamivudine (USP)



#### Accucore aQ 2.6 μm, 50mm x 2.1mm

Mobile phase:	95:5 (v/v) Ammonium Acetate, pH 3.80 / Methanol
Flow rate:	200 μL/min
Temperature:	35°C
Detection:	UV at 277nm
Injection volume:	1 μL
Analytes:	Lamivudine
Asymmetry	1.36
%RSD $t_r$	0.00
%RSD Peak area	1.72
(%RSD calculated from 6 replicate injections)	
USP acceptance criteria:	% RSD ( $t_r$ , Peak Area) <2.0



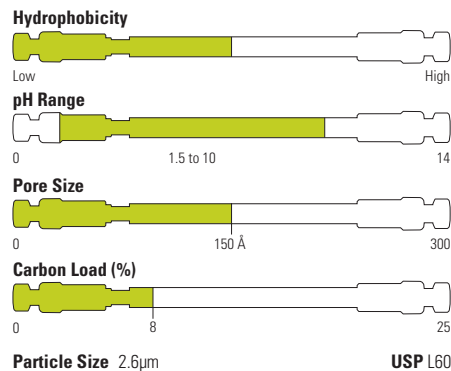


## Accucore Polar Premium

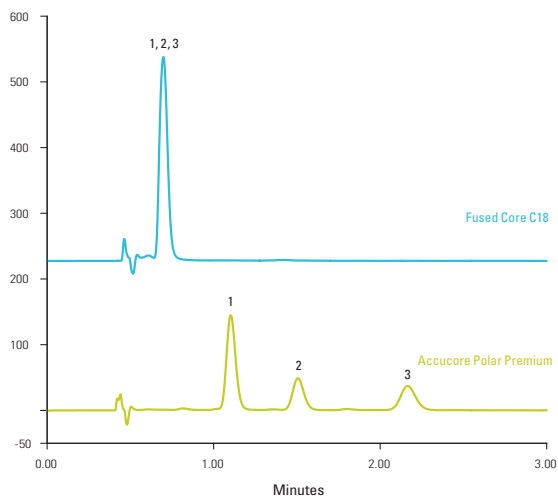
- Rugged amide-embedded C18 phase
- Selectivity complementary to conventional C18 phases
- Stable over a wide pH range and compatible with 100% aqueous mobile phase

Accucore Polar Premium is an exceptionally rugged polar embedded reverse phase material that offers high efficiency, wider operating pH range and unique selectivity complementary to standard C18 phases.

The specially designed bonded phase is stable from pH 1.5 to 10.5 and will not undergo phase collapse in 100% aqueous mobile phase.



### Curcuminoids (Turmeric)



#### Accucore Polar Premium 2.6µm, 100 x 3.0mm Fused Core C18, 100 x 3.0 mm

Mobile phase:	methanol : 10mM phosphoric acid, 80 : 20
Flow:	800 µL/min
Temperature:	40 °C
Injection:	6µL
Detection:	UV at 428nm
Analytes:	1. Curcumin 2. Desmethoxycurcumin 3. Bis-desmethoxycurcumin

The Accucore Polar Premium HPLC column provides desirable selectivity that resolves the major and minor component under simple isocratic conditions in less than three minutes, while the C18 columns fail to separate these components.

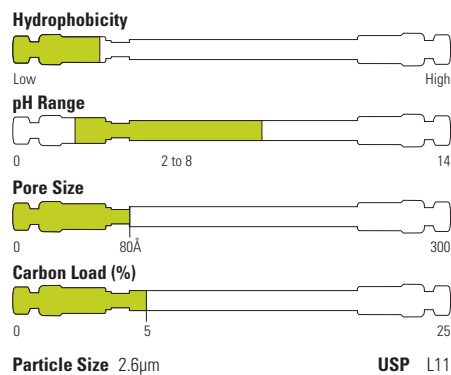


## Accucore Phenyl-Hexyl

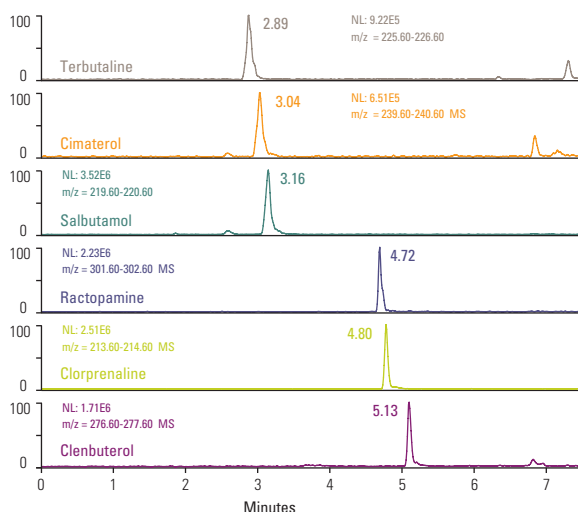
- Mixed-mode selectivity for aromatic and moderately polar analytes
- Enhanced Pi-pi interactions with aromatics
- Moderate hydrophobicity

The C6 chain in Accucore Phenyl-Hexyl phase exhibits classical RP retention and selectivity, while the phenyl ring can add special selectivity by interacting with polar groups within the solutes. This results in a mixed-mode separation mechanism. The reduced hydrophobicity of this phase makes it ideal for the separation of very non-polar compounds.

The Phenyl-Hexyl phase should be selected for complex samples where some peaks are well resolved on a conventional alkyl phases, but are not well resolved on a conventional phenyl phase, or when other peaks are well resolved on a phenyl phase, but not well resolved on a conventional alkyl phase.



### Beta-agonists



### Accucore Phenyl-Hexyl 2.6µm, 100mm x 2.1mm

Mobile phase:	A – Ammonium acetate 5mM, pH 4
	B – Acetonitrile
Gradient:	Time (min) %B
	0 5
	1 5
	10 100
Flow rate:	0.25mL/min
Temperature:	40°C
Detection:	+ESI-MS (45°C, 4.5kV, 60V, scan 150 – 350)
Injection volume:	1µL
Backpressure:	120 bar (at t0)

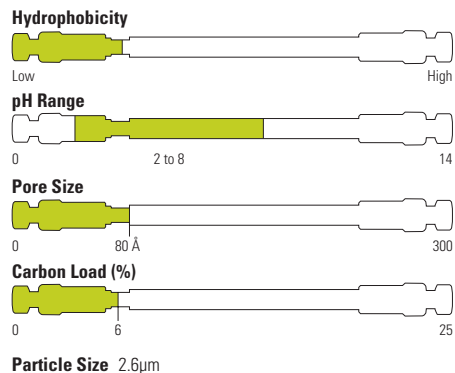
# Accucore Phenyl-X

- Unique reversed-phase shape selectivity
- Enhanced selectivity for aromatic compounds
- Compatible with highly aqueous mobile phases
- Robust, high-efficiency, low column bleed

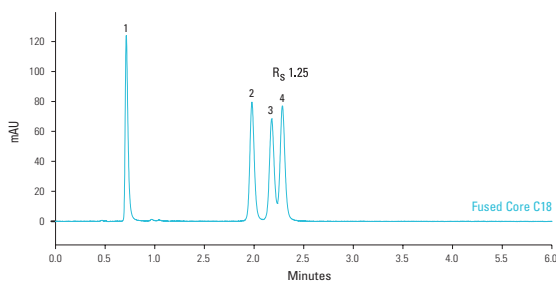
The proprietary Accucore Phenyl-X alkyl aromatic bonded phase provides a unique selectivity when compared to other reversed phase materials such as C18 or Phenyl.

Phenyl-X exhibits particularly high aromatic selectivity.

The advanced design of the bonded phase makes it compatible with highly aqueous mobile phases and robust, demonstrating very low bleed.

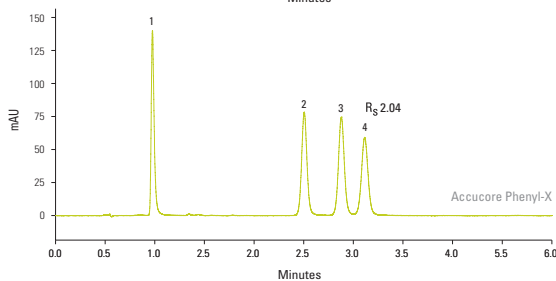


## Estrogens

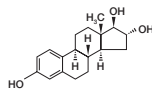


### Accucore Phenyl-X 2.6 μm, 100 x 2.1mm Fused Core C18, 100 x 2.1mm

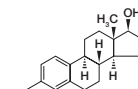
Mobile phase:	15:40:45 (v/v) acetonitrile: methanol : water
Flow:	400 μL/min
Temperature:	40 °C
Injection:	1 μL
Detection:	UV at 220nm
Wash solvent:	Same as mobile phase



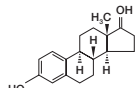
1. Estriol (E3)



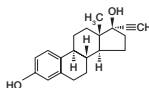
2. Estradiol (E2)



3. Estrone (E1)



4. Ethynylestradiol

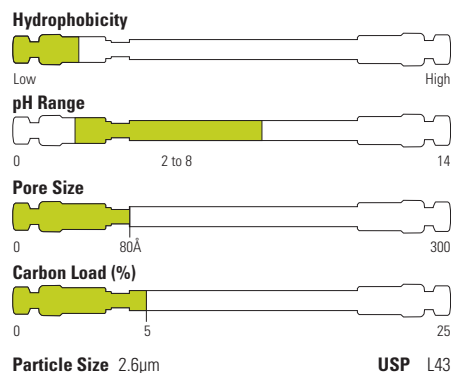


## Accucore PFP

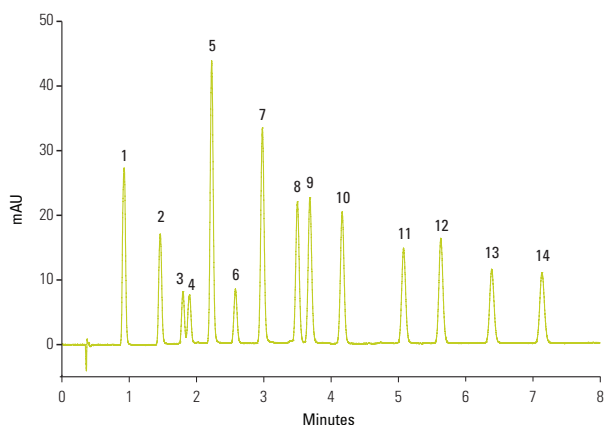
- Alternative selectivity to C18
- Extra retention for halogenated species
- Unique selectivity for non-halogenated polar compounds

The introduction of fluorine groups into the Accucore PFP (pentafluorophenyl) stationary phase causes significant changes in solute-stationary phase interactions. This can lead to extra retention and selectivity for positional isomers of halogenated compounds.

PFP Columns are also well suited to the selective analysis of non-halogenated compounds, in particular polar compounds containing hydroxyl, carboxyl, nitro, or other polar groups. High selectivity is often most apparent when the functional groups are located on an aromatic or other rigid ring system.



### Positional isomers



#### Accucore PFP 2.6 μm, 50mm x 2.1mm

Mobile phase: A – 0.1% Formic Acid in Water  
 Mobile phase: B – 0.1% Formic Acid in Acetonitrile  
 Gradient: 15-30%B in 7 minutes  
 Flow rate: 600 μL/min  
 Temperature: 50°C  
 Detection: UV at 270nm  
 Injection volume: 2 μL

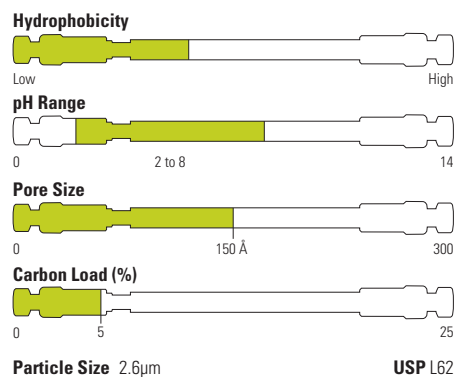
1. 3,4 – Dimethoxyphenol
2. 2,6 – Dimethoxyphenol
3. 2,6 – Difluorophenol
4. 3,5 – Dimethoxyphenol
5. 2,4 – Difluorophenol
6. 2,3 – Difluorophenol
7. 3,4 – Difluorophenol
8. 3,5 – Dimethylphenol
9. 2,6 – Dimethylphenol
10. 2,6 – Dichlorophenol
11. 4 – Chloro-3-Methylphenol
12. 4 – Chloro-2-Methylphenol
13. 3,4 – Dichlorophenol
14. 3,5 – Dichlorophenol

## Accucore C30

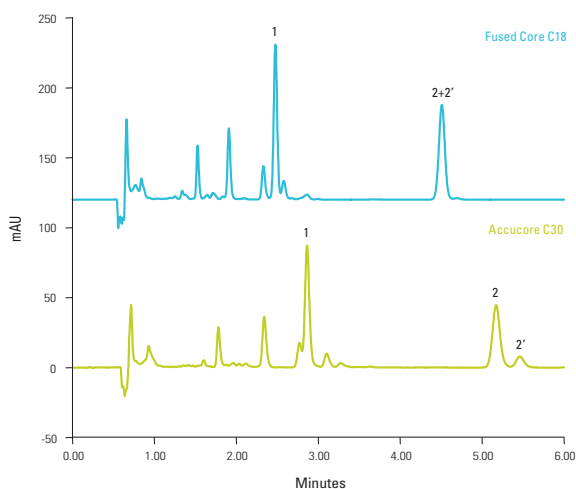
- Ideal for separation of hydrophobic, long alkyl chain compounds
- High shape selectivity for structurally related isomers
- Excellent aqueous-compatibility

Accucore C30 offers high shape selectivity for hydrophobic, long chain, structurally related isomers, for example carotenoids and steroids. This is a different form of shape selectivity from that measured in the SS phase characterisation test.

It is also an excellent alternative to normal-phase columns for lipid analysis. The optimized bonding density of the long alkyl chains facilitated by a wider pore diameter particle result in a phase that is stable even in highly aqueous mobile phases.



### Vitamin K isomers



#### Accucore C30 2.6µm, 100 x 3.0mm Fused Core C18, 100 x 3.0mm

Mobile phase: methanol: 2mM ammonium acetate, 98:2  
 Flow: 650µL/min  
 Temperature: 20 °C  
 Injection: 5µL  
 Detection: UV at 250nm

Accucore C30 shows better separation for vitamin K1 isomers than the C18 column.

Chromatogram showing the separation of Vitamin K compounds  
 Minutes 1-Vitamin K2, 2-Vitamin K1 (trans isomer), 2'-Vitamin K1 (cis isomer)



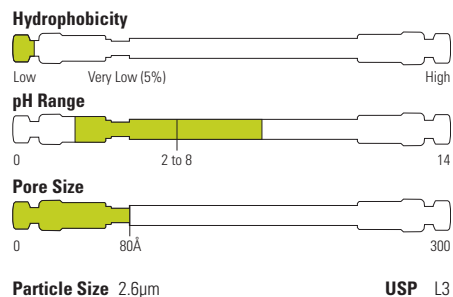
## Accucore HILIC

- Enhanced retention of polar and hydrophilic analytes
- Alternative selectivity to C18 without ion-pair or derivatization

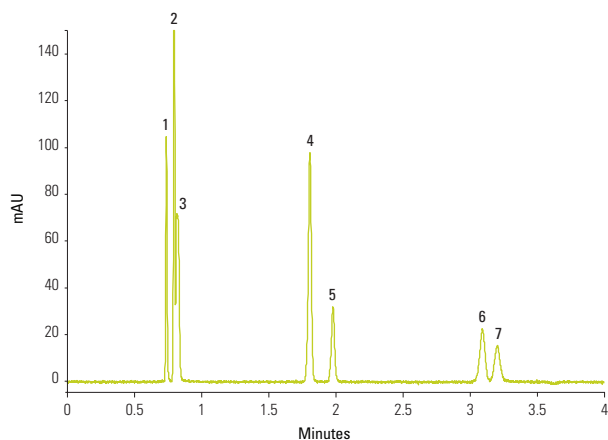
In HILIC mode the separation occurs through two mechanisms. The primary mechanism is a partitioning effect due to the enriched water layer around the polar or charged substrate material. The secondary mechanism involves interaction between the analyte and the active surface moiety.

Analyte properties that govern retention with HILIC phases are acidity/basicity, which determines hydrogen bonding, and polarizability which determines dipole-dipole interactions.

The highly organic mobile phases used with Accucore HILIC phase ensure efficient desolvation in ESI MS detection, which in turn leads to improved sensitivity.



### Catecholamines



#### Accucore HILIC 2.6µm, 50mm x 2.1mm

Mobile phase: 85:15 Acetonitrile:100mM Ammonium Formate, pH 3.2

Flow rate: 2mL/min

Temperature: 40°C

Detection: UV at 280nm

Injection volume: 5µL

Backpressure: 157 bar

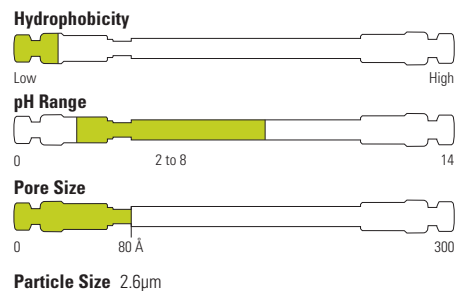
Analytes:  
 1. Catechol  
 2. 5-HIAA  
 3. DOPAC  
 4. Serotonin  
 5. L-tyrosine  
 6. Dopamine  
 7. L-DOPA

## Accucore Urea-HILIC

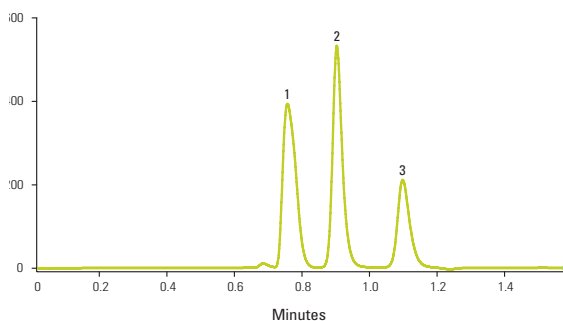
- Bonded hydrophilic stationary phase
- Unique selectivity compared to other HILIC phases
- Low ion exchange activity

Accucore Urea-HILIC has an alternative selectivity and lower ion exchange activity than other HILIC phases.

The bonded hydrophilic stationary phase provides retention of broad range of polar analytes using up to 20% aqueous mobile phase.



### Analgesic compounds



#### Accucore Urea-HILIC 2.6µm, 100 x 2.1mm

Mobile phase:	composition 10:80:10, A : B : C
	A: water
	B: acetonitrile
	C: 100 mM ammonium acetate adjusted to pH 4.9
Flow:	300 µL/min
Run Time:	2 minutes
Temperature:	35 °C
Injection:	2 µL into 10 µL partial loop mode.
Injection wash solvent:	water:acetonitrile 20:80
Detection:	UV at 230 nm
Backpressure:	71 bar

	Acetaminophen			Salicylic acid			Aspirin		
	$t_r$	$A_s$	$R_s$	$t_r$	$A_s$	$R_s$	$t_r$	$A_s$	$R_s$
Mean	0.760	1.474	0.908	1.303	2.359	1.100	1.318	3.264	
CV %	0.00	1.17	0.48	0.92	0.49	0.00	0.63	0.48	

Data from eight replicate analyses of a mixture of acetaminophen, salicylic acid and aspirin

Retention time ( $t_r$ ), peak asymmetry ( $A_s$ ), peak resolution ( $R_s$ )

## Accucore XL HPLC Columns

Based on Core Enhanced Technology using 4 $\mu$ m solid core particles, Accucore XL HPLC columns allow users of conventional HPLC methods to enjoy performance far beyond that of columns packed with 5 $\mu$ m, 4 $\mu$ m or even 3 $\mu$ m fully porous particles. Very high separation efficiencies using standard HPLC instruments and conditions provide increased peak resolution and lower limits of detection. An ultra-stable packed bed results in exceptionally robust columns that demonstrate excellent retention and response reproducibility.

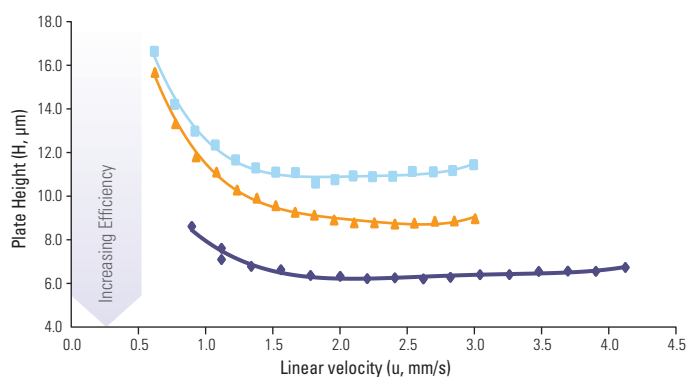
### 4 $\mu$ m Solid Core Particles for all Users

The 4 $\mu$ m solid core particles used in Accucore XL HPLC columns have been specifically designed to get the optimum chromatographic performance from conventional HPLC instruments.

- Very high efficiencies
- Little decrease in efficiency as flow rate is increased
- Moderate backpressures

#### Efficiency

Accucore XL HPLC columns generate higher efficiencies than columns packed with 5 $\mu$ m and 3 $\mu$ m fully porous material – as shown in the van Deemter curve below.



- Fully porous C18, 5 $\mu$ m
- ▲— Fully porous C18, 3 $\mu$ m
- ◆— **Accucore XL C18, 4 $\mu$ m**

#### Identical instrument and method conditions for all columns

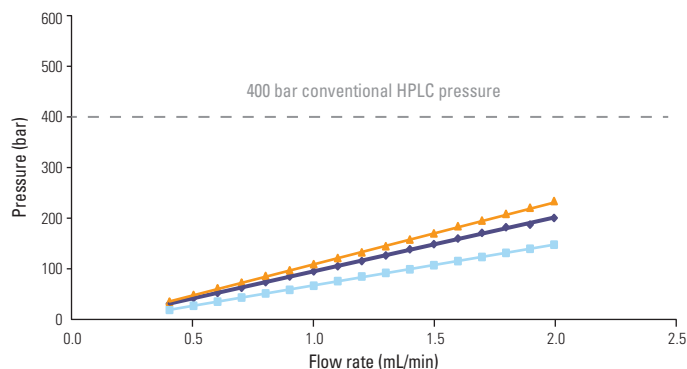
Dimensions:	150 x 4.6mm
Mobile Phase:	50% water: 50% acetonitrile
Temperature:	30°C
Injection Volume:	1 $\mu$ L
Detection:	UV at 254nm (0.1s rise time, 20 Hz)
Sample:	o-xylene

- 75% higher efficiency than 5 $\mu$ m fully porous
- 50% higher efficiency than 3 $\mu$ m fully porous



### Backpressure

Accucore XL HPLC columns generate reasonable backpressures, moderately higher than fully porous 5µm and lower than fully porous 3µm, that are compatible with conventional HPLC instruments.



- Fully porous C18, 5µm
- ▲— Fully porous C18, 3µm
- ◆— **Accucore XL C18, 4µm**

**Identical instrument and method conditions for all columns**

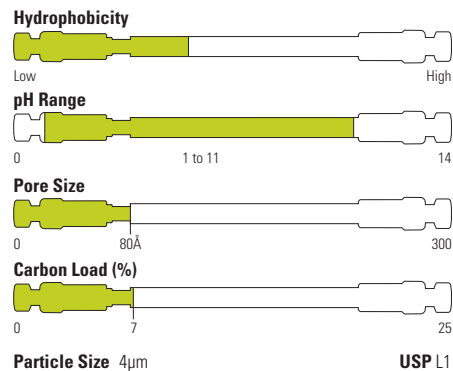
Dimensions:	150 x 4.6mm
Mobile Phase:	50% water : 50% acetonitrile
Temperature:	30°C

- *Backpressures between those generated by 3µm and 5µm fully porous particles*
- *Within conventional HPLC instrumentation pressure limit – even at high flow rates*

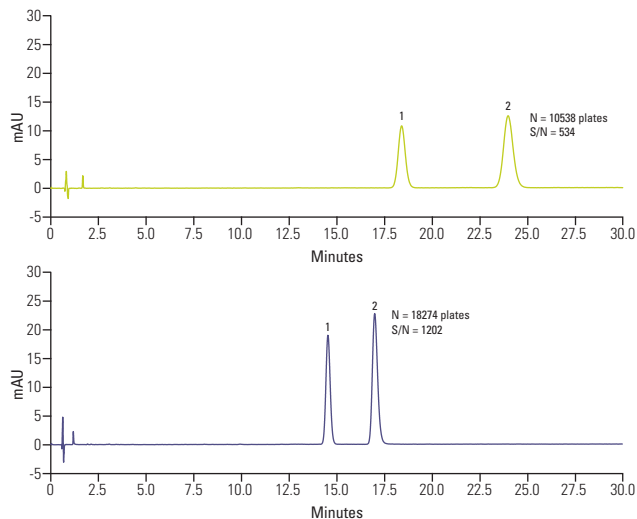
### Accucore XL C18

- Optimum retention of non-polar compounds
- Hydrophobic interaction mechanism
- Separates a broad range of analytes

The carbon loading of Accucore XL C18 provides high retention of non-polar analytes via a predominantly hydrophobic interaction mechanism. The highly retentive nature of the phase means that it can be used to separate a broad range of analytes.



### Ibuprofen and Valerophenone (USP)



**Accucore XL C18 4µm, 150 x 4.6mm**  
**Fully porous C18 5µm, 150 x 4.6mm**

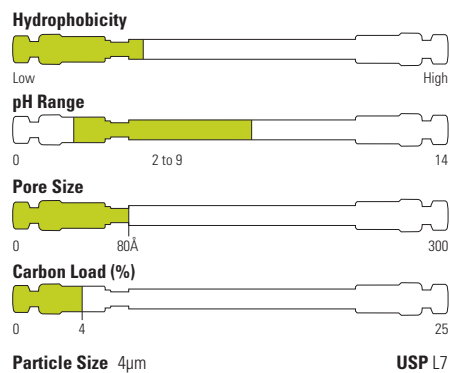
Mobile phase:	66.3:33.7 (v/v) water with phosphoric acid, pH 2.5:methanol
Flow rate:	2mL/min
Temperature:	30°C
Detection:	UV at 214nm
Injection volume:	5µL
Analytes:	1. Valerophenone 2. Ibuprofen

- *73% higher efficiency*
- *125% higher sensitivity*

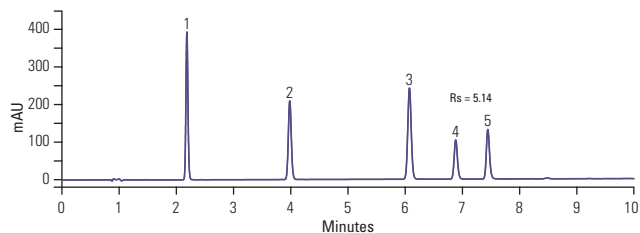
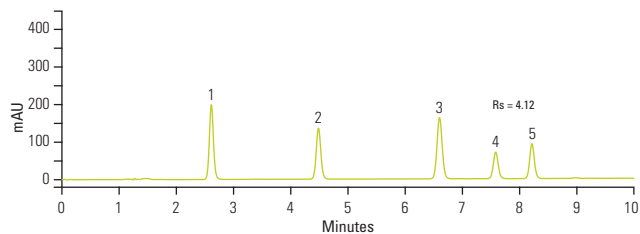
## Accucore XL C8

- Similar selectivity to C18 with lower retention
- Recommended for analytes with moderate hydrophobicity

Accucore XL C8 offers lower hydrophobic retention than columns packed with longer alkyl chain length material, such as C18. It is then therefore recommended for analytes with moderate hydrophobicity, or when a less hydrophobic phase provides optimum retention.



### Endocrine Disruptors



#### Accucore XL C8 4µm, 150 x 4.6mm Fully porous C8 5µm, 150 x 4.6mm

Mobile phase A:	water	
Mobile phase B:	acetonitrile	
Gradient:	Time (min)	% B
	0.0	25
	20.0	70
	20.1	75
	25.0	25
Flow rate:	1.5mL/min	
Temperature:	25°C	
Detection:	UV at 220nm	
Injection volume:	5µL	
Analytes	1. Desethyl Atrazine	
	2. Simazine	
	3. Atrazine	
	4. Diuron	
	5. Bisphenol A	

- 31% better resolution of critical pair
- 37% narrower peaks
- 226% higher sensitivity

## Accucore Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	RP-MS	C18	C8	aQ	
2.6	Defender Guard (4/pk)	10	2.1	<b>17626-012105</b>	<b>17126-012105</b>	<b>17226-012105</b>	<b>17326-012105</b>	
			3.0	<b>17626-013005</b>	<b>17126-013005</b>	<b>17226-013005</b>	<b>17326-013005</b>	
			4.6	<b>17626-014005</b>	<b>17126-014005</b>	<b>17226-014005</b>	<b>17326-014005</b>	
	HPLC Column	30	30	2.1	<b>17626-032130</b>	<b>17126-032130</b>	<b>17226-032130</b>	<b>17326-032130</b>
				3.0	<b>17626-052130</b>	<b>17126-052130</b>	<b>17226-052130</b>	<b>17326-052130</b>
				4.6	<b>17626-053030</b>	<b>17126-053030</b>	<b>17226-053030</b>	<b>17326-053030</b>
		50	50	2.1	<b>17626-052130</b>	<b>17126-052130</b>	<b>17226-052130</b>	<b>17326-052130</b>
				3.0	<b>17626-053030</b>	<b>17126-053030</b>	<b>17226-053030</b>	<b>17326-053030</b>
				4.6	<b>17626-054630</b>	<b>17126-054630</b>	<b>17226-054630</b>	<b>17326-054630</b>
		100	100	2.1	<b>17626-102130</b>	<b>17126-102130</b>	<b>17226-102130</b>	<b>17326-102130</b>
				3.0	<b>17626-103030</b>	<b>17126-103030</b>	<b>17226-103030</b>	<b>17326-103030</b>
				4.6	<b>17626-104630</b>	<b>17126-104630</b>	<b>17226-104630</b>	<b>17326-104630</b>
150	150	2.1	<b>17626-152130</b>	<b>17126-152130</b>	<b>17226-152130</b>	<b>17326-152130</b>		
		3.0	<b>17626-153030</b>	<b>17126-153030</b>	<b>17226-153030</b>	<b>17326-153030</b>		
		4.6	<b>17626-154630</b>	<b>17126-154630</b>	<b>17226-154630</b>	<b>17326-154630</b>		
250		250	2.1	—	—	—	—	

Particle Size (µm)	Format	Length (mm)	ID (mm)	C18	C8	
4	Drop-in Guard (4/pk)	10	2.1	<b>74104-012101</b>	<b>74204-012101</b>	
			3.0	<b>74104-013001</b>	<b>74204-013001</b>	
			4.6	<b>74104-014001</b>	<b>74204-014001</b>	
	HPLC Column	50	50	2.1	<b>74104-052130</b>	<b>74204-052130</b>
				3.0	<b>74104-053030</b>	<b>74204-053030</b>
				4.6	<b>74104-054630</b>	<b>74204-054630</b>
		100	100	2.1	<b>74104-102130</b>	<b>74204-102130</b>
				3.0	<b>74104-103030</b>	<b>74204-103030</b>
				4.6	<b>74104-104630</b>	<b>74204-104630</b>
		150	150	2.1	<b>74104-152130</b>	<b>74204-152130</b>
				3.0	<b>74104-153030</b>	<b>74204-153030</b>
				4.6	<b>74104-154630</b>	<b>74204-154630</b>
250	250	2.1	<b>74104-252130</b>	<b>74204-252130</b>		
		3.0	<b>74104-253030</b>	<b>74204-253030</b>		
		4.6	<b>74104-254630</b>	<b>74204-254630</b>		





Polar Premium	Phenyl-Hexyl	Phenyl-X	PFP	C30	HILIC	Urea-HILIC
<b>28026-012105</b>	<b>17926-012105</b>	<b>27926-012105</b>	<b>17426-012105</b>	<b>27826-012105</b>	<b>17526-012105</b>	<b>27726-012105</b>
–	<b>17926-013005</b>	–	<b>17426-013005</b>	–	<b>17526-013005</b>	–
–	<b>17926-014005</b>	–	<b>17426-014005</b>	–	<b>17526-014005</b>	–
–	<b>17926-032130</b>	–	<b>17426-032130</b>	–	<b>17526-032130</b>	–
<b>28026-052130</b>	<b>17926-052130</b>	<b>27926-052130</b>	<b>17426-052130</b>	<b>27826-052130</b>	<b>17526-052130</b>	<b>27726-052130</b>
<b>28026-053030</b>	<b>17926-053030</b>	<b>27926-053030</b>	<b>17426-053030</b>	<b>27826-053030</b>	<b>17526-053030</b>	<b>27726-053030</b>
<b>28026-054630</b>	<b>17926-054630</b>	<b>27926-054630</b>	<b>17426-054630</b>	<b>27826-054630</b>	<b>17526-054630</b>	<b>27726-054630</b>
<b>28026-102130</b>	<b>17926-102130</b>	<b>27926-102130</b>	<b>17426-102130</b>	<b>27826-102130</b>	<b>17526-102130</b>	<b>27726-102130</b>
<b>28026-103030</b>	<b>17926-103030</b>	<b>27926-103030</b>	<b>17426-103030</b>	<b>27826-103030</b>	<b>17526-103030</b>	<b>27726-103030</b>
<b>28026-104630</b>	<b>17926-104630</b>	<b>27926-104630</b>	<b>17426-104630</b>	<b>27826-104630</b>	<b>17526-104630</b>	<b>27726-104630</b>
<b>28026-152130</b>	<b>17926-152130</b>	<b>27926-152130</b>	<b>17426-152130</b>	<b>27826-152130</b>	<b>17526-152130</b>	<b>27726-152130</b>
<b>28026-153030</b>	<b>17926-153030</b>	<b>27926-153030</b>	<b>17426-153030</b>	<b>27826-153030</b>	<b>17526-153030</b>	<b>27726-153030</b>
<b>28026-154630</b>	<b>17926-154630</b>	<b>27926-154630</b>	<b>17426-154630</b>	<b>27826-154630</b>	<b>17526-154630</b>	<b>27726-154630</b>
<b>28026-252130</b>	–	<b>27926-252130</b>	–	<b>27826-252130</b>	–	<b>27726-252130</b>

Format	Length (mm)	ID (mm)	Cat. No.
	10	2.1	<b>852-00</b>
UNIGUARD Guard Cartridge Holder		3.0	<b>852-00</b>
		4.6	<b>850-00</b>

Particle Size (µm)	Length (mm)	ID (mm)	Format	Validation	Narrow Selectivity	Wide Selectivity	Polar Selectivity
2.6	50	2.1	3-column Kit	<b>17126-052130-3V</b>	<b>17X26-052130-3VA</b>	<b>17X26-052130-3VB</b>	<b>17X26-052130-3VC</b>
	100			<b>17126-102130-3V</b>	<b>17X26-102130-3VA</b>	<b>17X26-102130-3VB</b>	<b>17X26-102130-3VC</b>
	150			<b>17126-152130-3V</b>	<b>17X26-152130-3VA</b>	<b>17X26-152130-3VB</b>	<b>17X26-152130-3VC</b>
			Kit contains	C18	C18	C18	aQ
				C18	RP-MS	Phenyl-Hexyl	PFP
				C18	aQ	PFP	HILIC

# Thermo Scientific Acclaim HPLC Columns

Optimal selectivity through innovative chemistry

- Novel and proprietary surface chemistries for diversified selectivities
- Ultrapure, porous, spherical silica
- High efficiencies
- Low silanol activity for good basic analyte peak shapes
- Reproducible and reliable manufacturing process

Thermo Scientific™ Acclaim™ columns are based on high-purity, porous silica particles, with advanced and innovative column bonding technologies. This provides complementary selectivity, high column efficiencies, and symmetrical peaks. Acclaim columns meet the high standards set by modern HPLC and LC-MS methods and are used in applications such as pharmaceutical, environmental, food and beverage, chemical, and consumer products. General reversed-phase, HILIC and Specialty phases are available. Acclaim RSLC columns, with a particle size of 2.2µm, are designed for use with UHPLC systems.

## Reliability and Durability

Quality and reliability are essential to a successful analysis. The Acclaim columns are thoroughly tested individually, so that chromatographers can have full confidence in them. Manufacturing starts with an ultrapure silica substrate, using only carefully selected lots with narrow ranges of physical parameters. By design, the bonding processes are clean and repeatable with no unexpected changes in performance. Each batch of bonded silica receives a full suite of validation tests appropriate to its intended use. The bonded silica is packed in precision-polished 316 stainless steel hardware using highly reliable processes. Each packed column is tested to ensure the same great performance every time. The quality assurance reports for silica lot validation and column performance explain the test protocols, list the specifications, and show the actual chromatograms.

## Performance Indicators

Acclaim columns have been designed to meet the high quality standard needed in laboratories today. The innovative surface chemistries deliver exceptional peak efficiencies for a broad range of analytes. To ensure optimal performance, all Acclaim products are thoroughly characterized using a number of performance indicators, including surface coverage of the bonded phase, metal contamination, steric selectivity, column polarity, column hydrophobicity, and low silanol activity for bases. The specialty columns are also application-tested for their specific analysis, to ensure that each lot of bonded silica provides high-performance separations.

## Reversed-phase Columns

**Acclaim 120 C18:** High-density, monolayer C18 reversed-phase columns for exceptional resolution in a variety of applications.

**Acclaim 120 C8:** High-density monolayer C8 reversed-phase column.

**Acclaim Phenyl-1:** A unique reversed-phase column for the superior separation of aromatic compounds with enhanced hydrolytic stability.

**Acclaim C30:** Designed to provide high shape selectivity for separation of hydrophobic structurally related isomers.

**Acclaim PolarAdvantage:** Sulfonamide-embedded column for separating a wide variety of analytes.

**Acclaim PolarAdvantage II:** Amide-embedded reversed-phase columns with enhanced hydrolytic stability.

## Size-exclusion Columns

**Acclaim SEC Columns:** Polymeric columns designed for separating water soluble polymers and oligomers in the MW range of 100 to 1,000,000 Daltons.

## Hydrophilic Interaction Columns

**Acclaim HILIC-10:** Designed for separating hydrophilic compounds

## Acclaim Trinity P1 and P2 columns:

Unique trimodal surface chemistry provides simultaneous reversed-phase, anion and cation exchange capability for unparalleled chromatographic performance and maximum flexibility in adjusting selectivity (see Specialty Columns).

## Mixed-Mode Columns

Mixed-mode columns provide a unique, adjustable selectivity tool, using variation in pH, ionic strength, or organic modifier to influence the separation selectivity of acids, bases, zwitterions and neutral molecules.

**Acclaim Mixed-Mode HILIC-1:** Combines both reversed-phase and hydrophilic interaction liquid chromatography (HILIC) properties.

**Acclaim Mixed-Mode WAX-1:** High-density monolayer that incorporates both reversed-phase and weak anion exchange properties.

**Acclaim Mixed-Mode WCX-1:** Reversed-phase and cation exchange combined in a single column.

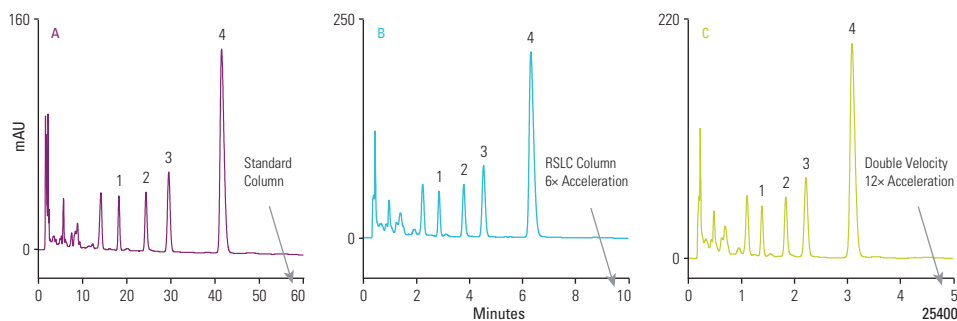
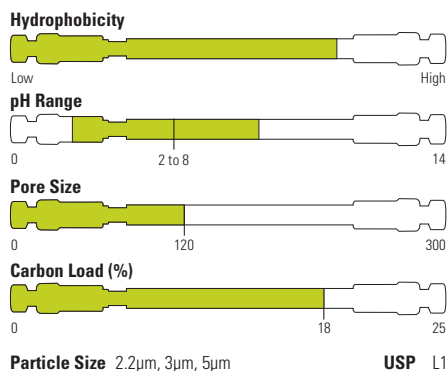


## Acclaim 120 C18

High performance reversed-phase columns for reproducible results

- High hydrophobic retention
- Excellent efficiencies for maximum resolution
- Low silanol activity for excellent peak shapes for basic analytes
- Reproducible manufacturing practices for reproducible column-to-column performance
- Extremely low bleed, fully compatible with MS
- Available in 2.2, 3 and 5µm particle size

The Acclaim 120 columns are for high resolution reversed-phase separations. The very high surface coverage and very low metal content together result in columns with excellent efficiencies. These columns provide exceptional performance for a variety of applications in the pharmaceutical, chemical, environmental, and food separations areas.



<b>Column:</b>	<b>A: Acclaim 120 C18, 5µm, 4.6 × 150mm</b> <b>B, C: Acclaim RSLC C18, .2µm, 2.1 × 50mm</b>
<b>Mobile Phase:</b>	200mM HOAc in 10% (v/v) MeOH
<b>Flow:</b>	A: 1.00mL/min B: 0.41mL/min C: 0.82mL/min
<b>Temperature:</b>	20°C
<b>Injection:</b>	A: 10µL B: 1.2µL C: 1.2µL
<b>Detector:</b>	UV, 254 nm, A: 1 Hz data rate B: 5 Hz data rate C: 10 Hz data rate
<b>Peaks:</b>	1. p-Hydroxybenzoic acid 2. p-Hydroxybenzaldehyde 3. Vanillic acid 4. Vanillin
<b>Sample:</b>	Commercial vanilla extract in 40% ethanol, filtered
<b>Reference:</b>	AOAC Official Method 990.25

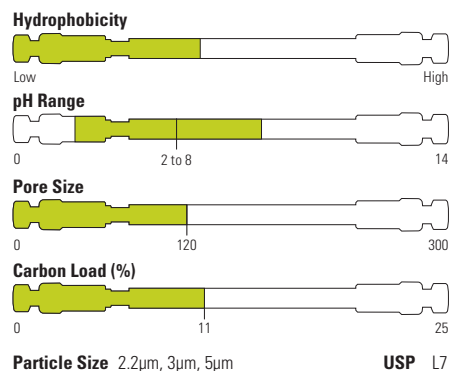


## Acclaim 120 C8

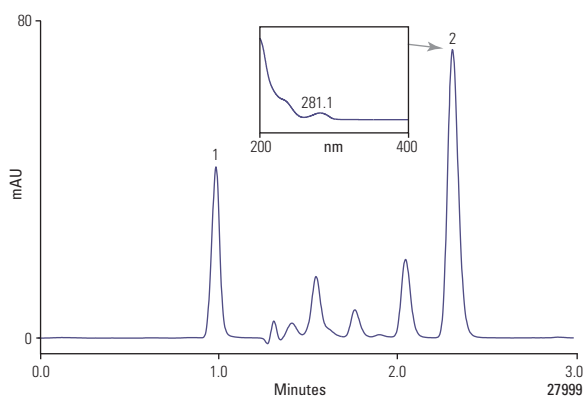
High performance reversed-phase columns with intermediate hydrophobic retention

- Low silanol activity for excellent peak shapes for basic analytes
- Excellent column efficiencies
- LC-MS compatible
- Reproducible manufacturing practices for reproducible column-to-column performance
- Available in 2.2, 3 and 5µm particle size

Acclaim 120 C8 reversed-phase columns feature densely bonded monolayer C8 ligands on a high-purity, spherical porous silica substrate. The columns are a well-characterized line of LC/MS compatible C8 phases with very high surface coverage and extremely low silanol activity. These columns provide exceptional performance for a variety of applications in the pharmaceutical, environmental, food and many other industrial sectors.



### Triclosan in toothpaste



<b>Column:</b>	<b>Acclaim RSLC C8, 2.2µm</b>
Dimension:	2.1 × 100mm
HPLC System:	UltiMate 3000 RSLC
Buffer:	2mM Ammonium acetate pH 5
Mobile Phase:	Isocratic, 15% buffer, 85% methanol (v/v)
Flow Rate:	0.200mL/min
Inj. Volume:	1.0µL
Temperature:	50°C
Detection:	Diode array detector, 281nm, 10Hz, 0.1 s resp. time and spectra 200–400 nm
Samples:	Toothpaste containing 0.3% triclosan
Preparation:	1.0g Toothpaste + 1.0mL of 7.5mg/mL magnesium sulfate + methanol to make 25mL.
Sonicate and filter.	
Peaks:	1. Saccharin 2. Triclosan

## Acclaim Phenyl-1

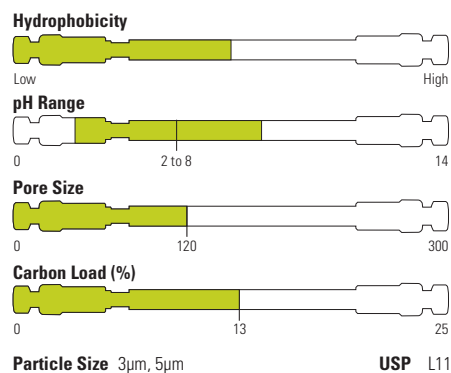
A unique reversed-phase column with high aromatic selectivity

- High aromatic selectivity
- High hydrophobic retention
- Unique and complementary selectivity compared to any other phenyl type column
- Compatibility with highly aqueous mobile phase
- High efficiency and rugged packing

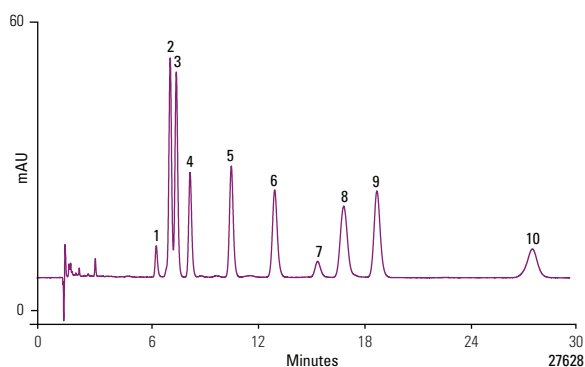
Acclaim Phenyl-1 columns provide unique selectivity of aromatic compounds for superior chromatographic performance.

This column has a higher  $\pi$ - $\pi$  interaction than other phenyl phases and provides unique selectivity for aromatic compounds while maintaining sufficient hydrophobic interaction and aqueous compatibility for superior chromatographic performance.

The Acclaim Phenyl-1 column can be used in a wide range of applications in pharmaceutical, environmental, food testing and product-quality testing. This column is ideally suited for the analysis of aromatic analytes; some examples include glucocorticosteroids, estrogens, fat-soluble vitamins and phospholipids.



### Separation of fat-soluble vitamins



#### Column: Acclaim Phenyl-1, 3 $\mu$ m

Dimension:	3 $\times$ 150mm
Mobile Phase:	Methanol/water v/v 90/10
Temperature:	30°C
Flow Rate:	0.5mL/min
Inj. Volume:	2 $\mu$ L
Detection:	UV at 220nm
Peaks:	(100 ppm each)
	1. Retinol acetate (vitamin A acetate)
	2. Vitamin D2
	3. Vitamin D3
	4. delta-Tocopherol
	5. gamma-Tocopherol
	6. alpha-Tocopherol (vitamin E)
	7. Impurity (unknown)
	8. Vitamin E acetate
	9. Vitamin K2
	10. Vitamin K1

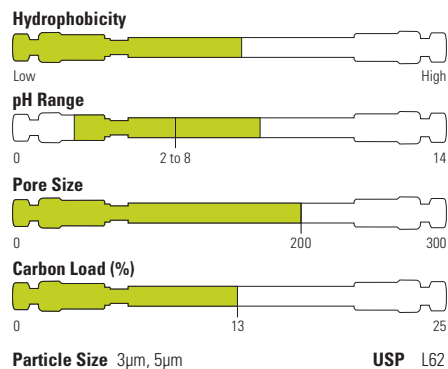


# Acclaim C30

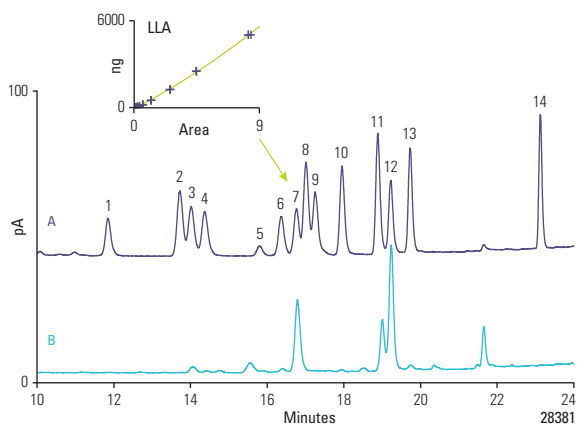
Columns for separating structurally related isomers

- High shape selectivity
- Unique selectivity complementary to other reversed-phase columns
- Compatibility with highly aqueous mobile phase
- High-quality: low column bleed, high efficiency and rugged packing

The Acclaim C30 is designed to provide high shape selectivity for separating hydrophobic structural related isomers and unique selectivity complementary to other reversed-phase columns (e.g. C18).



## Omega fatty acids



### Column: Acclaim C30, 5µm (4.6 × 150mm)

LC System: UltiMate 3000 RS, Dual Gradient  
 Mobile Phases: A. Water:formic acid:mobile phase B 900:3.6:100 (v/v)  
B. Acetone:acetonitrile:THF:formic acid 675:225:100:4(v/v/v)  
 Gradient:

Time (min)	%A	%B
0	100	0
1	40	60
13	30	70
22	5	95
24	5	95
29	100	0
32	100	0

Flow Rate: 1.00mL/min  
 Temperature: 30°C  
 Inj. Volume: 2µL  
 Detection: Corona ultra, nebulizer 15°C, filter high  
 Samples: A. Standards in isopropanol  
B. Saponified chicken fat  
 Peaks:

1. SDA
2. EPA
3. ALA
4. GLA
5. DHA
6. Arach.
7. LLA





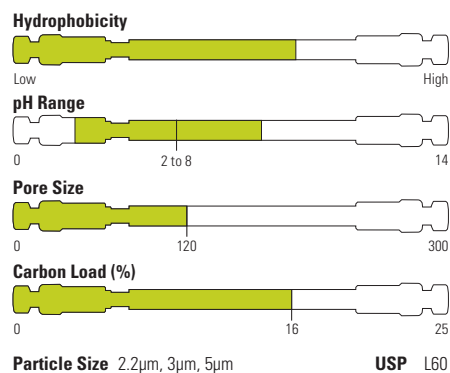
## Acclaim PolarAdvantage

Novel polar-embedded reversed-phase columns with unique selectivity

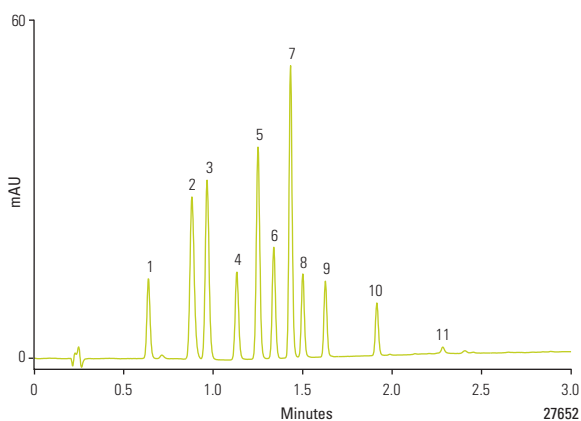
- Selectivity complementary to the C18 column
- Low silanol activity for excellent peak shape with basic compounds
- Compatible with 100% aqueous mobile phase
- High selectivity for hydrophobic aromatic molecules
- Wide range of applications
- Available in 2.2, 3 and 5µm

Acclaim PolarAdvantage (PA) columns feature a patented bonding column chemistry that incorporates a polar sulfonamide group with an ether linkage near the silica surface. This unique chemistry provides low silanol activity, compatibility with 100% aqueous mobile phase. The Acclaim PA column offers great separation power to resolve a wide variety of polar and nonpolar analytes and supports LC/MS analysis.

Acclaim PA columns provide unique selectivity, good peak shape for acidic, basic, and neutral analytes, and full compatibility with 100% aqueous conditions. Applications include pharmaceutical, environmental, life science, food testing, and product-quality testing.



### EPA 604 phenols



#### Column: Acclaim RSLC PolarAdvantage, 2.2µm

Dimensions:	3 × 50mm
System:	UltiMate 3000 RSLC
Mobile Phases:	A: 10mM formic acid + 10mM ammonium formate, pH 3.75 ± 0.05 B: Acetonitrile
Gradient Time (min):	-1.5 0.0 0.3 2.6 3.0
	%A 70 70 70 10 10 %B 30 30 30 90 90
Flow Rate:	1.25mL/min
Temperature:	30°C
Injection Volume:	0.5µL
Detection:	UV at 280nm, 10Hz, 0.5s resp. time
Sample:	Calibration mix, 50µg/mL in water
Peaks:	1. Phenol 2. 2,4-Dinitrophenol 3. 4-Nitrophenol 4. 2-Chlorophenol 5. 2-Nitrophenol 6. 2,4-Dimethylphenol 7. 4,6-Dinitro-2-methylphenol 8. 4-Chloro-3-methylphenol 9. 2,4-Dichlorophenol 10. 2,4,6-Trichlorophenol 11. Pentachlorophenol

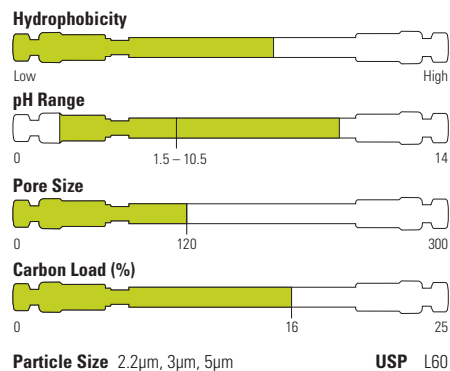
## Acclaim PolarAdvantage II

Complementary selectivity and enhanced hydrolytic stability

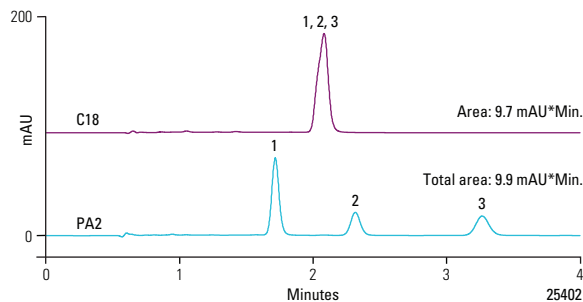
- Unique selectivity complementary to the C18 column
- Novel polar-embedded column chemistry for hydrolytic stability
- Compatible with 100% aqueous mobile phase
- Low bleed for MS compatibility
- Wide range of applications
- Available in 2.2, 3 and 5µm

Acclaim PolarAdvantage II (PA2) columns feature a patented surface chemistry that incorporates an amide-embedded polar group and multi-point attachment between the ligands and the silica surface. This unique chemistry provides enhanced hydrolytic stability from pH 1.5-10 with 100% aqueous mobile phases and exhibits high reversed-phase capacity, with selectivity complementary to conventional C18 columns.

The Acclaim PA2 column is specifically designed to withstand high pH conditions, making it a good choice for the separation of both basic and acidic analytes.



### Turmeric



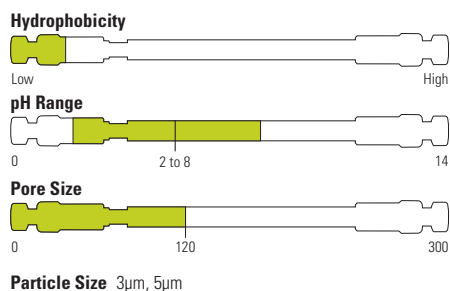
<b>Columns:</b>	<b>Acclaim RSLC 120 C18</b> <b>Acclaim RSLC PA2</b>
Dimensions:	2.2µm, 2.1 × 100mm
Mobile Phase:	A: 15mM H <sub>3</sub> PO <sub>4</sub> B: Methanol
Isocratic:	C18: 70% B (v/v) PA2: 80% B (v/v)
Flow:	0.41mL/min
Temperature:	30°C
Detector:	UV, 428nm
Sample:	Turmeric extract
Peaks:	1. Curcumin 2. Demethoxycurcumin 3. Bis-demethoxycurcumin

## Acclaim HILIC-10

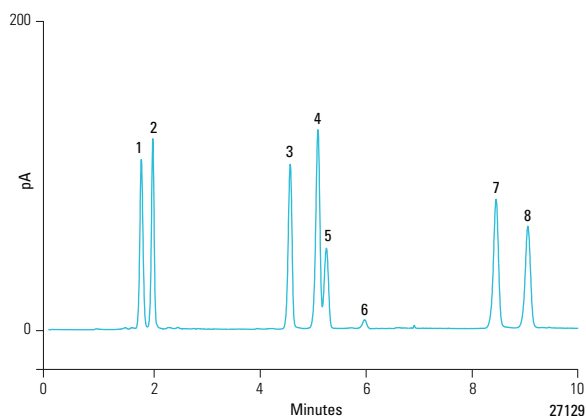
Designed with unique selectivity for hydrophilic molecules

- Retains highly polar molecules that are not retained by reversed-phase chromatography
- Unique selectivity, complementary to reversed-phase columns
- Hydrolytically stable
- Rugged column packing
- Broad application range

The Acclaim HILIC-10 column is designed for separating highly hydrophilic molecules by Hydrophilic Interaction Liquid Chromatography (HILIC). This column is based on high-purity spherical porous silica covalently modified with a proprietary hydrophilic layer.



### Glycerides



#### Column: Acclaim HILIC-10, 3µm

Dimensions:	3 × 150mm
Mobile Phase:	A: Heptane B: 2-Propanol/acetic acid 99.5:0.5
Step Elution (min):	-6.0 0.0 0.5 4.0 10.0 %A 99.99 99.96 87.87 %B 1.1 4.13 13
Flow Rate:	0.50mL/min
Temperature:	25°C
Inj. Volume:	4µL
Detector:	Corona ultra, nebulizer 15°C
Peaks:	1. Tristearin 2. Trilaurin 3. Distearin isomer 1 4. Dilaurin isomer 1 5. Distearin isomer 2 6. Dilaurin isomer 2 7. Monostearin 8. Monolaurin



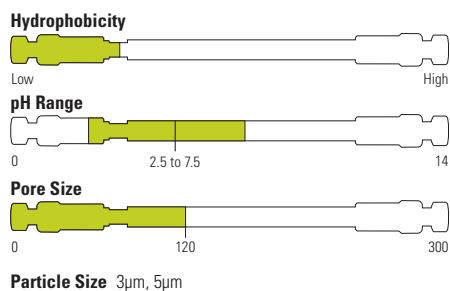
## Acclaim Mixed-Mode HILIC-1

Uniquely designed for both reversed-phase and HILIC operations

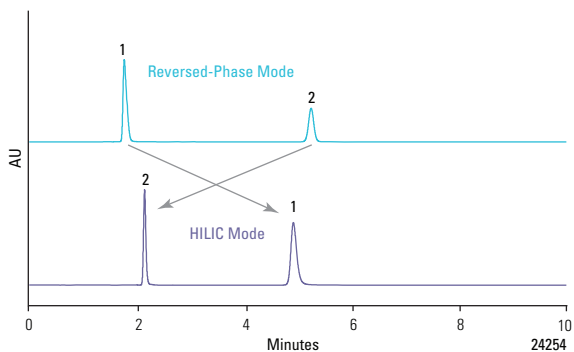
- Can operate in both RP and HILIC modes
- Retains highly polar molecules
- Unique selectivity complementary to RP columns
- Broader application range compared with conventional diol-based columns
- High-efficiency column for high-resolution separations

The Acclaim Mixed-Mode HILIC-1 column features a unique, high-efficiency, silica-based HPLC mixed-mode stationary phase that combines both reversed-phase (RP) and hydrophilic interaction liquid chromatography (HILIC) properties. This combination allows both hydrophobic interaction and hydrophilic interaction to be utilized to optimize separations.

The Acclaim Mixed-Mode HILIC-1 stationary phase consists of a hydrophobic alkyl chain with a diol group at the terminus. The hydrophobic moiety provides reversed-phase retention and the terminal diol group facilitates hydrophilic interactions. This unique combination results in the adjustable selectivity, making Acclaim Mixed-Mode HILIC-1 separate mixtures that would be impossible for a C18 column. This column is suitable for a broad range of applications, including non-ionic ethoxylated surfactants, drug metabolites, lipids, polyethylene glycols (PEGs), ethoxylated surfactants, and more.



### Cytosine and naphthalene



#### Column: Acclaim Mixed-Mode HILIC-1, 5µm

Dimensions:	4.6 × 150mm
Mobile Phase:	CH <sub>3</sub> CN/0.1 M NH <sub>4</sub> OAc, pH 5.2 v/v 52/48 for RP mode v/v 92/8 for HILIC mode
Temperature:	30°C
Flow Rate:	1mL/min
Inj. Volume:	10µL
Detection:	UV at 254nm
Peaks:	1. Cytosine (100 ppm) 2. Naphthalene (100 ppm)



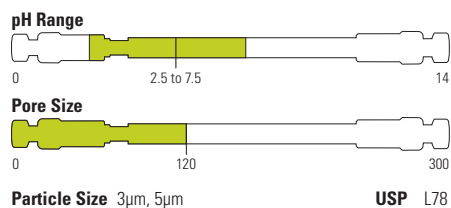
## Acclaim Mixed-Mode WAX-1

Designed for separating anionic molecules; with powerful adjustable selectivity control

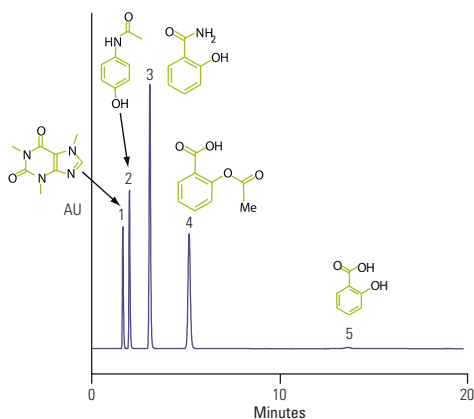
- Adjustable selectivity
- Selectivity orthogonal to reversed-phase (RP) columns
- Ideal selectivity for anionic molecules
- Excellent column efficiency and peak asymmetry
- Multimode retention mechanisms: reversed-phase, weak anion exchange, and HILIC modes

The Acclaim Mixed-Mode WAX-1 is a novel, high-efficiency silica HPLC column that combines hydrophobic and weak anion exchange characteristics. Its unique chemistry results in a multimode separation mechanism that includes reversed-phase, anion exchange, and HILIC interactions. Selectivity can be adjusted by changing ionic strength, pH, or organic solvent content.

The Acclaim Mixed-Mode WAX-1 surface consists of a hydrophobic alkyl chain with a tertiary amine group at the terminus. The hydrophobic moiety provides reversed-phase retention and the terminal amino group facilitates electrostatic interactions.

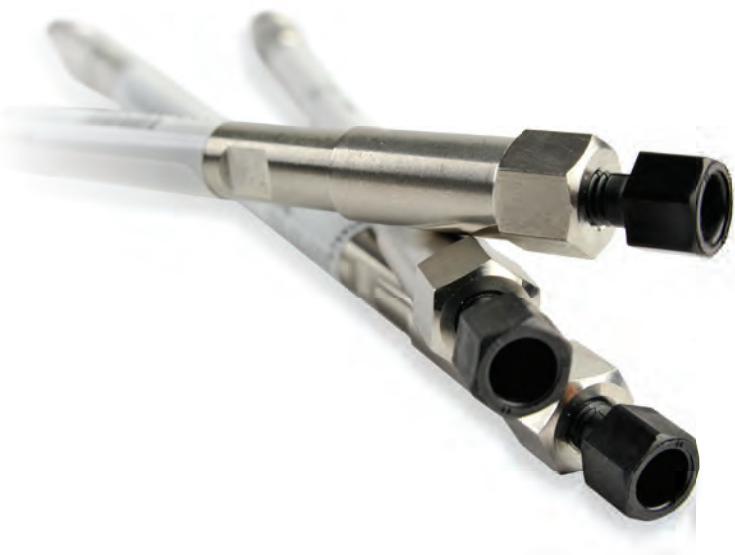


### Pain relief medicine



#### Column: Acclaim Mixed-Mode WAX-1, 5µm

Dimensions:	4.6 × 150mm
Mobile Phase:	40/60 v/v Acetonitrile/buffer (6.8 g potassium monophosphate and 0.5 g pyrophosphate in 1000 g D.I. H <sub>2</sub> O, pH is adjusted to 6.0 with NaOH)
Temperature:	30°C
Flow Rate:	1mL/min
Inj. Volume:	1µL
Detection:	UV, 220nm
Peaks:	1. Caffeine 2. Acetaminophen 3. Salicylamide 4. Acetyl salicylic acid (Aspirin) 5. Salicylic acid



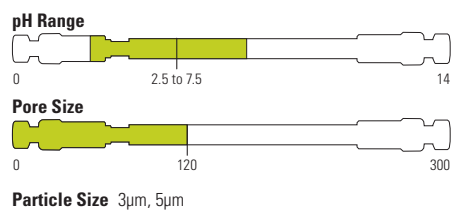
## Acclaim Mixed-Mode WCX-1

Designed for separating cationic molecules with adjustable selectivity control

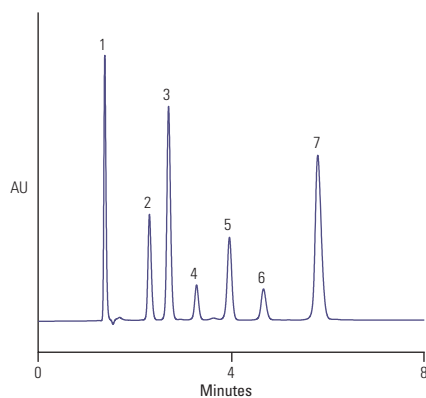
- Adjustable selectivity
- Ideal selectivity for separating basic molecules
- Selectivity complementary to C18 RP columns
- Multimode separation mechanism: reversed-phase, weak cation exchange, anion-exclusion and HILIC

The Acclaim Mixed-Mode WCX-1 is a novel, high-efficiency, silica-based column, manufactured by bonding a specially designed proprietary ligand with both hydrophobic and weak cation exchange properties. Selectivity of ionizable and neutral compounds can be controlled independently or simultaneously by tuning mobile phase ionic strength, pH or organic modifier. This column therefore can separate using multiple separation modes: reversed-phase, cation exchange, and normal-phase/ HILIC.

Basic compounds are important in a variety of industrial applications, including pharmaceutical, chemical, consumer products, foods and beverages, and more. The Acclaim Mixed-Mode WCX-1 not only retains basic molecules (from highly hydrophilic to highly hydrophobic), but also separates them with symmetrical peak shapes and excellent efficiency.



### Pharmaceutical counterions



#### Column: Acclaim Mixed-Mode WCX-1, 5µm Dimension: 4.6 × 150mm

Mobile Phase:	40/60 v/v CH <sub>3</sub> CN/NH <sub>4</sub> OAc, pH 5.2 (20 mM total)
Temperature:	30°C
Flow Rate:	1mL/min
Inj. Volume:	5µL
Detection:	UV (225 nm)
Peaks:	1. Maleate 50µg/mL 2. Ketoprofen 30µg/mL 3. Naproxen 30µg/mL 4. Hydrocortisone 60µg/mL 5. Dexamethasone 60µg/mL 6. Oxprenolol 300µg/mL 7. Timolol 250µg/mL



## Acclaim Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	120 C18	120 C8	PolarAdvantage	PolarAdvantage II
2.2	RSLC Column	30	2.1	<b>071400</b>	<b>072614</b>	<b>072621</b>	<b>071402</b>
			3.0	<b>071606</b>	<b>072618</b>	<b>072625</b>	<b>071609</b>
		50	2.1	<b>068981</b>	<b>072615</b>	<b>072622</b>	<b>068989</b>
			3.0	<b>071605</b>	<b>072619</b>	<b>072626</b>	<b>071608</b>
		75	3.0	<b>075697</b>	<b>075696</b>	<b>075698</b>	<b>075699</b>
		100	2.1	<b>068982</b>	<b>072616</b>	<b>072623</b>	<b>068990</b>
			3.0	<b>071604</b>	<b>072620</b>	<b>072627</b>	<b>071607</b>
		150	2.1	<b>071399</b>	<b>072617</b>	<b>072624</b>	<b>071401</b>
		250	2.1	<b>074812</b>	<b>074811</b>	<b>074813</b>	<b>074814</b>
		3	HPLC Column	33	3.0	<b>066272</b>	–
50	2.1			<b>059128</b>	<b>059122</b>	<b>063174</b>	<b>077999</b>
	3.0			<b>068971</b>	–	<b>068972</b>	<b>068973</b>
	4.6			<b>059131</b>	<b>059125</b>	–	<b>063189</b>
75	3.0			<b>066273</b>	–	<b>066275</b>	<b>066277</b>
100	2.1			<b>059129</b>	<b>059123</b>	<b>061316</b>	<b>077998</b>
	3.0			<b>076186</b>	<b>076184</b>	<b>076214</b>	<b>078000</b>
	4.6			<b>059132</b>	<b>059126</b>	<b>076216</b>	<b>078001</b>
150	2.1			<b>059130</b>	<b>059124</b>	<b>061317</b>	<b>063187</b>
	3.0			<b>063691</b>	<b>068970</b>	<b>063693</b>	<b>063705</b>
	4.6			<b>059133</b>	<b>059127</b>	<b>061318</b>	<b>063191</b>
250	2.1			<b>076187</b>	<b>076185</b>	<b>076215</b>	<b>077997</b>
	3.0			<b>070077</b>	<b>070078</b>	<b>070079</b>	<b>070080</b>
	4.6			<b>069689</b>	<b>069688</b>	<b>069691</b>	<b>069692</b>
5	Guard Cartridge	10	2.1	<b>069689</b>	<b>069688</b>	<b>069691</b>	<b>069692</b>
			3.0	<b>071981</b>	<b>071979</b>	<b>071983</b>	<b>071985</b>
			4.6	<b>069695</b>	<b>069696</b>	<b>069698</b>	<b>069699</b>
	HPLC Column	50	2.1	<b>059142</b>	<b>059134</b>	–	–
			4.6	<b>059146</b>	<b>059138</b>	<b>061319</b>	–
		100	2.1	<b>059143</b>	<b>059135</b>	–	–
			4.6	<b>059147</b>	<b>059139</b>	–	–
		150	2.1	<b>059144</b>	<b>059136</b>	–	–
			4.6	<b>059148</b>	<b>059140</b>	<b>061320</b>	<b>063197</b>
		250	2.1	<b>059145</b>	<b>059137</b>	–	–
			4.6	<b>059149</b>	<b>059141</b>	<b>061321</b>	<b>063199</b>

Format	Cat. No.
Acclaim Guard Cartridge Holder	<b>069580</b>
Acclaim Guard Cartridge-Column Coupler	<b>074188</b>
Acclaim Guard Kit (Holder and Coupler)	<b>069707</b>

## Acclaim Ordering Guide *continued*

### Acclaim Phenyl-1 Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Phenyl-1	
3	Guard Cartridge	10	2.1	<b>079934</b>	
			3.0	<b>071974</b>	
			4.6	<b>071973</b>	
	HPLC Column	50	50	2.1	<b>078016</b>
				3.0	<b>071972</b>
				4.6	<b>078018</b>
		100	100	2.1	<b>078015</b>
				3.0	<b>074693</b>
				4.6	<b>078017</b>
		150	150	2.1	<b>071971</b>
				3.0	<b>071970</b>
				4.6	<b>071969</b>
250	250	2.1	<b>078014</b>		
		3.0	<b>074694</b>		
		4.6	<b>074694</b>		
5	HPLC Column	150	2.1	<b>079698</b>	
			4.6	<b>088016</b>	
			250	<b>079697</b>	

### Acclaim C30 Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	C30		
3	HPLC Column	50	2.1	<b>078666</b>		
			3.0	<b>078663</b>		
			4.6	<b>078661</b>		
		100	100	2.1	<b>078665</b>	
				4.6	<b>078660</b>	
				150	2.1	<b>075725</b>
		250	250	3.0	<b>075724</b>	
				4.6	<b>075723</b>	
				2.1	<b>078664</b>	
		5	Guard Cartridge	10	2.1	<b>075722</b>
					3.0	<b>075721</b>
					4.6	<b>075720</b>
HPLC Column	150		4.6	<b>075719</b>		
			250	<b>075718</b>		
			4.6	<b>075718</b>		

### Acclaim HILIC-10 Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	HILIC-10
3	HPLC Column	150	2.1	<b>074259</b>
			3.0	<b>074258</b>
			4.6	<b>074257</b>
5	Guard Cartridge	10	2.1	<b>074263</b>
			3.0	<b>074261</b>
			4.6	<b>074262</b>

### Acclaim Mixed-Mode Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	HILIC-1	WAX-1	WCX-1
3	HPLC Column	50	3.0	<b>071912</b>	<b>071908</b>	<b>071910</b>
			2.1	<b>070091</b>	<b>070089</b>	<b>070093</b>
			3.0	<b>070090</b>	<b>070088</b>	<b>070092</b>
5	Guard Cartridge	10	2.1	<b>069694</b>	<b>069686</b>	<b>085455</b>
			3.0	<b>071913</b>	<b>071909</b>	<b>071911</b>
			4.6	<b>069706</b>	<b>069704</b>	<b>069705</b>
	HPLC Column	150	2.1	<b>066847</b>	<b>067084</b>	<b>068371</b>
			4.6	<b>066843</b>	<b>064984</b>	<b>068353</b>
			250	<b>066844</b>	<b>064985</b>	<b>068352</b>



# Thermo Scientific Synchronis HPLC Columns

Consistent Reproducible Separations, Column after Column, Time after Time. Extensive testing and strong quality control procedures ensure the consistency of Synchronis HPLC columns – column after column.

- Thermo Scientific™ Synchronis™ HPLC columns are manufactured, packed and tested in ISO9000 accredited facilities. Each lot of silica is tested for the physical properties of the silica support and only released for production if it meets the stringent test specifications.
  - Synchronis columns are based on highly pure 100Å silica, with a surface area of 320m<sup>2</sup>/g, compared to 200m<sup>2</sup>/g for typical silica based material. This greater surface area ensures good retention of analytes having a range of hydrophobicity, away from the solvent front.
  - Available in three particle sizes: 1.7µm for rapid UHPLC separations plus 3µm and 5µm for the more traditional HPLC analysis.
  - Synchronis reversed phase columns are densely bonded and double endcapped to minimize the number of residual silanols available to interact with basic analytes.
  - Each batch of chromatographic media packed into Synchronis columns is put through a series of diagnostic chromatographic tests, based on those developed by Tanaka<sup>1</sup> to ensure consistent, predictable separations.
- These tests rigorously probe interactions between analytes and the stationary phase, measuring hydrophobicity, shape selectivity and secondary interactions with bases, acids and chelators.
- Enhanced, automated packing methods drive consistency even further and every column is individually tested to ensure that it meets the required quality.



View product information and application notes

For full details on the Synchronis column range, please request or view a copy of our Synchronis technical guide  
[www.thermoscientific.com/synchronis](http://www.thermoscientific.com/synchronis)



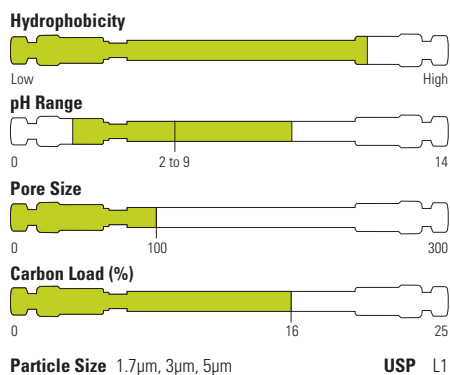
## Synchronis C18

Synchronis C18 columns deliver consistent predictable separations, column after column, time after time

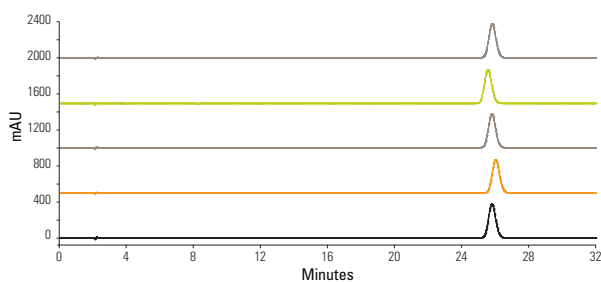
- Highly pure, high surface area silica
- High carbon load for increased retention
- Double endcapped for extra surface coverage
- Highly inert towards basic compounds
- Rigorously tested to ensure quality

When developing a new method, one of the most important goals for the chromatographer is to achieve a consistent, reproducible separation. The selection of a highly reproducible HPLC column is essential to attaining this goal.

Synchronis C18 columns show excellent column to column reproducibility, as illustrated here by the analysis of zidovudine using five separate columns. The reproducibility in terms of retention time and peak area is less than or equal to 0.5%, column to column.



### Zidovudine



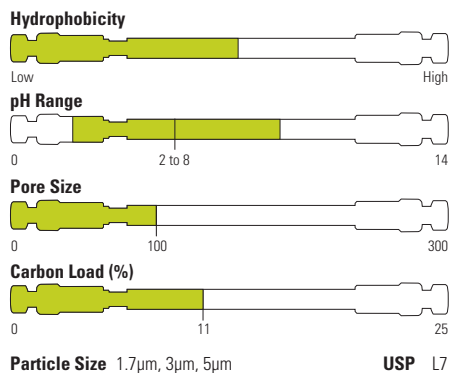
**Column: Synchronis C18, 5µm, 150mm x 4.6mm**

Mobile phase: Water:Methanol (4:1)  
 Flow rate: 1.0mL min<sup>-1</sup>  
 Temperature: 25°C  
 Detection: 265nm  
 Injection volume: 10µL  
 1. Zidovudine

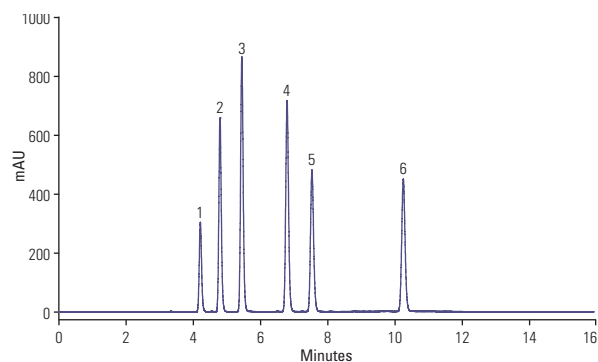
## Synchronis C8

Reduces hydrophobic interactions allowing compounds to elute quicker from the column. Recommended for analytes with medium hydrophobicity or when a less hydrophobic phase is required to obtain optimum retention

- Highly pure, high surface area silica
- Less hydrophobic than Synchronis C18
- Double endcapped for extra surface coverage
- Rigorously tested to ensure quality



### Uron herbicides



**Column: Synchronis C8, 5µm, 150mm x 4.6mm**

Mobile phase:	A: Water B: Acetonitrile
Gradient:	35 to 60% B in 10 minutes
Flow rate:	1.0mL/min
Temperature:	30°C
Detection:	240nm
Injection volume:	20µL
	1. Tebuthiuron 2. Metoxuron 3. Monuron 4. Chlorotoluron 5. Diuron 6. Linuron



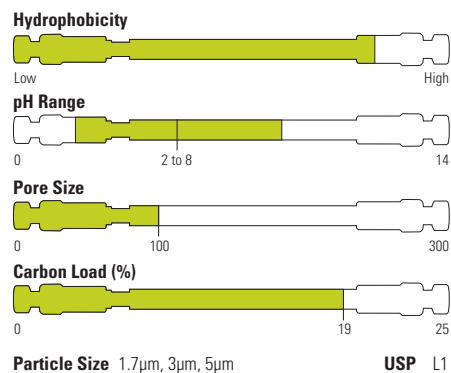


## Synchronis aQ

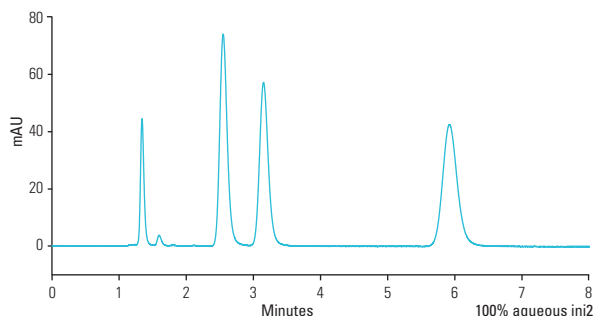
Polar endcapped Synchronis aQ columns provide a controlled interaction mechanism that retains and resolves polar analytes. Stable in 100% aqueous mobile phase

- Stable in 100% aqueous mobile phase
- Enhanced retention of polar compounds
- Rigorously tested to ensure quality

In comparison to a conventionally endcapped C18, the Synchronis aQ polar end-capped C18 stationary phase exhibits superior stability towards aqueous mobile phase. Synchronis aQ shows no degradation in performance after 100 injections in a buffered 100% aqueous eluent.

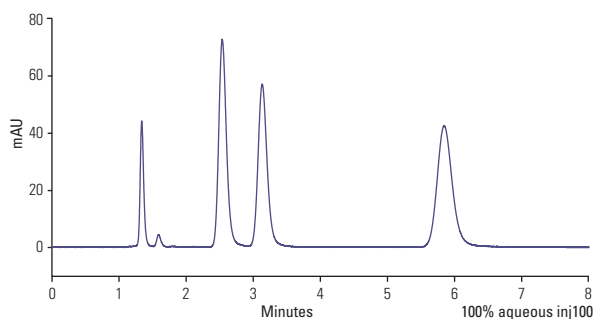


### Stability of Synchronis aQ in 100% aqueous mobile phase



**Column: Synchronis aQ, 5µm, 100mm x 4.6mm**

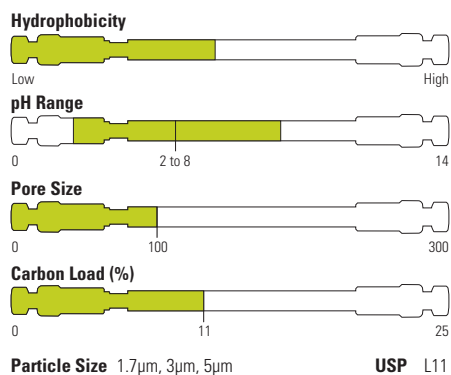
Mobile phase:	50mM Aqueous K <sub>2</sub> HPO <sub>4</sub> (pH 6)
Flow rate:	0.7mL/min
Temperature:	30°C
Detection:	260nm
Injection volume:	2µL
1.	Cytidine-5'-diphosphate
2.	Adenosine-5'-triphosphate
3.	Adenosine-5'-diphosphate
4.	Adenosine-5'-monophosphate



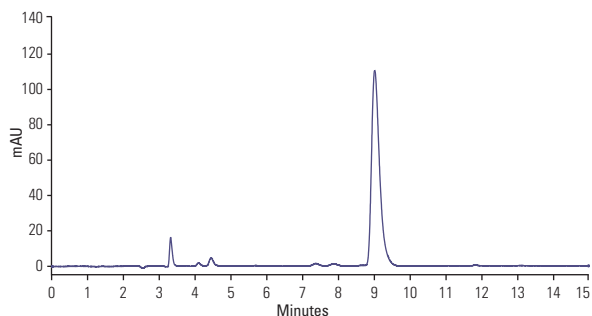
## Synchronis Phenyl

Provides an alternative to Synchronis C18 and is particularly useful for retention of aromatic compounds

- Alternative selectivity to Synchronis C18
- Double endcapped for extra surface coverage
- Highly inert towards basic compounds
- Rigorously tested to ensure quality



### Oxacillin sodium (USP)



**Column: Synchronis Phenyl, 5µm, 300mm x 4.0mm**

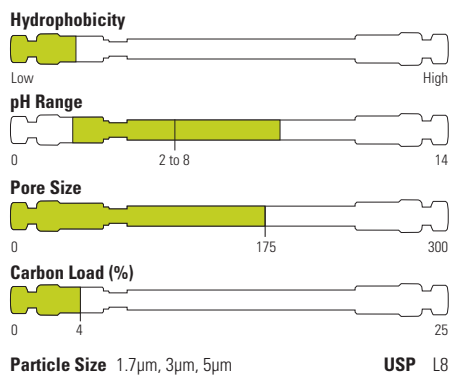
Mobile phase: Phosphate Buffer: MeCN:MeOH  
(70:30:10)  
Flow rate: 1.0mL/min (2mL/min in USP method)  
Temperature: 25°C  
Detection: 225nm  
Injection volume: 10µL  
1. Oxacillin Sodium (0.11mg/mL)



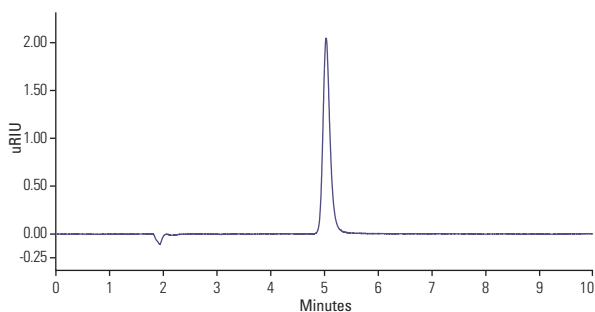
## Synchronis Amino

Provides a versatile aminopropyl phase that gives excellent chromatographic properties in four modes: weak anion exchange, reversed phase, normal phase and HILIC

- Highly pure, high surface area silica
- Double endcapped for extra surface coverage
- Rigorously tested to ensure quality



### Lactulose



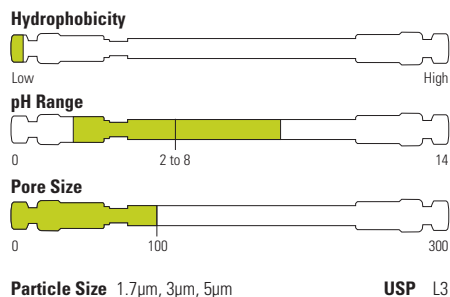
**Column: Synchronis Amino 5µm, 150mm x 4.6mm**

Mobile phase: Water: MeCN (30:70)  
Flow rate: 1.0mL/min  
Temperature: 35°C  
Detection: RI  
Injection volume: 5µL  
1. Lactulose

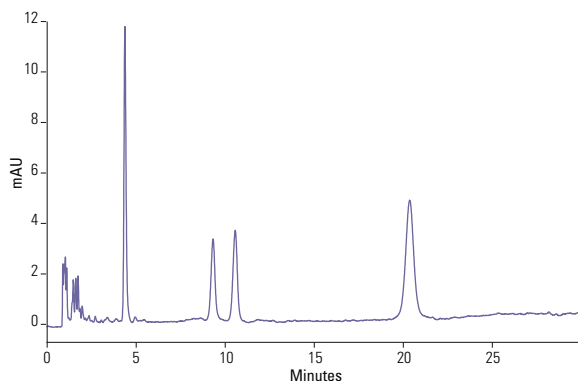
## Synchronis Silica

Serves as a powerful and efficient tool for the chromatography of moderately polar organic compounds by normal phase chromatography

- Highly pure, high surface area silica
- Excellent reproducibility for normal phase chromatography
- Rigorously tested to ensure quality



### Tocopherols



**Column: Synchronis Silica 5µm, 150 x 4.6mm**  
**Part Number: 97005-154630**

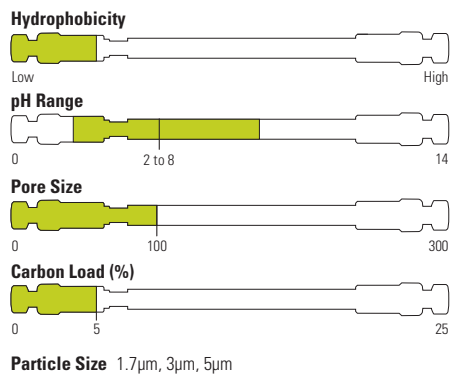
Mobile phase: Hexane +0.2% propan-2-ol (IPA)  
Flow rate: 2.0mL/min  
Temperature: 40°C  
Detection: 254nm  
Injection volume: 10µL  
Sample:  
Mixture of standards (200-1000 ug/ml) of the following:  
α-tocopherol  
β-tocopherol  
γ-tocopherol  
δ-tocopherol



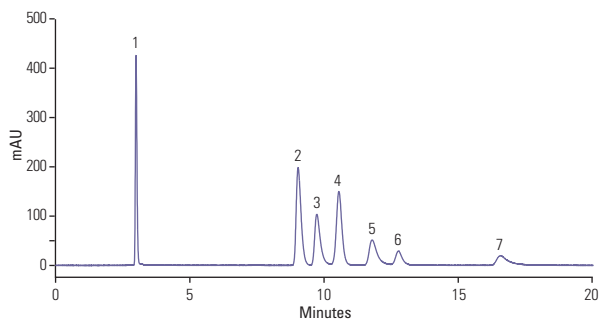
## Synchronis HILIC

Provides enhanced retention of polar and hydrophilic analytes

- Alternative selectivity to Synchronis C18
- Improved sensitivity with MS detection
- No need for ion-pair or derivatisation
- Outstanding peak shape and sensitivity
- Highly pure, high surface area silica particles
- Neutral (uncharged), highly polar surface



### Catecholamines



**Column: Synchronis HILIC, 5µm, 250 x 4.6mm**  
**Part Number: 97505-254630**

Mobile phase: water : acetonitrile : 200mM ammonium formate (10.5 : 84.5 : 5)

Flow rate: 1.0mL/min

Temperature: 40°C

Detection: 280nm

Injection volume: 5µL

Sample:

1. catechol
2. 5-HIAA
3. DOPAC
4. serotonin
5. tyrosine
6. dopamine
7. L-DOPA

## Synchronis Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	C18	C8	aQ	Phenyl		
1.7	UHPLC Column	30	2.1	<b>97102-032130</b>	–	–	–		
			2.1	<b>97102-052130</b>	<b>97202-052130</b>	<b>97302-052130</b>	<b>97902-052130</b>		
		3.0	<b>97102-053030</b>	–	–	–			
		4.6	<b>97102-054630</b>	<b>97202-054630</b>	<b>97302-054630</b>	<b>97902-054630</b>			
	100	2.1	100	2.1	<b>97102-102130</b>	<b>97202-102130</b>	<b>97302-102130</b>	<b>97902-102130</b>	
				3.0	<b>97102-103030</b>	<b>97202-103030</b>	<b>97302-103030</b>	<b>97902-103030</b>	
		3.0	100	3.0	<b>97102-103030</b>	<b>97202-103030</b>	<b>97302-103030</b>	<b>97902-103030</b>	
				4.6	<b>97102-104630</b>	<b>97202-104630</b>	<b>97302-104630</b>	<b>97902-104630</b>	
3	HPLC Column	30	2.1	<b>97103-032130</b>	–	–	–		
			2.1	<b>97103-052130</b>	<b>97203-052130</b>	<b>97303-052130</b>	<b>97903-052130</b>		
		3.0	<b>97103-053030</b>	–	–	–			
		4.6	<b>97103-054630</b>	–	–	–			
		100	2.1	100	2.1	<b>97103-102130</b>	–	–	–
					3.0	<b>97103-103030</b>	<b>97203-103030</b>	<b>97303-103030</b>	–
			4.6	100	4.6	<b>97103-104630</b>	<b>97203-104630</b>	<b>97303-104630</b>	<b>97903-104630</b>
					2.1	<b>97103-152130</b>	–	–	–
	150	4.6	150	4.6	<b>97103-154630</b>	<b>97203-154630</b>	<b>97303-154630</b>	<b>97903-154630</b>	
				2.1	<b>97103-152130</b>	–	–	–	
		2.1	150	2.1	<b>97105-012101</b>	<b>97205-012101</b>	<b>97305-012101</b>	<b>97905-012101</b>	
				3.0	<b>97105-013001</b>	<b>97205-013001</b>	<b>97305-013001</b>	<b>97905-013001</b>	
	5	Drop-in Guard (4/pk)	10	2.1	<b>97105-012101</b>	<b>97205-012101</b>	<b>97305-012101</b>	<b>97905-012101</b>	
				3.0	<b>97105-013001</b>	<b>97205-013001</b>	<b>97305-013001</b>	<b>97905-013001</b>	
				4.0/4.6	<b>97105-014001</b>	<b>97205-014001</b>	<b>97305-014001</b>	<b>97905-014001</b>	
		HPLC Column	30	30	2.1	<b>97105-032130</b>	<b>97205-032130</b>	<b>97305-032130</b>	<b>97905-032130</b>
50					2.1	<b>97105-052130</b>	<b>97205-052130</b>	<b>97305-052130</b>	<b>97905-052130</b>
					3.0	<b>97105-053030</b>	<b>97205-053030</b>	<b>97305-053030</b>	<b>97905-053030</b>
			4.6	<b>97105-054630</b>	<b>97205-054630</b>	<b>97305-054630</b>	<b>97905-054630</b>		
100			2.1	100	2.1	<b>97105-102130</b>	<b>97205-102130</b>	<b>97305-102130</b>	<b>97905-102130</b>
					3.0	<b>97105-103030</b>	<b>97205-103030</b>	<b>97305-103030</b>	<b>97905-103030</b>
			4.6	100	4.6	<b>97105-104630</b>	<b>97205-104630</b>	<b>97305-104630</b>	<b>97905-104630</b>
					2.1	<b>97105-152130</b>	<b>97205-152130</b>	<b>97305-152130</b>	<b>97905-152130</b>
150			3.0	150	3.0	<b>97105-153030</b>	<b>97205-153030</b>	<b>97305-153030</b>	<b>97905-153030</b>
					4.0	<b>97105-154030</b>	<b>97205-154030</b>	<b>97305-154030</b>	<b>97905-154030</b>
			4.6	150	4.6	<b>97105-154630</b>	<b>97205-154630</b>	<b>97305-154630</b>	<b>97905-154630</b>
					2.1	<b>97105-252130</b>	–	–	–
					3.0	<b>97105-253030</b>	<b>97205-253030</b>	<b>97305-253030</b>	<b>97905-253030</b>
4.0	150	4.0	<b>97105-254030</b>	<b>97205-254030</b>	<b>97305-254030</b>	<b>97905-254030</b>			
		4.6	<b>97105-254630</b>	<b>97205-254630</b>	<b>97305-254630</b>	<b>97905-254630</b>			

Format	Length (mm)	ID (mm)	Cat. No.
UNIGUARD Guard Cartridge Holder	10	2.1	<b>852-00</b>
		3.0	<b>852-00</b>
		4.0/4.6	<b>850-00</b>



Amino	Silica	HILIC
-	-	-
<b>97702-052130</b>	<b>97002-052130</b>	<b>97502-052130</b>
-	-	-
<b>97702-054630</b>	<b>97002-054630</b>	<b>97502-054630</b>
<b>97702-102130</b>	<b>97002-102130</b>	<b>97502-102130</b>
<b>97702-103030</b>	<b>97002-103030</b>	<b>97502-103030</b>
-	-	-
<b>97703-052130</b>	<b>97003-052130</b>	<b>97503-052130</b>
-	-	-
-	-	-
-	-	-
-	-	-
<b>97703-104630</b>	<b>97003-104630</b>	<b>97503-104630</b>
-	-	<b>97503-152130</b>
<b>97703-154630</b>	<b>97003-154630</b>	<b>97503-154630</b>
<b>97705-012101</b>	<b>97005-012101</b>	<b>97505-012101</b>
<b>97705-013001</b>	<b>97005-013001</b>	<b>97505-013001</b>
<b>97705-014001</b>	<b>97005-014001</b>	<b>97505-014001</b>
<b>97705-032130</b>	<b>97005-032130</b>	<b>97505-032130</b>
<b>97705-052130</b>	<b>97005-052130</b>	<b>97505-052130</b>
<b>97705-053030</b>	<b>97005-053030</b>	<b>97505-053030</b>
<b>97705-054630</b>	<b>97005-054630</b>	<b>97505-054630</b>
<b>97705-102130</b>	<b>97005-102130</b>	<b>97505-102130</b>
<b>97705-103030</b>	<b>97005-103030</b>	<b>97505-103030</b>
<b>97705-104630</b>	<b>97005-104630</b>	<b>97505-104630</b>
<b>97705-152130</b>	<b>97005-152130</b>	<b>97505-152130</b>
<b>97705-153030</b>	<b>97005-153030</b>	<b>97505-153030</b>
<b>97705-154030</b>	<b>97005-154030</b>	<b>97505-154030</b>
<b>97705-154630</b>	<b>97005-154630</b>	<b>97505-154630</b>
-	-	-
<b>97705-253030</b>	<b>97005-253030</b>	<b>97505-253030</b>
<b>97705-254030</b>	<b>97005-254030</b>	<b>97505-254030</b>
<b>97705-254630</b>	<b>97005-254630</b>	<b>97505-254630</b>

# Thermo Scientific Hypercarb HPLC Columns

100% porous graphitic carbon for extended separation capabilities

- Exceptional retention of very polar analytes
- Separates structurally related substances
- pH stable from 0 to 14
- Ideal for high temperature applications

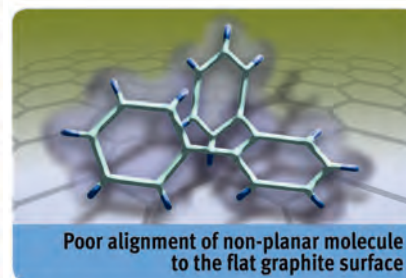
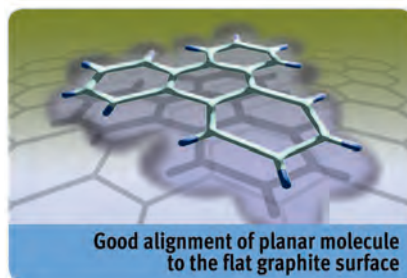
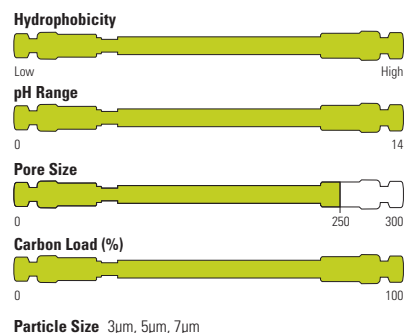
Porous Graphitic Carbon (PGC) is a unique stationary phase composed of flat sheets of hexagonally arranged carbon atoms with a satisfied valence, as in a very large polynuclear aromatic molecule. Thermo Scientific™ Hypercarb™ columns are unlike traditional silica bonded phases in both its structure and retentive properties, allowing for total pH stability and the retention and separation of highly polar species. Hypercarb columns are ideally suited to solve “problem” separations, in both reversed phase and normal phase HPLC and LC/MS applications.

## Retention and Resolution

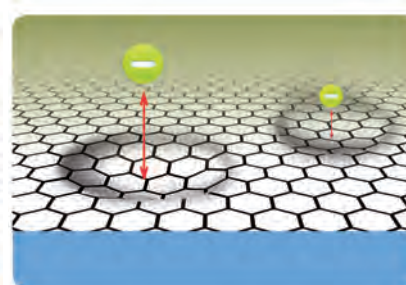
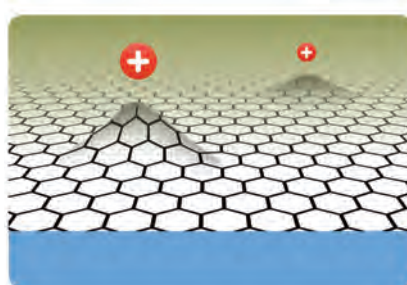
The mechanism of interaction is very dependent upon both the polarity and planarity (shape) of the solute. These specific interaction mechanisms allow the successful retention and resolution of analytes that cannot be separated by typical reversed phase HPLC. Removal of complex buffering systems or ion-pair reagents, and use of increased organic modifier concentration for polar analytes allows greater compatibility with detection techniques such as MS.

The overall retention on Hypercarb columns is a combination of two mechanisms:

**1) Adsorption:** The strength of analyte interactions with Hypercarb columns is largely dependent on the molecular area in contact with the graphite surface, and also on the type and positioning of the functional groups in relation to the graphite surface at the points of contact. The approach of a planar and a non-planar molecule to the Hypercarb surface is shown in the diagrams above. The strength of the interaction depends upon the size and orientation of the molecular area that is able to come in contact with the flat graphite surface. More planar molecules will show more retention than rigid molecules with a 3-dimensional spatial arrangement.



Schematic representation of molecular area of a planar and non-planar molecule interacting with the Hypercarb surface



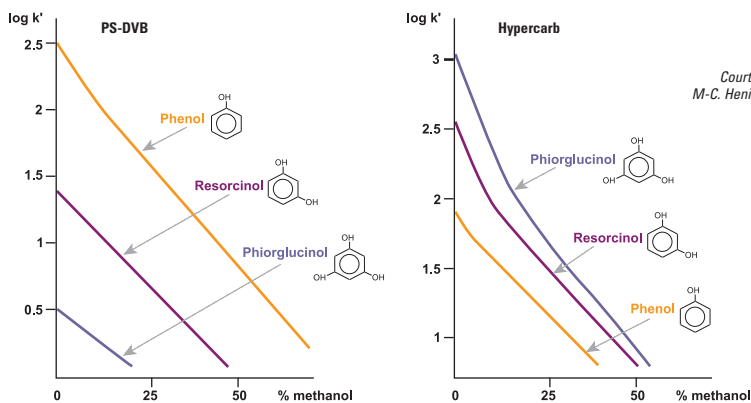
Schematic representation of a point charge approaching the Hypercarb surface

**2) Charge induced interactions of a polar analyte with the polarizable surface of graphite:** The second mechanism, charge-induced dipole, is illustrated above and accounts for the strong retention exhibited by polar analytes. As the polar group with a permanent dipole approaches the surface, an induced dipole is formed, increasing the attraction between the analyte and graphite surface. These charges should not be confused with the overall ionic charge of the molecule, such as a basic compound ionized in acidic pH conditions. The charge-induced dipole mechanism is strictly due to the interaction of the electrostatic charge of the polar molecule with the graphite surface.

The strong mechanisms of interaction with Hypercarb columns usually allows for shorter columns to be used during the method development process. In most cases, 100mm length columns or shorter are sufficient for a separation.

### Increased Retention of Polar Analytes

In typical reversed phase chromatography, the retention of an analyte is directly related to its hydrophobicity: the more hydrophobic the analyte, the longer its retention. Conversely, as the polarity of the analyte increases, analyte-solvent interactions begin to dominate and retention is reduced. This observation holds true for the majority of reversed phase systems. An exception to this rule is Hypercarb columns, for which retention may in some cases increase as the polarity of the analyte increases, illustrated to the right. This phenomenon is referred to as the "polar retention effect on graphite" (PREG). This property makes Hypercarb columns particularly useful for the separation of highly polar compounds (with logP as low as -4) that are normally difficult to retain and resolve on silica-based alkyl chain phases. The retention of very polar solutes on Hypercarb columns can be achieved without ion pair reagents or complex mobile phase conditions, as illustrated in the chromatogram below.

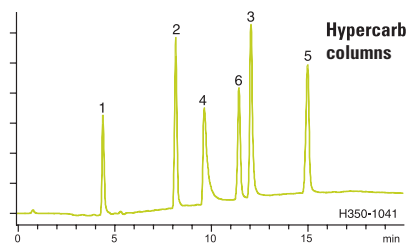
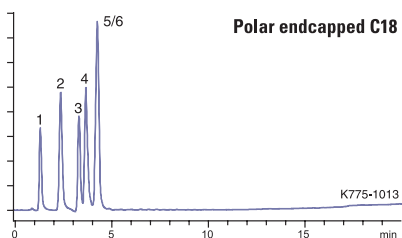


Retention on Hypercarb columns increases as polarity of the analyte increases, which is the opposite of typical reversed phase materials such as PS-DVB

### Extended pH Range

One of the other key benefits of Hypercarb columns is the extreme stability of the phase to chemical or physical attack. Due to the unique characteristics of the media, it can withstand chemical attack across the entire pH range of 0 to 14, allowing applications to be run at pH levels that are incompatible

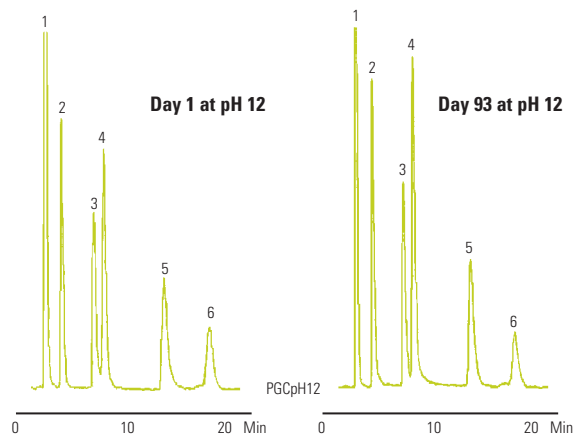
with typical silica-based columns. Hypercarb columns offer more choice in buffer selection while handling both high temperature and high pressure.



Additional retention is achieved for polar compounds using a Hypercarb column compared to a polar endcapped C18. Note also the change in elution order.

**Hypercarb column, 5µm, 100 x 0.32mm**  
Part Number: 35005-100365

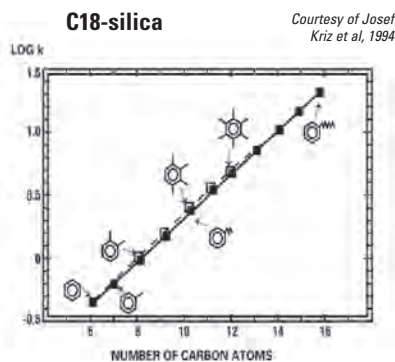
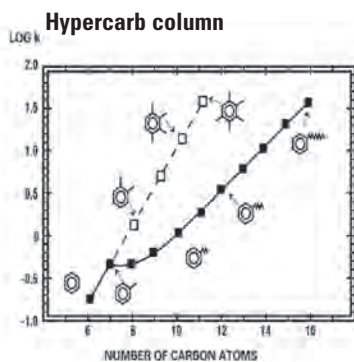
Mobile Phase:	A: H <sub>2</sub> O + 0.1% formic acid
	B: ACN + 0.1% formic acid
Gradient:	0 to 25% B in 15 minutes
Flow Rate:	8µL/min
Temperature:	25°C
Detection:	UV at 254nm
Analytes:	1. Cytosine
	2. Uracil
	3. Guanine
	4. Adenine
	5. Xanthine
	6. Thymine



**Hypercarb column, 5µm, 100 x 4.6mm**

Part Number:	35005-104630
Mobile Phase:	MeOH:H <sub>2</sub> O
Isocratic:	70:30
Flow Rate:	0.7mL/min
Detection:	UV at 254nm
Sample:	1. Acetone
	2. Phenol
	3. p-Cresol
	4. Anisol
	5. Phenetole
	6. 3,5-Xylenol

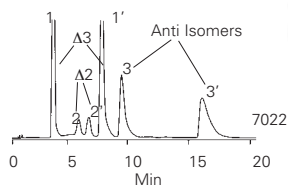
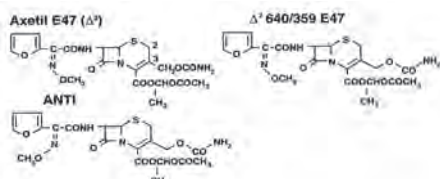
Hypercarb column stability at pH 12: retention and selectivity do not change even after 93 days of storage in 0.1M NaOH/MeOH



Courtesy of Josef Kriz et al, 1994

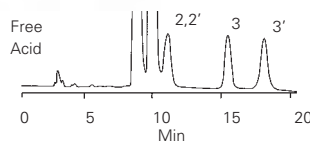
Comparison of methyl and methylene group selectivity on C18 and Hypercarb columns

Courtesy of Norman Smith, Glaxo Group Research, Greenford, 1988



**Hypercarb column, 5µm, 100 x 4.6mm**

Part Number: 35005-104630  
 Mobile Phase: ACN:H<sub>2</sub>O:MeOH:Dioxan  
 Isocratic: 38:20:35:10  
 Flow Rate: 1mL/min  
 Detector: UV at 254nm



**Hypersil SAS, 5µm, 200 x 4.6mm**

Part Number: 30505-204630  
 Mobile Phase: MeOH:0.05M NH<sub>4</sub>H<sub>2</sub>PO<sub>4</sub>  
 Isocratic: 38:62  
 Flow Rate: 1mL/min  
 Detector: UV at 254nm

Separation of geometric isomers of Axetil: comparison of a Hypercarb and bonded silica column

**Resolution of Structurally Related Compounds**

By virtue of the nature of the surface and the way solute shape affects retention, Hypercarb columns can differentiate between closely related analytes such as isomers and homologous series. Where no discrimination between methylene and methyl groups is observed using a traditional C18 column, considerable resolving power is observed with Hypercarb columns, as shown above. The differentiation of analytes is based on their fit to the graphite surface, allowing for the chromatographic resolution of compounds that are very similar in structure as shown above with the resolution of diastereomers of the antibiotic Axetil. The Hypercarb column provides both a significant improvement in separation over the silica-based column originally used, as well as a change in elution order.

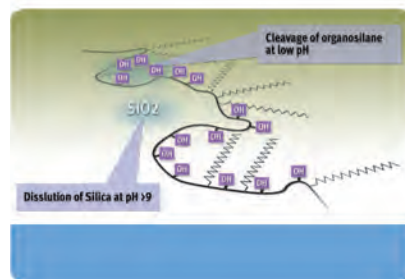
**Ideal for Reversed Phase LC/MS of Polar Compounds**

Reversed phase-LC/MS analysis of very polar compounds is challenging because the typical hydrophobic stationary phases when combined with the most suitable mobile phases for MS detection do not provide the necessary retention to resolve and quantify these compounds.

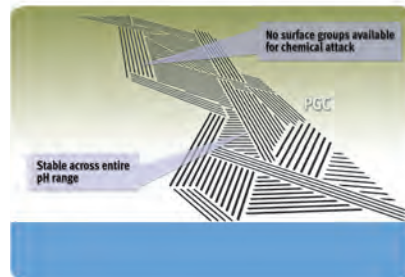
A Hypercarb column overcomes these challenges because it:

- Retains and separates very polar compounds using "MS friendly" mobile phases such as 0.1% formic or acetic acid and low concentrations of volatile buffers such as ammonium acetate or ammonium formate
- Can be used with high concentrations of organic modifiers in the mobile phase, which improves nebulization in atmospheric pressure ionization techniques, improving the sensitivity of the analysis.

**Typical C18 silica**



**Hypercarb**



Surface comparison between C18 bonded silica and Hypercarb porous graphitic carbon

- Allows shorter column lengths and smaller diameters to be used without compromising peak capacity, often with increased sensitivity. The flow rates used with narrowbore and capillary columns are more compatible with MS techniques.
- Is stable with any mobile phase and produces no phase bleed issues because the Hypercarb column's porous graphitic surface is not modified.

## Hypercarb Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.		
3	Drop-in Guard (4/pk)	10	1.0	<b>35003-011001</b>		
			2.1	<b>35003-012101</b>		
			3.0	<b>35003-013001</b>		
			4.6	<b>35003-014001</b>		
	HPLC Column	30	30	1.0	<b>35003-031030</b>	
				2.1	<b>35003-032130</b>	
				3.0	<b>35003-033030</b>	
				1.0	<b>35003-051030</b>	
				2.1	<b>35003-052130</b>	
				3.0	<b>35003-053030</b>	
		50	30	50	4.6	<b>35003-054630</b>
					1.0	<b>35003-101030</b>
					2.1	<b>35003-102130</b>
					3.0	<b>35003-103030</b>
					4.6	<b>35003-104630</b>
					1.0	<b>35003-152130</b>
	High Temperature HPLC Column	30	30	2.1	<b>35003-153030</b>	
				3.0	<b>35003-153030</b>	
				4.6	<b>35003-154630</b>	
				2.1	<b>35003-032146</b>	
				2.1	<b>35003-052146</b>	
				4.6	<b>35003-054646</b>	
	100	30	100	1.0	<b>35003-101046</b>	
				2.1	<b>35003-102146</b>	
3.0				<b>35003-103046</b>		
4.6				<b>35003-104646</b>		
1.0				<b>35005-011001</b>		
2.1				<b>35005-012101</b>		
5	Drop-in Guard (4/pk)	10	3.0	<b>35005-013001</b>		
			4.6	<b>35005-014001</b>		
			2.1	<b>35005-032130</b>		
			3.0	<b>35005-033030</b>		
	HPLC Column	30	30	4.6	<b>35005-034630</b>	
				1.0	<b>35005-051030</b>	
				2.1	<b>35005-052130</b>	
				3.0	<b>35005-053030</b>	
				4.6	<b>35005-054630</b>	
				1.0	<b>35005-101030</b>	
		50	30	50	2.1	<b>35005-102130</b>
					3.0	<b>35005-103030</b>
					4.6	<b>35005-104630</b>
					1.0	<b>35005-151030</b>
					2.1	<b>35005-152130</b>
					3.0	<b>35005-153030</b>
	High Temperature HPLC Column	30	30	4.6	<b>35005-154630</b>	
				2.1	<b>35005-032146</b>	
				4.6	<b>35005-034646</b>	
				2.1	<b>35005-052146</b>	
				4.6	<b>35005-054646</b>	
				2.1	<b>35005-102146</b>	
	100	30	100	4.6	<b>35005-104646</b>	
				2.1	<b>35005-022135</b>	
1.0				<b>35005-109070</b>		
21.2				<b>35005-109270</b>		
3.0				<b>35005-109370</b>		
10				<b>35005-159070</b>		
Javelin HTS Column	20	100	21.2	<b>35005-159270</b>		
			10	<b>35005-109070</b>		
			21.2	<b>35005-109270</b>		
			3.0	<b>35005-109370</b>		
Preparative HPLC Column	100	150	10	<b>35005-109070</b>		
			21.2	<b>35005-109270</b>		
			3.0	<b>35005-109370</b>		
			10	<b>35005-159070</b>		
21.2	100	150	21.2	<b>35005-159270</b>		
			10	<b>35005-159070</b>		
			21.2	<b>35005-159270</b>		
			10	<b>35005-159070</b>		
Format	UNIGUARD Guard Cartridge Holder	10	1.0	<b>851-00</b>		
			2.1	<b>852-00</b>		
			3.0	<b>852-00</b>		
			4.6	<b>850-00</b>		
			4.6	<b>850-00</b>		

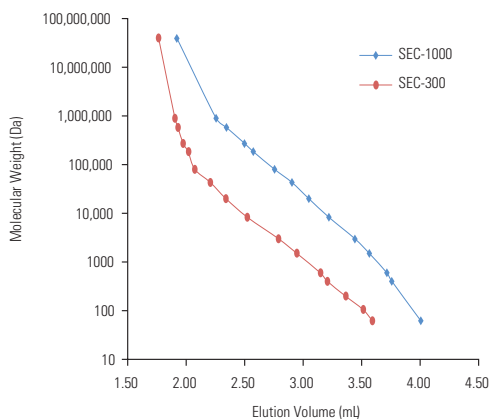


# Acclaim Size Exclusion Chromatography (SEC)

High Performance SEC Columns for Analysis of Water Soluble Polymers

- Proprietary mono-dispersed multi-pore hydrophilic resin: no inflection points in calibration curve
- SEC-300 calibrated from 100 to 50,000 Daltons
- SEC-1000 calibrated from 1,000 to 1,000,000 Daltons
- Availability of small particle sizes packed in 4.6 x 300mm dimension allows for high-resolution analysis at reduced solvent consumption
- Stable surface bonding with low column bleed and compatibility with UV, RI, MS, ELSD and Thermo Scientific™ Dionex™ Corona™ Charged Aerosol Detectors

Thermo Scientific™ Acclaim™ SEC-300 and SEC-1000 are a family of resin based, high performance size exclusion chromatography columns specifically designed for the separation of water soluble polymers and oligomers. Acclaim SEC columns are available in two sizes to cover a broad molecular weight range: 5µm, 300 Å for Acclaim SEC-300 and 7µm, 1000 Å for Acclaim SEC-1000.

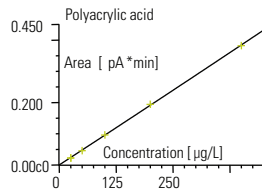
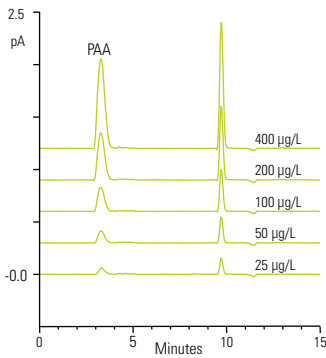


Columns:	Acclaim SEC-300 Acclaim SEC-1000
Dimensions:	4.6 x 300mm
Mobile Phases:	10mM sodium perchlorate
Flow rate:	0.35mL/min
Temperature:	25°C
Injection Volume:	50µL
Detection:	RI
Samples:	(0.03% - 0.1% in mobile phase) dextran (MW 5,000,000 - 40,000,000), PEO (MW 895,000, 580,000, 272,000, 185,000, 80,000, 43,000, and 20,000), PEG (MW 8,300, 3,000, 1,500, 600, 400 and 200), diethylene glycol (MW 106 and ethylene glycol (MW 62)





## Polyacrylic acid using size-exclusion chromatography with charged-aerosol detection



### HPLC Conditions

Column: Acclaim SEC-300

Dimensions: 5µm, 4.6 x 300mm

System: UltiMate 3000 RS

Mobile Phases: A: Acetonitrile

B: Water

Isocratic: 10:90

Flow rate: 0.35mL/min

Injection: 35µL

Temperature: 30°C

Detection: Corona III; evaporator 55°C, Engine 40 °C, 2 Hz, filter 5, power function 1.20

Peaks: 1. PAA standards in water

### Acclaim SEC Ordering Guide

Description	Particle Size (µm)	Format	Length (mm)	4.6 mm ID	7.8 mm ID
Acclaim SEC-300	5	Guard	33	<b>082740</b>	–
		HPLC Column	150	–	<b>079726</b>
			300	<b>079723</b>	<b>079725</b>
Acclaim SEC-1000	7	Guard	33	<b>082739</b>	–
		HPLC Column	150	–	<b>079722</b>
			300	<b>079724</b>	<b>079721</b>



# Thermo Scientific Application Specific LC Columns

Innovative chemistries tailored for challenging and critically important applications

- Acclaim Trinity P1 and P2 for API and counterion analysis
- Acclaim Organic Acid for fast organic acid analysis
- Acclaim Surfactant and Surfactant Plus columns for separation of surfactants
- Acclaim Explosives for separation of explosive residues
- Acclaim Trinity Q1 for diquat and paraquat analysis
- Acclaim Carbamate for the separation of carbamate insecticides
- Acclaim Carbonyl C18 for aldehyde and ketone separation
- Hypersil Green PAH for polyaromatic hydrocarbon analysis

Thermo Scientific application specific columns are based on novel and unique chemistries and provide superior resolution with ease-of-use.

## Acclaim Trinity P1 and P2

Application specific columns designed for the simultaneous separation of pharmaceutical drug substances and counterion analysis, as well as mixtures of acidic, basic, and neutral drugs.

## Acclaim Organic Acid

Designed for separation of hydrophilic, aliphatic, and aromatic organic acids.

## Acclaim Surfactant and Surfactant Plus

The most versatile commercially-available column specifically for the separation of all classes of surfactants.

## Acclaim Explosives

Optimized column chemistry for baseline separation of all 14 explosives in EPA Method 8330, with complementary selectivity.

## Acclaim Trinity Q1

Unique, high-efficiency, silica-based columns designed for the separation of the herbicides diquat and paraquat.

## Acclaim Carbamate

A specifically column for the separation of carbamate pesticide specified in US EPA Method 531.2.

## Acclaim Carbonyl C18

Designed for separating DNPH derivatives of aldehydes and ketones in air, water and soil using CARB Method 1004, EPA Method 554, EPA Method 8315 and related methods.

## Hypersil Green PAH

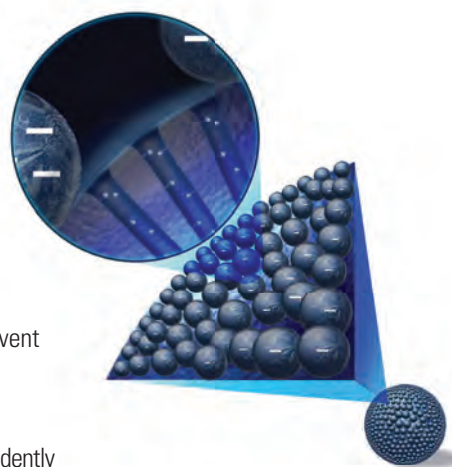
Specially tailored alkyl bonded silica with a high carbon loading, designed specifically for the analysis of polyaromatic hydrocarbons (PAHs), specified in EPA Method 610.



## Acclaim Trinity P1

Most innovative advancement in mixed mode column technology: reverse-phase, anion- and cation exchange functionality on a single support

- Ideal selectivity for simultaneous separation of API and counterion
- Adjustable selectivity by mobile phase ionic strength, electrolyte type, pH, and organic solvent
- Low bleed; compatible with MS, CAD and ELSD.
- Retention of hydrophilic ionic and ionizable analytes without ion-pairing reagents
- Greater flexibility in method development: each retention mechanisms can be controlled independently



The Thermo Scientific™ Acclaim™ Trinity™ P1 HPLC column is designed with unique multimode surface chemistry ideal for the simultaneous separation of drugs and their counterions. The surface chemistry concurrently provides reversed-phase, cation exchange, and anion exchange functionalities. The result is maximum flexibility in method development. Separations can be optimized easily by adjusting the chromatographic parameters (mobile phase pH, ionic strength, and organic strength).

The Acclaim Trinity P1 stationary phase, based on this Nanopolymer Silica Hybrid (NSH) technology, consists of high-purity porous, spherical 3µm silica particles, coated with charged nanopolymer beads. The unique surface chemistry includes an inner-pore area modified with an organic layer that provides both reversed phase and anion exchange properties. The outer-pore surface, conversely, is modified with cation exchange functionality.

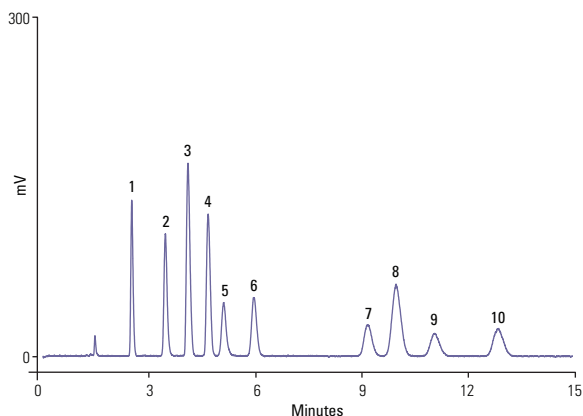
### Acclaim Trinity P1 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm ID	3.0mm ID
3	Guard Cartridges (2/pk)	10	<b>071391</b>	<b>071390</b>
	HPLC Column	50	<b>075565</b>	<b>071388</b>
		100	<b>071389</b>	<b>071387</b>
		150	<b>075564</b>	<b>075563</b>

### Acclaim Guard Holder Ordering Guide

Format	Cat. No.
Acclaim SST Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>

### Simultaneous separation of pharmaceutical counterions

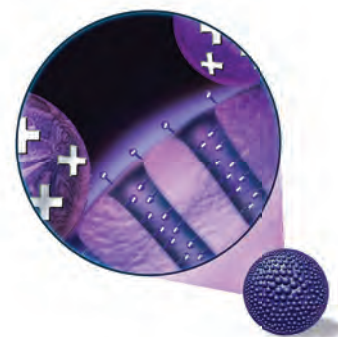


#### Column: Acclaim Trinity P1, 3µm

Dimensions:	3.0 × 100mm
Mobile Phase:	60/40 v/v CH <sub>3</sub> CN/20mM (total) NH <sub>4</sub> OAc, pH 5
Temperature:	30°C
Flow Rate:	0.5mL/min
Inj. Volume:	2µL
Detection:	Corona ultra (Gain = 100 pA; Filter = med; Neb Temp = 30°C)
Peaks: (50 to 100ppm)	
	1. Choline
	2. Tromethamine
	3. Sodium
	4. Potassium
	5. Meglumine
	6. Mesylate
	7. Nitrate
	8. Chloride
	9. Bromide
	10. Iodide

## Acclaim Trinity P2

Most innovative mixed-mode column technology; hydrophilic interaction, HILIC, anion exchange and cation exchange functionalities

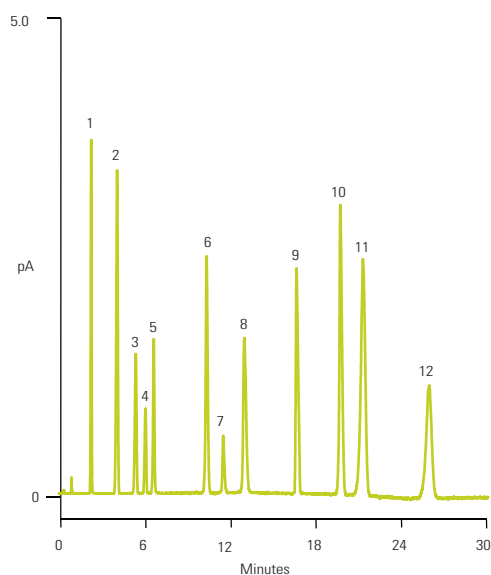


- Ideal for separating pharmaceutical counterions, including monovalent and divalent cations or anions
- Selectivity complementary to the Trinity P1 column
- Low column bleed, compatible with CAD and MS
- Hydrolytically stable
- High efficiency

The Acclaim Trinity P2 is a unique, high-efficiency, silica-based column specifically designed for separation of pharmaceutical counterions, including monovalent and divalent cations or anions.

The Acclaim Trinity P2 column is based on NSH technology, which consists of high-purity porous spherical silica particles coated with charged nanopolymer particles. The inner-pore area of the silica bead is modified with a covalently bonded organic layer that provides cation-exchange retention, while the outer surface is modified with anion-exchange nano-polymer beads. This chemistry ensures spatial separation of the anion-exchange and cation-exchange regions. Acclaim Trinity P2 column is aimed to complement Acclaim Trinity P1 to provide a total solution for pharmaceutical counter ion analysis by HPLC.

### Pharmaceutical-related anions and cations



#### Column: Acclaim Trinity P2, 3µm

Dimensions:	3.0 x 100 mm
Mobile phase:	D.I. water and 100 mM NH <sub>4</sub> OFm, pH 3.65 gradient
Temperature:	30°C
Flow rate:	0.60 mL/min
Injection volume:	2µL
Detection:	Corona Veo Charged Aerosol Detector
Samples:	0.02 – 0.10 mg/mL each in D.I. water
Peaks:	1. Phosphate 2. Sodium 3. Potassium 4. Chloride 5. Malate 6. Bromide 7. Nitrate 8. Citrate 9. Fumarate 10. Sulfate 11. Magnesium 12. Calcium

Time (min)	H <sub>2</sub> O	0.1 M Ammonium formate, pH3.65
-10	0.760	1.474
0	80	20
2	80	20
22	0	100
30	0	100

### Acclaim Trinity P2 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1 mm ID	3.0 mm ID
3	Guard Cartridges (2/pk)	10	<b>085435</b>	<b>085436</b>
	HPLC Column	50	<b>085431</b>	<b>085433</b>
		100	<b>085432</b>	<b>085434</b>

### Acclaim Guard Holder Ordering Guide

Format	Cat. No.
Acclaim Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>

## Acclaim Organic Acid

Optimized and application-tested for the analysis of hydrophilic organic acids

- Use-tested to guarantee consistent hydrophilic organic acid separations
- Compatible with 100% aqueous mobile phases
- Hydrolytic stability at low-pH conditions
- Ideal selectivity for separating a wide spectrum of organic acids
- Excellent column efficiency and peak shapes for organic acids



The Acclaim Organic Acid (OA) is a silica-based reversed-phase column designed for high-efficiency, high-throughput organic acids analysis. It offers unparalleled performance for separating hydroxyl aliphatic and aromatic organic acids.

The Acclaim OA is the recommended column for determining small hydrophilic organic acids, C1 to C7 aliphatic acids, and hydrophilic aromatic acid and is also valuable for the analysis and quality assurance of food and beverage products, pharmaceutical preparations, plating baths, and manufacturing chemicals, chemical intermediates, and environmental samples.

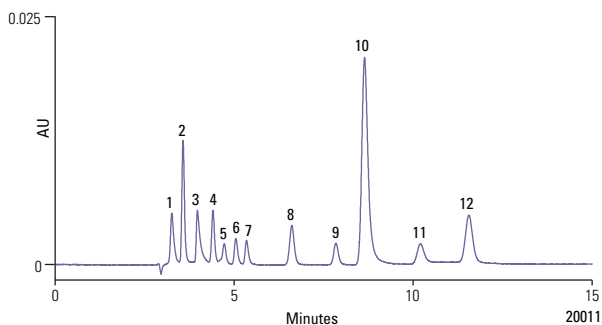
### Acclaim Organic Acid Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm ID	3.0mm ID	4.0mm ID
3	HPLC Column	150	<b>070087</b>	<b>070086</b>	–
5	Guard Cartridges (2/pk)	10	–	<b>071987</b>	<b>069700</b>
	HPLC Column	150	–	–	<b>062903</b>
	HPLC Column	250	–	–	<b>062902</b>

### Acclaim Guard Holder Ordering Guide

Format	Cat. No.
Acclaim SST Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>

### Hydrophilic organic acids



#### Column: Acclaim OA, 5µm, 4 × 250mm

Mobile phase:	100mM Na <sub>2</sub> SO <sub>4</sub> , pH 2.65 (adjusted with methanesulfonic acid)
Temperature:	30°C
Flow rate:	0.6mL/min
Injection volume:	5µL
Detection:	UV, 210nm
Peaks:	1. Oxalic acid 15mg/L (ppm) 2. Tartaric acid 120 3. Formic acid 180 4. Malic acid 120 5. iso-Citric acid 120 6. Lactic acid 180 7. Acetic acid 120 8. Citric acid 120 9. Succinic acid 120 10. Fumaric acid 7 11. cis-Aconitic acid * 12. trans-Aconitic acid *

\* 7ppm total for cis and trans isomers



## Acclaim Surfactant

Excellent performance for separating a broad range of surfactants

- Ideal selectivity for separation of anionic, nonionic, cationic and amphoteric surfactants
- Excellent peak shapes, especially for cationic surfactants
- Compatible with highly aqueous mobile phases
- Improved resolution for ethoxylated surfactants
- Rugged separations under a variety of conditions



The Acclaim Surfactant columns are the first generation high-efficiency, silica-based columns designed specifically for separating a wide variety of surfactants, including anionic, cationic, nonionic, and amphoteric surfactants using UV, ELSD or RI detection.

As a consequence of its novel chemistry, this column exhibits a unique polarity that provides significantly improved resolution for individual oligomers of ethoxylated surfactants compared with conventional C18 columns.

Acclaim Surfactant columns are also resistant to dewetting under highly aqueous mobile phase conditions, and thus can be used to provide excellent resolution between strongly hydrophilic compounds, such as isomers of xylene sulfonate.

Surfactants are widely used in industrial, agricultural, and pharmaceutical markets, in products as diverse as pesticides, detergents powders, petroleum products, cosmetics, and pharmaceuticals. The Acclaim Surfactant column was designed specifically for HPLC separation of these surfactants.

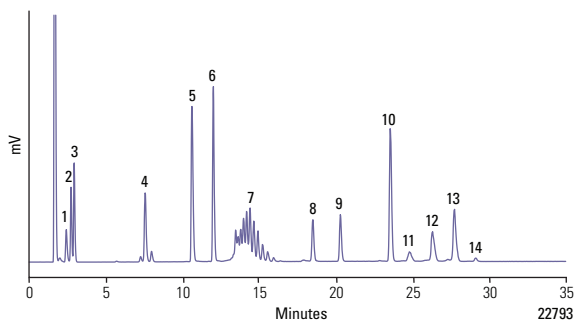
### Acclaim Surfactant Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3	HPLC Column	150	<b>070085</b>	<b>070084</b>	—
5	Guard Cartridges (2/pk)	10	<b>069693</b>	<b>071991</b>	<b>069701</b>
	HPLC Column	150	<b>068123</b>	—	<b>063201</b>
		250	—	—	<b>063203</b>

### Acclaim Guard Holder Ordering Guide

Description	Cat. No.
Acclaim SST Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>

### Inorganic anion, hydrotropes, cationic, nonionic, amphoteric, and anionic surfactants



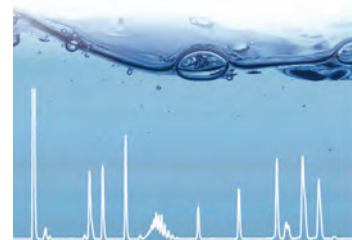
<b>Column:</b>	<b>Acclaim Surfactant, 5µm</b>
<b>Dimensions:</b>	4.6 × 150mm
<b>Mobile Phase:</b>	(A) CH <sub>3</sub> CN, (B) 0.1 M NH <sub>4</sub> OAc, pH 5.4
<b>Gradient:</b>	25% to 85% A in 25min, then hold 85% A for 10min
<b>Temperature:</b>	30°C
<b>Flow Rate:</b>	1mL/min
<b>Inj. Volume:</b>	25µL
<b>Detection:</b>	ELS detector
<b>Peaks:</b>	1. Chloride 2. Bromide 3. Nitrate 4. Xylene sulfonate 5. Laurylpyridinium chloride 6. Lauryldimethylbenzyl-ammonium chloride 7. Triton X-100 8. Cetyl betaine 9. Decyl sulfate 10. Dodecyl sulfate 11. C <sub>10</sub> -LAS 12. C <sub>11</sub> -LAS 13. C <sub>12</sub> -LAS 14. C <sub>13</sub> -LAS



## Acclaim Surfactant Plus

Column of Choice for Surfactant Analysis using Higher Sensitivity Detection: Performance, Versatility, Throughput

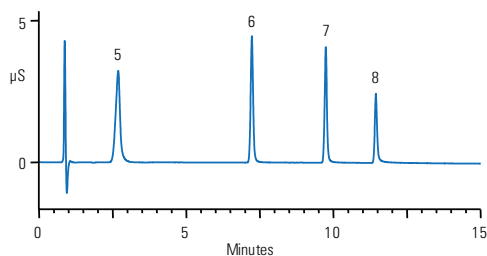
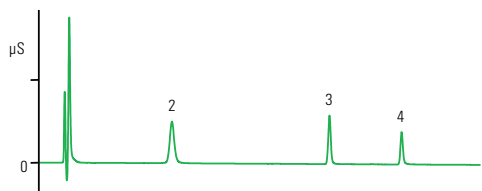
- Ideal selectivity for simultaneous separation of anionic, nonionic, cationic, and amphoteric surfactants
- Compatible with multiple detectors including MS, CAD, ELSD and UV
- Well suited for the determination of cationic surfactants
- High efficiency and fast analysis
- Rugged separations under a variety of conditions



Acclaim Surfactant Plus is a new generation of columns offering improved performance and higher throughput for analyzing surfactants. They have similar selectivity to the Acclaim Surfactant columns, but have been designed with exceptionally low bleed for use with charged aerosol detectors (CAD) and mass spectrometers (MS). These columns can be used to separate a wide variety of surfactants including anionic, cationic, nonionic and amphoteric surfactants.

Additionally, these columns can be used with evaporative light scattering detectors (ELSD), suppressed conductivity detectors (SCD), and UV-Vis detectors (UV). They are resistant to dewetting under highly aqueous mobile phase conditions, and thus can be used to provide excellent resolution between strongly hydrophilic compounds, such as isomers of xylene sulfonate. Non-metallic PEEK hardware is available for best compatibility with Dionex ion chromatography systems.

### Cationic surfactants



#### Column: Acclaim Surfactant Plus, 3 $\mu$ m

Dimensions: 3.0  $\times$  150 mm

System: ICS 3000

Mobile phases: A: Acetonitrile  
B: 100mM Formic acid  
C: Water

Time (min)	%A	%B	%C
-12	5	5	90
0	5	5	90
12	40	5	55
20	40	5	55

Flow Rate: 0.5 mL/min

Injection: 5  $\mu$ L

Temperature: 25°C

Detection: Conductivity with blank subtraction

Suppressor: CSRS300-2mm (external water  
1.0 mL/min, current = 8 mA)

Peaks: 1. Tetrabutylammonium  
2. Tetrapentylammonium  
3. Tetrahexylammonium  
4. Tetraheptylammonium  
5. Decyl-trimethylammonium  
6. Dodecyl-trimethylammonium  
7. Tetradecyl-trimethylammonium  
8. Hexadecyl-trimethylammonium

### Acclaim Surfactant Plus Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm	3.0 mm	4.6 mm	4.0 mm PEEK
3	HPLC Column	100	<b>078955</b>	<b>078952</b>	–	–
		150	<b>078954</b>	<b>078951</b>	<b>078950</b>	–
		250	<b>078953</b>	–	–	–
5	Guard Cartridges (2/pk)	10	<b>078960</b>	<b>078959</b>	<b>082773</b>	–
	HPLC Column	250	–	–	<b>082767</b>	–
		150	–	–	<b>082768</b>	<b>078956</b>

### Acclaim Guard Holder Ordering Guide

Description	Cat. No.
Acclaim SST Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>



## Acclaim Explosives

The best solution for explosives analysis (EPA Method 8330)

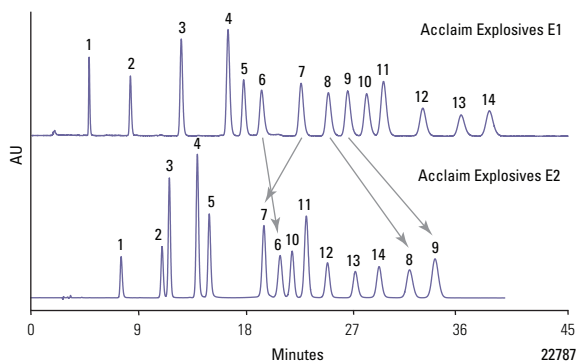
- Both Acclaim E1 and E2 columns provide baseline resolution of all 14 compounds targeted by EPA Method 8330
- E2 columns available in 2.2, 3 and 5µm particle size
- The E1 and E2 columns have mutually complementary selectivity
- Simple isocratic elution conditions
- Rugged columns with good lot-to-lot reproducibility



Acclaim Explosives E1 and E2 columns are specifically designed to resolve all 14 explosives listed in EPA SW-846 Method 8330: Nitroaromatics and Nitramines by HPLC. The novel and unique chemistries of these columns provide superior resolution with complementary selectivities.

The Acclaim Explosives E1 is recommended for use as a direct replacement for ODS columns for the primary analysis. The Acclaim Explosives E2 may be used as either a primary or a confirmatory column. The unique selectivity and versatility of Acclaim Explosives E2 column provides a wider application range, including the analysis of explosives beyond U.S. EPA Method 8330 (ISO22478).

### Complimentary baseline separation of 14 target compounds listed in EPA SW-846 method 8330

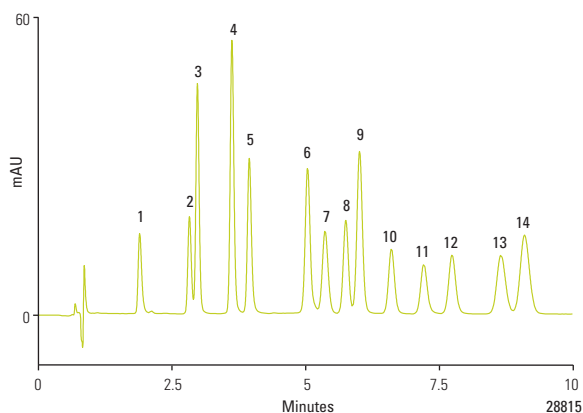


#### Column: 5µm, 4.6 x 250mm

Column:	5µm, 4.6 x 250mm
Eluent:	EPA 8330 mix, 50 ppm each
Temperature:	30 °C
Flow Rate:	1 mL/min
Inj. Volume:	5µL
Detection:	UV, 254nm

Peaks:	1. HMX
	2. RDX
	3. 1,3,5-Trinitrobenzene
	4. 1,3-Dinitrobenzene
	5. Nitrobenzene
	6. Tetryl
	7. 2,4,6-Trinitrotoluene
	8. 4-Amino-2,6-Dinitrotoluene
	9. 2-Amino-4,6-Dinitrotoluene
	10. 2,6-Dinitrotoluene
	11. 2,4-Dinitrotoluene
	12. 2-Nitrotoluene
	13. 4-Nitrotoluene
	14. 3-Nitrotoluene

### Rapid determination of EPA 8330A explosives



#### Column: Acclaim RSLC Explosives E2, 2.2µm

Dimension:	2.1 x 100mm
HPLC System:	UltiMate 3000 RSLC HPG
Mobile Phases:	Methanol:water 48:52 (v/v)
Flow Rate:	0.34mL/min (293 bar)
Injection Vol.:	1µL
Temperature:	31°C
Detection:	UV at 254nm, 10 Hz, 0.4 s resp. time
Sample:	Calibration mix, 25µg/mL in 50% acetonitrile

Peaks:	1. HMX	8. 2,6-DNT
	2. RDX	9. 2,4-DNT
	3. 1,3,5-TNB	10. 2-NT
	4. 3,5-DNB	11. 4-NT
	5. NB	12. 3-NT
	6. 2,4,6-TNT	13. 4-Am-2,6-DNT
	7. Tetryl	14. 2-Am-4,6-DNT

## Acclaim Explosives Ordering Guide

### Acclaim Explosives E1 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5	Guard Cartridges (2/pkg)	10	–	–	<b>069702</b>
	HPLC Column	250	–	–	<b>064305</b>

### Acclaim Explosives E2 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.2	RSLC Column	100	<b>076225</b>	<b>076227</b>	–
		150	<b>076226</b>	–	–
3	HPLC Column	150	<b>070083</b>	<b>070082</b>	–
		250	–	<b>070081</b>	–
5	Guard Cartridges (2/pkg)	10	–	<b>071989</b>	<b>069703</b>
	HPLC Column	250	–	–	<b>064309</b>

### Acclaim Guard Holder Ordering Guide

Description	Cat. No.
Acclaim SST Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>

### Acclaim Explosives Kit Ordering Guide

Description	Cat. No.
E1 and E2 HPLC Columns (4.6 x 250mm) E1 and E2 Guard Cartridges (4.6 x 10mm), pkg of 2	<b>064312</b>

# Acclaim Trinity Q1

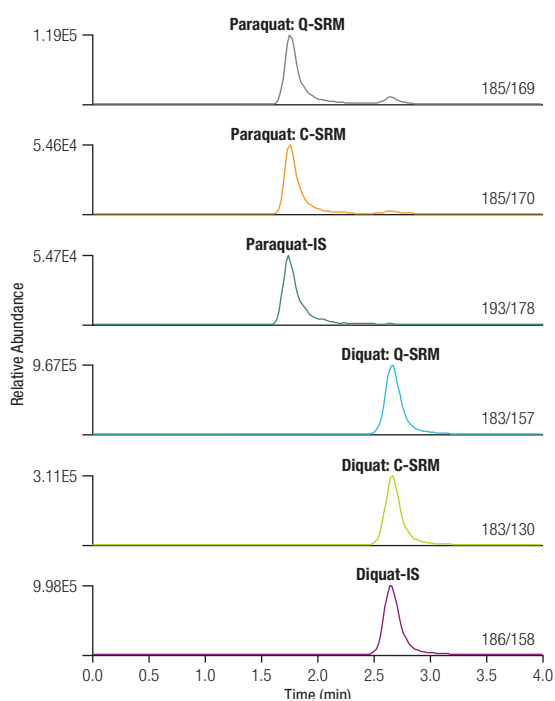
For Trace Analysis of Diquat and Paraquat

- Excellent resolution of diquat and paraquat
- Good peak shape
- Fast analysis
- LC/MS compatibility
- No ion-pairing reagent needed
- Easy to use



Acclaim Trinity Q1 columns are unique, high-efficiency, silica-based columns designed for the separation of the herbicides diquat and paraquat. These herbicides are toxic and residues are monitored in drinking water, wastewater and agricultural products. The Acclaim Trinity Q1 column is a tri-mode (WCX, WAX, RP), column based on Nano-polymer Silica Hybrid technology. It offers unmatched high-resolution and high-throughput trace analysis of the herbicides diquat and paraquat by LC-MS/MS and LC-UV methods.

## Diquat and paraquat



### Chromatographic Conditions

System: Thermo Scientific Dionex UltiMate 3000 RSLC system  
 Column: **Acclaim Trinity Q1, 3µm**  
 Column Temp: Ambient  
 Mobile Phase: 25% Ammonium Acetate (100 mM, pH 5.0); 75% Acetonitrile  
 Flow Rate: 0.5 mL/min  
 Injection: 5µL

### Mass Spectrometric Conditions

System: Thermo Scientific Quantum TSO Access MAX Quadrupole Mass Spectrometer  
 Interface: Heated Electrospray Ionization with HESI II probe  
 Spray Voltage: 1500 V  
 Vaporizer Temp: 400 °C  
 Sheath Gas Pressure: 70  
 Aux Gas Pressure: 10  
 Capillary Temp: 350 °C  
 Quantitation Mode: Selected Reaction Monitoring (SRM)

Scan Events	Precursor	Quantitative SRM (CID)	Confirmative SRM (CID)
Paraquat	185	169 (27)	170 (17)
Paraquat-d <sub>5</sub>	193	178 (17)	
Diquat	183	157 (22)	130 (31)
Diquat-d <sub>5</sub>	186	158 (22)	

## Acclaim Trinity Q1 Ordering Guide

Particle Size		Length (mm)	3.0 mm ID	2.1 mm ID
3	HPLC Column	50	<b>079716</b>	<b>079718</b>
5	Guard Cartridges (2/pk)	10	<b>079719</b>	<b>079720</b>

## Acclaim Carbamate

Designed for baseline separation of carbamate pesticides specified in US EPA Method 531.2

- Baseline separation of carbamate pesticides specified in US EPA Method 531.2
- Use with either LC/postcolumn derivatization/fluorescence or LC/MS detection
- Available in 2.2, 3 and 5µm particle size
- Compatible with both binary (methanol/water) and ternary (acetonitrile/methanol/water) mobile phase gradients
- High-efficiency, extremely low column bleed, and rugged column packing



Acclaim Carbamate columns are designed for baseline separation of carbamates (*N*-methylcarbamate and *N*-methylcarbamoyloxime pesticides) specified in US EPA Method 531.2. Carbamate pesticides are widely used throughout the world.

Drinking water and raw surface water is monitored for the presence of carbamate pesticides and related compounds using an established EPA Method 531.2 that uses HPLC with postcolumn derivatization. LC-MS is the method of choice for the ultimate sensitivity.

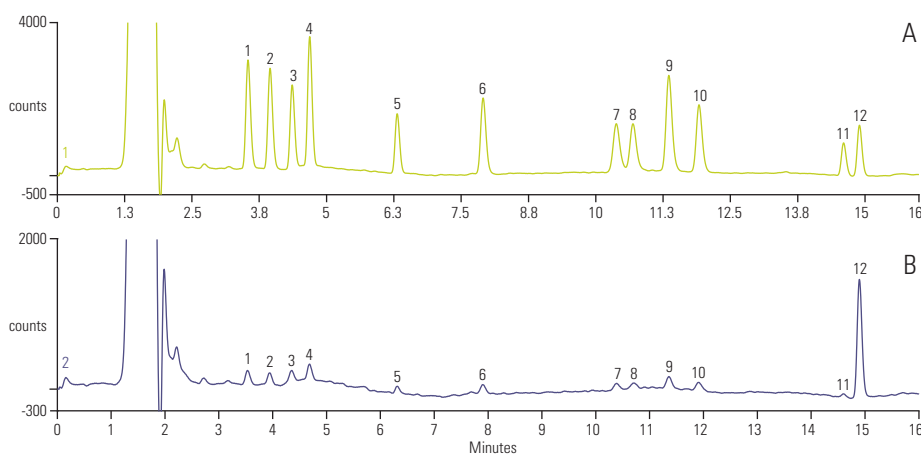
### Acclaim Carbamate Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.2	RSLC Column	100	<b>075597</b>	–	–
		150	<b>075596</b>	–	–
3	Guard Cartridges (2/pk)	10	<b>072930</b>	<b>072929</b>	<b>072928</b>
	HPLC Column	150	<b>072927</b>	<b>072926</b>	<b>072925</b>
5	HPLC Column	250	–	–	<b>072924</b>

### Acclaim Guard Holder Ordering Guide

Description	Cat. No.
Acclaim SST Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>

### Carbamate standard - spiked rice samples



A: without dispersive SPE  
B: with dispersive SPE using PSA

#### Column: Acclaim Carbamate, 3.0 × 150mm, 3µm

Mobile Phase:	Methanol–H <sub>2</sub> O
In Gradient:	Methanol, -4.0–0.0 min, 14%; 2.0 min, 20%; 8.0 min, 40%; 13.6–16 min, 70%
Temperature:	50 °C
Flow Rate:	0.9mL/min
Injection Volume:	250µL
Standard Concentration:	0.4µg/L for each component
Postcolumn Reagent 1:	0.2% NaOH, first reaction coil at 100 °C
Postcolumn Reagent 2:	OPA reagent, second reaction coil at room temperature
Flow Rate of Reagents 1 and 2:	0.3mL/min
Fluorescence Detection:	Excitation/330nm and Emission/465nm
Peaks:	1. Aldicarb sulfoxide 2. Aldicarb sulfone 3. Oxamyl 4. Methomyl 5. 3-Hydroxy carbofuran 6. Aldicarb 7. Propoxur 8. Carbofuran 9. Carbaryl 10. 1-Naphthol 11. Methiocarb 12. BDMC (I.S.)

REF: 28175



## Acclaim Carbonyl C18

A silica-based, reversed-phase column designed specifically for separating DNPH derivatives of aldehydes and ketones

- Ideal selectivity for baseline resolution of DNPH derivatives of aldehydes and ketones regulated by various official methods, including EPA 554, EPA 8315, EPA 1667, EPA TO-11, and CARB 1004
- High efficiency for UHPLC performance
- Rugged columns with good lot-to-lot reproducibility
- Proven robust methods



Acclaim Carbonyl C18 columns are silica-based reversed phase columns designed specifically for separating DNPH derivatives of aldehydes and ketones. They exhibit superior resolution compared with other commercially available columns.

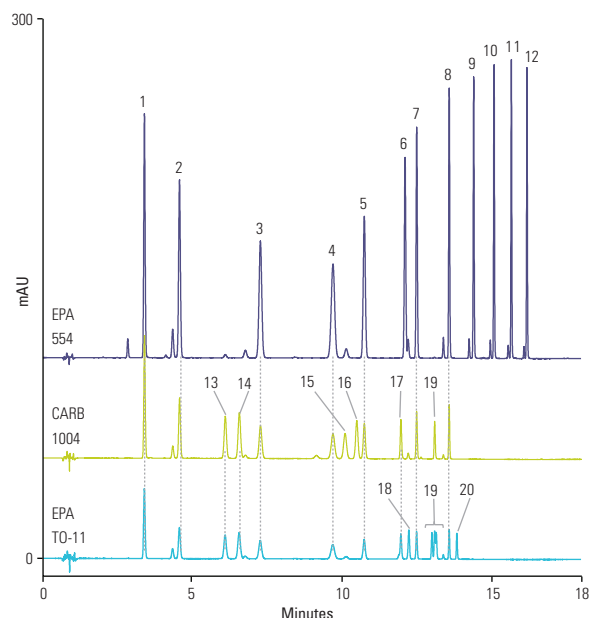
Aldehydes and ketones are common pollutants in air and water. The analytical difficulties that need to be overcome include their volatility, their reactivity, and their modest UV absorption. The reaction with dinitrophenylhydrazine (DNPH) is a convenient means of trapping, stabilizing, and tagging these substances. Several standard methods have been developed to apply this chemistry to various environmental situations.

Some of the better known ones include CARB 1004 for vehicle exhaust, EPA 554 for drinking water, EPA 1667 for pharmaceutical wastewater, and EPA 8315 for general wastewater.

### Acclaim Carbonyl C18 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.2	RSLC Column	100	<b>077972</b>	<b>077974</b>	–
		150	<b>077973</b>	–	–
3	HPLC Column	150	<b>079011</b>	<b>079010</b>	–
		250	–	<b>079009</b>	–
5	Guard Cartridge (2/pk)	10	<b>079012</b>	<b>079013</b>	<b>079014</b>
	HPLC Column	150	–	–	<b>079008</b>
		250	–	–	<b>083214</b>

### DNPH aldehydes and ketones



**Column: Acclaim Carbonyl RSLC, 2.2µm  
Dimension: 2.1 × 150mm**

Mobile Phases: A: D.I. water

B: Acetonitrile

Gradient (min):	-4.5	0.0	8.3	15.0	18.0
%A	48	48	48	0	0
%B	52	52	52	100	100

Flow Rate: 0.400mL/min

Injection: 1µL

Temperature: 28°C

Detection: UV at 360nm  
(data collection rate at 25Hz)

Samples: Calibration mixes diluted in methanol

Peaks:

1. Formaldehyde DNPH
2. Acetaldehyde DNPH
3. Propionaldehyde DNPH
4. Crotonaldehyde DNPH
5. Butyraldehyde DNPH
6. Cyclohexanone DNPH
7. Valeraldehyde DNPH
8. Hexanal DNPH
9. Heptanal DNPH
10. Octanal DNPH
11. Nonanal DNPH
12. Decanal DNPH
13. Acetone DNPH
14. Acrolein DNPH
15. Butanone DNPH
16. Methacrolein DNPH
17. Benzaldehyde DNPH
18. Isovaleraldehyde DNPH
19. Toluvaldehyde DNPH
20. Xylaldehyde DNPH

## Hypersil Green PAH

Specially tailored alkyl bonded silica with a high carbon loading, designed specifically for the analysis of polyaromatic hydrocarbons (PAHs)

- Optimized for EPA Method 610
- Rapid analysis of 16 PAHs in 4 minutes using short, fast columns
- Available in 3µm and 5µm particle size and variety of column dimensions



### Hypersil Green PAH Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
3	Guard Cartridge	10	2.1	<b>31103-012101</b>
			3.0	<b>31103-013001</b>
			4.6	<b>31103-014001</b>
	HPLC Column	100	2.1	<b>31103-102130</b>
			3.0	<b>31103-103030</b>
			4.6	<b>31103-104630</b>
HPLC Column	150	2.1	<b>31103-152130</b>	
		4.6	<b>31103-154630</b>	
5	Guard Cartridge	10	4.6	<b>31105-014001</b>
	HPLC Column	100	4.6	<b>31105-104630</b>
		150	4.6	<b>31105-154630</b>
		250	4.6	<b>31105-254630</b>

Subscribe to our  
 chromatography channel on YouTube  
[www.youtube.com/chromatographyvideos](http://www.youtube.com/chromatographyvideos)



## Dionex OmniPac

DVB polymer columns for combined ion exchange and reversed-phase separations

- Acid, base and solvent compatible, pH 0 to 14
- Ideal for the separation of high molecular weight organic acids
- Delivers optimal separation of very hydrophobic anions
- Delivers optimal separation of halogenated anions
- Provides simultaneous separation of neutral and ionic species
- Unique selectivity for polar and ionic organic analytes
- Delivers optimal separation of organic, hydrophobic, and halogenated cations

Thermo Scientific™ Dionex™ OmniPac™ PAX-100 columns are used to separate hydrophobic anionic analytes such as larger organic acids. The Dionex OmniPac PAX-500 column simultaneously separates anionic and neutral species. The Dionex OmniPac PCX-100 column separates low-molecular-weight hydrophobic cations. The Dionex OmniPac PCX-500 column simultaneously separates cationic and neutral species in a single run.

The Dionex OmniPac PAX- and PCX-100 and 500 are latex-based columns. Both PAX columns have an ion exchange capacity of about 40 µeq per column, providing equivalent anion exchange separations. The PCX columns have a capacity of approximately 120 µeq per column. The PAX- and PCX-500 columns separate analytes through both ion exchange and reversed-phase mechanisms, due to their higher reversed-phase capacity relative to the PAX- and PCX-100 columns.

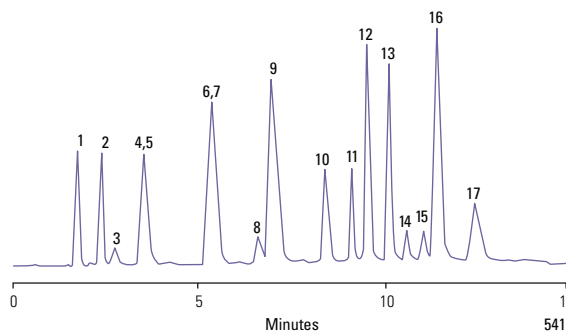
### Dionex OmniPac Anion Exchange Ordering Guide

Description	Porosity	Length (mm)	4.0mm ID
PAX-100	microporous	50	<b>042151</b>
		250	<b>042150</b>
PAX-500	macroporous	50	<b>042153</b>
		250	<b>042152</b>

### Dionex OmniPac Cation Exchange Ordering Guide

Description	Porosity	Length (mm)	4.0mm ID
PCX-100	microporous	50	<b>042193</b>
		250	<b>042189</b>
PCX-500	macroporous	50	<b>042195</b>
		250	<b>042191</b>

### Gradient separation of nitrogen-containing compounds



#### Column: Dionex OmniPac PCX-500 (4 × 250mm)

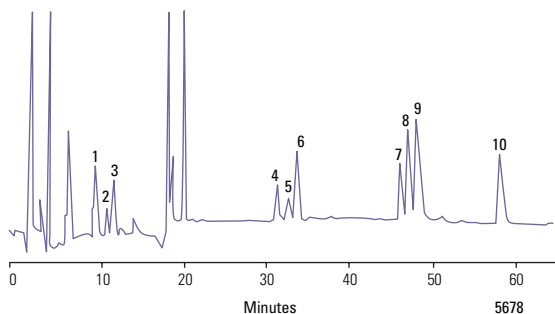
Eluent: Acetonitrile/Sodium Chloride/Hydrochloric Acid Gradient

Flow Rate: 1.0mL/min

Detection: UV, 254nm

- Peaks:
1. Orotic Acid
  2. 4-Hydroxybenzamide
  3. Luminol Impurity
  4. Luminol
  5. Pyridine
  6. PABA
  7. 2,2'-Bipyridine
  8. p-Phenylenediamine
  9. Naphthylamine
  10. Nitrobenzoic Acid
  11. Tribenzylamine
  12. p-Nitroaniline
  13. 2,4-Dinitroaniline
  14. Dibenzylamine
  15. N-Methyl-N-nitrosoaniline
  16. 4-Chloro-2-nitroaniline
  17. 2,6-Dichloro-4-nitroaniline

### Gradient separation of inositol mono-, di-, tri-, and tetraphosphates



Column: **Dionex OmniPac PAX-100 (4 x 250mm)**

Eluent: Isopropanol / Sodium Hydroxide Gradient

Flow Rate: 1.0mL/min

Detection: Suppressed Conductivity (Baseline Subtracted)

Peaks:

1. Ins (2) P
2. Ins (1) P
3. Ins (4) P
4. Ins (1,4) P2
5. Ins (2,4) P2
6. Ins (4,5) P2
7. Ins (1,3,4) P3
8. Ins (1,4,5) P3
9. Ins (2,4,5) P3
10. Ins (1,4,5,6) P4

## Dionex IonPac NS1 and NS2

Polymeric Reversed-Phase Column Ideal for the Separation of Hydrophobic, Ionizable Compounds

The Thermo Scientific™ Dionex™ IonPac™ NS1-10µm and NS1-5µm columns are packed with a neutral, macroporous, high-surface-area, ethylvinylbenzene polymer crosslinked with 55% divinylbenzene. This resin makes the NS1 resistant to solvents, acids, and bases, and permits the use of eluent from pH 0 to 14. The Dionex IonPac NS1 column is the column of choice for routine ion pair chromatography.

IonPac NS2 is a silica-based column for mobile-phase ion chromatography (MPIC) applications using eluents containing trifluoroacetic acid (TFA), heptafluorobutyric acid (HFBA), or tetrabutylammonium borate (TBAB). It provides high performance analysis for hydrophobic amines and hydrophobic acids using suppressed conductivity detection.

- Excellent resolution
- Good peak shape
- Ideal for separation of large molecules that carry localized charges, such as surfactants
- Compatible with acids, bases, and solvent from pH 0 to 14
- Can also be used for traditional polymeric reversed-phase applications
- Utilize ion-pair chromatography for difficult separations

### Dionex IonPac NS1 and NS2 Ordering Guide

Description	Particle Size (µm)	Format	Length (mm)	2.0mm ID	4.0mm ID
IonPac NS1	5	HPLC Column	150	—	<b>039568</b>
	10	Guard Column	35	<b>SP4356</b>	<b>039567</b>
		HPLC Column	250	<b>SP4354</b>	<b>035321</b>
IonPac NS2	5	Guard Column	35	—	<b>SP6907</b>
		HPLC Column	150	—	<b>SP6906</b>
			250	—	<b>SP6905</b>

# Hypersil BDS

A good choice for robust, general-purpose columns

## Hypersil BDS Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	C18	C8	Phenyl	CN			
2.4	Drop-in Guard (4/pk)	10	2.1	<b>28102-012101</b>	<b>28202-012101</b>	–	–			
			4.0/4.6	<b>28102-014001</b>	<b>28202-014001</b>	–	–			
			4.6	<b>28102-054630</b>	<b>28202-054630</b>	–	–			
		50	2.1	<b>28102-052130</b>	<b>28202-052130</b>	–	–			
			4.6	<b>28102-054630</b>	<b>28202-054630</b>	–	–			
			4.6	<b>28102-154630</b>	<b>28202-154630</b>	–	–			
	100	2.1	100	2.1	<b>28102-102130</b>	<b>28202-102130</b>	–	–		
				4.6	<b>28102-104630</b>	<b>28202-104630</b>	–	–		
			2.1	<b>28102-152130</b>	<b>28202-152130</b>	–	–			
		4.6	100	4.6	<b>28102-104630</b>	<b>28202-104630</b>	–	–		
				4.6	<b>28102-154630</b>	<b>28202-154630</b>	–	–		
			4.6	<b>28102-154630</b>	<b>28202-154630</b>	–	–			
3	Drop-in Guard (4/pk)	10	2.1	<b>28103-012101</b>	<b>28203-012101</b>	<b>28903-012101</b>	<b>28803-012101</b>			
			3.0	<b>28103-013001</b>	<b>28203-013001</b>	–	–			
			4.0/4.6	<b>28103-014001</b>	<b>28203-014001</b>	<b>28903-014001</b>	<b>28803-014001</b>			
		HPLC Column	30	2.1	<b>28103-032130</b>	–	–	–		
				2.1	<b>28103-052130</b>	<b>28203-052130</b>	<b>28903-052130</b>	<b>28803-052130</b>		
				3.0	<b>28103-053030</b>	–	–	–		
	100		4.6	4.6	<b>28103-054630</b>	<b>28203-054630</b>	–	–		
				2.1	<b>28103-102130</b>	–	–	–		
				3.0	<b>28103-103030</b>	–	–	–		
			4.0	100	4.0	<b>28103-104030</b>	–	–	–	
					4.6	<b>28103-104630</b>	<b>28203-104630</b>	–	–	
				4.6	<b>28103-104630</b>	<b>28203-104630</b>	–	–		
	150		2.1	150	2.1	<b>28103-152130</b>	–	–	–	
					3.0	<b>28103-153030</b>	<b>28203-153030</b>	–	–	
				4.0	<b>28103-154030</b>	–	–	–		
		4.6	150	4.6	<b>28103-104630</b>	<b>28203-104630</b>	–	–		
				4.6	<b>28103-154630</b>	<b>28203-154630</b>	<b>28903-154630</b>	<b>28803-154630</b>		
			4.6	<b>28103-154630</b>	<b>28203-154630</b>	<b>28903-154630</b>	<b>28803-154630</b>			
	5	Drop-in Guard (4/pk)	10	2.1	<b>28105-012101</b>	<b>28205-012101</b>	–	–		
				3.0	<b>28105-013001</b>	<b>28205-013001</b>	–	–		
				4.0/4.6	<b>28105-014001</b>	<b>28205-014001</b>	<b>28905-014001</b>	<b>28805-014001</b>		
			HPLC Column	50	2.1	<b>28105-052130</b>	<b>28205-052130</b>	–	–	
					3.0	<b>28105-053030</b>	<b>28205-053030</b>	–	–	
					4.6	<b>28105-054630</b>	<b>28205-054630</b>	–	–	
		100		2.1	100	2.1	<b>28105-102130</b>	<b>28205-102130</b>	–	–
						3.0	<b>28105-103030</b>	–	–	–
					4.0	<b>28105-104030</b>	–	–	–	
				4.6	100	4.6	<b>28105-104630</b>	<b>28205-104630</b>	–	–
						4.6	<b>28105-104630</b>	<b>28205-104630</b>	–	–
					4.6	<b>28105-104630</b>	<b>28205-104630</b>	–	–	
125		3.0		125	3.0	<b>28105-123030</b>	–	–	–	
					4.0	<b>28105-124030</b>	–	–	–	
				4.6	<b>28105-124630</b>	–	–	–		
		150	2.1	150	2.1	<b>28105-152130</b>	–	–	–	
					3.0	<b>28105-153030</b>	–	–	–	
				4.0	<b>28105-154030</b>	<b>28205-154030</b>	–	–		
4.6			150	4.6	<b>28105-154630</b>	<b>28205-154630</b>	<b>28905-154630</b>	<b>28805-154630</b>		
				4.6	<b>28105-154630</b>	<b>28205-154630</b>	<b>28905-154630</b>	<b>28805-154630</b>		
			4.6	<b>28105-154630</b>	<b>28205-154630</b>	<b>28905-154630</b>	<b>28805-154630</b>			
250		2.1	250	2.1	<b>28105-252130</b>	–	–	–		
				3.0	<b>28105-253030</b>	–	–	–		
			4.0	<b>28105-254030</b>	<b>28205-254030</b>	<b>28905-254030</b>	–			
		4.6	250	4.6	<b>28105-154630</b>	<b>28205-154630</b>	<b>28905-154630</b>	<b>28805-154630</b>		
				4.6	<b>28105-254630</b>	<b>28205-254630</b>	<b>28905-254630</b>	<b>28805-254630</b>		
			4.6	<b>28105-254630</b>	<b>28205-254630</b>	<b>28905-254630</b>	<b>28805-254630</b>			
Format		Length (mm)	ID (mm)	Cat. No.						
UNIGUARD Guard Cartridge Holder		10	1.0	<b>851-00</b>						
			2.1	<b>852-00</b>						
			3.0	<b>852-00</b>						
			4.0/4.6	<b>850-00</b>						

# Hypersil Classical

A global standard for many existing methods

## Hypersil ODS Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.		
3	Drop-in Guard (4/pk)	10	2.1	<b>30103-012101</b>		
			3.0	<b>30103-013001</b>		
			4.0/4.6	<b>30103-014001</b>		
	HPLC Column	50	50	2.1	<b>30103-052130</b>	
				3.0	<b>30103-053030</b>	
				4.6	<b>30103-054630</b>	
		100	100	2.1	<b>30103-102130</b>	
				3.0	<b>30103-103030</b>	
				4.0	<b>30103-104030</b>	
		125	125	4.6	<b>30103-104630</b>	
				2.1	<b>30103-122130</b>	
				4.0	<b>30103-124030</b>	
		150	150	4.6	<b>30103-124630</b>	
				2.1	<b>30103-152130</b>	
				3.0	<b>30103-153030</b>	
	250	250	4.0	<b>30103-154030</b>		
			4.6	<b>30103-154630</b>		
			2.1	<b>30103-252130</b>		
	5	Drop-in Guard (4/pk)	10	2.1	<b>30105-012101</b>	
				3.0	<b>30105-013001</b>	
				4.0/4.6	<b>30105-014001</b>	
		HPLC Column	50	50	2.1	<b>30105-052130</b>
					3.0	<b>30105-053030</b>
					4.6	<b>30105-054630</b>
100			100	2.1	<b>30105-102130</b>	
				3.0	<b>30105-103030</b>	
				4.0	<b>30105-104030</b>	
125			125	4.6	<b>30105-104630</b>	
				2.1	<b>30105-122130</b>	
				3.0	<b>30105-123030</b>	
150			150	4.0	<b>30105-124030</b>	
				4.6	<b>30105-124630</b>	
				2.1	<b>30105-152130</b>	
200		200	3.0	<b>30105-153030</b>		
			4.0	<b>30105-154030</b>		
			4.6	<b>30105-154630</b>		
250	250	2.1	<b>30105-202130</b>			
		4.0	<b>30105-204030</b>			
		4.6	<b>30105-204630</b>			
250	250	2.1	<b>30105-252130</b>			
		3.0	<b>30105-253030</b>			
		4.0	<b>30105-254030</b>			
			4.6	<b>30105-254630</b>		



### Hypersil ODS-2 Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
3	Drop-in Guard (4/pk)	10	4.0/4.6	<b>31603-014001</b>
	HPLC Column	50	4.6	<b>31603-054630</b>
		100	4.0	<b>31603-104030</b>
			4.6	<b>31603-104630</b>
		150	4.6	<b>31603-154630</b>
5	Drop-in Guard (4/pk)	10	4.0/4.6	<b>31605-014001</b>
	HPLC Column	50	4.6	<b>31605-054630</b>
		100	4.6	<b>31605-104630</b>
		150	4.6	<b>31605-154630</b>
		250	4.0	<b>31605-254030</b>
			4.6	<b>31605-254630</b>

### Hypersil MOS (C8) Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
5	Drop-in Guard (4/pk)	10	4.0/4.6	<b>30205-014001</b>
	HPLC Column	50	4.6	<b>30205-054630</b>
		100	4.6	<b>30205-104630</b>
		150	4.6	<b>30205-154630</b>
		250	4.0	<b>30205-254030</b>
			4.6	<b>30205-254630</b>

### Hypersil MOS-2 (C8) Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
5	Drop-in Guard (4/pk)	10	4.0/4.6	<b>30305-014001</b>
	HPLC Column	150	4.6	<b>30305-154630</b>
		250	4.0	<b>30305-254030</b>
			4.6	<b>30305-254630</b>

### Hypersil SAS (C1) Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
5	Drop-in Guard (4/pk)	10	4.0/4.6	<b>30505-014001</b>
	HPLC Column	150	4.6	<b>30505-154630</b>
		250	4.6	<b>30505-254630</b>

## Hypersil Classical *continued*

### Hypersil Phenyl Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
5	Drop-in Guard (4/pk)	10	4.0/4.6	<b>30905-014001</b>
		HPLC Column	50	4.6
		100	4.6	<b>30905-104630</b>
		150	4.6	<b>30905-154630</b>
		250	4.0	<b>30905-254030</b>
				4.6

### Hypersil Phenyl-2 Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
5	Drop-in Guard (4/pk)	10	4.0/4.6	<b>31905-014001</b>
		HPLC Column	150	4.6
		250	4.6	<b>31905-254630</b>

### Hypersil CPS Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
3	Drop-in Guard (4/pk)	10	4.0/4.6	<b>30803-014001</b>
		HPLC Column	150	4.6
5	Drop-in Guard (4/pk)	10	4.0/4.6	<b>30805-014001</b>
		HPLC Column	150	4.6
		250	4.0	<b>30805-254030</b>
			4.6	<b>30805-254630</b>

### Hypersil CPS-2 Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
5	Drop-in Guard (4/pk)	10	4.0/4.6	<b>31905-014001</b>
		HPLC Column	150	4.6
		250	4.6	<b>31905-254630</b>

### Hypersil APS-2 Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.	
3	Drop-in Guard (4/pk)	10	2.1	<b>30703-012101</b>	
			4.0/4.6	<b>30703-014001</b>	
	HPLC Column	50	2.1	<b>30703-052130</b>	
			4.6	<b>30703-054630</b>	
			100	2.1	<b>30703-102130</b>
			150	2.1	<b>30703-152130</b>
			4.6	<b>30703-154630</b>	
5	Drop-in Guard (4/pk)	10	3.0	<b>30705-013001</b>	
			4.0/4.6	<b>30705-014001</b>	
	HPLC Column	100	3.0	<b>30705-103030</b>	
			4.6	<b>30705-104630</b>	
			150	4.6	<b>30705-154630</b>
			250	4.0	<b>30705-254030</b>
			4.6	<b>30705-254630</b>	

### Hypersil Silica Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
3	Drop-in Guard (4/pk)	10	2.1	<b>30003-012101</b>
			3.0	<b>30003-013001</b>
			4.0/4.6	<b>30003-014001</b>
	HPLC Column	50	2.1	<b>30003-052130</b>
			3.0	<b>30003-053030</b>
			4.6	<b>30003-054630</b>
5	Drop-in Guard (4/pk)	10	3.0	<b>30005-013001</b>
			4.0/4.6	<b>30005-014001</b>
			4.6	<b>30005-054630</b>
	HPLC Column	50	4.6	<b>30005-104630</b>
			100	<b>30005-154630</b>
			150	<b>30005-254030</b>
		250	4.0	<b>30005-254630</b>
			4.6	<b>30005-254630</b>

### Hypersil SAX Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
5	Drop-in Guard (4/pk)	10	2.1	<b>34105-012101</b>
			3.0	<b>34105-013001</b>
			4.0/4.6	<b>34105-014001</b>
	HPLC Column	50	2.1	<b>34105-052130</b>
			4.6	<b>34105-154630</b>
			3.0	<b>34105-253030</b>
			4.6	<b>34105-254630</b>

## Other HPLC Columns

### Aquasil HPLC Columns

Thermo Scientific™ Aquasil™ HPLC Columns are available in limited dimensions. Please contact Customer Service for more details.

### BetaBasic HPLC Columns

Thermo Scientific™ BetaBasic™ HPLC Columns are available in limited dimensions. Please contact Customer Service for more details.

### BETASIL HPLC Columns

Thermo Scientific™ BETASIL™ HPLC Columns are available in limited dimensions. Please contact Customer Service for more details.

### HyPurity HPLC Columns

Thermo Scientific™ HyPurity™ HPLC Columns are available in limited dimensions. Please contact Customer Service for more details.

# Thermo Scientific LC Columns for Biomolecules

The diversity of biological samples in terms of compound structure and properties coupled with matrix complexity demands a range of sample separation modes, column chemistries, column configurations and detection techniques for their effective characterization. Thermo Scientific addresses these needs with a range of silica and polymeric columns specifically designed to handle the unique rigors of the analysis of proteins, peptides, oligonucleotides and other biomolecules.

## Columns for proteins

### Reversed Phase

Thermo Scientific™ BioBasic™ reversed-phase columns provide superior chromatography because the extra dense bonding chemistry used for these packings produce a highly stable, reproducible surface for reliable results. BioBasic reversed phase packings are available in C18, C8 and C4, chemistries.

Acclaim 300 C18 features 3µm silica particles for rapid analysis of complex protein digests. Compared to 5µm column packings, the smaller particles support increased flow rates and shallower gradients on shorter columns, for faster separation analysis.

Thermo Scientific™ ProSwift™ RP monolith columns uniquely provide the advantages of high resolution at exceptionally high flow rates for fast protein separation analysis.

### Ion Exchange

Thermo Scientific™ ProPac™ and Thermo Scientific™ MAbPac™ ion exchange columns are based on a pellicular nonporous core particles providing exceptionally high resolution and efficiency for separations of protein variants, resolving isoforms that differ by a single charged residue. A hydrophilic layer prevents unwanted secondary interactions, and a grafted cation exchange surface provides pH-based selectivity control and fast mass transfer for high-efficiency separation and moderate capacity. ProPac WCX and MAbPac SCX columns are specifically developed for monoclonal separation and analytical characterization. Applications include protein variants in a variety of matrices, such as biopharmaceuticals and dairy products. MAbPac columns are specifically designed for the analysis of monoclonal antibody variants.

BioBasic AX and BioBasic SCX ion exchange columns demonstrate superior reproducibility, both column-to-column and batch-to-batch because the 5µm, 300Å silica provides high efficiency. Both phases provide superior performance for proteins, peptides and nucleic acids using protein friendly ion exchange conditions.

ProSwift ion exchange monoliths provide an excellent alternative to porous or non porous ion exchange media. They offer increased loading capacity compared to pellicular phases combined with excellent resolution compared to traditional porous ion exchange media.

### Size Exclusion

BioBasic SEC columns, based on silica with a proprietary polymeric coating, offer the mechanical stability of silica-based size exclusion columns with higher efficiencies than that of polymer-based columns. Four pore sizes (60Å, 120Å, 300Å, 1000Å) are available, making them ideal for molecular weight determination of peptides, proteins and water soluble polymers. They can also be used for sample clean-up prior to other analyses.

MAbPac SEC-1 (300Å 5µm silica) is a size exclusion chromatography (SEC) column specifically designed for separation and characterization of monoclonal antibodies (MAb) and their aggregates, as well as the analysis of Fab and Fc fragments resulting from proteolysis.

### Hydrophobic Interaction

The ProPac HIC-10 column is a high-resolution, high-capacity, 300Å, 5µm silica-based HIC column that provides excellent high resolution separations of proteins and variants for analytical and preparative applications. ProPac HIC columns provide exceptional hydrolytic stability under the highly aqueous conditions used in HIC.

## Affinity

The MAbPac Protein A column is a unique non-porous polymeric column designed for fast, accurate determination of monoclonal antibody titer analysis from harvest cell culture. The ProPac IMAC-10 is a high-resolution analytical and semipreparative column for separation of proteins and peptides by immobilized metal affinity chromatography. It is packed with 10µm, nonporous, polymeric beads coated with a hydrophilic layer, then grafted with poly(IDA) chains.

The ProSwift ConA-1S affinity monolith column is unsurpassed for fast, highly efficient enrichment and purification of Concanavalin A (Con A) binding glycans, glycopeptides, and glycoproteins containing high-mannose regions.

## Columns for oligonucleotides

Thermo Scientific™ DNAPac™ strong anion exchange columns provide industry-leading resolution for analysis and purification of synthetic oligonucleotides. DNAPac columns can resolve full length oligonucleotides from n-1, n+1, and other failure sequences not possible with other columns.

Thermo Scientific™ DNASwift™ a strong anion exchange monolith column that provides exceptionally high oligonucleotide purity. This semipreparative column incorporates the high resolution and selectivity of the DNAPac column, with increased loading capacity.

## Columns for carbohydrates

Thermo Scientific™ GlycanPac™ AXH-1 and AXR-1 columns are HPLC columns designed for the simultaneous separation of glycans by charge, size and polarity. Separating either fluorescently labeled or native glycans.

## Columns for proteomics

### Nano, capillary and micro columns

Thermo Scientific™ Acclaim™ PepMap™ and PepMap RSLC columns are specially designed for high-resolution analyses of tryptic, natural, and synthetic peptides. The columns are often applied for LC-MS/MS peptide mapping for protein identification, biomarker discovery, and systems biology. Due to their high loading capacity, the columns are exceptionally suitable for the analysis of low abundant peptides in complex proteomics samples. Acclaim PepMap Trap columns are typically applied for the desalting and preconcentration of peptides

before LC separation with MS detection. The columns are designed to provide the highest efficiencies for one dimensional peptide mapping experiments and 2D-LC analyses. Thermo Scientific™ PepSwift™ monolithic columns are specially designed for fast separation and identification of proteins and peptides using nano and capillary LC coupled to MS.

Using highly pure chromatographic media and biocompatible, metal-free fused silica capillaries, Thermo Scientific™ EASY-Column™ capillary LC columns are produced with a focus on design simplicity and strict quality control. As a result,

they deliver outstanding chromatographic performance on any nano LC system.

Thermo Scientific™ EASY-Spray™ columns provide a fully integrated and temperature controlled combined column-emitter design with only a single nanoViper connection between the LC and the MS ion source. This dead volume reduction is a critical component in helping to deliver state of the art performance with ease of use.

## Bio Columns Selection Guide

Analyte	Mode of Analysis	Recommended Column		
Monoclonal antibodies and Proteins	Size Exclusion	BioBasic SEC	4-139	
		MABPac SEC-1	4-129	
	Ion Exchange	BioBasic AX	4-141	
		ProPac SCX-10, WCX-10, SAX-10, WAX-10, SCX-20	4-116	
		MABPac SCX-10, MABPac SCX-10 RS	4-127	
	Reversed Phase	ProSwift IEX	4-123	
		BioBasic 18, 8, 4	4-140	
		Acclaim 300 C18	4-142	
	Hydrophobic Interaction	Accucore 150-C18, 150-C4	4-144	
		ProSwift RP	4-124	
Affinity	ProPac HIC-10	4-121		
	MABPac Protein A	4-126		
Peptides	Proteomics	ProPac IMAC-10	4-122	
		ProSwift ConA-1S	4-125	
		Acclaim PepMap	4-149	
	Analytical	PepSwift	4-154	
		EASY-Column	4-155	
		EASY-Spray Columns	4-153	
	Preparative	BioBasic 18, 8, 4	4-140	
		Acclaim 300	4-142	
	Amino Acids (derivatized)	Preparative	BioBasic	Inquire
		Ion Exchange	AminoPac PA10	Inquire
Amino Acids (underivatized)	Reversed phase	Hypersil GOLD	4-026	
	Ion Exchange	AminoPac PA10	Inquire	
Nucleotides	Reversed phase	Hypercarb	4-084	
	Anion Exchange	BioBasic AX	4-141	
Oligonucleotides	Polar retention	Hypercarb	4-084	
	Ion Exchange	BioBasic AX	4-141	
		DNApac PA100, PA200, PA200 RS	4-134	
		DNASwift	4-137	
Carbohydrates	Ligand Exchange	HyperREZ XP	4-056	
	Ion Exchange	CarboPac	Inquire	
		Mixed Mode	GlycanPac AXH-1	4-032
	HILIC	Acclaim HILIC	4-067	
		Hypersil GOLD HILIC	4-037	
		Synchronis HILIC	4-081	
	Polar retention	Accucore 150-Amide-HILIC	4-146	
	Hypercarb	4-084		



View product information and application notes

## HPLC Phases for Biomolecules

### Silica-based Reversed Phase and Ion Exchange Phases

Phase	Particle Type	Particle Size (µm)	Pore Size (Å)	Nominal Surface Area (m <sup>2</sup> /g)	% Carbon	Endcapping	USP Code	Phase Code	Page
<b>Acclaim Phase</b>									
300 C18	Spherical, fully porous silica	3	300	100	8	Yes	L1	–	<b>4-142</b>
<b>Acclaim PepMap Phases</b>									
100 C18	Spherical, fully porous silica	2, 3, 5	100	300	15	Yes	L1	–	<b>4-149</b>
300 C18	Spherical, fully porous silica	5	300	100	9	Yes	L1	–	<b>4-149</b>
100 C8	Spherical, fully porous silica	3, 5	100	300	9	Yes	L7	–	<b>4-149</b>
300 C4	Spherical, fully porous silica	5	300	300	3	Yes	L26	–	<b>4-149</b>
<b>Accucore Phases</b>									
150-C18	Spherical, solid core silica	2.6	150	80	7	Yes	L1	161	<b>4-144</b>
150-C4	Spherical, solid core silica	2.6	150	80	2	Yes	L26	165	<b>4-145</b>
150-Amide-HILIC	Spherical, solid core silica	2.6	150	80	–	–	–	167	<b>4-146</b>
<b>BioBasic Phases</b>									
18	Spherical, fully porous silica	5	300	100	9	Yes	L1	721	<b>4-140</b>
8	Spherical, fully porous silica	5	300	100	5	Yes	L7	722	<b>4-140</b>
4	Spherical, fully porous silica	5	300	100	4	Yes	L26	723	<b>4-140</b>
AX	Spherical, fully porous silica	5	300	100	3	No	–	731	<b>4-141</b>
SCX	Spherical, fully porous silica	5	300	100	3	No	L52	733	<b>4-141</b>

## Columns for Protein Separations

### Silica-based Size Exclusion Chromatography Phases

Phase	SEC Type	Particle Type	Particle Size (µm)	Pore Size (Å)	Exclusion Limit Operating Range (kDa)	USP Code	Phase Code	Page
<b>BioBasic Phases</b>								
SEC 60	Aqueous	Spherical, fully porous silica	5	60	0.1 – 6	–	733	<b>4-139</b>
SEC 120	Aqueous	Spherical, fully porous silica	5	120	0.1 – 50	L33	734	<b>4-139</b>
SEC 300	Aqueous	Spherical, fully porous silica	5	300	1 – 500	L33, L59	735	<b>4-139</b>
SEC 1000	Aqueous	Spherical, fully porous silica	5	1000	20 – 4000	L33	736	<b>4-139</b>

### Silica-based Hydrophobic Interaction Chromatography Phases

Column	Phase	Target Applications	Base Matrix Material	Particle Size (µm)	Pore Size (Å)	Nominal Surface Area (m <sup>2</sup> /g)	Breakthrough Capacity	Solvent Compatibility	pH Range
ProPac HIC-10	Hydrophobic Interaction	High resolution separations of proteins and protein variants	Spherical, porous ultrapure silica with amide/ethyl surface chemistry	5	300	100	340mg lysozyme per 7.8 x 75mm column	Ammonium sulfate/phosphate salts, organic solvent for cleanup	2.5-7.5

Search our database of thousands of applications  
[www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)



**Polymeric Ion Exchange, Reversed Phase and Affinity Columns**

Column	Phase	Target Applications	Base Matrix Material	Functional Groups	Breakthrough Capacity	Recommended Flow Rate	Solvent Compatibility	Maximum Backpressure	pH Range
ProPac WCX-10	Weak Cation Exchange	High resolution separations of proteins and protein variants	Ethylvinylbenzene cross linked with 55% divinylbenzene 10µm nonporous particles	Carboxylate	6mg/mL lysozyme	0.2-2.0 mL/min	80% ACN, acetone. Incompatible with alcohols and MeOH	3000psi (21 MPa)	2.0-12
ProPac SCX-10	Strong Cation Exchange	High resolution separations of proteins and protein variants	Ethylvinylbenzene cross linked with 55% divinylbenzene 10µm nonporous particles	Sulfonate	3mg/mL lysozyme	0.2-2.0 mL/min	80% ACN, acetone, MeOH	3000psi (21 MPa)	2.0-12
ProPac SCX-20	Strong Cation Exchange	High Resolution separations of proteins and protein variants	Divinylbenzene 10µm nonporous particles	Sulfonic	20µg/mL Dynamic capacity	0.2-2.0 mL/min	50% acetonitrile	3000psi (21 MPa)	2.0-12
ProPac WAX-10	Weak Anion Exchange	High resolution separations of proteins and protein variants	Ethylvinylbenzene cross linked with 55% divinylbenzene 10µm nonporous particles	Tertiary amine	5mg/mL BSA	0.2-2.0 mL/min	80% ACN, acetone, MeOH,	3000psi (21 MPa)	2.0-12
ProPac SAX-10	Strong Anion Exchange	High resolution separations of proteins and protein variants	Ethylvinylbenzene cross linked with 55% divinylbenzene 10µm nonporous particles	Quaternary ammonium	15mg/mL BSA	0.2-2.0 mL/min	80% ACN, acetone, MeOH	3000psi (21 MPa)	2.0-12
ProSwift RP-1S	Reversed Phase	Fast protein analysis with high resolution of large peptides to medium proteins	Monolith; polystyrene-divinylbenzene	Phenyl	5.5mg/mL Insulin	2.0-4.0 mL/min	Most common organic solvents	2800psi (19.2 MPa)	1.0-14
ProSwift RP-2H	Reversed Phase	Fast protein analysis with high resolution over a wide size range	Monolith; polystyrene-divinylbenzene	Phenyl	1.0mg/mL Lysozyme	1.0-10 mL/min	Most common organic solvents	2800psi (19.3 MPa)	1.0-14
ProSwift RP-3U	Reversed Phase	Fast protein analysis with high resolution of large proteins	Monolith; polystyrene-divinylbenzene	Phenyl	0.5mg/mL Lysozyme	1.0-16 mL/min	Most common organic solvents	2800psi (19.3 MPa)	1.0-14
ProSwift RP-4H	Reversed Phase	Fast protein analysis with high resolution	Monolith; polystyrene-divinylbenzene	Phenyl	2.3mg/mL Lysozyme	0.1-0.3 mL/min	Most common organic Solvents	1500psi	1.0-14
ProSwift SAX-1S	Strong Anion Exchange	Fast protein analysis with high resolution	Monolith; polymethacrylate	Quaternary amine	18mg/mL BSA	0.5-1.5 (4.6mm)	Most common organic solvents	1000psi (4.6mm) 2000psi (1.0mm)	2.0-12
ProSwift SCX-1S	Strong Cation Exchange	Fast protein analysis with high resolution	Monolith; polymethacrylate	Sulfonic acid	30mg/mL Lysozyme	0.5-1.5 mL/min (4.6mm)	Most common organic solvents	1000psi (4.6mm)	2.0-12
ProSwift WAX-1S	Weak Anion Exchange	Fast protein analysis with high resolution	Monolith; polymethacrylate	Tertiary amine (DEAE)	18mg/mL BSA	0.5-1.5 mL/min (4.6mm)	Most common organic solvents	1000psi (4.6mm) 2000psi (1.0mm)	2.0-12
ProSwift WCX-1S	Weak Cation Exchange	Fast protein analysis with high resolution	Monolith; polymethacrylate	Carboxylic acid	23mg/mL Lysozyme	0.5-1.5mL/min (4.6mm), 0.05-0.20	Most common organic solvents	1000psi (4.6mm) 2000psi (1.0mm)	2.0-12
ProPac IMAC-10	Immobilized Metal Affinity	High resolution separation of certain metal-binding proteins and peptides	Polystyrene divinylbenzene 10µm nonporous particles	Poly (IDA) grafts	>60mg lysozyme/mL gel (4x250mm)	1.0mL/min	EtOH, urea, NaCl, non-ionic detergents, glycerol, acetic acid, guanidine HCl	3000psi (21MPa)	2.0-12
ProSwift ConA-1S	Affinity	Concanavalin A binding (high-mannose) glycans, glycopeptides and proteins	Monolith; polymethacrylate	Concanavalin A ligands	12-16mg of protein	0-1.0mL/min	Up to 10% methanol	2000psi	5.0-8

## Columns for Monoclonal Antibody Separations

### Polymeric Ion Exchange Columns

Phase	IEX Type	Particle Type	Particle Size (µm)	Pore Size (Å)	Dynamic Capacity	Recommended Flow Rate	Solvent Compatibility	Maximum Backpressure	pH Range	Page
MABPac SCX-10	Strong cation exchange (sulfonic)	Polymeric, Highly crosslinked DVB	3, 5, 10	non-porous	MABPac SCX-10 PEEK 3µm: 60µg/mL 5µm: 40µg/mL 10µm: 20µg/mL MABPac SCX-10 RS 5µm: 40 µg/mL	0.2-2.0mL/min (Depending on the particle size and column pressure limits)	50% Acetonitrile	3000psi (21MPa) RS columns 7000psi	2.0-12	<b>4-127</b>
ProPac WCX-10	Weak cation exchange (carboxylate)	Polymeric, Non-porous DVB	10	non-porous	6mg/mL	0.2-2.0mL/min	80% ACN, acetone. Incompatible with alcohols including methanol	3000psi (21MPa)	2.0-12	

### Silica-based Size Exclusion Chromatography Columns

Phase	SEC Type	Particle Type	Particle Size (µm)	Pore Size (Å)	Exclusion Limit Operating Range (kDa)	USP Code	Page
MABPac SEC-1	Aqueous	Spherical, fully porous silica	5	300	1-500	L33, L59	<b>4-129</b>

### Affinity Columns

Phase	Affinity ligand	Particle Type	Particle Size (µm)	Pore Size (Å)	Capacity	Recommended Flow Rate	Maximum temperature	Maximum Backpressure	pH Range	Page
MABPac Protein A	Protein A	Polymeric	12	non-porous	100µg IgG/column	< 2.5	30	1000	2.5-7.5	<b>4-126</b>

## Columns for Carbohydrate Separations

### Polymeric Ligand Exchange Columns

Phase	Particle Type	Particle Size (µm)	Pore Size (Å)	Nominal Surface Area (m <sup>2</sup> /g)	% Carbon	Endcapping	USP Code	Phase Code	Page
<b>HyperREZ XP Phases</b>									
Carbohydrate H <sup>+</sup>	Spherical, polymer	8	—	—	—	—	L17	690	<b>4-156</b>
Carbohydrate Pb <sup>2+</sup>	Spherical, polymer	8	—	—	—	—	L34	691	<b>4-156</b>
Carbohydrate Ca <sup>2+</sup>	Spherical, polymer	8	—	—	—	—	L19	692	<b>4-156</b>
Carbohydrate Na <sup>+</sup>	Spherical, polymer	10	—	—	—	—	—	693	<b>4-156</b>
Organic Acid	Spherical, polymer	8	—	—	—	—	L17	696	<b>4-156</b>
Sugar Alcohol	Spherical, polymer	8	—	—	—	—	L19	697	<b>4-156</b>

### Silica-based HILIC and Mixed-Mode Columns

Phase	Particle Type	Particle Size (µm)	Pore Size (Å)	Nominal Surface Area (m <sup>2</sup> /g)	% Carbon	Endcapping	USP Code	Phase Code	Page
<b>GlycanPac Phases</b>									
AXH-1	Spherical, fully porous silica	1.9	175	220	-	Yes	-	-	<b>4-132</b>
AXH-1	Spherical, fully porous silica	3	120	300	-	Yes	-	-	<b>4-132</b>
<b>Accucore Phase</b>									
150-Amide-HILIC	Spherical, solid core silica	2.6	150	80	-	-	-	167	<b>4-156</b>

**Monolithic Affinity Columns**

Phase	Particle Type	Particle Size (µm)	Pore Size (Å)	Nominal Surface Area (m <sup>2</sup> /g)	% Carbon	Endcapping	USP Code	Phase Code	Page
<b>ProSwift Phases</b>									
ConA-1S	Concanavalin A binding (high mannose) glycans, glycopeptides and proteins	"Monolith;	175	220	-	Yes	-	-	<b>4-125</b>

**Columns for Oligonucleotide Separations**

Column	Target Applications	Base Matrix Material	Substrate Crosslinking	Latex Crosslinking	Capacity	Recommended Eluents	Recommended Flow Rate	Solvent Compatibility	Maximum Backpressure	pH Range
DNAPac PA100	High resolution separations of single and double stranded DNA or RNA oligonucleotides	13µm diameter nonporous substrate agglomerated with alkyl quaternary ammonium functionalized latex 100nm MicroBeads	55%	5%	40µeq	Hydroxide or sodium and lithium salts of Chloride or Perchlorate	1.5mL/min	0-100%	4000psi (28MPa)	2-12.5
DNAPac PA200	Improved high resolution separations of single and double stranded DNA or RNA orthogonal to DNAPac PA100	8µm diameter nonporous substrate agglomerated with alkyl quaternary ammonium functionalized latex 130nm MicroBeads	55%	5%	40µeq	Hydroxide, acetate/ or sodium and lithium salts of Chloride or Perchlorate	1.2mL/min	0-100%	4000psi (28MPa)	2-12.5
DNAPac PA200 RS	UHPLC-resolution separations of single and double stranded DNA or RNA Best available resolution	4µm diameter nonporous substrate agglomerated with alkyl quaternary ammonium functionalized latex 130nm MicroBeads	55%	5%	40µeq	Hydroxide, acetate/ hydroxide or sodium and lithium salts of Chloride or Perchlorate	1.3mL/min	0-100%	10,000 psi (69MPa)	2-12.5
DNASwift	High resolution separations for purification of oligonucleotides Highest latex-based capacity	Monolith; polymethacrylate substrate agglomerated with quaternary amine functionalized latex	70%	3%	8mg, of a 20 mer oligonucleotide	NaClO <sub>4</sub> and NaCl	0.5-2.5mL	Most Common Organic Solvents	1500psi, 10MPa	6.0-12.4

## ProPac WCX-10 and SCX-10

Weak and strong cation exchange columns are based on a nonporous core particle providing exceptionally high resolution and efficiency for separations of protein variants

- Characterization and quality control assessment of monoclonal antibodies and other proteins
- Unequaled high resolution separations
- High-efficiency peaks
- Unmatched column-to-column and lot-to-lot reproducibility
- Useful for characterization of related protein variants including deamidation and MAb lysine truncation variants
- ProPac WCX-10 is a weak cation exchanger with a carboxylate functional groups
- ProPac SCX-10 is a strong cation exchange column with sulfonate functional groups

ProPac WCX-10 and SCX-10 columns can resolve isoforms that differ by a single charged residue. A hydrophilic layer prevents unwanted secondary interactions, and a grafted cation exchange surface provides pH-based selectivity control and fast mass transfer for high-efficiency separation and moderate capacity.

### ProPac WCX-10 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10	Guard Column	50	<b>063480</b>	<b>054994</b>	–	–
	HPLC Column	50	–	<b>074600</b>	–	–
		100	–	<b>SP5829</b>	–	–
		150	–	<b>SP6703</b>	–	–
		250	<b>063472</b>	<b>054993</b>	<b>063474</b>	<b>SP5482</b>

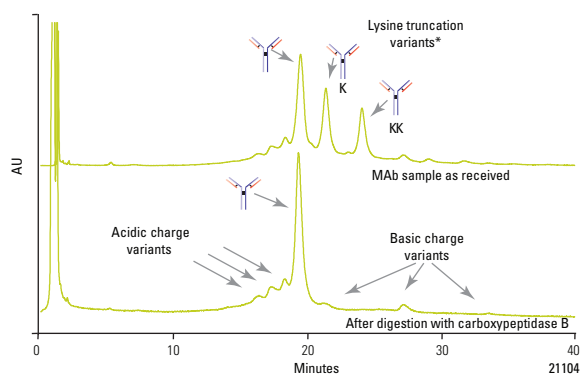
### ProPac SCX-10 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10	Guard Column	50	<b>063462</b>	<b>079930</b>	–	–
	HPLC Column	250	<b>063456</b>	<b>054995</b>	<b>063700</b>	<b>SP5522</b>



## ProPac WCX-10 and SCX-10 *continued*

### MAB lysine truncation variants



#### Column: ProPac WCX-10, 4 x 250mm

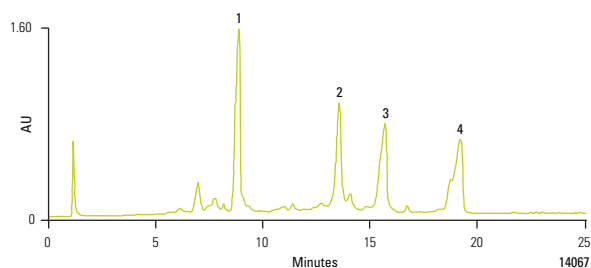
Eluents: (E1) 20mM MES  
+ 115mM NaCl  
+ 1mM EDTA, pH 5.5  
(E2) 20mM MES  
+ 145mM NaCl  
+ 1mM EDTA, pH 5.5

Gradient:	t (min)	%E1	%E2
	0	100	0
	2	100	0
	40	0	100
	60	0	100

Sample: MAb  
Flow Rate: 1.0mL/min  
 $\lambda$ : 280nm

\* Peak assignment supported by data from R.J. Harris, et.al. *J.Chromatogr., A* 1995,705, 129-134. and Carboxypeptidase B digest.

### Hemoglobin variants



#### Column: ProPac SCX-10, 4 x 250mm

Eluent: A) 20mM Sodium phosphate,  
4mM Potassium cyanide, pH 6  
B) 1 M Sodium chloride in water  
C) Water

Gradient:	Time	%A	%B	%C
	Init	50	0	50
	30 min	50	50	0

Flow Rate: 1mL/min  
Inj. Vol.: 10 $\mu$ L  
Detection: 220nm

Sample: 1. Fetal hemoglobin  
2. Hemoglobin  
3. Sickle cell hemoglobin  
4. Hemoglobin C

### ProPac Kits Ordering Guide

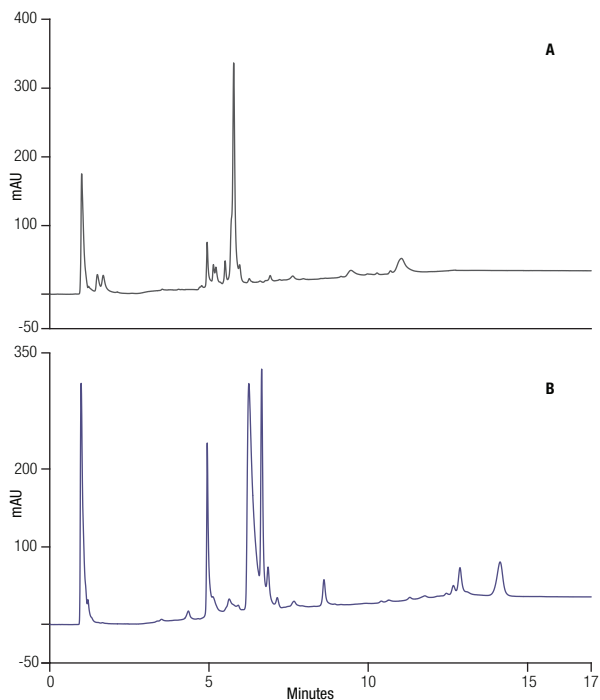
Part Number	Phase Description	Set Contents	Column Dimensions
SP5731	ProPac WAX-10 Lot Select Column Set	3 columns from 1 lot of resin	250 x 4mm
SP5732	ProPac WAX-10 Lot Select Column Set	3 lots of resin, 1 column from each lot	250 x 4mm
SP5729	ProPac SAX-10 Lot Select Column Set	3 columns from 1 lot of resin	250 x 4mm
SP5730	ProPac SAX-10 Lot Select Column Set	3 lots of resin, 1 column from each lot	250 x 4mm
SP5512	ProPac WCX-10 Lot Select Column Set	3 columns from 1 lot of resin	250 x 4mm
SP5513	ProPac WCX-10 Lot Select Column Set	3 lots of resin, 1 column from each lot	250 x 4mm
SP5727	ProPac SCX-10 Lot Select Column Set	3 columns from 1 lot of resin	250 x 4mm
SP5728	ProPac SCX-10 Lot Select Column Set	3 lots of resin, 1 column from each lot	250 x 4mm

## ProPac SCX-20 Columns

The ProPac SCX-20 column is a strong cation exchange (SCX) column designed specifically to provide high-resolution separations of proteins. The stationary phase is composed of 10µm, non-porous, solvent compatible resin beads that are uniformly coated with a highly hydrophilic layer to reduce non-specific interactions between the bead surface and the biopolymer.

- Grafted cation-exchange surface provides pH-based selectivity control
- Fast mass transfer for high-efficiency separation

### Snake venoms from naja naja and Russell's viper



**Column: ProPac SCX-20, 4 × 250mm**

Eluent A:	20mM Tris pH 7.3
Eluent B:	0.5M NaCl in Eluent A
Gradient:	1–100% B in 10 min
Inj. Volume:	10µL
Temperature:	30°C
Detection:	UV, 214nm
Samples:	A. Snake Venom (Naja naja) 1mg/mL
	B. Snake Venom (Russell's viper) 1mg/mL

### ProPac SCX-20 Ordering Guide

Particle Size (µm)	Description	Length (mm)	4.0mm ID
10	Guard Column	50	<b>074643</b>
	HPLC Column	250	<b>074628</b>



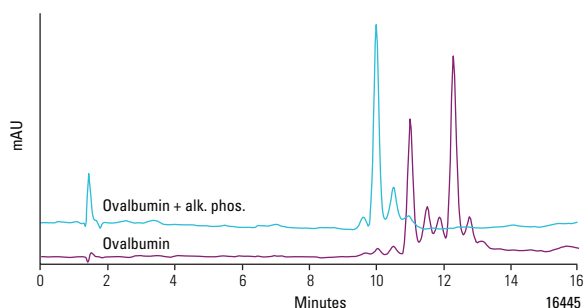
## ProPac WAX-10 and SAX-10

Weak and strong anion exchange columns are based on a nonporous core particle providing unequalled high resolution and efficiency in the separations of protein variants

- Unequalled resolution
- High-efficiency peaks
- Useful for characterization and quality control assessment of closely-related protein variants
- Supports separation of proteins that differ by as little as one amino acid residue
- Neutral hydrophilic coat that eliminates protein-resin hydrophobic interactions
- Superior lot-to-lot and column-to-column reproducibility
- ProPac WAX-10 column is a weak anion exchanger with a tertiary amine functional group
- ProPac SAX-10 is a strong anion exchange column with quaternary amine functional group

These columns can resolve protein isoforms that differ by as little as one charged residue. A hydrophilic layer prevents unwanted secondary interactions and a grafted anion exchange surface provides pH based selectivity control and fast mass transfer for high peak efficiency and resolution separations.

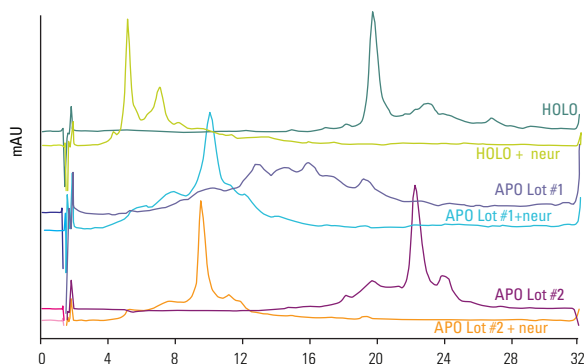
### Resolution of phosphorylation variants of ovalbumin



#### Column: ProPac SAX-10, 4 x 250mm

Eluents:	A) Water	B) 2.0 M NaCl	C) 0.1 M Tris/HCl (pH 8.5)
Gradient:	Time	%A	%B %C
	Init	80	0 20
	15 min	67.5	12.5 20
Flow Rate:	1.0mL/min		
Inj. Volume:	30µL		
Detection:	214nm		
Sample:	Ovalbumin before and after alkaline phosphatase treatment		

### Effect of sialylation on transferrin chromatography



#### Columns: ProPac SAX-10, 4 x 250mm

Eluents:	A) Water	B) 2.0 M NaCl	C) 0.2 M Tris/HCl (pH 9)
Gradient:	Time	%A	%B %C
	Init	87	3 10
	30 min	83	7 10
Flow Rate:	1.0mL/min		
Inj. Volume:	50µL		
Detection:	214nm		
Samples:	HOLO (iron rich) and APO (iron poor) human transferrin samples before and after neuraminidase treatment. Digestions were carried out overnight at 37 C in sodium acetate buffer at pH 5.		

### ProPac WAX-10 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10	Guard Column	50	<b>063470</b>	<b>055150</b>	–	–
	HPLC Column	250	<b>063464</b>	<b>054999</b>	<b>063707</b>	<b>SP5598</b>

### ProPac SAX-10 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10	Guard Column	50	<b>063454</b>	<b>054998</b>	–	–
	HPLC Column	250	<b>063448</b>	<b>054997</b>	<b>063703</b>	<b>SP5594</b>

## ProPac PA1

For hydrophilic anionic protein separations

- Good for hydrophilic proteins and peptides
- Ideal for high-resolution separations of proteins with pI values from 3 to 11
- Available in semipreparative format
- Pellicular packing ensures high-efficiency and fast mass transport

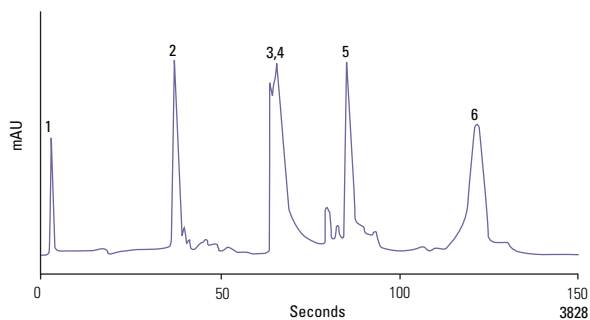
The ProPac PA1 column supports the analysis and purification of hydrophilic anionic proteins and peptides.



### ProPac PA1 Ordering Guide

Particle Size (µm)	Format	Length (mm)	4.0mm ID	9.0mm ID
10	Guard Column	50	<b>039657</b>	–
	HPLC Column	250	<b>039658</b>	<b>040137</b>

### Gradient separation of protein standards



Column: ProPac PA1 (4 × 50mm)	
Eluent:	10 to 350mM NaCl in 1.0mM Tris, pH 8.2
Flow Rate:	5mL/min
Detection:	UV, 280nm
Peaks:	1. Horseheart Myoglobin 33µg 2. Contaminant – 3,4. Conalbumin 66 5. Ovalbumin 66 6. Soybean Trysin Inhibitor 66

## ProPac HIC-10

Hydrophobic Interaction Chromatography columns for the high resolution separation of proteins and peptides

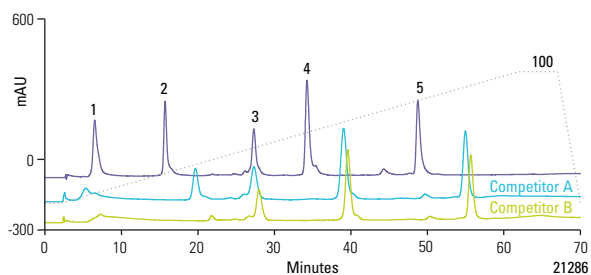
- High-resolution HPLC separation of proteins, protein variants and peptides
- Proteins are separated under non-denaturing conditions
- High protein loading capacity for protein purification applications
- Wide range of applications
- Based on 5µm ultra high purity spherical silica gel particles with 300Å pores

The ProPac HIC-10 column is a high-resolution, high-capacity, silica-based HIC column that provides excellent separations of proteins and variants for analytical and preparative applications. ProPac HIC columns provide exceptional hydrolytic stability under the highly aqueous conditions used in HIC.

### ProPac HIC-10 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm ID	4.6mm ID	7.8mm ID
5	HPLC Column	75	—	—	<b>063665</b>
		100	<b>063653</b>	<b>063655</b>	—
		250	—	<b>074197</b>	—

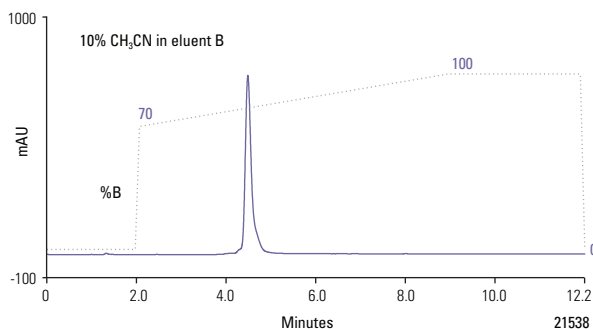
### Protein mixture



#### Column: 7.5 × 75mm (Competitors A and B); 7.8 × 75mm (ProPac HIC-10)

Flow:	1.0mL/min
WVL:	214nm
Eluents:	(A) 2 M (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> in 0.1 M NaH <sub>2</sub> PO <sub>4</sub> (pH 7.0) (B) 0.1 M NaH <sub>2</sub> PO <sub>4</sub> (pH 7.0)
Sample:	Mixture of proteins (1mg/mL each final after 1:1 dilution with eluent A)
Inj. Volume:	20µL
Order of elution:	1. Cytochrome c 2. Myoglobin 3. Ribonuclease A 4. Lysozyme 5. Chymotrypsinogen

### Monoclonal antibody



#### Column: ProPac® HIC-10, 4.6 × 100mm

Eluents:	(A) 0.5 M (NH <sub>4</sub> ) <sub>2</sub> SO <sub>4</sub> in 0.1M NaH <sub>2</sub> PO <sub>4</sub> (pH 7.0) (B) 0.1 M NaH <sub>2</sub> PO <sub>4</sub> (pH 7.0)
Gradient:	70–100% B in 15 min
Flow:	1mL/min
Inj. Volume:	5µL (25µg)
Detection:	UV, 214nm
Sample:	MAb 50µL (50mg/mL) + 450µL Eluent B

## ProPac IMAC-10

Immobilized Metal Affinity Chromatography (IMAC) column for analytical and semipreparative protein and peptide applications

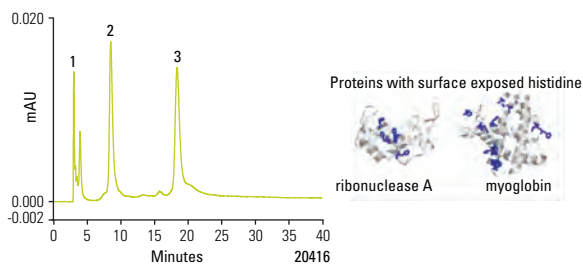
- High-purity separations of metal-binding proteins
- State-of-the-art technology for reusable columns with metal tailored specificity
- Resolve target proteins using a single column in a high-resolution gradient run
- Retention control by imidazole concentration or pH gradient
- High loading capacity for protein purification applications
- Wide range of metal-specific applications

The ProPac IMAC-10 is a high-resolution analytical and semipreparative column for separation of proteins and peptides by immobilized metal affinity chromatography

### ProPac IMAC-10 Ordering Guide

Particle Size (µm)	Format	Length (mm)	1.0mm ID	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10	Loading Column	50	–	–	<b>063667</b>	<b>063710</b>	–
		250	–	–	–	<b>063718</b>	–
	HPLC Column	50	<b>063617</b>	<b>063272</b>	<b>063276</b>	<b>063615</b>	–
		250	–	<b>063274</b>	<b>063278</b>	<b>063280</b>	<b>063282</b>

### Standard proteins with surface-exposed histidines



#### Column: ProPac IMAC-10 (4mm x 250mm)

E1: 20mM MES + 0.5 M NaCl, pH = 7.5

E2: E1 + 100mM imidazole, pH = 7.5

Gradient:	t (min)	%E1
	0	96
	15	0 curve 7
	40	0

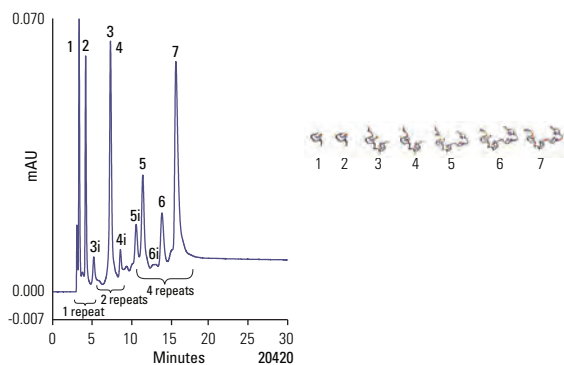
Inject Vol: 15µL

Sample: 1. 0.25mg/mL ribonuclease A  
2. 1.00mg/mL myoglobin  
3. 1.50mg/mL carbonic anhydrase

Flow Rate: 0.5mL/min

Wavelength: 280nm

### Prion-related peptides



#### Column: ProPac IMAC-10 (4 x 250mm)

Eluent: (E1) 20mM HEPES + 0.5 M NaCl, pH = 7.5

(E2) E1 + 50mM imidazole, pH = 7.5

Gradient:	t (min)	%A
	0	95
	10	0 curve 7
	30	0

Inj. Volume: 15µL

Sample: Prion-derived peptides

Flow Rate: 0.5mL/min

Wavelength: 280nm

Peak	# Sequence
1	PHGGGWGQ
2	PHGXGWGQ
3	KKRPKP(PHGGGWGQ) <sub>2</sub>
4	KKRP(PHGXGWGQ) <sub>2</sub>
5	KKRPKPWGQ(PHGGGWGQ) <sub>4</sub>
6	WGQ(PHGGGWGQ) <sub>4</sub>
7	WGA(PHGGGWGA) <sub>4</sub>

X = sarcosine (N-methylglycine)

## ProSwift IEX

Monolith IEX columns for high-resolution and fast protein analysis

ProSwift IEX monoliths provide excellent resolving power at high mass loading combined with fast analysis capability

- High resolution
- High loading capacity
- Fast analysis
- Wide range of operational flow rates
- Excellent stability over a wide pH range
- Outstanding reproducibility and ruggedness

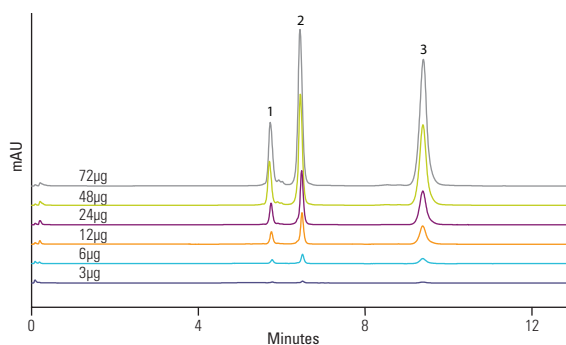
ProSwift polymer monolith (poly(Meth)acrylate) media are uniquely suited for separation of proteins. Each monolith is a single cylindrical, sponge-like polymer rod containing an uninterrupted, interconnected network of flow-through channels of a specific pore size. These large channels combined with the monolith's nonporous surfaces result in fast mass-transfer, high-resolution, and fast protein separations. The unique globular morphology of the polymer medium provides its high capacity.

### ProSwift Ion Exchange Monolith Ordering Guide

Functional Group	Length (mm)	1.0mm ID	4.6mm ID
WAX-1S	50	<b>066642</b>	<b>064294</b>
WCX-1S	50	<b>066643</b>	<b>064295</b>
SAX-1S	50	<b>068459</b>	<b>064293</b>
SCX-1S	50	<b>071977</b>	<b>066765</b>



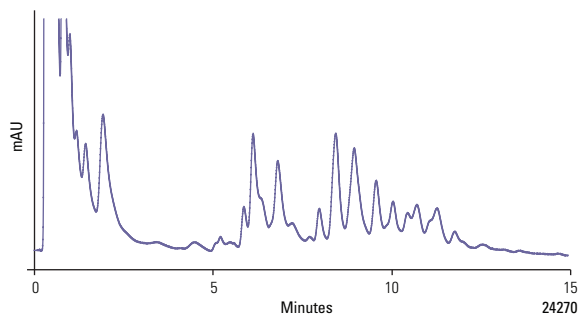
### Dynamic protein loading capacity of ProSwift WCX-1S 1 × 50mm



#### Column: ProSwift WCX-1S, 1 × 50mm

Eluents:	A. 10mM Sodium phosphate (pH 7.6) B. 1 M NaCl in eluent A
Gradient:	0% B for 2 min, 0–85% B in 7.5 min, 85% B for 3 min
Flow Rate:	0.2mL/min
Inj. Volume:	1–24µL
Temperature:	30°C
Detection:	UV, 280nm
Sample:	Protein mix, 1mg/mL each
Peaks:	1. Ribonuclease A 2. Cytochrome C 3. Lysozyme

### Protein separation



#### Column: ProSwift WAX-1S, 1 × 50mm

Eluents:	A. 10mM Tris, pH 7.6 B. 1 M NaCl in 10mM Tris, pH 7.6
Gradient:	5 to 55% of B in 13 min, hold for 2 min
Flow Rate:	0.2mL/min
Temperature:	30°C
Detection:	UV, 280nm
Inj. Volume:	1.3µL
Sample:	1.25mg/mL <i>E. coli</i> protein

## ProSwift RP

Reversed-phase monolith columns that uniquely provide the advantages of high resolution at exceptionally high flow rates for fast protein separations and analysis

Deliver the outstanding resolving power of nonporous analytical media combined with faster separations and analysis than any bead based columns available.

- High resolution at high speed
- Highest operational flow rates available
- High throughput and improved productivity
- Excellent stability over a wide pH range of 1 to 14
- Outstanding reproducibility and ruggedness
- High stringent wash compatible, for example, 1 M NaOH
- High loading capacity

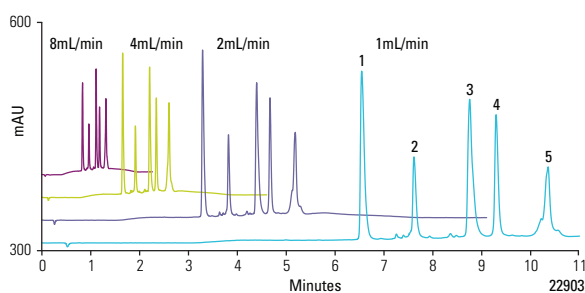
ProSwift polymer reversed-phase monolith media are (polyStyrene-co-DVB) uniquely suited for the separation of proteins. Each monolith is a single cylindrical polymer rod containing an uninterrupted, interconnected network of flow-through channels of a specific pore size; ranging from small channel (1S), medium size channels (2H & 4H) to very large channel (3U) sizes. These channels and the monolith's nonporous surfaces result in fast mass transfer for high-resolution and fast protein separations. The channels also produce low backpressure, allowing the use of higher linear velocities with minimal loss of resolution.



### ProSwift RP Ordering Guide

Functional Group	Length (mm)	1.0mm ID	4.6mm ID
RP-1S	50	—	<b>064297</b>
RP-2H	50	—	<b>064296</b>
RP-3U	50	—	<b>064298</b>
RP-4H	50	<b>069477</b>	—
RP-4H	250	<b>066640</b>	—

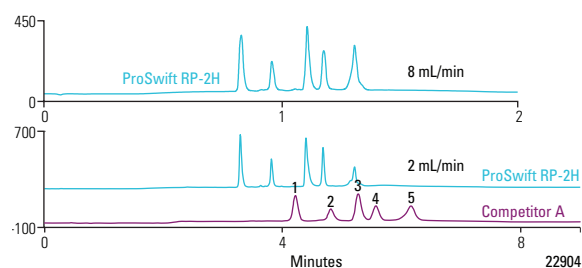
### Proteins



#### Column: ProSwift RP-2H (4.6 x 50mm)

Flow Rate:	1, 2, 4, or 8mL/min
Eluents:	(A) DI H <sub>2</sub> O/CH <sub>3</sub> CN (95:5; V/V) + 0.1% TFA (B) DI H <sub>2</sub> O/CH <sub>3</sub> CN (5:95; V/V) + 0.1% TFA
Gradient:	1mL/min: 1-75% B in 12 min 2mL/min: 1-75% B in 6 min 4mL/min: 1-75% B in 3 min 8mL/min: 1-75% B in 1.5 min
UV Detection:	214nm
Sample:	Mixture of five proteins
Inj. Volume:	5µL
Order of Elution:	1. Ribonuclease A 1.5mg/mL 2. Cytochrome C 0.5 3. BSA 1.5 4. Carbonic anhydrase 0.9 5. Ovalbumin 1.5

### Competitive comparison



#### Columns: 1. ProSwift RP-2H, 4.6 x 50mm 2. Competitor A, 4.6 x 100mm, 15µm

Eluents:	(A) DI H <sub>2</sub> O/CH <sub>3</sub> CN (95:5; V/V) + 0.1% TFA (B) DI H <sub>2</sub> O/CH <sub>3</sub> CN (5:95; V/V) + 0.1% TFA
Gradient:	2mL/min: 1-75% B in 6 min 8mL/min: 1-75% B in 1. min
Flow Rate:	2 or 8mL/min
Inj. Volume:	5µL
Temperature:	30°C
Detection:	UV, 214nm
Sample:	Mixture of five proteins
Peaks:	1. Ribonuclease A 1.5mg/mL 2. Cytochrome C 0.5 3. BSA 1.5 4. Carbonic anhydrase 0.9 5. Ovalbumin 1.5



## ProSwift ConA-1S

For the highly efficient enrichment and purification of Con A binding glycans and glycoconjugates

The ProSwift ConA-1S affinity monolith column is unsurpassed for fast, highly efficient enrichment and purification of Concanavalin A (Con A) binding glycans, glycopeptides, and glycoproteins.

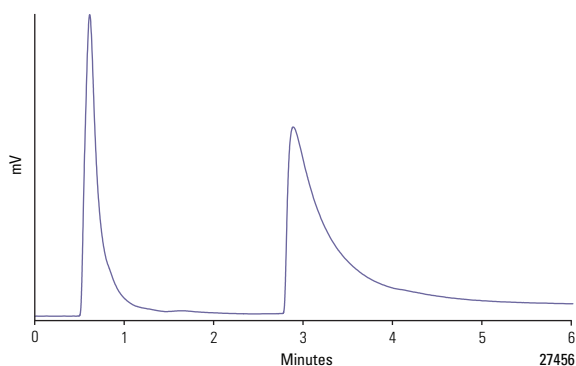
- Highly efficient enrichment and purification through high-mannose-Con A binding
- Highly purified glycan and glycoconjugate products
- High capacity and ligand density
- High sample recovery
- Low elution volumes
- Fast separations
- HPLC compatible
- Reusable for over one hundred purifications

The HPLC compatible ProSwift ConA-1S affinity column maintains the specificity and selectivity for Con A binding glycans and glycoconjugates. The high capacity monolith (poly(meth)acrylate) and ligand density of the ProSwift ConA-1S column facilitates the highly efficient enrichment of samples and can purify up to 2mg of glycoproteins. The high peak efficiency monolith (poly(meth)acrylate) column produces sharp, narrow peaks resulting in low elution volumes of highly concentrated products. The column is reusable, and many enrichments and purifications are possible with minimal loss of capacity.

### ProSwift ConA-1S Ordering Guide

Functional Group	Length (mm)	5.0mm ID
ConA-1S	50	<b>074148</b>

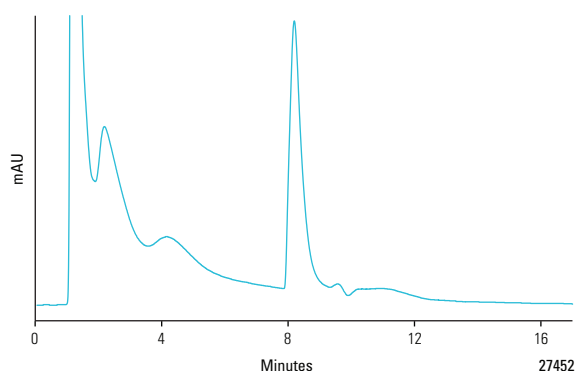
### Fast, highly efficient enrichment and purification of a group of fluorescently labeled glycans



#### Column: ProSwift ConA-1S (5 x 50mm)

Flow rate:	1.0mL/min
Eluent A:	50mM NaOAc, 0.2M NaCl, pH 5.3, with 1mM CaCl <sub>2</sub> and 1mM MnCl <sub>2</sub>
Eluent B:	100mM α-methylmannoside in eluent A
Gradient:	0% B for 2 min, 0-100% B in 0.5 min, 100% B for 3.5 min
Temperature:	25°C
Sample:	2-AB labeled serum protein N-glycans
Detection:	Fluorescence, EM at 420nm

### Glycopeptide enrichment



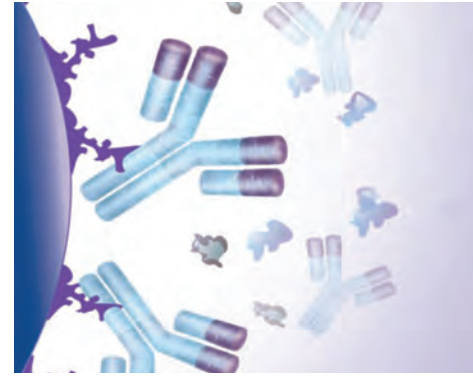
#### Column: ProSwift ConA (5 x 50mm)

Eluent A:	50mM NaOAc, 0.2 M NaCl, pH 5.3, with 1mM CaCl <sub>2</sub> , 1mM MgCl <sub>2</sub>
Eluent B:	100mM α-methyl-mannopyranoside in eluent A
Flow Rate:	0.5mL/min
Temperature:	25°C
Detection:	UV 214nm
Sample:	Trypsin digested HRP peptides
Inj. Volume:	40µL
Gradient:	100% A from 0–5 min, 100% B from 6–15 min, 100% A from 16–25 min

# MABPac Protein A Column

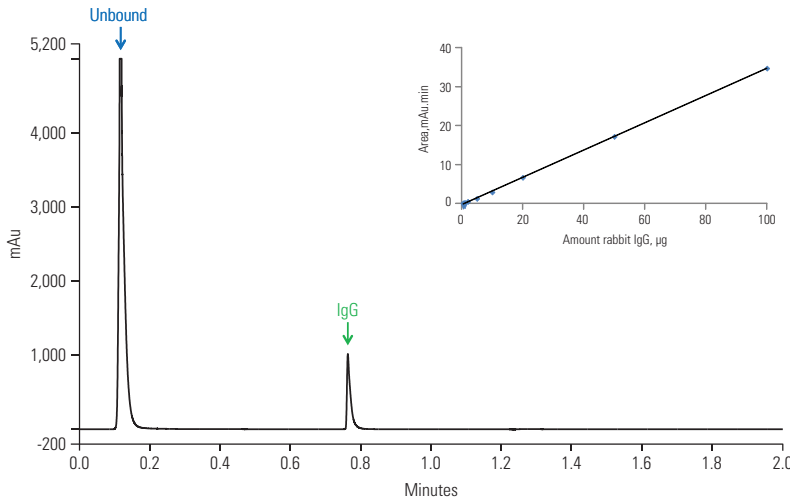
Fast MAb titer analysis

The Thermo Scientific MABPac Protein A column is an affinity column designed to provide fast monoclonal antibody (MAb) titer analysis of samples such as harvest cell cultures (HCC). This HPLC column offers high throughput and accurate analysis through a combination of low back pressure and high efficiency. The MABPac Protein A column format allows rapid automation of loading, binding, elution and collection using Thermo Scientific biocompatible systems. The column is based on a novel non-porous polymeric resin consisting of a divinylbenzene core and a hydrophilic surface, optimized for affinity separation.



- High efficiency column
- Rugged
- Excellent sample recovery
- Designed for ease of use and automation

## Harvest cell culture titer analysis



### Column: MABPac Protein A, (4 × 35mm)

Flow Rate:	2 mL/min
Eluent A:	50mM Sodium Phosphate, 150mM NaCl, 5% acetonitrile, pH 7.5
Eluent B:	50mM Sodium Phosphate, 150mM NaCl, 5% acetonitrile, pH 2.5
Gradient:	0% B for 0.2 mins, 100% B for 0.60 mins, 0% B for 1.20 mins
Temperature:	30°C
Detection:	280 nm
Injection volume:	10µL
Sample:	MAB B, 5mg/mL Harvest Cell Culture

## MABPac Protein A Ordering Guide

Particle Size (µm)	Format	Length (mm)	4.0 mm ID
12	HPLC Column	35	<b>082539</b>



## MAbPac SCX-10

Strong cation exchange column designed specifically for the high-resolution, high efficiency analysis of monoclonal antibodies and associated variants

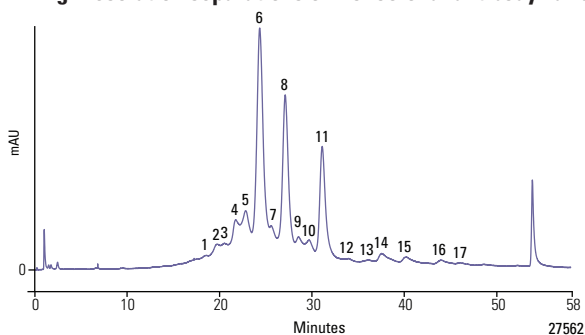
- Exceptionally high resolution for monoclonal antibody variants
- High efficiency
- Ideal for characterization and quality control assessment of monoclonal antibodies
- Unmatched column-to-column and lot-to-lot reproducibility
- Hydrophobic interactions essentially eliminated
- Ideal for stability studies
- Meets the regulatory requirements for biopharmaceutical characterization

The unique nonporous pellicular resin provides exceptionally high resolving power, permitting the separation of monoclonal antibody variants that differ by as little as one charged residue. Hydrophobic interactions with the resin are essentially eliminated for very efficient peaks.

### MAbPac SCX-10 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID
3	HPLC Column	50	–	<b>077907</b>	–
5	HPLC Column	50	–	<b>078656</b>	–
		150	–	<b>085198</b>	–
		250	–	<b>078655</b>	–
10	Guard Column	50	<b>075749</b>	<b>074631</b>	–
	HPLC Column	50	–	<b>075603</b>	–
		150	–	<b>075602</b>	–
		250	<b>075604</b>	<b>074625</b>	<b>SP6866</b>

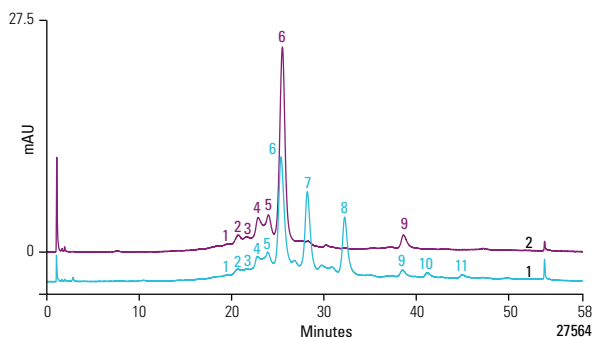
### High resolution separations of monoclonal antibody variants



#### Column: MAbPac SCX-10 (4 × 250mm)

Eluents:	A. 20mM MES (pH 5.6) + 60mM NaCl B. 20mM MES (pH 5.6) + 300mM NaCl
Gradient:	15–36% B in 50 min
Flow Rate:	1mL/min
Temperature:	30°C
Inj. Volume:	10µL
Detection:	UV at 280nm
Sample:	MAb B, 5mg/mL
Peaks 1–5:	Acidic variants
Peaks 6, 8, 11:	C-Terminal Lys variants
Peaks 12–17:	Basic variants

### Baseline resolution of C-terminal lysine variants of a monoclonal antibody



#### Column: MAbPac SCX-10 (4 × 250mm)

Eluents:	A. 20mM MES (pH 5.6) + 60mM NaCl B. 20mM MES (pH 5.6) + 300mM NaCl
Gradient:	15–36% B in 50 min
Flow Rate:	1mL/min
Temperature:	30°C
Inj. Volume:	5µL
Detection:	UV at 280nm
Samples:	1. MAb B, 900µg in 100µL (no carboxypeptidase) 2. MAb B, 900µg in 100µL + carboxypeptidase, 50µg, incubation at 37°C for 3 h
Both Chromatograms:	Peaks 1–5: Acidic variants
Sample 1:	Peaks 6–8: C-Terminal lysine truncation variants of main peak Peaks 9–11: C-Terminal lysine truncation variants of minor variant peak
Sample 2:	Peak 6 results from peaks 6, 7, and 8 after CBP treatment. Peak 9 results from peaks 9, 10, and 11 after CBP treatment

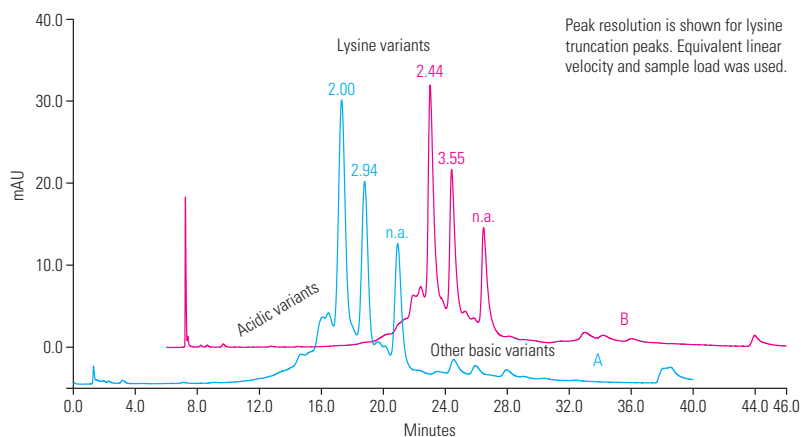
## MABPac SCX-10 RS Columns

BioRS, strong cation exchange column designed for monoclonal antibodies and associated variants

- UHPLC, high throughput analysis
- Specially developed bio-inert PEEK lined stainless steel column hardware
- High pressure compatibility
- Suitable for operation up to 7,000 psi

Higher resolution and throughput of MAb charge variant UHPLC separations can be achieved using the small particle MABPac strong cation-exchange phase with specially developed bio-inert PEEK lined stainless steel column hardware. These columns take advantage of smaller resin size as well as longer column length to maximize the resolution of MAb variant separation, and are suitable for operation up to 7,000 psi. Higher pressure compatibility of the column hardware allows use of high flow rates for faster separation

### Improved MAb resolution



#### Column: MABPac SCX, 5µm

Dimension:	4.6 × 250mm
Sample:	MAb 5mg/mL
Injection Volume:	15µL
Eluent A:	20 mM MES pH 5.6 + 60 mM
Eluent B:	20 mM MES pH 5.6 + 300 mM NaCl
Flow Rate:	1.5 mL/min
Column backpressure:	~8900Psi
A:	Gradient: 33-53% B in 30 min
B:	Gradient: 33-53% in 20 min

### MABPac SCX-10 RS Ordering Guide

Particle Size (µm)	Format	Length (mm)	4.6 mm ID
5	BioRS Column	50	<b>082674</b>
		150	<b>085209</b>
		250	<b>082673</b>



## MABPac SEC-1

A size exclusion chromatography (SEC) column specifically designed for the high resolution separation and characterization of monoclonal antibodies (MAB) and their aggregates

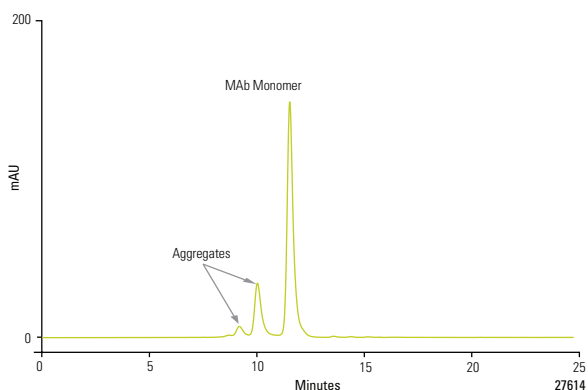
- Analysis of monoclonal antibodies (MAB) and their aggregates
- Analysis of MAB Fab and Fc fragments.
- Hydrophilic bonded layer for minimal undesired interactions between the biomolecules and the stationary phase
- Nonmetallic and Biocompatible PEEK housing eliminates metal contamination from the column hardware
- Stable surface bonding leads to low column bleed and compatibility with MS, ELSD and Corona CAD detection
- Reproducible and rugged
- Superior performance for the analysis of monoclonal antibodies, even using high and low-salt concentrations

The stationary phase is packed in bio-inert PEEK format and is compatible with different eluent conditions containing both low and high concentrations of salt in mobile phases, and mass spectrometry friendly volatile eluents.

### MABPac SEC-1 Ordering Guide

Particle Size ( $\mu\text{m}$ )	Format	Length (mm)	4.0mm ID
5	Guard Column	50	<b>074697</b>
	HPLC Column	150	<b>075592</b>
		300	<b>074696</b>

### Monoclonal antibody aggregate separation



#### Column: MABPac SEC-1, 5 $\mu\text{m}$

Dimension:	4.0 x 300mm (PEEK)
Mobile Phase:	0.3 M NaCl in 50mM phosphate buffer pH 6.8
Temperature:	30°C
Flow Rate:	0.20mL/min
Inj. Volume:	2 $\mu\text{L}$
Detection:	UV, 280nm
Sample:	MAB (10mg/mL)

## Monoclonal Antibody Characterization and Analysis Kits

### MAB Charge Variant Analysis IEX Column Kit

MAB Charge Variant Analysis IEX Column Kit includes two ion-exchange (IEX) specialty columns for MAb charge variants analysis. This kit is a convenient starter kit for researchers at the beginning of MAB analysis projects, and facilitates the screening of two columns for determination of the best column for their specific monoclonal antibody sample.

Included in the Kit:

- ProPac WCX-10 Analytical column, 4 × 250mm (P/N 054993), a weak cation-exchange column, the industry standard for high-resolution, high-efficiency analysis of monoclonal antibodies and associated variants
- MABPac SCX-10 Analytical column, 4 × 250mm (P/N 074625), a strong cation-exchange column designed specifically for high-resolution, high-efficiency analysis of monoclonal antibodies and associated variants

#### MAB Charge Variants Kit Ordering Guide

Description	Cat. No.
MAB Charge Variants Analysis IEX Column Kit	<b>076196</b>

### MAB Analysis IEX and SEC Column Kit

The MAB Analysis IEX and SEC Column Kit includes two columns: an ion-exchange (IEX) column and a size-exclusion (SEC) column. This kit is a convenient starter and column replacement kit for MAB analysis projects.

Included in the kit:

- MABPac SCX-10 Analytical column, 4 × 250mm (P/N 074625), a strong cation-exchange column designed specifically for high-resolution, high-efficiency analysis of monoclonal antibodies and associated variants.
- MABPac SEC-1 Analytical column, 4 × 300mm (P/N 074696), a size-exclusion column designed for separating monoclonal antibody (MAb) monomers, aggregates, and fragments.

#### MAB Analysis Kit Ordering Guide

Description	Cat. No.
MAB Analysis IEX and SEC Column Kit	<b>076197</b>





## Thermo Scientific pH Gradient Buffers

Simple method development for charge variant characterization



The Thermo Scientific pH gradient platform accelerates method development and facilitates method transfer to QA/QC for a wide range of protein and MAb charge variants through a generic LC-based approach to charge variant characterization.

- Patented buffer formulations enable fast, robust and reproducible pH gradients that are simple to optimize and easily automated
- Ready to use with existing LC columns and systems, without the need for time consuming mobile phase adjustments
- Applicable to the majority of MAbs

Thermo Scientific pH buffer concentrates used in the pH gradient platform can be purchased individually or as a pair, in quantities of 125mL or 250mL. For added convenience, the 125mL buffers can also be bundled with columns in a number of specifically preconfigured kits

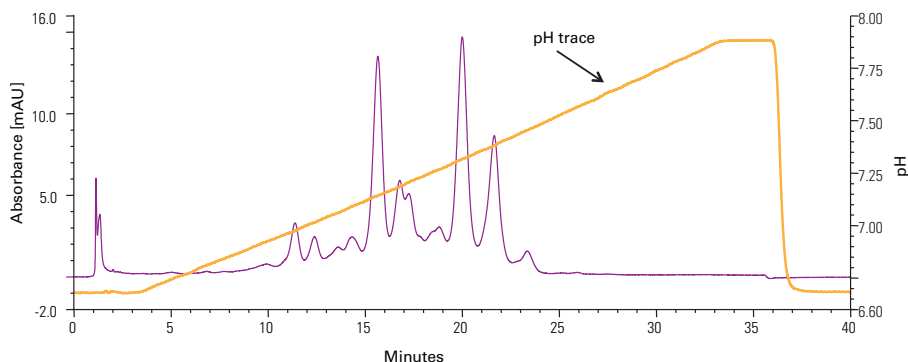
- The CX-1 pH gradient starter kit contains 125mL each of buffers A and B, plus a MAbPac SCX-10, 10 $\mu$ m, 4  $\times$  250mm column
- The CX-1 pH gradient high throughput kit contains 125mL each of buffers A and B, plus a MAbPac SCX-10, 5 $\mu$ m, 4  $\times$  50mm column
- The CX-1 pH gradient high resolution kit contains 125mL each of buffers A and B, plus a MAbPac SCX-10, 5 $\mu$ m, 4  $\times$  250mm column

For the ultimate flexibility, the preconfigured kits are also available as platforms, including the pH Designer Software. The options are listed in the table below:

### pH Gradient Buffers Ordering Guide

Description	Cat. No.
CX-1 pH Gradient Buffer A (pH 5.6), 125mL	083273
CX-1 pH Gradient Buffer B (pH 10.2), 125mL	083275
CX-1 pH Gradient Buffer Kit (pH 5.6 to 10.2), 125mL	083274
CX-1 pH Gradient Buffer A (pH 5.6), 250mL	085346
CX-1 pH Gradient Buffer B (pH 10.2), 250mL	085348
CX-1 pH Gradient Buffer Kit (pH 5.6 to 10.2), 250mL	085349
CX-1 pH Gradient Starter Kit (pH 5.6 to 10.2), 125mL	083381
CX-1 pH Gradient High Throughput Kit (pH 5.6 to 10.2), 125mL	083378
CX-1 pH Gradient High Resolution Kit (pH 5.6 to 10.2), 125mL	083272
CX-1 pH Gradient Starter Platform (pH 5.6 to 10.2), 125mL	083380
CX-1 pH Gradient High Throughput Platform (pH 5.6 to 10.2), 125mL	083376
CX-1 pH Gradient High Resolution Platform (pH 5.6 to 10.2), 125mL	083270
pH Designer Software	085022

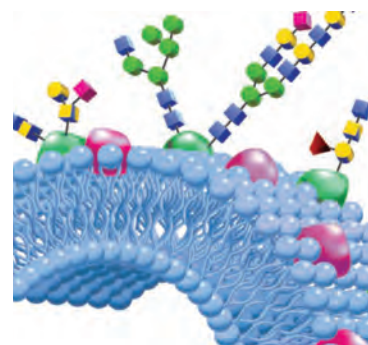
### Optimization of MAb charge variant separation using a linear pH gradient: 25% B (pH 6.75) to 50% B (pH 7.9)



## GlycanPac AXH-1 Column

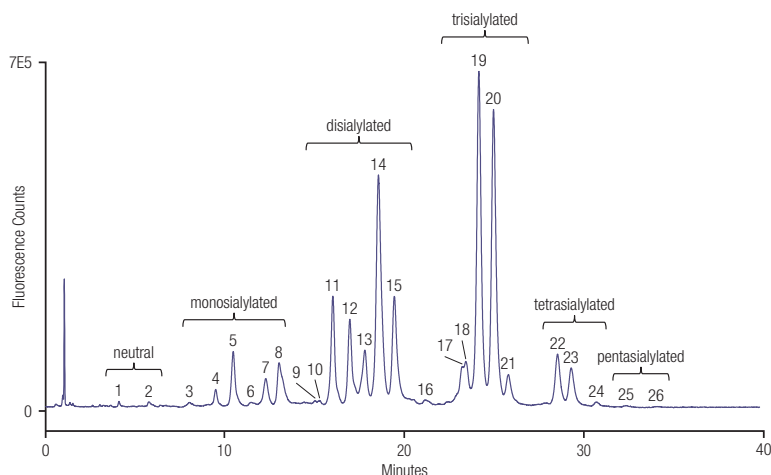
High-Resolution Columns for Glycan Analysis

- Unique glycan selectivity based on charge, size and polarity
- Excellent resolution for both native and labeled glycans
- Useful for both high-resolution glycan profile characterization and easy quantification of glycans based on charge
- Compatible with fluorescence and MS detection methods
- High chromatographic efficiency and excellent column stability



Thermo Scientific™ GlycanPac™ AXH-1 is a high-performance, silica-based HPLC column for simultaneous separation of glycans by charge, size and polarity. It is designed for high-resolution and high-throughput analysis with unique selectivity for biologically important glycans, either labeled or native, by LC-fluorescence and LC-MS methods.

### Separation of 2AB labeled N-glycans from bovine fetuin by charge, size and polarity



#### Column: GlycanPac AXH-1 (1.9µm)

Dimension:	2.1 × 150mm
Mobile Phase	A: Acetonitrile (100%) B: Water C: Ammonium formate (100mM, pH = 4.4)
Flow Rate:	0.4mL/min
Injection Vol.:	50 Pmoles
Temperature:	30 °C
Detection:	Fluorescence at 320/420nm
Sample:	2AB labeled N-glycan from bovine fetuin

Time (min)	% A	% B	% C	Flow (mL/min)	Curve
-10	78	20	2	0.4	5
0	78	20	2	0.4	5
30	70	20	10	0.4	5
35	60	20	20	0.4	5
40	50	20	30	0.4	5

### GlycanPac AXH-1 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1 mm ID	3.0 mm ID	4.6 mm ID
1.9	UHPLC Column	100	<b>082473</b>	—	—
		150	<b>082472</b>	—	—
		250	<b>082521</b>	—	—
3	Guard Cartridges (2/pk)	10	<b>082476</b>	<b>082475</b>	<b>082474</b>
	HPLC Column	150	<b>082470</b>	<b>082469</b>	<b>082468</b>

### Acclaim Guard Holder Ordering Guide

Description	Cat. No.
Acclaim Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>

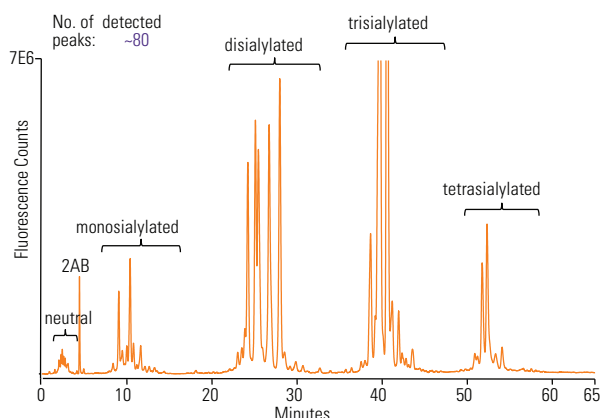
## GlycanPac AXR-1

Ultra-high resolution UHPLC columns for glycan analysis

- Excellent glycan selectivity based on hydrophobicity, charge, size, and isomerization
- High resolution for isomeric glycans
- Compatibility with fluorescence and MS detection methods
- High column efficiency and stability
- Ideal tool for qualitative, quantitative and structural analysis of glycans

The GlycanPac AXR-1 column, based on 1.9 $\mu$ m, high-purity and spherical silica substrates, combines both weak anion-exchange (WAX) and reversed-phase (RP) retention mechanisms for optimal selectivity and ultra-high resolution for glycan separation. The WAX functionality separates glycans based on charge, and RP property facilitates high resolution for glycans of the same charge according to their hydrophobicity, branching and isomerization. As the result, the GlycanPac AXR-1 column provides unparalleled resolutions for complex charged glycans.

### Separation of 2AB labeled N-glycans from bovine fetuin using GlycanPac AXR-1



#### Column: GlycanPac AXR-1, 1.9 $\mu$ m

Dimension:	2.1 x 150mm
Mobile phase:	A: acetonitrile B: D.I. water C: ammonium formate (100 mM, pH =4.4)
Flow Rate:	0.4 mL/min
Temperature:	40 °C
Injection Vol.:	100 pmoles
Detection:	fluorescence at 320/420nm
Sample:	2AB labeled N-glycan from bovine fetuin

Time (min)	% A	% B	% C	Curve
-10	0	95	5	5
0	0	95	5	5
1	0	95	5	5
30	1	74	25	5
65	20	50	30	5

### GlycanPac AXR-1 Ordering Guide

Particle Size ( $\mu$ m)	Format	Length (mm)	2.1 mm ID
1.9	UHPLC Column	150	<b>088136</b>
		250	<b>088135</b>

## DNAPac PA100

A strong anion exchange column developed to provide high-resolution analysis and purification of synthetic oligonucleotides

- High-resolution oligonucleotide separations
- Capable of n, n-1 resolution for oligonucleotides
- Resolves oligonucleotides with secondary structures
- Compatible with solvent, high pH or high temperatures
- Analyzes phosphorothioate-based clinical samples
- Provides easy scale-up from 2.0mm to 22mm ID column (>100x)

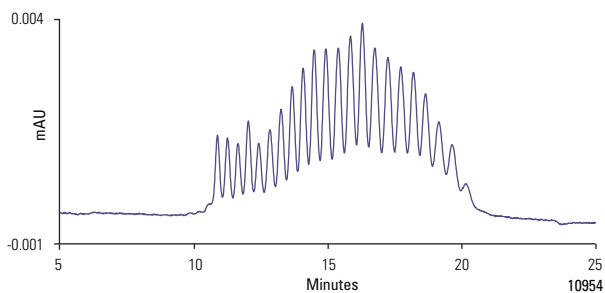
The DNAPac PA100 is a high-resolution anion-exchange column that provides single-base resolution. It is stable under denaturing conditions, rugged, reliable, and can be readily scaled up. The DNAPac PA100 is a 13  $\mu\text{m}$  pellicular, nonporous polymeric resin with bound quaternary amine-functionalized Thermo Scientific™ Dionex™ MicroBeads™. The rapid mass-transport characteristics of this resin result in very high-resolution oligonucleotide separations.

DNAPac PA100 can resolve full length from n-1, n+1, and other failure sequences.

### DNAPac PA100 Ordering Guide

Particle Size ( $\mu\text{m}$ )	Format	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
13	Guard Column	50	<b>SP4016</b>	<b>043018</b>	<b>SP4511</b>	<b>SP4513</b>
	HPLC Column	250	<b>SP3686</b>	<b>043010</b>	<b>043011</b>	<b>SP2091</b>

### Oligonucleotides



**Column: DNAPac PA100**

Eluent: 410-510mM NaCl  
in 25mM Tris-Cl, pH 8.0

---

Flow Rate: 1.5mL/min

---

Detection: UV, 260nm

---

Sample: pd(A)<sub>40-60</sub>



## DNAPac PA200

The DNAPac PA200 is a strong anion exchange column developed to provide best-resolution for analysis and purification of synthetic oligonucleotides

- Industry leading resolution for oligonucleotide separations
- Achieve n, n-1 resolution for oligonucleotides
- Resolve oligonucleotides with secondary structures
- Assay phosphorothioate purity
- Selectivity control with eluent pH, salt, and solvent
- Resolve RNA with aberrant (2', 5') links from normal SS-RNA
- Separate individual phosphorothioate diastereoisomers
- HR/AM AXLC/MS via automated desalting

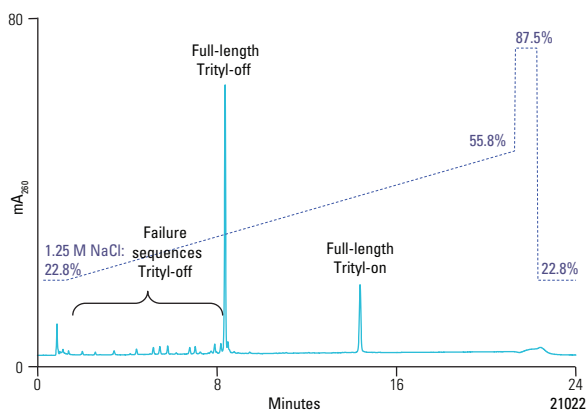


The DNAPac PA200 is packed with a pellicular anion-exchange resin composed of an 8  $\mu\text{m}$  diameter nonporous polymeric substrate to which quaternary amine-functionalized Dionex MicroBeads are bound. The rapid mass transport characteristics of this resin result in high-resolution oligonucleotide separations. DNAPac PA200 can resolve full length from n-1, n+1, and other failure sequences not possible with other columns.

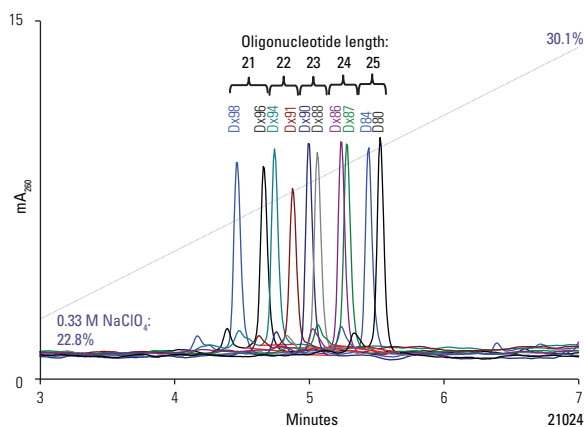
### DNAPac PA200 Ordering Guide

Particle Size ( $\mu\text{m}$ )	Format	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
8	Guard Column	50	<b>063423</b>	<b>062998</b>	<b>063419</b>	<b>SP6731</b>
	HPLC Column	250	<b>063425</b>	<b>063000</b>	<b>063421</b>	<b>SP6734</b>

### Target, failure and trityl-on oligonucleotides



### Separation of oligonucleotides by length



#### Column: DNAPac® PA200

Eluent:	NaClO <sub>4</sub> pH 6.5 with 20% CH <sub>3</sub> CN
Flow Rate:	1.2mL/min
Inj. Volume:	8 $\mu\text{L}$
Detection:	UV, 260nm

# DNAPac PA200 RS

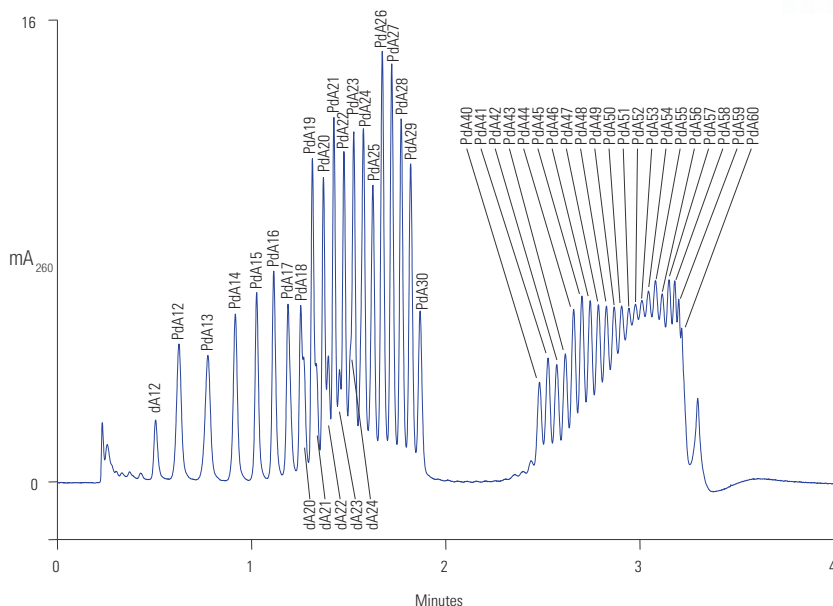
UHPLC Solutions for Nucleic Acid Analysis

DNAPac PA200 RS columns are packed with smaller, 4 µm particles, for improved resolution and better performance. The smaller particles also allow shorter columns to provide significantly higher throughput. These columns are packed in bioinert PEEK-lined stainless steel (SST) bodies, designed to protect from unwanted interactions of eluents and analytes with metals, while maintaining 10,000 psi stability. They columns offer exceptional resolution of oligonucleotides, including isomer separations; and are able to resolve full length oligonucleotides from n-1 and n+1 oligonucleotides and other failure sequences.

- Provide single base resolution of oligonucleotides
- Higher efficiency to improve resolution
- Improved throughput
- Ruggedness consistent with the DNAPac PA200 column line.
- 10,000 psi stable



### Partial resolution of 46 oligonucleotides



#### Column: DNAPac PA200 RS, 4.6 x 50mm

Eluent A:	20 mM Tris pH 8
Eluent B:	A + 1.25 M NaCl
Temp:	30 °C
Flow Rate:	1.30 mL/min
Inj. (µL):	2.5 µL
Detection:	28–43% B in 4 CV* (2.56 min) curve 3**
Sample:	PdA12–30, 40–60

\*CV = column volumes  
 \*\*Curve 3 indicates continuously changing gradient, asymptotically approaching a maximum salt concentration. Programmed in Chromeleon 6.8.

### DNAPac PA200 RS Ordering Guide

Particle Size (µm)	Format	Length (mm)	4.6 mm ID
4	BioRS column	50	<b>082508</b>
		150	<b>082509</b>
		250	<b>082510</b>



## DNASwift SAX-1S

A strong anion exchange monolith column that provides improved capacity and industry-leading oligonucleotide yield-purity performance.

This semipreparative column incorporates selectivity control of the DNAPac column, providing unsurpassed purity and yields.

- Micromole purifications in a 5cm column body
- Substantial capacity in a small format
- Tunable selectivity control, the DNAPac columns, for high resolution
- Compatible with high pH mobile phases, solvents, or high temperatures
- Ideal for therapeutic and diagnostic oligonucleotide research
- Purify difficult oligonucleotide products
- Use in combination with the DNAPac for industry leading purification and characterisation of oligonucleotide products

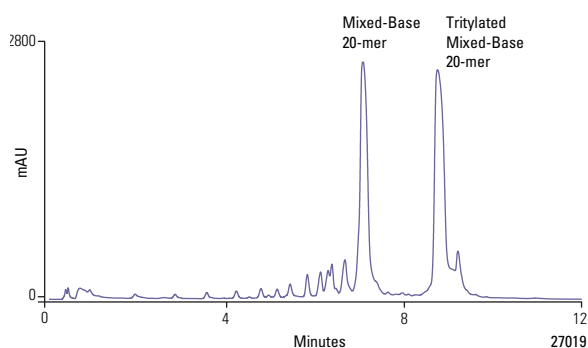
The DNASwift column is a unique porous polymer monolith coated with functionalized latex nanobeads, optimized for oligonucleotide separations. The monolith, a polymer cylinder with interconnected flow through channels, provides fast mass transfer, low back pressure (for increased flow rates), very high capacity, and refined selectivity control.



### DNASwift SAX-1S Ordering Guide

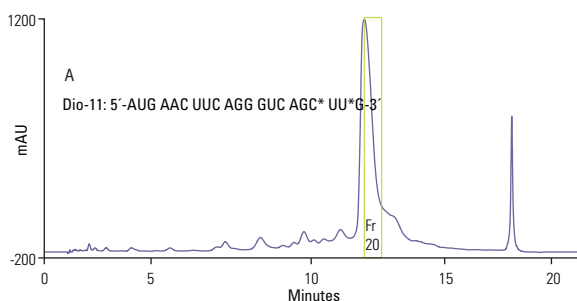
Functional Group	Length (mm)	5.0mm ID
SAX-1S	150	<b>066766</b>

#### Tritylated oligonucleotide



<b>Column:</b>	<b>DNASwift SAX-1S, 5 × 150mm</b>
<b>Mobile Phases:</b>	A: 15mM Tris, pH 8 B: 15mM Tris, pH 8, 1.25 M NaCl
<b>Gradient:</b>	8–64% B in 10 min
<b>Flow Rate:</b>	1.5mL/min
<b>Inj. Volume:</b>	20µL
<b>Detection:</b>	UV at 260nm Prep Cell (2mm path length)
<b>Sample:</b>	Derivatized mixed-base 20mer, 20mg/mL

#### Purification of a 21-base RNA Sample with aberrant 2' -5" linkages at the 1 and 3 positions from the 3" end



<b>Column:</b>	DNASwift SAX-1S, 5 × 150mm
<b>Eluents:</b>	A. 40mM Tris, pH 7 B. 40mM Tris, pH 7 + 1.25 M NaCl
<b>Gradient:</b>	26–42% B in 10 column volumes
<b>Flow Rate:</b>	1.5mL/min
<b>Inj. Amount:</b>	125µg
<b>Temperature:</b>	30°C
<b>Detection:</b>	UV at 260nm



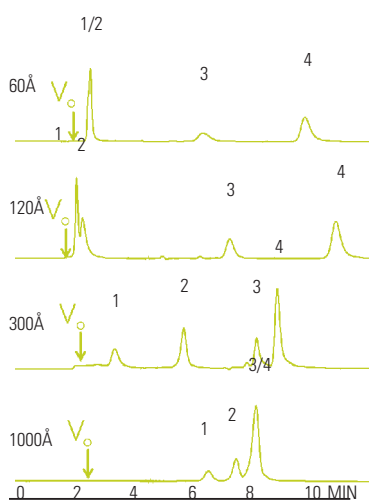
# BioBasic SEC Columns

Superior separation of water soluble compounds

- Covers separation of analytes over a wide molecular weight range
- Long column life and high column efficiencies
- Simple mechanism of interaction based on molecular size and shape
- Ideal for sample clean-up
- Straightforward method development, simple mobile phases

## BioBasic SEC Ordering Guide

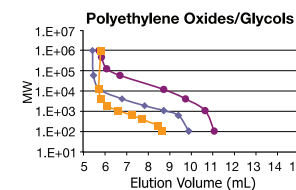
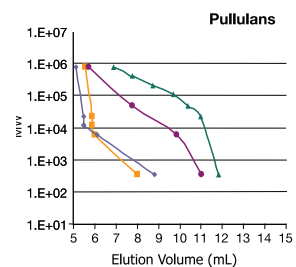
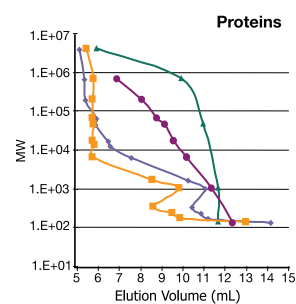
Pore Size (Å)	Description	ID (mm)	Length (mm)	Cat. No.
<b>BioBasic SEC 60</b>				
60	Guard	7.8	30	<b>73305-037821</b>
	HPLC Column	7.8	150	<b>73305-157846</b>
	HPLC Column	7.8	300	<b>73305-307846</b>
<b>BioBasic SEC 120</b>				
120	Guard	7.8	30	<b>73405-037821</b>
	HPLC Column	7.8	150	<b>73405-157846</b>
	HPLC Column	7.8	300	<b>73405-307846</b>
<b>BioBasic SEC 300</b>				
300	Guard	7.8	30	<b>73505-037821</b>
	HPLC Column	7.8	150	<b>73505-157846</b>
	HPLC Column	7.8	300	<b>73505-307846</b>
<b>BioBasic SEC 1000</b>				
1000	Guard	7.8	30	<b>73605-037821</b>
	HPLC Column	7.8	150	<b>73605-157846</b>
	HPLC Column	7.8	300	<b>73605-307846</b>



### Columns: BioBasic SEC, 5µm, 300 x 7.8mm

Eluent: 0.1M KH<sub>2</sub>PO<sub>4</sub>, pH 7  
 Flow: 1.0mL/min  
 Detector: UV at 254nm  
 Injection: 20µL  
 Sample:  
 1. Thyroglobulin (MW669,00)  
 2. Ovalbumin (MW 45,000)  
 3. Angiotensin II (MW 1,046)  
 4. PABA (V<sub>m</sub>) (MW 137)

Effect of pore size on SEC resolution



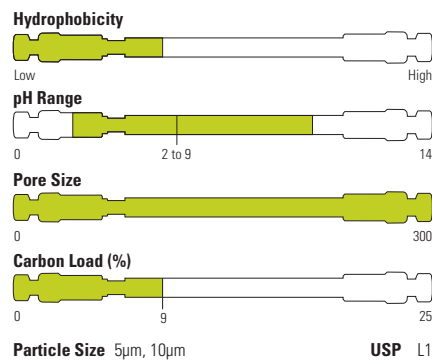
BioBasic SEC,  
 60Å 300Å  
 120Å 1000Å

Molecular weight calibration curves

## BioBasic 18

Outstanding separation of small to medium peptides

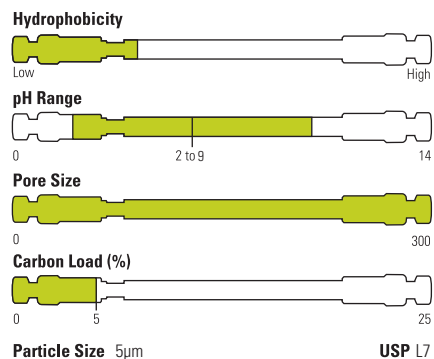
- 300Å pore size for maximum performance with biomolecules
- High peak capacity stationary phase
- Outstanding reproducibility, efficiency and column lifetime
- Excellent for LC-MS separations



## BioBasic 8

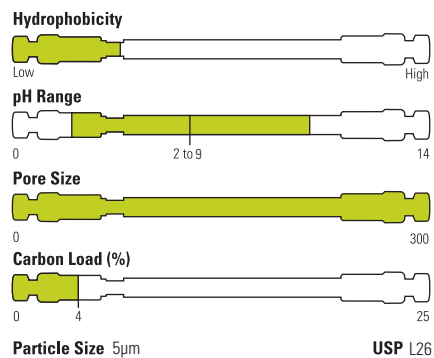
Optimized for the separation of a wide range of peptides

- 300Å pore size for improved biomolecule analysis
- An excellent starting column for protein and peptide analysis
- Outstanding reproducibility, efficiency and column lifetime
- Excellent for LC-MS separations



## BioBasic 4

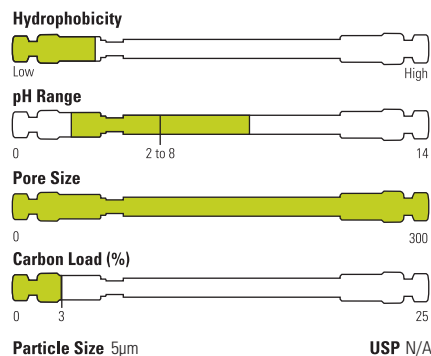
- Based on 300Å silica for outstanding biomolecule performance
- Lower carbon load for optimal retention of larger peptides and proteins
- Outstanding reproducibility, efficiency and column lifetime
- Excellent for LC-MS separations



## BioBasic AX

Optimized for the separation of proteins, peptides, other anionic species and polar molecules

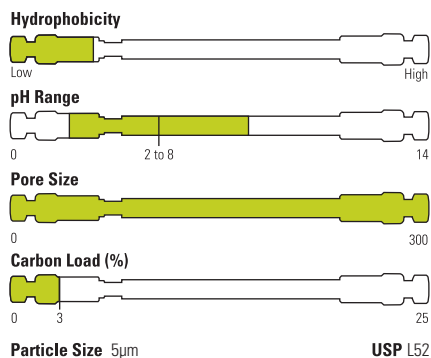
- Weak anion exchange phase for multiple charged species
- 300Å pore size for enhanced protein and peptide separations
- Suitable for HILIC retention and separation of highly polar molecules
- Superb stability under demanding pH conditions



## BioBasic SCX

For the separation of proteins, peptides, and other cationic species

- Strong cation exchange phase based on sulfonic acid chemistry
- Separation and retention of basic and other cationic species
- 300Å pore size for enhanced protein and peptide separations
- Outstanding stability under demanding pH conditions



### BioBasic Ordering Guide

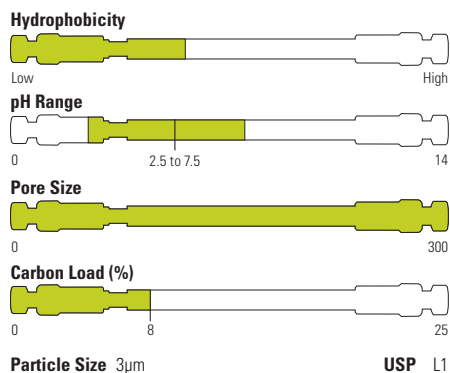
Particle Size (μm)	Format	Length (mm)	ID (mm)	C18	C8	C4	AX	SCX	
5	Drop-in Guard (4/pk)	10	1.0	<b>72105-011001</b>	<b>72205-011001</b>	<b>72305-011001</b>	<b>73105-011001</b>	<b>73205-011001</b>	
			2.1	<b>72105-012101</b>	<b>72205-012101</b>	<b>72305-012101</b>	<b>73105-012101</b>	<b>73205-012101</b>	
			3.0	<b>72105-013001</b>	<b>72205-013001</b>	<b>72305-013001</b>	<b>73105-013001</b>	<b>73205-013001</b>	
			4.0/4.6	<b>72105-014001</b>	<b>72205-014001</b>	<b>72305-014001</b>	<b>73105-014001</b>	<b>73205-014001</b>	
	HPLC Column	50	100	1.0	<b>72105-051030</b>	<b>72205-051030</b>	<b>72305-051030</b>	<b>73105-051030</b>	<b>73205-051030</b>
				2.1	<b>72105-052130</b>	<b>72205-052130</b>	<b>72305-052130</b>	<b>73105-052130</b>	<b>73205-052130</b>
				3.0	–	–	–	<b>73105-053030</b>	<b>73205-053030</b>
				4.6	–	–	–	<b>73105-054630</b>	<b>73205-054630</b>
			150	1.0	<b>72105-101030</b>	<b>72205-101030</b>	<b>72305-101030</b>	<b>73105-101030</b>	<b>73205-101030</b>
				2.1	<b>72105-102130</b>	<b>72205-102130</b>	<b>72305-102130</b>	<b>73105-102130</b>	<b>73205-102130</b>
				3.0	<b>72105-103030</b>	<b>72205-103030</b>	<b>72305-103030</b>	<b>73105-103030</b>	<b>73205-103030</b>
				4.6	<b>72105-104630</b>	<b>72205-104630</b>	<b>72305-104630</b>	<b>73105-104630</b>	<b>73205-104630</b>
250	1.0	<b>72105-151030</b>	<b>72205-151030</b>	<b>72305-151030</b>	<b>73105-151030</b>	<b>73205-151030</b>			
	2.1	<b>72105-152130</b>	<b>72205-152130</b>	<b>72305-152130</b>	<b>73105-152130</b>	<b>73205-152130</b>			
	3.0	–	–	–	<b>73105-153030</b>	<b>73205-153030</b>			
	4.6	<b>72105-154630</b>	<b>72205-154630</b>	<b>72305-154630</b>	<b>73105-154630</b>	<b>73205-154630</b>			
5	HPLC Column	50	1.0	<b>72105-251030</b>	<b>72205-251030</b>	<b>72305-251030</b>	<b>73105-251030</b>	<b>73205-251030</b>	
			2.1	<b>72105-252130</b>	<b>72205-252130</b>	<b>72305-252130</b>	<b>73105-252130</b>	<b>73205-252130</b>	
			4.6	<b>72105-254630</b>	<b>72205-254630</b>	<b>72305-254630</b>	<b>73105-254630</b>	<b>73205-254630</b>	

Format	Length (mm)	ID (mm)	Cat. No.
UNIGUARD Guard Cartridge Holder	10	1.0	<b>851-00</b>
		2.1	<b>852-00</b>
		3.0	<b>852-00</b>
		4.0/4.6	<b>850-00</b>

## Acclaim 300 C18

High-resolution reversed-phase separation of proteins and peptides

- Designed for high-resolution peptide mapping and protein separations
- High-efficiency 3µm spherical silica substrate
- High-performance bonding chemistry on 300Å pore silica
- Application tested for suitability in peptide mapping
- Reproducible for dependable results
- LC-MS compatible
- Ultrapure silica with low metal content and exhaustive bonding and endcapping



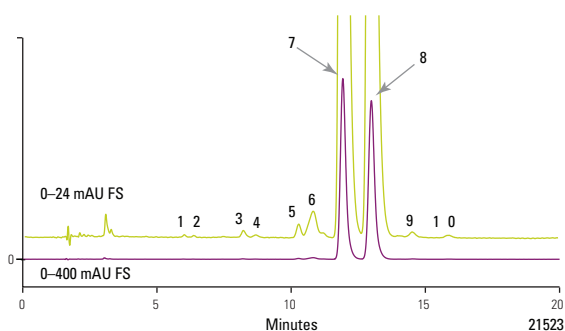
### Acclaim 300 C18 Ordering Guide

Particle Size (µm)	Format	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3	HPLC Column	50	<b>060263</b>	—	<b>060265</b>
		150	<b>060264</b>	<b>063684</b>	<b>060266</b>
5	Guard Cartridges (2/pk)	10	<b>069690</b>	<b>075721</b>	<b>069697</b>

### Acclaim Guard Holder Ordering Guide

Description	Cat. No.
Acclaim SST Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>

### Budesonide and related substances



Column: Acclaim 300 C18 3.0µm, 4.6 x 150mm

Pump:	Summit P580 HPG/4
Mobile Phase:	(A) Acetonitrile:ethanol 15:1 (B) 0.1% phosphoric acid Isocratic 66% B
Flow:	1.0mL/min
Temperature:	30°C
Injection:	ASI-100 autosampler, 15µL
Detector:	UVD 340U; UV at 240nm
Sample:	Budesonide, 500µg/mL after three days
Peaks:	7, 8. Budesonide epimers, 99%

Reference: Hou S, Hindle M, Byron PR;  
*J. Pharm. Biomed. Anal.* 2001 24:371-80.

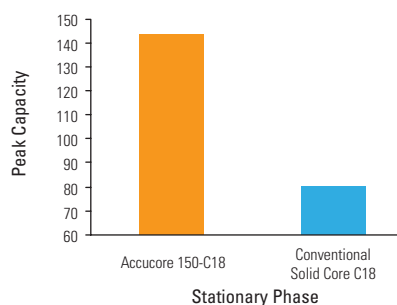
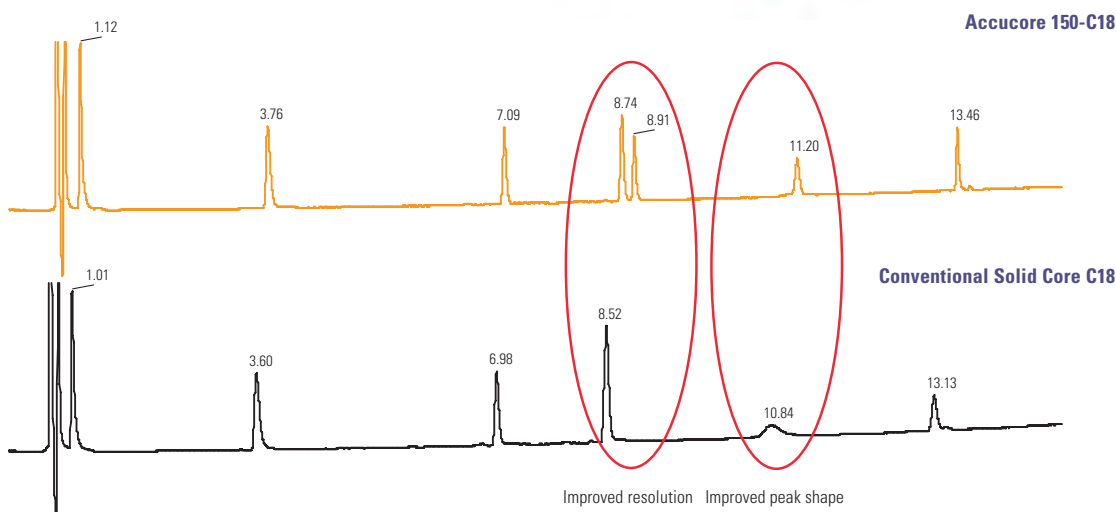
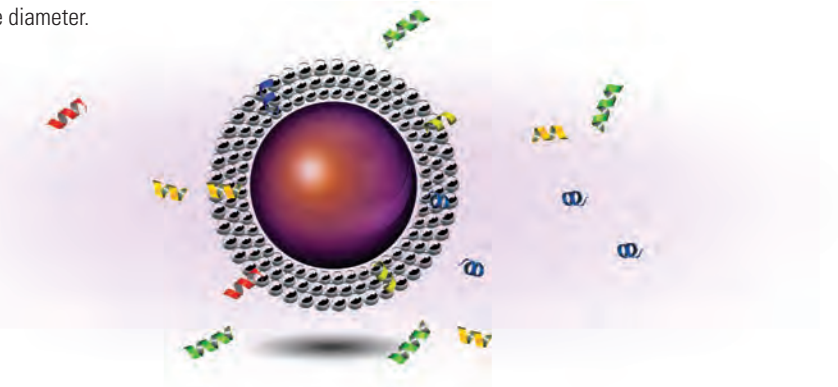


# Accucore Columns for Biomolecules

Ultimate Core Performance for Biomolecule Separations

The range of Accucore HPLC columns packed with 150Å pore diameter particles allow biomolecule separations to benefit from the superb resolution and high speed enabled by the Core Enhanced Technology™ that Accucore columns are based on. The 150Å pore diameter solid core particles used in the Accucore 150-C18, 150-C4 and 150-Amide-HILIC columns are designed specifically to provide the optimum combination of retention and resolution for biomolecules.

The chromatograms below show the improved resolution and peak shapes achieved with Accucore 150-C18 compared to a C18 solid core phase with an 80Å pore diameter.



### Peak Capacity Comparison

Sharper peaks result in a significantly higher peak capacity for 150-C18 compared to the conventional solid core C18 column.

### Accucore 2.6µm 150Å HPLC and nanoLC Columns Optimum Conditions and Ratings

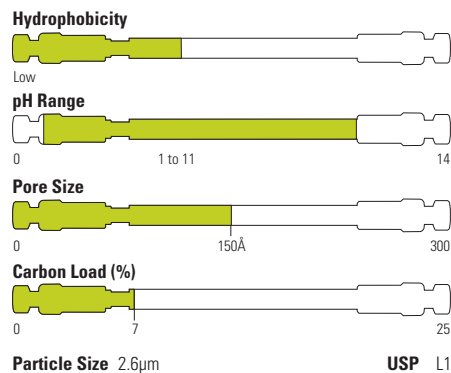
Column ID	Optimum Flow Rate	Backpressure Rating	Temperature Rating
75µm	300nL/min	800 bar	70°C
2.1mm	400µL/min	1000 bar	70°C
3.0mm	800µL/min	1000 bar	70°C
4.6mm	1800µL/min	1000 bar	70°C

## Accucore 150-C18

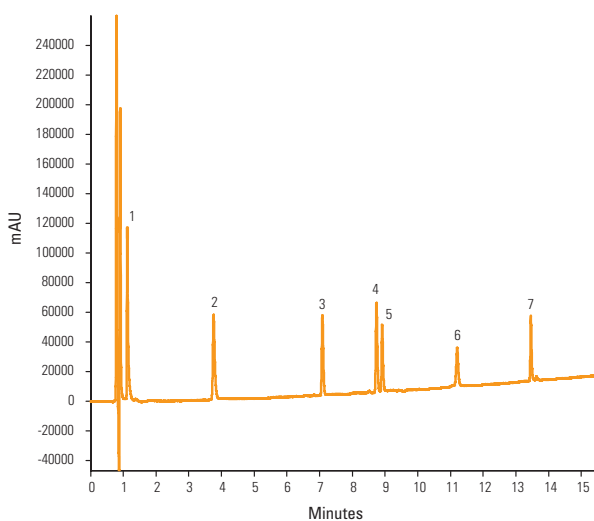
- Designed for the separation of peptides
- Outstanding resolution
- 150Å pore diameter material

Higher peak capacities facilitate increased peptide identifications. Accucore 150-C18 provides much narrower peak widths, therefore significantly higher peak capacity than a column packed with <math>2\mu\text{m}</math> wide pore fully porous C18.

Precision of retention times is critical for reliable analysis. The Accucore 150-C18 column exhibits excellent retention time reproducibility.



### Peptide separations



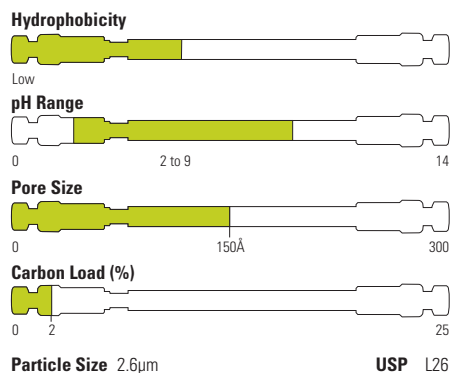
#### Column: Accucore 150-C18 2.6 μm, 100 x 2.1 mm

Mobile phase A:	0.1% TFA in 10:90 acetonitrile:water
Mobile phase B:	0.1% TFA in 70:30 acetonitrile:water
Gradient:	0-50% B over 15 min; hold for 2 min; drop to 0% in 0.1 min; hold at 0% B for 5 min
Flow:	300 μL/min
Temperature:	35°C
Injection:	5 μL
Detection:	UV (220nm)
Peaks:	1. Glycine-Tyrosine 2. Valine-Tyrosine-Valine 3. Met-Enkephalin 4. Angiotensin III 5. Leu-Enkephalin 6. Ribonuclease A 7. Insulin

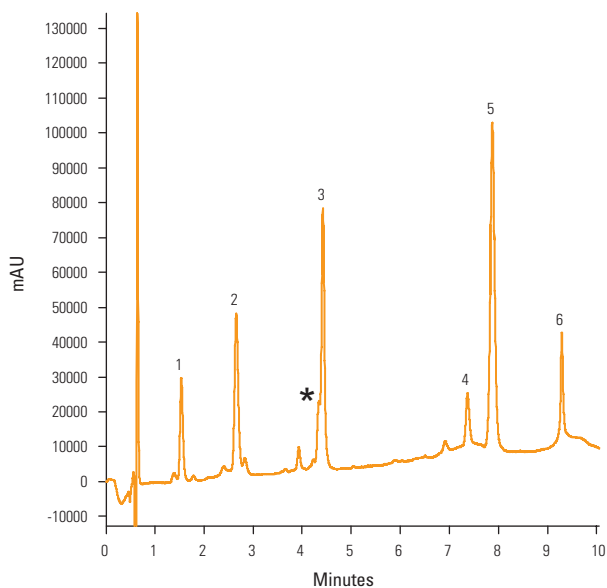
## Accucore 150-C4

- Significantly lower hydrophobic retention than C18
- Ideal for retention of proteins and larger peptides

Accucore 150-C4 provides significantly sharper and higher peaks than a column packed with 5µm wide pore fully porous C4, thus offering better resolution and sensitivity. The Accucore 150-C4 also performs better than a column packed with <2µm wide pore fully porous C4 and generates only a fraction of the backpressure.



### Intact proteins



#### Column: Accucore 150-C4 2.6µm, 100 x 2.1mm

Mobile phase A: 0.1% TFA in 30:70 acetonitrile:water

Mobile phase B: 0.1% TFA in 98:2 acetonitrile:water

Gradient: 0-30% B over 8 mins  
30-95% B over 2 mins  
95% B hold for 1 min  
0% B hold for 4 mins

Flow: 400µL/min

Temperature: 40°C

Injection: 2µL 10pmol/µL solution

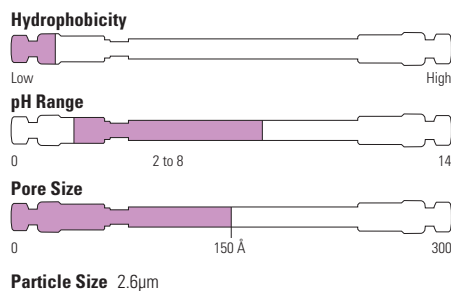
Detection: UV (214 and 280nm)

Peaks:  
1. Insulin  
2. Cytochrome C  
3. Lysozyme  
4. Myoglobin  
5. Carbonic anhydrase  
6. Ovalbumin  
\* Carbonic anhydrase impurity

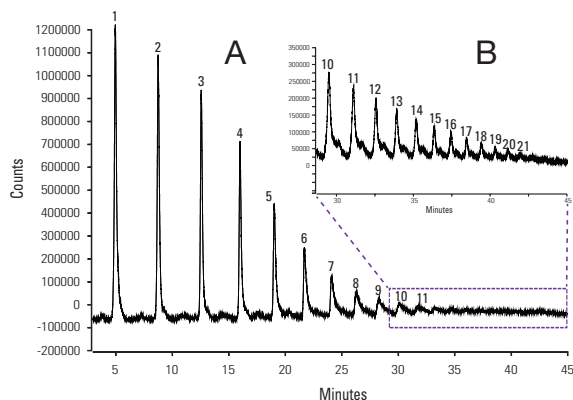
## Accucore 150-Amide-HILIC

- Amide phase bonded onto 150 Å pore diameter solid core particles
- High retention of a broad range of hydrophilic analytes in HILIC mode
- Recommended for hydrophilic biomolecules such as glycans

The amide bonded phases provide strong hydrogen bonding interaction between the stationary phase and the analytes, resulting in unique selectivity compared to other HILIC phases. Combined with larger pore size of the solid core particles, Accucore 150-Amide-HILIC is well suited for separating a variety of hydrophilic molecules, including carbohydrates and peptides. As a result the Accucore 150-Amide-HILIC is an excellent choice for glycan separations.



### 2-AB labelled dextran ladder



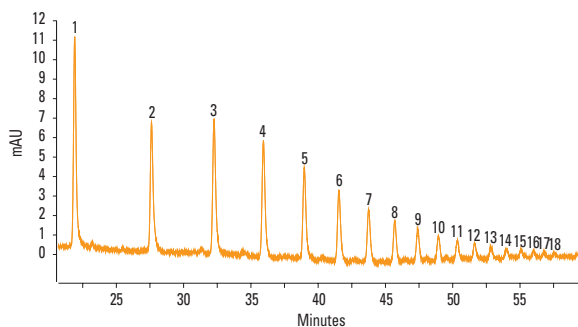
**Column: Accucore 150-Amide-HILIC, 2.6μm, 100 x 2.1mm**

Mobile phase A:	acetonitrile
Mobile phase B:	50 mM ammonium formate, pH 4.5
Gradient:	20–50 % B in 40.0 minutes 50 % B for 5.0 minutes 50–20 % B in 0.5 minutes 50 % B for 4.5 minutes
Flow:	500 μL/min
Backpressure at starting conditions:	110 bar
Run time:	50 minutes
Temperature:	60 °C
Injection:	2μL to 5μL of sample.
Injection wash solvent:	80:20 (v/v) acetonitrile:water.
Fluorescence detector acquisition parameters:	330nm excitation wavelength; 420nm emission wavelength; acquisition start after 3 min from gradient start.

(A) 2 μL injection of sample, where 11 glycans were separated.

(B) 5 μL injection of sample, zoomed-in to the later part of the gradient rise. A further 10 glycans were detected.

### 2-AB labelled dextran ladder



**Column: Accucore 150-Amide-HILIC 2.6μm, 150mm x 75μm**

Mobile phase A:	98:2 (v/v) acetonitrile: water
Mobile phase B:	2:98 (v/v) acetonitrile: water
Gradient:	0–50 % B in 50 minutes 50 % B for 8 minutes
Flow:	200 nL/min
Temperature:	40 °C
Backpressure:	60 bar (100% A)
Sample Pick-up:	0.5μL at 20 μL/min
Sample Loading:	1μL at 280 bar
Detection:	UV (240 and 33 nm)

## Accucore Columns for Biomolecules Ordering Guide

Particle Size (µm)	Format	Length (mm)	ID (mm)	150-C18	150-C4	150-Amide-HILIC
2.6	Defender Guard (4/pk)	10	2.1	<b>16126-012105</b>	<b>16526-012105</b>	<b>16726-012105</b>
			3.0	<b>16126-013005</b>	<b>16526-013005</b>	<b>16726-013005</b>
			4.6	<b>16126-014005</b>	<b>16526-014005</b>	<b>16726-014005</b>
	HPLC Column	30	2.1	<b>16126-032130</b>	<b>16526-032130</b>	–
			3.0	<b>16126-033030</b>	<b>16526-033030</b>	–
			4.6	<b>16126-034630</b>	<b>16526-034630</b>	–
		50	2.1	<b>16126-052130</b>	<b>16526-052130</b>	<b>16726-052130</b>
			3.0	<b>16126-053030</b>	<b>16526-053030</b>	<b>16726-053030</b>
			4.6	<b>16126-054630</b>	<b>16526-054630</b>	<b>16726-054630</b>
		100	2.1	<b>16126-102130</b>	<b>16526-102130</b>	<b>16726-102130</b>
			3.0	<b>16126-103030</b>	<b>16526-103030</b>	<b>16726-103030</b>
			4.6	<b>16126-104630</b>	<b>16526-104630</b>	<b>16726-104630</b>
	150	2.1	<b>16126-152130</b>	<b>16526-152130</b>	<b>16726-152130</b>	
		3.0	<b>16126-153030</b>	<b>16526-153030</b>	<b>16726-153030</b>	
		4.6	<b>16126-154630</b>	<b>16526-154630</b>	<b>16726-154630</b>	
	250		2.1	–	–	<b>16726-252130</b>

Format	Length (mm)	ID (mm)	Cat. No.
UNIGUARD Guard Cartridge Holder	10	2.1	<b>852-00</b>
		3.0	<b>852-00</b>
		4.6	<b>850-00</b>

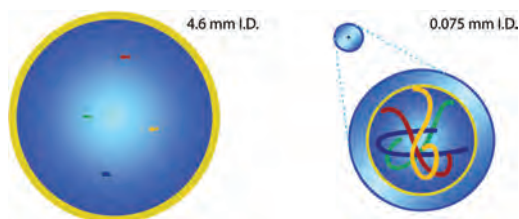
## Nano, Capillary and Micro LC Columns

### Introduction

Nano, capillary and micro columns are ideal in cases where the sample amount is limited. The (theoretical) sensitivity increase of these LC columns is obtained by introducing the limited sample amounts in an environment with a low internal volume. This will result

in a sensitivity gain that is dependent on the internal diameter, as shown in the table below. The best known use is the application of nano LC columns in proteomics, but certainly the concentrating effects of capillary and micro columns are beneficial in e.g. metabolomics or facilitation of LC-MS interfacing.

Name	Internal Diameter	Theoretical Sensitivity	Predominant application area
Conventional	4.6mm	1	Small molecules, pharma
Narrowbore	2.1mm	5	DMPK, Metabolomics, LC-MS
Micro	1.0mm	21	Protein prefractionation
Capillary	300µm	235	Peptide prefractionation
Nano	75µm	3761	Proteomics



### Formats

Our columns come in a variety of formats. We offer most chemistries in nano (75µm), capillary (300µm) and micro (1000µm) internal diameter. In addition, different lengths are available to allow tuning for throughput with short micro columns or high resolution and sensitivity with 50cm long nano columns. However most importantly, Thermo Scientific™ Dionex™ nanoViper™ fingertight fitting system has now become the standard column format for our nano, capillary, and micro LC columns. nanoViper fingertight connections eliminate the assembly of PEEK sleeve connections, allowing tool-free nano-LC connections. They are capable of withstanding pressures up to a 1000 bar, offering the same levels of performance with improved ease of use.

Our trap columns come in two formats as well, the nano trap design, features a single capillary with the trap column at the end. These are ideal for high resolution separation of relatively clean samples or samples with hydrophilic peptides. The cartridge based trap columns are use at

higher flow rates and have a wider ID. These are ideal for large sample amounts and when sample quality demands more robustness. For more details on trap columns, please check the RSLCnano standard applications manual.

Thermo Scientific EASY-Spray columns minimize the impact of dead volumes through the use of specifically designed columns in which the separation column, column heater, high-voltage electrode, and emitter are integrated in a ready-made assembly which incorporates a nanoViper connector. Eliminating imperfect connections makes it far easier to achieve state-of-the-art nanospray performance and data.

### Chemistries

The most common “sample limited” sources are from biological origin and involve the analysis of peptides and proteins. It is for that reason that our nano, capillary and micro column portfolio has a strong focus on column chemistries for peptides and proteins.

The Acclaim PepMap range (C18, C8, C4) has been the benchmark for nano LC peptide analysis for many years. The Acclaim PepMap RSLC (C18, 2µm particle) range builds on this heritage improving peptide separation capabilities. Acclaim PepMap columns are available in 100 and 300Å pore size to accommodate a wide range of peptides and proteins. In addition to these hallmark columns our range also includes monolithic columns that are capable of separating both proteins and peptides with very high efficiency. Our portfolio is completed by a selection of columns that are applicable as the first dimension in a multidimensional approach.

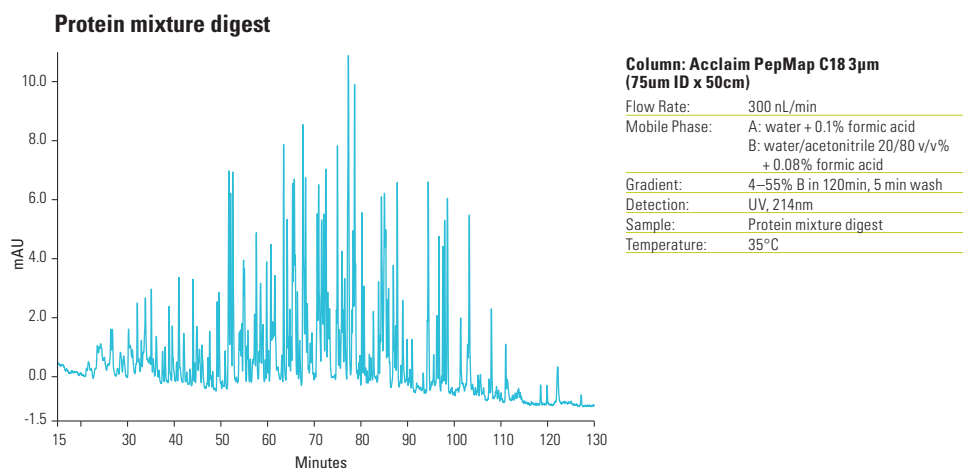


## Acclaim PepMap C18 100Å

The standard for peptide separations in proteomics

- High resolution protein identification for biomarker discovery, verification or any other analysis
- Highest sensitivity in LC-MS
- Quality control by factory testing all columns

Acclaim PepMap and Acclaim PepMap RSLC columns are specially designed for high-resolution analyses of tryptic, natural, and synthetic peptides. The columns are often applied for LC-MS/MS peptide mapping for protein identification, biomarker discovery, and systems biology. Due to their high loading capacity, the columns are exceptionally suitable for the analysis of low abundant peptides in complex proteomics samples.



## Acclaim PepMap C8, 100Å

An excellent alternative to Acclaim PepMap 100Å C18, when separating very hydrophobic peptides (e.g., non-tryptic peptides)

## Acclaim PepMap C4, 300Å

Ideal for the separation of larger hydrophobic peptides and proteins, providing higher recoveries

## Acclaim PepMap C18, 300Å

Wide pore version allows larger peptides and proteins

## Accucore 150-C18

Designed to give narrow peaks and high peak capacity for peptide separations

## Accucore 150-C4

Ideal for high resolution protein separations

## Accucore 150-Amide-HILIC

Well suited for separating a variety of hydrophilic molecules, including carbohydrates and peptides

## Separation Columns

### Acclaim PepMap C18 100Å Ordering Guide

Particle size (µm)	Length (mm)	nanoViper Column				Classic Column
		50µm ID	75µm ID	300µm ID	1000µm ID	75µm ID
2	50	<b>164561</b>	<b>164563</b>	<b>164560</b>	<b>164454</b>	–
	150	<b>164562</b>	<b>164534</b>	<b>164537</b>	<b>164711</b>	–
	250	<b>164709</b>	<b>164536</b>	–	–	–
	500	<b>164710</b>	<b>164540</b>	–	–	–
3	50	<b>164712</b>	<b>164567</b>	<b>164716</b>	<b>164717</b>	–
	150	<b>164713</b>	<b>164568</b>	<b>164571</b>	<b>164572</b>	<b>160321</b>
	250	<b>164714</b>	<b>164569</b>	–	–	<b>164261</b>
	500	<b>164715</b>	<b>164570</b>	–	–	–
5	50	–	–	<b>164901</b>	<b>164899</b>	–
	150	–	–	<b>164902</b>	<b>164900</b>	<b>160323</b>
	250	–	–	–	–	<b>160326</b>

### Acclaim PepMap C8 100Å Ordering Guide

Particle size (µm)	Length (mm)	nanoViper Column				Classic Column
		50µm ID	75µm ID	300µm ID	1000µm ID	75µm ID
3	150	–	<b>164706</b>	<b>164722</b>	<b>164723</b>	<b>161185</b>

### Acclaim PepMap C4 300Å Ordering Guide

Particle size (µm)	Length (mm)	nanoViper Column				Classic Column
		50µm ID	75µm ID	300µm ID	1000µm ID	75µm ID
5	150	–	<b>164707</b>	<b>164720</b>	<b>164721</b>	<b>163579</b>

### Acclaim PepMap C18 300 Å Ordering Guide

Particle size (µm)	Length (mm)	nanoViper Column				Classic Column
		50µm ID	75µm ID	300µm ID	1000µm ID	75µm ID
5	150	–	<b>164708</b>	<b>164718</b>	<b>164719</b>	<b>163574</b>

### Accucore 150-C18 Ordering Guide

Particle size (µm)	Length (mm)	nanoViper Column	
		50µm ID	75µm ID
2.6	150	<b>16126-157569</b>	
	500	<b>16126-507569</b>	

### Accucore 150-C4 Ordering Guide

Particle size (µm)	Length (mm)	nanoViper Column	
		50µm ID	75µm ID
2.6	150	<b>16526-157569</b>	
	500	<b>16526-507569</b>	

### Accucore 150-Amide-HILIC Ordering Guide

Particle size (µm)	Length (mm)	nanoViper Column	
		50µm ID	75µm ID
2.6	150	<b>16726-157569</b>	



## Trap columns – nano trap design

### Acclaim PepMap C18 100Å Ordering Guide

Type	Part number	Particle Size	ID	Bed Length (mm)	Total Length	Quantity
nanoViper Column	<b>164535</b>	3	75	20	150	2
	<b>164705</b>	3	75	20	70	2
	<b>164564</b>	5	100	20	150	2
Classic Column	<b>164197</b>	5	100	10	150	2
	<b>164199</b>	5	100	20	150	2
	<b>164213</b>	5	200	20	150	2

Note: 164705 is a shorter total length used for vented column set up for example with EASY nLC 1000

## Trap Columns – Cartridge (Set of 5)

### Acclaim PepMap C18 100Å Ordering Guide

Length (mm)	300µm ID	1000µm ID
5	<b>160454</b>	<b>160434</b>
15	–	<b>160438</b>

### Acclaim PepMap C8 100Å Ordering Guide

Length (mm)	300µm ID
5	<b>161194</b>

### Acclaim PepMap C4 300Å Ordering Guide

Length (mm)	300µm ID
5	<b>163591</b>

### Acclaim PepMap C18 300Å Ordering Guide

Length (mm)	300µm ID
5	<b>163589</b>

### Accucore 150-C18 Ordering Guide

Length (mm)	300µm ID
5	<b>16126-900379</b>

### Accucore 150-C4 Ordering Guide

Length (mm)	300µm ID
5	<b>16526-900379</b>

### Accucore 150-Amide-HILIC Ordering Guide

Length (mm)	300µm ID
5	<b>16726-900379</b>

### µ-Precolumn™ holder, 5mm, with 30µm ID connecting tubing, nanoViper fittings

Length (mm)	300µm ID
5	<b>164649</b>



## 1<sup>st</sup> dimension columns for 2D separations

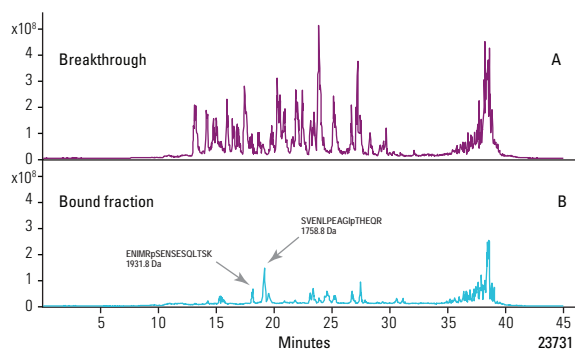
Improving separation efficiency can be achieved by adding a column to the setup for multidimensional analysis. There are dedicated application kits which utilize either SCX or RP as the first dimension.

A TiO<sub>2</sub> trapping column can be added to the application for phosphopeptide analysis. Check the RSLCnano standard applications manual on the Thermo Scientific website for more information on 2D separations.

### 1<sup>st</sup> dimension columns Ordering Guide

Chemistry	Part Number	Description	Application
SCX	<b>164565</b>	300µm ID x 10cm, packed with Poros 10 S, nanoViper column	2D Salt plugs (6720.0325)
	<b>164566</b>	1.0mm ID x 15cm, packed with Polysulfoethyl ASP, 5µm, 300Å, nanoViper column	Automated off-line 2D LC of Peptides, micro SCX x nano RP (6720.0330)
RP	<b>164592</b>	300µm ID x 15cm, packed with Acclaim PA2, nanoViper column	Automated off-line 2D LC, Cap RP (basic) x Nan RP (acidic) (6720.0335)
TiO <sub>2</sub>	<b>164205</b>	100µm ID x 1cm packed with TiO <sub>2</sub>	Phosphopeptide analysis
	<b>164215</b>	200µm ID x 1cm packed with TiO <sub>2</sub>	Phosphopeptide analysis

### Isolation of two synthetic phosphopeptides from a BSA tryptic digest



<b>Trap Column: 200µm ID x 1cm, packed with TiO<sub>2</sub>, 5µm</b>
<b>100µm ID x 1cm, packed with Acclaim PepMap C18, 5µm</b>
Separation Column: Acclaim PepMap C18, 3µm
Dimensions: 75µm x 15cm
Loading Solvent: 0.05% HFBA in DI H <sub>2</sub> O
Wash Solvent: 0.01% HFBA in DI H <sub>2</sub> O
Mobile Phases: (A) 0.05% TFA in DI H <sub>2</sub> O
(B) 0.04% TFA in acetonitrile/ DI H <sub>2</sub> O (80:20 v/v)
Gradient: 3–40% acetonitrile in 30 min
TiO <sub>2</sub> Trap Eluent: 250mM NH <sub>4</sub> HCO <sub>3</sub> in DI H <sub>2</sub> O, pH 9.0
Flow Rate: 300nL/min
Loading Flow: 8µL/min
Inj. Volume: 5µL
Detection: MS

## EASY-Spray Columns

Nanoflow LC-MS utilizes very narrow fused silica columns and as a result, even the slightest inconsistency in column connection can result in leaks and dead volumes and are a frequent source of poor data, causing unstable spray and a significant loss in performance. Trouble-shooting connection issues can be difficult and time consuming, even for experts.

Thermo Scientific™ EASY-Spray™ columns address the aforementioned issues by incorporating high-performance nanobore columns and integrating them within a radical new design.

Packed with either C18 for peptide separations or with selected wide pore phases and monoliths for the separation of intact proteins, e.g. top-down proteomics or the structural identification of biotherapeutics, the “plug and spray” approach delivers state of the art performance in a simple to use format, making research routine.

### Acclaim PepMap C18 100Å Ordering Guide

Particle size (µm)	Length (mm)	50µm ID	75µm ID
2	150	<b>ES801</b>	–
	250	–	<b>ES802</b>
	500	–	<b>ES803</b>
3	150	–	<b>ES800</b>

### Accucore C4 150Å Ordering Guide

Particle size (µm)	Length (mm)	75µm ID
2.6	150	<b>ES811</b>

### Acclaim PepMap C18 300Å Ordering Guide

Particle size (µm)	Length (mm)	75µm ID
5	150	<b>ES812</b>

### PepSwift Ordering Guide

Length (mm)	200µm ID
250	<b>ES810</b>

## EASY-Spray Emitters

EASY-Spray emitters are integrated devices consisting of a sprayer coupled with a transfer line. The EASY-Spray benefits of pre-made connections, as well as the easy installation in the MS ion source can now be exploited in cases where no chromatography is required, for example when tuning the mass spectrometer.

### EASY-Spray Emitters Ordering Guide

Description	Cat. No.
EASY-Spray emitter, nanoflow (Emitter ID 7µm, Transfer line ID 20µm, Transfer line length 500mm)	<b>ES791</b>
EASY-Spray emitter, microflow (Emitter ID 20µm, Transfer line ID 75µm, Transfer line length 500mm)	<b>ES792</b>



## PepSwift and ProSwift (PS-DVB) Capillary and Micro HPLC Columns

- High-resolution for protein identification, biomarker discovery, and systems biology
- High-speed peptide and protein separations (<15 min)
- Highest sensitivity for LC/MS
- Highest column-to-column reproducibility
- Wide range of column IDs and lengths available
- Superior lifetime
- nanoViper fittings for easy column installation



PepSwift and ProSwift monolithic columns are specially designed for fast and high-resolution LC/MS analysis in protein identification, biomarker discovery, and systems biology. Based on a polystyrene divinylbenzene copolymer, the monolithic structure offers a high-quality alternative to traditional microparticulate sorbents, providing important advantages to the chromatographic separation. High-sensitivity proteomics and biotech applications are easily performed using these columns.

PepSwift Precolumns can be used for preconcentration and desalting of samples consisting of peptides and proteins without negative impact on the chromatographic performance or recovery of the compounds. Various ion-pairing agents can be used in the loading solvent and/or mobile phases to change the selectivity of the separation or improve the trapping efficiency.

### PepSwift and ProSwift, nanoViper Ordering Guide

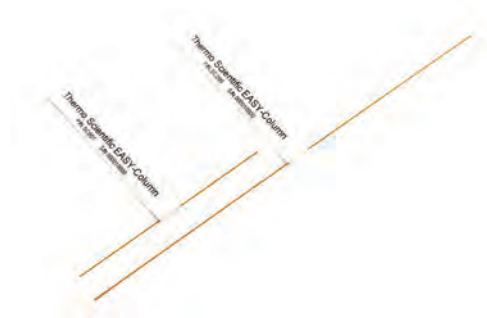
Length (mm)	PepSwift			ProSwift
	100µm ID	200µm ID	500µm ID	1000µm ID
5	–	<b>164558</b>	–	–
50	<b>164584</b>	<b>164557</b>	<b>164585</b>	<b>164586</b>
250	<b>164543</b>	<b>164542</b>	–	–



## EASY-Columns

Excellence in nanoscale separations

- Compatible with any nanoscale HPLC system
- Optimized for online LC-MS
- Quality control on every column
- Simple, flexible design



Using highly pure chromatographic media and biocompatible, metal-free fused silica capillaries, Thermo Scientific™ EASY-Column™ capillary LC columns are produced with a focus on design simplicity and strict quality control. As a result, EASY-Column capillary LC columns deliver outstanding chromatographic performance on any nano LC system.

### EASY-Columns Ordering Guide

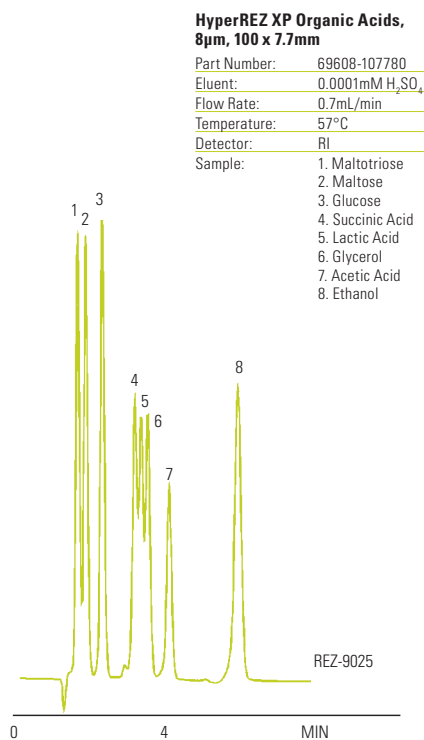
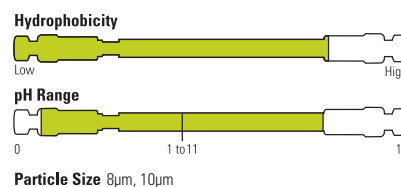
Description	Quantity	Cat. No.
EASY-Column, 2cm, ID 100µm, 5µm, C18-A1 (Trap column)	3	<b>SC001</b>
EASY-Column, 10cm, ID 75µm, 3µm, C18-A2 (Analytical column)	1	<b>SC200</b>
EASY-Column, 10cm, ID 75µm, 3µm, C18-A2 (Analytical column)	3	<b>SC2003</b>
HPLC-to-Column Connector kit Zero-dead-volume union (1/32in OD tubing), 10x SC603	1	<b>SC600</b>
A/B mixing tee & Venting Tee for two-column setup Nanoliter-dead-volume tee (1/32in OD tubing), 10 sleeves for 360µm OD fused silica (10xSC603).	1	<b>SC601</b>
Connector Kit for two-column setup Zero-dead-volume union (1/32in OD tubing), Nanoliter-dead-volume tee (1/32 inch OD tubing), 10x SC603	1	<b>SC602</b>
Sleeves (2cm, 1/32in OD) for 360µm OD fused silica	30	<b>SC603</b>

# HyperREZ XP

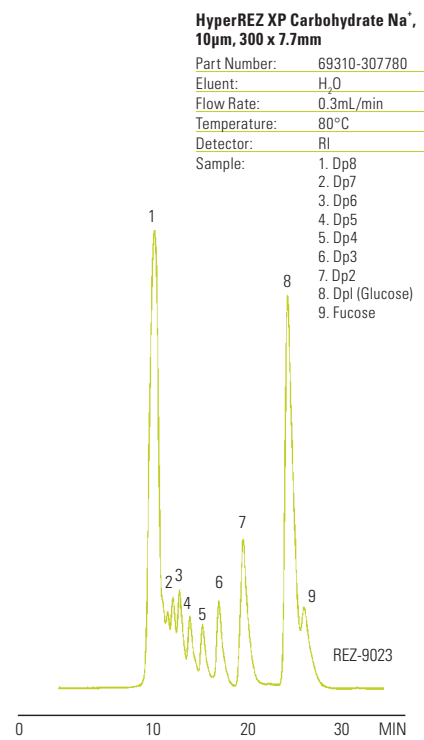
Polymer-based columns for carbohydrate analysis

- Designed for the determination of carbohydrates, saccharides, organic acids, and alcohols
- Efficient and reproducible monodisperse particles
- Stable for long column lifetimes even at low pH and high temperatures

Thermo Scientific™ HyperREZ™ XP Carbohydrate columns are based on a monodisperse resin with a 4 or 8% divinylbenzene content, and provide an ideal medium for the analysis of carbohydrates and organic acids. Unlike silica based columns they are stable at low pH, allowing the use of dilute acid as a mobile phase. The columns can also be run at elevated temperatures, for faster analysis and improved resolution of some closely eluting analytes. The columns can easily be regenerated for increased column lifetime. Control of the degree of cross-linking of the gel provides a size exclusion mode of operation in addition to the ligand exchange interactions with the metal ion associated with the sulfonated resin. Selectivity differences arise from the interactions of the different counter-ion forms with the hydroxyl groups on the analyte molecules. HyperREZ XP columns are available in H<sup>+</sup>, Ca<sup>2+</sup>, Pb<sup>2+</sup>, and Na<sup>+</sup> forms, enabling you to choose the appropriate counter-ion to meet your application requirements. Refer to the tables below to help choose the best column based on application area or retention times. HyperREZ XP columns are also available in dedicated organic acid and sugar alcohol forms.



Products of fermentation, including organic acids, sugars and alcohols, can be separated using a HyperREZ XP Organic Acids column



Analysis of sports drink using a HyperREZ XP Carbohydrate Na<sup>+</sup> column

Phase	Particle Size (µm)	Porosity
HyperREZ XP Carbohydrate H <sup>+</sup> Counter-ion	8	8% cross linkage
HyperREZ XP Carbohydrate Pb <sup>2+</sup> Counter-ion	8	8% cross linkage
HyperREZ XP Carbohydrate Ca <sup>2+</sup> Counter-ion	8	8% cross linkage
HyperREZ XP Carbohydrate Na <sup>+</sup> Counter-ion	10	4% cross linkage
HyperREZ XP Organic Acids	8	8% cross linkage
HyperREZ XP Sugar Alcohols	8	8% cross linkage

Column Type	Application Areas
HyperREZ XP Ca <sup>2+</sup>	Adulteration of food & beverages, confectionary, disaccharides, food additives Alcohols, dairy products, fermentation, wine Anomer separation
HyperREZ XP Pb <sup>2+</sup>	Fruit juice, monosaccharides
HyperREZ XP H <sup>+</sup>	Alcohols, dairy products, fermentation, wine Oligosaccharides, glycoprotein constituents, organic acids, fermentation products
HyperREZ XP Na <sup>+</sup>	Corn syrup

**HyperREZ XP Ordering Guide**

	Particle Size (µm)	Format	Length (mm)	ID (mm)	Cat. No.
HyperREZ XP Carbohydrate H+	8	Guard Cartridge (2/pk)	5	3.0	<b>69008-903027</b>
		Guard Column	50	7.7	<b>69008-057726</b>
		HPLC Column	300	7.7	<b>69008-307780</b>
HyperREZ XP Carbohydrate Ca <sup>2+</sup>	8	Guard Cartridge (2/pk)	5	3.0	<b>69208-903027</b>
		Guard Column	50	7.7	<b>69208-057726</b>
		HPLC Column	300	7.7	<b>69208-307780</b>
HyperREZ XP Carbohydrate Pb <sup>2+</sup>	8	Guard Cartridge (2/pk)	5	3.0	<b>69108-903027</b>
		Guard Column	50	7.7	<b>69108-057726</b>
		HPLC Column	300	7.7	<b>69108-307780</b>
HyperREZ XP Carbohydrate Na+	10	Guard Cartridge (2/pk)	5	3.0	<b>69310-903027</b>
		Guard Column	50	7.7	<b>69310-057726</b>
		HPLC Column	300	7.7	<b>69310-307780</b>
HyperREZ XP Organic Acids	8	Guard Cartridge (2/pk)	5	3.0	<b>69008-903027</b>
		Guard Column	—	—	Inquire
		HPLC Column	100	7.7	<b>69608-107780</b>
HyperREZ XP Sugar Alcohols	8	Guard Cartridge (2/pk)	5	3.0	<b>69208-903027</b>
		Guard Column	—	—	Inquire
		HPLC Column	300	7.7	<b>69708-254030</b>

Format	Length (mm)	ID (mm)	Cat. No.
HyperRez Guard Cartridge Holder	5	3	<b>60002-354</b>

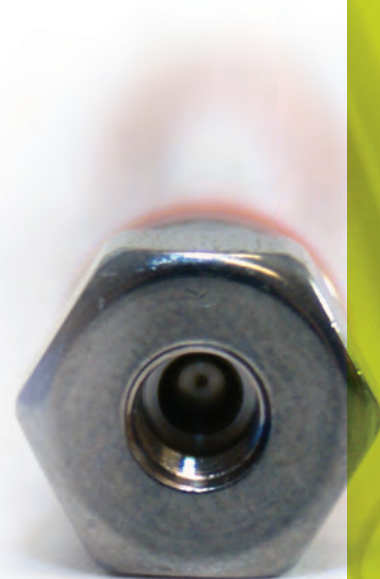
**Retention Times of Common Saccharides (min)**

Saccharide	H <sup>+</sup>	Ca <sup>2+</sup>	Pb <sup>2+</sup>
Adonitol	11.5	14.9	20.4
Arabinose	11.4	13.6	19.4
Erythritol	12.7	15.6	20.3
Fructose	10.6	13.5	19.3
Fucose	12.2	13.7	17.1
Galactose	1.07	12.2	15.6
Glucose	9.9	11.1	13.9
Glycerol	14.1	16.1	19.5
Lactose	8.6	9.7	12.8
Maltose	8.4	9.5	12.5
Maltotriose	7.7	8.7	11.9
Mannitol	11.0	17.3	28.9
Mannose	1.5	12.5	16.7
Raffinose	8.2	8.6	11.4
Sorbitol	11.1	20.7	N/A
Sucrose	9.8	9.4	11.9
Xylose	10.6	12.0	15.0

**Conditions: Column: 300 x 7.7mm**

Mobile Phase:	H <sub>2</sub> O
Flow Rate:	0.6mL/min
Detection:	RI
Temperature:	75°C (H <sup>+</sup> )
	85°C (Ca <sup>2+</sup> )
	80°C (Pb <sup>2+</sup> )

Note: partial hydrolysis may occur with some saccharides using H<sup>+</sup>.



# Thermo Scientific LC Accessories

## Viper Fingertight Fittings

Provides ease of use and dead-volume free plumbing of every conventional HPLC and UHPLC system

- Provides virtually zero-dead volume fingertight connections
- Supports operating pressures up to 1250 bar (18,130 psi)
- Available in different lengths: 65mm and from 150 to 950mm in 100mm steps
- Available in different inner diameters: 0.1mm (0.004in), 0.13mm (0.005in) or 0.18mm (0.007in)
- Easy to use due to stainless steel or biocompatible MP35N™ capillaries (1/32in OD) and fingertight design
- Works with virtually any valve and column from any manufacturer
- Fits narrow connections such as 10-port valves and enables mixed use with different designs



The Thermo Scientific™ Dionex™ Viper™ fingertight fitting system provides ease of use and virtually dead-volume free plumbing of every conventional HPLC and modern UHPLC system. Together with flexible stainless steel (SST) or biocompatible MP35N® capillaries, it opens a new dimension in liquid chromatography. The Viper system improves chromatographic results, independent of various different connection geometries and system backpressures. Connecting LC modules,

valves, and columns quickly and easily without tools is simple with the Viper system.

Extra column volumes in HPLC have the most detrimental effects on the separation efficiency of an LC system and must be minimized. Conventional fittings tightened by hand or using tools have considerable drawbacks which can compromise efficiency. The Viper fitting system overcomes these

drawbacks by design, working without ferrules to reduce the dead volume of any fluidic connection to virtually zero. The Viper system unifies robust performance, ease of use, acceptable lifetime, and universal compatibility with virtually all different valves and columns for HPLC system users. All Thermo Scientific™ Dionex™ UltiMate™ 3000 XRS, RS, BioRS and SD systems are equipped with Viper fingertight fitting system as a standard.

### Viper Fingertight Fitting Systems – SST and Biocompatible MP35N

Length (mm)	0.1mm ID, SST	0.1mm ID, MP35N	0.13mm ID, SST	0.18mm ID, SST	0.18mm ID, MP35N
65	<b>6040.2207</b>	<b>6042.2306</b>	<b>6040.2307</b>	<b>6040.2357</b>	–
150	<b>6040.2215</b>	<b>6042.2320</b>	<b>6040.2315</b>	<b>6040.2360</b>	–
250	<b>6040.2225</b>	<b>6042.2330</b>	<b>6040.2325</b>	<b>6040.2385</b>	<b>6042.2315</b>
350	<b>6040.2235</b>	<b>6042.2340</b>	<b>6040.2335</b>	<b>6040.2375</b>	<b>6042.2327</b>
450	<b>6040.2245</b>	<b>6042.2350</b>	<b>6040.2345</b>	<b>6040.2365</b>	<b>6042.2337</b>
550	<b>6040.2255</b>	<b>6042.2360</b>	<b>6040.2305</b>	<b>6040.2355</b>	<b>6042.2365</b>
650	<b>6040.2265</b>	–	<b>6040.2310</b>	<b>6040.2395</b>	–
750	–	–	<b>6040.2320</b>	<b>6040.2370</b>	<b>6042.2355</b>
850	–	–	<b>6040.2330</b>	<b>6040.2380</b>	–
950	–	–	<b>6040.2350</b>	<b>6040.2390</b>	<b>6042.2375</b>

### Viper Accessories

Description	Cat. No.	Quantity
Plug, SST	<b>6040.2303</b>	1 Each
Union, SST	<b>6040.2304</b>	1 Each



## Viper Fingertight Fittings Kits for UltiMate 3000 Systems

### Viper Fingertight Fitting Kits for UltiMate 3000 systems

Description	SD Systems	RS Systems
Viper Capillary Kit for ISO, LPG or DGP pumps	<b>6040.2302</b>	<b>6040.2301</b>
Viper Capillary Kit for HPG pumps	<b>6040.2309</b>	<b>6040.2308</b>
Viper Capillary Kit for biocompatible RSLC systems	–	<b>6841.2301</b>
On-line SPE Solution Kit for x2 Dual Standard or RSLC systems	<b>6040.2802</b>	<b>6040.2801</b>
Tandem Operation Solution Kit for x2 Dual Standard or RSLC systems	<b>6040.2804</b>	<b>6040.2803</b>
Application Switching Solution Kit for x2 Dual Standard or RSLC systems	<b>6040.2806</b>	<b>6040.2805</b>
Parallel Setup Solution Kit for x2 Dual Standard or RSLC systems	<b>6040.2810</b>	<b>6040.2809</b>
Inverse Gradient Kit for x2 Dual Standard or RSLC systems	<b>6040.2819</b>	<b>6040.2820</b>
Automated Method Scouting Solution Kit for Standard or RSLC systems	<b>6040.2808</b>	<b>6040.2807</b>
MS Connection Kit for MS-frontends with WPS autosampler, excluding UV detection	<b>6720.0355</b>	<b>6720.0370</b>
MS Connection Kit for MS-frontends with WPS autosampler, including UV detection	<b>6720.0365</b>	<b>6720.0375</b>
MS Connection Kit for MS-frontends with HPG-RS pump and OAS autosampler excluding UV detection	–	<b>6720.0372</b>
MS Connection Kit for MS-frontends with HPG-RS pump and OAS autosampler including UV detection	–	<b>6720.0377</b>

Description	XRS Systems
Viper Capillary Kit for standalone system with with WPS autosampler	<b>6043.2301</b>
Viper Capillary Kit for standalone system with with OAS autosampler	<b>6845.2301A</b>
MS Connection Kit for MS-frontends with WPS autosampler excluding UV detection	<b>6720.0380</b>
MS Connection Kit for MS-frontends with WPS autosampler including UV detection	<b>6720.0385</b>
MS Connection Kit for MS-frontends with LPG-XRS pump and OAS autosampler excluding UV detection	<b>6720.0372</b>
MS Connection Kit for MS-frontends with LPG-XRS pump and OAS autosampler including UV detection	<b>6720.0377</b>

An overview of all UltiMate 3000 systems can be found in the Instruments spare parts section on [4-209](#).

## nanoViper Fingertight Fittings

The Thermo Scientific™ Dionex™ nanoViper™ fingertight UHPLC fitting system is virtually dead volume-free by design. It offers nano LC connections that never fail and brings a peace of mind appreciated by novices, as well as the most experienced users.

- Provides virtually zero-dead-volume connections
- Compatible with backpressures up to 1000 bar (14,500 psi)
- Suitable for temperatures up to 80°C
- Easy to use 1/32" PEEK sheathed fused silica and fingertight design
- Works with virtually any valve, and any column, from any manufacturer
- Paves the way for the easy, tool-free nano, capillary and micro LC setup of any application
- nanoViper fingertight fittings allow you to configure your nano, capillary, and micro LC application completely tool free.



Classical connections in nano LC involve either PEEKsil™ or fused silica in PEEK™ sleeves. These connections consist of a nut, ferrule, sleeve, and fused silica, which all need to be assembled correctly. The sealing is at the ferrule, which theoretically leaves a large potential dead volume. Apart from the risk of dead volume (an extreme case indicated above), there is also a risk of damaging the fused silica tubing or column at the point where the ferrule is compressed. The ferrule has to hold the tubing in the sleeve and seal of the connection.

The nanoViper connections come preassembled and high pressure tested. The fittings do not “grab” the tubing at a single point. It seals at the tip and not with a ferrule. Nor does it “grab” the tubing at a single point. It is this feature that gives nanoViper fittings their UHPLC, virtually dead-volume-free capabilities. The theoretical performance effect between the two example chromatograms below is about 20% increase in peak capacity.



### nanoViper Fingertight Fittings

Length (mm)	Orange 20µm ID	Brown 50µm ID	Black 75µm ID	Red 100µm ID	Purple 150µm ID
70	<b>6041.5120</b>	<b>6041.5123</b>	<b>6041.5126</b>	<b>6041.5820</b>	<b>6041.5817</b>
150	<b>6041.5121</b>	<b>6041.5124</b>	<b>6041.5127</b>	<b>6041.5811</b>	<b>6041.5818</b>
250	–	–	<b>6041.5730</b>	<b>6041.5812</b>	<b>6041.5819</b>
350	<b>6041.5240</b>	<b>6041.5540</b>	<b>6041.5735</b>	<b>6041.5813</b>	<b>6041.5820</b>
450	–	–	–	<b>6041.5814</b>	<b>6041.5821</b>
550	<b>6041.5260</b>	<b>6041.5560</b>	<b>6041.5760</b>	<b>6041.5815</b>	<b>6041.5822</b>
650	<b>6041.5275</b>	<b>6041.5575</b>	<b>6041.5775</b>	–	–
750	<b>6041.5280</b>	<b>6041.5580</b>	<b>6041.5780</b>	<b>6041.5816</b>	<b>6041.5823</b>
950	<b>6041.5122</b>	<b>6041.5125</b>	<b>6041.5128</b>	–	–

### Trap Column Cartridges Holders with nanoViper Fittings

Description	Cartridge Length (mm)	Fitting ID (µm)	Cat. No.
µ-Precolumn holder for trap cartridges with 2 x 100mm length nanoViper fittings	5	30	<b>164649</b>
	15	75	<b>164650</b>

### Sample Loops with nanoViper Fittings

Volume (µL)	Cat. No.	Quantity
1	<b>6826.2401</b>	1 Each
5	<b>6826.2405</b>	1 Each
10	<b>6826.2410</b>	1 Each
20	<b>6826.2420</b>	1 Each
50	<b>6826.2450</b>	1 Each
125	<b>6826.2412</b>	1 Each

## nanoViper Application Kits

nanoViper fittings are also included in tubing and application kits designed for use with the UltiMate 3000 RSLCnano systems.

### nanoViper Fitting Kits for UltiMate 3000 RSLCnano Systems

Description	Tubing	Samples	Trap Column	Separation Column	RSLCnano Systems
Direct Injection nano LC Kit	Y	Y	–	Y	<b>6720.0300</b>
Direct Injection capillary LC Kit	Y	Y	–	Y	<b>6720.0305</b>
Preconcentration nano LC kit	Y	Y	Y	Y	<b>6720.0310</b>
Preconcentration capillary LC kit	Y	Y	Y	Y	<b>6720.0315</b>
Preconcentration monolithic LC kit	Y	Y	Y	Y	<b>6720.0320</b>
2D salt plugs kit	Y	Y	Y	Y	<b>6720.0325</b>
Automated off line SCX-RP peptides kit	Y	Y	Y	Y	<b>6720.0330</b>
Automated off line RP-RP peptides kit	Y	Y	Y	Y	<b>6720.0340</b>
Tandem nano LC kit	Y	Y	Y	Y	<b>6720.0335</b>
FLM nanoViper tubing kit (All tubing for nano LC preconcentration)	Y	–	–	–	<b>6041.5100</b>
MS connection kit	Y	–	–	–	<b>6720.0345</b>
EASY-Spray connection kit (Supports direct injection as well as preconcentration)	Y	Y	Y	–	<b>6720.0395</b>

## SLIPFREE Connectors





Universal self-adjusting connections

- Void-free and leak-free by pushing tubing and ferrule into the end-fitting
- Compatible with all column end-fittings
- Stainless-steel threads
- Fingertight connections to 10,000psi





### SLIPFREE Ferrules

Material	Cat. No.	Quantity
PEEK	<b>36023</b>	1 Each
Vespel	<b>36024</b>	1 Each
Kel-F	<b>36025</b>	1 Each

### SLIPFREE Connectors, Single

	Length (cm)	0.005in ID	0.010in ID	0.020in ID
<b>Single</b>				
	6	<b>30106</b>	<b>31106</b>	<b>32106</b>
	10	<b>30110</b>	<b>31110</b>	<b>32110</b>
	20	<b>30120</b>	<b>31120</b>	<b>32120</b>
	30	<b>30130</b>	<b>31130</b>	<b>32130</b>
	50	<b>30150</b>	—	—
<b>Single Flexible</b>				
	10.5	<b>30111-FLEX</b>	<b>39111-FLEX</b>	—
	15	<b>30115-FLEX</b>	<b>39115-FLEX</b>	—
	28	<b>30128-FLEX</b>	<b>39128-FLEX</b>	—
	40	<b>30140-FLEX</b>	<b>39140-FLEX</b>	—
	50	<b>30150-FLEX</b>	—	—
	60	<b>30160-FLEX</b>	—	—
<b>Single PEEK Collared</b>				
	6	<b>30306</b>	<b>31306</b>	<b>32306</b>
	10	<b>30310</b>	<b>31310</b>	<b>32310</b>
	20	<b>30320</b>	<b>31320</b>	<b>32320</b>
<b>Single Long-neck</b>				
	10	<b>30510</b>	<b>31510</b>	—
	20	<b>30520</b>	<b>31520</b>	<b>32520</b>

### SLIPFREE Connectors, Double

	Length (cm)	0.005in ID	0.010in ID	0.020in ID
<b>Double</b>				
	6	<b>30206</b>	<b>31206</b>	<b>32206</b>
	10	<b>30210</b>	<b>31210</b>	<b>32210</b>
	20	<b>30220</b>	<b>31220</b>	<b>32220</b>
	30	<b>30230</b>	<b>31230</b>	<b>32230</b>
	40	<b>30240</b>	—	—
<b>Double Flexible</b>				
	10.5	<b>30211-FLEX</b>	<b>39211-FLEX</b>	—
	15	<b>30215-FLEX</b>	<b>39215-FLEX</b>	—
	28	<b>30228-FLEX</b>	<b>39228-FLEX</b>	—
	40	<b>30240-FLEX</b>	<b>39240-FLEX</b>	—
<b>Double PEEK Collared</b>				
	6	<b>30406</b>	<b>31406</b>	<b>32406</b>
	10	<b>30410</b>	<b>31410</b>	<b>32410</b>
	20	<b>30420</b>	<b>31420</b>	<b>32420</b>
<b>Double Long-neck</b>				
	10	<b>31710</b>	<b>32710</b>	—
	20	<b>31720</b>	<b>32720</b>	—

## PTFE One-Piece Column Connector

Excellent for high-throughput screening and quick connection

- Fingertight, leak-free connection of analytical and guard columns with 10-32 threads
- Minimizes dead volume
- Inert and biocompatible material



### PEEK One-Piece Column Connector

Description	Cat. No.	Quantity
One Piece Coupler	<b>60170-370</b>	1 Each



## Solvent Inlet Filters

Feature a large surface area for a long lifetime

- 10µm inlet filters for longer lifetime
- No tools required for replacement






### Solvent Inlet Filters for UltiMate 3000 Systems

Description	Model	Cat. No.	Quantity
Filter frit, porosity 10µm, V4A stainless steel	UltiMate 3000 pumps	<b>6268.0110</b>	10 Each
Filter frit, porosity 10µm, titanium	UltiMate 3000 pumps	<b>6268.0111</b>	10 Each
Filter holder	UltiMate 3000 pumps	<b>6268.0115</b>	6 Each
Solvent supply line, 1.5 x 3.0 x 1000mm	UltiMate 3000 pumps	<b>6030.2548</b>	1 Each

## Bottom-of-the-Bottle solvent filters

- Efficient draw
- 100% PTFE polymer, including 2µm filters
- Built-in helium sparge port and frit

### Solvent Filters for HPLC Systems






	Type	For Use with	Cat. No.	Quantity
	Stainless Steel	Fit 1/16in OD tube to 1/8in OD plastic tubing	<b>A-302</b>	1 Each
	Stainless Steel	Fit to 1/8in OD plastic tubing using 1/8in PP nut	<b>A-302A</b>	1 Each
	Bottom-of-the-Bottle	3/16in OD plastic tubing	<b>A-436</b>	1 Each
	Bottom-of-the-Bottle	1/8in OD tubing	<b>A-437</b>	1 Each

## High Pressure Stainless Steel Nuts and Ferrules

Accommodate a wide range of configurations

- Designed for 10-32 port configurations
- Burr and contaminant free

### Thermo Scientific High Pressure Stainless Steel Nuts and Ferrules

Type	Cat. No.	Quantity
 10-32 thread nut with ferrule	<b>F-190</b>	1 Each
Replacement PEEK Ferrules	<b>F-192x</b>	10 Pack
 Male hex nut	<b>U-400x</b>	10 Pack
Universal ferrules, 0.625in	<b>U-401x</b>	10 Pack
 Valco male hex nut, 10-32 thread	<b>U-320x</b>	10 Pack
 Valco ferrules, 0.625in	<b>U-321x</b>	10 Pack
 Male hex nut, Waters compatible	<b>U-410x</b>	10 Pack

## Reducing Union for Preparative Columns

Connects 30 to 50mm ID preparative columns to 1/16in tubing

- Stainless steel construction
- 1.0mm bore
- Without frit

### Reducing Union for Preparative Column




Description	Cat. No.	Quantity
1/8in to 1/16in Reducing Union for Preparative Column	<b>60182-357</b>	1 Each

## PEEK Fingertight Fittings

Machined for reliability and ease of use

- Resist cracking, breaking, thread stripping and leaking in both low and high pressure applications
- Biocompatible for a broad range of applications

### PEEK Fingertight Fittings

Type	Cat. No.	Quantity
 One-piece Fingertight Fitting, 1/16in, 0.37in head	<b>F-120x</b>	10 Pack
 One-Piece Long Fingertight Fitting, 1/16in, 0.37in head	<b>F-130x</b>	10 Pack
 One-Piece PEEK Fingertight Fitting, 1/32in, 0.25in head	<b>M-645x</b>	10 Pack
 Two-Piece Fingertight Wing Nut with Ferrule, 1/16in	<b>F-300x</b>	10 Pack
 Replacement PEEK Ferrules	<b>F-142x</b>	10 Pack
 Column End Plugs, 1/16in, 10-32 coned, Delrin, Black	<b>U-467BLKx</b>	10 Pack
 Column End Plugs, 1/16in, 10-32 coned, Delrin, Red	<b>U-467Rx</b>	10 Pack

## Viper Unions

Suitable only for direct connection of two Viper capillaries

Description	Cat. No.	Quantity
Viper union, stainless steel	<b>6040.2304</b>	1 Each











## Stainless Steel Unions, Tees and Crosses

Well-suited to high pressure applications

- Absolute zero or low dead volume formats
- Includes two stainless steel nuts and ferrules

### Stainless Steel Unions, Tees and Crosses




Description	Through Hole (in)	Swept Volume (μL)	Cat. No.	Quantity
 Union, stainless steel, Upchurch Scientific/Parker fittings compatible, includes 2 stainless steel nuts and ferrules	0.010	0.025	<b>U-435</b>	1 Each
 Union, stainless steel, Upchurch Scientific/Parker fittings compatible, includes 2 stainless steel nuts and ferrules	0.020	0.134	<b>U-402</b>	1 Each
 Union, stainless steel, Upchurch Scientific/Parker fittings compatible, includes 2 stainless steel nuts and ferrules	0.050	0.836	<b>U-437</b>	1 Each
 Union, stainless steel, Upchurch Scientific/Parker fittings compatible, includes 2 stainless steel nuts and ferrules	0.062	~0.0	<b>U-438</b>	1 Each
 Union, stainless steel, Waters fittings compatible, includes 2 stainless steel nuts and ferrules	0.020	0.129	<b>U-412</b>	1 Each
 Union, stainless steel, Valco fittings compatible, includes 2 stainless steel nuts and ferrules	0.020	0.103	<b>U-322</b>	1 Each
 Tee, stainless steel, 10-32 fittings for use with 1/16in OD tubing	0.020	0.57	<b>U-428</b>	1 Each
 Cross, stainless steel, 10-32 fittings for use with 1/16in OD tubing	0.020	0.72	<b>U-430</b>	1 Each

## PEEK Unions, Tees and Crosses

Well-suited to high pressure applications

- Absolute zero or low dead volume formats
- Biocompatible

### PEEK and PEEK Lined Unions, Tees and Crosses

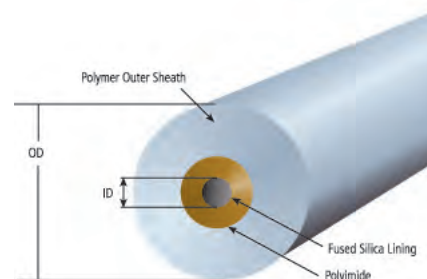
	Description	Through Hole (in)	Swept Volume (µL)	Cat. No.	Quantity
	Union, PEEK polymer, includes two PEEK 2-piece fittings	0.010	0.070	<b>P-742</b>	1 Each
	Union, PEEK polymer, includes two PEEK 2-piece fittings	0.020	0.28	<b>P-704</b>	1 Each
	Tee, PEEK, 10-32 fittings for use with 1/16in OD tubing, includes three 10-32 PEEK double-winged nuts	0.020	0.57	<b>P-727</b>	1 Each
	PEEK, 10-32 fittings for use with 1/16in OD tubing, includes four 10-32 PEEK double-winged nuts	0.020	0.72	<b>P-729</b>	1 Each



## PEEKsil Capillary Tubing

Excellent chemical compatibility and very low carryover

- Precision-bore fused silica tubing coated with 1/16in OD PEEK covering
- Usable in most standard chromatography systems
- Withstands high pressures
- Smooth internal surface for excellent flow characteristics
- Tubing is stiff: not recommended for uses requiring tubing bends
- Precut lengths only: cutting in the lab may damage tubing



### PEEKsil Capillary Tubing

ID (in)	Length (cm)	Cat. No.	Quantity
0.002	10	<b>60182-500</b>	5 Pack
	20	<b>60182-501</b>	5 Pack
	50	<b>60182-502</b>	2 Pack
0.004	10	<b>60182-503</b>	5 Pack
	20	<b>60182-504</b>	5 Pack
	50	<b>60182-505</b>	2 Pack
0.007	10	<b>60182-506</b>	5 Pack
	20	<b>60182-507</b>	5 Pack
	50	<b>60182-508</b>	2 Pack

### Applications:

- HPLC
- LC-MS

## PEEK Sleeves for Fused Silica Capillary Tubing

Withstands high pressures

### 1/16in OD PEEK Sleeves for Fused Silica Capillary Tubing

ID (in)	Color	Cat. No.	Quantity
0.008	Yellow	<b>F-227</b>	1 Each
0.010	Blue	<b>F-228</b>	1 Each
0.012	Natural	<b>F-229</b>	1 Each
0.015	Orange	<b>F-230</b>	1 Each
0.021	Natural	<b>F-231</b>	1 Each
0.030	Natural	<b>F-232</b>	1 Each

## 316 Stainless Steel Capillary Tubing

Cleaned, polished, passivated and ready-to-use

- Suitable for ultra high pressure applications
- Wide chemical compatibility
- Prefinished, square, burr-free ends and interiors to minimize dead volume connections
- Not recommended for biological samples
- Rough internal surface may lead to sample carryover



### 316 Stainless Steel Capillary Tubing

ID (in)	Length (cm)	Color	Cat. No.	Quantity
<b>1/16in OD Precut Tubing</b>				
0.005	5	Red	<b>U-152</b>	1 Each
	10	Red	<b>U-153</b>	1 Each
	20	Red	<b>U-154</b>	1 Each
	30	Red	<b>U-155</b>	1 Each
	50	Red	<b>U-156</b>	1 Each
	100	Red	<b>U-157</b>	1 Each
0.007	5	Black	<b>U-126</b>	1 Each
	10	Black	<b>U-127</b>	1 Each
	20	Black	<b>U-128</b>	1 Each
	30	Black	<b>U-129</b>	1 Each
	50	Black	<b>U-130</b>	1 Each
	100	Black	<b>U-131</b>	1 Each
0.010	5	Blue	<b>U-111</b>	1 Each
	10	Blue	<b>U-112</b>	1 Each
	20	Blue	<b>U-113</b>	1 Each
	30	Blue	<b>U-114</b>	1 Each
	50	Blue	<b>U-132</b>	1 Each
	100	Blue	<b>U-133</b>	1 Each
<b>1/32in OD Precut Tubing with 1/16in Sleeves</b>				
0.005	10.5	Red	<b>30011-FLEX</b>	1 Each
	15	Red	<b>30015-FLEX</b>	1 Each
	28	Red	<b>30028-FLEX</b>	1 Each
	40	Red	<b>30040-FLEX</b>	1 Each
0.007	10.5	Yellow	<b>39011-FLEX</b>	1 Each
	15	Yellow	<b>39015-FLEX</b>	1 Each
	28	Yellow	<b>39028-FLEX</b>	1 Each
	40	Yellow	<b>39040-FLEX</b>	1 Each

### 1/16in 316 Stainless Steel Tubing, 5-Foot Coil

ID (in)	Cat. No.	Quantity
0.005	<b>U-158</b>	1 Each
0.007	<b>U-108</b>	1 Each
0.010	<b>U-106</b>	1 Each
0.020	<b>U-105</b>	1 Each
0.030	<b>U-107</b>	1 Each
0.040	<b>U-144</b>	1 Each
0.046	<b>U-151</b>	1 Each

## PEEK Capillary Tubing

Pre-cut and color-coded for easy identification and use

- Broad chemical compatibility
- Biocompatible
- Easily cut to desired length
- Appropriate for many HPLC applications
- Resistant to most organic solvents, but nitric acid, sulfuric acid, dichloromethane, THF and DMSO are not recommended

### 1/16in OD Precut PEEK Tubing

ID (in)	Length (cm)	Color	Cat. No.	Quantity
0.003	5	Natural	<b>37003-5</b>	1 Each
	10	Natural	<b>37003-10</b>	1 Each
	20	Natural	<b>37003-20</b>	1 Each
	30	Natural	<b>37003-30</b>	1 Each
	50	Natural	<b>37003-50</b>	1 Each
	100	Natural	<b>37003-100</b>	1 Each
0.005	5	Red	<b>37005-5</b>	1 Each
	10	Red	<b>37005-10</b>	1 Each
	20	Red	<b>37005-20</b>	1 Each
	30	Red	<b>37005-30</b>	1 Each
	50	Red	<b>37005-50</b>	1 Each
	100	Red	<b>37005-100</b>	1 Each
0.007	5	Yellow	<b>37007-5</b>	1 Each
	10	Yellow	<b>37007-10</b>	1 Each
	20	Yellow	<b>37007-20</b>	1 Each
	30	Yellow	<b>37007-30</b>	1 Each
	50	Yellow	<b>37007-50</b>	1 Each
	100	Yellow	<b>37007-100</b>	1 Each
0.010	5	Blue	<b>37010-5</b>	1 Each
	10	Blue	<b>37010-10</b>	1 Each
	20	Blue	<b>37010-20</b>	1 Each
	30	Blue	<b>37010-30</b>	1 Each
	50	Blue	<b>37010-50</b>	1 Each
	100	Blue	<b>37010-100</b>	1 Each
0.020	5	Orange	<b>37020-5</b>	1 Each
	10	Orange	<b>37020-10</b>	1 Each
	20	Orange	<b>37020-20</b>	1 Each
	30	Orange	<b>37020-30</b>	1 Each
	50	Orange	<b>37020-50</b>	1 Each
	100	Orange	<b>37020-100</b>	1 Each

### 1/16in OD PEEK Tubing, 5-Foot Coil

ID (in)	Cat. No.	Quantity
0.003	<b>37003</b>	1 Each
0.005	<b>37005</b>	1 Each
0.007	<b>37007</b>	1 Each
0.010	<b>37010</b>	1 Each
0.020	<b>37020</b>	1 Each
0.030	<b>37030</b>	1 Each
0.040	<b>37040</b>	1 Each



## Polymer Tubing Cutter

Produces a flat, 90°, burr-free end

- Compatible with rigid polymeric tubing
- Guide holes for 1/16in and 1/8in tubing



### Polymer Tubing Cutter

Description	Cat. No.	Quantity
Polymeric Tubing Cutter	<b>A-327</b>	1 Each
Replacement blades	<b>A-328</b>	5 Pack

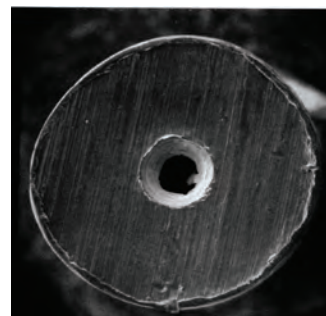
## Terry Tool Tubing Cutters

Produce clean, 90° cuts of stainless steel tubing



### Terry Tool Tubing Cutters

Description	Cat. No.	Quantity
1/16in stainless steel tubing	<b>60182-509</b>	1 Each
1/8in stainless steel tubing	<b>60182-510</b>	1 Each



## Fused Silica Cutter

### Fused Silica Cutter

Description	Cat. No.	Quantity
Cutter for fused silica capillaries	<b>6720.0016</b>	1 Each



## Rheodyne 7725 and 7725i Sample Injectors

Allow continuous flow between the load and inject positions to protect against pressure shock

- Stainless steel construction
- Make-Before-Break (MBB) design
- Can use partial filling for zero sample waste or complete filling for better reproducibility
- Inject 1µL to 5mL with high accuracy and precision
- 7725i features a position sensing switch for a reproducible start signal



### Rheodyne 7725 and 7725i Sample Injectors

Model	Mode	Features	Cat. No.	Quantity
7725	Dual	Continuous flow	<b>7725</b>	1 Each
7725i	Dual	Continuous flow, position sensing switch	<b>7725i</b>	1 Each

## Rheodyne 9725 and 9725i Sample Injectors

Allow continuous flow between the load and inject positions to protect against pressure shock

- Biocompatible PEEK construction
- Make-Before-Break (MBB) design
- Can use partial filling for zero sample waste or complete filling for better reproducibility
- Inject 1µL to 5mL with high accuracy and precision
- 9725i features a position sensing switch for a reproducible start signal

### Rheodyne 9725 and 9725i Sample Injectors

Model	Mode	Features	Cat. No.	Quantity
9725	Dual	Continuous flow	<b>9725</b>	1 Each
9725i	Dual	Continuous flow, position sensing switch	<b>9725i</b>	1 Each

## Rheodyne 8125 Low-dispersion Microscale Injector

Designed for use with 1 and 2mm ID HPLC columns

- Can use partial filling for zero sample waste or complete filling for better reproducibility
- Position sensing switch provides reproducible start signal
- Suitable for use with 5 to 50µL sample loops



### Rheodyne 8125 Low-dispersion Microscale Injector

Model	Mode	Features	Cat. No.	Quantity
8125	Dual	Continuous flow	<b>8125</b>	1 Each

## Rheodyne 7010 Sample Injector

Single-mode sample injector designed for the complete filling method



### Rheodyne 7010 Sample Injector

Model	Mode	Features	Cat. No.	Quantity
7010	Single	Complete filling method	<b>7010</b>	1 Each

### Compatible with:

sample loop sizes 5µL to 20mL

## Rheodyne 9010 Sample Injector

Single-mode sample injector designed for the complete filling method

- Compatible with sample loop sizes 5µL to 10mL
- PEEK stator
- Position sensing switch provides a reproducible start signal

### Rheodyne 9010 Sample Injector

Model	Mode	Features	Cat. No.	Quantity
9010	Single	Continuous flow, position sensing switch	<b>9010</b>	1 Each

## Rheodyne Ports for Injectors

Suitable for popular Rheodyne injector models



### Rheodyne Ports for Rheodyne Injectors Models 7010 and 9010

For Use with Rheodyne Model	Cat. No.	Quantity
7010 Filler Port, Stainless Steel	<b>7012</b>	1 Each
9010 Filler Port, PEEK	<b>9012</b>	1 Each
9010 Needle Port, PEEK	<b>9013</b>	1 Each



## Rheodyne Sample Loops

For Rheodyne sample injectors in stainless steel or biocompatible PEEK

### PEEK and Stainless Steel Sample Loops

Description	Volume	ID (mm / in)	Cat. No.	Quantity
Sample loops for 7010 and 7125 injectors, Stainless Steel	5µL	0.18 / 0.007	<b>7020</b>	1 Each
	10µL	0.30 / 0.012	<b>7021</b>	1 Each
	20µL	0.30 / 0.012	<b>7022</b>	1 Each
	50µL	0.51 / 0.020	<b>7023</b>	1 Each
	100µL	0.51 / 0.020	<b>7024</b>	1 Each
	200µL	0.76 / 0.030	<b>7025</b>	1 Each
	500µL	0.76 / 0.030	<b>7026</b>	1 Each
	1mL	0.76 / 0.030	<b>7027</b>	1 Each
	5mL	1.0 / 0.040	<b>7029</b>	1 Each
Sample loops for 7725 and 7725i injectors Stainless Steel	5µL	0.18 / 0.007	<b>7755-020</b>	1 Each
	10µL	0.30 / 0.012	<b>7755-021</b>	1 Each
	20µL	0.30 / 0.012	<b>7755-022</b>	1 Each
	50µL	0.51 / 0.020	<b>7755-023</b>	1 Each
Sample loops for 8125 injectors, Stainless Steel	5µL	0.20 / 0.008	<b>8020</b>	1 Each
	10µL	0.20 / 0.008	<b>8021</b>	1 Each
	20µL	0.25 / 0.010	<b>8022</b>	1 Each
	50µL	0.30 / 0.012	<b>8023</b>	1 Each
Sample loops for 9010 and 9725 injectors, PEEK	2µL	Internal	<b>7755-015</b>	1 Each
	5µL	0.18 / 0.007	<b>9055-020</b>	1 Each
	10µL	0.25 / 0.010	<b>9055-021</b>	1 Each
	20µL	0.25 / 0.010	<b>9055-022</b>	1 Each
	50µL	0.51 / 0.020	<b>9055-023</b>	1 Each
	100µL	0.51 / 0.020	<b>9055-024</b>	1 Each
	200µL	0.51 / 0.020	<b>9055-025</b>	1 Each
	500µL	0.76 / 0.030	<b>9055-026</b>	1 Each
	1mL	0.76 / 0.030	<b>9055-027</b>	1 Each
	5mL	0.76 / 0.030	<b>9055-029</b>	1 Each
Sample loops for 9725 and 9725i injectors, PEEK	5µL	0.18 / 0.007	<b>9055-020</b>	1 Each
	10µL	0.25 / 0.010	<b>9055-021</b>	1 Each
	20µL	0.25 / 0.010	<b>9055-022</b>	1 Each
	50µL	0.51 / 0.020	<b>9055-023</b>	1 Each

## RheBuild Kits

Maintain Rheodyne valves and injectors

### RheBuild Kits

For Use with Rheodyne Models	Cat. No.	Quantity
3725/3725i/3725-038/3725i-038	<b>3725-999</b>	1 Each
7010/7000	<b>7010-999</b>	1 Each
7125/7126	<b>7125-999</b>	1 Each
7410	<b>7410-999</b>	1 Each
7520/7526	<b>7520-999</b>	1 Each
7725/7725i/7726	<b>7725-999</b>	1 Each
8125/8126	<b>8125-999</b>	1 Each
9125/9126	<b>9125-999</b>	1 Each

## Rheodyne Suction Needle Adapter

For use with Rheodyne sample injectors

### Rheodyne Suction Needle Adapter

For Use with	Cat. No.	Quantity
Rheodyne Injector Models 9725 and 9725i	<b>9125-076</b>	1 Each

## Rheodyne Replacement Rotor Seals for Injectors

Suitable for popular Rheodyne injector models

### Rheodyne Replacement Rotor Seals for Injectors

For Use with Rheodyne Models	Cat. No.	Quantity
<b>Vespel Seals</b>		
7000/7010/7040/7067	<b>7010-039</b>	1 Each
7030	<b>7030-003</b>	1 Each
7060/7066	<b>7060-070</b>	1 Each
7125/7126	<b>7125-047</b>	1 Each
7410	<b>7410-038</b>	1 Each
7413	<b>7413-013</b>	1 Each
8125/8126	<b>8125-038</b>	1 Each
<b>Tefzel Seals</b>		
7000/7010/7040	<b>7010-071</b>	1 Each
7030	<b>7030-015</b>	1 Each
7060/7066/9060	<b>7060-074</b>	1 Each
7410	<b>7410-075</b>	1 Each
7125/7126	<b>7125-079</b>	1 Each
8125	<b>8125-097</b>	1 Each
9010	<b>9010-051</b>	1 Each
9125	<b>9125-082</b>	1 Each
<b>PEEK Seals</b>		
3725/3725i/3725-038/3725i-038	<b>3725-018</b>	1 Each

## Rheodyne Stators

Suitable for popular Rheodyne injector models

### Rheodyne Stators

For Use with Rheodyne Models	Cat. No.	Quantity
7000/7010/7030/7040/7125	<b>7010-040</b>	1 Each
7010-087/7125-081	<b>7010-066</b>	1 Each
7060/7066	<b>7060-039</b>	1 Each
7410/7413	<b>7410-041</b>	1 Each
9010/9030/9125	<b>9125-043</b>	1 Each
9060	<b>9060-016</b>	1 Each
7725	<b>7725-010</b>	1 Each
8125/8126	<b>8125-098</b>	1 Each

### Rheodyne Stator Face Assemblies

For Use with Rheodyne Models	Cat. No.	Quantity
3725/3725i/3725-038/3725i-038	<b>3725-039</b>	1 Each
7125	<b>7125-067</b>	1 Each
8125	<b>8125-074</b>	1 Each
9125/9010/9030	<b>8125-094</b>	1 Each
9060	<b>9060-015</b>	1 Each
9725	<b>7725-026</b>	1 Each

## Rheodyne Injection Port Needle Cleaner

For use with Rheodyne sample injectors

### Rheodyne Injection Port Needle Cleaner

For Use with	Cat. No.	Quantity
Rheodyne injectors	<b>7125-054</b>	1 Each

## Rheodyne Valve Mounting Brackets

For use with Rheodyne sample injectors

### Rheodyne Injection Port Needle Cleaner






For Use with	Cat. No.	Quantity
Angle bracket	<b>7160-010</b>	1 Each
Mouting panel	<b>7160</b>	1 Each

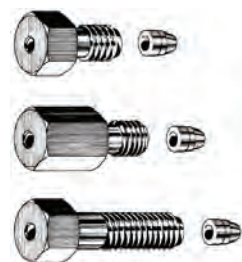


## RheFlex High Pressure Fittings

Precision machined from 316 stainless steel

### RheFlex High Pressure Fittings

	Type	Cat. No.	Quantity
	Short Fittings Set	<b>6000-109</b>	5 Pack
	Short Fittings Set	<b>6000-209</b>	10 Pack
	Long Fittings Set	<b>6000-111</b>	5 Pack
	Long Fittings Set	<b>6000-211</b>	10 Pack
	Extra Long Fittings Set	<b>6000-162</b>	5 Pack
	Extra Long Fittings Set	<b>6000-262</b>	10 Pack
	1/16in Ferrule	<b>6000-110</b>	5 Pack
	1/16in Ferrule	<b>6000-210</b>	10 Pack
	0.5mm Ferrule for Model 8125	<b>8125-084</b>	1 Each



## RheFlex Two-Piece PEEK Fittings

Provide inert, metal-free connections

- Slotted back-side of the ferrule is squeezed down onto the tube by the mating conical surface of the nut
- May be used on 1/16in metal or plastic tubing reliably up to 5000 psi
- Reusable ferrule and nut

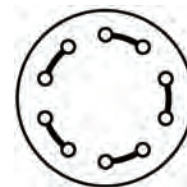
### RheFlex Two-Piece PEEK Fittings

Type	Cat. No.	Quantity
Fitting set, standard length	<b>6000-054</b>	5 Pack
Fitting set, short	<b>6000-055</b>	5 Pack
Fitting set, X-long	<b>6000-066</b>	1 Each
Replacement ferrules	<b>6000-051</b>	5 Pack



## Cheminert Model C2 Microbore Injector

Can be used as an injector or switching valve



- 1/16in fittings
- 0.010in ports
- Available in 6-port or 10-port configurations
- Available with manual or microelectric actuator

### Cheminert Model C2 Microbore Injector

Description	Sample Volume	Cat. No.	Quantity
Model C2 injector, N60 stainless stator, 5µL loop, manual	6 ports	<b>C2-1006</b>	1 Each
	10 ports	<b>C2-1000</b>	1 Each
Model C2 injector, N60 stainless stator, 5µL loop, microelectric actuator	6 ports	<b>C2-1006EH</b>	1 Each
	10 ports	<b>C2-1000EP</b>	1 Each
Sample injector loops, stainless steel	2µL	<b>CSL2</b>	1 Each
	5µL	<b>CSL5</b>	1 Each
	10µL	<b>CSL10</b>	1 Each
	20µL	<b>CSL20</b>	1 Each
	50µL	<b>CSL50</b>	1 Each
	100µL	<b>CSL100</b>	1 Each
Model C4 injector, PAEK stator, 5µL loop, microelectric actuator	6 ports	<b>C2-1346EH</b>	1 Each
	10 ports	<b>C2-1340EP</b>	1 Each
Sample injector loops, PAEK	5µL	<b>CZSL5PK</b>	1 Each
	10µL	<b>CZSL10PK</b>	1 Each
	50µL	<b>CZSL50PK</b>	1 Each
	100µL	<b>CZSL100PK</b>	1 Each

## Valco Injector Model C6W

Description	Volume	Cat. No.	Quantity
Model C6W injector, six 0.016in ports, manual	20µL loop	<b>C6W</b>	1 Each
Model EPC6W injector, six 0.016in ports, microelectric actuator	20µL loop	<b>EPC6W</b>	1 Each
Replacement rotor	–	<b>SSAC6W</b>	1 Each
Sample injector loop, stainless steel	2µL	<b>SL2CW</b>	1 Each
Sample injector loop, stainless steel	5µL	<b>SL5CW</b>	1 Each
Sample injector loop, stainless steel	10µL	<b>SL10CW</b>	1 Each
Sample injector loop, stainless steel	20µL	<b>SL20CW</b>	1 Each
Sample injector loop, stainless steel	50µL	<b>SL50CW</b>	1 Each
Sample injector loop, stainless steel	100µL	<b>SL100CW</b>	1 Each

## Valco Accessories

Description	Volume	Cat. No.	Quantity
Valco syringe ports	22 ga. needles; 1/16in fittings	<b>VISF-1</b>	1 Each
Valco syringe ports	22 ga. 2in needles	<b>VISF-2</b>	1 Each
Valco Nuts and Ferrules	1/16in standard nut	<b>ZN1-10</b>	10 Pack
Valco Nuts and Ferrules	1/16in long nut	<b>LZN1-10</b>	10 Pack
Valco Nuts and Ferrules	1/16in SS ferrule	<b>ZF1-10</b>	10 Pack

## HPLC Syringes

Syringes and needles for Thermo Scientific LC instruments

### Syringes for UltiMate 3000 Instruments

Volume (µL)	Instrument	Cat. No.	Quantity
25	All WPS-3000 variants	<b>6822.0001</b>	1 Each
100	All WPS-3000 variants	<b>6822.0002</b>	1 Each
250	All WPS-3000 and ACC-3000 variants, except the WPS-3000TXRS	<b>6822.0003</b>	1 Each
500	All WPS-3000 variants, except the WPS-3000TXRS	<b>6822.0004</b>	1 Each
1000	All WPS-3000 and ACC-3000 variants, except the WPS-3000TXRS	<b>6822.0005</b>	1 Each

### Syringes for Thermo Scientific Instruments

Volume (µL)	Needle Type	Length (mm)	Gauge	Instrument	Cat. No.	Quantity
250	Removable	50	22	LCQ	<b>365ILT21</b>	1 Each
500	Removable	50	22	LCQ	<b>365JLT41</b>	1 Each
250	–	–	–	AS1000, AS3000	<b>365ILT91</b>	1 Each
500	–	–	–	AS1000, AS3000	<b>365JLT61</b>	1 Each
2500	–	–	–	AS3000, AS3500	<b>365LLT81</b>	1 Each

### Mass Spectrometry Replacement ESI Probe Needles

Instrument	Cat. No.	Quantity
LCQ, XP, DECA, Advantage	<b>365RNLT1</b>	1 Each
LCQ MS	<b>365RNLT2</b>	1 Each
LCQ XSQ	<b>365RNLT3</b>	1 Each





## LC Syringes for Manual Injection valves

Easy, accurate and reproducible manual injection

- Square tip to prevent damage to the injector
- Wide range of volumes
- Precision made from borosilicate glass and stainless steel
- Robust design and easy-to-read markings

### Gas Tight Syringes for Rheodyne / Valco Injectors

Volume (µL)	Needle Type	Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
10	Removable	50	22	90° Blunt End	<b>365DLG21</b>	1 Each
25	Removable	50	22	90° Blunt End	<b>365FLG31</b>	1 Each
50	Removable	50	22	90° Blunt End	<b>365GLG41</b>	1 Each
100	Removable	50	22	90° Blunt End	<b>365HLG51</b>	1 Each
250	Removable	50	22	90° Blunt End	<b>365ILG61</b>	1 Each
500	Removable	50	22	90° Blunt End	<b>365JLG71</b>	1 Each

### Replacement Needles

Replacement Needle for Syringe	Cat. No.	Quantity
365DLG21	<b>365RNL15</b>	5 Pack
365FLG31	<b>365RNL25</b>	5 Pack
365GLG41	<b>365RNL25</b>	5 Pack
365HLG51	<b>365RNL25</b>	5 Pack
365ILG61	<b>365RNL25</b>	5 Pack
365JLG71	<b>365RNL25</b>	5 Pack

### Gas Tight Syringes for Rheodyne / Valco Injectors

Volume (µL)	Needle Type	Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
10	Fixed	50	22	90° Blunt End	<b>365DL263</b>	1 Each
25	Fixed	50	22	90° Blunt End	<b>365F6315</b>	1 Each
50	Fixed	50	22	90° Blunt End	<b>365G6316</b>	1 Each
100	Fixed	50	22	90° Blunt End	<b>365H6317</b>	1 Each
250	Fixed	50	22	90° Blunt End	<b>365ILG61</b>	1 Each
500	Fixed	50	22	90° Blunt End	<b>365J6319</b>	1 Each

### Syringes for Rheodyne / Valco Injectors

Volume (µL)	Needle Type	Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
5	Fixed	50	22	90° Blunt End	<b>365CL221</b>	1 Each
10	Fixed	50	22	90° Blunt End	<b>365DL231</b>	1 Each
25	Fixed	50	22	90° Blunt End	<b>365FL241</b>	1 Each
50	Fixed	50	22	90° Blunt End	<b>365GL251</b>	1 Each
100	Fixed	50	22	90° Blunt End	<b>365HL261</b>	1 Each
250	Fixed	50	22	90° Blunt End	<b>365IL271</b>	1 Each
500	Fixed	50	22	90° Blunt End	<b>365JL281</b>	1 Each

## Other LC Syringes

- Instrument specific syringes
- Luer-Lok syringes ideal for priming
- Macro volume sampling syringes suitable for liquid or gas samples

### Syringes for CTC Instruments

Volume (µL)	Needle Type	Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
10	Fixed	50	22	–	<b>365DL991</b>	1 Each
25	Fixed	50	22	–	<b>365FL715</b>	1 Each
50	Fixed	50	22	–	<b>365GL810</b>	1 Each
100	Fixed	50	22	–	<b>365HL331</b>	1 Each

### Replacement Plungers

Replacement Plunger for Syringe	Cat. No.	Quantity
365DL991	<b>365RP532</b>	1 Each
365FL715	<b>365RP922</b>	1 Each

### Syringes for Waters Instruments

Volume (µL)	Needle Type	Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
1	Fixed	70	26s	Bevel	<b>365BL443</b>	1 Each
1	Fixed	70	26s	90° Blunt End	<b>365BL447</b>	1 Each

### PTFE Luer-Lok Syringes

Volume (mL)	Needle Type	Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
1	–	–	–	–	<b>365KL531</b>	1 Each
2.5	–	–	–	–	<b>365LL541</b>	1 Each
5	–	–	–	–	<b>365ML551</b>	1 Each
10	–	–	–	–	<b>365NL561</b>	1 Each
25	–	–	–	–	<b>365PL571</b>	1 Each

### Needles for Luer-Lok Priming Syringes

	Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
	50	22	90° Blunt End	<b>365RNL22</b>	2 Pack

### Syringes for Macro Volume Sampling

Volume (mL)	Needle Type	Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
1	Fixed	50	22s	Bevel	<b>365K3051</b>	1 Each
2.5	Fixed	50	22s	Bevel	<b>365LL375</b>	1 Each
5	Fixed	50	22s	Bevel	<b>365M5212</b>	1 Each
10	Fixed	50	22s	Bevel	<b>365N5214</b>	1 Each

## Detector Lamps

### Detector Lamps for UltiMate 3000 Instruments

Description	Model	Cat. No.	Quantity
Deuterium Lamp	MWD-3000(RS), DAD-3000(RS), VWD-3100 and VWD-3400RS	<b>6074.1110</b>	1 Each
Tungsten Lamp	MWD-3000(RS), DAD-3000(RS), VWD-3100 and VWD-3400RS	<b>6074.2000</b>	1 Each

### Detector Lamps for Thermo Scientific Instruments

Description	Model	Cat. No.	Quantity
Deuterium Lamp	SP8400/SP8430/SP8440/SP8450/SP8480/SP8490	<b>DSP-901</b>	1 Each
	SP8480XR/SP8773XR	<b>DSP-907</b>	1 Each
	Linear UV100/UV200/UV1000/UV2000/UV3000/ Focus/Spectrochrom	<b>DSP-908</b>	1 Each

### Detector Lamps for Agilent Instruments

Description	Model	Cat. No.	Quantity
Deuterium Lamp	Agilent HP1040/HP1050 (G1306A) DAD/HP 1050 DA (1050 MWD)/ HP MW (79854A) / HP 1090 (75880A) DAD	<b>DHP-901</b>	1 Each
	HP 1080/HP 1081/HP1081B/HP1082B/HP1084/HP1084B	<b>DHP-902</b>	1 Each
	HP 1050 VW (79853C)	<b>DHP-903</b>	1 Each
	HP 8450/8450A	<b>DHP-909</b>	1 Each
	HP 1100 (G1314) VW	<b>DHP-910</b>	1 Each
	HP 1100 (G1315A) DAD	<b>DHP-911</b>	1 Each
	HP 8453	<b>DHP-912</b>	1 Each
	HP 8452 A DAD/HP 8452A Opt 002	<b>DHP-913</b>	1 Each
Xenon Lamp	HP 1046/HP1046A	<b>DHP-906</b>	1 Each
LL Deuterium Lamp	Agilent 1100 VWD long life	<b>DHP-910LL</b>	1 Each
	Agilent 1100 DAD long life	<b>DHP-911LL</b>	1 Each

### Detector Lamps for Merck-Hitachi Instruments

Description	Model	Cat. No.	Quantity
Deuterium Lamp	101/102/111	<b>DHI-901</b>	1 Each
	100-10/100-40/100-50/100-60	<b>DHI-902</b>	1 Each
	150-20/200/220/300/330/340/2000/3000/4000/ L2500/L3000/L4000/L-4500	<b>DHI-903</b>	1 Each
	L4200/L4250/L4500	<b>DHI-908</b>	1 Each
	LaChrom L4720/L4520/L7400/L450	<b>DHI-910</b>	1 Each
Xenon Lamp	Hitachi fluorescence detectors F1000/2000/4000 Series	<b>DHI-911</b>	1 Each

Our applications team is regularly presenting at key events, download one of our recent posters.  
[www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)

**Detector Lamps for PerkinElmer Instruments**

Description	Model	Cat. No.	Quantity
Deuterium Lamp	Lambda 3/7/9	<b>DPE-903</b>	1 Each
	360/460/560	<b>DPE-906</b>	1 Each
	Integral 2000/Integral 4000/LC55/LC65/LC85/LC95	<b>DPE-911</b>	1 Each
	LC-90/LC-290	<b>DPE-913</b>	1 Each
	Lambda 2/2S/10/11 and others	<b>DPE-914</b>	1 Each
	Series 200 DAD	<b>DPE-915</b>	1 Each
Tungsten Lamp	Lambda 2/2S/10/11 and others	<b>DPE-908</b>	1 Each

**Detector Lamps for Shimadzu Instruments**

Description	Model	Cat. No.	Quantity
Deuterium Lamp	UV120/UV160/UV160A/UV240/UV260/UV265	<b>DSH-901</b>	1 Each
	SPD-2A/SPD-3/SPD-4	<b>DSH-902</b>	1 Each
	D300L/UV200S	<b>DSH-903</b>	1 Each
	SPD 6A/SPD-6AV	<b>DSH-916</b>	1 Each
	SPD 10A/SPD 10AS/SPD-10AV/SPD-10AVP	<b>DSH-917</b>	1 Each
	SPD-M10AVP PDA	<b>DSH-918</b>	1 Each
Xenon Lamp	Shimadzu RF530/RF510	<b>DSH-912</b>	1 Each
	Shimadzu RF540/RF535/RF551/RF500	<b>DSH-913</b>	1 Each
	Shimadzu RF1501.5301/5000	<b>DSH-914</b>	1 Each
	RF10A RF10AX	<b>DSH-915</b>	1 Each
LL Deuterium Lamp	Shimadzu SPD-10 Series long life	<b>DSH-918LL</b>	1 Each

**Detector Lamps for Varian Instruments**

Description	Model	Cat. No.	Quantity
Deuterium Lamp	UV 2050	<b>DVA-901</b>	1 Each
	UV 50/Varichrom	<b>DVA-903</b>	1 Each
	UV100/UV200	<b>DVA-904</b>	1 Each
	UV5/2550	<b>DVA-905</b>	1 Each
	LC5000/LC5500	<b>DVA-906</b>	1 Each
	Star 9050	<b>DVA-907</b>	1 Each
	ProStar 340/345 UV/Vis	<b>DVA-909</b>	1 Each

**Detector Lamps for Waters Instruments**

Description	Model	Cat. No.	Quantity
Mercury Lamp	440/441/490	<b>DWA-901</b>	1 Each
Deuterium Lamp	480/481/480LC/481LC/Lambda Max/LC1	<b>DWA-910</b>	1 Each
	484	<b>DWA-915</b>	1 Each
	486	<b>DWA-918</b>	1 Each
	2486	<b>DWA-918LC</b>	1 Each
	996 PDA/2996	<b>DWA-921</b>	1 Each
	990/991/994 PDA	<b>DWA-926</b>	1 Each
	2487 Dual Wavelength/2488	<b>DWA-930</b>	1 Each
Tungsten Lamp	RI/R401/R403/R404	<b>DWA-911</b>	1 Each
Cadmium Lamp	440/441/490	<b>DWA-912</b>	1 Each
Zinc Lamp	440/441/490	<b>DWA-913</b>	1 Each
Xenon Lamp	470/475/2475 Lamp only	<b>DWA-923</b>	1 Each
	474	<b>DWA-929</b>	1 Each
LL Deuterium Lamp	Waters 996	<b>DWA-921LL</b>	1 Each
	Waters Alliance 2487/2488	<b>DWA-930LL</b>	1 Each

## Pump Spares

### Pump Spares for UltiMate 3000 Instruments

Description	Model	Cat. No.	Quantity
<b>Maintenance Kits</b>			
Maintenance Kit for ISO-3100SD	ISO-3100SD	<b>6040.1950</b>	1 Each
Maintenance Kit for LPG-3400SD	LPG-3400SD	<b>6040.1951</b>	1 Each
Maintenance Kit for DGP-3600SD	DGP-3600SD	<b>6040.1952</b>	1 Each
Maintenance Kit for HPG-3x00SD	HPG-3x00SD	<b>6040.1953</b>	1 Each
Maintenance Kit for LPG-3400RS	LPG-3400RS	<b>6040.1954A</b>	1 Each
Maintenance Kit for DGP-3600RS	DGP-3600RS	<b>6040.1955A</b>	1 Each
Maintenance Kit for HPG-3x00RS	HPG-3x00RS	<b>6040.1956A</b>	1 Each
Maintenance Kit for LPG-3400XRS	LPG-3400XRS	<b>6043.1954</b>	1 Each
<b>Pistons</b>			
Pistons, sapphire	SD, RS, BM pumps	<b>6040.0042</b>	2 Each
Pistons, sapphire	LPG-3400XRS pump	<b>6043.0169</b>	1 Each
<b>Piston Seals</b>			
Piston Seals, RP	SD, RS pumps	<b>6040.0304</b>	2 Each
Piston Seals, NP	SD, RS pumps	<b>6040.0306</b>	2 Each
Piston Seal	LPG-3400XRS pump	<b>6043.0295</b>	1 Each
<b>Check Valves</b>			
Check valve, sapphire, cartridge type	SD, RS, BX, BM pumps	<b>6041.2300</b>	1 Each
Check valve, ZrO ceramics, cartridge type	SD, RS, BX, BM pumps	<b>6041.2301</b>	1 Each
Check valve, sapphire, cartridge type	LPG-3400XRS pump	<b>6043.0145</b>	1 Each

### Pump Spares for Thermo Scientific Instruments

Description	Model	Cat. No.	Quantity
<b>Pistons</b>			
Piston	Accela pump	<b>00201-11328</b>	2 Each
Piston, sapphire	Accela pump	<b>00950-01-00126</b>	2 Each
<b>Piston Seals</b>			
Secondary piston seal (wash seal)	Accela pump	<b>00950-01-00128</b>	2 Each
Piston Seal Black	Surveyor LC	<b>SFS-220</b>	1 Each
Piston Seal Yellow	Surveyor LC	<b>SFS-220G</b>	1 Each
Wash Seal White	Surveyor LC	<b>SFS-230</b>	1 Each
Piston Seal Black	Surveyor MS	<b>SFS-320</b>	1 Each
Piston Seal Clear	Surveyor MS	<b>SFS-320U</b>	1 Each
Wash Seal clear	Surveyor MS	<b>SFS-330</b>	1 Each
<b>Check Valves</b>			
Outlet Check Valve	Accela pump	<b>00950-01-00131</b>	1 Each
Inlet Check Valve	Accela pump	<b>00950-01-00130</b>	1 Each
Inlet Check Valve Assembly – Cartridge Type	Surveyor LC	<b>SFS-3001</b>	1 Each
Outlet Check Valve Assembly – Cartridge Type	Surveyor LC	<b>SFS-3002</b>	1 Each
Inlet/Outlet Check Valve Cartridge	Surveyor MS	<b>SFS-6001C</b>	1 Each

### Pump Spares for Agilent Instruments

Description	Model	Cat. No.	Quantity
<b>Pistons</b>			
Piston Assembly Sapphire	1090	<b>SHP-200</b>	1 Each
Piston Assembly Sapphire	1050 and 1100	<b>SHP-400</b>	1 Each
<b>Piston Seals</b>			
Piston Seal Yellow	1050, 1090 and 1100	<b>SHP-220G</b>	1 Each
Piston Seal Black	1050 and 1100	<b>SHP-420K</b>	1 Each
<b>Check Valves and Spares</b>			
Replacement Inlet/Outlet Check Valve Cartridge	1090	<b>SHP-5002</b>	1 Each
Inlet/Outlet Check Valve Assembly	1090	<b>SHP-5001</b>	1 Each

### Pump Spares for PerkinElmer Instruments

Description	Model	Cat. No.	Quantity
<b>Pistons</b>			
HP Piston Assembly Sapphire	Series 200, 400, 410, 620, Model 250, Integral 4000	<b>SOT-PE600</b>	1 Each
HP Piston Assembly Sapphire	Series 200, 400, 410, 620, Model 250, Integral 4000	<b>SOT-PE500</b>	1 Each
<b>Piston Seals</b>			
HP Piston Seal Grey	Series 200, 400, 410, 620, Model 250, Integral 4000	<b>SOT-PE220</b>	1 Each
HP Piston Seal Yellow	Series 200, 400, 410, 620, Model 250, Integral 4000	<b>SOT-PE220G</b>	1 Each
LP Piston Seal Black	Series 200, 400, 410, 620, Model 250, Integral 4000	<b>SOT-PE320</b>	1 Each
LP Piston Seal Yellow	Series 200, 400, 410, 620, Model 250, Integral 4000	<b>SOT-PE320G</b>	1 Each
<b>Check Valves and Spares</b>			
Inlet/Intermediate Check Valve Assembly	Series 200, 400, 410, 620, Model 250, Integral 4000	<b>SOT-PE3001</b>	1 Each
Outlet Check Valve Assembly	Series 200, 400, 410, 620, Model 250, Integral 4000	<b>SOT-PE3002</b>	1 Each

### Pump Spares for Varian Instruments

Description	Model	Cat. No.	Quantity
<b>Pistons</b>			
Piston Assembly Sapphire	5000, 5500, 5600	<b>SOT-VA200</b>	1 Each
Piston Assembly Sapphire	2010, 2210, 2510	<b>SOT-VA400</b>	1 Each
<b>Piston Seals</b>			
Piston Seal Black	5000, 5500, 5600	<b>SOT-VA220</b>	1 Each
Piston Seal Black	2010, 2210, 2510	<b>SOT-VA320</b>	1 Each
Piston Seal Yellow	2010, 2210, 2510	<b>SOT-VA320G</b>	1 Each
<b>Check Valves and Spares</b>			
Inlet Check Valve Assembly	2010, 2210, 2510	<b>SVA-3001</b>	1 Each
Outlet Check Valve Assembly	2010, 2210, 2510	<b>SVA-3002</b>	1 Each



## Pump Spares *continued*

### Pump Spares for Shimadzu Instruments

Description	Model	Cat. No.	Quantity
<b>Pistons</b>			
Piston Assembly Sapphire	LC-10 AS, LC-6, LC-6A	<b>SOT-SH200</b>	1 Each
Piston Assembly Sapphire	LC-9, LC-10AD, LC-600	<b>SOT-SH202</b>	1 Each
<b>Piston Seals</b>			
Piston Seal Yellow	LC-10 AT	<b>SOT-SH-100-01</b>	1 Each
Wash Seal White	LC-10 AT	<b>SOT-SH-100-02</b>	1 Each
Piston Seal Grey	LC-3, LC-4, LC-5, LC-6, LC-6A, LC-10 AS	<b>SOT-SH220</b>	1 Each
Wash Seal White	LC-3, LC-4, LC-5, LC-6, LC-6A, LC-10 AS	<b>SOT-SH220G</b>	1 Each
Piston Seal Yellow	LC-3, LC-4, LC-5, LC-6, LC-6A, LC-10 AS	<b>SOT-SH520G</b>	1 Each
Piston Seal Grey	LC-9, LC-10AD, LC-600	<b>SOT-SH420</b>	1 Each
Piston Seal Black	LC-10 ATvp	<b>SOT-SH520</b>	1 Each
<b>Check Valves and Spares</b>			
Inlet Check Valve Assembly	LC-3, LC-4, LC-5, LC-6, LC-6A, LC-10 AS	<b>SOT-SSH3001</b>	1 Each
Outlet Check Valve Assembly	LC-3, LC-4, LC-5, LC-6, LC-6A, LC-10 AS	<b>SOT-SSH3002</b>	1 Each
Inlet Check Valve Assembly – Cartridge Type	LC-9, LC-10AD, LC-600	<b>SSH-6001</b>	1 Each
Outlet Check Valve Assembly – Cartridge Type	LC-9, LC-10AD, LC-600	<b>SSH-6002</b>	1 Each

### Pump Spares for Waters Instruments

Description	Model	Cat. No.	Quantity
<b>Pistons</b>			
Piston Assembly Sapphire	M510, M590, M600, M610 M6000	<b>SWA-WA200</b>	1 Each
Piston Assembly Ruby	M510, M590, M600, M610 M6000	<b>SWA-WA200R</b>	1 Each
Piston Assembly Sapphire	M45, M501	<b>SWA-WA205</b>	1 Each
Piston Assembly Sapphire	M515	<b>SWA-WA800</b>	1 Each
Piston Assembly Sapphire	Alliance 2690	<b>SWA-WA900</b>	1 Each
<b>Piston Seals</b>			
Piston Seal Black	M45, M501, M510, M590, M600, M610 M6000	<b>SWA-WA220</b>	1 Each
Piston Seal Yellow	M45, M501, M510, M590, M600, M610 M6000	<b>SWA-WA220G</b>	1 Each
Piston Seal Grey	M510EF, M590EF, M600EF, M610EF, M6000EF	<b>SWA-WA600S</b>	1 Each
Piston Seal Black	M515	<b>SWA-WA820</b>	1 Each
Piston Seal Yellow	M515	<b>SWA-WA820G</b>	1 Each
Piston Seal Black	Alliance 2690	<b>SWA-WA920</b>	1 Each
Piston Seal Yellow	Alliance 2690	<b>SWA-WA920G</b>	1 Each
<b>Check Valves and Spares</b>			
Inlet Check Valve Assembly	M45, M501, M510, M590, M600, M610 M6000	<b>SWA-3201</b>	1 Each
Outlet Check Valve Assembly Actuator Type	M45, M501, M510, M590, M600, M610 M6000	<b>SWA-3202</b>	1 Each
Outlet Check Valve	M45, M501, M510, M590, M600, M610 M6000	<b>SWA-3202B</b>	1 Each
Inlet Check Valve Repair Kit	M510, M590, M600, M610 M6000	<b>SWA-3212</b>	1 Each
Outlet Check Valve Assembly Actuator Type	M45, M501, M510, M590, M600, M610 M6000	<b>SWA-3402</b>	1 Each
Outlet Check Valve Assembly Ball & Seat Type	M45, M501, M510, M590, M600, M610 M6000	<b>SWA-3402B</b>	1 Each
Inlet Check Valve Assembly	M510EF, M590EF, M600EF, M610EF, M6000EF	<b>SWA-4107</b>	1 Each
Inlet Check Valve Repair Kit	M510EF, M590EF, M600EF, M610EF, M6000EF	<b>SWA-4123</b>	1 Each
Inlet Check Valve Assembly	M515	<b>SWA-8001</b>	1 Each
Outlet Check Valve Assembly	M515	<b>SWA-8002</b>	1 Each
Check Valve Cartridge	Alliance 2690	<b>SWA-9001</b>	1 Each

## Dionex ICS-900 Ion Chromatography Systems

Routinely Analyze Multiple Anions or Cations in 10-15 Minutes

- Sensitive, stable, heated conductivity detection for precise results
- Compatibility with a broad range of polymeric separation columns for unparalleled application flexibility and reliability
- Thermo Scientific™ Dionex™ Chromeleon™ SE allows control of a single Thermo Scientific Dionex ICS-900 with an autosampler

**The Dionex ICS-900** is an integrated, single-channel ion chromatography system designed to run specific isocratic anion and cation applications. The system uses Thermo Scientific™ Dionex™ MMS™ 300 membrane suppression with Displacement Chemical Regeneration (DCR) technology for low noise and stable baselines. Each ICS-900 system has an all-polymeric flow path with a reliable dual piston pump, high-pressure pulse damper, electrically actuated PEEK™ valve, and a temperature-controlled conductivity cell.

### Dionex ICS-900 Key Features:

- Dionex MMS 300 membrane suppression with DCR technology for drift-free baseline and ease-of-use
- Wide pump flow rate range to support 2, 3, and 4mm isocratic anion and cation columns
- Dual-piston, serial-pumping system with PEEK™ flow path for low maintenance costs and maximum up-time
- All-polymeric flow pathway to eliminate contamination and corrosion
- Chromeleon Chromatography Data System software for full control, quality integration, and versatile reports to exceed all your data processing needs
- USB connectivity for fast, trouble-free instrument connection and configuration

### Dionex ICS-900 Physical Specifications

Dimensions (h × w × d):

33 × 24 × 40cm (13 × 9.5 × 15.75in)

Weight 10kg (22lbs)

Power Requirements:

100 - 240 VAC, 50–60Hz, autoranging

**The AS-DV** autosampler is a low-cost, metal-free, rugged, automated sample loading device designed especially for ion chromatography applications. The random access and sample preparation capabilities provide easily automated sample introduction to the chromatograph. Its new software control provides high flexibility to select the optimum injection parameters for filling injection loops or loading concentrator columns.

### AS-DV Key Features:

- Full loop and concentrator loading
- Optional 6-port or 10-port valve for automated sample preparation or sample injection
- Random access
- Chromeleon control provides high flexibility to select the optimum injection parameters
- 0.5mL and 5.0mL polymeric vials with optional filter caps
- Automatic switching power supply for universal input voltage
- Sample Overlap injections for increased productivity

### AS-DV Autosampler Specifications

Dimensions (h × w × d):

23 × 45 × 56cm (9 × 17.5 × 22in)

Weight: 16 kg (35 lbs)

Power Requirements:

100 - 240 VAC, 50–60Hz, autoranging



## Dionex ICS-900 Ion Chromatography System Bundles

Description	Cat. No.
Dionex ICS-900 IC System for Anions with AS-DV Autosampler and Chromeleon Software	<b>078028</b>
Dionex ICS-900 IC System for Cations with AS-DV Autosampler and Chromeleon Software	<b>078029</b>

Contact Customer Service for details of replacement columns and reagents for the Dionex ICS-900

### The Anion Bundle includes:

- Dionex ICS-900 Ion Chromatography System
- AS-DV Autosampler
- Chromeleon 7 SE Software
- AS22 4mm Consumables Bundle:
  - 1- Dionex IonPac AS22 4mm, 064141
  - 1- Dionex IonPac AG22 4mm, 064139
  - 1- Thermo Scientific™ Dionex™ AMMS™  
300 Anion MicroMembrane™  
Suppressor 4mm, 064558
  - 1- Dionex AMMS III Regenerant  
Concentrate, 4 pack, 057555
  - 1- Dionex ICS-900 DCR Anion Regenerant  
2L Bottle, 057712
  - 1- AS22 Eluent Concentrate, 0670

### The Cation Bundle includes:

- Dionex ICS-900 Ion Chromatography System
- AS-DV Autosampler
- Chromeleon 7 SE Software
- CS12A 4mm Consumables Bundle:
  - 1- Dionex IonPac CS12A 4mm, 046073
  - 1- Dionex IonPac CG12A 4mm, 046074
  - 1- Thermo Scientific™ Dionex™ CMMS™  
300 Cation MicroMembrane Suppressor  
4mm, 064560
  - 1- Dionex CMMS III Regenerant  
Concentrate, 4 pack, 057556
  - 1- Dionex ICS-900 DCR Cation Regenerant  
2L Bottle, 057713
  - 1- CS12A Eluent Concentrate, 057562

## HOT POCKET and COOL POCKET Column Temperature Controllers

Wrap-around column temperature control systems

- Easy to install and use with a variety of column lengths
- Dual display of both actual and set point temperature
- HOT POCKET range from just above ambient to 85°C
- COOL POCKET range from 5°C to 55°C
- Explore sample selectivity and stability on both sides of ambient



### Column Heating and Cooling in an Efficient, Compact Design

The Thermo Scientific™ HOT POCKET™ and Thermo Scientific™ COOL POCKET™ Column Temperature Controllers have a unique, space saving design for the efficient control of HPLC column temperature using a novel, soft, wrap-around sealing mantle. The mantle is wrapped directly onto the column, in situ, in horizontal, vertical, or slant position. The standard size accepts column lengths up to 300mm, and columns up to 150mm can be used with the short HOT POCKET model. The inserts also allow the use of guard columns or the optional eluent pre-heater. The inserts are modular, allowing them to be easily removed or rearranged for your specific column configuration. Special inserts are available for larger or smaller diameter columns. The temperature is set on the Temperature Controller Unit, which is permanently attached to the heater/cooler. Both the actual temperature and the user selected set point are simultaneously displayed on the LED controller display.

### HOT POCKET Column Heater

The HOT POCKET Column Heater has a temperature range of just above ambient to 85°C with excellent control, allowing validation of HPLC methods at accurate temperatures. HPLC method ruggedness can be investigated by exploring the sensitivity of a separation to temperature changes. The HOT POCKET is available in a standard size to accommodate column combinations up to 300mm in length, and a short version for columns up to 150mm.

It is easy to install a column into the HOT POCKET or COOL POCKET. Depending upon column length and auxiliary fixtures such as a guard column or eluent pre-heater, some of the inserts may have to be rearranged or removed through the special slot at one end. Rotate the inserts so that the groove in each is positioned in the open part of the channel. Columns are simply placed into the inserts, which are then rotated to lock the column into the channel. The insulated mantle is wrapped around the column with a Velcro™ closure.

### COOL POCKET Temperature Controller

The COOL POCKET Temperature Controller provides efficient control of the temperature of HPLC columns both above and below ambient, with an operational temperature range of 5°C to 55°C. The COOL POCKET Temperature Controller is ideal for chiral applications where a lower temperature may give better separation of enantiomers or other closely related compounds. It also allows you to validate HPLC methods at accurate temperatures near ambient and check HPLC method ruggedness by exploring the sensitivity of your separation to temperature changes on both sides of ambient.

## HOT POCKET Column Heaters, Eluent Preheater/Precooler and COOL POCKET Chiller

Column heating or cooling in a compact, efficient design

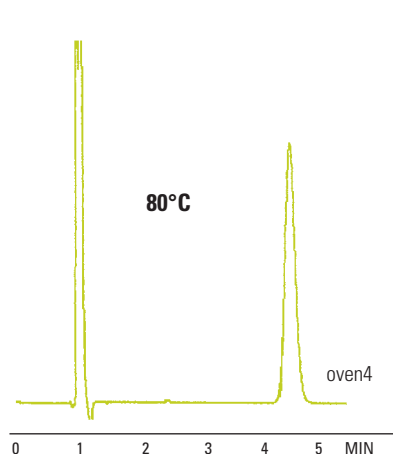
- The Eluent Pre-Heater provides a dramatic improvement in chromatography as demonstrated by the USP method for enalapril maleate at 80°C
- For preheating or precooling the mobile phase before it enters column
- Use in temperatures above 50°C or below 15°C
- 0.005in ID



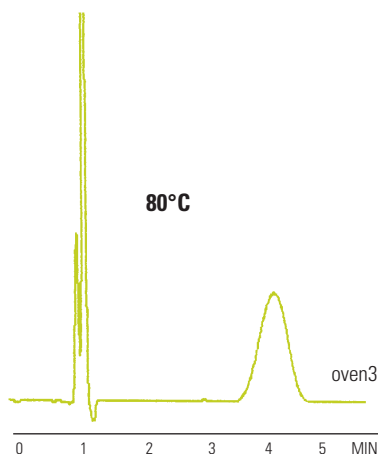
### Product Specifications

	HOT POCKET	COOL POCKET
Operating Range	5°C above ambient to 85°C	5°C to 55°C
Display	Dual LED displays of actual and set point temperatures in °C	
Temperature Accuracy	± 2°C over entire range	± 2°C over entire range
Temperature Repeatability	± 1°C	± 1°C
Temperature Stability	± 0.1°C	± 0.1°C
Time to Stabilization (from ambient)	85°C in less than 30 minutes	55°C in 25 minutes, 5°C in 20 minutes
Column Capacity	Standard: up to 3/8in OD and up to 300mm in length and end-fittings up to 19mm OD (250mm length column with guard or eluent pre-heater in addition to column) Short (HOT POCKET only): up to 150mm total length (100mm column plus guard or pre-heater)	
Controller Dimensions	2.8 x 4.0 x 6.5in	2.8 x 4.0 x 6.5in
Mantle Dimensions	Standard: 1.5 x 1.5 x 17in	Standard: 1.5 x 4.0 x 17in Short: 1.5 x 1.5 x 12in
Power Cord	3 foot retractable coil cord	3 foot retractable coil cord
Weight	1lb enclosure (3lb total with power supply)	2lb enclosure (4lb total with power supply)
Power	24 VAC, 25 Watts maximum	15 VDC, 20 Watts maximum

**With Eluent Pre-heater**



**Without Eluent Pre-heater**



Effect of eluent pre-heater on efficiency

Data courtesy of Dr. Richard F. Myer, Quantitative Technologies, Inc., Whitehouse, NJ

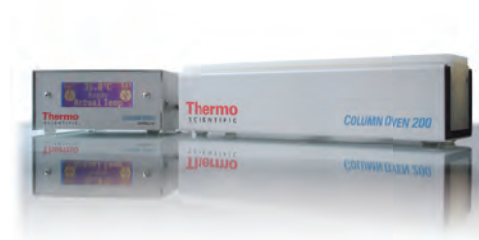
### HOT POCKET Column Heaters, Eluent Preheater/Precooler and COOL POCKET Chiller

Description	Cat. No.	Quantity
HOT POCKET Column Heater	92016	1 Each
HOT POCKET Column Heater – short version	92016-150	1 Each
COOL POCKET Column Chiller	92017	1 Each
Eluent Preheater/Precooler	92018	1 Each

## ColumnOven

Exact temperature control for LC columns

- Temperature control from ambient to 90°C
- Fits up to four columns in one compartment
- Compatible with CTC autosamplers and Thermo Scientific Mass Spectrometer ion sources



### Product Description

The Thermo Scientific ColumnOven delivers efficient temperature control of HPLC columns. With exact temperature control to +/- 0.1°C, ColumnOven provides the highest levels of reproducibility and stability. Temperatures up to 90°C can significantly reduce backpressure when using columns packed with sub 2µm particle sizes, allowing the use of higher flow rates to accelerate the chromatography. ColumnOven 200 can accommodate up to 4 analytical HPLC columns with lengths up to 150mm while ColumnOven 300 can accommodate up to 4 analytical columns with lengths up to 250mm.

### Options

Optional mounts allow ColumnOven to be secured to a CTC PAL® autosampler and many Thermo Scientific Mass Spectrometer ion sources.

The optional software package includes a standalone version (Windows™ compatible) and drivers for Thermo Scientific™ XCalibur™ and other instrument control software.

An optional heat exchanger can be used as a connection / transfer line between injection port and column.

### Product Specifications

Description	ColumnOven 200	ColumnOven 300
Column oven dimensions:	212mm x 40mm x 46mm	312mm x 40mm x 46mm
Column oven dimensions (with mounted heat shield):	212mm x 62mm x 52mm	312mm x 62mm x 52mm
Thermostated column compartment:	200mm x 21mm x 21mm	300mm x 21mm x 21mm
Remote control	LAN or serial port	LAN or serial port
Power supply	110 - 240 VAC	110 - 240 VAC
Temperature control:	Ambient to 90°C in 0.1°C increments	Ambient to 90°C in 0.1°C increments
Temperature stability:	+/- 0.1°C	+/- 0.1°C

### Thermo Scientific ColumnOven

Description	Cat. No.
ColumnOven 200	<b>66001-020</b>
CTC Mount	<b>66001-021</b>
Thermo MS Mount	<b>66001-022</b>
ABI MS Mount	<b>66001-023</b>
Heat Exchanger	<b>66001-024</b>
Heat Exchanger (low volume)	<b>66001-025</b>
Software drivers	<b>66001-026</b>
ColumnOven 300	<b>66001-030</b>



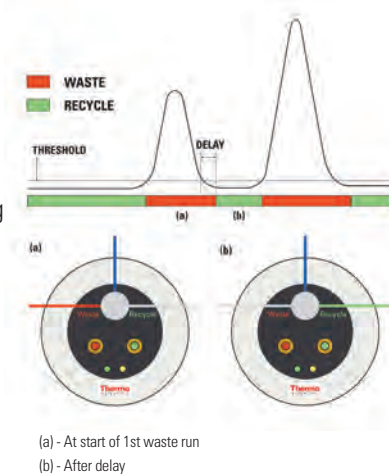
## SRS Pro Solvent Recycling System

Reduce mobile phase consumption by up to 90%

- Continuously monitors the output signal of the chromatographic detector, recycling the mobile phase to the solvent reservoir when the baseline is below a certain preset threshold
- Easy-to-use software is provided to configure system parameters, perform on-line monitoring and audit trail facilities
- No power adapter is required as the solvent saver is powered directly from the chromatography data system PC through a USB connection
- Recycles the mobile phase only if switched on: in case of power failure the valve remains in the waste position and the mobile phase in the reservoir remains uncontaminated
- Analog input allows unipolar or bipolar operation of the device within a range of  $\pm 1V$  with an analog-to-digital converter
- TTL/contact closure for the device can be configured as start, auto-zero or valve position control input

### Operational Principle

- If the input signal level exceeds this threshold value, the SRS Pro redirects the eluent flow to waste (a), taking account of the transport time from the detector to the switching valve
- When the signal returns below the threshold (b), the SRS Pro again waits for the transport delay and then switches the mobile phase back to the reservoir
- Autosampler injection marker connected to the SRS Pro zeroes signal input at the moment of injection



### Product Specifications

<b>Data Rate</b>	1Hz
<b>Wetted Material</b>	PEEK
<b>Power Source</b>	USB port of PC
<b>Max. Pressure</b>	30psi/0.2MPa
<b>Requires</b>	1 free USB port, MS-Windows XP/2000/Vista

### Compatible with:

Any HPLC detector

### SRS Pro Solvent Recycling System

Description	Cat. No.	Quantity
SRS Pro solvent recycling system	<b>66001-001</b>	1 Each

## SDG Pro Solvent Degasser

For gas-free HPLC solvents

- High efficiency in-line system
- Reliable, continuous operation
- Quick equilibration and short startup times
- Removes dissolved gases from solvents
- Used to degas the mobile phase for HPLC and can be employed in other applications where gases may interfere with the use of the system (such as an autotitrator)



### Product Specifications

General	
Channels	4 independent
Mode of Degassing	Gas permeation through a fluoropolymer tube
Maximum Flow Rate	10mL/min
Degassing Capacity	~2ppm at 1mL/min
Dead Volume	~480µL per channel for standard channel
Materials Contacting Solvents	PEEK, Glass-filled PTFE, Teflon AF
Power	
Power Requirement if using supplied AC Adapter	100 – 240 VAC (±10%), 1A, 50 to 60Hz (±3Hz)
Power Requirement if not using supplied AC Adapter	15 – 24 VDC at 0.85 A maximum (0.5 A typical)
Wall Sockets	4 supplied with AC adapter, interchangeable: North America/Japan, U.K., Continental Europe, Australia
Installation Over-Voltage Category	II
Validation Output	
Signal	5mVDC / 1mm Hg absolute from 20 to 800mm Hg (0.100 VDC at 20mm Hg; 4.000 VDC at 800mm Hg)
Accuracy	±1.0% of reading ±0.010 VDC from 20 to 800mm Hg
Operating Conditions	
Ambient Temperature	10 to 35°C
Ambient Relative Humidity (RH)	20 to 80 % RH (without condensation)
Altitude	0 to 2000 Meters
Indoor vs. Outdoor Use	Indoor
Pollution Degree	2
Storage Conditions	
Ambient Temperature	-20 to +60°C
Ambient Relative Humidity	20 to 80% RH (without condensation)
Altitude	0 to 12000M
Physical	
Dimensions	Height: 127mm (5.0in) Width: 73mm (2.8in) Depth: 250mm (9.8in)
Weight	2.7kg (6lb).

### SDG Pro

Description	Cat. No.	Quantity
SDG Pro degasser	66001-010	1 Each

# Thermo Scientific Liquid Chromatography Reagents

## Introduction to HPLC Ion Pair Reagents

High-purity reagents with the selectivity needed for good separation.

In the past, reverse-phase HPLC analysis of highly charged acidic and basic compounds was frustrating and resulted in poor resolution. Important biomolecules such as amino acids, peptides, organic acids, polyamines and catecholamines had to be separated by ion exchange or by suppression techniques.

Thermo Scientific Ion Pair Reagents enable you to quickly and efficiently analyze charged compounds using reverse-phase techniques. Our ion pair reagents are simply dissolved in the HPLC solvent system, resulting in the formation of stable chromatographic complexes that can be separated using reverse-phase columns.

By using the correct ion pair reagents, you achieve:

- Increased or decreased retention, permitting controlled selectivity
- Resolution of complex ionic mixtures without using ion exchange columns
- Improved peak symmetry

### Reverse-phase ion pair chromatography theories

Two principal theories have been proposed to explain reverse-phase ion pair chromatography. In the first theory, small polar ion pair reagents react with the ionized solute, forming neutral ion pairs. The second theorizes that an active ion exchange surface is produced in which long chain, nonpolar anions and cations are absorbed by the hydrophobic stationary phase.

To optimize chromatographic separations in ion pair elution systems, high-purity reagents of exceptional optical transparency are needed. Ion Pair Reagents are specially purified for ion pair chromatography and provide the selectivity needed for good separations.



## Derivatization and Visualization Reagents for HPLC

Designed to provide selectivity and improve sensitivity.

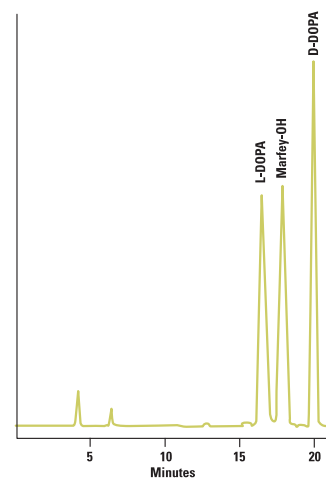
The lack of a universal HPLC detector that provides high sensitivity (as well as some degree of selectivity) established the need for suitable derivatization procedures. Derivatization is the chemical modification of an existing compound, producing a new compound that has properties more suitable for a specific analytical procedure. It is an analytical tool that can be used to provide both selectivity and improved sensitivity.

### There are several requirements for derivatization protocol:

1. At least one acidic, polar functional group must be available for reaction on the parent compound.
2. A single derivative should be formed per parent compound.
3. The reaction should be reproducible under the given time and reaction conditions.
4. The reaction should proceed quickly and easily under mild conditions.
5. The reaction byproducts (if any) should not interfere with the chromatography, or with detection of the sample.


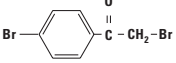

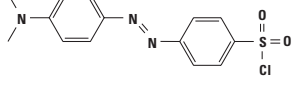
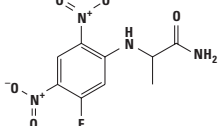
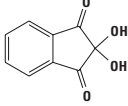
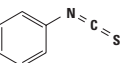
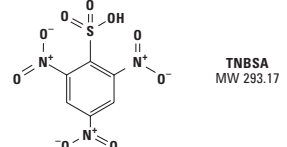

Pre- and post-chromatographic techniques are both used in HPLC derivatization. In addition, off-line and on-line reactions have been employed with both techniques. Pre-chromatographic (or pre-column techniques) offer more than greater selectivity and sensitivity in detection. Pre-column techniques can be used to enhance stability, improve resolution, improve peak symmetry and increase or decrease retention of solutes. FDAA (Marfey's Reagent) allows separation and quantification of optical isomers of amino acids (Figure 2). Post-chromatographic (or post-column) techniques are used primarily to provide selectivity and improve sensitivity.

We offer a variety of HPLC detection reagents for pre- and post-chromatographic techniques. All compounds and formulations are purified for chromatography, minimizing artifact formation.



**Separation of D- and L-DOPA on 100mm x 4.6mm C18**  
Conditions: A – 0.05 M triethylamine phosphate, pH 3.0;  
B – acetonitrile.  
Linear gradient: 10 to 40% B in 45 minutes,  
2.0mL/minute, 25°C, 340nm

## Derivatization Reagents for HPLC

Functional Group	Description	Detection*	Page	Comments
Carboxylic Acid 	<i>p</i> -Bromophenaclyate 	UV	<b>4-201</b>	Formulation of 1.0mmol/ml <i>p</i> -bromophenacly bromide and 0.005mmol/ml crown ether in acetonitrile; pre-column; nanomole detection levels: $\lambda_{\max} = 260\text{nm}^{1-7}$
Primary Amine 	Dabsyl Chloride 	Vis	<b>4-204</b>	4-N, N-dimethylaminoazobenzene-4'-sulfonyl chloride (dabsyl chloride); pre-column; nanomole detection levels: $\lambda_{\max} = 436\text{nm}^{8-14}$
	FDAA, Marfey's Reagent 	UV	<b>4-200</b>	1-fluoro-2,4-dinitrophenyl-5-L-alanine amide (FDAA); pre-column; nanomole detection levels: $\lambda_{\max} = 340\text{nm}$ . For chiral separations of amino acids. <sup>15, 28-29</sup>
	Ninhydrin 	Vis	<b>4-203</b>	Post-column; nanomole detection levels: $\lambda_{\max} = 570\text{nm}^{22}$
	PITC 	UV	<b>4-204</b>	Phenylisothiocyanate (PITC); pre-column; picomole detection levels: $\lambda_{\max} = 254\text{nm}^{23-24}$
	TNBSA 	EC, UV	<b>4-201</b>	2,4,6-Trinitrobenzene-sulfonic acid (TNBSA); pre- or post-column; nanomole detection levels with EC and UV, GC - 0.85V; $\lambda_{\max} = 250\text{nm}^{25-26}$
Secondary Amine 	Ninhydrin (see structure above)	Vis	<b>4-203</b>	Post-column; nanomole detection levels: $\lambda_{\max} = 440\text{nm}^{22}$
	PITC (see structure above)	UV	<b>4-204</b>	Phenylisothiocyanate (PITC); pre-column; picomole detection levels: $\lambda_{\max} = 254\text{nm}^{23-24}$

\*EC = electrochemical; F = fluorescence; UV = ultraviolet; Vis = visible.

### References

- Durst, H.D., *et al.* (1975). *Anal. Chem.* **47**, 1797.
- Borch, R.F., *et al.* (1975). *Anal. Chem.* **47**, 2437.
- Grushka, E., *et al.* (1975). *J. Chromatogr.* **112**, 673.
- Fitzpatrick, F.A. (1976). *Anal. Chem.* **48**, 499.
- Nagels, L., *et al.* (1980). *J. Chromatogr.* **190**, 411.
- Ahmed, M.S., *et al.* (1980). *J. Chromatogr.* **192**, 387.
- Pierce Technical Bulletin: Preparation of Phenacly and *p*-Bromophenacly Derivatives for HPLC.
- Stocchi, V., *et al.* (1985). *J. Chromatogr.* **349**, 77-82.
- Chang, J.Y., *et al.* (1981). *Biochem. J.* **199**, 547-555.
- Chang, J.Y., *et al.* (1982). *Biochem. J.* **203**, 803-806.
- Vendrell, J., *et al.* (1986). *J. Chromatogr.* **358**, 401-413.
- Chang, J.Y., *et al.* (1984). *J. Chromatogr.* **295**, 193-200.
- Lin J.K., *et al.* (1980). *Anal. Chem.* **52**, 630-635.
- Chang, J.Y., *et al.* (1981). *FEBS Letters* **132**, 117-120.
- Marfey, P. (1984). *Carlsberg Res. Comm.* **49**, 591-596.
- Jones, B.N. and Gilligan, J.P. (1983). *Amer. Biotech. Lab.* **12**, 46-51.
- Fiedler, H.P., *et al.* (1986). *J. Chromatogr.* **353**, 201-206.
- Fried, V.A., *et al.* (1985). *Anal. Biochem.* **146**, 271-276.
- Jones, B.N., *et al.* (1983). *J. Chromatogr.* **266**, 471-482.
- Seaver, S.S., *et al.* (Sept./Oct. 1984). *Biotechniques* 254-260.
- Böhlen, P., *et al.* (1979). *Anal. Biochem.* **94**, 313-321.
- Stein, W.H. and Moore, S. (1949). *Cold Spring Harbor Symp. Quant. Bio.* **14**, 179.
- Heinrickson, R.L. and Meredith, S.C. (1984). *Anal. Biochem.* **137**, 65-74.
- Scholze, H. (1985). *J. Chromatogr.* **350**, 453-460.
- Caudill, W.L., *et al.* (1982). *J. Chromatogr.* **227**, 331.
- Caudill, W.L., *et al.* (1982). *Bioanalytical System's Current Separations* **4(4)**, 59.
- Andrews, J.L., *et al.* (1982). *Arch. Biochem. Biophys.* **214**, 386-396.
- Aberhart, D.J., *et al.* (1985). *Anal. Biochem.* **151**, 88-91.
- Szokan, G., *et al.* (1988). *J. Chromatogr.* **444**, 115-122.



## Developments in Amino Acid Analysis

Improvements in amino acid analysis by ion exchange chromatography have involved the analytical system, as well as the instrumentation. Systems have been developed (by varying buffer pH or ionic strength) that work to displace the amino acids into discrete bands. The buffer systems are compatible with single- or two-column analysis of amino acids found in protein hydrolyzates or physiological fluids. Buffer systems are determined by the counter ion used (sodium or lithium) and by the method of buffer changes introduced to the resin (step changes or gradient elution).<sup>9-15</sup> The most commonly used buffering component, citrate, is suitable for solutions below pH7.<sup>16</sup> Buffers are prepared either with citric acid or an alkali salt.

Unfortunately, for high-sensitivity work, citric acid is a significant contributor to amino acid contamination. Therefore, to achieve consistent analyses, it is essential to use high-purity reagents for buffer preparation.

Alternatives to ion exchange are available for the separation of amino acids. Because amino acid analysis is one of the basic protein chemistry tools available, more rapid and sensitive methods for separation and quantitation are desirable.<sup>17</sup> Several pre-column derivatization methods using reverse-phase HPLC have been developed.

Two of the most widely used of these methods involve the formation of dansyl<sup>18-19</sup> or o-phthalaldehyde (OPA)<sup>20-24</sup> derivatives of amino acids prior to HPLC analysis. Both methods offer greater sensitivity and shorter analysis time than post-column derivatization techniques. Other methods include the quantitative derivatization of amino acids with phenylisothiocyanate (PITC) and the separation and quantitation of the resulting phenylthiocarbonyl derivatives via HPLC. These derivatives are stable enough to eliminate in-line derivatization.

Note: Please refer to page **3-122** for details of references





## Sample Preparation and Hydrolysis

The extraction and purification of proteins play an important role in determining amino acid content. These methods are based on one or more of their physical characteristics (e.g., solubility, molecular size, charge, polarity and specific covalent or noncovalent interactions).

### The techniques commonly used to separate proteins and peptides include:

- Reverse-phase HPLC
- Polyacrylamide gel electrophoresis
- Gel filtration
- Ion exchange chromatography
- Affinity chromatography
- The table below provides a more detailed list of methods for fractionating peptide mixtures.<sup>25</sup>

### Hydrolysis

Most protein samples require some form of chemical treatment before their component amino acids are suitable for analysis. Protein and peptide samples must be hydrolyzed to free amino acids from peptide linkages. Acids (usually HCl) are the most widely used agents for hydrolyzing proteins.

A simplified hydrolysis procedure involves refluxing the protein with excess HCl, then removing the excess acid in vacuum.<sup>26</sup> The lyophilized protein then is suspended in constant boiling 6 N HCl and introduced into the hydrolysis tube. The sample is frozen by immersing the tube in dry ice and acetone. Before sealing, the tube is evacuated to avoid formation of cysteic acid, methionine sulfoxide

and chlorotyrosine.<sup>27</sup> This procedure minimizes decomposition of reduced S-carboxymethylcysteine and analyzes S-carboxymethylated proteins. Hydrolysis is conducted at 110°C (with the temperature accurately controlled) for 20-70 hours by Moore and Stein's method.<sup>28</sup> After hydrolysis, residual HCl is removed in a rotary evaporator. The residue is dissolved in water and brought to the appropriate pH for addition to the analyzer column.<sup>28</sup>

### Methods for the fractionation of peptide mixtures.

Technique	Properties of Peptide Molecules Exploited
Centrifugation	Solubility
Size exclusion chromatography	Size
Ion exchange chromatography	Charge, with some influence of polarity
Paper electrophoresis	Charge and size
Paper chromatography	Polarity
Thin layer electrophoresis	Charge and size
Thin layer chromatography	Polarity
Polyacrylamide gel electrophoresis	Charge and size
High-performance liquid chromatography (HPLC)	Polarity
Gas chromatography	Volatility of derivatives
Counter-current extraction	Polarity; sometimes specific interactions
Affinity chromatography	Specific interactions
Covalent chromatography or irreversible binding	Disulfide bond formation; reactivity of homoserine lactone

### References

1. Braconnot, H. (1820). *Ann. Chem. Phys.* **13**, 113.
2. Mulder, G.J. (1848). *J. Prakt. Chem.* **38**, 294.
3. Kjeldahl, J.G.C.T. (1883). *Z. Anal. Chem.* **22**, 366.
4. Rattenbury, J.M. (1981). *Amino Acid Analysis*, Ellow Horwood, publisher, Chichester, England, Chapter 1.
5. Martin, A.J.P. and Synge, R.L.M. (1941). *Biochem. J.* **35**, 1358.
6. Elsdon, S.R. and Synge, R.L.M. (1944). *Proc. Biochem. Soc. IX*.
7. Synge, R.L.M. (1944). *Biochem. J.* **38**, 285.
8. Stein, W.H. and Moore, S. (1949). *Cold Spring Harbor Symposia Quant. Biol.* **14**, 179.
9. Liao, T.H., et al. (1973). *Anal. Chem.* **45**, 2286.
10. Hare, P.E. (1972). *Space Life Sciences* **3**, 354.
11. Dus, K., et al. (1966). *Anal. Biochem.* **14**, 41.
12. Thomson, A.R. and Miles, B.J. (1964). *Nature* **203**, 483.
13. Robinson, G.W. (1975). *J. Chromatogr.* **3**, 416.
14. Benson, J.V. (1972). *Anal. Biochem.* **50**, 477.
15. Benson, J.V. and Patterson, J.A. (1965). *Anal. Chem.* **37**, 1108.
16. Bates, R.G. and Pinching, G.D. (1949). *J. Amer. Chem. Soc.* **71**, 1274.
17. Jones, B.N. and Gilligan, J.P. (1983). *American Biotech. Lab.* December, 46-51.
18. Weidmeier, V.T., et al. (1982). *J. Chromatogr.* **231**, 410-417.
19. DeJong, C., et al. (1982). *J. Chromatogr.* **241**, 345-359.
20. Lindroth, P. and Mopper, K. (1979). *Anal. Chem.* **51**, 1667-1674.
21. Jones, B.N., et al. (1981). *J. Liq. Chromatogr.* **4**, 565-586.
22. Turnell, D.C. and Cooper, J.D.H. (1982). *Clin. Chem.* **28**, 527-531.
23. Umagat, H., et al. (1982). *J. Chromatogr.* **241**, 324-334.
24. Jones, B.N. and Gilligan, J.P. (1983). *J. Chromatogr.* **266**, 471-482.
25. Allen, G. (1981). *Laboratory Techniques in Biochemistry and Molecular Biology*, T.S. Work and R.H. Burdon, Eds., Elsevier/North-Holland, Biomedical Press.
26. Moore, S. and Stein, W.H. (1963). *Meth. Enzymol.* **6**, 819.
27. Eveleigh, J.V. and Winter, G.D. (1970). *Protein Sequence Determination*, S.B. Needleman, Ed., Springer-Verlag, pp. 92-95.
28. Moore and Stein, *op. cit.*

## HPLC Ion Pair Reagents

### Heptafluorobutyric Acid

Ion-pair reagent for the reverse-phase HPLC separation of proteins and peptides

- Typical purity is 99.7% by GC; <0.1% water
- Sequencing reagent for classical and automated Edman degradation of peptides and proteins
- Density: 1.645
- B.P. 120°C
- Packaged under nitrogen in amber glass ampules or bottles
- Clear, colorless liquid

#### Heptafluorobutyric Acid

Description	Quantity	Cat. No.	Quantity
Heptafluorobutyric Acid, Sequencing Grade	100mL	X <b>TS-25003</b>	1 Each
Heptafluorobutyric Acid, HPLC Grade	10 x 1mL ampules	<b>TS-53104</b>	1 Pack

1. Hearn, M.T.W. and Hancock, W.S. (1979). *Trends Biochem. Sci.* **4**, N58-N62.
2. Bennett, H.P.J., et al. (1980). *J. Liquid Chromatogr.* **3**, 1353-1366.
3. Bennett, H.P., et al. (1981). *Biochemistry*, **20**, 4530-4538.

X in the ordering table indicates that hazardous shipping charges apply.

### Triethylamine (TEA)

Ideal for HPLC separation and analysis of peptides

Triethylamine is an ion-pairing reagent that alters selectivity in reverse-phase HPLC separations. By pairing with peptides, it effectively sharpens peaks, resulting in improved peak resolution.

- 99.5% triethylamine purity, allowing sensitive peptide detection at low UV wavelengths in reverse-phase HPLC peptide separation systems
- Packaged in amber glass bottles with protective PTFE-lined fluorocarbon caps for reagent integrity
- Has a low UV absorbance to provide the most sensitive detection across all wavelengths

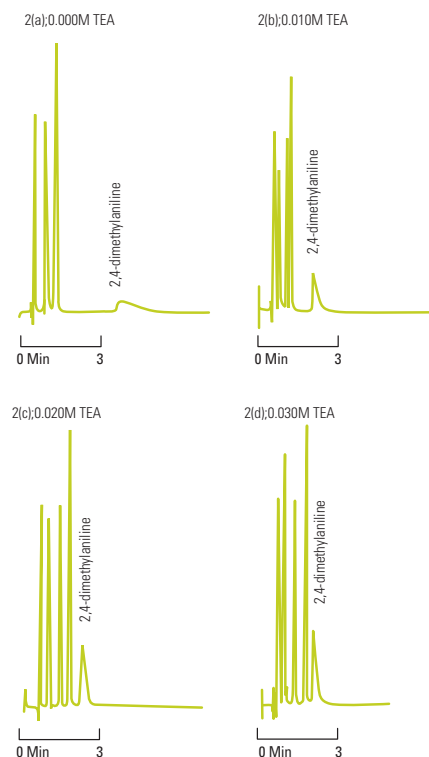
#### Properties of Triethylamine

- Alternate names TEA, Diethylethanamine
- Molecular formula C<sub>6</sub>H<sub>15</sub>N
- Molecular weight 101.19
- Density 0.726g/mL

#### Triethylamine (TEA)

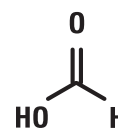
Description	Quantity	Cat. No.	Quantity
Triethylamine, HPLC Grade	25g	<b>TS-53101</b>	1 Each
Triethylamine, Sequencing Grade	100g	X <b>TS-25108</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.



## Formic Acid Ampules

Well-suited for HPLC and mass spectrometry applications



**Formic Acid**  
MW 46.03

Formic acid is a component found in reverse-phase mobile phases to provide protons for LC/MS analysis. The presence of a low concentration of formic acid in the mobile phase is also known to improve the peak shapes of the resulting separation. Unlike trifluoroacetic acid (TFA), formic acid is not an ion-pairing reagent, and it does not suppress MS ionization of polypeptides when used as a mobile phase component.

- Prescored, nitrogen-flushed, amber glass to protect formic acid from light and moisture
- 99% purity for consistent LC baselines and no interference introduced into LC and mass spectrometry applications
- Convenient format simplifies preparation of gradient and isocratic mobile phases containing 0.1% (v/v) formic acid in water or acetonitrile
- Contents of a single vial in a final volume of 1L solvent yields a mobile phase of the most common formic acid concentration

### Formic Acid Ampules

Description	Quantity	Cat. No.	Quantity
Formic Acid 99+%	10 x 1mL ampules	<b>TS-28905</b>	1 Each

For complex peptide separations, the key to success can be to vary selectivity. Varying mobile phase composition on the same column can change selectivity enough to resolve peptide that would otherwise overlap. The TFA concentration is usually specified as 0.1% for reverse-phase HPLC of peptides. For reproducible separations from run-to-run or from lab-to-lab, it is essential to make concentrations the same.



## Derivation and Visualization Reagents for HPLC

### Trifluoroacetic Acid (TFA)

Routinely used ion-pairing agent in reversed-phase peptide separations

- Purity: >99.5% TFA and exceptional clarity allows sensitive, nondestructive peptide detection at low UV wavelengths
- High-performance packaging: Packaged under nitrogen in amber glass with protective TFE-lined fluorocarbon caps to ensure TFA integrity
- Choice of formats for convenience: 1mL ampules can prepare 1L of 0.1% v/v TFA solution for the mobile phase in reverse-phase chromatography in moments

#### Trifluoroacetic Acid (TFA)

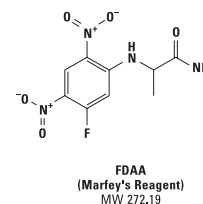
Description	Quantity	Cat. No.	Quantity
Trifluoroacetic Acid, Sequencing Grade	500mL	X <b>TS-28901</b>	1 Each
Trifluoroacetic Acid, Sequencing Grade	100g	X <b>TS-28903</b>	1 Each
Trifluoroacetic Acid, Sequencing Grade	10 × 1mL	X <b>TS-28904</b>	1 Pack
Trifluoroacetic Acid, Sequencing Grade	1g	X <b>TS-28902</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

### FDAA, Marfey's Reagent

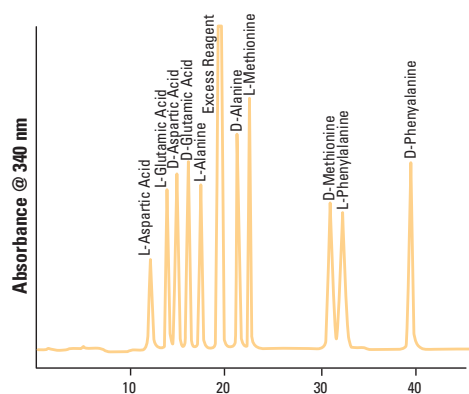
Makes separation and quantitation of optical isomers of amino acids by reverse-phase chromatography quick and easy

- Optical isomers of amino acids derivatization complete in just 90 minutes
- Derivatives have an absorption coefficient of  $\sim 3 \times 10^4$
- Derivatives can be detected by UV at 340nm with picomole sensitivity



#### FDAA, Marfey's Reagent

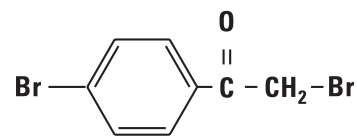
Description	Quantity	Cat. No.	Quantity
FDAA, Marfey's Reagent	50mg	<b>TS-48895</b>	1 Each



## p-Bromophenacylate Reagent

Gives quantitative yields with few or no side reactions

- Premixing of phenacylbromide and crown ether is not necessary
- Derivatization is both rapid and quantitative, with yields of >95% in 15 to 20 minutes at 80°C
- Excess reactants do not interfere
- Large excess of alkylating reagent is not necessary
- Small amounts of water or alcohol do not interfere
- If isolation is desired, products are usually crystalline



**p-Bromophenacylate**  
MW 277.94

### p-Bromophenacylate Reagent

Description	Quantity	Cat. No.	Quantity
p-Bromophenacylate Reagent	10mL	<b>TS-48891</b>	1 Each

1. Durst, H.D., et al. (1975). *Anal. Chem.* **47**, 1797.
2. Borch, R.F., et al. (1975). *Anal. Chem.* **47**, 2437.
3. Grushka, E., et al. (1975). *J. Chromatogr.* **112**, 673.
4. Fitzpatrick, F.A., et al. (1976). *Anal. Chem.* **48**, 499.

## TNBSA (Trinitrobenzene Sulfonic Acid)

An excellent choice for spectrophotometric detection

- Couples with primary amines, sulfhydryls and hydrazides in aqueous solution at pH 8, without undesirable side reactions
- Excellent for solution or solid phase analysis
- Suitable for qualitative and quantitative estimation of biomolecules; including amino acids, peptides or proteins
- Chromogenic,  $O_{\max} = 335\text{nm}$
- Reacts readily with primary amino groups of amino acids in aqueous format at pH 8 to form yellow adducts
- No colored derivatives are formed with secondary amino acids proline and hydroxyproline
- Colored derivatives are monitored at 345nm and have extinction coefficients in range of  $1-1.5 \times 10^4$

### TNBSA

Description	Quantity	Cat. No.	Quantity
TNBSA	100mL	X <b>TS-28997</b>	1 Each

1. Goodwin, J.F. and Choi, S-Y. (1970). *Clinical Chemistry*. **16**, 24-31.
2. Snyder, S.L. and Sobocinski, P.Z. (1975). *Anal. Biochem.* **64**, 284-288.
3. Drozdovskaya, N.R., et al. (1982). *FEBS Lett.* **150**, 385.
4. Takahashi, S., et al. (1984). *Chem. Lett. (Jpn)*. **1**, 127

X in the ordering table indicates that hazardous shipping charges apply.

## Hydrolysis Reagents

### Constant Boiling (6N) Hydrochloric Acid

Sequencing-grade reagent for total protein hydrolysis

- Hydrolyzes peptides in 6 hours at 150°C
- Specially purified to give ninhydrin-negative blank on hydrolysis
- Packaged in prescored ampules to eliminate contamination and ensure product integrity

#### Constant Boiling (6N) Hydrochloric Acid

Description	Quantity	Cat. No.	Quantity
Hydrochloric Acid 6N	10 × 1mL	<b>TS-24308</b>	1 Pack

1. Eveleigh, J.W. and Winter, G.D. (1970). *Protein Sequence Determination*, Ed Needleham, S.B., Springer-Verlag, pp. 92-95.
2. Blankenship, et al. (1989). *High-sensitivity amino acid analysis by derivatization with o-Phthalaldehyde and 9-Fluorescence detection: applications in protein structure determination. Anal. Biochem.* **178**, 227-232.
3. Hurley, J.B., et al. (1984). *Isolation and characterization of a cDNA clone for the subunit of bovine retinal transducin. Proc. Natl. Acad. Sci. USA.* **81**, 6948-6952.
4. Lee, K. et al. (1979). *Derivatization of cysteine and cystine for fluorescence amino acid analysis with the o-Phthalaldehyde/2-mercaptoethanol reagent. J. Biol. Chem.* **July 25**, 6248-6251.

## Amino Acid Standard H

High-purity calibration standard for protein hydrolysates

- Uses L-form configuration to permit standardization of microbial and other assays
- Molar concentration verified by conventional amino acid analysis methods
- With the exception of cystine, each amino acid is supplied at a concentration of 2.5µmoles/mL in 0.1N HCl

#### The following amino acids are included in Amino Acid Standard H:

L-alanine, Ammonia [(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>], L-Arginine, L-Aspartic Acid, L-Cystine, L-Glutamic Acid, Glycine, L-Histidine, L-Isoleucine, L-Leucine, L-Lysine •HCl, L-Methionine, L-Phenylalanine, L-Proline, L-Serine, L-Threonine, L-Tyrosine, L-Valine.

#### Amino Acid Standard H

Description	Quantity	Cat. No.	Quantity
Amino Acid Standard H	10 × 1mL	<b>TS-20088</b>	1 Pack

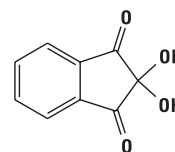
When kept frozen, an unopened vial has an indefinite storage life. Once the seal is broken, the reagent has a maximum storage life of six months. Store frozen between uses.



## Amino Acid Detection Reagents

### Ninhydrin

The reagent of choice for detection of amino acids



**Ninhydrin**  
MW 178.14

- Used in amino acid chromatography
- Offers superb color response and low blank
- Indefinitely stable and requires no refrigeration

#### Ninhydrin

Description	Quantity	Cat. No.	Quantity
Ninhydrin	500g	<b>TS-21003</b>	1 Each

1. Stein, W.H. and Moore, S. (1949). *Cold Spring Harbor Symp. Quant. Biol.* **14**, 179.

2. Moore, S. (1968). *Amino acid analysis: aqueous dimethyl sulfoxide as solvent for the ninhydrin reaction.* *J. Biol. Chem.* **243(23)**, 6281-6283.

3. James, L.B. (1978). *Amino acid analysis: ninhydrin reaction with titanous chloride.* *J. Chromatogr.* **152**, 298-300.

Indefinitely stable. No refrigeration required. Keep bottle tightly sealed. Avoid exposure to direct sunlight and ammonia.

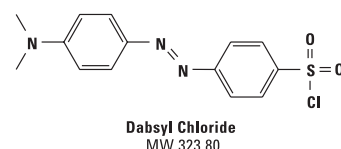


## High-Purity Pre-Column Derivatization Reagents

### Dabsyl Chloride

Recrystallized twice

- For the precolumn derivatization and detection of amino acids in visible light down to sub-picomolar levels
- Analysis of 10-30ng of protein hydrolysates
- Analysis of peptides and determination of C-terminal sequence of polypeptides
- Analysis of phosphoamino and amino acid amides
- Analysis of amino acid neurotransmitters in mouse brain



#### Dabsyl Chloride

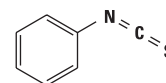
Description	Quantity	Cat. No.	Quantity
Dabsyl Chloride (4-N,N Dimethylaminoazobenzene-4-sulfonyl chloride)	500g	X <b>TS-21720</b>	1 Each

1. Chang, J.Y., et al. (1981). *Biochem. J.* **199**, 547-555.
2. Chang, J.Y., et al. (1982). *Biochem. J.* **199**, 803-806.
3. Chang, J.Y. (1984). *J. Chromatogr.* **295**, 193-200.
4. Chang, J.Y., et al. (1981). *FEBS Lett.* **132**, 117-120.
5. Vendrell, J. et al. (1986). *J. Chromatogr.* **358**, 401-413.
6. Lin, J.K., et al. (1980). *Clin. Chem.* **26**, 579-583.
7. Chang, J.Y., et al. (1983). *Methods. Enzymol.* **92**, 41-48.
8. Stocchi, V., et al. (1985). *J. Chromatogr.* **349**, 77-82.

X in the ordering table indicates that hazardous shipping charges apply.

### PITC (Phenylisothiocyanate)

High-purity reagent for pre-column quantitative derivatization of amino acids by reverse-phase HPLC



**PITC**  
**Edman's Reagent**  
MW 135.19

- Also known as Edman's Reagent
- Reacts readily with amino acids in 5 to 10 minutes at room temperature
- Resulting phenylthiocarbonyl derivatives can be separated and quantified in 30 minutes using reverse-phase HPLC to produce stable products with all amino acids including proline

#### PITC (Phenylisothiocyanate)

Description	Quantity	Cat. No.	Quantity
PITC (Edman's Reagent)	10 × 1mL	<b>TS-26922</b>	1 Pack

1. Henrikson, R.L. and Meredith, S.C. (1984). *Anal. Biochem.* **136**, 65-74.
2. Scholze, H. (1985). *J. Chromatogr.* **350**, 453-460.
3. Janssen, et al. (1986). *Chromatogr.* **22(7-12)**.  
Evert, R.F. (1986). *Anal. Biochem.* **154**, 431-435.

## HPLC and Spectrophotometric Grade Solvents

Ultrapure solvents are carefully packed for thorough protection

- Distilled in glass, filtered through 0.2µm TFE membranes and packed in solvent-rinsed, amber glass bottles
- TFE-lined screw caps seal bottles

### Acetonitrile, HPLC Grade, Physical Properties

- UV Cutoff: 190nm
- Optical Absorbance: <0.02 at 220nm
- Refractive Index at 25°C: 1.342

### Water, HPLC Grade, Physical Properties

- UV Cutoff: 190nm
- Optical Absorbance: <0.005 at 220nm
- Refractive Index at 25°C: 1.332

### Dimethylformamide (DMF), Sequencing Grade, Physical Properties

- $\text{HCON}(\text{CH}_3)_2$
- Purity (GC): ≥99%
- MW: 73.09
- Density: 0.944
- B.P. 153°C
- Water: 0.1%

### Dimethylsulfoxide (DMSO), Sequencing Grade, Physical Properties

- $\text{C}_2\text{H}_6\text{OS}$
- Purity (GC): >99.5%
- MW: 78.13
- Density: 1.101
- Water: ≤0.2%

### Pyridine

- $\text{C}_5\text{H}_5\text{N}$
- Purity (GC): ≥99%
- MW: 79.10
- Density: 0.978
- B.P. 115°C

## HPLC and Spectrophotometric Grade Solvents

Description	Quantity		Cat. No.	Quantity
Acetonitrile	1L	X	<b>TS-51101</b>	1 Each
Water	1L		<b>TS-51140</b>	1 Each
Dimethylformamide (DMF)	50mL	X	<b>TS-20673</b>	1 Each
Dimethyl sulfoxide (DMSO)	950mL	X	<b>TS-20688</b>	1 Each
Pyridine	100g	X	<b>TS-25104</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

## Peptide Standards

### Peptide Retention Standard

Allows accurate prediction of elution time for peptides of known amino acid composition up to 20 residues in length

- Save time in peptide purification
- Simplify identification of specific peptides in a complex mixture
- Increase the efficiency of predicting peptide elution profiles
- Determine the relative order of peptide elution of a complex mixture
- Predict the HPLC retention time for peptides of known amino acid composition on reverse phase HPLC columns
- Monitor column performance: efficiency, selectivity and resolution during column ageing
- Compare reverse-phase columns from different manufacturers
- Evaluate reverse-phase supports of varying n-alkyl chain lengths and ligand densities

Retention times are predicted by totaling the values that represent the contribution in minutes of each amino acid residue and the peptide terminal groups. Retention time is dependent upon the molecular weight of the peptide. The effect on retention is relatively unimportant with a small peptide, but it increases with the size of the molecule. The accuracy of predicting peptide retention time significantly decreases beyond 20 residues. To ensure accuracy, a peptide standard is used to correct for instrument variation, column aging, n-alkyl chain length variation and ligand density.

#### Peptide Retention Standard

Description	Quantity	Cat. No.	Quantity
Peptide Retention Standard, S1-S5	1 vial	<b>TS-31700</b>	1 Each

1. Guo, D., et al. (1985). *Proceedings of the Ninth American Peptide Symposium*, Published by Thermo Fisher Scientific, Rockford, Illinois, page 23.
2. Guo, D., et al. (1986). *J. Chromatogr.* **359**, 499-517.
3. Guo, D., et al. (1986). *J. Chromatogr.* **359**, 519-532.
4. Mant, C.T. and Hodges, R.S. (1986). *L.C. Magazine Liq. Chrom. and HPLC* **4(3)**, 250.
5. Guo, D., et al. (1987). *J. Chromatogr.* **386**, 205-222.

### Peptide Retention Time Calibration Mixture

Heavy peptide mixture for column assessment and prediction of peptide retention times

- Assessment of chromatography and MS instrument performance
- Prediction of peptide retention across multiple instrument platforms
- Prediction of peptide retention time from sequence using calculated hydrophobicity factor
- Optimization of scheduled MS acquisition windows for improving quantification and increased multiplexing
- Internal standard to normalise for variation in retention times and peak intensities between runs

#### Thermo Scientific Peptide Retention Time Calibration Mixture

Description	Quantity	Cat. No.	Quantity
Peptide Retention Time Calibration Mixture, 0.5pmol/μL	50μL	<b>TS-88320</b>	1 Each
Peptide Retention Time Calibration Mixture, 5pmol/μL	200μL	<b>TS-88321</b>	1 Each

## Dionex Ion Standard Concentrates

- The Dionex IonPac ready-to-use ion standards are designed for routine anion or cation determinations
- All standards are traceable to NIST Standard Reference Materials
- Shipped with a Certificate of Analysis verifying the concentration

Description	Volume (mL)	Cat. No.
Combined Five Anion Standard	100	<b>037157</b>
Combined Seven Anion Standard I	50	<b>056933</b>
Combined Seven Anion Standard II	100	<b>057590</b>
Fluoride Standard (1000mg/L)	100	<b>037158</b>
Chloride Standard (1000mg/L)	100	<b>037159</b>
Sulfate Standard (1000mg/L)	100	<b>037160</b>
Combined Six Cation Standard-I	50	<b>040187</b>
Combined Six Cation Standard-II	50	<b>046070</b>

## MS Standard Concentrates

- MS standards for validation and calibration of the MSQ System

Description	Cat. No.
Kit of 2 standards for performance validation in ESI and APCI modes	<b>061496</b>
Standard for Mass Calibration (All MSQ Models)	<b>062917</b>

## Perchlorate Internal Standard

- For the quantification of perchlorate at low parts-per-trillion levels using mass spectrometric detection. Contains stable-labeled perchlorate (1mg/L).

Description	Cat. No.
Perchlorate-ISTD. <sup>18</sup> O Internal Standard for Perchlorate	<b>062923</b>

## Haloacetic Acid Internal Standards

- Ready-to-use internal standards for haloacetic acid analysis using electrospray-mass spectrometric detection
- Stable-labeled internal standards prepared in MTBE (methyl-t-butyl ether), 1mL ampule plus empty vial

Description	Volume (mL)	Cat. No.
Monochloroacetic Acid -2-13C Internal Standard, 1000mg/L in MtBE	1	<b>069406</b>
Monobromoacetic Acid -1-13C Internal Standard, 1000mg/L in MtBE	1	<b>069407</b>
Dichloroacetic Acid -2-13C Internal Standard, 1000mg/L in MtBE	1	<b>069408</b>
Trichloroacetic Acid -2-13C Internal Standard, 1000mg/L in MtBE	1	<b>069409</b>

## Ion Pairing Reagents

- Highly purified ion-pairing reagents are used in mobile phase ion chromatography (MPIC), combining reversed-phase ion-pair chromatography with chemical suppression

Description	Volume (mL)	Cat. No.
Tetrabutylammonium hydroxide (TBAOH)	500	<b>035360</b>
Tetrapropylammonium hydroxide (TPAOH)	500	<b>035363</b>
Hexanesulfonic acid (HSA)	500	<b>035361</b>
Octanesulfonic acid (OSA)	500	<b>035362</b>





# LC and LC-MS Instrument Accessories, Consumables and Spare Parts

Our liquid chromatographs and mass spectrometers advance scientific knowledge, enable drug discovery, improve manufacturing processes, and protect people and the environment. When your instrument is maintained with Thermo Scientific parts, you can expect the best results and highest productivity, keeping your research or processes moving smoothly.



# Thermo Scientific Dionex UltiMate 3000 Systems Portfolio

## Basic Automated System

The Thermo Scientific™ Dionex™ UltiMate™ 3000 Basic Automated System is optimized for reliability and ease-of-use with routine LC applications, and also offers full UHPLC compatibility. The ACC-3000 Autosampler Column Compartment is at the heart of the system. Its unique instrument design combines a rugged sample injection principle with a powerful column oven.



## Standard (SD) LC Systems

UltiMate 3000 Standard (SD) Systems are designed to meet current and future challenges. System components provide low extra-column and gradient delay volume for high separation efficiency and low gradient response times, as well as superior mixing performance. They offer full support of all HPLC applications and provide UHPLC compatibility – allowing you to move to UHPLC whenever you are ready.



## Rapid Separation (RS) LC Systems

UltiMate 3000 Rapid Separation (RS) Systems provides unrivaled performance and flexibility in UHPLC. Precision-engineered instrumentation, advanced data processing, and highly optimized chemistries meet all chromatographic performance challenges. With an outstanding product portfolio, UltiMate 3000 RS Systems offers industry leading versatility covering the maximum range of UHPLC applications, while keeping fully compatible to conventional LC.



## Biocompatible Rapid Separation (BioRS) LC Systems

UltiMate 3000 Biocompatible Rapid Separation (BioRS) Systems are powered by UltiMate 3000 Rapid Separation technology to support the high pressures required for the separation of bioanalytes on high resolution bio UHPLC columns. This state-of-the-art technology combined with a biocompatible, low-dispersion flow path, provides the highest peak capacity and sensitivity for complex samples, whether proteins, peptides, or biotherapeutics. Bio UHPLC enables faster gradients and shorter run times compared to conventional Bio LC analysis. This results in increased sample throughput in typical modes of biochromatography.



## x2 Dual Rapid Separation LC Systems

UltiMate 3000 x2 Dual LC Systems are the ideal choice to maximize sample throughput of conventional HPLC and UHPLC separations by combining the flexibility of ternary solvent selection with the productivity and performance of x2 Dual technology.

Advanced chromatographic techniques such as parallel, tandem, and two-dimensional LC become a realistic and practical option, even at ultrahigh speed. Operate conventional or ultrahigh speed applications, increase sample throughput, achieve higher chromatographic resolutions, or automate tedious sample preparation steps such as analyte enrichment or matrix elimination.



## XRS LC Systems

UltiMate 3000 XRS Systems are highly LC/MS optimized quaternary UHPLC systems and the best choice for ultrahigh resolution and high speed UHPLC MS-frontend solutions. This system is the ideal solution for high sample throughput and ultra high resolution chromatography.



## Accessories, Consumables and Spare Parts for UltiMate 3000 Instruments

### Accessories for the Use with UltiMate 3000 Instruments

Description	Quantity	Cat. No.
Drainage kit for UltiMate 3000 systems	1	<b>6040.0005</b>
Menu pen	1	<b>6300.0100</b>
Installation tool for Viper capillaries with torque toothing	1	<b>6040.2314</b>
HPLC Troubleshooting Guide poster	1	<b>6040.0050</b>

## UltiMate 3000 Solvent Racks

### Consumables and Spare Parts for UltiMate 3000 Solvent Racks

Description	Quantity	Cat. No.
Solvent supply line (analytical)	1	<b>6030.2548</b>
Solvent supply line from analytical degasser to pump head	1	<b>6030.2546</b>
Bottle cap for solvent reservoirs	4	<b>6270.0013</b>
Caps and retaining guides for solvent bottles (5 caps and 10 retaining guides)	1	<b>6030.9101</b>
Degasser Channel Upgrade Kit for SRD	1	<b>6035.0089</b>
External power supply unit	1	<b>6510.0004</b>



Also use our HPLC Troubleshooting Guide as a Mobile App for iPhone, Android and Windows phones.

# UltiMate 3000 Pumps

## Accessories for the Use with UltiMate 3000 Pumps

Description	Quantity	Cat. No.	For use with				
			SD pumps	RS pumps	BM pumps	XRS pumps	BX pumps
Filter holder for solvent filter	6	<b>6268.0115</b>	X	X	X		
Filter holder for solvent filter	2	<b>6268.0116</b>					X
Filter frit (SST, porosity: 10µm)	10	<b>6268.0110</b>	X	X			
Filter frit (Ti, biocompatible, porosity: 10µm)	10	<b>6828.0111</b>		X	X		X
Filter frit (PEEK, porosity: 10µm)	10	<b>6828.0117</b>			X		
Solvent lines kit with filter frits (SST, porosity: 20µm)	1	<b>6043.8109</b>				X	

## Spare Parts for UltiMate 3000 Pumps

Description	Quantity	Cat. No.	For use with				
			SD pumps	RS pumps	BM pumps	XRS pumps	BX pumps
<b>Check Valves</b>							
Check valve, cartridge (ceramics) for the inlet and outlet valve	1	<b>6041.2301</b>	X	X	X		X
Check valve cartridge for the inlet and outlet valve	1	<b>6043.0145</b>				X	
<b>Pistons</b>							
Pistons (sapphire)	2	<b>6040.0042</b>	X	X	X		
Pistons (ceramics)	2	<b>6040.0842</b>					X
Pistons (sapphire)	2	<b>6043.0169</b>				X	
<b>Piston Seals</b>							
Piston seal (in plate of seal wash system) Normal Phase	2	<b>6040.0306</b>	X	X	X		
Piston seal kit (in plate of seal wash system) Reversed Phase (2 seals and 1 support ring)	1	<b>6040.9010</b>					X
Piston seal (main piston seal) Reversed Phase	2	<b>6040.0304</b>	X				
Piston seal (main piston seal) Reversed Phase	2	<b>6266.0305</b>		X			
Piston seal kit (main piston seal) Reversed Phase (2 seals and 1 support ring)	1	<b>6025.2012</b>			X		
Piston seal kit (main piston seal) Reversed Phase (2 seals and 1 support ring)	1	<b>6040.9010</b>					X
Piston seal kit (main piston seal) Normal Phase (2 seals and 1 support ring)	1	<b>6040.9011</b>					X
Piston seal kit Reversed phase (2 primary piston seals and 2 secondary piston seals)	1	<b>6043.0295</b>				X	
<b>Support Rings</b>							
Support ring for pistons seals	2	<b>6040.0012</b>	X	X			
Support ring/pistons seal kit Reversed Phase (2 piston seals and 1 support ring)	1	<b>6025.2012</b>			X		
Support ring/pistons seal kit Reversed Phase (2 seals and 1 support ring)	1	<b>6040.9010</b>					X
Support ring/pistons seal kit Normal phase (2 seals and 1 support ring)	1	<b>6040.9011</b>					X

### Manual Sample Injection Valves for the Use with UltiMate 3000 Pumps

Description	Quantity	Cat. No.
Manual injection valve kit, pressures > 50 MPa	1	6040.0610
Manual injection valve kit, biocompatible, pressures > 34 MPa	1	6042.0600
Motorized manual injection valve kit	1	6040.0110
Mounting kit for manual injection valve	1	6040.0611
<b>Syringe for use with the manual injection valve</b>		
100µL syringe	1	6035.0665
5mL syringe	1	6035.0670
1mL syringe	1	6040.0620

### Mixing Systems for the Use with UltiMate 3000 Pumps

Description	Quantity	Cat. No.	
		SD pumps <sup>1</sup>	RS pumps
Mixer for 35µL mixing volume	1	6040.5000	6042.5000
Mixer for 100µL mixing volume	1	6040.5100	6042.5100
Mixer for 200µL mixing volume	1		6040.5110
Mixer for 400µL mixing volume	1		6040.5310
Mixer for 800µL mixing volume	1		6040.5750
Mixer for 1550µL mixing volume	1		6040.5450

<sup>1</sup>except ISO-3100

### Normal Phase Upgrade Kits for UltiMate 3000 Pumps

Description	Quantity	Cat. No.
Normal Phase Kit for HPG-3200BX	1	6040.1975
Normal Phase Kit for SD pumps	1	6040.1972

### Maintenance Kits for UltiMate 3000 Pumps

Description	Quantity	SD pumps	RS pumps	BM pumps	XRS pumps	BX pumps
Maintenance kit for ISO-3100	1	6040.1950	—	6042.1950	—	—
Maintenance kit for HPG-3x00	1	6040.1953	6040.1956A	—	—	—
Maintenance kit for LPG-3400	1	6040.1951	6040.1954A	6042.1951	6043.1954	6042.1954(NP) 6042.1953(RP)
Maintenance kit for DGP-3600	1	6040.1952	6040.1955A	6042.1952	—	—





# UltiMate 3000 Autosamplers

## Sample Racks for the Use with UltiMate 3000 WPS Autosamplers and UltiMate 3000 ACC Autosampler Column Compartments

Description	Quantity	Cat. No.	For use with	
			WPS	ACC
<b>Sample Racks</b>				
Sample Rack (10 position and/or normal well plates) for 10mL vials, 22.5mm×46mm	1	<b>6820.4086</b>	X	X
Sample Rack (22 position) for 4mL vials, 15mm×45mm, cylindrical	1	<b>6820.4084</b>	X	X
Sample Rack (40 position) for 2mL vials, 12mm×32mm, cylindrical	1	<b>6820.4070</b>	X	X
Sample Rack (40 position and/or normal well plates) for 1.1mL vials, 12mm×32mm, conical	1	<b>6820.4087</b>	X	X
Sample Rack (40 position) for 0.5mL Eppendorf tubes	1	<b>6820.4096</b>	X	X
Sample Rack (40 position) for 1.5mL Eppendorf tubes	1	<b>6820.4094</b>	X	X
Sample Rack (72 position and/or normal well plates) for 1.2mL vials, 8mm×40mm, cylindrical	1	<b>6820.4090</b>	X	X
Sample Rack (72 position and/or normal well plates) for 0.3mL vials, 8mm OD, cylindrical	1	<b>6820.4091</b>	X	X
Sample Rack (72 position) for 0.3mL micro dialysis vials	1	<b>6820.4097</b>	X	X
<b>Support Racks for Well Plates</b>				
Support rack for deep well plates (34 – 46mm high)	1	<b>6820.4079</b>	X	
Support rack for deep well plates (30 – 36mm high, 96 or 384 wells)	1	<b>6820.4083</b>	X	
Support rack for deep well plates (20 – 32mm high, 96 or 384 wells)	1	<b>6820.4089</b>	X	

Find the Thermo Fisher Scientific Vials and Closures portfolio on page **2-001**.



### Optional Accessories for the Use with UltiMate 3000 WPS-3000 Split Loop Autosamplers

Description	Quantity	Cat. No.	For use with			
			WPS-3000TXRS/ WPS-3000(T) RS	WPS-3000TBRS	WPS-3000(T) SL Analytical	WPS-3000(T) SL Semiprep
<b>Needles</b>						
Needle (SST) Viper compatible	1	6820.2432	X/X		X	
Needle (ceramic) Viper compatible	1	6841.2420		X		
Needle (SST)	1	6820.2403				X
Needle (SST)	1	6820.2419				X
<b>Needle Seat Capillaries</b>						
Needle seat capillary, 3.1µL, Viper (SST)	1	6820.2464	X/X		X	
Needle seat capillary, 3.1µL, Viper (PEEK)	1	6827.2408				X
Needle seat capillary, 3.1µL, Viper (MP35N™)	1	6841.2464		X		
Needle seat capillary, 1µL, Viper (MP35N)	1	6841.2472		X		
Needle seat capillary, 1µL, Viper (SST)	1	6820.2472	X/-			
Needle seat capillary, 24µL, Viper (SST)	1	6820.2409				X
<b>Sample Loops - SST</b>						
25µL Sample loop, Viper	1	6820.2452	X/X		X	
100µL Sample loop, Viper	1	6820.2451	X/X		X	
250µL Sample loop, Viper	1	6820.2453	-/X		X	
500µL Sample loop, Viper	1	6820.2454	-/X		X	
1000µL Sample loop	1	6820.2429				X
<b>Sample Loops – MP35N</b>						
25µL Sample loop, Viper	1	6841.2452		X		
100µL Sample loop, Viper	1	6841.2451		X		
250µL Sample loop, Viper	1	6841.2453		X		
500µL Sample loop, Viper	1	6841.2454		X		
<b>Sample Loops – PEEK</b>						
100µL Sample loop	1	6820.2431				X
<b>Buffer Loops</b>						
Buffer loop, 100µL, Viper (SST)	1	6820.2466	X/X		X	X
Buffer loop, 100µL, Viper (MP35N)	1	6841.2466		X		
Buffer loop, > 250µL, Viper (SST)	1	6820.2468				X
Buffer loop, > 250µL, Viper (MP35N)	1	6841.2468		X		
<b>Syringes</b>						
25µL Syringe	1	6822.0001	X/X	X	X	X
100µL Syringe	1	6822.0002	X/X	X	X	X
250µL Syringe	1	6822.0003	X/X	X	X	X
500µL Syringe	1	6822.0004	X/X	X	X	X
1000µL Syringe	1	6822.0005	X/X	X	X	X
2500µL Syringe	1	6822.0006	X/X	X	X	X

### Injection Volume Kits for the Use with UltiMate 3000 WPS-3000 Split Loop Autosamplers

Description	Quantity	Cat. No.	For use with			
			WPS-3000(T)RS	WPS-3000TBRS	WPS-3000(T)SL Analytical	WPS-3000(T)SL Semiprep
Injection volume kit (250µL), Viper	1	6822.2442	X		X	
Injection volume kit (250µL), Viper	1	6841.2442		X		
Injection volume kit (500µL), Viper	1	6822.2443	X		X	
Injection volume kit (500µL), Viper	1	6841.2443		X		
Injection volume kit (1000µL)	1	6822.2436				X

**Optional Accessories for the Use with UltiMate 3000 WPS-3000 Pulled Loop Autosamplers**

Description	Quantity	Cat. No.	For use with			
			WPS-3000(T)PL RS Nano/Cap	WPS-3000TBPL Analytical	WPS-3000TFC	WPS-3000TBFC
<b>Modification Kits</b>						
Nano/Cap modification kit	1	<b>6824.0030</b>			X	
Nano/Cap modification kit	1	<b>6825.0030</b>				X
Upgrade kit PAEK	1	<b>6821.0045</b>	X			
Front cover, transparent	1	<b>6820.1427</b>	X	X	X	X
<b>Needles</b>						
2.4µL Needle, nanoViper	1	<b>6820.3010</b>	X		X <sup>1</sup>	X <sup>1</sup>
3.6µL Needle, Viper	1	<b>6820.3023</b>	X	X	X <sup>1</sup>	X <sup>1</sup>
15µL Needle, Viper	1	<b>6820.3025</b>	X <sup>2</sup>	X	X	X
15µL Needle, nanoViper	1	<b>6820.3115</b>	X <sup>2</sup>	X	X	X
<b>Sample Loops – nanoViper</b>						
1µL Sample loop, nanoViper	1	<b>6826.2401</b>	X		X <sup>1</sup>	X <sup>1</sup>
5µL Sample loop, nanoViper	1	<b>6826.2405</b>	X		X <sup>1</sup>	X <sup>1</sup>
10µL Sample loop, nanoViper	1	<b>6826.2410</b>	X		X <sup>1</sup>	X <sup>1</sup>
20µL Sample loop, nanoViper	1	<b>6826.2420</b>	X		X <sup>1</sup>	X <sup>1</sup>
50µL Sample loop, nanoViper <sup>2</sup>	1	<b>6826.2450</b>	X	X	X	X
125µL Sample loop, nanoViper <sup>2</sup>	1	<b>6826.2412</b>	X	X	X	X
<b>Sample Loops – SST</b>						
50µL Sample loop	1	<b>6824.0019</b>			X	
250µL Sample loop	1	<b>6824.0020</b>			X	
<b>Sample Loops – PEEK</b>						
5µL Sample loop	1	<b>6823.0016</b>	X	X		X
10µL Sample loop	1	<b>6823.0017</b>	X	X		X
20µL Sample loop	1	<b>6823.0018</b>	X	X		X
50µL Sample loop	1	<b>6823.0019</b>	X <sup>2</sup>	X		X
125µL Sample loop	1	<b>6821.0032</b>	X <sup>2</sup>	X		X
250µL Sample loop	1	<b>6823.0020</b>		X		X
<b>Buffer Tubings</b>						
50 µL Buffer tubing (SST)	1	<b>6820.0019</b>	X		X <sup>1</sup>	
50 µL Buffer tubing (PEEK/PTFE)	1	<b>6821.0019</b>	X <sup>3</sup>			X <sup>1</sup>
500 µL Buffer tubing (SST)	1	<b>6820.0020</b>	X		X	
500 µL Buffer tubing (PEEK/PTFE)	1	<b>6821.0020</b>	X <sup>3</sup>	X		X
1000 µL Buffer tubing (SST)	1	<b>6820.0056</b>			X	
1000 µL Buffer tubing (PEEK/PTFE)	1	<b>6821.0022</b>		X		X
2000 µL Buffer tubing (SST)	1	<b>6820.0021</b>	X			
2000 µL Buffer tubing (PEEK/PTFE)	1	<b>6821.0021</b>	X <sup>3</sup>			
<b>Syringes</b>						
25µl Syringe	1	<b>6822.0001</b>	X		X <sup>1</sup>	X <sup>1</sup>
100µl Syringe	1	<b>6822.0002</b>	X	X	X	X
250µl Syringe	1	<b>6822.0003</b>	X <sup>4</sup>	X	X	X
500µl Syringe	1	<b>6822.0004</b>	X <sup>4</sup>			
1000µl Syringe	1	<b>6822.0005</b>	X <sup>4</sup>			
Syringe upgrade kit (250µL) <sup>4</sup>	1	<b>6820.0031</b>	X			
Syringe upgrade kit (250µL, biocompatible version) <sup>4</sup>	1	<b>6821.0031</b>	X <sup>3</sup>			
<b>Bridges</b>						
1µL Bridge (PEEKsil)	1	<b>6824.0015</b>			X <sup>1</sup>	
1µL Bridge (PEEKsil)	1	<b>6825.0015</b>				X <sup>1</sup>
6.2µL Bridge (PEEK)	1	<b>6824.0016</b>			X	
6.2µL Bridge (PEEK)	1	<b>6825.0016</b>				X

Find recommended combinations for syringes, buffer tubings and sample loops on page 4-218.

1. Can be used for Nano/Cap/Mic applications only if Nano/Cap modification kit is previously installed
2. For analytical applications only, please use the smaller sample loops for Nano/Cap
3. Can be mounted only when PAEK Upgrade Kit is previously installed
4. For analytical applications only, please use the smaller syringes for Nano/Cap

**Recommended Syringes, Buffer Tubings and Sample Loops Combinations for the Use with UltiMate 3000 WPS-3000(T)PL RS Nano/Cap, WPS-3000(T)BPL Analytical, WPS-3000TFC and WPS-3000TBFC Autosamplers**

Recommended Combinations		
Syringe	Buffer Tubing	Sample Loop
WPS-3000(T)PL RS Nano/Cap		
25µL	50µL	1µL, 5µL
100µL	500µL	10µL, 20µL
250µL	500µL	50µL, 125µL
WPS-3000TBPL Analytical		
100µL	500µL	5µL, 10µL, 20µL, 50µL
250µL	1000µL	125µL, 250µL
WPS-3000TFC and WPS-3000TBFC Analytical (with Nano/Cap Modification Kit)		
25µL	50µL	1µL, 5µL
100µL	500µL	5µL, 10µL, 20µL, 50µL
250µL	500µL	50µL, 125µL
250µL	1000µL	250µL

**Accessories and Spare Parts for the Use with UltiMate 3000 OAS-3x00 Open Autosamplers**

Description	Quantity	Cat. No.
Holding loop (FEP) with needle adapter mounted	1	<b>6845.0034</b>
Holding loop kit (FEP)	1	<b>6845.0035</b>
Holding loop (SST)	1	<b>6845.0029</b>
2µL Sample loop for Cheminert injection valve	1	<b>755.CSL2</b>
20µL Sample loop for Cheminert injection valve	1	<b>755.CSL20</b>
100µL Sample loop for Cheminert injection valve	1	<b>755.CSL100</b>
100µL Syringe	1	<b>6845.0062</b>
Sample tray (VT54) for 2mL vials (54 positions per tray)	6	<b>6845.0055</b>

**Accessories and Spare Parts for the Use with ACC-3000(T) Autosampler Column Compartments**

Description	Quantity	Cat. No.
Adapter for 5-position holder to be used for 2mL vials	1	<b>6820.4092</b>
Adapter for vial pusher for uncapped 10mL vials	1	<b>6820.2402</b>
Needle	1	<b>6820.2403</b>
Buffer tubing, >250µL, Viper	1	<b>6820.2468</b>
20µL Sample loop, Viper	1	<b>6830.2414</b>
50µL Sample loop, Viper	1	<b>6830.2416</b>
200µL Sample loop, Viper	1	<b>6830.2418</b>
250µL Syringe	1	<b>6822.0003</b>
1000µL Syringe	1	<b>6822.0005</b>
Front cover, transparent	1	<b>6820.1427</b>

## UltiMate 3000 Thermostatted Column Compartments

### Accessories for the Use with UltiMate 3000 TCC-3000(RS) Thermostatted Column Compartments

Description	Quantity	Cat. No.
1µL Pre-column heater, Viper (SST)	1	6722.0510
2µL Pre-column heater, Viper (SST)	1	6722.0530
7µL Pre-column heater, Viper (SST)	1	6722.0540
11µL Pre-column heater, Viper (SST)	1	6722.0550
Post-column cooler insert, Viper (SST)	1	6730.0008
Column clip for columns with an outer diameter < 8mm	6	6722.0290
Column clip for columns with an outer diameter of 8-12mm	6	6722.0280

### Optional Column Switching Valves for the Use with UltiMate 3000 TCC-3000RS/SD Thermostatted Column Compartments

Description	Quantity	Biocompatible			Non biocompatible		
		TitanHP™		TitanHT™	TitanHP™	TitanHT™	
		< 34 MPa (5000 psi)	< 41 MPa (6000 psi)	< 103 MPa (15000 psi)	< 41 MPa (6000 psi)	< 103 MPa (15000 psi)	<125 MPa (18130 psi)
<b>Valve Drives</b>							
Valve Drive (Actuator) for right side installation	1	6730.0003		6730.0001	6730.0003		6730.0001
Valve Drive (Actuator) for left side installation	1	6730.0004		6730.0002	6730.0004		6730.0002
<b>Pods</b>							
Pod, 2-position, 6-port	1	6723.9013 (PEEK)	–	6730.0031 (Ti)	6722.9013 (SST)	6730.0006 (SST)	–
Pod, 2-position, 10-port	1	6723.9023 (PEEK)	–	6730.0032 (Ti)	6722.9023 (SST)	6730.0026 (SST)	–
Pod, 6-position, 7-port	1	–	6722.9035 (Ti)	6730.0030 (Ti)	–	6730.0016 (SST)	6730.0050 (SST)



## UltiMate 3000 Detectors

### Flow Cells for UltiMate 3000 DAD-3000(RS), MWD-3000(RS), VWD-3x00(RS) and FLD-3x00(RS) Detectors

Description	Quantity	Cat. No.	DAD-3000(RS) MWD-3000(RS)	VWD-3x00(RS)	FLD-3x00(RS)
Analytical flow cell (13µL, SST, 12 MPa)	1	6082.0100	X		
Semi-analytical flow cell (5µL, SST, 12 MPa)	1	6082.0200	X		
Semi-micro flow cell (2.5µL, SST, 12 MPa)	1	6082.0300	X		
Analytical flow cell (13µL, PEEK, 5 MPa)	1	6082.0400	X		
Semi-micro flow cell (2.5µL, PEEK, 5 MPa)	1	6082.0500	X		
Semipreparative flow cell (0.7µL, PEEK, 10 MPa)	1	6082.0600	X		
Flow cell, analytical (11µL, SST, 12 MPa)	1	6074.0250		X	
Flow cell, semi-micro (2.5µL, SST, 12 MPa)	1	6074.0360		X	
Flow cell, analytical (11µL, PEEK, 5 MPa)	1	6074.0200		X	
Flow cell, semi-micro (2.5µL, PEEK, 5 MPa)	1	6074.0300		X	
Flow cell, semi-preparative (0.7µL, PEEK, 10 MPa)	1	6074.0320		X	
Flow cell, Mic (180nL, fused silica, 20 MPa)	1	6074.0290		X	
Flow cell, capillary (45nL, fused silica, 20 MPa)	1	6074.0280		X	
Flow cell, nano (3nL, fused silica, 20 MPa)	1	6074.0270		X	
UV monitor, ultra-low dispersion (45nL, fused silica, 30 MPa)	1	6074.0285		X	
Flow cell, dummy	1	6074.0190		X	
Flow cell, analytical (8µL, SST, 2 MPa)	1	6078.4230			X
Flow cell, micro (2µL, SST, 4 MPa)	1	6078.4330			X

### Accessories and Spare Parts for UltiMate 3000 Optical Detectors

Description	Quantity	Cat. No.	DAD-3000(RS) MWD-3000(RS)	VWD-3x00(RS)	FLD-3x00(RS)
Deuterium lamp	1	6074.1110	X	X	
Tungsten lamp	1	6074.2000	X	X	
DAC board	1	6082.0305	X	X	X
DAC cable (analog out)	1	6074.0002	X	X	





### Accessories and Spare Parts for the Use with the UltiMate 3000 PCM-3000 pH and Conductivity Monitor

Description	Quantity	Cat. No.
pH flow cell, 28µL (PEEK)	1	<b>6082.2030</b>
pH electrode for PCM-3000	1	<b>6082.2020</b>
Dummy electrode for PCM-3000	1	<b>6082.2042</b>
Conductivity flow cell, 21µL (Ti)	1	<b>6082.2060</b>

### Accessories and Spare Parts for the Use with the UltiMate 3000 ECD-3000RS Detectors

Description	Quantity	Cat. No.
In-Line Filter Kit with Graphite Filter Elements	1	<b>70-0893</b>
In-Line Filter Kit with PEEK Filter Elements	1	<b>70-4093</b>
Filter Element (Graphite)	5	<b>70-0898</b>
Filter Element (PEEK)	5	<b>70-3824</b>
Amperometric Cell 6041RS ultra (25nL or 50nL, glassy carbon or boron-doped diamond, 1.4 MPa)	1	<b>6070.3000</b>
Gasket for Amperometric Cell 6041RS (25nL, boPET)	5	<b>6070.2528</b>
Gasket for Amperometric Cell 6041RS (50nL, boPET)	5	<b>6070.2529</b>
Working Electrode for Amperometric Cell 6041RS (boron-doped diamond, BDD)	1	<b>6070.3100</b>
Working Electrode for Amperometric Cell 6041RS (glassy carbon, GC)	1	<b>6070.3200</b>
Coulometric Cell 6011RS ultra (7.06µL, micro-porous graphite carbon, 4 MPa)	1	<b>6070.2400</b>
Potentiostat Module, dual channel DC	1	<b>6070.1400</b>
Cell Simulator – SimulatorRS	1	<b>6070.4100</b>
Cell Simulator – QualifierRS	1	<b>6070.4200</b>

### Accessories and Spare Parts for the Use with Charged Aerosol Detectors

Description	Quantity	Cat. No.	Corona CAD	Corona ultra RS
Gas Filter Assembly (HEPA/Carbon)	1	<b>70-6224</b>	X	X
Corona Waste Bottle Cap Assembly	1	<b>70-7754</b>	X	X
Bottle, 5.0 L Waste (Compatible with 70-7754 only)	1	<b>70-7751</b>	X	X
Filter-HPLC Inline	1	<b>70-4538</b>	X	X
Drain/Vent Tubing Assembly	1	<b>70-7115</b>	X	X
Gas Inlet Tubing (¼")	1	<b>70-6260</b>	X	X
Gas Exhaust Hose Assembly	1	<b>70-6261</b>	X	X
Maintenance Kit for Nitrogen Generator	1	<b>70-6230</b>	X	X
Corona ultra RS Waste Level Detector Assembly	1	<b>70-9363R</b>		X

## UltiMate 3000 Automated Fraction Collector

### Sample Racks and Accessories for the Use with the UltiMate 3000 AFC-3000

Description	Quantity	Cat. No.
<b>Sample Racks</b>		
Sample Rack (10 position) for 10mL vials, 22mm × 45mm	1	<b>6820.4086</b>
Sample Rack (22 position) for 4mL vials, 15mm × 45mm	1	<b>6820.4084</b>
Sample Rack (40 position) vfr 2mL vials, 12mm × 32mm	1	<b>6820.4070</b>
Sample Rack (21 position) for 50mL tubes, 30mm × 100mm	1	<b>6702.0021</b>
Sample Rack (24 position) for 30mL tubes, 24mm × 100mm	1	<b>6702.0024</b>
Sample Rack (40 position) for 20mL tubes, 20mm × 100mm	1	<b>6702.0040</b>
Sample Rack (60 position) for 14mL tubes, 16mm × 100mm	1	<b>6702.0060</b>
Sample Rack (90 position) for 8mL tubes, 13mm × 100mm	1	<b>6702.0090</b>
Sample Rack (36 position) for Foxy vials, scintillation vials, 28mm OD	1	<b>5701.2025</b>
Sample Rack (60 position) for Foxy vials, 1.5mL	1	<b>5701.2023</b>
Sample Rack (72 position) for Foxy mini tubes, 18mm OD	1	<b>5701.2024</b>
Positioning pins for Foxy racks	2	<b>6702.9006</b>
Funnel rack	1	<b>6702.1021</b>
Adapter for 4 WPS racks	1	<b>6702.0100</b>
Adapter for 4 well plates	1	<b>6702.0200</b>
Adapter for 2 well plates (Foxy Jr./R1)	1	<b>5701.2021</b>
<b>Accessories</b>		
Diverter valve, 0.4mm ID drop former, and tubing ("Kit for low flow rates")	1	<b>6702.0300</b>
Drop former, 1mm ID SST, including grounding cable ("Kit for normal-phase LC")	1	<b>6702.0400</b>

Find the Vials and Closures portfolio on page **2-001**.



## UltiMate 3000 RSLC Nano System

The UltiMate 3000 RSLC Nano System was developed with throughput in mind. The robust, continuous direct-flow delivery is designed for interruption-free analysis. The wide flowpressure footprint enables the application of UHPLC to the nano scale, allowing analysts to tune for the highest resolution or the fastest analysis time, even for tryptic peptide samples of utmost complexity. Configurable for speed, separation power, or sensitivity, the UltiMate 3000 RSLC Nano is the only system to deliver all.



### Consumables and Spare Parts for UltiMate 3000 RSLC Nano Systems

Description	Quantity	Cat. No.
Maintenance kit for NCS-3500RS loading pump	1	6042.1951
Check valve cartridge, ceramics (for both the inlet and outlet valve) for the NC pump and loading pump	1	6041.2301
Column switching valve; 2-position, 6-port valve	1	6041.0004
Column switching valve; 2-position, 10-port valve	1	6041.0001
Flow meter, biocompatible with flow selector for nano LC (50 – 1000nL/min)	1	6041.7901A
Flow meter, biocompatible with flow selector for capillary LC (0.5 – 10µL/min)	1	6041.7902A
Flow meter, biocompatible with flow selector for micro LC (5 – 50µL/min)	1	6041.7903A
Flow selector for nano LC (50 – 1000nL/min)	1	6041.0002
Flow selector for capillary LC (0.5 – 10µL/min)	1	6041.0003
Flow selector for micro LC (5 – 50µL/min)	1	6041.0014
Mixer kit (8µL) for capillary LC	1	6041.7130
Piston (sapphire)	2	6040.0042
Piston seal (in plate of seal wash system), NP, for NC pump and loading pump	1	6040.0306
Piston seal (main piston seal), RP, for NC pump and loading pump	2	6266.0305
Support ring for main piston seal for NC pump and loading pump	2	6040.0012
Pump head, entire assembly, for NC pump	1	6041.1901A
Pump head, entire assembly, for loading pump	1	6041.1902
Rear seal wash system, seals	1	6040.2208
Column installation/capillary clips kit (6 column clips, 2 clips to attach capillaries routed from top to bottom through the column chamber)	1	6041.0011
Tubing from proportioning valve to pump head, loading pump (with fittings)	2	6040.3023

## EASY-nLC 1000 Liquid Chromatograph

Thermo Scientific™ EASY-nLC 1000 Liquid Chromatograph provides effortless split-free, nano-flow UHPLC performance up to 1000 bar with minimal investment. Dual in-line flow sensors before mixing gives uncompromising gradient precision.

Identify more peptides and increase productivity with higher pressure without compromising reliability and robustness.



### Common replacement parts for EASY-nLC 1000 Systems

Description	Cat. No.
Pump Piston Seal Replacement Kit (contains four spring-energized piston seals and a piston seal tool)	LC510
Valve rotor seal (contains one rotor seal)	LC228
Autosampler needle, ASC model	LC302
Column Out solvent line	LC560
Waste In solvent line	LC562
Flow sensor filters (contains four flow sensor filters)	LC542

## Accessories, Consumables and Spare Parts for Thermo Scientific Accela High Speed LC

### Accela Accessory Kits

Description	Quantity	Cat. No.
Accela Pump accessory kit	1	60157-62001
LC/MS system solvent interconnect kit	1	F5050-010
Kit, maintenance, Accela Pump	1	60157-62002
Kit, Seal, Accela Pump	1	60157-62003
Accela Autosampler Accessory Kit	1	60357-62001
Accela PDA Detector accessory kit	1	60257-62001

### Accela Autosampler Consumables

Description	Quantity	Cat. No.
Assembly, needle, inert	1	60357-60017
Assembly, needle tubing	1	60053-60102
Assembly, wash bottle kit	1	60053-60041
Assembly, syringe valve	1	A3692-010
Assembly, transfer tube, 0.012in ID	1	60053-60014
Cooling Adapter, 96 well	1	60053-20002
Filter, flush solvent	1	A4258-010
Grease, Silicon/Teflon (for lead screw)	1	00301-01910
Kit, maintenance Accela Autosampler	1	60357-62002
Kit, needle tubing	1	60053-62043
Kit, wash bottle	1	60053-62009
Ferrule Front, Swagelok	1	00101-08-00001
Ferrule Back, Swagelok	1	00101-08-00002
Lubricant, Triflow	1	1611-0030
Nut, compression, long, 10-32, 1/16in OD tube	1	00101-07-00001
Port, needle	1	60053-20031
Syringe, concentric, 100µL	1	F1100-010
Syringe, concentric, 250µL	1	F1100-020
Syringe, concentric, 500µL	1	F1100-030
Plunger, replacement, concentric, 100µL	1	F1123-010
Plunger, replacement, concentric, 250µL	1	F1123-020
Plunger, replacement, concentric, 500µL	1	F1123-030
Reservoir vials, 16mL	1	00301-07527
Retainer, needle port (injection port)	1	60053-10035
Syringe, standard, 2500µL (with needle tubing ext)	1	60053-62002
Syringe, 2.5mL	1	60053-60006
Sample Loop, 5µL	1	00109-99-00007
Sample Loop, 10µL	1	00109-99-00008
Sample Loop, 20µL	1	00109-99-00009
Sample Loop, 25µL	1	00109-99-00010
Sample Loop, 50µL	1	00109-99-00011
Sample Loop, 100µL	1	00109-99-00012
Sample Loop, 500µL	1	00109-99-00013
Sample Loop, 1000µL	1	00109-99-00014
Stripper	1	F1034-010
Valve, injector	1	00110-03-00013
Seal, Rotor	1	00109-99-00021
Rotor, Valco injection valve	1	00110-03-00019
Tubing assembly, 2.5mL syringe	1	60053-60005

### Accela Open Autosampler Consumables

Kit Description	Cat. No.
Kit, asp tube, Accela Open A/S, RoHS PAL DiAspKit	00950-01-00311
Loop, hldg, dlw, Accela Open A/S, RoHS PAL DLWLoop	00950-01-00317
Screw, syringe, Accela Open A/S, RoHS PAL DLW Screw	00950-01-00322
Tool, needle, Accela Open A/S, RoHS PAL DLW NdTool	00950-01-00323
Holder, needle, dlw, Accela Open A/S, RoHS PAL DLWNHA	00950-01-00324
Syringe, dlw, Accela Open A/S, RoHS Syrc DLW 100-R	00950-01-00325
Plunger, syringe, dlw, Accela Open A/S, RoHS PLG DLW 100	00950-01-00326
Holder, needle, dlw, Accela Open A/S, RoHS PAL DLWPig	00950-01-00327
Needle kit, dlw, 3PK, Accela Open A/S, RoHS PAL DLWNdl	00950-01-00328
Kit, dlw replament, Accela Open A/S, RoHS PAL DLW Option	00950-01-00330
Kit, insert, dlw, Accela Open A/S, RoHS PAL DLW Insert	00950-01-00334
Tube, waste, dlw, Accela Open A/S, RoHS PAL TubeWaste	00950-01-00335
Valve, inject, 18K, Accela Open A/S, RoH N/A	00950-01-00336
Rotor, Inj Valve, VALCO 18KPSI, RoHS C72-16R6	00110-03-00019
Stator Inj Valve, VALCO 18KPSI, RoHS C72V-6C96	00950-01-00337

### Accela PDA Accessories

Description	Quantity	Cat. No.
Filter Wheel for linearity calibration, (5 position; 1 cuvette with perchloric acid blank and 4 cuvettes with different concentrations of potassium dichromate in perchloric acid solution, NIST traceable)	1	803264
10mm flowcell assembly, with inlet/outlet tubing and fittings (1cm LightPipe)	1	803265-01
Flowcell Assembly, with inlet/outlet tubing and fittings (5cm Lightpipe)	1	803237-01
Backpressure regulator	1	802259
FingerTight PEEK Ferrule Nuts	1	2522-0285
Inlet tubing, with insulation, PEEK 1/16 x 0.005in ID (red)	1	803260
Outlet tubing, PEEK 1/16 x 0.01in ID (blue)	1	703950

### Accela Pump Liquid Displacement Assembly Parts

Description	Material	Quantity	Cat.No.
Seal, film, PEEK, Accela pump	PEEK	4	00950-01-00122
Seal, high pressure, GFP, Accela pump	PTFE/GFP/Ti	2	00950-01-00129
Valve, check, outlet, Accela pump	Ti/ruby/sapphire	1	00950-01-00131
Valve, check, inlet, Accela pump	Ti/ruby/sapphire	1	00950-01-00130
Cartridge, blind, inlet, Accela pump	PEEK	1	00950-01-00120
Piston, sapphire	Sapphire	2	00950-01-00126
Secondary piston seal (wash seal)	PE/SS	2	00950-01-00128

### Accela 1250 Pump Liquid Displacement Assembly

Description	Quantity	Cat. No.
UHP PEEK sealing ring	5	00950-01-00284
Check valve, Titanium and ruby	2	00110-05110
Piston unit, sapphire	2	00950-01-00126
Secondary piston seal (GFP)	2	00950-01-00129
Primary piston seal (GFP)	2	00950-01-00129

### Accela 600 Pump Spare Parts

Description	Quantity	Cat. No.
O-ring, 2.69mm x 1.14mm, perfluor	1	00950-01-00286
Kit, inlet tubing, Accela 600 pump	1	60157-62008
Mixer, static, 65µL, Accela 600 pump, RoHS	1	00950-01-00292
Seal, H/P	2	00107-18110
Piston, 1/8", TZP	2	00201-11324
Valve, check	2	00110-05110
Seal, face, PEEK, check valve	5	00950-01-10013
Seal, piston, secondary	2	00107-18114

## Accessories, Consumables and Spare Parts for Thermo Scientific LC-MS Systems

### Ion Traps and Orbitrap Series

Thermo Scientific™ Orbitrap™ LC-MS systems are the recognized standards for high-resolution, accurate-mass measurements.

Orbitrap LC-MS technology routinely delivers the superior mass resolution and mass accuracy necessary to reduce analysis times and increase confidence in results. This makes it the platform of choice for the most confident protein and metabolite identification, characterization and quantitation. Combined with superior dynamic range and unsurpassed sensitivity, Orbitrap systems are the only mass spectrometers capable of providing all four benefits at the same time, without compromise.

With market and technology leadership for over 25 years, we offer ion trap LC-MS systems for every application and budget. Ion trap LC-MS systems offer unique capabilities such as MS<sup>n</sup> and data-dependent analysis along with excellent full-scan sensitivity to provide routine detection and rapid identification of low-level analytes. Ion trap systems support a variety of applications from compound identification and routine HPLC detection through the most demanding analyses of low-level components in complex biological matrices.



### TSQ Series Triple Quadrupole LC-MS

Robust triple-stage quadrupole LC-MS systems enable ultra-sensitive quantitation of target compounds in complex matrices.

TSQ Series triple-stage quadrupole LC-MS systems offer a wide range of capabilities. From the value-conscious Thermo Scientific™ TSQ Endura™ LC-MS to the precise Thermo Scientific™ TSQ Quantiva™ LC-MS, our mass spectrometers couple perfectly with our HPLC, UHPLC, and nano-LCs to easily accommodate complex matrices encountered in a variety of applications.



### MSQ Plus Single Quadrupole LC-MS

Our single quadrupole LC-MS system offers superior ease-of-use and modest price and space requirements.

The system can be used with both HPLC and IC systems in a wide range of applications and methodologies.





## Ion Traps and Orbitrap Series

### API Source Components

Description	Cat. No.
USI ESI probe	<b>OPTON-20011</b>
USI APCI probe	<b>OPTON-20012</b>
Capillary heater cage assembly, for LTQ & LTQ XL	<b>97055-60040</b>
Capillary heater cage assembly, for the LXQ & LCQ Fleet	<b>97055-60181</b>

### Accessory Kits

Description	Cat. No.
TSQ Quantum forepump kit (used with LTQ series)	<b>70111-62014</b>
Hose and accessories kit, LTQ & LTQ XL	<b>97055-62007</b>
Hose, single mechanical pump accessory, LXQ & LCQ Fleet	<b>97055-60135</b>
LTQ series ship kit	<b>70111-62033</b>
Accessory Kit, LTQ/LTQ XL	<b>97055-62044</b>
Accessory Kit, LXQ & LCQ Fleet	<b>97055-62045</b>

### Chemicals

Description	Cat. No.
LCQ chemicals kit, for LTQ & LCQ series	<b>97000-62042</b>
Met-Arg-Phe-Ala, 20mg	<b>00301-07709</b>
Ultramark 1621	<b>00301-12200</b>
Caffeine, 1mg/mL	<b>00301-12310</b>
Reserpine, 1g	<b>00301-12901</b>

### Pressure Gauges

Description	Cat. No.
Ion gauge	<b>00105-01525</b>
Ion gauge o-ring, 0.737id 3/32 THK Viton	<b>00107-10056</b>

### Metal Needle Kits

Description	Cat. No.
32-Gauge metal needle kit for high flow LC flow rates between 5µL/min to 400µL/min Uses 32-gauge needle, (P/N 00950-00954)	<b>OPTON-53003</b>
34-Gauge metal needle kit for low flow LC flow rates between 500nL/min to 10µL/min Uses 34-gauge needle, (P/N 97144-20040)	<b>OPTON-30004</b>

### Fittings, Ferrules, Sample Loops and Tubing

Description	Cat. No.
Fitting, HPLC, adaptor 10-32 x 1/4 PEEK	<b>00101-18080</b>
Fitting, nut, fingertight, HPLC, 10-32, PEEK	<b>00101-18081</b>
Fitting, fingertight, 2, Upchurch	<b>00101-18195</b>
Fitting, flangeless, 1/8in, Delrin, green	<b>00101-18198</b>
Fitting, flangeless, 1/8in, Delrin, blue	<b>00101-18200</b>
Fitting, plug, 1/4-28, Tefzel	<b>00101-18075</b>
Nut, LC, 1/16in, ss, Rheodyne	<b>2522-0066</b>
Ferrule, LC, 1/16in, ss, Rheodyne	<b>2522-3830</b>
Ferrule, 0.008in ID, Kel-F HPLC	<b>00101-18114</b>
Ferrule, 0.012in ID, Kel-F HPLC	<b>00101-18116</b>
Ferrule, 0.016in ID, PEEK, HPLC	<b>00101-18120</b>
Ferrule, Fingertight 2, Upchurch	<b>00101-18196</b>
Ferrule, 1/8in, Tefzel	<b>00101-18199</b>
Fitting, grounding union, 1/16, ss	<b>00101-18182</b>
Fitting, LC union, 0.010in orifice, PEEK	<b>00101-18202</b>
Fitting, LC TEE union, 0.020in orifice, PEEK	<b>00101-18204</b>
5µL sample loop, ss	<b>00110-22026</b>
10µL sample loop, ss	<b>00110-22012</b>
20µL sample loop, ss	<b>00110-22028</b>
50µL sample loop, ss	<b>207180</b>
100µL sample loop, ss	<b>00110-22018</b>
500µL sample loop, ss	<b>00110-22020</b>
1mL sample loop, ss	<b>00110-22022</b>
Tubing, 0.15mm ID x 0.39mm OD fused-silica capillary for APCI sample tube	<b>00106-10498</b>
Tubing, 0.10mm ID x 0.19mm OD fused-silica capillary for ESI sample tube	<b>00106-10499</b>
Tubing, 0.05mm ID x 0.19mm OD fused-silica capillary for ESI sample tube for low flow up to 200µL/min	<b>00106-10502</b>
Tubing, 0.1mm ID x 0.363mm OD fused-silica capillary for infusion line	<b>00106-10504</b>
Tubing, 0.075mm ID x 0.3193mm OD fused-silica capillary for low flow applications instead of metal needle	<b>00106-10511</b>
Teflon tube, .03in ID x 1/16in OD for syringe adapter assembly	<b>00301-22915</b>
Tubing, 1in ID x 3/16in, Tygon	<b>00301-22922</b>
Hose, 1.5in ID, PVC reinforced	<b>00301-24163</b>

## TSQ Series Triple Quadrupole LC-MS

### Chemicals

Description	Quantity	Cat. No.
Cesium iodide	1 x 1g vial	<b>HAZMAT-01-00004</b>
TSQ Quantum AM calibration kit	1	<b>70111-62029S</b>
Reserpine	1 x 1g vial	<b>00301-12901</b>
Polytyrosine-1,3,6 calibration solution (liquid)	1 x 20mL	<b>00301-22924</b>
Polytyrosine-1,3,6 calibration standard (solid)	1	<b>00301-22925</b>
FC43 calibration liquid	1 vial	<b>50010-30059</b>
Syringe Adapter Kit for infusion of calibrant	1	<b>70005-62011</b>

### Ion Transfer Tubes, Seals and O-rings

Description	Quantity	Cat. No.
TSQ Quantiva	1	<b>80100-20641</b>
TSQ Endura	1	<b>70005-20606</b>
TSQ Quantum Access	1	<b>70111-20972</b>
TSQ Quantum Ultra, Ultra AM & Ultra EMR	1	<b>97055-20199</b>
TSQ Quantum Discovery Max	1	<b>70111-20396</b>
TSQ Quantum, Quantum AM & Quantum Discovery	1	<b>70111-20100</b>
TSQ Vantage, Vantage AM & Vantage EMR	1	<b>70005-20423</b>
Seal for ion transfer tube (TSQ Quantiva)	1	<b>70005-20922</b>
Graphite vespel o-ring (not TSQ Quantiva)	1	<b>97055-20442</b>

### Metal Needle Kits

Description	Quantity	Cat. No.
Metal Needle Insert Standard Flow (TSQ Quantiva and TSQ Endura)	1	<b>80000-60317</b>
Metal Needle Insert Low Flow (TSQ Quantiva and TSQ Endura)	1	<b>80000-60152</b>
32-Gauge Metal Needle Insert LC Flow rates between 5µL/min to 2000µL/min Contains Metal Needle PN 70005-20434	1	<b>OPTON-53010</b>
34-Gauge Metal Needle Insert LC Flow rates between 1µL/min to 10µL/min Contains Metal Needle PN 70005-20483	1	<b>OPTON-53011</b>
High flow metal needle kit	1	<b>OPTON-20004</b>
Low flow metal needle kit	1	<b>OPTON-20005</b>
High flow metal needle kit	1	<b>OPTON-20016</b>
Low flow metal needle kit	1	<b>OPTON-20017</b>
High flow metal needle kit	1	<b>OPTON-53003</b>
Low flow metal needle kit	1	<b>OPTON-30004</b>
H-ESI metal needle kit	1	<b>OPTON-20034</b>

### MS Maintenance Kit

Description	Quantity	Cat. No.
MS maintenance kit	1	<b>70111-62032</b>
Ferrule, 0.008 ID, Kel-F (for fused silica sample tube)	2	<b>00101-18114</b>
Tubing, fused-silica, 0.10 ID x 0.19 OD (fused silica sample tube)	6ft	<b>00106-10499</b>
O-ring, Viton, 0.125 ID x 1/16 (for source mount assembly gas connections)	2	<b>00107-02550</b>
Fitting, HPLC, 10-32, short one-piece, 10/pk, RoHS	3	<b>00109-99-00016</b>
Oil, vacuum pump, 1 liter	3	<b>00301-15101</b>
Syringe, 500 $\mu$ L, Gastight	1	<b>00301-19016</b>
Tubing, PEEK, 0.005in ID x 1/16in OD, red	3ft	<b>00301-22912</b>
Tube, Teflon, 0.03in ID x 1/16in OD (for syringe adapter)	0.1ft	<b>00301-22915</b>
Polytyrosine-1,3,6 calibration standard (liquid)	1	<b>00301-22924</b>
Screw, 6-32 x 3/8 (used to secure front panels to chassis)	2	<b>00405-63266</b>
Screw, 6-32 x 5/16 (used to secure side panels and EMI shield to chassis)	2	<b>00407-63205</b>
Screw, 4 x 6mm (used to secure PS2 and PS3 to chassis)	2	<b>00407-90000</b>
Screw, 8-32 x 3/8 (used to secure top cover to chassis)	2	<b>00415-83206</b>
O-ring, graphite Vespel (for ion transfer tube)	1	<b>97055-20442</b>

### ESI Needles and Needle Seal

Description	Quantity	Cat. No.
ESI needle	1	<b>00950-00990</b>
ESI needle seal	1	<b>00950-00952</b>
H-ESI needle	1	<b>97055-20273</b>
H-ESI needle seal	1	<b>97055-20271</b>

### Viper Fittings (for grounded union to sprayer/probe)

Description	Cat. No.
Viper Capillary, 65 $\mu$ m x 150 mm PEEK	<b>6041.5615</b>
Viper Capillary, 130 $\mu$ m x 150 mm PEEK	<b>6041.5616</b>
Viper Kit, 65 $\mu$ m x 150mm PEEK (5 capillaries)	<b>6041.5601</b>
Viper Kit, 130 $\mu$ m x 150mm PEEK (5 capillaries)	<b>6041.5602</b>

### Pump Oil

Description	Cat. No.
Pump oil for Sogevac sv65 mechanical pump	<b>HAZMAT-01-00063</b>

## MSQ Plus Single Quadrupole LC-MS

### MSQ Plus Kits

Description	Quantity	Cat. No.
Annual Maintenance Kit*	1	<b>60111-62014</b>
Probe Heater Repair Kit – insulating teflon parts	1	<b>60111-62010</b>
Surveyor MSQ Test Kit	1	<b>FM104284</b>

\*The Consumables Kit contains the non-liquid parts required for the upkeep of your MSQ Plus MS Detector including source O-rings, entrance cones, esi/apci capillaries, cone wash assembly, esi probe repair supplies, turbo oil wick

### Consumables and General Spares

Description	Quantity	Cat. No.
Probe repair supplies: APCI probe capillary	1	<b>FM102594</b>
ESI probe capillary	1	<b>FM102598</b>
PEEK tube insert For API probe	1 pk (12)	<b>FM102591</b>
Graphite 1/16in Vespel ferrule	1 pk (10)	<b>6070119</b>
ESI ceramic sleeve	1	<b>FM103394</b>
Calibration solution MSQ version 1.4 and higher	1	<b>60111-01001</b>
Calibration solution MSQ classic version 1.0	1	<b>FM104285</b>
Titanium entrance cone complete with O-ring	1	<b>60111-60049</b>
Cone wash nozzle assembly	1	<b>FM102521</b>
Cone wash nozzle O-ring	1pk (10)	<b>FM101464</b>
Entrance cone spare O-ring	1pk (10)	<b>5711000</b>
Exit (Extraction) cone	1	<b>FM102263</b>
Swage connector for 6mm nitrogen tubing	1	<b>00101-02-00006</b>
6mm x 1/4in NPT nitrogen fitting	1	<b>00103-02-00001</b>
6mm Teflon tubing for nitrogen supply	Per foot	<b>00109-99-00004</b>
Pfeiffer turbo replacement oil wick	1	<b>00950-01116</b>
Edwards vacuum pump oil	1 liter	<b>00301-15102</b>
ESI probe complete	1	<b>FM102595</b>
APCI probe complete	1	<b>FM102587</b>
Probe heater assembly	1	<b>60111-60023</b>
Vacuum exhaust hose, blue, 1in ID	Per foot	<b>00301-08301</b>
Hexapole screws – 3 required	1	<b>60111-20055</b>
USB cable 2m	1	<b>00302-99-00008</b>
APCI corona pin needle	1	<b>70005-98033</b>

### Software

Description	Cat. No.
Upgrade to MSQ 2.0 with Xcalibur 2.0 includes LC Devices 2.02	<b>OPTON-20432</b>
Validation MSQ Plus on Xcalibur 2.0 – MS only	<b>OPTON-09015</b>

## Method Transfer to Accucore 2.6 μm Columns

Containing solid core particles, which are engineered to a diameter of 2.6μm and a very narrow particle size distribution; Accucore HPLC columns allows high speed, high resolution separation, with back pressures significantly lower than those associated with sub-2μm fully porous particles.

When transferring methods from conventional HPLC to a solid core column several approaches can be taken, depending on the analytical needs. If column dimensions are maintained and the particle characteristics, design and diameter, are changed then an improvement in efficiency and, therefore, sensitivity, resolution and peak capacity is obtained. A second approach is to change not only particle characteristics but also column dimensions, which has the benefit of further reducing analysis time and increasing sensitivity.

An understanding of some practical calculations can help to achieve the correct scaling and maintain a consistent assay profile between the original and transferred method. An identical approach can be used when transferring a conventional HPLC analysis to a UHPLC method using columns packed with sub-2μm fully porous particles such as Hypersil GOLD 1.9μm and Synchronis 1.7μm.

There are three main considerations when transferring a method to a shorter column using different particles: Scaling the flow rate, adjusting the injection volume and adjusting the gradient profile. These are discussed in more detail below.\*

### 1. Scale the Flow Rate

To maintain an equivalent separation when transferring a method it is important to keep the linear velocity constant between the original and new method. The linear velocity is related to the flow rate, internal diameter of the column and particle size. A simple equation can be derived to calculate the flow rate ( $F_2$ ) required for the new method. This is shown below, normalized for particle size.

$$F_2 = F_1 \times (d_{c2}^2 / d_{c1}^2) \times (d_{p1} / d_{p2})$$

$F_1$  – original flow rate (mL/min)

$d_{c1}$  – original column internal diameter (mm)

$d_{p1}$  – original column particle size (μm)

$d_{c2}$  – new column internal diameter (mm)

$d_{p2}$  – new column particle size (μm)

### 2. Adjust the Injection Volume

Because sub-3μm solid core based methods are most often transferred to smaller volume columns, the same injection volume will take up a larger proportion of the new column, possibly leading to band broadening or potentially overloading the column. It is therefore important to scale down the injection volume to match the change in column volume. Once again, a simple equation can be used to calculate the injection volume ( $V_{i2}$ ) required for the new method.

$$V_{i2} = V_{i1} \times (d_{c2}^2 \times L_2 / d_{c1}^2 \times L_1)$$

$V_{i1}$  – original injection volume (μL)

$d_{c1}$  – original column internal diameter (mm)

$L_1$  – original column length (mm)

$V_{i2}$  – new injection volume (μL)

$d_{c2}$  – new column internal diameter (mm)

$L_2$  – new column length (mm)

### 3. Adjust the Gradient Profile

Geometrical transfer of the gradient requires calculation of the number of column volumes of mobile phase in each segment (time interval) of the gradient in the original method to ensure that the new calculated gradient takes place over the same number of column volumes, for the new column.

The following calculation should be performed for each time segment of the gradient, including column re-equilibration. It takes into consideration the void volume of each column ( $V_c$ , calculation described below), the flow rate in the original method and the flow rate in the new method (calculated in step 1 above) and the time segment in the original method.

$$t_{g2} = t_{g1} \times (V_{c2}/V_{c1}) \times (F_1/F_2)$$

$t_{g1}$  – Time segment in original gradient (min)

$t_{g2}$  – Time segment in new gradient (min)

$V_{c1}$  – Original column void volume (mL)

$V_{c2}$  – New column void volume (mL)

$F_1$  – Original flow rate (mL/min)

$F_2$  – New flow rate (mL/min)

The void volume of the column is the volume that is not taken up by the stationary phase (approximately 68% of the column volume):

$$V_c = 0.68 \times \pi \times r^2 \times L$$

$V_c$  – column volume (mL)

$L$  – column length (cm)

$r$  – column radius (cm)

An example of a method transferred following steps 1 to 3 above is illustrated in the following table:

Column: Fully porous 5 µm, 150 x 4.6mm		Column: Accucore RP-MS 2.6 µm, 100 x 2.1mm		Column: Accucore RP-MS 2.6µm, 50 x 2.1mm	
<b>Flow rate (mL/min)</b>	1.00	<b>Flow rate (mL/min)</b>	0.4	<b>Flow rate (mL/min)</b>	0.4
<b>Inj. volume (µL)</b>	1	<b>Inj. volume (µL)</b>	1.4	<b>Inj. volume (µL)</b>	0.7
<b>Gradient Time (min)</b>	%B	<b>Gradient Time (min)</b>	%B	<b>Gradient Time (min)</b>	%B
0.0	35.0	0.0	35.0	0.0	35.0
10.0	60.0	3.5	60.0	1.7	60.0
11.0	35.0	3.8	35.0	1.9	35.0
17.0	35.0	6.0	35.0	3.0	35.0
<b>Backpressure</b>	59	<b>Backpressure</b>	218	<b>Backpressure</b>	120
<b>Resolution</b>	2.6	<b>Resolution</b>	2.5	<b>Resolution</b>	1.5
<b>Run Time (minutes)</b>	17.0	<b>Run Time (minutes)</b>	6.0	<b>Run Time (minutes)</b>	3.0
<b>Solvent Used (mL)</b>	17	<b>Solvent Used (mL)</b>	2.4	<b>Solvent Used (mL)</b>	1.2

Method transfer conditions from HPLC (150 x 4.6mm, 5µm columns) to Accucore (100 x 2.1mm, 2.6µm and 50 x 2.1mm, 2.6µm columns).

\*We offer a convenient method transfer calculator at the Chromatography Resource Center ([www.thermoscientific.com/crc](http://www.thermoscientific.com/crc))

### System Considerations

To obtain the best data using fast chromatography it is critical that the LC instrument system is optimized to operate under these conditions. All system components for the assay should be considered. System volume (connecting tubing ID and length, injection volume, flow cell volume in UV) must be minimized, detector time constant and sampling rate need to be carefully selected, and when running fast gradients pump dwell volume needs to be minimal.

### Minimizing System Volume

Excess system volume gives rise to band broadening, which has a detrimental effect on the chromatographic performance. This can arise from the column, the autosampler, the tubing connecting the column to injector and detector and in the detector flow cell. The extra column effects become more significant for scaled down separations because of the smaller column volumes and for less retained peaks which have a lower peak volume making it even more critical to minimize extra column dispersion.

### Detector Sampling Rate

With 1.9µm particles, operating parameters can be optimized to give fast analysis. This results in narrow chromatographic peaks

which may be of the order of 1-2 seconds or less in width. It is important to scan the detector (whether it is UV or MS) fast enough to achieve optimum peak definition, otherwise resolution, efficiency and analytical accuracy will be compromised.

### Dwell Volume

The HPLC pump dwell volume is particularly important when running high speed applications using fast gradients, typical of high throughput separations on small particle packed columns. This is because the pump dwell volume affects the time it takes for the gradient to reach the head of the column. If we consider a method using a flow rate of 0.4mL/min and a fast gradient of 1 minute, the theoretical gradient reaches the column immediately. A pump with a 65µL dwell volume will get the gradient onto the column in 9.75 seconds. A traditional quaternary pump with a dwell volume of 800µL will take 2 minutes to get the gradient to the column. When running rapid gradients this is too slow and it may become necessary to introduce an isocratic hold at the end of the gradient to allow elution of the analytes.





## Scaling Down a Method

### Reasons to Scale Down a HPLC or LC/MS Method

There are applications where it is desirable to scale down a method without transferring the method to U-HPLC. These reasons may be to:

- Maximize sensitivity when small amounts of sample are available
- Make flow rate compatible with ionization technique in MS detection
- Reduce costs by reducing solvent consumption

### Transfer Method to a Narrower Column

Reducing the scale of a separation by reducing the column internal diameter may be necessary when transferring a method from UV to MS detection, or when only very small amounts of sample are available, such as in drug discovery or proteomics. In the first case ionization technique or source design determines the best flow rate range (see table above) and in the latter case, method sensitivity is maximized because solutes elute in more concentrated chromatographic bands.

If all other method parameters (column length and particle size, column chemistry, mobile phase composition, gradient range and time, separation temperature) are kept unchanged, the change to a narrower column only requires adjustment of the flow rate.

$$F_2 = F_1 \times (d_{c2}/d_{c1})^2$$

$F_1$  – original flow rate (to be reduced)

$F_2$  – new flow rate

$d_{c1}$  – original column internal diameter

$d_{c2}$  – new column internal diameter

This is applicable to both isocratic and gradient methods. The new method should produce a chromatogram with identical resolution and identical run time. If small changes in retention times and resolution are observed this is generally caused by system dwell volume (discussed below).

### Typical Flow Rates for Analytical, Narrowbore, Capillary and Nanobore Columns (5 $\mu$ m Particles)

Column ID (mm)	Flow Rate Range ( $\mu$ L/min)	Optimum Flow Rate <sup>1</sup> ( $\mu$ L/min)	Recommended Injection Volume <sup>2</sup> ( $\mu$ L)	API Source
4.6	1000 – 1500	1250	30	APCI or High flow ESI
3.0	400 – 600	500	10	APCI or High flow ESI
2.1	200 – 300	250	5	APCI or Micro-ESI
1.0	40 – 60	50	1	Micro-ESI
0.5	10 – 25	12	0.35	Micro-ESI
0.32	4 – 10	5	0.15	Micro-ESI
0.18	1 – 3	2	0.05	Micro-ESI
0.1	0.4 – 1	0.5	0.015	Nanospray
0.075	0.2 – 0.5	0.3	0.01	Nanospray

1. Recommended for good efficiency and moderate pressure. Higher flow rates may lead to column voids. Lower flow rates are recommended for washing column bed or changing solvents.
2. Estimates based on negligible loss of efficiency and isocratic elution with sample solvent identical to mobile phase. Larger volumes can be introduced under gradient conditions or using weaker sample solvent.

### Transfer Method to a Shorter Column

In gradient elution, the simplest way to reduce the method cycle time is to reduce the column length. If all other method parameters (column ID and particle size, column chemistry, mobile phase composition, gradient range, flow rate, separation temperature) are kept unchanged the only requirement is to change the gradient time using the equation below, where gradient time is reduced by the same factor as the reduction in column volume.

$$t_{g1}/V_{c1} = t_{g2}/V_{c2}$$

$t_{g1}$  – gradient time in original method (min)

$t_{g2}$  – gradient time in new method (min)

$V_{c1}$  – original column volume (mL)

$V_{c2}$  – new column volume (mL)

Column volume  $V_c$  (mL) can be estimated using:

$$V_c = 0.68 \times \pi \times r^2 \times L$$

$V_c$  – column volume (mL)

$L$  – column length (cm)

$r$  – column radius (cm)

### Dwell Volume

Dwell volume is just as important when scaling down a method as for method transfer to U-HPLC. The effect of dwell volume on the separation is more significant when narrow columns are used at low flow rates. For instance, if the system has a dwell volume of 2.0mL and a 4.6mm ID column is run at 1mL/min, it takes 2 minutes for the gradient to reach the head of the column; however, if a 2.1mm ID column is used with a 0.4mL/min flow rate it will take 5 minutes for the gradient to reach the column. In high throughput gradient separations using small volume columns, dwell volume causes an increase in run times and longer re-equilibration time between runs.

Several approaches can be taken to minimize these effects:

- Select a pump with a small gradient delay volume (e.g., Thermo Scientific Accela high speed LC system has a delay volume of only 65 $\mu$ L);
- Delay sample injection until gradient has reached the head of the column;
- Set the pump at a higher flow rate and split the flow before the column.

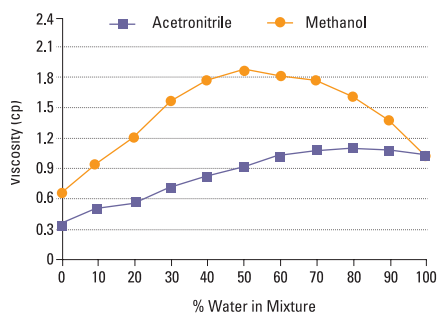
## Scaling Up a Method

### Reasons to Scale Up an HPLC Method

- Increase method capacity
- Isolation and purification of target compounds
- Increase sample throughput

Analytical methods may require scale up to preparative sizes to isolate and purify compounds from mixtures. In choosing the best column and packing material for your preparative application, consider the selectivity and loadability of the media as well as column dimensions, to give the results you need most quickly or economically. We have established a strong reputation for the manufacture and supply of high quality preparative silicas and bonded phases, designed to give the same levels of performance and reproducibility as our popular analytical silica ranges such as the Thermo Scientific Hypersil phases.

Scale up is easiest when starting from an analytical column packed with smaller particle size media offering the same selectivity as the larger particle size preparative media. The leading families of Thermo Scientific phases are offered in various sizes to complement lab scale operations and facilitate the scale up to preparative chromatography. Scout columns, typically 250 x 4.6mm packed with the media of interest can also be used to develop the separation. Once the method is finalized on the smaller column, a scaling factor can be applied.



Mobile phase viscosity changes with composition

### Scaling Up to a Preparative Column

Flow rate and column load scaling are only required when changing the internal diameter of the column. The scaling of flow rates allows peak retention times to remain relatively constant between columns with different internal diameters. The typical solvent flow rate through a column is dependent on its internal diameter and the particle size of the column packing material. This scaling factor can also be used to estimate the loading capacity of a given column. Assuming column length is a constant, the scale factor can be calculated using the following formula:

$$\text{Scale Factor} = d_{c2}^2 / d_{c1}^2$$

$d_{c1}$  – original column internal diameter (mm)  
 $d_{c2}$  – new column internal diameter (mm)

The column loading capacity and flow rate required for the new larger ID columns can be calculated using this factor.

### Column Backpressure

Column operating backpressure is affected by column length, internal diameter, media particle size, temperature, solvent properties and solvent flow rate. It can also be affected by the use of gradients, where the pressure may vary with solvent composition. Typical operating backpressure for columns or cartridges can be calculated using the following equation:

$$\text{Pressure (atm)} = \frac{2.1 \times \Phi \times L \times \eta}{d_p^2 \times d^2}$$

$\Phi$  = column impedance  
 (1000 for 4.6mm ID columns)  
 L = column length (mm)  
 $d_p$  = particle diameter ( $\mu\text{m}$ )  
 d = column diameter (mm)  
 $\eta$  = mobile phase viscosity (centipoises)

The mobile phase viscosity varies with composition. As an example, the figure above shows how water viscosity varies with the addition of methanol or acetonitrile. This variability is a critical component in maximizing throughput with respect to the chromatography instrumentation being used.

Discover eVol XR for precise and accurate dispensing

➤ PAGE 1-062

### Selecting the Media

Media selection for your preparative separation is important. Choose media that has a narrow particle size distribution which will provide high efficiency columns with a low back pressure, since there are no 'fines' to block frits or impede flow. The uniformly spherical particles, with narrow pore size distribution, apparent in Thermo Scientific preparative columns, provide reproducible performance and a longer column life. Media that is available in a range of particle sizes offers choice for scale up applications with controlled selectivity. We offers a range of choices for preparative media in several particle sizes to tailor the media to your application.

### High Load and High Retention – HyperPrep HS

Materials with higher surface area can offer increased loadability. This drive to maximize surface area must be undertaken in a considered manner particularly with regard to particle pore diameter and pore volume. Too high a pore volume will compromise stability and robustness of the bed and too small a pore diameter will influence mass transfer at the expense of efficiency. The high surface area provides enhanced retention of polar compounds. A high carbon loading gives a robust, stable phase. Please contact Technical Support for more information on Thermo Scientific HyperPrep columns and media.

### Peak Shape – Hypersil GOLD Media

In analytical HPLC, the use of packings based on highly pure silica has been shown to improve peak shape. Our highly developed and reproducible manufacturing processes ensure that our leading analytical brand of Hypersil GOLD media is also available in a range of particle sizes suitable for preparative LC without compromise on performance.

### Polar Compounds and Isomers – Hypercarb Columns, Hypersil GOLD aQ

Often when dealing with very polar compounds, achieving sufficient retention can be a challenge. We are able to offer a variety of choices to overcome this common problem: The polar endcapping on Hypersil GOLD aQ provides a controlled interaction mechanism by which moderately polar compounds can be retained. Hypersil GOLD AX can be used in HILIC mode to provide retention of polar compounds. Hypercarb columns offer truly orthogonal selectivity to C18 in reversed phase LC and can be used to retain highly polar compounds. Hypercarb columns can also be used to differentiate between very closely related compounds including geometric and positional isomers.

### Peptides and Proteins – BioBasic and Hypersil GOLD Media

When it comes to the analysis of peptides, the correct selection of packing material becomes ever more important. When deciding on which pore size of packing material to use in the analysis of a polypeptide mix, molecular weight and hydrophobicity of the peptides must be taken into account. Our breadth of silica offerings allow the chromatographer to obtain the best resolution using materials with pore diameters in the 100 to 300Å range. A general rule is that hydrophilic peptides with a molecular weight of less than 2000 daltons can be analyzed using a lower pore volume media, such as Hypersil GOLD media. Above this molecular weight, access to small pores is restricted, and separations tend to be inefficient. For hydrophobic peptides with a molecular weight greater than 2000, a 300Å media such as Thermo Scientific BioBasic is recommended. For the separation of small or hydrophilic peptides, a 100Å material such as HyperPrep HS may give better resolution.



## HPLC Troubleshooting

Before you start any troubleshooting, it is essential to observe safe laboratory practices. Know the chemical and physical properties of any solvents used and have the appropriate Material Safety Data Sheets (MSDSs) readily available. All electrically powered instruments should be shut down and unplugged before starting. Eye protection should also be worn.

The following table lists common HPLC problems encountered, the possible causes and solutions for your quick reference.

Symptom	Cause	Action
<b>Pressure Related Problems</b>		
Low Pressure	Low viscosity mobile phase.	Confirm expected pressure using the Kozeny-Carmen or similar equation.
	Piston seals leaking.	Check for evidence of leaking or wear and replace where necessary.
	Leak in system.	Check for and replace any leaking tubing or fittings.
	Air in solvent lines or pump.	Ensure that the reservoirs and solvent lines are fully primed and the purge valve is fully closed.
High Pressure	High viscosity mobile phase.	Confirm expected pressure using the Kozeny-Carmen or similar equation.
	Pump flow-rate malfunction.	Contact manufacturer.
	Tubing blocked.	Working backwards from detector outlet, check source of blockage and replace item as necessary.
	Guard blocked.	Replace guard cartridge.
	Sample precipitation.	Consider sample clarification steps such as filtration or SPE.
	Detector blockage.	Clean the flow cell according to the manufacturer's instructions.
<b>Baseline Related Problems</b>		
Fluctuating Baseline	System not equilibrated.	Equilibrate the column with 10 volumes of mobile phase.
	Bubbles in flow cell.	Degas the mobile phase and pass degassed solvent through the flow-cell. Do not exceed the cell's pressure limit.
	Contaminated guard.	Replace the guard cartridge.
	Contaminated column.	Wash the column using an appropriate solvent. If this does not resolve the problem, replace the column.
	Detector contamination.	Clean the flow cell according to the manufacturer's instructions.
	Contaminated solvents.	Use freshly prepared solvents of HPLC grade.
	Old detector lamp.	Replace the lamp, particularly when this has been in use for > 2000 hours.
Sloping Baseline	Contaminated solvents.	Use freshly prepared solvents of HPLC grade.
	Gradient mobile phase.	Consider purer solvents or higher wavelengths. Otherwise, this is normal.
	System not equilibrated.	Equilibrate the column with 10 volumes of mobile phase.
	Leak in system.	Check for and replace any leaking tubing or fittings.
	Temperature fluctuations.	Use a thermostatically controlled column oven.
	Contaminated column.	Wash the column using an appropriate solvent. Ensure that a gradient method has a wash period at the end.
	Pump not mixing solvents properly.	Where being used, ensure that the proportioning valve is mixing the solvents correctly. If the method is isocratic, blend the solvents manually.
	Blocked solvent reservoir frits.	Ultrasonicate the reservoir frits in water and then methanol.
Old detector lamp.	Replace the lamp, particularly when this has been in use for > 2000 hours.	
<b>Peak Shape Problems</b>		
Broad Peaks	System not equilibrated.	Equilibrate the column with 10 volumes of mobile phase.
	Injection solvent too strong.	Ensure that the injection solvent is the same or weaker strength than the mobile phase.
	Injection volume too high.	Reduce the injection volume to avoid overload. Typically injection volumes of < 40% of the expected peak width should be used.
	Injected mass too high.	Reduce the sample concentration to avoid mass overload.
	Extra column volume too high.	Reduce diameter and length of connecting tubing. Reduce the volume of the flow cell where possible.
	Temperature fluctuations.	Use a thermostatically controlled column oven. Higher temperatures will produce sharper peaks.
	Old guard cartridge.	Replace the guard cartridge.
	Old column.	Do not use columns that have been used with ion-pair reagents for reverse-phase methods. Old columns give much lower efficiencies than new columns. Replace the column if necessary.
	Contaminated column.	Wash the column using an appropriate solvent. If this does not resolve the problem, replace the column.
	Voided column.	Replace the column. Do not use outside the recommended pH range.
Double Peaks	Old guard cartridge.	Replace the guard cartridge.
	Contaminated column.	Wash the column using an appropriate solvent. If this does not resolve the problem, replace the column.
	Voided column.	Replace the column. Do not use outside the recommended pH range.
Negative Peaks	Contaminated solvents.	Use freshly prepared solvents of HPLC grade.
	Wrongly wired detector.	Check the signal polarity from the detector to the recording device.
	Unbalanced RI detector optics.	Refer to manufacturer's instructions.
	Ion pair method.	Inject the sample in the mobile phase.



Symptom	Cause	Action
<b>Peak Shape Problems</b>		
Flat topped Peaks	Detector overload.	Reduce the sample concentration.
	Detector set-up.	Check the detector attenuation and re-zero.
Tailing Peaks	Old guard cartridge.	Replace the guard cartridge.
	Injection solvent too strong.	Ensure that the injection solvent is the same or weaker strength than the mobile phase.
	Injection volume too high.	Reduce the injection volume to avoid overload. Typically injection volumes of < 40% of the expected peak width should be used.
	Injected mass too high.	Reduce the sample concentration to avoid mass overload.
	Old column.	Do not use columns that have been used with ion-pair reagents for reversed phase methods. Old columns give much lower efficiencies than new columns. Replace the column if necessary.
	Contaminated column.	Wash the column using an appropriate solvent. If this does not resolve the problem, replace the column.
Fronting Peaks	Voided column.	Replace the column. Do not use outside the recommended pH range.
	Old or damaged column.	Replace the column.
<b>Peak Size and Retention Problems</b>		
Small Peaks	Degraded sample.	Inject a fresh sample.
	Low analyte concentration.	Increase the analyte concentration.
	Detector set-up.	Check the detector attenuation and re-zero.
	No wash solvent.	Check that the solvent wash reservoir is filled with a miscible solvent and that the injector is set to wash between injections.
	Damaged or blocked syringe.	Replace the syringe.
	Incorrect amount injected.	Check injector loop size and that no more than 50% of this volume is used for partial loop injections.
	Viscous injection solvent.	Reduce syringe draw-time.
	Old detector lamp.	Replace the lamp, particularly when this has been in use for > 2000 hours.
No Peaks	Sample vial empty.	Fill sample vial.
	Leak in system.	Check for and replace any leaking tubing or fittings.
	Pump not mixing solvents properly.	Where being used, ensure that the proportioning valve is mixing the solvents correctly. If the method is isocratic, blend the solvents manually.
	Damaged or blocked syringe.	Replace the syringe.
	Different dwell volume.	For gradient methods, check that the dwell volume of any new system is not very different from any previous system. Apply a final hold time if necessary.
Missing Peaks	Old detector lamp.	Replace the lamp, particularly when this has been in use for > 2000 hours.
	Degraded sample.	Inject a fresh sample.
	Immiscible mobile phase.	Check that any solvent already in the column is miscible with the mobile phase. Flush with propan-2-ol or ethanol where necessary.
Extra Peaks	Fluctuations in pH.	Buffer the mobile phase so that retention of ionizable compounds is controlled.
	Degraded sample.	Inject a fresh sample.
	Contaminated solvents.	Use freshly prepared solvents of HPLC grade. Gradient methods often show 'ghost-peaks'.
	Immiscible mobile phase.	Check that any solvent already in the column is miscible with the mobile phase. Flush with propan-2-ol or ethanol where necessary.
	Fluctuations in pH.	Buffer the mobile phase so that retention of ionizable compounds is controlled.
	Contaminated guard cartridge.	Replace the guard cartridge.
Varying Retention	Contaminated column.	Wash the column using an appropriate solvent. If this does not resolve the problem, replace the column.
	System not equilibrated.	Equilibrate the column with 10 volumes of mobile phase.
	Leak in system.	Check for and replace any leaking tubing or fittings.
	Temperature fluctuations.	Use a thermostatically controlled column oven.
	Contaminated column.	Wash the column using an appropriate solvent. If this does not resolve the problem, replace the column.
	Blocked solvent reservoir frits.	Ultrasonicate the reservoir frits in water and then methanol.
	Pump not mixing solvents properly.	Where being used, ensure that the proportioning valve is mixing the solvents correctly. If the method is isocratic, blend the solvents manually.
	Contaminated solvents.	Use freshly prepared solvents of HPLC grade.
	Different dwell volume.	For gradient methods, check that the dwell volume of any new system is not very different from any previous system. Apply a final hold time if necessary.
	Piston seals leaking.	Check for evidence of leaking or wear and replace where necessary.
	Air in solvent lines or pump.	Ensure that the reservoirs and solvent lines are fully primed and that the purge valve is fully closed.

For more information, please request Successful HPLC Operation – A Troubleshooting Guide, TG20094.

## HPLC Definitions and Equations

### Backpressure

The pressure required to pump the mobile phase through the column. It is related to mobile phase viscosity ( $\eta$ ), flow rate (F), column length (L) and diameter ( $d_c$ ), and particle size ( $d_p$ ) by the following equation:

$$\text{Pressure Drop (psi)} = \frac{250 L \eta F}{d_p^2 d_c^2}$$

L = column length (cm)

$\eta$  = viscosity

F = flow rate (mL/min)

$d_p$  = particle diameter ( $\mu\text{m}$ )

$d_c$  = column internal diameter (cm)

### Capacity Factor (k)

Expression that measures the degree of retention of an analyte relative to an unretained peak, where  $t_R$  is the retention time for the sample peak and  $t_0$  is the retention time for an unretained peak. A measurement of capacity will help determine whether retention shifts are due to the column (capacity factor is changing with retention time changes) or the system (capacity factor remains constant with retention time changes).

$$k = \frac{t_R - t_0}{t_0}$$

### Efficiency (N)

Also number of theoretical plates. A measure of peak band spreading determined by various methods, some of which are sensitive to peak asymmetry. The most common are shown here, with the ones most sensitive to peak shape shown first:

**5-Sigma**  $N = 25(t_R/W)^2$   
 W = peak width at 4.4% peak height

**4-Sigma**  $N = 16(t_R/W)^2$   
**or** W = tangential peak width or  
**Tangential** 13.4% peak height

**Half-Height**  $N = 5.54(t_R/W)^2$   
 W = peak width at 50% peak height

### Elution Volume ( $V_R$ )

Refers to the volume of mobile phase required to elute a solute from the column at maximum concentration (apex).

$$V_R = F \cdot t_R$$

where F is flow rate in volume/time and  $t_R$  is the retention time for the peak of interest.

### HETP

Height equivalent to a theoretical plate. A carryover from distillation theory: a measure of a column's efficiency. For a typical well-packed HPLC column with  $5\mu\text{m}$  particles, HETP (or H) values are usually between 0.01 and 0.03mm.

$$\text{HETP} = L/N$$

where L is column length in millimeters and N is the number of theoretical plates.

### Linear Velocity

The flow rate normalized by the column cross section. This effects column performance and is directly related to column pressure. Linear velocity is given by the following equation where L is column length and  $t_0$  is the breakthrough time of an unretained peak:

$$\mu = \frac{L}{t_0}$$

### Resolution ( $R_s$ )

The ability of a column to separate chromatographic peaks. Resolution can be improved by increasing column length, decreasing particle size, changing temperature, changing the eluent or stationary phase.

$$R_s = \frac{1}{4} \sqrt{N} \left( \frac{k}{1+k} \right) \left( \frac{\alpha-1}{\alpha} \right)$$

It can also be expressed in terms of the separation of the apex of two peaks divided by the tangential width average of the peaks:

$$R_s = \frac{(t_2 - t_1)}{0.5(W_1 + W_2)}$$

### Selectivity ( $\alpha$ )

A thermodynamic factor that is a measure of relative retention of two substances, fixed by a certain stationary phase and mobile phase composition. Where  $k_1$  and  $k_2$  are the respective capacity factors.

$$\alpha = \frac{k_2}{k_1}$$

### Tailing Factor (T)

A measure of the symmetry of a peak, given by the following equation where  $W_{0.05}$  is the peak width at 5% height and f is the distance from peak front to apex point at 5% height. Ideally, peaks should be Gaussian in shape or totally symmetrical.

$$T = W_{0.05}/2f$$

### van Deemter Equation

An equation used to explain band broadening in chromatography. The equation represents the height equivalent of a theoretical plate (H) and has three terms. The A term is used to describe eddy diffusion, which allows for the different paths a solute may follow when passing over particles of different sizes.

The B term is for the contribution caused by molecular diffusion or longitudinal diffusion of the solute while passing through the column. The C term is the contribution of mass transfer and allows for the finite rate of transfer of the solute between the stationary phase and mobile phase.  $u$  is the linear velocity of the mobile phase as it passes through the column.

$$H = A + \frac{B}{u} + Cu$$



## Selecting the Right Buffer

A partial list of common buffers and their corresponding pH values is shown in the Common Buffer Systems table. Perhaps the most common HPLC buffer is some form of phosphoric acid. Remember that a true buffer should have the ability to resist pH change when a sample is introduced at a different pH, and that buffer capacity is only 100% at the pK<sub>a</sub> value of the acid or base. At pH 4, phosphate is a poor buffer and would change rapidly toward one of its pK<sub>a</sub> values if a more acidic or basic sample were introduced.

As a rule, one should work within ±1pH unit of the buffer pK<sub>a</sub> value for good pH control of the mobile phase. Adequate buffer concentrations for HPLC tend to be in the 10-100 millimolar level depending on the size and nature of the sample, as well as the column packing material. Phases based on highly pure silica with robust bondings such as the Hypersil GOLD range, are often more compatible with dilute buffers than traditional packings.

When control at a lower pH (2-3) is desired, phosphate, or stronger organic acids such as TFA or acetic acid, are commonly used. If control at pH 4-5 is desired, an organic acid buffer such as acetate or citrate should be considered in place of phosphate.

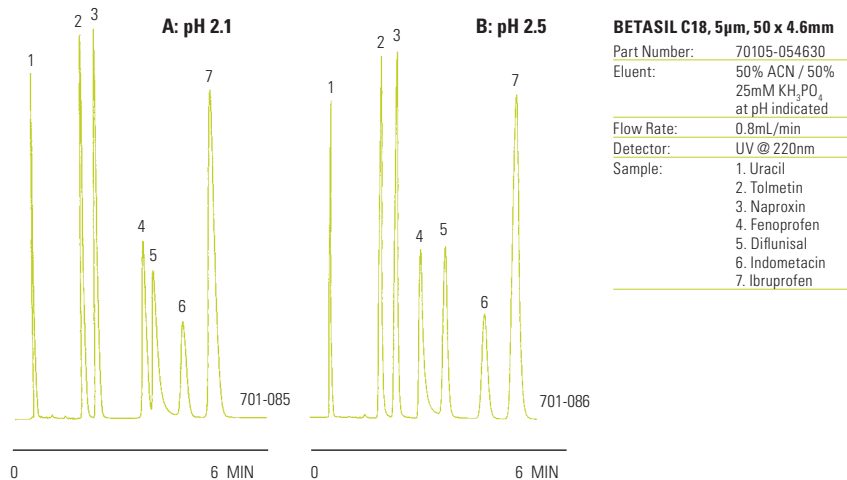
The figure to the right shows the importance of choosing the correct pH for a separation. Even slight changes in pH, either from measuring errors, mixing complications with the pump, or atmospheric water adsorption into the mobile phase, can alter any method if not properly buffered.

Care should be taken when choosing a buffer and organic modifier mixture to ensure that a solution of the two does not produce a solid salt which could cause blockages and system contamination.

Buffers should always be flushed from the analytical column and instrument after use to avoid salts being deposited on delicate frits etc.

### Common Buffer Systems

Buffer	pK <sub>a</sub>	Useful pH Range	MS-Compatible	
TFA	0.30		Yes	
Phosphate	pK <sub>1</sub>	2.1	1.1 – 3.1	No
	pK <sub>2</sub>	7.2	6.2 – 8.2	No
	pK <sub>3</sub>	12.3	11.3 – 13.3	No
Citrate	pK <sub>1</sub>	3.1	2.1 – 4.1	No
	pK <sub>2</sub>	4.7	3.7 – 5.7	No
	pK <sub>3</sub>	5.4	4.4 – 6.4	No
Formate	3.8	2.8 – 4.8	Yes	
Acetate	4.8	3.8 – 5.8	Yes	
Tris Base (Trizma, THAM)	8.3	7.3 – 9.3	Yes	
Ammonia	9.2	8.2 – 10.2	Yes	
Borate	9.2	8.2 – 10.2	No	
Diethylamine	10.5	9.5 – 11.5	Yes	
Carbonate	pK <sub>1</sub>	6.4	5.4 – 7.4	Yes
	pK <sub>2</sub>	10.3	9.3 – 11.3	Yes
Triethanolamine	7.80		Yes	



Effect of small changes in pH on the separation of mildly ionizable compounds

## Buffer Selection for LC/MS

Buffer choice will be very dependent on the analyte and the instrumentation used. Ideally, LC/MS applications should use a volatile buffer as this will not form a contaminating deposit on the source. Inorganic acids, involatile buffers and ion-pair reagents should all be avoided. Typical LC/MS buffers include:

- Ammonium acetate/formate/hydrogen carbonate (< 50mM)
- Formic/acetic acid (0.01 – 1% v/v)
- Trifluoroacetic acid (< 0.1% v/v)
- Trialkylamine (< 0.1% v/v) and aqueous ammonia type bases
- TRIS
- BIS-TRIS propane

**Note:** There are LC/MS instruments available, for example the Thermo Scientific Surveyor MSQ LC/MS, which incorporate a self-cleaning mechanism to reduce the build up of inorganic buffers on the source during routine use. Care should still be taken not to purposefully over-contaminate the instrument source as this will lead to operating difficulties.

## Preparation of Mobile Phases

Correct solvent preparation is very important. It can save vast amounts of time spent troubleshooting spurious peaks, baseline noise etc.

### Quality

All reagents and solvents should be of the highest quality. HPLC grade reagents may cost slightly more than lower grade reagents, but the difference in purity is marked. HPLC grade reagents contain no impurities to produce spurious peaks in a chromatogram baseline whereas lower grade reagents do contain trace levels of impurities, which may produce spurious baseline peaks.

Ensure that any water used in buffer preparation is of the highest purity. Deionized water often contains trace levels of organic compounds and therefore is not recommended for HPLC use. Ultra pure HPLC water (18m $\Omega$  resistivity) is generated by passing deionized water through an ion exchange bed. Modern water purification instruments use this mechanism to produce water of suitable quality in high volumes. Preferably, HPLC grade water can be purchased from solvent suppliers.

**Important:** Do not store HPLC grade water in plastic containers. Additives in the plastic may leach into the water and contaminate it. Always store HPLC grade water in glass containers.

### Buffers

All buffers should be prepared freshly on the day required. This practice ensures that the buffer pH is unaffected by prolonged storage and that there is no microbial growth present. Changes in pH and microbial growth will affect chromatography.

If buffer solutions are stored, be aware that they have a finite lifetime. Refer to pharmacopoeia monographs or similar for further guidance on buffer shelf life.

Buffer reagents can contain a stabilizing agent, for example, sodium metabisulphite. These stabilizing agents often affect the optical and chromatographic behavior of buffer solutions, so it is often worth buying reagents that contain no stabilizer. Containers of solid reagent are easily contaminated by repeated use. For this reason, we recommend that reagents be purchased in low container weights.

### Filtration

Ideally, all HPLC solvents should be filtered through a 0.45 $\mu$ m filter before use. This removes any particulate matter that may cause blockages. After filtration, the solvents should be stored in a covered reservoir to prevent re-contamination with dust etc.

Filtering HPLC solvents will benefit both your chromatography and the wear and tear of the HPLC system. Pump plungers, seals and check valves will perform better and lifetimes will be maximized.

### Degassing

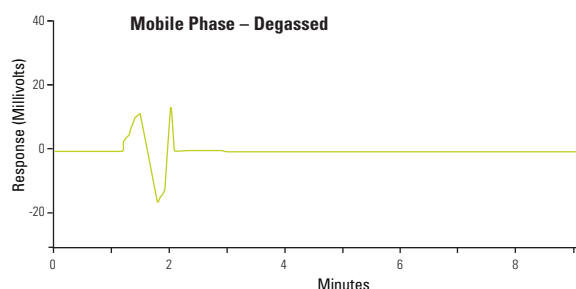
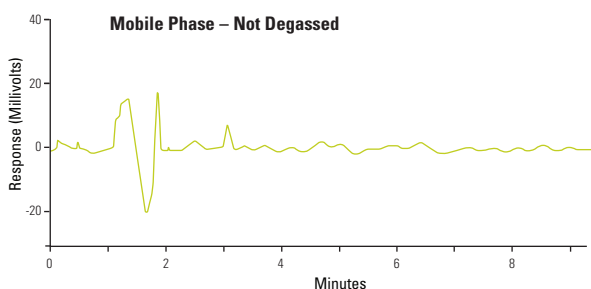
Before the freshly prepared mobile phase is pumped around the HPLC system, it should be thoroughly degassed to remove all dissolved gasses. Dissolved gas can be removed from solution by:

- Bubbling with helium
- Sonication
- Vacuum filtration

If the mobile phase is not degassed, air bubbles can form in the low pressure of the detector cell resulting in problems with system instability, spurious baseline peaks etc.

The most efficient form of degassing is bubbling with helium or another low solubility gas. If this method is available, we recommend that the mobile phase is continually degassed at very low levels throughout the analysis. This will inhibit the re-adsorption of gases over the analysis time.

**Note:** Ensure that the solvent reservoir has a vent to the atmosphere to prevent the build up of pressure inside the reservoir.



Baseline noise from gas in mobile phase

# Solvent Properties (vs Silica Gel) and Miscibility

## Solvent Properties and Miscibility

Solvent Strength	Polarity Index	UV Cutoff (nm)	Refractive index	Viscosity (cP, 20°C)	Boiling point (°C)	Water solubility (W/W%)	Solvent
0.01	0.1	215	1.391	0.50	99	0.0002	Isooctane
0.04	0.0	200	1.410	0.92	174	0.01	n-Decane
0.05	0.1	200	1.407	0.44	49	0.01	Cyclopentane
0.1	1.0	220	1.402	0.45	78	0.11	1-Chlorobutane
0.21	2.1	220	1.397	0.64	142	0.19	n-Butyl Ether
0.28	2.4	220	1.388	0.37	68	0.62	Isopropyl Ether
0.42	3.1	233	1.424	0.44	40	1.6	Methylene Chloride
0.43	4.2	334	1.396	0.51	117	-	Methyl Butyl Ketone
0.47	4.7	320	1.451	2.00	196	-	Cyclohexanone
0.55	5.5	210	1.402	1.72	125	Miscible	Methoxyethanol
0.6	4.5	260	1.362	0.37	57	-	Methyl Acetate
0.64	6.0	380	1.344	0.67	101	2.1	Nitromethane
0.65	6.5	268	1.438	0.84	166	Miscible	N,N'-Dimethylacetamide
0.69	6.0	265	1.447	1.55	182	-	N-Methylformamide
1.11	6.9	210	1.432	1.93	198	Miscible	Ethylene Glycol
2	6.0	260	1.372	1.26	118	Miscible	Acetic acid
0.56	5.1	330	1.359	0.36	56	Miscible	Acetone
0.65	5.8	190	1.344	0.38	82	Miscible	Acetonitrile
-	2.7	238	1.501	0.65	80	0.18	Benzene
0.39	3.9	215	1.399	2.98	117	7.8	n-Butanol
-	4.0	254	1.394	0.73	126	0.43	Butyl Acetate
-	1.6	263	1.460	0.97	77	0.08	Carbon Tetrachloride
0.4	4.1	245	1.446	0.57	61	0.815	Chloroform
0.04	0.2	200	1.427	1.00	81	0.01	Cyclohexane
-	3.5	228	1.445	0.79	83	0.3	1,2-Dichloroethane
-	3.1	233	1.424	0.44	40	1.3	Dichloromethane
0.64	6.4	268	1.431	0.92	153	Miscible	N,N'-Dimethylformamide
0.62	7.2	268	1.478	2.24	189	Miscible	Dimethyl Sulphoxide
0.56	4.8	215	1.422	1.37	101	Miscible	Dioxane
0.88	4.3	210	1.361	1.20	79	Miscible	Ethanol
0.58	4.4	256	1.372	0.45	77	8.7	Ethyl Acetate
-	2.8	218	1.352	0.23	35	6.89	Diethyl Ether
0.01	0.1	200	1.388	0.40	98	0.0004	n-Heptane
0.01	0.1	200	1.375	0.31	69	0.0012	n-Hexane
0.95	5.1	205	1.329	0.55	65	Miscible	Methanol
0.35	2.5	210	1.389	0.27	55	4.8	Methyl-t-Butyl Ether
0.51	4.7	329	1.379	0.43	80	24	Methyl Ethyl Ketone
-	0.0	190	1.358	0.23	36	0.004	Pentane
0.82	4.0	210	1.385	2.30	97	Miscible	n-Propanol
0.82	3.9	205	1.378	2.40	82	Miscible	Iso-Propanol
-	2.2	220	1.368	0.37	68	-	Di-iso-Propyl Ether
0.45	4.0	210	1.407	0.55	66	Miscible	Tetrahydrofuran
0.29	2.4	284	1.496	0.59	111	0.05	Toluene
-	1.0	273	1.477	0.57	87	0.11	Trichloroethylene
2	10.2	190	1.000	1.00	100	-	Water
0.26	2.5	288	1.506	0.81	144	0.018	o-Xylene

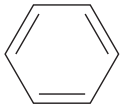
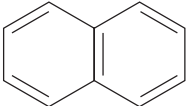
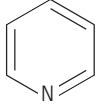
Data Sourced from: CRC Handbook of Chemistry and Physics - 73rd Edition  
The Merck Index - 12th Edition  
High Purity Solvent Guide, Burdick & Jackson Laboratories, Inc.  
The HPLC Solvent Guide, 2nd Edition, Paul C Saake  
HPLC Columns, Theory, Technology & Practice, Uwe D Neue  
Fisher Solvent Table

**Immiscible**  
Those squares shaded as "immiscible" refer to solvent mixes where, in some proportions, two phases will be produced

- Xylene
- Water
- Trichloroethylene
- Toluene
- Tetrahydrofuran
- Di-iso-Propyl Ether
- Iso-Propanol
- n-Propanol
- Pentane
- Methyl Ethyl Ketone
- Methyl-t-Butyl Ether
- Methanol
- Hexane
- Heptane
- Diethyl Ether
- Ethyl Acetate
- Ethanol
- Dioxane
- Dimethyl Sulphoxide
- Dimethylformamide
- Dichloromethane
- 1,2-Dichloroethane
- Cyclohexane
- Chloroform
- Carbon Tetrachloride
- Butyl Acetate
- n-Butanol
- Benzene
- Acetonitrile
- Acetone
- Acetic acid

## Chromophore Detection Wavelengths

Chromophores are light absorbing groups. Their behavior is used to allow the detection of analytes. They have one or more detection wavelengths, each of which has a molar adsorbivity associated with it. The information contained in the following table is intended as a guide to common chromophores. It is not an exhaustive list.

Chromophore		$\lambda_{\max}$ (nm)	$\epsilon_{\max}$ (L/m/cm)
Acetylide	-C≡C-	175 – 180	6,000
Aldehyde	-CHO	210	Strong
		280 – 300	11 – 18
Amine	-NH <sub>2</sub>	195	2,800
Azidin	> C=N-	190	5,000
Azo	-N=N-	285 – 400	3 – 25
Benzene		184	46,700
		202	6,900
		255	170
Carboxyl	-COOH	200 – 210	50 – 70
Ester	-COOR	205	50
Ether	-O-	185	1,000
Ethylene	-C=C-	190	8,000
Ketone	> C=O	195	1,000
		270 – 285	18 – 30
Naphthalene		220	112,000
		275	175
		312	5,600
Nitrate	-ONO <sub>2</sub>	270	12
	-(C=C) <sub>2</sub> acyclic	210 – 230	21,000
	-(C=C) <sub>3</sub>	260	35,000
	C=C-C=C	219	6,500
	C=C-C=N	220	23,000
	C=C-C=O	210 – 250	10,000 – 20,000
	C=C-NO <sub>2</sub>	300 – 350	Weak
Nitrile	-C≡N	160	-
		220 – 230	1,000 – 2,000
		300 – 400	10
Nitro	-NO <sub>2</sub>	210	Strong
Nitroso	-N=O	302	100
Oxime	-NOH	190	5,000
Pyridine		174	80,000
		195	6,000
		251	1,700
Sulfone	-SO <sub>2</sub> -	180	Very strong
Sulfoxide	> S-O	210	1,500
Thioether	-S-	194	4,600
		215	1,600
Thiol	-SH	195	1,400

## Column Cleaning and Regeneration

Testing of column performance can be undertaken using the experimental conditions in the test certificate provided with the column. The column efficiency, capacity factor, etc. should be measured at the start and end of the clean-up procedure to ensure that it has been performed successfully and has improved the column performance.

In all instances, the volume of solvent used is 40–60 column volumes unless otherwise stated. Ensure that no buffers or samples are present on the column and that the solvent used prior to the clean up is miscible with the first wash solvent. After the clean up, ensure that the test mobile phase is miscible with the last solvent in the column.

### Normal Phase Media

1. Flush with tetrahydrofuran
2. Flush with methanol
3. Flush with tetrahydrofuran
4. Flush with methylene chloride
5. Flush with benzene-free n-hexane

### Reversed Phase Media

1. Flush with HPLC grade water; inject 4 aliquots of 200µL DMSO during this flush
2. Flush with methanol
3. Flush with chloroform
4. Flush with methanol

### Anion Exchange Media

1. Flush with HPLC grade water
2. Flush with gradient of 50mM to 1M appropriate buffer solution
3. Flush with HPLC grade water
4. Flush with methanol
5. Flush with chloroform

### Cation Exchange Media

1. Flush with HPLC grade water; inject 4 aliquots of 200µL DMSO during this flush
2. Flush with tetrahydrofuran

### Protein Size Exclusion Media

There are two wash/regeneration procedures associated with the removal of contaminants from protein size exclusion media.

#### Weakly Retained Proteins

1. Flush with 30mL 0.1M pH 3.0 phosphate buffer

#### Strongly Retained Proteins

1. Flush for 60 minutes using a 100% water to 100% acetonitrile gradient

### Porous Graphitic Carbon

There are four wash or regeneration procedures associated with porous graphitic carbon. The one(s) used will depend on the analytes and solvents that have been used with the column

#### Acid/Base Regeneration

Suitable for ionized species analyzed in strongly aqueous mobile phases.

1. Invert the column
2. Flush with 50mL tetrahydrofuran:water (1:1) containing 0.1% trifluoroacetic acid
3. Flush with 50mL tetrahydrofuran:water (1:1) containing 0.1% triethylamine or sodium hydroxide
4. Flush with 50mL tetrahydrofuran:water (1:1) containing 0.1% trifluoroacetic acid
5. Flush column with 70 column volumes of THF
6. Flush with methanol/water (95:5) to re-equilibrate
7. Re-invert the column

Author: R. Plumb – Glaxo, UK

#### Strong Organic Regeneration

Suitable for applications involving polar and/or ionized species analyzed in aqueous mobile phases.

1. Flush with 50mL acetone
2. Flush with 120mL dibutylether
3. Flush with 50mL acetone
4. Flush with aqueous mobile phase until equilibrated

### Normal Phase Regeneration

Suitable for applications running predominantly in normal phase mobile phases.

1. Flush with 50mL dichloromethane
2. Flush with 50mL methanol
3. Flush with 50mL water
4. Flush with 50mL 0.1M hydrochloric acid
5. Flush with 50mL water
6. Flush with 50mL methanol
7. Flush with 50mL dichloromethane
8. Flush with mobile phase until equilibrated

Author: A. Karlsson – Uppsala, Sweden

### Removal of TFA and DEA

TFA and DEA have the potential to adsorb to the surface of porous graphitic carbon; after using these additives in the mobile phase, regeneration of the column should be undertaken to ensure the original Hypercarb selectivity and optimum performance will always be achieved. The regeneration is as follows:

1. Removal of TFA: Flush column with 70 column volumes of THF.
2. Removal of DEA: Set column oven to 75°C and flush column with 120 column volumes of ACN.

### Polymeric Media with Metallic Counter Ions

There are three types of regeneration available for polymeric columns with metal counter ion. Details of each procedure are listed in the following table.

Column Type	Metal Contamination	Organic Contamination	Column Cleaning
Hydrogen Counter Ion	Pump in reverse flow mode at 0.1mL/min with 0.1M H <sub>2</sub> SO <sub>4</sub> @ 25°C for 4 to 16 hr	Pump in reverse flow mode at 0.1mL/min with 20:80 ACN: H <sub>2</sub> O @ 25°C for 4 hr	Pump in reverse flow mode at 0.1mL/min with 20:80 ACN: 0.01M H <sub>2</sub> SO <sub>4</sub> @ 65°C for 4 hr
Calcium Counter Ion	Pump in reverse flow mode at 0.1mL/min with 0.1M Ca(NO <sub>3</sub> ) <sub>2</sub> @ pH 6.3 and 85°C for 4 to 16 hr	Pump in reverse flow mode at 0.1mL/min with 20:80 ACN:H <sub>2</sub> O @ 25°C for 4 hr	Pump in reverse flow mode at 0.1mL/min with 20:80 ACN:H <sub>2</sub> O @ 25°C for 4 hr
Sodium Counter Ion	Pump in reverse flow mode at 0.1mL/min with 0.1M NaNO <sub>3</sub> @ 85°C for 4 to 16 hr	Pump in reverse flow mode at 0.1mL/min with 20:80 ACN:H <sub>2</sub> O @ 25°C for 4 hr	Pump in reverse flow mode at 0.1mL/min with 20:80 ACN:H <sub>2</sub> O @ 25°C for 4 hr
Lead Counter Ion	Pump in reverse flow mode at 0.1mL/min with 0.1M Pb(NO <sub>3</sub> ) <sub>2</sub> @ pH 5.3 and 85°C for 4 to 16 hr	Pump in reverse flow mode at 0.1mL/min with 20:80 ACN: H <sub>2</sub> O @ 25°C for 4 hr	Pump in reverse flow mode at 0.1mL/min with 20:80 ACN: H <sub>2</sub> O @ 25°C for 4 hr

# Resources

## for Chromatographers

### Chromatography Resource Center

Our web-based resource center provides technical support, applications, technical tips and literature to help move your separations forward.

Visit [www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)



### How to order

#### USA and Canada

800 332 3331  
865 354 4616 fax

#### France

+33 (0)1 60 92 48 34  
+33 (0)1 60 92 49 00 fax  
Consumableslscgfr@thermofisher.com

#### Germany

+49 (0) 2423 9431 -20 or -21  
+49 (0) 6103 408 1111 fax  
lcgc.consumables.DE@thermofisher.com

#### United Kingdom

+44 1928 534110  
+44 1928 534001 fax  
lcgc.consumables@thermofisher.com

#### China

+86 800 810 5118  
or +86 400 650 5118  
Shanghai: +86 21 68654588  
Beijing: +86 10 84193588  
Guangzhou: +86 20 83145188  
analyze.cn@thermofisher.com

#### India

+91 22 6742 9494  
+91 22 6742 9495 fax  
analyze.in@thermofisher.com

#### Japan

0120 753 670 (free call domestic)  
0120 753 671 fax  
analyze.jp@thermofisher.com

#### Thermo Fisher Scientific Australia Pty Ltd

1300 735 292 (free call domestic)  
1800 067 639 fax  
AUinfo@thermofisher.com

#### Thermo Fisher Scientific New Zealand Ltd

0800 933 966 (free call domestic)  
0800 329 246 fax  
nzinfo@thermofisher.com

#### All Other Enquiries

+44 (0) 1928 534 050  
+44 (0) 1928 534 049 fax  
salesorders.columns.uk@thermofisher.com

### Technical Support

For advice and support, please visit our website:  
[www.thermoscientific.com/chromexpert](http://www.thermoscientific.com/chromexpert)

For more information visit: [www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)

© 2014 Thermo Fisher Scientific Inc. All rights reserved.  
Specifications, terms and pricing are subject to change. Not all products are available in all countries.  
Please consult your local sales representative for details.

BR20834\_E 01/14S

**Thermo**  
SCIENTIFIC  
Part of Thermo Fisher Scientific