

2012-2013

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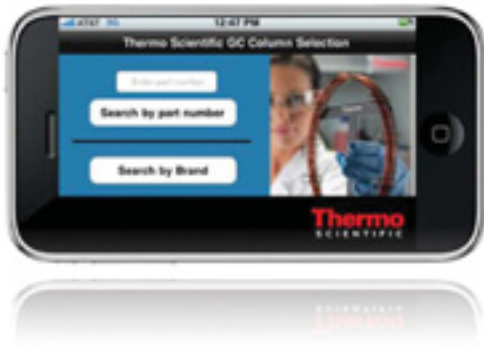
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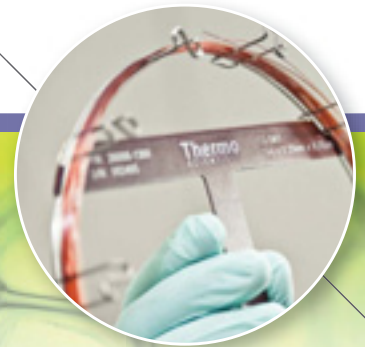


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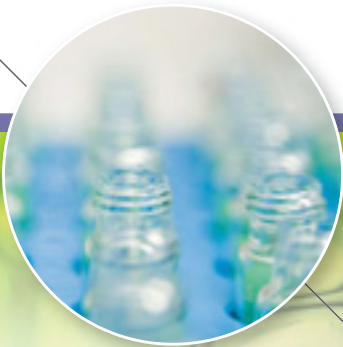




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trust



## Sample Preparation Products

Our comprehensive range of sample preparation products have been developed for rapid, effective and economical sample preparation. Thermo Scientific HyperSep SPE products are available in a range of formats including columns, multi-well plates and pipette tips. We also offer the complete line of Thermo Scientific syringe filters and the innovative WebSeal™ system.

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## Featured Products

### SOLA

First in class SPE performance, maximize reproducibility and extract cleanliness

» **PAGE 1-007**



### HyperSep Retain

Reproducible and clean sample extraction

» **PAGE 1-012**



### QuEChERS – Dispersive SPE

Efficient pesticide sample preparation from food matrices

» **PAGE 1-057**



### HyperSep SLE and Protein Precipitation

Fast, efficient methods for sample extraction from complex biological matrices

» **PAGE 1-043**



### Filtration

Simplified sample clean up

» **PAGE 1-064**



### WebSeal

Sample storage solutions, preventing cross contamination and sample loss

» **PAGE 1-074**



# Thermo Scientific SPE Products

## SPE Column Selection

Thermo Scientific HyperSep SPE products have been developed to meet the requirements of today's sample preparation challenges. HyperSep SPE columns and multi-well plates are offered in a range of phases, ideal for use in application areas such as: Pharmaceutical, Biochemical, Environmental, and Food and Beverage.

The following flow chart is designed to help in selecting the correct phase for the compound of interest.

### SPE Phase Selection

Sample Matrix	Solubility of Sample	Polarity of Sample	Separation Mode	Recommended HyperSep Sorbent(s)
Aqueous	Water Soluble	Non-Polar	Reversed Phase	SOLA, C18, C8, Phenyl Retain PEP
		Moderately Polar	Reversed Phase	SOLA, C18, C8, Retain PEP
		Polar	Reversed Phase	SOLA, Hypercarb Retain PEP
		Cationic	Ion Exchange	SCX
		Anionic	Ion Exchange	SAX Aminopropyl
		Non-Polar & Cationic	Reversed Phase and Ion Exchange	SOLA CX, Verify CX Retain CX
		Non-Polar & Anionic	Reversed Phase and Ion Exchange	SOLA AX, Verify AX Retain AX
Aqueous	Organic Soluble	Non-Polar	Reversed Phase	SOLA, C18, C8, Phenyl Retain PEP
Organic	Organic Soluble	Polar	Normal Phase	Silica, Aminopropyl Cyano, Diol
		Moderately Polar	Normal Phase	Silica, Florisil, Aminopropyl Cyano, Diol
		Cationic	Ion Exchange	SCX
		Anionic	Ion Exchange	SAX Aminopropyl
		Non-Polar & Cationic	Reversed Phase and Ion Exchange	Verify CX
		Non-Polar & Anionic	Reversed Phase and Ion Exchange	Verify AX

## SPE Phase Selection by Manufacturer

Thermo Scientific HyperSep Product	Alternative To	Thermo Scientific HyperSep Product	Alternative To
<b>HyperSep C18</b> Page 1-025	CLEAN-UP™ C18-U Supelclean™ ENVI-18 / LC-18 SampliQ C18 BAKERBOND spe™ Polar Plus™ Isolute™ C18 CHROMABOND™ C18 Bond Elut™ C18 strata™ C18-U Sep-Pak™ C18	<b>HyperSep SAX</b> Page 1-029	CLEAN-UP QAX Supelclean LC-SAX SampliQ Si-SAX BAKERBOND spe Quaternary amine Isolute SAX CHROMABOND SB Bond Elut SAX strata SAX
<b>HyperSep C8</b> Page 1-026	CLEAN-UP C8 Supelclean ENVI-8 / LC-8 SampliQ C8 BAKERBOND spe Octyl C8 Isolute C8 CHROMABOND C8 Bond Elut C8 strata C8 Sep Pak C8	<b>HyperSep SCX</b> Page 1-030	CLEAN-UP BCX Supelclean LC-SCX SampliQ Si-SCX BAKERBOND spe Aromatic Sulfonic Acid Isolute SCX CHROMABOND SA Bond Elut SCX strata SCX
<b>HyperSep Phenyl</b> Page 1-027	CLEAN-UP Phenyl Supelclean LC-Ph SampliQ Phenyl BAKERBOND spe Phenyl Isolute Ph Bond Elut Ph strata Phenyl (PH)	<b>HyperSep Verify AX</b> Page 1-032	CLEAN-UP THC Isolute HAX Bond Elut Certify II strata Screen-A
<b>HyperSep Silica</b> Page 1-028	CLEAN-UP Silica Supelclean LC-Si SampliQ Silica BAKERBOND spe Silica Gel Isolute Silica CHROMABOND SiOH Bond Elut Si strata Si-1 Sep Pak Si	<b>HyperSep Verify CX</b> Page 1-031	CLEAN-UP DAU Discovery DSC-MCAX SampliQ C8/SCX Isolute HCX CHROMABOND Drug Bond Elut Certify I strata Screen-C
<b>HyperSep Aminopropyl</b> Page 1-034	CLEAN-UP Aminopropyl Supelclean LC-NH <sub>2</sub> SampliQ Amino BAKERBOND spe Amino Isolute NH <sub>2</sub> CHROMABOND NH <sub>2</sub> Bond Elut NH <sub>2</sub> strata NH <sub>2</sub> Sep-Pak NH <sub>2</sub>	<b>HyperSep Retain PEP</b> Page 1-012	Oasis HLB (Waters) Strata-X (Phenomenex) FOCUS™ (Varian) Easy (Macherey Nagel) Isolute ENV+ (Biotage) SampliQ OPT StyreScreen DVB (UCT) H <sub>2</sub> O-philic DVB (JT Baker)
<b>HyperSep Florisil</b> Page 1-033	CLEAN-UP Florisil Supelclean ENVI-Florisil / LC-Florisil SampliQ Florisil BAKERBOND spe Florisil Isolute Florisil CHROMABOND Florisil Bond Elut Florisil strata FL-PR Sep Pak Florisil	<b>HyperSep Retain CX</b> Page 1-013	Oasis MCX (Waters) SampliQ SCX Strata-X-C (Phenomenex) StyreScreen DBX (UCT)
		<b>HyperSep Retain AX</b> Page 1-014	Oasis MAX (Waters) SampliQ SAX StyreScreen QAX (UCT)





## Removing Uncertainty by Applying the Science to SPE

Our comprehensive range of SPE solutions offer un-paralleled performance in purity of extract and reproducibility. Having a fundamental effect on the quality, time and analysis cost, SPE is a critical step during the sample analysis procedure.

We are dedicated to supplying the highest quality SPE solutions, in combination with providing our customers with the support and resources to optimize their SPE solutions and maximize their analysis.

### The Importance of SPE

Reducing the effects of the matrix on the separation (GC/LC) and detection (UV, MS etc.) is beneficial. The use of SPE as a sample preparation technique can significantly improve analysis aiding robustness and generating reproducibly accurate, precise and sensitive analytical methods. This relies on the ability of SPE to reproducibly:

#### Maximize detection selectivity

- Reduce ion suppression
- Reduce protein binding
- Reduce matrix interferences by elimination of matrix and particulates
- Compatibility of solvent with analytical technique

#### Improve analytical system performance

- Longer column lifetimes
- Less detector maintenance
- Syringes less likely to block
- Less contamination

#### Improve sensitivity by concentration of the analytes

- Lower limits of detection
- More accurate quantitation
- Improved data processing

Matrix effects are an issue in many areas of analytical chemistry, however, modification of ionisation (ion suppression/enhancement) can be a major problem in atmospheric pressure ionisation (API) mass spectrometry and, in particular, electrospray based ion sources.



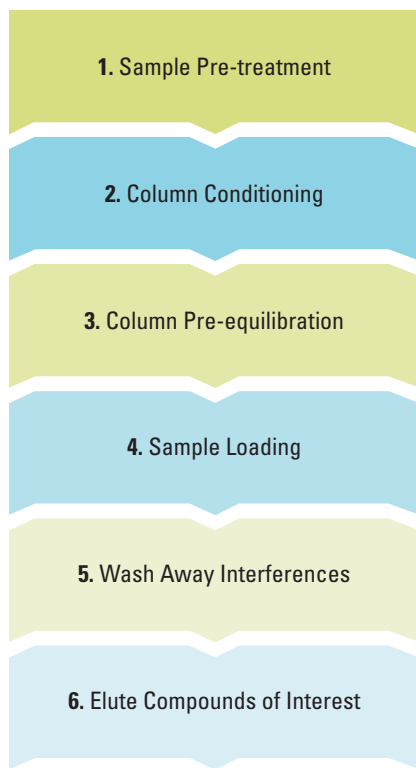
View our video on SPE

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## SPE Procedure – Six Steps for Clean Extract



### 1. Sample Pre-treatment

#### 1. Sample Pre-treatment

It is important to optimize the sample for effective analyte retention. The following should be considered:

- Sample volume/analyte concentration/matrix complexity
- Adjust sample/matrix composition for proper dilution/ionic strength
- Sample pH for optimum retention
- Confirm that analytes are free in solution
- Remove any unwanted particulates via filtration or centrifugation

#### 2. Column Conditioning

Prepare the sorbent for effective interaction(s) with the compounds of interest.

- Use appropriate solvent for column condition/activation
- Prevent sorbent drying during conditioning

### 2. Column Conditioning

### 3. Column Pre-equilibration

#### 3. Column Pre-equilibration

Equilibrate with weakly eluting solvent to prepare the phase for sample addition.

- Use the same solvent as for sample pre-treatment
- Prevent sorbent drying during column equilibration

### 4. Sample Loading

#### 4. Sample Loading

Analytes are retained on the sorbent.

- Apply samples at appropriate flow rate (1mL/minute typical)

#### For Reversed-Phase Interactions

- Neutral compounds are not affected by pH
- For charged compounds, a pH at which the compound is not charged is used. Neutralize the molecule according to the following:
  - For basic compounds, the neutral molecule exists at least 2pH units below the  $pK_a$  of the compound
  - For acidic compounds, the neutral molecule exists at least 2pH units above the  $pK_a$  of the compound

#### For Normal-Phase Interactions

- pH is not normally an issue in normal phase interactions, as the solvents used are typically non-polar organic solvents, rather than water
- There is no need to verify the sample application pH

#### For Ion-Exchange Interactions

- pH and  $pK_a$  are important considerations
- Acidic compounds are extracted from a sample solution at least 2pH units above the  $pK_a$  of the analyte
- Basic compounds are extracted from a sample solution 2 or more pH units below the  $pK_a$  of the analyte
- For second (organic) wash, choose the strongest solution where no compound breakthrough occurs
- For elution step, use a solution stronger than where all the compound of interest is eluted
- NB: when choosing these solutions allow some margin for error

#### 5. Wash Away Interferences

Remove impurities bound less strongly than the compounds of interest.

- Select a strong enough wash solvent to remove interferences but weak enough to leave compounds of interest bound
- Selectively rinse away the less strongly bonded interferences
- Wash solvent selected according to phase mechanism/analyte properties

#### 6. Elute Compounds of Interest

Selectively recover the analyte(s) by disrupting the analyte-sorbent interaction.

- Selectively elute analytes of interest using different solvents
- Smaller elution volume produces a more concentrated extract
- Select elution solvent that does not elute strongly retained impurities
- Select elution solvent according to phase mechanism/analyte properties

It is important to optimize the Wash and Elution steps in order to obtain maximum levels of recovery.

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## Method Development Optimization in SPE

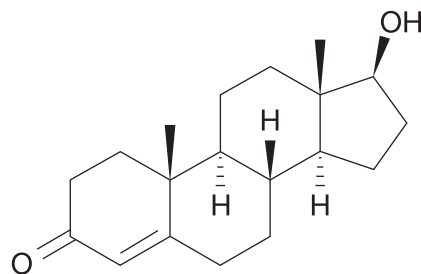
For cleaner extracts, optimization of the SPE process can be important. By optimizing the load, wash, and elution steps of the SPE process, a cleaner sample extract can be obtained.

An example of this is in the development of an SPE method for testosterone.

### HyperSep Retain PEP

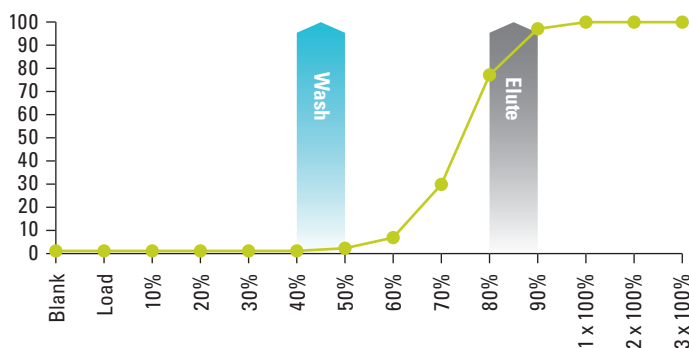
Using a 30mg 1mL SPE Cartridge  
(Part Number **60107-201**)

1. Condition with 1mL methanol followed by 1mL water
2. Load 1mL of 500ng/mL sample in water
3. Sequentially wash with increasing strengths of methanol in water, collecting the eluent 0% methanol/100% water to 90% methanol/10% water, increasing methanol content by 10% each time
4. Elution with multiple volumes of methanol



$$\text{LogP} = 3.6 \quad \text{P}k_a = 2.99$$

### Elution Profile of Testosterone



An alternative would be to use HyperSep Retain AX with the added benefit of Phospholipid removal.



For more information on how to optimize your SPE methodology and specific applications visit [www.thermoscientific.com/spe](http://www.thermoscientific.com/spe) and request your free copy of the Thermo Scientific HyperSep Columns Application Notebook.

# Thermo Scientific SOLA SPE Columns and Plates

Join the revolution

Thermo Scientific SOLA products revolutionize Solid Phase Extraction (SPE). This first fritless SPE product range provides greater reproducibility with cleaner, more consistent extracts.

SOLA products provide unparalleled performance characteristics compared to conventional SPE, phospholipid removal and protein precipitation products. This includes:

- Higher levels of reproducibility
- Higher levels of extract cleanliness
- Reduced solvent requirements
- Increased sensitivity

This increased performance gives higher confidence in analytical results and lowers cost without compromising ease of use or requiring complex method development.

SOLA products provide reduced failure rates, higher analysis speeds and lower solvent requirements which are critical in today's high throughput laboratory environment.

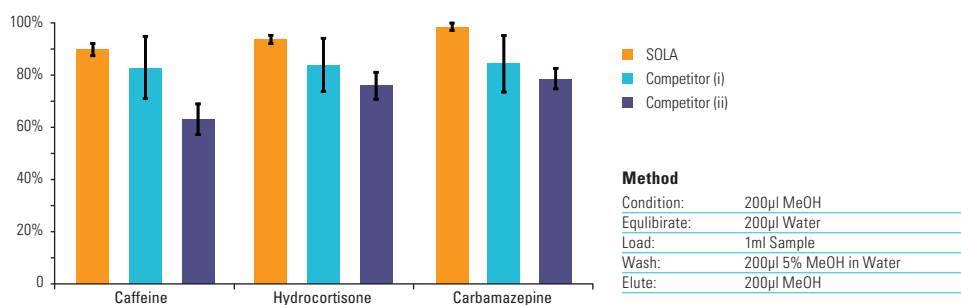
## Technical Information

The following information highlights the advantages associated with SOLA products over conventional loose packed SPE products.

### Improved Reproducibility and Recovery

The data in Figure 1 and Table 1 shows that SOLA products out perform conventional loose packed competitor SPE products even when utilizing the competitor recommended generic methodology.

The error bars illustrate significantly lower variability sample to sample for SOLA products compared to conventional loose packed competitor SPE products, ensuring you achieve the correct result time after time.



**Figure 1:** SOLA shows significantly higher reproducibility and recovery levels

	SOLA		Competitor (i)		Competitor (ii)	
	Recovery	Precision (%RSD n=30)	Recovery	Precision (%RSD n=30)	Recovery	Precision (%RSD n=30)
<b>Caffeine</b>	89.88%	4.37%	63.10%	23.89%	82.88%	12.11%
<b>Hydrocortisone</b>	93.76%	3.32%	76.05%	20.49%	83.95%	10.41%
<b>Carbamazepine</b>	98.72%	2.71%	78.64%	21.83%	84.47%	7.79%

**Table 1:** SOLA provides higher reproducibility and recovery levels

### Improved reproducibility

Figure 2 shows that SOLA products have consistent recoveries (across all 30 test samples). The conventional loose packed SPE product from competitor (i) shows that on average one in every four samples gives a significantly lower recovery. This results in inconsistencies in results. In comparison SOLA products provide significantly higher levels of reproducibility which is vitally important for high throughput studies.

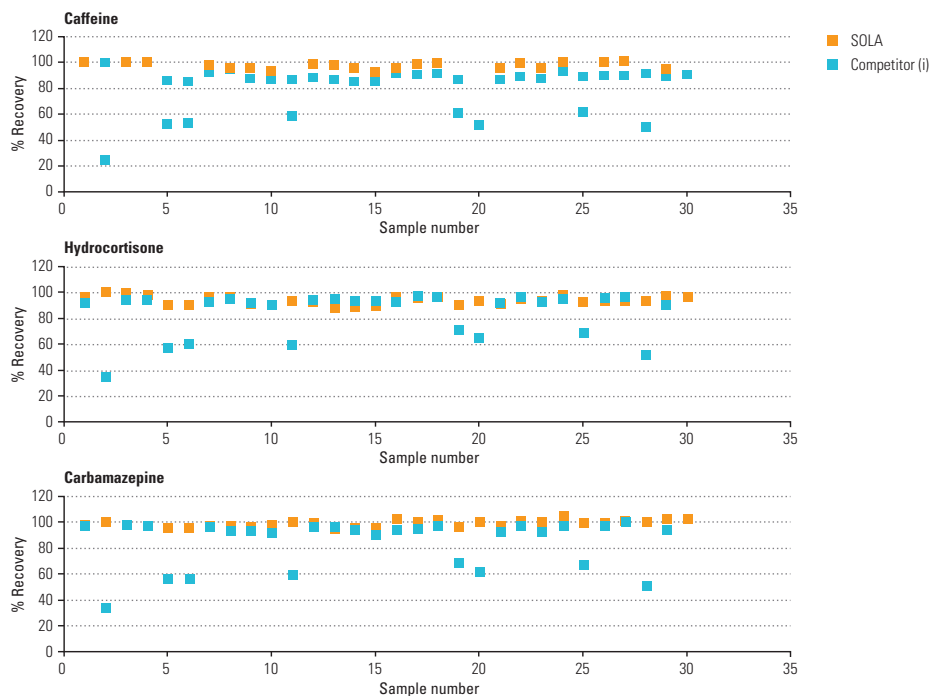


Figure 2: Shows inconsistency of loose packed products compared to SOLA.

### Higher sensitivity and lower solvent consumption

Figure 3 shows that SOLA products achieve excellent recovery levels even with low volumes of extract solvents, resulting in a more concentrated analyte and increased sensitivity. Additional cost and time saving benefits can be achieved from reduced sample dry down time and solvent usage. These low volume extractions would be significantly compromised when using a conventional loose packed, low bed weight, SPE product as seen in Figure 4.

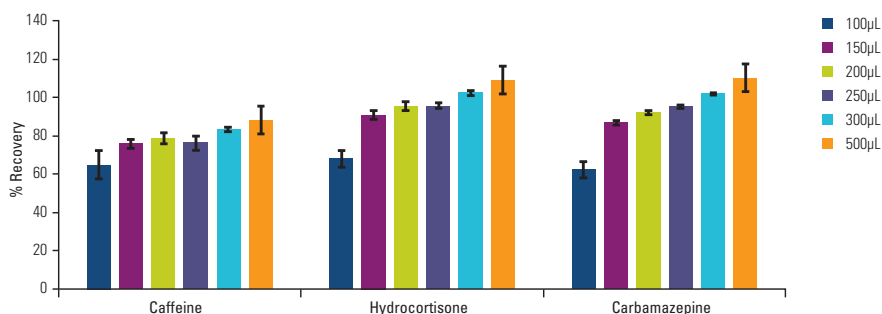
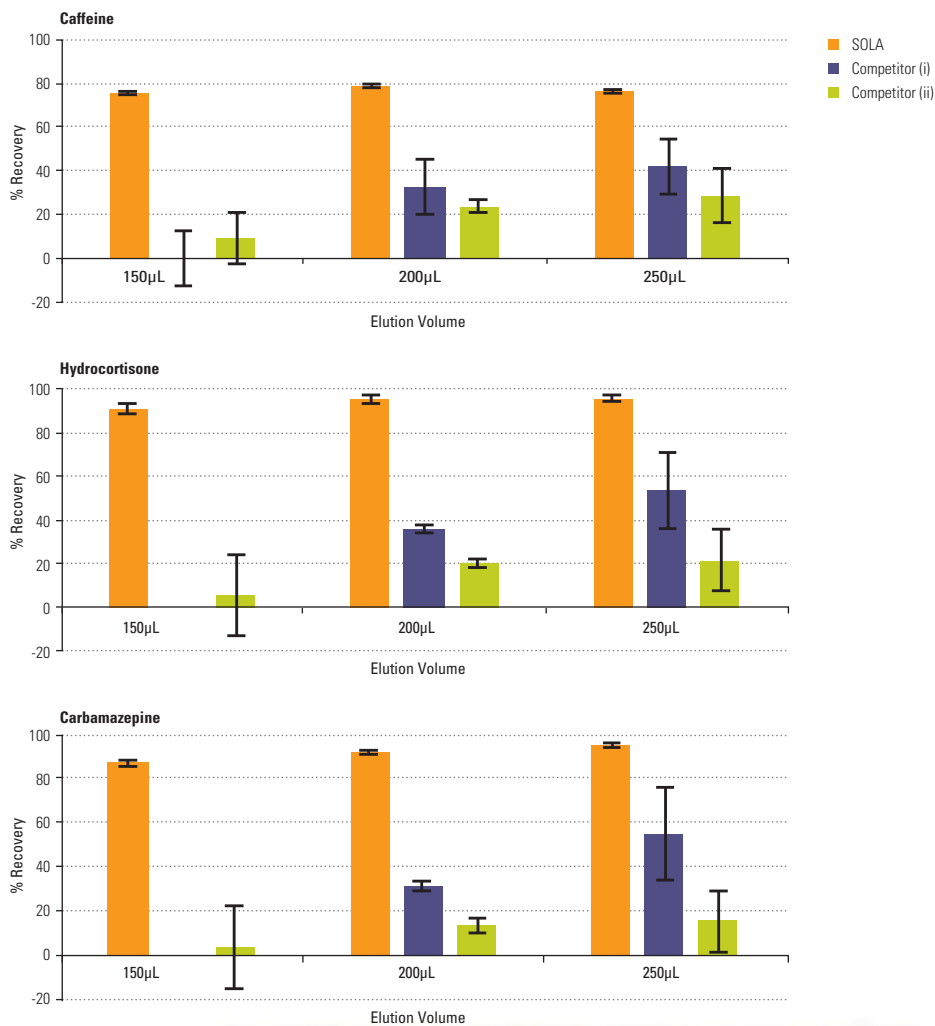


Figure 3: Shows high recovery levels are achieved with SOLA products at low elution volumes, resulting in increased sample concentrations and sensitivity



The data in Figure 4 shows significantly higher recovery levels and lower variability sample to sample with SOLA products at low elution volumes compared to conventional loose packed SPE products. This ensures correct results time after time.

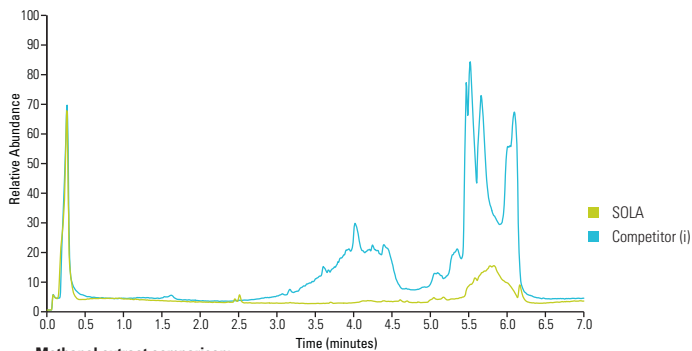


**Figure 4:** SOLA products recovery and reproducibility at low extraction volumes

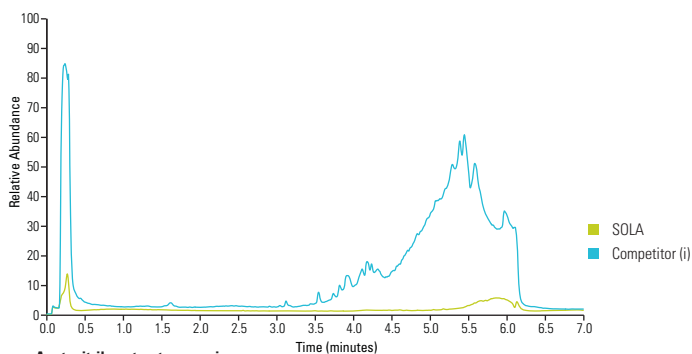


## Cleanliness of Extract

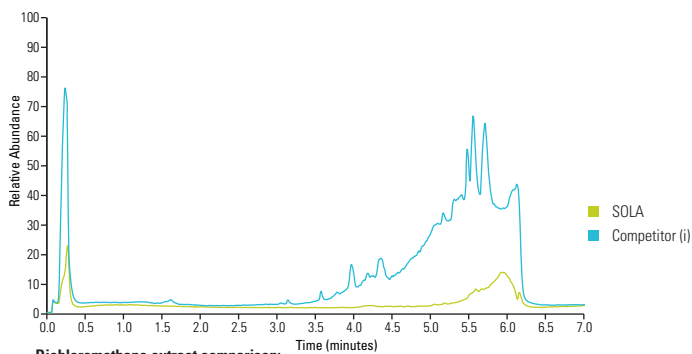
SOLA products proprietary manufacturing process provides a cleaner product and as a result a cleaner sample extract. This is shown in Figure 5 where SOLA products are compared against competitor (i) conventional loose packed SPE product, which have both been extracted with acetonitrile, dichloromethane and methanol, respectively.



**Methanol extract comparison:  
SOLA products versus competitor (i)**



**Acetonitrile extract comparison:  
SOLA products versus competitor (i)**



**Dichloromethane extract comparison:  
SOLA products versus competitor (i)**

**Figure 5:** Shows SOLA products are significantly cleaner than the equivalent loose packed SPE product from competitor (i)

In today's demanding laboratory environment where reproducibility, certainty of results and cost saving is a fundamental requirement, SOLA products are an indispensable tool to provide confidence and first time/ every time success in the analytical process.

## Product information

SOLA SPE columns and plates are available in 10mg/1ml cartridge and 10mg/2mL 96 well plate formats.

### SOLA SPE Cartridges

Description	Bed weight	Column volume (mL)	Cat No.	Quantity
SOLA	10mg	1mL	<b>60109-001</b>	100
SOLA CX	10mg	1mL	<b>60109-002</b>	100
SOLA AX	10mg	1mL	<b>60109-003</b>	100

### SOLA 96 Well Plates

Description	Bed weight	Column volume (mL)	Cat No.	Quantity
SOLA	10mg	2mL	<b>60309-001</b>	1
SOLA CX	10mg	2mL	<b>60309-002</b>	1
SOLA AX	10mg	2mL	<b>60309-003</b>	1

To Learn more about SOLA visit

[www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)



# Thermo Scientific HyperSep SPE Columns and Plates

## HyperSep Retain PEP SPE Columns and Plates

Versatile polymeric material for retention of polar and non-polar analytes

- Exceptional recoveries for polar and non-polar analytes
- High and consistent recoveries
- High capacity material is a high purity, highly porous polystyrene DVB material modified with urea functional groups to give balanced retention of polar and non-polar analytes
- Fast and easy sample preparation and method development
- pH stable 0 to 14



### HyperSep Retain PEP SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
10mg	1	<b>60107-222</b>	100 Pack
30mg	1	<b>60107-201</b>	100 Pack
30mg	3	<b>60107-202</b>	50 Pack
60mg	3	<b>60107-203</b>	50 Pack
60mg	6	<b>60107-208</b>	30 Pack
100mg	3	<b>60107-217</b>	50 Pack
100mg	6	<b>60107-207</b>	30 Pack
150mg	6	<b>60107-211</b>	30 Pack
200mg	3	<b>60107-204</b>	50 Pack
200mg	6	<b>60107-212</b>	30 Pack
500mg	3	<b>60107-205</b>	50 Pack
500mg	6	<b>60107-206</b>	30 Pack
1g	25	<b>60107-215</b>	20 Pack
1g	6	<b>60107-218</b>	30 Pack
2g	25	<b>60107-214</b>	20 Pack

### Applications:

- Drugs and metabolites in biological fluids
- Peptides in serum, plasma or biological fluids
- Environmental samples

### HyperSep Retain PEP 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
5	1	<b>60303-201</b>	100 Pack
10	1	<b>60303-202</b>	100 Pack
30	1	<b>60303-203</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
5	1	<b>60303-205</b>	1 Each
10	1	<b>60303-206</b>	1 Each
30	1	<b>60303-207</b>	1 Each

### HyperSep Retain PEP 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
5	1	<b>60306-205</b>	1 Each
10	1	<b>60306-206</b>	1 Each
30	1	<b>60306-207</b>	1 Each
60	1	<b>60306-208</b>	1 Each

## HyperSep Retain CX SPE Columns and Plates

Versatile polymeric material for retention of basic compounds

- Exceptional recoveries for basic analytes
- High and consistent recoveries
- High capacity material is a high purity, highly porous polystyrene DVB material partially modified with sulfonic acid functional groups
- Fast and easy sample preparation and method development
- pH stable 0 to 14

### HyperSep Retain CX SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60107-301</b>	100 Pack
30mg	3	<b>60107-302</b>	50 Pack
60mg	3	<b>60107-303</b>	50 Pack
60mg	6	<b>60107-308</b>	30 Pack
100mg	6	<b>60107-307</b>	30 Pack
150mg	6	<b>60107-311</b>	30 Pack
200mg	3	<b>60107-304</b>	50 Pack
200mg	6	<b>60107-314</b>	30 Pack
500mg	3	<b>60107-305</b>	50 Pack
500mg	6	<b>60107-306</b>	30 Pack
1g	25	<b>60107-315</b>	20 Pack
2g	25	<b>60107-312</b>	20 Pack

### Applications:

- Analysis of a wide range of drugs of abuse including basic and neutral drugs

### HyperSep Retain CX 96 Well Plates and Individual Wells

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
5	1	<b>60303-301</b>	100 Pack
10	1	<b>60303-302</b>	100 Pack
30	1	<b>60303-303</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
5	1	<b>60303-305</b>	1 Each
10	1	<b>60303-306</b>	1 Each
30	1	<b>60303-307</b>	1 Each

### HyperSep Retain CX 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
5	1	<b>60306-301</b>	1 Each
10	1	<b>60306-302</b>	1 Each
30	1	<b>60306-303</b>	1 Each
60	1	<b>60306-304</b>	1 Each



## HyperSep Retain AX SPE Columns and Plates

Versatile polymeric material for retention of acidic compounds

- Exceptional recoveries for acidic analytes
- High and consistent recoveries
- High capacity material is a high purity, highly porous polystyrene DVB material partially modified with quaternary amine functional groups
- Fast and easy sample preparation and method development
- pH stable 0 to 14



### HyperSep Retain AX SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60107-401</b>	100 Pack
30mg	3	<b>60107-402</b>	50 Pack
60mg	3	<b>60107-403</b>	50 Pack
60mg	6	<b>60107-408</b>	30 Pack
100mg	3	<b>60107-417</b>	50 Pack
100mg	6	<b>60107-407</b>	30 Pack
150mg	6	<b>60107-411</b>	30 Pack
200mg	3	<b>60107-404</b>	50 Pack
200mg	6	<b>60107-412</b>	30 Pack
500mg	3	<b>60107-405</b>	50 Pack
500mg	6	<b>60107-406</b>	30 Pack
500mg	15	<b>60107-419</b>	20 Pack
1g	25	<b>60107-415</b>	20 Pack
2g	25	<b>60107-414</b>	20 Pack

### Applications:

- Analysis of THC and its metabolites

### HyperSep Retain AX 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
5	1	<b>60303-401</b>	100 Pack
10	1	<b>60303-402</b>	100 Pack
30	1	<b>60303-403</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
5	1	<b>60303-405</b>	1 Each
10	1	<b>60303-406</b>	1 Each
30	1	<b>60303-407</b>	1 Each

### HyperSep Retain AX 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
5mg	1	<b>60306-401</b>	1 Each
10mg	1	<b>60306-402</b>	1 Each
30mg	1	<b>60306-403</b>	1 Each
60mg	1	<b>60306-404</b>	1 Each

## HyperSep Hypercarb SPE Columns and Plates

Unique material for retention of highly polar compounds

- Flat, 100% porous graphitic carbon (PGC) with selectivity for structurally similar compounds, offering separation of compounds with simple solvents
- pH stable 0 to 14
- High batch-to-batch reproducibility
- Strong retention properties allow use of low bed weights for concentrated extracts
- Interaction mechanism with polar molecules



### HyperSep Hypercarb SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
25mg	1	<b>60106-304</b>	50 Pack
50mg	1	<b>60106-303</b>	50 Pack
100mg	1	<b>60106-302</b>	30 Pack
200mg	3	<b>60106-301</b>	30 Pack
500mg	6	<b>60106-402</b>	20 Pack
1g	6	<b>60106-403</b>	10 Pack
2g	15	<b>60106-404</b>	10 Pack

### HyperSep Hypercarb 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60302-601</b>	100 Pack
25	1	<b>60302-602</b>	100 Pack
50	1	<b>60302-603</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60302-606</b>	1 Each
25	1	<b>60302-607</b>	1 Each
50	1	<b>60302-608</b>	1 Each

### HyperSep Hypercarb 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60306-501</b>	1 Each
25	1	<b>60306-502</b>	1 Each
50	1	<b>60306-503</b>	1 Each

## HyperSep Servo+ and HyperSep Servo Columns and Plates

Thermo Scientific HyperSep Servo+ and HyperSep Servo provide optimized SPE solutions for analysis of drugs of abuse. Both product ranges have been specifically designed to provide an out-of-the-box solution for sample preparation for drugs of abuse.

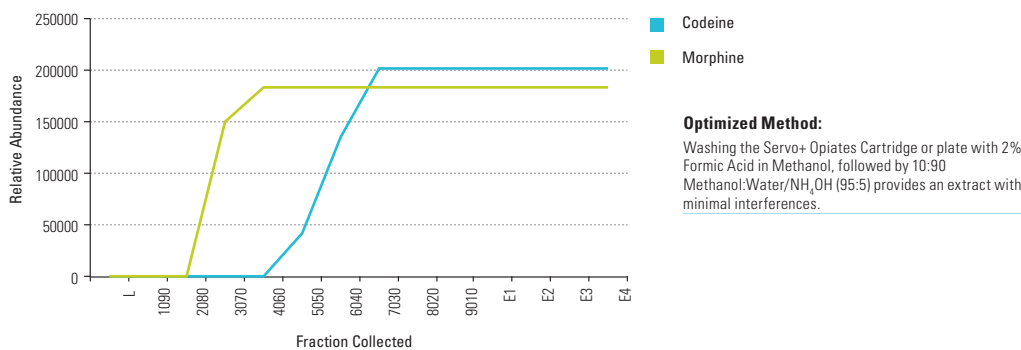
Both product ranges offer high levels of reproducibility and cleanliness of extract for dealing with difficult to analyze biological sample matrices where absolute confidence in your results is required. HyperSep Servo+ provides the additional benefit of greater selectivity, higher loading capacities and improved robustness. Both HyperSep Servo+ and HyperSep Servo ranges offer optimized solutions for different compound classes.

Optimized extraction procedures have been developed to allow ready-to-use solutions where there are no requirements for method development and allow confidence that the sample extraction technique will provide the cleanest extract possible.

The following information highlights the elution profiles generated to provide optimized methods for the different drug classes for Servo+.

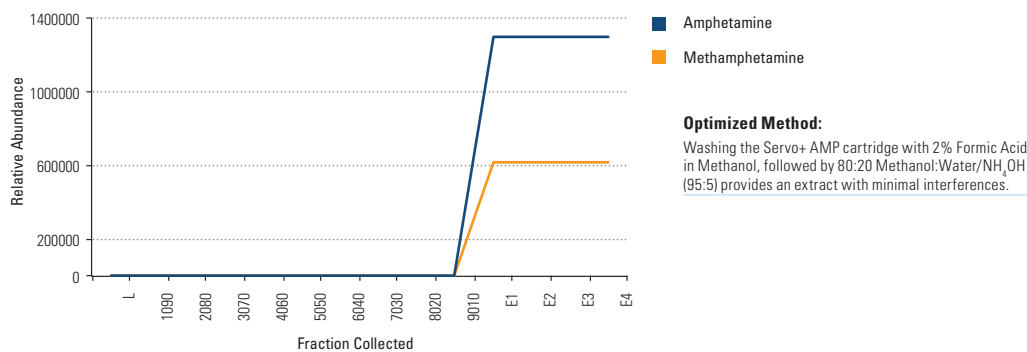
### HyperSep Servo+ Opiates

#### Elution Profile



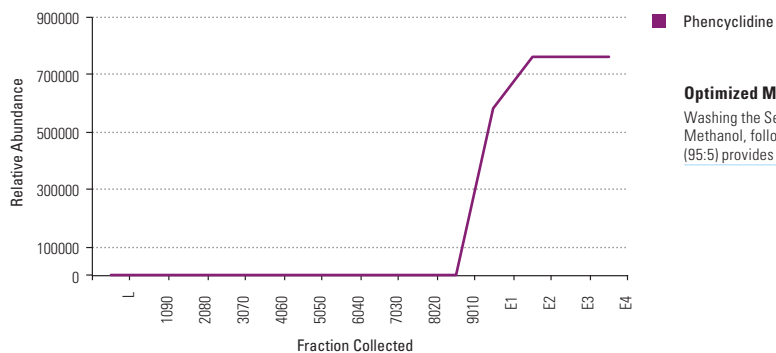
### HyperSep Servo+ AMP

#### Elution Profile



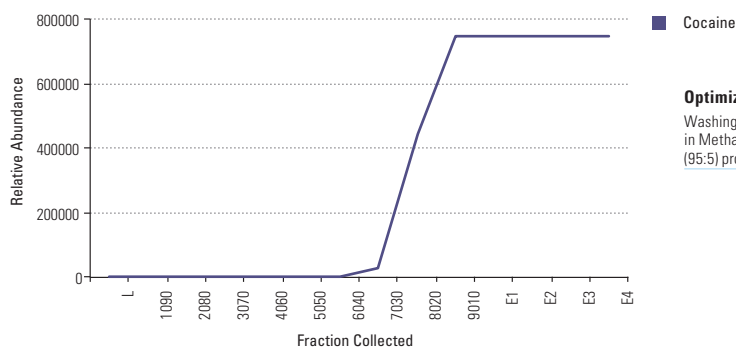
## HyperSep Servo+ PCP

### Elution Profile



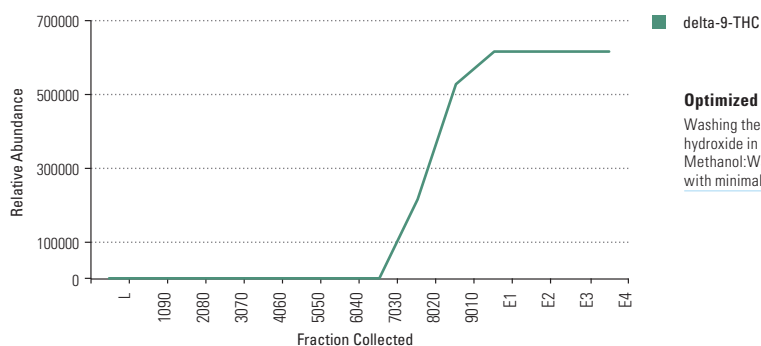
## HyperSep Servo+ Cocaine

### Elution Profile



## HyperSep Servo+ THC

### Elution Profile



### HyperSep Servo+ Total SPE Columns

Servo+ Total – for screening of a wide range of unknown components

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60110-101C</b>	100 Pack
30mg	3	<b>60110-102C</b>	50 Pack
60mg	3	<b>60110-103C</b>	50 Pack
200mg	3	<b>60110-104C</b>	50 Pack
500mg	3	<b>60110-105C</b>	50 Pack
500mg	6	<b>60110-106C</b>	30 Pack
100mg	6	<b>60110-107C</b>	30 Pack
60mg	6	<b>60110-108C</b>	30 Pack
150mg	6	<b>60110-109C</b>	30 Pack
200mg	6	<b>60110-110C</b>	30 Pack
1g	25	<b>60110-111C</b>	20 Pack

### HyperSep Servo+ Total 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60110-101P</b>	1 Each
10	1	<b>60110-102P</b>	1 Each
30	1	<b>60110-103P</b>	1 Each

### HyperSep Servo+ Total-A SPE Columns

Servo+ Total A – for screening of a wide range of unknown acidic compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60110-201C</b>	100 Pack
30mg	3	<b>60110-202C</b>	50 Pack
60mg	3	<b>60110-203C</b>	50 Pack
200mg	3	<b>60110-204C</b>	50 Pack
500mg	3	<b>60110-205C</b>	50 Pack
500mg	6	<b>60110-206C</b>	30 Pack
100mg	6	<b>60110-207C</b>	30 Pack
60mg	6	<b>60110-208C</b>	30 Pack
150mg	6	<b>60110-209C</b>	30 Pack
200mg	6	<b>60110-210C</b>	30 Pack
1g	25	<b>60110-211C</b>	20 Pack

### HyperSep Servo+ Total-A 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60110-201P</b>	1 Each
10	1	<b>60110-202P</b>	1 Each
30	1	<b>60110-203P</b>	1 Each



### HyperSep Servo+ Total-B SPE Columns

Servo+ Total B – for screening of a wide range of unknown basic compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60110-301C</b>	100 Pack
30mg	3	<b>60110-302C</b>	50 Pack
60mg	3	<b>60110-303C</b>	50 Pack
200mg	3	<b>60110-304C</b>	50 Pack
500mg	3	<b>60110-305C</b>	50 Pack
500mg	6	<b>60110-306C</b>	30 Pack
100mg	6	<b>60110-307C</b>	30 Pack
60mg	6	<b>60110-308C</b>	30 Pack
150mg	6	<b>60110-309C</b>	30 Pack
200mg	6	<b>60110-310C</b>	30 Pack
1g	25	<b>60110-311C</b>	20 Pack

### HyperSep Servo+ Total-B 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60110-301P</b>	1 Each
10	1	<b>60110-302P</b>	1 Each
30	1	<b>60110-303P</b>	1 Each

### HyperSep Servo+ THC SPE Columns

Servo+ THC – for dedicated extraction of THC and associated metabolites

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60110-401C</b>	100 Pack
30mg	3	<b>60110-402C</b>	50 Pack
60mg	3	<b>60110-403C</b>	50 Pack
200mg	3	<b>60110-404C</b>	50 Pack
500mg	3	<b>60110-405C</b>	50 Pack
500mg	6	<b>60110-406C</b>	30 Pack
100mg	6	<b>60110-407C</b>	30 Pack
60mg	6	<b>60110-408C</b>	30 Pack
150mg	6	<b>60110-409C</b>	30 Pack
200mg	6	<b>60110-410C</b>	30 Pack
1g	25	<b>60110-411C</b>	20 Pack

### HyperSep Servo+ THC 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60110-401P</b>	1 Each
10	1	<b>60110-402P</b>	1 Each
30	1	<b>60110-403P</b>	1 Each

### HyperSep Servo+ OPIATE SPE Columns

Servo+ Opiates – for dedicated extraction of Opiate class compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60110-501C</b>	100 Pack
30mg	3	<b>60110-502C</b>	50 Pack
60mg	3	<b>60110-503C</b>	50 Pack
200mg	3	<b>60110-504C</b>	50 Pack
500mg	3	<b>60110-505C</b>	50 Pack
500mg	6	<b>60110-506C</b>	30 Pack
100mg	6	<b>60110-507C</b>	30 Pack
60mg	6	<b>60110-508C</b>	30 Pack
150mg	6	<b>60110-509C</b>	30 Pack
200mg	6	<b>60110-510C</b>	30 Pack
1g	25	<b>60110-511C</b>	20 Pack

### HyperSep Servo+ OPIATE 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60110-501P</b>	1 Each
10	1	<b>60110-502P</b>	1 Each
30	1	<b>60110-503P</b>	1 Each

### HyperSep Servo+ PCP SPE Columns

Servo+ PCP – for dedicated extraction of PCP class compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60110-601C</b>	100 Pack
30mg	3	<b>60110-602C</b>	50 Pack
60mg	3	<b>60110-603C</b>	50 Pack
200mg	3	<b>60110-604C</b>	50 Pack
500mg	3	<b>60110-605C</b>	50 Pack
500mg	6	<b>60110-606C</b>	30 Pack
100mg	6	<b>60110-607C</b>	30 Pack
60mg	6	<b>60110-608C</b>	30 Pack
150mg	6	<b>60110-609C</b>	30 Pack
200mg	6	<b>60110-610C</b>	30 Pack
1g	25	<b>60110-611C</b>	20 Pack

### HyperSep Servo+ PCP 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60110-601P</b>	1 Each
10	1	<b>60110-602P</b>	1 Each
30	1	<b>60110-603P</b>	1 Each

### HyperSep Servo+ AMP SPE Columns

Servo+ AMP – for dedicated extraction of Amphetamine class compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60110-701C</b>	100 Pack
30mg	3	<b>60110-702C</b>	50 Pack
60mg	3	<b>60110-703C</b>	50 Pack
200mg	3	<b>60110-704C</b>	50 Pack
500mg	3	<b>60110-705C</b>	50 Pack
500mg	6	<b>60110-706C</b>	30 Pack
100mg	6	<b>60110-707C</b>	30 Pack
60mg	6	<b>60110-708C</b>	30 Pack
150mg	6	<b>60110-709C</b>	30 Pack
200mg	6	<b>60110-710C</b>	30 Pack
1g	25	<b>60110-711C</b>	20 Pack

### HyperSep Servo+ AMP 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60110-701P</b>	1 Each
10	1	<b>60110-702P</b>	1 Each
30	1	<b>60110-703P</b>	1 Each

### HyperSep Servo+ Cocaine SPE Columns

Servo+ Cocaine – for dedicated extraction of Cocaine class compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
30mg	1	<b>60110-801C</b>	100 Pack
30mg	3	<b>60110-802C</b>	50 Pack
60mg	3	<b>60110-803C</b>	50 Pack
200mg	3	<b>60110-804C</b>	50 Pack
500mg	3	<b>60110-805C</b>	50 Pack
500mg	6	<b>60110-806C</b>	30 Pack
100mg	6	<b>60110-807C</b>	30 Pack
60mg	6	<b>60110-808C</b>	30 Pack
150mg	6	<b>60110-809C</b>	30 Pack
200mg	6	<b>60110-810C</b>	30 Pack
1g	25	<b>60110-811C</b>	20 Pack

### HyperSep Servo+ Cocaine 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60110-801P</b>	1 Each
10	1	<b>60110-802P</b>	1 Each
30	1	<b>60110-803P</b>	1 Each

### HyperSep Servo Total SPE Columns

Servo Total – for screening of a wide range of unknown components

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60110-901C</b>	100 Pack
100mg	1	<b>60110-902C</b>	100 Pack
200mg	3	<b>60110-903C</b>	50 Pack
500mg	3	<b>60110-904C</b>	50 Pack
500mg	6	<b>60110-905C</b>	30 Pack
1g	6	<b>60110-906C</b>	30 Pack
2g	15	<b>60110-907C</b>	20 Pack

### HyperSep Servo Total 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
10	1	<b>60110-901P</b>	1 Each
25	1	<b>60110-902P</b>	1 Each
50	1	<b>60110-903P</b>	1 Each
100	1	<b>60110-904P</b>	2 Each

### HyperSep Servo Total-A SPE Columns

Servo Total A – for screening of a wide range of unknown acidic compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
130mg	1	<b>60111-101C</b>	100 Pack
300mg	3	<b>60111-102C</b>	50 Pack
500mg	3	<b>60111-103C</b>	50 Pack
200mg	6	<b>60111-104C</b>	50 Pack
500mg	6	<b>60111-105C</b>	30 Pack
1g	6	<b>60111-106C</b>	30 Pack

### HyperSep Servo Total-A 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60111-101P</b>	1 Each
10	1	<b>60111-102P</b>	1 Each
30	1	<b>60111-103P</b>	1 Each
100	1	<b>60111-104P</b>	2 Each

### HyperSep Servo Total-B SPE Columns

Servo Total B – for screening of a wide range of unknown basic compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
130mg	1	<b>60111-201C</b>	100 Pack
300mg	3	<b>60111-202C</b>	50 Pack
500mg	3	<b>60111-203C</b>	50 Pack
200mg	6	<b>60111-204C</b>	50 Pack
500mg	6	<b>60111-205C</b>	30 Pack
1g	6	<b>60111-206C</b>	30 Pack

### HyperSep Servo Total-B 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60111-201P</b>	1 Each
10	1	<b>60111-202P</b>	1 Each
30	1	<b>60111-203P</b>	1 Each
100	1	<b>60111-204P</b>	2 Each

### HyperSep Servo THC SPE Columns

Servo THC – for dedicated extraction of THC and associated metabolites

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
130mg	1	<b>60111-301C</b>	100 Pack
300mg	3	<b>60111-302C</b>	50 Pack
500mg	3	<b>60111-303C</b>	50 Pack
200mg	6	<b>60111-304C</b>	50 Pack
500mg	6	<b>60111-305C</b>	30 Pack
1g	6	<b>60111-306C</b>	30 Pack

### HyperSep Servo THC 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60111-301P</b>	1 Each
10	1	<b>60111-302P</b>	1 Each
30	1	<b>60111-303P</b>	1 Each
100	1	<b>60111-304P</b>	2 Each

### HyperSep Servo OPIATE SPE Columns

Servo Opiates – for dedicated extraction of Opiate class compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
130mg	1	<b>60111-401C</b>	100 Pack
300mg	3	<b>60111-402C</b>	50 Pack
500mg	3	<b>60111-403C</b>	50 Pack
200mg	6	<b>60111-404C</b>	50 Pack
500mg	6	<b>60111-405C</b>	30 Pack
1g	6	<b>60111-406C</b>	30 Pack

### HyperSep Servo OPIATE 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60111-401P</b>	1 Each
10	1	<b>60111-402P</b>	1 Each
30	1	<b>60111-403P</b>	1 Each
100	1	<b>60111-404P</b>	2 Each

### HyperSep Servo PCP SPE Columns

Servo PCP – for dedicated extraction of PCP class compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
130mg	1	<b>60111-501C</b>	100 Pack
300mg	3	<b>60111-502C</b>	50 Pack
500mg	3	<b>60111-503C</b>	50 Pack
200mg	6	<b>60111-504C</b>	50 Pack
500mg	6	<b>60111-505C</b>	30 Pack
1g	6	<b>60111-506C</b>	30 Pack

### HyperSep Servo PCP 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60111-501P</b>	1 Each
10	1	<b>60111-502P</b>	1 Each
30	1	<b>60111-503P</b>	1 Each
100	1	<b>60111-504P</b>	2 Each

### HyperSep Servo AMP SPE Columns

Servo AMP – for dedicated extraction of Amphetamine class compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
130mg	1	<b>60111-601C</b>	100 Pack
300mg	3	<b>60111-602C</b>	50 Pack
500mg	3	<b>60111-603C</b>	50 Pack
200mg	6	<b>60111-604C</b>	50 Pack
500mg	6	<b>60111-605C</b>	30 Pack
1g	6	<b>60111-606C</b>	30 Pack

### HyperSep Servo AMP 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60111-601P</b>	1 Each
10	1	<b>60111-602P</b>	1 Each
30	1	<b>60111-603P</b>	1 Each
100	1	<b>60111-604P</b>	2 Each

### HyperSep Servo Cocaine SPE Columns

Servo Cocaine – for dedicated extraction of Cocaine class compounds

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
130mg	1	<b>60111-701C</b>	100 Pack
300mg	3	<b>60111-702C</b>	50 Pack
500mg	3	<b>60111-703C</b>	50 Pack
200mg	6	<b>60111-704C</b>	50 Pack
500mg	6	<b>60111-705C</b>	30 Pack
1g	6	<b>60111-706C</b>	30 Pack

### HyperSep Servo Cocaine 96 Well Plates

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
5	1	<b>60111-701P</b>	1 Each
10	1	<b>60111-702P</b>	1 Each
30	1	<b>60111-703P</b>	1 Each
100	1	<b>60111-704P</b>	2 Each

To learn more about  
HyperSep Servo+ and Servo visit  
[www.thermoscientific.com/servo](http://www.thermoscientific.com/servo)

## HyperSep C18 SPE Columns and Plates

Feature a highly retentive alkyl-bonded phase for non-polar to moderately polar compounds

- Retentive for most non-polar compounds
- Retains most organic analytes from aqueous matrices
- Hydrophobic reversed phase
- For non-polar to moderately polar compounds

### HyperSep C18 SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
25mg	1	<b>60108-376</b>	100 Pack
50mg	1	<b>60108-390</b>	100 Pack
100mg	1	<b>60108-302</b>	100 Pack
100mg	3	<b>60108-765</b>	50 Pack
200mg	3	<b>60108-303</b>	50 Pack
500mg	3	<b>60108-304</b>	50 Pack
500mg	6	<b>60108-305</b>	30 Pack
500mg	10	<b>60108-786</b>	50 Pack
1g	6	<b>60108-301</b>	30 Pack
2g	15	<b>60108-701</b>	20 Pack
5g	25	<b>60108-702</b>	20 Pack
10g	75	<b>60108-703</b>	10 Pack

### Applications:

- Retentive for non-polar compounds
- Retains most organic analytes from aqueous matrices

### HyperSep C18 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-421</b>	100 Pack
25	1	<b>60300-422</b>	100 Pack
50	1	<b>60300-423</b>	100 Pack
100	1	<b>60300-524</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-425</b>	1 Each
25	1	<b>60300-426</b>	1 Each
50	1	<b>60300-427</b>	1 Each
100	1	<b>60300-428</b>	1 Each

### HyperSep C18 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-201</b>	1 Each
25	1	<b>60307-202</b>	1 Each
50	1	<b>60307-203</b>	1 Each
100	1	<b>60307-204</b>	1 Each



## HyperSep C8 SPE Columns and Plates

Less retentive alternative to C18 for polar and non-polar compounds

- Well-suited for methods requiring less retention than C18
- Excellent for moderately polar analytes
- Potential for polar interactions greater than with C18



### HyperSep C8 SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-391</b>	100 Pack
100mg	1	<b>60108-392</b>	100 Pack
200mg	3	<b>60108-393</b>	50 Pack
500mg	3	<b>60108-309</b>	50 Pack
500mg	6	<b>60108-394</b>	30 Pack
1g	6	<b>60108-427</b>	30 Pack
2g	15	<b>60108-704</b>	20 Pack
5g	25	<b>60108-705</b>	20 Pack
10g	75	<b>60108-706</b>	10 Pack

### Applications:

- Drugs and their metabolites in biological samples
- Peptides in biological samples

### HyperSep C8 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-441</b>	100 Pack
25	1	<b>60300-442</b>	100 Pack
50	1	<b>60300-443</b>	100 Pack
100	1	<b>60300-444</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-445</b>	1 Each
25	1	<b>60300-446</b>	1 Each
50	1	<b>60300-447</b>	1 Each
100	1	<b>60300-448</b>	1 Each

### HyperSep C8 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-211</b>	1 Each
25	1	<b>60307-212</b>	1 Each
50	1	<b>60307-213</b>	1 Each
100	1	<b>60307-214</b>	1 Each

## HyperSep Phenyl SPE Columns and Plates

Offer alternative selectivity for retention of basic compounds

- Commonly employed for non-polar interactions
- The electron density of the aromatic ring provides different selectivity than other non-polar sorbents

### HyperSep Phenyl SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-516</b>	100 Pack
100mg	1	<b>60108-386</b>	100 Pack
200mg	3	<b>60108-387</b>	50 Pack
500mg	3	<b>60108-388</b>	50 Pack
500mg	6	<b>60108-389</b>	30 Pack
1g	6	<b>60108-517</b>	30 Pack
2g	15	<b>60108-707</b>	20 Pack
5g	25	<b>60108-708</b>	20 Pack
10g	75	<b>60108-709</b>	10 Pack

### Applications:

- Extraction of aromatic compounds
- Extraction of basic analytes

### HyperSep Phenyl 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-681</b>	100 Pack
25	1	<b>60300-682</b>	100 Pack
50	1	<b>60300-683</b>	100 Pack
100	1	<b>60300-684</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-685</b>	1 Each
25	1	<b>60300-686</b>	1 Each
50	1	<b>60300-687</b>	1 Each
100	1	<b>60300-688</b>	1 Each

### HyperSep Phenyl 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-221</b>	1 Each
25	1	<b>60307-222</b>	1 Each
50	1	<b>60307-223</b>	1 Each
100	1	<b>60307-224</b>	1 Each

## HyperSep Silica SPE Columns and Plates

A polar sorbent primarily used to retain analytes in non-polar matrices

- Effectively separates compounds of very similar structure
- Adsorbs analytes from non-polar solvents like hydrocarbons, less polar esters and ethers
- Suitable for use as an intermediate strength cation exchanger in aqueous medium

### HyperSep Silica SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-409</b>	100 Pack
100mg	1	<b>60108-317</b>	100 Pack
200mg	3	<b>60108-410</b>	50 Pack
500mg	3	<b>60108-315</b>	50 Pack
500mg	6	<b>60108-411</b>	30 Pack
500mg	10	<b>60108-793</b>	50 Pack
1g	6	<b>60108-426</b>	30 Pack
2g	15	<b>60108-710</b>	20 Pack
5g	25	<b>60108-711</b>	20 Pack
10g	75	<b>60108-712</b>	10 Pack
50g	150	<b>60108-850</b>	10 Pack
20g	75	<b>60108-851</b>	10 Pack
70g	150	<b>60108-852</b>	10 Pack
10g	25	<b>60108-853</b>	20 Pack

### Applications:

- Extraction of polar compounds including aldehydes, amines, drugs, pesticides and herbicides
- Extraction of carotenoids, fat-soluble vitamins, aflatoxins in food matrices
- Extraction of fatty acids and phospholipids

### HyperSep Silica 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-481</b>	100 Pack
25	1	<b>60300-482</b>	100 Pack
50	1	<b>60300-483</b>	100 Pack
100	1	<b>60300-484</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-485</b>	1 Each
25	1	<b>60300-486</b>	1 Each
50	1	<b>60300-487</b>	1 Each
100	1	<b>60300-488</b>	1 Each

### HyperSep Silica 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-231</b>	1 Each
25	1	<b>60307-232</b>	1 Each
50	1	<b>60307-233</b>	1 Each
100	1	<b>60307-234</b>	1 Each

## HyperSep SAX Strong Anion Exchanger SPE Columns and Plates

Strong anion exchange sorbent for extraction of weak acids

- Extracts negatively charged compounds from both aqueous and non-aqueous solutions
- Ideally suited for the extraction of weak acids, e.g. carboxylic acids
- Amine group masks the effect of the carbon chain of the functional group
- Selectivity can be tuned by selection of buffer

### HyperSep SAX SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-417</b>	100 Pack
100mg	1	<b>60108-418</b>	100 Pack
200mg	3	<b>60108-419</b>	50 Pack
500mg	3	<b>60108-521</b>	50 Pack
500mg	6	<b>60108-360</b>	30 Pack
1g	6	<b>60108-434</b>	30 Pack
2g	15	<b>60108-713</b>	20 Pack
5g	25	<b>60108-714</b>	20 Pack
10g	75	<b>60108-715</b>	10 Pack

### Applications:

- Isolation of anionic proteins
- Removal of acidic food pigments
- Isolation of phenolic compounds
- Nucleic acids, nucleotides and surfactants

### HyperSep SAX 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-561</b>	100 Pack
25	1	<b>60300-562</b>	100 Pack
50	1	<b>60300-563</b>	100 Pack
100	1	<b>60300-564</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-565</b>	1 Each
25	1	<b>60300-566</b>	1 Each
50	1	<b>60300-567</b>	1 Each
100	1	<b>60300-568</b>	1 Each

### HyperSep SAX 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-241</b>	1 Each
25	1	<b>60307-242</b>	1 Each
50	1	<b>60307-243</b>	1 Each
100	1	<b>60307-244</b>	1 Each

## HyperSep SCX Strong Cation Exchanger SPE Columns and Plates

A strong cation exchange sorbent for extraction of charged basic compounds

- Modified benzene ring provides potential for non-polar interactions
- Low  $pK_a$  value sorbent

### HyperSep SCX SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-420</b>	100 Pack
100mg	1	<b>60108-421</b>	100 Pack
200mg	3	<b>60108-422</b>	50 Pack
500mg	3	<b>60108-423</b>	50 Pack
500mg	6	<b>60108-520</b>	30 Pack
1g	6	<b>60108-433</b>	30 Pack
2g	15	<b>60108-716</b>	20 Pack
5g	25	<b>60108-717</b>	20 Pack
10g	75	<b>60108-718</b>	10 Pack
20g	75	<b>60108-857</b>	10 Pack
50g	150	<b>60108-858</b>	10 Pack

### Applications:

- Isolation of anionic proteins
- Removal of acidic food pigments
- Isolation of phenolic compounds
- Nucleic acids, nucleotides and surfactants

### HyperSep SCX 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-581</b>	100 Pack
25	1	<b>60300-582</b>	100 Pack
50	1	<b>60300-583</b>	100 Pack
100	1	<b>60300-584</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-585</b>	1 Each
25	1	<b>60300-586</b>	1 Each
50	1	<b>60300-587</b>	1 Each
100	1	<b>60300-588</b>	1 Each

### Hyper Sep SCX 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-251</b>	1 Each
25	1	<b>60307-252</b>	1 Each
50	1	<b>60307-253</b>	1 Each
100	1	<b>60307-254</b>	1 Each

## HyperSep Verify CX SPE Columns and Plates

Features non-polar and anionic characteristics for improved analysis of drugs of abuse

- Mixed mode sorbent for extraction of basic drugs
- Separation based on two functional groups: reversed phase C8 and an ion exchanger, benzene sulfonic acid
- Co-polymerized on a rigid, purified silica gel support

### HyperSep Verify CX SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-741</b>	100 Pack
130mg	1	<b>60108-719</b>	100 Pack
130mg	10	<b>60108-769</b>	50 Pack
200mg	3	<b>60108-777</b>	50 Pack
200mg	6	<b>60108-722</b>	50 Pack
200mg	10	<b>60108-742</b>	50 Pack
300mg	3	<b>60108-720</b>	50 Pack
500mg	3	<b>60108-721</b>	50 Pack
500mg	6	<b>60108-723</b>	30 Pack
1g	6	<b>60108-724</b>	30 Pack

### Applications:

- Analysis of a wide range of drugs of abuse from biological matrices, including basic and neutral drugs

### HyperSep Verify CX 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-801</b>	100 Pack
25	1	<b>60300-802</b>	100 Pack
50	1	<b>60300-803</b>	100 Pack
100	1	<b>60300-804</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-805</b>	1 Each
25	1	<b>60300-806</b>	1 Each
50	1	<b>60300-807</b>	1 Each
100	1	<b>60300-808</b>	1 Each

### Hyper Sep Verify CX 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-261</b>	1 Each
25	1	<b>60307-262</b>	1 Each
50	1	<b>60307-263</b>	1 Each
100	1	<b>60307-264</b>	1 Each

## HyperSep Verify AX SPE Columns and Plates

Features non-polar and cationic characteristics for improved analysis of acidic drugs and metabolites

- Mixed mode sorbent suited for the extraction of acidic drugs and metabolites from biological matrices
- Separation based on two functional groups: reversed phase C8 and an ion exchanger, quaternary amine
- Rigid, purified silica gel support to which the two functionalities are co-polymerized



### HyperSep Verify AX SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
130mg	1	<b>60108-727</b>	100 Pack
130mg	10	<b>60108-767</b>	50 Pack
200mg	6	<b>60108-730</b>	50 Pack
200mg	10	<b>60108-764</b>	50 Pack
300mg	3	<b>60108-728</b>	50 Pack
500mg	3	<b>60108-729</b>	50 Pack
500mg	6	<b>60108-731</b>	30 Pack
1g	6	<b>60108-732</b>	30 Pack

### Applications:

- Analysis of THC and its metabolites

### HyperSep Verify AX 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-809</b>	100 Pack
25	1	<b>60300-810</b>	100 Pack
50	1	<b>60300-811</b>	100 Pack
100	1	<b>60300-812</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-813</b>	1 Each
25	1	<b>60300-814</b>	1 Each
50	1	<b>60300-815</b>	1 Each
100	1	<b>60300-816</b>	1 Each

### Hyper Sep Verify AX 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-271</b>	1 Each
25	1	<b>60307-272</b>	1 Each
50	1	<b>60307-273</b>	1 Each
100	1	<b>60307-274</b>	1 Each



## HyperSep Florisil SPE Columns and Plates

Ideal for the isolation of polar compounds from non-polar matrices

- Magnesia-loaded silica gel offers rapid flowrates for large sample volumes
- Extremely polar in nature, especially well-suited for extraction of chlorinated pesticides



### HyperSep Florisil SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-402</b>	100 Pack
100mg	1	<b>60108-403</b>	100 Pack
200mg	3	<b>60108-404</b>	50 Pack
500mg	3	<b>60108-405</b>	50 Pack
500mg	6	<b>60108-500</b>	30 Pack
1g	6	<b>60108-431</b>	30 Pack
2g	15	<b>60108-735</b>	20 Pack
5g	25	<b>60108-736</b>	20 Pack
10g	75	<b>60108-737</b>	10 Pack

### Applications:

- Extraction of pesticides using official methods
- Polychlorinated biphenyls in transformer oil
- Alcohol, aldehydes, amines and drugs

### HyperSep Florisil 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-721</b>	100 Pack
25	1	<b>60300-722</b>	100 Pack
50	1	<b>60300-723</b>	100 Pack
100	1	<b>60300-724</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-725</b>	1 Each
25	1	<b>60300-726</b>	1 Each
50	1	<b>60300-727</b>	1 Each
100	1	<b>60300-728</b>	1 Each

### Hyper Sep Florisil 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-281</b>	1 Each
25	1	<b>60307-282</b>	1 Each
50	1	<b>60307-283</b>	1 Each
100	1	<b>60307-284</b>	1 Each

## HyperSep Aminopropyl SPE Columns and Plates

A polar sorbent for both polar and anion exchange interactions

- Weak anion exchanger
- Enhanced retention of strong anions like sulfonic acids
- Excellent retention of drugs, metabolites and structural isomer

### HyperSep Aminopropyl SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-424</b>	100 Pack
100mg	1	<b>60108-364</b>	100 Pack
200mg	3	<b>60108-425</b>	50 Pack
500mg	3	<b>60108-518</b>	50 Pack
500mg	6	<b>60108-519</b>	30 Pack
1g	6	<b>60108-432</b>	30 Pack
2g	15	<b>60108-738</b>	20 Pack
5g	25	<b>60108-739</b>	20 Pack
10g	75	<b>60108-740</b>	10 Pack

### Applications:

- Separation of structural isomers
- Drugs and metabolites in biological fluids
- Separation of saccharides, phenols and petroleum products

### HyperSep Aminopropyl 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-501</b>	100 Pack
25	1	<b>60300-502</b>	100 Pack
50	1	<b>60300-503</b>	100 Pack
100	1	<b>60300-504</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-505</b>	1 Each
25	1	<b>60300-506</b>	1 Each
50	1	<b>60300-507</b>	1 Each
100	1	<b>60300-508</b>	1 Each

### Hyper Sep Aminopropyl 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-291</b>	1 Each
25	1	<b>60307-292</b>	1 Each
50	1	<b>60307-293</b>	1 Each
100	1	<b>60307-294</b>	1 Each

## HyperSep Cyano SPE Columns and Plates

Optimized for the retention of polar compounds from non-polar matrices

- Medium polarity sorbent, less retentive than silica or diol
- Suitable for reverse phase extractions of moderately polar compounds

### HyperSep Cyano SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-746</b>	100 Pack
100mg	1	<b>60108-745</b>	100 Pack
200mg	3	<b>60108-747</b>	50 Pack
500mg	3	<b>60108-748</b>	50 Pack
500mg	6	<b>60108-749</b>	30 Pack
1g	6	<b>60108-750</b>	30 Pack
2g	15	<b>60108-751</b>	20 Pack
5g	25	<b>60108-752</b>	20 Pack
10g	75	<b>60108-753</b>	10 Pack

### Applications:

- Retaining polar compounds from hexane and oils
- Reversed phase extraction of moderately polar compounds

### HyperSep Cyano 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-817</b>	100 Pack
25	1	<b>60300-818</b>	100 Pack
50	1	<b>60300-819</b>	100 Pack
100	1	<b>60300-820</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-821</b>	1 Each
25	1	<b>60300-822</b>	1 Each
50	1	<b>60300-823</b>	1 Each
100	1	<b>60300-824</b>	1 Each

### Hyper Sep Cyano 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-301</b>	1 Each
25	1	<b>60307-302</b>	1 Each
50	1	<b>60307-303</b>	1 Each
100	1	<b>60307-304</b>	1 Each

## HyperSep Diol SPE Columns and Plates

Ideal for the extraction of polar compounds

- Short alkyl chains with polar functional groups

### HyperSep Diol SPE Columns

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
50mg	1	<b>60108-571</b>	100 Pack
100mg	1	<b>60108-572</b>	100 Pack
200mg	3	<b>60108-573</b>	50 Pack
500mg	3	<b>60108-574</b>	50 Pack
500mg	6	<b>60108-575</b>	30 Pack
1g	6	<b>60108-576</b>	30 Pack
2g	15	<b>60108-755</b>	20 Pack
5g	25	<b>60108-756</b>	20 Pack
10g	75	<b>60108-757</b>	10 Pack

### Applications:

- Normal phase extraction of polar compounds
- Purification of polar compounds

### HyperSep Diol 96 Well Plates and Individual Wells

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
<b>Individual Wells</b>			
10	1	<b>60300-635</b>	100 Pack
25	1	<b>60300-636</b>	100 Pack
50	1	<b>60300-637</b>	100 Pack
100	1	<b>60300-638</b>	100 Pack
<b>Well Plates – Removable Wells</b>			
10	1	<b>60300-630</b>	1 Each
25	1	<b>60300-631</b>	1 Each
50	1	<b>60300-632</b>	1 Each
100	1	<b>60300-633</b>	1 Each

### Hyper Sep Diol 96 Fixed Well Plates

Bed Weight (mg)	Volume (mL)	Cat. No.	Quantity
10	1	<b>60307-311</b>	1 Each
25	1	<b>60307-312</b>	1 Each
50	1	<b>60307-313</b>	1 Each

# Thermo Scientific SPE Accessories

A comprehensive range of accessories to improve your sample preparation workflow

## HyperSep Universal Vacuum Manifold

- Accommodates both SPE columns and 96 well plates
- System supplied with: Manifold, base/gauge, flask and stopper, tubing and spigots



Universal Manifold  
Base/Gauge

### HyperSep Universal Vacuum Manifold

Description	Cat. No.	Quantity
Universal Vacuum Manifold	<b>60104-230</b>	1 Each
Vacuum Pump, European Version	<b>60104-241</b>	1 Each
Vacuum Pump, North American Version	<b>60104-243</b>	1 Each
24 Well Extraction Plate	<b>60104-284</b>	1 Each
48 Well Extraction Plate	<b>60104-289</b>	1 Each
Plugs for 24-position Extraction Plate	<b>60104-234</b>	24 Pack
Plugs for 48-position Extraction Plate	<b>60104-235</b>	48 Pack
Plugs for UVM 24 Port Plate	<b>60104-234</b>	24 Pack
Plugs for UVM 48 Port Plate	<b>60104-235</b>	48 Pack

## HyperSep Positive Pressure Manifold

### HyperSep Positive Pressure Manifold

Description	Cat. No.	Quantity
Positive Pressure Manifold with 13mm Collection Rack	<b>60104-236</b>	1 Each
Adaptor Plate for 1mL Columns for PP Manifold	<b>60104-265</b>	1 Each
Adaptor Plate for 3mL Columns for PP Manifold	<b>60104-266</b>	1 Each
Adaptor Plate for 6mL Columns for PP Manifold	<b>60104-267</b>	1 Each
Collection Rack for 13mm Tubes	<b>60104-268</b>	1 Each
Pre-Drilled Waste Container	<b>60104-270</b>	1 Each
Adaptor Plate for 10mL/15mL Columns for PP Manifold	<b>60104-271</b>	1 Each
Installation Kit	<b>60104-272</b>	1 Each
In Line Air Filter	<b>60104-273</b>	1 Each
Positive Pressure Manifold with 16mm Collection Rack	<b>60104-274</b>	1 Each



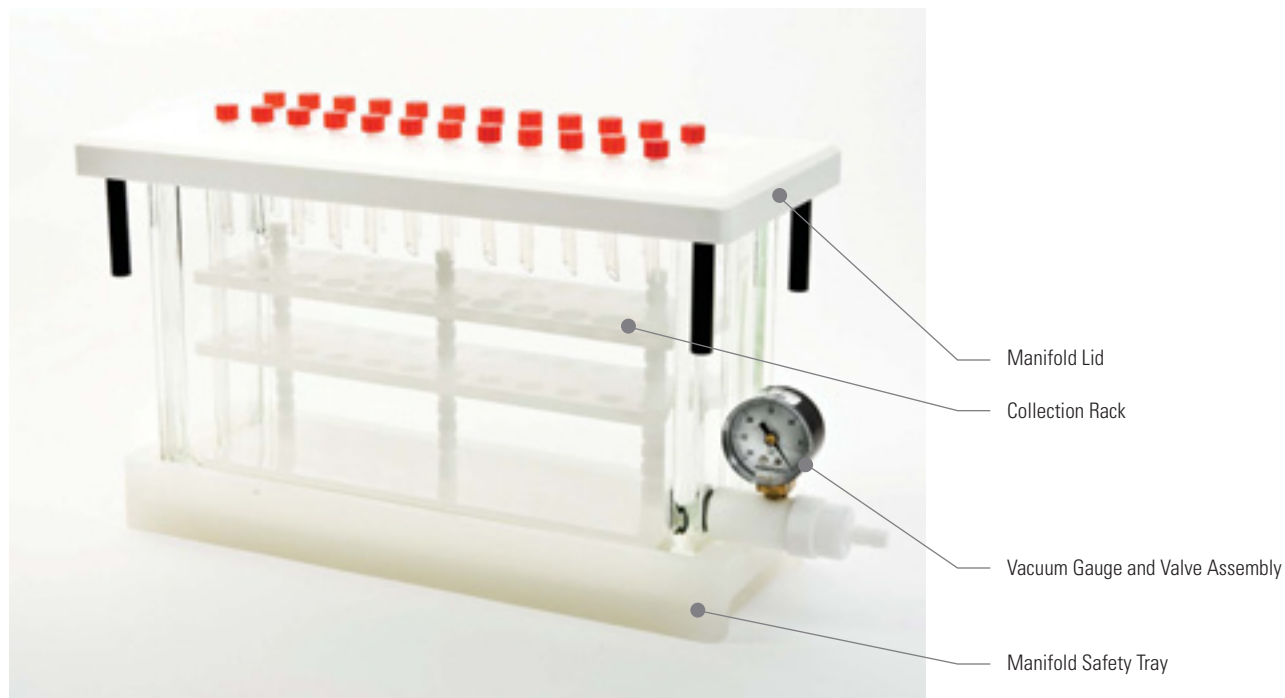
## HyperSep Glass Block Manifolds

16-Port Vacuum Manifold:

- Glass Block, Corian Manifold Lid, Cover Gasket, Vacuum Gauge and Valve Assembly, 16 Tips, Adjustable Collection Rack, Bulkhead Luer Fittings, 16 Plugs and Manifold Safety Tray

24-Port Vacuum Manifold:

- Glass Block, Corian Manifold Lid, Cover Gasket, Vacuum Gauge and Valve Assembly, 24 Tips, Adjustable Collection Rack, Bulkhead Luer Fittings, 24 Plugs and Manifold Safety Tray



Luer Lock Plugs Luer Lock



Retaining Clips for  
Collection Rack



Bulkhead Luer Fittings



Collection Rack



Vacuum Gauge



Valve Assembly



Tips

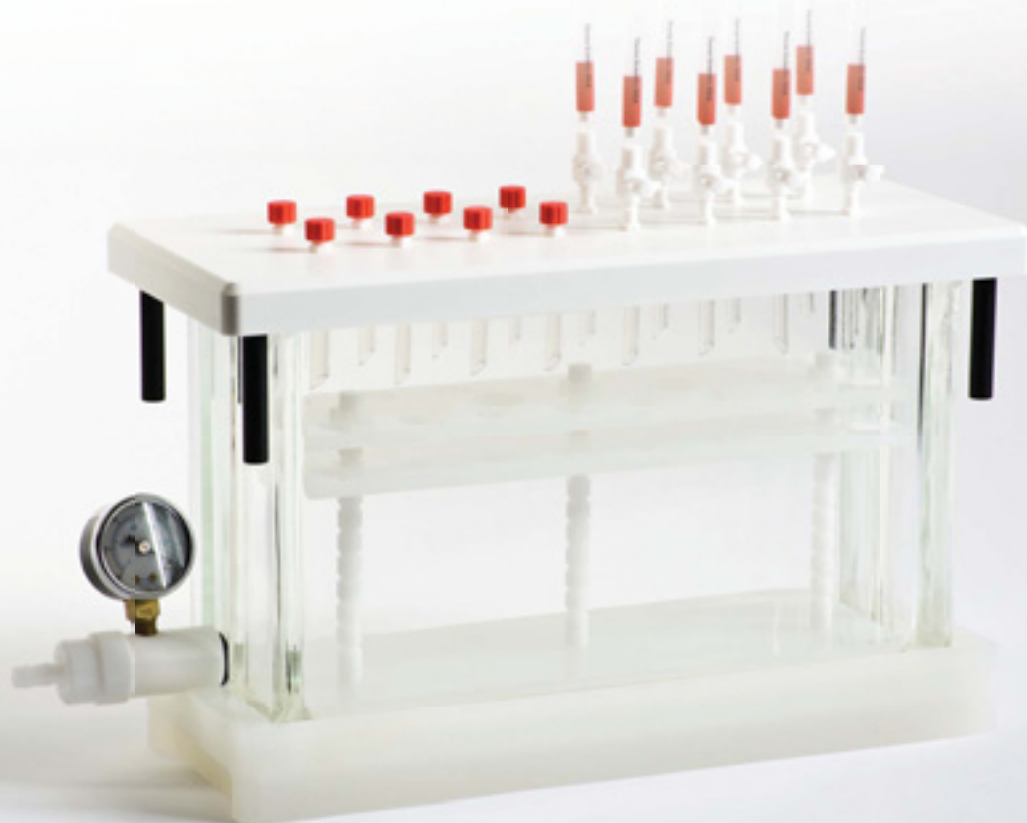


Manifold Lid Legs



## HyperSep Glass Block Manifolds

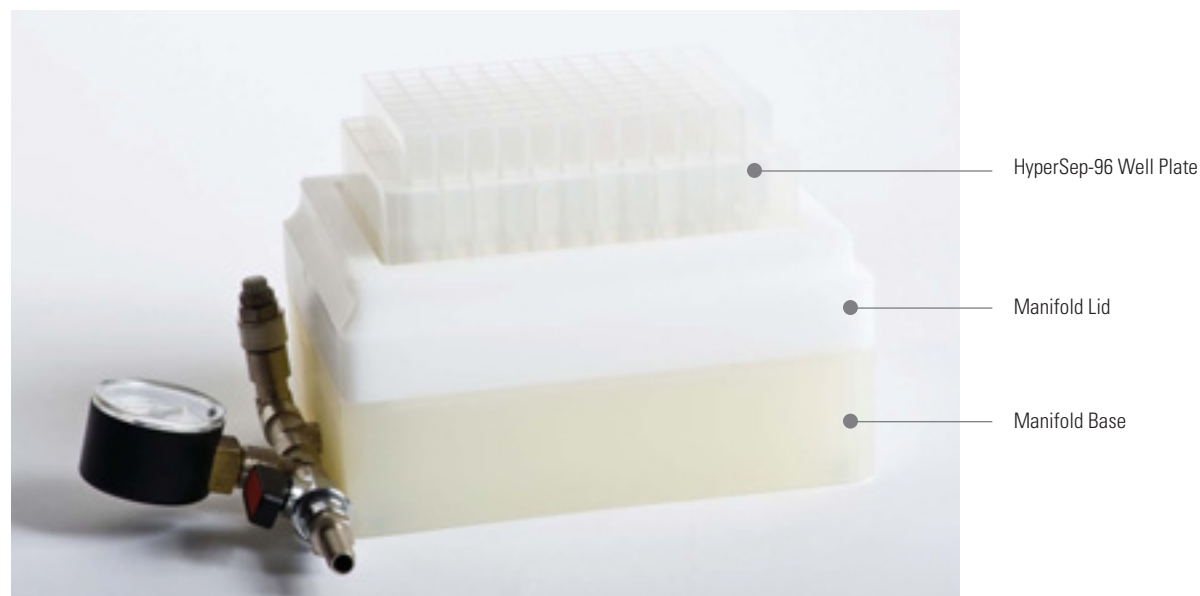
Description	Cat. No.	Quantity
16-port Vacuum Manifold	<b>60104-232</b>	1 Each
24-port Vacuum Manifold	<b>60104-233</b>	1 Each
Vacuum Pump, European Version	<b>60104-241</b>	1 Each
Vacuum Pump, North American Version	<b>60104-243</b>	1 Each
<b>Replacement Parts</b>		
Vacuum Gauge	<b>60104-240</b>	1 Each
Stopcocks for 16-port Vacuum Manifold	<b>60104-242</b>	16 Pack
Stopcocks for 24-port Vacuum Manifold	<b>60104-244</b>	24 Pack
Tips for Vacuum Manifold	<b>60104-245</b>	12 Pack
Vacuum Gauge and Valve Assembly	<b>60104-261</b>	1 Each
Lid for 16-port Glass Block Manifold	<b>60104-262</b>	1 Each
Lid for 24-port Glass Block Manifold	<b>60104-248</b>	1 Each
Gasket for 16-port Manifold	<b>60104-249</b>	1 Each
Gasket for 24-port Manifold	<b>60104-250</b>	1 Each
Collection Rack for 16-port Vacuum Manifold	<b>60104-251</b>	1 Each
Collection Rack for 24-port Vacuum Manifold	<b>60104-252</b>	1 Each
Glass Block for 16-port Vacuum Manifold	<b>60104-253</b>	1 Each
Glass Block for 24-port Vacuum Manifold	<b>60104-254</b>	1 Each
Manifold Safety Tray	<b>60104-260</b>	1 Each
Retaining Clips for Collection Rack	<b>60104-255</b>	12 Pack
Bulkhead Luer Fittings	<b>60104-256</b>	12 Pack
Manifold Lid Legs	<b>60104-257</b>	4 Pack
Luer Lock Plugs	<b>60104-258</b>	12 Pack
Column Adaptors	<b>60104-259</b>	15 Pack



## HyperSep-96 Well Plate Manifold

Included with system:

- Base
- Lid
- Waste collection tray



HyperSep-96 well plate is not included and needs to be purchased separately.

### HyperSep-96 Well Plate Manifolds

Description	Cat. No.	Quantity
HyperSep-96 Vacuum Manifold	<b>60103-351</b>	1 Each
Vacuum Pump, European Version	<b>60104-241</b>	1 Each
Vacuum Pump, North American Version	<b>60104-243</b>	1 Each

## HyperSep SPE Accessories

A range of accessories to complement the HyperSep SPE Manifolds

### HyperSep SPE Accessories

Description	Cat. No.	Quantity
Base Plate for HyperSep-96 Well Plate	<b>60300-301</b>	1 Each
Base Plate for HyperSep-96 Well Plate	<b>60300-303</b>	5 Pack
Sample Collection Plate, 1mL	<b>60300-402</b>	50 Pack
Sample Collection Plate, 2mL	<b>60300-403</b>	50 Pack
Adaptors for 1mL, 3mL and 6mL SPE Columns	<b>60104-259</b>	15 Pack
Empty 1mL Wells	<b>60300-318</b>	100 Pack
Empty 1mL Wells, Fritted	<b>60300-311</b>	100 Pack



## HyperSep Protein Precipitation Plate

Provides a quick effective approach for removal of proteins from biological compounds using the protein crash technique. In combination with SPE and SLE, the Protein Precipitation Plate offers a comprehensive range of options for sample preparation of biological based compounds. The 96 well format provides a high throughput functionality which lends itself to full automation.

- Dual frit design
- Hydrophobic/oleophobic frits to enable only precipitation of proteins
- Pore size optimized for ideal flow rate
- Specially selected polypropylene for low extractables

### Protein Precipitation Products

Description	Cat. No.	Quantity
Protein Precipitation Plate	<b>60304-201</b>	1 Each

## HyperSep SLE Columns and Plates

Solid supported liquid/liquid extraction (SLE) is a fast effective sample preparation technique that provides considerable benefits over liquid-liquid extraction (LLE) protocols for removal of phospholipids, from biological samples.



SLE offers the following advantages:

- Greater reproducibility and recoveries compared to LLE techniques
- Prevents emulsification often associated with LLE as the sample and water immiscible solvents are not in direct contact
- Reduced solvent requirements compared to LLE
- Can be completely automated unlike LLE
- Improved cleanliness of sample extract compared to protein precipitation techniques
- Improved sensitivity compared to protein precipitation techniques

HyperSep SLE is available in cartridge and 96 well formats and in acidified or basified formats to help simplify the protocol when acidic or basic mobile phases are used.

### HyperSep SLE Columns

Special treated diatomite SLE (pH=7)

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
200mg	3	<b>60109-200-3-7</b>	50
500mg	3	<b>60109-500-3-7</b>	50
500mg	6	<b>60109-500-6-7</b>	30
1g	6	<b>60109-1000-6-7</b>	30
2g	12	<b>60109-2000-12-7</b>	20
4g	25	<b>60109-4000-25-7</b>	15
20g	60	<b>60109-20000-60-7</b>	10

### HyperSep SLE Plates

Special treated diatomite SLE (pH=7)

Bed Weight (mg)	Column Volume (mL)	Cat. No.	Quantity
200	2	<b>60109-200-2-7W</b>	1 Each
300	2	<b>60109-300-2-7W</b>	1 Each
400	2	<b>60109-400-2-7W</b>	1 Each
500	2	<b>60109-500-2-7W</b>	1 Each

**HyperSep SLE Columns**

Special treated diatomite SLE (pH=9)

Bed Weight	Column Volume (mL)	Cat. No.	Quantity
200mg	3	<b>60109-200-3-9</b>	50
500mg	3	<b>60109-500-3-9</b>	50
500mg	6	<b>60109-500-6-9</b>	30
1g	6	<b>60109-1000-6-9</b>	30
2g	12	<b>60109-2000-12-9</b>	20
4g	25	<b>60109-4000-25-9</b>	15
20g	60	<b>60109-20000-60-9</b>	10

**HyperSep SLE Plates**

Special treated diatomite SLE (pH=9)

Bed Weight (mg)	Column Volume (mL)	Catalog No	Quantity
200	2	<b>60109-200-2-9W</b>	1 Each
300	2	<b>60109-300-2-9W</b>	1 Each
400	2	<b>60109-400-2-9W</b>	1 Each
500	2	<b>60109-500-2-9W</b>	1 Each

To learn more visit [www.thermoscientific.com/sle](http://www.thermoscientific.com/sle)

## HyperSep Lab Plates

For the purification and sample preparation of proteins, DNA, RNA and other biomolecules

- Sample concentration of small-scale samples
- Available in a range of chromatographic materials
- 96 well format with media embedded at the bottom of the plate
- Can be processed manually or using a liquid-handling robot
- Not suitable for use with a vacuum

### HyperSep Lab Plates

Description	Cat. No.	Quantity
<b>Polystyrene</b>		
C18	<b>60110-201</b>	5 Pack
C8	<b>60110-202</b>	5 Pack
C4	<b>60110-203</b>	5 Pack
Hypercarb	<b>60110-204</b>	5 Pack
Hypercarb and C18 (Mixed Mode)	<b>60110-205</b>	5 Pack
Zirconium Dioxide	<b>60110-206</b>	5 Pack
Titanium Dioxide	<b>60110-207</b>	5 Pack
SCX	<b>60110-208</b>	5 Pack
SAX	<b>60110-209</b>	5 Pack
<b>Polypropylene</b>		
C18	<b>60110-301</b>	5 Pack
C8	<b>60110-302</b>	5 Pack
C4	<b>60110-303</b>	5 Pack
Hypercarb	<b>60110-304</b>	5 Pack
Hypercarb and C18 (Mixed Mode)	<b>60110-305</b>	5 Pack
Zirconium Dioxide	<b>60110-306</b>	5 Pack
Titanium Dioxide	<b>60110-307</b>	5 Pack
SCX	<b>60110-308</b>	5 Pack
SAX	<b>60110-309</b>	5 Pack

### Applications:

- Tissue culture and separation of products
- Sample concentration
- Sample clean-up
- Collection of sample after chromatography

## HyperSep Filter Plates

For effective clean-up of small-scale samples

- 96 Well Plate for the purification and separation of proteins, peptides, DNA, RNA and other biomolecules
- Cleanup of microgram-level samples
- Can be used under vacuum
- Available in a range of chromatographic materials

### HyperSep Filter Plates

Description	Cat. No.	Quantity
<b>5-7<math>\mu</math>L Bed Volume</b>		
C18	<b>60110-401</b>	1 Each
C8	<b>60110-402</b>	1 Each
C4	<b>60110-403</b>	1 Each
Hypercarb	<b>60110-404</b>	1 Each
Hypercarb and C18 (Mix Mode)	<b>60110-405</b>	1 Each
Zirconium Dioxide	<b>60110-406</b>	1 Each
Titanium Dioxide	<b>60110-407</b>	1 Each
SCX	<b>60110-408</b>	1 Each
SAX	<b>60110-409</b>	1 Each
<b>40<math>\mu</math>L Bed Volume</b>		
C18	<b>60110-501</b>	1 Each
C8	<b>60110-502</b>	1 Each
C4	<b>60110-503</b>	1 Each
Hypercarb	<b>60110-504</b>	1 Each
Hypercarb and C18 (Mix Mode)	<b>60110-505</b>	1 Each
Zirconium Dioxide	<b>60110-506</b>	1 Each
Titanium Dioxide	<b>60110-507</b>	1 Each
SCX	<b>60110-508</b>	1 Each
SAX	<b>60110-509</b>	1 Each



## TurboFlow Columns

- For use with Thermo Scientific Aria and Transcend systems only
- Unique, patented technology
- Automated online sample extraction
- Reduce costs and improve data results



TurboFlow™ columns are used exclusively with the Aria and Transcend TLX Systems. Their patented design allows for compounds of interest to be retained on the TurboFlow column while the complex matrices quickly and completely flow through to waste.

The retained compounds can then be eluted to another column for further separation or directly into a detector. Using TurboFlow technology, the Aria and Transcend TLX systems provide an alternative high throughput sample preparation technique to solid phase extraction (SPE), liquid-liquid extraction (LLE), and protein precipitation (PPT). TurboFlow technology minimizes ion suppression, resulting in clean sample extracts and more reproducible MS detection. This provides significant advantages compared to PPT and as an alternative to SPE, making it a powerful tool for analysis of biological fluids, food and other complex matrices.

TurboFlow columns are available in a variety of packing chemistries to enable extraction of many different compounds of interest. The most appropriate column can be selected by determining the overall polarity of the analyte, the mobile phase needed to solubilize it and the sample matrix from which it must be extracted.

TurboFlow XL columns have an improved silica packing material and TurboFlow Cyclone columns are polymer based. Both columns are robust and have long lasting performance. All columns are available in both 1.0 and 0.5mm ID.

### Transcend™ and Aria™ System TurboFlow Columns

Product Description	1x50mm	.5x50mm
TurboFlow Cyclone Column	<b>CH-952434</b>	<b>CH-953288</b>
TurboFlow Cyclone-P Column	<b>CH-952605</b>	<b>CH-953289</b>
TurboFlow Cyclone MAX Column	<b>CH-952979</b>	<b>CH-953286</b>
TurboFlow Cyclone MCX Column	<b>CH-952813</b>	<b>CH-953287</b>
TurboFlow Cyclone MCX-2 Column	<b>CH-953456</b>	<b>CH-953457</b>
TurboFlow XL Column C18	<b>CH-953244</b>	<b>CH-953280</b>
TurboFlow XL Column C18-P	<b>CH-953275</b>	<b>CH-953281</b>
TurboFlow XL Column C2	<b>CH-953279</b>	<b>CH-953285</b>
TurboFlow XL Column C8	<b>CH-953276</b>	<b>CH-953282</b>
TurboFlow XL Column Fluoro	<b>CH-953277</b>	<b>CH-953283</b>
TurboFlow Column Phenyl*	<b>CH-952178</b>	<b>CH-952820</b>
TurboFlow Column PolarPlus™*	<b>CH-952242</b>	<b>CH-952708</b>

\*Suggested operating pressure of 250 bar or below

For more information please visit [www.thermoscientific.com/transcend](http://www.thermoscientific.com/transcend)

## HyperSep Online SPE Products

Retain specific analytes in a sample matrix when used with an appropriate HPLC column

- Effective removal of contaminants such as proteins from samples
- Compatible with conventional HPLC systems
- Fast and effective clean-up and concentration of target compounds
- HyperSep Retain PEP: for retention of polar and non-polar analytes
- HyperSep Retain CX: for retention of basic and non-polar analytes
- HyperSep Retain AX: for retention of acidic and non-polar analytes
- HyperSep Hypercarb: for retention of extremely polar analytes



### HyperSep Javelin Direct-Connect Online SPE Columns

ID (mm)	Length (mm)	Retain PEP	Retain CX	Retain AX	Hypercarb	Quantity
2.1	10	<b>60310-201</b>	<b>60310-301</b>	<b>60310-401</b>	<b>60310-501</b>	4 Pack
3.0	10	<b>60310-202</b>	<b>60310-302</b>	<b>60310-402</b>	<b>60310-502</b>	4 Pack

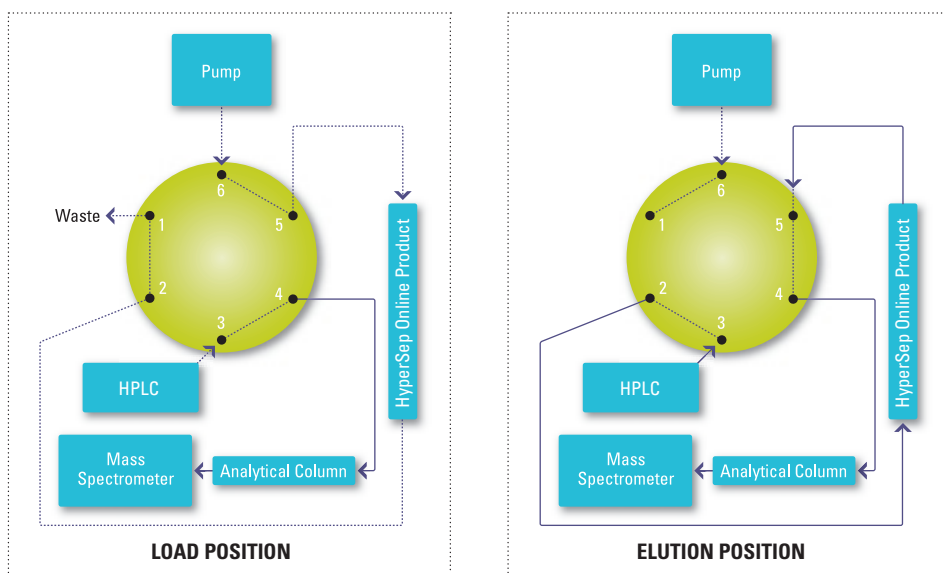
### HyperSep UNIGUARD Direct-Connect Online SPE Cartridges

ID (mm)	Length (mm)	Retain PEP	Retain CX	Retain AX	Hypercarb	Quantity
2.1	10	<b>60311-201</b>	<b>60311-301</b>	<b>60311-401</b>	<b>60311-501</b>	4 Pack
3.0	10	<b>60311-202</b>	<b>60311-302</b>	<b>60311-402</b>	<b>60311-502</b>	4 Pack

### HyperSep HPLC Columns for Online SPE

ID (mm)	Length (mm)	Retain PEP	Retain CX	Retain AX	Hypercarb	Quantity
2.1	20	<b>60312-201</b>	<b>60312-301</b>	<b>60312-401</b>	<b>60312-501</b>	1 Each
3.0	20	<b>60312-202</b>	<b>60312-302</b>	<b>60312-402</b>	<b>60312-502</b>	1 Each

This diagram shows the typical load and elution positions for the HyperSep Online SPE Setup



## Dionex SolEx HRP Online Sample SPE Concentration Columns

Dionex SolEx™ Online Solid-phase extraction (SPE) columns are designed for fast, easy preconcentration of contaminants from water samples prior to HPLC analysis. The column is placed in the valve to automatically concentrate the analytes of interest. The online Dionex SolEx HRP columns are packed with a hydrophilic reversed-phase packing.

- Greater confidence in results due to less sample handling
- More reproducible results because of automated online use
- A wide range of compounds: from polar to hydrophobic analytes
- High capacity with good recoveries
- Wide pH compatibility (0-14)

Dionex SolEx HRP columns (2.1 × 20mm) are designed specifically for online HPLC use, and are packed with a divinylbenzene polymer with a hydrophilic bonded layer. This resin is used in the reversed-phase mode and demonstrates excellent retention properties on both polar and hydrophobic analytes. Even with 100% aqueous mobile phases, no de-wetting occurs. The Dionex SolEx HRP columns are available in both a cartridge format and an ultra high pressure compatible (UHPLC), rapid separation (RSLC) column format. The cartridge fits in a holder for easy cartridge exchange when necessary. The ultra high pressure, rapid separation column format can be used up to 800 bar.

### Dionex SolEx Columns for Online HPLC Sample Preparation

Dionex SolEx Online Sample Preparation Columns	Cat No.
SolEx HRP cartridge (2.1 x 20mm), requires Holder V-3	074400
Cartridge Holder V-3	074403
SolEx RSLC HRP column (2.1 x 20mm)	075590



## HyperSep MEPS Products

Online SPE for GC and LC sample preparation – extraction to injection in a single process

- Save hours in sample preparation
- Significantly reduce the time to prepare and inject samples from hours to minutes
- Eliminate all extra steps between sample preparation and sample injection (fully compatible with direct injection onto LC or GC)
- Reduce buffer and solvent volume from milliliters to microliters
- Reduce the sample volume needed to as little as 3.6 $\mu$ L
- Compatible with CTC and eVol platforms for automation

MEPS (Micro Extraction by Packed Sorbent) is the miniaturization of conventional SPE packed bed devices from milliliter bed volumes to microliter volumes and is available in a variety of phase chemistries. It offers advantages in rapid and effective SPE method development.



To learn more visit [www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography) and download the brochure.

Discover eVol – the world's first analytical syringe

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## HyperSep MEPS Syringe Components

### MEPS Syringes and Components

Description	Cat. No.	Quantity
<b>Thermo Scientific, CTC analytics, HTA and Varian 8400 systems</b>		
100µL removable needle MEPS syringe	<b>60308-101</b>	1 Each
Replacement plunger assembly for 100µL MEPS syringe	<b>60308-102</b>	1 Each
250µL removable needle MEPS Syringe	<b>60308-103</b>	1 Each
Replacement plunger assembly for 250µL MEPS syringe	<b>60308-104</b>	1 Each
<b>CTC Analytics Only</b>		
250µL removable needle MEPS syringe	<b>60308-105</b>	1 Each
Replacement plunger assembly for 250µL CTC-compatible syringe	<b>60308-106</b>	1 Each

## HyperSep MEPS for GC Applications: Thermo Scientific, CTC Analytics, HTA and Varian 8400 Systems

- For use with 100 and 250µL MEPS syringes

### MEPS For GC: Thermo Scientific, CTC Analytics, HTA and Varian 8400 Systems

Description	Cat. No.	Quantity
HyperSep Retain PEP MEPS	<b>60308-201</b>	5 Pack
HyperSep Retain CX MEPS	<b>60308-202</b>	5 Pack
HyperSep Retain-AX MEPS	<b>60308-203</b>	5 Pack
HyperSep Hypercarb MEPS	<b>60308-204</b>	5 Pack
HyperSep Verify CX MEPS	<b>60308-205</b>	5 Pack
HyperSep Verify AX MEPS	<b>60308-206</b>	5 Pack
HyperSep C18 MEPS	<b>60308-207</b>	5 Pack
HyperSep Silica MEPS	<b>60308-208</b>	5 Pack
MEPS Development Kit for GC Applications	<b>60308-209</b>	5 Pack

HyperSep MEPS Development Kit for GC applications contains 1 each of Retain PEP, Retain CX, Retain AX, Hypercarb and C18

## HyperSep MEPS for GC Applications: CTC Analytics Using 250µL Syringes

### MEPS For GC: CTC Analytics Using 250µL Syringes

Description	Cat. No.	Quantity
HyperSep Retain PEP MEPS	<b>60308-301</b>	5 Pack
HyperSep Retain CX MEPS	<b>60308-302</b>	5 Pack
HyperSep Retain AX MEPS	<b>60308-303</b>	5 Pack
HyperSep Hypercarb MEPS	<b>60308-304</b>	5 Pack
HyperSep Verify CX MEPS	<b>60308-305</b>	5 Pack
HyperSep Verify AX MEPS	<b>60308-306</b>	5 Pack
HyperSep C18 MEPS	<b>60308-307</b>	5 Pack
HyperSep Silica MEPS	<b>60308-308</b>	5 Pack
MEPS Development Kit for GC Applications	<b>60308-309</b>	5 Pack

HyperSep MEPS Development Kit for GC applications contains 1 each of Retain PEP, Retain CX, Retain AX, Hypercarb and C18

## HyperSep MEPS For LC Applications: Thermo Scientific, CTC Analytics, HTA and Varian 8400 Systems

- For use with 100 and 250 $\mu$ L MEPS syringes

### MEPS For LC: Thermo Scientific, CTC Analytics, HTA and Varian 8400 Systems

Description	Cat. No.	Quantity
HyperSep Retain PEP MEPS	<b>60308-401</b>	5 Pack
HyperSep Retain CX MEPS	<b>60308-402</b>	5 Pack
HyperSep Retain AX MEPS	<b>60308-403</b>	5 Pack
HyperSep Hypercarb MEPS	<b>60308-404</b>	5 Pack
HyperSep Verify CX MEPS	<b>60308-405</b>	5 Pack
HyperSep Verify AX MEPS	<b>60308-406</b>	5 Pack
HyperSep C18 MEPS	<b>60308-407</b>	5 Pack
HyperSep Silica MEPS	<b>60308-408</b>	5 Pack
MEPS Development Kit for LC applications	<b>60308-409</b>	5 Pack

HyperSep MEPS Development Kit for LC applications contains 1 each of Retain PEP, Retain CX, Retain AX, Hypercarb and C18.

## HyperSep MEPS For LC Applications: CTC Analytics Using 250 $\mu$ L Syringes

- For use with 250 $\mu$ L MEPS syringes

### MEPS For LC Applications: CTC Analytics Using 250 $\mu$ L Syringes

Description	Cat. No.	Quantity
HyperSep Retain PEP MEPS	<b>60308-501</b>	5 Pack
HyperSep Retain CX MEPS	<b>60308-502</b>	5 Pack
HyperSep Retain AX MEPS	<b>60308-503</b>	5 Pack
HyperSep Hypercarb MEPS	<b>60308-504</b>	5 Pack
HyperSep Verify CX MEPS	<b>60308-505</b>	5 Pack
HyperSep Verify AX MEPS	<b>60308-506</b>	5 Pack
HyperSep C18 MEPS	<b>60308-507</b>	5 Pack
HyperSep Silica MEPS	<b>60308-508</b>	5 Pack
HyperSep MEPS Development Kit for LC applications	<b>60308-509</b>	5 Pack

HyperSep MEPS Development Kit for LC applications contains 1 each of Retain PEP, Retain CX, Retain AX, Hypercarb and C18.

## eVol Dispensing System

Allows precise and accurate, operator-independent dispensing for better deployment of laboratory staff

- Can be calibrated easily by user to ensure validity of results
- Intuitive interface with touch wheel and full-color screen
- Complies to GLP and GMP protocols
- Improves confidence in reported results
- Unifies two precision devices, a digitally controlled electronic drive and an XCHANGE™ analytical syringe
- Integrated XCHANGE coupling allows syringes to be quickly and easily changed
- XCHANGE syringes offer exceptional versatility and functionality
- Addition of MEPS to XCHANGE syringe offers automated sample preparation by SPE in a handheld system

### eVol Dispensing System

Description	Cat. No.	Quantity
Sample Dispensing System	<b>66002-020</b>	1 Each
eVol™ XCHANGE syringe 5µL	<b>66002-021</b>	1 Each
eVol XCHANGE syringe 50µL	<b>66002-022</b>	1 Each
eVol XCHANGE syringe 500µL	<b>66002-023</b>	1 Each
Sample Dispensing System Kit	<b>66002-024</b>	1 Each
eVol Stand	<b>66002-025</b>	1 Each
Charger for eVol System	<b>66002-026</b>	1 Each
Charging Stand for eVol System	<b>66002-027</b>	1 Each
Replacement Battery for eVol System	<b>66002-028</b>	1 Each
Replacement Plunger for 5µL eVol Syringe	<b>66002-029</b>	1 Each
Replacement Plunger for 50µL eVol Syringe	<b>66002-030</b>	1 Each
Replacement Plunger for 500µL eVol Syringe	<b>66002-031</b>	1 Each
Charger for eVol System	<b>66002-026</b>	1 Each
Charging Stand for eVol System	<b>66002-027</b>	1 Each
Replacement Battery for eVol System	<b>66002-028</b>	1 Each
Replacement Plunger for 5µL eVol Syringe	<b>66002-029</b>	1 Each
Replacement Plunger for 50µL eVol Syringe	<b>66002-030</b>	1 Each
Replacement Plunger for 500µL eVol Syringe	<b>66002-031</b>	1 Each



### Applications:

- Routine dispensing of volatile solvents, hazardous, corrosive or viscous chemicals





## HyperSep Microscale Solid Phase Extraction Tips

Revolutionary micropipette tip for sample preparation

- Faster sample preparation with minimal sample loss
- Patented micropipette tip in which the chromatographic material is directly attached to its inner surface
- No contamination from the supporting matrix
- Separation in volumes as low as 100nL



### HyperSep Tip Microscale Solid Phase Extraction Tips

Material	Cat. No.	Quantity
<b>1-10<math>\mu</math>L Capacity</b>		
BioBasic C18	<b>60109-201</b>	96 Pack
BioBasic C8	<b>60109-202</b>	96 Pack
BioBasic C4	<b>60109-203</b>	96 Pack
Hypercarb	<b>60109-204</b>	96 Pack
Hypercarb and C18 (mix mode)	<b>60109-205</b>	96 Pack
HILIC	<b>60109-206</b>	96 Pack
Trypsin	<b>60109-207</b>	96 Pack
Titanium Dioxide	<b>60109-208</b>	96 Pack
Zirconium Dioxide	<b>60109-217</b>	96 Pack
<b>10-200<math>\mu</math>L Capacity</b>		
BioBasic C18	<b>60109-209</b>	96 Pack
BioBasic C8	<b>60109-210</b>	96 Pack
BioBasic C4	<b>60109-211</b>	96 Pack
Hypercarb	<b>60109-212</b>	96 Pack
Hypercarb and C18 (Mix Mode)	<b>60109-213</b>	96 Pack
HILIC	<b>60109-214</b>	96 Pack
Trypsin	<b>60109-215</b>	96 Pack
Titanium Dioxide	<b>60109-216</b>	96 Pack
Zirconium Dioxide	<b>60109-218</b>	96 Pack

### Applications:

- Mass spectrometry
- Desalting
- Protein purification
- MALDI
- Electrophoresis
- HPCE
- HPLC
- CEC



## HyperSep SpinTip Microscale Solid Phase Extraction Tips

Revolutionary micropipette tip for sample preparation

- Pipette tips with a 1 to 2µm wide slit at the bottom that permits the liquid to pass through but retains the chromatographic material (20 to 30µm)
- Faster sample preparation with minimal sample loss
- No contamination from the supporting matrix
- Separation in volumes as low as 100nL



### HyperSep SpinTip Microscale Solid Phase Extraction Tips

Material	Cat. No.	Quantity
<b>1-10µL Capacity</b>		
C18	<b>60109-401</b>	96 Pack
C8	<b>60109-402</b>	96 Pack
C4	<b>60109-403</b>	96 Pack
Hypercarb	<b>60109-404</b>	96 Pack
Hypercarb and C18 (mix mode)	<b>60109-405</b>	96 Pack
HILIC	<b>60109-406</b>	96 Pack
Trypsin	<b>60109-407</b>	96 Pack
POROS Weak Anion Exchanger	<b>60109-408</b>	96 Pack
POROS Strong Anion Exchanger	<b>60109-409</b>	96 Pack
POROS Strong Cation Exchanger	<b>60109-410</b>	96 Pack
Titanium Dioxide	<b>60109-411</b>	96 Pack
Zirconium Dioxide	<b>60109-424</b>	96 Pack
<b>10-200µL Capacity</b>		
C18	<b>60109-412</b>	96 Pack
C8	<b>60109-413</b>	96 Pack
C4	<b>60109-414</b>	96 Pack
Hypercarb	<b>60109-415</b>	96 Pack
Hypercarb and C18 (mix mode)	<b>60109-416</b>	96 Pack
HILIC	<b>60109-417</b>	96 Pack
Trypsin	<b>60109-418</b>	96 Pack
POROS Weak Anion Exchanger	<b>60109-419</b>	96 Pack
POROS Strong Anion Exchanger	<b>60109-420</b>	96 Pack
POROS Strong Cation Exchanger	<b>60109-421</b>	96 Pack
Titanium Dioxide	<b>60109-422</b>	96 Pack
Zirconium Dioxide	<b>60109-425</b>	96 Pack

## Aspire Protein A and Protein G Tips

Purify antibodies in minutes

- Capture and purify a wide range of monoclonal and polyclonal IgG antibodies from serum, ascites and cell culture supernatants
- Embedded with high quality immobilized Thermo Scientific Protein A Plus and Protein G Plus Agarose with the capacity to purify (1mg of human IgG)
- Spin column capacity for a fraction of the cost
- Fast and easy protocol does not compromise purity and yield



### Aspire Protein A and Protein G Tips

Description	Cat. No.	Quantity
Aspire Protein A Tips	<b>990-03</b>	96 Pack
Aspire Protein G Tips	<b>990-02</b>	96 Pack

## Aspire IMAC

Quick and clean purification

- Designed in a pipette tip format to effectively purify up to 0.5mg of his-tagged from cell protein lysates
- Color-coded, multichannel Thermo Scientific Aspire protocol allows parallel sample processing in minutes without the need for centrifugation



### Aspire IMAC Cobalt Tips

Description	Cat. No.	Quantity
Aspire IMAC Cobalt Tips	<b>990-04</b>	96 Pack
Aspire Nickel-NTA Tips	<b>990-08</b>	96 Pack
Aspire Glutathione Tips	<b>990-07</b>	96 Pack

## Aspire RP30 Desalting Tips

Effectively remove ion-suppressing contaminants from digested complex protein mixtures for LC/MS analysis within 20 minutes

Proprietary reversed-phase resin allows superior peptide binding and recovery of digested complex protein mixtures compared to conventional C18 products.

- Removes salts, detergents and other ion-suppressing contaminants
- Reduced ion-suppression, increase signal-to-noise ratios and sequence coverage
- Effective sample clean-up prior to LC/MS and LC/MS/MS analysis
- 20-Minute purification protocol features color-coded parallel sample processing
- Bind up to 30µg of total peptide without the need for centrifugation



### Aspire RP30 Desalting Tips

Description	Cat. No.	Quantity
Aspire RP30 Desalting Tips	<b>990-01</b>	96 Pack

## HyperSep Dispersive SPE Products

### QuEChERS Products

Convenient and effective approach for determining pesticide residues in fruit, vegetables and other foods

#### QuEChERS Dispersive SPE Product Selection

The QuEChERS (Quick, Easy, Cheap, Effective, Rugged and Safe) technique is increasingly becoming the technique of choice for extraction and clean-up of pesticide residues. It was developed by the USDA Eastern Regional Research Center. Please refer to the information below for selection of the most appropriate QuEChERS product for multi-residue pesticide analysis.

There are four variations of the QuEChERS method currently being used:

- The original QuEChERS method – this was introduced in 2003, using sodium chloride to enhance extraction
- Dispersive AOAC 2007.01 – this uses sodium acetate as a buffer, replacing sodium chloride
- The dual phase variation – this method introduces the use of PSA and GCB to remove high levels of chlorophyll and plant sterols in the final extract without the loss of planar pesticides (polar aromatics) using an acetone:toluene solvent mix (3:1)
- The European version is similar to the AOAC method, except the extraction uses sodium chloride, sodium citrate dihydrate and disodium citrate sesquihydrate instead of sodium acetate

#### Sorbents used in QuEChERS Methods

Material	Purpose	Typical Matrices
Magnesium Sulfate	Removal of excess water	Fruits, vegetables
PSA (Primary/Secondary Amine)	Removal of organic acids, fatty acids, sugars	Fruits
C18	Removal of lipids and sterols	Milk, meat, fish
GCB (Graphitized Carbon Black)	Removal of pigments and sterols	Wine, green vegetables, carrots

#### Product Selection

Matrix Type	Examples	Sorbent Requirements
General Matrices	Apples Cucumber Melon	Magnesium Sulfate, PSA
Fatty Matrices	Milk Cereals Fish	Magnesium Sulfate, PSA, C18
Pigmented Matrices	Lettuce Carrot Wine	Magnesium Sulfate, PSA, C18, GCB
High Pigmented Matrices	Spinach Red Peppers	Magnesium Sulfate, PSA, C18, GCB

QuEChERS Products *continued*

Method	Description	Cat. No.	Quantity
Original	50mL tube with 4g magnesium sulfate, 1g sodium chloride	<b>60105-211</b>	250pk
AOAC 2007.1	50mL tube with 6g magnesium sulfate, 1.5g sodium acetate	<b>60105-210</b>	250pk
	2mL tube with 150mg magnesium sulfate, 50mg PSA	<b>60105-203</b>	100pk
	2mL tube with 150mg magnesium sulfate, 50mg PSA, 50mg C18	<b>60105-204</b>	100pk
	15mL tube with 900mg magnesium sulfate, 300mg PSA, 150mg GCB	<b>60105-205</b>	50pk
	15mL tube with 900mg magnesium sulfate, 300mg PSA, 150mg C18	<b>60105-206</b>	50pk
	2mL tube with 150mg magnesium sulfate, 50mg PSA, 50mg C18, 50mg GCB	<b>60105-223</b>	100pk
	15mL tube with 1200mg magnesium sulfate, 400mg PSA	<b>60105-224</b>	50pk
	15mL tube with 1200mg magnesium sulfate, 400mg PSA, 400mg C18	<b>60105-225</b>	50pk
	15mL tube with 1200mg magnesium sulfate, 400mg PSA, 400mg C18, 400mg GCB	<b>60105-226</b>	50pk
European EN15662	50mL tube with 6g magnesium sulfate, 1.5g sodium chloride, 1.5g sodium citrate tribasic dihydrate, 0.75g sodium citrate dibasic sesquihydrate	<b>60105-212</b>	250pk
	50mL tube with 4g magnesium sulfate, 1g sodium chloride, 1g sodium citrate tribasic dihydrate, 0.5g sodium citrate dibasic sesquihydrate	<b>60105-216</b>	250pk
	15mL tube with 900mg magnesium sulfate, 150mg PSA,	<b>60105-215</b>	50pk
	15mL tube with 900mg magnesium sulfate, 150mg PSA, 45mg GCB	<b>60105-217</b>	50pk
	15mL tube with 900mg magnesium sulfate, 150mg PSA, 15mg GCB	<b>60105-218</b>	50pk
	2mL tube with 150mg magnesium sulfate, 25mg PSA	<b>60105-219</b>	100pk
	2mL tube with 150mg magnesium sulfate, 25mg PSA, 2.5mg GCB	<b>60105-221</b>	100pk
	2mL tube with 150mg magnesium sulfate, 25mg PSA, 7.5mg GCB	<b>60105-222</b>	100pk
	15mL tube with 900mg magnesium sulfate, 150mg PSA, 150mg C18	<b>60105-227</b>	50pk
Dual Phase Method	6mL column with 200mg GCB on top, 400mg PSA on bottom, separated by a Frit	<b>60105-207</b>	30pk
	6mL column with 250mg GCB on top, 500mg PSA on bottom, separated by a Frit	<b>60105-208</b>	30pk
	6mL column with 500mg GCB on top, 500mg PSA on bottom, separated by a Frit	<b>60105-209</b>	30pk



The QuEChERS method is a two-step process: extraction followed by clean-up. The extraction step products use magnesium sulfate to aid extraction, along with either sodium chloride, sodium citrate, or anhydrous sodium acetate for "base-sensitive" compounds (e.g., folpet or captan). The extraction step products are supplied in a 50mL polypropylene centrifuge tube for convenient extractions. The clean-up step products contain PSA (primary/secondary amine) for the removal of organic acids and polar pigments among other compounds. Some products couple the PSA with endcapped C18 for the removal of most lipids and sterols, or graphitized carbon black for the removal of sterols and pigments such as chlorophyll. A variety of tube formats and bed weights are available to accommodate large and small sample sizes.

- Determine greater number of pesticides than with standard SPE
- Easy to use
- Available in a number of configurations

### HyperSep Dispersive SPE Extraction Products

Description	Capacity (mL)	Cat. No.	Quantity
6g anhydrous magnesium sulfate, 1.5g anhydrous sodium acetate	50	<b>60105-210</b>	250 Pack
4g anhydrous magnesium sulfate, 1g anhydrous sodium chloride	50	<b>60105-211</b>	250 Pack
4g anhydrous magnesium sulfate, 1g sodium chloride, 1g sodium citrate dihydrate, 0.5g disodium citrate sesquihydrate	50	<b>60105-216</b>	250 Pack
6g anhydrous magnesium sulfate, 1.5g sodium chloride, 1.5g sodium citrate dihydrate, 0.75g disodium citrate sesquihydrate	50	<b>60105-212</b>	250 Pack
Centrifuge tube with 1500mg magnesium sulfate, 500mg C18	50	<b>60105-234</b>	250 Pack
Centrifuge tube with 4g anhydrous magnesium sulfate, 1g sodium chloride	50	<b>60105-311</b>	25 Pack
Centrifuge tube with 6g anhydrous magnesium sulfate, 1.5g sodium chloride, 1.5g Sodium citrate tribasic dihydrate, 750mg sodium citrate dibasic	50	<b>60105-312</b>	25 Pack
Centrifuge tube with 4g anhydrous magnesium sulfate, 1g sodium chloride, 1g Sodium citrate tribasic dihydrate, 500mg sodium citrate dibasic	50	<b>60105-316</b>	25 Pack



## HyperSep Dispersive SPE Clean-Up Products

## HyperSep Dispersive SPE Clean-Up Products

Description	Capacity (mL)	Cat. No.	Quantity
150mg anhydrous magnesium sulfate, 25mg PSA	2	<b>60105-219</b>	100 Pack
150mg anhydrous magnesium sulfate, 25mg PSA, 25mg C18	2	<b>60105-220</b>	100 Pack
150mg anhydrous magnesium sulfate, 25mg PSA, 2.5mg GCB	2	<b>60105-221</b>	100 Pack
150mg anhydrous magnesium sulfate, 25mg PSA, 7.5mg GCB	2	<b>60105-222</b>	100 Pack
150mg anhydrous magnesium sulfate, 50mg PSA, 50mg GCB	2	<b>60105-202</b>	100 Pack
150mg anhydrous magnesium sulfate, 50mg PSA	2	<b>60105-203</b>	100 Pack
150mg anhydrous magnesium sulfate, 50mg PSA, 50mg C18	2	<b>60105-204</b>	100 Pack
150mg anhydrous magnesium sulfate, 50mg PSA, 50mg C18, 50mg GCB	2	<b>60105-223</b>	100 Pack
900mg anhydrous magnesium sulfate, 300mg PSA, 150mg C18	15	<b>60105-206</b>	50 Pack
900mg anhydrous magnesium sulfate, 300mg PSA, 150mg GCB	15	<b>60105-205</b>	50 Pack
1200mg anhydrous magnesium sulfate, 400mg PSA	15	<b>60105-224</b>	50 Pack
1200mg anhydrous magnesium sulfate, 400mg PSA, 400mg C18	15	<b>60105-225</b>	50 Pack
1200mg anhydrous magnesium sulfate, 400mg PSA, 400mg C18, 400mg GCB	15	<b>60105-226</b>	50 Pack
900mg anhydrous magnesium sulfate, 150mg PSA, 150mg C18	15	<b>60105-227</b>	50 Pack
150mg anhydrous magnesium sulfate, 50mg PSA, 50mg GCB	15	<b>60105-230</b>	50 Pack
900mg anhydrous magnesium sulfate, 150mg PSA, 45mg GCB	15	<b>60105-217</b>	50 Pack
900mg anhydrous magnesium sulfate, 150mg PSA, 15mg GCB	15	<b>60105-218</b>	50 Pack
900mg anhydrous magnesium sulfate, 150mg PSA	15	<b>60105-215</b>	50 Pack
150mg anhydrous magnesium sulfate, 300mg PSA, 150mg chlorofiltr	15	<b>60105-231</b>	50 Pack
750mg anhydrous magnesium sulfate, 250mg PSA, 250mg C18, 250mg GCB	15	<b>60105-213</b>	50 Pack
900mg anhydrous magnesium sulfate, 300mg PSA	15	<b>60105-214</b>	50 Pack
400mg PSA on bottom, 200mg GCB on top, separated by a frit	6	<b>60105-207</b>	30 Pack
500mg PSA on bottom, 250mg GCB on top, separated by a frit	6	<b>60105-208</b>	30 Pack
500mg PSA on bottom, 500mg GCB on top, separated by a frit	6	<b>60105-209</b>	30 Pack



## HyperSep Dispersive SPE Multipacks

QuEChERS reagents are provided in individual metalized pouches. Each pack of 50 pouches is supplied with 50 empty centrifuge tubes with plug seal caps.

### HyperSep Dispersive SPE Multipacks

Description	Cat. No.	Quantity
4000mg magnesium sulfate, 1000mg sodium chloride	<b>60105-332</b>	50 Pack
4000mg magnesium sulfate, 1000mg sodium chloride, 500mg sodium citrate dibasic sesquihydrate, 1000mg sodium citrate tribasic	<b>60105-333</b>	50 Pack
4000mg magnesium sulfate, 1g sodium acetate	<b>60105-334</b>	50 Pack
6000mg magnesium sulfate, 1500mg sodium acetate	<b>60105-335</b>	50 Pack
6000mg magnesium sulfate, 1500mg sodium chloride	<b>60105-336</b>	50 Pack
6000mg magnesium sulfate, 1500mg magnesium sulfate, 1500mg sodium citrate dihydrate, 750mg disodium citrate sesquihydrate	<b>60105-337</b>	50 Pack
8000mg magnesium sulfate, 200mg of sodium chloride	<b>60105-338</b>	50 Pack
8000mg magnesium sulfate, 3500mg of sodium chloride	<b>60105-339</b>	50 Pack

## HyperSep Dispersive SPE Mylar Packs

QuEChERS reagents are provided in individual pouches. Each pack contains 50 pouches (no centrifuge tubes are supplied).

### HyperSep Dispersive SPE Mylar Packs

Description	Cat. No.	Quantity
Mylar pouch: 4000mg magnesium sulfate, 1000mg sodium chloride	<b>60105-340</b>	50Pk
Mylar pouch: 6000mg magnesium sulfate, 1500mg sodium acetate (anhydrous)	<b>60105-341</b>	50Pk
Mylar pouch: 6000mg magnesium sulfate, 1500mg sodium chloride – (no tubes)	<b>60105-342</b>	50Pk
Mylar pouch: 6000mg magnesium sulfate, 1500mg sodium chloride, 1500mg sodium citrate dihydrate, 750mg disodium citrate sesquihydrate	<b>60105-343</b>	50Pk
Mylar pouch: 4000mg magnesium sulfate, 1000mg sodium chloride, 500mg sodium citrate dibasic sesquihydrate, 1000mg sodium citrate tribasic	<b>60105-344</b>	50Pk
Mylar pouch: 1.2g sodium chloride	<b>60105-345</b>	50Pk
Mylar pouch: 4g sodium sulfate and 0.5g magnesium sulfate	<b>60105-346</b>	50Pk

## QuEChERS Methods

For non-base sensitive compounds, such as bendiocarb and diuron using the original QuEChERS method

- Add 15mL of acetonitrile to QuEChERS centrifuge tube
- Shake to mix contents
- Add surrogate or internal standards if necessary
- Add 15g of homogenised hydrated sample and shake for 1 minute
- Centrifuge tube for 1 minute at 3700rcf
- Add an aliquot of the supernatant to the appropriate clean-up tube (and shake for 1 minute)
- Centrifuge for 1 minute at 3700rcf
- Analyze extract

For base sensitive compounds such as folpet and captan using the AOAC 2007.01 QuEChERS method

- Add 15mL of 1% acetic acid in acetonitrile to QuEChERS centrifuge tube
- Shake to mix contents
- Add surrogate or internal standards if necessary
- Add 15g of homogenised hydrated sample and shake for 1 minute
- Centrifuge tube for 1 minute at 3700rcf
- Add an aliquot of the supernatant to the appropriate clean-up tube and shake for 1 minute
- Centrifuge for 1 minute at 3700rcf
- Analyze extract

For non-base sensitive compounds using the European EN15662 method

- Weigh 15g of homogenized (hydrated at least 80%) sample in a 50mL centrifuge tube
- Add 15mL acetonitrile (or 1:1 acetone/hexane, ethyl acetate) and IS
- Shake briefly
- Add 6g anhydrous magnesium sulfate, 1.5g sodium chloride, 1.5g sodium citrate tribasic dehydrate, 0.75g sodium citrate dibasic
- Shake by hand for 1 minute
- Centrifuge at 5,000 rpm for 5 minutes
- Transfer a portion of supernatant to a QuEChERS clean up tube
- Shake for 30 seconds
- Centrifuge for 1 minute at 6,000 rpm

For polar aromatic (planar) compounds such as matrix plant pigments using the Schenck method

- Pre-rinse the cartridge with 5mL of toluene
- Add an aliquot of the supernatant to the cartridge
- Start collection
- Elute with 6-12mL of 3:1 acetone:toluene
- Concentrate for GC/MS analysis – or –
- Concentrate to dryness and reconstitute in mobile phase for LC analysis





## QuEChERS Dispersive SPE Technical Information

### Considerations in Method Development

1) Determine the properties of the pesticides of interest:

- Base sensitive
- pH dependent
- Non-base sensitive

### Product Selection – Sample Extraction

- Base Sensitive Compounds  
Use extraction product with sodium acetate
- Non-Base Sensitive Compounds  
Use extraction product with sodium chloride or sodium citrate

2) Determine the properties of the sample matrix:

- General
- Fatty
- Pigmented
- Highly pigmented

### Product Selection – Sample Cleanup

Matrix Type	Examples	Sorbent Requirements
General Matrices	Apples Cucumber Melon	magnesium sulfate, PSA
Fatty Matrices	Milk Cereals Fish	magnesium sulfate, PSA, C18
Pigmented Matrices	Lettuce Carrot Wine	magnesium sulfate, PSA, C18, GCB
High Pigmented Matrices	Spinach Red Peppers	magnesium sulfate, PSA, C18, GCB



### QuEChERS Troubleshooting

Problem	Causes	Recommended Solutions
Loss of planar pesticides	Presence of GCB may result in a loss of planar compounds	Use a product with less GCB Use the Dual Phase QuEChERS product
Loss of acidic compounds e.g. 2,4-D from starting matrix	Presence of PSA will extract acidic compounds from matrix	Use a product containing magnesium sulfate and C18
Loss of compounds during subsequent analysis	Some compounds are unstable and can break down during analysis	Use an analyte protectant e.g. toluene or sorbitol
Addition of sample to QuEChERS extraction tube containing sorbent causes an exothermic reaction	Exothermic reaction between water in sample and magnesium sulfate	Add the sample to the tube, then the solvents, then the sorbent materials
Poor recovery of pesticide compounds	Sample not in appropriate homogenisation state	Wrong products used in method Ensure sample is hydrated to 80% or higher Verify nature of pesticides e.g. are base sensitive compounds present

# Thermo Scientific Syringes and Filters

## Titan3 and Target2 Syringe Filters

Sample preparation with Titan3 and Target2 syringe filters help provide consistent and reliable experimental results. Both these products provide high quality filtration solutions for a range of samples and applications. The premium Titan3 range provides even higher levels of confidence due to the robust design characteristics (burst pressures of 120psi for the 30mm range) cleaner extracts due to the inclusion of a pre-filter (most 30mm products) and ease of membrane selection via the color coded ring.

### Membrane Selection Guide

#### Choose a filter or membrane based on:

1. Chemical compatibility of the membrane and housing with your sample matrix
2. Size and amount of particulates in the sample
3. Potential interactions (binding) between the membrane and sample components
4. Special considerations such as requirement for pre-filter or inorganic ion certification

#### Housings

- Target2 and Titan3 filter housings are manufactured from solvent-resistant, low-extractable polypropylene resins specifically selected for wide compatibility with common HPLC sample matrices
- Solutions at temperatures up to 100°C can be filtered using Target2 and Titan3 syringe filters.
- Syringe filters can be sterilized by autoclave at 125°C for 15 minutes
- The inlet connection is an enhanced female Luer Lock™ fitting designed for extra security when attached to a Luer Lock syringe
- The outlet fitting is a standard size male Luer-slip fitting for ease of filtrate collection
- Target2 polypropylene syringe filter housings meet the requirements of 21 CFR 177.1520



This table offers general guidelines for membrane characteristics and compatible applications.

Membrane Type	Membrane Characteristics	Applications
Cellulose Acetate	Low protein binding, ideal for aqueous-based samples; high protein recovery from filtrate; lower protein binding compared to PVDF	Tissue culture media filtration, sensitive biological samples
Glass MicroFiber	Larger porosity; able to remove large particulates without clogging	Dissolution testing, general filtration
Nylon	Most frequently selected membrane; broad compatibility with aqueous and organic naturally hydrophilic membrane; extremely low in extractables; excellent flowrate with most sample matrices; not compatible with strong acids or bases	General laboratory filtration; filtration for most samples; HPLC samples NOTE: Nylon binds protein, do not use when high protein recovery is desired
Polyethersulfone	High flowrates with good throughput volume; low protein binding; compatible with high temperature liquids; mechanically strong membrane low in inorganic extractable ions	PES is certified for ion chromatography; tissue culture filtration; filtration of proteins and nucleic acids
Polypropylene	Hydrophobic membrane has wide chemical compatibility with organic solvents; low nonspecific protein binding	Filtration of biological samples; filtration of aggressive organic solutions
PTFE	Hydrophobic membrane is resistant to nearly all solvents, acids, and bases; membrane is mechanically strong and will withstand exposure to high temperature liquids; low in extractables; PTFE blocks water vapor; can be used to filter aqueous solutions after prewetting with an alcohol	Filtration of aggressive organic, highly basic or hot solutions, ideal for transducer protectors
PVDF	Hydrophilic membrane with good solvent resistance; low UV absorbing extractables and low nonspecific binding	General biological filtration; filtration of samples where high protein recovery is desired
Regenerated Cellulose	Hydrophilic membrane with good solvent resistance, extremely low nonspecific binding; compatible with nearly all common HPLC solvents; tolerates aqueous samples in pH range of 3 to 12	Membrane of choice for low nonspecific binding applications; Tissue Culture media filtration and general biological sample filtration

## Syringe Filter Membrane Compatibility Chart

Use the information in this table to determine the ability of a specific syringe filter membrane to withstand exposure to a solvent. All concentrations are 100% unless noted.

### Legend

C = Compatible

LC = Limited Compatibility (Membrane may swell and shrink)

IC = Incompatible (Not Recommended)

ND = No Compatibility Data Currently Available

PTFE = Polytetrafluoroethylene

PVDF = Polyvinylidene

PES = Polyethersulfone

CA = Cellulose Acetate

RC = Regenerated Cellulose

PP = Polypropylene

GMF = Glass MicroFiber

Chemical	Nylon	PTFE	PVDF	PES	CA	RC	PP	GMF
<b>Acids</b>								
Acetic, Glacial	LC	C	C	C	IC	C	C	C
Acetic, 25%	C	C	C	C	CA	C	C	C
Hydrochloric, Concentrated	IC	C	C	C	IC	IC	C	C
Hydrochloric, 25%	IC	C	C	C	IC	IC	C	C
Sulfuric, Concentrated	IC	C	IC	IC	IC	IC	C	C
Sulfuric, 25%	IC	C	C	C	IC	LC	C	C
Nitric, Concentrated	IC	C	C	IC	IC	IC	C	LC
Nitric, 25%	IC	C	C	C	IC	IC	C	LC
Phosphoric, 25%	IC	C	ND	ND	C	LC	C	ND
Formic, 25%	IC	C	ND	ND	LC	C	C	C
Trichloroacetic, 10%	IC	C	ND	ND	C	C	C	ND
<b>Alcohols</b>								
Methanol, 98%	C	C	C	C	C	C	C	C
Ethanol, 98%	C	C	C	C	C	C	C	C
Ethanol, 70%	LC	C	C	C	C	C	C	C
Isopropanol	C	C	C	C	C	C	C	C
n-Propanol	C	C	C	C	C	C	C	C
Amyl Alcohol (Butanol)	C	C	C	C	C	C	C	C
Benzyl Alcohol	C	C	C	ND	LC	C	C	IC
Ethylene Glycol	C	C	C	C	C	C	C	C
Propylene Glycol	C	C	C	C	LC	C	C	C
Glycerol	C	C	C	C	C	C	C	C
<b>Alkalies</b>								
Ammonium Hydroxide, 25%	C	C	LC	C	C	LC	C	C
Sodium Hydroxide, 3N	C	C	C	C	IC	LC	C	IC
<b>Amines and Amides</b>								
Dimethyl Formamide	LC	C	IC	IC	IC	LC	C	C
Diethylacetamide	C	C	ND	ND	IC	C	ND	C
Triethanolamine	C	C	ND	ND	C	C	ND	ND
Aniline	ND	C	ND	ND	IC	C	ND	ND
Pyridine	C	C	IC	IC	IC	C	IC	C
Acetonitrile	C	C	C	LC	IC	C	C	C

Chemical	Nylon	PTFE	PVDF	PES	CA	RC	PP	GMF
<b>Esters</b>								
Ethyl Acetate/Methyl Acetate	C	C	C	IC	IC	C	LC	C
Amyl Acetate/Butyl Acetate	C	C	IC	IC	LC	C	LC	C
Propyl Acetate	C	C	IC	IC	LC	C	LC	ND
Propylene Glycol Acetate	ND	C	ND	IC	IC	C	C	ND
2-Ethoxyethyl Acetate	ND	C	ND	IC	LC	C	ND	ND
Methyl Cellulose	ND	C	ND	IC	IC	C	C	C
Benzyl Benzoate	C	C	ND	IC	C	C	ND	ND
Isopropyl Myristate	C	C	ND	IC	C	C	ND	ND
Tricresyl Phosphate	ND	C	ND	IC	C	C	ND	ND
<b>Halogenated Hydrocarbons</b>								
Methylene Chloride	LC	C	C	IC	IC	C	LC	C
Chloroform	C	C	C	IC	IC	C	LC	C
Trichloroethylene	C	C	C	IC	C	C	C	C
Chlorobenzene	C	C	C	LC	C	C	C	C
Freon®	C	C	C	LC	C	C	C	C
Carbon Tetrachloride	C	C	C	IC	LC	C	LC	C
<b>Hydrocarbons</b>								
Hexane/Xylene	C	C	C	IC	C	C	IC	C
Toluene/Benzene	C	C	C	IC	C	C	IC	C
Kerosene/Gasoline	C	C	C	LC	C	C	LC	ND
Tetralin/Decalin	ND	C	C	ND	C	C	ND	ND
<b>Ketones</b>								
Acetone	C	C	IC	IC	IC	C	C	C
Cyclohexanone	C	C	IC	IC	IC	C	C	C
Methyl Ethyl Ketone	C	C	LC	IC	LC	C	LC	C
Isopropylacetone	C	C	IC	IC	C	C	ND	C
Methyl Isobutyl Ketone	ND	C	LC	IC	ND	C	LC	C
<b>Organic Oxides</b>								
Ethyl Ether	C	C	C	C	C	C	LC	ND
Dioxane	C	C	LC	IC	LC	C	C	C
Tetrahydrofuran	C	C	LC	IC	LC	C	C	C
Triethanolamine	C	C	ND	ND	C	C	ND	ND
Dimethylsulfoxide (DMSO)	C	C	IC	IC	LC	C	C	C
Isopropyl Ether	ND	C	C	C	C	C	C	ND
<b>Miscellaneous</b>								
Phenol, Aqueous Solution, 10%	ND	C	LC	IC	IC	IC	C	C
Formaldehyde Aqueous Solution, 30%	C	C	C	C	C	LC	C	C
Hydrogen Peroxide, 30%	C	C	ND	ND	C	C	ND	ND
Silicone Oil/Mineral Oil	ND	C	C	C	C	C	C	C



## Titan3 Syringe Filters

Titan3 Syringe Filters provide:

- Low extractable membranes and housing
- HPLC performance tested
- Color coding for easy selection of the correct membrane and pore size
- Enhanced Luer Lock inlet which prevents leakage
- Most 30mm devices are provided with a 1mm boro-silicate glass pre-filter. This is of benefit for high solids samples with larger size particulates.
- Integral ring provides greater strength to the housing preventing leakage and bursting
- 30mm products pressure rated to 120psi
- Packed in re-usable rigid transparent color coded containers

### Titan3 Nylon Syringe Filters

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.2	No	<b>42204-NN</b>	100 Pack
	0.45	No	<b>44504-NN</b>	100 Pack
17	0.2	No	<b>42213-NN</b>	100 Pack
	0.45	No	<b>44513-NN</b>	100 Pack
30	0.2	Yes	<b>42225-NN</b>	100 Pack
	0.45	Yes	<b>44525-NN</b>	100 Pack
	0.45	No	<b>44526-NN</b>	100 Pack
	1.5	No	<b>41225-NN</b>	100 Pack
	5	No	<b>45025-NN</b>	100 Pack

#### Applications:

- General laboratory filtration
- Filtration for most HPLC samples

### Titan3 PTFE

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.2	No	<b>42204-NPE</b>	100 Pack
	0.45	No	<b>44504-NPE</b>	100 Pack
17	0.2	No	<b>RM42213-NPE</b>	100 Pack
	0.45	No	<b>RM44513-NPE</b>	100 Pack
30	0.2	Yes	<b>RM42225-NPE</b>	100 Pack
	0.45	Yes	<b>RM44525-NPE</b>	100 Pack
	1.0	No	<b>RM41025-NPE</b>	100 Pack

#### Applications:

- Filtration of aggressive organic, highly basic or hot solutions, transducer protectors
- Filter aqueous solutions after prewetting with an alcohol

### Titan3 PVDF Syringe filters

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.2	No	<b>42204-PV</b>	100 Pack
	0.45	No	<b>44504-PV</b>	100 Pack
17	0.2	Yes	<b>42213-PV</b>	100 Pack
	0.45	No	<b>44513-PV</b>	100 Pack
30	0.2	Yes	<b>42225-PV</b>	100 Pack
	0.45	No	<b>44525-PV</b>	100 Pack

#### Applications:

- General biological filtration
- Filtration of samples where high protein recovery is desired

**Titan3 Cellulose Acetate Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.2	No	<b>52204-RCE</b>	100 Pack
	0.45	No	<b>54504-RCE</b>	100 Pack
17	0.2	Yes	<b>RM52213-RCE</b>	100 Pack
	0.45	No	<b>RM54513-RCE</b>	100 Pack
30	0.2	Yes	<b>RM52225-RCE</b>	100 Pack
	0.45	No	<b>RM54525-RCE</b>	100 Pack

**Titan3 PES (Polyethersulfone) Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
17	0.2	No	<b>42213-PS</b>	100 Pack
	0.45	No	<b>44513-PS</b>	100 Pack
30	0.2	Yes	<b>42225-PS</b>	100 Pack
	0.45	No	<b>44525-PS</b>	100 Pack

**Titan3 GMF (Glass MicroFiber) Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
30	0.7	No	<b>40725-GM</b>	100 Pack
	1.2	No	<b>41225-GM</b>	100 Pack
	3.1	No	<b>42725-GM</b>	100 Pack

**Titan3 Polypropylene Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
17	0.2	No	<b>42213-PP</b>	100 Pack
	0.45	No	<b>44513-PP</b>	100 Pack
30	0.2	No	<b>42225-PP</b>	100 Pack
	0.45	No	<b>44525-PP</b>	100 Pack

**Titan3 Cellulose Acetate Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.2	No	<b>42204-CA</b>	100 Pack
	0.45	No	<b>44502-CA</b>	100 Pack
17	0.2	No	<b>42213-CA</b>	100 Pack
	0.45	No	<b>44513-CA</b>	100 Pack
30	0.2	No	<b>42225-CA</b>	100 Pack
	0.45	No	<b>44525-CA</b>	100 Pack

**Applications:**

- Low nonspecific binding applications
- Tissue culture media filtration and general biological sample filtration

**Applications:**

- Ion chromatography
- Tissue culture filtration, filtration of proteins and nucleic acids
- High-temperature liquids

**Applications:**

- Dissolution testing
- General filtration

**Applications:**

- Filtration of biological samples
- Filtration of aggressive organic solutions

**Applications:**

- Tissue culture media filtration, sensitive biological samples





## Target2 Syringe Filters

Target2 Syringe Filters provide:

- Low extractable membranes and housing
- HPLC performance tested
- Plain polypropylene housing
- 30mm products pressure rated to 100psi
- Enhanced Luer Lock inlet which prevents leakage

### Target2 Nylon Syringe Filters

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.45	No	<b>F2504-1</b>	100 Pack
	0.2	No	<b>F2504-2</b>	100 Pack
17	0.45	No	<b>F2513-1</b>	100 Pack
	0.2	No	<b>F2513-2</b>	100 Pack
30	0.45	No	<b>F2500-1</b>	100 Pack
	0.2	No	<b>F2500-2</b>	100 Pack
	1.5	No	<b>F2500-12</b>	100 Pack
	5.0	No	<b>F2500-50</b>	100 Pack
	0.45	Yes	<b>F2502-1</b>	100 Pack
	0.2	Yes	<b>F2502-2</b>	100 Pack

#### Applications:

- General laboratory filtration
- Filtration for most HPLC samples

### Target2 PTFE Syringe Filters

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.45	No	<b>F2504-3</b>	100 Pack
	0.2	No	<b>F2504-4</b>	100 Pack
17	0.45	No	<b>F2513-3</b>	100 Pack
	0.2	No	<b>F2513-4</b>	100 Pack
30	0.45	No	<b>F2500-3</b>	100 Pack
	0.2	No	<b>F2500-4</b>	100 Pack
	1.0	No	<b>F2500-13</b>	100 Pack
	0.45	Yes	<b>F2502-3</b>	100 Pack

#### Applications:

- Filtration of aggressive organic, highly basic or hot solutions, transducer protectors
- Filter aqueous solutions after prewetting with an alcohol

### Target2 PVDF Syringe Filters

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.45	No	<b>F2504-5</b>	100 Pack
	0.2	No	<b>F2504-6</b>	100 Pack
17	0.45	No	<b>F2513-5</b>	100 Pack
	0.2	No	<b>F2513-6</b>	100 Pack
30	0.45	No	<b>F2500-5</b>	100 Pack
	0.2	No	<b>F2500-6</b>	100 Pack

#### Applications:

- General biological filtration
- Filtration of samples where high protein recovery is desired

**Target2 Regenerated Cellulose Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.45	No	<b>F2504-7</b>	100 Pack
	0.2	No	<b>F2504-8</b>	100 Pack
17	0.45	No	<b>F2513-7</b>	100 Pack
	0.2	No	<b>F2513-8</b>	100 Pack
30	0.45	No	<b>F2500-7</b>	100 Pack
	0.2	Yes	<b>F2500-8</b>	100 Pack

**Applications:**

- Low nonspecific binding applications
- Tissue culture media filtration and general biological sample filtration

**Target2 PES (Polyethersulfone) Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
17	0.45	No	<b>F2513-14</b>	100 Pack
	0.2	No	<b>F2513-17</b>	100 Pack
30	0.45	No	<b>F2500-14</b>	100 Pack
	0.2	No	<b>F2500-17</b>	100 Pack

**Applications:**

- Ion chromatography
- Tissue culture filtration, filtration of proteins and nucleic acids
- High-temperature liquids

**Target2 GMF (Glass MicroFiber) Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
30	0.7	No	<b>F2500-18</b>	100 Pack
	1.2	No	<b>F2500-19</b>	100 Pack
	3.1	No	<b>F2500-20</b>	100 Pack

**Applications:**

- Dissolution testing
- General filtration

**Target2 Polypropylene Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.45	No	<b>F2504-9</b>	100 Pack
	0.2	No	<b>F2504-10</b>	100 Pack
17	0.45	No	<b>F2513-9</b>	100 Pack
	0.2	No	<b>F2513-10</b>	100 Pack
30	0.45	No	<b>F2500-9</b>	100 Pack
	0.2	No	<b>F2500-10</b>	100 Pack
	0.45	Yes	<b>F2502-9</b>	100 Pack

**Applications:**

- Filtration of biological samples
- Filtration of aggressive organic solutions

**Target2 Cellulose Acetate Syringe Filters**

Outside Dia (mm)	Pore Size (µm)	PreFilter	Cat. No.	Quantity
4	0.45	No	<b>F2504-15</b>	100 Pack
	0.2	No	<b>F2504-16</b>	100 Pack
17	0.45	No	<b>F2513-15</b>	100 Pack
	0.2	No	<b>F2513-16</b>	100 Pack
30	0.45	No	<b>F2500-15</b>	100 Pack
	0.2	No	<b>F2500-16</b>	100 Pack

**Applications:**

- Tissue culture media filtration, sensitive biological samples



## All-Plastic Disposable Syringes

Disposable syringes with polyethylene barrels and polypropylene plungers; use for all syringe filter applications

- Two-part, all-plastic construction eliminates the need for rubber or synthetic plunger gaskets
- No silicone or oil lubricant is required in the barrel
- Choose Luer-Slip or Luer Lock syringes, in capacities ranging from 1 to 50mL



### National Target All-Plastic Disposable Syringes

Capacity (mL)	Cat. No.	Quantity
<b>Luer-Slip Syringes</b>		
1	<b>S7510-1</b>	100 Pack
3	<b>S7510-3</b>	100 Pack
5	<b>S7510-5</b>	100 Pack
10	<b>S7510-10</b>	100 Pack
20	<b>S7510-20</b>	100 Pack
30	<b>S7510-30</b>	50 Pack
50	<b>S7510-50</b>	30 Pack
<b>Luer Lock Syringes</b>		
3	<b>S7515-3</b>	100 Pack
5	<b>S7515-5</b>	100 Pack
10	<b>S7515-10</b>	100 Pack
20	<b>S7515-20</b>	100 Pack

Nonsterile; packed in bulk.

## National 750µL Micro-Centrifugal Filters, Nonsterile

Filter volumes as low as 50µL with low hold-up volume

- Filter volumes as low as 50µL up to 750µL with low hold-up volume
- Use with any laboratory microcentrifuge
- Virgin polypropylene filter housing with tapered 2mL, capped receiver tube
- 10,000xG maximum centrifugal force



### National 750µL Micro-Centrifugal Filters, Nonsterile

Material [Membrane]	Pore Size (µm)	Cat. No.	Quantity
Cellulose Acetate	0.22	<b>F2517-1</b>	100 Pack
Cellulose Acetate	0.45	<b>F2517-2</b>	100 Pack
Nylon	0.2	<b>F2517-3</b>	100 Pack
Nylon	0.45	<b>F2517-4</b>	100 Pack
PVDF	0.2	<b>F2517-5</b>	100 Pack
PVDF	0.45	<b>F2517-6</b>	100 Pack
Regenerated Cellulose	0.2	<b>F2517-7</b>	100 Pack
Regenerated Cellulose	0.45	<b>F2517-8</b>	100 Pack
PTFE	0.2	<b>F2517-9</b>	100 Pack
PTFE	0.45	<b>F2517-10</b>	100 Pack

## National 2mL Centrifugal Filters, Nonsterile

- Filter sample volumes up to 2mL
- Virgin polypropylene filter housing with tapered 5mL, capped receiver tube
- Use with benchtop or floor model centrifuges
- 5,000xG maximum centrifugal force

### National 2mL Centrifugal Filters, Nonsterile

Material	Pore Size (µm)	Cat. No.	Quantity
Cellulose Acetate	0.22	<b>F2520-1</b>	25 Pack
Cellulose Acetate	0.45	<b>F2520-2</b>	25 Pack
Nylon	0.2	<b>F2520-3</b>	25 Pack
Nylon	0.45	<b>F2520-4</b>	25 Pack
PVDF	0.2	<b>F2520-5</b>	25 Pack
PVDF	0.45	<b>F2520-6</b>	25 Pack
PTFE	0.2	<b>F2520-7</b>	25 Pack
PTFE	0.45	<b>F2520-8</b>	25 Pack



## National 25mL Centrifugal Filters, Nonsterile

- Filter sample volumes up to 25mL
- Virgin polypropylene filter housing with conical receiver
- Use with benchtop or floor model centrifuges
- 2,500xG maximum centrifugal force

### National 25mL Centrifugal Filters, Nonsterile

Material	Pore Size (µm)	Cat. No.	Quantity
Cellulose Acetate	0.22	<b>F2519-1</b>	50 Pack
Cellulose Acetate	0.45	<b>F2519-2</b>	50 Pack
Nylon	0.22	<b>F2519-3</b>	50 Pack
Nylon	0.45	<b>F2519-4</b>	50 Pack
PVDF	0.22	<b>F2519-5</b>	50 Pack
PVDF	0.45	<b>F2519-6</b>	50 Pack





## Thermo Scientific WebSeal

The WebSeal system is a comprehensive range of 96 well titer plates with glass inserts and a silicone/PTFE coated sealing mat. This system provides the analyst with 96 completely inert chambers and reduces the risk of cross-contamination from well to well when removing the cover. The products are ideal for High Throughput Screening, Combinatorial Chemistry, Life Science applications and HPLC.

### WebSeal Product Selection

- WebSeal mats are typically blue or clear silicone rubber in nature. The clear mats have no PTFE coating, making them ideal for use with aqueous mobile phases
- Blue mats have a thin protective film of sprayed PTFE, making them ideal for use with organic solvents
- Mats are available in standard and pre-cut versions for delicate autosampler needles
- The addition of vials to the 96 well plates allows the use of aggressive solvents in the WebSeal system
- Products are available in volumes from 500µL to 1.5mL

#### Product Selection According to Manufacturer Type

Manufacturer	96 Round Silicone	96 Round Silicone/PTFE	96 Square Silicone	96 Square Silicone/PTFE	384 Square	384 Square Silicone/PTFE
Abgene	WSM-2E	WSM-2				
CoStar	WSM-2FBE	WSM-2FB WSM-2			WSM-5E	WSM-5
Greiner	WSM-2FBE WSM-2E	WSM-2FB WSM-2	WSM-3SXE	WSM-3S	WSM-5E	WSM-5
Matrix	WSM-2FBE WSM-2E	WSM-2FB WSM-2	WSM-3SXE	WSM-3S		
NUNC	WSM-7E		WSM-3SXE	WSM-3S	WSM-5E	WSM-5
Porvair	WSM-2FBE WSM-2E	WSM-2FB WSM-2	WSM-3SXE	WSM-3S	WSM-5E	WSM-5
Whatman	WSM-2FBE WSM-2E	WSM-2	WSM-3SXE	WSM-3S		



## WebSeal Technical Information

The following section provides properties of the WebSeal product range:

### Physical Properties and Resistance

	Low	High
Operating Temperature	-80°C	260°C
Specific Gravity	1.15	
Shore Hardness	57	
Tear Strength	Fair	

### Sterilization

WebSeal may be sterilized but is produced in a chromatographically clean form and is suitable for use straight from the packet.

Property	Method	Comment
Sterilization methods	Autoclave recommended	160°C
	Chemical	All common disinfectants may be suitable
	Radiation	Gamma

### Evaporation Study

An evaporation study was performed using water, acetonitrile and DMSO at two different volumes (100µL and 200µL) at three different temperatures (28°C, 4°C and -20°C for 24 hours). Plates were filled with solvent, weighed, then sealed with MicroMats. The sealed plates were incubated at their respective temperatures for 24 hours. Mats were removed and the plates were reweighed to determine evaporation of sample content.

### Results

Temperature	Solvent	% loss after 24 hours
-20°C	Water	0.15%
	Acetonitrile	12.0%
	DMSO	-1.1%
4°C	Water	0.4%
	Acetonitrile	19.2%
	DMSO	0.8%
20°C	Water	1.0%
	Acetonitrile	34.3%
	DMSO	-1.2%

### WebSeal Sealing Mat Properties

Material	Properties
Blue Silicone/PTFE Mat	Soft silicone with sprayed clear PTFE layer to give resistance against a wide range of organic solvents. Suitable for injection with a wide range of autosampler and sample processing units. Pre-slit versions allow use of blunt probes and pipette tips.
Clear Silicone Mat	Soft silicone without protective spray. Cannot be used for extended periods with strong solvents. May be used under aqueous conditions for storage.

### WebSeal Chemical Resistance

The chemical resistance has been tested with long-term exposure of mats to filled plates with measurement of solvent integrity and observation of mat sealing performance over periods of 2-3 months.

Resistance to attack and application suitability	PTFE coated for glass vials	PTFE coated for square or round well plates	Pre-Slit PTFE coated for square or round well plates	Solvents
No permeation of mat elastomer or mat coating. Suitable for long-term storage, sample transfer and autosampler use.	Excellent	Excellent	Excellent	Water & Inorganic Buffers Methanol/Water IPA Acetonitrile/Water Hexane Heptane Cyclohexane
No permeation of mat elastomer by solvent with intact PTFE surface. Suitable for sample transfer and autosampler use. Suitable for elevated temperature use.	Excellent under most conditions	Excellent under most conditions	Excellent under most conditions	Acetone Acetonitrile Dichloromethane (DCM) Dimethylformamide (DMF) Trifluoroacetic Acid
Permeation of the elastomer after 3-5 days may lead to solvent collection on upper face of mat. Suitable for short-term sample transfer and autosampler use only.	Fair but alternative may be preferred	Not recommended for this application	Not recommended for this application	Dimethylsulphoxide (DMSO)

## WebSeal 500 $\mu$ L Kit and Accessories

Mid-depth polypropylene 96 well microtiter plate, pre-inserted 500 $\mu$ L glass vials and WebSeal silicone/PTFE mats

### WebSeal 500 $\mu$ L Kit

Description	Cat. No.	Quantity
96 well microtiter plate with 500 $\mu$ L glass vials and sealing mats	<b>05-MTPVC-96</b>	5 Pack
<b>Accessories</b>		
96 well mid-depth polypropylene plate for 500 $\mu$ L vials	<b>05-MTP-96</b>	5 Pack
500 $\mu$ L clear glass replacement vials for kit	<b>05-MTV-96</b>	500 Pack
96 round well silicone/PTFE sealing mat	<b>WSM-1</b>	5 Pack
96 round well silicone/PTFE sealing mat, pre-slit	<b>WSM-1X</b>	5 Pack

## WebSeal 700 $\mu$ L Kit and Accessories

700 $\mu$ L kits available with clear glass, amber glass and PTFE vials pre-inserted into 96 well polypropylene microtiter plates

### WebSeal 700 $\mu$ L Kit

Description	Cat. No.	Quantity
96 well plate, 700 $\mu$ L clear glass vials, sealing mat and cutting tool	<b>MTPVC-96</b>	5 Pack
96 well plate, 700 $\mu$ L amber glass vials, sealing mat and cutting tool	<b>MTPVC(A)-96</b>	5 Pack
96 well plate, 700 $\mu$ L PTFE vials, sealing mat and cutting tool	<b>MTPTC-96</b>	1 Each
<b>Accessories</b>		
700 $\mu$ L clear glass vials for kit	<b>1-MTV-96</b>	500 Pack
700 $\mu$ L amber glass vials for kit	<b>1-MTV(A)-96</b>	500 Pack
700 $\mu$ L PTFE vials for kit	<b>1-MTTV-96</b>	100 Pack
96 well polypropylene plate for 700 $\mu$ L vials	<b>MTP-96</b>	5 Pack
96 round well silicone/PTFE sealing mat	<b>WSM-1</b>	5 Pack
96 round well silicone/PTFE sealing mat, pre-slit	<b>WSM-1X</b>	5 Pack
Cutting tool	<b>MTPC-1</b>	1 Each

## WebSeal 1.1mL Kit and Accessories

1.1mL kits available as 8mm crimp top standard vials or with WebSeal silicone/PTFE sealing mats

### WebSeal 1.1mL Kit and Accessories

Description	Cat. No.	Quantity
96 well PP plate with 1.1mL glass vials, sealing mats	<b>1.1-MTPVC-96</b>	5 Pack
96 well PP plate with 1.1mL, 8mm crimp top vials	<b>1.1-CMTPVC-96</b>	5 Pack
<b>Accessories</b>		
1.1mL clear glass vials for kit	<b>1.1-MTV-96</b>	500 Pack
1.1mL clear glass crimp top vials for kit	<b>1.1-CRV</b>	500 Pack
96 deep well PP plate for 1.1mL shell vial	<b>1.1-MTP-96</b>	5 Pack
96 square deep well PP plate for 1.1mL crimp top vials	<b>1.1-MTPS-96</b>	5 Pack
Silicone/PTFE sealing mat	<b>WSM-6</b>	5 Pack
Silicone/PTFE sealing mat pre-slit	<b>WSM-6X</b>	5 Pack

## WebSeal 1.5mL Kit and Accessories

1.5mL kit available in 96 well polypropylene microtiter plate pre-inserted with 1.5mL clear glass vials and WebSeal silicone/PTFE sealing mats

### WebSeal 1.5mL Kit and Accessories

Description	Cat. No.	Quantity
96 well polypropylene plate, 1.5mL glass vials, sealing mat	<b>1.5-MTPVC-96</b>	5 Pack
<b>Accessories</b>		
1.5mL clear glass vials for kit	<b>1.5-MTV-96</b>	500 Pack
96 well polypropylene plate for 1.5mL glass vials	<b>1.5-MTP-96</b>	5 Pack
Silicone/PTFE sealing mat	<b>WSM-6</b>	5 Pack
Silicone/PTFE sealing mat pre-slit	<b>WSM-6X</b>	5 Pack

## MicroMat CLR Sealing Mats

Designed to fit 96 well plates to eliminate cross-contamination from well to well

### MicroMat CLR Sealing Mats

Description	Cat. No.	Quantity
96 round well; 7mm domed base	<b>WSM-2E</b>	5 Pack
96 round well sealing mat, 7mm domed base, silicone only pre-slit	<b>WSM-2XE</b>	5 Pack
384 square well sealing mat; silicone only	<b>WSM-5E</b>	5 Pack
384 square well sealing mat; silicone only pre-slit	<b>WSM-5XE</b>	5 Pack
96 square well sealing mat; silicone only	<b>WSM-3SE</b>	5 Pack
96 square well sealing mat; silicone only pre-slit	<b>WSM-3SXE</b>	5 Pack
96 round well sealing mat; 8mm flat base, silicone	<b>WSM-2FBE</b>	5 Pack
96 round well sealing mat; 8mm flat base, silicone pre-slit	<b>WSM-2FBXE</b>	5 Pack

## WebSeal MicroMat CLR Sealing Strips

Use where only partial plate capacity is required

### WebSeal MicroMat CLR Sealing Strips

Description	Cat. No.	Quantity
96 round well sealing strips; 8mm strips; silicone pre-slit	<b>WSMS-2XE</b>	12 Pack

## WebSeal Mats

Superior resealability after multiple injections

### WebSeal Mats

Description	Cat. No.	Quantity
96 round well silicone/PTFE sealing mat	<b>WSM-1</b>	5 Pack
96 round well silicone/PTFE sealing mat, pre-slit	<b>WSM-1X</b>	5 Pack
Silicone/PTFE sealing mat	<b>WSM-6</b>	5 Pack
Silicone/PTFE sealing mat pre-slit	<b>WSM-6X</b>	5 Pack

## WebSeal Mat Applicator

Handheld applicator for easy sealing of WebSeal mats

### WebSeal Mat Applicator

Description	Cat. No.	Quantity
Handheld mat applicator	<b>WSA-1</b>	1 Each

## WebSeal Silicone/PTFE Mats

Manufactured from silicone with PTFE coating on underside

### WebSeal Silicone/PTFE Mats

Description	Cat. No.	Quantity
96 round well; 7mm dome base; Dark Blue	<b>WSM-2</b>	5 Pack
96 round well; 7mm flat base; Light Blue	<b>WSM-2FB</b>	5 Pack
96 round well; 7mm flat base; Light Blue, pre-slit	<b>WSM-2FBX</b>	5 Pack
96 square well; 8mm square well; Light Blue	<b>WSM-3S</b>	5 Pack
96 square well; 8mm square well; Light Blue, pre-slit	<b>WSM-3SX</b>	5 Pack
96 square well; 8mm square well; Yellow, pre-slit	<b>WSM-3SXY</b>	5 Pack
384 round well; 4mm square well; Red	<b>WSM-5</b>	5 Pack
384 square well; 4mm square well; Light Blue, pre-slit	<b>WSM-5RX</b>	5 Pack



## Mini-Vap Sample Concentrator

Evaporates 500µL methanol in less than 10 minutes



### Mini-Vap Sample Concentrator

Description	Cat. No.	Quantity
Minivap Sample Concentrator, Spiral Needle Design (110 volt)	<b>CLS-229203</b>	1 Each

## WebSeal UltraVap High-Speed Sample Concentrator

Programmable high speed sample concentrator with patented spiral needles

- Evaporating 500µL methanol in 6 minutes



### WebSeal UltraVap High Speed Sample Concentrator

Description	Cat. No.	Quantity
UltraVap 96 Well High Speed Sample Concentrator	<b>CLS-229070</b>	1 Each
Replacement Spiral Needle Kit with Fitting Tool	<b>CLS-229074</b>	1 Each

## WebSeal Glass-Coated Microplates

Lightweight, precision molded, cost-effective alternative to solid glass plates

- Polypropylene microplates coated with 200nm thick layer of silicone dioxide
- Chemically resistant with the qualities of glass and advantages of polypropylene
- Operating temperatures of -80° to +80°C

### WebSeal Glass-coated Microplates

Description	Cat. No.	Quantity
96 Well PP Plate 350µL Volume V-Bottom	<b>CLS-210003</b>	100 Pack
96 U deep-well design; 1mL glass-coated PP plate	<b>CLS-400042</b>	10 Pack
96 flat well design; 2mL glass-coated PP plate	<b>CLS-400046</b>	10 Pack
96 V-design 190µL; Glass coated PP plate	<b>CLS-400058</b>	10 Pack
384 square-rounded; 180µL glass-coated PP plate	<b>CLS-400156</b>	10 Pack
96 U-well design; 250µL glass-coated PP plate	<b>CLS-400054</b>	10 Pack
96 well flat bottom; 300µL glass-coated PP plate	<b>CLS-400062</b>	10 Pack
384 square/rounded well design; 90µL glass-coated PP plate	<b>CLS-400150</b>	10 Pack

# Thermo Scientific Automated SPE

## Dionex AutoTrace Systems

Provides fast and reliable automated solid phase extraction of organic pollutants from samples

The Thermo Scientific Dionex AutoTrace 280 instrument provides reliable automated SPE for analytical chemists determining organic pollutants in large volume liquid samples (10mL to 20L). Compared to liquid-liquid extraction, the Dionex AutoTrace 280 saves time, solvent, and labor, ensuring high reproducibility and productivity for analytical labs. The system uses powerful pumps (no check valves) and positive-pressure constant-flow technology to process the most difficult samples and can process up to six samples. Features include:

- SPE technology for liquid-liquid extraction: Reduces solvent usage and eliminates glassware.
- No technician involvement is required to maintain a liquid reservoir or to control the flow.
- Provides constant flow of liquids through SPE cartridges resulting in superior reproducibility.
- Closed systems with fan to vent solvent vapors: No hood required, conserves valuable hood space.
- The instrument can store 24 methods on board and the software used for editing methods is easy to use.
- USB cable connection to PC. Methods to run can be chosen from those stored in the instrument memory.
- Multi-port switching valve ensures the systems reliability.

*Note: Contact your local sales representative to confirm part numbers.*

### Dionex AutoTrace 280

Description	Cat. No.	Quantity
Dionex AutoTrace 280 Automated Large Volume SPE for 47mm Disks	<b>071386</b>	1 Each
Dionex AutoTrace 280 Automated Large Volume SPE for Cartridges with 6mL Plungers	<b>071385</b>	1 Each
Dionex AutoTrace 280 Automated Large Volume SPE for Cartridges with 1mL Plungers	<b>072604</b>	1 Each
Dionex AutoTrace 280 Automated Large Volume SPE for Cartridges with 3mL Plungers	<b>072605</b>	1 Each
Dionex AutoTrace 280 Automated Large Volume SPE for Cartridges with 6mL Glass Plungers	<b>072606</b>	1 Each



The Dionex AutoTrace 280 instrument provides automated solid-phase extraction with a choice of cartridge or disk formatting.



## Dionex AutoTrace Accessories

The Dionex AutoTrace 280 parts and accessories are designed to be used specifically with the AutoTrace 280 solid-phase extraction system. Each part and accessory meets strict Dionex quality standards.

### SolEx SPE Cartridges

#### SolEx SPE Cartridges

Description	Cat. No.	Quantity
SolEx C18 6mL Cartridge with 1.0g of Packing	<b>074410</b>	30 Pack
SolEx C18 6mL Cartridge with 0.5g of Packing	<b>074417</b>	30 Pack
SolEx C8 6mL Cartridge with 1.0g of Packing	<b>074411</b>	30 Pack
SolEx C18 3mL Cartridge with 0.5g of Packing	<b>074412</b>	30 Pack
SolEx C8 3mL Cartridge with 0.5g of Packing	<b>074413</b>	30 Pack
SolEx C18 1mL Cartridge with 0.1g of Packing	<b>074623</b>	100 Pack
SolEx C8 1mL Cartridge with 0.1g of Packing	<b>074415</b>	100 Pack
SolEx C18 Unendcapped 6mL Cartridge with 1.0g of Packing	<b>074416</b>	30 Pack
SolEx 6mL Cartridge Silica (unbonded) with 0.5g Silica	<b>074589</b>	50 Pack
SolEx Carbon-521, with 2g Packing	<b>074590</b>	20 Pack
SolEx C18 with 1g Endcapped C18, clean	<b>075895</b>	30 Pack
SolEx C18 with 1.5g C18 Clean	<b>075896</b>	30 Pack
SolEx C8 Cartridge with 0.5g Endcapped, Clean	<b>075897</b>	50 Pack
SolEx Carbon-535 6mL Cartridge with 0.5g of Packing	<b>075898</b>	30 Pack

### Plunger Assemblies

#### Plunger Assemblies

Description	Cat. No.	Quantity
Plunger Assembly for 1mL Columns	<b>071078</b>	1 Each
Plunger Assembly for 3mL Columns	<b>071079</b>	1 Each
Plunger Assembly for 6mL Columns	<b>071080</b>	1 Each
Plunger Assembly for 6mL Glass Cartridges	<b>071081</b>	1 Each

### Elution Racks

#### Elution Racks

Description	Cat. No.	Quantity
Elution Rack for 11mm GC vials	<b>071068</b>	1 Each
Elution Rack for 15mL Conical Tubes	<b>071069</b>	1 Each
Elution Rack for 16 x 100mL Test Tubes	<b>071070</b>	1 Each
Elution Rack for 17 x 60mm Vials	<b>071071</b>	1 Each
Elution Rack for 4mL Vials	<b>071072</b>	1 Each
15mL Conical Tubes	<b>071056</b>	Case of 12

## Sample Rack

The Dionex AutoTrace 280 sample rack will hold six 60mL vials, 250mL bottles or 1L bottles. The rack is angled to ensure all the sample is retrieved from the sample vessels.

### Sample Rack

Description	Cat. No.	Quantity
Sample Rack for 60, 250, and 1000mL Bottles for Dionex AutoTrace 280	<b>071333</b>	1 Each

## Glass-Coated Solvent Bottles

Glass-coated solvent bottles are available in 1 and 2L sizes.

### Glass-Coated Solvent Bottles

Description	Cat. No.	Quantity
Bottle, 1L, Coated Glass	<b>045900</b>	1 Each
Bottle, 2L, Coated Glass, GL45	<b>045901</b>	1 Each

## Preventative Maintenance Kit

The preventative maintenance kit contains new tubing, seals and rotors.

### Preventative Maintenance Kit

Description	Cat. No.	Quantity
Preventative Maintenance Kit	<b>072598</b>	1 Each

## Dionex OnGuard II Cartridges

- Dionex OnGuard II Cartridges remove matrix interferences such as phenolics compounds, metals, cations, anions, or hydrophobic substances encountered in many IC and HPLC applications.
- Cartridges are available in 1 cc and 2.5 cc high-capacity formats.



### Related Literature

For detailed specifications and applications, see the following PDF documents under Literature on [www.thermoscientific.com/dionex](http://www.thermoscientific.com/dionex)

### Product Data Sheets

Dionex OnGuard II Sample Pretreatment Cartridges and Workstation

### Application Notes

- AN 101: Trace Level Determination of Bromate in Ozonated Drinking Water Using Ion Chromatography
- AN 136: Determination of Inorganic Oxyhalide Disinfection Byproduct Anions and Bromide in Drinking Water Using Ion
- Chromatography with the Addition of a Postcolumn Reagent for Trace Bromate Analysis
- AN 37: The Determination of Iodide in Milk Products

### Application Updates

- AU 140: The Determination of Iodide in Urine

## Dionex OnGuard II A

- The Dionex OnGuard II A is used in the removal of anionic contaminants from sample matrices and for the neutralization of highly acidic samples
- Cartridges contain styrene-based, anion exchange resin in the bicarbonate form

### Key Specifications

- Functionality: anion-exchange, bicarbonate form
- Capacity ( $\mu\text{eq}/\text{cartridge}$ ): 0.7 (1 cc cartridge); 1.75 (2.5 cc cartridge)
- Solvents: 0-100% HPLC
- pH stability: 0-14
- Mode: removal of anions; pH adjustments of acidic samples

### Dionex OnGuard II A

Description	Cat. No.	Quantity
Dionex OnGuard II A Cartridges, 1 cc	<b>057091</b>	48 Pack
Dionex OnGuard II A Cartridges, 2.5 cc	<b>057092</b>	48 Pack

## Dionex vOnGuard II Ag

- The Dionex OnGuard II Ag contains a silver-form, high-capacity, sulfonated, cation-exchange resin similar to the OnGuard II H packing
- Cartridges remove chloride, bromide, and iodide from sample matrices
- Dionex OnGuard II H cartridge should be used after the Dionex OnGuard II Ag cartridge to remove dissolved Ag<sup>+</sup>

### Key Specifications

- Functionality: cation-exchange, silver form
- Capacity (µeq/cartridge): 2.0-2.2 (1cc); 5.0-5.5 (2.5cc)
- Solvents: 0-100% HPLC
- pH Stability: 0-14
- Mode: removal of chloride, bromide, iodide by precipitation

### Dionex OnGuard II Ag

Description	Cat. No.	Quantity
Dionex OnGuard II Ag Cartridges, 1cc	<b>057089</b>	48 Pack
Dionex OnGuard II Ag Cartridges, 2.5cc	<b>057090</b>	48 Pack

## Dionex OnGuard II Ag/H

The Dionex OnGuard II Ag/H is a layered cartridge that contains both OnGuard II Ag and Dionex OnGuard II H resins.

- Easily removes chloride, bromide, and iodide from concentrated matrices such as brines
- Traps soluble silver and other cations
- Removes high levels of alkaline earth and transition metals
- Neutralizes caustic samples
- Removes carbonate
- The two-layer cartridge replaces two cartridges in series, and provides greater silver capacity

### Dionex OnGuard II Ag/H

Description	Cat. No.	Quantity
Dionex OnGuard II Ag-H Cartridge, 2.5cc, Pkg. of 48	<b>057410</b>	48 Pack

## Dionex OnGuard II Ba

- The Dionex OnGuard II Ba resin is a styrene-based, sulfonic acid resin in the barium form, designed for the removal of high concentrations of sulfate from sample matrices
- For reproducible, quantitative determinations in low-ionic strength samples, activate these cartridges by adding sodium chloride or other sodium salt
- Samples treated with NaCl should be passed through an Dionex OnGuard II Ag cartridge to remove the added chloride, followed by the Dionex OnGuard II H cartridge or MetPac™ CC-1 chelating column to remove residual silver counterions

### Key Specifications

- Functionality: cation-exchange, barium form
- Capacity (µeq/cartridge): 2.0-2.2 (1cc); 5.0-5.5 (2.5cc)
- Solvents: 0-100% HPLC
- pH Stability: 0-14
- Mode: removal of sulfate by precipitation

### Dionex OnGuard II Ba

Description	Cat. No.	Quantity
Dionex OnGuard II Ba Cartridges, 1cc	<b>057093</b>	48 Pack
Dionex OnGuard II Ba Cartridges, 2.5cc	<b>057094</b>	48 Pack

## Dionex OnGuard II Ba/Ag/H

The Dionex OnGuard II Ba/Ag/H is a layered cartridge containing Dionex OnGuard II Ba, Ag, and H styrene-based, sulfonic acid resins.

- The Ba resin removes high concentrations of sulfate from sample matrices
- The Ag form easily removes chloride, bromide, and iodide from concentrated matrices
- The H form is highly selective for polyvalent cations such as calcium and transition metals
- Ideal for the removal of high levels of alkaline earth and transition metals from sample matrices, neutralization of caustic samples, and removal of carbonate
- Three-layer cartridge can be used in place of three single cartridges in series and has the added advantage of higher silver capacity

### Dionex OnGuard II Ba/Ag/H

Description	Cat. No.	Quantity
Dionex OnGuard II Ba/Ag/H Cartridges, 2.5cc	<b>063955</b>	48 Pack



## Dionex OnGuard II H

- The Dionex OnGuard II H removes high levels of alkaline earth and transition metals from sample matrices and neutralizes highly alkaline samples such as sodium hydroxide or sodium carbonate. Carbonate can then be removed by sparging the sample
- Cartridges contain 16% crosslinked, styrene-based, sulfonic acid resin in the hydrogen form. This resin is designed to have very high selectivity for multivalent cations such as calcium and transition metals

### Key Specifications

- Functionality: cation-exchange hydronium form
- Capacity ( $\mu\text{eq}/\text{cartridge}$ ): 2.0-2.2 (1cc); 5.0-5.5 (2.5cc)
- Solvents: 0-100% HPLC
- pH Stability: 0-14
- Mode: removal of alkaline earth and transition metals; pH adjustment of basic samples

### Dionex OnGuard II H

Description	Cat. No.	Quantity
Dionex OnGuard II H Cartridges, 1cc	<b>057085</b>	48 Pack
Dionex OnGuard II H Cartridges, 2.5cc	<b>057086</b>	48 Pack

## OnGuard II M

- The OnGuard II M is used for the removal of transition metals and for matrix elimination of alkali and alkaline earth metals
- Cartridges contain an iminodiacetate resin in the ammonium form, ready to use with no lengthy preparation required

### Key Specifications

- Functionality: iminodiacetate, ammonium form
- Capacity ( $\mu\text{eq}/\text{cartridge}$ ): 0.4 (1cc); 1.0 (2.5cc)
- Solvents: 0-100% HPLC
- pH Stability: 0-14 (resin shrinks in acid form)
- Mode: concentration of transition metals by chelation (2.5cc format); removal of transition metals (1cc format)

### Dionex OnGuard II M

Description	Cat. No.	Quantity
Dionex OnGuard II M Cartridges, 1cc	<b>057137</b>	48 Pack
Dionex OnGuard II M Cartridges, 2.5cc	<b>057095</b>	48 Pack

## Dionex OnGuard II Na

- The Dionex OnGuard II Na removes high levels of alkaline earth and transition metals from sample matrices without acidifying the sample. This ensures good recovery of acid-labile analytes such as nitrite
- Cartridges contain 16% crosslinked, styrene-based, sulfonic acid resin in the sodium form
- This resin has very high selectivity for multivalent cations such as calcium, magnesium and transition metals

### Key Specifications

- Functionality: cation-exchange, sodium form
- Capacity ( $\mu\text{eq}/\text{cartridge}$ ): 2.0-2.2 (1cc); 5.0-5.5 (2.5cc)
- Solvents: 0-100% HPLC
- pH Stability: 0-14
- Mode: removal of alkaline earth and transition metals without acidifying the sample

### Dionex OnGuard II Na

Description	Cat. No.	Quantity
Dionex OnGuard II Na Cartridges, 1cc	<b>062948</b>	48 Pack
Dionex OnGuard II Na Cartridges, 2.5cc	<b>062962</b>	48 Pack

## Dionex OnGuard II P

- The Dionex OnGuard II P is recommended for removing the phenolic fraction of humic acids, tannic acids, lignins, anthocyanins, and azo dyes from samples prior to analysis by anion or cation exchange
- Cartridges contain polyvinylpyrrolidone (PVP) polymer with very high selectivity for phenolics, azo-containing compounds, aromatic carboxylic acids, aromatic aldehydes, and iodine as the triiodide complex

### Key Specifications

- Functionality: polyvinylpyrrolidone
- Capacity ( $\mu\text{eq}/\text{cartridge}$ ): 6.0 (1 cc); 2.5cc format not available
- Solvents: 0-100% HPLC
- pH Stability: 1-10
- Mode: removal of phenols, azo dyes, humic acids by complexation

### Dionex OnGuard II P

Description	Cat. No.	Quantity
Dionex OnGuard II P Cartridges, 1cc	<b>057087</b>	48 Pack

## Dionex OnGuard II RP

- The Dionex OnGuard II RP cartridge is recommended for removing hydrophobic substances such as aromatic dyes, some aromatic carboxylic acids, hydrocarbons, and surfactants from sample matrices
- Cartridges contain a macroporous divinylbenzene resin that has a very high selectivity for hydrophobic substances, especially unsaturated or aromatic organic substances

### Key Specifications

- Functionality: polydivinylbenzene
- Capacity ( $\mu\text{eq}/\text{cartridge}$ ): 0.3g resin (1cc); 0.75g resin (2.5cc)
- Solvents: 0-100% HPLC
- pH Stability: 0-14
- Mode: removal of surfactants, high-molecular weight carboxylic acids, aromatic dyes by adsorption

### Dionex OnGuard II RP

Description	Cat. No.	Quantity
Dionex OnGuard II RP Cartridges, 1cc	<b>057083</b>	48 Pack
Dionex OnGuard II RP Cartridges, 2.5cc	<b>057084</b>	48 Pack

## Dionex OnGuard Accessories

The Dionex OnGuard Sample Prep Station

- Enables simultaneous pretreatment of multiple samples with Dionex OnGuard sample pretreatment cartridges
- When used with 0.5mL PolyVials and a vacuum source, the Dionex OnGuard Sample Prep Station supports semi-automatic pretreatment of up to 12 samples
- Samples may also be treated manually using standard luer tip syringes
- Individual stopcock valves on each sample tube to allow control of individual flow rates
- The station will hold six 10mL volumetric flasks

### Dionex OnGuard Accessories

Description	Cat. No.	Quantity
Dionex OnGuard Sample Prep Workstation	<b>039599</b>	1 Each
Dionex OnGuard Needle, 18 Gauge, 1.25/Luer	<b>039996</b>	1 Each
Dionex OnGuard Valve, Stopcock Luer	<b>040896</b>	1 Each

## Dionex InGuard Cartridges

The Dionex InGuard line of sample pretreatment cartridges is designed to remove matrix interferences such as anions, cations, transition metals, or hydrophobic substances encountered in many IC and HPLC applications. The Dionex InGuard cartridge is installed inline between the autosampler and the IC injection valve facilitating immediate, automated sample pretreatment.

- Eliminates manual sample pretreatment steps
- Facilitates better separations
- Increases lifetimes of analytical columns
- Solves major matrix problems
- Achieves reproducible ppm-level determinations in concentrated matrices
- Convenient and easy to use



The InGuard cartridge is optimized for the best performance in matrix removal applications and can be used singly or in series. Designed to eliminate leaks and channeling, the cartridges use standard 10-32 fittings for easy installation into an IC or HPLC system. The unique sample distribution frit maximizes complete resin bed usage.

*Note: Depending on the chemistry and samples treated, some cartridges can be regenerated.*

### Related Literature

For detailed product specifications and applications, see the following, available under Literature on [www.thermoscientific.com/dionex](http://www.thermoscientific.com/dionex)

### Product Datasheets

InGuard In-Line Sample Pretreatment Cartridges Data Sheet

## Dionex InGuard Ag Cartridge

- Removes chloride, bromide, and iodide from concentrated sample matrices such as brines
- Styrene-based sulfonic acid resin in the silver form, the same material used in Dionex OnGuard II Ag cartridges
- For the removal of any residual silver ions, a Dionex InGuard H or Dionex InGuard Na cartridge should be placed after the Dionex InGuard Ag cartridge

*Note: The Dionex InGuard H or Dionex InGuard Na cartridge should be placed after the Dionex InGuard Ag cartridge to remove any residual silver ions.*

### Key Specifications

- Functionality: Cation-exchange, silver form
- Capacity: 5-5.5meq
- Solvents: 0-100% HPLC
- pH: 0-14
- Mode: Removal of halides by precipitation

### Dionex InGuard Ag

Description	Cat. No.	Quantity
Dionex InGuard Ag	074038	4 Pack

## Dionex InGuard H Cartridge

- The Dionex InGuard H cartridge is ideal for the removal of high levels of alkaline earth metals and transition metals from sample matrices. It is also used for the neutralization of highly alkaline samples such as sodium hydroxide or sodium carbonate
- Carbonate can be reduced to very low levels following this pH reduction by passing the sample through a Thermo Scientific Dionex CRD 200
- Contains styrene-based, sulfonic acid resin in the hydronium form, the same as that used in Dionex OnGuard II H cartridges
- Resin is designed to have very high selectivity for polyvalent cations, such as calcium and transition metals

### Key Specifications

- Functionality: Cation-exchange, hydronium form
- Capacity: 5-5.5meq
- Solvents: 0-100% HPLC
- pH: 0-14
- Mode: Removal of alkaline earth and transition metals; pH adjustment of basic samples

### Dionex InGuard H

Description	Cat. No.	Quantity
Dionex InGuard H	<b>074037</b>	4 Pack

## Dionex InGuard Na

- The Dionex InGuard Na cartridge is used for the removal of high levels of alkaline earths and transition metals from sample matrices without acidifying the sample, ensuring good recovery of acid labile analytes such as nitrite
- Contains styrene-based, sulfonic acid in the sodium form, designed to have high selectivity for multivalent cations

### Key Specifications

- Functionality: Cation-exchange, sodium form
- Capacity: 5-5.5meq
- Solvents: 0-100% HPLC
- pH: 0-14
- Mode: Removal of alkaline earth and transition metals

### Dionex InGuard Na

Description	Cat. No.	Quantity
Dionex InGuard Na	<b>074036</b>	4 Pack

## Dionex InGuard HRP Cartridge

- The Dionex InGuard HRP cartridge can be used to remove organic matrix material over a wide range of hydrophobicity, including fats from whole milk
- Contains a hydrophilic reversed-phase resin based on divinylbenzene. The material is water-wettable, thus 100% aqueous samples can be pretreated without disruption of the column bed

### Key Specifications

- Functionality: Hydrophilic divinylbenzene
- Capacity: 2g
- Solvents: 0-100% HPLC
- pH: 0-14
- Mode: Adsorption,  $\pi$ - $\pi$  bonding. Removal of hydrophobic species, azo-, and cyano-containing species

### Dionex InGuard HRP

Description	Cat. No.	Quantity
Dionex InGuard HRP	<b>074034</b>	4 Pack

## Dionex InGuard Na/HRP

- The Dionex InGuard Na/HRP cartridge is designed to provide general purpose clean-up of samples, such as foods, for anion analysis
- Contains a blend of sulfonated resin in the sodium form and HRP resin to provide the dual functionality of removing both organic contaminants and cations, including metals, from a sample

### Key Specifications

- Functionality: Dual Functionality
- Capacity: 50% Na/50% HRP
- Solvents: 0-100% HPLC
- pH: 0-14
- Mode: Ion-exchange (Na) and adsorption remove  $\text{Ca}^{2+}$  ( $\text{Na}^+$ ) and lipids (HRP) from dairy

### Dionex InGuard Na/HRP

Description	Cat. No.	Quantity
Dionex InGuard Na/HRP	<b>074035</b>	4 Pack

# innovation



## Vials and Closures

Our portfolio includes over 800 Thermo Scientific vials and closures products designed for any instrument and any application. Our pages have been arranged by product line and vial size, allowing you to quickly find the most appropriate products for your lab.



## Section Contents

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## Featured Products



### MS Certified Vials

Unmatched consistency for the most sensitive applications

**>> PAGE 2-002**



### Micro Sampling Vials

World's broadest portfolio of reduced volume sampling options



### Tools and Accessories

A comprehensive range of accessories

## MS Certified Vials

Pre-cleaned, low particle, low background chromatography vial for every high sensitivity application

- Testing process ensures integrity of 15 critical physical characteristics
- Unique pre-cleaned vials packaging and airtight, re-sealable closure containers
- Background scans by LC/MS, GC/MS and particle counts provided
- Unmatched consistency for sample protection, testing efficiency and reliable results
- Certificate of Conformance included in every pack
- Bonded caps to prevent septa push-through
- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- Fixed insert or conical base vials for limited volume sampling



### Low Particle Background

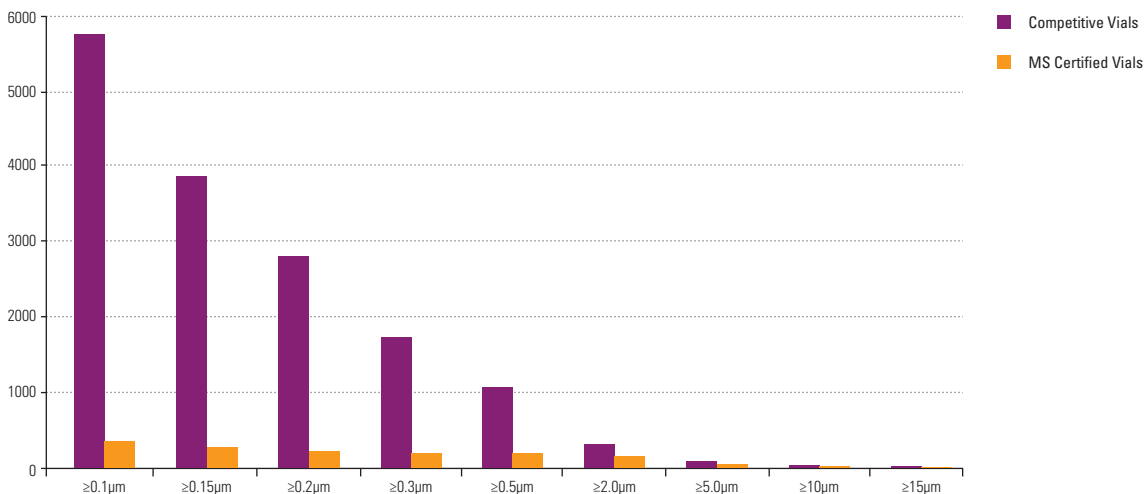
Thermo Scientific MS Certified Vials undergo a proprietary cleaning process that greatly reduces the background particulates and their potential affect on high sensitivity chromatography.

A typical vial that has not been processed can exhibit particle counts exceeding 5000 particles per mL with the highest counts occurring in the range below 0.5µm.

GC techniques employing on-column injection create the need for a sample vial with minimal background particulates to prevent an accumulation of foreign material at the head of the column than might adversely affect a separation. Similarly newer techniques employing finely packed HPLC columns, capillary columns and direct connection of the analytical column to the sample valve also

require the elimination of as much particulate matter as possible from the sample stream. The scheme below gives a comparison of the particle distribution obtained from an analysis of standard vials versus the Thermo Scientific MS Certified Vials. All vials are processed and tested for background particulates. The processed vial shows a significant reduction in total particle counts.

Typical Cumulative Particle Counts



Search thousands of applications at our chromatography resource center.

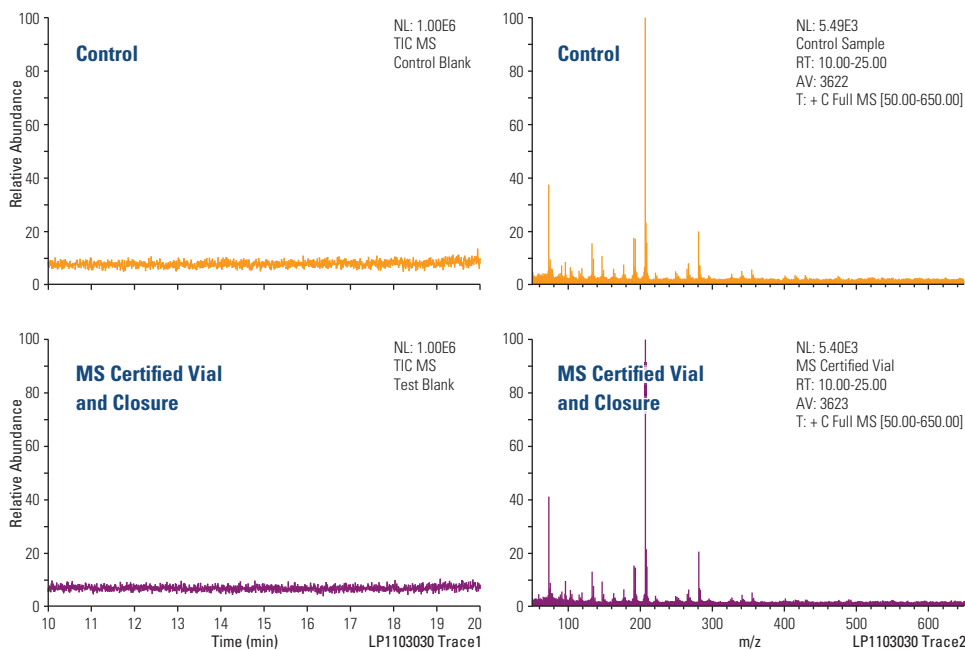
[www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)



### Low GC/MS Background

A portion of the vial extracts prepared for LC/MS analysis were taken for analysis by GC/MS. A typical GC/MS scan is shown in figure 1 below with bank solvent in the upper scan and the vial extract shown in the lower scan.

**Figure 1 GC/MS chromatograms and spectra**



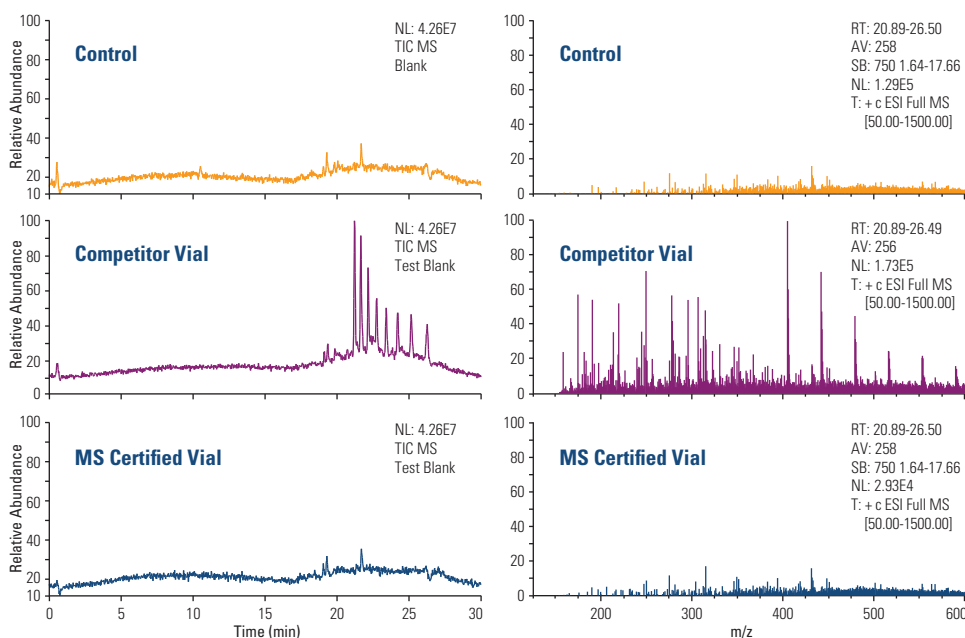
### GC conditions

- Instrument: Thermo Scientific DSQII GC/MS with Triplus AS autosampler
- Software: Xcalibur 2.0.7
- Column: TRACEGOLD TG-5MS, 30m x 0.25mm x 0.25µm
- Carrier gas: Helium
- Flow rate: 1.2mL/min
- Oven program: 40°C, hold for 0.5min; 15°C to 150°C, hold for 1min; 10°C to 290°C, hold for 5 min
- Inlet temperature: 250°C; Split flow: 50mL/min
- Injection vol.: 1µL splitless
- MS transfer line: 290°C
- MS ion source: 230°C
- MS detection: Positive EI; Full scan 50 to 650m/z

### Low LC/MS Background

Figures 2 show the LC/MS analysis of a control, a competitor vial + closure and a MS Certified vial + closure. The LC/MS chromatograms for the control and the MS Certified Vials are very similar, suggesting that there is minimal interference from the vial + closure. However, the Total Ion Chromatogram (TIC) obtained for the competitor vial shows a substantial amount of contamination.

**Figure 2**



### Methods:

Vials and closures were exposed to acetonitrile for 2 hours and subsequently analysed by LC/UV, LC/MS and GC/MS to characterise the interferences. Comparisons were made between pre-cleaned MS Certified vials and closures, a control and a competitor vial and closure set.

## MS Certified Vials Kits

### Unassembled and Assembled Vial Kits

Kit Type	Glass	Patched	Cap Color	Septum	Cat. No.	Pack of
Convenience Kit, 9mm 200µL Fused Insert Screw Vial	Clear	Yes	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-30LVW</b>	100
Convenience Kit, 9mm 350µL Fused Insert Screw Vial	Clear	Yes	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-31LVW</b>	100
Convenience Kit, 9mm Wide Opening 1.7mL High Recovery Screw Vial with 30µL Reservoir	Clear	No	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-32</b>	100
Convenience Kit, 9mm Wide Opening 1.5mL Total Recovery Screw Vial with 10µL Reservoir	Clear	No	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-33TR</b>	100
Convenience Kit, 9mm Wide Opening Screw Vial, 2mL	Clear	Yes	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-34W</b>	100
	Amber	Yes	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-35W</b>	100
Convenience Kit, 9mm 200µL Fused Insert Screw Vial	Clear	Yes	Gray	Bonded Clear PTFE/Clear Silicone, Pre-slit	<b>MSCERT4000-36LVW</b>	100
Convenience Kit, 9mm 350µL Fused Insert Screw Vial	Clear	Yes	Gray	Bonded Clear PTFE/Clear Silicone, Pre-slit	<b>MSCERT4000-37LVW</b>	100
Convenience Kit, 9mm Wide Opening 1.7mL High Recovery Screw Vial with 30µL Reservoir	Clear	No	Gray	Bonded Clear PTFE/Clear Silicone, Pre-slit	<b>MSCERT4000-38</b>	100
Convenience Kit, 9mm Wide Opening 1.5mL Total Recovery Screw Vial with 10µL Reservoir	Clear	No	Gray	Bonded Clear PTFE/Clear Silicone, Pre-slit	<b>MSCERT4000-39TR</b>	100
Convenience Kit, 9mm Wide Opening Screw Vial, 2mL	Clear	Yes	Gray	Bonded Clear PTFE/Clear Silicone, Pre-slit	<b>MSCERT4000-40W</b>	100
	Amber	Yes	Gray	Bonded Clear PTFE/Clear Silicone, Pre-slit	<b>MSCERT4000-41W</b>	100
Convenience Kit, 9mm Wide Opening Screw Vial, 2mL, silanized	Clear	Yes	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-S34W</b>	100
	Amber	Yes	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-S35W</b>	100
	Clear	Yes	Gray	Bonded Clear PTFE/Clear Silicone, Pre-slit	<b>MSCERT4000-S40W</b>	100
	Amber	Yes	Gray	Bonded Clear PTFE/Clear Silicone, Pre-slit	<b>MSCERT4000-S41W</b>	100
Convenience Kit, 11mm Snap Top Vial, 2mL	Clear	Yes	Black	Clear PTFE/Clear Silicone	<b>MSCERT4011-73W</b>	100
	Clear	Yes	Red	Clear PTFE/Clear Silicone, Pre-slit	<b>MSCERT4011-74W</b>	100
Assembled Kit, 9mm Wide Opening Screw Vial, 2mL	Clear	Yes	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-134W</b>	100
	Amber	Yes	Blue	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4000-135W</b>	100
Assembled Kit, 13-425 Screw Vial, 4mL	Clear	Yes	Black	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4015-135W</b>	100
	Amber	Yes	Black	Bonded Clear PTFE/Clear Silicone	<b>MSCERT4015-136W</b>	100





# Thermo Scientific Premium Vials and Closures

Our comprehensive range of vials and closures offers you the assurance of uninterrupted productivity, separation after separation

- The first choice for Thermo Scientific Chromatography and Mass Spectrometry Instruments
- Assured quality
- Guaranteed fit
- Extensively tested on Thermo Scientific instruments

## 8mm Crimp Top Vials and Closures

- Conical Thermo Scientific 8mm Crimp Vials sometimes need an adapter for certain autosampler and cannot stand alone
- Superior quality borosilicate clear (Type 1, Class A), meets all requirements of Pharm. US, EU, JPN
- Aluminum Crimp Seals with Prefitted Septa for 8mm Crimp Top Vials
- Pre-assembled caps and septa are convenient and minimize contamination from handling



### 8mm Crimp Top Vials

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (µL)	Usable Volume (µL)	Residual (µL)	Cat. No.	Pack of
1mL Crimp Top Tapered Vial	Clear	No	8x40	Conical Base	1180	1000	<5	<b>60180-500</b>	100

### 8mm Crimp Top Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
8mm Crimp Cap, 4mm centre hole	Blue	Aluminum	Blue Silicone/Red PTFE	20	1.4	<b>60180-525</b>	100

For autosampler compatibility look on pages **2-100 to 2-104**

## 8mm Crimping and Decrimping Tools

- Crimping tools provide a reproducible, secure vial closure
- Easy and convenient handling
- High quality construction for durability and long life
- Painted, plated and coated for maximum corrosion resistance
- Textured handle surface provides an assured grip



Items not shown to scale

### 8mm Crimping and Decrimping Tools

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 8mm aluminum crimp seals	<b>C4008-100</b>	1
Decapping Pliers	Removes 8mm aluminum crimp seals, Protective gloves recommended	<b>C4008-101</b>	1
Manual Decrimper	Removes 8mm aluminum crimp seals without vial damage	<b>C4008-102</b>	1

For electronic crimpers look on page **2-094**

## 8mm Screw Vials and Closures

8-425 thread finish, Standard Opening, 2mL, 12x32mm

- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass, meets all requirements of Pharm. US, EU, JPN
- Open top caps are designed to be used with any of our 8mm septa
- Polypropylene caps are chemically inert and suitable for most chromatography applications
- Flanged caps are particularly suitable for many Japanese autosamplers
- Pre-assembled caps and septa are convenient and minimize contamination from handling



### Recommended for the following instruments:

- Thermo Scientific Accella
- Thermo Scientific Surveyor LC autosampler
- Beckman
- CTC
- Gilson
- Knauer
- Shimadzu
- Spark
- Varian
- VWR (Merck)/Hitachi

For autosampler compatibility look on pages **2-100 to 2-104**

### 8mm, 2mL, 12x32mm Standard Opening Screw Thread Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (mL)	Usable Volume (mL)	Residual (µL)	Cat. No.	Pack of
8-425 Screw Thread Vial	Clear	Yes	12x32	Flat Bottom	2.0	1.5	<170	<b>60180-508</b>	100
	Amber	Yes	12x32	Flat Bottom	2.0	1.5	<170	<b>60180-560</b>	100

### 8-425 Screw Thread Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
8mm Open Top Screw Cap, 8-425 thread, 5.5mm hole	Black	Polypropylene	–	–	–	<b>60180-514</b>	100
8mm Open Top Screw Cap, flanged, 8-425 thread, 5.5mm hole	Pink	Polypropylene	–	–	–	<b>60180-660</b>	100
8mm Open Top Screw Cap, 8-425 thread, 5.5mm hole	Pink	Polypropylene	–	–	–	<b>60180-664</b>	100
8mm Seal Silicone/PTFE	–	–	Blue Silicone/PTFE	30	1.1	<b>60180-515</b>	500
	–	–	White Silicone/Red PTFE	50	1.5	<b>60180-562</b>	100
8mm Open Top Screw Cap with flange, 8-425 thread, 5.5mm hole	Pink	Polypropylene	Red PTFE/White Silicone	45	1.3	<b>60180-661</b>	100
	Pink	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	0.9	<b>60180-662</b>	100
	Pink	Polypropylene	Red PTFE/White Silicone, Pre-slit	55	1.0	<b>60180-663</b>	100
8mm Open Top Screw Cap, 8-425 thread, 5.5mm hole	Pink	Polypropylene	Ivory PTFE/Red Rubber	45	1.0	<b>60180-665</b>	100
	Pink	Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>60180-666</b>	100
	Pink	Polypropylene	Red PTFE/White Silicone	45	1.3	<b>60180-667</b>	100

For 8mm screw vial convenience kits look on page **2-008**



## 8mm Standard Opening Screw Thread Vial Convenience Kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Caps feature pre-inserted septa for added convenience during sample preparation

### 8mm Standard Opening Screw Thread Vial Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap/Septum Cat.No.	Cat. No.	Pack of
Convenience Kit, Standard	Clear	Yes	Black	Blue Silicone/PTFE	60180-508	60180-514/60180-515	<b>60180-596</b>	1000
Opening Screw Vial	Clear	Yes	Black	Red PTFE/White Silicone	60180-508	60180-514/60180-562	<b>60180-600</b>	100

## 9mm Wide Opening Screw Thread Vials and Closures

- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass, meets all requirements of Pharm. US, EU, JPN
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts
- Easy-on, easy-off convenience with just one turn
- Caps with bonded septa resist dislodging during injection when using large diameter blunt needles
- Closures have the profile of a crimp or snap closure for compatibility with robotic autosamplers

### Compatible with:

- Thermo Scientific Trace GC
- Thermo Scientific Triplus
- Most other HPLC and GC autosamplers

For autosampler compatibility look on pages **2-100 to 2-104**



\* This vial fits Thermo Scientific AS 3000 and Triplus only

### 9mm Wide Opening Screw Thread Vials

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (mL)	Usable Volume (mL)	Residual (µL)	Cat. No.	Pack of
9mm Screw Thread Micro+™ Vial 300µL, Fused Insert	Clear	Yes	12x32	Insert Vial	0.3	250µL	<3	<b>60180-507</b>	100
9mm Screw Thread Vial	Clear	Yes	12x32	Flat Bottom	2.0	1.5	<170	<b>60180-509</b>	100
	Clear	No	12x32	Flat Bottom	2.0	1.5	<170	<b>60180-723</b>	1000
	Amber	Yes	12x32	Flat Bottom	2.0	1.5	<170	<b>60180-561</b>	100
	Amber	No	12x32	Flat Bottom	2.0	1.5	<170	<b>60180-724</b>	1000
	Clear	No	15x46	Flat Bottom	4.0	3.5	<500	<b>60180-510</b>	125



### 9mm Short Screw Thread Vial Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
9mm Open Top Short Screw Cap, 6mm hole	Blue	Polypropylene	Clear PTFE/Blue Silicone	30	1.0	<b>60180-516</b>	100
	Blue	Polypropylene	Red PTFE/White Silicone	55	1.0	<b>60180-729</b>	1000
	Blue	Polypropylene	Ivory PTFE/Red Rubber	45	1.0	<b>60180-728</b>	1000
	Pink	Polypropylene	Red PTFE/White Silicone	55	1.0	<b>60180-671</b>	100
	Pink	Polypropylene	Ivory PTFE/Red Rubber	45	1.0	<b>60180-669</b>	100
	Pink	Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>60180-670</b>	100
	Pink	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>60180-672</b>	100
	Pink	Polypropylene	Bonded Natural PTFE/Clear Silicone	45	1.2	<b>60180-673</b>	100
	Pink	Polypropylene	Bonded Natural PTFE/Clear Silicone, Pre-slit	45	1.2	<b>60180-674</b>	100

### 9mm Convenience Kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Caps feature pre-inserted septa for added convenience during sample preparation



Items not shown to scale

### 9mm Wide Opening Screw Thread Vials Convenience Kits

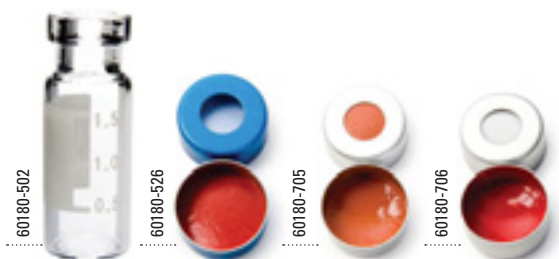
Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, Wide Open Short Screw Vial	Clear	Yes	Blue	Blue Silicone/PTFE	60180-509	60180-516	<b>60180-599</b>	100
	Clear	Yes	Pink	Ivory PTFE/Red Rubber	60180-723	60180-669	<b>60180-693</b>	100
	Clear	Yes	Pink	Red PTFE/White Silicone	60180-723	60180-671	<b>60180-694</b>	100
	Clear	Yes	Pink	Bonded Natural PTFE/White silicone	60180-723	60180-673	<b>60180-695</b>	100
	Clear	Yes	Pink	Bonded Natural PTFE/White silicone, Pre-slit	60180-723	60180-674	<b>60180-696</b>	100
	Amber	No	Pink	Ivory PTFE/Red Rubber	60180-724	60180-669	<b>60180-697</b>	100
	Amber	No	Pink	Red PTFE/White Silicone	60180-724	60180-671	<b>60180-698</b>	100
	Amber	No	Pink	Bonded Natural PTFE/White silicone	60180-724	60180-673	<b>60180-699</b>	100
	Amber	No	Pink	Bonded Natural PTFE/White silicone, Pre-slit	60180-724	60180-674	<b>60180-700</b>	100

## 11mm Crimp Top Vials, Wide Neck, 2mL, 12x32mm and Closures

- Superior quality 33 expansion borosilicate clear (Type 1, Class A) meets all requirements of Pharm. US, EU, JPN
- Aluminum Crimp Seals with Prefitted Septa for all 11mm Crimp Top and Snap Cap Vials
- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Aluminum seals must be applied with a crimping tool

### Compatible with:

Most HPLC and GC autosamplers  
For autosampler compatibility look on pages **2-100 to 2-104**



### 11mm Wide Opening Crimp Top Vials, 2mL, 12x32mm

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (mL)	Usable Volume (mL)	Residual (µL)	Cat. No.	Pack of
11mm Crimp Top Vial, Wide Opening	Clear	Yes	12x32	Flat Bottom	2.0	1.5	<170	<b>60180-502</b>	100

### 11mm Crimp Top Vial Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
11mm Crimp Cap, 6mm centre hole	Blue	Aluminum	Blue Silicone/Red PTFE	20	1.4	<b>60180-526</b>	100
11mm Crimp Cap, 5.5mm centre hole	Silver	Aluminum	Clear PTFE/Rubber	60	1.0	<b>60180-705</b>	1000
	Silver	Aluminum	Red PTFE/White Silicone	45	1.3	<b>60180-706</b>	1000

## 11mm Crimp Top Convenience Kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Caps feature pre-inserted septa for added convenience during sample preparation

### 11mm Crimp Top Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, Wide Opening Crimp Top Vial	Clear	Yes	Blue	Blue Silicone/Red PTFE	60180-502	60180-526	<b>60180-597</b>	100
	Clear	Yes	Silver	White Silicone/Red PTFE	60180-502	60180-706	<b>60180-598</b>	100

### 11mm Crimping and Decrimping tools

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 11mm aluminum crimp seals	<b>60180-543</b>	1
11mm Manual Crimper Crimpmate System	Attaches 11mm aluminum crimp seals	<b>60180-549</b>	1

We offer electronic crimping options

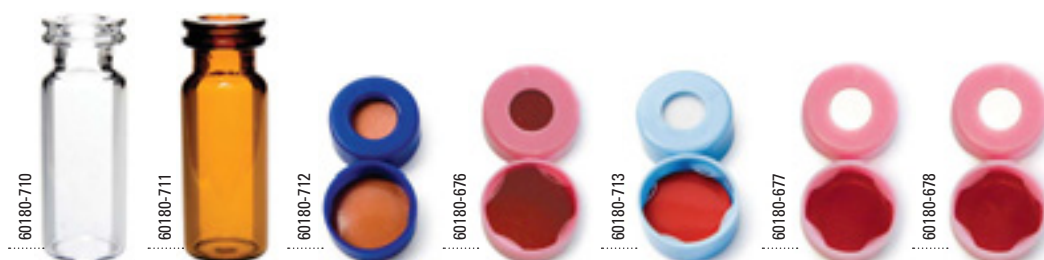
➤ Visit **PAGE 2-094**

## 11mm Snap Cap Vials, Wide Opening, 2mL, 12x32mm and Closures

- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass, meets all requirements of Pharm. US, EU, JPN
- Crimp/Snap vials can be used with snap caps or aluminum crimp seal closures
- Snap Caps eliminate the need for crimping or de-capping tools
- Polyethylene caps are chemically inert and suitable for most chromatography applications

### Compatible with:

Most HPLC and GC autosamplers  
For autosampler compatibility look on pages **2-100 to 2-104**



### 11mm Snap Cap Vials, Wide Opening, 2mL, 12x32mm

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (mL)	Usable Volume (mL)	Residual (µL)	Cat. No.	Pack of
11mm Crimp/Snap Vial	Clear	No	12x32	Flat Bottom	2	1.5	<170	<b>60180-710</b>	1000
	Amber	No	12x32	Flat Bottom	2	1.5	<170	<b>60180-711</b>	1000

### 11mm Snap Cap Vial Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
11mm Snap Cap, 6mm hole	Blue	Polyethylene	Clear PTFE/Synthetic Red Rubber	60	1.0	<b>60180-712</b>	1000
	Pink	Polyethylene	Clear PTFE/Synthetic Red Rubber	60	1.0	<b>60180-676</b>	100
	Blue	Polyethylene	Red PTFE/White Silicone	45	1.3	<b>60180-713</b>	1000
	Pink	Polyethylene	Red PTFE/White Silicone	45	1.3	<b>60180-677</b>	100
	Pink	Polyethylene	Red PTFE/White Silicone, Star-slit	45	1.3	<b>60180-678</b>	100

## 11mm Wide Opening Snap Cap Convenience Kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Caps feature pre-inserted septa for added convenience during sample preparation

### 11mm Snap Cap Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, Wide Opening Snap Cap Vial	Clear	No	Pink	Clear PTFE/Red Rubber	60180-710	60180-676	<b>60180-679</b>	100
	Clear	No	Pink	Red PTFE/White Silicone	60180-710	60180-677	<b>60180-680</b>	100
	Clear	No	Pink	Red PTFE/White Silicone, Star-slit	60180-710	60180-678	<b>60180-681</b>	100

## 20mm Headspace Crimp Top Vials and Closures

- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass, meets all requirements of Pharm. US, EU, JPN



### Applications:

Recommended for operation of Thermo Scientific Triplus HS Autosampler.

Clear glass vials with 20mm crimp seal finish are designed to fit most headspace autosamplers.

For autosampler compatibility look on pages **2-100 to 2-104**

Images shown are 70% to scale

### 20mm Crimp Top Headspace Vials

Description	Glass	Patched	Dimension (mm)	Finish	Profile	Total Volume (mL)	Usable Volume (mL)	Cat. No.	Pack of
20mm Headspace Crimp Vial	Clear	Yes	22.5x45	Beveled Edge	Round Bottom	12	10	<b>60180-504</b>	125
	Clear	No	22.5x45	Beveled Edge	Round Bottom	12	10	<b>60180-740</b>	1000
	Amber	No	22.5x45	Beveled Edge	Round Bottom	12	10	<b>60180-505</b>	125
	Clear	Yes	22.5x75	Beveled Edge	Round Bottom	21	20	<b>60180-506</b>	125
	Clear	No	22.5x75	Beveled Edge	Round Bottom	21	20	<b>60180-741</b>	1000



Images shown are 70% to scale

### 20mm Crimp Top Vial Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
20mm Crimp Cap, 9.5mm hole	Silver	Aluminum	–	–	–	<b>60180-512</b>	100
20mm Composite Magnetic Crimp Cap, 8mm hole	Blue	Alu/Tinplate	–	–	–	<b>60180-519</b>	100
Stopper for 20mm Crimp Caps	–	–	20mm Gray Butyl Stopper	37	3.0	<b>60180-744</b>	1000
Septum for 20mm Crimp Caps	–	–	PTFE/Rubber Seal 20mm	50	3.0	<b>60180-745</b>	1000
	–	–	Natural PTFE/Blue Silicone	45	3.2	<b>60180-521</b>	100
20mm Crimp Cap, 8mm hole	Silver	Aluminum	20mm Gray Chlorobutyl/Gray PTFE	52	3.0	<b>60180-513</b>	100
20mm Crimp Cap, 9.5mm hole	Silver	Aluminum	Natural PTFE/Blue Silicone	45	3.2	<b>60180-511</b>	100
20mm Composite Magnetic Crimp Cap, 8mm hole	Blue	Alu/Tinplate	Natural PTFE/Blue Silicone	45	3.2	<b>60180-520</b>	100

### 20mm Crimping and Decrimping tools

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 20mm crimp seals	<b>60180-544</b>	1
Manual Crimper Crimpmate	Attaches 20mm crimp seals	<b>60180-550</b>	1
Manual Decrimper	Removes 20mm crimp seals without vial damage	<b>60180-557</b>	1

For electronic crimpers and decappers look on page **2-094**



# Thermo Scientific National Vials and Closures

More laboratory professionals look to Thermo Scientific National products to meet their critical sampling needs than any other company

- Comprehensive instrument compatibility, "correct fit"
- The industry's widest selection of vials and closures for every application, from economical to high end products
- Innovative products for challenging applications
- Quality products in glass (type 33 glass for clear vials), closures and septa
- Certified and Mass Spec Certified Vial Kits
- The leading manufacturer of vials and closures in North America since 1986
- In-house product development team
- Leading company in convenience and assembled kits

## National Certified Vials and Closures Convenience Kits

- National Certified Vial Kits are fully lot-tested including HPLC and GC analysis for 15 critical parameters
- Certificate of Conformance included in every pack
- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- Fixed insert or conical base vials for limited volume sampling

### Unassembled kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Reusable two compartment trays protect vials and closures while keeping matching supplies together
- Clear trays make it easy to keep track of available supplies without opening containers

### Assembled kits

- Include 100 vials with pre-attached caps and septa
- Packaged in convenient vial trays with clear covers



### National Certified Vial and Closure Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, Certified 9mm Wide Opening Screw Vial, 2mL	Clear	No	Blue	Ivory PTFE/Red Rubber	C4000-1	C4000-51B	<b>CERT4000-80</b>	100
	Clear	Yes	Blue	Ivory PTFE/Red Rubber	C4000-1W	C4000-51B	<b>CERT4000-80W</b>	100
	Amber	Yes	Blue	Ivory PTFE/Red Rubber	C4000-2W	C4000-51B	<b>CERT4000-82W</b>	100
	Clear	Yes	Blue	Red PTFE/White Silicone	C4000-1W	C4000-54B	<b>CERT4000-92W</b>	100
Convenience Kit, Certified 9mm Wide Opening High Recovery Screw Vial, 1.7mL	Clear	No	Black	Bonded Red PTFE/White Silicone	C4000-9	C4000-64B	<b>CERT4000-992</b>	100
Convenience Kit, Certified 9mm Wide Opening Screw Vial, 2mL	Clear	Yes	Black	Bonded Red PTFE/White Silicone	C4000-1W	C4000-64B	<b>CERT4000-78W</b>	100
	Amber	Yes	Black	Bonded Red PTFE/White Silicone	C4000-2W	C4000-64B	<b>CERT4000-75W</b>	100
Convenience Kit, Certified 9mm Wide Opening Precision Taper Screw Vial, 1mL	Clear	No	Black	Bonded Red PTFE/White Silicone	C4000-1PT	C4000-64B	<b>CERT4000-98PT</b>	100
Convenience Kit, Certified 9mm Screw Vial, 350µL Fused Insert	Clear	Yes	Black	Bonded Red PTFE/White Silicone	C4000-LV1W	C4000-64B	<b>CERT4000-69LV</b>	100
	Amber	Yes	Black	Bonded Red PTFE/White Silicone	C4000-LV2W	C4000-64B	<b>CERT4000-72LV</b>	100
Convenience Kit, Certified 10-425 Screw Vial, 2mL	Clear	No	Black	Bonded Red PTFE/White Silicone	C4010-1	C4010-68A	<b>CERT4010-91</b>	100
Convenience Kit, Certified 13-425 Screw Vial, 4mL	Clear	No	Black	Bonded Red PTFE/White Silicone	C4015-1	C4015-67A	<b>CERT4015-83</b>	100
Convenience Kit, Certified 9mm Wide Opening High Recovery Screw Vial, 1.7mL	Clear	No	Gray	Bonded Red PTFE/White Silicone, Pre-slit	C4000-9	C4000-75C	<b>CERT4000-79</b>	100
Convenience Kit, Certified 9mm Wide Opening Screw Vial, 2mL	Clear	Yes	Gray	Bonded Red PTFE/White Silicone, Pre-slit	C4000-1W	C4000-75C	<b>CERT4000-93W</b>	100
	Amber	Yes	Gray	Bonded Red PTFE/White Silicone, Pre-slit	C4000-2W	C4000-75C	<b>CERT4000-76W</b>	100
Convenience Kit, Certified 9mm Wide Opening Total Recovery Screw Vial, w/10µL Reservoir	Clear	No	Gray	Bonded Red PTFE/White Silicone, Pre-slit	C4000-9TR	C4000-75C	<b>CERT4000-993</b>	100
Convenience Kit, Certified Shell Vial 1mL with SepCap	Clear	No	Natural	Integral Molded Polyethylene	–	–	<b>CERT4015-96</b>	200
Assembled Kit, Certified Crimp Top Vial, 2mL	Clear	Yes	Silver	PTFE/Synthetic Red Rubber	C4011-1W	–	<b>CERT4011-89W</b>	100
Assembled Kit, Certified 9mm Wide Opening Screw Vial, 2mL	Amber	Yes	Black	Bonded Red PTFE/White Silicone	C4000-2W	C4000-64B	<b>CERT4000-175W</b>	100
	Clear	Yes	Gray	Bonded Red PTFE/White Silicone	C4000-1W	C4000-75C	<b>CERT4000-193W</b>	100
	Amber	Yes	Gray	White Silicone, Pre-slit	C4000-2W	C4000-75C	<b>CERT4000-176W</b>	100

### National 8mm Crimp Top Vials

- Superior quality type 1 borosilicate and amber glass. Conical and Round Bottom 8mm Crimp Vials sometimes need an adapter for certain autosampler and cannot stand alone.

#### Recommended for the following instruments:

- Thermo Scientific
- Agilent
- Beckman
- Carlo Erba
- CTC
- Fisons
- PerkinElmer
- Shimadzu
- VWR (Merck)/Hitachi

For autosampler compatibility look on pages **2-100 to 2-104**



#### National 8mm Crimp Top Vials

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (µL)	Usable Volume (µL)	Residual (µL)	Cat. No.	Pack of
8mm Crimp Top Vial	Clear	No	6x32	Round Base	325	250	<6	<b>C4008-632R</b>	100
	Clear	No	6x32	Conical Base	250	200	<2	<b>C4008-632C</b>	100
	Amber	No	7x30	Conical Base	550	400	<3	<b>C4008-730</b>	100
	Clear	No	7x40	Conical Base	575	450	<2	<b>C4008-739</b>	100
	Amber	No	7x40	Conical Base	575	450	<2	<b>C4008-740</b>	100
	Clear	No	7x40	Flat Base	775	650	<70	<b>C4008-741</b>	100
	Amber	No	7x40	Flat Base	775	650	<70	<b>C4008-742</b>	100
	Clear	No	8x30	Flat Base	800	800	<80	<b>C4008-1</b>	200



## National 8mm Top Crimp Closures

- Aluminum crimp seals with prefitted septa
- Provide a secure leak-resistant seal
- Pre-assembled caps and septa are convenient and minimize contamination from handling



### National 8mm Crimp Top Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
8mm Crimp Cap, 4mm centre hole	Silver	Aluminum	Clear PTFE/Red Rubber	45	1.0	<b>C4008-1A</b>	200
	Silver	Aluminum	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4008-2A</b>	200
	Silver	Aluminum	Red PTFE/White Silicone	45	1.3	<b>C4008-4A</b>	200

## National 8mm Crimping and Decrimping Tools

- Crimping tools provide a reproducible, secure vial closure
- Easy and convenient handling
- High quality construction for durability and long life
- Painted, plated and coated for maximum corrosion resistance
- Textured handle surface provides an assured grip



Items not shown to scale

### National 8mm Crimping and Decrimping Tools

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 8mm aluminum crimp seals	<b>C4008-100</b>	1
Decapping Pliers	Removes 8mm aluminum crimp seals, Protective gloves recommended	<b>C4008-101</b>	1
Manual Decrimper	Removes 8mm aluminum crimp seals without vial damage	<b>C4008-102</b>	1

We offer electronic crimping options

Visit **PAGE 2-094**

## National Standard Opening Screw Thread Vials

2mL, 12x32mm, 8mm Standard Opening Screw Thread Vials and Inserts

- 8-425 thread finish
- I-D vials feature a write-on patch with graduation for convenient sample identification
- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts
- Available silanized (deactivated) for optimal recovery of critical polar, labile or OH-interacting compounds\*
- Polyspring inserts are self-aligning and provide a cushion against needle contact
- Precision point insert minimizes residual sample loss
- Pulled point inserts are an economical choice for noncritical applications

### Recommended for the following instruments:

- Beckman
  - CTC
  - Gilson
  - Knauer
  - Shimadzu
  - Spark Holland
  - Varian
  - VWR (Merck)/Hitachi
- For autosampler compatibility look on pages **2-100 to 2-104**



### National Standard Opening Screw Thread Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
8-425 Screw Thread Vial	Clear	No	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4013-1</b>	100
	Clear	No	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4013-1500</b>	1000
	Clear	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4013-1W</b>	100
	Amber	No	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4013-2</b>	100
	Amber	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4013-2W</b>	100
8-425 Screw Thread 150µL MicroVial, Clear Solid Glass	Clear	No	12x32	Conical	400µL	200µL	<2	<b>C4013-12</b>	12
8-425 Screw Thread Vial, silanized*	Clear	No	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4013-S1</b>	100
8-425 Screw Thread 250µL Conical MicroVial	Polypropylene	No	12x32	Conical	475µL	250µL	<4	<b>C4013-11</b>	100
8-425 Screw Thread 600µL Tapered MicroVial	Polypropylene	No	12x32	High Recovery	850µL	675µL	<8	<b>C4013-13</b>	1000
200µL MicroSert Insert	Clear	–	5x31	Flat Bottom	250µL	200µL	<12	<b>C4012-465</b>	500
150µL Polyspring Insert	Clear	–	5x29	Pulled point	200µL	175µL	<1	<b>C4012-530</b>	100
150µL Insert	Clear	–	5x29	Pulled point	200µL	175µL	<3	<b>C4012-529</b>	100
125µL Polyspring Insert	Polypropylene	–	5x29	Precision point	175µL	125µL	<2	<b>C4012-530P</b>	100
150µL Polyspring Insert, silanized*	Clear	–	5x29	Pulled point	200µL	175µL	<1	<b>C4012-S530</b>	100

\* For information about silanized products see page **2-055**

## National Screw Thread Caps and Septa

- Open top caps are designed to be used with any of our 8mm septa
- Phenolic caps are suitable for autoclaving and low temperature applications
- Polypropylene caps are chemically inert and suitable for most chromatography applications
- Flanged caps are preferred for Shimadzu and Tosoh autosamplers
- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Caps with bonded septa resist dislodging during injection when using large diameter blunt needles
- Closures are shipped in sealed polybags to prevent contamination during transport



### National 8-425 Screw Thread Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
8mm Open Top Cap 5.5mm hole	Black	Polypropylene	–	–	–	<b>C4013-1A</b>	100
8mm Open Top Cap with flange, 5.5mm hole	Black	Polypropylene	–	–	–	<b>C4013-3A</b>	100
	White	Polypropylene	–	–	–	<b>C4013-98W*</b>	100
8mm Open Top Cap, 5.5mm hole	Pink	Polypropylene	–	–	–	<b>C4013-1P</b>	100
Septum for 8-425 Screw Caps	–	–	White Virgin PTFE, 0.01" Septum	53	0.25	<b>C4013-10</b>	1000
	–	–	Ivory PTFE/Red Rubber Septum	45	1.00	<b>C4013-30</b>	100
	–	–	Blue PTFE/White Silicone, Pre-slit Septum	55	0.90	<b>C4013-32</b>	100
	–	–	Red PTFE/White Silicone/ Red PTFE Septum	45	1.00	<b>C4013-40</b>	100
	–	–	Red PTFE/White Silicone Septum	45	1.30	<b>C4013-60</b>	100
	–	–	Tan PTFE/White Silicone Septum	45	1.50	<b>C4013-61</b>	1000
	8mm Open Top Cap, 5.5mm hole	Black	Polypropylene	Ivory PTFE/Red Rubber	45	1.00	<b>C4013-30A</b>
Pink		Polypropylene	Ivory PTFE/Red Rubber	45	1.00	<b>C4013-30P</b>	100
Black		Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.00	<b>C4013-40A</b>	100
Pink		Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.00	<b>C4013-40P</b>	100
Black		Polypropylene	Red PTFE/White Silicone	45	1.30	<b>C4013-60A</b>	100
Pink		Polypropylene	Red PTFE/White Silicone	45	1.30	<b>C4013-60P</b>	100
8mm Open Top Cap with flange, 5.5mm hole		Black	Polypropylene	Red PTFE/White Silicone	45	1.30	<b>C4013-63A</b>
	White	Polypropylene	Red PTFE/White Silicone	45	1.30	<b>C4013-63W</b>	100
	Pink	Polypropylene	Red PTFE/White Silicone	45	1.30	<b>C4013-63P</b>	100
	Black	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	0.90	<b>C4013-64A</b>	100
	White	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	0.90	<b>C4013-64W</b>	100
	Pink	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	0.90	<b>C4013-64P</b>	100
	8mm Open Top Cap, 5.5mm hole	Black	Phenolic Resin	Red PTFE/White Silicone	45	1.30	<b>C4013-74A</b>
8mm Open Top Cap with flange, 5.5mm hole	Black	Polypropylene	Red PTFE/White Silicone, Pre-slit	55	1.00	<b>C4013-77A</b>	100
	Pink	Polypropylene	Red PTFE/White Silicone, Pre-slit	55	1.00	<b>C4013-77P</b>	100
8mm Solid Top Cap, 8-425 thread	White	Polypropylene	PTFE/Foam Urethane Liner	–	1.30	<b>B7815-8</b>	100
8mm Open Top Cap, 5.5mm hole	Black	Polypropylene	Bonded Red PTFE/White Silicone, Pre-slit	45	1.30	<b>C4013-69A</b>	100

\* Additional colors on request

## National Standard Opening Screw Thread Vial Convenience Kits

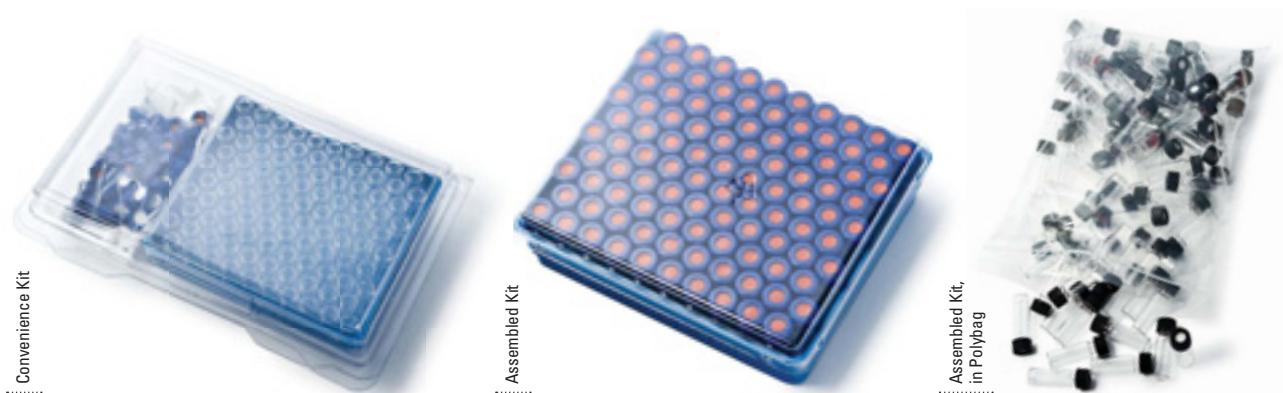
- Save time during sample preparation
- Reduce the risk of contamination

### Unassembled kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Reusable two compartment trays protect vials and closure while keeping matching supplies together
- Clear trays make it easy to keep track of available supplies without opening containers

### Assembled kits

- Include 100 vials with pre-attached caps and septa
- Packaged in convenient vial trays with clear covers or in economical polybags



Items not shown to scale

### National Standard Opening Screw Thread Vial Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap/Septum Cat.No.	Cat. No.	Pack of
Convenience Kit	Clear	No	Black, flanged	Red PTFE/White Silicone	C4013-1	C4013-63A	<b>C4013-14</b>	100
	Clear	No	Black	Red PTFE/White Silicone	C4013-1	C4013-60A	<b>C4013-15</b>	100
	Clear	No	Pink	Red PTFE/White Silicone	C4013-1	C4013-60P	<b>C4013-15P</b>	100
	Amber	No	Black	Red PTFE/White Silicone	C4013-2	C4013-60A	<b>C4013-17</b>	100
	Amber	No	Pink	Red PTFE/White Silicone	C4013-2	C4013-60P	<b>C4013-17P</b>	100
	Clear	Yes	Black, flanged	Red PTFE/White Silicone, Pre-slit	C4013-1W	C4013-77A	<b>C4013-95W</b>	100
	Clear	No	Black, phenolic	Red PTFE/White Silicone	C4013-1	C4013-74A	<b>C4013-492</b>	100
Assembled Kit	Clear	No	Black	White Virgin PTFE, 0.01"	C4013-1	C4013-1A/ C4013-10	<b>C4013-10A</b>	100
	Clear	No	Black	Red PTFE/White Silicone	C4013-1	C4013-60A	<b>C4013-15A</b>	100
	Amber	No	Black	Red PTFE/White Silicone	C4013-2	C4013-60A	<b>C4013-17A</b>	100
	Clear	No	Black, flanged	Blue PTFE/White Silicone, Pre-slit	C4013-1	C4013-3A/ C4013-32	<b>C4013-32A</b>	100
	Clear	Yes	Yellow, flanged	Red PTFE/White Silicone, Pre-slit	C4013-1W	C4013-98Y/ C4013-60TW	<b>C4013-36A</b>	100
	Clear	No	Black, flanged	Red PTFE/White Silicone	C4013-1	C4013-63A	<b>C4013-57</b>	100
	Clear	No	White, flanged	Red PTFE/White Silicone	C4013-1	C4013-63V	<b>C4013-58</b>	100
	Clear	No	Black, phenolic	Red PTFE/White Silicone	C4013-1	C4013-74A	<b>C4013-492A</b>	100
Assembled Kit, in Polybag	Clear	No	Black, phenolic	Red PTFE/White Silicone	C4013-2	C4013-74A	<b>C4013-494A</b>	100
				White Virgin PTFE, 0.01"	C4013-1	C4013-1A/ C4013-10	<b>C4013-010A</b>	100



## National Standard Opening Screw Thread Vial Storerooms

- Storerooms organize supplies and save valuable bench space
- Storerooms are shipped fully stocked
- 6 drawer mini-storeroom holds 500 vials and closures.
- 9 drawer full size storeroom holds 2000 vials and closures



C4075-380



C4000-MS



C4075-500

Items not shown to scale

### National Standard Opening Screw Thread Vial Storerooms

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap/Septum Cat.No.	Cat. No.	Pack of
Nine Drawer Storeroom, 2000 pieces Caps and Vials	Clear	No	Black, phenolic	Red PTFE/White Silicone	C4013-1	C4013-74A	<b>C4075-380</b>	1
Six Drawer Mini Storeroom – Cabinet Only	–	–	–	–	–	–	<b>C4000-MS</b>	1
Nine Drawer Storeroom, Full Size – Cabinet Only	–	–	–	–	–	–	<b>C4075-500</b>	1



## National Target DP 9mm Wide Opening Screw Thread Vials

2mL, 12x32mm, 9mm Wide Opening Short Screw Thread Vials and Inserts

**Recommended for most brands of autosamplers:**

For autosampler compatibility look on pages **2-100 to 2-104**

- Some vials feature an I-D write-on patch with graduation for convenient sample identification
- Wide neck opening design, allows easy filling, requires Micro-Inserts with a diameter of 6mm
- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts
- Available silanized (deactivated) for optimal recovery of critical polar, labile or OH-interacting compounds
- Polyspring inserts are self-aligning and provide a cushion against needle contact
- Precision point insert minimizes residual sample loss



**National Target DP 9mm Wide Opening Screw Thread Vials and Inserts**

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
9mm Target DP Vial	Clear	No	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-1</b>	100
	Clear	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-1W</b>	100
	Amber	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-2W</b>	100
	Amber PP	Graduated	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-12</b>	100
9mm Target DP ColorBand Vial	Clear	Blue**	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-1B</b>	100
	Clear	Green**	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-1G</b>	100
	Clear	Red**	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-1R</b>	100
	Clear	Yellow**	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-1Y</b>	100
9mm Target DP Vial, High Recovery with 30µL Reservoir	Clear	No	12x32	Tapered Base	1.7mL	1.3mL	<4	<b>C4000-9</b>	100
	Amber	No	12x32	Tapered Base	1.7mL	1.3mL	<4	<b>C4000-9A</b>	100
9mm Target DP Vial, Total Recovery with 10µL Reservoir	Clear	No	12x32	Deep Well Base	1.5mL	1.2mL	<1	<b>C4000-9TR</b>	100
9mm Target DP MacroVial 350µL, Fused Insert	Clear	No	12x32	Insert Vial	475µL	350µL	<2	<b>C4000-LV1</b>	100
	Clear	Yes	12x32	Insert Vial	475µL	350µL	<2	<b>C4000-LV1W</b>	100
	Amber	No	12x32	Insert Vial	475µL	350µL	<2	<b>C4000-LV2</b>	100
	Amber	Yes	12x32	Insert Vial	475µL	350µL	<2	<b>C4000-LV2W</b>	100
9mm Target DP MacroVial 200µL, Fused Insert	Clear	Yes	12x32	Insert Vial	375µL	240µL	<1	<b>C4000-LV3W</b>	100
9mm Target DP Micro-V Tapered MicroVial with 150µL reservoir	Clear	No	12x32	Tapered Base	1.4mL	1.0mL	<4	<b>C4000-V1</b>	100
	Amber	No	12x32	Tapered Base	1.4mL	1.0mL	<4	<b>C4000-V2</b>	100
9mm Target DP Vial, silanized*	Clear	No	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-S1</b>	100
	Clear	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-S1W</b>	100
	Amber	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4000-S2W</b>	100
9mm Target DP High Recovery Vial, silanized*, with 30µL Reservoir	Clear	No	12x32	Tapered Base	1.7mL	1.3mL	<4	<b>C4000-S9</b>	100
9mm Target DP 300µL Target DP Vial	Polypropylene	No	12x32	Conical	400µL	300µL	<2	<b>C4000-11</b>	100
350µL Insert	Clear	–	6x31	Pulled Point	400µL	350µL	<4	<b>C4010-627L</b>	100
300µL Insert	Clear	–	6x30	Pulled Point	375µL	300µL	<4	<b>C4010-629</b>	100
350µL Insert	Clear	–	6x31	Precision Point	400µL	350µL	<2	<b>C4010-629L</b>	100
300µL Insert, Graduation Marks	Polypropylene	–	6x30	Conical	325µL	250µL	<2	<b>C4010-629P</b>	100
300µL Polyspring Insert	Clear	–	6x31	Conical	375µL	300µL	<1	<b>C4010-630</b>	100
	Polypropylene	–	6x30	Conical	325µL	250µL	<2	<b>C4010-630P</b>	100
400µL MicroSert Insert	Clear	–	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-631</b>	500
	Polypropylene	–	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-631P</b>	500
300µL Insert, silanized*	Clear	–	6x31	Pulled Point	375µL	300µL	<4	<b>C4010-S629</b>	100
300µL Polyspring Insert, silanized*	Clear	–	6x29	Conical	375µL	300µL	<1	<b>C4010-S630</b>	100
400µL MicroSert Insert, silanized*	Clear	–	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-S631</b>	500
300µL Polyspring Insert, Kimshield*	Clear	–	6X29	Conical	375µL	300µL	<1	<b>C4010-K630</b>	100

\* For information about silanized products see page **2-055**

\*\*Target DP ColorBand vials are designed to provide full sample color coding for autosamplers with optical vial detection. Use the optimum cap for your instrument without sacrificing your color coding scheme.



## National 9mm Screw Caps and Septa

- Fully compatible with all National Target DP vials
- Easy-on, easy-off convenience with just one turn
- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Polypropylene caps are chemically inert and suitable for most chromatography applications
- Closures have the profile of a crimp or snap closure for compatibility with robotic autosamplers
- Closures are shipped in sealed polybags to prevent contamination during transport



### National 9mm Screw Thread Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
9mm Open Top Cap, 6 mm hole	Blue	Polypropylene	–	N/A	N/A	<b>C4000-98B</b>	100
	Pink	Polypropylene	–	N/A	N/A	<b>C4000-98P</b>	100
Septum for 9mm Cap	–	–	Ivory PTFE/Red Rubber	35	1.0	<b>C4000-30</b>	100
	–	–	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4000-40</b>	100
	–	–	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4000-55</b>	100
	–	–	Red PTFE/White Silicone	50	1.0	<b>C4000-60</b>	100



**National 9mm Screw Thread Caps and Septa (Continued)**

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
9mm Open Top Cap, 6mm hole	Black	Polypropylene	Ivory PTFE/Red Rubber	35	1.0	<b>C4000-51A</b>	100
	Blue	Polypropylene	Ivory PTFE/Red Rubber	35	1.0	<b>C4000-51B</b>	100
	Green	Polypropylene	Ivory PTFE/Red Rubber	35	1.0	<b>C4000-51G</b>	100
	Red	Polypropylene	Ivory PTFE/Red Rubber	35	1.0	<b>C4000-51R</b>	100
	Yellow	Polypropylene	Ivory PTFE/Red Rubber	35	1.0	<b>C4000-51Y</b>	100
	Pink	Polypropylene	Ivory PTFE/Red Rubber	35	1.0	<b>C4000-51P</b>	100
	Black	Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4000-53A</b>	100
	Blue	Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4000-53B</b>	100
	Green	Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4000-53G</b>	100
	Red	Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4000-53R</b>	100
	Yellow	Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4000-53Y</b>	100
	Pink	Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4000-53P</b>	100
	Black	Polypropylene	Red PTFE/White Silicone	50	1.0	<b>C4000-54A</b>	100
	Blue	Polypropylene	Red PTFE/White Silicone	50	1.0	<b>C4000-54B</b>	100
	Green	Polypropylene	Red PTFE/White Silicone	50	1.0	<b>C4000-54G</b>	100
	Red	Polypropylene	Red PTFE/White Silicone	50	1.0	<b>C4000-54R</b>	100
	Yellow	Polypropylene	Red PTFE/White Silicone	50	1.0	<b>C4000-54Y</b>	100
	Pink	Polypropylene	Red PTFE/White Silicone	50	1.0	<b>C4000-54P</b>	100
	Black	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4000-55A</b>	100
	Blue	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4000-55B</b>	100
Green	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4000-55G</b>	100	
Red	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4000-55R</b>	100	
Yellow	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4000-55Y</b>	100	
Pink	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4000-55P</b>	100	
Blue	Polypropylene	Ivory PTFE/Red Rubber, Pre-slit	45	1.0	<b>C4000-57B</b>	100	
Green	Polypropylene	Ivory PTFE/Red Rubber, Pre-slit	45	1.0	<b>C4000-57G</b>	100	
Black	Polypropylene	Bonded Red PTFE/White Silicone	45	1.2	<b>C4000-64B</b>	100	
Gray	Polypropylene	Bonded Red PTFE/White Silicone, Pre-slit	45	1.2	<b>C4000-75C</b>	100	
Blue	Polypropylene	Bonded Natural PTFE/Clear Silicone	45	1.2	<b>C4000-62B</b>	100	
Pink	Polypropylene	Bonded Natural PTFE/Clear Silicone	45	1.2	<b>C4000-62P</b>	100	
Pink	Polypropylene	Bonded Natural PTFE/Clear Silicone, Pre-slit	45	1.2	<b>C4000-72P</b>	100	
9mm Solid Top Cap	Blue	Polypropylene	Ivory PTFE/Red Rubber	35	1.0	<b>C4000-99</b>	100

Trying to decide what closure is right for you?

➤➤ Use our selection guide on **PAGE 2-053**



## National 9mm Screw Vials Convenience Kits

- Save time during sample preparation
- Reduce the risk of contamination

### Unassembled kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Reusable two compartment trays protect vials and closure while keeping matching supplies together
- Clear trays make it easy to keep track of available supplies without opening containers

### Assembled kits

- Include 100 vials with pre-attached caps and septa
- Packaged in convenient vial trays with clear covers or in economical polybags



Items not shown to scale

## National 9mm Wide Opening Screw Thread Vials Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat . No.	Pack of
Convenience Kit	Clear	No	Blue	Ivory PTFE/Red Rubber	C4000-1	C4000-51B	<b>C4000-80</b>	100
	Clear	No	Pink	Ivory PTFE/Red Rubber	C4000-1	C4000-51P	<b>C4000-80P</b>	100
	Clear	Yes	Blue	Ivory PTFE/Red Rubber	C4000-1W	C4000-51B	<b>C4000-80W</b>	100
	Amber	Yes	Blue	Ivory PTFE/Red Rubber	C4000-2W	C4000-51B	<b>C4000-82W</b>	100
	Amber	Yes	Blue	Ivory PTFE/Red Rubber	C4000-2W	C4000-51P	<b>C4000-82P</b>	100
	Clear	Yes	Blue	Ivory PTFE/Red Rubber, Pre-slit	C4000-1W	C4000-57B	<b>C4000-83W</b>	100
	Clear	No	Blue	Red PTFE/White Silicone/Red PTFE	C4000-1	C4000-53B	<b>C4000-86</b>	100
	Clear	Yes	Blue	Red PTFE/White Silicone/Red PTFE	C4000-1W	C4000-53B	<b>C4000-86W</b>	100
	Amber	Yes	Blue	Red PTFE/White Silicone/Red PTFE	C4000-2W	C4000-53B	<b>C4000-88W</b>	100
	Clear	Yes	Black	Red PTFE/White Silicone	C4000-1W	C4000-54A	<b>C4000-91W</b>	100
	Clear	No	Blue	Red PTFE/White Silicone	C4000-1	C4000-54B	<b>C4000-92</b>	100
	Clear	No	Pink	Red PTFE/White Silicone	C4000-1	C4000-54P	<b>C4000-92P</b>	100
	Clear	Yes	Blue	Red PTFE/White Silicone	C4000-1W	C4000-54B	<b>C4000-92W</b>	100
	Amber	Yes	Blue	Red PTFE/White Silicone	C4000-2W	C4000-54B	<b>C4000-94W</b>	100
	Amber	Yes	Pink	Red PTFE/White Silicone	C4000-2W	C4000-54P	<b>C4000-94P</b>	100
	Polypropylene	No	Blue	Red PTFE/White Silicone	C4000-11	C4000-54B	<b>C4000-87</b>	100
	Clear	No	Blue	Blue PTFE/White Silicone, Pre-slit	C4000-1	C4000-55B	<b>C4000-95</b>	100
	Clear	Yes	Blue	Blue PTFE/White Silicone, Pre-slit	C4000-1W	C4000-55B	<b>C4000-95W</b>	100
	Clear	No	Blue	Blue PTFE/White Silicone, Pre-slit	C4000-LV1	C4000-55B	<b>C4000-LV95</b>	100
	Polypropylene	No	Blue	Blue PTFE/White Silicone, Pre-slit	C4000-11	C4000-55B	<b>C4000-97</b>	100
Clear	Yes	Black	Bonded Red PTFE/White Silicone	C4000-1W	C4000-64B	<b>C4000-78W</b>	100	
Clear	Yes	Gray	Bonded Red PTFE/White Silicone, Pre-slit	C4000-1W	C4000-75C	<b>C4000-93W</b>	100	
Clear	No	Pink	Bonded Natural PTFE/Clear silicone, Pre-slit	C4000-1	C4000-72P	<b>C4000-93P</b>	100	

**National 9mm Wide Opening Screw Thread Vials Convenience Kits (Continued)**

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Assembled Kit	Clear	No	Blue	Ivory PTFE/Red Rubber	C4000-1	C4000-51B	<b>C4000-180</b>	100
	Clear	Yes	Blue	Ivory PTFE/Red Rubber	C4000-1W	C4000-51B	<b>C4000-180W</b>	100
	Amber	Yes	Blue	Ivory PTFE/Red Rubber	C4000-2W	C4000-51B	<b>C4000-182W</b>	100
	Clear	Yes	Blue	Ivory PTFE/Red Rubber, Pre-slit	C4000-1W	C4000-57B	<b>C4000-183W</b>	100
	Amber	Yes	Blue	Ivory PTFE/Red Rubber, Pre-slit	C4000-2W	C4000-57B	<b>C4000-184W</b>	100
	Clear	No	Blue	Red PTFE/White Silicone/Red PTFE	C4000-1	C4000-53B	<b>C4000-186</b>	100
	Clear	Yes	Blue	Red PTFE/White Silicone/Red PTFE	C4000-1W	C4000-53B	<b>C4000-186W</b>	100
	Clear	Yes	Red	Red PTFE/White Silicone/Red PTFE	C4000-1W	C4000-53R	<b>C4000-186WR</b>	100
	Amber	Yes	Blue	Red PTFE/White Silicone/Red PTFE	C4000-2W	C4000-53B	<b>C4000-188W</b>	100
	Clear	No	Blue	Red PTFE/White Silicone	C4000-1	C4000-54B	<b>C4000-192</b>	100
	Clear	Yes	Blue	Red PTFE/White Silicone	C4000-1W	C4000-54B	<b>C4000-192W</b>	100
	Amber	Yes	Blue	Red PTFE/White Silicone	C4000-2W	C4000-54B	<b>C4000-194W</b>	100
	Clear	Yes	Blue	Blue PTFE/White Silicone, Pre-slit	C4000-1W	C4000-55B	<b>C4000-195W</b>	100
	Amber	Yes	Blue	Blue PTFE/White Silicone, Pre-slit	C4000-2W	C4000-55B	<b>C4000-196W</b>	100

**National 9mm Wide Opening Screw Thread Vial Storerooms**

- Storerooms organize supplies and save valuable bench space
- Some storerooms are shipped fully stocked.
- 6 Drawer Mini-Storeroom holds 500 vials and closures
- 9 Drawer Storeroom holds 2000 vials and closures



Items not shown to scale

**National 9mm Storeroom**

Description	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap/Septum Cat.No.	Cat. No.	Pack of
9 Drawer Storeroom , 2000 pieces Caps and Vials	Clear	No	Blue	Red PTFE/White Silicone/Red PTFE	C4000-1	C4000-53B	<b>C4075-211</b>	1
	Clear	Yes	Blue	Red PTFE/White Silicone/Red PTFE	C4000-1W	C4000-53B	<b>C4075-213</b>	1
	Clear	No	Blue	Red PTFE/White Silicone	C4000-1	C4000-54B	<b>C4075-219</b>	1
6 Drawer Mini-Storeroom – Cabinet Only	–	–	–	–	–	–	<b>C4000-MS</b>	1
9 Drawer Storeroom, Full Size - Cabinet Only	–	–	–	–	–	–	<b>C4075-500</b>	1

## National 10mm Wide Opening Screw Thread Vials

2mL, 12x32mm 10mm Wide Opening Screw Thread Vials and Inserts

- 10-425 thread finish
- I-D vials feature a write-on patch with graduation for convenient sample identification
- Wide neck opening design, allows easy filling, requires Micro-Inserts with a diameter of 6mm
- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts
- Optional silanized (deactivated) glass provides optimal recovery of critical polar, labile or OH-interacting compounds\*
- Polyspring inserts are self-aligning and provide a cushion against needle contact
- Precision point insert minimizes residual sample loss

### Recommended for the following instruments:

- Jasco
- PerkinElmer
- Shimadzu
- Varian
- Waters

For autosampler compatibility look on pages **2-100 to 2-104**

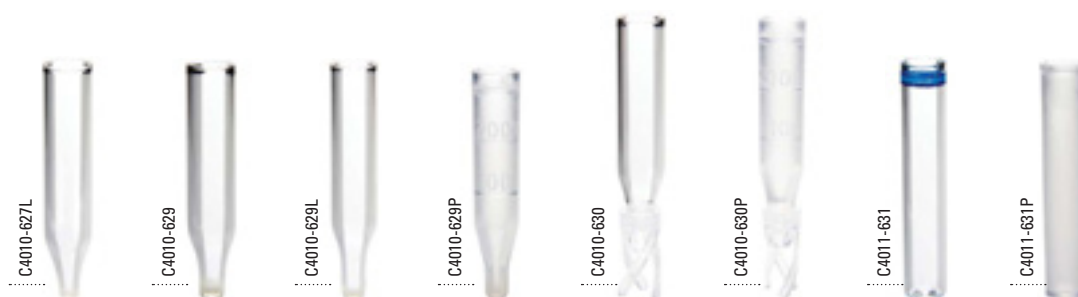


### National 10mm Wide Opening Screw Thread Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
10-425 Screw Thread Vial	Clear	No	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4010-1</b>	100
	Clear	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4010-1W</b>	100
	Amber	No	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4010-2</b>	100
	Amber	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4010-2W</b>	100
10-425 Screw Thread MacroVial 350µL, Fused Insert	Clear	No	12x32	Insert Vial	450µL	350µL	<2	<b>C4010-LV1</b>	100
	Amber	No	12x32	Insert Vial	450µL	350µL	<2	<b>C4010-LV2</b>	100
10-425 Screw Thread Micro-V 1.5mL Tapered MicroVial with 150µL reservoir	Clear	No	12x32	Tapered Base	1.5mL	1.1mL	<4	<b>C4010-V1</b>	100
10-425 Screw Thread Vial, silanized*	Clear	No	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4010-S1</b>	100
	Clear	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4010-S1W</b>	100
	Amber	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>C4010-S2W</b>	100
10-425 Screw Thread	Polypropylene	No	12x32	Conical	600µL	400µL	<6	<b>C4010-11</b>	100
	Polypropylene	No	12x32	Reservoir Base	750µL	550µL	<70	<b>C4010-14</b>	100

\* For information about silanized products see page **2-055**





### National 10mm Wide Opening Screw Thread Vials and Inserts (Continued)

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
350µL Insert	Clear	–	6x31	Pulled Point	400µL	350µL	<4	<b>C4010-627L</b>	100
300µL Insert	Clear	–	6x31	Pulled Point	375µL	300µL	<4	<b>C4010-629</b>	100
350µL Insert	Clear	–	6x31	Precision Point	400µL	350µL	<2	<b>C4010-629L</b>	100
300µL Insert, Graduation Marks	Polypropylene	–	6x30	Conical	325µL	250µL	<2	<b>C4010-629P</b>	100
300µL Polyspring Insert	Clear	–	6x30	Conical	375µL	300µL	<1	<b>C4010-630</b>	100
	Polypropylene	–	6x30	Conical	325µL	250µL	<2	<b>C4010-630P</b>	100
400µL MicroSert Insert	Clear	–	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-631</b>	500
	Polypropylene	–	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-631P</b>	500
300µL Insert, silanized*	Clear	–	6x31	Pulled Point	375µL	300µL	<4	<b>C4010-S629</b>	100
300µL Polyspring Insert, silanized*	Clear	–	6x30	Conical	375µL	300µL	<1	<b>C4010-S630</b>	100
400µL MicroSert Insert, silanized*	Clear	–	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-S631</b>	500
300µL Polyspring Insert, Kimshield*	Clear	–	6x29	Conical	375µL	300µL	<1	<b>C4010-K630</b>	100

\* For information about silanized products see page **2-055**

Search thousands of applications at our chromatography resource center.

[www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)

## National 10-425 Wide Opening Screw Caps and Septa

- Open top caps are designed to be used with any of our 10mm septa
- Polypropylene caps are chemically inert and suitable for most chromatography applications
- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Closures are shipped in sealed polybags to prevent contamination during transport



### National 10-425 Wide Opening Screw Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
10mm Open Top Cap, 8.5mm hole	Light Blue	Polypropylene	—	—	—	<b>C4010-1A</b>	100
	White	Polypropylene	—	—	—	<b>C4010-98W</b>	100
	Black	Polypropylene	—	—	—	<b>C4010-98BLK</b>	100
Septum for 10-425 Screw Caps	—	—	White Virgin PTFE, 0.01" Septum	53	0.25	<b>C4010-10</b>	1000
	—	—	Red PTFE/White Silicone, Soft Septum	50	1.3	<b>C4010-35</b>	100
	—	—	Red PTFE/White Silicone/Red PTFE Septum	45	1.3	<b>C4010-40</b>	100
	—	—	Blue PTFE/White Silicone, Pre-slit Septum	55	1.5	<b>C4010-55</b>	100
	—	—	Red PTFE/White Silicone Septum	45	1.3	<b>C4010-60</b>	100
10mm Open Top Cap, 8.5mm hole	Light Blue	Polypropylene	Ivory PTFE/Red Rubber	45	1.0	<b>C4010-30A</b>	100
	Black	Polypropylene	Red PTFE/White Silicone, Soft	45	1.3	<b>C4010-35BLK</b>	100
	White	Polypropylene	Red PTFE/White Silicone, Soft	45	1.3	<b>C4010-35W</b>	100
	Light Blue	Polypropylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4010-40A</b>	100
	Light Blue	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.5	<b>C4010-55A</b>	100
	Black	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.5	<b>C4010-55BLK</b>	100
	Light Blue	Polypropylene	Red PTFE/White Silicone	50	1.3	<b>C4010-60A</b>	100
	Red	Polypropylene	Red PTFE/White Silicone	50	1.3	<b>C4010-60AR</b>	1000
	White	Polypropylene	Red PTFE/White Silicone	50	1.3	<b>C4010-60AW</b>	1000
	Black	Polypropylene	Red PTFE/White Silicone	50	1.3	<b>C4010-60BLK</b>	100
	Light Blue	Polypropylene	Red PTFE/White Silicone, Star-slit	50	1.5	<b>C4010-65A</b>	100
10mm Solid Top Cap, 8.5mm hole	White	Polyurethane	PTFE/PE Foam Liner	—	1.3	<b>C4010-99</b>	100

Trying to decide what closure is right for you?

➤ Use our selection guide on **PAGE 2-053**





## National 10mm Wide Opening Screw Thread Vials Convenience Kits

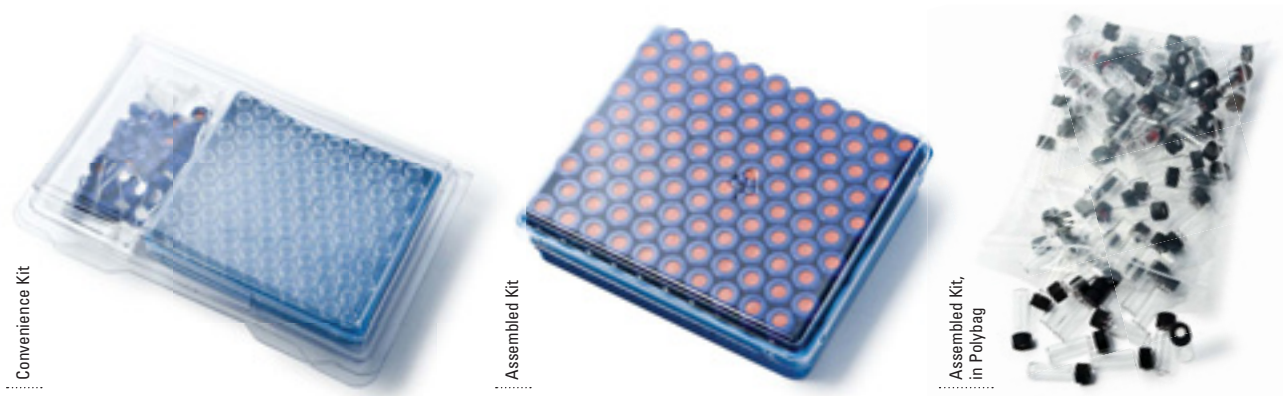
- Save time during sample preparation
- Reduce the risk of contamination

### Unassembled kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Reusable two compartment trays protect vials and closure while keeping matching supplies together
- Clear trays make it easy to keep track of available supplies without opening containers

### Assembled kits

- Include 100 vials with pre-attached caps and septa
- Packaged in convenient vial trays with clear covers or in economical polybags



Items not shown to scale

### National 10mm Wide Opening Screw Thread Vials Convenience Kits

Description	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit	Clear	No	Light Blue	Red PTFE/White Silicone	C4010-1	C4010-60A	<b>C4010-88</b>	100
	Amber	Yes	Light Blue	Red PTFE/White Silicone	C4010-2W	C4010-60A	<b>C4010-88AW</b>	100
	Clear	Yes	Light Blue	Red PTFE/White Silicone	C4010-1W	C4010-60A	<b>C4010-88W</b>	100
	Clear	Yes	Light Blue	Red PTFE/White Silicone, Star-slit	C4010-1W	C4010-65A	<b>C4010-93W</b>	100
	Clear	No	White	Red PTFE/White Silicone, Soft	C4010-1	C4010-35W	<b>C4010-95</b>	100
	Clear	Yes	White	Red PTFE/White Silicone, Soft	C4010-1W	C4010-35W	<b>C4010-95W</b>	100
	Clear	Yes	Black	Blue PTFE/White Silicone, Pre-slit	C4010-1W	C4010-55BLK	<b>C4010-97W</b>	100
Assembled Kit	Clear	No	Light Blue	Red PTFE/White Silicone	C4010-1	C4010-60A	<b>C4010-17</b>	100
	Clear	Yes	Light Blue	Red PTFE/White Silicone	C4010-1W	C4010-60A	<b>C4010-17W</b>	100
	Clear	No	Light Blue	White Virgin PTFE, 0.01"	C4010-1	C4010-1A/C4010-10	<b>C4010-21</b>	100
	Clear	No	White	Red PTFE/White Silicone, Soft	C4010-1	C4010-35W	<b>C4010-57</b>	100
	Amber	No	White	Red PTFE/White Silicone, Soft	C4010-2	C4010-35W	<b>C4010-57A</b>	100
	Amber	Yes	White	Red PTFE/White Silicone, Soft	C4010-2W	C4010-35W	<b>C4010-57AW</b>	100
	Clear	Yes	White	Red PTFE/White Silicone, Soft	C4010-1W	C4010-35W	<b>C4010-57W</b>	100
	Clear	No	Black	Red PTFE/White Silicone, Soft	C4010-1	C4010-35BLK	<b>C4010-67</b>	100
	Amber	No	Black	Red PTFE/White Silicone, Soft	C4010-2	C4010-35BLK	<b>C4010-67A</b>	100
	Amber	Yes	Black	Red PTFE/White Silicone, Soft	C4010-2W	C4010-35BLK	<b>C4010-67AW</b>	100
	Clear	Yes	Black	Red PTFE/White Silicone, Soft	C4010-1W	C4010-35BLK	<b>C4010-67W</b>	100
	Assembled Kit, in Polybag	Amber	Yes	Light Blue	Red PTFE/White Silicone	C4010-2W	C4010-60A	<b>C4010-017AW</b>
Clear		Yes	Light Blue	Red PTFE/White Silicone	C4010-1W	C4010-60A	<b>C4010-017W</b>	100
Clear		No	Light Blue	Red PTFE/White Silicone/Red PTFE	C4010-1	C4010-40A	<b>C4010-019</b>	100
Clear		No	White	Red PTFE/White Silicone, Soft	C4010-1	C4010-35W	<b>C4010-057</b>	100
Amber		Yes	White	Red PTFE/White Silicone, Soft	C4010-2W	C4010-35W	<b>C4010-057AW</b>	100

## National 11mm Crimp Top Vials

2mL, 12x32, Crimp Top Vials and Inserts

**Recommended  
for most brands...**

For autosampler compatibility look  
on pages **2-100 to 2-104**

- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- I-D vials feature a write-on patch with graduation for convenient sample identification
- Standard opening requires Micro-Inserts with a diameter of 5mm
- Wide neck opening design, allows easy filling, requires Micro-Inserts with a diameter of 6mm
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts
- Optional silanized (deactivated) glass provides optimal recovery of critical polar, labile or OH-interacting compounds\*
- Polyspring inserts are self-aligning and provide a cushion against needle contact
- Precision point insert minimizes residual sample loss
- Pulled point inserts are an economical choice for noncritical applications
- Glastic vial features a glass insert pre-inserted inside of a clear TPX vial



### National 11mm Standard Opening Crimp Top Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
11mm Standard Opening Crimp Top Vial	Clear	No	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4012-1</b>	100
	Clear	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4012-1W</b>	100
	Amber	No	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4012-2</b>	100
	Amber	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4012-2W</b>	100
11mm Standard Opening Crimp /Snap Top Vial 150µL Clear Solid Glass Microvial	Clear	No	12x32	Narrow Conical	425µL	200µL	<2	<b>C4012-10</b>	12
11mm - Crimp/Snap Glastic Glass Insert/TPX Vial	Clear	No	12x32	Insert Vial	475µL	350µL	<4	<b>C4012-15</b>	100
200µL MicroSert Insert	Clear	–	5x31	Flat Bottom	250µL	200µL	<12	<b>C4012-465</b>	500
150µL Polyspring Insert	Clear	–	5x29	Pulled point	200µL	175µL	<1	<b>C4012-530</b>	100
150µL Insert	Clear	–	5x29	Pulled point	200µL	175µL	<3	<b>C4012-529</b>	100
200µL Insert	Clear	–	5x31	Pulled point	200µL	170µL	<2	<b>C4012-529L</b>	100
125µL Polyspring Insert	Polypropylene	–	5x29	Precision point	175µL	125µL	<2	<b>C4012-530P</b>	100
150µL Polyspring Insert, silanized*	Clear	–	5x29	Pulled point	200µL	175µL	<1	<b>C4012-S530</b>	100

\* For information about silanized products see page **2-055**



### National 11mm Wide Opening Crimp Top Vials and Inserts (Continued)

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
11mm Crimp Top Vial, Wide Opening	Clear	No	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-1</b>	100
	Clear	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-1W</b>	100
	Amber	No	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-2</b>	100
	Amber	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-2W</b>	100
11mm Crimp Top ColorBand Vial, Wide Opening	Clear	Blue*	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-1B</b>	100
	Clear	Green*	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-1G</b>	100
	Clear	Red*	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-1R</b>	100
	Clear	Yellow*	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-1Y</b>	100
11mm Crimp/Snap MacroVial 250µL, Fused Insert	Clear	No	12x32	Fused Conical	500µL	350µL	<2	<b>C4011-LV1</b>	100

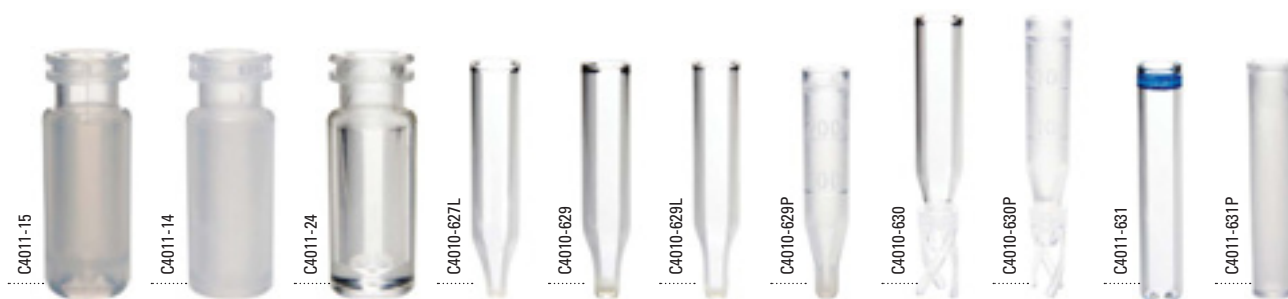
\* ColorBand vials are designed to provide full sample color coding for autosamplers with optical vial detection. Use the optimum cap for your instrument without sacrificing your color coding scheme.



### National 11mm Crimp Top Vials and Inserts (Continued)

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
11mm Crimp Top MacroVial 250µL, Fused Insert	Clear	Yes	12x32	Fused Conical	500µL	350µL	<2	<b>C4011-LV1W</b>	100
11mm Crimp/Snap MacroVial 250µL, Fused Insert	Amber	No	12x32	Fused Conical	500µL	350µL	<2	<b>C4011-LV2</b>	100
11mm Crimp Top MacroVial 250µL, Fused Insert	Amber	Yes	12x32	Fused Conical	500µL	350µL	<2	<b>C4011-LV2W</b>	100
11mm Crimp Top Solid Glass MicroVials	Clear	No	12x32	Conical Base	650µL	500µL	<5	<b>C4011-10</b>	12
11mm Crimp Top Micro-V Microsampling Vial, 15µL Reservoir	Clear	No	12x32	High Recovery	1.5mL	1.1mL	<4	<b>C4011-V1</b>	100
11mm Crimp Top 1.5mL High Recovery MicroVial	Clear	No	12x32	High Recovery	1.7mL	1.3mL	<4	<b>C4011-9</b>	100
11mm Crimp Top, Wide Opening, silanized*	Clear	No	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-S1</b>	100
	Clear	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-S1W</b>	100
	Amber	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-S2W</b>	100
11mm Crimp/Snap 250µL MicroVial	Polypropylene	No	12x32	Conical Base	475µL	300µL	<2	<b>C4011-13</b>	100
11mm Crimp/Snap 600µL MicroVial	Polypropylene	No	12x32	Conical Base	600µL	400µL	<4	<b>C4011-16</b>	100
11mm Crimp/Snap 800µL MicroVial	Polypropylene	No	12x32	Conical Base	800µL	600µL	<6	<b>C4011-11</b>	100

\* For information about silanized products see page 2-055



**National 11mm Crimp Top Vials and Inserts (Continued)**

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
11mm Crimp/Snap 850µL AP-2000 MaxVial	Polypropylene	No	12x32	High Recovery	825µL	650µL	<8	<b>C4011-15</b>	1000
11mm Crimp/Snap 1mL Vial	Polypropylene	No	12x32	Flat Bottom	1000µL	800µL	<80	<b>C4011-14</b>	100
11mm Crimp/Snap 1mL TPX High Recovery Vial	TPX	No	12x32	High Recovery	1000µL	750µL	<8	<b>C4011-24</b>	100
350µL Insert	Clear	–	6x31	Pulled Point	400µL	350µL	<4	<b>C4010-627L</b>	100
300µL Insert	Clear	–	6x31	Pulled Point	375µL	300µL	<4	<b>C4010-629</b>	100
350µL Insert	Clear	–	6x31	Precision Point	400µL	350µL	<2	<b>C4010-629L</b>	100
300µL Insert, Graduation Marks	Polypropylene	–	6x30	Conical	325µL	250µL	<2	<b>C4010-629P</b>	100
300µL Polyspring Insert	Clear	–	6x30	Conical	375µL	300µL	<1	<b>C4010-630</b>	100
	Polypropylene	–	6x30	Conical	325µL	250µL	<2	<b>C4010-630P</b>	100
400µL MicroSert Insert	Clear	–	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-631</b>	500
	Polypropylene	–	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-631P</b>	500
300µL Insert, silanized*	Clear	–	6x31	Pulled Point	375µL	300µL	<4	<b>C4010-S629</b>	100
300µL Polyspring Insert, silanized*	Clear	–	6x29	Conical	375µL	300µL	<1	<b>C4010-S630</b>	100
400µL MicroSert Insert, silanized*	Clear	–	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-S631</b>	500
300µL Polyspring Insert, Kimshield*	Clear	–	6x29	Conical	375µL	300µL	<1	<b>C4010-K630</b>	100

\* For information about silanized products see page **2-055**

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» Visit **PAGE 4-032**

## National 11mm Crimp Top Closures

- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Aluminum crimp closures provide a secure leak-resistant seal
- Aluminum seals must be applied with a crimping tool
- Closures are shipped in sealed polybags to prevent contamination during transport
- Synthetic PTFE/Red Rubber seal is specially formulated for improved background performance



### National 11mm Crimp Top Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
11mm Crimp Cap, 5.5mm hole	Silver	Aluminum	Clear PTFE/Red Rubber	60	1.0	<b>C4011-1AP</b>	100
	Silver	Aluminum	Clear PTFE/Red Rubber	60	1.0	<b>C4011-1A</b>	1000
	Blue	Aluminum	Clear PTFE/Red Rubber	60	1.0	<b>C4011-98B</b>	100
	Green	Aluminum	Clear PTFE/Red Rubber	60	1.0	<b>C4011-98G</b>	100
	Red	Aluminum	Clear PTFE/Red Rubber	60	1.0	<b>C4011-98R</b>	100
	Yellow	Aluminum	Clear PTFE/Red Rubber	60	1.0	<b>C4011-98Y</b>	100
	Silver	Aluminum	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4011-2A</b>	100
	Silver	Aluminum	Red PTFE/White Silicone	45	1.3	<b>C4011-4A</b>	100
	Blue	Aluminum	Red PTFE/White Silicone	45	1.3	<b>C4011-4B</b>	100
	Green	Aluminum	Red PTFE/White Silicone	45	1.3	<b>C4011-4G</b>	100
	Red	Aluminum	Red PTFE/White Silicone	45	1.3	<b>C4011-4R</b>	100
	Silver	Aluminum	Solid PTFE Disk	53	0.25	<b>C4011-6A</b>	1000
	Silver	Aluminum	PTFE/Synthetic Red Rubber	65	1.0	<b>C4011-7A</b>	100
Blue	Aluminum	PTFE/Synthetic Red Rubber	65	1.0	<b>C4011-7B</b>	1000	
Green	Aluminum	PTFE/Synthetic Red Rubber	65	1.0	<b>C4011-7G</b>	1000	
Red	Aluminum	PTFE/Synthetic Red Rubber	65	1.0	<b>C4011-7R</b>	1000	
Yellow	Aluminum	PTFE/Synthetic Red Rubber	65	1.0	<b>C4011-7Y</b>	1000	
11mm Crimp Cap, 5.5mm hole, Mixed Color, 200 each	Silver, Blue, Green, Red, Yellow	Aluminum	PTFE/Synthetic Red Rubber	65	1.0	<b>C4011-7K</b>	1000

Trying to decide what closure is right for you?

Use our selection guide on **PAGE 2-053**





## National 11mm Crimp Top Crimping and Decrimping Tools

- Crimping tools provide a reproducible, secure vial closure
- Manual de-crimping tools allow easy removal of aluminum seals without breakage
- Decapping pliers are an economical choice for small quantities of vials
- Clean room crimpers and decrimpers can be autoclaved



Items not shown to scale

### National 11mm Crimp Top Crimping and Decrimping Tools

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 11mm aluminum crimp seals	<b>C4012-100</b>	1
Decapping Pliers	Removes 11mm aluminum crimp seals, Protective gloves recommended	<b>C4012-101</b>	1
Manual Decrimper	Removes 11mm aluminum crimp seals	<b>C4012-102</b>	1
Manual stainless steel Cleanroom Crimper	Attaches 11mm crimp seals	<b>C4012-100SS</b>	1
Manual stainless steel Cleanroom Decrimper	Removes 11mm crimp seals without vial damage	<b>C4012-102SS</b>	1

For electronic crimpers and decappers look on page **2-094**

## National 11mm Crimp Top Convenience Kits

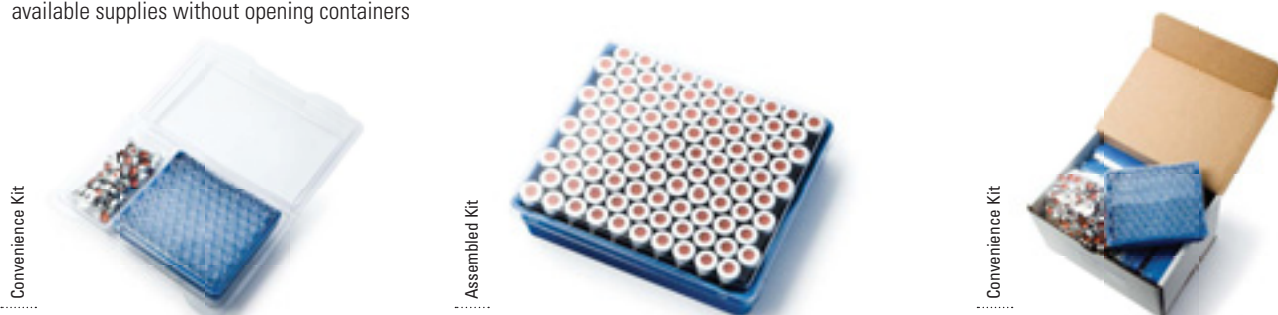
- Save time during sample preparation
- Reduce the risk of contamination

### Unassembled kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Reusable two compartment trays protect vials and closure while keeping matching supplies together
- Clear trays make it easy to keep track of available supplies without opening containers

### Assembled kits

- Include 100 vials with pre-attached caps and septa
- Packaged in convenient vial trays with clear covers or in economical polybags



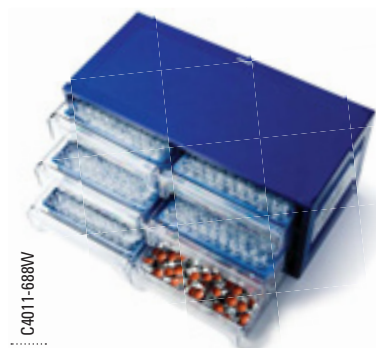
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### National 11mm Crimp Top Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, Standard Opening Crimp Top Vial	Clear	No	Silver	Clear PTFE/Red Rubber	C4012-1	C4011-1AHP	<b>C4012-88</b>	500
	Amber	No	Silver	Clear PTFE/Red Rubber	C4012-2	C4011-1AHP	<b>C4012-88A</b>	500
Convenience Kit, Wide Opening Crimp Top Vial	Clear	No	Silver	Clear PTFE/Red Rubber	C4011-1	C4011-1AP	<b>C4011-87</b>	100
	Clear	Yes	Silver	Clear PTFE/Red Rubber	C4011-1W	C4011-1AP	<b>C4011-87W</b>	100
	Amber	Yes	Silver	Clear PTFE/Red Rubber	C4011-2W	C4011-1AP	<b>C4011-87AW</b>	100
	Clear	No	Silver	Clear PTFE/Red Rubber	C4011-1	C4011-1AP	<b>C4011-88</b>	500
	Clear	Yes	Silver	Clear PTFE/Red Rubber	C4011-1W	C4011-1AP	<b>C4011-88W</b>	500
	Clear	No	Silver	PTFE/Synthetic Red Rubber	C4011-1	C4011-7A	<b>C4011-89W</b>	100
Kit includes PolySpring Tapered Insert for small sample volumes	Clear	No	Silver	Clear PTFE/Red Rubber	C4011-1/ C4010-630	C4011-1AP	<b>C4011-95</b>	100
Assembled Kit, Wide Opening Crimp Top Vial, Nitrogen purged	Clear	No	Silver	Clear PTFE/Red Rubber	C4011-1	C4011-1AP	<b>C4011-1CV</b>	100
	Amber	Yes	Silver	Clear PTFE/Red Rubber	C4011-2W	C4011-1AP	<b>C4011-2WCV</b>	100

## National 11mm Crimp Top Vial Storerooms

- Storerooms organize supplies and save valuable bench space
- 6 Drawer Mini-Storeroom holds 500 vials and closures
- 9 Drawer Storeroom holds 2000 vials and closures.



C4011-688W



C4000-MS



C4075-500

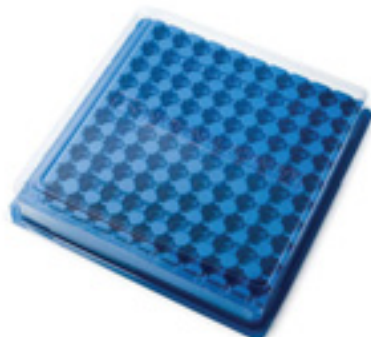
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### National 11mm Crimp Top Vial Storerooms

Description	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
6 Drawer Mini-Storeroom, 500 pieces Caps and Vials	Clear	Yes	Silver	Clear PTFE/Red Rubber	C4011-1W	C4011-1AP	<b>C4011-688W</b>	1
6 Drawer Mini-Storeroom – Cabinet Only	–	–	–	–	–	–	<b>C4000-MS</b>	1
9 Drawer Storeroom – Cabinet Only	–	–	–	–	–	–	<b>C4075-500</b>	1

## National 11mm Crimp Top Vial Racks

- Polypropylene vial racks are resistant to most solvents
- Racks feature alphanumeric indexing for easier vial identification
- Racks can be stacked for efficient storage



C4011-25



C4012-25

Items not shown to scale

### National 11mm Crimp Top Vial Racks

Description	Capacity	Cat. No.	Pack of
Polystyrene storage rack for 12x32mm vials with clear lid	100 vials, 10x10	<b>C4011-25</b>	1
Polypropylene storage rack for 12 x 32mm vials, no lid	50 vials, 5x10	<b>C4012-25</b>	1



## National 11mm Wide Opening Snap-It Vials

2mL, 12x32mm Wide Opening Snap-It Vials and Inserts

**Recommended for most brands of instruments:**

For autosampler compatibility look on pages **2-100 to 2-104**

- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- I-D vials feature a write-on patch with graduation for convenient sample identification
- Wide neck opening design, allows easy filling, requires Micro-Inserts with a diameter of 6mm
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts
- Optional silanized (deactivated) glass provides optimal recovery of critical polar, labile or OH-interacting compounds\*
- Polyspring inserts are self-aligning and provide a cushion against needle contact
- Precision point insert minimizes residual sample loss
- Pulled point inserts are an economical choice for noncritical applications
- Glastic vial features a glass insert pre-inserted inside of a clear TPX vial
- Snap-It vials can be used with snap caps or aluminum crimp seal closures



### National 11mm Wide Opening Snap-It Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
11mm Snap-It Vial	Clear	No	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-5</b>	100
	Clear	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-5W</b>	100
	Amber	No	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-6</b>	100
	Amber	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-6W</b>	100
11mm Snap-It MacroVial 250µL, Fused Insert	Clear	No	12x32	Fused Conical	500µL	350µL	<2	<b>C4011-LV1</b>	100
	Amber	No	12x32	Fused Conical	500µL	350µL	<2	<b>C4011-LV2</b>	100
11mm Snap-It High Recovery MicroVial, 1.5mL	Clear	No	12x32	High Recovery	1.7mL	1.3mL	<4	<b>C4011-4</b>	100
11mm Snap-It Vial, silanized*	Clear	No	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-S5</b>	100
	Clear	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-S5W</b>	100
	Amber	Yes	12x32	Flat Bottom	2mL	1.5mL	<170	<b>C4011-S6W</b>	100
	Clear	No	12x32	High Recovery	1.5mL	1.1mL	<4	<b>C4011-S4</b>	100
11mm Snap-It Vial, Total Recovery with 10µL Reservoir	Clear	No	12x32	Deep Well Base	1.5mL	1.2mL	<1	<b>C4011-9TR</b>	100
11mm Snap-It 250µL MicroVial	Polypropylene	No	12x32	Conical Base	475µL	300µL	<2	<b>C4011-13</b>	100

\* For information about silanized products see page **2-055**



### National 11mm Wide Opening Snap-It Vials and Inserts (Continued)

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
11mm Snap-It 600µL MicroVial	Polypropylene	No	12x32	Conical Base	600µL	400µL	<4	<b>C4011-16</b>	100
11mm Snap-It 800µL MicroVial	Polypropylene	No	12x32	Conical Base	800µL	600µL	<6	<b>C4011-11</b>	100
11mm Snap-It 850µL AP-2000 MaxVial	Polypropylene	No	12x32	High Recovery	825µL	650µL	<8	<b>C4011-15</b>	1000
11mm Snap-It 1mL Vial	Polypropylene	No	12x32	Flat Bottom	1000µL	800µL	<80	<b>C4011-14</b>	100
11mm Snap-It 1mL TPX High Recovery Vial	TPX	No	12x32	High Recovery	1000µL	750µL	<8	<b>C4011-24</b>	100
11mm Snap-It Glastic Glass Insert/TPX Vial	Clear	No	12x32	Insert Vial	475µL	350µL	<4	<b>C4012-15</b>	100



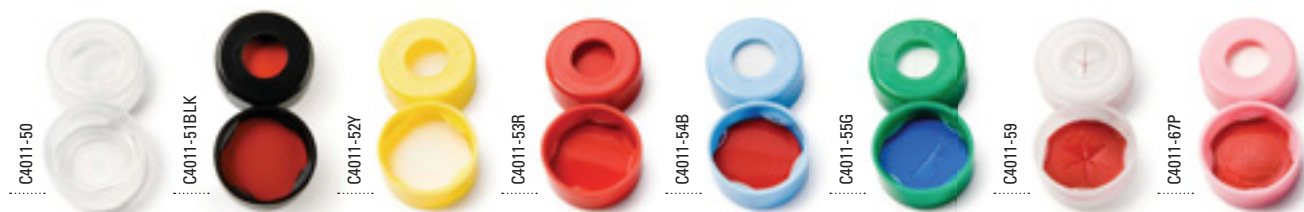
### National 11mm Wide Opening Snap-It Vials and Inserts (Continued)

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
350µL Insert	Clear	-	6x31	Pulled Point	400µL	350µL	<4	<b>C4010-627L</b>	100
300µL Insert	Clear	-	6x31	Pullet Point	375µL	300µL	<4	<b>C4010-629</b>	100
350µL Insert	Clear	-	6x31	Precision Point	400µL	350µL	<2	<b>C4010-629L</b>	100
300µL Insert, Graduation Marks	Polypropylene	-	6x30	Conical	325µL	250µL	<2	<b>C4010-629P</b>	100
300µL Polyspring Insert	Clear	-	6x30	Conical	375µL	300µL	<1	<b>C4010-630</b>	100
	Polypropylene	-	6x30	Conical	325µL	250µL	<2	<b>C4010-630P</b>	100
400µL MicroSert Insert	Clear	-	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-631</b>	500
	Polypropylene	-	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-631P</b>	500
300µL Insert, silanized*	Clear	-	6x31	Pulled Point	375µL	300µL	<4	<b>C4010-S629</b>	100
300µL Polyspring Insert, silanized*	Clear	-	6x29	Conical	375µL	300µL	<1	<b>C4010-S630</b>	100
400µL MicroSert Insert, silanized*	Clear	-	6x31	Flat Bottom	500µL	450µL	<25	<b>C4011-S631</b>	500
300µL Polyspring Insert, Kimshield*	Clear	-	6x29	Conical	375µL	300µL	<1	<b>C4010-K630</b>	100

\* For information about silanized products see page **2-055**

## National 11mm Wide Opening Snap-It Caps and Septa

- Fully compatible with all Snap-It vials
- Snap-It caps are easy to apply and easy to remove
- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Snap-It caps eliminate the need for crimping or de-capping tools
- Polyethylene caps are chemically inert and suitable for most chromatography applications
- Closures are shipped in sealed polybags to prevent contamination during transport
- Integral Molded Polyethylene cap is an economical choice for routine HPLC applications, but with low sealing property and zero resealing capacity



### National 11mm Snap-It Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
11mm Snap-It Cap, thinned penetration area	Clear	Polyethylene	Integral Molded In Polyethylene	–	–	<b>C4011-50</b>	100
	Blue	Polyethylene	Integral Molded In Polyethylene	–	–	<b>C4011-50B</b>	100
	Green	Polyethylene	Integral Molded In Polyethylene	–	–	<b>C4011-50G</b>	100
	Red	Polyethylene	Integral Molded In Polyethylene	–	–	<b>C4011-50R</b>	100
11mm Snap-It Cap, 6mm hole	Clear	Polyethylene	Clear PTFE/Synthetic Red Rubber	60	1.0	<b>C4011-51</b>	100
	Blue	Polyethylene	Clear PTFE/Synthetic Red Rubber	60	1.0	<b>C4011-51B</b>	100
	Black	Polyethylene	Clear PTFE/Synthetic Red Rubber	60	1.0	<b>C4011-51BLK</b>	100
	Green	Polyethylene	Clear PTFE/Synthetic Red Rubber	60	1.0	<b>C4011-51G</b>	100
	Pink	Polyethylene	Clear PTFE/Synthetic Red Rubber	60	1.0	<b>C4011-51P</b>	100
	Red	Polyethylene	Clear PTFE/Synthetic Red Rubber	60	1.0	<b>C4011-51R</b>	100
	Clear	Polyethylene	White Virgin PTFE, 0.01"	53	0.25	<b>C4011-52</b>	100
	Blue	Polyethylene	White Virgin PTFE, 0.01"	53	0.25	<b>C4011-52B</b>	100
	Green	Polyethylene	White Virgin PTFE, 0.01"	53	0.25	<b>C4011-52G</b>	100
	Red	Polyethylene	White Virgin PTFE, 0.01"	53	0.25	<b>C4011-52R</b>	100
	Yellow	Polyethylene	White Virgin PTFE, 0.01"	53	0.25	<b>C4011-52Y</b>	100
	Clear	Polyethylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4011-53</b>	100
	Blue	Polyethylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4011-53B</b>	100
	Red	Polyethylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4011-53R</b>	100
	Yellow	Polyethylene	Red PTFE/White Silicone/Red PTFE	45	1.0	<b>C4011-53Y</b>	100
	Clear	Polyethylene	Red PTFE/White Silicone	50	1.3	<b>C4011-54</b>	100
	Blue	Polyethylene	Red PTFE/White Silicone	50	1.3	<b>C4011-54B</b>	100
	Black	Polyethylene	Red PTFE/White Silicone	50	1.3	<b>C4011-54BLK</b>	100
	Green	Polyethylene	Red PTFE/White Silicone	50	1.3	<b>C4011-54G</b>	100
	Pink	Polyethylene	Red PTFE/White Silicone	50	1.3	<b>C4011-54P</b>	100
	Red	Polyethylene	Red PTFE/White Silicone	50	1.3	<b>C4011-54R</b>	100
	Yellow	Polyethylene	Red PTFE/White Silicone	50	1.3	<b>C4011-54Y</b>	100
	Clear	Polyethylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4011-55</b>	100
	Blue	Polyethylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4011-55B</b>	100
	Black	Polyethylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4011-55BLK</b>	100
	Green	Polyethylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4011-55G</b>	100
	Red	Polyethylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4011-55R</b>	100
	Yellow	Polyethylene	Blue PTFE/White Silicone, Pre-slit	55	1.0	<b>C4011-55Y</b>	100
Clear	Polyethylene	Red PTFE/White Silicone, Star-slit	45	1.3	<b>C4011-59</b>	100	
Pink	Polyethylene	Red PTFE/White Silicone, Y-cut	45	1.3	<b>C4011-67P</b>	100	

## National 11mm Wide Opening Snap-It Cap Convenience Kits

- Save time during sample preparation
- Reduce the risk of contamination

### Unassembled kits

- Includes 100 vials and 100 caps with pre-assembled septa
- Reusable two compartment trays protect vials and closure while keeping matching supplies together
- Clear trays make it easy to keep track of available supplies without opening containers



Items not shown to scale

### National 11mm Wide Opening Snap-It Cap Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, Wide Opening Snap Cap Vial	Clear	No	Clear	Clear PTFE/Red Rubber	C4011-5	C4011-51	<b>C4011-72</b>	100
	Clear	No	Pink	Clear PTFE/Red Rubber	C4011-5	C4011-51P/60180-676	<b>C4011-72P</b>	100
	Amber	Yes	Clear	Clear PTFE/Red Rubber	C4011-6W	C4011-51	<b>C4011-72AW</b>	100
	Clear	No	Clear	Red PTFE/White Silicone	C4011-5	C4011-54	<b>C4011-73</b>	100
	Clear	Yes	Clear	Red PTFE/White Silicone	C4011-5W	C4011-54	<b>C4011-73W</b>	100
	Clear	No	Pink	Red PTFE/White Silicone	C4011-5	C4011-54P	<b>C4011-73P</b>	100
	Clear	No	Pink	Red PTFE/White Silicone/Red PTFE, Y-cut	C4011-5	C4011-67P	<b>C4011-78P</b>	100



## National 13mm Snap/Crimp Vials

4mL, 15x45mm Snap/Crimp Cap Vials and Inserts

- Superior quality 33 expansion borosilicate clear (Type 1, Class A) Vials feature a 13mm crimp/snap-ring finish – use with 13mm Aluminum Seals or Kim-Snap Closures
- Polyspring inserts are self-aligning and provide a cushion against needle contact



### Recommended for the following instruments:

- Dionex
- Shimadzu
- Spark Holland
- Varian
- VWR (Merck)/Hitachi
- Waters (Wisp 48 Position Carousel)

For autosampler compatibility look on pages **2-100** to **2-104**

### National 13mm Snap/Crimp Cap Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
13mm Crimp/Snap Vial	Clear	No	15x45	Flat Bottom	4.8mL	4.25mL	<800µL	<b>C4015-4</b>	100
800µL Polyspring Conical Insert	Clear	–	8x38	Pulled Point	950µL	800µL	<9µL	<b>C4015-638</b>	100
350µL Conical Insert	Clear	–	6x40	Pulled Point	375µL	300µL	<8µL	<b>C4015-643</b>	100
Metal spring for glass inserts in 4mL vials	–	–	–	–	–	–	–	<b>C4015-640</b>	100

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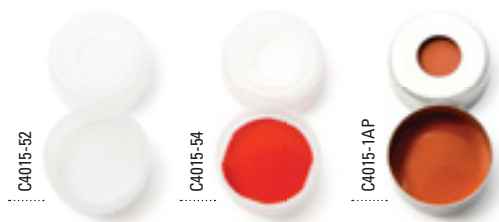
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## National 13mm Snap/Crimp Caps and Septa

- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Aluminum crimp closures provide a secure leak-resistant seal
- Aluminum seals must be applied with a crimping tool
- Synthetic PTFE/Red Rubber seal is specially formulated for improved background performance
- Kim-Snap closures provide a tight seal without the need of a crimper



### National 13mm Snap/Crimp Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
13mm Kim-Snap Closure	Clear	Polypropylene	White Virgin PTFE, 0.01"	53	0.25	<b>C4015-52</b>	100
	Clear	Polypropylene	Red PTFE/White Silicone	45	1.3	<b>C4015-54</b>	100
13mm Crimp Cap, 6mm hole	Silver	Aluminum	Clear PTFE/Synthetic Red Rubber	65	1.3	<b>C4015-1AP</b>	144

## National 13mm Snap/Crimp Crimping and Decrimping Tools

- Crimping tools provide a reproducible, secure vial closure
- Manual de-crimping tools allow easy removal of aluminum seals without breakage
- Decapping pliers are an economical choice for small quantities of vials
- Clean room crimpers and decrimpers can be autoclaved



Items not shown to scale

### National 13mm Snap/Crimp Crimping and Decrimping Tools

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 13mm aluminum crimp seals	<b>C4013-100</b>	1
Decapping Pliers	Removes 13mm aluminum crimp seals, Protective gloves recommended	<b>C4013-101</b>	1
Manual Decrimper	Removes 13mm aluminum crimp seals	<b>C4013-102</b>	1
Manual stainless steel Cleanroom Crimper	Attaches 13mm crimp seals	<b>C4013-100SS</b>	1
Manual stainless steel Cleanroom Decrimper	Removes 13mm crimp seals without vial damage	<b>C4013-102SS</b>	1

For electronic crimpers and decappers look on page **2-094**

## National 4mL Screw Thread Vials

4mL, 15x45mm Screw Thread Vials and Inserts

- 13-425 thread finish
- I-D vials feature a write-on patch with graduation for convenient sample identification
- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1, Class B) glass
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts
- Optional silanized (deactivated) glass provides optimal recovery of critical polar, labile or OH-interacting compounds\*
- Polyspring inserts are self-aligning and provide a cushion against needle contact

### Recommended for the following instruments:

- Dionex
- Shimadzu
- Spark Holland
- Varian
- VWR (Merck)/Hitachi
- Waters (Wisp 48 Position Carousel)

For autosampler compatibility look on pages **2-100 to 2-104**



### National 4mL Thread Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
13-425 Screw Thread Vial	Clear	No	15x45	Flat Bottom	4mL	4mL	<800	<b>C4015-1</b>	100
	Clear	Yes	15x45	Flat Bottom	4mL	4mL	<800	<b>C4015-11W</b>	100
	Amber	No	15x45	Flat Bottom	4mL	4mL	<800	<b>C4015-2</b>	100
	Amber	Yes	15x45	Flat Bottom	4mL	4mL	<800	<b>C4015-2W</b>	100
13-425 Screw Thread AP2000 High Recovery Vial	Clear	No	15x45	Tapered Base	3.5mL	3.5mL	<15	<b>C4015-9</b>	100
	Polypropylene	No	15x45	Tapered Base	2.5mL	2mL	<15	<b>C4015-14</b>	100
13-425 Screw Thread Vial, silanized*	Clear	No	15x45	Flat Bottom	4mL	4mL	<800	<b>C4015-S1</b>	100
800µL Polyspring Conical Insert	Clear	–	8x38	Pulled Point	950µL	800µL	<9	<b>C4015-638</b>	100
350µL Conical Insert	Clear	–	6x40	Pulled Point	375µL	300µL	<8	<b>C4015-643</b>	100
Metal spring for glass inserts in 4mL vials	–	–	–	–	–	–	–	<b>C4015-640</b>	100

\* For information about silanized products see page **2-055**



## National 13-425 Screw Thread Caps and Septa

- Polypropylene caps are chemically inert and suitable for most chromatography applications
- Phenolic resin caps perform well at high temperatures and are compatible with exposure to corrosives
- Open top caps are designed to be used with any of our 13mm septa
- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Caps with bonded septa resist dislodging during injection when using large diameter blunt needles
- Integral Molded Polypropylene cap is an economical choice when septum resealing is not required



Images shown are 70% to scale

### National 13-425 Screw Thread Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
13mm Open Top Screw Cap, 13-425 thread, 8.5mm hole	Black	Polypropylene	–	–	–	<b>C4015-1A</b>	100
	White	Polypropylene	–	–	–	<b>C4015-1W</b>	100
	Black	Phenolic	–	–	–	<b>C4015-66</b>	1000
Septum for 13-425 Screw Caps	–	–	White Virgin PTFE, 0.01"	53	0.25	<b>C4015-10</b>	1000
	–	–	Ivory PTFE/Red Rubber	35	1.5	<b>C4015-30</b>	100
	–	–	Red PTFE/White Silicone/Red PTFE	55	1.25	<b>C4015-40</b>	100
	–	–	Red PTFE/White Silicone, Soft	45	1.5	<b>C4015-45</b>	100
	–	–	Red PTFE/White Silicone	50	1.5	<b>C4015-60</b>	100
	–	–	Ivory PTFE/White Silicone	45	1.5	<b>C4015-61</b>	1000
13mm Open Top Screw Cap, 13-425 thread, 8.5mm hole	Black	Polypropylene	Ivory PTFE/Red Rubber	35	1.5	<b>C4015-30A</b>	100
	Black	Polypropylene	Red PTFE/White Silicone/Red PTFE	55	1.25	<b>C4015-40A</b>	100
	White	Polypropylene	Red PTFE/White Silicone, Soft	65	1.5	<b>C4015-45W</b>	100
	Black	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.5	<b>C4015-55BLK</b>	100
	White	Polypropylene	Blue PTFE/White Silicone, Pre-slit	55	1.5	<b>C4015-55W</b>	100
	Black	Polypropylene	Red PTFE/White Silicone	60	1.5	<b>C4015-75A</b>	100
	White	Polypropylene	Red PTFE/White Silicone	60	1.5	<b>C4015-75W</b>	100
13mm Single Piece Screw Cap, 13-425 thread	Natural	Polypropylene	Integral Molded Polypropylene	–	0.25	<b>C4015-5A</b>	100
13mm Open Top Screw Cap, 13-425 thread, 8.5mm hole	Black	Phenolic	Red PTFE/White Silicone	60	1.5	<b>C4015-66A</b>	100
13mm Urea Solid Top Storage Cap, 13-425 thread	White	Polypropylene	PTFE/Foam Urethane Liner	–	1.25	<b>B7815-13</b>	100
13mm Open Top Screw Cap, 13-425 thread, 8.5mm hole	Black	Polypropylene	Bonded Red PTFE/White Silicone	45	1.5	<b>C4015-67A</b>	100

## National 4mL Screw Thread Convenience Kits

- Save time during sample preparation
- Reduce the risk of contamination

### Unassembled kits

- Includes 100 vials and 100 caps with pre-assembled septa

### Assembled kits

- Include 100 vials with pre-attached caps and septa
- Packaged in convenient vial trays with clear covers or in economical polybags



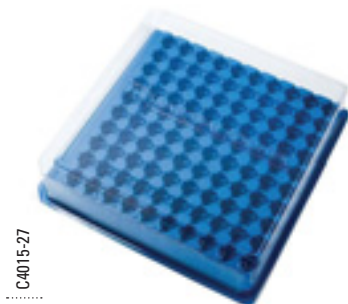
Items not shown to scale

### National 4mL Screw Thread Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap/Septum Cat.No.	Cat. No.	Pack of
Convenience Kit	Clear	No	Black	Red PTFE/White Silicone	C4015-1	C4015-75A	<b>C4015-88</b>	100
	Amber	Yes	Black	Red PTFE/White Silicone	C4015-2W	C4015-75A	<b>C4015-88AW</b>	100
Assembled Kit	Clear	No	Black	White Virgin PTFE, 0.01"	C4015-1	C4015-1A/C4015-10	<b>C4015-21</b>	100
	Clear	No	Black	Red PTFE/White Silicone	C4015-1	C4015-75A	<b>C4015-17</b>	100
	Amber	No	Black	Red PTFE/White Silicone	C4015-2	C4015-75A	<b>C4015-17A</b>	100
	Amber	Yes	Black	Red PTFE/White Silicone	C4015-2W	C4015-75A	<b>C4015-17AW</b>	100
	Clear	Yes	Black	Red PTFE/White Silicone	C4015-11W	C4015-75A	<b>C4015-17W</b>	100
	Clear	No	Black	PTFE/Red Rubber	C4015-1	C4015-66/73816T-13P	<b>C4015-482A</b>	100
Assembled Kit, in Polybag	Clear	No	Black	Red PTFE/White Silicone	C4015-1	C4015-75A	<b>C4015-017</b>	100
	Amber	No	Black	Red PTFE/White Silicone	C4015-2	C4015-75A	<b>C4015-017A</b>	100
	Clear	Yes	Black	Red PTFE/White Silicone	C4015-11W	C4015-75A	<b>C4015-017W</b>	100

## National 4mL Screw Top Vial Racks

- Polypropylene vial racks are resistant to most solvents
- Racks feature alphanumeric indexing for easier vial identification
- Racks can be stacked for efficient storage



Items not shown to scale

### National 4mL Screw Thread Vial Racks

Description	Capacity	Cat. No.	Pack of
Polystyrene storage rack for 15x45mm vials with clear lid	100 vials, 10x10	<b>C4015-27</b>	1
Polypropylene storage rack for 15x45mm vials, no lid	50 vials, 5x10	<b>C4015-25</b>	1

## National Shell Vials and Inserts

- Superior quality type 1 borosilicate and amber glass
- Polyethylene SepCap with starburst center design eases syringe needle penetration
- Convenient vial kits include equal quantities of vials and caps
- Polyspring inserts are self-aligning and provide a cushion against needle contact
- Microsampling vials allow maximum sample extraction without need for separate inserts

### Recommended for the following instruments:

- Alcott
- Gilson
- Shimadzu
- Waters (Wisp 96 respectively 48 Position Carousel)

For autosampler compatibility look on pages **2-100 to 2-104**



### National Shell Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
1mL Shell Vial with SepCap	Clear	No	8x40	Flat Bottom	1.25mL	1mL	<80	<b>C4015-96</b>	200
	Amber	No	8x40	Flat Bottom	1.25mL	1mL	<80	<b>C4015-99</b>	200
	Polypropylene	No	8x40	Flat Bottom	1.25mL	1mL	<80	<b>C4015-95P</b>	250
250µL Polyspring Conical Insert	Clear	–	5x34	Pulled Point	250µL	210µL	<3	<b>C4015-96A</b>	100
300µL Polyspring Conical Insert	Polypropylene	–	5x29	Precision Point	275µL	250µL	<3	<b>C4015-96PA</b>	100
0.7mL Accuform Shell Vial with SepCap	Polypropylene	No	8x40	Tapered Base	0.90mL	0.7mL	<8	<b>C4015-94</b>	1000
2mL Shell Vial with SepCap	Clear	No	12x32	Flat Bottom	2.4mL	1.8mL	<200	<b>C4011-80</b>	200
	Polypropylene	No	12x32	Flat Bottom	2.4mL	1.8mL	<200	<b>C4011-77P</b>	1000
4mL Shell Vial with SepCap	Clear	No	15x45	Flat Bottom	5.5mL	4mL	<800	<b>C4015-48</b>	100
	Polypropylene	No	15x45	Flat Bottom	5.5mL	4mL	<800	<b>C4015-47P</b>	100
800µL Polyspring Conical Insert	Clear	–	6x38	Pulled Point	950µL	800µL	<9	<b>C4015-638</b>	100
3mL Accuform Shell Vial with SepCap	Polypropylene	No	15x45	Tapered Base	3.75mL	2.9mL	<8	<b>C4015-46P</b>	1000
Positive Displacement Vial for Alcott with PE Plug Cap	Clear	No	8x35	Flat Bottom	1mL	900µL	–	<b>C4008-50</b>	1000

## National Headspace Vials

- Superior quality (Type 1, Class A) glass
- Headspace vials are available with either a round or flat base.
- Round bottom vials are compatible with most autosamplers and more easily handled by robotic arms that lift the vial from the tray
- Flat bottom vials maximize heating efficiency in manual headspace sampling and are required for use in some instrument models
- Vials feature beveled or square edge finish
- The bevel edge on the lip of the vial provides additional sealing power for greater leak resistance under high pressure.

**Recommended for most brands of instruments.**

For autosampler compatibility look on pages **2-100 to 2-104**



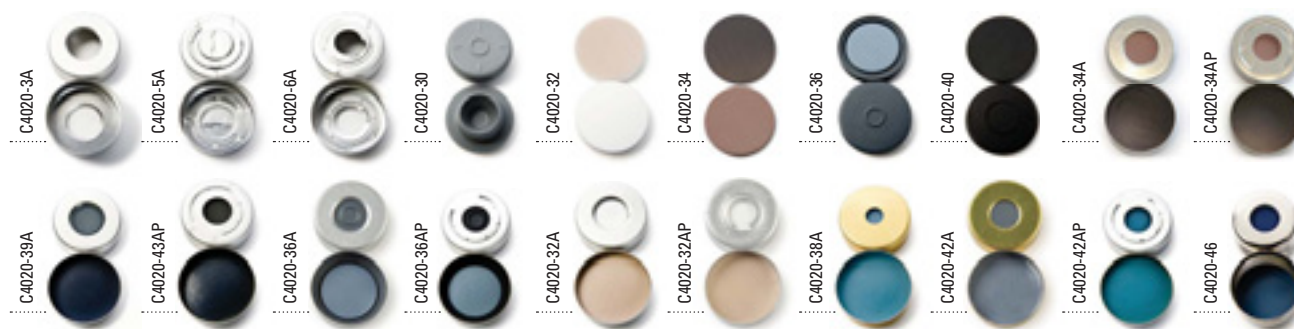
Images shown are 90% to scale

### National 20mm Crimp Top Headspace Vials

Description	Glass	Dimension (mm)	Finish	Profile	Total Volume (mL)	Usable Volume (mL)	Cat. No.	Pack of
20mm Headspace Crimp Vial	Clear	22x38	Beveled Edge	Flat Bottom	9	6	<b>C4020-60</b>	1000
	Clear	22x38	Square Rim	Flat Bottom	9	6	<b>C4020-6</b>	1000
	Clear	23x46	Beveled Edge	Flat Bottom	12.5	10	<b>C4020-10</b>	100
	Clear	23x46	Beveled Edge	Round Bottom	12.5	10	<b>C4020-210</b>	100
	Clear	23x46	Square Rim	Flat Bottom	12.5	10	<b>C4020-410</b>	1000
	Clear	23x75	Beveled Edge	Flat Bottom	21.5	20	<b>C4020-20</b>	100
	Clear	23x75	Beveled Edge	Round Bottom	21	20	<b>C4020-2</b>	100
	Clear	23x75	Square Rim	Flat Bottom	21.5	20	<b>C4020-25</b>	1000
	Clear	30x60	Beveled Edge	Flat Bottom	27	25	<b>C4020-27</b>	1000
18mm Screw Top Headspace Vial	Clear	22.5x46	Screw Thread	Round Bottom	12	10	<b>C4020-180</b>	125
	Clear	22.5x76	Screw Thread	Round Bottom	21	20	<b>C4020-18</b>	125

## National Headspace Caps and Septa

- Aluminum seals are available in standard center hole, pressure release and tear-off
- Pressure release seals are designed to open when internal pressure exceeds 3.0±0.5bar
- Use magnetic tinplate seals with CTC/Leap Technologies, Gerstel and other magnetic transport autosamplers
- Pre-assembled caps and septa are convenient and minimize contamination from handling



Images shown are 50% to scale

### National 20mm Crimp Top Headspace Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
20mm Crimp Cap, 9.5mm hole	Silver	Aluminum	–	–	–	<b>C4020-3A</b>	1000
20mm Tear-off Crimp Cap	Silver	Aluminum	–	–	–	<b>C4020-5A</b>	1000
20mm Pressure Release Crimp Cap, 7.5mm hole	Silver	Aluminum	–	–	–	<b>C4020-6A</b>	1000
Septum for 20mm Crimp Caps	–	–	20mm Gray Butyl Stopper	37	–	<b>C4020-30</b>	1000
	–	–	20mm Tan PTFE/White Silicone	45	3.2	<b>C4020-32</b>	100
	–	–	20mm Gray PTFE/Red Rubber	50	3.0	<b>C4020-34</b>	100
	–	–	20mm Gray PTFE/Black Butyl Molded	50	3.0	<b>C4020-36</b>	100
	–	–	Unfaced Black Rubber	55	3.0	<b>C4020-40</b>	100
20mm Crimp Cap, 9.5mm hole	Silver	Aluminum	Gray PTFE/Red Rubber	50	3.0	<b>C4020-34A</b>	100
20mm Pressure Release Crimp Cap, 8mm hole	Silver	Aluminum-PR	Gray PTFE/Red Rubber	50	3.0	<b>C4020-34AP</b>	100
20mm Crimp Cap, 9.5mm hole	Silver	Aluminum	Clear PTFE/Gray Butyl Rubber	50	3.0	<b>C4020-39A</b>	100
20mm Pressure Release Crimp Cap, 8mm hole	Silver	Aluminum-PR	Clear PTFE/Gray Butyl Rubber	50	3.0	<b>C4020-43AP</b>	100
20mm Crimp Cap, 9.5mm hole	Silver	Aluminum	Gray PTFE/Gray Butyl Rubber, Pharmafix	50	3.0	<b>C4020-36A</b>	100
20mm Pressure Release Crimp Cap, 8mm hole	Silver	Aluminum-PR	Gray PTFE/Gray Butyl Rubber, Pharmafix	50	3.0	<b>C4020-36AP</b>	100
20mm Crimp Cap, 9.5mm hole	Silver	Aluminum	Tan PTFE/White Silicone	45	3.2	<b>C4020-32A</b>	100
20mm Pressure Release Crimp Cap, 8mm hole	Silver	Aluminum-PR	Tan PTFE/White Silicone	45	3.2	<b>C4020-32AP</b>	100
20mm Magnetic Crimp Cap, 5mm hole	Gold	Tin-plated	Clear PTFE/Translucent Blue Silicone	45	3.0	<b>C4020-38A</b>	100
20mm Magnetic Crimp Cap, 8mm hole	Gold	Tin-plated	Clear PTFE/Translucent Blue Silicone	45	3.0	<b>C4020-42A</b>	100
20mm Pressure Release Crimp Cap, 7.5mm hole	Silver	Aluminum-PR	Clear PTFE/Translucent Blue Silicone	45	3.0	<b>C4020-42AP</b>	100
18mm Magnetic Screw Cap, 8mm hole	Silver	Steel	18mm Blue Silicone/Natural PTFE	45	3.0	<b>C4020-46</b>	125
18mm Magnetic Screw Cap, 8mm hole, SPME	Silver	Steel	18mm Blue Silicone/PTFE, not prefitted	30	1.0	<b>C4020-48</b>	125

Trying to decide what septum is right for you?

➤ Use our selection guide on **PAGE 2-053**





## National 20mm Crimp Top Headspace Unassembled Convenience Kits

- Include matched quantities of vials and silver aluminum seals with prefitted septa
- Caps feature pre-inserted septa for added convenience during sample preparation
- Convenience kits save time during sample preparation



Item not shown to scale

### National 20mm Crimp Top Headspace Unassembled Convenience Kits

Kit Type	Glass	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, 20mm Headspace Crimp Vial, Beveled Edge, Round Bottom, Pressure Release Crimp Cap, 7.5mm hole	Clear	Silver	Gray PTFE/Black Butyl Rubber, Pharmafix	C4020-2	C4020-36AP	<b>C4020-139</b>	100
	Clear	Silver	Tan PTFE/White Silicone	C4020-2	C4020-32AP	<b>C4020-320</b>	1000

## National 20mm Crimp Top Headspace Crimping and Decrimping Tools

- Crimping tools provide a reproducible, secure vial closure
- Manual decrimping tools allow easy removal of aluminum seals without breakage
- Decapping pliers are an economical choice for small quantities of vials
- Clean room crimpers and decrimpers can be autoclaved



Items not shown to scale

### National 20mm Crimp Top Headspace Crimping and Decrimping Tools:

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 20mm crimp seals	<b>C4020-100</b>	1
Decapping Pliers	Removes 20mm crimp seals, Protective gloves recommended	<b>C4020-101</b>	1
Manual Decrimper	Removes 20mm crimp seals	<b>C4020-102</b>	1
Manual stainless steel Cleanroom Crimper	Attaches 20mm crimp seals	<b>C4020-100SS</b>	1
Manual stainless steel Cleanroom Decrimper	Removes 20mm crimp seals without vial damage	<b>C4020-102SS</b>	1

For electronic crimpers and decappers look on page **2-094**

## National Sample Storage Screw Thread Vials

Sample Storage Screw Thread Vials, Caps and Septa

- Capacity ranges from 2-40mL
- Superior quality 33 expansion borosilicate clear (Type 1, Class A) or 51A amber (Type 1, Class B) glass
- Eliminate leaching of ions
- Provide consistent pH for duration of sample storage life
- PTFE-Lined Solid-top storage caps
- PTFE on film/foam backing offers broad chemical resistance
- Not autoclavable



Images shown are 70% to scale

### National Sample Storage Screw Thread Vials

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (mL)	Capacity (DRAMS)	Cat. No.	Pack of
8-425 Screw Vial	Clear	No	12x32	Flat Bottom	2	0.5	<b>B7999-1</b>	100
13-425 Screw Vial	Clear	No	12x45	Flat Bottom	4	1	<b>B7999-2</b>	100
15-425 Screw Vial	Clear	No	17x60	Flat Bottom	8	2	<b>B7999-3</b>	200
15-425 Screw Vial	Clear	No	19x65	Flat Bottom	12	3	<b>B7999-12</b>	200
18-400 Screw Vial	Clear	No	21x70	Flat Bottom	16	4	<b>B7999-4</b>	200
20-400 Screw Vial	Clear	No	23x85	Flat Bottom	22	6	<b>B7999-5</b>	200
24-400 Screw Vial	Clear	No	28x95	Flat Bottom	40	8	<b>B7999-6</b>	100
13-425 Screw Vial	Amber	No	12x45	Flat Bottom	4	1	<b>B7999-2A</b>	100
15-425 Screw Vial	Amber	No	17x60	Flat Bottom	8	2	<b>B7999-3A</b>	200
15-425 Screw Vial	Amber	No	19x65	Flat Bottom	12	3	<b>B7999-12A</b>	200
18-400 Screw Vial	Amber	No	21x70	Flat Bottom	16	4	<b>B7999-4A</b>	200
24-400 Screw Vial	Amber	No	28x95	Flat Bottom	40	8	<b>B7999-6A</b>	100





Images shown are 70% to scale

**National Sample Storage Screw Thread Caps and Septa**

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
8-425 Screw Cap	White	Urethane	PTFE/Foam Urethane Liner	75	1.3	<b>B7815-8</b>	100
13-425 Screw Cap	White	Urethane	PTFE/Foam Urethane Liner	75	1.3	<b>B7815-13</b>	100
15-425 Screw Cap	White	Polypropylene	PTFE/Foam Urethane Liner	75	1.3	<b>B7815-15</b>	100
18-400 Screw Cap	White	Polypropylene	PTFE/Foam Urethane Liner	75	1.3	<b>B7815-18</b>	100
20-400 Screw Cap	White	Polypropylene	PTFE/Foam Urethane Liner	75	1.3	<b>B7815-20</b>	100
24-400 Screw Cap	White	Polypropylene	PTFE/Foam Urethane Liner	75	1.3	<b>B7815-24</b>	100
Septa for 8-425 Screw Cap	–	–	0.01" White PTFE/0.09" Clear Silicone	50	1.5	<b>B7995-8</b>	100
Septa for 13-425 Screw Cap	–	–	0.01" White PTFE/0.09" Clear Silicone	50	1.5	<b>B7995-13</b>	100
Septa for 15-425 Screw Cap	–	–	0.01" White PTFE/0.09" Clear Silicone	50	1.5	<b>B7995-15</b>	100
Septa for 18-400 Screw Cap	–	–	0.01" White PTFE/0.09" Clear Silicone	50	1.5	<b>B7995-18</b>	100
Septa for 20-400 Screw Cap	–	–	0.01" White PTFE/0.09" Clear Silicone	50	1.5	<b>B7995-20</b>	100
Septa for 24-400 Screw Cap	–	–	0.01" White PTFE/0.09" Clear Silicone	50	1.5	<b>B7995-24</b>	100
Septa for 24-400 Screw Cap	–	–	0.005" White PTFE/0.120" Clear Silicone	50	3.3	<b>B7995-26</b>	100
Open top 8-425 Screw Cap	Black	Polypropylene	–	–	–	<b>B7807-8</b>	100
Open top 13-425 Screw Cap	Black	Polypropylene	–	–	–	<b>B7807-13</b>	100
Open top 15-425 Screw Cap	Black	Polypropylene	–	–	–	<b>B7807-15</b>	100
Open top 18-400 Screw Cap	Black	Polypropylene	–	–	–	<b>B7807-18</b>	100
Open top 20-400 Screw Cap	Black	Polypropylene	–	–	–	<b>B7807-20</b>	100
Open top 24-400 Screw Cap	White	Polypropylene	–	–	–	<b>B7807-24</b>	100

## National Sample Storage Unassembled Convenience Kits

- Convenience kits save time during sample preparation
- Solid top convenience kits include matched quantities of vials and screw caps with pre-assembled septa
- Open top convenience kits contain shrink-wrapped vials and separately packaged caps and septa in polybags



B7990-2



B7800-20

Items not shown to scale

### National Sample Storage Unassembled Convenience Kits

Kit Type	Glass	Total Volume (mL)	Cap Color	Cap Material	Septum	Vial Cat.No.	Cap/Septum Cat.No.	Cat. No.	Pack of
Screw Vial Convenience Kit, Solid-top Cap	Clear	2	White	Urethane	PTFE/Polyethylene Foam Liner	B7999-1	B7815-8	<b>B7800-1</b>	100
	Clear	4	White	Urethane		B7999-2	B7815-13	<b>B7800-2</b>	100
	Clear	8	White	Polypropylene	B7999-3	B7815-15	<b>B7800-3</b>	200	
	Clear	12	White	Polypropylene	B7999-12	B7815-15	<b>B7800-12</b>	200	
	Clear	16	White	Polypropylene	B7999-4	B7815-18	<b>B7800-4</b>	200	
	Clear	22	White	Polypropylene	B7999-5	B7815-20	<b>B7800-5</b>	200	
	Clear	40	White	Polypropylene	B7999-6	B7815-24	<b>B7800-6</b>	100	
	Amber	2	White	Urethane	B7999-1A	B7815-8	<b>B7800-1A</b>	100	
	Amber	4	White	Urethane	B7999-2A	B7815-13	<b>B7800-2A</b>	100	
	Amber	8	White	Polypropylene	B7999-3A	B7815-15	<b>B7800-3A</b>	200	
	Amber	12	White	Polypropylene	B7999-12A	B7815-15	<b>B7800-12A</b>	200	
	Amber	16	White	Polypropylene	B7999-4A	B7815-18	<b>B7800-4A</b>	200	
	Amber	40	White	Polypropylene	B7999-6A	B7815-24	<b>B7800-6A</b>	100	
	Screw Vial Assembled Kit, Solid-top Cap	Clear	20	White	Polypropylene	0.01" White PTFE/0.05" Clear Silicone	B7920-VO	B7815-24	<b>B7800-20</b>
Amber		20	White	Polypropylene	B7921-VO	B7815-24	<b>B7800-20A</b>	100	
Screw Vial Convenience Kit, Open top Cap	Clear	2	Black	Polypropylene	0.01" White PTFE/0.05" Clear Silicone	B7999-1	B7807-8/B7995-8	<b>B7990-1</b>	100
	Clear	4	Black	Polypropylene		B7999-2	B7807-13/B7995-13	<b>B7990-2</b>	100
	Clear	8	Black	Polypropylene		B7999-3	B7807-15/B7995-15	<b>B7990-3</b>	200
	Clear	12	Black	Polypropylene		B7999-12	B7807-15/B7995-15	<b>B7990-12</b>	200
	Clear	16	Black	Polypropylene		B7999-4	B7807-18/B7995-18	<b>B7990-4</b>	200
	Clear	22	Black	Polypropylene		B7999-5	B7807-20/B7995-20	<b>B7990-5</b>	200
	Clear	40	White	Polypropylene	B7999-6	B7807-24/B7995-24	<b>B7990-6</b>	100	
	Amber	2	Black	Polypropylene	B7999-1A	B7807-8/B7995-8	<b>B7990-1A</b>	100	
	Amber	4	Black	Polypropylene	B7999-2A	B7807-13/B7995-13	<b>B7990-2A</b>	100	
	Amber	12	Black	Polypropylene	B7999-12A	B7807-15/B7995-15	<b>B7990-12A</b>	200	
	Amber	40	White	Polypropylene	B7999-6A	B7807-24/B7995-24	<b>B7990-6A</b>	100	

## National EPA Screw Vials

### EPA Screw Vial Convenience Kits

- Convenience kits save time during sample preparation
- Unassembled convenience kits include shrink-wrapped vials and separately packaged caps and septa in polybags
- Assembled kits include vials with pre-attached caps and septa
- Recommended for discrete water sampling under EPA 40 CFR 136 "Guidelines for Establishing Test Procedures for the Analysis of Pollutants" and EPA 40 CFR 141 "National Interim Primary Drinking Water Regulations: Control of Trihalomethanes in Drinking Water"



B7920

Items not shown to scale

### National EPA Screw Vial Convenience Kits

Kit Type	Glass	Total Volume (mL)	Class	Septum	Cat. No.	Pack of
EPA Screw Vial Convenience Kit	Clear	40	100	0.01" White PTFE/0.09" Clear Silicone	<b>B7950-B</b>	100
EPA Screw Vial Assembled Kit	Clear	40	100	0.01" White PTFE/0.09" Clear Silicone	<b>B7950</b>	100
	Amber	40	100	0.01" White PTFE/0.09" Clear Silicone	<b>B7951</b>	100
	Clear	20	100	0.01" White PTFE/0.09" Clear Silicone	<b>B7920</b>	100
	Amber	20	100	0.01" White PTFE/0.09" Clear Silicone	<b>B7921</b>	100
EPA Screw Vial Assembled Kit	Clear	40	200	0.01" White PTFE/0.09" Clear Silicone	<b>B7950-C</b>	72



B7950-VO

B7951-VO



B7950-1A

B7995-24

\* 60% to scale

### National EPA Screw Vials, Caps and Septa

Description	Glass	Cap Color	Dimension (mm)	Total Volume (mL)	Material	Cat. No.	Pack of
24-400 EPA Screw Vial	Clear	—	28x95	40	—	<b>B7950-VO</b>	100
	Amber	—	28x95	40	—	<b>B7951-VO</b>	100
24-400 EPA Screw Cap	—	White	—	—	Polypropylene	<b>B7950-1A</b>	100
Septa for 24-400 Screw Cap	—	—	—	—	0.01" White PTFE/0.09" Clear Silicone	<b>B7995-24</b>	100

## Septum Selection Guide

Septa for use with general chromatography vials

### PTFE/Natural Red Rubber

PTFE Natural Red Rubber are moderately priced seals for GC and HPLC with good chemical properties. They are ideal for multiple injections due to high resealability, but not as easy to penetrate as PTFE/RR.

### PTFE/Synthetic Red Rubber Septa: (PTFE/RR)

PTFE/Red Rubber septa are the most popular and economical choice for general GC and HPLC applications. Used primarily for routine analysis in gas chromatography with FID, TCD and FPD detectors, PTFE/Red Rubber septa offer moderate resealability and excellent chemical inertness before puncture. The low durometer of red rubber allows for easy needle penetration even with thin bore GC needles. PTFE/Red Rubber septa are not recommended for multiple injections or retention of samples for further analysis.

**Note:** C4000-30 and C4000-51 Series feature high-quality red rubber with a thin 0.003" layer of PTFE. C4011-1A, C4011-98 Series, C4011-51 Series, C4008-1A Series, and C4008-98 Series feature high-quality medium durometer red rubber with a thin (0.015") layer of PTFE.

### PTFE/High Performance Red Rubber

PTFE Red Rubber is a highly pure synthetic red rubber septum that provides a reduced background level for specific GC applications, employing sensitive detectors such as ECD or NPD. PTFE Red Rubber has resealing characteristics similar to PTFE/Red Rubber and is pre-inserted into an aluminum seal.

### PTFE/Silicone Septa: (T/S)

High-quality, lowest background/blank value, 100% synthetic pure silicone septa, for all types of chromatographic applications. Laminated to 0.005" thick PTFE for a pure, highly inert septum with excellent resealing characteristics even after repeated punctures. PTFE/Silicone septa are ideal for use in most HPLC and GC applications where resealability and purity are critical. Cleaner than Natural Rubber or Red Rubber. Available with different hardnesses (durometers) meeting requirements of various needle types.

### Pre-slit PTFE/Silicone Septa

A PTFE/Silicone septum is provided with a thin 0.005" PTFE layer laminated to highly pure silicone, and slit through the center for easier needle penetration and to release the vacuum that forms when a large volume of sample is withdrawn from a vial. This septum provides chromatographic characteristics similar to that of a septum without a slit, except that the ability to withstand exposure to aggressive solvents is slightly lessened. Pre-slit septa are highly recommended for Shimadzu, Hitachi, and other autosamplers with thin gauge needles. Bonded caps: feature a PTFE/Silicone septum electrolytically bonded into the cap.

### PTFE/Silicone/PTFE Septa: (T/S/T)

A layer of 0.003" thick PTFE is laminated to each side of high-purity, medium durometer silicone to form a septum that is resistant to coring, but still maintains good resealing characteristics. T/S/T septa are recommended

for the most critical applications such as ultratrace analysis, where there is a longer time between injections, or for internal standard methods. T/S/T septa provide superior performance with Agilent 1050, 1090, 1100, or any autosampler employing a large diameter, blunt-tip needle.

### PTFE Septa

A solid disk of 0.010" thick PTFE offers superior chemical inertness against the most aggressive solvents. The thin membrane allows for easy penetration by most needles. PTFE septa are not resealable and should be used with relatively short cycle times or single injection methods.

### Polyethylene (PE) Septa/Integral Molded Closures/Caps/Stoppers:

Chemically resistant polyethylene septa are usually molded into single-piece caps. The surface for needle penetration is 0.01" thick, allowing for use with thin gauge needles. Polyethylene septa are not resealable and are intended for single injection use.

### Polypropylene (PP) Septa: /Integral Molded Closures/Caps/Stoppers:

Chemically resistant polypropylene septa are available molded into single piece caps or as 0.01" thick disks. The surface for needle penetration is 0.01" thick, allowing for use with thin gauge needles. Polypropylene septa are not resealable and are intended for single injection use.

## Septum Selection Guide

### 20mm Headspace Septa

#### Gray Butyl Stopper: (C4020-30)

An economical septum for lower temperature (125°C) or low-pressure applications. Gray Butyl stoppers do not provide a PTFE barrier and are not suitable for use with alkanes, benzene, chlorinated solvents or cyclohexane.

#### Gray PTFE/Red Rubber Septa: (C4020-34)

Good solvent resistance, good resealing characteristics, resistant to coring. An economical choice where a PTFE barrier is desired.

#### PTFE/White Silicone PurePack Septa: (C4020-32)

Excellent choice for volatiles. Septa are packed in a glass PurePak jar to assure low background, low permeability, and the highest performance of any headspace septum. PTFE/Silicone septa provide excellent resealing characteristics and broad chemical compatibility.

#### Gray PTFE/Molded Black Butyl Septa (Pharmafix Style): (C4020-36)

C4020-36 is a molded septum featuring a PTFE-faced center surface that does not extend to the edges of the septum. The PTFE center area provides good resistance to a wide variety of solvents. The center puncture area is resistant to coring and will reseal after several punctures. The black butyl outer sealing edge conforms well to the rim of the vial affecting a more positive seal.

#### Black Rubber Septa: (C4020-40)

Black Rubber septa are molded from a higher density rubber compound compared to the standard red rubber. This septum has characteristics similar to the Gray Butyl stopper. The Black Rubber septum is an economical choice for applications where reduced levels of vapor penetration are desired.

### Temperature Stability Chart

	min. Temp °C	max. Temp °C	min. Temp °F	max. Temp °F
PTFE/Natural Red Rubber	-10	+85	14	+185
PTFE/Synthetic Red Rubber Septa: (PTFE/RR)	-30	+110	-22	+230
PTFE/ High Performance Red Rubber Septa	-40	+110	-40	+230
PTFE/Silicone Septa: (T/S)	-60	+200	-76	+392
PTFE/Silicone/PTFE Septa: (T/S/T)	-60	+200	-76	+392
PTFE Septa	-200	+250	-328	+482
Polyethylene (PE)	-50	+80	-58	+176
Polypropylene (PP)	0	+121	32	+250
Butyl/Chlorobutyl/Bromobutyl Stopper or Septa	-20	+125	-4	+257
Gray PTFE/Red Rubber	-40	+120	-40	+248
PTFE/White Silicone PurePack Septa	-60	+200	-76	+392
Gray PTFE/Molded Black Butyl (Pharmafix) Septa	-20	+125	-4	+257
Black Rubber Septa	-20	+100	-4	+212

*eVol is the worlds first analytical syringe*

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## Deactivated Glass Vials and Inserts

We use only the highest-quality glass to manufacture vials and inserts. Clear and Amber glass tubes have been selected for their consistent composition, dimensional stability and cleanliness. The vast majority of chemical compounds demonstrate no interaction with our standard, un-treated glass products. Strongly polar compounds present at trace concentrations may exhibit lower than expected recoveries due to interactions with Si-OH active sites that are present in all borosilicate glass. The use of a deactivated sample vial is recommended for these samples.

We employ two methods of surface treatment to produce a deactivated product for those instances where a specific compound displays an undesirable interaction with the standard glass product. Most reactive compounds will give a similar improvement in results for either deactivation method.

A few compounds will give a better result in one treatment compared to the other.

We recommend that compound recovery be first evaluated in our standard glass product, followed by the silanized product and finally in our Kimshield deactivated product.

The following are general descriptions of the glass deactivation treatments available.

### Silanized Products:

Silanized glassware is the most widely applicable and popular deactivation method in use for improving the recovery of reactive compounds from glass vials and inserts. A proprietary methylating agent is introduced by vapor phase deposition onto the surface of the glassware. Our controlled vapor phase deposition process assures complete and uniform surface coverage. Silanization lowers the surface tension of the glass and forms a hydrophobic barrier that discourages leaching of trace glass constituents into aqueous solutions and adsorption of trace sample components onto the surface of the glass. Vapor phase deposition leaves no liberated acids or other residues that are common with other treatment methods. Our automated silanization process assures that every vial will be consistently treated – leaving a minimum of unreacted silanol groups.

### Kimshield Deactivation:

Kimshield Deactivation is also a vapor deposition method employing a proprietary silicone fluid to coat the surface of the glass. Kimshield deactivation lowers the surface tension of the glass and forms a hydrophobic barrier similar to silanization, but with a slightly different functionality.

As with Silanized products, Kimshield deactivated vials and inserts do not release acids, solvents or other residues. Kimshield deactivation is slightly less durable compared to Silanization, but will withstand exposure to most solvents that are compatible with borosilicate glass.

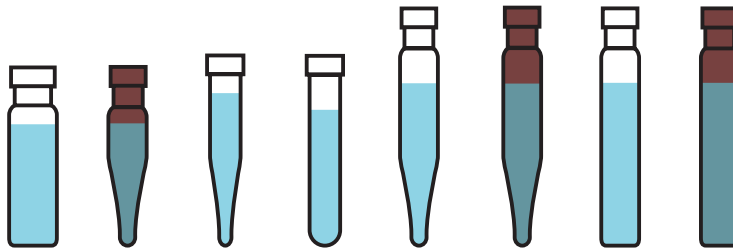




# National Vial Reference Chart

\* Drawing is valid for: C4000-1B, C4000-1G, C4000-1R, C4000-1Y  
 Images shown are 80% to scale

## 8mm CrimpTop Vials



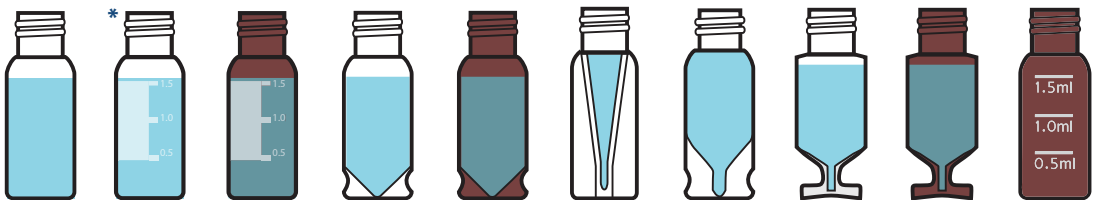
	<b>C4008-1</b>	<b>C4008-730</b>	<b>C4008-632C</b>	<b>C4008-632R</b>	<b>C4008-739</b>	<b>C4008-740</b>	<b>C4008-741</b>	<b>C4008-742</b>
Part No.	C4008-1	C4008-730	C4008-632C	C4008-632R	C4008-739	C4008-740	C4008-741	C4008-742
Dimensions	8 x 30	7 x 30	6 x 32	6 x 32	7 x 40	7 x 40	7 x 40	7 x 40
Common Description	0.8mL	0.5mL	0.2mL	0.3mL	0.7mL	0.7mL	0.8mL	0.8mL
Approx. Total Capacity	1mL	550µL	250µL	325µL	575µL	575µL	775µL	775µL
Rec. Usable Volume	0.8mL	400µL	200µL	250µL	450µL	450µL	650µL	650µL
Residual Volume	<80µL	<3µL	<3µL	<6µL	<2µL	<2µL	<70µL	<70µL
Composition	Glass	Amber	Glass	Glass	Glass	Amber	Glass	Amber

## Standard-Opening Screw Thread Vials - 12 x 32mm



	<b>C4013-1</b>	<b>C4013-1W</b>	<b>C4013-2</b>	<b>C4013-2W</b>	<b>C4013-11</b>	<b>C4013-12</b>	<b>C4013-13</b>
Part No.	C4013-1	C4013-1W	C4013-2	C4013-2W	C4013-11	C4013-12	C4013-13
Common Description	2mL	2mL	2mL	2mL	250µL	100µL	600µL
Approx. Total Capacity	1.9mL	1.9mL	1.9mL	1.9mL	475µL	400µL	850µL
Rec. Usable Volume	1.5mL	1.5mL	1.5mL	1.5mL	250µL	200µL	675µL
Residual Volume	<170µL	<170µL	<170µL	<170µL	<3µL	<2µL	<8µL
Composition	Glass	Glass	Amber	Amber	Polypro	Glass	Polypro

## Target DP 9mm Screw Vials 12 x 32mm



	<b>C4000-1</b>	<b>C4000-1W</b>	<b>C4000-2W</b>	<b>C4000-9</b>	<b>C4000-9A</b>	<b>C4000-11</b>	<b>C4000-9TR</b>	<b>C4000-V1</b>	<b>C4000-V2</b>	<b>C4000-12</b>
Part No.	C4000-1	C4000-1W	C4000-2W	C4000-9	C4000-9A	C4000-11	C4000-9TR	C4000-V1	C4000-V2	C4000-12
Common Description	2mL	2mL	2mL	1.5mL	1.5mL	450µL	1.5mL	1.5mL	1.5mL	2mL
Approx. Total Capacity	2mL	2mL	2mL	1.7mL	1.7mL	250µL	1.5mL	1.4mL	1.4mL	2mL
Rec. Usable Volume	1.5mL	1.5mL	1.5mL	1.3mL	1.3mL	250µL	1.2mL	1.0mL	1.0mL	1.5mL
Residual Volume	<170 µL	<170µL	<170µL	<4µL	<4µL	<1µL	<1µL	<4µL	<4µL	<180 µL
Composition	Glass	Glass	Amber	Glass	Amber	PolyPro	Glass	Glass	Amber	Amber PP

## Target DP 9mm Screw Vials 12 x 32mm

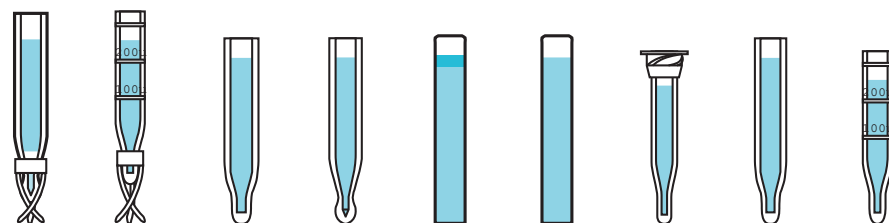


	<b>C4000-LV1</b>	<b>C4000-LV1W</b>	<b>C4000-LV2</b>	<b>C4000-LV2W</b>	<b>C4000-LV3W</b>
Part No.	C4000-LV1	C4000-LV1W	C4000-LV2	C4000-LV2W	C4000-LV3W
Common Description	350µL	350µL	350µL	350µL	200µL
Approx. Total Capacity	475µL	475µL	475µL	475µL	375µL
Rec. Usable Volume	350µL	350µL	350µL	350µL	240µL
Residual Volume	<2µL	<2µL	<2µL	<2µL	<1µL
Composition	Glass	Glass	Amber	Amber	Glass

## Target DP Microvolume Inserts

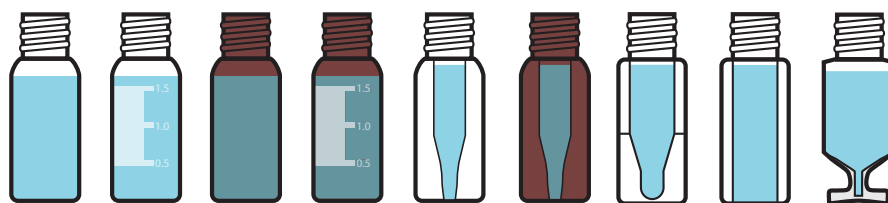
\*Drawing is valid for: C4011-1B, C4011-1G, C4011-1R, C4011-1Y

Images shown are 80% to scale



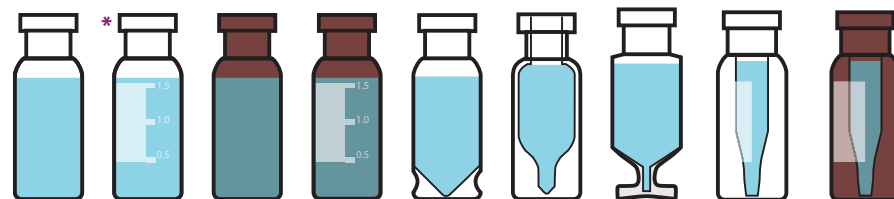
	<b>C4010-630</b>	<b>C4010-630P</b>	<b>C4010-627L</b>	<b>C4010-629L</b>	<b>C4011-631</b>	<b>C4011-631P</b>	<b>C4010-630TS</b>	<b>C4010-629</b>	<b>C4010-629P</b>
Part No.	C4010-630	C4010-630P	C4010-627L	C4010-629L	C4011-631	C4011-631P	C4010-630TS	C4010-629	C4010-629P
Dimensions	6 x 31mm	6 x 30mm	6 x 31mm	6 x 31mm	6 x 31mm	6 x 31mm	6 x 29mm	6 x 30mm	6 x 30mm
Common Description	300µL	300µL	350µL	350µL	400µL	300µL	150µL	300 µL	300 µL
Approx. Total Capacity	375µL	325µL	400µL	400µL	500µL	500µL	450µL	375 µL	325 µL
Rec. Usable Volume	300µL	250µL	350µL	350µL	400µL	400µL	325µL	300 µL	250 µL
Residual Volume	<1µL	<2µL	<4µL	<2µL	<25µL	<25µL	<3µL	<4 µL	<2 µL
Composition	Glass	Polypro	Glass	Glass	Glass	Polypro	Glass	Glass	Polypro

## 10mm Wide Opening Screw Thread Vials - 12 x 32mm



	<b>C4010-1</b>	<b>C4010-1W</b>	<b>C4010-2</b>	<b>C4010-2W</b>	<b>C4010-LV1</b>	<b>C4010-LV2</b>	<b>C4010-11</b>	<b>C4010-14</b>	<b>C4010-V1</b>
Part No.	C4010-1	C4010-1W	C4010-2	C4010-2W	C4010-LV1	C4010-LV2	C4010-11	C4010-14	C4010-V1
Common Description	2mL	2mL	2mL	2mL	350µL	450µL	250µL	700µL	1.5mL
Approx. Total Capacity	2mL	2mL	2mL	2mL	450µL	450µL	600µL	750µL	1.5mL
Rec. Usable Volume	1.5mL	1.5mL	1.5mL	1.5mL	350µL	350µL	400µL	550µL	1.1mL
Residual Volume	<170µL	<170µL	<170µL	<170µL	<2µL	<2µL	<4µL	>70µL	<4mL
Composition	Glass	Glass	Amber	Amber	Glass	Amber	Polypro	Polypro	Glass

## 11mm Wide Opening Crimp Top Vials



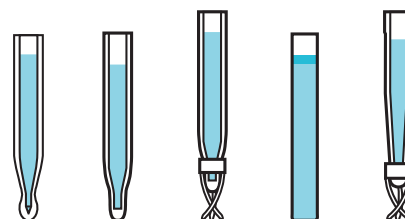
	<b>C4011-1</b>	<b>C4011-1W</b>	<b>C4011-2</b>	<b>C4011-2W</b>	<b>C4011-9</b>	<b>C4011-10</b>	<b>C4011-V1</b>	<b>C4011-LV1W</b>	<b>C4011-LV2W</b>
Part No.	C4011-1	C4011-1W	C4011-2	C4011-2W	C4011-9	C4011-10	C4011-V1	C4011-LV1W	C4011-LV2W
Common Description	2mL	2mL	2mL	2mL	1.5mL	400µL	1.5mL	250µL	250µL
Approx. Total Capacity	2mL	2mL	2mL	2mL	1.7mL	650µL	1.5mL	500µL	500µL
Rec. Usable Volume	1.5mL	1.5mL	1.5mL	1.5mL	1.3mL	500µL	1.1mL	350µL	350µL
Residual Volume	<170µL	<170µL	<170µL	<170µL	<4µL	<5µL	<4µL	<2µL	<2µL
Composition	Glass	Glass	Amber	Amber	Glass	Glass	Glass	Glass	Amber

## 11mm Standard-Opening Crimp Vials 12 x 32mm



	<b>C4012-1</b>	<b>C4012-1W</b>	<b>C4012-2</b>	<b>C4012-2W</b>	<b>C4012-10</b>
Part No.	C4012-1	C4012-1W	C4012-2	C4012-2W	C4012-10
Common Description	2mL	2mL	2mL	2mL	100µL
Approx. Total Capacity	2mL	2mL	2mL	2mL	425µL
Rec. Usable Volume	1.5mL	1.5mL	1.5mL	1.5mL	200µL
Residual Volume	<170µL	<170µL	<170µL	<170µL	<2µL
Composition	Glass	Glass	Amber	Amber	Glass

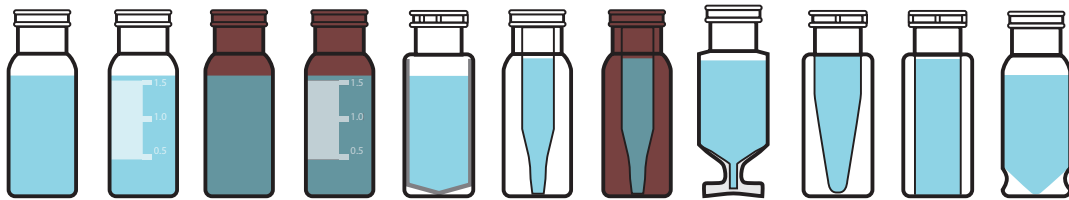
## Standard Microvolume Inserts



	<b>C4012-529</b>	<b>C4012-529L</b>	<b>C4012-530</b>	<b>C4012-465</b>	<b>C4012-530P</b>
Part No.	C4012-529	C4012-529L	C4012-530	C4012-465	C4012-530P
Dimensions	5 x 29mm	5 x 31mm	5 x 29mm	5 x 31mm	5 x 30mm
Common Description	150µL	150µL	150µL	200µL	125µL
Approx. Total Capacity	200µL	200µL	200µL	250µL	175µL
Rec. Usable Volume	175µL	170µL	170µL	200µL	150µL
Residual Volume	<3µL	<2µL	<1µL	<12µL	<2µL
Composition	Glass	Glass	Glass	Glass	Polypro

## National Vials Comparison Chart

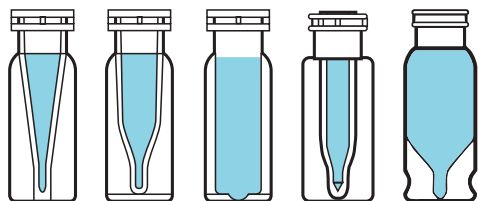
11mm Snap-It-Vials - 12 x 32mm



Part No.	C4011-5	C4011-5W	C4011-6	C4011-6W	C4011-24	C4011-LV1	C4011-LV2	C4011-V5	C4011-11	C4011-14	C4011-4
Common Description	2mL	2mL	2mL	2mL	700µL	350µL	350µL	1.5mL	450µL	3700µL	1.5mL
Approx. Total Capacity	2mL	2mL	2mL	2mL	1000µL	500µL	500µL	1.5mL	800µL	1000µL	1.7mL
Rec. Usable Volume	1.5mL	1.5mL	1.5mL	1.5mL	750µL	350µL	350µL	1.1mL	600µL	800µL	1.3mL
Residual Volume	<170µL	<170µL	<170µL	<170µL	<8µL	<2µL	<2µL	<4µL	<6µL	<80µL	<4µL
Composition	Glass	Glass	Amber	Amber	TPX	Glass	Amber	Glass	Polypro	Polypro	Glass

11mm Snap-It-Vials - 12 x 32mm

Headspace Vials



Part No.	C4011-13	C4011-16	C4011-15	C4012-15	C4011-9TR
Common Description	250µL	600µL	850µL	250µL	1.5mL
Approx. Total Capacity	475µL	600µL	825µL	475µL	1.5mL
Rec. Usable Volume	300µL	400µL	650µL	350µL	1.2mL
Residual Volume	<2µL	<4µL	<8µL	<4µL	<1µL
Composition	Polypro	Polypro	Polypro	Glastic	Glass



Part No.	C4020-6	C4020-60	C4020-27
Common Description	6mL	6mL	27mL
Approx. Total Capacity	9mL	9mL	27mL
Composition	Glass	Glass	Glass

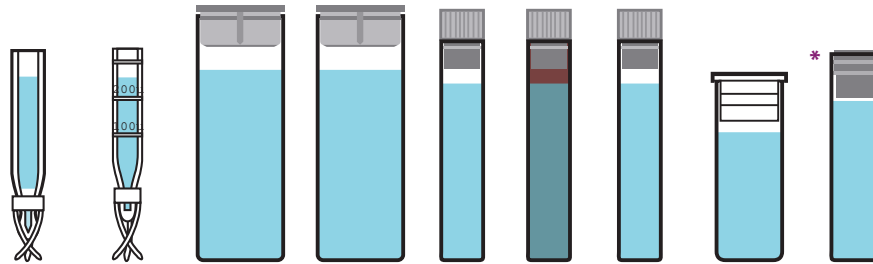
Headspace Vials



Part No.	C4020-20	C4020-10	C4020-2	C4020-210	C4020-25	C4020-410
Common Description	20mL	10mL	20mL	10mL	20mL	10mL
Approx. Total Capacity	21mL	12mL	21.5mL	12mL	21.5mL	12.5mL
Composition	Glass	Glass	Glass	Glass	Glass	Glass

Images shown are 80% to scale

Shell Vials and Inserts



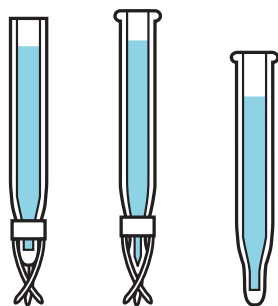
	<b>C4015-96A</b>	<b>C4015-96PA</b>	<b>C4015-48</b>	<b>C4015-47P</b>	<b>C4015-96</b>	<b>C4015-99</b>	<b>C4015-95P</b>	<b>C4011-80</b>	<b>C4008-50</b>
Part No.	C4015-96A	C4015-96PA	C4015-48	C4015-47P	C4015-96	C4015-99	C4015-95P	C4011-80	C4008-50
Dimensions	5 x 34mm	5 x 29mm	—	—	—	—	—	—	8 x 35mm
Common Description	250 µL	275 µL	4mL	4mL	1mL	1mL	1mL	2mL	1mL
Approx. Total Capacity	375 µL	375 µL	5.5mL	5.5mL	1.25mL	1.25mL	1.25mL	2.4mL	1mL
Rec. Usable Volume	210 µL	250 µL	4mL	4mL	1mL	1mL	1mL	1.8mL	850µL
Residual Volume	<3 µL	<3 µL	<800µL	<800 µL	<80µL	<80µL	<80µL	<200µL	—
Composition	Glass	PolyPro	Glass	Polypro	Glass	Amber	PolyPro	Glass	Glass

15 x 45mm Screw Thread Vials



	<b>C4015-1</b>	<b>C4015-11W</b>	<b>C4015-2</b>	<b>C4015-2W</b>	<b>C4015-9</b>	<b>C4015-14</b>
Part No.	C4015-1	C4015-11W	C4015-2	C4015-2W	C4015-9	C4015-14
Common Description	4mL	4mL	4mL	4mL	3.5mL	2.5mL
Approx. Total Capacity	5.2mL	5.2mL	5.2mL	5.2mL	4.5mL	2.5mL
Rec. Usable Volume	4mL	4mL	4mL	4mL	3.5mL	2mL
Residual Volume	<800µL	<800µL	<800µL	<800µL	<15µL	<15µL
Composition	Glass	Glass	Amber	Amber	Glass	Polypro

Microvolume Inserts for 15 x 45mm 4mL Vials



	<b>C4015-638</b>	<b>C4015-641</b>	<b>C4015-643</b>
Part No.	C4015-638	C4015-641	C4015-643
Dimensions	6 x 38mm	6 x 41mm	6 x 42mm
Common Description	700µL	500µL	500µL
Approx. Total Capacity	950µL	575µL	375µL
Rec. Usable Volume	800µL	500µL	300µL
Residual Volume	<9µL	<6µL	<8µL
Composition	Glass	Glass	Glass

TOC Vials



	<b>C4011-1296</b>
Part No.	C4011-1296
Common Description	5mL
Approx. Total Capacity	5mL
Composition	Glass

Images shown are 80% to scale  
 \* 50% to scale  
 \* Positive Displacement Vial for Alcott 708

## Thermo Scientific Chromacol Vials and Closures

- Innovative products in micro- and precision sampling
- High quality, stringent manufacturing tolerances, has been tested extensively for comprehensive autosampler compatibility
- Products developed in close technical cooperation with the instrument manufacturers
- Detailed information regarding material specifications and compatibility
- Custom manufactured capabilities
- Competent and experienced worldwide distributor network



### Chromacol 8mm Crimp Top Vials

- The SCI-VI system gives the chromatography user the ability to inject reproducibly from glass vials with residual volumes as low as 1 $\mu$ L to 5 $\mu$ L in a full range of autosampler instruments.
- Precision-machined sleeves that allow the vials to be used in the vast majority of commercial autosamplers.
- Sleeves are re-usable and support the crimped, sealed vials in the correct position within both the autosampler carousel or racks
- Allow movement of the vials as a unit to injection positions in both GC and HPLC autosamplers.
- GOLD glass quality, a low expansion high purity glass with an extremely low concentration of active sites.
- Available in both clear and amber glass these vials can be used with crimp and snap caps

#### Approximate Chemical Composition for Borosilicate Glass

Description	SiO <sub>2</sub>	B <sub>2</sub> O <sub>3</sub>	Al <sub>2</sub> O <sub>3</sub>	CaO	MgO	Na <sub>2</sub> O	K <sub>2</sub> O	BaO
33 expansion Glass	80%	13%	3%	0.1%	–	4%	0.1%	<0.1%
N-51A Glass	72%	12%	7%	1%	–	6%	2%	<0.1%
Neutral Borosilicate-GOLD Grade	80.6%	13%	2.3%	–	–	4%	–	–

For autosampler compatibility look on pages **2-100** to **2-104**



### Chromacol 8mm Crimp Top Vials

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (µL)	Usable Volume (µL)	Residual (µL)	Cat. No.	Pack of
0.3mL Sci-Vi Crimp Top Vial - GOLD Grade Glass	Clear	No	6x32	Round Bottom	325	250	<5	<b>03-CVG</b>	500
0.2mL Sci-Vi Crimp Top Vial - GOLD Grade Glass	Clear	No	6x32	Conical	250	200	<5	<b>02-CTVG</b>	500
0.2mL Sci-Vi Crimp Top Vial	Amber	No	6x32	Conical	250	200	<5	<b>02-CTV(A)</b>	500
0.1mL Sci-Vi Crimp Top Vial - GOLD Grade Glass	Clear	No	6x32	Round Bottom	125	80	<1	<b>01-CVG</b>	500
1.2mL Crimp Top Vial	Clear	No	8x40	Flat Bottom	1300	1200	<75	<b>1.2-CWV</b>	500
1mL Crimp Top Tapered Vial	Clear	No	8x40	Conical	1180	1000	<5	<b>1-CWV</b>	500
0.8mL Crimp Top Vial	Clear	No	8x30	Flat Bottom	1000	800	<80	<b>08-CV</b>	500
	Clear	No	7x40	Flat Bottom	775	650	<70	<b>08-CPV</b>	500
	Amber	No	7x32	Round Bottom	700	600	<30	<b>08-CRV(A)</b>	500
0.7mL Crimp Top Tapered Vial	Clear	No	7x40	Conical	575	450	<5	<b>07-CPV</b>	500
	Amber	No	7x40	Conical	575	450	<5	<b>07-CPV(A)</b>	500



### Chromacol 8mm Crimp Top Vials (Continued)

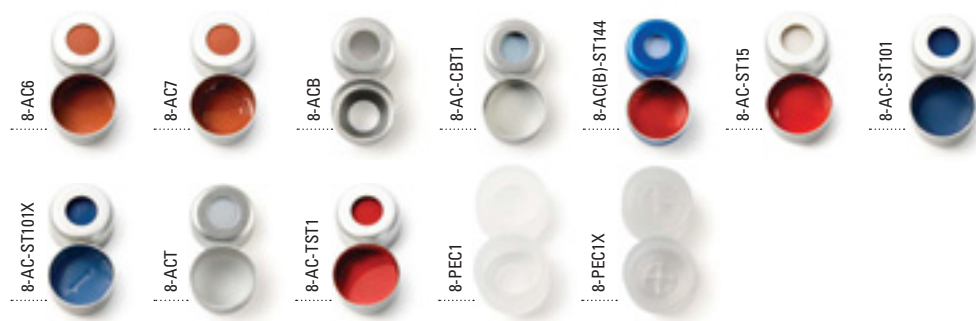
Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (µL)	Usable Volume (µL)	Residual (µL)	Cat. No.	Pack of
0.6mL Crimp Top Tapered Vial	Amber	No	7x32	Conical	600	550	<5	<b>06-CTV(A)</b>	500
0.5mL Crimp Top Tapered Vial	Amber	No	7x30	Conical	500	450	<5	<b>05-CTV(A)</b>	500
PTFE Vial Support Sleeve for 6x32mm vials, fits most autosamplers	PTFE	No	12x31	Flat Bottom	-	-	-	<b>SV-S1</b>	50
PTFE Vial Support Sleeve for 6x32mm vials, fits robotic autosamplers	PTFE	No	12x32	Flat Bottom	-	-	-	<b>SV-S11A</b>	25
Glass Vial Support Sleeve for 6x32mm vials, fits robotic autosamplers	Clear	Yes	12x32	Flat Bottom	-	-	-	<b>SV-S11G</b>	25

Sleeves adapt 6x32mm vials for use in autosamplers designed for 12x32mm vials. Use sleeve SV-S1 for autosamplers that do not lift the vial from the tray. Use SV-S11A or SV-S11G for autosamplers that move the vial during sampling.



## Chromacol 8mm Closures

- Aluminum crimp seals with prefitted septa
- Provide a secure leak-resistant seal
- Pre-assembled caps and septa are convenient and minimize contamination from handling

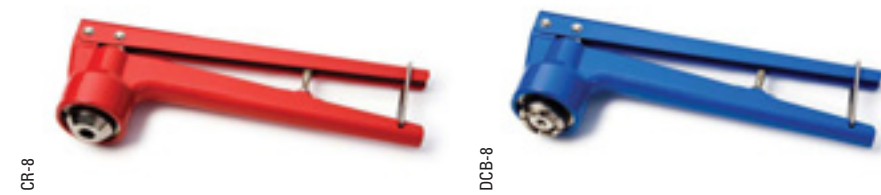


### Chromacol 8mm Crimp Top Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
8mm Crimp Cap, 4mm hole, Type 6 Rubber/PTFE Liner	Silver	Aluminum	Red Natural Rubber/Clear PTFE	38	1.0	<b>8-AC6</b>	1000
	Blue	Aluminum	Red Natural Rubber/Clear PTFE	38	1.0	<b>8-AC6(B)</b>	1000
	Red	Aluminum	Red Natural Rubber/Clear PTFE	38	1.0	<b>8-AC6(R)</b>	1000
8mm Crimp Cap, 4mm hole, Type 7 Rubber/PTFE Liner	Silver	Aluminum	Red Natural Rubber/Clear PTFE	60	1.0	<b>8-AC7</b>	1000
8mm Crimp Cap, 4mm hole	Silver	Aluminum	—	—	—	<b>8-ACB</b>	1000
	Silver	Aluminum	Gray Chlorobutyl Rubber/Clear PTFE	52	1.0	<b>8-AC-CBT1</b>	500
	Blue	Aluminum	Blue Silicone/Red PTFE	20	1.4	<b>8-AC(B)-ST144</b>	500
	Silver	Aluminum	White Silicone/Red PTFE	50	1.3	<b>8-AC-ST15</b>	500
	Silver	Aluminum	Blue Silicone/PTFE	30	1.0	<b>8-AC-ST101</b>	500
	Silver	Aluminum	Blue Silicone/PTFE, Pre-slit	30	1.0	<b>8-AC-ST101X</b>	500
	Silver	Aluminum	White Virgin PTFE, 0.01"	53	0.2	<b>8-ACT</b>	1000
	Silver	Aluminum	Red PTFE/White Silicone/Red PTFE	57	1.0	<b>8-AC-TST1</b>	500
8mm Snap Cap, Thinned penetration area	Clear	Polyethylene	Integral Molded In Polyethylene	—	—	<b>8-PEC1</b>	1000
	Clear	Polyethylene	Integral Molded In Polyethylene, Pre-cut	—	—	<b>8-PEC1X</b>	1000

## Chromacol Crimping and Decrimping Tools

- Crimping tools provide a reproducible, secure closure
- High quality construction for durability and long life
- Painted, plated and coated for maximum corrosion resistance



Items not shown to scale

### Chromacol Crimping and Decrimping Tools

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 8mm aluminum crimp seals	<b>CR-8</b>	1
Manual Decrimper/De-capper	Removes 8mm aluminum crimp seals without vial damage	<b>DCB-8</b>	1

For electronic crimpers and decappers look on page **2-094**

## Chromacol 2mL, 12x32mm Standard Opening Screw Thread Vials and Inserts

- 8-425 thread finish vials are best suited for most instruments where the vial remains in the sample tray during injection
- Manufactured from clear, Type 1 Class A or amber, Type 1 Class B borosilicate glass
- GOLD grade glass quality is a low expansion high purity glass with an extremely low concentration of active sites.
- Available with a graduated, write-on patch for convenient sample identification
- Small opening requires Micro-Inserts with a diameter of 5mm
- While maintaining the standard outer dimensions the internal volumes of these vials range from below 300µL to 2mL
- Where levels of inorganic ions have to be kept to an absolute minimum the use of plastics may be preferred to the more conventional glass vials

### Recommended for the following instruments:

- Beckman
- CTC
- Gilson
- Knauer
- Shimadzu
- Spark Holland
- Varian
- VWR (Merck)/Hitachi

For autosampler compatibility look on pages **2-100 to 2-104**



### Chromacol 2mL, 12x32 Standard Opening Screw Thread Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (µL)	Usable Volume (µL)	Residual (µL)	Cat. No.	Pack of
8-425 Screw Thread Vial	Clear	Yes	12x32	Flat Bottom	2.0	1.5	<170	<b>2-SV</b>	500
	Amber	Yes	12x32	Flat Bottom	2.0	1.5	<170	<b>2-SV(A)</b>	500
8-425 Screw Thread Vial - GOLD Grade Glass	Clear	No	12x32	Flat Bottom	2.0	1.5	<170	<b>2-SVG</b>	500
8-425 Screw Thread 1.1mL Vial - GOLD Grade Glass	Clear	No	12x32	Conical	1.2	1.1	<5	<b>1.1-STVG</b>	500
8-425 Screw Thread 0.6mL Vial, White	HDPE	No	12x32	Insert Vial	0.6	0.4	<3	<b>06-PESV</b>	500
200µL Insert	Clear Glass	No	5x31	Flat Bottom	250µL	200µL	<12	<b>02-NV</b>	1000
	Clear Glass	No	5x30	Conical	200µL	160µL	<4	<b>02-MTV</b>	1000
Self-centering support device for tapered glass inserts	Polyethylene	–	–	–	–	–	–	<b>MTS-1</b>	500
Support Sleeve for 1.1-STVG	PTFE	–	–	–	–	–	–	<b>TTS-312</b>	50

Support sleeve allows conical tip vial to be used in standard 12x32mm autosampler trays

We offer electronic crimping options

>> Visit **PAGE 2-094**

## Chromacol Screw Thread Caps and Septa

- Open top caps are designed to be used with any of our 8mm septa
- Polypropylene caps are chemically inert and suitable for most chromatography applications
- Flanged caps are particularly suitable for Shimadzu and Tosoh autosamplers
- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Closures are shipped in sealed polybags to prevent contamination during transport



### Chromacol 8-425 Screw Thread Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
8mm Open Top Screw Cap, 8-425 thread, 5mm hole	Black	Polypropylene	—	—	—	<b>8-SC</b>	500
	Red	Polypropylene	—	—	—	<b>8-SC(R)</b>	500
	White	Polypropylene	—	—	—	<b>8-SC(W)</b>	500
8mm Open Top Screw Cap with flange, 8-425 thread, 5mm hole	Black	Polypropylene	—	—	—	<b>8-SCJ</b>	500
	White	Polypropylene	—	—	—	<b>8-SCJ(W)</b>	500
Septum for 8-425 Screw Caps	—	—	Red Natural Rubber/Clear PTFE	38	1.0	<b>8-6RT1</b>	1000
	—	—	White Silicone/Red PTFE	50	1.3	<b>8-ST15</b>	500
	—	—	Blue Silicone/PTFE	50	1.2	<b>8-ST14</b>	500
	—	—	Blue Silicone/PTFE, Pre-slit	50	1.2	<b>8-ST14X</b>	500
	—	—	White Silicone/PTFE	20	1.4	<b>8-ST143</b>	500
	—	—	Blue Silicone/PTFE	30	1.0	<b>8-ST101</b>	500
	—	—	Red PTFE/White Silicone/Red PTFE	57	1.0	<b>8-TST1</b>	500
	—	—	White Virgin PTFE, 0.01"	53	0.3	<b>8-T02</b>	1000
	—	—	Blue Silicone/Red PTFE	20	1.4	<b>8-ST144</b>	500
8mm Open Top Screw Cap, 8-425 thread, 5mm hole, Type 8 Rubber/PTFE Liner	Black	Polypropylene	Red Natural Rubber/Clear PTFE	50	1.3	<b>8-SC-8RT1</b>	500
8mm Open Top Screw Cap, 8-425 thread, 5mm hole	Black	Polypropylene	White Silicone/Red PTFE	57	1.3	<b>8-SC-ST15</b>	500

Trying to decide what closure is right for you?

➤ Use our selection guide on **PAGE 2-053**



## Chromacol Standard Opening Screw Thread Vial Convenience Kits

- Convenience kits save time during sample preparation
- Includes 100 vials and 100 caps with pre-assembled septa
- Reusable two compartment trays protect vials and closure while keeping matching supplies together
- Caps feature pre-inserted septa for added convenience during sample preparation

Convenience Kits



Items not shown to scale

### Chromacol Standard Opening Screw Thread Vial Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat. No.	Cap/Septum Cat.No.	Cat. No.	Pack of
Convenience Kit, Standard Opening Screw Vial	Clear	Yes	White, flanged	Blue Silicone/PTFE	2-SV	2-SCJ(W) + 8-ST101	<b>2-SVJ(W)101-CP</b>	100
Convenience Kit, Standard Opening Screw Vial for Shimadzu LC Autosamplers	Clear	Yes	White, flanged	Blue Silicone/PTFE	2-SV	2-SCJ(W) + 8-ST101	<b>SHL</b>	100
Convenience Kit, Standard Opening Screw Vial for Thermo Scientific LC Autosamplers	Clear	Yes	Black	White Silicone/Red PTFE	2-SV	8-SC-ST15	<b>TSL</b>	100

## Chromacol 9mm Wide Opening Screw Thread Vials and Inserts

- Available with a graduated, write-on patch for convenient sample identification
- Wide neck opening design, allows easy filling, requires Micro-Inserts with a diameter of 6mm
- Manufactured from clear, Type 1 Class A or amber, Type 1 Class B borosilicate glass
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts

### Compatible with:

Most HPLC and GC autosamplers  
For autosampler compatibility look on pages **2-100 to 2-104**

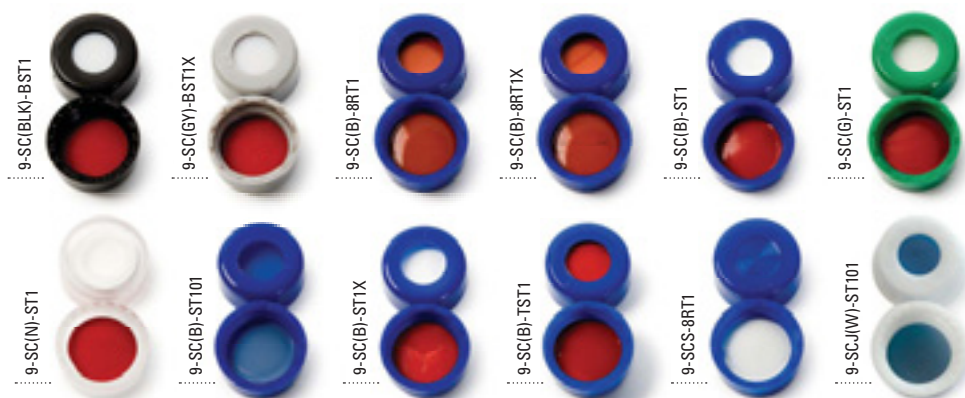


### Chromacol 9mm Wide Opening Screw Thread Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
9mm Screw Thread Vial	Clear	No	15x46	Flat Bottom	4.0mL	3.5mL	<500	<b>4-SVQ</b>	500
	Clear	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>2-SVW</b>	500
	Amber	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>2-SVW(A)</b>	500
9mm Screw Thread Vial, High Recovery with 30µL Reservoir	Clear	No	12x32	Tapered Base	1.5mL	1.3mL	<4	<b>1.5-HRSV</b>	100
9mm Screw Thread Vial, Ultra High Recovery with 10µL Reservoir	Clear	No	12x32	Mandrel Base	1.2mL	1.0mL	<2	<b>1.2-UHRSV</b>	100
9mm Screw Thread Vial 900µL, Fused Insert	Clear	No	12x32	Insert Vial	0.9mL	830µL	<3	<b>09-FISV</b>	500
9mm Screw Thread Vial 300µL, Fused Insert	Clear	Yes	12x32	Insert Vial	0.3mL	250µL	<3	<b>03-FISV</b>	500
	Amber	Yes	12x32	Insert Vial	0.3mL	250µL	<3	<b>03-FISV(A)</b>	500
9mm Screw Thread Vial 200µL, Fused Insert-GOLD grade glass	Clear	Yes	12x32	Insert Vial	0.2mL	180µL	<2	<b>02-FISVG</b>	500
300µL Insert	Clear	–	6x31	Flat Bottom	300µL	200µL	<12	<b>03-NV</b>	1000
200µL Insert - GOLD Grade Glass	Clear	–	6x30	Pulled Point	200µL	160µL	<4	<b>02-MTVWG</b>	1000
Self-centering support device for tapered glass inserts	Polyethylene	–	–	–	–	–	–	<b>MTS-1</b>	500
9mm Screw Thread Vial	Polypropylene	No	12x32	Insert Vial, Mandrel	300µL	200µL	<4	<b>03-PPSVW</b>	500

## Chromacol 9mm Screw Thread Closures

- Easy-on, easy-off convenience with just one turn
- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Polypropylene caps are chemically inert and suitable for most chromatography applications
- Closures have the profile of a crimp or snap closure for compatibility with robotic autosamplers
- Closures are shipped in sealed polybags to prevent contamination during transport



### Chromacol 9mm Screw Thread Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
9mm Open Top Short Screw Cap, 6mm hole	Black	Polypropylene	Bonded Red PTFE/White Silicone	57	1.0	<b>9-SC(BLK)-BST1</b>	500
	Gray	Polypropylene	Bonded Red PTFE/White Silicone, Pre-slit	45	1.2	<b>9-SC(GY)-BST1X</b>	500
	Blue	Polypropylene	Red Natural Rubber/Clear PTFE	58	1.0	<b>9-SC(B)-8RT1</b>	500
	Blue	Polypropylene	Red Natural Rubber/Clear PTFE, Pre-slit	58	1.0	<b>9-SC(B)-8RT1X</b>	500
	Blue	Polypropylene	White Silicone/Red PTFE	57	1.0	<b>9-SC(B)-ST1</b>	500
	Green	Polypropylene	White Silicone/Red PTFE	57	1.0	<b>9-SC(G)-ST1</b>	500
	Clear	Polypropylene	White Silicone/Red PTFE	57	1.0	<b>9-SC(N)-ST1</b>	500
	Blue	Polypropylene	Blue Silicone/PTFE	30	1.0	<b>9-SC(B)-ST101</b>	500
	Blue	Polypropylene	White Silicone/Red PTFE, Pre-slit	57	1.0	<b>9-SC(B)-ST1X</b>	500
	Blue	Polypropylene	Red PTFE/White Silicone/Red PTFE	57	1.0	<b>9-SC(B)-TST1</b>	500
9mm Solid Top Short Screw Cap	Blue	Polypropylene	Red Natural Rubber/Clear PTFE	58	1.0	<b>9-SCS-8RT1</b>	500
9mm Open Top Short Screw Cap with flange, 6mm hole	White	HDPE	Blue Silicone/PTFE	30	1.0	<b>9-SCJ(W)-ST101</b>	500

*Trying to decide what closure is right for you?*

➤➤ Use our selection guide on **PAGE 2-053**





## Chromacol 9mm Wide Opening Convenience and Instrument Select Kits

- Convenience kits save time during sample preparation
- Includes 100 vials and 100 caps with pre-assembled septa
- Reusable two compartment trays protect vials and closure while keeping matching supplies together
- Caps feature pre-inserted septa for added convenience during sample preparation



2-SVW8-CP

Items not shown to scale

### Chromacol 9mm Wide Opening Screw Thread Vial Convenience Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, Wide Open Short Screw Vial	Clear	Yes	Blue	Red Natural Rubber/ Clear PTFE	2-SVW	9-SC(B)-8RT1	<b>2-SVW8-CP</b>	100
	Clear	Yes	Blue	White Silicone/Red PTFE	2-SVW	9-SC(B)-ST1	<b>2-SVWST-CP</b>	100
	Amber	Yes	Blue	Red Natural Rubber/ Clear PTFE	2-SVW(A)	9-SC(B)-8RT1	<b>2-SVW(A)8-CP</b>	100
	Amber	Yes	Blue	White Silicone/Red PTFE	2-SVW(A)	9-SC(B)-ST1	<b>2-SVW(A)ST-CP</b>	100
Convenience Kit, Wide Open Short Screw Vial for Agilent LC Autosampler	Clear	Yes	Blue	Red Natural Rubber/ Clear PTFE	2-SVW	9-SC(B)-8RT1	<b>HPLS</b>	100
Convenience Kit, Wide Open Short Screw Vial for PerkinElmer LC Autosampler	Clear	Yes	Green	White Silicone/ Red PTFE, Pre-slit	2-SVW	9-SC(G)-ST1X	<b>PEL</b>	100
Convenience Kit, Wide Open Short Screw Vial for Thermo GC Autosampler	Clear	Yes	Blue	Blue Silicone/PTFE	2-SVW	9-SC(B)-ST101	<b>TTR</b>	100
Convenience Kit, Wide Open Short Screw Vial for Varian GC Autosampler	Clear	Yes	Blue	White Silicone/Red PTFE	2-SVW	9-SC(B)-ST1	<b>VAG</b>	100
Convenience Kit, Wide Open Short Screw Vial for Varian LC Autosampler	Clear	Yes	Blue	White Silicone/Red PTFE	2-SVW	9-SC(B)-ST1	<b>VAL</b>	100
Convenience Kit, Wide Open Short Screw Vial for Waters Alliance LC Autosampler	Clear	Yes	Blue	White Silicone/Red PTFE	2-SVW	9-SC(B)-ST1	<b>WAL</b>	100
	Clear	Yes	Black	Bonded Red PTFE/ White Silicone	2-SVW	9-SC(BLK)-BST1	<b>WALB</b>	100
Convenience Kit, Wide Open Short Screw Vial for Waters ACQUITY LC Autosampler	Clear	Yes	Gray	Bonded Red PTFE/ White Silicone, Pre-slit	2-SVW	9-SC(GY)-BST1X	<b>WAQ</b>	100

## Chromacol 2mL, 12x32mm, 11mm Crimp Top Vials and Closures

### Compatible with:

Most HPLC and GC autosamplers  
 For autosampler compatibility look on pages **2-100 to 2-104**

- Chromacol GOLD™ glass quality, a low expansion high purity glass with an extremely low concentration of active sites.
- Manufactured from clear, Type 1 Class A or amber, Type 1 Class B borosilicate glass
- Available with a graduated, write-on patch for convenient sample identification
- Wide neck opening design, allows easy filling, requires Micro-Inserts with a diameter of 6mm
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts
- Where levels of inorganic ions have to be kept to an absolute minimum the use of plastics may be preferred to the more conventional glass vials



### Chromacol 2mL 12x32mm Wide Opening Crimp Top Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
11mm Crimp Top Vial, Wide Opening	Clear	Glass	15x46	Flat Bottom	4.0mL	3.5mL	<500	<b>4-CV</b>	500
	Clear	Glass	12x40	Flat Bottom	2.5mL	2mL	<170	<b>2.5-CV</b>	500
	Clear	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>2-CV</b>	500
	Amber	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>2-CV(A)</b>	500
11mm Crimp Top Vial, Wide Opening - GOLD Grade Glass	Clear	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>2-CVG</b>	500
11mm Crimp Top Vial, Wide Opening	Clear	Yes	12x32	Round Bottom	2.0mL	1.5mL	<170	<b>2-CRV</b>	500
11mm Crimp Top 1.5mL High Recovery Vial	Clear	No	12x32	High Recovery	1.5mL	1.3mL	<4µL	<b>1.5-HRCV</b>	100



**Chromacol 2mL 12x32mm Wide Opening Crimp Top Vials and Inserts (Continued)**

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
11mm Crimp Top 1.1mL Vial, Wide Opening - GOLD Grade Glass	Clear	No	12x32	Conical	1.4mL	1.1mL	<5	<b>1.1-CTVG</b>	500
11mm Crimp Top 1.1mL Vial, Wide Opening	Amber	No	12x32	Conical	1.4mL	1.1mL	<5	<b>1.1-CTV(A)</b>	500
11mm Crimp Top 0.9mL Vial, Wide Opening	Clear	No	10x32	Conical	1.0mL	850µL	<5	<b>09-CTV</b>	500
11mm Crimp Top 0.6mL Vial	Clear	No	12x32	Insert Vial	0.9mL	830µL	<3	<b>09-FIV</b>	500
	HDPE	No	12x32	Internal Taper	0.6mL	0.5mL	<25	<b>06-PECV</b>	500
11mm Crimp Top 0.3mL Vial, Fused Insert	Polypropylene	No	12x32	Internal Taper	0.6mL	0.5mL	<25	<b>06-PPCV</b>	500
	Clear	Yes	12x32	Insert Vial	0.3mL	250µL	<3	<b>03-FIV</b>	500
11mm Crimp Top 0.2mL Vial, Fused Insert - GOLD Grade Glass	Amber	Yes	12x32	Insert Vial	0.3mL	250µL	<3	<b>03-FIV(A)</b>	500
	Clear	Yes	12x32	Insert Vial	0.2mL	180µL	<2	<b>02-FIVG</b>	500



**Chromacol 2mL 12x32mm Wide Opening Crimp Top Vials and Inserts (Continued)**

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
300µL Insert	Clear	-	6x31	Flat Bottom	300µL	200µL	<12	<b>03-NV</b>	1000
200µL Insert - GOLD Grade Glass	Clear	-	6x30	Pulled Point	200µL	160µL	<4	<b>02-MTVWG</b>	1000
Self-centering vial support device for tapered glass inserts	Polyethylene	-	-	-	-	-	-	<b>MTS-1</b>	500
PTFE Vial Support 1.1-CTVG	PTFE	-	-	-	-	-	-	<b>TTS-312</b>	50
Plastic Vial Support Sleeve for 09-CTV Only	Polyethylene	-	-	-	-	-	-	<b>WS-6</b>	100

Support sleeves allow conical tip vials to be used in standard 12x32mm autosampler trays

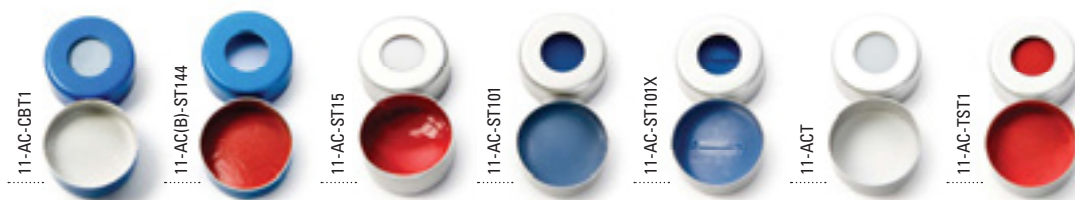
## Chromacol 11mm Crimp Top Closures

- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Aluminum crimp closures provide a secure leak-resistant seal
- Aluminum seals must be applied with a crimping tool
- Closures are shipped in sealed polybags to prevent contamination during transport



### Chromacol 11mm Crimp Top Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
Septum for 11mm Crimp Caps	–	–	Silicone/PTFE for liquid - liquid extraction	–	0.2	<b>11-LLX</b>	100
11mm Crimp Cap, 6mm centre hole	Silver	Aluminum	–	–	–	<b>11-ACB</b>	500
11mm Crimp Cap, 6mm centre hole, Type 6 Rubber/PTFE	Silver	Aluminum	Red Natural Rubber/Clear PTFE,	38	1.0	<b>11-AC6</b>	500
	Blue	Aluminum	Sulphur free	38	1.0	<b>11-AC6(B)</b>	500
	Red	Aluminum		38	1.0	<b>11-AC6(R)</b>	500
11mm Crimp Cap, 6mm centre hole, Type 7 Rubber/PTFE	Silver	Aluminum	Red Natural Rubber/Clear PTFE	60	1.0	<b>11-AC7</b>	500
	Blue	Aluminum		60	1.0	<b>11-AC7(B)</b>	500
	Red	Aluminum		60	1.0	<b>11-AC7(R)</b>	500
	Green	Aluminum		60	1.0	<b>11-AC7(G)</b>	500
	Gold	Aluminum		60	1.0	<b>11-AC7(GO)</b>	500



**Chromacol 11mm Crimp Top Closures (Continued)**

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
11mm Crimp Cap, 6mm centre hole	Blue	Aluminum	Gray Chlorobutyl/PTFE	52	1.0	<b>11-AC-CBT1</b>	500
	Blue	Aluminum	Blue Silicone/Red PTFE	20	1.4	<b>11-AC(B)-ST144</b>	500
	Silver	Aluminum	White Silicone/Red PTFE	50	1.3	<b>11-AC-ST15</b>	500
	Silver	Aluminum	Blue Silicone/PTFE	30	1.0	<b>11-AC-ST101</b>	500
	Silver	Aluminum	Blue Silicone/PTFE, Pre-slit	30	1.0	<b>11-AC-ST101X</b>	500
	Silver	Aluminum	White Virgin PTFE, 0.01"	–	0.25	<b>11-ACT</b>	1000
	Silver	Aluminum	Red PTFE/White Silicone/Red PTFE	57	1.0	<b>11-AC-TST1</b>	500



**Chromacol 11mm Crimp Top Closures (Continued)**

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
11mm Crimp Cap, magnetic	Silver	Steel Alloy	White Silicone/Red PTFE	57	1.3	<b>11-MC-ST15</b>	500
11mm Crimp Cap, magnetic, Type 8 Rubber/PTFE	Silver	Steel Alloy	Red Natural Rubber/Clear PTFE	38	1.0	<b>11-MC-8RT1</b>	500
11mm Crimp Cap, magnetic	Silver	Steel Alloy	Blue Silicone/PTFE	30	1.0	<b>11-MC-ST101</b>	500
11mm Snap Cap for Crimp Vials	Clear	Polyethylene	–	–	–	<b>11-PEC1</b>	1000
11mm Snap Cap for Crimp Vials, Pre cut	Clear	Polyethylene	–	–	–	<b>11-PEC1X</b>	1000
11mm Snap Cap for Crimp Vials	Clear	Polyethylene	White Silicone/Red PTFE	57	1.0	<b>11-PEC-ST1</b>	500

Trying to decide what closure is right for you?

➤ Use our selection guide on **PAGE 2-053**



## Chromacol 11mm Crimp Top Convenience and Instrument Select Kits

- Convenience kits save time during sample preparation
- Include matched quantities of vials and aluminum seals with prefitted septa
- Reusable two compartment trays protect vials and closure while keeping matching supplies together
- Caps feature pre-inserted septa for added convenience during sample preparation



2-CV7-CP



2-CV(A)ST-CP

Items not shown to scale

### Chromacol 11mm Crimp Top Convenience and Instrument Select Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, Wide Opening Crimp Top Vial	Clear	Yes	Silver	Red Natural Rubber/Clear PTFE, Type 7	2-CV	11-AC7	<b>2-CV7-CP</b>	100
	Clear	Yes	Silver	White Silicone/Red PTFE	2-CV	11-AC-ST15	<b>2-CVST-CP</b>	100
	Amber	Yes	Silver	Red Natural Rubber/Clear PTFE, Type 7	2-CV(A)	11-AC7	<b>2-CV(A)7-CP</b>	100
	Amber	Yes	Silver	White Silicone/Red PTFE	2-CV(A)	11-AC-ST15	<b>2-CV(A)ST-CP</b>	100
Convenience Kit, Wide Opening Crimp Top Vial for CTC LCPAL Autosampler	Clear	Yes	Blue	Blue Silicone/Red PTFE	2-CV	11-AC(B)-ST144	<b>CTCL</b>	100
Convenience Kit, Wide Opening Crimp Top Vial for Agilent GC Autosampler	Clear	Yes	Silver	Red Natural Rubber/Clear PTFE, Type 7	2-CV	11-AC7	<b>HPG</b>	100
Convenience Kit, Wide Opening Crimp Top Vial for Agilent LC Autosampler	Clear	Yes	Silver	Red Natural Rubber/Clear PTFE, Type 7	2-CV	11-AC7	<b>HPL</b>	100
Convenience Kit, Wide Opening Crimp Top Vial for VWR(Merck)-Hitachi LC Autosampler	Clear	Yes	Silver	Blue Silicone/PTFE-Pre-Cut	2-CV	11-AC-ST101X	<b>MEL</b>	100
Convenience Kit, Wide Opening Crimp Top Vial for PerkinElmer GC Autosampler	Clear	Yes	Silver	Red Natural Rubber/Clear PTFE, Sulphur free, Type 6	2-CV	11-AC6	<b>PEG</b>	100
Convenience Kit, Wide Opening Crimp Top Vial for Shimadzu LC Autosampler	Clear	Yes	Silver	Blue Silicone/PTFE	2-CV	11-AC-ST101	<b>SHG</b>	100
Convenience Kit, Wide Opening Crimp Top Vial for Spark LC Autosampler	Clear	Yes	Silver	Red Natural Rubber/Clear PTFE, Type 7	2-CV	11-AC7	<b>SPL</b>	100
Convenience Kit, Wide Opening Crimp Top Vial for Thermo Scientific AS2000 GC Autosampler	Clear	Yes	Silver	Blue Silicone/Red PTFE	2-CV	11-AC(N)-ST144	<b>TQG</b>	100
Convenience Kit, Wide Opening Crimp Top Vial for Thermo LC Autosampler	Clear	Yes	Silver	White Silicone/Red PTFE	2-CV	11-AC-ST15	<b>TQL</b>	100



## Chromacol Crimpers and Decappers

- Crimping tools provide a reproducible, secure vial closure for all 11mm vial and seal combinations
- Easy and convenient handling
- High quality construction for durability and long life
- Painted, plated and coated for maximum corrosion resistance



Items not shown to scale

### Chromacol Crimpers and Decappers

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 11mm aluminum crimp seals	<b>CR-11</b>	1
Decapping Pliers	Removes 11mm aluminum crimp seals, Protective gloves recommended	<b>DCR-11</b>	1
Manual Decrimper	Removes 11mm aluminum crimp seals without vial damage	<b>DCB-11</b>	1

For electronic crimpers and decappers look on page **2-094**

## Chromacol 2mL, 32x12mm, 11mm Snap Cap Vials

- Superior quality borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- Available with a graduated, write-on patch for convenient sample identification
- Wide neck opening design, allows easy filling, requires Micro-Inserts with a diameter of 6mm
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts
- Available silanized (deactivated) for optimal recovery of critical polar, labile or chelating compounds
- Snap-Cap vials can be used with snap caps or aluminum crimp seal closures

### Compatible with:

Most HPLC and GC autosamplers  
For autosampler compatibility look on pages **2-100 to 2-104**



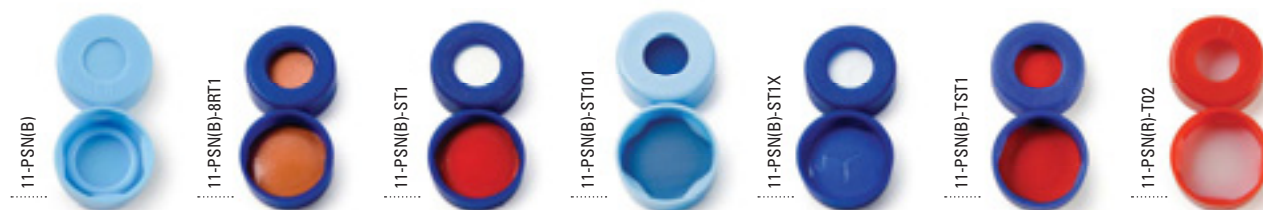
### Chromacol 2mL, 12x32mm 11mm Snap Vials and Inserts

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume	Usable Volume	Residual (µL)	Cat. No.	Pack of
11mm Snap Cap Vial	Clear	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>2-RV</b>	500
	Amber	Yes	12x32	Flat Bottom	2.0mL	1.5mL	<170	<b>2-RV(A)</b>	500
11mm Snap Cap 1.5mL Vial	Clear	No	12x32	High Recovery	1.5mL	1.3mL	<4	<b>1.5-HRRV</b>	100
11mm Snap Cap 1.5mL Vial, silanized*	Clear	No	12x32	High Recovery	1.5mL	1.3mL	<4	<b>1.5-HRRV(S)</b>	100
11mm Snap Cap Vial, Ultra High Recovery with 10µL Reservoir	Clear	No	12x32	Mandrel Base	1.2mL	1mL	<2	<b>1.2-UHRRV</b>	100
11mm Snap Cap 300µL Vial, Fused Insert	Clear	Yes	12x32	Fused Conical	300µL	250µL	<3	<b>03-FIRV</b>	500
	Amber	Yes	12x32	Fused Conical	300µL	250µL	<3	<b>03-FIRV(A)</b>	500
11mm Snap Cap 200µL Vial, Fused Insert – GOLD grade glass	Clear	Yes	12x32	Fused Conical	200µL	180µL	<2	<b>02-FIRVG</b>	500
300µL Insert	Clear	–	6x31	Flat Bottom	300µL	200µL	<12	<b>03-NV</b>	1000
200µL Insert - GOLD Grade Glass	Clear	–	6x30	Pulled Point	200µL	160µL	<4	<b>02-MTVWG</b>	1000
Self-centering support device for tapered glass inserts	Polyethylene	–	–	–	–	–	–	<b>MTS-1</b>	500

\* For information about silanized products see page **2-055**

## Chromacol 11mm Snap Closures

- Easy to apply and easy to remove from Snap vials
- Pre-assembled caps and septa are convenient and minimize contamination from handling
- Snap caps eliminate the need for crimping or de-capping tools
- Polyethylene caps are chemically inert and suitable for most chromatography applications
- Closures are shipped in sealed polybags to prevent contamination during transport



### Chromacol 11mm Snap Closures

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
11mm Snap Cap, thinned penetration area	Blue	Polyethylene	Integral Molded In Polyethylene	–	–	<b>11-PSN(B)</b>	500
11mm Snap Cap, 6mm hole	Blue	Polyethylene	Red Natural Rubber/Clear PTFE	58	1.0	<b>11-PSN(B)-8RT1</b>	500
	Blue	Polyethylene	White Silicone/Red PTFE	57	1.0	<b>11-PSN(B)-ST1</b>	500
	Blue	Polyethylene	Blue Silicone/PTFE	30	1.0	<b>11-PSN(B)-ST101</b>	500
	Blue	Polyethylene	White Silicone/Blue PTFE, Pre-slit	57	1.0	<b>11-PSN(B)-ST1X</b>	500
	Blue	Polyethylene	Red PTFE/White Silicone/Red PTFE	57	1.0	<b>11-PSN(B)-TST1</b>	500
	Red	Polyethylene	White Virgin PTFE, 0.01"	53	0.3	<b>11-PSN(R)-T02</b>	500

## Chromacol 11mm Snap Cap Wide Opening Vial Convenience and Instrument Select Kits

- Convenience kits save time during sample preparation
- Includes 100 vials and 100 caps with pre-assembled septa
- Reusable two compartment trays protect vials and closure while keeping matching supplies together
- Caps feature pre-inserted septa for added convenience during sample preparation



Items not shown to scale

### Chromacol 11mm Snap Cap Wide Opening Vial Convenience and Instrument Select Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, Wide Opening Snap Vial	Clear	Yes	Blue	White Silicone/Red PTFE	2-RV	11-PSN(B)-ST1	<b>2-RVST-CP</b>	100
	Clear	Yes	Blue	Red Natural Rubber/Clear PTFE	2-RV	11-PSN(B)-8RT1	<b>2-RV8-CP</b>	100

## Chromacol 13mm Screw Vials, 13-425 Thread Finish Vials

- Superior quality borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- Microsampling and High Recovery Vials allow maximum sample extraction without need for separate inserts



### Compatible with:

The 4mL vials are preferentially used on instruments of the following manufacturers:

- Dionex
- Shimadzu
- Spark Holland, Varian
- VWR (Merck)/Hitachi
- Waters (Wisp 48 Position Carousel)

For autosampler compatibility look on pages **2-100 to 2-104**

Images shown are 60% to scale  
\* 40% to scale

### Chromacol 13mm Screw Vials

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (mL)	Usable Volume (mL)	Residual (μL)	Cat. No.	Pack of
13-425 Screw Thread Vial	Clear	No	13x100	Round Bottom	10.0	8.5	<500	<b>10-SV</b>	125
	Clear	No	13x65	Round Bottom	5.0	4.5	<500	<b>5-SV</b>	125
	Clear	No	15x46	Flat Bottom	4.0	4.0	<800	<b>4-SV</b>	500
	Amber	No	15x46	Flat Bottom	4.0	4.0	<800	<b>4-SV(A)</b>	500
13-425 Screw Thread 3.5mL High Recovery Vial	Clear	No	15x46	High Recovery	3.5	3.0	<12	<b>3.5-HRSV</b>	250

## Chromacol 13mm Screw Vials, 13-425 Thread Finish Closures

- Open top caps are designed to be used with any of our 12mm septa
- Polypropylene caps are chemically inert and suitable for most chromatography applications
- Pre-assembled caps and septa are convenient and minimize contamination from handling



### Chromacol 13-425 Screw Thread Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
13mm Open Top Screw Cap, 13-425 thread, 8mm hole	Black	Polypropylene	—	—	—	<b>12-SC</b>	500
	White	Polypropylene	—	—	—	<b>12-SC(W)</b>	500
	Red	Polypropylene	—	—	—	<b>12-SC(R)</b>	500
	Yellow	Polypropylene	—	—	—	<b>12-SC(Y)</b>	500
13mm Solid Top Storage Cap, 13-425 thread	Black	Polypropylene	—	—	—	<b>12-SCS</b>	500
PTFE Lined Solid Top Cap for 13-425 Thread	White	Urea	PTFE/Foam Urethane Liner	—	—	<b>13-SCST</b>	100
Septum for 13-425 Screw Caps	—	—	Red Natural Rubber/Clear PTFE	38	1.0	<b>12-6RT1</b>	500
	—	—	White Silicone/Red PTFE	57	2.0	<b>12-ST2</b>	500
	—	—	Blue Silicone/PTFE	57	1.8	<b>12-ST18</b>	500
	—	—	Blue Silicone/PTFE	30	1.0	<b>12-ST101</b>	500
	—	—	White Virgin PTFE, 0.01"	53	0.25	<b>12-T02</b>	1000



### Chromacol 13-425 Screw Thread Caps and Septa (Continued)

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
13mm Open Top Screw Cap, 13-425 thread, 8mm hole	Black	Polypropylene	White Silicone/Red PTFE	57	1.3	<b>13-SC-ST15</b>	500
	Black	Polypropylene	Red Natural Rubber/Clear PTFE	58	1.0	<b>12-SC-8RT1</b>	500
	Black	Polypropylene	Red PTFE/White Silicone	57	2.0	<b>12-SC-ST2</b>	500

### Chromacol Shell/Neckless Vials

- Superior quality borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- Polyethylene Cap with starburst center design eases syringe needle penetration
- Convenient vial kits include equal quantities of vials and caps

#### Recommended for the following instruments:

- Alcott
- Gilson
- Shimadzu
- Waters (Wisp 96 respectively 48 Position Carousel)

For autosampler compatibility look on pages **2-100 to 2-104**



### Chromacol Shell/Neckless Vials and Kits

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (mL)	Usable Volume (mL)	Residual (µL)	Cat. No.	Pack of
1mL Neckless/Shell Vial	Clear	No	8x40	Flat Bottom	1.25	1.0	<80	<b>1-NWV</b>	500
1mL Neckless/Shell Vial with PE-Cap	Clear	No	8x40	Flat Bottom	1.25	1.0	<80	<b>1-NWV-C</b>	200
1mL Neckless/Shell Vial with PE-Cap	Amber	No	8x40	Flat Bottom	1.25	1.0	<81	<b>1-NWV(A)-C</b>	200
2mL Neckless/Shell Vial	Clear	No	12x32	Flat Bottom	2.5	2.0	<175	<b>2.5-NV</b>	500
4mL Neckless/Shell Vial with PE-Cap	Clear	No	15x46	Flat Bottom	5.5	4.0	<350	<b>4-NWV-C</b>	100
8mm PE-Cap/Plug for 1mL Shell-Vial	Polyethylene	—	—	—	—	—	—	<b>8-NPWP</b>	1000
12mm Polyethylene Plug for 2mL Shell-Vial	Polyethylene	—	—	—	—	—	—	<b>12-NPEP4</b>	1000

*Trying to decide what closure is right for you?*

Use our selection guide on **PAGE 2-053**



## Chromacol Headspace Vials

Clear glass vials with 20mm crimp seal or Screw Thread finish are designed to fit most headspace autosamplers

- Superior quality borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass, meets all requirements of Pharm. US, EU, JPN
- Round bottom vials are compatible with most autosamplers and more easily handled by robotic arms that lift the vial from the tray
- Vials feature beveled edge 20mm crimp finish
- The bevel edge on the lip of the vial provides additional sealing power for greater leak resistance under high pressure
- Screw thread headspace vials are convenient and do not require tools
- Multiple turn threading maintains a tight seal through extreme heating cycles



### Chromacol Headspace Vials

Description	Glass	Patched	Dimension (mm)	Finish	Profile	Total Volume (mL)	Usable Volume (mL)	Cat. No.	Pack of
20mm Headspace Crimp Vial	Clear	No	30x60	Beveled Edge	Flat Bottom	27	27	<b>27-CV</b>	100
	Clear	No	22 x75	Beveled Edge	Round Bottom	22	20	<b>22-CV</b>	125
	Clear	No	22.5x75	Beveled Edge	Round Bottom	21	20	<b>20-CV</b>	125
	Amber	No	22.5x75	Beveled Edge	Round Bottom	21	20	<b>20-CV(A)</b>	125
	Clear	No	18x65	Beveled Edge	Round Bottom	12	10	<b>12-CV</b>	100





### Chromacol Headspace Vials (Continued)

Description	Glass	Patched	Dimension (mm)	Finish	Profile	Total Volume (mL)	Usable Volume (mL)	Cat. No.	Pack of
20mm Headspace Crimp Vial	Clear	No	22.5x45	Beveled Edge	Round Bottom	12	10	<b>10-CV</b>	125
	Amber	No	22.5x45	Beveled Edge	Round Bottom	12	10	<b>10-CV(A)</b>	125
	Clear	No	18x50	Beveled Edge	Round Bottom	10	9	<b>9-CV</b>	100
	Clear	No	22x38	Beveled Edge	Round Bottom	8	6	<b>6-CV</b>	125
18mm Screw Top Headspace Vial	Clear	No	22.5x76	Screw Thread	Round Bottom	21	20	<b>20-HSV</b>	125
	Clear	No	22.5x46	Screw Thread	Round Bottom	12	10	<b>10-HSV</b>	125

## Chromacol Crimping and Decrimping Tools

- Crimping tools provide a reproducible, secure vial closure for all 20mm vial and seal combinations
- Easy and convenient handling
- High quality construction for durability and long life
- Painted, plated and coated for maximum corrosion resistance



Items not shown to scale

### Chromacol Crimping and Decrimping Tools

Description	Use	Cat. No.	Pack of
Manual Crimper	Attaches 20mm crimp seals	<b>CR-20</b>	1
Decapping Pliers	Removes 20mm crimp seals, Protective gloves recommended	<b>DCR-20</b>	1
Manual Decrimper	Removes 20mm crimp seals without vial damage	<b>DCB-20</b>	1

For electronic crimpers and decappers look on page **2-094**



## Chromacol Headspace Caps and Septa

- Use magnetic seals with CTC/Leap Technologies, Gerstel and other magnetic transport autosamplers
- 20mm Crimp seals must be applied with a crimping tool
- Pre-assembled caps and septa are convenient and minimize contamination from handling



Images shown are 50% to scale

### Chromacol Headspace Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
20mm Crimp Cap, 8mm hole	Silver	Aluminum	–	–	–	<b>20-ACB</b>	500
20mm Magnetic Crimp Cap, 6mm hole	Silver	Tin-plated	–	–	–	<b>20-MCB</b>	500
20mm Composite Magnetic Crimp Cap, 8mm hole	Blue	Alu/Tinplate	–	–	–	<b>20-MCBC</b>	500
	Red	Alu/Tinplate	–	–	–	<b>20-MCBC(R)</b>	500
18mm Magnetic Screw Cap, 8mm hole	Silver	Steel	–	–	–	<b>18-MSC</b>	125
Septum for 20mm Crimp Caps	–	–	20mm Gray Butyl Stopper	55	3.0	<b>20-B3P</b>	500
	–	–	20mm Molded Gray Chlorobutyl	52	3.0	<b>20-CB3</b>	1000
	–	–	20mm Molded Gray Chlorobutyl/Gray PTFE	52	3.0	<b>20-CBT3</b>	1000
	–	–	20mm Molded Blue Chlorobutyl/Gray PTFE, Bellows Type	52	3.0	<b>20-CBT3B</b>	1000
	–	–	20mm Red Silicone/Aluminium Face Seal 3mm Thick, for >170°C.	45	3.0	<b>20-ASH3</b>	100
	–	–	20mm Silicone/PTFE for liquid - liquid extraction	–	0.25	<b>20-LLX</b>	100
	–	–	20mm Blue Silicone/Natural PTFE	45	3.0	<b>20-ST3</b>	500
	–	–	20mm Red Silicone/Natural PTFE, high temperature	45	3.0	<b>20-ST3HT</b>	100
	–	–	20mm Blue Silicone/Red PTFE Seal 1.5mm Thick	20	1.5	<b>20-ST15</b>	500
	–	–	20mm Blue Silicone/PTFE	30	1.0	<b>20-ST101</b>	500
Septum for 18mm Screw Caps	–	–	18mm Blue Silicone/PTFE	30	1.0	<b>18-ST101</b>	125
20mm Composite Magnetic Crimp Cap, 8mm hole	Blue	Alu/Tinplate	20mm Blue Silicone/Natural PTFE	45	3.0	<b>20-MCBC-ST3</b>	500
	Red	Alu/Tinplate	20mm Blue Silicone/Natural PTFE	45	3.0	<b>20-MCBC(R)-ST3</b>	500
20mm Magnetic Tin Plate Crimp Cap	Silver	Tinplate	20mm Blue Silicone/Natural PTFE	45	3.0	<b>20-MCB-ST3</b>	500
20mm Crimp Cap, 8mm hole	Silver	Aluminum	20mm Molded Gray Chlorobutyl/Gray PTFE	52	3.0	<b>20-AC-CBT3</b>	500
	Silver	Aluminum	20mm Blue Silicone/Natural PTFE	45	3.0	<b>20-AC-ST3</b>	500
18mm Magnetic Screw Cap, 8mm hole	Silver	Steel	18mm Molded Blue Chlorobutyl/Gray PTFE	52	3.0	<b>18-MSC-CBT3</b>	125
	Silver	Steel	18mm Blue Silicone/PTFE, not prefitted	30	1.0	<b>18-MSC-ST101</b>	125
	Silver	Steel	18mm Blue Silicone/Natural PTFE	45	3.0	<b>18-MSC-ST3</b>	125
20mm Plug	Neutral	Polyethylene	PE Membrane	–	–	<b>20-PEPC5</b>	250

## Chromacol Headspace Vial Combination Kits

- Include matched quantities of vials and silver aluminum seals with prefitted septa
- Caps feature pre-inserted septa for added convenience during sample preparation
- Convenience kits save time during sample preparation



20-HSVST3-CP



20-CVST3-CP

Items not shown to scale

### Chromacol Headspace Vials Combination Kits

Kit Type	Glass	Patched	Cap Color	Septum	Vial Cat.No.	Cap Cat.No.	Cat. No.	Pack of
Convenience Kit, 20mL Headspace Screw Vial, Round Bottom, Steel Screw Cap, 8mm hole	Clear	No	Silver	18mm Blue Silicone/ Natural PTFE	20-HSV	18-MSC-ST3	<b>20-HSVST3-CP</b>	125
Convenience Kit, 20mL Headspace Crimp Vial, Beveled Edge, Round Bottom, Alu Crimp Cap, 8mm hole	Clear	No	Silver	20mm Molded Blue Chlorobutyl/Gray PTFE	20-CV	20-AC-CBT3	<b>20-CVCBT3-CP</b>	125
Convenience Kit, 20mL Headspace Crimp Vial, Beveled Edge, Round Bottom, Alu Crimp Cap, 8mm hole	Clear	No	Silver	20mm Blue Silicone/ Natural PTFE	20-CV	20-AC-ST3	<b>20-CVST3-CP</b>	125

Trying to decide what septum is right for you?

➤➤ Use our selection guide on **PAGE 2-053**



## Chromacol Sample Storage Screw Thread Vials

- Capacity range up to 40mL
- Superior quality borosilicate clear (Type 1, Class A) or 51A amber (Type 1 Class B) glass
- Provide consistent pH for duration of sample storage life
- PTFE-Lined Solid-top storage caps



Caps and Septa images 50% to scale

### Chromacol Sample Storage Screw Vials

Description	Glass	Patched	Dimension (mm)	Profile	Total Volume (mL)	Capacity (DRAMS)	Cat. No.	Pack of
24-400 Screw Vial	Clear	No	28x95	Flat Bottom	40	8	<b>40-SV</b>	100
	Amber	No	28x95	Flat Bottom	40	8	<b>40-SV(A)</b>	100
20-400 Screw Vial	Clear	No	23x85	Flat Bottom	22	6	<b>22-SV</b>	200
18-400 Screw Vial	Clear	No	21x70	Flat Bottom	16	4	<b>16-SV</b>	200
	Amber	No	21x70	Flat Bottom	16	4	<b>16-SV(A)</b>	200
15-425 Screw Vial	Clear	No	19x65	Flat Bottom	12	3	<b>12-SV</b>	200
	Amber	No	19x65	Flat Bottom	12	3	<b>12-SV(A)</b>	200
8-425 Screw Vial	Clear	No	17x60	Flat Bottom	8	2	<b>8-SV</b>	200
	Amber	No	17x60	Flat Bottom	8	2	<b>8-SV(A)</b>	200

For smaller Vials look at the previous sections



Caps and Septa images 50% to scale

### Chromacol Sample Storage Screw Caps and Septa

Description	Cap Color	Cap Material	Septum	Hardness °shore	Thickness (mm)	Cat. No.	Pack of
24-400 Screw Cap	White	Polypropylene	PTFE/Foam Urethane Liner	-	1.0	<b>24-SCST</b>	100
20-400 Screw Cap	White	Urea	PTFE/Foam Urethane Liner	-	1.0	<b>20-SCST</b>	100
18-400 Screw Cap	White	Urea	PTFE/Foam Urethane Liner	-	1.0	<b>18-SCST</b>	100
15-425 Screw Cap	White	Urea	PTFE/Foam Urethane Liner	-	1.0	<b>15-SCST</b>	100
13-425 Screw Cap	White	Urea	PTFE/Foam Urethane Liner	-	1.0	<b>13-SCST</b>	100



## Chromacol EPA , TOC and Scintillation Screw Vials

### Level 300 Cleaned and Certified

- Processed and packaged under a registered ISO Quality Management System.
- Laboratory certified to meet U.S. EPA Super Fund Standards in accordance with the latest edition of EPA's "Specifications and Guidance for Contaminant Free Sample Containers."
- The Level 300 Certificate of Analysis is backed by third party generated validatable laboratory data, and provides complete traceability through the production process.
- Every case of Level 300 product contains a Certificate of Analysis and is custody sealed to ensure reliable chain-of-custody.

### Level 200 Cleaned

- Processed and packaged under a strict registered ISO Quality Management System in the same manner as Level 300 products.
- Level 200 products are not certified.
- Every case of product is labeled with its production number and is custody sealed to ensure reliable chain-of-custody.

### Level 100

- These processed and packaged under a strict registered ISO Quality Management System in the same manner as Level 300 products.
- Level 100 products are not certified or pre-cleaned.
- Every case of product is labeled with its production number and is custody sealed to ensure reliable chain-of-custody.

### TOC Vials

- The only low-level certified vials in the market for Total Organic Carbon testing and sampling.
- Major TOC instrument manufacturers recommend these vials when analysis of low levels of TOC requires low background level assurance.
- Each lot of vials is tested and certified to contribute less than 10ppb TOC as background or for less stringent applications the 20ppb TOC version.
- Certificate of Analysis is included with lot production numbers.

### Scintillation Vials

- Provide the very lowest background count and benefit from very high optical clarity.
- Typical background count of 13CPM or lower, compared to an average 16-65CPM from competitive products.
- Noise level of 2.28 and a quenching index factor of 349.

40-EPAVCS



40-TOCSV-10



Items not shown to scale  
\* 50% to scale

### Chromacol EPA Screw Vial Kits

Kit Type	Glass	Dimension (mm)	Total Volume (mL)	Class	Septum	Cat. No.	Pack of
EPA Screw Vial Assembled Kit Vials/Septa/Caps	Clear	28x95	40	Class 100	0.01" White PTFE/ 0.09" Clear Silicone	<b>40-EPAVCS</b>	100
	Clear	28x95	40	Class 200 Pre-cleaned		<b>40-EPAVCS-PC</b>	72
	Clear	28x95	40	Class 300 Pre-cleaned		<b>40-EPAVCS-PC3</b>	72
	Amber	28x95	40	Class 100		<b>40-EPAVCS(A)</b>	100
	Amber	28x95	40	Class 200 Pre-cleaned		<b>40-EPAVCS(A)-PC</b>	72
	Amber	27x57	40	Class 300 Pre-cleaned		<b>40-EPAVCS(A)-PC3</b>	72
	Clear	28x57	20	Class 100		<b>20-EPAVCS</b>	100
	Amber	28x57	20	Class 100		<b>20-EPAVCS(A)</b>	100
	Clear	28x140	60	Class 100		<b>60-EPAVCS</b>	72

### Chromacol TOC Vials Kits

Description	Glass	Dimension (mm)	Total Volume (mL)	Cap Color	Cap Material	Septum	Cat. No.	Pack of
TOC clear vial with cap cover, open top cap TOC 10ppb	Clear	28x96	40	White	Polypropylene	Beige PTFE/ White Silicone	<b>40-TOCSV-10</b>	72
TOC clear vial with cap cover, open top cap TOC 20ppb	Clear	28x96	40	White	Polypropylene	Beige PTFE/ White Silicone	<b>40-TOCSV-20</b>	72

### Chromacol Scintillation Vials Kit

Description	Glass	Dimension (mm)	Total Volume (mL)	Noise	Background Count	Quenching Index Factor	Cat. No.	Pack of
20mL vial with foil lined caps	Clear	27x57	10	2.28	13 CPM	349	<b>20-EPSVCA</b>	500



## Seal Hardness

The hardness testing of plastics is most commonly measured by the Shore (Durometer) test. This method measures the resistance of plastics toward indentation and provides an empirical hardness value. Shore Hardness, is the preferred method for rubbers/ elastomers and is also commonly used for 'softer' plastics such as fluoropolymers. Most septa hardness values are stated in Shore A. The results obtained from this test are a useful measure of relative resistance to piercing of various grades of polymers. This gives guidance on the type of needle that will penetrate the seal and whether thinner gauge needles may be used.

### Seals in 8mm, 9mm, 11mm, 12mm Caps

Seal Material	Hardness °shore	Thickness (mm)
TST1 Red PTFE/white silicone/red PTFE	57	1.0
CBT1 Gray Chlorobutyl/PTFE	52	1.0
ST14 Blue silicone/PTFE	50	1.2
6RT1/AC6 Synthetic rubber/PTFE	38	1.0
ST101 Blue silicone/PTFE	30	1.0
ST143 White silicone/PTFE	20	1.4
ST144 Blue silicone/redPTFE	20	1.4
V1 Viton	62	1.0
AC7 Natural rubber/PTFE	60	1.0
8RT1 Synthetic rubber/PTFE	58	1.0
ST2 White silicone/red PTFE	57	2.0
ST18 White silicone/red PTFE	57	1.8
ST15 White silicone/red PTFE	57	1.5
ST1 White silicone/red PTFE	57	1.0

### Seals in 20mm Caps

Seal Material	Hardness °shore	Thickness (mm)	max. Temp °C
CBT3B Chlorobutyl/PTFE	52	3	120
CBT3 Chlorobutyl/PTFE	52	3	120
CB3 Chlorobutyl	52	3	120
ST3 Blue silicone/PTFE	45	3	200
ST3HT Red silicone/PTFE	45	3	250
AS3 White silicone/aluminium	45	3	<170
ASH3 Red silicone/aluminium	45	3	>170

## Seal properties

Rubber	Used primarily for routine analysis in gas chromatography. Offers moderate resealability and good chemical inertness. Not recommended for multiple injections or holding samples for further analysis. PTFE is protective layer that once broken exposes rubber to chemical attack.
PTFE/Red rubber – AC6, 8RT1	Low durometer of rubber allows ease of needle penetration. A popular and economical septa for general GC purposes.
PTFE/Rubber – AC7, 8RT1	Harder grade of rubber for use with piercing needle. Most popular and economical septa for general GC purposes in Agilent systems.
Pre-slit PTFE/red rubber – 8RT1X	Pre-slit, high quality red rubber with a thin (0.003") layer PTFE. For applications using a very thin-gauge syringe needle or in instances when a vacuum may form in the vial.
Silicone rubber	High quality, silicone rubber laminated to PTFE. Use when excellent resealing qualities are a must. Septum resists coring and is recommended when multiple injections are required. Preferred septa for use in liquid chromatography applications.
PTFE/silicone – ST1, ST15, ST18, ST2	A white medium hardness silicone with red PTFE protective layer available in a range of thickness.
PTFE/silicone – ST101, ST14	<ul style="list-style-type: none"> <li>• A very pure soft silicone laminated to PTFE. Septum resists coring and is recommended for instruments with fine gauge needles.</li> <li>• Also recommended for LC-MS and GC-MS due to high purity.</li> </ul>
PTFE /silicone – ST143, ST144	A very soft silicone laminated to PTFE. Use with flexible needle.
PTFE /silicone/PTFE – TST1, TST11	<ul style="list-style-type: none"> <li>• A layer of PTFE on each side of medium hardness silicone. Most resistant to coring with above average resealing characteristics.</li> <li>• Recommended for most demanding applications such as trace analysis, longer time between injections or for internal standards.</li> <li>• Use with Gilson instruments and with any autosampler using large diameter, blunt-tip syringe needles.</li> </ul>
Pre-slit PTFE/Silicone – ST1X, ST101X, ST14X	Pre-slit, high quality pure white silicone faced with PTFE. For applications using a very thin-gauge syringe needle or in instances when a vacuum may form in the vial. Highly recommended for Shimadzu and Hitachi autosampler units.
PTFE and fluoropolymers	Very good chemical resistance and used as a protective layer for less resistant elastomers.
PTFE – T, T02	For single injections and short sample cycles. This type of septa is not resealable.
Viton – V1	Viton provides the best chemical resistance with limited resealability. Recommended for chlorinated solvents. Due to Viton®'s intrinsic hardness, these septa are not suitable for finer-gauge syringe needles.
Integral plastic seal	Moulded as part of the cap.
Polyethylene – PE, Polypropylene – PP	Chemically resistant but for one time use only with no resealability.

## 20mm seal selection for Headspace and Sample Preparation applications

Butyl rubber/chlorobutyl rubber	An economical choice for low temperature (< 125°C) or low-pressure applications. Not suitable for alkanes, benzene, chlorinated solvents or cyclohexane without a protective PTFE layer.
Grey butyl stopper – B3P	Does not provide PTFE barrier. Use for gas sampling due to low permeability.
Blue chlorobutyl – CB3	Does not provide PTFE barrier. Use for gas sampling due to low permeability.
Blue chlorobutyl/natural PTFE – CBT3	Has PTFE barrier that makes it suitable for work with general organic solvents with low gas permeability.
Grey PTFE/chlorobutyl molded – CBT3B	Specially molded seal with PTFE insert. Sealing surface of Butyl and PTFE affects a more positive seal than non-PTFE-faced septa. Ideal choice for temperatures below 125°C. Good sealing characteristics, excellent resistance to most solvents and coring, and high puncture tolerance. PTFE provides increased chemical resistance.
Silicone rubber	Excellent septa choice for volatiles with very low background peaks and low permeability. Also ideal for alcohols and aqueous samples. Good resealing characteristics and resistant to coring.
Natural PTFE/blue silicone – ST3	Best septa choice when temperatures are over 125°C.
Natural PTFE/red silicone – ST3HT	High temperature formulated seal with low bleed. Best septa choice when temperatures are up to 250°C.
Blue Silicone/red PTFE – ST144	Thin 1.4mm seal with PTFE face for use with Fisons/ Carlo Erba Instruments. Resealing capability limited due to thinner silicone layer.
Aluminium/white silicone – AS3	Reflective aluminium face protects the silicone seal. The white silicone is suitable for use up to 170°C
Aluminium/red silicone – ASH3	Reflective aluminium face protects the silicone seal. The red silicone is suitable for use at temperatures of >170°C
Blue silicone/natural PTFE – ST101	Soft silicone with clean formulation for minimal interference. Thinner seal suitable for solvent washing, solvent extraction and SPME applications with some resealing. Not for direct headspace applications.
Freezer bungs – 2FB3	Butyl bungs for sealing of lyophilized products. Compatible with low storage temperatures and low gas permeability.
PTFE/silicone ring – LLX	Thin PTFE layer with sealing ring to give secure closure for strong solvents. For use in liquid extraction or SPME stage during sample preparation. Does not reseal.

# Solvent Compatibility

## Sealing Material

Solvent	AC6	AC7	B3P	CBT1	CB3	CBT3	LDPE	HDPE	PP	PTFE
Acetic Acid Aqueous	A(A)	A(B)	A(B)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Acetone	A(A)	A(C)	A(A)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
Acetonitrile	A(A)	A(A)	–	A(A)	A(A)	A(A)	–	–	–	A(A)
Alcohols(Aromatic)	A(B)	A(D)	–	A(B)	B(B)	A(B)	D(D)	D(D)	B(B)	A(A)
Alcohols(Aliphatic)	A(A)	A(B)	A(B)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
Amyl Acetate	A(A)	A(D)	A(C)	A(A)	A(A)	A(A)	D(D)	D(D)	–	A(A)
Aqueous Solutions Dilute	A(A)	A(A)	–	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Benzene	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Butyl Alcohol	A(B)	A(A)	A(B)	A(B)	B(B)	A(B)	B(B)	B(B)	B(B)	A(A)
Carbon Disulphide	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Carbon Tetrachloride	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Chloroform	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Cyclohexane	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	–	–	–	A(A)
Cyclohexanol	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	B(B)	A(A)
Diethyl Ether	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Dimethyl Sulphoxide	A(C)	A(D)	D(D)	A(C)	C(C)	A(C)	–	–	–	A(A)
Dioxane	A(B)	A(D)	A(B)	A(B)	B(B)	A(B)	–	–	–	A(A)
Esters	A(B)	A(D)	A(C)	A(B)	B(B)	A(B)	D(D)	D(D)	B(B)	A(A)
Ethyl Acetate	A(B)	A(D)	A(B)	A(B)	B(B)	A(B)	D(D)	D(D)	B(B)	A(A)
Ethyl Alcohol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
Ethylene Chloride	A(D)	A(D)	A(C)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Ethylene Glycol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Formaldehyde	A(B)	A(B)	A(A)	A(B)	B(B)	A(B)	A(A)	A(A)	A(A)	A(A)
Glycol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Halogenated Hydrocarbons	A(D)	A(C)	A(B)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Hexane	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	–	–	–	A(A)
Hydrochloric Acid Dilute	A(A)	A(C)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Iso-Octane	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	–	–	–	A(A)
Ketones	A(A)	A(C)	A(B)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
MeOH/H2O/Acetonitrile	A(A)	A(–)	–	A(A)	A(A)	A(A)	–	–	–	A(A)
Methanol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	–	–	–	A(A)
Methyl Chloride	A(C)	A(D)	A(C)	A(C)	C(C)	A(C)	D(D)	D(D)	D(D)	A(A)
Methyl Acetate	A(B)	A(C)	A(A)	A(B)	B(B)	A(B)	D(D)	D(D)	B(B)	A(A)
Methyl Ethyl Ketone	A(A)	A(D)	A(B)	A(A)	A(A)	A(A)	D(D)	B(B)	B(B)	A(A)
Methylene Chloride	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Nitric Acid Dilute	A(A)	A(D)	A(B)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Pentane	A(D)	A(–)	–	A(D)	D(D)	A(D)	–	–	–	A(A)
Petroleum Ether	A(D)	A(–)	–	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Sodium Hydroxide	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Sulphuric Acid Dilute	A(D)	A(C)	A(B)	A(D)	D(D)	A(D)	A(A)	A(A)	A(A)	A(A)
Surfactants	A(A)	A(–)	–	A(A)	A(A)	A(A)	–	–	–	A(A)
Toluene	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	B(B)	A(A)
Trichloroethylene	A(D)	A(D)	D(D)	A(D)	D(D)	A(D)	D(D)	D(D)	D(D)	A(A)
Water	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)

Key: The first character indicates the characteristics of the seal prior to any injection.

The second character in ( ) indicates the potential characteristics of the seal after an injection.

A = Recommended B = Suitable for most purposes C = Use with care D = Not advisable – = Not tested

## Sealing Material

Solvent	ST3	ST2	ST18	ST15 and ST1	ST14	ST144	ST143	ST101	TST11	TST1	VITON
Acetic Acid Aqueous	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	D(D)
Acetone	A(D)	A(B)	A(A)	A(A)	A(A)	A(D)	A(B)	A(A)	A(A)	A(B)	D(D)
Acetonitrile	A(A)	A(-)	A(A)	A(A)	A(A)	A(A)	A(-)	A(A)	A(A)	A(-)	B(B)
Alcohols(Aromatic)	A(B)	A(A)	A(A)	A(A)	A(A)	A(B)	A(-)	A(A)	A(A)	A(-)	-
Alcohols(Aliphatic)	A(B)	A(-)	A(A)	A(A)	A(A)	A(B)	A(-)	A(A)	A(A)	A(-)	-
Amyl Acetate	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	D(D)
Aqueous Solutions Dilute	A(A)	A(-)	A(A)	A(A)	A(A)	A(A)	A(-)	A(A)	A(A)	A(-)	-
Benzene	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Butyl Alcohol	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(A)
Carbon Disulphide	A(D)	A(-)	A(A)	A(A)	A(A)	A(D)	A(-)	A(A)	A(A)	A(-)	A(A)
Carbon Tetrachloride	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Chloroform	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Cyclohexane	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Cyclohexanol	A(D)	A(-)	A(B)	A(B)	A(B)	A(D)	A(-)	A(B)	A(B)	A(-)	A(A)
Diethyl Ether	A(D)	A(-)	A(B)	A(B)	A(B)	A(D)	A(-)	A(B)	A(B)	A(-)	D(D)
Dimethyl Sulphoxide	A(D)	A(-)	A(A)	A(A)	A(A)	A(D)	A(-)	A(A)	A(A)	A(-)	C(C)
Dioxane	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	D(D)
Esters	A(B)	A(-)	A(B)	A(B)	A(B)	A(B)	A(-)	A(B)	A(B)	A(-)	-
Ethyl Acetate	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	A(B)	D(D)
Ethyl Alcohol	A(A)	A(B)	A(A)	A(A)	A(A)	A(A)	A(B)	A(A)	A(A)	A(B)	-
Ethylene Chloride	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	-
Ethylene Glycol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)
Formaldehyde	A(B)	A(B)	A(A)	A(A)	A(A)	A(B)	A(B)	A(A)	A(A)	A(B)	D(D)
Glycol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	-
Halogenated Hydrocarbons	A(D)	A(-)	A(A)	A(A)	A(A)	A(D)	A(-)	A(A)	A(A)	A(-)	-
Hexane	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	-
Hydrochloric Acid Dilute	A(D)	A(-)	A(A)	A(A)	A(A)	A(D)	A(-)	A(A)	A(A)	A(-)	A(A)
Iso-Octane	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	-
Ketones	A(D)	A(-)	A(B)	A(B)	A(B)	A(D)	A(-)	A(B)	A(B)	A(-)	-
MeOH/H2O/Acetonitrile	A(A)	A(A)	A(B)	A(B)	A(B)	A(A)	A(-)	A(B)	A(B)	A(-)	-
Methanol	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	D(D)
Methyl Chloride	A(D)	A(D)	A(A)	A(A)	A(A)	A(D)	A(D)	A(A)	A(A)	A(D)	A(A)
Methyl Acetate	A(D)	A(D)	A(B)	A(B)	A(B)	A(D)	A(D)	A(B)	A(B)	A(D)	D(D)
Methyl Ethyl Ketone	A(D)	A(D)	A(A)	A(A)	A(A)	A(D)	A(D)	A(A)	A(A)	A(D)	D(D)
Methylene Chloride	A(D)	A(B)	A(B)	A(B)	A(B)	A(D)	A(-)	A(B)	A(B)	A(-)	-
Nitric Acid Dilute	A(D)	A(B)	A(B)	A(B)	A(B)	A(D)	A(B)	A(B)	A(B)	A(B)	A(A)
Pentane	A(D)	A(C)	A(C)	A(C)	A(C)	A(D)	A(-)	A(C)	A(C)	A(-)	-
Petroleum Ether	A(D)	A(-)	A(C)	A(C)	A(C)	A(D)	A(-)	A(C)	A(C)	A(-)	-
Sodium Hydroxide	A(A)	A(B)	A(A)	A(A)	A(A)	A(A)	A(B)	A(A)	A(A)	A(B)	D(D)
Sulphuric Acid Dilute	A(D)	A(D)	A(B)	A(B)	A(B)	A(D)	A(D)	A(B)	A(B)	A(D)	A(A)
Surfactants	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(-)	A(A)	A(A)	A(-)	-
Toluene	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Trichloroethylene	A(D)	A(D)	A(C)	A(C)	A(C)	A(D)	A(D)	A(C)	A(C)	A(D)	A(A)
Water	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	A(A)	B(B)

Key: The first character indicates the characteristics of the seal prior to any injection.

The second character in ( ) indicates the potential characteristics of the seal after an injection.

A = Recommended B = Suitable for most purposes C = Use with care D = Not advisable - = Not tested

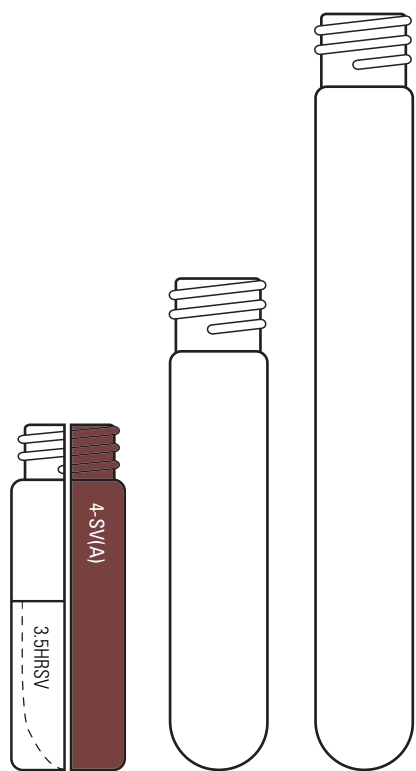
# Chromacol Vials Comparison Chart

Part No.	<b>02-CTVG</b>	<b>01-CVG</b>	<b>08-CPV</b>	<b>08-CRV(A)</b>	<b>08-CV</b>	<b>07-CPV</b>	<b>06-CTV(A)</b>	<b>05-CTV(A)</b>	<b>03-CVG</b>	<b>1.2-CWV</b>	<b>1-CWV</b>
Dimensions	6 x 32mm	6 x 32mm	7 x 40mm	7 x 32mm	8 x 30mm	7 x 40mm	7 x 32mm	7 x 30mm	6 x 32mm	8 x 40mm	8 x 40mm

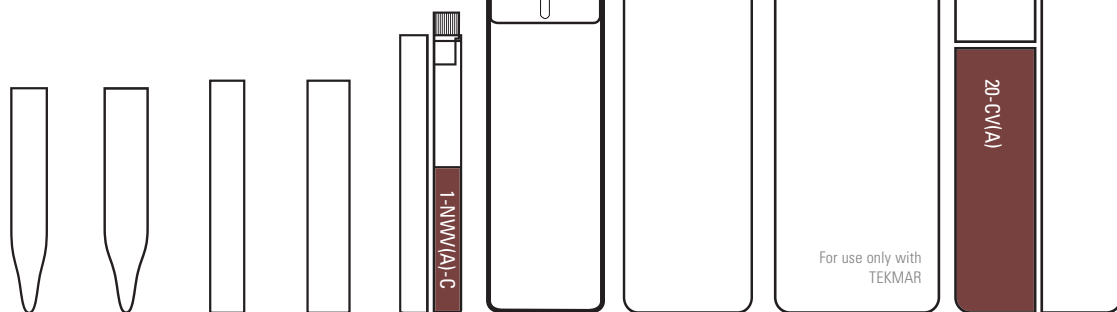
Part No.	<b>2-SV</b>	<b>2-SV(A)</b>	<b>2-SVW</b>	<b>2-SW(A)</b>	<b>1.1-STVG</b>	<b>4-SVQ</b>	<b>1.5-HRSV</b>	<b>09-FISV</b>	<b>03-FIV</b>	<b>03-FISV</b>	<b>06-PESV</b>
Dimensions	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm	15 x 46mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm

Part No.	<b>1.2-UHRSV</b>	<b>03-FISVG</b>	<b>2.5-CV</b>	<b>4-CV</b>	<b>1.5-HRCV</b>	<b>2-CV</b>	<b>2-CV(A)</b>	<b>2-CRV</b>	<b>1.1-CTVG</b>	<b>1.5-HRRV</b>	<b>2-RV</b>
Dimensions	12 x 32 mm	12 x 32mm	12 x 40mm	15 x 46mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm

Part No.	<b>09-CTV</b>	<b>09-FIV</b>	<b>02-FIVG</b>	<b>03-FIRV</b>	<b>1.2-UHRRV</b>	<b>06-PECV</b>	<b>06-PPCV</b>
Dimensions	10 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm	12 x 32mm



Part No. Dimensions  
**4-SV** 15 x 46mm  
**5-SV** 13 x 65mm  
**10-SV** 13 x 100mm



Part No. Dimensions  
**02-MTV** 5 x 30mm  
**02-MTVWG** 6 x 30mm  
**02-NV** 5 x 31mm  
**03-NV** 6 x 31mm  
**1-NWV** 8 x 40mm  
**4-NWV-C** 15 x 46mm  
**12-CV** 18 x 65mm  
**22-CV** 22 x 75mm  
**20-CV** 22 x 75mm



Part No. Dimensions  
**9-CV** 18 x 50mm  
**6-CV** 22 x 38mm  
**20-EPSVCA** 27 x 57mm  
**27-CV** 30 x 60mm  
**10-CV** 22 x 45mm



# Chromacol Caps and Septa Comparison Chart

Part No. Dimensions	 <b>*8-AC6</b> 8 x 5mm	 <b>8-AC7</b> 8 x 5mm	 <b>8-ACB</b> 8 x 5mm	 <b>8-AC-CBT1</b> 8 x 5mm	 <b>8-AC-ST15</b> 8 x 5mm	 <b>8-AC-ST101</b> 8 x 5mm	 <b>8-AC-ST101X</b> 8 x 5mm	 <b>8-AC(B)-ST144</b> 8 x 5mm	
Part No. Dimensions	 <b>8-ACT</b> 8 x 5mm	 <b>8-AC-TST1</b> 8 x 5mm	 <b>8-PEC1</b> 8 x 5mm	 <b>8-PEC1X</b> 8 x 5mm	 <b>*8-SC</b> 8 x 9mm	 <b>8-SCJ</b> 8 x 9mm	 <b>8-SC-8RT1</b> 8 x 9mm	 <b>8-SC-ST15</b> 8 x 9mm	
Part No. Dimensions	 <b>8-ST14</b> 8 x 1.4mm	 <b>8-ST14X</b> 8 x 1.4mm	 <b>8-ST143</b> 8 x 1.5mm	 <b>8-ST144</b> 8 x 1.4mm	 <b>8-6RT1</b> 8 x 1mm	 <b>8-ST101</b> 8 x 1mm	 <b>8-T02</b> 8 x 0.25mm	 <b>8-TST1</b> 8 x 1mm	 <b>8-ST15</b> 8 x 1.5mm
Part No. Dimensions	 <b>*9-SC(B)-8RT1</b> 9 x 6.5mm	 <b>9-SC(B)ST101</b> 9 x 6.5mm	 <b>*9-SC(B)-ST1</b> 9 x 6.5mm	 <b>9-SC(B)-TST1</b> 9 x 6.5mm	 <b>9-SCS-8RT1</b> 9 x 6.5mm	 <b>*11-AC6</b> 11 x 6mm	 <b>*11-AC7</b> 11 x 6mm	 <b>11-ACB</b> 11 x 6mm	
Part No. Dimensions	 <b>11-AC-CBT1</b> 11 x 6mm	 <b>11-AC-ST101</b> 11 x 6mm	 <b>11-AC-ST101X</b> 11 x 6mm	 <b>11-AC(B)-ST144</b> 11 x 6mm	 <b>11-AC-ST15</b> 11 x 6mm	 <b>11-ACT</b> 11 x 6mm	 <b>11-AC-TST1</b> 11 x 6mm	 <b>11-LLX</b> 11 x 3mm	
Part No. Dimensions	 <b>11-PEC1</b> 11 x 6mm	 <b>11-PEC1X</b> 11 x 6mm	 <b>11-PEC-ST1</b> 11 x 7mm						



\*Cap available in alternative colors. See below for more details

## Alternative Colors




### 8-AC6

-  8-AC6(R)
-  8-AC6(B)






### 8-SC

-  8-SC(R)
-  8-SC(W)

### 9-SC(B)-8RT1

-  9-SC(G)-8RT1
-  9-SC(N)-8RT1
-  9-SC(B)-8RT1X

### 9-SC(B)-ST1

-  9-SC(G)-ST1
-  9-SC(N)-ST1
-  9-SC(B)-STIX
-  9-SC(BLK)-BST1
-  9-SC(GY)-BST1X

### 11-AC6

-  11-AC6(R)
-  11-AC6(B)

### 11-AC7

-  11-AC7(R)
-  11-AC7(GO)
-  11-AC7(G)
-  11-AC7(B)

Part No. Dimensions	<b>11-PSN(B)</b> 11 x 6.5mm	<b>11-PSN(B)-ST101</b> 11 x 6.5mm	<b>*11-PSN(B)-T02</b> 11 x 6.5mm	<b>11-PSN(B)-TST1</b> 11 x 6.5mm	<b>11-PSN(B)-8RT1</b> 11 x 6.5mm	<b>*11-PSN(B)-ST1X</b> 11 x 6.5mm	<b>11-PSN(B)-ST1</b> 11 x 6.5mm
Part No. Dimensions	<b>*12-SC</b> 12 x 10mm	<b>12-SCS</b> 12 x 10mm	<b>12-SC-ST2</b> 12 x 10mm	<b>12-SC-8RT1</b> 12 x 10mm	<b>13-SC-ST15</b> 12 x 10mm	<b>13-SCST</b> 12 x 10mm	
Part No. Dimensions	<b>12-ST2</b> 12 x 2mm	<b>12-ST18</b> 12 x 1.8mm	<b>12-6RT1</b> 12 x 1mm	<b>12-ST101</b> 12 x 1mm	<b>12-T02</b> 12 x 0.25mm	<b>8-NPWP</b> 8 x 9mm	<b>12-NPEP4</b> 12 x 7mm
Part No. Dimensions	<b>18-MSC</b> 18 x 13mm	<b>*18-MSC-ST3</b> 18 x 13mm	<b>20-ACB</b> 20 x 7mm	<b>20-MCB</b> 20 x 7mm	<b>*20-MCBC</b> 20 x 7mm	<b>*20-MCBC-ST3</b> 20 x 7mm	
Part No. Dimensions	<b>20-AC-CBT3</b> 20 x 7mm	<b>20-AC-ST3</b> 20 x 7mm	<b>20-CB3</b> 20 x 3mm	<b>20-CBT3</b> 20 x 3mm	<b>20-CBT3B</b> 20 x 3mm	<b>20-LLX</b> 20 x 3mm	
Part No. Dimensions	<b>20-ST3</b> 20 x 3mm	<b>20-ST3HT</b> 20 x 3mm	<b>20-ST101</b> 20 x 1mm	<b>18-ST101</b> 18 x 1mm	<b>20-B3P</b> 20 x 9mm	<b>20-PEPC5</b> 20 x 10mm	

\* Cap available in alternative colors. See below for more details

### Alternative Colors

#### 11-PSN(B)-T02

11-PSN(R)-T02

#### 11-PSN(B)-ST1X

11-PSN(G)-ST1X

#### 12-SC

12-SC(R)

12-SC(W)

12-SC(Y)

#### 18-MSC-ST3

18-MSC-ST101

18-MSC-CBT3

#### 20-MCBC

20-MCBC(R)

#### 20-MCBC-ST3

20-MCBC(R)-ST3

20-MCBC(N)-ST3

# Thermo Scientific Crimpers and De-Crimpers

Electronic Crimpers and De-Crimpers provide an adjustable crimp with reproducible results.

Thermo Scientific offers hand held electronic crimpers for crimping or removal of aluminum seals on 8, 11, 13 and 20mm vials. The crimper is a hand held device, which allows aluminum seals to be firmly attached to the vial while it remains in most sample trays with the touch of a button. A separate de-crimper allows the removal of the seal just as easily. The instruments have an adjustment for septa of varying thicknesses. Power is supplied by rechargeable Lithium Ion Cells. The 7.5 volt DC power supply comes with a set of plug adaptors to fit power outlets for most countries.

## Electronic Crimpers and De-Crimpers

- One hand secure, reproducible crimps of 8, 11, 13 and 20mm vials with the push of a button
- Reduces hand strain compared to manual crimper operation
- Quick and easy removal of aluminum seals with the push of a button
- Ergonomic design eliminates wrist strain
- Vials can be crimped while they remain in most standard removable sample trays
- Adjustable crimp settings for compatibility with most vial/septum/seal combinations
- Fully rechargeable Lithium Ion Battery
- Provided with universal power supply/recharger and international plug adaptors



### Electronic Hand-held Crimper and De-Crimper

Description	Cat. No.	Pack of
Electronic Hand-held Crimper for 8mm Crimp Caps, Generation 3	<b>ECR-8C</b>	1
Electronic Hand-held Crimper for 11mm Crimp Caps, Generation 3	<b>ECR-11C</b>	1
Electronic Hand-held Crimper for 13mm Crimp Caps, Generation 3	<b>ECR-13C</b>	1
Electronic Hand-held Crimper for 20mm Crimp Caps, Generation 3	<b>ECR-20C</b>	1
Electronic Hand-held De-Crimper for 11mm Crimp Caps, Generation 3	<b>EDCB-11C</b>	1
Electronic Hand-held De-Crimper for 13mm Crimp Caps, Generation 3	<b>EDCB-13C</b>	1
Electronic Hand-held De-Crimper for 20mm Crimp Caps, Generation 3	<b>EDCB-20C</b>	1
Replacement Battery, 6.4V Lithium Ion, For Generation 3 Electronic Crimpers and De-Crimpers	<b>ECR-CBATT</b>	1



## Chemical Resistance Reference Chart

This chart provides a guideline for the chemical resistance of the glass and plastic materials. Because so many factors can affect chemical resistance, test your product under your actual conditions of use.

### Effects of Chemicals on Plastics

Chemicals can affect the strength, flexibility, surface appearance, color, dimensions, and weight of a plastic. These changes are caused by (1) an attack on the polymer chain resulting in oxidation, reaction of functional groups, and depolymerization; (2) dissolution in a solvent and solvent absorption or permeation that causes softening and swelling; and (3) stress cracking from a "stress-cracking agent."

Environmental stress cracking is the failure of a plastic in the presence of certain types of chemicals, but it is not a result of a chemical attack. Simultaneous presence of three factors causes stress cracking: tensile stress in the plastic, its inherent stress-cracking susceptibility, and a stress-cracking agent. Common stress-cracking agents are detergents, surface active chemicals, lubricants, oils, ultrapure water, and

plating additives such as brighteners and wetting agents. Relatively small concentrations of stress-cracking agent may be sufficient to cause cracking.

Mixing and/or diluting certain chemicals in plastic labware can be potentially dangerous. The combining of different chemicals or two or more compounds of classes may produce a synergistic or undesirable chemical effect, resulting in an increased temperature that can affect chemical resistance (as temperature increases, resistance to attack decreases), causing product failure. Other factors that also affect chemical resistance include pressure, internal or external stresses (e.g., centrifugation), length of exposure, and concentration of the chemical. Always pre-test your specific usage and follow correct lab safety procedures.

Attention: Please be aware that, although several polymers may have excellent resistance to various flammable organic chemicals and solvents, OSHA H CFR 29 1910.106 for flammable and combustible materials or other local regulations may restrict the volume of solvents that may legally be stored in an enclosed area.

### Effects of Chemicals on Glass

Clear borosilicate and amber 51 expansion glass exhibit a high degree of chemical resistance with a few exceptions: Some chemicals can etch the surface of glass. Surface etching does not usually affect the dimensional characteristics of glass, but it can release chemical components into the sample solution.

Plastic Resin Code	Description	Appearance	Temp MAX °C	Temp MIN °C	Autoclavable	Dry Heat	Gamma	Microwavable	Ethylene Oxide	Analytical Purity	Fragmentation*	Hardness†	Resealability‡
HDPE	High-density polyethylene	Opaque	120	-35	No	No	Yes	Yes	Yes			Very hard (very thin)	No resealability
LDPE	Low-density polyethylene	Translucent	100	-40	No	No	Yes	Yes	Yes			Very hard (very thin)	No resealability
TPX	polyethylene	Transparent	175	0	Yes	No	Yes	Yes	Yes				
PP	Polypropylene	Translucent	135	-20	Yes	No	No	Yes	Yes				
PTFE	polytetrafluoroethylene	white	260	-200	Yes	Yes	Yes	Yes	Yes	Very high		Very hard (very thin)	No resealability
	RedRubber/PTFE	red/ivory	110	-30	No	No	No	No	No	Medium	Medium	Medium hard	Medium
	Silicon/PTFE	white/red	200	-60	Yes	Yes	Yes	Yes	Yes	High	Low to medium	Soft	Low to medium
	PTFE/Silicon/PTFE	red/white/red	200	-60	Yes	Yes	Yes	Yes	Yes	High	Very low	Soft	Very low
	Viton®	black	230	-30	Yes	Yes	Yes	Yes	Yes	Medium	Medium	Hard	Medium

\* Due to hardness and molecular structure (coring)

† Needle penetration

‡ In case of multiple injections

### Key to Chart on Following Pages

E – No damage after 30 days of constant exposure

G – Little or no damage after 30 days of constant exposure

F – Some effect after seven days of constant exposure

N – Immediate damage may occur. Not recommended for continuous use

S – Surface etching possible

The first letter of each pair applies to minimum temperature conditions; the second to maximum temperature conditions.



Chemical	LDPE	HDPE	PP	TPX	Glass	PTFE
1,4-Dioxane	GF	GG	FN	GF	EE	EE
2,2,4-Trimethylpentane	FN	FN	FN	FN	EE	EE
2-Methoxyethanol	EG	EE	GE	EE	EE	EE
2-Propanol	EE	EE	EE	EE	EE	EE
Acetaldehyde	GN	GF	GN	GN	EE	EE
Acetamide, Sat.	EE	EE	EE	EE	EE	EE
Acetic Acid, 5%	EE	EE	EE	EE	EE	EE
Acetic Acid, 50%	GF	EG	EE	EE	EE	EE
Acetic Acid, Glacial	GN	GG	EG	GG	EE	EE
Acetic Anhydride	NN	FF	GF	EG	EE	EE
Acetone	NN	NN	GN	EE	EE	EE
Acetonitrile	EE	EE	EG	FN	EE	EE
Acetophenone	NN	FF	FN	GN	EE	EE
Acrylonitrile	EE	EE	EG	FN	EE	EE
Adipic Acid	EG	EE	EE	EE	EE	EE
Alanine	EE	EE	EE	EE	EE	EE
Allyl Alcohol	EE	EE	EE	EG	EE	EE
Aluminum Chloride	EE	EE	EE	EE	EE	EE
Aluminum Hydroxide	EG	EE	EG	EG	SS	EE
Aluminum Salts	EE	EE	EE	EE	EE	EE
Amino Acids	EE	EE	EE	EE	EE	EE
Ammonia (pure)	EE	EE	EE	EE	SS	EE
Ammonia, 25%	EE	EE	EE	EE	SS	EE
Ammonium Acetate, Sat.	EE	EE	EE	EE	EE	EE
Ammonium Chloride	EE	EE	EE	EE	EE	EE
Ammonium Glycolate	EG	EE	EG	EG	EE	EE
Ammonium Hydroxide, 5%	EE	EE	EE	EE	SS	EE
Ammonium Hydroxide, 30%	EG	EE	EG	EG	SS	EE
Ammonium Oxalate	EG	EE	EG	EG	EE	EE
Ammonium Salts	EE	EE	EE	EE	EE	EE
Amyl Alcohol	EE	EE	EF	GF	EE	EE
Amyl Chloride	NN	FN	NN	FF	EE	EE
Aniline	EG	GF	EG	GF	EE	EE
Aqua Regia	NN	NN	NN	NN	SS	EE
Arsenic Acid	GF	EE	EE	EE	EE	EE
Benzaldehyde	EG	GN	EG	EF	EE	EE
Benzenamine	EG	GF	EG	GF	EE	EE
Benzene	NN	NN	NN	NN	EE	EE
Benzoic Acid, Sat.	EE	EE	EG	EE	EE	EE
Benzyl Acetate	EG	EE	EG	EG	EE	EE
Benzyl Alcohol	NN	FN	GG	GG	EE	EE
Boric Acid	EE	EE	EE	EE	EE	EE
Bromine	NN	FN	NN	NN	EE	EE
Bromobenzene	NN	NN	NN	NN	EE	EE
Bromoform	NN	NN	NN	NN	EE	EE
Butadiene	NN	FN	NN	NN	EE	EE
Butyl Acetate	GF	GF	FN	FF	EE	EE
Butyl Chloride	NN	NN	NN	FN	EE	EE
Butyric Acid	NN	FN	NN	NN	EE	EE
Calcium Chloride	EE	EE	EE	EE	EE	EE
Calcium Hydroxide, Conc.	EE	EE	EE	EE	SS	EE
Calcium Hypochlorite, Sat.	EE	EE	EE	EG	EE	EE
Carbazole	EE	EE	EE	EE	EE	EE
Carbon Disulfide	NN	NN	NN	NN	EE	EE
Carbon Tetrachloride	FN	GF	GF	NN	EE	EE
Caustic Potash	EE	EE	EE	EE	SS	EE
Caustic Soda, 1%	EE	FF	EE	EE	SS	EE
Caustic Soda	GG	GF	EE	EE	SS	EE

Chemical	LDPE	HDPE	PP	TPX	Glass	PTFE
Cedarwood Oil	NN	FN	NN	NN	EE	EE
Cellosolve Acetate	EG	EE	FN	EG	EE	EE
Chlorine Water	GN	GF	FN	NN	EE	EE
Chlorine, 10% (Moist)	GN	GF	FN	NN	EE	EE
Chlorine, 10% in air	GN	EF	FN	GN	EE	EE
Chlorine, wet gas	GN	GF	FN	NN	EE	EE
Chloroacetic Acid	EE	EE	EG	EG	EE	EE
Chlorobenzene	NN	NN	NN	NN	EE	EE
Chloroform	FN	FN	NN	NN	EE	EE
Chromic Acid, 10%	EE	EE	EE	EE	EE	EE
Chromic Acid, 20%	EE	EE	GG	EE	EE	EE
Chromic Acid, 50%	EE	EE	GF	GG	EE	EE
Chromic:Sulfuric	NN	NN	NN	NN	EE	EE
Cinnamon Oil	NN	NN	NN	NN	EE	EE
Citric Acid, 10%	EE	EE	EE	EE	EE	EE
Copper Sulfate	EE	EE	EE	EE	EE	EE
Cresol	NN	FN	GF	NN	EE	EE
Cyclohexane	FN	FN	GN	NN	EE	EE
Cyclohexanone	NN	FN	FN	GF	EE	EE
Cyclopentane	NN	FN	FN	FN	EE	EE
Decahydronaphthalene	GF	EG	NN	FN	EE	EE
Decalin	GF	EG	NN	FN	EE	EE
Diacetone	NN	NN	GF	FF	EE	EE
Diacetone Alcohol	FN	EE	GF	EE	EE	EE
Dibutylphthalate	FN	FN	GN	GG	EE	EE
Diethyl Benzene	NN	FN	NN	NN	EE	EE
Diethyl Ether	NN	FN	FN	NN	EE	EE
Diethyl Ketone	NN	NN	GG	GF	EE	EE
Diethyl Malonate	EE	EE	EE	EG	EE	EE
Diethylamine	NN	FN	GN	FF	EE	EE
Diethylene Dioxide	GF	GG	NN	FN	EE	EE
Diethylene Glycol	EE	EE	EE	EE	EE	EE
Diethylene Glycol Ethyl Ether	EE	EE	EE	EE	EE	EE
Dimethyl Acetamide	FN	EE	EE	FG	EE	EE
Dimethyl Formamide	EE	EE	EE	EE	EE	EE
Dimethylsulfoxide	EE	EE	EE	EE	EE	EE
Dioxane	GF	GG	NN	FN	EE	EE
Dipropylene Glycol	EE	EE	EE	EE	EE	EE
DMSO	EE	EE	EE	EE	EE	EE
Ethanol, 40%	EG	EE	EE	EG	EE	EE
Ether	NN	FN	NN	FN	EE	EE
Ethyl Acetate	EE	EE	GN	FN	EE	EE
Ethyl Alcohol (Absolute)	EG	EE	EE	EG	EE	EE
Ethyl Alcohol, 40%	EG	EE	EE	EG	EE	EE
Ethyl Alcohol, 96%	EG	EG	EE	EG	EE	EE
Ethyl Benzene	NN	FN	NN	NN	EE	EE
Ethyl Benzoate	FF	GG	GF	GF	EE	EE
Ethyl Butyrate	GN	GF	GN	FN	EE	EE
Ethyl Chloride	FN	NN	FN	FN	EE	EE
Ethyl Chloride, Liquid	FN	FF	FN	FN	EE	EE
Ethyl Cyanoacetate	EE	EE	EE	EE	EE	EE
Ethyl Lactate	EE	EE	EE	EE	EE	EE
Ethylene Chloride	NN	NN	NN	NN	EE	EE
Ethylene Glycol	EE	EE	EE	EE	EE	EE
Ethylene Glycol Monomethyl Ether	EG	EE	GF	EE	EE	EE
Ethylene Oxide	FF	GF	FN	FN	EE	EE
Ethylene Oxide Gas	FF	GF	FN	FN	EE	EE

Chemical	LDPE	HDPE	PP	TPX	Glass	PTFE
Ethylene Oxide, 100%	FF	GF	FN	FN	EE	EE
EtO Gas	FF	GF	FN	FN	EE	EE
EtO	FF	GF	FN	FN	EE	EE
Fatty Acids	EG	EE	EG	EG	EE	EE
Fluorides	EE	EE	EE	EE	EE	EE
Fluorine	FN	GN	NN	FN	EE	EG
Formaldehyde, 10%	EE	EE	EE	EE	EE	EE
Formaldehyde, 40%	EG	EG	EE	EE	EE	EE
Formalin, 10%	EE	EE	EE	EE	EE	EE
Formalin, 40%	EG	EG	EE	EE	EE	EE
Formic Acid	GG	EE	EG	EE	EE	EE
Formic Acid, 3%	EG	EE	EE	EE	EE	EE
Formic Acid, 100%	GG	EE	EG	EE	EE	EE
Formic Acid, 50%	GG	EE	EG	EE	EE	EE
Formic Acid, 85%	GG	EE	EG	EE	EE	EE
Freon TF	EG	EG	EG	FN	EE	EE
Fuel Oil	FN	GF	EF	GF	EE	EE
Gasoline	NN	FN	FN	GF	EE	EE
Glutaraldehyde	EG	EE	EE	FF	EE	EE
Glutaraldehyde Disinfectant	EG	EE	EE	FF	EE	EE
Glycerine	EE	EE	EE	EE	EE	EE
Glycerol	EE	EE	EE	EE	EE	EE
Hexane	NN	GF	GF	FN	EE	EE
Hydrazine	NN	NN	NN	NN	EE	EE
Hydrobromic Acid, 69%	EE	EG	EG	EE	EE	EE
Hydrochloric Acid, 5%	EE	EE	EE	EE	EE	EE
Hydrochloric Acid, 20%	EE	EE	EE	EE	EE	EE
Hydrochloric Acid, 35%	EE	EE	EG	EG	EE	EE
Hydrofluoric Acid, 4%	EE	EE	EE	EE	SS	EE
Hydrofluoric Acid, 48%	EE	EE	EG	EG	SS	EE
Hydrogen Peroxide, 3%	EE	EE	EG	EE	EE	EE
Hydrogen Peroxide, 30%	EG	EE	EF	EG	EE	EE
Hydrogen Peroxide, 90%	EN	EE	EF	EG	EE	EE
Iodine Crystals	NN	NN	EE	GN	EE	EE
Iso-Propanol, 100%	EE	EE	EE	EG	EE	EE
Isobutanol	EE	EE	EE	EG	EE	EE
Isobutyl Alcohol	EE	EE	EE	EG	EE	EE
Isopropanol	EE	EE	EE	EG	EE	EE
Isopropanol, 100%	EE	EE	EE	EE	EE	EE
Isopropyl Acetate	GF	EG	GF	GF	EE	EE
Isopropyl Alcohol	EE	EE	EE	EG	EE	EE
Isopropyl Alcohol, 100%	EE	EE	EE	EG	EE	EE
Isopropyl Benzene	FN	FN	FN	NN	EE	EE
Isopropyl Ether	NN	FN	NN	NN	EE	EE
Jet Fuel	FN	FN	FN	FN	EE	EE
Kerosene	FN	FN	FN	GF	EE	EE
Lacquer Thinner	NN	FN	FN	FF	EE	EE
Lactic Acid, 3%	EG	EE	EE	EG	EE	EE
Lactic Acid, 85%	EG	EE	EG	EG	EE	EE
Lead Acetate	EE	EE	EE	EE	EE	EE
Magnesium Chloride	EE	EE	EE	EE	EE	EE
MEK	NN	NN	EG	FN	EE	EE
Mercuric Chloride	EE	EE	EE	EE	EE	EE
Methanol	EG	EE	EE	EG	EE	EE
Mercury	EE	EE	EE	EE	EE	EE
Methanol, 100%	EG	EE	EE	EG	EE	EE
Methoxyethyl Oleate	EG	EE	EG	EG	EE	EE
Methyl Acetate	EN	FF	GF	EE	EE	EE

Chemical	LDPE	HDPE	PP	TPX	Glass	PTFE
Methyl Alcohol	EG	–	EE	EG	EE	EE
Methyl Alcohol, 100%	EG	EE	EE	EG	EE	EE
Methyl Ethyl Ketone	NN	NN	EG	FN	EE	EE
Methyl Isobutyl Ketone	NN	NN	GF	FF	EE	EE
Methyl Propyl Ketone	NN	FN	GF	FF	EE	EE
Methyl-t-Butyl Ether	NN	FN	FN	EE	EE	EE
Methylene Chloride	NN	FN	FN	EN	EE	EE
MIBK	NN	NN	GF	FF	EE	EE
Mineral Oil	GN	EF	EF	EG	EE	EE
Mineral Spirits	FN	FN	FN	EE	EE	EE
n-Amyl Acetate	GF	EG	GF	GF	EE	EE
n-Butanol	EE	EE	EE	EG	EE	EE
n-Butyl Acetate	GF	GF	GF	GF	EE	EE
n-Butyl Alcohol	EE	EE	EE	EG	EE	EE
n-Decane	FN	FN	FN	FN	EE	EE
n-Heptane	NN	FF	FF	FF	EE	EE
n-Octane	EE	EE	EE	EE	EE	EE
Nitric Acid, 10%	EE	EE	EE	EE	EE	EE
Nitric Acid, 20%	EE	GG	FF	EE	EE	EE
Nitric Acid, 50%	GF	FN	FN	FN	EE	EE
Nitric Acid, 70%	EN	FN	NN	FN	EE	E
Nitrobenzene	NN	NN	NN	FN	EE	E
Nitromethane	NN	FN	FN	EF	EE	EE
o-Dichlorobenzene	FN	NN	FN	FN	EE	EE
Oil, Cedarwood	NN	FN	NN	NN	EE	EE
Oil, Cinnamon	NN	FN	NN	NN	EE	EE
Oil, Mineral	GN	EE	EE	EG	EE	EE
Oil, Pine	GN	FN	EG	GF	EE	EE
Orange Oil	FN	GF	GF	FF	EE	EE
Oxalic Acid, 10%	EE	EE	EE	EE	EE	EE
Ozone	GN	GN	FN	EE	EE	EE
p-Chloroacetophenone	EE	EE	EE	EE	EE	EE
p-Dichlorobenzene	FN	NN	GF	GF	EE	EE
Perchloric Acid	GN	GN	GN	GN	EE	GF
Perchloric Acid, Concentrated (70%)	GN	GN	GN	GN	EE	GF
Perchloroethylene	NN	NN	NN	NN	EE	EE
Petroleum	NN	GN	NN	GF	EE	EE
Phenol, 100%	NN	NN	NN	NN	EE	EE
Phenol, 50%	NN	NN	NN	NN	EE	EE
Phenol, Crystals	FN	GF	GN	FG	EE	EE
Phenol, Liquid	NN	NN	NN	NN	EE	EE
Phosphoric Acid, 5%	EE	EE	EE	EE	EE	EE
Phosphoric Acid, 85%	EN	EE	EG	EG	EE	EE
Picric Acid	NN	NN	NN	EE	EE	EE
Pine Oil	GN	FN	EG	GF	EE	EE
Potassium Chloride	EE	EE	EE	EE	EE	EE
Potassium Hydroxide, 10%	EE	FF	EE	EE	SS	EE
Potassium Hydroxide, 30%	EE	EE	EE	EE	SS	EE
Potassium Hydroxide, Concentrated	EE	EE	EE	EE	SS	EE
Potassium Permanganate	EE	EE	EG	EE	EE	EE
Propane Gas	NN	EE	NN	NN	EE	EE
Propionic Acid	FN	EF	EG	EF	EE	EE
Propylene Glycol	EE	EE	EE	EE	EE	EE
Propylene Oxide	EG	EE	EG	EG	EE	EE
Pyridine	NN	NN	EE	FN	EE	EE
Resorcinol, 5%	EE	EE	EE	EE	EE	EE



Chemical	LDPE	HDPE	PP	TPX	Glass	PTFE
Resorcinol, Sat.	EE	EE	EE	EE	EE	EE
Salicylaldehyde	EG	EE	EG	EG	EE	EE
Salicylic Acid, Powder	EE	EE	EE	EE	EE	EE
Salicylic Acid, Sat.	EE	EE	EE	EG	EE	EE
Salt Solutions, Metallic	EE	EE	EE	EE	SS	EE
sec-Butanol	EE	EE	EE	EG	EE	EE
sec-Butyl Alcohol	EE	EE	EE	EG	EE	EE
Silicone Oil	EG	EE	EE	EE	EE	EE
Silver Acetate	EE	EE	EE	EE	EE	EE
Silver Nitrate	EG	EE	EE	EE	EE	EE
Skydrol LD4	GF	EG	EG	EG	EE	EE
Sodium Acetate, Sat.	EE	EE	EE	EE	EE	EE
Sodium Carbonate	EE	EE	EE	EE	EE	EE
Sodium Dichromate	EE	EE	EE	EE	EE	EE
Sodium Hydroxide, 1%	EE	FF	EE	EE	SS	EE
Sodium Hydroxide, 10%	EE	EE	EE	EE	SS	EE
Sodium Hydroxide, Concentrated (50%)	GG	EE	EE	EE	SS	EE
Sodium Hypochlorite, 15%	EF	EG	FN	EE	EE	EE
Stearic Acid	EE	GG	EE	EE	EE	EE
Stearic Acid, Crystals	EE	EE	EE	EE	EE	EE
Sulfur Dioxide	NN	EN	EE	NN	EE	EE
Sulfur Dioxide, Liquid	NN	FN	NN	NN	EE	EE
Sulfur Dioxide, Wet or Dry Gas	EE	EE	EE	EE	EE	EE
Sulfur Salts	FN	GF	FN	FN	EE	EE
Sulfuric Acid, 6%	EE	EE	EE	EE	EE	EE
Sulfuric Acid, 20%	EE	EE	EE	EE	EE	EE
Sulfuric Acid, 30%	EE	EE	EE	EE	EE	EE

Chemical	LDPE	HDPE	PP	TPX	Glass	PTFE
Sulfuric Acid, 60%	EG	EG	GF	EG	EE	EE
Sulfuric Acid, 98%	GG	FN	FN	GF	EE	EE
Sulfuric Acid, Concentrated (96%)	GG	FN	FN	GF	EE	EE
Tartaric Acid	EE	EE	EE	EE	EE	EE
TCA	FN	FN	GF	EE	EE	EE
tert-Butanol	EG	EE	EG	EG	EE	EE
tert-Butyl Alcohol	EG	EE	EG	EG	EE	EE
Tetrahydrofuran	FN	FN	GF	FF	EE	EE
THF	FN	FN	GF	FF	EE	EE
Thionyl Chloride	NN	NN	NN	NN	EE	EE
Tincture of Iodine	EG	GF	EE	NN	EE	EE
Toluene	FN	NN	NN	FF	EE	EE
Tributyl Citrate	GF	EG	GF	GF	EE	EE
Trichloroacetic Acid	FN	FN	GF	EE	EE	EE
Trichloroethane	NN	NN	NN	NN	EE	EG
Trichloroethylene	NN	NN	NN	NN	EE	EE
Triethylene Glycol	EE	EE	EE	EE	EE	EE
Tripropylene Glycol	EE	EE	EE	EE	EE	EE
Tris Buffer, Solution	EG	EG	EG	EG	EE	EE
Trisodium Phosphate	EE	EE	EE	EE	EE	EE
Turpentine	FN	FN	FN	FN	EE	EE
Undecyl Alcohol	EF	EG	EG	EG	EE	EE
Urea	EE	EE	EE	EG	EE	EE
Vinylidene Chloride	NN	FN	NN	NN	EE	EE
Xylene	NN	FN	NN	NN	EE	EE
Zinc Chloride, 10%	EE	EE	EE	EE	EE	EE
Zinc Stearate	EE	EE	EE	EE	EE	EE
Zinc Sulfate, 10%	EE	EE	EE	EE	EE	EE



## Properties of Glass

Vials and inserts are manufactured from the highest-quality borosilicate glass, selected for its purity and dimensional stability

**Clear glass type 33 expansion** products are manufactured from 33 expansion borosilicate glass, have a low coefficient of expansion and very high resistance to chemical attack. It has low alkali content and is free of elements from the calcium, magnesium, and zinc group of heavy metals. The total of combined oxides of arsenic and antimony is less than 0.005%. 33 expansion borosilicate glass meets the requirements for Type I Class A glass of ASTM E438.

**Chromacol GOLD™ glass** quality, a low expansion high purity glass with an extremely low concentration of active sites. This gives a low activity surface with high recovery of basic and polar samples that may show adsorption on more typical glass surfaces.

**Clear and Amber glass** products manufactured from N-51A borosilicate glass, have a relatively low coefficient of expansion and high chemical durability. N-51A

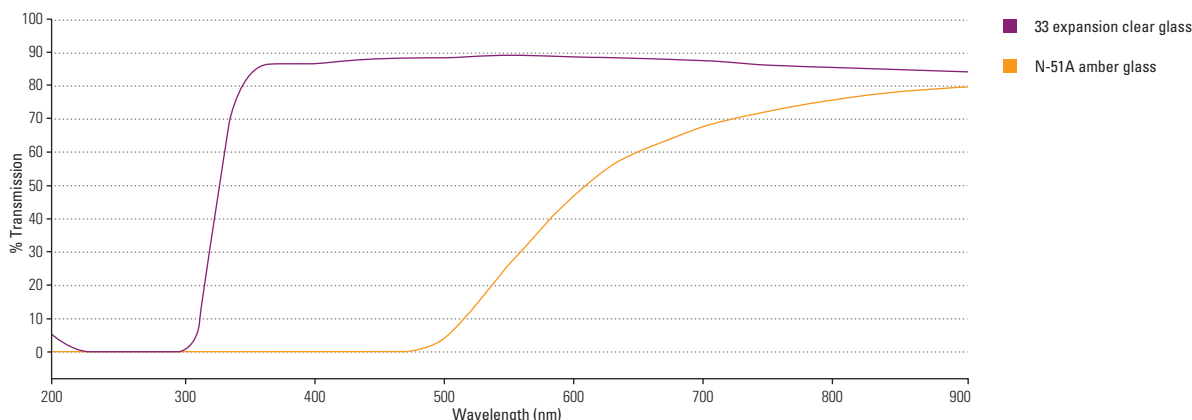
borosilicate glass meets the requirements for Type I Class B glass of ASTM E438.

Unless otherwise stated, all autosampler vials offered through this catalog (clear and amber glass) are classified as Type I in accordance with the U.S.Ph. 33th ed. and the European Ph. 7<sup>th</sup> ed, as well as other Pharmacopoeias or E.P. definitions of type 1 Hydrolytic Class Glass including e.g. the Japanese, Italian and DAB Pharmacopoeias.

### Approximate Chemical Composition for Borosilicate Glass

	33 expansion and Chromacol GOLD Grade Glass	N-51Clear Glass	N-51Amber Glass
Silicon Dioxide (SiO <sub>2</sub> )	80%	75%	72%
Boron Oxide (B <sub>2</sub> O <sub>3</sub> )	13%	11%	12%
Aluminum Oxide (Al <sub>2</sub> O <sub>3</sub> )	3%	5%	7%
Calcium Oxide (CaO)	0.1%	2%	1%
Magnesium Oxide (MgO)	Not Detected	Not Detected	Not Detected
Sodium Oxide (Na <sub>2</sub> O)	4%	7%	6%
Potassium Oxide (K <sub>2</sub> O)	0.1%	Not Detected	2%
Barium Oxide (BaO)	<0.1%	1%	<0.1%

### Optical Properties of Glass



## Autosampler Compatibility Table

This table indicates the categories of vials that are compatible with various models of autosamplers. Certain autosamplers require the purchase of optional vial trays and, in few cases, programming upgrades to use all of the vials listed.

Manufacturer	Model	8mm Crimp	11mm Crimp and Snap	8-425 Screw	Target DP Short Screw	10-425 Screw	Shell Vials	13-425 Screw and Crimp	Headspace	Plate
Agilent	1050, 1090		●		●					
	1050 (34 Pos. Tray), 1090 (34 Pos. Tray)	●								
	1100/1200		●		●					
	G1888A								●	
	7673A/7683A	●	●		●					
	7693A		●	●	●		●	●		
	HS7694							●	●	
	7697A								●	
	79855(A)		●		●					
	5880/5890		●		●					
	6850 (27 Pos. Tray)		●		●					
	6850 (22 Pos. Tray)								●	
	6890			●		●				
	CTC HTS+HTC PAL+CTC GC PAL	●	●		●					●
	CTC Combi PAL								●	
1100 Well-Plate/1100 Nanoflow		●	●	●	●				●	
1200 Well-plate/1200 SL plus		●	●	●	●				●	
AI	42 vial tray		●	●	●					
	60 vial tray	●	●	●	●					
	CTC A200S	●	●	●	●					
	Headspace								●	
AIM	CPS-100+CPS-200		●	●	●					
Alcott	708 AL, 728						●			
	738, 719 D/ D-PCS		●	●	●	●				
	719 AL		●	●	●	●		●	●	
Alpha M.O.S.	Prometheus/Fox/Kronos							●		
Antec Leyden	AS 100, 736 Unisampler, 738		●	●	●	●				
	Alexys		●	●	●					
ATAS GL	Focus		●	●	●				●	
Beckman	501, 502/502e, 507/507e	●	●	●	●	●				
	504	●								
	508 (System Gold)				●				●	
	Marathon, Promis		●	●	●					
	Triathlon, Standard Tray		●	●	●				●	
	Triathlon, LSV Tray	●						●		
	Triathlon, Super-LSV Tray								●	
	Triathlon, Micro-Tray	●								
Bruker	LC51							●		
	Mapi1									●
Cambridge Scientific Instruments	205 Series, 300 Series		●	●	●	●		●		
Carlo Erba	AS100, A200LC, AS300	●	●	●	●		●			
	AS200, AS200S	●	●	●	●					
	AS800, 42 vial tray		●	●	●					
	AS800, 60 vial tray	●	●	●	●					
	HS250, 500, 800, 850								●	
Cecil Instruments	CE4800		●	●	●	●				
	AutoQuest		●	●	●	●				
CTC	A200S	●	●	●	●	●				
	A200 LC	●	●	●	●	●			●	
	HS 500								●	

- indicates that the vials from this category are compatible with the autosampler in most configurations.
- indicates that a magnetic seal is required for use with the autosampler.

Manufacturer	Model	8mm Crimp	11mm Crimp and Snap	8-425 Screw	Target DP Short Screw	10-425 Screw	Shell Vials	13-425 Screw and Crimp	Headspace	Plate
CTC (LEAP)	LC PAL (216 Pos.)		•	•	•	•			•	
	HTX PAL, HTC PAL, HTS PAL (200 Pos. Tray), Combi PAL (200 Pos. Tray), GC PAL (200 Pos. Tray)	•								
	HTX PAL, HTC PAL, HTS PAL (54/98 Pos. Tray)	•	•	•	•	•			•	
	HTX PAL, HTC PAL, HTS PAL (32 Pos. Tray), Combi PAL (32 Pos. Tray), GC PAL (32 Pos. Tray), Combi PAL SPME Mode (32 Pos. Tray)								•	
	Combi PAL (98 Pos. Tray), GC PAL (98 Pos. Tray)	•	•		•					
	Combi PAL SPME Mode (98 Pos. Tray)		•		•					
DANI	ALS 39.80, ALS 86.80, ALS 1000		•		•					
	HS39.50, HS86.50								•	
	Master AS		•		•				•	
	Master DHS								•	
Dionex	Gina 50	•	•		•			•		
	AS 50	•	•	•	•	•				
	Summit ASI 100, Micro-Tray (192 Pos.)	•								
	Summit ASI 100, Analytical-Tray (117 Pos.)		•	•	•					
	Summit ASI 100, Semiprep.-Tray (63 Pos.)							•		
	Famos (LC Packings/Dionex)		•	•	•	•			•	
	UltiMate Analytical, cylindrical, WPS-3000 SL, 120 Pos. Rack (2ml)		•	•	•	•			•	
	UltiMate Analytical, conical, WPS-3000 SL, 120 (3x40) Pos. Rack (1.1ml=2ml w. Inserts)		•						•	
	UltiMate Micro, conical, WPS-3000 SL, 120 (3x40) Pos. Rack (250µl), UltiMate Nano/Cap/Micro, WPS-3000 SL, 216 (3x72) Pos. Rack (1.2ml)	•								•
	UltiMate Semipreparative, WPS-3000 SL, 66 (3x22) Pos. Rack (4ml)							•	•	
	AS 40						•	•		
AS-HV			•							
D-Star	DAS 10		•	•						
Dynatech	42 vial tray		•	•	•					
	60 vial tray	•	•	•	•					
	LC2000	•								
	GC111, GC311	•	•	•						
	LC-241	•	•	•						
Eksigent	NanoLC-AS1		•	•						
ESA	540-MT/540		•	•	•					•
EST	LC-241plus		•	•						
EST Analytical	Cobra L/S GC Autosampler; 120 vial tray		•	•	•	•				
	Cobra L/S GC Autosampler; 60 vial tray, Markelov HS9000								•	
Finnigan	A200S	•	•	•	•					
Fisons	AS100, A200LC, AS300	•	•	•	•		•			
	AS200	•	•	•	•					
	AS200S	•	•	•	•					
	AS800, 42 vial tray		•	•	•					
	AS800, 60 vial tray	•	•	•	•					
	HS250, HS500, HS800, HS 850									•
GBC	Avanta Ultra Z		•	•	•		•			
	LC 1650		•	•						
GE Healthcare	Ettan A-905		•		•	•				
GE Instruments	Sievers 900								•	
Gerstel	MPS	•	•	•	•			•	•	•
Gilson	201/202, 221/222, 231/401/232/402, Aspec, Aspec Xli, Aspec XL4			•	•		•			
	221XL/222XL, 223, 231XL/232XL/233XL	•								
	Nano Injektor			•	•					
	235/235P/SP 235/SP 235P	•		•	•					
Gynkotec	Gina 50	•	•		•		•			

- indicates that the vials from this category are compatible with the autosampler in most configurations.
- indicates that a magnetic seal is required for use with the autosampler.

Manufacturer	Model	8mm Crimp	11mm Crimp and Snap	8-425 Screw	Target DP Short Screw	10-425 Screw	Shell Vials	13-425 Screw and Crimp	Headspace	Plate	
HTA	HT200H								•		
	HT250D, HT280T, HT300L		•	•	•	•			•		
	HT300A, HT310A		•	•	•	•					
ICI	LC1600	•	•								
IMT GmbH	PTA3000								•		
Jasco	AS 2055/AS 2055 (i), AS 2057/AS 2057 (i), AS 2059	•	•	•	•	•					
	851/AS-950/AS-1550/AS-1555			•							
	AS-2059/AS-2059Plus			•						•	
	AS-2059-SF/X-LC	•		•						•	
Knauer	K-3800 (Basic Marathon), Smartline K-3950, PLATINblue AS-1		•	•	•				•		
Konik -Tech	Robokrom Static HS								•		
	Robokrom HRGC	•	•								
	Robokrom HPLC		•	•	•	•					
Kontron	MSI 660			•				•			
	360, 460	•	•	•	•						
	360/460/560/565	•	•	•	•						
LDC	713-60	•									
	Marathon, Promis		•	•	•						
Metrohm	Triathlon		•	•							
PerkinElmer	Series 200, 25 vial tray, ISS-225, 25 vial tray									•	
	Series 200, 85 vial tray, ISS-100, 85 vial tray, ISS-200, 85 vial tray, ISS-225, 85 vial tray		•			•				•	
	Series 200, 81/100 vial tray, Integral 4000, ISS-100, 100 vial tray, ISS-200, 100 vial tray		•	•			•				
	Series 200, 205 vial tray	•	•			•					
	Series 200, 225 vial tray	•									
	AI-1	•	•								
	AS-100/AS-100B	•	•								
	AS2000/AS2000B	•	•			•					
	AS-300, AS8300, Autosystem	•	•								
	HS 6, HS40/HS100/101									•	
	TurboMatrix HS16/HS40/HS40 XL/ HS40 Trap/HS110/ HS110 Trap									•	
	ISS-200, 145 vial tray	•									
	ISS-225, 205 vial tray	•	•			•					
	ISS-225, 100 vial tray + 80 vial tray		•			•					
	LC 600, 42 vial tray	•									
	LC 600, 60 vial tray		•			•					
	Clarus 400, 500, 600		•								
	Pharmacia	LKB 2157-010		•	•	•					
		LKB 2157-020	•	•							
		Akta A-900		•	•						
Polymer Laboratories	PL-AS RT		•	•	•	•		•			
	GPC 110/210		•	•							
Quma Elektronik	QHSS-40								•		
Sedere	-		•		•						
Selerity	3100		•	•							
Sepiatech	Sepmatix									•	
SGE	LS-3200	•									
Shimadzu	AOC-5000	•	•		•					•	
	AOC-14/1400, AOC-17, AOC-20/20i/20s 150 Pos. Tray		•	•	•	•		•			
	AOC-20/20i/20s 96 Pos. Tray										
	LC-20A		•	•	•	•		•			
	SIL-2AS, SIL-6A, SIL-10A/SIL-10AF/SIL-10AP/SIL-10Ai/SIL-10AxL/Rack S 100 Pos.	•	•	•	•	•	•	•			
	SIL-6B/SIL-7A/SIL-8A/SIL-9A		•	•	•	•	•	•			
	SIL-10A/SIL-10AF/SIL-10AP/SIL-10Ai/SIL-10AxL/Rack L 80 Pos.							•	•		

- indicates that a cap having an outer flange is required for the vial to operate properly with the autosampler.
- indicates that the vials from this category are compatible with the autosampler in most configurations.
- indicates that a magnetic seal is required for use with the autosampler.

Manufacturer	Model	8mm Crimp	11mm Crimp and Snap	8-425 Screw	Target DP Short Screw	10-425 Screw	Shell Vials	13-425 Screw and Crimp	Headspace	Plate
Shimadzu	SIL-10A/SIL-10AF/SIL-10AP/SIL-10Ai/SIL-10AxL/Rack MTP2 192 Pos., SIL-10HTA/SIL-10HTC 350 pos. Tray						•			
	SIL-10HTA/SIL-10HTC 140 Pos. Tray		•	•	•	•	•			
	SIL-10HTA/SIL-10HTC 100 Pos. Tray						•	•		
	SIL-10ADvp		•	•	•	•	•	•		
	HTA 200 H									•
	SIL-20A (Prominence) 105 vial tray/SIL-20AC (Prominence) 70 vial tray	•	•	•	•	•				
	SIL-20A/Sil-20AC (Prominence) 175 vial tray						•			
	SIL-20A/Sil-20AC (Prominence) 50 vial tray, LC2010C + LC2010A 100 Pos. Tray						•	•		
	LC2010C + LC2010A 350 Pos. Tray						•			
	LC2010C + LC2010A 140 Pos. Tray		•	•	•	•	•			
HSS-2B									•	
Spark	Marathon Basic, Standard 96 Pos. Tray, Midas, Large Capacity 96 Pos. Tray, Promis, SPH 125		•	•	•					
	Marathon Basic Prep King Size 48 Pos. Tray, Midas, Large Volume 24 Pos. Tray									•
	Midas, Standard 84 Pos. Tray, Alias		•	•	•					•
	Triathlon, Standard 96 Tray		•	•	•		•			
	Triathlon, LSV 72 Pos. Tray							•		
	Triathlon, Super-LSV 32 Pos. Tray									•
	Triathlon, Micro 160 Pos. Tray	•								
	Endurance 48 Pos. Tray, Reliance 48 Pos. Tray		•	•	•					
	Integrity		•	•	•					•
	Prospekt 2		•	•						
Reliance/Symbiosis Pharma		•	•						•	
Symbiosis Pico									•	
Spectra-Physics	8875, 8880		•	•	•					
	SpectraSYSTEM AS1000, AS3000, AS3500	•	•	•	•		•			
Sykam	S 5200		•		•					
Talbot	ASI		•		•					
Teledyne Tekmar	7000/7000HT/7050									•
	HT3A									•
Thermo Scientific	AS1000 (Trace GC), AS200, AS2000 90 vial tray (Trace GC)	•	•	•	•					
	AS300	•	•	•	•		•			
	AS2000 30 vial tray									•
	AI3000 (II)/AS3000 (II) AS3500 (Trace GC + Focus GC)	•	•		•					•
	A200LC, AS 100	•	•	•	•		•			
	SpectraSYSTEM AS 1000, AS 3000, AS 3500	•	•	•	•		•			
	A200S	•	•	•	•					
	AS800, 42 vial tray		•	•	•					
	AS800, 60 vial tray	•	•	•	•					
	HS250, HS500, HS800, HS 850, HS2000									•
	TriPlus (=GC PAL) (AS+ Duo)	•	•	•	•					•
	TriPlus HS, TriPlus SPME									•
	Surveyor (Surveyor Plus)	•	•	•	•		•			•
	Accela High Speed LC Autosampler (200 Pos.)	•	•	•	•					
	Accela Open Autosampler (342 Pos)	•	•	•	•					•
Tosoh	AS 8010		•		•					
	TSK-6080		•		•					•
Tracor	770/771/772		•	•	•					•
Unicam	4247, 4710		•	•	•					
	4700 (GC)	•								
	4700 (LC)	•		•	•					
	LC-XP		•	•	•			•		
	S4/S8	•								

- indicates that the vials from this category are compatible with the autosampler in most configurations.
- indicates that a magnetic seal is required for use with the autosampler.

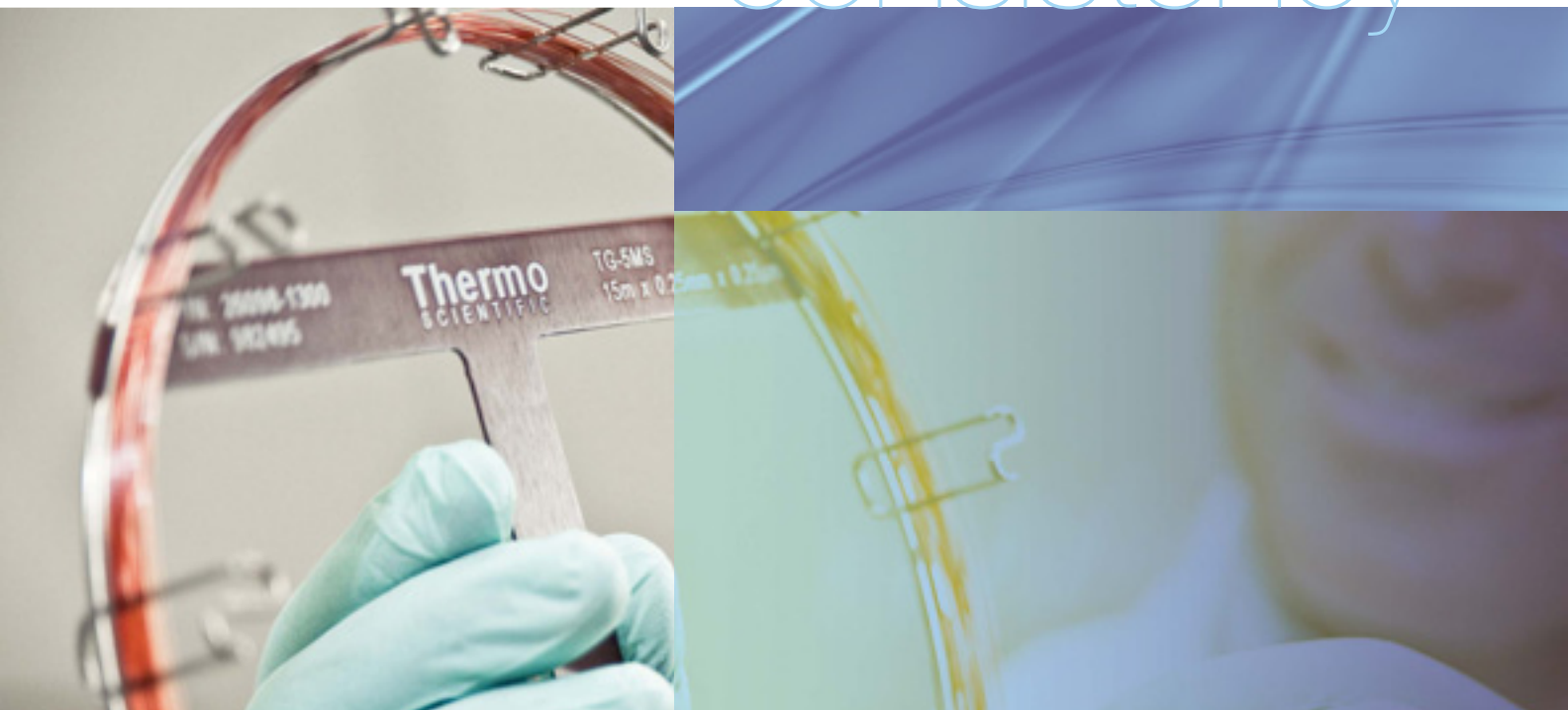


Manufacturer	Model	8mm Crimp	11mm Crimp and Snap	8-425 Screw	Target DP Short Screw	10-425 Screw	Shell Vials	13-425 Screw and Crimp	Headspace	Plate
Varian	ProStar 400, Standard 96 Pos. Tray, ProStar 410, Large Capacity 96 Pos. Tray		•	•	•	•				
	ProStar 400, King Size 48 Pos. Tray, ProStar 410, Large Volume 24 Pos. Tray								•	
	ProStar 410, Standard 84 Pos. Tray		•	•	•	•			•	
	ProStar 420, Standard 96 Pos. Tray		•	•	•	•	•			
	ProStar 420, LSV 72 Pos. Tray	•						•		
	ProStar 420, Super-LSV 32 Pos. Tray								•	
	ProStar 420, Micro 160 Pos. Tray	•								
	ProStar 430, 48 Pos. Tray		•	•	•					
	8035			•	•					
	8000, 8100		•	•	•					
	8200		•	•	•		•			
	8400 (100 Pos.), 8410-Autoinjector (10 x 2ml; 6 x 5ml; 5 x 10ml)		•	•	•				•	
	CP-910, 911, 912		•	•	•					
	CP-940, 941		•	•						
	LC 9100/LC 9095/LC 9090		•	•		•				
	COMBI PAL (200 Pos. Tray) GC PAL (200 pos. Tray)	•								•
	COMBI PAL (98 Pos. Tray) GC PAL (98 Pos. Tray)	•				•				•
	COMBI PAL SPME mode (98 Pos. Tray)		•			•				•
	COMBI PAL (32 Pos. Tray) GC PAL (32 Pos. Tray), COMBI PAL SPME mode (32 Pos. Tray)					•				•
	Genesis									•
	Marathon Basic, Standard 96 Pos. Tray			•	•	•				
	Marathon Basic, Prep, King Size 48 Pos. Tray									•
	Vista				•	•				
	CP-9020/CP-9025, CP-9060									•
	CP-9010			•	•	•				
CP-8410/8034/8035/8100/8200/9095/9100			•	•						
920-LC/940-LC			•	•						
Viscotek	GPC Autosampler			•	•	•				
VWR(Merck)/Hitachi	L2200 (LaChrom Elite)/L2200-U (LaChrom Ultra) (200 Pos. Tray), L7200 (LaChrom) (80 Pos. Tray)/L7250(LaChrom) (Pos. Tray)		•	•	•					
	L2200 (LaChrom Elite) (128 Pos. Tray)							•		
	L7250 (LaChrom) (Rack Holder for combination Racks)	•	•	•	•			•		
	655-A40 (108 Pos. Tray), L-9100, AS 2000 (50 Pos. Tray), AS 4000 (150 Pos. Tray)			•	•	•				
	AS 4000 (198 Pos. Tray)	•								
	AS 6000	•	•	•	•					
	AS 6000	•	•	•	•					
Waters	Acquity Sample Organizer		•		•					•
	Acquity/CapLC/Waters/Nano Acquity		•		•					•
	Alliance HTS									•
	Model 2767		•	•						•
	Model 2707		•	•						•
	Model 2777		•	•						•
	ACQUITY™ UPLC Systems				•				•	
	Wisp 48 position						•	•		
	Wisp 96 position, 717, 96 Position Carousel						•			
	717, 48 Position Carousel						•	•		
	Alliance®, Alliance HT Syst.		•		•	•				
	Alliance® GPC 2000							•	•	
Alliance® 2790/2795, Alliance 2690/2695		•		•	•					

- indicates that the vials from this category are compatible with the autosampler in most configurations.
- indicates that a magnetic seal is required for use with the autosampler.



# consistency



## GC Columns and Accessories

Thermo Scientific GC Columns offer high temperature stability and exhibit low bleed and long lifetimes. From general purpose non-polar to polar columns, TraceGOLD™, TRACE and TracePLOT™ columns provide excellent quality and performance, with guaranteed reproducibility. Our range of GC accessories includes all the consumables and tools necessary for today's gas chromatographer.

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## Featured Products



### TraceGOLD GC Columns

Offering you a leap forward in column performance delivering low bleed and superior inertness

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### TracePLOT GC Columns

The latest innovation in PLOT column technology, providing reproducible analyses of permanent gases, hydrocarbons and solvents

» **PAGE 3-075**



### GC Equipment

Our GFM Pro flowmeter and GLD Pro leak detector are essential tools for maintaining optimal performance of your GC instrument

» **PAGE 3-098**

# GC Column Selection

When selecting a GC column for your analysis, it can often be difficult to choose the most appropriate column because of the wide range of options. However, the choice can be simplified by considering a number of questions about the planned separation. This section provides useful information to help you determine the most suitable column for your analysis.



## Column Selection for Existing or Regulated Methods

This section provides a number of tools to aid in selecting the most appropriate Thermo Scientific GC Column. The Thermo Scientific TRACE Phase table lists details for the wide array of phases offered in the TraceGOLD, TRACE and TracePLOT GC Column ranges. The GC Column Selection by Manufacturer table provides a quick cross reference for Thermo Scientific columns to other GC column manufacturers. If you are following an ASTM, NIOSH or US EPA method, please refer to the Column Selection by Method tables for the best Thermo Scientific product.

## Method Development Considerations

When first developing a method, you should consider these column characteristics to determine the best column for the separation.

- Column Phase
- Internal Diameter
- Film Thickness
- Column Length

### A. Column Phase

In GC, the separation of two analytes occurs due to differences in their interaction with the stationary phase, therefore a phase must be chosen that matches the properties of the sample. For example, if the components have different boiling points (greater than 2°C), a non-polar column such as the TG-1MS is recommended. If the products differ primarily in their polarities, then a polar column such as the TG-WaxMS will be ideal.

If you know the particular class of your sample, please refer to the column Selection by Application for a recommended phase (see page 3-010). Always select the least polar column which will perform the separation.

### B. Internal Diameter

The selection of the internal diameter is often determined by the instrument or detection method. Most modern GC equipment will accommodate most column sizes. With a larger internal diameter, column sample capacity increases, but resolution and sensitivity decrease. Conversely, a smaller ID column can improve resolution and sensitivity, but with the drawback of reduced sample capacity and a greater need for sample preparation. It is a good idea to find a similar application which gives separation of the desired components and use this as a guide.

### C. Film Thickness

Increasing the film thickness increases the sample capacity of the column and slows the elution of the peaks which can help when analyzing volatile compounds. A thicker film also reduces the potential of overloading the column, thus improving the resolution. However, a thicker film can be more sensitive to degradation. The same component will elute at a higher temperature on a thick film when compared to a thin film.

Compounds with high boiling points or those with a high molecular weight should be analyzed using a thin film to improve resolution and avoid unnecessarily long analysis times.

Another factor to consider is the phase ratio ( $\beta$ ) which is calculated using both the internal diameter and film thickness in the following equation:

$$\beta = \frac{\text{Internal diameter } (\mu\text{m})}{4 \times \text{Film thickness } (\mu\text{m})}$$

The phase ratio can be used in two ways:

- To categorize the best dimensions for an application:
  - For volatile samples  $\beta < 100$
  - For general samples  $\beta \sim 250$
  - For high molecular weight samples  $\beta > 400$

- To transfer an analysis from a column of one ID to another without changing the method substantially, choose a column with a similar  $\beta$  value as this will have similar retention properties.

Internal Diameter (mm)	Film Thickness ( $\mu\text{m}$ )					
	0.1	0.25	0.5	1	1.8	3
0.1	250	100	50	25	14	8
0.25	625	250	125	63	35	21
0.32	800	320	160	80	44	27
0.53	1325	530	265	133	74	44

Phase ratio ( $\beta$ ) of common column dimensions

### D. Column Length

A longer column length will provide greater efficiency and resolution, but this is not a linear relationship. Resolution is proportional to the square root of column length, so doubling the column length will increase resolution by approximately 40%. However, increasing the column length will also increase the retention time. Double column length, twice the analysis time. Generally, it is recommended to use the shortest column which will perform the desired separation.

### Additional Considerations

Several generalizations regarding GC columns exist that you might rely on when in doubt. First, 95% of all GC columns used are either TG-1MS, TG-5MS or TG-WaxMS type columns. A good starting column is a 30m x 0.25mm ID, 5% Phenyl column with a 0.25 $\mu\text{m}$  film thickness, such as the TG-5MS. (26098-1420; Page 3-025).

This is a non-polar column, which separates predominately on boiling point, but has some polar characteristics.

*For further assistance in choosing the right column for your separation, please contact our technical support help desk.*



## GC Column Phase Information

Range	Column	Phase	Polarity	Maximum Operating Temperature
TraceGOLD	TG-1MS	100% Dimethyl Polysiloxane	Non-Polar	330°C / 350°C
	TG-XLBMS	Proprietary	Non-Polar	360°C
	TG-5MS	5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
	TG-SQC	Proprietary	Non-Polar	330°C / 350°C
	TG-5MS AMINE	Base Optimised 5% Phenyl Methylpolysiloxane	Non-Polar	300°C / 315°C
	TG-5SILMS	Similar to 5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C
	TG-5HT	5% Phenyl Methylpolysiloxane	Non-Polar	380°C / 400°C
	TG-35MS	35% Phenyl Methylpolysiloxane	Mid-Polarity	300°C / 320°C
	TG-35MS AMINE	Base Optimised 35% Phenyl Methylpolysiloxane	Mid-Polarity	220°C
	TG-1301MS	6% Cyanopropylphenyl Methylpolysiloxane	Mid-Polarity	260°C / 280°C
	TG-624	6% Cyanopropylphenyl Methylpolysiloxane	Mid-Polarity	240°C
	TG-VRX	Proprietary		260°C
	TG-VMS	Proprietary		260°C
	TG-1701MS	14% Cyanopropylphenyl Methylpolysiloxane	Mid-Polarity	260°C / 280°C
	TG-17MS	50% Phenyl Polysiloxane	Mid-Polarity	300°C / 320°C
	TG-225MS	50% Cyanopropylmethyl Phenylmethylpolysiloxane	Mid-Polarity	220°C / 240°C
	TG-200MS	Trifluoropropyl Methylpolysiloxane	Mid-Polarity	320°C / 340°C
	TG-WaxMS	Polyethylene Glycol (PEG)	Polar	240°C / 260°C
	TG-WaxMS A	Acid Optimised Polyethylene Glycol (PEG)	Polar	240°C / 250°C
	TG-WaxMS B	Base Optimised Polyethylene Glycol (PEG)	Polar	200°C / 220°C
	TG-OCP I	Proprietary		340°C
	TG-OCP II	Proprietary		340°C
	TG-OPP I	Proprietary		330°C
	TG-OPP II	Proprietary		330°C
	TG-ALC I	Proprietary		260°C
	TG-ALC II	Proprietary		260°C
	TG-POLAR	90% Cyanopropyl Phenylcyanopropyl Polysiloxane	Polar	275°C
	TG-1MT	100% Dimethyl Polysiloxane	Non-Polar	430°C
	TG-5MT	5% Diphenyl Polysiloxane	Non-Polar	430°C
	TG-WaxMT	Polyethylene Glycol (PEG)	Polar	240°C / 260°C





GC Column Phase Information *continued*

Range	Column	Phase	Polarity	Maximum Operating Temperature	
TRACE	TR-1MS	100% Dimethyl Polysiloxane	Non-Polar	370°C / 380°C	
	TR-5	5% Phenyl Methylpolysiloxane	Non-Polar	340°C / 350°C for films ≤ 1.5µm 280°C / 300°C for films > 1.5µm	
	TR-5MS	5% Phenyl Polysilphenylene-siloxane	Non-Polar	360°C / 370°C for films ≤ 1.5µm 350°C / 360°C for films > 1.5µm	
	TR-5HT	5% Phenyl Polycarborane Siloxane	Non-Polar	380°C / 400°C	
	TR-35MS	35% Phenyl Polysilphenylene-siloxane	Mid-Polarity	360°C / 370°C	
	TR-1701	14% Cyanopropylphenyl Polysiloxane	Mid-Polarity	280°C / 300°C	
	TR-50MS	50% Phenyl Polysilphenylene-siloxane	Mid-Polarity	360°C / 370°C	
	TR-225	50% Cyanopropylphenyl Polysiloxane	Mid-Polarity	230°C / 250°C	
	TR-Wax	Polyethylene Glycol (PEG)	Polar	260°C / 280°C for films ≤ 1.0µm 240°C / 260°C for films > 1.0µm	
	TR-WaxMS	Polyethylene Glycol (PEG)	Polar	280°C / 300°C	
	TR-FFAP	TPA Modified Polyethylene Glycol (PEG)	Polar	240°C / 250°C	
	TR-SimDist	100% Dimethyl Polysiloxane	Non-Polar	400°C for films ≤ 1.0µm 370°C for 2.65µm films	
	TR-V1	6% Cyanopropylphenyl Polysiloxane	Mid-Polarity	280°C / 300°C	
	TR-FAME	70% Cyanopropyl Polysilphenylene-siloxane	Polar	250°C / 260°C	
	TR-524	Cyanopropylphenyl Dimethyl Polysiloxane	Mid-Polarity	240°C / 260°C	
	TR-525	Proprietary	Mid-Polarity	340°C / 360°C	
	TR-527	5% Phenyl Polysilphenylene-siloxane	Non-Polar	330°C / 350°C	
	TR-8095	8% Phenyl Polycarborane-siloxane	Mid-Polarity	360°C / 370°C	
	TR-8270	5% Phenyl Polysilphenylene-siloxane	Non-Polar	330°C / 350°C	
	TR-PCB 8MS	8% Phenyl Polysilphenylene-siloxane	Mid-Polarity	330°C / 350°C	
	TR-Dioxin 5MS	5% Phenyl Polysilphenylene-siloxane	Non-Polar	330°C / 350°C	
	TR-Biodiesel (M)	100% Dimethyl Polysiloxane	Non-Polar	300°C / 320°C	
	TR-Biodiesel (F)	Polyethylene Glycol (PEG)	Polar	280°C / 300°C	
	TR-Biodiesel (G)	5% Phenyl Polysilphenylene-siloxane	Non-Polar	380°C / 400°C	
	TR-DoA5	5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C	
	TR-DoA35	35% Phenyl Polysilphenylene-siloxane	Mid-Polarity	330°C / 350°C	
	TR-Pesticide	5% Phenyl Methylpolysiloxane	Non-Polar	330°C / 350°C	
	TR-Pesticide II	Proprietary	Non-Polar	330°C / 350°C	
	TR-Pesticide III	35% Phenyl Methylpolysiloxane	Mid-Polarity	300°C / 320°C	
	TR-Pesticide IV	35% Phenyl Methylpolysiloxane	Mid-Polarity	300°C / 320°C	
	TracePLOT	TR-Bond Alumina (Na <sub>2</sub> SO <sub>4</sub> )	Na <sub>2</sub> SO <sub>4</sub> Deactivated Aluminium Oxide	Non-Polar	200°C
		TR-Bond Alumina (KCl)	KCl Deactivated Aluminium Oxide	Non-Polar	200°C
		TR-Bond Msieve 5A	Molecular Sieve (5A)	Non-Polar	300°C
TR-Bond Q		100% Divinylbenzene	Non-Polar	280°C / 300°C	
TR-Bond Q+		Porous Divinylbenzene Polymer	Mid-Polarity	250°C	
TR-Bond S		Divinylbenzene 4-Vinylpyridine	Mid-Polarity	250°C	
TR-Bond U		Divinylbenzene Ethylene Glycol / Dimethylacrylate	Polar	190°C	

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## GC Column Selection by Manufacturer

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	007-1(MS)	Quadrex	TG-1MS	<b>3-023</b>
	007-17(MPS-50)	Quadrex	TG-17MS	<b>3-037</b>
	007-1701	Quadrex	TG-1701MS	<b>3-036</b>
	007-2(MP-5)	Quadrex	TG-5MS	<b>3-025</b>
	007-2(MPS-5)	Quadrex	TG-5SiIMS	<b>3-028</b>
	007-23	Quadrex	TR-FAME	<b>3-066</b>
	007-5MS	Quadrex	TG-5MS	<b>3-025</b>
	007-624	Quadrex	TG-624	<b>3-033</b>
	007-CW	Quadrex	TG-WaxMS	<b>3-040</b>
	AT-5	Alltech	TR-5	<b>3-054</b>
	AT50	Alltech	TG-17MS	<b>3-037</b>
	AT-5MS	Alltech	TG-5MS	<b>3-025</b>
	AT-624	Alltech	TG-624	<b>3-033</b>
	AT-Silar	Alltech	TR-FAME	<b>3-066</b>
	AT-Wax	Alltech	TR-WaxMS	<b>3-062</b>
	BP10	SGE	TG-1701MS	<b>3-036</b>
	BP20	SGE	TG-WaxMS	<b>3-040</b>
	BP21	SGE	TG-WaxMS A	<b>3-041</b>
			TR-FFAP	<b>3-063</b>
	BP225	SGE	TG-225MS	<b>3-038</b>
	BP5	SGE	TG-5MS	<b>3-025</b>
	BP624	SGE	TG-624	<b>3-033</b>
	BPX1	SGE	TG-1MS	<b>3-023</b>
			TR-SimDist	<b>3-064</b>
	BPX1	SGE	TR-SimDist	<b>3-064</b>
	BPX1	SGE	TR-SimDist	<b>3-064</b>
	BPX5	SGE	TG-5MS	<b>3-025</b>
	BPX50	SGE	TG-17MS	<b>3-037</b>
	BPX608	SGE	TG-35MS	<b>3-030</b>
	BPX70	SGE	TR-FAME	<b>3-066</b>
	BPX90	SGE	TG-POLAR	<b>3-048</b>
	BPX-Volatiles	SGE	TG-624	<b>3-033</b>
	CARBOWAX	Agilent	TR-WaxMS	<b>3-062</b>
CP-1301	Varian	TG-1301MS	<b>3-032</b>	
CP-FFAP CB	Varian	TG-WaxMS A	<b>3-041</b>	
		TR-FFAP	<b>3-063</b>	
CP-Select624CB	Varian	TG-624	<b>3-033</b>	
CP-Sil 19CB	Varian	TG-1701MS	<b>3-036</b>	
CP-Sil 5CB MS	Varian	TG-1MT	<b>3-050</b>	
CP-Sil 88	Varian	TG-5SiIMS	<b>3-028</b>	
		TG-5MT	<b>3-051</b>	
CP-Sil 8CB	Varian	TG-5SiIMS	<b>3-028</b>	
CP-SimDist	Varian	TR-SimDist	<b>3-064</b>	
CP-Wax 51 (Amines)	Varian	TG-WaxMS B	<b>3-042</b>	
CP-Wax 52CB	Varian	TG-WaxMS	<b>3-040</b>	
		TG-WaxMT	<b>3-052</b>	
CP-Wax 58 CB (FFAP)	Varian	TG-WaxMS A	<b>3-041</b>	
		TR-FFAP	<b>3-063</b>	

GC Column Selection by Manufacturer *continued*

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	DB-1	Agilent	TG-1MT	<b>3-050</b>
	DB-1301	Agilent	TG-1301MS	<b>3-032</b>
	DB-17	Agilent	TG-17MS	<b>3-037</b>
	DB-1701	Agilent	TG-1701MS	<b>3-036</b>
	DB-17ht	Agilent	TG-17MS	<b>3-037</b>
	DB-17ms	Agilent	TG-17MS	<b>3-037</b>
	DB-1ms	Agilent	TG-1MS TG-1MT	<b>3-023</b> <b>3-050</b>
	DB-200	Agilent	TG-200MS	<b>3-039</b>
	DB-225	Agilent	TG-225MS	<b>3-038</b>
	DB-225ms	Agilent	TG-225MS	<b>3-038</b>
	DB-23	Agilent	TR-FAME	<b>3-066</b>
	DB-2887	Agilent	TR-SimDist	<b>3-064</b>
	DB-35	Agilent	TG-35MS	<b>3-030</b>
	DB-35ms	Agilent	TG-35MS	<b>3-030</b>
	DB-5	Agilent	TR-5 TG-5MT	<b>3-054</b> <b>3-051</b>
	DB-5.625	Agilent	TG-5MS	<b>3-025</b>
	DB-5ht	Agilent	TG-5HT	<b>3-029</b>
	DB-5ms	Agilent	TG-5MS	<b>3-025</b>
	DB-624	Agilent	TG-624	<b>3-033</b>
	DB-ALC1	Agilent	TG-ALC I	<b>3-047</b>
	DB-ALC2	Agilent	TG-ALC II	<b>3-047</b>
	DB-FFAP	Agilent	TG-WaxMS A TR-FFAP	<b>3-041</b> <b>3-063</b>
	DB-HT Sim Dis	Agilent	TR-SimDist	<b>3-064</b>
	DB-PETRO	Agilent	TG-1MS	<b>3-023</b>
	DB-WAX	Agilent	TG-WaxMS TG-WaxMT	<b>3-040</b> <b>3-052</b>
	DB-WAXetr	Agilent	TR-WaxMS TG-WaxMT	<b>3-062</b> <b>3-052</b>
	DB-XLB	Agilent	TG-XLBMS	<b>3-024</b>
	Elite-1301	PerkinElmer	TG-1301MS	<b>3-032</b>
	Elite-17	PerkinElmer	TG-17MS	<b>3-037</b>
	Elite-1701	PerkinElmer	TG-1701MS	<b>3-036</b>
	Elite-17ms	PerkinElmer	TG-17MS	<b>3-037</b>
	Elite-200	PerkinElmer	TG-200MS	<b>3-039</b>
	Elite-23	PerkinElmer	TR-FAME	<b>3-066</b>
	Elite-35ms	PerkinElmer	TG-35MS	<b>3-030</b>
	Elite-5	PerkinElmer	TR-5	<b>3-054</b>
	Elite-5ms	Perkin Elmer	TG-5MS	<b>3-025</b>
	Elite-5ht	PerkinElmer	TG-5HT	<b>3-029</b>
	Elite-624	PerkinElmer	TG-624	<b>3-033</b>
	Elite-FFAP	PerkinElmer	TG-WaxMS A TR-FFAP	<b>3-041</b> <b>3-063</b>
	Elite-WAX	PerkinElmer	TG-WaxMS	<b>3-040</b>
	Elite-WAX ETR	PerkinElmer	TG-WaxMS	<b>3-040</b>

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	HP-1	Agilent	TG-1MT	<b>3-050</b>
	HP-17	Agilent	TG-17MS	<b>3-037</b>
	HP-1701	Agilent	TG-1701MS	<b>3-036</b>
	HP-1MS	Agilent	TG-1MS TG-1MT	<b>3-023</b> <b>3-050</b>
	HP20M	Agilent	TG-WaxMS	<b>3-040</b>
	HP-23	Agilent	TR-FAME	<b>3-066</b>
	HP-35	Agilent	TG-35MS	<b>3-030</b>
	HP-35MS	Agilent	TG-35MS	<b>3-030</b>
	HP-5	Agilent	TR-5	<b>3-054</b>
	HP-50+	Agilent	TG-17MS	<b>3-037</b>
	HP-5MS	Agilent	TG-5MS TG-5MT	<b>3-025</b> <b>3-051</b>
	HP5-TA	Agilent	TG-5MS	<b>3-025</b>
	HP-88	Agilent	TR-FAME	<b>3-066</b>
	HP-FFAP	Agilent	TG-WaxMS A TR-FFAP	<b>3-041</b> <b>3-063</b>
	HP-INNOWax	Agilent	TG-WaxMS TG-WaxMT	<b>3-040</b> <b>3-052</b>
	HP-VOC	Agilent	TG-624	<b>3-033</b>
	HP-Wax	Agilent	TG-WaxMS TG-WaxMT	<b>3-040</b> <b>3-052</b>
	HT5	SGE	TG-5HT	<b>3-029</b>
	HT8	SGE	TR-PCB 8MS	<b>3-068</b>
	MDN-1	Sigma Aldrich	TG-1MT	<b>3-050</b>
	MDN-35	Sigma Aldrich	TG-35MS	<b>3-030</b>
	MDN-5	Sigma Aldrich	TR-5 TG-5MT	<b>3-054</b> <b>3-051</b>
	MDN-5S	Sigma Aldrich	TG-5SiIMS	<b>3-028</b>
	Nukol	Sigma Aldrich	TG-WaxMS	<b>3-040</b>
	OV-17	Ohio Valley	TG-17MS	<b>3-037</b>
	OV-1701	Ohio Valley	TG-1701MS	<b>3-036</b>
	OV-5	Ohio Valley	TR-5	<b>3-054</b>
	OV-624	Ohio Valley	TG-624	<b>3-033</b>
	Petrocol 2887	Sigma Aldrich	TR-SimDist	<b>3-064</b>
	Petrocol DH	Sigma Aldrich	TG-1MS	<b>3-023</b>
	Petrocol EX2887	Sigma Aldrich	TR-SimDist	<b>3-064</b>
	MXT-1	Restek	TG-1MT	<b>3-050</b>
	MXT-5	Restek	TG-5MT	<b>3-051</b>
	MXT-WAX	Restek	TG-WaxMT	<b>3-052</b>
	Rtx-1301	Restek	TG-1301MS	<b>3-032</b>
	Rtx-1701	Restek	TG-1701MS	<b>3-036</b>
	Rtx-1MS	Restek	TG-1MS	<b>3-023</b>
	Rtx-200	Restek	TG-200MS	<b>3-039</b>
	Rtx-200MS	Restek	TG-200MS	<b>3-039</b>
	Rtx-225	Restek	TG-225MS	<b>3-038</b>
	Rtx-2330	Restek	TG-POLAR	<b>3-048</b>
	Rtx-2560	Restek	TR-FAME	<b>3-066</b>
	Rtx-2887	Restek	TR-SimDist	<b>3-064</b>
	Rtx-35	Restek	TG-35MS	<b>3-030</b>
	Rtx-35 Amine	Restek	TG-35MS AMINE	<b>3-031</b>

GC Column Selection by Manufacturer *continued*

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	Rtx-35MS	Restek	TG-35MS	<b>3-030</b>
	Rtx-5	Restek	TR-5	<b>3-054</b>
	Rtx-5 Amine	Restek	TG-5MS AMINE	<b>3-027</b>
	Rtx-50	Restek	TG-17MS	<b>3-037</b>
	Rtx-5SiIMS	Restek	TG-5SiIMS	<b>3-028</b>
	Rtx-624	Restek	TG-624	<b>3-033</b>
	Rtx-CLPesticides	Restek	TG-OCP I	<b>3-045</b>
	Rtx-CLPesticides2	Restek	TG-OCP II	<b>3-045</b>
	Rtx-OPPesticides	Restek	TG-OPP I	<b>3-045</b>
	Rtx-OPPesticides2	Restek	TG-OPP II	<b>3-045</b>
	Rtx-VMS	Restek	TG-VMS	<b>3-035</b>
	Rtx-Volatiles	Restek	TG-624	<b>3-033</b>
	Rtx-VRX	Restek	TG-VRX	<b>3-034</b>
	Rtx-Wax	Restek	TG-WaxMS	<b>3-040</b>
	Rxi-17	Restek	TG-17MS	<b>3-037</b>
	Rxi-1ms	Restek	TG-1MS	<b>3-023</b>
	Rxi-5HT	Restek	TG-5HT	<b>3-029</b>
	Rxi-5MS	Restek	TG-5MS	<b>3-025</b>
	Rxi-5SiI MS	Restek	TG-5SiIMS	<b>3-028</b>
	Rxi-XLB	Restek	TG-XLBMS	<b>3-024</b>
	SE-30	Agilent	TG-1MS	<b>3-023</b>
	SE-52	Agilent	TG-5MS	<b>3-025</b>
	SE-54	Agilent	TG-5MS	<b>3-025</b>
	SolGel-Wax	SGE	TG-WaxMS	<b>3-040</b>
	SP-2100	Supelco	TG-1MS	<b>3-023</b>
	SP-2250	Supelco	TG-17MS	<b>3-037</b>
	SP-2330	Supelco	TR-FAME	<b>3-066</b>
	SP-2380	Supelco	TR-FAME	<b>3-066</b>
	SPB-1	Supelco	TG-1MT	<b>3-050</b>
	SPB-17	Supelco	TG-17MS	<b>3-037</b>
	SPB-35	Supelco	TG-35MS	<b>3-030</b>
	SPB-5	Supelco	TR-5 / TG-5MT	<b>3-054 / 3-051</b>
	SPB-50	Supelco	TG-17MS	<b>3-037</b>
SPELCO WAX-10	Supelco	TG-WaxMS	<b>3-040</b>	
		TG-WaxMT	<b>3-052</b>	
Stabilwax	Restek	TG-WaxMS	<b>3-040</b>	
Stabilwax-DA	Restek	TG-WaxMS A	<b>3-041</b>	
		TR-FFAP	<b>3-063</b>	
Stabilwax-DB	Restek	TG-WaxMS B	<b>3-042</b>	
SPELCO WAX-10	Supelco	TG-WaxMS	<b>3-040</b>	
VF-17ms	Varian	TG-17MS	<b>3-037</b>	
VF-1ms	Varian	TG-1MS	<b>3-023</b>	
		TG-1MT	<b>3-058</b>	
VF-200ms	Varian	TG-200MS	<b>3-039</b>	
VF-23ms	Varian	TR-FAME	<b>3-066</b>	
VF-35ms	Varian	TG-35MS	<b>3-030</b>	
VF-5ht	Varian	TG-5HT	<b>3-029</b>	
VF-5ms	Varian	TG-5MS	<b>3-025</b>	
VF-Xms	Varian	TG-XLBMS	<b>3-024</b>	

Column	Phase	Manufacturer	Recommended Thermo Scientific Alternative	Page
Capillary	ZB-1701	Phenomenex	TG-1701MS	<b>3-036</b>
	ZB-1701P	Phenomenex	TG-WaxMS	<b>3-040</b>
	ZB-1HT Inferno	Phenomenex	TR-SimDist	<b>3-064</b>
	ZB-1MS	Phenomenex	TG-1MS	<b>3-023</b>
	ZB-35	Phenomenex	TG-35MS	<b>3-030</b>
	ZB-5	Phenomenex	TR-5	<b>3-054</b>
	ZB-50	Phenomenex	TG-17MS	<b>3-037</b>
	ZB-5HT Inferno	Phenomenex	TG-5HT	<b>3-029</b>
	ZB-5MS	Phenomenex	TG-5MS	<b>3-025</b>
	ZB-5MS Si	Phenomenex	TG-5SiMS	<b>3-028</b>
	ZB-624	Phenomenex	TG-624	<b>3-033</b>
	ZB-FFAP	Phenomenex	TG-WaxMS A TR-FFAP	<b>3-041</b> <b>3-063</b>
	ZB-WAX	Phenomenex	TG-WaxMS	<b>3-040</b>
	ZB-WAXplus	Phenomenex	TR-WaxMS	<b>3-062</b>
	PLOT	Alumina-PLOT	Supelco	TG-BOND Alumina (Na <sub>2</sub> SO <sub>4</sub> )
AT-Alumina		Alltech	TG-BOND Alumina (Na <sub>2</sub> SO <sub>4</sub> )	<b>3-075</b>
AT-Molsieve		Alltech	TG-BOND Msieve 5A	<b>3-076</b>
AT-Q		Alltech	TG-BOND Q	<b>3-077</b>
CP-AI203/KCl		Varian	TG-BOND Alumina (KCl)	<b>3-075</b>
CP-AI203/Na <sub>2</sub> SO <sub>4</sub>		Varian	TG-BOND Alumina (Na <sub>2</sub> SO <sub>4</sub> )	<b>3-075</b>
CP-Molsieve 5A		Varian	TG-BOND Msieve 5A	<b>3-076</b>
CP-PoraPLOT Q		Varian	TG-BOND Q	<b>3-077</b>
CP-PoraPLOT S		Varian	TG-BOND S	<b>3-078</b>
CP-PoraPLOT U		Varian	TR-BOND U	<b>3-078</b>
GS-Alumina		Agilent	TG-BOND Alumina (Na <sub>2</sub> SO <sub>4</sub> )	<b>3-075</b>
GS-Alumina KCl		Agilent	TG-BOND Alumina (KCl)	<b>3-075</b>
GS-Molsieve		Agilent	TG-BOND Msieve 5A	<b>3-076</b>
GS-Q		Agilent	TG-BOND Q+	<b>3-077</b>
HP PLOT M		Agilent	TG-BOND Alumina (Na <sub>2</sub> SO <sub>4</sub> )	<b>3-075</b>
HP PLOT Molsieve		Agilent	TG-BOND Msieve 5A	<b>3-076</b>
HP PLOT S		Agilent	TG-BOND Alumina (Na <sub>2</sub> SO <sub>4</sub> )	<b>3-075</b>
HP-UPLLOT		Agilent	TG-BOND U	<b>3-078</b>
Molsieve 5A PLOT		Supelco	TG-BOND Msieve 5A	<b>3-076</b>
PLT-5A		Quadrex	TG-BOND Msieve 5A	<b>3-076</b>
PoraBond Q		Varian	TG-BOND Q	<b>3-077</b>
PoraBond U		Varian	TG-BOND U	<b>3-078</b>
Rt-Alumina Bond (KCl)		Restek	TG-BOND Alumina (KCl)	<b>3-075</b>
Rt-Alumina Bond (Na <sub>2</sub> SO <sub>4</sub> )		Restek	TG-BOND Alumina (Na <sub>2</sub> SO <sub>4</sub> )	<b>3-075</b>
Rt-Msieve 5A		Restek	TG-BOND Msieve 5A	<b>3-076</b>
Rt-Q-BOND		Restek	TG-BOND Q	<b>3-077</b>
Rt-QS-BOND		Restek	TG-BOND Q+	<b>3-077</b>
Rt-S-BOND		Restek	TG-BOND S	<b>3-078</b>
Rt-U-BOND		Restek	TG-BOND U	<b>3-078</b>
Supel-Q-PLOT		Supelco	TG-BOND Q	<b>3-077</b>



# GC Column Selection by Application

- Recommended
- Alternative

	TG-1MS, TG-1MT, TR-1MS	TG-5MS, TG-5S1MS, TG-5MS AMINE, TR-5MT, TR-5, TR-5MS	TG-35MS, TR-35MS AMINE, TR-35MS	TG-17MS	TG-130IMS	TG-170IMS, TR-170I	TG-WaxMS, TG-WaxMT, TR-Wax, TR-WaxMS	TG-WaxMS A	TG-WaxMS B	TG-POLAR	TG-624	TG-200MS	TG-225MS	TG-5HT, TR-5HT	TG-XLBMS	TG-VRX, TG-VMS	TG-OCF I, TG-OCF II	TG-OPP I, TG-OPP II	TG-ALC I, TG-ALC II	TR-FFAP	TR-V1	TR-FAME	TR-Simdist	TR-524	TR-525	TR-527	TR-8270	TR-DoA5	TR-DoA35	TR-Biodiesel (M)	TR-Biodiesel (F)	TR-Biodiesel (G)	TR-Dioxin 5MS	TR-Pesticide	TR-Pesticide II	TR-Pesticide III	TR-Pesticide IV	TR-PCB 8MS	TR-8095			
Acids																																										
Acid/Neutral Drugs																																										
Alcohols																																										
Alcohols in Beverages																																										
Aldehydes																																										
Alditol Acetates (sugars)																																										
Amines – Aliphatic																																										
Amines – Aromatic																																										
Antidepressants																																										
Benzenes, substituted																																										
Biodiesel – Methanol																																										
Biodiesel – FAMES																																										
Biodiesel – Glycerine																																										
Blood Alcohols																																										
Brominated Flame Retardants																																										
Butter Fat																																										
Carboxylic Acids																																										
Cigarette Lighter Fuel																																										
Chlorinated Aromatics																																										
Dioxins																																										
Drugs of Abuse																																										
Drugs of Abuse – THC																																										
Essential Oils																																										
Explosives																																										
FAMES																																										
Glucose – Methylated																																										
Herbicides																																										
Hydrocarbons																																										
Ketones																																										
Monomers																																										
Nitroaromatics																																										
Organic Acids																																										
Organochlorine Pesticides																																										
Organophosphorous Pesticides																																										
PAHs																																										
Paraffins																																										
PCBs																																										
Pesticides																																										
Petroleum																																										
Phenols																																										
Phthalates																																										
Plant Sterols																																										
Polyethylene																																										
Polymers																																										
Polywax																																										
Pyrethroids																																										
Sedatives																																										
Semivolatiles																																										
Silicon Oil																																										
Solvents																																										
Terpenes																																										
Triglycerides																																										
TRPH																																										
Volatiles																																										
Xylenes																																										

## GC Column Selection by U.S. Pharmacopeia Specifications

The USP specifications are listed below with the appropriate Thermo Scientific GC column offerings included for your convenience. In some cases, there is more than one phase that matches the phase description. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

USP Code	Description	Recommended Thermo Scientific Phase	Page
<b>G1</b>	Dimethylpolysiloxane oil	TG-1MS	<b>3-023</b>
		TG-1MT	<b>3-050</b>
		TR-1MS	<b>3-053</b>
		TR-1MS	<b>3-053</b>
<b>G2</b>	Dimethylpolysiloxane gum	TG-1MS	<b>3-023</b>
		TG-1MT	<b>3-050</b>
		TR-1MS	<b>3-053</b>
		TR-1MS	<b>3-053</b>
<b>G3</b>	50% Phenyl-50% Methylpolysiloxane	TG-17MS	<b>3-037</b>
		TR-50MS	<b>3-059</b>
<b>G5</b>	3-Cyanopropylpolysiloxane	TR-FAME	<b>3-066</b>
<b>G6</b>	Trifluoropropyl Methylpolysiloxane	TG-200MS	<b>3-039</b>
<b>G7</b>	50% Cyanopropyl Phenylmethyl Polysiloxane	TG-225MS	<b>3-038</b>
<b>G16</b>	Polyethylene Glycol Compound (ave. mol. wt. ~15,000) with Diepoxide Linker	TG-WaxMS	<b>3-040</b>
		TG-WaxMT	<b>3-052</b>
		TR-WaxMS	<b>3-062</b>
		TR-Wax	<b>3-061</b>
<b>G19</b>	50% Cyanopropyl 50% Phenylmethyl Polysiloxane	TG-225MS	<b>3-038</b>
<b>G20</b>	Polyethylene Glycol (ave. mol. wt. of 380 – 420)	TG-WaxMS	<b>3-040</b>
		TG-WaxMT	<b>3-052</b>
		TR-WaxMS	<b>3-062</b>
		TR-Wax	<b>3-061</b>
<b>G27</b>	5% Phenyl-95% Methylpolysiloxane	TG-5MS	<b>3-025</b>
		TG-5MT	<b>3-051</b>
		TR-5MS	<b>3-055</b>
		TR-5MS	<b>3-055</b>
<b>G36</b>	1% Vinyl-5% Phenylmethylpolysiloxane	TR-5MS	<b>3-055</b>
		TR-5MS	<b>3-055</b>
<b>G38</b>	Phase G1 containing a small percentage of tailing inhibitor	TG-5MS	<b>3-025</b>
		TG-5MT	<b>3-051</b>
		TR-5MS	<b>3-055</b>
		TR-5MS	<b>3-055</b>
<b>G42</b>	35% Phenyl-65% Dimethylpolysiloxane (percentages refer to molar substitution)	TG-35MS	<b>3-030</b>
		TR-35MS	<b>3-057</b>
<b>G43</b>	6% Cyanopropylphenyl-94% Dimethylpolysiloxane (percentages refer to molar substitution)	TG-624	<b>3-053</b>
		TR-V1	<b>3-065</b>
<b>G46</b>	14% Cyanopropylphenol-86% Methylpolysiloxane	TG-1701MS	<b>3-036</b>
		TR-1701	<b>3-058</b>
<b>G48</b>	90% Biscyanopropyl 10% Cyanopropyl Phenyl Polysiloxane	TG-POLAR	<b>3-048</b>

## GC Column Selection by ASTM Method

Selected ASTM methods are listed below with the appropriate Thermo Scientific GC column offerings. In some cases, there is more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
D1983	Fatty acid methyl ester composition	TG-WaxMS	26088-1420	3-040
D2245	Oils and oil acids in solvent-reducible paints	TR-FAME	260M154P	3-066
D2268	High-purity n-heptane and isooctane	TG-1MS	Inquire	3-023
D2306	C8 aromatic hydrocarbons	TG-WaxMS	26088-1540	3-040
D2360	Trace impurities in monocyclic aromatic hydrocarbons	TG-WaxMS	26088-1550	3-040
D2456	Polyhydric alcohols in alkyd resin	TG-WaxMS	26088-2980	3-040
D2580	Phenols in water	TG-5MS	26098-2230	3-025
D2753	Oil and oil acids	TR-FAME	260M154P	3-066
D2800	FAME analysis	TR-FAME	260M154P	3-066
D2804	Purity of methyl ethyl ketone	TG-WaxMS	26088-2980	3-040
D2887	Boiling range distribution of petroleum fractions	TR-SimDist	260S348P	3-064
D2998	Polyhydric alcohols in alkyd resin	TG-1MS	26099-2970	3-023
D2999	Monopentaerythritol in commercial pentaerythritol	TG-1MS	Inquire	3-023
D3009	Composition of turpentine	TG-WaxMS	26088-2240	3-040
D3054	Cyclohexane	TG-1MS	Inquire	3-023
D3168	Polymers in emulsion paints	TG-1MS	26099-2970	3-023
D3257	Aromatics in mineral spirits	TG-624	26085-3960	3-033
D3271	Solvent analysis in paints	TG-WaxMS	26088-2980	3-040
D3304	PCBs in environmental materials	TG-5MS TR-PCB 8MS	26098-1540 26AJ148P	3-025 3-068
D3329	Purity of methyl isobutyl ketone	TG-WaxMS TG-624	26088-2980 26085-3960	3-040 3-033
D3432	Unreacted toluene diisocyanates in urethane prepolymers and coating solutions	TG-1MS	26099-3090	3-023
D3447	Purity of halogenated organic solvents	TG-624	26085-3960	3-033
D3452	Identification of rubber	TG-1MS	26099-3090	3-023
D3457	FAME analysis	TR-FAME	260M154P	3-066
D3534	PCBs in water	TG-5MS TR-PCB 8MS	26098-3360 26AJ148P	3-025 3-068
D3545	Alcohol content and purity of acetate esters	TG-624	26085-3960	3-033
D3687	Alcohol content and purity of acetate esters	TG-WaxMS	26088-2980	3-040
D3695	Volatile alcohols in water by direct aqueous-injection GC	TG-WaxMS	26088-2980	3-040
D3710	Boiling range distribution of gasoline and gasoline fractions	TR-SimDist	260S348P	3-064
D3725	Fatty acids in drying oils	TR-FAME	Inquire	3-066
D3760	Isopropylbenzene (cumene)	TG-WaxMS TG-1MS	26088-1550 Inquire	3-040 3-023
D3797	o-Xylene	TG-WaxMS	26088-2360	3-040
D3798	p-Xylene	TG-WaxMS	26088-2360	3-040
D3871	Purgeable organic compounds in water using headspace sampling	TG-624	26085-4080	3-033
D3893	Purity of methyl amyl ketone and methyl isoamyl ketone	TG-624	26085-3960	3-033
D3973	Low molecular weight halogenated hydrocarbons in water	TG-624	26085-3960	3-033
D4059	PCBs in insulating liquids	TG-5MS TR-PCB 8MS	26098-1540 26AJ148P	3-025 3-068
D4415	Dimer in acrylic acid	TG-WaxMS	26088-1430	3-040

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
D4443	Residual vinyl chloride monomer content in ppb range in homo- and co-polymers by headspace GC	TG-624	26085-3960	3-033
D4735	Trace thiophene in refined benzene	TG-WaxMS	26088-2250	3-040
D4773	Propylene glycol monomethyl ether, dipropylene glycol monomethyl ether, and propylene glycol monomethyl ether acetate	TR-5	260E470P	3-054
D4806	Denatured fuel ethanol for blending with gasoline for use as automotive spark-ignition engine fuel	TG-1MS	Inquire	3-023
D4864	Traces of methanol in propylene concentrates	TG-5MS	Inquire	3-025
D4947	Chlordane and heptachlor in indoor air	TG-5MS	26098-3360	3-025
D5060	Impurities in high-purity ethylbenzene	TG-WaxMS	26088-2360	3-040
D5075	Nicotine in indoor air	TG-5MS	26098-2970	3-025
D5134	Petroleum naphthas through n-nonane	TG-1MS	Inquire	3-023
D5135	Styrene	TG-WaxMS	26088-2360	3-040
D5399	Boiling point distribution of hydrocarbon solvents	TR-SimDist	260S348P	3-064
D5441	Methyl t-butyl ether	TG-1MS	Inquire	3-023
D5442	Petroleum waxes	TG-1MS TG-5MS	26099-1430 26098-1300	3-023 3-025
D5480	Motor oil volatility	TG-5MS	Inquire	3-025
D5501	Ethanol content of denatured fuel ethanol	TG-1MS	Inquire	3-023
D5599	Oxygenates in gasoline by oxygen selective FID	TG-1MS	26099-3080	3-023
D5623	Sulfur compounds in light petroleum liquids using sulfur selective detection	TG-1MS	Inquire	3-023
D5713	High purity benzene for cyclohexane feedstock	TG-1MS	Inquire	3-023
D5739	Oil spill source identification using positive ion electron impact low resolution MS	TG-5MS	26098-1420	3-025
D5769	Benzene, toluene and total aromatics in finished gasolines	TG-1MS TG-624	26099-3080 26085-3330	3-023 3-033
D5790	Purgeable organic compounds in water	TG-5MS	26098-1420	3-025
D5812	Organochlorine pesticides in water	TG-1701MS TG-17MS TG-WaxMS	26090-1420 26089-1420 26088-1550	3-036 3-037 3-040
D5917	Trace impurities in monocyclic aromatic hydrocarbons	TR-FAME	260M154P	3-066
D5974	Fatty androsin acids in tall oil fraction products	TG-1MS	Inquire	3-023
D5986	Oxygenates, benzene, toluene, C8-C12 aromatics and total aromatics in finished gasoline by GC/FTIR	TG-5MS	26098-1420	3-025
D6160	PCBs in waste materials	TR-SimDist	260S250P	3-064
D6352	Boiling range distribution of petroleum fractions	TG-1MS TR-SimDist	Inquire 260S250P	3-023 3-064
D6417	Engine oil volatility	TG-1MS	Inquire	3-023
D6584	Free and Total Glycerin in B-100 Biodiesel	TR-BioDiesel (G)	26AF024P	3-069
D6729	Individual components in spark ignition engine fuels	TG-1MS	Inquire	3-023
D6730	Individual components in spark ignition engine fuels using precolumn	TG-5MS TG-624	26098-2960 26085-4080	3-025 3-033
E202	Ethylene glycols and propylene glycols	TR-5	260E470P	3-054
E475	Di-tert-butyl peroxide	TG-1MS	Inquire	3-023
E1616	Acetic anhydride	TG-WaxMS	26088-3090	3-040
E1863	Acrylonitrile	TR-SimDist	260S250P	3-064

## GC Column Selection by U.S. EPA Drinking Water Test Method

Selected EPA Drinking Water methods are listed below with the appropriate Thermo Scientific GC column offerings. In some cases, there is more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
501.3	Trihalomethanes	TG-624	26085-3960	3-033
502.1	Volatile halogenated compounds	TG-624 TR-5MS	26085-4080 260F396P	3-033 3-055
502.2	Volatile organic compounds	TG-624 TG-624	26085-4080 26085-3320	3-033 3-033
503.1	Volatile aromatic and unsaturated organics	TG-624 TR-5MS	26085-4080 260F396P	3-033 3-055
504	EDB and DBCP	TR-5MS TG-5MS	260F396P 26098-2240	3-055 3-025
504.1	EDB and DBCP	TR-5MS TG-5MS	260F396P 26098-2240	3-055 3-025
506	Phthalates and adipates	TG-1MS TG-5MS	26099-1430 26098-1430	3-023 3-025
507	Organonitrogen and organophosphorus pesticides	TG-5MS TG-5MT TG-17MS	26098-1420 26M98-1420 26089-1420	3-025 3-051 3-037
509	Ethylene thiourea	TG-1701MS TG-WaxMS	26090-1420 26088-1300	3-036 3-040
513	Dioxin	TG-5MS TG-5MT	26098-1540 26M98-1540	3-025 3-051
515.2	Chlorinated herbicides	TG-5MS TG-17MS	26098-1430 26089-1430	3-025 3-051
524.1	Volatile organic compounds	TR-524 TG-624 TG-624	26RV495P 26085-4080 26085-3320	3-067 3-033 3-033
524.2	Volatile organic compounds	TR-524 TG-624 TG-624	26RV495P 26085-4080 26085-3320	3-067 3-033 3-033
525.1	Semi-volatile organic compounds	TR-525 TG-5MS TG-5MT	26RX142P 26098-1420 26M98-1420	3-067 3-025 3-051
525.2	Semi-volatile organic compounds	TR-525 TG-5MS TG-5MT	26RX142P 26098-1420 26M98-1420	3-067 3-025 3-051
527	Selected pesticides and flame retardants	TR-527 TG-5MS TG-5MT	26RF142P 26098-1420 26M98-1420	3-067 3-025 3-051
548.1	Endothall	TG-1MS TG-5MS TG-5MT	26099-1430 26098-1420 26M98-1420	3-023 3-025 3-051
551	Chlorinated disinfection by-products/chlorinated solvents	TG-5MS TG-5MT TG-1701MS	26098-1420 26M98-1420 26090-2240	3-025 3-051 3-036
552	Haloacetic acids	TG-1701MS TG-35MS	26090-1430 26094-1430	3-036 3-030
552.1	Haloacetic acids and dalapon	TG-1701MS TG-35MS	26090-1430 26094-1430	3-036 3-030

## GC Column Selection by U.S. EPA Waste Water Test Method

Selected EPA Waste Water methods are listed below with the appropriate Thermo Scientific GC column offerings. In some cases, there is more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
601	Purgable halocarbons	TG-624	26085-4080	3-033
		TG-624	26085-3320	3-033
602	Purgable aromatics	TG-624	26085-4080	3-033
		TG-5MS	26098-2960	3-025
		TG-5MT	26M98-2960	3-051
603	Acrolein and acrylonitrile	TG-624	26085-4080	3-033
		TG-5MS	26098-2960	3-025
		TG-5MT	26M98-2960	3-051
604	Phenols	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-35MS	26094-1420	3-030
606	Phthalate ester	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-35MS	26094-1420	3-030
607	Nitrosamines	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-35MS	26094-1420	3-030
608.1	Organochlorine pesticides in industrial and municipal water	TG-5MS	26098-2240	3-025
608.2	Organochlorine pesticides in wastewater	TG-5MS	26098-2240	3-025
609	Nitroaromatics and isophorone	TG-5MS	26098-1430	3-025
		TG-35MS	26094-1430	3-030
610	Polynuclear aromatic hydrocarbons	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
611	Haloethers	TG-5MS	26098-1430	3-025
		TG-35MS	26094-1430	3-030
612	Chlorinated hydrocarbons	TG-5MS	26098-1430	3-025
		TG-35MS	26094-1430	3-030
613	Dioxin	TG-5MS	26098-1540	3-025
		TG-5MT	26M98-1540	3-051
614	Organophosphorous pesticides in industrial and municipal water	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-17MS	26089-1420	3-037
614.1	Organophosphorous pesticides in wastewater	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-17MS	26089-1420	3-037
615	Chlorinated herbicides in industrial and municipal water	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-17MS	26089-1420	3-037
616	C, H, and O compounds	TG-1MS	26099-1420	3-023
		TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
617	Organohalide pesticides and PCBs in industrial and municipal water	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
618	Volatile pesticides in industrial and municipal water	TG-1MS	26099-2240	3-023
		TG-5MS	26098-2240	3-025
619	Triazines, pesticides and PCBs in industrial and municipal water	TG-35MS	26094-1430	3-030
620	Diphenylamine in industrial and municipal water	TG-1MS	26099-1430	3-023
		TG-5MS	26098-1430	3-025
622	Organophosphorous pesticides in industrial and municipal water	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-17MS	26089-1420	3-037



GC Column Selection by U.S. EPA Waste Water Test Method *continued*

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
622.1	Thiophosphate pesticides	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-35MS	26094-1420	3-030
624	Purgeables	TG-624	26085-4080	3-033
		TG-624	26085-3320	3-033
625	Base/neutrals and acids	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-5MS	26098-1430	3-025
627	Dinitroaniline pesticides in industrial and municipal water	TG-5MS	26098-1430	3-025
		TG-35MS	26094-1430	3-030
630.1	Dithiocarbamate pesticides as carbon disulfide	TG-5MS	26098-1420	3-025
		TG-5MS	26098-1430	3-025
		TG-5MT	26M98-1420	3-051
633	Organonitrogen pesticides	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-17MS	26089-1420	3-037
633.1	Neutral nitrogen-containing pesticides	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-35MS	26094-1420	3-030
634	Thiocarbamate pesticides	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-35MS	26094-1420	3-030
645	Amine pesticides and lethane in industrial and municipal water	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-35MS	26094-1420	3-030
646	Dinitro aromatic pesticides	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
		TG-35MS	26094-1420	3-030

## GC Column Selection by U.S. EPA Solid Waste Test Method

Selected EPA Solid Waste methods are listed below with the appropriate Thermo Scientific GC column offerings. In some cases, there is more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
8010B	Halogenated volatile organics	TG-624	26085-4080	3-033
		TG-624	26085-3320	3-033
8011	EDB and DBCP	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
8015B	Nonhalogenated volatile organics	TG-624	26085-4080	3-033
		TG-5MS	26098-2960	3-025
		TG-5MT	26M98-2960	3-051
8020A	Aromatic volatile organics	TG-624	26085-4080	3-033
		TG-5MS	26098-2960	3-025
		TG-5MT	26M98-2960	3-051
8021A	Halogenated and aromatic volatile organics	TG-624	26085-4080	3-033
		TG-5MS	26098-2960	3-025
		TG-5MT	26M98-2960	3-051
8030A	Acrolein and acrylonitrile	TG-624	26085-4080	3-033
8031	Acrylonitrile	TG-624	26085-3390	3-033
8032	Acrylamide	TG-624	26085-3390	3-033

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
<b>8040A</b>	Phenols	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
		TG-35MS	<b>26094-1420</b>	<b>3-030</b>
<b>8060</b>	Phthalate esters	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
<b>8061</b>	Phthalate esters	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
<b>8070</b>	Nitrosamines	TG-5MS	<b>26098-1430</b>	<b>3-025</b>
<b>8081</b>	Organochlorine pesticides and PCBs	TG-5MS	<b>26098-2230</b>	<b>3-025</b>
		TG-5MT	<b>26M98-2230</b>	<b>3-051</b>
		TG-17MS	<b>26089-1420</b>	<b>3-037</b>
<b>8090</b>	Nitroaromatics and cyclic ketones	TG-5MS	<b>26098-1430</b>	<b>3-025</b>
<b>8095</b>	Explosives	TR-8095	<b>260P123P</b>	<b>3-067</b>
<b>8100</b>	Polynuclear aromatic hydrocarbons	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
<b>8110</b>	Haloethers	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
<b>8120A</b>	Chlorinated hydrocarbons	TG-5MS	<b>26098-1430</b>	<b>3-025</b>
<b>8121</b>	Chlorinated hydrocarbons	TG-5MS	<b>26098-1430</b>	<b>3-025</b>
<b>8140</b>	Organophosphorous pesticides	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
		TG-17MS	<b>26089-1420</b>	<b>3-037</b>
<b>8141A</b>	Organophosphorous pesticides	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
		TG-17MS	<b>26089-1420</b>	<b>3-037</b>
<b>8150B</b>	Chlorinated herbicides	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
		TG-17MS	<b>26089-1420</b>	<b>3-037</b>
<b>8151</b>	Chlorinated herbicides	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
		TG-17MS	<b>26089-1420</b>	<b>3-037</b>
<b>8240B</b>	Volatile organic compounds	TG-624	<b>26085-4080</b>	<b>3-033</b>
		TG-624	<b>26085-3320</b>	<b>3-033</b>
<b>8250A</b>	Semi-volatile organic compounds	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MS	<b>26098-1430</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
<b>8260A</b>	Volatile organic compounds	TG-624	<b>26085-4080</b>	<b>3-033</b>
		TG-624	<b>26085-3320</b>	<b>3-033</b>
<b>8270B</b>	Semi-volatile organic compounds	TG-5MS	<b>26098-1420</b>	<b>3-025</b>
		TG-5MS	<b>26098-1430</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1420</b>	<b>3-051</b>
<b>8270C</b>	Semi-volatile organic compounds	TR-8270	<b>26RF296P</b>	<b>3-067</b>
<b>8280</b>	Polychlorinated dioxins and furans	TG-5MS	<b>26098-1540</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1540</b>	<b>3-051</b>
<b>8290</b>	Polychlorinated dioxins and furans	TG-5MS	<b>26098-1540</b>	<b>3-025</b>
		TG-5MT	<b>26M98-1540</b>	<b>3-051</b>

## GC Column Selection by NIOSH Method

Selected NIOSH methods are listed below with the recommended Thermo Scientific GC column offerings included for your convenience. There may be more than one phase or column dimension that can be used. When in doubt, it is recommended that you consult the original complete method or contact our technical support team for additional information or help in choosing the correct column for your application.

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
801	Aerobic bacteria	TR-FAME	Inquire	3-066
1001	Methylene chloride	TG-1MS	26099-1430	3-023
1002	Chloroprene	TG-1MS TG-1MT	26099-2960 26M99-2960	3-023 3-050
1003	Halogenated hydrocarbons	TG-624	26085-3390	3-033
1004	Dichloroethyl ether	TG-1MS	Inquire	3-023
1005	Methylene chloride	TG-WaxMS	26088-1430	3-040
1010	Epichlorohydrin	TG-WaxMS	Inquire	3-040
1011	Ethyl bromide	TG-WaxMS	26088-2240	3-040
1013	Propylene dichloride	TG-WaxMS	Inquire	3-040
1015	Vinylidene chloride	TG-624	Inquire	3-033
1016	1,1,2,2-Tetrachoro-2,2-difluoroethane and 1,1,2,2-tetrachoro-1,2-difluoroethane	TG-WaxMS	26088-2240	3-040
1018	Dichlorodifluoromethane, 1,2-dichlorotetrafluoroethane and chlorodifluoromethane	TG-1MS	26099-2970	3-023
1020	1,1,2-Trichloro-1,2,2-trifluoroethane	TG-WaxMS	26088-1430	3-040
1300	Ketones 1	TG-WaxMS	26088-2240	3-040
1301	Ketones 2	TG-WaxMS	26088-2240	3-040
1302	N-Methyl-2-pyrrolidinone	TG-5MS	26098-2970	3-025
1400	Alcohols 1	TG-WaxMS	26088-2240	3-040
1401	Alcohols 2	TG-WaxMS	26088-2240	3-040
1402	Alcohols 3	TG-WaxMS	26088-2240	3-040
1403	Alcohols 4	TG-WaxMS	26088-1430	3-040
1450	Esters 1	TG-WaxMS	26088-2240	3-040
1451	Methyl cellosolve acetate	TG-5MS	26098-2970	3-025
1453	Vinyl acetate	TG-5MS	26098-2970	3-025
1454	Isopropyl acetate	TG-1MS	26099-2970	3-023
1457	Ethyl acetate	TG-WaxMS	26088-2970	3-040
1458	Methyl acetate	TG-WaxMS	26088-2970	3-040
1501	Aromatic hydrocarbons	TG-WaxMS	26088-2970	3-040
1550	Naphthas	TG-1MS TG-1MT	26099-1540 26M99-1540	3-023 3-050
1551	Turpentine	TG-1MS TG-1MT	26099-1540 26M99-1540	3-023 3-050
1552	Terpenes	TG-WaxMS	26088-3100	3-040
1601	1,1-Dichloro-1-nitroethane	TG-1MS	Inquire	3-023
1602	Dioxane	TG-5MS	26098-2970	3-025
1604	Acrylonitrile	TG-WaxMS	26088-2240	3-040
1606	Acetonitrile	TG-WaxMS	26088-2970	3-040
1608	Glycidol	TG-WaxMS	Inquire	3-040
1609	Tetrahydrofuran	TG-WaxMS	26088-2240	3-040
1610	Ethyl ether	TG-1MS	26099-2970	3-023
1611	Methylal	TG-WaxMS	Inquire	3-040
1612	Propylene oxide	TG-5MS	26098-2970	3-025
1613	Pyridine	TG-5SiIMS	26096-2970	3-028
1614	Ethylene oxide	TG-WaxMS	Inquire	3-040
1615	Methyl-tert-butyl ether	TG-1MS	26099-2240	3-023
2000	Methanol	TG-35MS	26094-2980	3-030
2004	Dimethylacetamide and dimethylformamide	TG-WaxMS	26088-2240	3-040

Method	Title	Recommended Thermo Scientific Phase	Part Number	Page
2005	Nitroaromatics	TG-5MS	26098-2250	3-025
		TG-5MT	26M98-2250	3-051
2007	Aminoethanol compounds 1	TG-5MS	Inquire	3-025
2010	Aliphatic amines	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
2012	n-Butylamine	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
2017	Aniline, o-toluidine and nitrobenzene	TG-5MS	26098-2970	3-025
2500	Methyl ethyl ketone	TG-1MS	26099-2970	3-023
2505	Furfuryl alcohol	TG-1MS	26099-1420	3-023
		TG-1MT	26M99-1420	3-050
2520	Methyl bromide	TG-1MS	26099-2970	3-023
2529	Furfural	TG-5MS	26098-2960	3-025
		TG-5MT	26M98-2960	3-051
2536	Valeraldehyde	TG-5MS	26098-1310	3-025
2537	Methyl methacrylate	TG-35MS	26094-2980	3-030
2541	Formaldehyde	TG-WaxMS	26088-2240	3-040
2542	Mercaptans	TG-1MS	26099-2960	3-023
		TG-1MT	26M99-2960	3-050
2546	Cresols and phenol	TG-WaxMS	26088-1430	3-040
2549	Volatile organic CPDS (screening)	TG-1MS	26099-2960	3-023
		TG-1MT	26M99-2960	3-050
2550	Benzothiazole in asphalt fume	TG-1MS	26099-2970	3-023
2551	Nicotine	TG-5MS	26098-2970	3-025
3511	Monomethylaniline	TG-5MS	26098-1420	3-025
		TG-5MT	26M98-1420	3-051
3513	Tetranitromethane	TG-1MS	26099-1420	3-023
		TG-1MT	26M99-1420	3-050
5020	Dibutyl phthalate and di(2-ethylhexyl) phthalate	TG-1MS	26099-1300	3-023
		TG-1MT	26M99-1300	3-050
5515	Polynuclear aromatic hydrocarbons	TG-1MS	26099-3090	3-023
5519	Endrin	TG-1MS	26099-3090	3-023
5523	Glycols	TG-35MS	26094-2980	3-030
5600	Organophosphorus pesticides	TG-5MS	26098-2970	3-025
5602	Chlorinated organonitrogen herbicides (air sampling)	TG-17MS	26089-1420	3-037
5701	Resorcinol	TG-1MS	26099-1420	3-023
		TG-1MT	26M99-1420	3-050
9200	Chlorinated organonitrogen herbicides (hand wash)	TG-17MS	26089-1420	3-037
9201	Chlorinated organonitrogen herbicides (dermal patch)	TG-17MS	26089-1420	3-037

# Thermo Scientific GC Columns

Thermo Scientific GC Columns offer high temperature stability and exhibit low bleed and long lifetimes. From general purpose non-polar to polar columns, TraceGOLD TRACE and TracePLOT columns provide excellent quality and performance, with guaranteed reproducibility.

## TraceGOLD GC Columns

Offering you a leap forward in column performance delivering low bleed and superior inertness

»» **PAGE 3-022**



## TRACE GC Columns

Offering excellent quality and reproducibility for a wide range of GC applications

»» **PAGE 3-053**



## TracePLOT GC Columns

The latest innovation in PLOT column technology, providing reproducible analyses of permanent gases, hydrocarbons and solvents

»» **PAGE 3-075**





## GC Capillary Columns

A leap forward in column performance

- Low bleed even at elevated temperatures
- Outstanding robustness for difficult separations
- Reliable and reproducible performance
- Complete range of GC consumables for all instruments



The heart of any gas chromatograph is the column. We have used the knowledge gained from more than 30 years of HPLC column production and 50 years in GC and GC/MS instrument manufacturing to offer a range of columns and consumables that are unsurpassed in the most important aspects of their performance.

### Low Bleed

Bleeding phases cause problems including low sensitivity, detector contamination, lower temperature limits and short lifetimes. All manufacturers have at some time claimed their columns have the lowest bleed, but use supporting chromatograms that lack reproducible scale information or methodology. By quantifying the amount of phase bleeding from the column, we can show that the Thermo Scientific TRACE column range has less than half the bleed of other popular columns.

### Robustness

Moisture and oxygen pose a danger to GC columns. Oxygen contamination can come from many sources, leading to shortened lifetimes, increased bleed and increased cost. Thermo Scientific GC columns have been manufactured with improved phase bonding to minimize the risk of damage due to contaminated carrier gas or difficult samples.

### Reproducibility

As well as focusing on individual column performance, we work to improve column-to-column reproducibility, arising from major improvements in the production processes.

### Guaranteed Performance

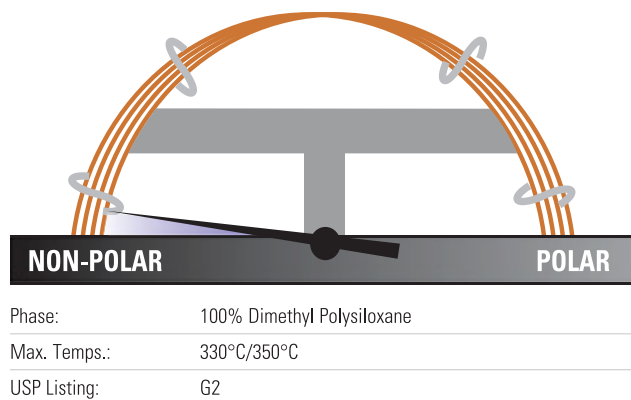
All Thermo Scientific columns have passed rigorous testing procedures to ensure the highest possible performance and are delivered with a serialized certificate to show their performance and assist with traceability. All Thermo Scientific columns come with a 100% guarantee. If for any reason the column does not perform up to our claims, we will replace it with one that does.

### Technical Support

Our quality technical support will help you solve your problems quickly, via phone, our web resource center or the technical section of this catalog. Please refer to the GC Column Selection Guide on page 3-002 for information to help you select the appropriate column for your separation. If you are looking for a column for a NIOSH, ASTM or EPA method, Thermo Scientific column recommendations are given on pages 3-012 to 3-019. Should you need assistance with column selection or method development, please contact one of our technical support desks and our highly trained team of scientists will be able to help.

### Quick Reference Icon

The reference graphic (below) on each column page gives easy access to the specifications of each phase type. It gives a relative measure of polarity, its chemistry and its maximum temperature limits as well as its USP classification.





## Thermo Scientific TraceGOLD GC Columns

TraceGOLD GC Columns offer you a leap forward in column performance delivering low bleed and superior inertness ideally suited to MS applications.

### Quick Reference

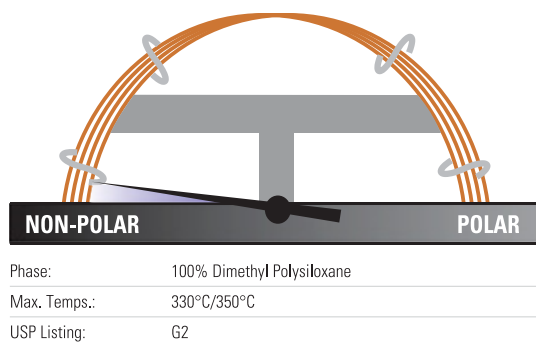
TG-1MS .....	<b>3-023</b>	TG-17MS .....	<b>3-037</b>
TG-XLBMS .....	<b>3-024</b>	TG-225MS .....	<b>3-038</b>
TG-5MS .....	<b>3-025</b>	TG-200MS .....	<b>3-039</b>
TG-SQC .....	<b>3-026</b>	TG-WaxMS .....	<b>3-040</b>
TG-5MS AMINE .....	<b>3-027</b>	TG-WaxMS A .....	<b>3-041</b>
TG-5SiIMS .....	<b>3-028</b>	TG-WaxMS B .....	<b>3-042</b>
TG-5HT .....	<b>3-029</b>	SafeGuard .....	<b>3-043</b>
TG-35MS .....	<b>3-030</b>	TG-OCP I / TG OCP II .....	<b>3-045</b>
TG-35MS AMINE .....	<b>3-031</b>	TG-OPP I / TG-OPP II .....	<b>3-046</b>
TG-1301MS .....	<b>3-032</b>	TG-ALC I / ALC II .....	<b>3-047</b>
TG-624 .....	<b>3-033</b>	TG-POLAR .....	<b>3-048</b>
TG-VRX .....	<b>3-034</b>	TG-1MT Metal .....	<b>3-050</b>
TG-VMS .....	<b>3-035</b>	TG-5MT Metal .....	<b>3-051</b>
TG-1701MS .....	<b>3-036</b>	TG-WaxMT Metal .....	<b>3-052</b>



## TraceGOLD TG-1MS GC Columns

Exceptionally low bleed for optimal signal-to-noise ratio, sensitivity and mass spec integrity

- Non-polar, 100% dimethyl polysiloxane
- Equivalent to USP G2



### TraceGOLD TG-1MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.1	10	0.1	<b>26099-0200</b>	1 Each
		0.25	<b>26099-1300</b>	1 Each
		0.5	<b>26099-2110</b>	1 Each
0.25	30	1.0	<b>26099-2840</b>	1 Each
		0.25	<b>26099-1420</b>	1 Each
		0.5	<b>26099-2230</b>	1 Each
	60	1.0	<b>26099-2960</b>	1 Each
		0.25	<b>26099-1540</b>	1 Each
		0.5	<b>26099-2350</b>	1 Each
0.32	15	1.0	<b>26099-3080</b>	1 Each
		0.25	<b>26099-1310</b>	1 Each
		0.5	<b>26099-2120</b>	1 Each
	30	1.0	<b>26099-2850</b>	1 Each
		0.25	<b>26099-1430</b>	1 Each
		0.5	<b>26099-2240</b>	1 Each
	60	1.0	<b>26099-2970</b>	1 Each
		0.25	<b>26099-1550</b>	1 Each
		0.5	<b>26099-2360</b>	1 Each
0.53	15	1.0	<b>26099-3090</b>	1 Each
		0.5	<b>26099-2130</b>	1 Each
		1.0	<b>26099-2860</b>	1 Each
	30	1.5	<b>26099-3340</b>	1 Each
		0.5	<b>26099-2250</b>	1 Each
		1.0	<b>26099-2980</b>	1 Each
	60	1.5	<b>26099-3360</b>	1 Each
		1.0	<b>26099-3370</b>	1 Each
		1.5		

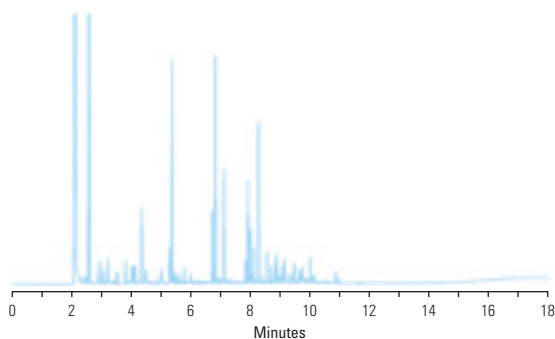
### Applications:

- Hydrocarbons
- PCBs
- Drugs of abuse
- Gasoline range organics (GRO)
- Refinery gases
- Essential oils
- Pesticides

### Similar to:

- Rxi-1ms
- DB-1
- DB-1ms
- HP-1
- HP-1ms
- Ultra-1
- SPB-1
- Equity-1
- VF-1ms
- CP-Sil 5 CB Low Bleed/MS

### Unleaded Gasoline



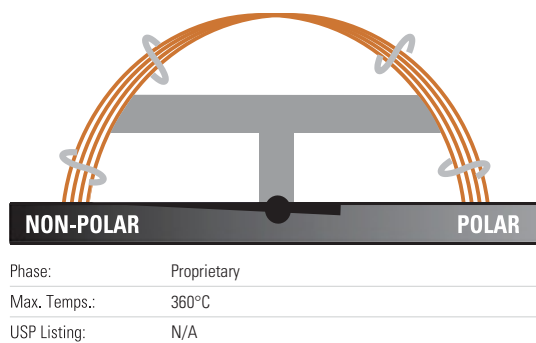
#### Column: TG-1MS 30m x 0.25mm x 0.25µm

Part Number:	26099-1420
Temperature:	50°C (2.0 minute hold) to 75°C at 10°C/minute to 300°C at 20°C/minute (5 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	1.0mL/min
Injection Volume:	1.0µL
Injection Mode:	Split (20:1), 250°C

## TraceGOLD TG-XLBMS GC Columns

General purpose columns exhibiting extremely low bleed

- Low polarity phase, proprietary
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Ideal for analysis of active, high molecular weight compounds with sensitive GC/MS systems



### TraceGOLD TG-XLBMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity		
0.10	10	0.1	<b>26079-0200</b>	1 Each		
0.18	20	0.18	<b>26079-5780</b>	1 Each		
0.25	15	0.1	<b>26079-0350</b>	1 Each		
		0.25	<b>26079-1300</b>	1 Each		
		1.0	<b>26079-2840</b>	1 Each		
		30	0.1	<b>26079-0470</b>	1 Each	
			0.25	<b>26079-1420</b>	1 Each	
			0.5	<b>26079-2230</b>	1 Each	
60	30	1.0	<b>26079-2960</b>	1 Each		
		0.25	<b>26079-1540</b>	1 Each		
		0.32	15	0.25	<b>26079-1310</b>	1 Each
				30	0.1	<b>26079-0480</b>
0.25	<b>26079-1430</b>				1 Each	
60	30	0.5	<b>26079-2240</b>	1 Each		
		1.0	<b>26079-2970</b>	1 Each		
		0.25	<b>26079-1550</b>	1 Each		
		0.53	15	1.5	<b>26079-3340</b>	1 Each
30	0.5			<b>26079-2250</b>	1 Each	
	1.5			<b>26079-3360</b>	1 Each	

### Applications

- Pesticides
- PCB congeners
- PAHs
- Aroclor mixes

### Similar to:

- Rxi-XLB
- DB-XLB
- VF-Xms

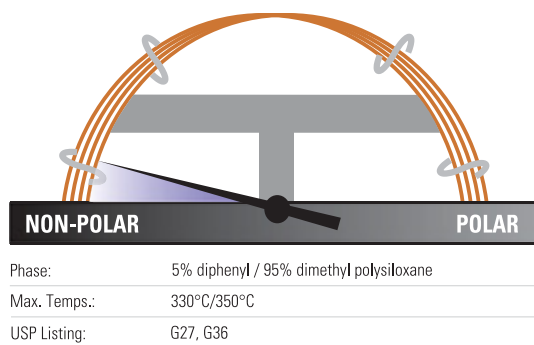
### Semi-Volatile Drinking Water Application Kit

Description	Cat. No.	Quantity
Semivolatile Drinking Water Application Kit	<b>60181-736</b>	1 Each
Containing the following:		
TraceGOLD TG-XLBMS GC Column 30m x 0.25mm x 0.25µm	<b>26079-1420</b>	1 Each
BTO Septa 17mm Diameter	<b>31303211</b>	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	<b>45350033</b>	5 Pack
S/SL Injector – Silver Seals	<b>29033629</b>	10 Pack
S/SL Injector – Graphite Liner Seals	<b>29033406</b>	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	<b>29053488</b>	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	<b>29033496</b>	10 Pack
2mL Screw Top Vials, Amber Glass	<b>60180-567</b>	100 Pack
Blue Caps With PTFE/Red Rubber Seals	<b>60180-569</b>	100 Pack
5µL Fixed Needle Syringe, 50mm Length, 26 Gauge, Cone Needle	<b>36500505</b>	1 Each

# TraceGOLD TG-5MS GC Columns

The most widely used MS phase in gas chromatography

- Low polarity phase, 5% diphenyl/95% dimethyl polysiloxane
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Exceptional inertness ideal for analysis of active compounds
- Equivalent to USP G27 phase



## TraceGOLD TG-5MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity	
0.1	10	0.1	<b>26098-0200</b>	1 Each	
0.18	20	0.18	<b>26098-5780</b>	1 Each	
0.25	10	0.25	<b>26098-1180</b>	1 Each	
		0.25	<b>26098-1300</b>	1 Each	
		0.5	<b>26098-2110</b>	1 Each	
	30	1.0	<b>26098-2840</b>	1 Each	
		0.25	<b>26098-1420</b>	1 Each	
		0.5	<b>26098-2230</b>	1 Each	
		1.0	<b>26098-2960</b>	1 Each	
	60	0.25	<b>26098-1540</b>	1 Each	
		0.5	<b>26098-2350</b>	1 Each	
		1.0	<b>26098-3080</b>	1 Each	
0.32		15	0.25	<b>26098-1310</b>	1 Each
			0.5	<b>26098-2120</b>	1 Each
			1.0	<b>26098-2850</b>	1 Each
30	0.25	<b>26098-1430</b>	1 Each		
	0.5	<b>26098-2240</b>	1 Each		
	1.0	<b>26098-2970</b>	1 Each		
	60	0.25	<b>26098-1550</b>	1 Each	
		0.5	<b>26098-2360</b>	1 Each	
		1.0	<b>26098-3090</b>	1 Each	
0.53	15	0.25	<b>26098-1320</b>	1 Each	
		0.5	<b>26098-2130</b>	1 Each	
		1.0	<b>26098-2860</b>	1 Each	
		1.5	<b>26098-3340</b>	1 Each	
	30	0.25	<b>26098-1440</b>	1 Each	
		0.5	<b>26098-2250</b>	1 Each	
		1.0	<b>26098-2980</b>	1 Each	
		1.5	<b>26098-3360</b>	1 Each	

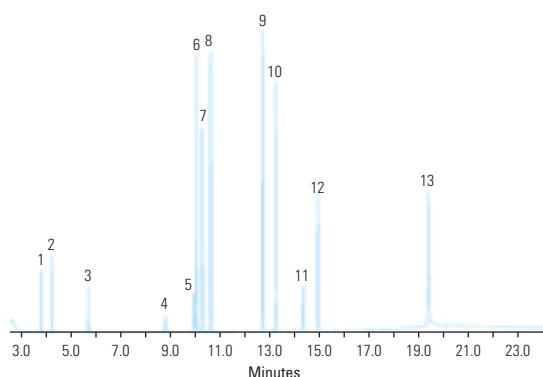
### Applications:

- Semivolatiles
- Phenols
- Amines
- Residual solvents and solvent impurities
- Drugs of abuse
- Pesticides
- PCB congeners
- Aroclor mixes

### Similar to:

- Rxi-5ms
- DB-5
- HP-5
- HP-5ms
- Ultra-2
- SPB-5
- Equity-5
- CP-Sil 8

### Basic Drugs



#### Column: TG-5MS 30m x 0.25mm x 0.25µm

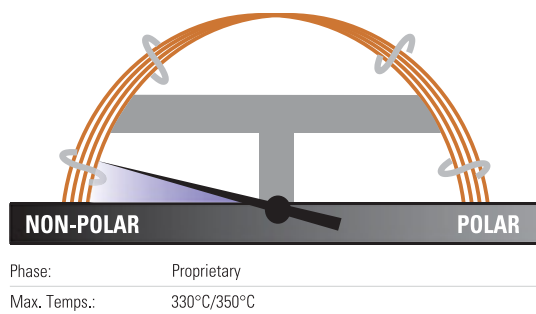
Part Number:	26098-1420
Temperature:	100°C to 220°C at 15°C/minute to 330°C at 10°C/minute (5 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	30cm/sec
Injection Volume:	1.0µL
Injection Mode:	Split 50:1, 250°C

- |                    |                  |
|--------------------|------------------|
| 1. amphetamine     | 8. phencyclidine |
| 2. methamphetamine | 9. methadone     |
| 3. nicotine        | 10. cocaine      |
| 4. cotinine        | 11. codeine      |
| 5. caffeine        | 12. scopolamine  |
| 6. benzphetamine   | 13. alprazolam   |
| 7. ketamine        |                  |

## TraceGOLD TG-SQC GC Columns

Ensure the quality of a Thermo Scientific instrument when installed on site

- Optimized for system qualification tests for new GCMS installations or during service/maintenance of an existing instrument
- We recommend reserving this column for benchmark testing only



### TraceGold TG-SQC GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	<b>26070-1300</b>	1 Each
	30	0.25	<b>26070-1420</b>	1 Each

### Applications:

- System Qualification Tests (Thermo Scientific GCMS)

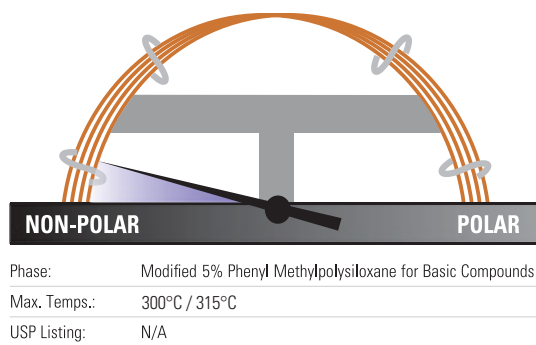




## TraceGOLD TG-5MS AMINE GC Columns

Analysis of ppm levels of amines without column priming

- Low polarity phase, 5% diphenyl/95% dimethyl polysiloxane
- Tubing surface is chemically altered to reduce tailing of active basic compounds
- Also allows analysis of neutral or weakly acidic compounds (e.g., phenols) and compounds susceptible to hydrogen bonding
- Low bleed at maximum operating temperature



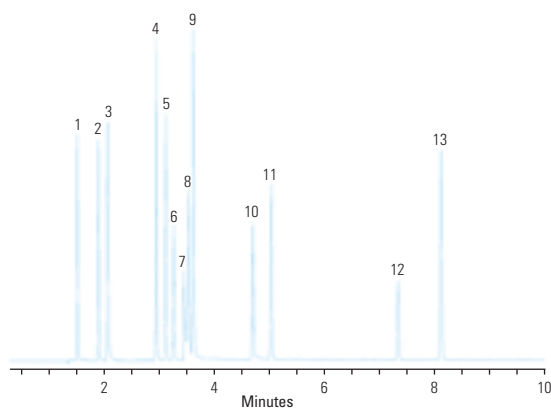
### TraceGOLD TG-5MS AMINE GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	<b>26097-1300</b>	1 Each
		0.5	<b>26097-2110</b>	1 Each
		1.0	<b>26097-2840</b>	1 Each
	30	0.25	<b>26097-1420</b>	1 Each
		0.5	<b>26097-2230</b>	1 Each
		1.0	<b>26097-2960</b>	1 Each
0.32	15	1.0	<b>26097-2850</b>	1 Each
	30	1.0	<b>26097-2970</b>	1 Each
0.53	15	1.0	<b>26097-2860</b>	1 Each
		3.0	<b>26097-3840</b>	1 Each
	30	1.0	<b>26097-2980</b>	1 Each
		3.0	<b>26097-3960</b>	1 Each

### Applications:

- Amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines
- Nitrogen-containing heterocyclics

### Amines and Phenols



#### Column: TG-5MS Amine 30m x 0.32mm x 1.0µm

Part Number:	26097-2970
Temperature:	120°C to 220°C at 10°C/minute
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	40cm/min
Injection Volume:	1.0µL
Injection Mode:	Split 25:1, 300°C

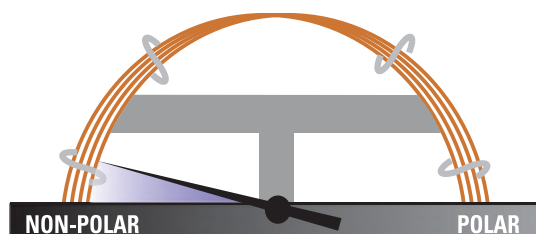
1. diethylamine	8. octylamine
2. pyridine	9. 1-methyl-2-pyrrolidinone
3. morpholine	10. 2-nitrophenol
4. phenol	11. 2,6-dimethylaniline
5. aniline	12. nicotine
6. 2-chlorophenol	13. 2-nitroaniline
7. diethylenetriamine	



## TraceGOLD TG-5SiIMS GC Columns

Incorporate phenyl groups in the polymer backbone for improved thermal stability, reduced bleed and reduced susceptibility to oxidation

- Low polarity, silarylene phase with selectivity comparable to 5% diphenyl/95% dimethyl polysiloxane
- Designed for low bleed and outstanding inertness



	NON-POLAR	POLAR
Phase:	Similar to 5% Phenyl Methylpolysiloxane	
Max. Temps.:	330°C/350°C	
USP Listing:	G27, G36	

### TraceGOLD TG-5SiIMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.1	10	0.1	<b>26096-0200</b>	1 Each
0.25	15	0.25	<b>26096-1300</b>	1 Each
		0.5	<b>26096-2110</b>	1 Each
		1.0	<b>26096-2840</b>	1 Each
		0.25	<b>26096-1420</b>	1 Each
		0.5	<b>26096-2230</b>	1 Each
		1.0	<b>26096-2960</b>	1 Each
0.32	30	0.25	<b>26096-1540</b>	1 Each
		1.0	<b>26096-3080</b>	1 Each
		0.25	<b>26096-1310</b>	1 Each
0.32	30	0.25	<b>26096-1430</b>	1 Each
		0.5	<b>26096-2240</b>	1 Each
		1.0	<b>26096-2970</b>	1 Each
0.53	30	1.5	<b>26096-3360</b>	1 Each

### Semivolatile Waste / Wastewater Application Kit

Description	Cat. No.	Quantity
Semivolatile Waste / Wastewater Application Kit	<b>60181-735</b>	1 Each
Containing the following:		
TraceGOLD TG-5SiIMS GC Column 30m x 0.25mm x 0.50µm	<b>26096-2230</b>	1 Each
BTO Septa 17mm Diameter	<b>31303211</b>	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	<b>45350033</b>	5 Pack
S/SL Injector – Silver Seals	<b>29033629</b>	10 Pack
S/SL Injector – Graphite Liner Seals	<b>29033406</b>	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	<b>29053488</b>	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	<b>29033496</b>	10 Pack
2mL Screw Top Vials, Amber Glass	<b>60180-567</b>	100 Pack
Blue Caps With PTFE/Red Rubber Seals	<b>60180-569</b>	100 Pack
5µL Fixed Needle Syringe, 50mm Length, 26 Gauge, Cone Needle	<b>36500505</b>	1 Each

### Applications:

- GC/MS applications using ion-trap systems
- Polycyclic aromatics
- Hydrocarbons including chlorinated hydrocarbons
- Phthalates
- Phenols
- Amines
- Organophosphate

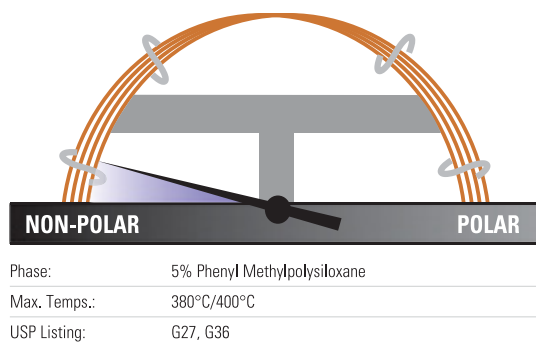
### Similar to:

- DB-5MS
- VF-5ms
- CP-Sil 8 Low-Bleed/MS
- Rxi-5Sil MS
- BPX5
- ZB-5ms
- Optima-5MS
- SLB-5

## TraceGOLD TG-5HT GC Columns

Offers extended operation up to 400°C, ideal for high temperature extended GC applications

- Low polarity, 5% diphenyl/95% dimethyl polysiloxane
- Lower bleed and better inertness than comparable high-temperature columns
- Special design of fused silica tubing extends column lifetime by up to 40%



### TraceGOLD TG-5HT GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.1	<b>26095-0350</b>	1 Each
		0.25	<b>26095-1300</b>	1 Each
	30	0.1	<b>26095-0470</b>	1 Each
		0.25	<b>26095-1420</b>	1 Each
0.32	15	0.1	<b>26095-0360</b>	1 Each
	30	0.1	<b>26095-0480</b>	1 Each
		0.25	<b>26095-1430</b>	1 Each
0.53	10	0.15	<b>26095-1640</b>	1 Each
	30	0.15	<b>26095-0620</b>	1 Each

### Applications:

- Phenols
- Residual solvents
- Solvents
- Semivolatiles
- Pesticides
- PCBs
- Solvent impurities

### PBDE (Environmental) Applications Kit

Description	Cat. No.	Quantity
PBDE (Environmental) Applications Kit	<b>60181-737</b>	1 Each
Containing the following:		
TraceGOLD TG-5HT GC Column 15m x 0.25mm x 0.10µm	<b>26095-0350</b>	1 Each
BTO Septa 12.7mm Diameter	<b>31303228</b>	50 Pack
PTV Injector – Deactivated Glass Baffle Liner, 2mm ID x 2.75mm OD x 120mm Length	<b>453T1001</b>	5 Pack
PTV Injector – Graphite Liner Seals	<b>29013417</b>	2 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	<b>29053488</b>	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	<b>29033496</b>	10 Pack
2mL Screw Top Vials, Amber Glass	<b>60180-567</b>	100 Pack
Blue Caps With PTFE/Red Rubber Seals	<b>60180-569</b>	100 Pack
100µL Removable Needle Gas Tight Syringe, 50mm Length, 23 Gauge, Side Hole	<b>36520050</b>	1 Each

### Similar to:

- Rxi-5HT
- BP-5HT
- VF-5HT
- ZB-5HT

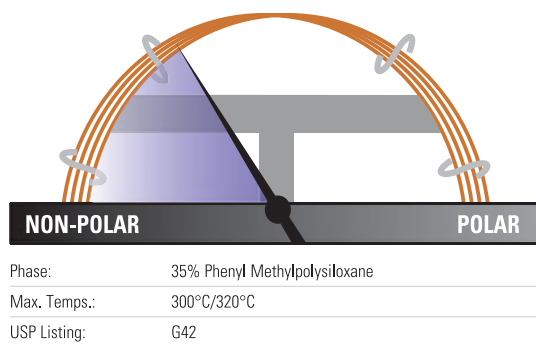
### PBDE (ROSH) Application Kit

Description	Cat. No.	Quantity
PBDE (ROSH) Applications Kit	<b>60181-738</b>	1 Each
Containing the following:		
TraceGOLD TG-5HT GC Column 15m x 0.25mm x 0.10µm	<b>26095-0350</b>	1 Each
S/SL Injector – BTO Septa 17mm Diameter	<b>31303211</b>	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	<b>45350033</b>	5 Pack
S/SL Injector – Silver Seals	<b>29033629</b>	10 Pack
S/SL Injector – Graphite Liner Seals	<b>29033406</b>	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	<b>29053488</b>	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	<b>29033496</b>	10 Pack
2mL Screw Top Vials, Amber Glass	<b>60180-567</b>	100 Pack
Blue Caps With PTFE/Red Rubber Seals	<b>60180-569</b>	100 Pack
10µL Fixed Needle Syringe, 50mm Length, 25 Gauge, Cone Needle	<b>36500525</b>	1 Each

## TraceGOLD TG-35MS GC Columns

Higher phenyl content for useful elution order and retention time changes

- Mid-polarity phase, 35% diphenyl/65% dimethyl polysiloxane
- Equivalent to USP G42 phase



### TraceGOLD TG-35MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity	
0.25	15	0.25	<b>26094-1300</b>	1 Each	
		0.5	<b>26094-2110</b>	1 Each	
		1.0	<b>26094-2840</b>	1 Each	
	30	0.25	<b>26094-1420</b>	1 Each	
		0.5	<b>26094-2230</b>	1 Each	
		1.0	<b>26094-2960</b>	1 Each	
0.32	15	0.25	<b>26094-1310</b>	1 Each	
		0.5	<b>26094-2120</b>	1 Each	
		1.0	<b>26094-2850</b>	1 Each	
	30	0.25	<b>26094-1430</b>	1 Each	
		0.5	<b>26094-2240</b>	1 Each	
		1.0	<b>26094-2970</b>	1 Each	
0.53	15	0.5	<b>26094-2130</b>	1 Each	
		1.0	<b>26094-2860</b>	1 Each	
		1.5	<b>26094-3340</b>	1 Each	
		3.0	<b>26094-3840</b>	1 Each	
		30	0.5	<b>26094-2250</b>	1 Each
			1.0	<b>26094-2980</b>	1 Each
	1.5		<b>26094-3360</b>	1 Each	
			3.0	<b>26094-3960</b>	1 Each

### Applications:

- Organochlorine pesticides and herbicides
- Pharmaceuticals
- PCB congeners
- Aroclor mixes
- Sterols
- Rosin acids
- Phthalate esters

### Similar to:

- Rtx-35
- BP-35
- HP-35
- SPB-35
- SPB-608

Thermo Scientific high-performance chromatography refrigerators offer close temperature control, instrumentation access and easy set-up.

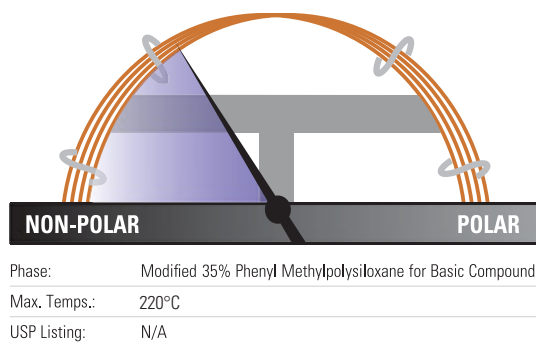
[www.thermoscientific.com/cold](http://www.thermoscientific.com/cold)



## TraceGOLD TG-35MS AMINE GC Columns

Chemically altered tubing surface reduces tailing and eliminates the need for column priming

- Mid-polarity phase, 35% diphenyl/65% dimethyl polysiloxane
- Developed for analysis of active basic compounds without derivatization
- Also allows analysis of neutral compounds and adsorptive compounds with oxygen groups susceptible to hydrogen bonding
- Low bleed at maximum operating temperature



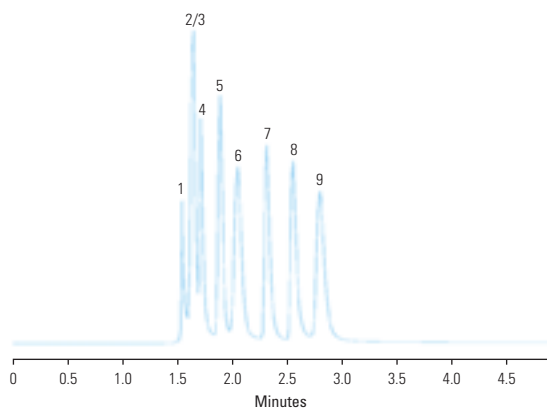
### TraceGOLD TG-35MS AMINE GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.5	<b>26092-2110</b>	1 Each
		1.0	<b>26092-2840</b>	1 Each
	30	0.5	<b>26092-2230</b>	1 Each
		1.0	<b>26092-2960</b>	1 Each
0.32	15	1.0	<b>26092-2850</b>	1 Each
		1.5	<b>26092-0680</b>	1 Each
	30	1.0	<b>26092-2970</b>	1 Each
		1.5	<b>26092-3350</b>	1 Each
0.53	15	1.0	<b>26092-2860</b>	1 Each
		3.0	<b>26092-3840</b>	1 Each
	30	1.0	<b>26092-2980</b>	1 Each
		3.0	<b>26092-3960</b>	1 Each

### Applications:

- Amines including alkylamines, diamines, triamines and ethanolamines
- Nitrogen-containing heterocyclics

### Primary Amines



#### Column: TG-35MS Amine 30m x 0.53mm x 1.0µm

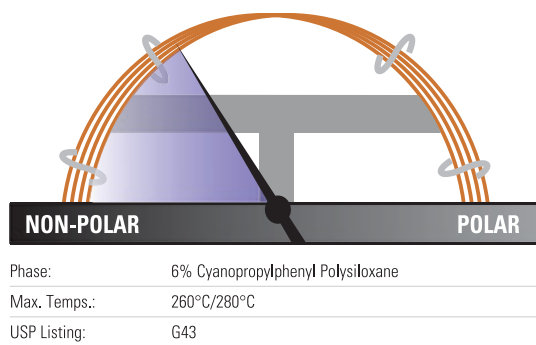
Part Number:	26092-2980
Temperature:	35°C (5 minute hold) Isothermal
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	35cm/sec
Injection Volume:	1.0µL
Injection Mode:	Split (10:1), 250°C

1. methylamine	6. tert-butylamine
2. dimethylamine	7. n-propylamine
3. trimethylamine	8. diethylamine
4. ethylamine	9. sec-butylamine
5. isopropylamine	

## TraceGOLD TG-1301MS GC Columns

Low bleed, excellent reproducibility and column-to-column consistency even with sensitive detectors like ECDs and MS

- Low to mid-polarity phase, 6% cyanopropylphenyl/94% dimethyl polysiloxane
- Long lifetime
- Excellent inertness
- Equivalent to USP G43 phase



### TraceGOLD TG-1301MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity	
0.25	15	0.25	<b>26091-1300</b>	1 Each	
		0.5	<b>26091-2110</b>	1 Each	
		1.0	<b>26091-2840</b>	1 Each	
	30	0.25	<b>26091-1420</b>	1 Each	
		0.5	<b>26091-2230</b>	1 Each	
		1.0	<b>26091-2960</b>	1 Each	
	60	0.25	<b>26091-1540</b>	1 Each	
		0.5	<b>26091-2350</b>	1 Each	
		1.0	<b>26091-3080</b>	1 Each	
		1.4	<b>26091-3330</b>	1 Each	
	0.32	15	0.25	<b>26091-1310</b>	1 Each
			0.5	<b>26091-2120</b>	1 Each
1.0			<b>26091-2850</b>	1 Each	
1.5			<b>26091-0680</b>	1 Each	
30		0.25	<b>26091-1430</b>	1 Each	
		0.5	<b>26091-2240</b>	1 Each	
		1.0	<b>26091-2970</b>	1 Each	
		1.5	<b>26091-3350</b>	1 Each	
60		1.8	<b>26091-3390</b>	1 Each	
		0.25	<b>26091-1550</b>	1 Each	
		0.5	<b>26091-2360</b>	1 Each	
		1.0	<b>26091-3090</b>	1 Each	
0.53		15	1.8	<b>26091-3410</b>	1 Each
			0.25	<b>26091-1320</b>	1 Each
			0.5	<b>26091-2130</b>	1 Each
			1.0	<b>26091-2860</b>	1 Each
		30	1.5	<b>26091-3340</b>	1 Each
			3.0	<b>26091-3840</b>	1 Each
	0.25		<b>26091-1440</b>	1 Each	
	0.5		<b>26091-2250</b>	1 Each	
	60	1.0	<b>26091-2980</b>	1 Each	
		1.5	<b>26091-3360</b>	1 Each	
		3.0	<b>26091-3960</b>	1 Each	
		0.25	<b>26091-1560</b>	1 Each	
75	0.5	<b>26091-2370</b>	1 Each		
	1.0	<b>26091-3100</b>	1 Each		
	1.5	<b>26091-3370</b>	1 Each		
	3.0	<b>26091-4080</b>	1 Each		
105	3.0	<b>26091-4900</b>	1 Each		
		3.0	<b>26091-4090</b>	1 Each	

### Applications:

- Alcohols
- Volatile organics
- Oxygenates
- Residual solvents

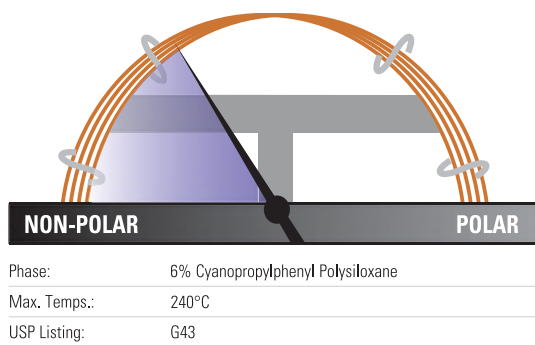
### Similar to:

- Rtx-1301
- DB-1301
- BP-624
- HP-1301
- HP-624
- SPB-1301
- SPB-624
- VP-1301
- BF-624ms
- CP-1301
- CP-Select 624 CB

## TraceGOLD TG-624 GC Columns

Offers 90+% resolution of the first six gases in EPA Method 8260 and EPA Method 524.2 for volatile organics analysis

- Low to mid-polarity phase, 6% cyanopropylphenyl/94% dimethyl polysiloxane
- Ideal for EPA methods 624 and 608
- Allows resolution of 2-nitropropane from 1,1-dichloropropanone under EPA Method 524.2 revision IV



### TraceGOLD TG-624 GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	1.0	<b>26085-4950</b>	1 Each
	40	1.0	<b>26085-4960</b>	1 Each
0.25	30	1.4	<b>26085-3320</b>	1 Each
	60	1.4	<b>26085-3330</b>	1 Each
0.32	30	1.8	<b>26085-3390</b>	1 Each
	60	1.8	<b>26085-3410</b>	1 Each
0.53	30	3.0	<b>26085-3960</b>	1 Each
	60	3.0	<b>26085-4080</b>	1 Each
	75	3.0	<b>26085-4900</b>	1 Each
	105	3.0	<b>26085-4090</b>	1 Each

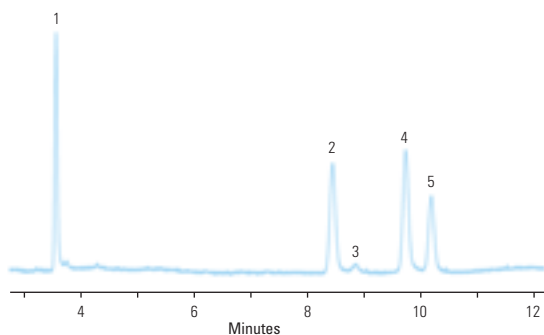
### Applications:

- Residual Solvents
- Volatile Organic Compounds
- Alcohols
- Oxygenates

### Similar to:

- DB-1301
- DB-624
- HP-1301
- HP-624
- SPB-1301
- SPB-624
- VF-1301
- VF-624ms
- CP-1301
- CP-Select 624 CB
- Rtx-624
- BP-624
- ZB-624
- Optima-1301
- Optima-624
- AT-624
- 007-1301

### Residual Solvents Class 1



#### Column: TG-624 30m x 0.32mm x 1.80µm

Part Number:	26085-3390
Temperature:	40°C (20 minute hold) to 240°C at 10°C/min (20 minute hold)
Detector Type:	FID
Carrier Gas:	He
Flow Rate:	2.15mL/min
Injection Volume:	1.0µL
Injection Mode:	Headspace, Split (1:5), 140°C

- 1,1-dichloroethene
- 1,1,1-trichloroethane
- carbon tetrachloride
- benzene
- 1,2-dichloroethane

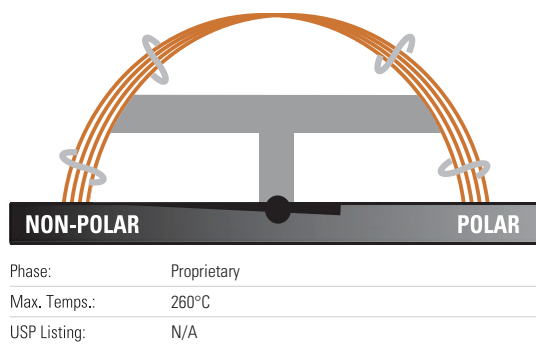




## TraceGOLD TG-VRX GC Columns

Application specific column for volatile organic pollutants

- Highly stable polymer phase
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Excellent resolution for analysis of volatile compounds
- Fast analysis times for volatile compounds



### TraceGOLD TG-XLBMS GC Columns

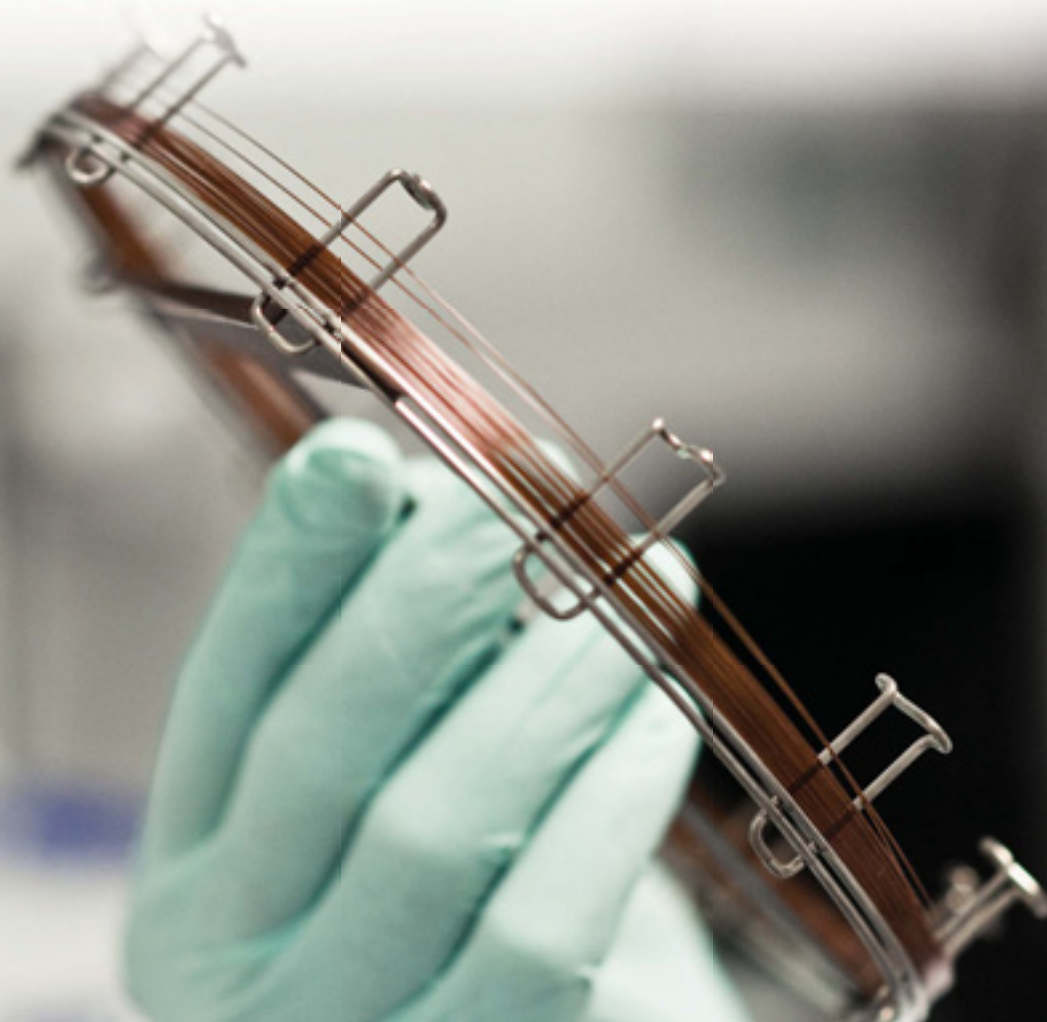
ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	1.0	<b>26081-4950</b>	1 Each
	40	1.0	<b>26081-4960</b>	1 Each
0.25	30	1.4	<b>26081-3320</b>	1 Each
	60	1.4	<b>26081-3330</b>	1 Each
0.32	30	1.8	<b>26081-3390</b>	1 Each
	60	1.8	<b>26081-3410</b>	1 Each
0.53	30	3.0	<b>26081-3960</b>	1 Each
	60	3.0	<b>26081-4080</b>	1 Each
	75	3.0	<b>26081-4900</b>	1 Each
	105	3.0	<b>26081-4090</b>	1 Each

### Applications:

- Volatile organic pollutants
- US EPA Method 8021 compounds

### Similar to:

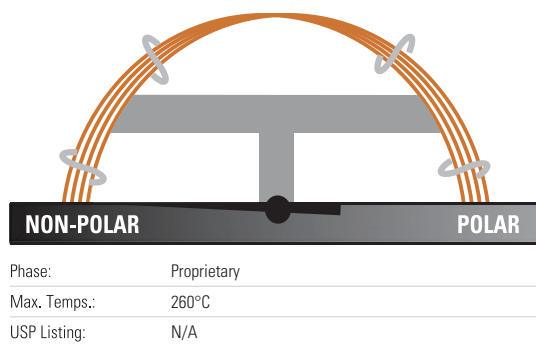
- Rtx-VRX
- DB-VRX



## TraceGOLD TG-VMS GC Columns

Application specific column for volatile organic pollutants

- Highly stable polymer phase
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Excellent resolution for analysis of volatile compounds
- Fast analysis times for volatile compounds



### TraceGOLD TG-VMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	1.0	<b>26080-4950</b>	1 Each
	40	1.0	<b>26080-4960</b>	1 Each
0.25	30	1.4	<b>26080-3320</b>	1 Each
	60	1.4	<b>26080-3330</b>	1 Each
0.32	30	1.8	<b>26080-3390</b>	1 Each
	60	1.8	<b>26080-3410</b>	1 Each
0.53	30	3.0	<b>26080-3960</b>	1 Each
	60	3.0	<b>26080-4080</b>	1 Each
	75	3.0	<b>26080-4900</b>	1 Each

### Applications:

- Volatile organic pollutants
- US EPA Method 8260B compounds

### Similar to:

- Rtx-VMS

### Volatile Organic Compound (VOC) Application Kit

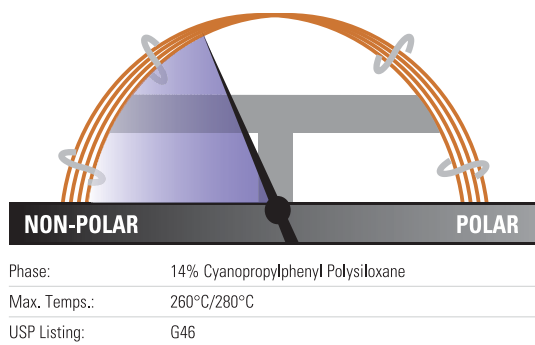
Description	Cat. No.	Quantity
Volatile Organic Compound (VOC) Application Kit	<b>60181-734</b>	1 Each
Containing the following:		
TraceGOLD TG-VMS GC Column 20m x 0.18mm x 1.00µm	<b>26080-4950</b>	1 Each
S/SL Injector – BTO Septa 9mm Diameter	<b>31303240</b>	50 Pack
S/SL Injector – Silver Seals	<b>29033629</b>	10 Pack
S/SL Injector – Graphite Liner Seals	<b>29033406</b>	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	<b>29053488</b>	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	<b>29033496</b>	10 Pack
2mL Screw Top Vials, Amber Glass	<b>60180-567</b>	100 Pack
Blue Caps with PTFE/Red Rubber Seals	<b>60180-569</b>	100 Pack
40mL VOA Sample Vials with Caps and Seals	<b>60180-573</b>	72 Pack

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## TraceGOLD TG-1701MS GC Columns

Feature a mix of cyano and phenyl groups for increased polarity and a different elution order relative to less polar columns

- Mid-polarity phase, 14% cyanopropylphenyl, 86% dimethyl polysiloxane
- Fully characterized for long-term reproducibility, column-to-column consistency and low bleed
- Optimal for confirmation analysis
- Equivalent to USP G46 phase



### TraceGOLD TG-1701MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity	
0.1	10	0.1	<b>26090-0200</b>	1 Each	
		0.25	<b>26090-1300</b>	1 Each	
		0.5	<b>26090-2110</b>	1 Each	
0.25	30	1.0	<b>26090-2840</b>	1 Each	
		0.25	<b>26090-1420</b>	1 Each	
		0.5	<b>26090-2230</b>	1 Each	
	60	1.0	<b>26090-2960</b>	1 Each	
		0.25	<b>26090-1540</b>	1 Each	
		0.5	<b>26090-2350</b>	1 Each	
0.32	15	1.0	<b>26090-3080</b>	1 Each	
		0.25	<b>26090-1310</b>	1 Each	
		0.5	<b>26090-2120</b>	1 Each	
	30	1.0	<b>26090-2850</b>	1 Each	
		1.5	<b>26090-0680</b>	1 Each	
		0.25	<b>26090-1430</b>	1 Each	
		0.5	<b>26090-2240</b>	1 Each	
		1.0	<b>26090-2970</b>	1 Each	
		1.5	<b>26090-3350</b>	1 Each	
60	0.25	<b>26090-1550</b>	1 Each		
	0.5	<b>26090-2360</b>	1 Each		
	1.0	<b>26090-3090</b>	1 Each		
	1.5	<b>26090-0630</b>	1 Each		
	0.53	15	0.25	<b>26090-1320</b>	1 Each
			0.5	<b>26090-2130</b>	1 Each
1.0			<b>26090-2860</b>	1 Each	
30		1.5	<b>26090-3340</b>	1 Each	
		3.0	<b>26090-3840</b>	1 Each	
		0.25	<b>26090-1440</b>	1 Each	
		0.5	<b>26090-2250</b>	1 Each	
		1.0	<b>26090-2980</b>	1 Each	
		1.5	<b>26090-3360</b>	1 Each	
60	3.0	<b>26090-3960</b>	1 Each		
	0.25	<b>26090-1560</b>	1 Each		
	0.5	<b>26090-2370</b>	1 Each		
	1.0	<b>26090-3100</b>	1 Each		
	1.5	<b>26090-3370</b>	1 Each		
	3.0	<b>26090-4080</b>	1 Each		

### Applications:

- Alcohols
- Pesticides
- Oxygenates
- PCB congeners
- Aroclor mixes

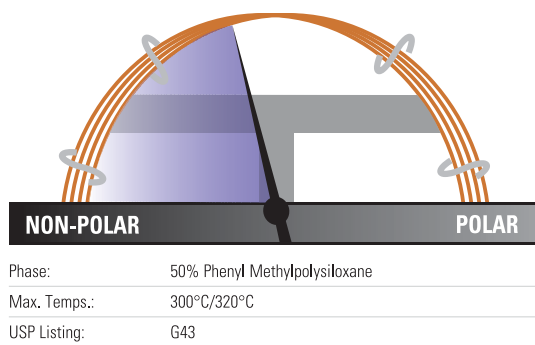
### Similar to:

- Rtx-1701
- DB-1701
- HP-1701
- SPB-1701
- VF-1701
- CP-Sil 19 CB

## TraceGOLD TG-17MS GC Columns

Particularly suited to GCMS applications that require more polarity than a 5% Phenyl phase

- Mid-polarity phase of 50% diphenyl/50% dimethyl polysiloxane
- Ideal for confirmational analysis
- Excellent inertness for active compounds such as pesticides
- Very low bleed ideal for analysis by GCMS



### TraceGOLD TG-17MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.1	10	0.1	<b>26089-0200</b>	1 Each
		0.25	<b>26089-1300</b>	1 Each
		0.5	<b>26089-2110</b>	1 Each
0.25	15	0.5	<b>26089-2110</b>	1 Each
		1.0	<b>26089-2840</b>	1 Each
		1.0	<b>26089-2960</b>	1 Each
	30	0.25	<b>26089-1420</b>	1 Each
		0.5	<b>26089-2230</b>	1 Each
		1.0	<b>26089-2960</b>	1 Each
60	0.25	<b>26089-1540</b>	1 Each	
	0.5	<b>26089-2230</b>	1 Each	
	1.0	<b>26089-2960</b>	1 Each	
0.32	15	0.25	<b>26089-1310</b>	1 Each
		0.5	<b>26089-2120</b>	1 Each
		1.0	<b>26089-2850</b>	1 Each
	30	0.25	<b>26089-1430</b>	1 Each
		0.5	<b>26089-2240</b>	1 Each
		1.0	<b>26089-2970</b>	1 Each
0.53	15	0.25	<b>26089-1320</b>	1 Each
		0.5	<b>26089-2130</b>	1 Each
		1.0	<b>26089-2860</b>	1 Each
	30	1.5	<b>26089-3340</b>	1 Each
		0.25	<b>26089-1440</b>	1 Each
		0.5	<b>26089-2250</b>	1 Each
	60	1.0	<b>26089-2980</b>	1 Each
		1.5	<b>26089-3360</b>	1 Each

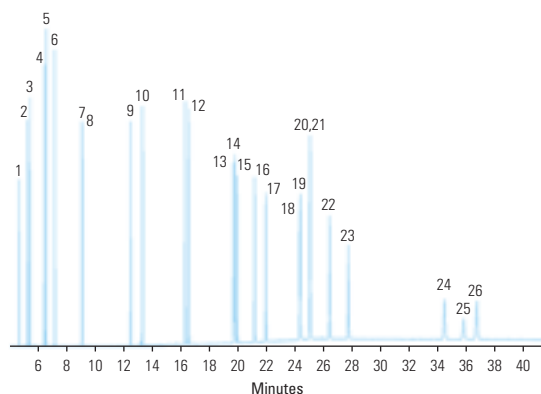
### Applications:

- Pesticides and herbicides
- Rosin acids
- Phthalate esters
- Triglycerides
- Sterols

### Similar to:

- Rxi-17
- DB-17
- DB-608
- VF-17ms
- CP-Sil 24 CB

### Polycyclic Aromatic Hydrocarbons



#### Column: TG-17MS 30m x 0.25mm x 0.25µm

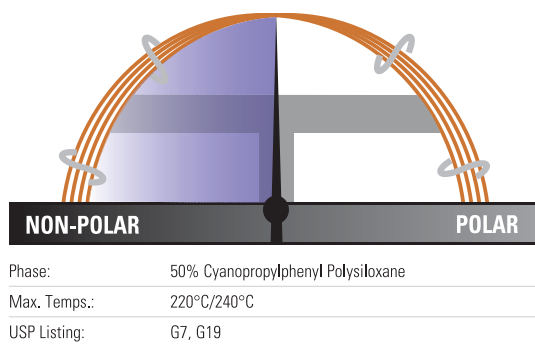
Part Number:	26089-1420
Temperature:	90°C (1.0 minute hold) to 215°C at 25°C/minute (0.5 minute hold) to 235°C at 4°C/minute to 280°C at 15°C/minute to 320°C at 4°C/minute (20 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2mL/min
Injection Volume:	1.0µL
Injection Mode:	Splitless, 300°C

1. naphthalene	14. benzo(k)fluoranthene
2. 1-methylnaphthalene	15. benzo(j)fluoranthene
3. 2-methylnaphthalene	16. benzo(a)pyrene
4. acenaphthylene	17. 3-methylcholanthrene
5. acenaphthene	18. dibenzo(a,h)acridine
6. fluorene	19. dibenzo(a,j)acridine
7. phenanthrene	20. indeno(1,2,3-cd)pyrene
8. anthracene	21. dibenzo(a,h)anthracene
9. fluoranthene	22. benzo(ghi)perylene
10. pyrene	23. 7H-dibenzo(c,g)carbazole
11. benzo(a)anthracene	24. dibenzo(a,e)pyrene
12. chrysene	25. dibenzo(a,i)pyrene
13. benzo(b)fluoranthene	26. dibenzo(a,h)pyrene

## TraceGOLD TG-225MS GC Columns

Offers better thermal stability than comparable columns

- Polar phase, 50% cyano propylmethyl/50% phenylmethyl polysiloxane
- Innovative deactivation process for siloxane reduces tailing and improves efficiency over comparable columns
- Equivalent to USP G7, G19 phases



### TraceGOLD TG-225MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity	
0.25	15	0.25	<b>26083-1300</b>	1 Each	
		0.5	<b>26083-2110</b>	1 Each	
	30	0.25	<b>26083-1420</b>	1 Each	
		0.5	<b>26083-2230</b>	1 Each	
	60	0.25	<b>26083-1540</b>	1 Each	
		0.5	<b>26083-2350</b>	1 Each	
0.32	15	0.25	<b>26083-1310</b>	1 Each	
		0.5	<b>26083-2120</b>	1 Each	
		1.0	<b>26083-2850</b>	1 Each	
	30	0.25	<b>26083-1430</b>	1 Each	
		0.5	<b>26083-2240</b>	1 Each	
		1.0	<b>26083-2970</b>	1 Each	
	60	0.25	<b>26083-1550</b>	1 Each	
		0.5	<b>26083-2360</b>	1 Each	
		1.0	<b>26083-3090</b>	1 Each	
	0.53	15	0.25	<b>26083-1320</b>	1 Each
			0.5	<b>26083-2130</b>	1 Each
			1.0	<b>26083-2860</b>	1 Each
30		0.25	<b>26083-1440</b>	1 Each	
		0.5	<b>26083-2250</b>	1 Each	
		1.0	<b>26083-2980</b>	1 Each	
60		0.5	<b>26083-2370</b>	1 Each	
		1.0	<b>26083-3100</b>	1 Each	

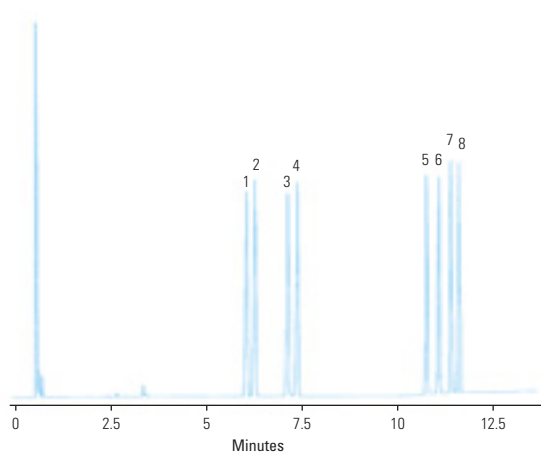
### Applications:

- FAMES
- Carbohydrates
- Sterols
- Flavor compounds

### Similar to:

- Rtx-225
- DB-225
- HP-225
- SPB-225

### Sugars



#### Column: TG-225MS 15m x 0.25mm x 0.25µm

Part Number:	26083-1300
Temperature:	190°C (5 minute hold) to 250°C at 8°C/min (5 minute hold)
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	45cm/sec
Injection Volume:	0.5µL
Injection Mode:	Split (35:1), 260°C

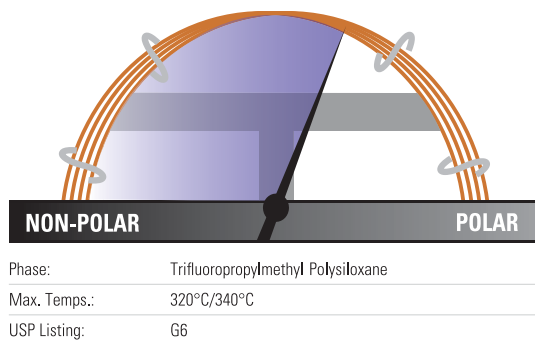
1. rhamnitol	5. mannitol
2. fucitol	6. galactitol
3. ribitol	7. glucitol
4. arabinitol	8. inositol



## TraceGOLD TG-200MS GC Columns

Exceptionally inert mid-polarity columns with selectivity and elution order optimized for difficult separations

- Polar phase, trifluoropropylmethyl polysiloxane solid phase resolves compounds that phenyl and cyano phases cannot
- Outstanding thermal stability and low bleed
- Suitable for use with sensitive detectors including ECDs, NPDs and MS
- Equivalent to USP G6 phase
- Confirmation column in combination with another GC column



### TraceGOLD TG-200MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	30	0.25	<b>26084-1420</b>	1 Each
		0.5	<b>26084-2230</b>	1 Each
		1.0	<b>26084-2960</b>	1 Each
0.32	30	0.25	<b>26084-1430</b>	1 Each
		0.5	<b>26084-2240</b>	1 Each
		1.0	<b>26084-2970</b>	1 Each

### Applications:

- Solvents
- Fluorocarbons
- Alcohols and ketones
- Silanes
- Glycols

### Similar to:

- Rtx-200MS
- DB-200
- DB-210

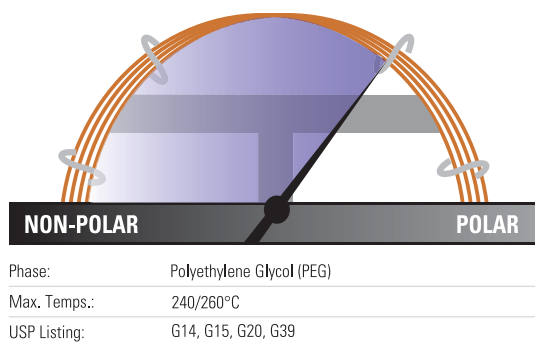




## TraceGOLD TG-WaxMS GC Columns

Manufactured for better column-to-column reproducibility

- Polar phase, polyethylene glycol
- Polar-deactivated surface tightly binds polymer for excellent thermal stability
- Resists oxidative damage, damage from strongly acidic or basic volatiles better than silicone solid phases
- Equivalent to USP G14, G15, G16, G20 and G39 phases



### TraceGOLD TG-WaxMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity	
0.1	10	0.1	<b>26088-0200</b>	1 Each	
		0.25	<b>26088-1300</b>	1 Each	
0.25	15	0.5	<b>26088-2110</b>	1 Each	
		0.25	<b>26088-1420</b>	1 Each	
	30	0.5	<b>26088-2230</b>	1 Each	
		0.25	<b>26088-1540</b>	1 Each	
	60	0.5	<b>26088-2350</b>	1 Each	
		0.25	<b>26088-1310</b>	1 Each	
0.32	15	0.5	<b>26088-2120</b>	1 Each	
		1.0	<b>26088-2850</b>	1 Each	
		0.25	<b>26088-1430</b>	1 Each	
	30	0.5	<b>26088-2240</b>	1 Each	
		1.0	<b>26088-2970</b>	1 Each	
		0.25	<b>26088-1550</b>	1 Each	
	60	0.5	<b>26088-2360</b>	1 Each	
		1.0	<b>26088-3090</b>	1 Each	
		0.25	<b>26088-1320</b>	1 Each	
	0.53	15	0.5	<b>26088-2130</b>	1 Each
			1.0	<b>26088-2860</b>	1 Each
			1.5	<b>26088-3340</b>	1 Each
0.25			<b>26088-1440</b>	1 Each	
0.5			<b>26088-2250</b>	1 Each	
30		1.0	<b>26088-2980</b>	1 Each	
		1.5	<b>26088-3360</b>	1 Each	
		0.25	<b>26088-1560</b>	1 Each	
		0.5	<b>26088-2370</b>	1 Each	
		1.0	<b>26088-3100</b>	1 Each	
60		1.5	<b>26088-3370</b>	1 Each	

### Applications:

- FAMES
- Flavor compounds and essential oils
- Solvents
- Xylene isomers
- EPA Method 603 for Acrolein/ Acrylonitrile

### Similar to:

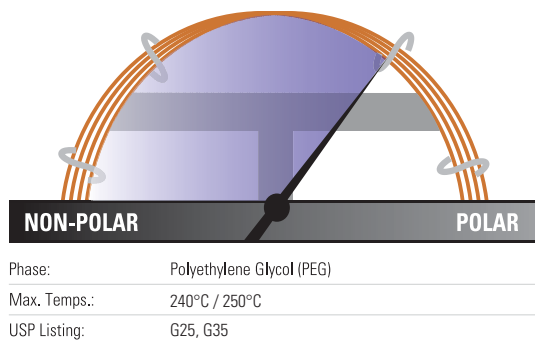
- DB-WAX
- DB-WAXetr
- HP-Wax
- HP-Innowax
- Supelcowax 10
- CP-Wax 52 CB
- Stabilwax
- Rtx-Wax
- BP20
- ZB-Wax
- Optima Wax
- AT-Wax

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## TraceGOLD TG-WaxMS A GC Columns

Acidic functionality in the polymer structure allows analysis of acidic compounds without derivatization

- Polar phase, acid-deactivated polyethylene glycol
- Resists oxidative damage and adsorption of acids
- Excellent peak shapes for high MW acids
- Equivalent to USP G25, G35 phases



### TraceGOLD TG-WaxMS A GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity	
0.25	15	0.25	<b>26087-1300</b>	1 Each	
		0.5	<b>26087-2110</b>	1 Each	
	30	0.25	<b>26087-1420</b>	1 Each	
		0.5	<b>26087-2230</b>	1 Each	
	60	0.25	<b>26087-1540</b>	1 Each	
		0.5	<b>26087-2350</b>	1 Each	
0.32	15	0.25	<b>26087-1310</b>	1 Each	
		0.5	<b>26087-2120</b>	1 Each	
		1.0	<b>26087-2850</b>	1 Each	
	30	0.25	<b>26087-1430</b>	1 Each	
		0.5	<b>26087-2240</b>	1 Each	
		1.0	<b>26087-2970</b>	1 Each	
	60	0.25	<b>26087-1550</b>	1 Each	
		0.5	<b>26087-2360</b>	1 Each	
		1.0	<b>26087-3090</b>	1 Each	
	0.53	15	0.25	<b>26087-1320</b>	1 Each
			0.5	<b>26087-2130</b>	1 Each
			1.0	<b>26087-2860</b>	1 Each
1.5			<b>26087-3340</b>	1 Each	
30		0.25	<b>26087-1440</b>	1 Each	
		0.5	<b>26087-2250</b>	1 Each	
		1.0	<b>26087-2980</b>	1 Each	
60		1.5	<b>26087-3360</b>	1 Each	
		0.25	<b>26087-1560</b>	1 Each	
		0.5	<b>26087-2370</b>	1 Each	
1.0		<b>26087-3100</b>	1 Each		
		1.5	<b>26087-3370</b>	1 Each	

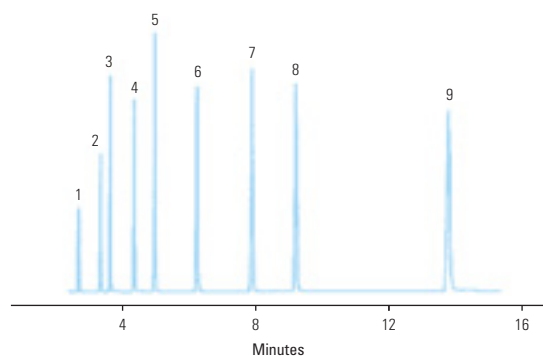
### Applications:

- Organic acids
- Free fatty acids
- Alcohols

### Similar to:

- DB-FFAP
- HP-FFAP
- NUKOL
- OV-351
- CP-Wax 58 CB
- FFAP
- Stabilwax-DA
- BP-21
- Optima FFAP

### Free Fatty Acids



#### Column: TG-WaxMS A 30m x 0.25mm x 0.25µm

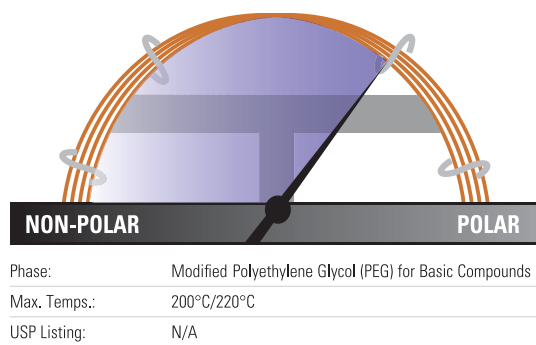
Part Number:	26087-1420
Temperature:	145°C Isothermal
Detector Type:	FID
Carrier Gas:	Hydrogen
Flow Rate:	40cm/sec
Injection Volume:	1.0µL
Injection Mode:	Split (50:1), 250°C

- |                    |                    |
|--------------------|--------------------|
| 1. acetic acid     | 6. n-valeric acid  |
| 2. propionic acid  | 7. isocaproic acid |
| 3. isobutyric acid | 8. caproic acid    |
| 4. n-butyric acid  | 9. heptanoic acid  |
| 5. isovaleric acid |                    |

## TraceGOLD TG-WaxMS B GC Columns

Base deactivation allows analysis of basic analytes without derivatization or column priming

- Polar phase, base deactivated polyethylene glycol phase
- Reduced absorption and improved responsiveness for basic compounds
- Not suitable for use with water or alcohols



### TraceGOLD TG-WaxMS B GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	<b>26086-1300</b>	1 Each
		0.25	<b>26086-1420</b>	1 Each
		0.5	<b>26086-2230</b>	1 Each
0.32	15	0.25	<b>26086-1310</b>	1 Each
		1.0	<b>26086-2850</b>	1 Each
		0.25	<b>26086-1430</b>	1 Each
	30	0.5	<b>26086-2240</b>	1 Each
		1.0	<b>26086-2970</b>	1 Each
		1.0	<b>26086-3090</b>	1 Each
0.53	15	1.0	<b>26086-2860</b>	1 Each
		0.5	<b>26086-2250</b>	1 Each
	30	1.0	<b>26086-2980</b>	1 Each
		1.5	<b>26086-3360</b>	1 Each
		1.0	<b>26086-3100</b>	1 Each

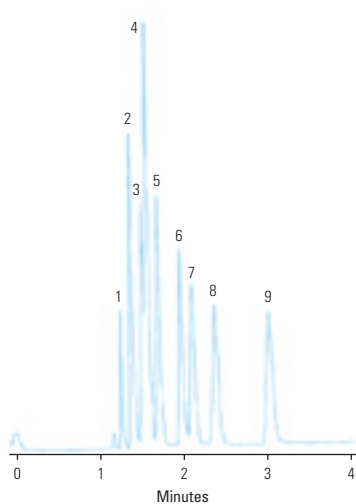
### Applications:

- Amines
- Alkylamines
- Diamines
- Other basic compounds

### Similar to:

- CAM
- Carbowax Amine
- CP Wax51
- Stabilwax-DB

### Amines



#### Column: TG-WaxMS B 30m x 0.53mm x 1.0µm

Part Number: 26086-2980  
 Temperature: 45°C Isothermal  
 Detector Type: FID  
 Carrier Gas: Hydrogen  
 Flow Rate: 40cm/sec  
 Injection Volume: 1µL  
 Injection Mode: Direct Injection, 250°C

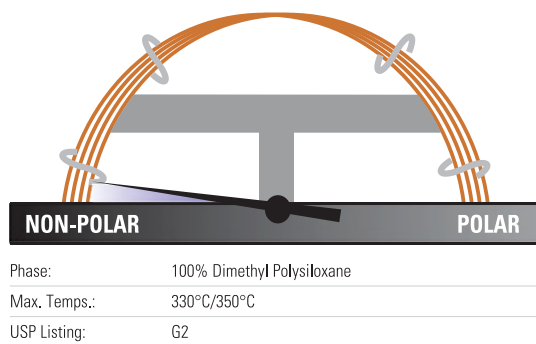
- |                   |                    |
|-------------------|--------------------|
| 1. trimethylamine | 6. n-propylamine   |
| 2. dimethylamine  | 7. tert-butylamine |
| 3. ethylamine     | 8. diethylamine    |
| 4. methylamine    | 9. sec-butylamine  |
| 5. isopropylamine |                    |

## TraceGOLD GC Columns with SafeGuard

Extend your column lifetime without compromising performance

- Prolong the lifetime of an analytical GC column
- No impact upon performance when cutting column during routine maintenance
- Available in a range of phases to meet many application needs

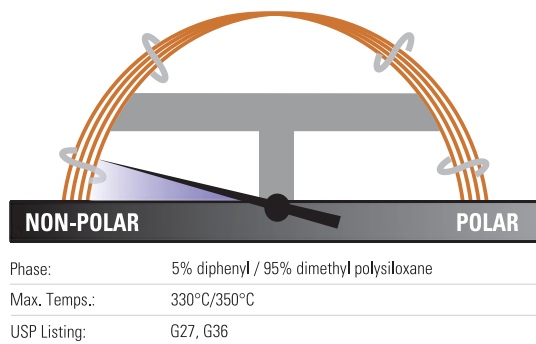
### TraceGOLD TG-1MS GC Columns with SafeGuard



#### TraceGOLD TG-1MS GC Columns with SafeGuard

ID (mm)	Length (m)	Film Thickness (µm)	SafeGuard Length (m)	Cat. No.	Quantity
0.25	30	0.25	5	<b>26099-1425</b>	1 Each
0.53	30	1.0	5	<b>26099-2985</b>	1 Each
		5.0	5	<b>26099-4705</b>	1 Each

### TraceGOLD TG-5MS GC Columns with SafeGuard

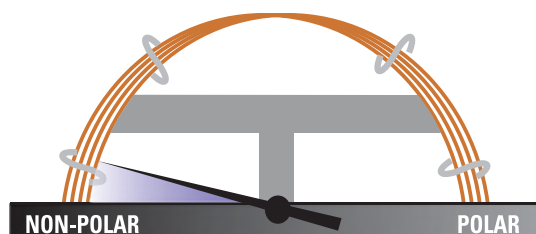


#### TraceGOLD TG-5MS GC Columns with SafeGuard

ID (mm)	Length (m)	Film Thickness (µm)	SafeGuard Length (m)	Cat. No.	Quantity
0.18	20	0.18	5	<b>26098-5785</b>	1 Each
0.25	15	0.25	5	<b>26098-1305</b>	1 Each
	30	0.1	5	<b>26098-0475</b>	1 Each
		0.25	5	<b>26098-1425</b>	1 Each
		0.5	5	<b>26098-2235</b>	1 Each
0.32	30	0.25	5	<b>26098-1435</b>	1 Each

## TraceGOLD TG-5SILMS GC Columns with SafeGuard

SafeGuard is an integrated guard on the GC Column



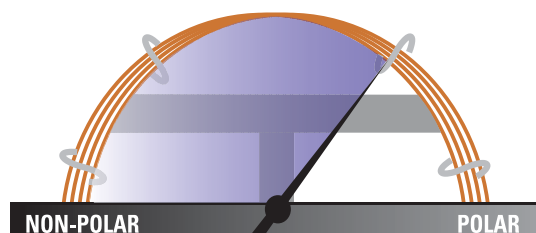
Phase:	Similar to 5% Phenyl Methylpolysiloxane
Max. Temps.:	330°C/350°C
USP Listing:	G27, G36

### TraceGOLD TG-5SILMS GC Columns with SafeGuard

ID (mm)	Length (m)	Film Thickness (μm)	SafeGuard Length (m)	Cat. No.	Quantity
0.25	15	0.25	10	<b>26096-1301</b>	1 Each
	30	0.25	5	<b>26096-1425</b>	1 Each
		0.25	10	<b>26096-1421</b>	1 Each
		0.5	5	<b>26096-2235</b>	1 Each
0.32	30	0.5	5	<b>26096-2245</b>	1 Each

## TraceGOLD TG-WaxMS GC Columns with SafeGuard

SafeGuard is an integrated guard on the GC Column



Phase:	Polyethylene Glycol (PEG)
Max. Temps.:	240/260°C
USP Listing:	G14, G15, G20, G39

### TraceGOLD TG-WaxMS GC Columns with SafeGuard

ID (mm)	Length (m)	Film Thickness (μm)	SafeGuard Length (m)	Cat. No.	Quantity
0.25	15	0.25	5	<b>26088-1305</b>	1 Each
	30	0.25	10	<b>26088-1421</b>	1 Each
	0.32	30	0.25	5	<b>26088-1435</b>

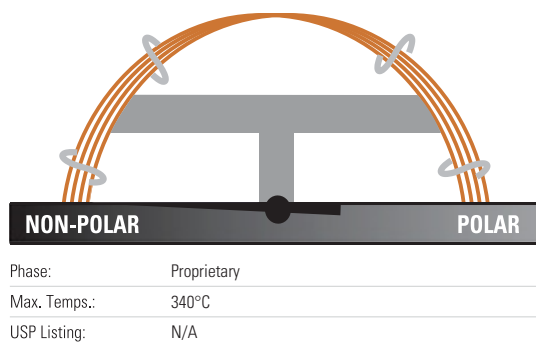
Trying to find the right column for your separation?  
Use our column selection guides

➤ PAGE 3-005

## TraceGOLD TG-OCP I / TG-OCP II GC Columns

Application-specific columns for organochlorine pesticides and herbicides

- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Fast analysis time giving full separation of chlorinated pesticides
- Ideal for US EPA methods 8081, 608 and CLP



### TraceGOLD TG-OCP I GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	<b>26078-0200</b>	1 Each
0.18	10	0.18	<b>26078-1510</b>	1 Each
	20	0.18	<b>26078-5780</b>	1 Each
0.25	15	0.25	<b>26078-1300</b>	1 Each
	30	0.25	<b>26078-1420</b>	1 Each
	60	0.25	<b>26078-1540</b>	1 Each
0.32	15	0.5	<b>26078-2120</b>	1 Each
	30	0.32	<b>26078-5760</b>	1 Each
		0.5	<b>26078-2240</b>	1 Each
0.53	15	0.5	<b>26078-2130</b>	1 Each
	30	0.5	<b>26078-2250</b>	1 Each

### Applications:

- Organochlorine pesticides
- Herbicides

### Similar to:

- Rtx-CLPesticides/  
Rtx-CLPesticides2

### TraceGOLD TG-OCP II GC Columns

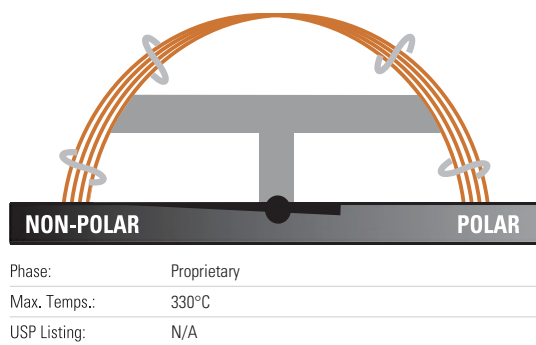
ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	<b>26077-0200</b>	1 Each
	20	0.1	<b>26077-1450</b>	1 Each
0.18	10	0.14	<b>26077-5700</b>	1 Each
	20	0.14	<b>26077-5690</b>	1 Each
0.25	15	0.2	<b>26077-5730</b>	1 Each
	30	0.2	<b>26077-5720</b>	1 Each
	60	0.2	<b>26077-5710</b>	1 Each
0.32	15	0.25	<b>26077-1310</b>	1 Each
		0.25	<b>26077-1430</b>	1 Each
	30	0.5	<b>26077-2240</b>	1 Each
0.53	15	0.42	<b>26077-5750</b>	1 Each
	30	0.42	<b>26077-5740</b>	1 Each



## TraceGOLD TG-OPP I / TG-OPP II GC Columns

Application-specific columns for organophosphorus pesticides

- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Fast analysis time giving full separation of organophosphorus pesticides
- Ideal for US EPA methods 8141A



### TraceGOLD TG-OPP I GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	30	0.25	<b>26076-1420</b>	1 Each
0.32	30	0.5	<b>26076-2240</b>	1 Each
0.53	30	0.83	<b>26076-0690</b>	1 Each

### TraceGOLD TG-OPP II GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	0.2	<b>26076-1580</b>	1 Each
0.25	30	0.25	<b>26075-1420</b>	1 Each
0.32	30	0.32	<b>26075-5760</b>	1 Each
0.53	30	0.5	<b>26075-2250</b>	1 Each

### Applications:

- Organophosphorus pesticides

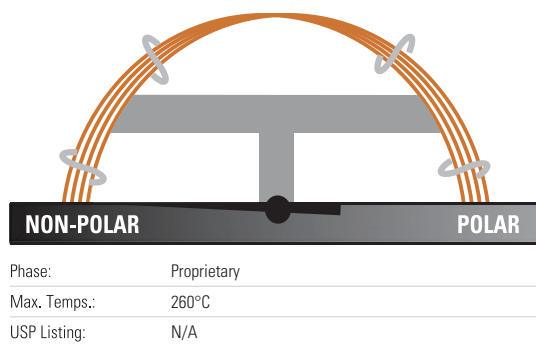
### Similar to:

- Rtx-OPPesticides/  
Rtx-OPPesticides2

## TraceGOLD TG-ALC I / ALC II GC Columns

Application-specific columns for blood alcohol analysis

- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Fast analysis time giving full separation of blood alcohols



### TraceGOLD TG-ALC I GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	30	1.8	<b>26074-3390</b>	1 Each
0.53	30	3.0	<b>26074-3960</b>	1 Each

### TraceGOLD TG-ALC II GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	30	1.20	<b>26073-2260</b>	1 Each
0.53	30	2.00	<b>26073-2200</b>	1 Each

#### Applications:

- Blood alcohol analysis
- Abused inhalent anesthetics
- $\gamma$ -hydroxybutyrate (GHB)
- $\gamma$ -butyrolactone (GBL)
- Glycols
- Common industrial solvents

#### Similar to:

- Rtx-BAC1/RTX-BAC2

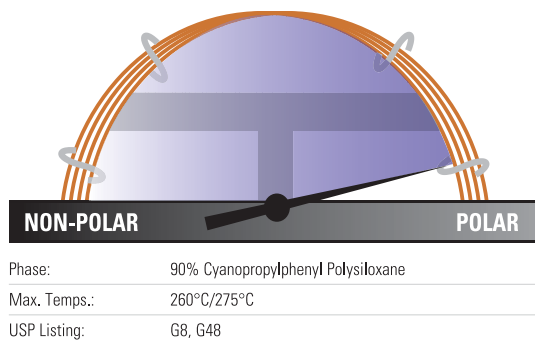
Search thousands of applications  
in our chromatography resource center  
[www.thermoscientific.com/crc](http://www.thermoscientific.com/crc)



## TraceGOLD TG-POLAR GC Columns

Specifically designed polymer and surface treatment overcome traditional problems with high-polarity columns

- Highly polar phase, 90% biscyanopropyl/10% phenylcyanopropyl polysiloxane, not bonded
- Strong dipole moment and high selectivity for cis/trans compounds or compounds with conjugated double bonds
- Equivalent to USP G8 and G48



### TraceGOLD TG-POLAR GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	30	0.1	<b>26082-0470</b>	1 Each
		0.2	<b>26082-5010</b>	1 Each
	60	0.1	<b>26082-0590</b>	1 Each
		0.2	<b>26082-5020</b>	1 Each
	105	0.1	<b>26082-5000</b>	1 Each
		0.2	<b>26082-5030</b>	1 Each
0.32	30	0.2	<b>26082-5040</b>	1 Each
	60	0.2	<b>26082-5050</b>	1 Each
	105	0.2	<b>26082-5060</b>	1 Each
0.53	30	0.1	<b>26082-0490</b>	1 Each
		0.2	<b>26082-5070</b>	1 Each
	60	0.1	<b>26082-0610</b>	1 Each
		0.2	<b>26082-5080</b>	1 Each

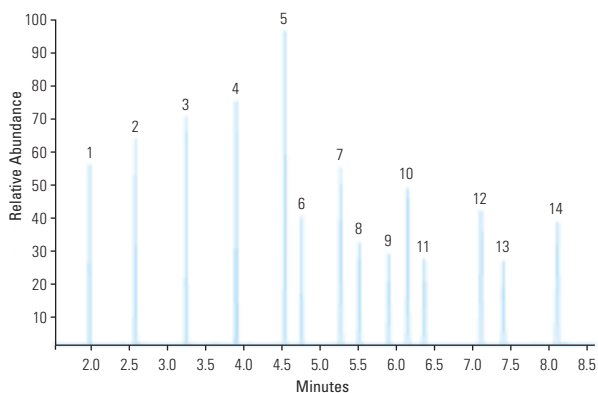
### Applications:

- Cis/Trans FAMES
- Dioxins

### Similar to:

- DB-23
- HP-23
- Rtx-2330
- SP-2330
- SP-2380
- SPB-2560
- HP-88
- Silar 10c
- CP-Sil 88 FAME
- CP-Sil 88
- BPX 70
- BPX 90

### FAMES C8-C24



#### Column: TG-POLAR 30m x 0.25mm x 0.25µm

Part Number:	26082-1420
Temperature:	100°C (0.5 minute hold) to 195°C at 25°C/minute (1 minute hold) to 250°C at 10°C/minute (3 minute hold)
Detector Type:	MS
Carrier Gas:	He
Flow Rate:	1.2mL/min
Injection Volume:	0.1µL
Injection Mode:	Split (100:1), 250°C

- |                        |                               |
|------------------------|-------------------------------|
| 1. Methyl octanoate    | 9. Methyl linoleate           |
| 2. Methyl decanoate    | 10. Methyl linolenate         |
| 3. Methyl decanoate    | 11. Methyl arachidate         |
| 4. Methyl myristate    | 12. Methyl behenate           |
| 5. Methyl palmitate    | 13. Methyl cis-13-docosanoate |
| 6. Methyl palmitoleate | 14. Methyl tetracosanoate     |
| 7. Methyl stearate     |                               |
| 8. Methyl oleate       |                               |

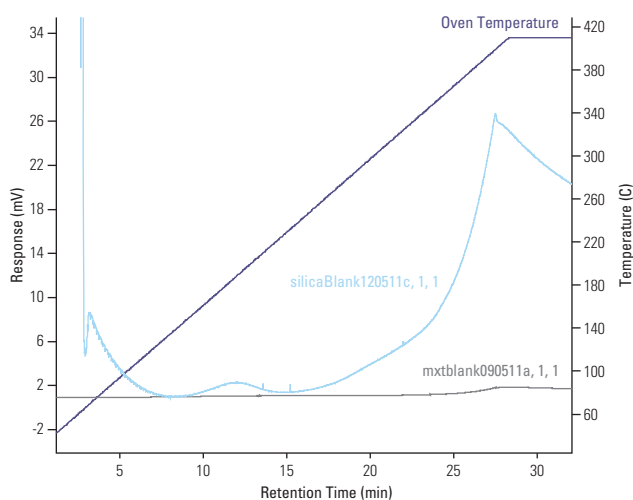
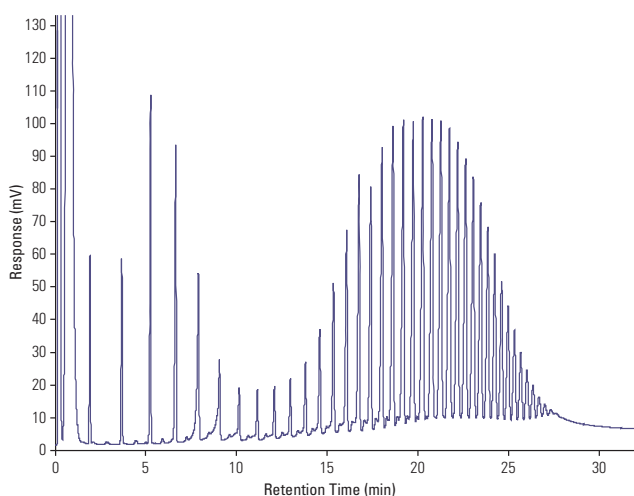
# TraceGOLD Metal Columns – Technical Information

Push the limits of your analyses

Your analysis is critical, so your tools are critical. Thermo Scientific TraceGOLD GC Metal Columns are proven to withstand the stress of elevated temperatures and highly active compounds, without any breakdown or column bleed.

Thermo Scientific TraceGOLD Metal Columns enable the user to work at higher temperatures with no compromise on performance. The columns also withstand added stress and perform to the high standard expected from a TraceGOLD Column when analysing highly active and aggressive compounds.

TraceGOLD Metal Column	Temperature Range (°C)
TG-1MT	-60 to 430
TG-5MT	-60 to 430
TG-WaxMT	+40 to 260



**Left:** A simulated distillation chromatogram shows carbon range C12-C90 using a TG-1MT metal GC column.

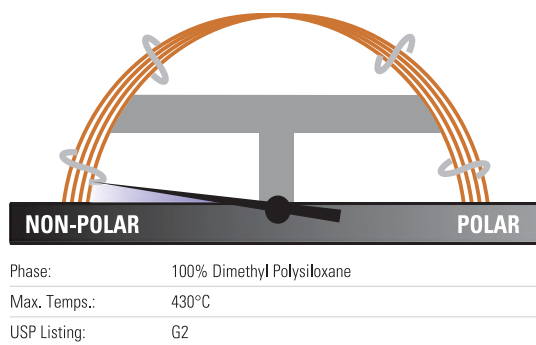
**Right:** This chromatogram shows the relative amounts of column bleed using a TG-1MT GC column against a TR-SimDist GC column when running a blank. As can be seen, the TG-1MT shows significantly lower bleed levels once the temperature rises above 300°C.



## TraceGOLD TG-1MT Metal GC Columns

Metal columns for elevated temperature use

- Non-polar, 100% dimethyl polysiloxane
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Equivalent to USP G1, G2, G38 phases



### TraceGOLD TG-1MT Metal GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	<b>26M99-1300</b>	1 Each
	30	0.25	<b>26M99-1420</b>	1 Each
		0.5	<b>26M99-2230</b>	1 Each
		1.0	<b>26M99-2960</b>	1 Each
0.53	60	0.25	<b>26M99-1540</b>	1 Each
	6	0.15	<b>26M99-4100</b>	1 Each
		0.5	<b>26M99-2130</b>	1 Each
	15	1.0	<b>26M99-2860</b>	1 Each
		0.25	<b>26M99-1440</b>	1 Each
		0.5	<b>26M99-2250</b>	1 Each
		1.0	<b>26M99-2980</b>	1 Each
		1.5	<b>26M99-3360</b>	1 Each
		3.0	<b>26M99-3960</b>	1 Each

### Applications:

- Hydrocarbons
- Solvent impurities
- PCB congeners
- Aroclor mixes
- Simulated distillation
- Drugs of abuse
- Natural gas odorants
- Essential oils
- Pesticides

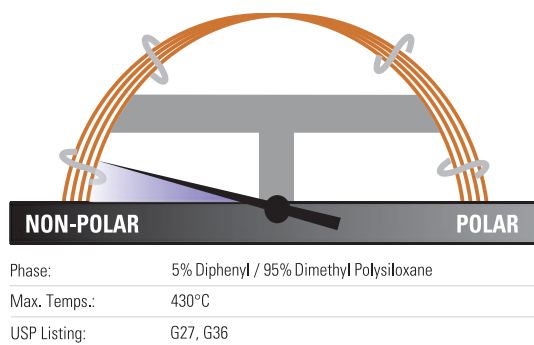
### Similar to:

- MXT-1
- DB-1
- DB-1MS
- HP-1
- HP-1MS
- Ultra-1
- SPB-1
- Equity-1
- MDN-1
- CP-Sil 5 CB
- VF-1ms
- ZB-1HT

## TraceGOLD TG-5MT Metal GC Columns

The most widely used MS phase in gas chromatography

- Low polarity phase, 5% diphenyl/95% dimethyl polysiloxane
- Low bleed for excellent signal-to-noise ratio, sensitivity and mass spectral integrity
- Exceptional inertness ideal for analysis of active compounds



### TraceGOLD TG-5MT Metal GC Columns

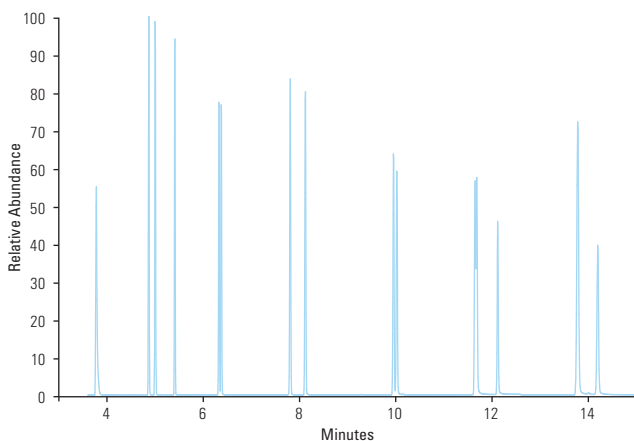
ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.1	<b>26M98-0350</b>	1 Each
		0.25	<b>26M98-1300</b>	1 Each
		0.5	<b>26M98-2230</b>	1 Each
	30	0.25	<b>26M98-1420</b>	1 Each
		0.5	<b>26M98-2230</b>	1 Each
		1.0	<b>26M98-2960</b>	1 Each
0.53	15	0.25	<b>26M98-1540</b>	1 Each
		0.5	<b>26M98-2250</b>	1 Each
		1.0	<b>26M98-2980</b>	1 Each
	30	0.25	<b>26M98-1440</b>	1 Each
		0.5	<b>26M98-2250</b>	1 Each
		1.0	<b>26M98-2980</b>	1 Each
		1.5	<b>26M98-3360</b>	1 Each
		3.0	<b>26M98-3960</b>	1 Each

### Applications:

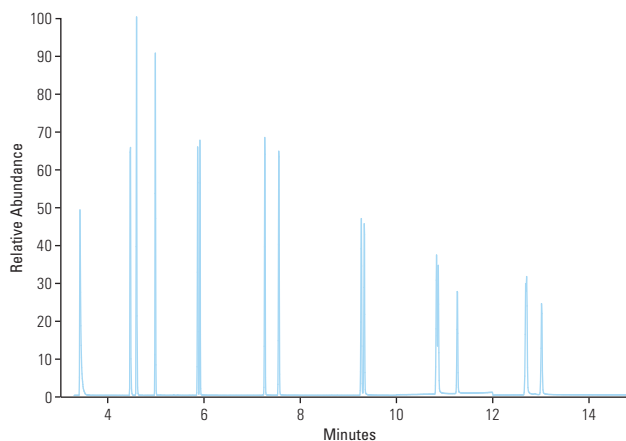
- Drugs
- Solvent impurities
- Pesticides
- Hydrocarbons
- PCB congeners
- Essential oils
- Semivolatiles

### Similar to:

- MXT-5
- DB-5
- HP-5
- HP-5MS
- Ultra-2
- SPB-5
- Equity-5
- MDN-5
- CP-Sil 8 CB
- ZB-5HT



Sample TIC chromatogram of 16 PAHs analyzed on a TG-5MT metal GC column.



Sample TIC chromatogram of 16 PAHs analyzed on a TG-5MS GC column.

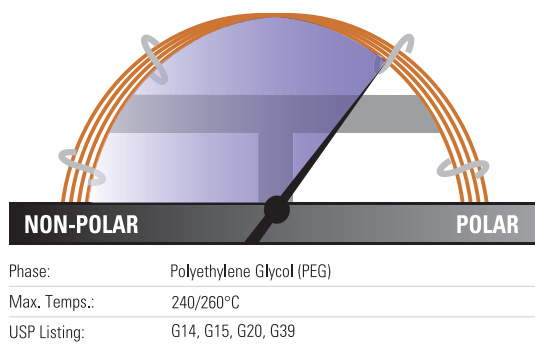
Only 15 peaks shown as Indeno(1,2,3-cd)pyrene and Dibenzo(a,h)anthracene coelute (seperatable using MS). These chromatograms illustrate that the chromatography is not adversely affected by using a metal column over a silica column.



## TraceGOLD TG-WaxMT Metal GC Columns

Manufactured for better column-to-column reproducibility

- Polar phase, polyethylene glycol
- Polar-deactivated surface tightly binds polymer for excellent thermal stability
- Resists oxidative damage, damage from strongly acidic or basic volatiles better than silicone solid phases
- Equivalent to USP G14, G15, G16, G20 and G39 phases



### TraceGOLD TG-WaxMT Metal GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.1	<b>26M88-0350</b>	1 Each
		0.25	<b>26M88-1300</b>	1 Each
	30	0.25	<b>26M88-1420</b>	1 Each
		0.5	<b>26M88-2230</b>	1 Each
	60	0.25	<b>26M88-1540</b>	1 Each
		0.53	15	0.5
1.0	<b>26M88-2860</b>			1 Each
30	0.25		<b>26M88-1440</b>	1 Each
	0.5		<b>26M88-2250</b>	1 Each
60	1.0		<b>26M88-2880</b>	1 Each
	1.5		<b>26M88-3360</b>	1 Each

### Applications:

- FAMES
- Flavor compounds
- Essential oils
- Amines
- Solvents
- Xylene isomers
- EPA Method 603 for Acrolein/ Acrylonitrile

### Similar to:

- MXT-WAX
- DB-WAX
- DB-WAXetr
- HP-Wax
- HP-Innowax
- Supelcowax 10
- CP-Wax 52 CB

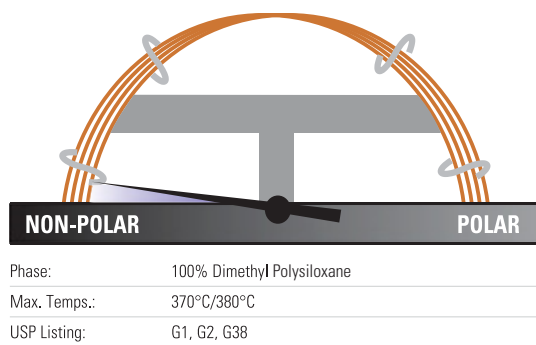
*We have vials for any instrument  
and any application, visit*

**» PAGE 1-001**

## TRACE TR-1MS GC Columns

Extremely low-bleed non-polar columns suitable for GC/MS applications

- Non-polar phase, 100% dimethyl polysiloxane
- High operating temperature
- Inert phase suited for environmental analyses



### TRACE TR-1MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	30	0.1	<b>260B047P</b>	1 Each
		0.25	<b>260B142P</b>	1 Each
	60	0.25	<b>260B154P</b>	1 Each
0.32	30	0.25	<b>260B143P</b>	1 Each
	60	0.25	<b>260B155P</b>	1 Each
		1.0	<b>260B309P</b>	1 Each

### Applications:

- Chlorinated and nitroaromatic compounds
- GC/MS environmental analyses

### Similar to:

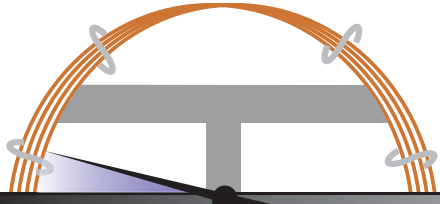
- DB-1
- DB-Petro
- BP1
- HP-1
- HP-1MS
- Rtx-1
- Ultra-1
- SPB-1
- SPB-1 Sulfur
- Petrocol DH
- CP-Sil 5CB
- RSL-150
- RSL-160
- ZB-1
- CB-1
- OV-1
- PE-1
- 007-1(MS)
- SP-2100
- SE-30
- RH-1
- CC-1
- CP-Sil 5CB MS
- VF-1ms



## TRACE TR-5 GC Columns

Excellent starting columns for method development, capable of performing most required separations

- Non-polar phase, 5% phenyl methyl polysiloxane
- High operating temperature and extremely low bleed
- Widely used in a variety of applications



NON-POLAR	POLAR
Phase:	5% Phenyl Methylpolysiloxane
Max. Temps.:	340°C/350°C for films ≤1.5µm 280°C/300°C for films >1.5µm
USP Listing:	G27, G36

### TRACE TR-5 GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	7	0.25	<b>260E113P</b>	1 Each
	15	0.25	<b>260E130P</b>	1 Each
	30	0.25	<b>260E142P</b>	1 Each
	60	0.5	<b>260E223P</b>	1 Each
	60	0.25	<b>260E154P</b>	1 Each
0.32	15	0.25	<b>260E131P</b>	1 Each
	30	0.25	<b>260E143P</b>	1 Each
		0.5	<b>260E224P</b>	1 Each
		1.0	<b>260E297P</b>	1 Each
	60	0.25	<b>260E155P</b>	1 Each
		1.0	<b>260E309P</b>	1 Each
	100	0.5	<b>260E242P</b>	1 Each
0.53	15	1.0	<b>260E286P</b>	1 Each
	30	0.5	<b>260E225P</b>	1 Each
		1.0	<b>260E298P</b>	1 Each
		1.5	<b>260E336P</b>	1 Each
		5.0	<b>260E470P</b>	1 Each

### Applications:

- Alcohols
- Free fatty acids
- Aromatics
- Flavors
- Low polarity pesticides

### Similar to:

- DB-5
- BP5
- Rtx-5
- HP-5
- Ultra-2
- PTE-5
- SPB5
- MDN-5
- CP-Sil 8CB
- SPB-5
- AT-5
- ZB-5
- 007-2(MPS-5)
- SE-52
- SE-54

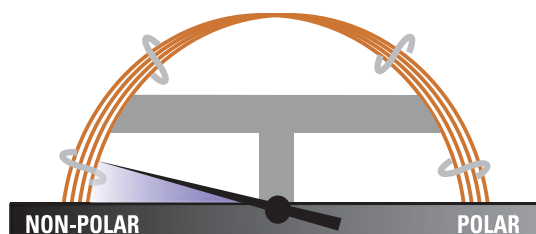
Thermo Scientific SOLA SPE Columns are revolutionizing sample preparation, visit

» PAGE 2-007

## TRACE TR-5MS GC Columns

Feature a popular GCMS phase for many applications

- Non-polar phase, 5% phenyl polysilphenylene-siloxane
- Low bleed and high stability
- High signal-to-noise ratio for increased sensitivity
- High robustness to oxygen and water contamination



Phase:	5% Phenyl Polysilphenylene-siloxane
Max. Temps.:	360°C/370°C for films ≤1.5µm 350°C/360°C for films >1.5µm
USP Listing:	G27, G36

### TRACE TR-5MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	<b>260F020P</b>	1 Each
0.15	25	0.25	<b>260F134P</b>	1 Each
0.18	20	0.18	<b>260F578P</b>	1 Each
0.25	15	0.1	<b>260F035P</b>	1 Each
		0.25	<b>260F130P</b>	1 Each
		1.0	<b>260F284P</b>	1 Each
		0.1	<b>260F047P</b>	1 Each
		0.25	<b>260F142P</b>	1 Each
		0.25	<b>260F142J</b>	1 Each
		0.5	<b>260F223P</b>	1 Each
0.25	30	1.0	<b>260F296P</b>	1 Each
		0.25	<b>260F154P</b>	1 Each
		1.0	<b>260F308P</b>	1 Each
		0.1	<b>260F024P</b>	1 Each
		1.0	<b>260F285P</b>	1 Each
0.32	10	0.1	<b>260F024P</b>	1 Each
		1.0	<b>260F285P</b>	1 Each
		0.25	<b>260F143P</b>	1 Each
		0.5	<b>260F224P</b>	1 Each
		1.0	<b>260F297P</b>	1 Each
		1.0	<b>260F309P</b>	1 Each
		0.25	<b>260F155P</b>	1 Each
0.32	60	1.0	<b>260F308P</b>	1 Each
		0.25	<b>260F154P</b>	1 Each
		1.0	<b>260F296P</b>	1 Each
0.53	100	0.5	<b>260F242P</b>	1 Each
		0.5	<b>260F213P</b>	1 Each
		3.0	<b>260F384P</b>	1 Each
		0.5	<b>260F225P</b>	1 Each
		1.0	<b>260F298P</b>	1 Each
		1.5	<b>260F336P</b>	1 Each
		3.0	<b>260F396P</b>	1 Each
		0.5	<b>260F213P</b>	1 Each
		3.0	<b>260F384P</b>	1 Each
		0.5	<b>260F225P</b>	1 Each

### Applications:

- Hydrocarbons
- Solvents
- Pesticides
- Herbicides
- Phenols
- Amines

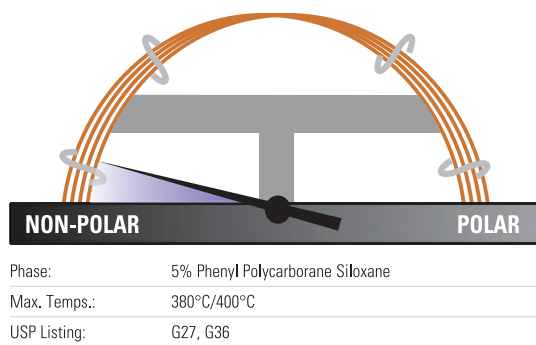
### Similar to:

- DB-5
- DB-5MS
- DB-5.625 XTI-5
- BPX5
- Rtx-5MS
- Rtx-5
- SiIMS
- AT-5
- AT-5MS
- 007-5MS
- SPB-5
- CP-Sil 8CB
- Ultra-2
- HP-5
- HP-5MS
- HP5-TA
- SPB-5
- MDN-5S
- VF-5ms
- RSL-200
- CB-5
- OV-5
- PE-5
- 007-2(MP-5)
- SE-52
- SE-54
- PTE-5
- CC-5
- RH-5ms
- ZB-5

## TRACE TR-5HT GC Columns

Feature upper temperature limits as high as 400°C

- Non-polar phase, 5% phenyl polycarborane siloxane
- Allow the elution of higher-boiling hydrocarbons up to C100
- Low bleed even at elevated temperatures



### TRACE TR-5HT GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.1	<b>260H035P</b>	1 Each
	30	0.1	<b>260H047P</b>	1 Each
		0.25	<b>260H142P</b>	1 Each
0.32	12	0.1	<b>260H030P</b>	1 Each

### Applications:

- Hydrocarbons
- Solvents
- Pesticides
- Herbicides
- Phenols
- Amines

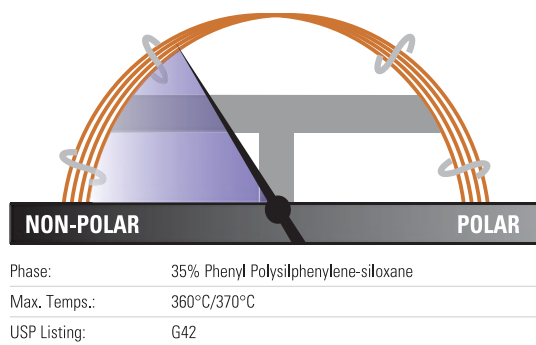
### Similar to:

- DB-5
- BP5
- Rtx-5
- HP-5
- Ultra-2
- PTE-5
- SPB5
- MDN-5
- CP-Sil 8CB
- SPB-5
- AT-5
- ZB-5
- 007-2(MPS-5)
- SE-52
- SE-54

## TRACE TR-35MS GC Columns

Mid-polarity columns excellent for many applications

- Mid-polarity phase, 35% phenyl polysilphenylene-siloxane
- Exceptionally low surface activity
- Low bleed even at elevated temperatures



### TRACE TR-35MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.22	15	0.25	<b>260C129P</b>	1 Each
	25	0.25	<b>260C135P</b>	1 Each
0.25	15	0.25	<b>260C130P</b>	1 Each
	30	0.25	<b>260C142P</b>	1 Each
		0.5	<b>260C223P</b>	1 Each
	60	0.25	<b>260C154P</b>	1 Each
0.32	15	0.25	<b>260C131P</b>	1 Each
	30	0.25	<b>260C143P</b>	1 Each
		0.5	<b>260C224P</b>	1 Each
0.53	15	1.0	<b>260C286P</b>	1 Each
	30	1.0	<b>260C298P</b>	1 Each

### Applications:

- Pesticides
- Herbicides
- Drugs of abuse
- Poly aromatic hydrocarbons
- Pharmaceuticals

### Similar to:

- DB-35
- DB-35MS
- HP-35
- HP-35MS
- MDN-35
- Rtx-35
- SPB-35
- BPX35

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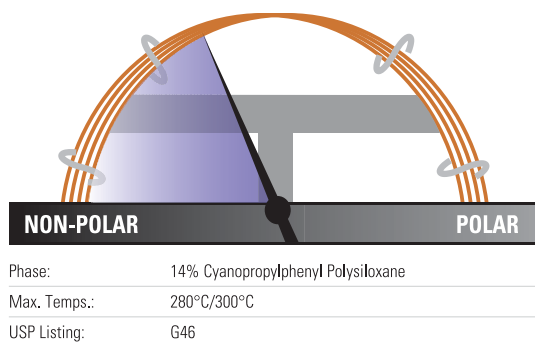




## TRACE TR-1701 GC Columns

Mid-polarity column with alternative selectivity

- Mid-polarity phase, 14% cyanopropylphenyl polysiloxane
- Low bleed even at a high operating temperature
- Excellent starting point for method development
- Suitable for a wide variety of applications



### TRACE TR-1701 GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	30	0.25	<b>260Q142P</b>	1 Each
	60	0.25	<b>260Q154P</b>	1 Each
0.32	15	0.25	<b>260Q131P</b>	1 Each
	30	0.25	<b>260Q143P</b>	1 Each
	60	1.0	<b>260Q309P</b>	1 Each
		0.25	<b>260Q155P</b>	1 Each
0.53	30	1.0	<b>260Q298P</b>	1 Each

### Applications:

- Pesticides
- PCB's
- PAH's
- Organic acids
- Drugs
- Steroids
- EPA 608, 8081

### Similar to:

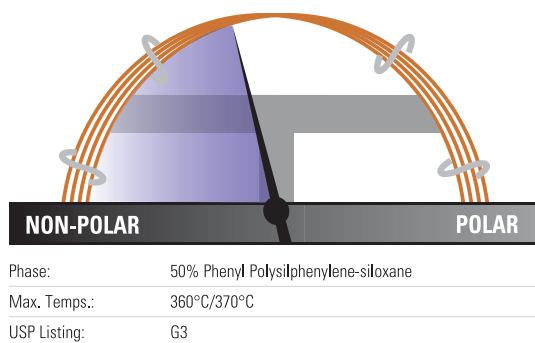
- DB-1701
- Rtx-1701
- HP-1701
- BP10
- OV-1701
- 007-1701
- CP-Sil 19 CB



## TRACE TR-50MS GC Columns

Mid-polarity columns well-suited to GC/MS applications

- Mid-polarity phase, 50% phenyl polysilphenylene-siloxane
- Low bleed decreases MS contamination
- Particularly useful for applications requiring a higher temperature and more polarity than a 5% phenyl column
- Column inertness results in minimal peak tailing and decreased breakdown of sensitive samples



### TRACE TR-50MS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	<b>260R020P</b>	1 Each
0.25	30	0.25	<b>260R130P</b>	1 Each
		0.1	<b>260R047P</b>	1 Each
		0.15	<b>260R050P</b>	1 Each
		0.25	<b>260R142P</b>	1 Each
	60	0.25	<b>260R154P</b>	1 Each
0.32	30	0.25	<b>260R143P</b>	1 Each
0.53	15	0.5	<b>260R213P</b>	1 Each
	30	0.5	<b>260R225P</b>	1 Each

### Applications:

- Herbicides
- Drugs of abuse
- EPA 604, 608, 8060, 8081
- Pharmaceuticals

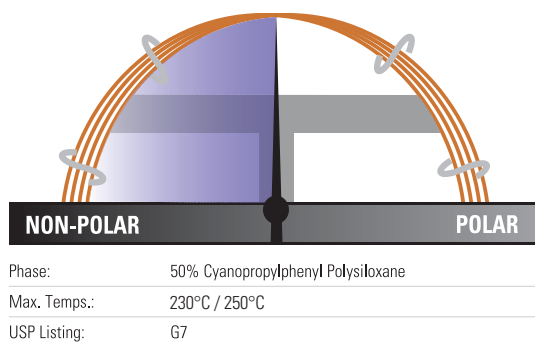
### Similar to:

- OV-17
- SP-2250
- DB-17
- DB-17ms
- DB-17ht
- BPX50
- RtX-50
- SPB-50
- HP-50+
- HP-17
- AT50
- RSL-300
- PE-17
- CC-17
- 007-17 (MPS-50)
- SPB-17
- ZB-50

## TRACE TR-225 GC Columns

Reliable and reproducible performance

- Mid-polarity phase, 50% cyanopropylphenyl polysiloxane
- Low bleed even at elevated temperatures
- Outstanding robustness for difficult separations
- Manufactured to minimize risk of damage from contaminated carrier gas



### TRACE TR-225 GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	<b>260Y130P</b>	1 Each
	30	0.25	<b>260Y142P</b>	1 Each
	60	0.25	<b>260Y154P</b>	1 Each
0.32	25	0.25	<b>260Y137P</b>	1 Each

### Applications:

- Fatty Acid Methyl Esters (FAMES)
- Carbohydrates
- Neutral sterols

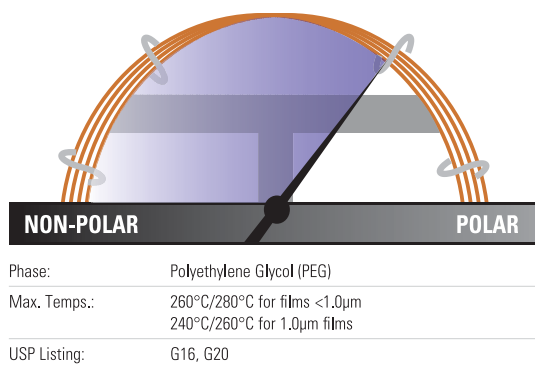
### Similar to:

- DB-225
- HP-225
- RTX-225
- BP225

# TRACE TR-Wax GC Columns

General-purpose, high-polarity columns

- Polar phase, polyethylene glycol
- Highly crosslinked and fully deactivated
- Solvent washable



## TRACE TR-Wax GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.1	<b>260W020P</b>	1 Each
0.25	15	0.25	<b>260W130P</b>	1 Each
		0.25	<b>260W142P</b>	1 Each
	30	0.5	<b>260W223P</b>	1 Each
		1.0	<b>260W296P</b>	1 Each
		0.25	<b>260W154P</b>	1 Each
0.32	15	0.25	<b>260W131P</b>	1 Each
		0.25	<b>260W143P</b>	1 Each
	30	0.5	<b>260W224P</b>	1 Each
		1.0	<b>260W297P</b>	1 Each
		0.25	<b>260W155P</b>	1 Each
	60	0.5	<b>260W236P</b>	1 Each
		1.0	<b>260W309P</b>	1 Each
1.0		<b>260W286P</b>	1 Each	
0.53	15	0.5	<b>260W225P</b>	1 Each
		1.0	<b>260W298P</b>	1 Each
	30	1.0	<b>260W310P</b>	1 Each
		60	1.0	<b>260W310P</b>

### Applications:

- Esters
- Alcohols
- Ketones
- Glycols
- Aromatic isomers

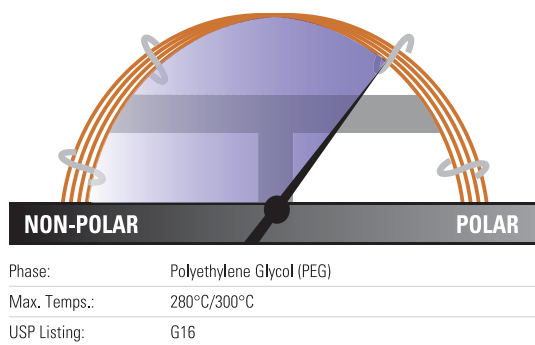
### Similar to:

- DB-Wax
- BP20
- Rtx-Wax
- Stabilwax
- HP20M
- HP-Wax
- HP-INNOWax
- SUPELCOWAX 10
- AT-Wax
- Nukol
- CP Wax52CB
- SUPEROX II
- Carbowax
- PE-WAX
- ZBWAX

## TRACE TR-WaxMS GC Columns

Feature a high-polarity phase designed for mass spectrometry detectors

- Polar phase, polyethylene glycol
- Proprietary bonding method expands operating temperatures
- Extremely low bleed improves sensitivity and library matches
- High stability with oxygen and water



### TRACE TR-WaxMS GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	20	0.1	<b>260X145P</b>	1 Each
0.25	30	0.25	<b>260X142P</b>	1 Each
		0.5	<b>260X223P</b>	1 Each
		1.0	<b>260X296P</b>	1 Each
		0.25	<b>260X154P</b>	1 Each
0.32	60	0.5	<b>260X235P</b>	1 Each
		0.25	<b>260X143P</b>	1 Each
	60	0.5	<b>260X224P</b>	1 Each
0.25		<b>260X155P</b>	1 Each	
1.0		<b>260X309P</b>	1 Each	
0.53	30	1.0	<b>260X298P</b>	1 Each

### Applications:

- Aromatic hydrocarbons
- Food additives
- Essential oils
- Alcohols
- Esters
- Aldehydes
- Ketones

### Similar to:

- DB-Wax
- Rtx-Wax
- Stabilwax
- HP20M
- BP20
- HP-Wax
- HP-INNOWax
- SUPELCOWAX 10
- AT-Wax
- Nukol
- CP Wax 52CB
- ZB-Wax

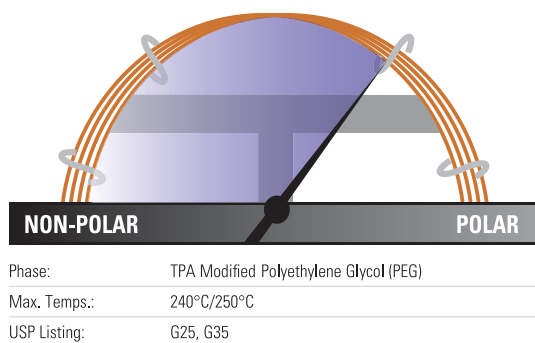
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**▶▶ PAGE 3-080**

## TRACE TR-FFAP GC Columns

High-polarity phase optimized for FFAP analysis

- Polar phase, TPA modified polyethylene glycol
- Bonded FFAP phase
- Quality tested for acidic compound analysis



### TRACE TR-FFAP Capillary GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.25	15	0.25	<b>260N130P</b>	1 Each
	30	0.25	<b>260N142P</b>	1 Each
	60	0.25	<b>260N154P</b>	1 Each
0.32	15	0.25	<b>260N131P</b>	1 Each
	30	0.25	<b>260N143P</b>	1 Each
	50	0.5	<b>260N230P</b>	1 Each
0.53	15	0.5	<b>260N213P</b>	1 Each
	30	0.5	<b>260N225P</b>	1 Each
		1.0	<b>260N298P</b>	1 Each

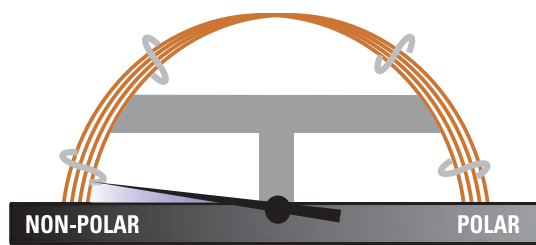




## TRACE TR-SimDist GC Columns

Feature a low-polarity phase for high temperature analyses

- Non-polar phase, 100% dimethyl polysiloxane
- Optimized for simulated distillation analysis
- High temperature limits
- Strongly cross-linked



Phase:	100% Dimethyl Polysiloxane
Max. Temps.:	400°C for films <1.0µm 370°C for 2.65µm films
USP Listing:	

### TRACE TR-SimDist GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.53	10	0.1	<b>260S025P</b>	1 Each
		0.9	<b>260S250P</b>	1 Each
		2.65	<b>260S348P</b>	1 Each

### Applications:

- High molecular weight hydrocarbons
- Simulated distillation
- ASTM D2887, D6532

### Similar to:

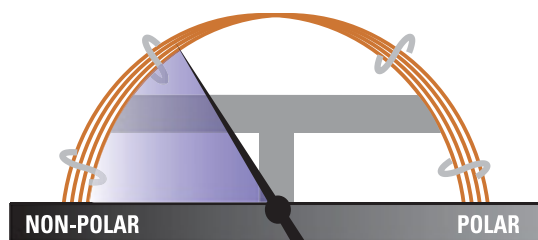
- DB-HT Sim Dis
- DB-2887
- BPX1
- Rtx-2887
- HP-1
- Petrocol 2887
- Petrocol EX2887



# TRACE TR-V1 GC Columns

Mid-polarity, thick-film columns

- Mid-polarity phase, 6% cyanopropylphenyl polysiloxane
- Thick films for the analysis of volatile analytes
- Low bleed suitable for MS detection



Phase: 6% Cyanopropylphenyl Polysiloxane  
Max. Temps.: 280°C/300°C  
USP Listing: G43

## TRACE TR-V1 GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.18	20	1.0	<b>260V495P</b>	1 Each
0.25	30	1.4	<b>260V332P</b>	1 Each
	60	1.4	<b>260V333P</b>	1 Each
0.32	30	1.8	<b>260V339P</b>	1 Each
	60	1.8	<b>260V341P</b>	1 Each
0.53	30	3.0	<b>260V396P</b>	1 Each
		5.0	<b>260V470P</b>	1 Each

### Applications:

- Volatile organics
- Alcohols
- EPA 502.2, 608 and 624

### Similar to:

- DB-624
- BPX volatiles
- Rtx volatiles
- VOCOL 56
- OV-624
- AT-624
- HP-VOC
- CP-Select 624CB
- 007-624
- ZM-624

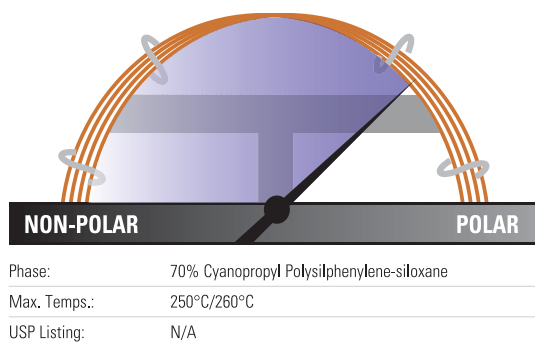
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## TRACE TR-FAME GC Columns

High-polarity phase optimized for FAME analysis

- Polar phase, 70% cyanopropyl polysilphenylene-siloxane
- High operating temperature compared to competitor columns
- Low bleed for mass spectrometry use



### TRACE TR-FAME GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.10	10	0.2	<b>260M096P</b>	1 Each
	25	0.25	<b>260M135P</b>	1 Each
0.22	30	0.25	<b>260M141P</b>	1 Each
	50	0.25	<b>260M147P</b>	1 Each
	60	0.25	<b>260M153P</b>	1 Each
	30	0.25	<b>260M142P</b>	1 Each
0.25	60	0.25	<b>260M154P</b>	1 Each
	120	0.25	<b>260M166L</b>	1 Each
	25	0.25	<b>260M137P</b>	1 Each
0.32	30	0.25	<b>260M143P</b>	1 Each
	50	0.25	<b>260M149P</b>	1 Each
	60	0.25	<b>260M155P</b>	1 Each

### Applications:

- Fatty Acid Methyl Esters (FAMEs)
- FAMEs Cis/Trans Isomers

### Similar to:

- DB-23
- BPX70
- Rtx-2330
- SP-2330
- CP-Sil 88
- SP-2380
- HP-23
- VF-23ms
- 007-23
- AT-Silar
- PE-23

## TRACE GC Columns for Specific EPA Methods

Low bleed and temperature-stable performance tailored to specific EPA methodologies

- TRACE TR-524 and TRACE TR-525: US EPA Drinking Water Test Methods 524 or 525
- TRACE TR-527: US EPA Drinking Water Test Method 527, features the robust, low-bleed performance required for analysis of pesticides and flame retardants
- TRACE TR-8270: US EPA Solid Waste Test Method 8270
- TRACE TR-8095: US EPA Method 8095 for Explosives Testing featuring high max temperature and low surface activity

### TRACE GC Columns for Specific EPA Methods

Phase	ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
TR-524	0.18	20	1.0	<b>26RV495P</b>	1 Each
TR-525	0.25	30	0.25	<b>26RX142P</b>	1 Each
TR-527	0.25	30	0.25	<b>26RF142P</b>	1 Each
TR-8095	0.32	12	0.25	<b>260P123P</b>	1 Each
TR-8270	0.25	30	0.5	<b>26RF223P</b>	1 Each
TR-8270	0.25	30	1.0	<b>26RF296P</b>	1 Each

### Applications:

- Volatile Organic Compounds (VOC's)
- Pesticides
- Flame retardants
- Explosives

## TRACE GC Columns for Dioxin and PCB Analysis

Designed to meet the requirements of high resolution GC/MS methods

- TRACE TR-Dioxin 5MS; Specifically designed for Dioxin and Furan testing
- Wide coverage of the 17 congeners with the highest toxicological significance
- TRACE TR-PCB 8MS; meets the requirements for HR GCMS analysis of PCB's
- Low bleed

### TRACE GC Columns for Specific EPA Methods

Phase	ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
TR-PCB 8MS	0.25	50	0.25	<b>26AJ148P</b>	1 Each
TR-Dioxin 5MS	0.25	60	0.25	<b>26AF154P</b>	1 Each
TR-Dioxin 5MS	0.25	30	0.1	<b>26AF047P</b>	1 Each
TR-Dioxin 5MS	0.25	60	0.1	<b>26AF059P</b>	1 Each

### Applications:

- Dioxins (PCDDs)
- Furans (PCDFs)
- PCB congeners

## Application Kits for Screening and Conformation of Persistent Organic Pollutants (POP)

### Persistent Organic Pollutants (POP) Screening Kit

Description	Cat. No.	Quantity
Persistent Organic Pollutants (POP) Screening Kit	<b>TS-MKITG501</b>	1 Each
Containing the following:		
TRACE TR-Dioxin 5MS GC Column 30m x 0.25mm x 0.10µm	<b>26AF047P</b>	1 Each
S/SL Injector – BTO Septa 17mm Diameter	<b>31303211</b>	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	<b>45350033</b>	5 Pack
S/SL Injector – Silver Seals	<b>29033629</b>	10 Pack
S/SL Injector – Graphite Liner Seals	<b>29033406</b>	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	<b>29053488</b>	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	<b>29033496</b>	10 Pack
1.1mL Screw Top Tapered Vial, Clear Gold Grade Glass	<b>1.1-STVG</b>	500 Pack
8mm Screw Caps with Pre-fitted Silicone/PTFE Seal	<b>8-SC-ST15</b>	500 Pack
10µL Fixed Needle Syringe, 50mm Length, 25 Gauge, Cone Needle	<b>36500525</b>	1 Each

### Persistent Organic Pollutants (POP) Conformation Kit

Description	Cat. No.	Quantity
Persistent Organic Pollutants (POP) Conformation Kit	<b>TS-MKITG502</b>	1 Each
Containing the following:		
TRACE TR-Dioxin 5MS GC Column 60m x 0.25mm x 0.25µm	<b>26AF154P</b>	1 Each
S/SL Injector – BTO Septa 17mm Diameter	<b>31303211</b>	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	<b>45350033</b>	5 Pack
S/SL Injector – Silver Seals	<b>29033629</b>	10 Pack
S/SL Injector – Graphite Liner Seals	<b>29033406</b>	10 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	<b>29053488</b>	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	<b>29033496</b>	10 Pack
1.1mL Screw Top Tapered Vial, Clear Gold Grade Glass	<b>1.1-STVG</b>	500 Pack
8mm Screw Caps with Pre-fitted Silicone/PTFE Seal	<b>8-SC-ST15</b>	500 Pack
10µL Fixed Needle Syringe, 50mm Length, 25 Gauge, Cone Needle	<b>36500525</b>	1 Each

## TRACE TR-BioDiesel GC Columns

Designed for use in carbon neutral fuels development applications

- TRACE TR-BioDiesel (M); for determination of residual methanol content in Biodiesel according to EN method 14110
- TRACE TR-BioDiesel (G); for the analysis of total glyceride content according to EN method 14105
- TRACE TR-BioDiesel (F); for the analysis of FAME content in biodiesel according to EN method 14103
- TRACE TR-BioDiesel (G) ASTM; for the analysis of total glyceride content according to ASTM method D-6751
- Specific columns developed for the determination of methanol, FAMES or glycerides

### Applications:

- Biodiesel
- ASTM D-6751
- EN14214

### TRACE TR-BioDiesel GC Columns

Phase	ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
TR-BioDiesel (M)	0.32	30	3.0	<b>26AA395P</b>	1 Each
TR-BioDiesel (G)	0.32	10	0.1	<b>26AF024P</b>	1 Each
TR-BioDiesel (F)	0.25	30	0.25	<b>26AX142P</b>	1 Each
TR-BioDiesel (G) ASTM	0.32	10	0.1	<b>26RF024P</b>	1 Each





## TRACE GC Columns for Drugs of Abuse

Specifically designed for the analysis of common drugs of abuse

- TRACE TR-DoA 5MS; widely used for the analysis and determination of a range of toxicological target compounds including amphetamines, codeine and morphine
- TRACE TR-DoA 35MS; the recommended column for use in drug testing labs for the confirmation of THC

### TRACE GC Columns for Drugs of Abuse

Phase	ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
TR-DoA35	0.20	15	0.33	<b>26AC497P</b>	1 Each
TR-DoA5	0.25	15	0.25	<b>26AF130P</b>	1 Each

### Applications:

- Amphetamines, codeine and morphine
- Carboxy-THC

### Application Kit for Drugs of Abuse / Toxicology Screening

Description	Cat. No.	Quantity
Drugs of Abuse / Toxicology Application Kit	<b>60181-741</b>	1 Each
Containing the following:		
TRACE TR-DoA 5MS GC Column 15m x 0.25mm x 0.25µm	<b>26AF130P</b>	1 Each
TRACE TR-DoA 35MS GC Column 15m x 0.20mm x 0.33µm	<b>26AC497P</b>	1 Each
S/SL Injector – BTO Septa 17mm Diameter	<b>31303211</b>	50 Pack
S/SL Injector – Split/Splitless Liner, 5mm ID x 8mm OD x 105mm Length	<b>45350033</b>	5 Pack
S/SL Injector – Graphite Ferrules for 0.25mm ID Column	<b>29053488</b>	10 Pack
MS Interface – Graphite/Vespel Ferrules for 0.25mm ID Column	<b>29033496</b>	10 Pack
S/SL Injector – Deactivated Glass Wool 10g	<b>60180-785</b>	1 Each
2mL Screw Top Vials, Amber with PTFE/Red Rubber Seal	<b>60180-565</b>	100 Pack
250µL Glass Inserts with Rubber Polyspring	<b>60180-566</b>	100 Pack
10µL Gas Tight Syringe, Fixed Needle, 50mm Length, 23 Gauge, Cone Needle	<b>365D3741</b>	1 Each
HyperSep Verify-CX SPE Columns 200mg 10mL	<b>60108-742</b>	50 Pack

## TRACE GC Columns for Pesticides

Specifically designed and tested for analysis of pesticides

- Low bleed decreases MS contamination
- Particularly useful for applications requiring a higher temperature
- Column inertness results in minimal peak tailing and decreased breakdown of sensitive samples

### Applications:

- Organophosphate pesticides
- Organochlorine pesticides
- Pyrethroid pesticides
- Herbicides

### TRACE GC Columns for Pesticides

Phase	ID (mm)	Length (m)	Film Thickness (µm)	Guard	Cat. No.	Quantity
TR-Pesticide	0.25	30	0.25	5m guard column attached	<b>26RF142F</b>	1 Each
TR-Pesticide II	0.25	30	0.25	5m guard column attached	<b>26RD142F</b>	1 Each
TR-Pesticide III	0.25	30	0.25	5m guard column attached	<b>26RC142F</b>	1 Each
TR-Pesticide IV	0.25	30	0.25	–	<b>26RC142P</b>	1 Each

*QuEChERS solutions offer efficient pesticide sample preparation options. Discover our portfolio of HyperSep Dispersive SPE products on*

**>> PAGE 1-056**

## Applications Kits for Pesticide Analysis

**Pesticide (S/SL Installation) Application Kit**

Description	Cat. No.	Quantity
Pesticide (S/SL Installation) Application Kit	<b>60181-730</b>	1 Each
Containing the following:		
TRACE TR-Pesticide II GC Column 30m x 0.25mm x 0.25µm + 5m Guard Column	<b>26RD142F</b>	1 Each
Deactivated Silica Guard Column 0.53mm ID x 2m Length	<b>26060375</b>	1 Each
SilTite Column Connector (0.1-0.25mm to 0.1-0.53mm)	<b>290MU498</b>	1 Each
SilTite Ferrules 0.53mm Column ID	<b>290MF231</b>	10 Pack
S/SL Injector – Split/Splitless Deactivated Liner 3mm ID x 8mm OD x 105mm Length	<b>453T2121</b>	5 Pack

**Pesticide (S/SL Consumables) Application Kit**

Description	Cat. No.	Quantity
Pesticide (S/SL Consumables) Application Kit	<b>60181-732</b>	1 Each
Containing the following:		
TRACE TR-Pesticide II GC Column 30m x 0.25mm x 0.25µm + 5m Guard Column	<b>26RD142F</b>	2 Pack
Deactivated Silica Guard Column 0.53mm ID x 2m Length	<b>26060375</b>	10 Pack
SilTite Column Connector (0.1-0.25mm to 0.1-0.53mm)	<b>290MU498</b>	2 Pack
SilTite Ferrules 0.53mm Column ID	<b>290MF231</b>	30 Pack
SilTite Ferrules 0.25mm Column ID	<b>290MF229</b>	30 Pack
S/SL Injector – Split/Splitless Deactivated Liner 3mm ID x 8mm OD x 105mm Length	<b>453T2121</b>	25 Pack

**Pesticide (PTV Installation) Application Kit**

Description	Cat. No.	Quantity
Pesticide (PTV Installation) Application Kit	<b>60181-731</b>	1 Each
Containing the following:		
TRACE TR-Pesticide II GC Column 30m x 0.25mm x 0.25µm + 5m Guard Column	<b>26RD142F</b>	1 Each
Deactivated Silica Guard Column 0.53mm ID x 2m Length	<b>26060375</b>	1 Each
SilTite Column Connector (0.1-0.25mm to 0.1-0.53mm)	<b>290MU498</b>	2 Pack
SilTite Ferrules 0.53mm Column ID	<b>290MF231</b>	10 Pack
PTV Injector – Deactivated Baffle Liner 2mm ID x 2.75mm OD x 120mm Length	<b>453T2120</b>	5 Pack

**Pesticide (PTV Consumables) Application Kit**

Description	Cat. No.	Quantity
Pesticide (PTV Consumables) Application Kit	<b>60181-733</b>	1 Each
Containing the following:		
TRACE TR-Pesticide II GC Column 30m x 0.25mm x 0.25µm + 5m Guard Column	<b>26RD142F</b>	2 Pack
Deactivated Silica Guard Column 0.53mm ID x 2m Length	<b>26060375</b>	10 Pack
SilTite Column Connector (0.1-0.25mm to 0.1-0.53mm)	<b>290MU498</b>	2 Pack
SilTite Ferrules 0.53mm Column ID	<b>290MF231</b>	30 Pack
SilTite Ferrules 0.25mm Column ID	<b>290MF229</b>	30 Pack
PTV Injector – Deactivated Baffle Liner 2mm ID x 2.75mm OD x 120mm Length	<b>453T2120</b>	25 Pack

## UltraFast GC Columns – Technical Information

The huge demand of samples to be analyzed every day by labs in industries such as environmental and petrochemical requires an increased speed of analysis

A significant gain in analysis speed compared to conventional GC procedures is obtained through UltraFast Gas Chromatography. UltraFast GC utilises short (2-10m) narrow bore capillaries and temperature programming conditions usually faster than 2°C/s. This leads to peak widths in the 50-200ms range. The analysis times are in the range of 1 minute or even less.

### Benefits of UltraFast GC Columns

- Dramatically shorter analysis times – typically a minute or less
- Ideal for applications in petrochem and environmental markets
- Long column lifetimes

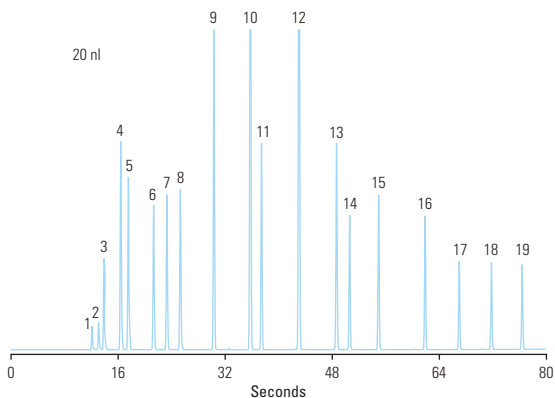
### Application – UltraFast Analysis of Pure Petroleum Products through Nanovolumes Injection

The analyses were performed in the UltraFast GC mode using a TRACE GC Ultra System equipped with a Split/Splitless injector (SSL) and a Digital Pressure and Flow Controller, as well as a FAST FID detector. The GC System was also equipped with an UltraFast Module (UFM).

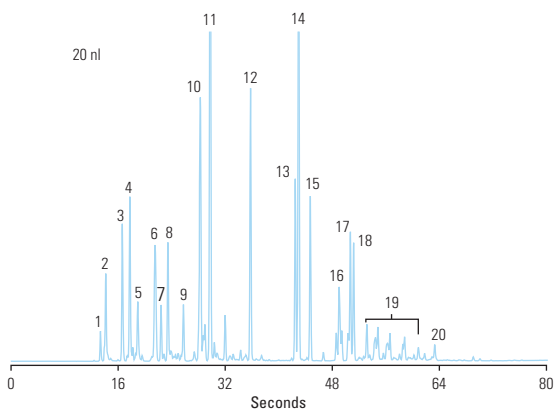
Split injections were performed with a AS3000 Autosampler using a 0.5µL plunger-in-needle syringe p/n 36504045). A minimum penetration depth in the injector (cold needle mode) was set, and 0.3µL of air was automatically withdrawn after the sample to ensure that the part of the needle inserted into the injector was empty. A 3mm ID upper-tapered empty liner with an 8mm long and 1mm wide restriction at the top was installed. The SSL injector was set to 225°C and the FID to 320°C.

#### Column: UFC-1 10m x 0.32mm x 3µm

Part Number:	UFMC00002070414
Temperature:	40°C (6 sec hold) to 300°C (6 sec hold) at 180°C/min
Detector Type:	FID
Carrier Gas:	Helium
Flow Rate:	0.5mL/min
Injection Mode:	Split/Splitless



- |                     |                    |
|---------------------|--------------------|
| 1. propane          | 11. octane         |
| 2. methyl-propane   | 12. p-xylene       |
| 3. butane           | 13. propyl-benzene |
| 4. methyl-butane    | 14. n-decane       |
| 5. pentane          | 15. butyl-benzene  |
| 6. methyl-pentane   | 16. n-dodecane     |
| 7. hexane           | 17. n-tridecane    |
| 8. dimethyl-pentane | 18. n-tetradecane  |
| 9. heptane          | 19. n-pentadecane  |
| 10. toluene         |                    |



- |                      |                                     |
|----------------------|-------------------------------------|
| 1. methyl-propane    | 12. toluene                         |
| 2. butane            | 13. ethyl-benzene                   |
| 3. 2-methyl-butane   | 14. p-xylene                        |
| 4. pentane           | 15. m-xylene                        |
| 5. ter-butyl alcohol | 16. propyl-benzene                  |
| 6. methyl-pentane    | 17. tetramethyl-octane              |
| 7. 3-methyl-pentane  | 18. 1,2,4-trimethyl-benzene         |
| 8. hexane            | 19. tri/tetramethyl-benzene isomers |
| 9. dimethyl-pentane  | 20. naphthalene                     |
| 10. cyclohexane      |                                     |
| 11. dimethyl-hexane  |                                     |

## UltraFast GC Columns

Short, narrow-bore columns for use with the Thermo Scientific TRACE GC UltraFast instrument

- Dramatically shorter analysis times
- Increase sample throughput by a factor of 20
- Lengthen column lifetimes

### Applications:

- Chemical
- Petrochemical
- Environmental
- Flavors and fragrances

### UltraFast GC Columns

Phase	ID (mm)	Length (m)	Film Thickness (µm)	Uses	Cat. No.	Quantity
UFC-1	0.10	5	0.1	General	<b>UFMC00001010401</b>	1 Each
		2.5	0.1	ASTM D-2887	<b>UFMC00000070401</b>	1 Each
	0.32	5	0.1	ASTM D-2887	<b>UFMC00001070401</b>	1 Each
		5	0.25	ISO 9377-2	<b>UFMC00001070404</b>	1 Each
		5	0.5	General	<b>UFMC00001070907</b>	1 Each
		10	3.0	ASTM D-3710	<b>UFMC00002070414</b>	1 Each
UFC-5	0.10	2.5	0.4	General	<b>UFMC00100000000</b>	1 Each
		5	0.4	General	<b>UFMC00200000000</b>	1 Each
		5	0.4	General	<b>UFMC00501010006</b>	1 Each
		5	0.1	General	<b>UFMC00300000000</b>	1 Each
		10	0.1	General	<b>UFMC00002010601</b>	1 Each
		10	0.4	General	<b>UFMC00002010006</b>	1 Each
		10	0.4	General	<b>UFMC00502010006</b>	1 Each
UFC-1701	0.10	5	0.1	General	<b>UFMC00400000000</b>	1 Each
UFC-WAX	0.10	5	0.1	FAMES, Essential Oils	<b>UFMC00001010501</b>	1 Each
		5	0.2	General	<b>UFMC00001010503</b>	1 Each
UFC-200	0.18	10	0.4	Alcohols, Ketones	<b>UFMC00002030306</b>	1 Each
UFC-264	0.10	10	0.5	Volatiles	<b>UFMC00002010207</b>	1 Each
UFC-23	0.15	10	0.15	FAMES	<b>UFMC00002020802</b>	1 Each
		10	0.2	FAMES	<b>UFMC00002030603</b>	1 Each
UFC-BioDiesel	0.32	5	0.5	BioDiesel	<b>UFMC00001070600</b>	1 Each
UFC-M1	0.10	2.5	0.1	General	<b>UFMC00000010906</b>	1 Each
		5	0.25	General	<b>UFMC00001070904</b>	1 Each
UFC-FFAP	0.25	10	0.25	FFAP	<b>UFMC00091025250</b>	1 Each
UFC-POR Q					<b>UFMC00002060614</b>	1 Each



## TracePLOT TG-BOND Alumina GC Columns: Na<sub>2</sub>SO<sub>4</sub> and KCl Deactivation

Optimized for linear and quantitative analysis of polar unsaturated hydrocarbons

- Strong bonding to prevent particle generation suits these columns to valve-switching operations without damage to injection and detection systems from particle release
- Columns to which water has adsorbed may be regenerated to restore full efficiency and selectivity
- Each column has been tested to ensure proper film thickness (1,3-butadiene), selectivity (propadiene and methyl acetylene), resolution (trans-2-butene and 1-butene) and coating efficiency (1,3-butadiene)

### TracePLOT TG-BOND Alumina GC Columns, Na<sub>2</sub>SO<sub>4</sub> and KCl Deactivation

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
<b>Na<sub>2</sub>SO<sub>4</sub> Deactivation</b>				
0.32	30	5	<b>26001-6020</b>	1 Each
	50	5	<b>26001-6050</b>	1 Each
0.53	30	10	<b>26001-6080</b>	1 Each
	50	10	<b>26001-6110</b>	1 Each
<b>KCl Deactivation</b>				
0.32	30	5	<b>26002-6020</b>	1 Each
	50	5	<b>26002-6050</b>	1 Each
0.53	30	10	<b>26002-6080</b>	1 Each
	50	10	<b>26002-6110</b>	1 Each

#### Applications:

- C1-C5 hydrocarbons
- Unsaturated hydrocarbon isomers

#### Similar to:

- Alumina-PLOT
- AT-Alumina
- CP-Al<sub>2</sub>O<sub>3</sub>/KCl
- CP-Al<sub>2</sub>O<sub>3</sub>/Na<sub>2</sub>SO<sub>4</sub>
- GS-Alumina
- GS-Alumina KCl
- HP PLOT M
- HP PLOT S
- Rt-Alumina BOND (KCl)
- Rt-Alumina BOND (Na<sub>2</sub>SO<sub>4</sub>)



## TracePLOT TG-BOND Msieve 5A GC Columns

Designed for separation of Ar/O<sub>2</sub> and other permanent gases

- Specially designed coating and deactivation procedures for chromatographic efficiency and the integrity of the coating porous layer
- Deactivation process yields a sharp peak for CO elution rather than the tailing commonly seen in other columns
- High retention of molecular sieve permits separation of permanent gases at temperatures above ambient
- Uniform particles remain adherent to the tubing even following continuous valve-cycling

### TracePLOT TG-BOND Msieve 5A GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	15	30	<b>26003-6010</b>	1 Each
	30	30	<b>26003-6040</b>	1 Each
0.53	15	50	<b>26003-6070</b>	1 Each
	30	50	<b>26003-6100</b>	1 Each
	50	50	<b>26003-1630</b>	1 Each

### Applications:

- Permanent gases
- Refinery or natural gases

### Similar to:

- GS-Msieve
- HP PLOT Molsieve
- CP-Molsieve 5A
- Molsieve 5A
- AT-Molsieve
- PLT-5A
- Rt-Msieve 5A



## TracePLOT TG-BOND Q GC Columns

Non-polar columns incorporating particles to the walls of the tubing for essentially no particle release

- Non-polar 100% divinyl benzene phase
- Particles incorporated to the walls of the tubing for essentially no particle release

### TracePLOT TG-BOND Q GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	15	10	<b>26004-6000</b>	1 Each
	30	10	<b>26004-6030</b>	1 Each
0.53	15	20	<b>26004-6060</b>	1 Each
	30	20	<b>26004-6090</b>	1 Each



### Applications:

- C1 to C3 isomers and alkanes up to C12
- Separation of CO<sub>2</sub>, methane and O<sub>2</sub>/N<sub>2</sub>/CO
- Analysis of oxygenated compounds and solvents

### Similar to:

- CP-PoraPLOT Q
- Rt-Q-BOND
- CP-PoraBond Q
- Supel-Q-Plot
- AT-Q

## TracePLOT TG-BOND Q+ GC Columns

Intermediate polarity columns incorporating particles to the walls of the tubing for essentially no particle release

- Intermediate polarity, porous divinyl benzene homopolymer
- Particles incorporated to the walls of the tubing for essentially no particle release

### TracePLOT TG-BOND Q+ GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	15	10	<b>26005-6000</b>	1 Each
	30	10	<b>26005-6030</b>	1 Each
0.53	15	20	<b>26005-6060</b>	1 Each
	30	20	<b>26005-6090</b>	1 Each

### Applications:

- Separation of ethane, ethylene and acetylene to baseline

### Similar to:

- GS-Q
- Rt-QS-BOND

## TracePLOT TG-BOND S GC Columns

Mid-polarity columns incorporating particles to the walls of the tubing for essentially no particle release

- Mid-polarity, divinylbenzene 4-vinylpyridine solid phase
- Particles incorporated to the walls of the tubing for essentially no particle release

### TracePLOT TG-BOND S GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	15	10	<b>26006-6000</b>	1 Each
	30	10	<b>26006-6030</b>	1 Each
0.53	15	20	<b>26006-6060</b>	1 Each
	30	20	<b>26006-6090</b>	1 Each

### Applications:

- Non-polar and polar compounds

### Similar to:

- CP-PoraPLOT S
- Supel-G45
- Rt-S-BOND

## TracePLOT TG-BOND U GC Columns

Polar columns incorporating particles to the walls of the tubing for essentially no particle release

- Polar, divinylbenzene ethylene glycol/dimethylacrylate phase
- Particles incorporated to the walls of the tubing for essentially no particle release

### TracePLOT TG-BOND U GC Columns

ID (mm)	Length (m)	Film Thickness (µm)	Cat. No.	Quantity
0.32	15	10	<b>26007-6000</b>	1 Each
	30	10	<b>26007-6030</b>	1 Each
0.53	15	20	<b>26007-6060</b>	1 Each
	30	20	<b>26007-6090</b>	1 Each

### Applications:

- Analysis of polar and non-polar compounds

### Similar to:

- HP-PLOT U
- Rt-U-BOND
- CP-PoraPLOT U
- CP-PoraBOND U
- Supel-N PLOT

## TracePLOT Particle Traps for GC Instruments

Provides a safeguard from dislodged particles entering the detector

- Provides a safeguard from dislodged particles entering the detector

### TracePLOT Particle Traps for GC Instruments

Description	ID (mm)	Cat. No.	Quantity
PLOT Particle Trap 2.5m x 0.32mm	0.32	<b>60180-860</b>	1 Each
PLOT Particle Trap 2.5m x 0.53mm	0.53	<b>60180-861</b>	1 Each



# GC Accessories

## Click-On Inline Filters

Easy-to-use format eliminates contamination

- Pure gas output 99.9999% or 6.0 grade
- No carrier gas line contamination during filter change
- Easy and fast replacement without the need for tools
- No risk of overtightening fittings
- Reuseable end fittings reduce cost of clean gas: remain installed during filter replacement
- TUEV approved
- Maximum pressure 11 bar (160 psi)
- Maximum flow 25L/min.
- Combi filter removes oxygen and moisture, or moisture and hydrocarbons
- Triple filter removes oxygen, moisture and hydrocarbons



Click-On Inline Filters	For Gas	Indicator Change	Filter Capacity
Moisture	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR, Air		21g H <sub>2</sub> O
Oxygen	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR		3L O <sub>2</sub>
Hydrocarbon	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR, Air		36g (as n-butane)
Combi – Moisture, Oxygen	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR		10g H <sub>2</sub> O, 1.5L O <sub>2</sub>
Combi – Moisture, Hydrocarbons	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR, Air		10g H <sub>2</sub> O, 18g HCs (as n-butane)
Triple – Moisture, Oxygen, Hydrocarbons	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR		6g H <sub>2</sub> O, 1L O <sub>2</sub> , 12g HCs (as n-butane)
Triple – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	He		6g H <sub>2</sub> O, 1L O <sub>2</sub> , 12g HCs (as n-butane)
Indicating Triple – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	He	Red to White Purple to Green	0.1g H <sub>2</sub> O, 100mL O <sub>2</sub> , 0.07HCs (as n-butane)

### Click-On Inline Filters

Type	Cat No.	Quantity
Moisture Filter	<b>60180-801</b>	1 Each
Oxygen Filter	<b>60180-802</b>	1 Each
Hydrocarbon Filter	<b>60180-803</b>	1 Each
Combi – Moisture, Oxygen	<b>60180-804</b>	1 Each
Combi – Moisture, Hydrocarbons	<b>60180-843</b>	1 Each
Triple – Moisture, Oxygen, Hydrocarbons	<b>60180-805</b>	1 Each
Triple – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	<b>60180-806</b>	1 Each
Indicating Triple – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	<b>60180-808</b>	1 Each

### Connectors and Accessories

Description	Cat No.	Quantity
Brass End Fitting, 0.125in.	<b>60180-809</b>	2 Pack
Steel End Fitting, 0.125in.	<b>60180-810</b>	2 Pack
Brass End Fitting, 0.25in.	<b>60180-811</b>	2 Pack
Steel End Fitting, 0.25in.	<b>60180-812</b>	2 Pack
Double Ended Connector to connect Filter to Indicator	<b>60180-813</b>	1 Each
Replacement O-Rings	<b>60180-833</b>	1 Each
Wall Mounting Clamp	<b>60180-834</b>	4 Pack

## Super Clean Cartridge Filters

Replace easily without tools

- 99.9999% pure gas (or 6.0 grade) output
- No carrier gas line contamination during cartridge change
- Cost effective
- TUEV approved
- Max. pressure 11 bar (160 psi)
- Max. flow 7L/min.



Super Clean Cartridge Filter	For Gas Type	Indicator Change	Filter Capacity
Moisture	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR, Air	Gray to White	7.2g H <sub>2</sub> O
Oxygen	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR	Green to Gray	1L O <sub>2</sub>
Hydrocarbon	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR, Air		24g HCs (as n-butane)
Combi	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR, Air	Purple to Green	3.5g H <sub>2</sub> O, 12g HCs (as n-butane)
Triple	Inert carrier, He, H <sub>2</sub> , N <sub>2</sub> , AR	Orange to Gray Purple to Green	1.8g H <sub>2</sub> O, 500mL O <sub>2</sub> , 7g HCs (as n-butane)

### Super Clean Cartridge Filters

Type	Base Included	Cat. No.	Quantity
Indicating Moisture Cartridge Filter	No	<b>60180-819</b>	1 Each
Indicating Oxygen Cartridge Filter	No	<b>60180-820</b>	1 Each
Hydrocarbon Cartridge Filter	No	<b>60180-821</b>	1 Each
Indicating Combi Filter – Moisture, Hydrocarbons	No	<b>60180-826</b>	1 Each
Indicating Triple Filter – Moisture, Oxygen, Hydrocarbons	No	<b>60180-824</b>	1 Each
Indicating Triple Filter – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	No	<b>60180-825</b>	1 Each
Triple Filter – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	Yes	<b>60180-830</b>	1 Each
Indicating Triple Filter – Moisture, Oxygen, Hydrocarbons – He preconditioned for GC/MS	Yes	<b>60180-829</b>	1 Each
3 Cartridge Pack – contains 1 x Triple Filter and 2 x Combi Filter (Moisture, Hydrocarbons)	No	<b>60180-822</b>	1 Each
4 Cartridge Pack – contains 1 x Moisture Filter, 1 x O <sub>2</sub> Filter and 2 x Hydrocarbon Filter	No	<b>60180-823</b>	1 Each
4 Cartridge Pack – contains 1 x Moisture Filter, 1 x O <sub>2</sub> Filter and 2 x Hydrocarbon Filter	Yes	<b>60180-827</b>	1 Each
3 Cartridge Pack – contains 1 x Triple Filter and 2 x Combi Filter (Moisture, Hydrocarbons)	Yes	<b>60180-828</b>	1 Each
Twin Hydrocarbon Filters for High Flow Base Plate for LC/MS – no Indicator	No	<b>60180-831</b>	1 Each
Twin Moisture Filters for High Flow (Air Generators)	No	<b>60180-832</b>	1 Each
High Flow Pack of 2 x Hydrocarbon Filters for LC/MS – no Indicator	No	<b>60180-839</b>	1 Each
High Flow Pack of 2 x Hydrocarbon Filters for LC/MS – with Indicator	No	<b>60180-840</b>	1 Each
High Flow Pack of 2 x Moisture Filters for LC/MS – with Indicator	No	<b>60180-841</b>	1 Each



## Super Clean Cartridge Filter Baseplates

One-time installation procedure

- Can be configured to the individual user requirements
- Needle valves ensure gas line is not contaminated during cartridge change

*Filters are not included.*

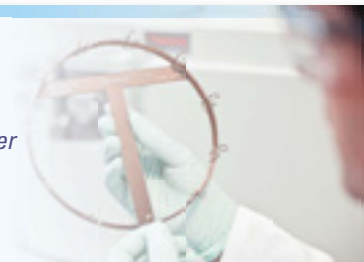


Type	For Use With	For Gas
Single Base	Triple Filter	Carrier Gas Only
Dual Base	2 x Combi Filter	Air and Fuel Gas
Triple Base	Triple and 2 x Combi Filter	Carrier, Make-Up, and Fuel Gas
Four-position Base	Moisture, Oxygen, 2 x Hydrocarbon	High Capacity Carrier, Fuel, Make Up
Two-position, High-flow Base	N <sub>2</sub> in LC/MS, H <sub>2</sub> O in H <sub>2</sub> /air generators	Carrier, Make Up and Fuel

### Super Clean Cartridge Filter Baseplates/Manifolds

Type	Cat. No.	Quantity
Single Base	<b>60180-814</b>	1 Each
Dual Base	<b>60180-815</b>	1 Each
Triple Base	<b>60180-817</b>	1 Each
Two-position, High-flow Base	<b>60180-816</b>	1 Each
Four-position Base	<b>60180-818</b>	1 Each
O-rings for Base Plates	<b>60180-837</b>	20 Pack
Flush Cap	<b>60180-838</b>	2 Pack

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## GC Installation Kit

Includes:

- Tubing cutter
- 1/8 x 1/4in. reamer
- 7/16in. wrench
- 1/2in. wrench
- 1/8in. brass tees, 4
- 1/8in. brass nuts, 10
- Brass front and back ferrules, 10
- 15.2m instrument-grade, cleaned 1/8in. copper tubing



### GC Installation Kit

Description	Cat. No.	Quantity
GC Installation Kit	<b>60180-888</b>	1 Each

## Septa

A wide range to cover most applications








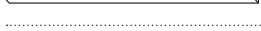






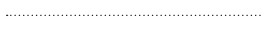


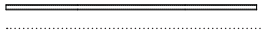

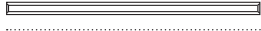




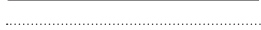



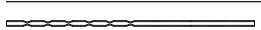
- Variety of materials and temperature limits for all applications
- For use in Thermo Scientific TRACE and Thermo Scientific FOCUS GCs and instruments from other manufacturers
- Contaminant-free in individual blister packs
- Temperature limit: 400°C




### Septa

Brand	Material	ID (mm)	Cat. No.	Quantity
BTO	Low Bleed Silicone	9	<b>31303240</b>	50 Pack
BTO	Low Bleed Silicone	11	<b>31303233</b>	50 Pack
BTO	Low Bleed Silicone	11.5	<b>31303230</b>	50 Pack
BTO	Low Bleed Silicone	12.7	<b>31303228</b>	50 Pack
BTO	Low Bleed Silicone	17	<b>31303211</b>	50 Pack
TR-Green	Low Coring Silicone	9	<b>313G3240</b>	50 Pack
TR-Green	Low Coring Silicone	11	<b>313G3230</b>	50 Pack
TR-Green	Low Coring Silicone	12.7	<b>313G3228</b>	50 Pack
TR-Green	Low Coring Silicone	17	<b>313G3211</b>	50 Pack


















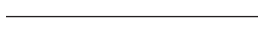


# Injection Port Liners for Thermo Scientific Instruments

Highly deactivated and produced to exacting tolerances to ensure a high degree of reproducibility






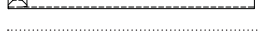
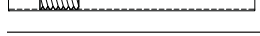
	Injection Type	ID x OD (mm)	Length (mm)	Packing	Cat. No.	Quantity	Liner Sealing Ring Cat No.	Quantity
<b>Liners for TRACE and FOCUS SSL Instruments</b>								
	Split Straight Liner	5 x 8	105	No	<b>45350030</b>	5 Pack	<b>29033406</b>	10 Pack
	Split Straight Liner	5 x 8	105	No	<b>45354030</b>	25 Pack	<b>29033406</b>	10 Pack
	Split Straight Liner	3 x 8	105	No	<b>45350031</b>	5 Pack	<b>29033406</b>	10 Pack
	Split Straight Liner	3 x 8	105	No	<b>45354031</b>	25 Pack	<b>29033406</b>	10 Pack
	Split Straight Liner	5 x 8	105	CarboFrit	<b>453T2131</b>	5 Pack	<b>29033406</b>	10 Pack
	Splitless Straight Liner	3 x 8	105	No	<b>45350032</b>	5 Pack	<b>29033406</b>	10 Pack
	Splitless Straight Liner	3 x 8	105	No	<b>45354032</b>	25 Pack	<b>29033406</b>	10 Pack
	Splitless Straight Liner	5 x 8	105	No	<b>45350033</b>	5 Pack	<b>29033406</b>	10 Pack
	Splitless Straight Liner	5 x 8	105	No	<b>45354033</b>	25 Pack	<b>29033406</b>	10 Pack
	Splitless Straight Liner	5 x 8	105	CarboFrit	<b>453T2130</b>	5 Pack	<b>29033406</b>	10 Pack
	Splitless Straight Liner (Siltek)	3 x 8	105	No	<b>453T2121</b>	5 Pack	<b>29033406</b>	10 Pack
	Split FocusLiner for 50mm Needle	5 x 8	105	Quartz Wool	<b>453T1905</b>	5 Pack	<b>29033406</b>	10 Pack
	Split FocusLiner for 50mm Needle	5 x 8	105	Quartz Wool	<b>453T4905</b>	25 Pack	<b>29033406</b>	10 Pack
	Splitless FocusLiner for 70mm Needle	5 x 8	105	Quartz Wool	<b>453T2895</b>	5 Pack	<b>29033406</b>	10 Pack
	Splitless FocusLiner for 70mm Needle	5 x 8	105	Quartz Wool	<b>453T4895</b>	25 Pack	<b>29033406</b>	10 Pack
	Splitless FocusLiner for 50mm Needle	5 x 8	105	Quartz Wool	<b>453T2999</b>	5 Pack	<b>29033406</b>	10 Pack
	Splitless FocusLiner for 50mm Needle	5 x 8	105	Quartz Wool	<b>453T4999</b>	25 Pack	<b>29033406</b>	10 Pack
	Baffle Liner	2 x 8	105	No	<b>453T1001</b>	5 Pack	<b>29033406</b>	10 Pack
<b>Liners for TRACE PTV Instruments</b>								
	PTV Straight Liner	0.75 x 2.75	105	No	<b>45352083</b>	5 Pack		
	PTV Straight Liner	1 x 2.75	120	No	<b>45352054</b>	5 Pack		
	PTV Straight Liner	1 x 2.75	120	No	<b>45354054</b>	25 Pack		
	PTV Straight Liner	2 x 2.75	120	No	<b>45352057</b>	5 Pack		
	PTV Straight Liner	2 x 2.75	120	No	<b>45354057</b>	25 Pack		
	PTV Liner with Sintered Lining	1 x 2.75	120	No	<b>45352060</b>	5 Pack		
	PTV Liner with Three Baffles	1 x 2.75	120	No	<b>45352062</b>	5 Pack		
	PTV Liner with Three Baffles	1 x 2.75	120	No	<b>45354062</b>	25 Pack		
	PTV Siltek Metal Liner	2 x 2.75	120	No	<b>45322044</b>	2 Pack		
	PTV Siltek Metal Liner	1 x 2.75	120	No	<b>45322046</b>	2 Pack		
	PTV Baffle Liner (Siltek)	2 x 2.75	120	No	<b>453T2120</b>	5 Pack		
	PTV SilcoSteel Liner for OC	1 x 2.75	120	No	<b>45322052</b>	2 Pack	<b>29013417</b>	2 Pack

	Injection Type	ID x OD (mm)	Length (mm)	Packing	Cat. No.	Quantity	Liner Sealing Ring Cat No.	Quantity
<b>Liners for Mega 4000, 5000 and 6000</b>								
	Split Straight Liner	2 x 5	79.5	No	<b>45350300</b>	5 Pack		
	Split Straight Liner	3 x 5	79.5	No	<b>45350400</b>	5 Pack		
	Split/Splitless Liner with Recessed Gooseneck	3 x 5	79.5	Quartz Wool	<b>453T2955</b>	5 Pack		

## Injection Port Liners for Agilent Instruments

	Injection Type	ID x OD (mm)	Length (mm)	Packing	Cat. No.	Quantity	Liner Sealing Ring Cat No.	Quantity
<b>Injection Port Liners for Agilent Instruments</b>								
	Direct Straight Liner	1.2 x 6.3	78.5	No	<b>453A1335</b>	5 Pack	<b>290GA242 (Graphite)</b>	10 Pack
	Direct Straight Liner	1.2 x 6.3	78.5	No	<b>453A2332</b>	25 Pack	<b>2900A241 (Viton)</b>	
	Split Straight Liner	4 x 6.3	78.5	Quartz Wool	<b>453A2265</b>	5 Pack	<b>290GA243 (Graphite)</b>	10 Pack
	Split Straight Liner	4 x 6.3	78.5	Quartz Wool	<b>453A1262</b>	25 Pack		
	Split Straight Liner	4 x 6.3	78.5	No	<b>453A1295</b>	5 Pack	<b>290GA243 (Graphite)</b>	10 Pack
	Split Straight Liner	4 x 6.3	78.5	No	<b>453A2292</b>	25 Pack		
	Split/Splitless FocusLiner	4 x 6.3	78.5	Quartz Wool	<b>453A1255</b>	5 Pack	<b>290GA243 (Graphite)</b>	10 Pack
	Split/Splitless FocusLiner	4 x 6.3	78.5	Quartz Wool	<b>453A1252</b>	25 Pack		
	Split/Splitless FocusLiner with Single Taper	4 x 6.3	78.5	No	<b>453A1315</b>	5 Pack	<b>290GA243 (Graphite)</b>	10 Pack
	Split/Splitless FocusLiner with Single Taper	4 x 6.3	78.5	No	<b>453A1312</b>	25 Pack		
	Split/Splitless Liner with Single Taper	4 x 6.3	78.5	No	<b>453A1345</b>	5 Pack	<b>290GA243 (Graphite)</b>	10 Pack
	Split/Splitless Liner with Single Taper	4 x 6.3	78.5	No	<b>453A2342</b>	25 Pack		
	Split/Splitless Liner with Double Taper	4 x 6.3	78.5	No	<b>453A1355</b>	5 Pack	<b>290GA242 (Graphite)</b>	10 Pack
	Split/Splitless Liner with Double Taper	4 x 6.3	78.5	No	<b>453A2352</b>	25 Pack		
	Split/Splitless Liner w/Recessed Gooseneck	4 x 6.3	78.5	Quartz Wool	<b>453A1305</b>	5 Pack	<b>290GA243 (Graphite)</b>	10 Pack
	Split/Splitless Liner w/Recessed Gooseneck	4 x 6.3	78.5	Quartz Wool	<b>453A2302</b>	25 Pack		
	Split/Splitless FAST FocusLiner	2.3 x 6.3	78.5	Quartz Wool	<b>453A1285</b>	5 Pack	<b>290GA243 (Graphite)</b>	10 Pack
	Split/Splitless FAST FocusLiner	2.3 x 6.3	78.5	Quartz Wool	<b>453A2282</b>	25 Pack		
	Split/Splitless FAST FocusLiner with Single Taper	2.3 x 6.3	78.5	Quartz Wool	<b>453A2375</b>	5 Pack	<b>290GA243 (Graphite)</b>	10 Pack
	Split/Splitless FAST FocusLiner with Single Taper	2.3 x 6.3	78.5	Quartz Wool	<b>453A1372</b>	25 Pack		

Injection Port Liners for Agilent Instruments *continued*

	Injection Type	ID x OD (mm)	Length (mm)	Packing	Cat. No.	Quantity	Liner Sealing Ring Cat No.	Quantity
	Splitless Liner with Single Taper	4 x 6.3	78.5	Quartz Wool	<b>453A1925</b>	5 Pack		
	Splitless Straight Liner	2.0 x 6.1	78.5	Quartz Wool	<b>453A2275</b>	5 Pack	<b>290GA244 (Graphite)</b>	10 Pack
	Splitless Liner with Recessed Gooseneck	2.0 x 6.3	78.5	No	<b>453A2325</b>	5 Pack	<b>2900A241 (Viton)</b>	10 Pack
	Cyclo/Single Gooseneck (Deactivated Metal)	5.2 x 6.3	78.5	No	<b>453A2000</b>	5 Pack		
	Single Gooseneck (Deactivated Metal)	5.2 x 6.3	78.5	No	<b>453A2001</b>	5 Pack		
	Cycloplitter Liner (Deactivated Metal)	5.2 x 6.3	78.5	No	<b>453A2002</b>	5 Pack		
	Split/Splitless Liner with Wool (Deactivated Metal)	5.2 x 6.3	78.5	Quartz Wool	<b>453A2003</b>	5 Pack		
	Split/Splitless Mixed Liner Sample Pack	Mixed	Mixed	No	<b>453AG001</b>	5 Pack		



## Gold Inlet Base Seals for Agilent GCs

Gold plating provides a surface with exceptional inertness suitable for analysis of highly active compounds

- Precision machined to provide exceptional sealing properties
- Reduces activity (especially useful for analysis of pesticide, PCBs, phenols, etc.)
- High grade stainless steel providing reproducible seal
- Direct equivalent to Agilent original part
- All Agilent GC 5890/6890/7890 split/splitless injection ports



### Gold Inlet Base Seals for Agilent GCs

For Use With	ID (mm)	Cat. No.	Quantity
Single column installation	0.8	<b>290GA081</b>	10 Pack
Single column installation	0.8	<b>290GA082</b>	2 Pack
Dual column installation	1.2	<b>290GA121</b>	10 Pack
Dual column installation	1.2	<b>290GA122</b>	2 Pack

## Gold Cross Inlet Base Seals for Agilent GCs

Gold plating provides a surface with exceptional inertness suitable for analysis of highly active compounds

- Precision machined to provide exceptional sealing properties
- Reduces activity (especially useful for analysis of pesticide, PCBs, phenols, etc.)
- High grade stainless steel providing reproducible seal
- Direct equivalent to Agilent original part
- Compatible with all Agilent GC 5890/6890/7890 split/splitless injection ports



### Gold Cross Inlet Base Seals for Agilent GC Instruments

ID (mm)	Cat. No.	Quantity
0.8	<b>290GA084</b>	10 Pack
0.8	<b>290GA083</b>	2 Pack

We offer a comprehensive range of user changeable instrument parts for your GC – visit

»» PAGE 3-142





## Siltek Inlet Base Seals for Agilent GCs

Siltek coating provides a surface with exceptional inertness suitable for analysis of highly active compounds

- Precision machined to provide exceptional sealing properties
- Reduces activity (especially useful for analysis of pesticides, PCB's, phenols, etc.)
- High grade stainless steel providing reproducible seal



### Siltek-Treated Inlet Base Seals for Agilent GC Instruments

ID (mm)	Cat. No.	Quantity
0.8	<b>290GA091</b>	10 Pack
0.8	<b>290GA092</b>	2 Pack

## Siltek Cross Inlet Base Seals for Agilent GCs

Siltek coating provides a surface with exceptional inertness suitable for analysis of highly active compounds

- Ideal for high-flow split applications on Agilent GCs
- Precision machined to provide exceptional sealing properties
- Reduces activity (especially useful for analysis of pesticides, PCB's, phenols, etc.)
- High grade stainless steel providing reproducible seal



### Siltek-Treated Cross Inlet Base Seals for Agilent GC Instruments

ID (mm)	Cat. No.	Quantity
0.8	<b>290GA094</b>	10 Pack
0.8	<b>290GA093</b>	2 Pack

## Finger Tite Connectors

Easier fit, reliability and leak-free connections

Advantages over conventional graphite/polymer ferrules:

- Perfect metal-to-metal seal eliminates contamination and gives lower air/water background
- No need to retighten ferrules, as they expand and contract with the fitting over GC operating temperatures
- Easy to handle with the nut touchable even with a hot injector/detector
- No tools required
- Available for Thermo Scientific and Agilent GC instruments



### Finger Tite Connectors for Thermo Scientific Instruments

Description	Cat. No.	Quantity
Female Nut	<b>290ST130</b>	5 Pack
Split/Splitless and MS Starter Kit	<b>290ST131</b>	1 Each
Split/Splitless and FID Starter Kit	<b>290ST132</b>	1 Each

### Finger Tite Connectors for Agilent Instruments

Description	Cat. No.	Quantity
Male Nut	<b>290SA130</b>	5 Pack
Split/Splitless and MS Starter Kit	<b>290SA131</b>	1 Each
Split/Splitless and FID Starter Kit	<b>290SA132</b>	1 Each
Split/Splitless Injector Base Seal	<b>290SA133</b>	2 Pack

### Finger Tite Ferrules

ID (mm)	For Use With	Cat. No.	Quantity
0.4	0.1-0.25mm ID columns	<b>290S1132</b>	10 Pack
0.5	0.32mm ID columns	<b>290S1131</b>	10 Pack



## QCC (Quick Column Change)

Leak free column installation

- Leak free column installation to injector and detector
- Tool-free installation of analytical GC column
- Graphite ferrules
- Available for Thermo Scientific and Agilent GC instruments

Complete QCC Kits:

Includes:

- Injector adaptor
- Detector adaptor
- Tight nut
- Ferrules (1 each 0.25mm, 0.32mm, 0.53mm)
- Ceramic column cutter

### Thermo Scientific QCC (Quick Column Change) for Thermo Scientific Instruments

Description	Cat. No.	Quantity
QCC Kit for GC/FID	<b>60180-879</b>	1 Each
QCC Kit for GC/TCD	<b>60180-883</b>	1 Each
S/SL Injector Adaptor	<b>60180-880</b>	1 Each
FID Detector Adaptor	<b>60180-881</b>	1 Each
TCD Detector Adaptor	<b>60180-884</b>	1 Each
Silver Seals	<b>60180-882</b>	10 Pack
Tight Nut	<b>60180-873</b>	1 Each
Graphite Ferrules 0.25mm	<b>29053488</b>	10 Pack
Graphite Ferrules 0.32mm	<b>29053487</b>	10 Pack
Graphite Ferrules 0.53mm	<b>29053486</b>	10 Pack

### Thermo Scientific QCC (Quick Column Change) for Agilent Instruments

Description	Cat. No.	Quantity
QCC Kit for GC/FID	<b>60180-870</b>	1 Each
QCC Kit for GC/TCD	<b>60180-871</b>	1 Each
S/SL Injector Adaptor	<b>60180-872</b>	1 Each
FID Detector Adaptor	<b>60180-877</b>	1 Each
TCD Detector Adaptor	<b>60180-878</b>	1 Each
Tight Nut	<b>60180-873</b>	1 Each
Ferrules 0.25mm	<b>60180-874</b>	10 Pack
Ferrules 0.32mm	<b>60180-875</b>	10 Pack
Ferrules 0.53mm	<b>60180-876</b>	10 Pack

## Ferrules

Wide range of choices for a wide range of instruments and applications

Thermo Scientific ferrules are available in three different materials and various dimensions to match the instrument and capillary column ID. The choice of material is dependent upon the use; guidelines are given in the table.

Material Type	Suitable for GC/MS	Temp Limit (°C)	Re-usable
Graphite	No	450	Yes
Graphite/Vespel	Yes	350	No
Stainless Steel (SilTite)	Yes	500	No

### 100% Graphite Ferrules



Thermo Scientific 100% graphite ferrules are a soft material that is porous to oxygen, making them suitable

for most applications except GC/MS interface connections. These easy-to-use ferrules form a soft grip with the column and provide a stable seal.

### 15% Graphite/85% Vespel Ferrules

The mechanically robust 15% Graphite/85% Vespel ferrules have a long lifetime and are compatible with GC/MS. These ferrules form a strong grip with the column and cannot be reused as they form a permanent seal with the column. They have a temperature limit of 350°C, but must be re-tightened after initial temperature cycles.

### SilTite™ Metal Ferrules



SilTite metal ferrules and nuts are made from the same material and have the same thermal expansion coefficient.

The SilTite ferrule forms a strong, permanent, airtight seal around the capillary column, eliminating leaks. The base of the ferrule is flat and forms a perfect seal with the MS interface. The ferrule's temperature tolerance is well above the limit of the injector, MS interface or GC oven. Unlike other ferrules, SilTite Ferrules do not need re-tightening after installation.

*Please also see syringes on page 3-099.*

All varieties of ferrules are supplied in contaminant-free, individual blister packs, allowing removal of an individual item without risk of contamination to the other supplied items.

### Ferrules for Thermo Scientific Instruments

For Use With	Ferrule Size (Column ID) (mm)	Cat. No.	Quantity
<b>100% Graphite Ferrules</b>			
TRACE and FOCUS Injectors and Detectors (not GC/MS Interface)	0.1-0.25	<b>29053488</b>	10 Pack
	0.32	<b>29053487</b>	10 Pack
	0.53	<b>29053486</b>	10 Pack
<b>15% Graphite/85% Vespel Ferrules</b>			
TRACE Cold On-Column Injectors	0.1-0.25	<b>29033461</b>	10 Pack
	0.32	<b>29033460</b>	10 Pack
	0.53	<b>29033471</b>	10 Pack
	Packed Column 1/8" OD	<b>290VT168</b>	10 Pack
	Packed Column 1/4" OD	<b>290VT165</b>	10 Pack
Injectors and Detectors	0.1-0.25	<b>290VT186</b>	10 Pack*
	0.32	<b>290VT187</b>	10 Pack*
	0.53	<b>290VT188</b>	10 Pack*
Brass Nut		<b>290BT239</b>	2 Pack
GC/MS Interface	0.1-0.25	<b>29033496</b>	10 Pack
	0.32	<b>29033497</b>	10 Pack
<b>SilTite Kit</b>			
GC/MS Interface	0.1-0.25	<b>290MT229</b>	1 Each**
	0.32	<b>290MT230</b>	1 Each**
	0.53	<b>290MT231</b>	1 Each**
<b>Replacement SilTite Ferrules</b>			
SilTite Kit	0.1-0.25	<b>290MT221</b>	10 Pack
	0.32	<b>290MT222</b>	10 Pack
	0.53	<b>290MT223</b>	10 Pack
	Replacement SilTite Nuts	<b>290MT211</b>	5 Pack

\* Must be used in conjunction with brass nut part number 290BT239

\*\* Kit contains 2 SilTite nuts and 10 ferrules

## Ferrules for Agilent 5890, 6890 and 6850 Instruments

For Use With	Ferrule Size (Column ID) (mm)	Cat. No.	Quantity
<b>100% Graphite Ferrules</b>			
Injectors and Detectors at atmospheric pressure (not GC/MS interface)	0.1-0.32	<b>290GA139</b>	10 Pack
	0.45-0.53	<b>290GA140</b>	10 Pack
	Packed Column 1/8" OD	<b>290GA108</b>	10 Pack
	Packed Column 1/4" OD	<b>290GA107</b>	10 Pack
<b>15% Graphite/85% Vespel Ferrules</b>			
Injectors and Detectors	0.1-0.25	<b>290VA191</b>	10 Pack
	0.32	<b>290VA192</b>	10 Pack
	0.53	<b>290VA193</b>	10 Pack
	Packed Column 1/8" OD	<b>290VT168</b>	10 Pack
	Packed Column 1/4" OD	<b>290VT165</b>	10 Pack
GC/MS Interface	0.1-0.25	<b>29033496</b>	10 Pack
	0.32	<b>29033497</b>	10 Pack
	0.53	<b>290VP144</b>	10 Pack
<b>SilTite Kits</b>			
GC/MS Interface	0.1-0.25	<b>290MA194</b>	1*
	0.32	<b>290MA195</b>	1*
	0.53	<b>290MA196</b>	1*
Split Splitless Injectors	0.1-0.25	<b>290MA215</b>	1**
	0.32	<b>290MA216</b>	1**
	0.53	<b>290MA217</b>	1**
<b>Replacement SilTite Ferrules</b>			
All SilTite Connectors	0.1-0.25	<b>290MA201</b>	10 Pack
	0.32	<b>290MA202</b>	10 Pack
	0.53	<b>290MA203</b>	10 Pack
<b>SilTite Nuts</b>			
GC/MS Interface		<b>290MA205</b>	10 Pack
Split Splitless Injectors		<b>290MA207</b>	5
Replacement Baseplate Seals		<b>290MA227</b>	10 Pack
		<b>290MA228</b>	10

\*Kit contains 2 nuts and 10 ferrules

\*\*Contains 2 nuts, 10 ferrules and 2 base seals



## Retention Gap Kits

Support Thermo Scientific gas chromatography consumables

- Length of deactivated fused silica tubing
- Mini-union
- 5 ferrules
- Kit contains one union and five ferrules



### Retention Gap Kits

Description	Cat. No.	Quantity
Retention gap kit, ID 0.22 – 0.32mm, 2m (includes connectors)	<b>260RG497</b>	1 Each
Retention gap kit, ID 0.53mm, 2m (includes connectors)	<b>260RG499</b>	1 Each
Retention gap kit, ID 0.53mm, 5m (includes connectors)	<b>260RG500</b>	1 Each
Deactivated silica tubing; 0.32mm ID; 2m Length	<b>260G498P</b>	1 Each
Deactivated silica tubing; 0.53mm ID; 2m Length	<b>260G499P</b>	1 Each
Deactivated silica tubing, ID 0.25mm, 5m	<b>260G495P</b>	1 Each
Deactivated silica tubing, ID 0.32mm, 5m	<b>260G496P</b>	1 Each
Deactivated silica tubing ID 0.53mm, 5m	<b>260G500P</b>	1 Each
Deactivated silica tubing ID 0.53mm, 1m (Siltek)	<b>260G401P</b>	1 Each

### Mini Capillary Unions

For Use With	Cat. No.	Quantity
0.32mm ID capillary GC column	<b>290GU498</b>	1 Each
0.53mm ID capillary GC column	<b>290GU499</b>	10 Pack



## Capillary Column End Caps

Feature a universal fit to all GC capillary columns

- Eliminate column contamination caused by leaving a column unsealed or sealed with a septum
- Color-coordinated fittings ensure that the column is reinstalled the same way it came out
- Reusable



### Capillary Column End Caps

Description	Cat No.	Quantity
Capillary Column End Caps, Paired	<b>260EC111</b>	10 Pack



## Capillary GuardGOLD Columns

Providing protection to the analytical column

- Protects against column contamination caused by non-volatile materials, extending the column lifetime
- Focuses target analytes at the head of the analytical column, leading to better chromatographic peak shape
- Highly deactivated to provide superior inertness, essential for analysis of active compounds.
- High maximum operating temperature of 360°C

### Capillary GuardGOLD Columns

ID (mm)	Length (m)	Cat. No.	Quantity
0.25	2	<b>26050-0225</b>	1 Each
0.32	2	<b>26050-0232</b>	1 Each
0.53	2	<b>26050-0253</b>	1 Each
0.25	5	<b>26050-0525</b>	1 Each
0.32	5	<b>26050-0532</b>	1 Each
0.53	5	<b>26050-0553</b>	1 Each
0.25	10	<b>26050-1025</b>	1 Each
0.32	10	<b>26050-1032</b>	1 Each
0.53	10	<b>26050-1053</b>	1 Each

## SilTite Capillary Column Connectors

For use with capillary GC columns

- For fused silica capillary columns
- Glass lined for inertness
- Low thermal mass

### SilTite Capillary Column Connectors

Column ID (mm)	2nd Column ID (mm)	Pack Contents	Cat. No.	Quantity
0.1 – 0.25	0.1 – 0.53	1 Connector, 2 Nuts and 5 Ferrules (0.1 – 0.25mm ID)	<b>290MU498</b>	1 Each
0.32	0.32 – 0.53	1 Connector, 2 Nuts and 5 Ferrules (0.32mm ID)	<b>290MU499</b>	1 Each
0.45 – 0.53	0.45 – 0.53	1 Connector, 2 Nuts and 5 Ferrules (0.45 – 0.53mm ID)	<b>290MU500</b>	1 Each
Replacement SilTite Connector Nuts†		5 Nuts	<b>290MN211</b>	1 Each

† SilTite nuts must be used with SilTite ferrules

### SilTite Ferrules

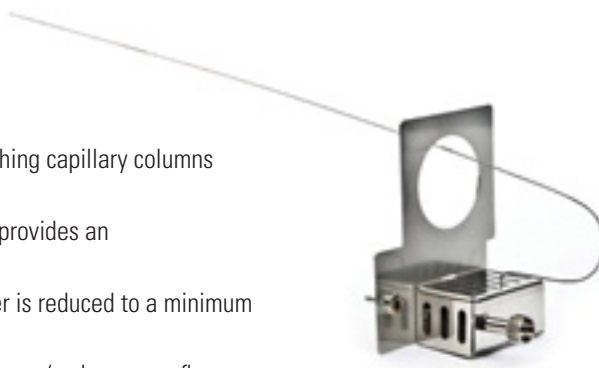
Column ID (mm)	Cat. No.	Quantity
0.25	<b>290MF229</b>	10 Pack
0.32	<b>290MF230</b>	10 Pack
0.53	<b>290MF231</b>	10 Pack

# SWAP-IT GC MS Interface System

Easy to install for quick column changeovers

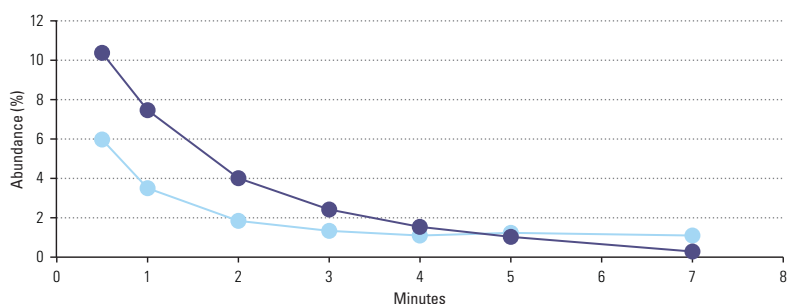
The SWAP-IT GCMS Interface provides a powerful tool for switching capillary columns without the need to vent the MS.

- Specially deactivated, robust stainless steel transfer capillary provides an interface between the analytical column and the MS detector
- Small ID of transfer capillary ensures exposure to air and water is reduced to a minimum during disconnection of the analytical column
- The system works without the requirement for additional He-purge/make-up gas flow
- Finger-tight connections make exchanging the analytical column quick and easy without the need for tools



## SWAP-IT GC MS Interface System

Description	Cat. No.	Quantity
<b>For Thermo Scientific Instruments (DSQ, DSQ II, Polaris Q, ITQ only)</b>		
SWAP-IT GCMS Interface Kit: SWAP-IT GCMS Interface, Nuts, Ferrules, Accessories	<b>60180-790</b>	1 Each
SWAP-IT GCMS Interface, SWAP-IT only	<b>60180-792</b>	1 Each
Transfer Line Nut	<b>290SG001</b>	1 Each
Graphite/Vespel Ferrule for Transfer Line	<b>290SG020</b>	10 Pack
<b>For Agilent Instruments</b>		
SWAP-IT GCMS Interface Kit: SWAP-IT GCMS Interface, Nuts, Ferrules, Accessories	<b>60180-794</b>	1 Each
SWAP-IT GCMS Interface, SWAP-IT Only	<b>60180-796</b>	1 Each
Transfer Line Nut	<b>290SG004</b>	1 Each
Graphite/Vespel Ferrule for Transfer Line	<b>290SG021</b>	10 Pack
SWAP-Tight Nut and Adaptor for S/SL Injector	<b>290SG003</b>	1 Each
<b>Accessories</b>		
SWAP-Tight Nut	<b>290SG002</b>	1 Each
SWAP-Tight Ferrules, Blank	<b>290SG000</b>	10 Pack
SWAP-Tight Ferrules, 0.1 – 0.25mm	<b>290SG025</b>	10 Pack
SWAP-Tight Ferrules, 0.32mm	<b>290SG032</b>	10 Pack



● Mass 28, nitrogen  
● Mass 18, water

Removal of water and nitrogen to levels less than 2% is obtained within 3-4 minutes after column replacement

## General Gas Chromatography Tools

Support GC applications

### General Gas Chromatography Tools

Description	Cat. No.	Quantity
Straight-Tipped Forceps	60180-770	1 Each
Angle-Tipped Forceps	60180-771	1 Each
Pin Vice	60180-772	1 Each
Probes	60180-774	1 Each
Inspection Mirror	60180-775	1 Each
Pick-Up Tool	60180-777	1 Each
0.35mm Drill Bit	60180-779	1 Each
0.45mm Drill Bit	60180-780	1 Each
0.70mm Drill Bit	60180-781	1 Each
Adjustable Spanner	60180-782	1 Each
Tri-Scale Ruler	60180-783	1 Each
Shortix Capillary Column Cutter	60180-835	1 Each
Shortix Capillary Column Cutter Repair Kit	60180-836	1 Each
Ceramic Column Cutter	60201-318	1 Each



## GC Tool Kit for Thermo Scientific Instruments

### GC Tool Kit for Thermo Scientific Instruments

Description	Cat. No.	Quantity
Capillary Tool Kit for Thermo Scientific GCs	60180-784	1 Each

## GC Tool Kit for Agilent Instruments

### GC Tool Kit for Agilent Instruments

Description	Cat. No.	Quantity
Capillary Tool Kit for Agilent GCs	60180-786	1 Each

## GLD Pro Gas Leak Detector

Aids in quickly locating and identifying gas leaks

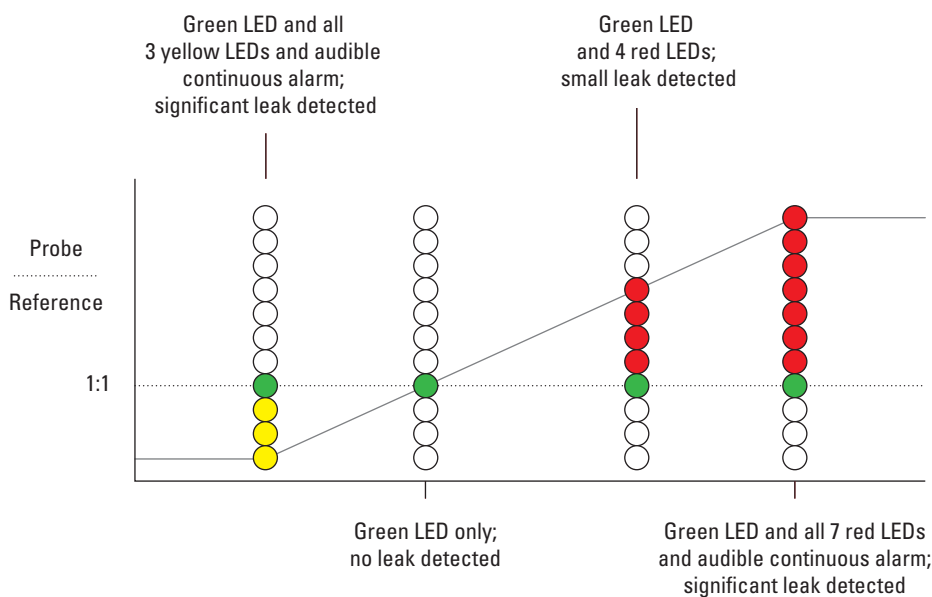
The GLD Pro Gas Leak Detector is specifically designed for use with gas chromatography instruments. Detection of leaks allows the user to reduce detector noise, provide a stable baseline, reduce carrier gas by minimizing waste, and maximize the lifetime of the analytical column by minimizing the presence of oxygen and other impurities in the carrier gas.

- Suitable for detection of a wide range of laboratory gases
- Push button on/off switch
- Push button zero function
- Automatic shutoff (5 minutes)
- LED light indicator for intensity of leak
- Rechargeable battery (up to 6 hrs. operation)
- Durable storage case
- Probe holder
- One year warranty



### GLD Pro Gas Leak Detector

Description	Cat. No.	Quantity
GLD Pro Leak Detector	<b>66002-001</b>	1 Each
Small Probe Adaptor	<b>66002-003</b>	1 Each
Soft-sided Carry Case (Leak Detector not included)	<b>66002-002</b>	1 Each



## GFM Pro Electronic Flowmeter

Measure and monitor flow quickly and efficiently

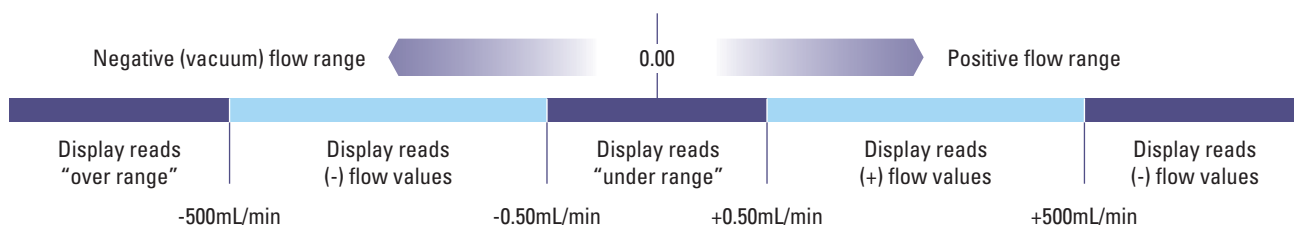
The GFM Pro Flowmeter is specifically designed for use with gas chromatography instruments. This versatile product is an electronic device capable of measuring bidirectional, volumetric flow for all types of gases. Real-time measurements can be made for various types of flow paths including continually changing gas types. The unit is portable so it can be hand-held or it also has an optional stand for bench-top convenience.

- Compact ergonomic design features side grips for added durability
- Easy-to-use interface features over-range warning indicator and auto-shutoff
- Measurement range of 0.5-500mL/min (both positive and negative flow)
- Accuracy of +/- 2% of flow or +/- 0.05mL/min, whichever is greater
- Data output via USB port
- Calibration: traceable to NIST primary standards
- Explosion-proof rating for flammable and explosive gases
- CE certified
- Uses 2-AA batteries
- Re-calibration service available



### GFM Pro Electronic Flowmeter

Description	Cat. No.	Quantity
GFM Pro Flowmeter	<b>66002-010</b>	1 Each
Soft-sided Carry Case (Flowmeter not included)	<b>66002-002</b>	1 Each



## GC Syringes for Thermo Scientific Instruments

## Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity	Instrument Compatibility
10	75	31	Cone	Manual OC	<b>36500520</b>	1 Each	<b>36550046</b>	2 Pack	
50	50	25	Bevel		<b>365G2161</b>	1 Each	<b>365RN225</b>	5 Pack	AS200/AS800
100	50	23	Side hole	See Note	<b>36520050</b>	1 Each	<b>36550040</b>	2 Pack	TriPlus, AS200/ AS800
100	50	25	Bevel		<b>365H2381</b>	1 Each	<b>365RN225</b>	5 Pack	AS200/AS800
100	50	23	Cone	LV Splitless	<b>36500495</b>	1 Each	<b>36566485</b>	5 Pack	TriPlus, AS2000, AS200/AS800
250	50	25	Bevel		<b>365I2611</b>	1 Each	<b>365RN225</b>	5 Pack	AS200/AS800
250	80	26	Cone	LVOC	<b>36500490</b>	1 Each	<b>36566480</b>	5 Pack	TriPlus, AS2000
250	50	23	Side hole	See Note	<b>36520051</b>	1 Each	<b>36550040</b>	2 Pack	TriPlus, AS2000, AS200/AS800
1000	50	23	Bevel		<b>365K3041</b>	1 Each	<b>365RN235</b>	5 Pack	AS200/AS800

## Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity	Instrument Compatibility
5	75	31	Cone	Manual OC	<b>36500510</b>	1 Each	<b>36550045</b>	2 Pack	
10	42	23	Cone		<b>365D1611</b>	6 Pack	<b>365RN252</b>	2 Pack	AS200/AS800
10	50	26	Cone		<b>365D1841</b>	1 Each	<b>365RN362</b>	2 Pack	AS3000, AS2000
10	50	23	Cone		<b>365D3731</b>	1 Each	<b>365RN372</b>	2 Pack	AS3000, AS2000, AS200/ AS800
50	50	23	Cone	LV Splitless	<b>36503015</b>	1 Each	<b>36566485</b>	5 Pack	AS2000
100	50	25	Bevel		<b>365H2301</b>	1 Each	<b>365RN225</b>	5 Pack	AS200/AS800

Syringe 36520051 is to be used when performing PTV/LVI injections with a dedicated liner for thermo labile compounds (liner 45352060). Compatible with Merlin Microseal device installed on BEST PTV and with AS2000 and TriPlus autosamplers for liquids.



**Fixed Needle, Gas Tight Syringes**

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat No.	Quantity	Instrument Compatibility
10	50	23	Cone		<b>365D3741</b>	1 Each	AS2000
250	50	25	Bevel		<b>365I2561</b>	1 Each	AS200/AS800

**Fixed Needle Syringes**

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat No.	Quantity	Instrument Compatibility
5	50	26	Cone	Split/PTV	<b>36504047</b>	1 Each	TriPlus
5	50	23	Cone		<b>365C3701</b>	1 Each	AS3000, AS2000, AS200/AS800
5	50	26	Cone	Split/PTV	<b>36500505</b>	1 Each	AS3000, AS2000
5	80	26	Cone	Splitless and OC	<b>36502025</b>	1 Each	TriPlus
10	50	26	Cone		<b>365D3711</b>	1 Each	AS3000, AS200, AS200/AS800
10	50	26	Cone		<b>365D1856</b>	6 Pack	AS300, AS2000, AS200/AS800
10	50	25	Cone	Split/PTV	<b>36500525</b>	1 Each	TriPlus, AS3000, AS2000, AS200/ AS800
10	50	23	Cone	PTV/SSL Split	<b>36520060</b>	1 Each	TriPlus, AS300, AS2000, AS200/ AS800
10	80	23	Cone	Merlin Valve SSL Splitless	<b>36520061</b>	1 Each	TriPlus, AS2000
10	50	23-26	Cone	OC in PTV Merlin Valve	<b>36500580</b>	1 Each	TriPlus, AS2000
10	80	26	Cone	OC and Splitless	<b>36502019</b>	1 Each	TriPlus, AS2000

**Plunger-in-Needle Syringes**

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat No.	Quantity	Instrument Compatibility
0.5	50	23	Cone	Split/PTV	<b>36504045</b>	1 Each	TriPlus, AS3000
0.5	75	31	Cone	Manual OC	<b>36500500</b>	1 Each	
0.5	80	26	Cone	Splitless and OC	<b>36504046</b>	1 Each	TriPlus

## GC Syringes for Thermo Scientific TriPlus RSH Autosampler

## Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat. No.	Quantity
0.5	57	23	Cone	Split	<b>365A0241</b>	1 Each
1	57	23	Cone	Split	<b>365B0251</b>	1 Each

## Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat. No.	Quantity
5	85	23s	Cone	Merlin Valve SSL Injector: Splitless	<b>365C0221</b>	1 Each
	57	23s	Cone	Merlin Valve Injector: PTV and split	<b>365C0231</b>	1 Each
	85	26s	Cone	Splitless and OC	<b>365C0241</b>	1 Each
	57	26s	Cone	Split and PTV	<b>365C0251</b>	1 Each
10	85	23s	Cone	Merlin Valve SSL Injector: Splitless	<b>365D0261</b>	1 Each
	57	23s	Cone	Merlin Valve Injector: PTV and split	<b>365D0271</b>	1 Each
	85	26s	Cone	Splitless and OC	<b>365D0281</b>	1 Each
	57	26s	Cone	Split and PTV	<b>365D0291</b>	1 Each

## Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Type	Cat. No.	Quantity
10	85	23s	Cone	Merlin Valve SSL Injector: Splitless	<b>365D0301</b>	1 Each
	57	23s	Cone	Merlin Valve Injector: PTV and split	<b>365D0311</b>	1 Each
	85	26s	Cone	Splitless and OC	<b>365D0321</b>	1 Each
	57	26s	Cone	Split and PTV	<b>365D0331</b>	1 Each
25	85	23s	Cone	Merlin Valve SSL Injector: Splitless	<b>365F2431</b>	1 Each
	57	23s	Cone	Merlin Valve Injector: PTV and split	<b>365F2441</b>	1 Each
	85	26s	Cone	Splitless and OC	<b>365F2451</b>	1 Each
	57	26s	Cone	Split and PTV	<b>365F2461</b>	1 Each
50	57	23s	Cone	Merlin Valve SSL Injector: LV Splitless	<b>365G2311</b>	1 Each
	85	26s	Cone	LV OC	<b>365G2321</b>	1 Each
	57	26s	Cone	LV Splitless	<b>365G2331</b>	1 Each
100	57	23s	Cone	Merlin Valve SSL Injector: LV Splitless	<b>365H2141</b>	1 Each
	85	26s	Cone	LV OC	<b>365H2151</b>	1 Each
	57	26s	Cone	LV Splitless	<b>365H2161</b>	1 Each
	85	23	Side Hole	Variable depth LV PTV (w & w/o Merlin)	<b>365H2171</b>	1 Each
	57	23	Side Hole	LV PTV (with or without Merlin valve)	<b>365H2181</b>	1 Each
250	85	26	Cone	LV OC	<b>365I2321</b>	1 Each
	57	26	Cone	LV Splitless	<b>365I2331</b>	1 Each
	85	23	Side Hole	Variable depth LV PTV (w & w/o Merlin)	<b>365I2341</b>	1 Each
	57	23	Side Hole	LV PTV (with or without Merlin valve)	<b>365I2351</b>	1 Each
500	85	26	Cone	LV OC	<b>365J2411</b>	1 Each
	57	26	Cone	Sample Dilution	<b>365J2421</b>	1 Each
	85	23	Side Hole	Variable depth LV PTV (w & w/o Merlin)	<b>365J2431</b>	1 Each
	57	23	Side Hole	LV PTV (with or without Merlin valve)	<b>365J2441</b>	1 Each
1000	65	23	Side Hole	Headspace	<b>365Q2121</b>	1 Each
	57	22	LC	Sample Dilution	<b>365K2811</b>	1 Each
2500	65	23	Side Hole	Headspace	<b>365Q2131</b>	1 Each
5000	65	22	Side Hole	Headspace	<b>365Q2141</b>	1 Each
10000	57	19	LC	Sample Dilution	<b>365N2721</b>	1 Each

## GC Syringes for Agilent Instruments

### Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity
0.5	42	26	Cone	<b>365A0411</b>	1 Each	<b>365RK541</b>	1 Each
		23	Cone	<b>365A0421</b>	1 Each	<b>365RK241</b>	1 Each
		23-26	Cone	<b>365A0431</b>	1 Each	<b>365RK261</b>	1 Each
10	42	23	Cone	<b>365D1611</b>	6 Pack	<b>365RN252</b>	2 Pack
		26	Cone	<b>365D1771</b>	1 Each	<b>365RN272</b>	2 Pack

### Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
5	42	23	Cone	<b>365C0951</b>	1 Each
		23	Cone	<b>365C0956</b>	6 Pack
		23-26	Cone	<b>365C0971</b>	1 Each
		23-26	Cone	<b>365C0976</b>	6 Pack
10	42	26	Cone	<b>365D1521</b>	1 Each
		26	Cone	<b>365D1526</b>	6 Pack
		23-26	Cone	<b>365D1561</b>	1 Each
		23	Cone	<b>365D1571</b>	1 Each
		23	Cone	<b>365D1576</b>	1 Each
		23-26	Cone	<b>365D1621</b>	1 Each
		23-26	Cone	<b>365D1636</b>	6 Pack



## GC Syringes for CTC Instruments

### Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity	Replacement Plunger Cat. No.	Quantity
10	50	23	Cone	<b>365D2985</b>	1 Each	<b>365RN362</b>	2 Pack	<b>365RP121</b>	1 Each
25	50	26	Side Hole	<b>365F3988</b>	1 Each	<b>365RN749</b>	2 Pack	<b>365RP816</b>	1 Each
100	50	26	Cone	<b>365H5333</b>	1 Each	<b>365RN732</b>	2 Pack	<b>365RP826</b>	1 Each

### Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity
0.5	50	26	Cone	<b>365A0490</b>	1 Each	<b>365RK770</b>	1 Pack
10	50	23	Cone	<b>365D3731</b>	1 Each	<b>365RN732</b>	2 Pack
10	50	26	Cone	<b>365D1841</b>	1 Each	<b>365RN363</b>	3 Pack

### Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity	Replacement Plunger Cat. No.	Quantity
10	50	23	Cone	<b>365D2972</b>	6 Pack	<b>365RP532</b>	1 Each
10	50	26	Cone	<b>365D2976</b>	6 Pack	<b>365RP532</b>	1 Each
10	50	26	Cone	<b>365D2977</b>	1 Each	<b>365RP532</b>	1 Each
10	50	23	Cone	<b>365D3741</b>	1 Each	<b>365RP532</b>	1 Each
25	50	26	Cone	<b>365F3700</b>	1 Each	<b>365RP922</b>	1 Each
25	50	23	Cone	<b>365F3761</b>	1 Each	<b>365RP431</b>	1 Each
100	50	23	Cone	<b>365H3771</b>	1 Each	<b>365RP471</b>	1 Each
100	50	26	Cone	<b>365H5700</b>	1 Each	<b>365RP471</b>	1 Each
250	50	26	Cone	<b>365H6700</b>	1 Each	<b>365RP926</b>	1 Each
500	50	26	Cone	<b>365J7700</b>	1 Each	<b>365RP928</b>	1 Each
1000	50	23	Side Hole	<b>365K8130</b>	1 Each	<b>365RP844</b>	1 Each
1000	50	26	Side Hole	<b>365K8135</b>	1 Each	<b>365RP844</b>	1 Each
2500	50	23	Side Hole	<b>365L8630</b>	1 Each	<b>365RP845</b>	1 Each
2500	50	26	Side Hole	<b>365L8635</b>	1 Each	<b>365RP845</b>	1 Each

### Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
5	50	23	Cone	<b>365C3701</b>	1 Each
5	50	26	Cone	<b>36500505</b>	1 Each
10	50	26	Cone	<b>365D3711</b>	1 Each
10	50	23	Cone	<b>36520060</b>	1 Each
10	50	26	Cone	<b>365D1856</b>	6 Pack
10	50	26	Bevel	<b>365D2705</b>	1 Each
10	50	23	Cone	<b>365D2971</b>	6 Pack
25	50	26	Cone	<b>365F3980</b>	1 Each

## Repair Kits for Thermo Scientific Plunger-in-Needle Syringes

Extend the life and performance of syringes

### Repair Kits for Thermo Scientific Plunger-in-Needle Syringes

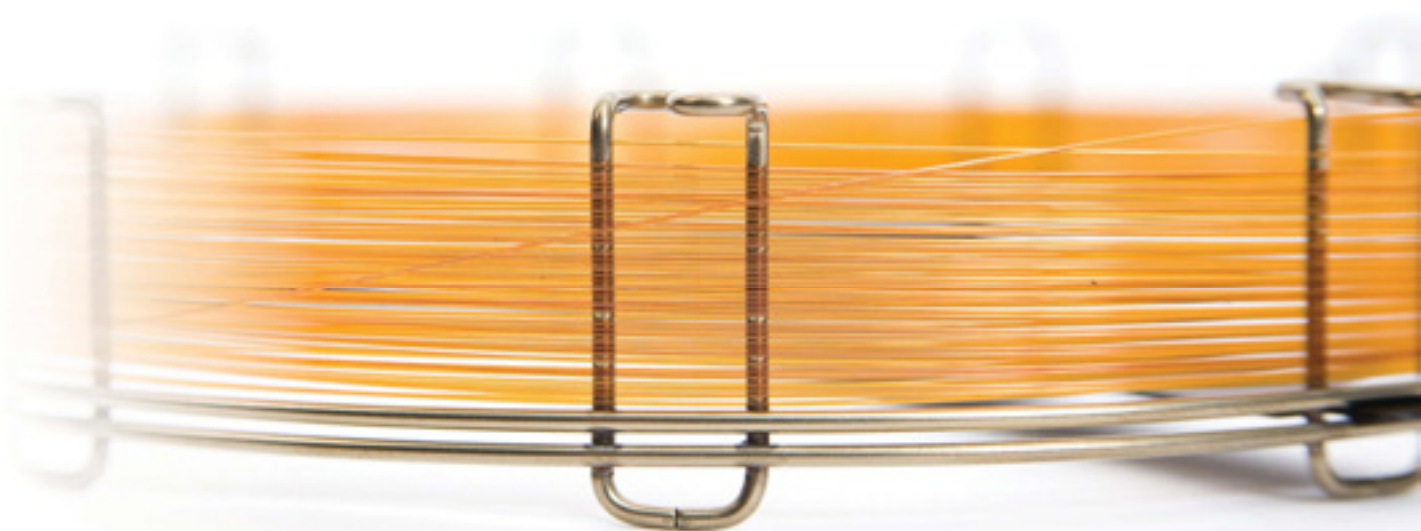
For Repair of Syringe Cat. No.	Cat. No.	Quantity
365A0411	<b>365RK541</b>	1 Each
365A0421	<b>365RK241</b>	1 Each
365A0431	<b>365RK261</b>	1 Each
365A0471	<b>365RK291</b>	1 Each
365A0481	<b>365RK331</b>	1 Each
365A0331	<b>365RK321</b>	1 Each
365B0511	<b>365RK311</b>	1 Each
365B0531	<b>365RK341</b>	1 Each
365A0490	<b>365RK770</b>	1 Each

Repair kits for plunger in needle syringes contain both the plunger and needle, which must be changed together.

## Replacement Seals for Thermo Scientific Syringes

### Replacement Seals for Thermo Scientific Syringes

For Use with	Cat. No.	Quantity
0.5µL Syringes	<b>365RK561</b>	2 Pack
1.0µL Syringes	<b>365RK563</b>	2 Pack



## Manual GC Syringes

### Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity	Replacement Plunger Cat No.	Quantity
25	70	25	Bevel	<b>365F1931</b>	1 Each	<b>365RN225</b>	5 Pack	<b>365RP421</b>	1 Each
50	50	25	Bevel	<b>365G2161</b>	1 Each	<b>365RN225</b>	5 Pack	<b>365RP451</b>	1 Each
100	50	25	Bevel	<b>365H2381</b>	1 Each	<b>365RN225</b>	5 Pack	<b>365RP461</b>	1 Each
250	50	25	Bevel	<b>365I2611</b>	1 Each	<b>365RN225</b>	5 Pack	<b>365RP481</b>	1 Each
500	50	25	Bevel	<b>365J2881</b>	1 Each	<b>365RN225</b>	5 Pack	<b>365RP491</b>	1 Each
1000	50	23	Bevel	<b>365K3041</b>	1 Each	<b>365RN235</b>	5 Pack	<b>365RP511</b>	1 Each

### Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity
5	50	26	Bevel	<b>365C0761</b>	1 Each	<b>365RN555</b>	5 Pack
10	50	26	Bevel	<b>365D1171</b>	1 Each	<b>365RN215</b>	5 Pack
25	50	25	Bevel	<b>365F1901</b>	1 Each	<b>365RN225</b>	5 Pack
50	50	25	Bevel	<b>365G2091</b>	1 Each	<b>365RN225</b>	5 Pack
100	50	25	Bevel	<b>365H2301</b>	1 Each	<b>365RN225</b>	5 Pack

### Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity	Replacement Plunger Cat No.	Quantity
25	50	25	Bevel	<b>365F1921</b>	1 Each	<b>365RP421</b>	1 Each
50	50	25	Bevel	<b>365G2111</b>	1 Each	<b>365RP451</b>	1 Each
100	50	25	Bevel	<b>365H2321</b>	1 Each	<b>365RP461</b>	1 Each
250	50	25	Bevel	<b>365I2561</b>	1 Each	<b>365RP481</b>	1 Each
250	50	25	Bevel	<b>365J2831</b>	1 Each	<b>365RP491</b>	1 Each
1000	50	22	Bevel	<b>365K3051</b>	1 Each	<b>365RP511</b>	1 Each

### Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
5	50	26	Bevel	<b>365C0741</b>	1 Each
10	50	26	Bevel	<b>365D1091</b>	1 Each
10	50	26	Bevel	<b>365D1096</b>	6 Pack
25	50	25	Bevel	<b>365F1891</b>	1 Each
50	50	25	Bevel	<b>365G2081</b>	1 Each
100	50	25	Bevel	<b>365H2291</b>	1 Each
250	50	25	Bevel	<b>365I2541</b>	1 Each



# National Target Precision GC Syringes

Syringes for Agilent Technologies Instruments

## Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity
5	42	23-26s	Cone	5181-3356	<b>NS604408</b>	1 Each		

## Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity
5	42	23-26s	Cone	5182-0835	<b>NS104308</b>	1 Each	<b>NS834308</b>	3 Pack
10	42	23-26s	Cone	5181-3321	<b>NS104408</b>	1 Each	<b>NS834408</b>	3 Pack

## Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	Cat No.	Quantity
5	42	23	Cone		<b>NS604305</b>	1 Each
	42	23	Cone		<b>NS604315</b>	6 Pack
	42	26	Cone		<b>NS604303</b>	1 Each
	42	26	Cone		<b>NS604313</b>	6 Pack
	42	23-26s	Cone		<b>NS604304</b>	1 Each
	42	23-26s	Cone		<b>NS604314</b>	6 Pack
10	42	23	Cone	5181-8809	<b>NS604405</b>	1 Each
	42	23	Cone	5181-4730	<b>NS604415</b>	6 Pack
	42	26	Cone		<b>NS604403</b>	1 Each
	42	26	Cone		<b>NS604413</b>	6 Pack
	42	23-26s	Cone	5181-3354	<b>NS604404</b>	1 Each
	42	23-26s	Cone	5181-3361	<b>NS604414</b>	6 Pack

## Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	Cat No.	Quantity
5	42	23	Cone	9301-0892	<b>NS104305</b>	1 Each
5	42	23	Cone	5182-0875	<b>NS104315</b>	6 Pack
5	42	26	Cone	9301-0891	<b>NS104303</b>	1 Each
5	42	26	Cone	5183-4728	<b>NS104313</b>	6 Pack
5	42	23-26s	Cone	5181-1273	<b>NS104304</b>	1 Each
5	42	23-26s	Cone	5181-8810	<b>NS104314</b>	6 Pack
10	42	23	Cone	9301-0713	<b>NS104405</b>	1 Each
10	42	23	Cone	9301-0725	<b>NS104415</b>	6 Pack
10	42	26	Cone	9301-0714	<b>NS104403</b>	1 Each
10	42	26	Cone	5181-4729	<b>NS104413</b>	6 Pack
10	42	23-26s	Cone	5181-1267	<b>NS104404</b>	1 Each
10	42	23-26s	Cone	5181-3360	<b>NS104414</b>	6 Pack

## Fixed Needle, Super-Elastic Plunger Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Agilent No.	Cat No.	Quantity
5	42	23-26s	Cone		<b>NS164304</b>	1 Each
10	42	23-26s	Cone		<b>NS164404</b>	1 Each

## GC Syringes for PerkinElmer Instruments

### Fixed Needle, Gas Tight Syringes

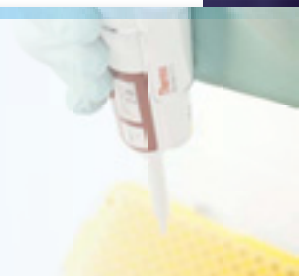
Volume (µL)	Length (mm)	Gauge	Tip Style	PerkinElmer No.	Cat No.	Quantity
5	70	26s	Cone	N6101390	<b>NS608302</b>	1 Each
5	70	23s	Cone	N6101380	<b>NS608303</b>	1 Each
5	70	26s	Cone		<b>NS108302</b>	1 Each

## GC Syringes for Shimadzu Instruments

### Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Shimadzu No.	Cat No.	Quantity
5	42	26s	Cone		<b>NS105303</b>	1 Each
5	42	23s	Cone		<b>NS105304</b>	1 Each
10	42	26s	Cone		<b>NS105403</b>	1 Each
10	42	23s	Cone	221-34618-00	<b>NS105404</b>	1 Each

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## GC Syringes for CTC/Leap Technologies Instruments

## Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
10	51	26s	Bevel	<b>NS606405</b>	1 Each

## Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
25	51	26s	Bevel	<b>NS620506</b>	1 Each
100	51	26s	Bevel	<b>NS620706</b>	1 Each
100	51	23s	Cone	<b>NS620703</b>	1 Each
500	51	26s	Bevel	<b>NS620903</b>	1 Each

## Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
10	51	26s	Bevel	<b>NS100401</b>	1 Each

## Fixed Needle, Headspace, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
10	51	26s	Bevel	<b>NS606401</b>	1 Each
1000	56	22s	Side Hole	<b>NS620013</b>	1 Each
2500	56	22s	Side Hole	<b>NS620023</b>	1 Each
5000	56	22s	Side Hole	<b>NS620049</b>	1 Each



## GC Syringes for Manual, On-Column and Septum Injection

### Series N Removable Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity
5	51	26s	Bevel	<b>NS100305</b>	1 Each	<b>NS832301</b>	3 Pack
10	51	26s	Bevel	<b>NS100405</b>	1 Each	<b>NS832401</b>	3 Pack
25	51	22s	Bevel	<b>NS100505</b>	1 Each	<b>NS832501</b>	3 Pack
50	51	22s	Bevel	<b>NS100605</b>	1 Each	<b>NS832501</b>	3 Pack
100	51	22s	Bevel	<b>NS100705</b>	1 Each	<b>NS832501</b>	3 Pack
250	51	22s	Bevel	<b>NS100805</b>	1 Each	<b>NS832601</b>	3 Pack
500	51	22s	Bevel	<b>NS100905</b>	1 Each	<b>NS832601</b>	3 Pack

### Series N Fixed Needle Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
5	51	26s	Bevel	<b>NS100301</b>	1 Each
5	51	26s	Bevel	<b>NS100311</b>	6 Pack
10	51	26s	Bevel	<b>NS100401</b>	1 Each
10	51	26s	Bevel	<b>NS100411</b>	6 Pack
25	51	22s	Bevel	<b>NS100501</b>	1 Each
100	51	22s	Bevel	<b>NS100701</b>	1 Each

### Series N Fixed Needle 90° Syringe

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
25	51	22s	90°	<b>NS101502</b>	1 Each
50	51	22s	90°	<b>NS101602</b>	1 Each
100	51	22s	90°	<b>NS101702</b>	1 Each
250	51	22s	90°	<b>NS101802</b>	1 Each

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## GC Syringes for Accurate Dosing of Liquids

- Suitable for liquid or gas samples
- 26s and 22s Gauge needles
- PTFE-tipped stainless-steel plunger eliminates frozen plungers

### Removable Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity
5	51	26s	Bevel	<b>NS600305</b>	1 Each	<b>NS832301</b>	3 Pack
10	51	26s	Bevel	<b>NS600405</b>	1 Each	<b>NS832401</b>	3 Pack
25	51	22s	Bevel	<b>NS600505</b>	1 Each	<b>NS831013</b>	3 Pack
50	51	22s	Bevel	<b>NS600605</b>	1 Each	<b>NS831013</b>	3 Pack
100	51	22s	Bevel	<b>NS600705</b>	1 Each	<b>NS831013</b>	3 Pack
250	51	26s	Bevel	<b>NS600805</b>	1 Each	<b>NS841013</b>	3 Pack
500	51	22s	Bevel	<b>NS600905</b>	1 Each	<b>NS841013</b>	3 Pack
1000	51	22s	Bevel	<b>NS600005</b>	1 Each	<b>NS841013</b>	3 Pack
5000	51	22s	Bevel	<b>NS600045</b>	1 Each	<b>NS841013</b>	3 Pack
10000	51	22s	Bevel	<b>NS600065</b>	1 Each	<b>NS841013</b>	3 Pack
5	51	26s	Blunt End	<b>NS600306</b>	1 Each	<b>NS834307</b>	3 Pack
10	51	26s	Blunt End	<b>NS600406</b>	1 Each	<b>NS834407</b>	3 Pack
25	51	22s	Blunt End	<b>NS600506</b>	1 Each	<b>NS831014</b>	3 Pack
50	51	22s	Blunt End	<b>NS600606</b>	1 Each	<b>NS831014</b>	3 Pack
100	51	22s	Blunt End	<b>NS600706</b>	1 Each	<b>NS831014</b>	3 Pack
500	51	22s	Blunt End	<b>NS600906</b>	1 Each	<b>NS841014</b>	3 Pack
1000	51	22s	Blunt End	<b>NS600006</b>	1 Each	<b>NS841014</b>	3 Pack
5000	51	22s	Blunt End	<b>NS600046</b>	1 Each	<b>NS841014</b>	3 Pack
10000	51	22s	Blunt End	<b>NS600066</b>	1 Each	<b>NS841014</b>	3 Pack
500	51	22s	Side Hole	<b>NS600908</b>	1 Each	<b>NS841015</b>	2 Pack
1000	51	22s	Side Hole	<b>NS600007</b>	1 Each	<b>NS841015</b>	2 Pack
5000	51	22s	Side Hole	<b>NS600047</b>	1 Each	<b>NS841015</b>	2 Pack

## Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat No.	Quantity
5	51	26s	Bevel	<b>NS600301</b>	1 Each
10	51	26s	Bevel	<b>NS600401</b>	1 Each
25	51	22s	Bevel	<b>NS600501</b>	1 Each
50	51	26s	Bevel	<b>NS100601</b>	1 Each
100	51	22s	Bevel	<b>NS600701</b>	1 Each
250	51	26s	Bevel	<b>NS100801</b>	1 Each
500	51	22s	Bevel	<b>NS600901</b>	1 Each
500	51	26s	Bevel	<b>NS100901</b>	1 Each
1000	51	22s	Bevel	<b>NS600000</b>	1 Each
5000	51	22s	Bevel	<b>NS600040</b>	1 Each
10000	51	22s	Bevel	<b>NS600060</b>	1 Each
5	51	26s	Blunt End	<b>NS600302</b>	1 Each
10	51	26s	Blunt End	<b>NS600402</b>	1 Each
25	51	22s	Blunt End	<b>NS600502</b>	1 Each
50	51	22s	Blunt End	<b>NS600602</b>	1 Each
100	51	22s	Blunt End	<b>NS600702</b>	1 Each
500	51	22s	Blunt End	<b>NS600902</b>	1 Each
1000	51	22s	Blunt End	<b>NS600001</b>	1 Each
5000	51	22s	Blunt End	<b>NS600041</b>	1 Each
10000	51	22s	Blunt End	<b>NS600061</b>	1 Each
250	51	22s	Side Hole	<b>NS600804</b>	1 Each
500	51	22s	Side Hole	<b>NS600904</b>	1 Each
1000	51	22s	Side Hole	<b>NS600002</b>	1 Each
5000	51	22s	Side Hole	<b>NS600042</b>	1 Each
10000	51	22s	Side Hole	<b>NS600062</b>	1 Each



GC Syringes for Accurate Dosing of Liquids *continued*

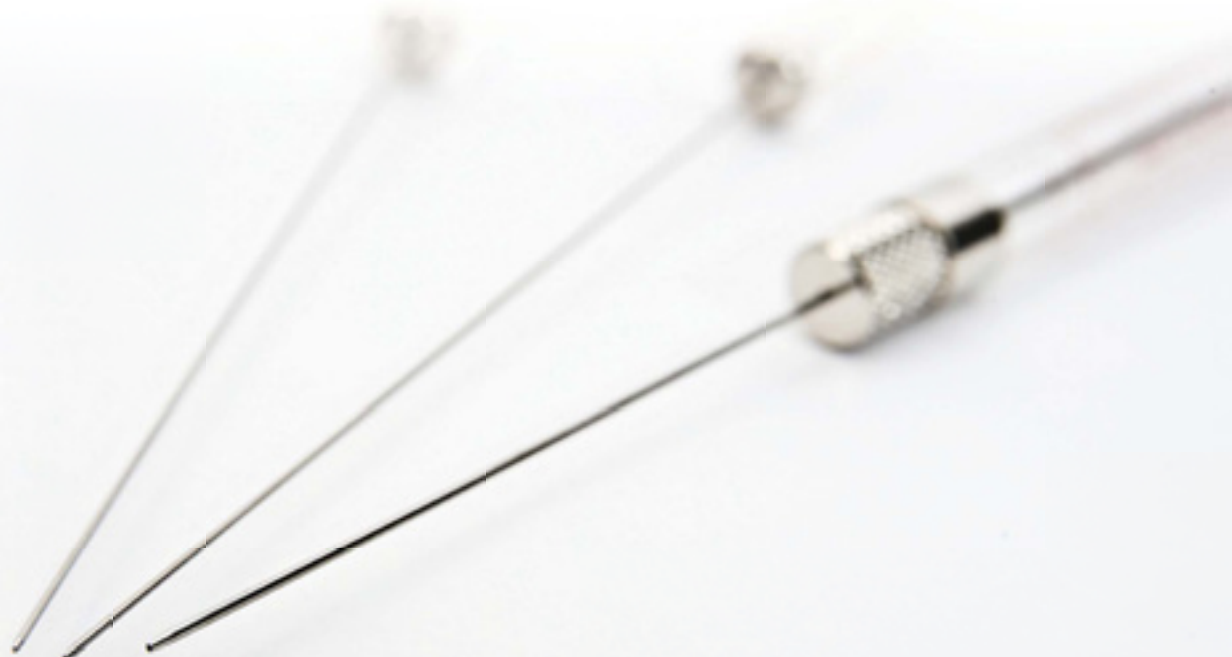
- Suitable for liquid or gas
- PTFE-tipped plunger eliminates frozen plungers

**PTFE Luer-Lok, Gas Tight Syringes**

Volume (µL)	Cat No.	Quantity
5	NS600309	1 Each
10	NS600409	1 Each
25	NS600509	1 Each
50	NS600609	1 Each
100	NS600709	1 Each
250	NS600809	1 Each
500	NS600909	1 Each
1000	NS607011	1 Each
2500	NS607031	1 Each
5000	NS607051	1 Each
10000	NS607071	1 Each
25000	NS607091	1 Each

**Luer Tip, Gas Tight Syringes**

Volume (µL)	Cat No.	Quantity
25	NS600511	1 Each
50	NS600611	1 Each
100	NS600711	1 Each
250	NS600811	1 Each
500	NS600911	1 Each
1000	NS600013	1 Each
2500	NS600033	1 Each
5000	NS600053	1 Each
10000	NS600073	1 Each



## Metal Luer Screw Replacement Needles

Feature a precision-machined PTFE-tipped plunger

### Metal Luer Screw Replacement Needles

Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
51	26s	90°	<b>NS842047</b>	3 Pack
		Bevel	<b>NS840047</b>	3 Pack
	22s	90°	<b>NS842070</b>	3 Pack
		Bevel	<b>NS840070</b>	3 Pack

## GC Syringes for Headspace / Soil Sampling Fixed Needle, Gas Tight Syringes

- With PTFE-tipped stainless-steel plungers

### GC Syringes for Headspace / Soil Sampling Fixed Needle, Gas Tight Syringes

Volume (µL)	Length (mm)	Gauge	Tip Style	Cat. No.	Quantity
5	51	26s	Side Hole	<b>NS600304</b>	1 Each
10	51	26s	Side Hole	<b>NS600404</b>	1 Each
250	51	22s	Side Hole	<b>NS600804</b>	1 Each
1000	51	22s	Side Hole	<b>NS600002</b>	1 Each
2500	51	22s	Side Hole	<b>NS600022</b>	1 Each
5000	51	22s	Side Hole	<b>NS600042</b>	1 Each

## GC Syringes for On-Column Fused Silica, Removable Needle Syringes

- Stainless-steel plungers

### GC Syringes for On-Column Fused Silica, Removable Needle Syringes

Volume (µL)	Length (mm)	OD (mm)	Cat No.	Quantity	Replacement Needle Cat. No.	Quantity
5	100	0.23	<b>NS142304</b>	1 Each	<b>NS822031</b>	3 Pack
10	100	0.23	<b>NS142404</b>	1 Each	<b>NS822042</b>	3 Pack

# Gas Chromatography Reagents

## Derivatization

The chemical literature contains an abundance of data on derivatization, most of which is relevant to particular compounds, classes of compounds and derivatization reagents. Two books are recognized as standards in the field of analytical derivatization. The first book, *Handbook of Analytical Derivatization Reactions* by Daniel R. Knapp<sup>1</sup>, provides a general collection of analytical derivatization methods for chromatography and mass spectroscopy (MS) that involves formation of covalent derivatives prior to analysis. The second book, *Silylation of Organic Compounds* by Alan F. Pierce,<sup>2</sup> was a significant factor in the transfer of silylation reactions from the relatively esoteric field of organosilicon chemistry to the status of perhaps the most widely practiced of derivatization methods.<sup>3</sup>

### Compounds or compound mixtures are derivatized before analysis for the following reasons:

1. To make a compound that otherwise could not be analyzed by a particular method suitable for analysis.<sup>4</sup>
2. To improve the analytical efficiency of the compound.<sup>5,6</sup>
3. To improve the detectability of the compound.<sup>7</sup>

## Suitability

Often compounds cannot be analyzed because they are not in a form that is suitable for the particular analytical technique. Examples include nonvolatile compounds for GC analysis,<sup>8,9,10</sup> insoluble compounds for HPLC analysis and materials that are not stable using the conditions of the technique.<sup>11</sup> The derivatization procedure modifies the chemical structure of the compounds, allowing analysis by a desired technique.<sup>12</sup>

## Efficiency

Direct analysis can be difficult when compounds interact with each other or with the column. These interactions can lead to poor peak resolution and/or asymmetrical peaks that make proper peak integration difficult or impractical. This interference can be reduced with conversion to derivatized products.<sup>13,14</sup> Compounds that exhibit co-elution can often be separated by using the appropriate derivatization methods.

## Detectability

As demand increases for the analysis of increasingly smaller amounts of materials, it becomes important to extend the detectability range of the materials in question. This increased sensitivity can be accomplished by improved detector design that is directed toward specific atoms or functional groups.

Another popular approach to increase detectability is the use of derivatization. Enhanced detectability can be achieved by increasing the bulk of the compound, or by introducing atoms or functional groups that strongly interact with the detector.<sup>16,17</sup> This technique is performed in gas chromatographic applications, with the addition of halogen atoms for electron capture detectors,<sup>18,19</sup> and with the formation of TMS derivatives to produce readily identifiable fragmentation patterns and mass ions.<sup>20</sup>

## Types of Derivatization

Compounds containing functional groups with active hydrogens (-COOH, -OH, -NH and -SH) are usually derivatized prior to analysis by gas chromatography. These functional groups have a tendency to form intermolecular hydrogen bonds that affect the volatility, their tendency to interact deleteriously with column packing materials and their thermal stability. Silylation, acylation and alkylation are derivatization techniques used to alter these functional groups to improve their thermal and chromatographic character.

### The ideal derivatization procedure will:

1. Accomplish the desired modification.
2. Proceed quantitatively, or at least reproducibly.
3. Produce products that are readily distinguishable and separable from the starting materials.
4. Proceed rapidly with simple and straightforward laboratory techniques that will be both selective and applicable to a number of similar compounds.
5. Involve reagents and reactions that present no unusual hazards.



## Thermo Scientific Silylation Reagents

Silyl derivatives are the most widely used derivatives for gas chromatographic applications. Usually they are formed by the replacement of the active hydrogens from acids, alcohols, thiols, amines, amides and enolizable ketones and aldehydes with the trimethylsilyl group. A variety of reagents is available for the introduction of the trimethylsilyl group. These reagents differ in their reactivity, selectivity and side reactions and the character of the reaction products from the silylation reagent itself. Considerable literature is available to assist you in the selection of the most suitable silylation reagent for your particular compounds or systems.<sup>1,2</sup>

Silylation reagents and trimethylsilyl derivatives are hydrolytically unstable and must be protected from moisture. However, the rate of hydrolysis for various reagents and derivatives is different, and sometimes it is possible to prepare derivatives in the presence of small amounts of moisture,<sup>21</sup> or to isolate and purify derivatives by extraction in an organic solvent, followed by washing with aqueous solutions.<sup>22</sup> Reagents that introduce a t-butyltrimethylsilyl group instead of the trimethylsilyl group were developed for greater hydrolytic stability.<sup>23</sup> These derivatives provide improved stability against hydrolysis and provide distinctive fragmentation patterns, making them useful in GC/MS applications.<sup>24</sup>

Most trimethylsilyl and t-butyltrimethylsilyl derivatives offer excellent thermal stability and are suitable for a wide range of injector and column conditions. However, as the silylation reagents will derivatize nearly all active hydrogens, it is important that they are not injected onto any column in which the stationary phase contains these functional groups. Examples of packings that are not compatible with silylating reagents are polyethylene glycols (TG-WaxMS) and free fatty acid phases (TG-WaxMS A).

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## Thermo Scientific Acylation Reagents

Acylation is the conversion of compounds (through the action of a carboxylic acid or a carboxylic acid derivative) that contain active hydrogens such as -OH, -SH and -NH esters; thioesters; and amides.<sup>1</sup> In chromatographic applications, the acylation reaction is used primarily for converting the above classes of compounds into derivatives that are better suited for chromatography<sup>2</sup> or that give a greater response to the chromatographic detection system than the parent compound.<sup>3</sup>

An important example of this application is the insertion of perfluoroacyl groups into a molecule to enhance the detectability of the substance by electron capture. The presence of a carbonyl group adjacent to the halogenated carbons enhances the electron capture detector (ECD) response.

Acyl derivatives are also useful in MS applications in which they influence the fragmentation patterns of the compounds to be studied.<sup>4</sup>

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## Thermo Scientific Alkylation Reagents

When used in derivatization for gas chromatography, alkylation represents the substitution of an active hydrogen by an aliphatic or aliphatic-aromatic<sup>1</sup> (benzyl) group. This technique is used to modify those compounds containing acidic hydrogens, such as carboxylic acids and phenols. The principal chromatographic use of this reaction is the conversion of organic acids into esters, which produce better chromatograms than the free acids.

In addition, alkylation reactions can be used to prepare ethers, thioethers and thioesters; N-alkylamines; and amides.<sup>2</sup> As the acidity of the active hydrogen decreases, the strength of the alkylating reagent must be increased. As the reagents and conditions become harsher, the selectivity and applicability of the methods become more limited.

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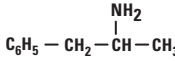
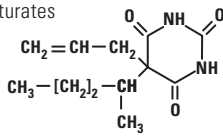
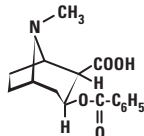
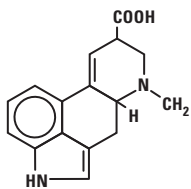
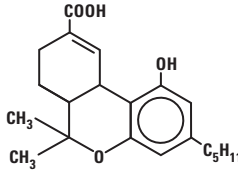
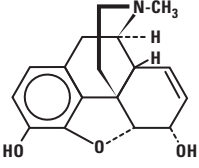
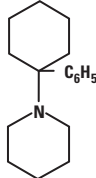
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# Derivatization Reagents for Specific Functional Groups

Functional Group	Procedure	Reagent	Derivative	Notes	
<b>Amides</b> $\begin{array}{c} \text{O} \\ \parallel \\ \text{-C-NH}_2 \end{array}$ Primary	Silylation	BSA	TMS Amides	Difficult to form due to steric hindrance	
		BSTFA	TMS Amides		
		BSTFA+TMCS	TMS Amides		TMCS used as a catalyst
		MSTFA	TMS Amides		Reaction byproducts more volatile
		MSTFA+TMCS	TMS Amides		
	$\begin{array}{c} \text{O} \\ \parallel \\ \text{-C-NHR} \end{array}$ Secondary	Acylation	Tri-Sil Reagents	TMS Amides	
			MTBSTFA	TBDMCS Amides	Difficult to form; very stable
			MTBSTFA+TBDMCS	TBDMCS Amides	
			MBTFA	Trifluoroacetamides	
			TFAA	Trifluoroacetamides	
Alkylation	MethElute Reagent (TMPAH)	Methyl Amides	On-column derivatization especially for drugs		
	PFAA	Pentafluoropropionamides	Good for ECD detection		
$\begin{array}{c} \text{H} \\   \\ \text{-C-NHR} \\   \\ \text{H} \end{array}$ Primary	Silylation	HFBA	Heptafluorobutyamides		
		MethElute Reagent (TMPAH)	Methyl Amides	On-column derivatization especially for drugs	
<b>Amines</b> $\begin{array}{c} \text{H} \\   \\ \text{-C-NH}_2 \\   \\ \text{H} \end{array}$ Primary	Silylation	BSA	TMS	TMCS aids derivatization	
		BSTFA	TMS		
		BSTFA+TMCS	TMS		
		MSTFA	TMS		
		MSTFA+TMCS	TMS		
	$\begin{array}{c} \text{H} \\   \\ \text{-C-NHR} \\   \\ \text{H} \end{array}$ Secondary	Acylation	Tri-Sil® Reagents	TMS	TMCS aids derivatization
			MTBSTFA	TBDMCS	Difficult to form, but more stable
			MTBSTFA+TBDMCS	TBDMCS	
			MBTFA	Trifluoroacetamides	
			TFAA	Trifluoroacetamides	Good for trace analysis with ECD
Alkylation	MethElute Reagent (TMPAH)	Methyl Amides	On-column derivatization for specific drugs		
	TFAI	Trifluoroacetamides	Good for trace analysis with ECD		
<b>Carbohydrates</b> $(\text{CH}_2\text{OH})_n$	Silylation	PFAA	Pentafluoropropionamides		
		PFPI	Pentafluoropropionamides		
		HFBA	Heptafluorobutyamides		
	Alkylation	MethElute Reagent (TMPAH)	Methyl Amides	On-column derivatization for specific drugs	
		HFBI	Heptafluorobutyamides		
	Silylation	MSTFA	TMS	Can be used with some syrups	
		TMSI	TMS		
		Tri-Sil Reagents	TMS		
	Acylation	MBTFA	Trifluoroacetates	Volatile derivatives of mono-, di- and trisaccharides	
		TFAI	Trifluoroacetates		
<b>Carboxyl</b> $\begin{array}{c} \text{O} \\ \parallel \\ \text{-C-OH} \end{array}$	Silylation	BSA	TMS	Easily formed, generally not stable, analyze quickly	
		BSTFA	TMS		
		BSTFA+TMCS	TMS		
		MSTFA	TMS		
		TMCS	TMS		Can be used with some salts
		TMSI	TMS		
		Tri-Sil Reagents	TMS		
	Alkylation	MTBSTFA	TBDMCS	More stable than TMS derivatives	
		MTBSTFA+TBDMCS	TBDMCS	TBDMCS aids derivatization	
		PFBBr	Pentafluorobenzyl Esters	Used in EC detection and UV, MS	
Silylation	BF <sub>3</sub> -Methanol	Methyl Esters	Best for large samples of fatty acids		
	Methylate Reagent (DMFDMA)	Methyl Esters	Fatty acids and amino acids		
	MethElute Reagent (TMPAH)	Methyl Esters	On-column derivatization		
	PFAA+Pentafluoropropanol	Pentafluoropropyl Ester	Drug analysis		
	<b>Hydroxyl-OH</b> $\text{R-OH}$ Alcohols	Silylation	BSA	TMS	Most often used derivatives
BSTFA			TMS	Good thermal stability	
BSTFA+TMCS			TMS	Poor hydrolytic stability	
HMDS			TMS	Weak donor usually used with TMCS	
MSTFA			TMS		
MSTFA+TMCS			TMS		
TMCS			TMS	Weak donor usually used with HMDS; can be used with salts	
TMSI			TMS	Can be used with syrups	
Tri-Sil Reagents			TMS		
$\text{C}_6\text{H}_5\text{-OH}$ Phenols			Acylation	MTBSTFA	
	MTBSTFA+TBDMCS	TBDMCS		TBDMCS aids derivatization	
	MBTFA	Trifluoroacetates		Good for trace analysis with EDC	
	TFAA	Trifluoroacetates		Good for trace analysis with EDC	
	TFAI	Trifluoroacetates		Good for trace analysis with EDC	
Alkylation	PFAA	Pentafluoropropionates	Good for trace analysis with EDC		
	HFBI	Heptafluorobutrates	Good for trace analysis with EDC		
	HFAA	Heptafluorobutrates	Good for trace analysis with EDC		
Alkylation	PFBBr	Pentafluorobenzyl Ethers	With alkoxides only		



## Derivatization Reagents for Drugs of Abuse

Drug	Form	Reagent	Reference
Amphetamines 	Amphetamines	BSTFA	1
	Amphetamines	HFAA	2-5
	Amphetamines	HFAA/PFAA	6
	Amphetamines	MSTFA with TMCS	7
	Amphetamines	TFAA	7,8
	Methamphetamine	TFAA	9,10
Barbiturates 		BSTFA	1
		MethElute Reagent (TMPAH)	11-13
		Methylate Reagent (DMFDMA)	14,15
		PFBBr	16
Cocaine 	Benzoyllecgonine	BSTFA/Butyl Iodine/TMAH	17
		BSTFA	1,18
		MTBSTFA	19
		PFAA/PFPOH	9,20
LSD 		BSA	21
		BSTFA	22
		MSTFA	21
		TFAI	23
Marijuana 	THC metabolites	BSA	24
		BSTFA/BSTFA+1% TMCS	24-27
		BSTFA/TMCS/TMSI	24
		MSTFA	9
		MSTFA/MSTFA+1% TMCS	27
		MTBSTFA	28
		PFBBr	29
		PFAA/HFIOH	30
		PFAA/PFPOH	31
		TFAA and BF3/MeOH	32
		MethElute Reagent (TMPAH)	9
		TMSI	24
Opiates 	Morphine	BSTFA+1% TMCS	33
		MBTFA	34
		PFAA	35
	Morphine/Codeine	TFAA	36
		BSTFA	1,37
		BSTFA+1% TMCS	38,39
		BSTFA/TFAI	40
		HFBA	38
		MBTFA	38
		PFAA	38,41
		PFAA/HFAA	37
		PFAA/PFPOH	9
		TFAA	42
Trimethylsilyl	43		
PCP 	PPC/PCHP/PCP	BSTFA+1% TMCS	44
		HFAA	45

See references on following page.

† Reagent names correspond to product names as listed in this catalog, except PFPOH (pentafluoropropanol).

HFIOH (heptafluoro-isopropanol) is not offered by Thermo Fisher Scientific. PFAA (PentaFluoropropionic Acid Anhydride) and HFAA (HeptaFluorobutyric Acid Anhydride) are sometimes incorrectly referred to as PFAA and HFBA (respectively), which are the appropriate abbreviations for the free acid.

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## Drugs of Abuse Derivatization Applications

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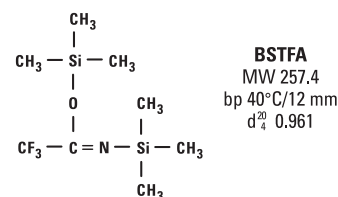
## Silylation Reagents

### BSTFA + TMCS

For excellent chromatographic separations and difficult-to-silylate compounds

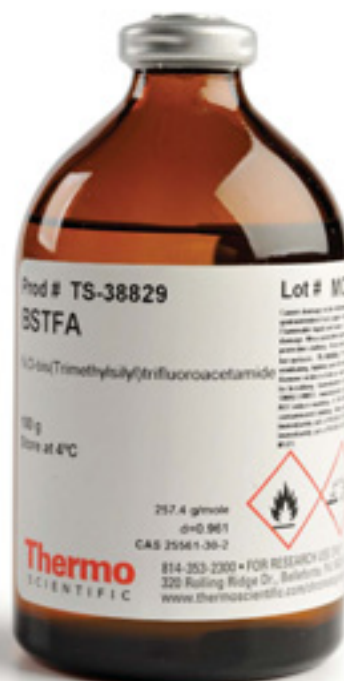
BSTFA is a powerful trimethylsilyl donor, with donor strength that is comparable to its unfluorinated analog BSA [N,O-Bis(trimethylsilyl)acetamide]. BSTFA reacts to replace labile hydrogens on a wide range of polar compounds with a  $-\text{Si}(\text{CH}_3)_3$  group. This physical characteristic is particularly useful in the gas chromatography of some lower boiling TMS-amino acids and TMS Krebs cycle acids.

- Increased volatility of reaction byproducts mono (trimethylsilyl) trifluoroacetamide and trifluoroacetamide over corresponding nonfluorinated compounds from BSA
- Increased volatility makes it possible to derivatize smaller molecules with which the TMS derivatives elute with the byproducts from BSA
- Excellent for derivatizing fatty acid amides, slightly hindered hydroxyls and other compounds
- Catalyzed formulation is stronger than BSTFA alone



#### BSTFA

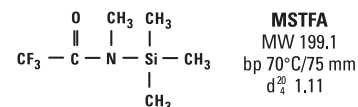
Description	Quantity	Cat. No.	Quantity
BSTFA	10 × 1mL ampules	<b>TS-38830</b>	1 Pack
	25g	<b>TS-38828</b>	1 Each
	100g	<b>TS-38829</b>	1 Each
BSTFA +1% TMCS	10 × 1mL ampules	<b>TS-38831</b>	1 Pack
	10g	<b>TS-38832</b>	1 Each
	25g	<b>TS-38833</b>	1 Each
	100g	<b>TS-38834</b>	1 Each
BSTFA +10% TMCS	10 × 1mL ampules	<b>TS-38840</b>	1 Pack



## MSTFA and MSTFA+1% TMCS

Offers maximum volatility

- Trimethylsilyl donor strength comparable to BSA and BSTFA
- Reacts to replace labile hydrogens on a wide range of polar compounds with a Si(CH<sub>3</sub>)<sub>3</sub> group
- Used to prepare volatile and thermally stable derivatives for GC and MS
- Volatile byproduct, N-methyltrifluoroacetamide, has an even lower retention time than MSTFA
- Often TMS derivatives of small molecules can be analyzed when derivatized with MSTFA because the byproducts and the reagent itself usually elute with the solvent front
- Addition of Thermo Scientific TMCS aids derivatization of amides, secondary amines and hindered hydroxyls not derivatized by MSTFA alone



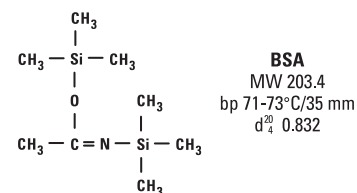
### MSTFA and MSTFA 1% TMCS

Description	Quantity	Cat. No.	Quantity
MSTFA	10 × 1mL ampules	<b>TS-48910</b>	1 Pack
	10g	<b>TS-48911</b>	1 Each
	25mL	<b>TS-48913</b>	1 Each
	100mL	<b>TS-48914</b>	1 Each
MSTFA +1% TMCS	10 × 1mL ampules	<b>TS-48915</b>	1 Pack

## BSA

The perfect reagent for rapid silylation reactions

- Highly reactive trimethylsilyl donor that reacts quantitatively to form volatile, stable TMS derivatives
- Reacts quickly and quantitatively under mild conditions with a variety of compounds
- Derivatizes alcohols, amines, amides, carboxylic acids, phenols, steroids, biogenic amines and alkaloids



### BSA

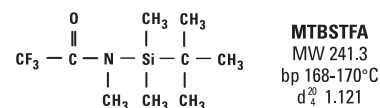
Description	Quantity	Cat. No.	Quantity
BSA	10 x 1mL	<b>TS-38836</b>	1 Pack
	25g	<b>TS-38838</b>	1 Each
	100g	<b>TS-38839</b>	1 Each

## Silylation Reagents

## MTBSTFA and MTBSTFA+1% TBDMCS

Offers stable TBDMS (tert-butyldimethylsilyl) derivatization

- Derivatizes hydroxyl, carboxyl, thiol and primary and secondary amines
- Typical yields are >96%
- Provides TBDMCS ethers that are 104 times more stable to hydrolysis than TMS ethers
- Reaction byproducts are neutral and volatile
- Derivatives have a high molecular concentration at M-57
- Silylating potential increased by adding 1% TBDMCS



## MTBSTFA and MTBSTFA+1% TBDMCS

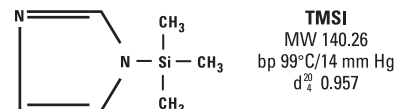
Description	Quantity		Cat. No.	Quantity
MTBSTFA	5mL ampules	X	<b>TS-48920</b>	1 Each
MTBSTFA +1% TBDMCS	10 × 1mL	X	<b>TS-48927</b>	1 Pack

X in the ordering table indicates that hazardous shipping charges apply.

TMSI (*N*-Trimethylsilylimidazole)

The strongest silylator available for carbohydrates and steroids

- Reacts quickly and smoothly with hydroxyls and carboxylic acids but not with amines
- Especially useful in multiderivatization schemes for compounds containing both hydroxyl and amine groups
- Used in the derivatization of alcohols, phenols, organic acids, steroids, hormones, glycols, nucleotides and narcotics
- Excellent for C1 through C5 fatty acids in serum and urine



## TMSI

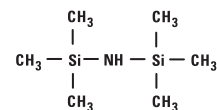
Description	Quantity		Cat. No.	Quantity
TMSI ( <i>N</i> -Trimethylsilylimidazole)	10 × 1mL ampules	X	<b>TS-88623</b>	1 Pack
TMSI	25g	X	<b>TS-88625</b>	1 Each
	100g	X	<b>TS-88626</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

## HMDS (Hexamethyldisilazane)

The popular choice for silylation of sugars and related substances

- Greatly extends the practical range of GC, improving chromatographic results
- Suitable for deactivating and coating chromatographic supports
- Monofunctional, making polymerization not possible and eliminating surface moisture



**HMDS**  
MW 161.4  
bp 125°C  
n<sub>D</sub><sup>20</sup> 1.4071

### HMDS

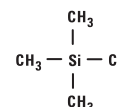
Description	Quantity (g)		Cat. No.	Quantity
HMDS (Hexamethyldisilazane)	25	X	<b>TS-84770</b>	1 Each
HMDS	100	X	<b>TS-84769</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

## TMCS (Trimethylchlorosilane)

An excellent catalyst for difficult-to-silylate compounds

- Excellent adjunct for forming trimethylsilyl ethers for GC determinations
- Used to prepare TMS derivatives of organic acids



**TMCS**  
MW 108.7  
bp 57.6°C  
d<sub>4</sub><sup>20</sup> 0.858

### TMCS

Description	Quantity (g)		Cat. No.	Quantity
TMCS	25	X	<b>TS-88530</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

## MOX (Methoxyamine) Reagent

Useful for preparing oximes of steroids and ketoacids prior to silylation

- 2% methoxyamine HCl (M.W. 83.51) in pyridine
- Prevents formation of multiple derivatives when enols are present during silylation
- Supplied in amber Thermo Scientific Hypo-Vial Sample Storage Vial with septum and crimp top

### MOX

Description	Quantity (mL)		Cat. No.	Quantity
MOX (Methoxyamine) Reagent (2% methoxyamine•HCl in pyridine)	10	X	<b>TS-45950</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.



## Silylation Reagents

### Tri-Sil HTP (HDMS:TMCS:Pyridine) Reagent

Reagent-catalyst mixture for one-step derivatization

- Derivatizes carbohydrates, phenols, steroids, sterols, organic acids, alcohols and some amines
- Useful for rapid production of TMS derivatives of polar compounds for gas chromatographic determination and biochemical synthesis
- The versatility, speed and ease of use of Tri-Sil HTP Reagent has made it the most widely used silylation formulation available

#### Tri-Sil HTP

Description	Quantity		Cat. No.	Quantity
Tri-Sil HTP Reagent HDMS:TMCS:Pyridine (2:1:10)	10 × 1mL ampules	X	<b>TS-48999</b>	1 Pack
Tri-Sil HTP Reagent HDMS:TMCS:Pyridine (2:1:10)	50mL	X	<b>TS-49001</b>	1 Each

1. Ng, L., et al. (1993). J. Chromatogr. **637**, 104-108.

X in the ordering table indicates that hazardous shipping charges apply.

### Tri-Sil BP (BSA:Pyridine) Reagent

Derivatizes alcohols, phenols, organic acids, aromatic amides and amines

Tri-Sil BP Reagent reacts with:

- Alcohols, phenols, some enols and other hydroxyl and polyhydroxyl compounds to form trimethylsilyl esters
- Organic acids to form trimethylsilyl esters
- Aromatic amides to form N-trimethylsilyl derivatives
- Amino acids to form both N- and O-trimethylsilyl derivatives
- Amines to form N-trimethylsilyl derivatives
- In addition, Tri-Sil BP is excellent for unhindered steroids, but it is not recommended for carbohydrates

#### Tri-Sil BP

Description	Quantity (mL)		Cat. No.	Quantity
Tri-Sil BP Reagent (2.5mEq/mL BSA in pyridine)	25	X	<b>TS-49012</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

## Tri-Sil TBT (TMSI:BSA:TMCS) Reagent

A catalyzed silylation reagent formulation containing three parts TMSI, three parts BSA and two parts TMCS

- Converts all classes of hydroxyl groups to TMS ethers
- Under usual conditions, the reaction is complete in a short period of time at 60 to 80°C, although very hindered hydroxyls may require several hours

### Tri-Sil TBT

Description	Quantity		Cat. No.	Quantity
Tri-Sil TBT Reagent TMSI:BSA:TMCS (3:3:2)	10 × 1mL ampules	X	<b>TS-49016</b>	1 Pack

1. Seidel, V., et al. (1993). *Chromatographia* **37**, 191-201.

X in the ordering table indicates that hazardous shipping charges apply.

## Tri-Sil TP Reagent (TMSI:Pyridine)

Derivatizes hydroxyl compounds, particularly carbohydrates

- Silylates alcohols and phenols, organic acids, hydroxylamines, amino acids, carbohydrates, flavonoids, glycols and polyglycols, nucleotides, steroids, hydroxyl acids, barbituates, narcotics, indoles and vitamins
- Does not react with amines
- May be used with water as long as there is enough reagent present to react with both the water and the sample

### Tri-Sil TP

Description	Quantity		Cat. No.	Quantity
Tri-Sil TP Reagent TMSI: Pyridine (1:4)	10 × 1mL ampules	X	<b>TS-49230</b>	1 Pack
Tri-Sil TP Reagent TMSI: Pyridine (1:4)	25mL	X	<b>TS-49231</b>	1 Each

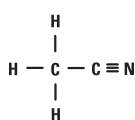
X in the ordering table indicates that hazardous shipping charges apply.

## Silylation Reagents

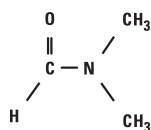
### Silylation Grade Solvents

Manufactured to meet your exacting silylation needs

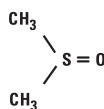
- Purified, dried and packaged under nitrogen in convenient 50mL Hypo-Vial Sample Storage Vials
- Supplied with elastomer septa, allowing immediate access to the sample without exposure to moisture and oxygen
- Use polar solvents (acetonitrile, dimethylformamide, dimethylsulfoxide, pyridine, tetrahydrofuran) to facilitate reactions; nonpolar organic solvents may be used, but they will not accelerate the rate of reaction



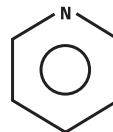
**Acetonitrile**  
MW 41.05  
bp 81.6°C



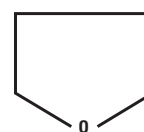
**Dimethylformamide**  
MW 73.09  
bp 153°C



**Dimethylsulfoxide**  
MW 78.13  
bp 189°C



**Pyridine**  
MW 79.10  
bp 115.2°C



**Tetrahydrofuran**  
MW 72.10  
bp 66°C

#### Silylation Grade Solvents

Description	Quantity (mL)		Cat. No.	Quantity
Acetonitrile	50	X	<b>TS-20062</b>	1 Each
Dimethylformamide (DMF)	50	X	<b>TS-20672</b>	1 Each
Dimethylsulfoxide (DMSO)	50		<b>TS-20684</b>	1 Each
Pyridine	50	X	<b>TS-27530</b>	1 Each
Tetrahydrofuran (THF)	50	X	<b>TS-27860</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

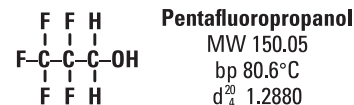
For HPLC Grade Solvents, see page 4-193.

## Acylation Reagents

### Pentafluoropropanol

Purified for GC/MS applications

- Addition of fluorine atoms into compounds greatly enhances the sensitivity of certain detectors for all those materials
- Carboxylic acids can be derivatized using a two-step reaction involving reaction with anhydride, followed by a fluorinated alcohol



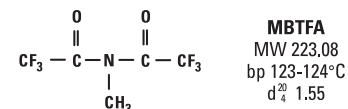
#### Pentafluoropropanol

Description	Quantity	Cat. No.	Quantity
Pentafluoropropanol	10 x 1mL ampules	<b>TS-65195</b>	1 Pack

### MBTFA

For trifluoroacylating primary and secondary amines, hydroxyl and thiol groups and carbohydrates

- Reacts under nonacidic conditions
- Principle byproduct from the derivatization reaction is N-methyltrifluoroacetamide, which is stable, volatile and does not present problems in subsequent GC
- Produces very volatile derivatives of carbohydrates
- Can be used to selectively acylate amines in the presence of hydroxyl and carboxyl groups that have been protected by silylation



#### MBTFA

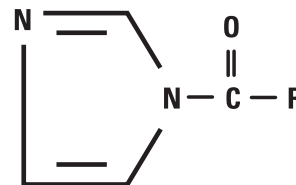
Description	Quantity		Cat. No.	Quantity
MBTFA [N-Methyl-bis(trifluoroacetamide)]	10 x 1mL ampules	X	<b>TS-49700</b>	1 Pack
MBTFA	25mL	X	<b>TS-49703</b>	1 Each
	100mL	X	<b>TS-49704</b>	1 Each
	5g	X	<b>TS-49701</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

## Perfluoroacylimidazoles (HFBI and TFAI)

Offer effective acylation of hydroxyl groups and primary and secondary amines

- Reactions are smooth, quantitative and produce no acid byproducts
- Principal byproduct, imidazole, is relatively inert
- Excellent for FID and ECD techniques
- Derivatives are volatile, despite size of group
- Closely bound fluorines contribute to stability



R	Name	M.W.	Boiling Point
C <sub>3</sub> F <sub>7</sub>	HFBI	264.10	57 to 58°C/10mm
CF <sub>3</sub>	TFAI	164.08	38 to 40°C/14mm

### Perfluoroacylimidazoles (HFBI and TFAI)

Description	Quantity	Cat. No.	Quantity
HFBI	5g	<b>TS-44211</b>	1 Each
TFAI	10 x 1mL ampules	X <b>TS-48882</b>	1 Pack

X in the ordering table indicates that hazardous shipping charges apply.

*Thermo Scientific high-performance chromatography refrigerators offer close temperature control, instrumentation access and easy set-up.*  
[www.thermoscientific.com/cold](http://www.thermoscientific.com/cold)



## Acylation Reagents

### Perfluoro Acid Anhydrides (TFAA, PFAA and HFAA)

Highly purified for optimal preparation of fluoracyl derivatives

- Used to prepare fluoracyl derivatives for GC/MS
- Produce stable volatile derivatives for FID and ECD techniques



#### Perfluoro Acid Anhydrides

Description	Quantity		Cat. No.	Quantity
TFAA (Trifluoroacetic Acid Anhydride)	100g	X	<b>TS-67363</b>	1 Each
PFAA (Pentafluoropropionic Acid Anhydride)	10 × 1mL ampules	X	<b>TS-65193</b>	1 Pack
PFAA	25g	X	<b>TS-65192</b>	1 Each
PFAA	100g	X	<b>TS-65191</b>	1 Each
HFAA (Heptafluorobutyric Acid Anhydride)	10 × 1mL ampules	X	<b>TS-63164</b>	1 Pack
HFAA	25g	X	<b>TS-63163</b>	1 Each
HFAA	100g	X	<b>TS-63162</b>	1 Each

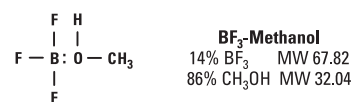
X in the ordering table indicates that hazardous shipping charges apply.

## Alkylation Reagents

### BF<sub>3</sub>-Methanol

Provides convenient, fast and quantitative esterification of fatty acids

- Supplied in septum-sealed Thermo Scientific Hypo-Vial Sample Storage Vial for convenient syringe removal
- Consists of 14% BF<sub>3</sub>, MW 67.82, and 86% CH<sub>3</sub>OH, MW 32.04



#### BF<sub>3</sub>-Methanol

Description	Quantity (mL)		Cat. No.	Quantity
BF <sub>3</sub> -Methanol	100	X	<b>TS-49370</b>	1 Each

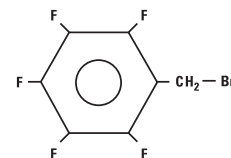
X in the ordering table indicates that hazardous shipping charges apply.



## Pentafluorobenzyl Bromide (PFBBr)

For electron capture GC analysis of carboxyl acids, phenols and sulfonamides

- Fast reaction times for extraction alkylation technique: ~20 minutes
- Derivatives are highly EC-sensitive, making them useful in low-level determinations of fatty acids
- Analysis of trace organics in asphalt



**PFBBr**  
MW 260.9  
bp 174-175°C  
d<sub>4</sub><sup>20</sup> 1.86

### Pentafluorobenzyl Bromide

Description	Quantity (g)	Cat. No.	Quantity
PFBBr (Pentafluorobenzyl Bromide)	5	X <b>TS-58220</b>	1 Each

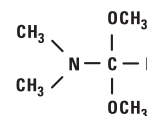
X in the ordering table indicates that hazardous shipping charges apply.

## Methylate Reagent (DMFDMA)

For easy, effective preparation of methyl esters from fatty acids and amino acids

Advantages for preparation of methyl esters for gas chromatography:

- Speed: the reaction is complete upon dissolution (except long chain solid acids)
- No water washing, extraction or concentration of derivatives required
- No water formed
- Quantitation: quantitative yields are obtained when the reagent and sample are injected without prior mixing
- Convenient: ready-to-use reagent contains 2mEq/mL pyridine



**Methylate Reagent**  
MW 119.17  
bp 102-104°C  
d<sub>4</sub><sup>20</sup> 0.897

### Methylate Reagent

Description	Quantity (mL)	Cat. No.	Quantity
Methylate Reagent (N, N-Dimethylformamide dimethyl acetal)	25	<b>TS-49350</b>	1 Each

Packaged in Hypo-Vial Sample Storage Vial.

## Alkylation Reagents

### MethElute Reagent (TMPAH)

Provides accurate sensitive on-column methylation

- 0.2M trimethylanilinium hydroxide (TMPAH) in methanol solution
- For quantitative methylation and detection of barbituates, sedatives, xanthine bases, phenolic alkaloids and phenytoin by gas chromatography
- Single quantitative peak for each substance
- When reagent is heated with drug-containing extracts, serum or urine, those drugs containing reactive amino, hydroxyl and carboxyl functions will be methylated at the reactive sites
- Comparable to or better than UV/TLC method (when phenobarbitol and phenytoin are present, GC is superior to UV/TLC)
- Coefficient of variation is 5% or less
- Detects barbituates to 0.2mg/dL

#### MethElute Reagent

Description	Quantity (mL)		Cat. No.	Quantity
MethElute Reagent (TMPAH)	10	X	<b>TS-49300</b>	1 Each
MethElute Reagent (TMPAH)	12 × 1	X	<b>TS-49301</b>	1 Pack

X in the ordering table indicates that hazardous shipping charges apply.



## Siliconizing Fluids

### Water-Soluble Siliconizing Fluid

Attaches the silane polymer, octadecyltrialkylsilane, to make the surface inert or polymerizes to create an inert film

- Easy-to-use silane monomer solution that is supplied as a 20% solid solution in a mixture of diacetone alcohol and tertiary butyl alcohol
- Greater resistance to base hydrolysis than other surface treatments
- Can be used on plastic surfaces

#### Water-Soluble Siliconizing Fluid

Description	Quantity (mL)		Cat. No.	Quantity
Siliconizing Fluid-Water Soluble	120	X	<b>TS-42799</b>	1 Each

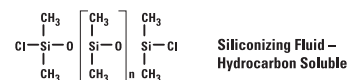
X in the ordering table indicates that hazardous shipping charges apply.

### Hydrocarbon-Soluble Siliconizing Fluid

Attaches a short-chain silane polymer to make the surface inert or polymerizes to create an inert film

When applied to glass, quartz or similar materials, the unhydrolyzed chlorines present on the chain react with surface silanols to form a neutral, hydrophobic and tightly bonded film over the entire surface.

- Soluble in organic solvents
- Excellent for modifying metals, glass, ceramics and fiber optics
- Can be used for certain plastic surfaces
- Well-suited for treatment of GC injection port liners



#### Hydrocarbon-Soluble Siliconizing Fluid

Description	Quantity (mL)		Cat. No.	Quantity
Siliconizing Fluid-Hydrocarbon Soluble	120	X	<b>TS-42800</b>	1 Each
Siliconizing Fluid-Hydrocarbon Soluble	480	X	<b>TS-42801</b>	1 Each
Siliconizing Fluid-Hydrocarbon Soluble	5 x 10	X	<b>TS-42855</b>	1 Pack

X in the ordering table indicates that hazardous shipping charges apply.

## Sample Handling Products

To complete our offering for gas and liquid chromatography, we offer a wide range of heating and stirring systems, vials, closures and other accessories. All Thermo Scientific sample handling products are manufactured under strict conditions, providing the quality you need for reliable derivatization reactions.

### Reacti-Therm Sample Derivatization System

This unique product combines heating, stirring and evaporation with unmatched convenience and versatility. The system comprises of a Reacti-Therm heating/stirring module (uniform dry heat to the sample) coupled with the Reacti-Vap evaporator (simultaneous or separate delivery of pressurized gas) to provide a complete solution for derivatization or other small scale reactions. To complete the system we offer a range of accessories including; Reacti-Vial Small Reaction Vials, Reacti-Blocks and Reacti-Vial Magnetic Stirrers.



## Reacti-Therm Heating and Stirring Modules

Reliable and easy-to-use for constant temperatures

- Uniform, stable heating: steady temperature incubation between ambient plus 10°C to 200°C
- LED display: match digital display to in-block thermometer to calibrate temperature set-point
- Modular design: switch aluminum blocks and vials; attach compatible evaporator manifold
- Dual-voltage flexibility: compatible with 120V and 240V power; country-specific power cord supplied
- Four models: single-block and triple-block sizes with either heat-only or heat-and-stir capability
- In-block temperature control option by Remote Temperature Probe, an optional accessory to allow temperature regulation from block wells or actual sample vials

### Reacti-Therm Heating Modules

Type	Size of Unit	Cat. No.	Quantity
Heating Function	Single-block	<b>TS-18822</b>	1 Each
Model with Heating Function	Triple-block	<b>TS-18824</b>	1 Each
Remote Temperature Probe		<b>TS-18820</b>	1 Each

### Reacti-Therm Heating and Stirring Modules

Type	Size of Unit	Cat. No.	Quantity
Heating and Stirring Function	Single block	<b>TS-18821</b>	1 Each
Model with Heating and Stirring Function	Triple-block	<b>TS-18823</b>	1 Each

### Applications:

- General sample incubation and evaporation in a variety of tube and vial sizes
- Silylation, alkylation and acylation derivatization reactions for GC sample preparation
- Protein hydrolysis and vacuum hydrolysis reactions for amino acid analysis by HPLC

*We offer a full range  
of Reacti-Thermo accessories*







## Reacti-Therm Thermometers

NIST-traceable thermometers specially designed for use in dry block heaters

- Mercury-free: alcohol-filled for greater safety
- PTFE coating ensures that glass is impervious to corrosive materials
- Certified and calibrated
- Shock-resistant glass and coatings
- Standard laboratory size: 225mm length x 8mm diameter with 35mm immersion length
- Compatible for use in Reacti-Therm Heating Modules and other laboratory equipment



### Reacti-Therm Thermometers

Min. Temperature (°C)	Max. Temperature (°C)	Cat. No.	Quantity
0	100	<b>TS-18914</b>	1 Each
0	200	<b>TS-18915</b>	1 Each

## Reacti-Block Aluminum Blocks

Optimal thermal conductivity

- Constructed of an aluminum alloy for optimal thermal conductivity
- Each Reacti-Block Aluminum Block contains a thermometer well
- Block dimensions are 9.4 L x 7.5 W x 5.1cm H for all blocks except for F, G, J and M which have a depth of 7.6cm
- For use with Reacti-Therm Modules only



### Reacti-Block Aluminum Blocks

Description	For Use With	No. of Tubes per Block	Cat. No.	Quantity
Reacti-Block A-1	0.3 or 1mL Reacti-Vial Small Reaction Vials	13 holes	<b>TS-18801</b>	1 Each
Reacti-Block B-1	3 to 5mL Reaction Vials	9 holes	<b>TS-18802</b>	1 Each
Reacti-Block C-1	3.5mL Screw Cap Septum Vials	13 holes	<b>TS-18803</b>	1 Each
Reacti-Block F	5 or 8mL Vacuum Reaction Tubes	8 holes	<b>TS-18806</b>	1 Each
Reacti-Block K	Custom Drilling	None	<b>TS-18810</b>	1 Each
Reacti-Block M-1	27.5mL Tubes	6 holes	<b>TS-18811</b>	1 Each
Reacti-Block L	0.1mL Reacti-Vial Small Reaction Vials	16 holes	<b>TS-18812</b>	1 Each
Reacti-Block Q-1	10mL Reacti-Vial Small Reaction Vials	8 holes	<b>TS-18814</b>	1 Each
Reacti-Block S-1	13mm Test Tubes	13 holes	<b>TS-18816</b>	1 Each
Reacti-Block T-1	16mm Test Tubes	9 holes	<b>TS-18817</b>	1 Each
Reacti-Block U-1	20mm Test Tubes	8 holes	<b>TS-18818</b>	1 Each
Reacti-Block V-1	Microfuge Test Tubes	17 holes	<b>TS-18819</b>	1 Each
Reacti-Block G	20mL Vacuum Reaction Tube	4 holes	<b>TS-18807</b>	1 Each
Reacti-Block J	Custom Drilling	None	<b>TS-18809</b>	1 Each

## Reacti-Vial Magnetic Stirrers

Triangular stir bars for faster reaction times and smooth mixing of small samples in conical-bottom vials

- PTFE-coated for chemical resistance and inertness
- Provide for simultaneous stirring of samples in multiple vials when used with a Reacti-Therm Heating/Stirring Module equipped with appropriate Reacti-Block Aluminum Blocks
- Allow increased speed of surface reactions by keeping insoluble reactants in suspension



### Reacti-Vial Magnetic Stirrers

Fits	Cat. No.	Quantity
3.0, 5.0 and 10.0mL Reacti-Vials	<b>TS-16000</b>	6 Pack
0.3 and 1mL Small Reacti-Vials	<b>TS-16010</b>	6 Pack

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in our chromatography resource center  
[www.thermoscientific.com/crc](http://www.thermoscientific.com/crc)



## Reacti-Vap Evaporators

Manifolds for easy sample evaporation

- Integrated pressure-relief valve protects against excessive gas-flow and dangerous pressure build up
- Easy set-up: attach to corresponding Reacti-Therm Module, attach tubing from gas supply, and lower into position over samples and start gas flow
- Choose 9-port or 27-port model for compatibility with single-block and triple-block Reacti-Therm Modules, respectively

### Reacti-Vap Evaporators

No. of Ports	For Use With	Cat. No.	Quantity
9	Single-block Reacti-Therm Heating Module	<b>TS-18825</b>	1 Each
27	Triple-block Reacti-Therm Heating Module	<b>TS-18826</b>	1 Each



### Applications:

- General sample incubation and evaporation in a variety of tube and vial sizes
- Silylation, alkylation and acylation derivatization reactions for GC sample preparation

## Reacti-Vap Evaporator Replacement Parts

Extend the lifetime of Reacti-Vap evaporators

### Reacti-Vap Evaporator Replacement Parts

Needle Length (mm)	Needle Gauge	Cat. No.	Quantity
64 (2.5in.)	16	<b>TS-18782</b>	9 Pack

## Reacti-Vap PTFE-Coated Needles

Support the operation of Reacti-Vap evaporators

### Reacti-Vap PTFE-Coated Needles

Needle Length (mm)	Needle Gauge	Cat. No.	Quantity
102 (4in.)	19	<b>TS-18784</b>	9 Pack
152 (6in.)	19	<b>TS-18786</b>	9 Pack



## Reacti-Vial Small Reaction Vials

An internal cone makes small sample handling easy and convenient

- Extra thick glass wall magnifies the sample, making these vials ideal for observing chemical reactions
- Amber vials available for light-sensitive compounds
- Supplied complete with Open-Top Screw Caps and PTFE/Rubber Discs



### Reacti-Vial Small Reaction Vials

Capacity	Cat. No.	Quantity
<b>Amber</b>		
1mL	<b>TS-13097</b>	12 Pack
5mL	<b>TS-13099</b>	12 Pack
<b>Clear</b>		
100µL	<b>TS-13100</b>	12 Pack
300µL	<b>TS-13220</b>	12 Pack
1mL	<b>TS-13221</b>	12 Pack
3mL	<b>TS-13222</b>	12 Pack
5mL	<b>TS-13223</b>	12 Pack
10mL	<b>TS-13225</b>	12 Pack

### Applications:

- Residue isolation, derivative preparation, maximum sample retrieval, moisture protection, sample storage, precipitations, centrifugations, solvent evaporation

## Thermo Scientific Tuf-Bond PTFE/Silicone Discs

Discs that combine the inertness of PTFE with the resealability of silicone

- Structurally bonded PTFE to silicone; no cement to leak out of your sample after needle penetration
- Reseals instantly, puncture after puncture
- Autoclavable
- Compresses to maintain a tight seal forcing the PTFE to conform to the sealing surface
- Standard syringe and GC needles penetrate the entire disc with ease



### Thermo Scientific Tuf-Bond PTFE/Silicone Discs

Diameter (mm)	Fits	Cat. No.	Quantity
8	100µL Reacti-Vial Small Reaction Vials, 1.5mL Screw Cap Septum Vials	<b>TS-12708</b>	72 Pack
12	0.3 and 1mL Reacti-Vial Small Reaction Vials, 3.5mL Screw Cap Septum Vials	<b>TS-12712</b>	72 Pack
13	7mL Screw Cap Septum Vials	<b>TS-12713</b>	72 Pack
16	14mL Screw Cap Septum Vials; 15mL (0.5 oz.) Screw Cap Bottles	<b>TS-12716</b>	72 Pack
18	3 and 5mL Reacti-Vial Small Reaction Vials	<b>TS-12718</b>	72 Pack
22	25 and 40mL Screw Cap Septum Vials, 240mL (8 oz.) Screw Cap Bottles, 10mL Reacti-Vial	<b>TS-12722</b>	72 Pack

## PTFE/Rubber Laminated Discs

Provides a highly inert and unreactive seal

- Constructed of white pharmaceutical rubber with PTFE bonded to one side
- Discs are autoclavable with no loss of integrity after heating above 100°C for 5 hours

### PTFE/Rubber Laminated Discs

Diameter (mm)	Fits	Cat. No.	Quantity
12	0.3 and 1mL Reacti-Vial Small Reaction Vials, 2 and 3.5mL Screw Cap Septum Vial	<b>TS-12412</b>	72 Pack
18	3 and 5mL Reacti-Vial Small Reaction Vials; 10 and 25mL Reacti-Flask	<b>TS-12418</b>	72 Pack
22	25 and 40mL Screw Cap Septum Vials	<b>TS-12422</b>	72 Pack



## Open-Top Screw Caps

Provide inert, air-tight seal and direct puncture-access to sample with a syringe needle

- Fits into Reacti-Vial Small reaction vials
- Used with PTFE/Rubber laminated discs

### Open-Top Screw Caps

Fits	Cat. No.	Quantity
1.5mL Screw Cap Septum Vials, 100µL Reacti-Vials	<b>TS-13208</b>	72 Pack
3 and 5mL Reacti-Vials, 40mL Screw Cap Septum Vials	<b>TS-13218</b>	72 Pack
0.3 and 1.0mL Reacti-Vials, 3.5mL Screw Cap Septum Vial	<b>TS-13215</b>	72 Pack
7mL Screw Cap Septum Vials	<b>TS-13216</b>	72 Pack
10mL Reacti-Vials	<b>TS-13219</b>	72 Pack
14mL Screw Cap Septum Vials	<b>TS-13217</b>	72 Pack



## Screw Cap Septum Vials

Economy, convenience and versatility in a vial and closure system

- Flat bottom vials
- Heavy-duty flip-top divider box provides easy access to vials, caps and septa and offers a convenient sample storage center
- Storage of reagents and standards under complete seal with instant syringe access

### Screw Cap Septum Vials

Capacity (mL)	Cat. No.	Quantity
<b>Amber</b>		
1.5	<b>TS-13080</b>	72 Pack
<b>Clear</b>		
3.5	<b>TS-13019</b>	72 Pack
7	<b>TS-13028</b>	72 Pack
14	<b>TS-13043</b>	72 Pack
40	<b>TS-13075</b>	72 Pack



## Vari-Clean Precleaned Vials

Versatile choice for sampling, analytical and general laboratory needs

### Vials

- Allow instant syringe access to reagents and standards through the open top screw caps
- Long-term sample storage of biological media and volatile solutions
- Meticulously cleaned and ready to use, with no residue from the manufacturing process

### TFE/Silicone Discs

- Autoclavable and resealable
- 90mm silicone body and 10mm TFE face not cemented into place: no cement leaching or baking out
- TFE provides an inert barrier between sample and screw cap



### Vari-Clean Precleaned Vials

Capacity (mL)	Cat. No.	Quantity
<b>Clear</b>		
3.5	<b>TS-13504</b>	72 Pack
40	<b>TS-13510</b>	72 Pack

## Mininert Valves

Excellent closures for chemicals that deteriorate or evaporate through conventional vial caps and seals

Thermo Scientific Mininert Valves are screw caps that have integrated resealable valves to allow repeated and unlimited syringe-needle access to samples. Slide the valve one way to open the needle-port. Slide the valve back to close and completely seal the close.

- Available in two sizes – 20mm (thread size 20/400) and 27mm (thread size 24/400) to fit 3 and 5mL Reacti-Vial Small Reaction Vials and 40mL Screw Cap Septum Vials, respectively
- Precision crafted from PTFE plastic for repeated use and chemical resistance
- Valve design eliminates the septum-boring that occurs with repeated puncture of traditional septa



### Mininert Valves

Size (mm)	Fits	Cat. No.	Quantity
20	Fits 40mL Screw Cap Septum Vials	<b>TS-10130</b>	12 Pack
27	Fits 3 and 5mL Reacti-Vial Small Reaction Vials	<b>TS-10135</b>	12 Pack



# Thermo Scientific GC Instrument Spare Parts

Our HPLC and GC chromatography and mass spectrometry instruments offer solutions to life science, laboratory, and industrial customers to advance scientific knowledge, enable drug discovery, improve manufacturing processes, and protect people and the environment. When your instrument is tuned for peak performance with parts, you can expect the best results and highest level of productivity to keep your research or processes moving smoothly.

## TRACE GC Ultra Gas Chromatograph

- Innovative advances for unprecedented performance and reliability
- UltraFast GC to boost lab productivity
- Utmost sensitivity through Large Volume Injection techniques

Incorporating a large variety of high quality solutions in injector and detector technology, the Thermo Scientific TRACE GC Ultra gas chromatograph delivers excellence and innovation in full a range of application fields. This versatile GC is designed to be easily configured with up to two injectors and three detectors for utmost flexibility. Unique UltraFast GC technology delivers tremendous productivity without compromising precision and reliability. A full range of Large Volume Injection (LVI) techniques helps you overcome the sensitivity boundaries of conventional GC.



## FOCUS GC

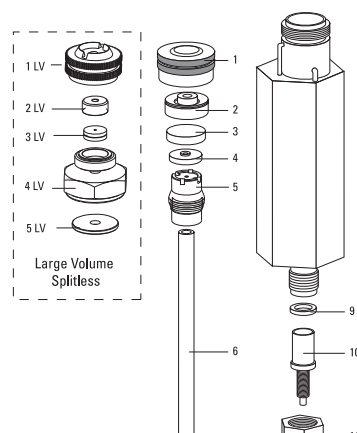
- Compact and productive
- Ease of use and reliability
- High quality QA/QC routine analyses

Compact in size and very affordable, the Thermo Scientific FOCUS GC is the ideal solution for every budget-conscious laboratory looking for an instantly productive GC environment. Designed for routine quality control and high throughput laboratories, the FOCUS GC is the benchmark for precision and accuracy of results as well as the standard for ruggedness. Even though it takes up less bench space, the FOCUS GC has a wide front-opening oven, which offers easy access for installation of capillary columns mounted on standard diameter cages.



### Split/Splitless (S/SL) Injector, TRACE GC Ultra and FOCUS GC

Item	Description	Cat. No.	Quantity
1	Septum cap	<b>35001050</b>	1
1 LV	Septum cap for LVSL	<b>35001055</b>	1
2	Septum holder	<b>23303015</b>	1
2 LV	Septum holder for LVSL	<b>23303020</b>	1
3/3 LV	Septum (standard = 17mm, LV = 9mm)	<b>See page 3-083</b>	
4	Septum support	<b>35005433</b>	1
4 LV	LVSL adapter	<b>34709346</b>	1
5	Liner cap	<b>29004290</b>	1
5 LV	LVSL adapter Vespel seal	<b>35603450</b>	1
6	Liner	<b>See page 3-084</b>	
7	Liner seal	<b>See page 3-087</b>	
8	Liner cap removing tool	<b>20507010</b>	1
9	Silver seal	<b>29033629</b>	10
10	Terminal fitting for capillary columns	<b>34705451</b>	1
11	Nut for terminal fitting	<b>35022125</b>	2
12	Graphite ferrule	<b>See page 3-091</b>	
13	Fixing nut for column	<b>35032423</b>	5



Split/Splitless (S/SL) Injector, TRACE GC Ultra and FOCUS GC

### Programmed Temperature Vaporizing (PTV) Injector, TRACE GC Ultra

Item	Description	Cat. No.	Quantity
1	Septum cap	<b>35001047</b>	1
1	Septum cap for TriPlus HS and HS 2000 autosamplers	<b>35001048</b>	1
1	Merlin septum cap	<b>35001055</b>	1
2	Septum holder	<b>23303018</b>	1
3	Septum	<b>See page 3-083</b>	
4	Septum support* (replaced by item 4A)	<b>35005435</b>	1
4A	Septum support	<b>35005436</b>	1
5	Liner cap* (replaced by item 5A)	<b>29004277</b>	1
5A	Liner cap for PTV 816 RP-2004	<b>29004279</b>	1
6	Liner seal graphite	<b>29013417</b>	2
7	Liner	<b>See page 3-084</b>	
8	Spacer	<b>29014278</b>	2
9	Graphite ferrule	<b>See page 3-091</b>	
10	Fixing nut for column	<b>35032423</b>	5
11	Liner removing tool	<b>39801404</b>	1
12	Screwdriver	<b>20502603</b>	1
13	Ceramic washer	<b>34401100</b>	1
14	Viton® O-ring for sintered liner	<b>29031305</b>	10
14	Kalrez® O-ring for sintered liner	<b>29013702</b>	2
15	Sealing cup for PTV glass liner. To be used with PN 29031305 or PN 29013702	<b>29003420</b>	1

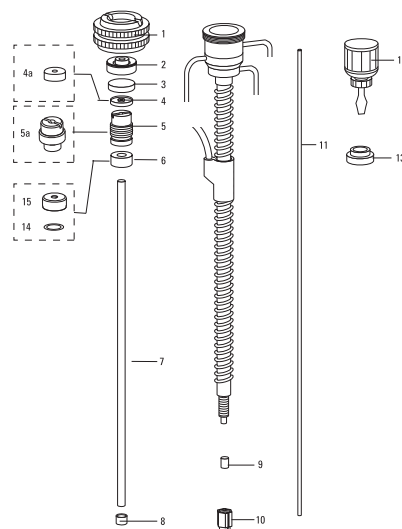
\* Parts for PTV manufactured prior to 2004

### Cold On-Column Injector for TriPlus Autosampler and TRACE GC Ultra

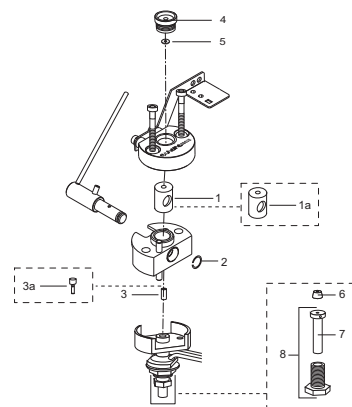
Item	Description	Cat. No.	Quantity
1	Seal, PTFE	<b>29007001</b>	1
1A	Direct on-column PTFE seal	<b>29007106</b>	1
2	Clip	<b>426003 57</b>	1
3	Needle guide	<b>45322036</b>	2
3A	Direct on-column needle guide	<b>45322063</b>	2
4	Seal holder (not used with direct on-column head)	<b>35001471</b>	1
5	O-ring (not used with direct on-column head)	<b>29011302</b>	2
6	Vespel® ferrule	<b>See page 3-091</b>	
7	Backwasher/cooling sleeve for OC	<b>45200001</b>	1
8	Column retaining nut and backwasher for OC	<b>45210001</b>	1

### Flame Ionization Detector (FID), TRACE GC Ultra and FOCUS GC

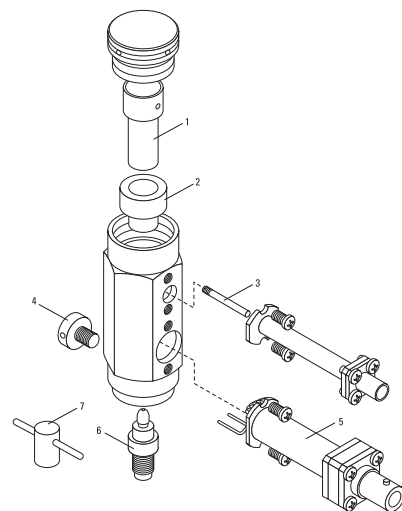
Item	Description	Cat. No.	Quantity
1	FID collecting electrode	<b>25901115</b>	1
2	Ceramic insulator	<b>30202310</b>	1
3	Collecting electrode pin	<b>20601602</b>	1
4	Retaining screw	<b>31106008</b>	1
5	FID jet	<b>40404301</b>	1
6	Jet removing tool	<b>20501900</b>	1



Programmed Temperature Vaporizing (PTV) Injector, TRACE GC Ultra



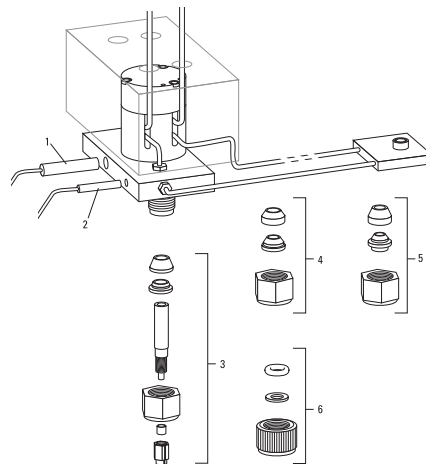
Cold On-Column Injector for TriPlus Autosampler and TRACE GC Ultra



Flame Ionization Detector (FID), TRACE GC Ultra and FOCUS GC

### Thermal Conductivity Detector (TCD), TRACE GC Ultra and FOCUS GC

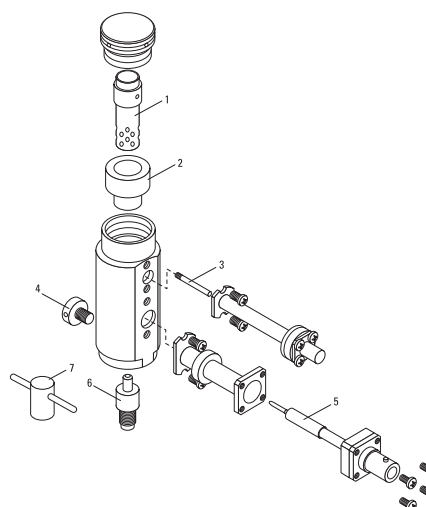
Item	Description	Cat. No.	Quantity
1	Adapter for capillary column (Kit)	<b>34709542</b>	1
2	Retaining nut for 6mm OD metal column and ferrule	<b>35020117</b>	1
3	Brass front/back ferrule for 1/8in. OD metal column	<b>29004666</b>	1
4	Retaining nut for 1/8in. OD column and ferrule	<b>35003062</b>	1



Thermal Conductivity Detector (TCD), TRACE GC Ultra and FOCUS GC

### Nitrogen Phosphorus Detector (NPD), TRACE GC Ultra

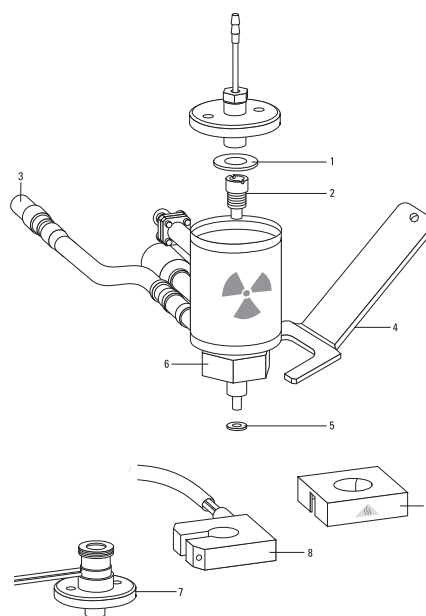
Item	Description	Cat. No.	Quantity
1	NPD collecting electrode	<b>25901110</b>	1
2	Ceramic insulator	<b>30202310</b>	1
3	Collecting electrode pin	<b>20601602</b>	1
4	Retaining screw	<b>31106008</b>	1
5	TS-2 source (standard)	<b>46500255</b>	1
5	TS-1 source for ENS mode	<b>46500250</b>	1
6	NPD jet	<b>40404302</b>	1
6	NPD (deactivated silcosteel) jet	<b>40404303</b>	1
7	Jet removing tool	<b>20501900</b>	1



Nitrogen Phosphorus Detector (NPD), TRACE GC Ultra

### Electron Capture Detector (ECD), TRACE GC Ultra

Item	Description	Cat. No.	Quantity
1	Upper seal, aluminum	<b>29032608</b>	10
2	ECD collecting electrode	<b>27700350</b>	1
3	ECD fixing tool	<b>20502150</b>	1
4	Lower seal, silver	<b>29015058</b>	2
5	ECD blocking nut	<b>35001120</b>	1
6	Adapter for stack configuration	<b>34709007</b>	1
7	Heating block for stacked configuration (including heater and RTD)	<b>35425064</b>	1
8	Cover for heating block	<b>24104449</b>	1



Electron Capture Detector (ECD), TRACE GC Ultra

### Flame Photometric Detector (FPD), TRACE GC Ultra

Item	Description	Cat. No.	Quantity
1	Mirror plug	35005350	1
2A	Graphite seal	19004589 (*)	2
2B	Heat shield	19004589 (*)	2
2C	Viton® O-ring	19004589 (*)	1
2D	Viton® O-ring	19004589 (*)	1
2E	Viton® O-ring	19004589 (*)	1
3	Detector body	19050111	1
4	Aluminium O-ring	29032630	10
5	FPD jet	40404511	1
5	FPD (deactivated Silcosteel) jet	40404512	1
6	Flange and relevant Viton® O-ring	36814235	1
7	Interferential filter for sulphur	28107000	1
7	Interferential filter for tin	28107001	1
7	Interferential filter for phosphorus	28107100	1
8	Photomultiplier	28600450	1
9	Heater/sensor/coil cable	23043479	1
10	FPD fixing tool	20502150	1
11	FPD blocking nut	35001125	1

\* Maintenance kit for FPD

### Detector Base Body, TRACE GC Ultra and FOCUS GC

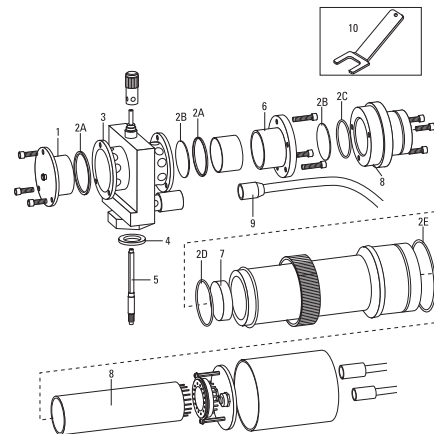
Item	Description	Cat. No.	Quantity
1	Adapter for flow measurement	35004107	1
2	Brass blind cap	35006101	1
3	Silicon seal	29033037	10
4	Blind jet	40401900	2
5	Seal, silver	29037100	10
6	Adapter for capillary column	34725436	2
7	Graphite ferrule	See page 3-091	
8	Fixing nut for column	35032423	5

### UltraFast Module Option – UFM S/SL-FID Configuration, TRACE GC Ultra

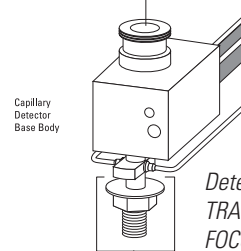
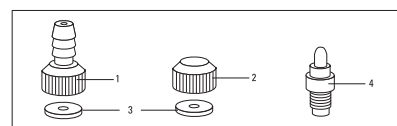
Item	Description	Cat. No.	Quantity
1	Silver seal for injector base	29033629	10
2	Terminal fitting for capillary column	34705458	1
3	1/4in. retaining nut for injector base	35002132	1
4	Silver seal for detector base	29037100	10
5	Terminal fitting for detector base	34705456	1
6	M8 x 1 retaining nut for detector base	35002134	1
7	Threaded locking ring	35001468	1

### UltraFast Module Option – UFM PTV-FID Configuration, TRACE GC Ultra

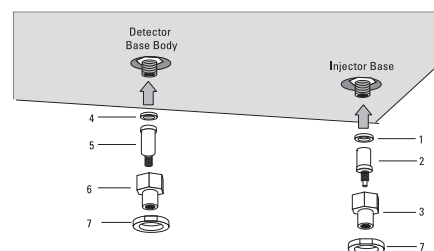
Item	Description	Cat. No.	Quantity
1	Injector guide	24104482	1
2	Silver seal for detector base	29037100	10
3	Terminal fitting for detector base	34705457	1
4	M8 x 1 PTV retaining nut for detector base	35002130	1
5	Supporting disk	36812760	1



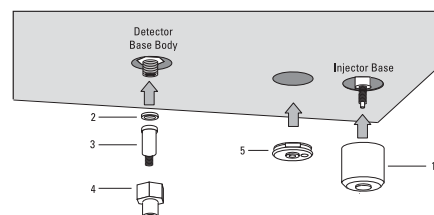
Flame Photometric Detector (FPD),  
TRACE GC Ultra



Detector Base Body,  
TRACE GC Ultra and  
FOCUS GC



UltraFast Module Option – UFM S/SL-FID  
Configuration, TRACE GC Ultra



UltraFast Module Option – UFM PTV-FID  
Configuration, TRACE GC Ultra

## TriPlus GC Autosampler

- Flexible sampling solutions for liquid, headspace and SPME
- Quick installation for easy start-up
- Double productivity with simultaneous operation of two different Thermo Scientific GC or GC/MS systems

The Thermo Scientific TriPlus autosampler is the evolution of autosamplers based on three dimensional (XYZ) space movements of the syringe holder. Besides conventional injection of liquid or headspace, this platform delivers unique “pluses” conceived to increase your lab's efficiency and productivity:

- Snap-on interchangeability of liquid, headspace and SPME<sup>™</sup> configurations
- Quick mechanical installation of mainframe and accessories
- Self-alignment procedure and self-recognition of all installed accessories
- Simultaneous automation of independent sampling methods on two GC/GC-MS units
- Rugged SPME automation

*\*Sold under license from Supelco®*



### Syringe Holders

Description	Cat. No.	Quantity
Syringe holder for 50mm needles (5, 10, 100, 250µL syringes)	<b>25401010</b>	1
Syringe holder for 50mm needles (0.5, 10, 100, 500µL syringes)	<b>25401015</b>	1
Syringe holder for 80mm syringe needles (5, 10, 100, 250µL syringes)	<b>25401020</b>	1
Syringe holder for 80mm syringe needles (0.5, 10, 100, 500µL syringes)	<b>25401025</b>	1
Syringe holder for TriPlus headspace	<b>36503008</b>	1
Syringe holder for SPME fiber	<b>25401080</b>	1



Syringe Holders

### Sample Trays

Description	Cat. No.	Quantity
Ambient tray holder, configurable in field as primary or secondary	<b>36812755</b>	1
Primary ambient tray, positions 1 – 150, for 1, 2, 2.5mL vials	<b>24010150</b>	1
Primary ambient tray, positions 1 – 54, for 10, 20mL vials	<b>24010160</b>	1
Secondary ambient tray, positions 151 – 300, for 1, 2, 2.5mL vials	<b>24010155</b>	1
Secondary ambient tray, positions 55 – 108, for 10, 20mL vials	<b>24010165</b>	1
Cooled/Heated tray holder, configurable in field as primary or secondary	<b>24010190</b>	1
Primary cooled/heated tray, positions 1 – 96, for 1, 2, 2.5mL vials	<b>24010195</b>	1
Primary cooled/heated tray, positions 1 – 33, for 10mL vials	<b>24010200</b>	1
Secondary cooled/heated tray, positions 97 – 192, for 1, 2, 2.5mL vials	<b>24010215</b>	1
Secondary cooled/heated tray, positions 34 – 66, for 10mL vials	<b>24010220</b>	1



Sample Trays

### Washing Stations

Description	Cat. No.	Quantity
Standard 5 x 10mL washing station	<b>19050390</b>	1
2 x 100mL washing station	<b>19050400</b>	1
Fast washing station	<b>19050401</b>	1



Washing Stations



**Turrets and Oven**

Description	Cat. No.	Quantity
Turret AS	<b>25401050</b>	1
Turret HS	<b>25401060</b>	1
HS incubation oven/agitator	<b>35408070</b>	1

**SPME**

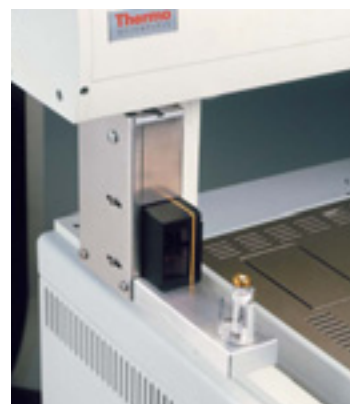
Description	Cat. No.	Quantity
SPME fiber holder kit (only for TriPlus with turret s/n above 20066157)	<b>19050434</b>	1
SPME fiber conditioning station (only for TriPlus s/n above 20066529)	<b>19050502</b>	1

**Septum Caps**

Description	Cat. No.	Quantity
Septum cap for SSL suitable for HS and SPME	<b>34750004</b>	1
Septum cap for PTV suitable for HS and SPME	<b>35001048</b>	1
Septum cap for Merlin Valve SSL-PTV	<b>35001056</b>	1

**Bar Code Reader**

Description	Cat. No.	Quantity
Bar code reader	<b>19050490</b>	1
Magnetic 9mm caps for bar code reader	<b>38606095</b>	100
Labels for bar code reader	<b>38706782</b>	1000

*SPME Fiber Conditioning Station**SPME Fiber Holder Kit**Bar Code Reader*

## AI/AS 3000 and AI/AS 3000 Series II Autosamplers

- Automated sampling systems for all Thermo Scientific GC and GC/MS systems
- Performance and simplicity in liquid sampling
- “Tool-Free” upgradability from 8 to 105 vial positions

Engineered to meet the highest level requirements of ruggedness and ease of use, the 3000 Series II automatic sampling system is ideal for high throughput and QA/QC control on the Thermo Scientific GC and GC/MS product portfolio. Utmost precision and ease-of-use of the plug and inject concept are combined in two available configurations: 8-position single module system for small batches of samples; 105-position tray system for high sample throughput. Boost productivity further with the Gemini configuration, which allows two autosamplers to be mounted on the same GC, serving two injection ports simultaneously.



AS 3000 II 8-vial Autoinjector

### AI/AS 3000 and AI/AS 3000 Series II Autosamplers

Description	Cat. No.	Quantity
Waste bottle complete with septum and cap (Set of 5)	<b>19004646</b>	1
Tray 8-position holder	<b>24010140</b>	1
Tray 105-position assembly	<b>25117445</b>	1
Centering Plate for Merlin Adapter on S/SL injector	<b>36812734</b>	1
Centering plate for PTV injector and Merlin Adapter on PTV injector	<b>36812736</b>	1
Centering plate for S/SL injector	<b>36812738</b>	1



AS 3000 II 105-vial Autosampler

## ISQ Innovative Single Quadrupole GC-MS

- Unique Full Source Removal™ capability delivers maximum uptime and unstoppable productivity
- ExtractaBrite™ solid, inert ion source provides robust operations and low detection limits
- Versatile and flexible for a broad range of applications

Re-think the way your lab operates with the Thermo Scientific ISQ single quadrupole GC-MS system. The ISQ™ GC-MS incorporates an innovative source design that keeps the ISQ cleaner, longer. With heat throughout the ion optics, the ISQ can analyze more samples per day, with maximum uptime. Easy to learn, easy to use, and easy to maintain, the ISQ was developed to meet the needs of the modern analytical laboratory.



### Ion Source Components

Description	Cat. No.	Quantity
El Ion Source Cartridge Kit	<b>120404-4100</b>	1
Ion Cartridge	<b>1R120404-1105</b>	1
El Ion Volume	<b>1R120404-4111</b>	1
Ion Volume-Repeller Insulator	<b>1R120404-1114</b>	1
Repeller (Low Activity)	<b>1R120404-1161</b>	1
Ion Volume Locking Ring	<b>1R120404-1118</b>	1
Repeller Spring (pkg of 5)	<b>1R76485-1000K</b>	5
Repeller Nut	<b>1R120404-1120</b>	1
Lens 1	<b>1R120404-1130</b>	1
Lens 2	<b>1R120404-1140</b>	1
Lens 3/RF Lens	<b>120404-1150</b>	1
Ion Volume, Cl	<b>1R120404-4112</b>	1
Ion Volume, El/Cl Combo	<b>1R120404-4113</b>	1
Cl Ion Source Cartridge Kit	<b>120404-4400</b>	1
Dual Filament	<b>1R120404-1900</b>	1

### Column Components

Description	Cat. No.	Quantity
Graphite Vespel ferrule for 0.25mm columns	<b>1R76458-2016</b>	10
Graphite Vespel ferrule for 0.32mm columns	<b>1R76458-2019</b>	10
Graphite Vespel ferrule for 0.53mm columns	<b>1R76458-2020</b>	10
2-hole graphite Vespel ferrule for <0.32mm column	<b>1R76458-2018</b>	10
No-hole graphite Vespel ferrule	<b>1R76458-2009</b>	10
SilTite ferrule for 0.10-0.25mm ID column	<b>1R76458-2000</b>	10
SilTite ferrule for 0.32mm columns	<b>1R76458-2024</b>	10
SilTite ferrule for 0.53mm columns	<b>1R76458-2026</b>	10
Nut for SilTite ferrules	<b>1R76458-2001</b>	5
Nickel-coated nut for graphite Vespel ferrule	<b>1R76256-0060</b>	5

### Mechanical (rotary-vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump	<b>A0301-15101</b>	1

### Accessories

Description	Cat. No.	Quantity
Aluminum oxide	<b>32000-60340</b>	1
Calibration Compound (perfluorotributylamine)	<b>50010-30059</b>	1
Forceps	<b>1R76360-0008</b>	1
ISQ Tool Kit (Does not include exchange tool)	<b>1R120467-0001</b>	1
Source Exchange Tool	<b>1R120406-2000</b>	1
Column Measuring Tool	<b>1R120461-0010</b>	1
Manifold o-ring	<b>1R3815-360</b>	1
Vent valve o-ring	<b>1R3814-111</b>	1
Oil mist filter	<b>1R76505-0036</b>	1
Electron Multiplier	<b>1R76022-14633</b>	1
T10 Torxhead Key	<b>1R3812-5T10</b>	1
T20 Torxhead Key	<b>1R3812-5T20</b>	1
T30 Torxhead Key	<b>1R3812-5T30</b>	1
Test mix, octofluoronaphthalene, benzophenone	<b>1R120151-TEST</b>	1

## DSQ Series Single Quadrupole GC-MS Systems

- Sensitivity and large dynamic range for demanding analyses
- Proven performance for difficult samples
- Analytical flexibility for applications from research to routine



The Thermo Scientific DSQ Series of single quadrupole GC-MS systems includes the DSQ and DSQ II mass spectrometers. The DSQ Series mass spectrometers are available with either the TRACE GC Ultra gas chromatograph, or the compact FOCUS GC. Featuring an innovative curved prefilter for reduction of neutral noise, resulting in excellent sensitivity and lower detection limits, the DSQ Series of single quadrupole GC-MS products are suitable for a wide variety of applications.

### DSQ II Spare Parts

Description	Cat. No.	Quantity
Magnet yoke	<b>119850-0710</b>	1
Magnet	<b>1R70001-98195</b>	1
Ion volume holder, Standard	<b>70001-20532</b>	1
Ion volume, EI	<b>119650-0220</b>	1
Ion volume, CI	<b>119650-0230</b>	1
Ion volume, EI/CI Combo	<b>119650-0240</b>	1
Ion volume kit, CEI w/holder	<b>119650-0221-KIT</b>	1
Ion volume holder, CEI Only	<b>70001-20532-T</b>	1
Ion volume, CEI	<b>119650-0221-T</b>	1
Lens heater ring	<b>120320-0020</b>	1
Lens assembly, Complete	<b>119650-0151</b>	1
Lens holder	<b>119650-0420</b>	1
Lens 1	<b>119650-0414</b>	1
Lens 2	<b>119650-0416</b>	1
Lens 3	<b>119650-0423</b>	1
Lens spacer	<b>119650-0426</b>	1
Lens retainer clip	<b>119650-0428</b>	1
Prefilter lens spacer	<b>119800-0475</b>	1
Prefilter lens	<b>119800-0535</b>	1
Prefilter lens retainer clip	<b>120173-0002</b>	1
Source alignment studs	<b>119650-0215</b>	1
Ion source heater assembly	<b>120309-0001</b>	1
Source block assembly	<b>120320-0101</b>	1
Lens retainer clip	<b>120320-0040B</b>	1
Lens retainer stud	<b>120320-0041</b>	1
Ion volume index screw	<b>120320-0042</b>	1
Filament	<b>120320-0030</b>	1
Filament insulator/spacer	<b>119650-0235</b>	1
Filament retainer clip	<b>120320-0050</b>	1
Lens alignment tool	<b>120271-0001</b>	1

### DSQ Spare Parts

Description	Cat. No.	Quantity
Ion source assembly (complete)	<b>119850-0250</b>	1
Lens alignment tool	<b>120271-0001</b>	1
Magnet	<b>1R70001-98195</b>	1
Magnet support	<b>119850-0710</b>	1
Source spacer assembly	<b>119800-0475</b>	1
Spring	<b>76485-0032</b>	1
Thumbscrew	<b>119825-0100</b>	1
Filament	<b>119701-60287</b>	1
Filament spacer/insulator	<b>119650-0235</b>	1
Ion source PCB	<b>96000-60087</b>	1
Ion volume, CI	<b>119650-0230</b>	1
Ion volume, EI	<b>119650-0220</b>	1
Ion volume, EI/CI combo	<b>119650-0240</b>	1
Ion volume holder	<b>70001-20532</b>	1

### DSQ and DSQ II Accessories and Spares

#### Inlet Valve (Upgrade Option)

Description	Cat. No.	Quantity
Ball valve seal replacement kit	<b>76461-2002</b>	1
Inlet valve seal replacement kit	<b>119265-0003</b>	1

#### Accessories

Description	Cat. No.	Quantity
Allen wrench kit, metric	<b>3812-0100</b>	1
Aluminum oxide	<b>32000-60340</b>	1
Back ferrule, 1/8in, brass	<b>A0101-02500</b>	1
Calibration compound (perfluorotributylamine)	<b>50010-30059</b>	1
Column measuring tool	<b>119640-0550</b>	1
Forceps	<b>76360-0400</b>	1
Front ferrule, 1/8in, brass	<b>A0101-08500</b>	1
Test mix, octafluoronaphthalene, benzophenone	<b>120150-TEST</b>	1
Transfer line ferrule, 1/16in to 0.4mm, graphite/vespel	<b>A0101-18100</b>	1

#### Mechanical (rotary-vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump	<b>A0301-15101</b>	1

## ITQ Series External Ionization GC-Ion Trap MS

- Excellent sensitivity in full-scan operation
- Advance to the power of MS<sup>n</sup> for incredible selectivity in the dirtiest of matrices
- External ionization source for maximum productivity, reliability, and classical, library searchable spectra

The Thermo Scientific ITQ Series is designed with the ability to upgrade in mind, protecting your investment by adapting to your lab's changing work-flows and needs over time. If your needs change, upgrade your instrument to gain access to new features, greater flexibility, more power. Better yet, regardless of your choice, you will have the most sensitive GC-ion trap mass spectrometer available, giving you lower detection limits, even in matrix.



The ITQ Series offers a range of operating modes, from full-scan MS and MS/MS (MS<sup>n</sup>), to positive and negative chemical ionization. Dual modes for sequential full scan and MS/MS or positive ion/negative ion chemical ionization (PPINICI) allow you to acquire both types of data in a single injection. Variable damping gas, an option available exclusively on the ITQ Series, further improves GC/MS sensitivity up to 5X or more across a broad range of real-world samples. Data Dependent™ scanning allows you to quickly collect data, confirm the identity of compounds, and further reduce sample cleanup costs.

### Ion Source Spare Parts

Description	Cat. No.	Quantity
Magnet support thumbscrew	<b>76483-0125</b>	1
Compression spring	<b>76485-0032</b>	1
Set screws	<b>76905-0405</b>	1
Magnet support yoke	<b>119650-0710</b>	1
Magnet	<b>1R70001-98195</b>	1
Ion volume holder, standard	<b>70001-20532</b>	1
Ion volume, EI	<b>119650-0220</b>	1
Ion volume, CI	<b>119650-0230</b>	1
Ion volume, EI/CI combo	<b>119650-0240</b>	1
Ion volume, closed exit (CEI)	<b>119650-0221-T</b>	1
Ion volume holder, CEI only	<b>70001-20532-T</b>	1
Lens heater ring	<b>119650-0422</b>	1
Lens assembly, complete	<b>119650-0150</b>	1
Lens holder	<b>119650-0420</b>	1
Lens 1	<b>119650-0414</b>	1
Lens 2	<b>119650-0416</b>	1
Lens 3	<b>119650-0418</b>	1
Lens spacer	<b>119650-0426</b>	1
Lens retainer clip	<b>119650-0428</b>	1
Filament	<b>120320-0030</b>	1
Filament spacer/insulator	<b>119650-0235</b>	1
Filament retainer clip	<b>120320-0050</b>	1
Ion source PCB	<b>96000-60087</b>	1
Ion source block	<b>119650-0205</b>	1
Ion volume key thumbscrew	<b>119650-0206</b>	1
Heater RTD Spring	<b>96000-20176</b>	1
Heater RTD spring thumbscrew	<b>119650-0208</b>	1

### Ion Trap Spare Parts

Description	Cat. No.	Quantity
Endcap electrode	<b>119650-0520</b>	1
Spacer	<b>119650-0540</b>	1
Ring electrode	<b>119650-0525</b>	1
Exit lens	<b>119650-0530</b>	1
Exit lens spacer	<b>119650-0515</b>	1
Helium inlet	<b>119650-0532</b>	1

### Inlet Valve (Upgrade Option)

Description	Cat. No.	Quantity
Ball valve seal replacement kit	<b>76461-2002</b>	1
Inlet valve seal replacement kit	<b>119265-0003</b>	1

### Mechanical (Rotary-vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump, 1L	<b>A0301-15101</b>	1

### Accessories

Description	Cat. No.	Quantity
Allen wrench kit, metric	<b>3812-0100</b>	1
Aluminum oxide	<b>32000-60340</b>	1
Calibration compound (perfluorotributylamine)	<b>50010-30059</b>	1
Back ferrule, 1/8in., brass	<b>A0101-02500</b>	1
Column measuring tool	<b>119640-0550</b>	1
Ion volume tool	<b>119270-0001</b>	1
Front ferrule, 1/8in., brass	<b>A0101-08500</b>	1
Test mix, octafluoronaphthalene and decafluorobenzophenone (DFBZ)	<b>120420-TEST</b>	1
Transfer line ferrule, 1/16in to 0.4mm, graphite/vespel	<b>A0101-18100</b>	1

## Polaris*Q* External Ionization Ion Trap GC/MS

- Stop matrix interference with the power of MS<sup>n</sup>
- Outstanding sensitivity in full scan mode
- Reliability, robustness, and library-searchable data from external ionization source

The Thermo Scientific Polaris*Q* is a high quality benchtop ion trap GC/MS system with EI, CI, Negative CI, MS/MS and direct sample probe capability. Proprietary Pulsed Positive Ion/Negative Ion Chemical Ionization (PPINICI) and variable buffer gas options enhance ppb sensitivity and performance in the toughest sample matrices. External ionization ensures data integrity, while providing robust, reliable performance.



### Ion Source

Description	Cat. No.	Quantity
CI ion volume	<b>119650-0230</b>	1
EI ion volume	<b>119650-0220</b>	1
EI/CI combo ion volume	<b>119650-0240</b>	1
Filament	<b>119701-60287</b>	1
Filament spacer	<b>119650-0235</b>	1
Ion source PCB	<b>96000-60087</b>	1
Ion volume holder	<b>70001-20532</b>	1

### Mechanical (Rotary-Vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump, 1L	<b>A0301-15101</b>	1

### Inlet Valve (Upgrade Option)

Description	Cat. No.	Quantity
Ball valve seal replacement kit	<b>76461-2002</b>	1
Inlet valve seal replacement kit	<b>119265-0003</b>	1

### Accessories

Description	Cat. No.	Quantity
Allen wrench kit, metric	<b>3812-0100</b>	1
Aluminum oxide	<b>32000-60340</b>	1
Back ferrule, 1/8in., brass	<b>A0101-02500</b>	1
Calibration compound	<b>50010-30059</b>	1
Filament	<b>119701-60287</b>	1
Front ferrule, 1/8in., brass	<b>A0101-08500</b>	1
Test mix, 100ng/μL decafluorobenzophenone, benzophenone, methyl stearate	<b>A0301-23057</b>	1
Test mix, 100pg/μL, 10pg/μL, and 1pg/μL decafluorobenzophenone	<b>96000-98044</b>	1
Transfer line ferrule, 1/16in. to 0.4mm, graphite/Vespel	<b>A0101-18100</b>	1



## TSQ Quantum GC and TSQ Quantum GC XLS Triple Quadrupole GC-MS/MS

- Higher compound sensitivity
- More matrix selectivity
- More productivity

The Thermo Scientific TSQ Quantum GC is the latest evolution in triple quadrupole GC-MS/MS. The TSQ Quantum GC provides unprecedented sensitivity for target compound analysis in complex samples. Timed selected reaction monitoring (t-SRM), unique to the TSQ Quantum GC, detects compounds at the expected elution time, with optimum sensitivity, independent of the total number of compounds, a feature no other GC-triple quadrupole MS can provide.



### Ion Source

Description	Cat. No.	Quantity
Ion source assembly, complete	<b>119850-0250</b>	1
Magnet, TSQ Quantum GC XLS	<b>1R70001-98195</b>	1
Magnet	<b>70001-98195</b>	1
Magnet support	<b>1R119850-0710</b>	1
Source spacer assembly	<b>119800-0475</b>	1
Spring	<b>76485-0032</b>	1
Lens 1, TSQ Quantum GC	<b>119650-0414</b>	1
Lens 2, TSQ Quantum GC	<b>119650-0416</b>	1
Lens 3, TSQ Quantum GC	<b>119650-0423</b>	1
Lens housing	<b>119650-0420</b>	1
Lens insulator	<b>119650-0426</b>	1
Ion volume, EI, stainless steel	<b>70111-22036</b>	1
Ion volume, CI	<b>70111-22037</b>	1
Ion volume, closed exit (CEI), stainless steel	<b>70111-22038</b>	1
Ion volume holder, stainless steel	<b>70001-20532</b>	1
Ion volume, closed exit (CEI), inert, "P"-type	<b>70111-22202</b>	1
Ion volume, closed exit (CEI), inert	<b>70111-22147</b>	1
Ion volume holder, inert	<b>70001-20532-T</b>	1
Lens 1, TSQ Quantum GC XLS	<b>1R119650-3414</b>	1
Lens 2, TSQ Quantum GC XLS	<b>1R119650-3416</b>	1
Lens 3, TSQ Quantum GC XLS	<b>1RR119650-3423</b>	1
GC-source/Q00 Heater, XLS-TSQ	<b>70111-60840</b>	1
Ball Plunger, 5/40 modified	<b>70111-22062</b>	1
Assy, Lens 1,2,3, GC Source, Heated, XLS-TSQ	<b>70111-60842</b>	1
Lens Circlip Ion Trap/DSQ	<b>119650-0428</b>	1
Lens, 1,2,3 Holder, Source, XLS-TSQ	<b>70111-22197</b>	1
Quad Spacer Ceramic, Heated, Q0, XLS-TSQ	<b>70111-22200</b>	1
Orientation Spacer, Q0, XLS-TSQ	<b>70111-22201</b>	1
Ceramic Heater PCB Assy, XLS-TSQ	<b>70111-60848</b>	1

### Ion Source Block

Description	Cat. No.	Quantity
Filament	<b>120320-0030</b>	1
Filament spacer	<b>70111-22061</b>	1
Filament retainer clip	<b>70111-22071</b>	1
Ion source heater board	<b>70111-60780</b>	1
Source block	<b>70111-60791</b>	1
Source alignment studs	<b>70111-22056</b>	1
Lens retainer clip	<b>70111-22070</b>	1
Lens retainer screw	<b>70111-22060</b>	1

### Inlet Valve

Description	Cat. No.	Quantity
Ball valve seal replacement kit	<b>76461-2002</b>	1
Inlet valve seal replacement kit	<b>119265-0003</b>	1

### Mechanical (Rotary-Vane) Pump

Description	Cat. No.	Quantity
Oil, rotary-vane pump, 1L	<b>A0301-15101</b>	1

### Accessories

Description	Cat. No.	Quantity
Allen wrench kit, metric	<b>3812-0100</b>	1
Aluminum oxide	<b>32000-60340</b>	1
Back ferrule, 1/8in., brass	<b>A0101-02500</b>	1
Front ferrule, 1/8in., brass	<b>A0101-08500</b>	1
Forceps	<b>76360-0400</b>	1
Calibration compound (FC-43)	<b>50010-30059</b>	1
Transfer line ferrule, 1/16in. to 0.4mm, graphite/Vespel	<b>A0101-18100</b>	1
Electron multiplier, with flange	<b>70001-98175</b>	1
Kit, calibration compound vial	<b>120433-0001</b>	1

## DFS High Resolution GC/MS

- Ultra high sensitivity analysis of dioxins, BFRs and other POPs
- Highest sample throughput at lowest LOQs
- Highest reliability of analytical results

The Thermo Scientific DFS is the highest performance, highest resolution GC/MS ever built for target compound analysis and structural elucidation, and the first completely new instrument of its class in more than 15 years. It delivers unprecedented flexibility and productivity for large sample series and can optionally be equipped with two TRACE GC Ultra™ units, simultaneously installed at the same ion source. The DFS is designed for unattended operation, with highest sample capacity and ultimate sampling flexibility.



## MAT95 Double Focusing Sector Field Mass Spectrometer

- Proven performance for target compound confirmation in environmental, food safety and forensic, sports doping analysis
- Versatile for structure elucidation using multiple inlet systems

The Thermo Scientific MAT95 XP has been the high-end workhorse in the analysis of polychlorinated dioxins and furans for many years. It combines unprecedented sensitivity with the ruggedness of a benchtop instrument. It is highly versatile and can be equipped with various ionization methods, such as EI, CI, FAB, ESI and APCI.



### High Resolution MS General Spares, DFS, MAT95/900

Description	Cat. No.	Quantity
Filament, EI Operation, Tungsten, for DFS/MAT95/900	<b>1062950</b>	1
Filament, CI Operation, Rhenium, for DFS/MAT95/900	<b>1062960</b>	1
Ion volume for exchange, EI operation	<b>1082100</b>	1
Ion volume for exchange, CI operation	<b>1082200</b>	1
Ion volume for exchange, ACE operation	<b>1082250</b>	1
Ion volume for exchange, FAB operation	<b>1082240</b>	1
SEV Unit, electron multiplier for DFS/MAT95/900	<b>1090010</b>	1
DIP aluminum crucibles for solid samples	<b>0568761</b>	200
Septum 12.5 PTFE coated	<b>0553371</b>	1
Source heater	<b>0491940</b>	1
Ferrule Vespel 1/16" transfer line	<b>0492490</b>	1

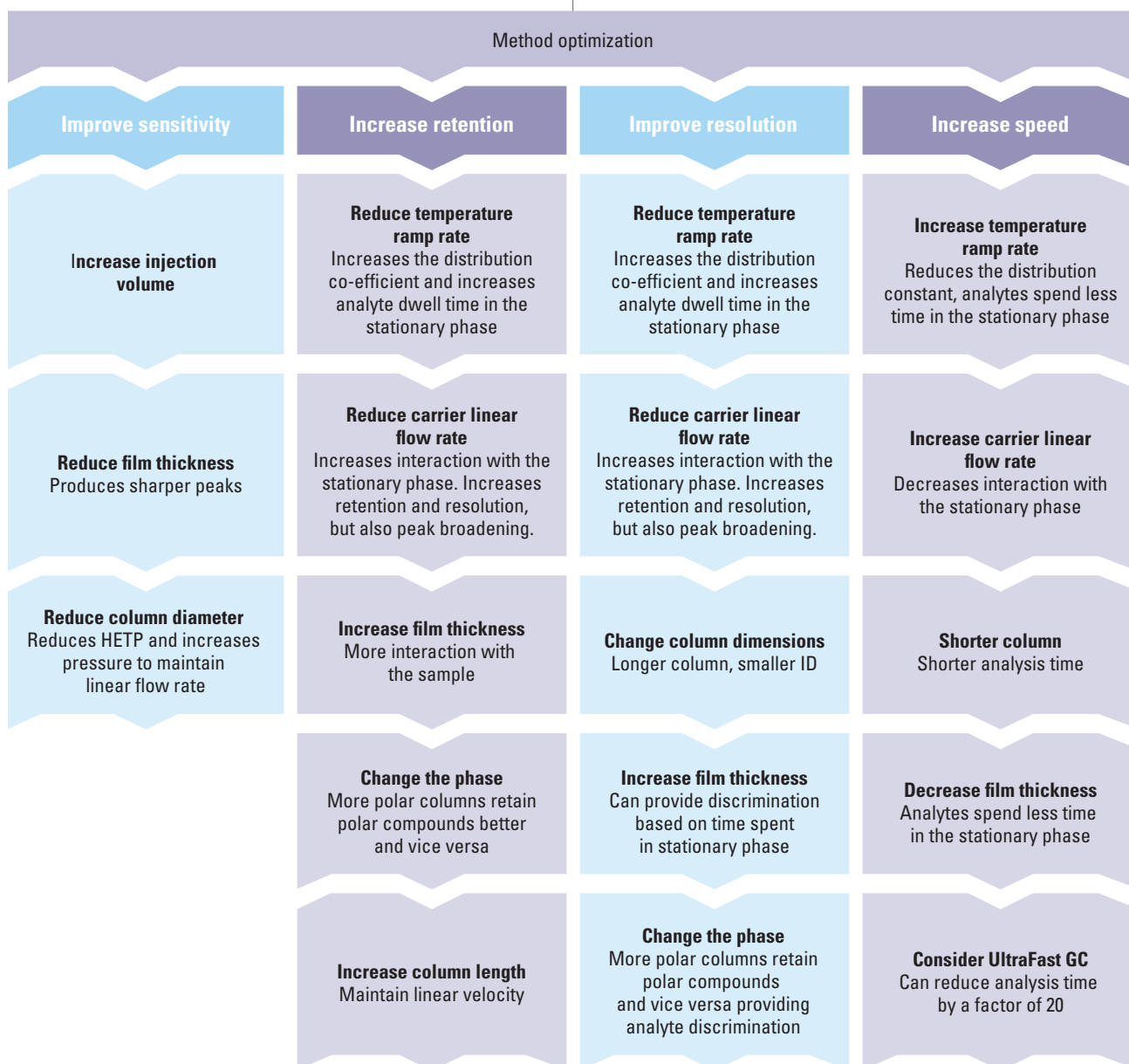
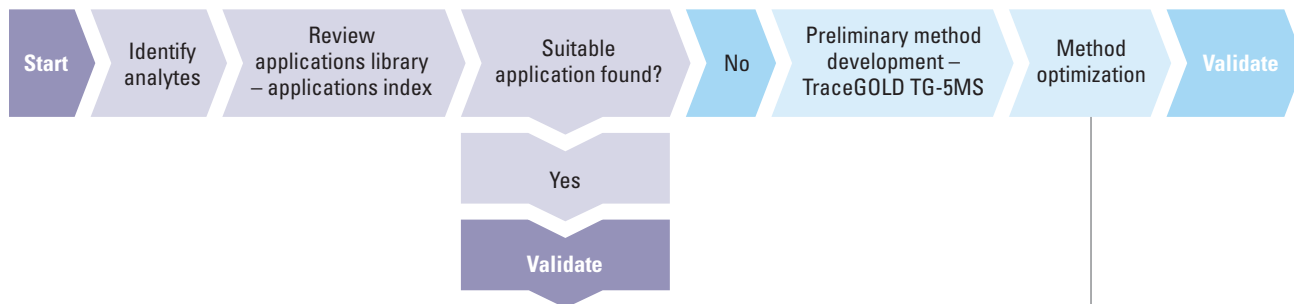
### High Resolution MS General Spares, DFS, MAT95/900

Description	Cat. No.	Quantity
DIP aluminum crucibles for liquid samples	<b>0568770</b>	200
DIP aluminum crucibles for liquid samples, caps	<b>568780</b>	200
DIP gold crucibles	<b>0574200</b>	1
DIP-HT quartz crucibles	<b>1006070</b>	10
Crucible holder	<b>0568770</b>	
DCI wire units	<b>0744860</b>	1

# GC Technical Information

## GC Method Selection and Optimization

The following flow chart briefly describes the common steps in GC method development and optimization.



## GC 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 GC problems encountered, the possible causes and solutions for your quick reference.

Symptom	Cause	Recommended Solutions
<b>Baseline Related Problems</b>		
Baseline Drifting	Accumulation of stationary phase.	Remove the end section of the column.
	Carrier gas cylinder pressure too low to allow control.	Replace the carrier gas cylinder. Increase the pressure.
	Drifting carrier gas or combustion gas flows.	Check the gas controllers.
	Accumulation of impurities in the column.	Check impurity levels in the gas source. Use correct gas purity. Replace or install appropriate Gas Filters (see page 3-080).
Baseline Falling	Carrier gas leak in the system.	Perform a leak test. Check the tightness of the connections on the carrier gas line.
	Column is baking out.	Allow enough time for the column to stabilize.
Baseline Falling Away Slowly After a High Initial Value	Purge valve left closed during acquisition.	Alter the GC program. See your GC user manual for details.
	Inadequate purge flow rate.	Increase the purge flow rate.
	Purge valve left closed for too long.	Shorten the purge time.
	Solvent tail peak.	Increase the solvent delay. Shorten the purge time.
	Pre-filters are dirty. (when using a quadrupole MS detector)	Contact your service representative.
Baseline Rising	Accumulation of impurities in the column.	Check impurity levels in the gas source. Use correct gas purity. Replace or install appropriate Gas Filters (see page 3-080).
	Contaminated detector.	Check the detector and clean it.
	There is bleeding from the GC column.	Condition column. Change the column.
	Air is leaking into the system.	Trace and repair the leak.
Baseline Rising Under Temperature Program Control	Column contaminated.	Recondition the column.
Baseline High Standing Current	Carrier gas flow rate too high.	Reduce the carrier gas flow.
	Column contaminated.	Recondition the column.
	Contaminated gases.	Replace gas cylinders. Replace the gas filters.
	Excessive column stationary phase bleeding.	Check the oven temperature, ensuring that it doesn't exceed the column upper limit. Recondition the column. Replace the column.
	Loose connections.	Ensure that all interconnections and screw connections are tight.
Baseline Irregular Shape: Dip After Solvent Peak	Detector contaminated.	Bake out the detector. Clean the detector.
Baseline Irregular Shape: S-shaped	Excessive column bleed during column temperature programming.	Reduce the upper column temperature. Bake out the column. Install a high temperature column.
	Oxygen contamination is decomposing the stationary phase.	Install oxygen filters in the carrier gas line. Check the pneumatic and inlet systems for leaks. Use correct gas purity with low oxygen content.
Baseline High Frequency Noise	Contaminated detector.	Isolate the detector from the electronics. If noise disappears, clean the collector.
	Combustion gas flow too low or too high.	Check the detector gas flows.
	Column contaminated.	Condition the column.
	Contaminated detector gas supply.	Check the gas purity and install appropriate filters.
	Detector temperature higher than column maximum temperature.	Reduce the detector temperature to the column temperature upper limit.
	Loose column fittings.	Tighten fittings accordingly.
Baseline Spiking	Column too close to flame. (when using an FID)	Lower the column to the correct position (2-3mm below the tip of the jet).
	Dirty jet or detector.	Isolate the detector from the electronics. If the spiking disappears, clean the jet and the collector.
	FID temperature too low. (when using an FID)	Increase the FID temperature to at least 150°C.

GC Troubleshooting *continued*

Symptom	Cause	Recommended Solutions
<b>Peak-Related Problems</b>		
Peaks Broadening	Column flow too high.	Reduce the flow to slightly above optimum.
	Column flow too low.	Increase the flow to slightly above optimum.
	Split flow too low in split injection.	Increase the flow to 40-50mL/min.
	Column performances degraded.	Test the column at the optimum flow rate.
	Dirty injector.	Clean or replace the liner.
	Stationary phase accumulated in the outlet.	Remove the last two coils from the column.
	Detector base body temperature too low.	Increase the temperature to 5°C below the column maximum.
	The sample is overloading the column.	Reduce the amount and/or concentration of the sample.
Double Peaks	Injection speed too low.	Inject more rapidly in a smooth motion.
	Wrong autosampler injection speed or mode.	Use a higher speed.
Peak Fronting	Column or detector overloaded.	Decrease the injected amount. Decrease the analyte concentrations. Increase the split ratio.
	Column temperature too low.	Increase the temperature.
	Stationary phase too thin.	Use a thicker-film column.
	Poor injection technique.	Repeat, with better injection technique.
Ghost Peaks	Contaminated carrier gas.	Replace the cylinder. Replace the filter (see page 3-080).
	Contamination from laboratory glassware.	Ensure the glassware is clean and contamination-free.
	Decomposition of injected sample.	Decrease the injection port temperature. Use the on-column injection technique.
	Dirty injection solution.	Carry out adequate clean-up of sample prior to injection.
Broad Ghost Peaks	Contaminated inlet or pneumatics.	Remove the column and bake out the inlet. Use a high-quality septum. Replace the split vent filter. Install an in-line filter between the pneumatics and the inlet.
	Incomplete elution of previous sample.	Increase the final oven program temperature or total run time. Increase the column flow rate.
Irregular, Chair-shaped Peaks	Solvent flooding of column.	Increase the initial oven temperature. Reduce the injection volume (On-column). Install a retention gap (On-column).
No Peaks After Solvent Peak	Carrier gas flow too high.	Reduce the carrier gas flow rate.
	Combustion gas flow incorrect.	Check the combustion gas flow.
	Detector contaminated.	Bake out or clean the detector.
	FID flame extinguished by solvent peak.	Check the detector temperature and that flame is lit.
	Too much sample injected.	Inject less sample.
	Incorrect column position in S/SL injector (too high).	Check the column position.
No Peaks at All	Clogged syringe needle.	Replace or repair the syringe.
	Column broken or disconnected.	Check the column and connections.
	Defective electrometer or amplifier.	Check electrometer or amplifier and associated connections. Replace if required.
	Defective recording device.	Replace the recording device.
	FID flame is out.	Clean FID jet, check detector gas flows and re-light flame.
	Incorrect column position in S/SL injector (too high).	Check the column position.
Sample Peak Tailing	Column degradation causing activity.	Inject a test mixture and evaluate the column.
	Column/oven temperature too low.	Increase the column/oven temperature. Do not exceed the recommended maximum temperature for the stationary phase.
	Column contaminated at inlet.	Trim first 10-20cm from column and re-install in injector.
	Glass wool or inlet liner causing activity.	Replace with fresh silanized wool and a clean inlet liner.
	Inlet temperature too low.	Increase the inlet temperature.
	Poor or obstructed column connections.	Remake the column inlet connection.
	Wrong stationary phase.	Replace the column according to the column manufacturer's literature.
Solvent Peak Tailing	Incorrect column position in inlet.	Reinstall the column.
	Initial oven temperature too high (On Column).	Reduce the initial oven temperature.
	Septum purge flow too low and/or split/splitless vent flow too low.	Check and adjust the septum purge and vent flows.
	Too large injection size.	Reduce the injection size.

Symptom	Cause	Recommended Solutions
Unresolved Peaks	Carrier gas flow rate too high.	Reduce the carrier gas flow rate.
	Column deteriorated.	Replace the column.
	Column temperature too high.	Lower the column oven temperature.
	Column too short.	Use a longer column.
	Incorrect column choice.	Install a suitable column.
	Injection technique is not adequate.	Choose a correct injection technique.
Discrete High-intensity Contaminant Peaks	Bleed from the GC column.	Condition or change the column.
	Bleed from the septum.	Replace the septum.
	Sample vial septa are contaminating the sample.	Discard sample. Store samples upright, in a refrigerator. Use Teflon™ faced septa, with the Teflon facing downwards (i.e. towards the sample).
<b>Results-Related Problems</b>		
Low Reproducibility of Peak Area	Concentration not compatible with the dynamic range of the detection system.	Ensure that the sample concentration is suitable for the detection system.
	Inappropriate injection technique.	Try a different injection technique.
	Injection parameters inappropriate.	Check the injection temperature. Check the flow rates.
	Non reproducible sample injection technique.	Evaluate the sample preparation sequences. Compare the results with a series of standard injections.
	Leaking syringe or septum.	Check and replace the syringe at regular intervals. Check and replace septum at regular intervals.
	Leaks at the injection.	Check the column connections. Run a leak check.
	Poor injection technique.	Carefully meter the injected amount. Use a clean, good-quality syringe.
Poor split flow or ratio control.	Monitor the flow. Replace the in-line filter.	
Poor Sensitivity Increased Retention Time	Carrier gas flow rate too low.	Increase the carrier gas flow rate. Locate and remove possible with obstructions in the carrier gas line. Check the injector/column ferrules.
Poor Sensitivity with Normal Retention Time	Oven or injector parameters are not optimized.	Adjust the oven parameters. Adjust the injector parameters.
	Leaks in the GC carrier gas line.	Run a leak test and correct leaks.
	Syringe leaks during injection.	Replace syringe or piston seals, if applicable.
	Split injection temperature too low.	Increase the temperature of the injector.
Retention Times Decreasing	Column is in poor condition, or wrong column type used.	Condition the columns. Change the column.
	Stationary phase deteriorated by oxygen and/or water.	Use a carrier gas free of oxygen and water. Replace or install appropriate gas filters (see page 3-080 to 3-082).
Retention Times Increasing	Stationary phase loss due to column bleeding.	Reduce the column temperature.
	Increasing carrier leakage.	Check the septum and column connections.
Low Reproducibility of Retention Times	Carrier gas supply running out.	Replace the bottle.
	Drifting or unstable pneumatic controller.	Monitor the column pressure or flow. Check and replace the controller if necessary.
	Poor injection technique.	Start the run at consistent time after injection.
	Sample size is too large.	Reduce the injected amount and/or volume.
Retention Times are Inconsistent	Unstable column temperature.	Check the main oven door and cooling flap. Monitor the column temperature.
	GC column is in poor condition.	Condition the column. Change the column.
	Insufficient equilibration time set on GC.	Increase equilibration time.
	Poor injection.	Repeat with better injection technique.
	Oven temperature programmed to rise too quickly.	Reduce oven temperature ramp rate.
	Air is leaking into the system at the injector seal or the carrier gas manifold.	Trace and repair the leak.

*If you need more assistance or information on specific detection systems, please contact us and request our **Troubleshooting Guide**.*



## GC Equations

### Adjusted Retention Time ( $t_R'$ )

An analyte's retention time ( $t_R$ ) minus the elution time of an unretained peak ( $t_m$ ).

$$t_R' = t_R - t_m$$

Adjusted retention time is also equivalent to the time the analyte spends in the stationary phase.

### 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  $t_m$  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).

$$k = \frac{t_R - t_m}{t_m}$$

Thus, the higher the capacity factor, the longer the retention time.

### Effective Theoretical Plates ( $N_{eff}$ )

A measure of a column performance that accounts for the effects of unretained elution time, where  $t_R'$  is the adjusted retention time and  $\sigma$  is the standard deviation of the peak.

$$N_{eff} = \left( \frac{t_R'}{\sigma} \right)^2$$

This value also remains constant as retention gaps and guards are used. Depending on the method of peak width calculation, different efficiencies can be reported. This leads to two popular measures:

$$N_{eff} = 16 \left( \frac{t_R'}{W} \right)^2$$

Where  $W$  is the tangential peak width (13.4% peak height).

$$N_{eff} = 5.54 \left( \frac{t_R'}{W} \right)^2$$

Where  $W$  is the width measured at half height (50% peak height).

### HEEP ( $H_{eff}$ )

Height Equivalent to an Effective Plate.

$$H_{eff} = L/N_{eff}$$

Where  $L$  is the column length. The smaller the  $N_{eff}$ , the more efficient the column's performance.

### HETP ( $H$ )

Height Equivalent to a Theoretical Plate is a measure of column efficiency where  $L$  is the column length and  $N$  is the number of theoretical plates.

$$H = L/N$$

HETP is based on actual ( $t_R$ ) rather than adjusted retention times ( $t_R'$ ).

### Linear Velocity ( $u$ )

Mobile phase flow rate expressed in cm/s and is expressed as:

$$u = L/t_m$$

Where  $L$  is the column length and  $t_m$  is the breakthrough time of an unretained peak.

### Phase Ratio ( $\beta$ )

The ratio of the volume of mobile phase to the stationary phase. An important value when changing the column dimensions in a method.

$$\beta = \frac{\text{column ID } (\mu\text{m})}{4 \times \text{film thickness } (\mu\text{m})}$$

### Resolution

A measure of the separation of two peaks taking into account both the difference in elution time and the peak widths.

$$R_s = \frac{(t_2 - t_1)}{0.5(W_1 + W_2)}$$

Where  $t_2$  and  $t_1$  are the two retention times, and  $W_1$  and  $W_2$  are baseline peak widths.

### Selectivity ( $\alpha$ )

The relative retention of two adjacent peaks. Selectivity can be calculated using capacity factor.

$$\alpha = \frac{k_2}{k_1}$$

### Trennzahl Number

A value to describe a separation. The Trennzahl number is calculated from the resolution between two consecutive homologous hydrocarbons. The Trennzahl number represents the number of peaks that can be included between the two hydrocarbon peaks.

$$T_z = \left( \frac{t_{R2} - t_{R1}}{(W_h)_1 + (W_h)_2} \right) - 1$$

Where  $t_R$  equals analyte retention time and  $W_h$  equals peak width at half height.

### van Deemter Equation

This is a relationship that considers the effect of linear velocity on the HETP or  $H$ , where  $A$  accounts for eddy diffusion,  $B$  describes the molecular diffusion of the vapor in the direction of the column axis,  $C$  refers to the resistance to transfer from the stationary to mobile phase and  $u$  is the linear velocity of the mobile phase.

$$H = A + \frac{B}{u} + C u$$

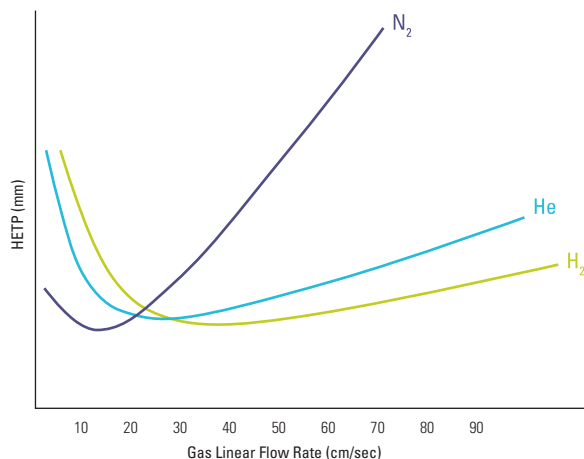
## Carrier Gas Choice

The choice of carrier gas is a compromise between a number of considerations, among them, efficiency and speed as well as availability, safety and cost. The three most common carrier gases used are nitrogen, helium and hydrogen.

Nitrogen shows the lowest HETP, making it the most efficient of the gases. High quality nitrogen is readily available and inexpensive compared to other options. However, the optimum flow rate to achieve nitrogen's very low HETP leads to long analysis times (see figure).

Helium has a slightly lower efficiency than nitrogen, but the optimum flow rate is higher. Also small changes in flow rate of helium around the optimum will not affect efficiency as greatly as with nitrogen.

For many, hydrogen is the carrier gas of choice. It shows higher efficiency than helium and at a higher flow rate. The variation in HETP with changes in flow rate is also far lower, making it more forgiving and reproducible. There is, however, a slight risk of an explosive atmospheric build-up in the oven.



A van Deemter plot of efficiency against linear flow rate for three carrier gases.

### Recommended Flow Rates and Velocities for Capillary Columns

Carrier Gas	0.25mm ID		0.32mm ID		0.53mm ID	
	mL/min	cm/min	mL/min	cm/min	mL/min	cm/min
He	1	35	1.7	35	6	35
H <sub>2</sub>	1.6	50	2.6	50	7.5	50
N <sub>2</sub>	0.4	14	0.5	11	0.9	7

### Recommended Detector Gas Flow Rates

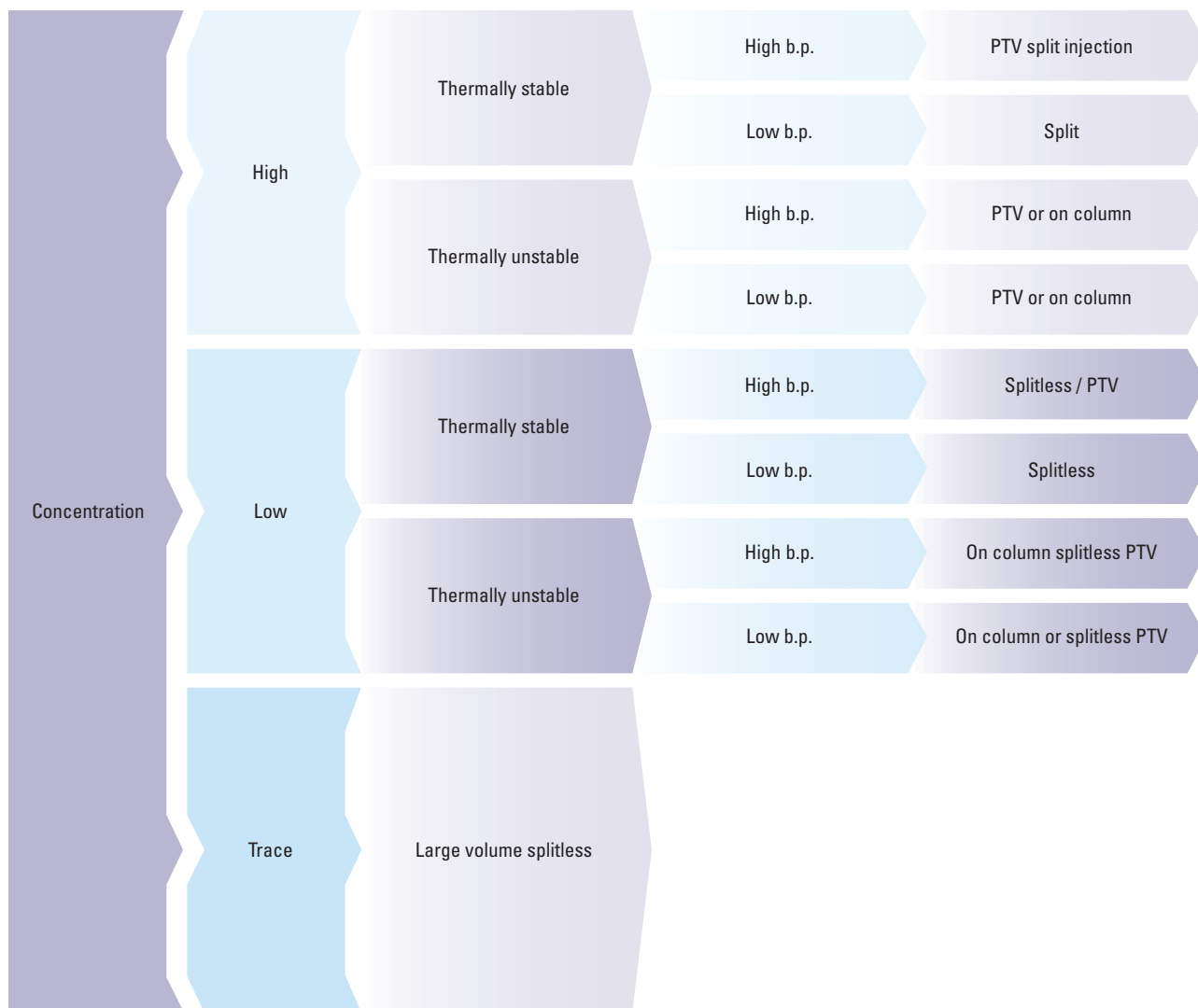
Detector	Air (mL/min)	H <sub>2</sub> (mL/min)	Make Up (mL/min)
ECD	–	–	35-40
FID	350	35	30
NPD	60	2.5	15
FPD	100	75	30

### Unretained Compounds

Detector	Analyte
FID	Methane
ECD	Methylene Chloride
NPD	Acetonitrile
TCD, MS	Methane, Butane
PID, ELCD	Vinyl Chloride

## Selection of Injection Method

The identification of the most appropriate injection method relies on the sample type and the boiling point to be used in the separation. The diagram below summarizes this selection process:



## Column Conditioning (All Columns Except TRACE TR-1MS and TR-WaxMS)

It is recommended that before the column is subjected to any thermal gradients, all oxygen has been removed because the presence of oxygen in the system can shorten the column lifetime. Removal of oxygen can be achieved by purging the columns with oxygen-free carrier gas for a minimum of 20 minutes at 40°C using an approximate head pressure of 100kPa.

Although all Thermo Scientific columns have been pre-conditioned, we recommend that they are conditioned after installation by following these steps:

1. Heat the column from 50°C to the maximum operating temperature at 5°C/min. and hold for one hour. The maximum operating temperatures for all TRACE GC columns are provided below. It is important to stay within the maximum temperature range for the column.
2. Monitor the detector signal during conditioning until a stable baseline is reached. Due to the factory pre-conditioning of the column, this should be achieved in approximately one hour. This duration may be longer in the case of thick films and polar phases.

### Maximum Operating Temperatures for TraceGOLD and TRACE GC Columns

Column	Maximum Operating Temperature
TG-1MS	330°C / 350°C
TG-XLBMS	360°C
TG-5MS	330°C / 350°C
TG-SQC	330°C / 350°C
TG-5MS AMINE	300°C / 315°C
TG-5SILMS	330°C / 350°C
TG-5HT	380°C / 400°C
TG-35MS	300°C / 320°C
TG-35MS AMINE	220°C
TG-17MS	300°C / 320°C
TG-1301MS	260°C / 280°C
TG-624	240°C
TG-VRX	260°C
TG-VMS	260°C
TG-1701MS	260°C / 280°C
TG-225MS	240°C
TG-200MS	320°C / 340°C
TG-POLAR	275°C
TG-WaxMS	260°C
TG-WaxMS A	250°C
TG-WaxMS B	220°C
TG-OCP I / TG-OCP II	340°C
TG-OPP I / TG-OPP II	330°C
TG-ALC I / TG-ALC II	260°C
TG-1MT	430°C
TG-5MT	430°C
TG-WaxMT	260°C

Column	Maximum Operating Temperature
TR-1MS	370°C / 380°C
TR-5	340°C / 350°C for films ≤ 1.5µm 280°C / 300°C for films > 1.5µm
TR-5MS	360°C / 370°C for films ≤ 1.5µm 350°C / 360°C for films > 1.5µm
TR-5HT	380°C / 400°C
TR-35MS	360°C / 370°C
TR-1701	280°C / 300°C
TR-50MS	360°C / 370°C
TR-225	230°C / 250°C
TR-Wax	260°C / 280°C for films ≤ 1.0µm 240°C / 260°C for films > 1.0µm
TR-WaxMS	280°C / 300°C
TR-FFAP	240°C / 250°C
TR-SimDist	400°C for films ≤ 1.0µm 370°C for 2.65µm films
TR-V1	280°C / 300°C
TR-FAME	250°C / 260°C
TR-524	240°C / 260°C
TR-525	340°C / 360°C
TR-527	330°C / 350°C
TR-8095	360°C / 370°C
TR-8270	330°C / 350°C
TR-PCB 8MS	330°C / 350°C
TR-Dioxin 5MS	330°C / 350°C
TR-Biodiesel (M)	300°C / 320°C
TR-Biodiesel (F)	280°C / 300°C
TR-Biodiesel (G)	380°C / 400°C
TR-DoA5	330°C / 350°C
TR-DoA35	330°C / 350°C
TR-Pesticide	330°C / 350°C
TR-Pesticide II	330°C / 350°C
TR-Pesticide III	300°C / 320°C
TR-Pesticide IV	300°C / 320°C

## Column Conditioning for the TRACE TR-WaxMS and TR-1MS Columns

This procedure will ensure an ultra low bleed for the column's entire lifetime and is only required once. Once performed, future installation of the column need only be followed by a 30-minute hold at the maximum temperature limit.

After installing the column according to the instrument manufacturer's instructions, follow the procedure below.

Steps	TR-WaxMS	TR-1MS
1	Equilibrate the column at 40°C with carrier gas flow for 20 minutes, purging air content.	Equilibrate the column at 40°C with carrier gas flow for 20 minutes, purging air content.
2	Raise the temperature to 100°C at 5°C/min.	Raise the temperature to 100°C at 5°C/min.
3	Hold for 30 minutes.	Hold for 30 minutes.
4	Raise to 150°C at 5°C/min.	Raise to 150°C at 5°C/min.
5	Hold for 30 minutes.	Hold for 30 minutes.
6	Raise to 200°C at 5°C.	Raise to 250°C at 5°C.
7	Hold for 40 minutes.	Hold for 40 minutes.
8	Raise to 250°C at 5°C/min.	Raise to 300°C at 5°C/min.
9	Hold for 40 minutes.	Hold for 40 minutes.
10	Raise to 280°C at 5°C/min.	Raise to 360°C at 5°C/min.
11	Hold for 30 minutes.	Hold for 30 minutes.

Although quite a long procedure, it will result in longer lifetimes and lower bleed for your column.

## Performance Recovery

The performance of the column may exhibit signs of deterioration over time as a result of many different causes. Some of these, such as contamination by high boiling or strongly retained compounds, can be cleared by repeating the column-conditioning until a stable baseline is achieved.

Other contamination such as non-volatile compounds, pieces of septa or ferrule metal can result in poor peak shape due to band broadening at the injection step. This can be cured by the removal of a section from the front end of the column. The amount removed is dependent on the degree of contamination, the size of injection and the ID of the column, but generally 50cm should be sufficient. As the efficiency of the column is proportional to the square root of its length, the removal of the front

end will not lower the separation effectiveness by the same ratio as 50cm/column length. A last resort in column regeneration is column washing. Column washing uses a pressurized vessel to force solvent through the column in a reverse direction. The selection of the solvent is dependent on the nature of the samples that have been analyzed and therefore the contamination. It is also dependent on the stationary phase. Generally, 2mL of pentane is suitable for non-polar contamination with methanol used for more polar samples.





# predictability



## LC Columns and Accessories

As a leader in LC column technology including silica 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.

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## Featured Products

### Accucore Columns

The ultimate core performance to maximize your investment

➤ **PAGE 4-032**



### Synchronis Columns

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

➤ **PAGE 4-040, 4-086**



### Hypersil GOLD Columns

Unleash the productivity of your HPLC

➤ **PAGE 4-022, 4-054**



### ProPac Columns

Unrivalled resolution and efficiency in the analysis of protein variants

➤ **PAGE 4-121**



### Acclaim PepMap Columns

The standard for peptide separations in proteomics

➤ **PAGE 4-142**



### Viper Connectors

Simple, dead volume free plumbing of HPLC and UHPLC systems

➤ **PAGE 4-154**



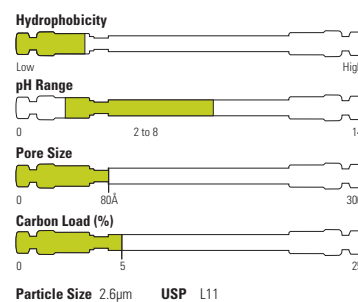
# LC Column Selection

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 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 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> )C <sub>6</sub> H <sub>5</sub>		•			Aromatic compounds and moderately polar compounds.
Pentafluorophenyl	PPF	-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 Polyetheleneimine (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 carbon 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.

Analyte solubility	Analyte chemical properties		Mode of analysis	Recommended phase	
Polar Solvents	Acidic	$pK_a < 2$	Anion exchange	Hypersil GOLD AX	4-067
				Hypersil GOLD SAX	4-068
		Polar retention effect on graphite		Hypercarb	4-094
			Anion Exchange / Reversed-phase mixed mode	Acclaim™ Mixed-Mode WAX-1	4-082
	Neutral	$pK_a > 2$	Reversed phase	Acclaim Trinity™ P1	4-083
				Accucore C18	4-034
				Accucore RP-MS	4-033
				Accucore Phenyl-Hexyl	4-036
				Acclaim 120 C18	4-073
				Acclaim 120 C8	4-074
				Acclaim C30	4-076
				Acclaim Phenyl-1	4-075
		Moderately polar	Reversed phase	Hypersil GOLD	4-056
				Hypersil GOLD C8	4-058
				Hypersil GOLD C4	4-059
				Synchronis C18	4-087
				Synchronis C8	4-088
				Accucore aQ	4-035
				Accucore PFP	4-037
				Acclaim PolarAdvantage	4-077
Highly polar	HILIC	Acclaim PolarAdvantage II	4-078		
		Hypersil GOLD aQ	4-060		
		Hypersil GOLD PFP	4-062		
		Hypersil GOLD Phenyl	4-064		
		Synchronis aQ	4-089		
		Synchronis Phenyl	4-090		
		Hypercarb	4-094		
		Accucore HILIC	4-038		
		Acclaim Mixed-Mode HILIC-1	4-080		
		Acclaim HILIC-10	4-079		
		Acclaim Trinity P1	4-083		
		Acclaim Mixed-Mode WAX-1	4-081		
Acclaim Mixed-Mode WCX-1	4-082				
Hypersil GOLD Amino	4-066				
Hypersil GOLD HILIC	4-070				
Synchronis Amino	4-091				
Synchronis HILIC	4-093				
Basic	$pK_a > 10$	Cation exchange	Acclaim Mixed-Mode WCX-1	4-082	
		Polar retention effect on graphite	Acclaim Trinity P1	4-083	
	$pK_a < 10$	Reversed phase	Hypercarb	4-094	
			Accucore C18	4-034	
			Accucore RP-MS	4-033	
			Accucore Phenyl-Hexyl	4-036	
			Acclaim 120 C18	4-073	
			Acclaim 120 C8	4-074	
			Acclaim C30	4-076	
			Acclaim Phenyl-1	4-075	
Non-polar solvents	Normal phase	Hypersil GOLD	4-056		
		Hypersil GOLD C8	4-058		
		Hypersil GOLD C4	4-059		
		Synchronis C18	4-087		
	Normal phase	Synchronis C8	4-088		
		Hypersil GOLD Amino	4-066		
		Hypersil GOLD CN	4-065		
	Normal phase	Hypersil GOLD Silica	4-069		
		Synchronis Amino	4-091		
	Normal phase	Synchronis Silica	4-092		

## Column 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 diagram 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	DASH™ HTS columns	Short, fast columns 20mm x 2.1mm Labelled and serialized, Economical multi-packs
	Javelin™ HTS columns	Direct-connection columns Slim design, 20mm length, 1mm to 4.6mm ID
High sensitivity analysis	KAPPA™ capillary columns	Capillary columns 75µm to 500µm ID, 30mm to 250mm lengths
	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	Acclaim PepMap 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
	PicoFrit™ and IntegraFrit™ columns	Flexible silica columns 75µm to 150µm ID PicoFrit columns spray direct from tip
	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, in 2.1mm column dimensions can also be used for LC/MS application.





### 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	DASH HTS, Analytical, Javelin HTS	
	Medium	APCI	Low	4.6, 4.0, 3.0	2000 – 200	Javelin HTS, Analytical	
			High	2.1, 1.0	200 – 50	DASH HTS, Analytical, Javelin HTS	
		ESI	Low	2.1, 1.0	200 – 50	DASH HTS, Analytical, Javelin HTS	
			High	1.0 – 0.3 0.2 – 0.05	50 – 5 2 – 0.2	KAPPA, Acclaim PepMap (RSLC) capillary and micro KAPPA, PicoFrit, IntegraFrit, EASY-Column, Acclaim PepMap (RSLC) nano	
	High (or ionizable)	ESI	Low	2.1, 1.0	200 – 50	DASH HTS, Analytical, Javelin HTS	
			High	1.0 – 0.3 0.2 – 0.05	50 – 5 2 – 0.2	KAPPA, Acclaim PepMap (RSLC) capillary and micro KAPPA, PicoFrit, IntegraFrit, EASY-Column, Acclaim PepMap (RSLC) nano	
			Low	2.1, 1.0	200 – 50	DASH HTS, Analytical, Javelin HTS	
			High	1.0 – 0.3 0.2 – 0.05	50 – 5 2 – 0.2	KAPPA, Acclaim PepMap (RSLC) capillary and micro KAPPA, PicoFrit, IntegraFrit, EASY-Column, Acclaim PepMap (RSLC) nano	
	> 1000 Da		ESI	Low	2.1, 1.0	200 – 50	DASH HTS, Analytical, Javelin HTS
				High	1.0 – 0.3 0.2 – 0.05	50 – 5 2 – 0.2	KAPPA, Acclaim PepMap (RSLC) capillary and micro KAPPA, PicoFrit, IntegraFrit, EASY-Column, Acclaim PepMap (RSLC) 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 – 60	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, 1.5-10µm in diameter, or a monolithic rod	Acclaim 120 C18	<b>4-073</b>
		Acclaim 300 C18	<b>4-141</b>
		Accucore C18	<b>4-034</b>
		Accucore aQ	<b>4-035</b>
		BioBasic 18	<b>4-138</b>
		Hypersil GOLD	<b>4-056</b>
		Hypersil GOLD aQ	<b>4-060</b>
		Acclaim PepMap 100 C18	<b>4-142</b>
		Synchronis C18	<b>4-087</b>
Synchronis aQ	<b>4-089</b>		
<b>L3</b>	Porous silica microparticles, 5-10µm in diameter	Accucore HILIC	<b>4-038</b>
		Hypersil GOLD Silica	<b>4-069</b>
		Synchronis Silica	<b>4-092</b>
<b>L7</b>	Octyl silane (C8) chemically bonded to totally porous silica particles, 1.5-10µm in diameter	Acclaim 120 C8	<b>4-074</b>
		BioBasic 8	<b>4-139</b>
		Hypersil GOLD C8	<b>4-058</b>
		Acclaim PepMap 100 C8	<b>4-144</b>
		Synchronis C8	<b>4-088</b>
<b>L8</b>	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 3-10µm in diameter	Hypersil GOLD Amino	<b>4-066</b>
		Synchronis Amino	<b>4-091</b>
<b>L10</b>	Nitrile groups (CN) chemically bonded to porous silica particles, 3-10µm in diameter	Hypersil GOLD CN	<b>4-065</b>
<b>L11</b>	Phenyl groups chemically bonded to porous silica particles, 1.5-10µm in diameter	Accucore Phenyl-Hexyl	<b>4-036</b>
		Hypersil GOLD Phenyl	<b>4-064</b>
		Synchronis Phenyl	<b>4-090</b>
<b>L13</b>	Trimethylsilane chemically bonded to porous silica particles, 3-10µm in diameter	BETASIL C1	<b>4-113</b>
		Hypersil SAS	<b>4-109</b>
<b>L14</b>	Silica gel having a chemically bonded, strongly basic quaternary ammonium anion exchange (SAX) coating, 5-10µm in diameter	Hypersil GOLD SAX	<b>4-068</b>
		Hypersil SAX	<b>4-111</b>
<b>L15</b>	Hexylsilane (C6) chemically bonded to totally porous silica particles, 3-10µm in diameter	BETASIL C6	<b>4-113</b>

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, 7-11µm in diameter	HyperREZ XP Carbohydrate H <sup>+</sup>	<b>4-152</b>
		HyperREZ XP Organic Acids	<b>4-152</b>
<b>L19</b>	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the calcium form, about 9µm diameter	HyperREZ XP Carbohydrate Ca <sup>2+</sup>	<b>4-152</b>
		HyperREZ XP Sugar Alcohols	<b>4-152</b>
<b>L20</b>	Dihydroxypropane groups chemically bonded to porous silica particles, 5-10µm in diameter	BETASIL Diol	<b>4-114</b>
<b>L26</b>	Butyl silane (C4) chemically bonded to totally porous silica particles, 3-10µm in diameter	BioBasic 4	<b>4-140</b>
		Hypersil GOLD C4	<b>4-059</b>
		Acclaim PepMap 300 C4	<b>4-144</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>4-135</b>
		BioBasic SEC 300	<b>4-135</b>
		BioBasic SEC 1000	<b>4-135</b>
<b>L34</b>	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the lead form, about 9µm in diameter	HyperREZ XP Carbohydrate Pb <sup>2+</sup>	<b>4-152</b>
<b>L43</b>	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 5-10µm in diameter	Accucore PFP	<b>4-037</b>
		Hypersil GOLD PFP	<b>4-062</b>
<b>L52</b>	A strong cation exchange resin made of porous silica with sulfopropyl groups by a propyl spacer, 5-10µm in diameter	BioBasic SCX	<b>4-137</b>
<b>L58</b>	Strong cation exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the sodium form, about 7-11µm in diameter	HyperREZ XP Carbohydrate Na <sup>+</sup>	<b>4-152</b>
<b>L59</b>	Packing having the capacity to separate proteins by molecular weight over the range of 10 to 500 kDa. It is spherical (10µm), silica-based, and processed to provide hydrophilic characteristics and pH stability	BioBasic SEC 300 (5µm)	<b>4-135</b>
		MABPac™ SEC-1	<b>4-131</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	HyPURITY ADVANCE	<b>Inquire</b>
		Acclaim PolarAdvantage II	<b>4-078</b>
<b>L62</b>	C30 silane bonded phase on a fully porous spherical silica, 3 to 15µm in diameter	Acclaim C30	<b>4-076</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.

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>AQUASIL</b>									
C18	spherical, fully porous silica	3, 5	100	310	12	polar	L1	775	<b>4-111</b>
<b>Acclaim</b>									
120 C18	spherical, fully porous silica	2.2, 3, 5	120	300	18	Yes	L1	–	<b>4-073</b>
300 C18	spherical, fully porous silica	2.2, 3, 5	300	100	8	Yes	L1	–	<b>4-141</b>
120 C8	spherical, fully porous silica	2.2, 3, 5	120	300	11	Yes	L7	–	<b>4-074</b>
Phenyl-1	spherical, fully porous silica	3	120	300	13	Yes	L11	–	<b>4-075</b>
C30	spherical, fully porous silica	3, 5	200	200	13	Proprietary	L62	–	<b>4-076</b>
PA	spherical, fully porous silica	2.2, 3, 5	120	300	16	Yes	L1	–	<b>4-077</b>
PA II	spherical, fully porous silica	2.2, 3, 5	120	300	16	Yes	L60	–	<b>4-078</b>
HILIC-10	spherical, fully porous silica	3	120	300	8	Yes	–	–	<b>4-079</b>
Trinity P1	nano polymer silica hybrid	3	300	100	–	Proprietary	–	–	<b>4-083</b>
Mixed Mode HILIC-1	spherical, fully porous silica	3	120	300	–	Proprietary	–	–	<b>4-080</b>
Mixed Mode WAX-1	spherical, fully porous silica	3, 5	120	300	–	Proprietary	–	–	<b>4-081</b>
Mixed Mode WCX-1	spherical, fully porous silica	3, 5	120	300	–	Proprietary	–	–	<b>4-082</b>
Organic Acid	spherical, fully porous silica	3, 5	120	300	–	Yes	–	–	<b>4-099</b>
Surfactant	spherical, fully porous silica	3, 5	120	300	–	Yes	–	–	<b>4-100</b>
Explosives	spherical, fully porous silica	3, 5	120	300	–	Yes	–	–	<b>4-101</b>
Carbamate	spherical, fully porous silica	3, 5	120	300	–	Yes	–	–	<b>4-103</b>
Carbonyl	spherical, fully porous silica	2.2	120	300	–	Yes	–	–	<b>4-104</b>
<b>Accucore</b>									
RP-MS	spherical, solid core silica	2.6	80	130	7	Yes	–	176	<b>4-033</b>
C18	spherical, solid core silica	2.6	80	130	9	Yes	L1	171	<b>4-034</b>
aQ	spherical, solid core silica	2.6	80	130	9	Polar	L1	173	<b>4-035</b>
PFP	spherical, solid core silica	2.6	80	130	5	Yes	L43	174	<b>4-037</b>
Phenyl-Hexyl	spherical, solid core silica	2.6	80	130	5	Yes	–	179	<b>4-036</b>
HILIC	spherical, solid core silica	2.6	80	130	–	–	L3	175	<b>4-038</b>
<b>BetaBasic</b>									
18	spherical, fully porous silica	3, 5	150	200	13	Yes	L1	715	<b>4-112</b>
8	spherical, fully porous silica	3, 5	150	200	7	Yes	L7	714	<b>4-112</b>
4	spherical, fully porous silica	3, 5	150	200	6	Yes	L26	716	Inquire
Phenyl	spherical, fully porous silica	5	150	200	7	Yes	L11	718	<b>4-112</b>
CN	spherical, fully porous silica	5	150	200	5	Yes	L10	717	<b>4-112</b>
<b>BETASIL</b>									
C18	spherical, fully porous silica	3, 5	100	310	20	Yes	L1	701	<b>4-113</b>
C8	spherical, fully porous silica	3, 5	100	310	12	Yes	L7	702	<b>4-113</b>
C6	spherical, fully porous silica	3, 5	100	310	11	Yes	L15	703	Inquire
Phenyl	spherical, fully porous silica	3, 5	100	310	11	Yes	L11	706	<b>4-113</b>
Phenyl-Hexyl	spherical, fully porous silica	3, 5	100	310	11	Yes	L11	730	<b>4-113</b>
CN	spherical, fully porous silica	5	100	310	6	Yes	L10	708	<b>4-114</b>
Silica 100	spherical, fully porous silica	5	100	310	–	–	L3	700	<b>4-114</b>
Diol 100	spherical, fully porous silica	5	100	310	6	–	L20	726	<b>4-114</b>

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</b>									
Hypercarb	spherical, porous graphitic carbon	3, 5, 7	250	120	100	–	–	350	<b>4-094</b>
<b>Hypersil</b>									
ODS (C18)	spherical, fully porous silica	3, 5	120	170	10	Yes	L1	301	<b>4-108</b>
ODS-2 (C18)	spherical, fully porous silica	3, 5	80	220	11	Yes	L1	316	<b>4-109</b>
MOS (C8)	spherical, fully porous silica	3, 5	120	170	6.5	No	L7	302	<b>4-109</b>
MOS-2 (C8)	spherical, fully porous silica	5	120	170	6.5	Yes	L7	303	<b>4-109</b>
SAS (C1)	spherical, fully porous silica	5	120	170	2.5	Yes	L13	305	<b>4-109</b>
Phenyl	spherical, fully porous silica	5	120	170	5	No	L11	309	<b>4-110</b>
Phenyl-2	spherical, fully porous silica	5	120	170	5	Yes	L11	319	<b>4-110</b>
CPS	spherical, fully porous silica	3, 5	120	170	4	No	L10	308	<b>4-110</b>
CPS-2	spherical, fully porous silica	5	120	170	4	Yes	L10	318	<b>4-110</b>
APS-2	spherical, fully porous silica	3, 5	120	170	1.9	No	L8	307	<b>4-110</b>
Silica	spherical, fully porous silica	3, 5	120	170	–	–	L3	300	<b>4-111</b>
SAX	spherical, fully porous silica	5	120	170	2.5	Yes	L14	341	<b>4-111</b>
<b>Hypersil BDS</b>									
C18	spherical, fully porous silica	2.4, 3, 5	130	170	11	Yes	L1	281	<b>4-106</b>
C8	spherical, fully porous silica	2.4, 3, 5	130	170	7	Yes	L7	282	<b>4-107</b>
Phenyl	spherical, fully porous silica	3, 5	130	170	5	Yes	L11	289	<b>4-107</b>
Cyano	spherical, fully porous silica	3, 5	130	170	4	Yes	L10	288	<b>4-107</b>
<b>Hypersil GOLD</b>									
C18 selectivity	spherical, fully porous silica	1.9, 3, 5, 12	175	220	10	Yes	L1	250	<b>4-056</b>
C8	spherical, fully porous silica	1.9, 3, 5	175	220	8	Yes	L7	252	<b>4-058</b>
C4	spherical, fully porous silica	1.9, 3, 5	175	220	5	Yes	L26	255	<b>4-059</b>
aQ	spherical, fully porous silica	1.9, 3, 5	175	220	12	Polar	L1	253	<b>4-060</b>
PFP	spherical, fully porous silica	1.9, 3, 5	175	220	8	Yes	L43	254	<b>4-062</b>
Phenyl	spherical, fully porous silica	1.9, 3, 5	175	220	8.5	Yes	L11	259	<b>4-064</b>
CN (Cyano)	spherical, fully porous silica	1.9, 3, 5	175	220	4	Yes	L10	258	<b>4-065</b>
Amino	spherical, fully porous silica	1.9, 3, 5	175	220	2	Yes	L8	257	<b>4-066</b>
AX	spherical, fully porous silica	1.9, 3, 5	175	220	6	No	–	261	<b>4-067</b>
SAX	spherical, fully porous silica	1.9, 3, 5	175	220	2.5	Yes	L14	263	<b>4-068</b>
Silica	spherical, fully porous silica	1.9, 3, 5	175	220	–	–	L3	251	<b>4-069</b>
HILIC	spherical, fully porous silica	1.9, 3, 5	175	220	6	No	–	265	<b>4-070</b>
<b>Hypersil Green</b>									
PAH	spherical, fully porous silica	3, 5	120	170	13.5	Yes	–	311	<b>4-105</b>
<b>HyPURITY™</b>									
C18	spherical, fully porous silica	3, 5	190	200	13	Yes	L1	221	<b>4-115</b>
C8	spherical, fully porous silica	5	190	200	8	Yes	L7	222	<b>4-115</b>
AQUASTAR	spherical, fully porous silica	3, 5	190	200	10	Polar	L1	225	<b>4-115</b>
<b>Syncronis</b>									
C18	spherical, fully porous silica	1.7, 5	100	320	16	Yes	L1	971	<b>4-087</b>
C8	spherical, fully porous silica	1.7, 5	100	320	10	Yes	L7	972	<b>4-088</b>
aQ	spherical, fully porous silica	1.7, 5	100	320	19	Polar	L1	973	<b>4-089</b>
Phenyl	spherical, fully porous silica	1.7, 5	100	320	11	Yes	L11	979	<b>4-090</b>
Amino	spherical, fully porous silica	1.7, 5	100	320	4	Yes	L8	977	<b>4-091</b>
Silica	spherical, fully porous silica	1.7, 5	100	320	–	–	L3	970	<b>4-092</b>
HILIC	spherical, fully porous silica	1.7, 5	100	320	5	–	–	975	<b>4-093</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>4-087</b>
ACE C8	ACT	100	300	9	Synchronis C8	<b>4-088</b>
ACE Phenyl	ACT	100	300	9.5	Synchronis Phenyl	<b>4-090</b>
ACE AQ	ACT	100	300	14	Synchronis aQ	<b>4-089</b>
ACE C18-300	ACT	300	100	9	BioBasic 18	<b>4-138</b>
ACE C8-300	ACT	300	100	5	BioBasic 8	<b>4-139</b>
ACE C4-300	ACT	300	100	2.6	BioBasic 4	<b>4-140</b>
AQUITY UPLC™ BEH HILIC	Waters	130	185	–	Hypersil GOLD Silica (1.9µm)	<b>4-031</b>
ACQUITY UPLC HSS C18	Waters	100	230	15	Hypersil GOLD (1.9µm)	<b>4-023</b>
ACQUITY UPLC BEH C18	Waters	130	185	18	Hypersil GOLD (1.9µm)	<b>4-023</b>
ACQUITY UPLC BEH C8	Waters	130	185	13	Hypersil GOLD C8 (1.9µm)	<b>4-024</b>
ACQUITY UPLC BEH Phenyl	Waters	130	185	15	Hypersil GOLD Phenyl (1.9µm)	<b>4-028</b>
ACQUITY UPLC HSS T3	Waters	100	230	11	Hypersil GOLD aQ (1.9µm)	<b>4-026</b>
Alltima™ HP C18	Grace	190	200	12	Hypersil GOLD	<b>4-056</b>
Alltima HP C18 AQ	Grace	100	450	20	Hypersil GOLD aQ	<b>4-060</b>
Alltima HP C18 HiLoad	Grace	100	450	24	Synchronis C18	<b>4-087</b>
Alltima HP C8	Grace	190	200	8	Hypersil GOLD C8	<b>4-058</b>
Alltima HP CN	Grace	190	200	4	Hypersil GOLD CN	<b>4-065</b>
Alltima HP Silica	Grace	190	200	–	Hypersil GOLD Silica	<b>4-069</b>
Aminex™ HPX42C	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate Ca <sup>2+</sup>	<b>4-152</b>
Aminex HPX72S	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate H <sup>+</sup>	<b>4-152</b>
Aminex HPX87C	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate Ca <sup>2+</sup>	<b>4-152</b>
Aminex HPX87H	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate H <sup>+</sup>	<b>4-152</b>
Aminex HPX87N	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate Na <sup>+</sup>	<b>4-152</b>
Aminex HPX87P	Bio-Rad	–	–	–	HyperREZ XP Carbohydrate Pb <sup>2+</sup>	<b>4-152</b>
AQUA™ C18	Phenomenex	125	320	15	Hypersil GOLD aQ	<b>4-060</b>
Ascentis C18	Supelco	100	450	25	Synchronis C18	<b>4-087</b>
Ascentis C8	Supelco	100	450	15	Synchronis C8	<b>4-088</b>
Ascentis Express C18	Supelco	90	150	–	Accucore C18	<b>4-034</b>
Ascentis Express C8	Supelco	90	150	–	Accucore RP-MS	<b>4-033</b>
Ascentis Express F5	Supelco	90	150	–	Accucore PFP	<b>4-037</b>
Ascentis Express HILIC	Supelco	90	150	–	Accucore HILIC	<b>4-038</b>
Ascentis Express Phenyl-Hexyl	Supelco	90	150	–	Accucore Phenyl-Hexyl	<b>4-036</b>
Ascentis Phenyl	Supelco	100	450	19	Synchronis Phenyl	<b>4-090</b>
Atlantis™ dC18	Waters	100	330	12	Acclaim Polar Advantage II	<b>4-078</b>
Atlantis T3	Waters	100	300	14	Hypersil GOLD	<b>4-056</b>
Atlantis HILIC Silica	Waters	100	300	–	Hypersil GOLD Silica	<b>4-069</b>
Atlantis dC18	Waters	100	330	12	Hypersil GOLD aQ	<b>4-060</b>
Capcell C18 AQ	Shiseido	120	300	11	Acclaim Polar Advantage II	<b>4-078</b>
Columbus™ C18	Phenomenex	110	375	19	Synchronis C18	<b>4-087</b>
Columbus C8	Phenomenex	110	375	13	Synchronis C8	<b>4-088</b>



Phase	Manufacturer	Pore Size (Å)	Area (m <sup>2</sup> /g)	% Carbon	Recommended Thermo Scientific Alternative	Page
Discovery BIO Wide Pore C18	Supelco	300	–	–	BioBasic 18	<b>4-138</b>
Discovery BIO Wide Pore C8	Supelco	300	–	–	BioBasic 8	<b>4-139</b>
Discovery C18	Supelco	180	200	14	Hypersil GOLD	<b>4-056</b>
Discovery C8	Supelco	180	200	–	Hypersil GOLD C8	<b>4-058</b>
Discovery Cyano	Supelco	180	200	–	Hypersil GOLD CN	<b>4-065</b>
Gemini™ C18	Phenomenex	110	375	14	Hypersil GOLD	<b>4-056</b>
Genesis™ AQ	Grace	120	300	–	Hypersil GOLD aQ	<b>4-060</b>
Genesis C4	Grace	120	300	–	Hypersil GOLD C4	<b>4-059</b>
Genesis C8	Grace	120	300	–	Hypersil GOLD C8	<b>4-058</b>
Genesis CN	Grace	120	300	7	Hypersil GOLD CN	<b>4-065</b>
Genesis MOS	Grace	120	300	11	Hypersil GOLD C8	<b>4-058</b>
Genesis ODS	Grace	120	300	18	Hypersil GOLD	<b>4-056</b>
Genesis Phenyl	Grace	120	300	–	Hypersil GOLD Phenyl	<b>4-064</b>
Genesis Silica	Grace	120	300	–	Hypersil GOLD Silica	<b>4-069</b>
Halo C18	AMT	90	150	–	Accucore C18	<b>4-034</b>
Halo C8	AMT	90	150	–	Accucore RP-MS	<b>4-033</b>
Halo HILIC	AMT	90	150	–	Accucore HILIC	<b>4-038</b>
Halo PFP	AMT	90	150	–	Accucore PFP	<b>4-037</b>
Halo Phenyl-Hexyl	AMT	90	150	–	Accucore Phenyl-Hexyl	<b>4-036</b>
Inertsil™ C4	GL Sciences	150	320	8	Hypersil GOLD C4	<b>4-059</b>
Inertsil C8	GL Sciences	150	320	11	Hypersil GOLD C8	<b>4-058</b>
Inertsil ODS3V	GL Sciences	100	450	15	Hypersil GOLD	<b>4-056</b>
Inertsil Phenyl	GL Sciences	150	320	10	Hypersil GOLD Phenyl	<b>4-064</b>
Inertsil Silica	GL Sciences	150	320	–	BETASIL Silica	<b>4-114</b>
Jsphere M80	YMC	80	–	14	Acclaim PolarAdvantage II	<b>4-078</b>
Jupiter™ C18	Phenomenex	300	170	13	BioBasic 18	<b>4-138</b>
Jupiter C4	Phenomenex	300	170	5	BioBasic C4	<b>4-140</b>
Kinetex C18	Phenomenex	100	–	12	Accucore C18	<b>4-034</b>
Kinetex C8	Phenomenex	100	–	10	Accucore RP-MS	<b>4-033</b>
Kinetex HILIC	Phenomenex	100	–	–	Accucore HILIC	<b>4-038</b>
Kinetex PFP	Phenomenex	100	–	9	Accucore PFP	<b>4-037</b>
Kinetex XB-C18	Phenomenex	100	–	12	Accucore C18	<b>4-034</b>
Kromasil™ C1	Akzo-Nobel	100	340	5	BETASIL C1	Inquire
Kromasil C18	Akzo-Nobel	100	340	19	Synchronis C18	<b>4-087</b>
					BETASIL C18	<b>4-113</b>
Kromasil C4	Akzo-Nobel	100	340	8	Hypersil GOLD C4	<b>4-059</b>
Kromasil Silica	Akzo-Nobel	100	340	–	Synchronis Silica	<b>4-065</b>
LiChrospher™ CN	Merck	100	350	7	Hypersil GOLD CN	<b>4-065</b>
LiChrospher Diol	Merck	100	350	–	BETASIL Diol	<b>4-114</b>
LiChrospher NH <sub>2</sub>	Merck	100	350	5	Hypersil GOLD Amino	<b>4-066</b>
LiChrospher RP 18	Merck	100	350	21	Hypersil GOLD	<b>4-056</b>
					BETASIL C18	<b>4-113</b>
LiChrospher RP-18e	Merck	100	350	22	Hypersil GOLD	<b>4-056</b>
					BETASIL C18	<b>4-113</b>
LiChrospher RP-8	Merck	100	350	13	Hypersil GOLD C8	<b>4-058</b>
LiChrospher RP-8e	Merck	100	350	13	Hypersil GOLD C8	<b>4-058</b>
Luna™ C18 (2)	Phenomenex	100	400	18	Synchronis C18	<b>4-087</b>
Luna C8 (2)	Phenomenex	100	400	14	Synchronis C8	<b>4-088</b>
Luna CN	Phenomenex	100	400	–	Hypersil GOLD CN	<b>4-065</b>
Luna HILIC	Phenomenex	200	200	5.7	BETASIL Diol	<b>4-114</b>
Luna NH <sub>2</sub>	Phenomenex	100	400	10	Hypersil GOLD Amino	<b>4-066</b>
Luna PFP (2)	Phenomenex	100	400	5.7	Hypersil GOLD PFP	<b>4-062</b>
Luna SCX	Phenomenex	100	400	–	BioBasic SCX	<b>4-137</b>
Luna Silica (2)	Phenomenex	100	400	–	Synchronis Silica	<b>4-092</b>



## HPLC Column Selection by Manufacturer (continued)

Phase	Manufacturer	Pore Size (Å)	Area (m <sup>2</sup> /g)	% Carbon	Recommended Thermo Scientific Alternative	Page
μBondapak™ C18	Waters	125	330	10	Hypersil GOLD	<b>4-056</b>
μBondapak CN	Waters	125	330	–	Hypersil GOLD CN	<b>4-065</b>
μBondapak NH <sub>2</sub>	Waters	125	330	4	Hypersil APS-2	<b>4-110</b>
μBondapak Phenyl	Waters	125	330	–	Hypersil GOLD Phenyl-2	<b>4-110</b>
Nova-Pak™ (HR) C18	Waters	60	120	7	Hypersil GOLD	<b>4-056</b>
Nova-Pak C8	Waters	60	120	–	Hypersil GOLD C8	<b>4-058</b>
Nova-Pak CN	Waters	60	120	–	Hypersil GOLD CN	<b>4-065</b>
Nova-Pak Phenyl	Waters	60	120	5	Hypersil GOLD Phenyl	<b>4-064</b>
Nova-Pak Silica	Waters	60	120	–	Hypersil GOLD Silica	<b>4-069</b>
NUCLEODUR™ C18 EC	Macherey-Nagel	110	340	18	Synchronis C18	<b>4-087</b>
NUCLEODUR C18 Gravity	Macherey-Nagel	110	340	18	Synchronis C18	<b>4-087</b>
NUCLEODUR CN	Macherey-Nagel	110	340	7	Hypersil GOLD CN	<b>4-065</b>
NUCLEODUR Pyramid	Macherey-Nagel	110	340	14	Synchronis aQ	<b>4-089</b>
Nucleosil™ 100 C18	Macherey-Nagel	100	350	17	Synchronis C18	<b>4-087</b>
Nucleosil 100 C18 AB	Macherey-Nagel	100	350	24	Synchronis C18	<b>4-087</b>
Nucleosil 100 C <sub>6</sub> H <sub>5</sub>	Macherey-Nagel	100	350	–	Synchronis Phenyl	<b>4-090</b>
Nucleosil 100 C8	Macherey-Nagel	100	350	9	Synchronis C8	<b>4-088</b>
Nucleosil 100 CN	Macherey-Nagel	100	350	–	Hypersil GOLD CN	<b>4-065</b>
Nucleosil 100 N(CH <sub>3</sub> ) <sub>2</sub>	Macherey-Nagel	100	350	–	Hypersil SAX	<b>4-111</b>
Nucleosil 100 NH <sub>2</sub>	Macherey-Nagel	100	350	4	Synchronis Amino	<b>4-091</b>
Nucleosil 100 OH	Macherey-Nagel	100	350	–	BETASIL Diol	<b>4-114</b>
Nucleosil 100 SA	Macherey-Nagel	100	350	7	BioBasic SCX	<b>4-137</b>
Nucleosil 100 SB	Macherey-Nagel	100	350	10	Hypersil GOLD SAX	<b>4-068</b>
Nucleosil 300 C18	Macherey-Nagel	300	100	7	BioBasic 18	<b>4-138</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>4-139</b>
Nucleosil 300 CN	Macherey-Nagel	300	100	–	BioBasic CN	Inquire
Pinnacle™ C1	Restek	120	170	2	Hypersil SAS	<b>4-109</b>
Pinnacle C18	Restek	120	170	10	Hypersil GOLD	<b>4-056</b>
Pinnacle C4	Restek	120	170	4	Hypersil GOLD C4	<b>4-059</b>
Pinnacle CN	Restek	120	170	5	Hypersil GOLD CN	<b>4-065</b>
Pinnacle DB C18	Restek	140	–	11	Hypersil GOLD	<b>4-056</b>
Pinnacle DB C18 1.9μm	Restek	140	–	11	Hypersil GOLD (1.9μm)	<b>4-023</b>
Pinnacle DB C8	Restek	140	–	6	Hypersil GOLD C8	<b>4-058</b>
Pinnacle DB Cyano	Restek	140	–	4	Hypersil GOLD CN	<b>4-065</b>
Pinnacle DB Phenyl	Restek	140	–	5	Hypersil GOLD Phenyl	<b>4-064</b>
Pinnacle IBD	Restek	120	170	–	Hypersil GOLD	<b>4-056</b>
Pinnacle NH <sub>2</sub>	Restek	120	170	2	Hypersil GOLD Amino	<b>4-066</b>
Pinnacle Phenyl	Restek	120	170	5	Hypersil GOLD Phenyl	<b>4-064</b>
Pinnacle SAX	Restek	120	170	3	Hypersil GOLD SAX	<b>4-068</b>
Pinnacle Silica	Restek	120	170	–	Hypersil GOLD Silica	<b>4-069</b>
Pinnacle Ultra C18	Restek	100	–	20	Synchronis C18	<b>4-087</b>
Pinnacle Wide Pore C4	Restek	300	–	2	BioBasic 4	<b>4-140</b>
Polaris NH <sub>2</sub>	Agilent	–	–	–	Hypersil GOLD Amino	<b>4-066</b>
Poroshell 120 EC-C18	Agilent	120	120	8	Accucore C18	<b>4-034</b>
Poroshell 120 EC-C8	Agilent	120	120	5	Accucore RP-MS	<b>4-033</b>
Poroshell 120 SB-C18	Agilent	120	120	7.5	Accucore C18	<b>4-034</b>
Primesep	SieLC	–	–	–	Acclaim Mixed-Mode Columns	<b>4-080</b>
Prodigy™ C8	Phenomenex	150	310	13	Synchronis C8	<b>4-088</b>
Prodigy ODS2	Phenomenex	150	310	18	Synchronis C18	<b>4-087</b>
Prodigy ODS-3	Phenomenex	100	450	16	Synchronis C18	<b>4-087</b>
Prodigy ODS-3V	Phenomenex	100	450	16	Hypersil GOLD	<b>4-056</b>
Prodigy Phenyl-3	Phenomenex	100	450	10	Synchronis Phenyl	<b>4-090</b>

Phase	Manufacturer	Pore Size (Å)	Area (m <sup>2</sup> /g)	% Carbon	Recommended Thermo Scientific Alternative	Page
Purospher™ RP-18	Merck	60	500	–	Hypersil GOLD	<b>4-056</b>
Purospher STAR-8e	Merck	120	300	–	Hypersil GOLD C8	<b>4-058</b>
Purospher STAR RP-18e	Merck	120	300	–	Hypersil GOLD	<b>4-056</b>
Pursuit™ C18	Agilent	–	–	–	Hypersil GOLD	<b>4-056</b>
Pursuit C8	Agilent	–	–	–	Hypersil GOLD C8	<b>4-058</b>
Pursuit Diphenyl	Agilent	–	–	–	BetaBasic Phenyl	Inquire
Pursuit PFP	Agilent	–	–	–	Hypersil GOLD PFP	<b>4-062</b>
Shodex PH	Showa Denko	100	–	–	Hypersil GOLD Phenyl	<b>4-064</b>
Shodex SIL	Showa Denko	100	–	–	BETASIL Silica	<b>4-114</b>
Shodex TMS	Showa Denko	100	–	–	Hypersil SAS	<b>4-109</b>
Waters™ Spherisorb™ C1	Waters	80	200	2	Hypersil SAS	<b>4-109</b>
Waters Spherisorb C6	Waters	80	200	5	BETASIL C6	<b>4-113</b>
Waters Spherisorb C8	Waters	80	200	6	Hypersil GOLD C8	<b>4-058</b>
Waters Spherisorb CN	Waters	80	200	3	Hypersil GOLD CN	<b>4-065</b>
Waters Spherisorb NH <sub>2</sub>	Waters	80	200	2	Hypersil APS-2	<b>4-110</b>
Waters Spherisorb ODS1	Waters	80	200	6	Hypersil GOLD	<b>4-056</b>
Waters Spherisorb ODS2	Waters	80	200	12	Hypersil GOLD	<b>4-056</b>
Waters Spherisorb ODSB	Waters	80	200	12	Hypersil GOLD	<b>4-056</b>
Waters Spherisorb Phenyl	Waters	80	200	3	Hypersil GOLD Phenyl	<b>4-064</b>
Waters Spherisorb SAX	Waters	80	200	–	Hypersil SAX	<b>4-111</b>
Waters Spherisorb SCX	Waters	80	200	–	BioBasic SCX	<b>4-137</b>
Waters Spherisorb W (silica)	Waters	80	200	–	BETASIL Silica	<b>4-114</b>
SunFire™ C18	Waters	90	340	16	Synchroneis C18	<b>4-087</b>
SunFire C8	Waters	90	340	16	Synchroneis C8	<b>4-088</b>
Supelcosil LC-1	Supelco	120	170	–	Hypersil SAS	<b>4-109</b>
Supelcosil LC-18	Supelco	120	170	11	Hypersil GOLD	<b>4-056</b>
Supelcosil LC-18DB	Supelco	120	170	11	Hypersil GOLD	<b>4-056</b>
Supelcosil LC-8	Supelco	120	170	–	Hypersil GOLD C8	<b>4-058</b>
Supelcosil LC-CN	Supelco	120	170	–	Hypersil GOLD CN	<b>4-065</b>
Supelcosil LC-NH <sub>2</sub>	Supelco	120	170	–	Hypersil GOLD Amino	<b>4-066</b>
Supelcosil LC-Si	Supelco	120	170	–	Hypersil GOLD Silica	<b>4-069</b>
Symmetry C18	Waters	100	335	19	Synchroneis C18	<b>4-087</b>
Symmetry C8	Waters	100	335	12	Synchroneis C8	<b>4-088</b>
Synergi Hydro-RP	Phenomenex	80	475	19	Synchroneis aQ	<b>4-089</b>
TSKgel™ G2000SW (incl XL)	Tosoh	125	–	–	BioBasic SEC 120	<b>4-135</b>
TSKgel Octyl-80TS	Tosoh	80	200	11	Hypersil GOLD C8	<b>4-058</b>
TSKgel ODS-120A	Tosoh	120	200	22	Hypersil GOLD	<b>4-056</b>
TSKgel ODS-120T	Tosoh	120	200	22	Synchroneis C18	<b>4-087</b>
TSKgel ODS-80TM	Tosoh	80	200	15	Hypersil GOLD	<b>4-056</b>
TSKgel Super Octyl	Tosoh	110	–	5	Hypersil GOLD C8	<b>4-058</b>
TSKgel Super ODS	Tosoh	110	–	8	Hypersil GOLD	<b>4-056</b>
TSKgel Super Phenyl	Tosoh	110	–	3	Hypersil GOLD Phenyl	<b>4-064</b>
TSKgel SuperSW3000	Tosoh	250	–	–	BioBasic SEC 300	<b>4-135</b>
Viva™ C18	Restek	300	–	9	BioBasic 18	<b>4-138</b>
Viva C4	Restek	300	–	4	BioBasic 4	<b>4-140</b>
Viva C8	Restek	300	–	5	BioBasic 8	<b>4-139</b>

## HPLC Column Selection by Manufacturer (continued)

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>4-056</b>
Vydac 201SP Selectapore 90M C18	Grace	90	250	–	Hypersil GOLD	<b>4-056</b>
Vydac 201TP C18	Grace	300	–	–	BioBasic 18	<b>4-138</b>
Vydac 202TP C18	Grace	300	–	–	BioBasic 18	<b>4-138</b>
Vydac 208TP C8	Grace	300	–	–	BioBasic 8	<b>4-139</b>
Vydac 214TP	Grace	300	–	–	BioBasic 4	<b>4-140</b>
Vydac 218TP	Grace	300	–	–	BioBasic 18	<b>4-138</b>
Vydac 218WP Selectapore 300M C18	Grace	300	70	–	BioBasic 18	<b>4-138</b>
XBridge™ C18	Waters	–	–	–	Hypersil GOLD	<b>4-056</b>
XBridge C8	Waters	–	–	–	Hypersil GOLD C8	<b>4-058</b>
Xbridge HILIC	Waters	130	185	–	Hypersil GOLD Silica (1.9µm)	<b>4-031</b>
XBridge Phenyl	Waters	–	–	–	Hypersil GOLD Phenyl	<b>4-064</b>
XTerra™ MS C18	Waters	125	180	16	Hypersil GOLD	<b>4-056</b>
XTerra MS C8	Waters	125	180	12	Hypersil GOLD C8	<b>4-058</b>
YMCbasic™	YMC	–	–	–	Hypersil GOLD C8	<b>4-058</b>
YMC-Pack™ C4	YMC	120	300	7	HyPURITY C4	<b>4-115</b>
YMC-Pack C8	YMC	120	300	10	Acclaim C8	<b>4-047</b>
YMC-Pack CN	YMC	120	300	7	Hypersil GOLD CN	<b>4-065</b>
YMC-Pack Diol	YMC	120	300	–	BETASIL Diol	<b>4-114</b>
YMC-Pack NH <sub>2</sub>	YMC	120	–	–	Hypersil GOLD Amino	<b>4-066</b>
YMC-Pack ODS AQ	YMC	120	300	16	Synchronis aQ	<b>4-089</b>
YMC-Pack ODS-A	YMC	120	300	17	Synchronis C18	<b>4-087</b>
YMC-Pack ODS-A	YMC	300	150	6	BioBasic 18	<b>4-138</b>
YMC-Pack Phenyl	YMC	120	300	9	Synchronis Phenyl	<b>4-090</b>
YMC-Pack Pro C18	YMC	120	350	16	Synchronis C18	<b>4-087</b>
YMC-Pack Silica	YMC	120	–	–	Synchronis Silica	<b>4-092</b>
YMC-Pack TMS (C1)	YMC	120	300	4	BETASIL C1	Inquire
Zorbax Eclipse XDB C18	Agilent	80	180	10	Hypersil GOLD	<b>4-056</b>
Zorbax Eclipse XDB C8	Agilent	80	180	8	Hypersil GOLD C8	<b>4-058</b>
Zorbax Eclipse XDB Phenyl	Agilent	80	180	8	Hypersil GOLD Phenyl	<b>4-064</b>
Zorbax Eclipse Plus C18	Agilent	95	160	8	Hypersil GOLD	<b>4-056</b>
Zorbax Eclipse Plus C8	Agilent	95	160	6	Hypersil GOLD C8	<b>4-058</b>
Zorbax RRHT Eclipse Plus C18	Agilent	95	160	8	Hypersil GOLD (1.9µm)	<b>4-023</b>
Zorbax RRHT Eclipse Plus C8	Agilent	95	160	6	Hypersil GOLD C8 (1.9µm)	<b>4-024</b>
Zorbax RRHT Eclipse XDB-C18	Agilent	80	180	10	Hypersil GOLD (1.9µm)	<b>4-023</b>
Zorbax RRHT Eclipse XDB-C8	Agilent	80	180	7.5	Hypersil GOLD C8 (1.9µm)	<b>4-024</b>
Zorbax RRHT SB-CN	Agilent	80	180	4	Hypersil GOLD CN (1.9µm)	<b>4-029</b>
Zorbax SB Aq	Agilent	80	180	–	Hypersil GOLD aQ	<b>4-060</b>
Zorbax SB C18	Agilent	80	180	10	Hypersil GOLD	<b>4-056</b>
Zorbax SB C18	Agilent	300	45	3	BioBasic 18	<b>4-138</b>
Zorbax SB C8	Agilent	80	180	6	Hypersil GOLD C8	<b>4-058</b>
Zorbax SB C8	Agilent	300	45	2	BioBasic 8	<b>4-139</b>
Zorbax SB CN	Agilent	80	180	4	Hypersil GOLD CN	<b>4-065</b>
Zorbax SB Phenyl	Agilent	80	180	6	Hypersil GOLD Phenyl	<b>4-064</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 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

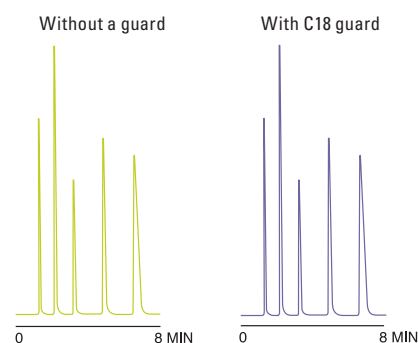
Guard columns are positioned between the injector and the analytical column, removing strongly adsorbed sample components before the sample reaches the analytical column. The simple rule of thumb in guard selection is to choose one that matches your analytical column. The internal diameters should match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

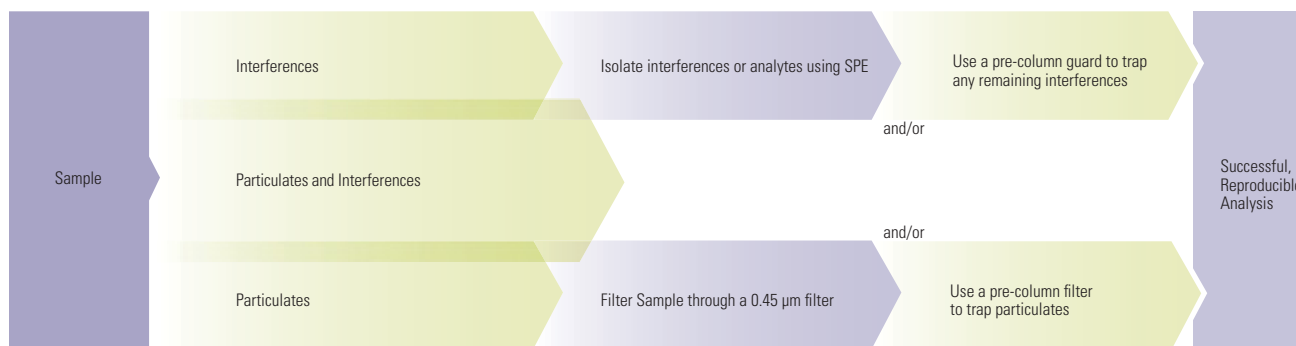
Pre-column filters are positioned between the solvent inlet filter and the column inlet. They are designed to trap particulate matter from the fluid path. They do not remove sample interferences or contaminants that are dissolved in the fluid path. These units are designed to be wholly disposable or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

Replaceable 0.2µm Thermo Scientific UHPLC filter cartridges protect Hypersil GOLD 1.9µm 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 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



### Hypersil GOLD Drop-in Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6/4.0mm ID	Quantity
<b>Hypersil GOLD</b>						
3.0	10	<b>25003-011001</b>	<b>25003-012101</b>	<b>25003-013001</b>	<b>25003-014001</b>	4 Pack
5.0	10	<b>25005-011001</b>	<b>25005-012101</b>	<b>25005-013001</b>	<b>25005-014001</b>	4 Pack
<b>Hypersil GOLD C8</b>						
3.0	10	<b>25203-011001</b>	<b>25203-012101</b>	<b>25203-013001</b>	<b>25203-014001</b>	4 Pack
5.0	10	<b>25205-011001</b>	<b>25205-012101</b>	<b>25205-013001</b>	<b>25205-014001</b>	4 Pack
<b>Hypersil GOLD aQ</b>						
3.0	10	<b>25303-011001</b>	<b>25303-012101</b>	<b>25303-013001</b>	<b>25303-014001</b>	4 Pack
5.0	10	<b>25305-011001</b>	<b>25305-012101</b>	<b>25305-013001</b>	<b>25305-014001</b>	4 Pack
<b>Hypersil GOLD PFP</b>						
3.0	10	<b>25403-011001</b>	<b>25403-012101</b>	<b>25403-013001</b>	<b>25403-014001</b>	4 Pack
5.0	10	<b>25405-011001</b>	<b>25405-012101</b>	<b>25405-013001</b>	<b>25405-014001</b>	4 Pack
<b>Hypersil GOLD CN</b>						
3.0	10	<b>25803-011001</b>	<b>25803-012101</b>	<b>25803-013001</b>	<b>25803-014001</b>	4 Pack
5.0	10	<b>25805-011001</b>	<b>25805-012101</b>	<b>25805-013001</b>	<b>25805-014001</b>	4 Pack
<b>Hypersil GOLD Phenyl</b>						
3.0	10	<b>25903-011001</b>	<b>25903-012101</b>	<b>25903-013001</b>	<b>25903-014001</b>	4 Pack
5.0	10	<b>25905-011001</b>	<b>25905-012101</b>	<b>25905-013001</b>	<b>25905-014001</b>	4 Pack
<b>Synchronis C18 Drop-in Guard Cartridges</b>						
5.0	10	<b>97105-011001</b>	<b>97105-012101</b>	<b>97105-013001</b>	<b>97105-014001</b>	4 Pack
<b>Synchronis C8 Drop-in Guard Cartridges</b>						
5.0	10	<b>97205-011001</b>	<b>97205-012101</b>	<b>97205-013001</b>	<b>97205-014001</b>	4 Pack
<b>Synchronis aQ Drop-in Guard Cartridges</b>						
5.0	10	<b>97305-011001</b>	<b>97305-012101</b>	<b>97305-013001</b>	<b>97305-014001</b>	4 Pack
<b>Synchronis Phenyl Drop-in Guard Cartridges</b>						
5.0	10	<b>97905-011001</b>	<b>97905-012101</b>	<b>97905-013001</b>	<b>97905-014001</b>	4 Pack
<b>Hypercarb Drop-in Guard Cartridges</b>						
3.0	10	<b>35003-011001</b>	<b>35003-012101</b>	<b>35003-013001</b>	<b>35003-014001</b>	2 Pack
5.0	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 Columns

Description	Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
Accucore RP-MS	2.6	10	<b>17626-012105</b>	<b>17626-013005</b>	<b>17626-014005</b>	4 Pack
Accucore C18	2.6	10	<b>17126-012105</b>	<b>17126-013005</b>	<b>17126-014005</b>	4 Pack
Accucore aQ	2.6	10	<b>17326-012105</b>	<b>17326-013005</b>	<b>17326-014005</b>	4 Pack
Accucore Phenyl-Hexyl	2.6	10	<b>17926-012105</b>	<b>17926-013005</b>	<b>17926-014005</b>	4 Pack
Accucore PFP	2.6	10	<b>17426-012105</b>	<b>17426-013005</b>	<b>17426-014005</b>	4 Pack
Accucore HILIC	2.6	10	<b>17526-012105</b>	<b>17526-013005</b>	<b>17526-014005</b>	4 Pack

## 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

Description	1.0mm ID	2.1mm ID	3.0mm ID	4.6/4.0mm 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 Column Line Guards

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

### Acclaim Guard Holder

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>

Description	Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
Acclaim 120 C18 HPLC Guards	5.0	10	<b>069689</b>	<b>071981</b>	<b>069695</b>
Acclaim 120 C8 HPLC Guards	5.0	10	<b>069688</b>	<b>071979</b>	<b>069696</b>
Acclaim Polar Advantage (PA) HPLC Guards	5.0	10	<b>069691</b>	<b>071983</b>	<b>069698</b>
Acclaim Polar Advantage II (PA2) HPLC Guards	5.0	10	<b>069692</b>	<b>071985</b>	<b>069699</b>
Acclaim Phenyl-1 HPLC Guards	3.0	10	<b>071975</b>	<b>071974</b>	<b>071973</b>
Acclaim C30 HPLC Guards	3.0	10	<b>075722</b>	<b>075721</b>	<b>075720</b>
Acclaim Organic Acid HPLC Guards	5.0	10	–	<b>071987</b>	<b>069700</b>
Acclaim Surfactant HPLC Guards	5.0	10	<b>069693</b>	<b>071991</b>	<b>069701</b>
Acclaim Explosives E1 HPLC Guards	5.0	10	–	–	<b>069702</b>
Acclaim Explosives E2 HPLC Guards	5.0	10	–	<b>071989</b>	<b>069703</b>
Acclaim Carbamate HPLC Guards	5.0	10	<b>072930</b>	<b>072929</b>	<b>072928</b>
Acclaim Mixed-Mode WAX-1 HPLC Guards	5.0	10	<b>069686</b>	<b>071909</b>	<b>069704</b>
Acclaim Mixed-Mode WCX-1 HPLC Guards	5.0	10	–	<b>071911</b>	<b>069705</b>
Acclaim Mixed-Mode HILIC-1 HPLC Guards	5.0	10	<b>069694</b>	<b>071913</b>	<b>069706</b>
Acclaim 300 C18 HPLC Guards	5.0	10	<b>069690</b>	–	<b>069697</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

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

## ColumnSaver Precolumn Filters

Filter mesh size 0.2µm

### ColumnSaver Precolumn Filters

Filter mesh Size (µm)	Cat. No	Quantity
0.2	<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

Description	2.1mm/ 3.0mm ID	4.0mm/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-WT</b>	<b>850-WT</b>	1 Each
Replacement Tip, Waters End-fitting	<b>850-RT</b>	<b>850-RT</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



### UNIFILTER Direct-Connection HPLC Filter Systems

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 LC

There are a number of excellent options in the Thermo Scientific column portfolio for fast LC

## Hypersil GOLD 1.9µm

Based on improved, highly pure silica and a novel proprietary derivatization and endcapping procedure using alkyl chemistry, Hypersil GOLD columns offer next generation silica-based columns with enhanced performance.

»» PAGE 4-022



## Accucore

The Core Enhanced Technology used in Accucore provides better speed, sensitivity and resolving power than 5µm and 3µm columns without the higher backpressures associated with sub-2µm materials.

»» PAGE 4-032



## Synchronis 1.7µm

Extensive testing and strong quality control procedures ensure the consistency of Synchronis HPLC columns - column after column, time after time.

»» PAGE 4-040



## Acclaim RSLC 2.2µm

Rugged, reproducible, and reliable chromatographic performance make Acclaim HPLC columns appropriate for pharmaceutical, environmental, food, and other industrial chromatographic separations.

»» PAGE 4-046

### Fast LC Selection Guide

Instrument pressure limit	Stationary Phase Hydrophobicity	Recommended Fast LC Option
400 bar		Accucore
600 bar	Low	Accucore
	High	Acclaim RSLC 2.2µm
> 600 bar	Low	Hypersil GOLD 1.9µm
	High	Synchronis 1.7µm

## Principles of Fast LC

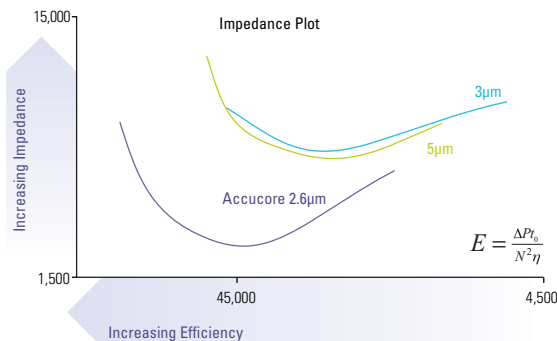
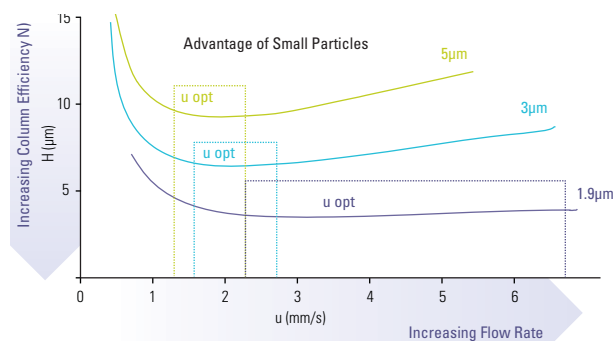
### Effect of particle size and type

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 generates 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/chromatography](http://www.thermoscientific.com/chromatography)).

### 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 4-225 for details of this optimization.

# Thermo Scientific Hypersil GOLD 1.9 $\mu$ m

Small particles to improve speed and efficiency

## Outstanding Peak Shape

Based on improved, highly pure silica and a novel proprietary derivatization and endcapping procedure using alkyl chemistry, Hypersil GOLD columns offer next generation silica-based columns with enhanced performance. The manufacturing process was designed to create an even surface which reduces the unwanted secondary and tertiary interactions that can occur between analytes and the acidic silanols of the silica support. This significantly reduces peak tailing and results in improved resolution, efficiency, sensitivity, and confidence in the accuracy and quality of your analytical data.

For further details on Hypersil GOLD refer to page **4-054**.

## The Power of 1.9 $\mu$ m Particles

1.9 $\mu$ m particles give higher efficiency than 3 $\mu$ m or 5 $\mu$ m particles and this efficiency is delivered over a greater range of optimum linear velocity. This makes it possible to operate at higher flow rates without losing performance. Because shorter columns packed with 1.9 $\mu$ m particles give equivalent efficiency to longer columns packed with 5 $\mu$ m particles faster analysis and solvent savings for the chromatographer become a reality.

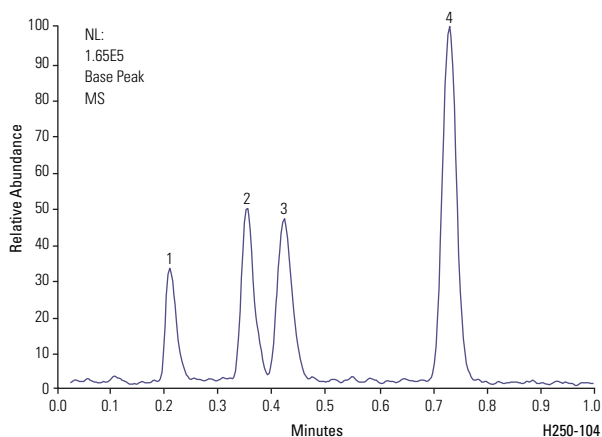
## Which 1.9 $\mu$ m Column?

We offer an extensive range of columns packed with 1.9 $\mu$ m particles to suit the full variety of application needs.

The choice of column will depend upon the requirement of the analysis.

- **Speed** – Choose from 20, 30 or 50mm long columns
- **Efficiency** – Choose a longer column, for example 150 or 200mm
- **Low backpressure** – Choose a 50mm x 4.6mm ID column. Traditionally, a 1.9 $\mu$ m column is used on UHPLC instruments. However, by producing less backpressure, this short, wider column is suitable for users of conventional systems where pressure limits are often in the 6000 psi/400 bar region, ensuring fast chromatography without the need for extensive instrument optimization.

## Sulphonamides on 1.9 $\mu$ m GOLD



Column: Hypersil GOLD™ 1.9 $\mu$ m, 20x2.1mm

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:	40°C
Detection:	+ESI
System:	Surveyor with MS Pump + Navigator
Analytes:	1. Sulfaguandinine 2. Sulfathiazole 3. Sulfamerazine 4. Sulfamonomethoxine

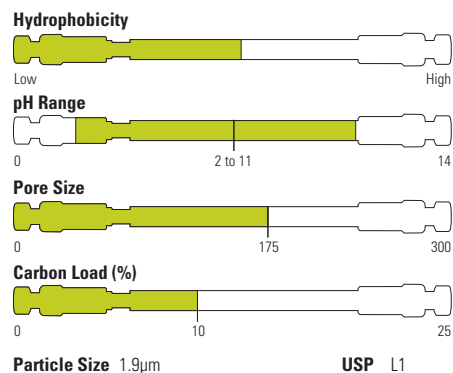




## Hypersil GOLD HPLC Columns

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

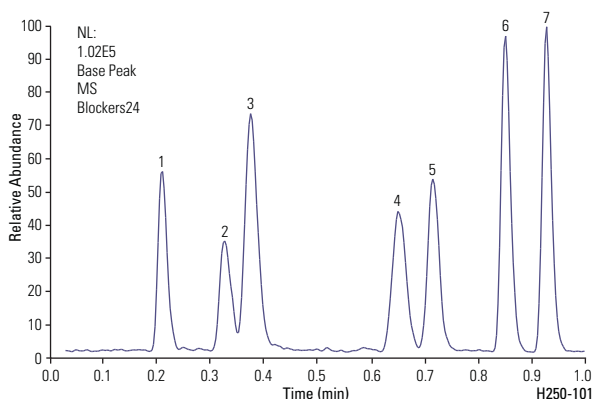
- Significant reduction in peak tailing while retaining C18 selectivity
- Excellent resolution, efficiency and sensitivity
- Confidence in the accuracy and quality of analytical data
- 1.9 $\mu$ m particle size columns improve speed and efficiency



### Hypersil GOLD Analytical HPLC Columns

Particle Size ( $\mu$ m)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	25002-021030	25002-022130	25002-023030	—
	30	25002-031030	25002-032130	25002-033030	—
	50	25002-051030	25002-052130	25002-053030	25002-054630
	100	25002-101030	25002-102130	25002-103030	—
	150	—	25002-152130	—	—
	200	—	25002-202130	—	—

### Seven $\beta$ -Blockers in 1 minute



Column: 1.9 $\mu$ m Hypersil™ GOLD 20x2.1mm

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: Surveyor™ MSQ

Analytes:

1. Atenolol

2. Nadolol

3. Pindolol

4. Timolol

5. Metoprolol

6. Oxprenolol

7. Propranolol

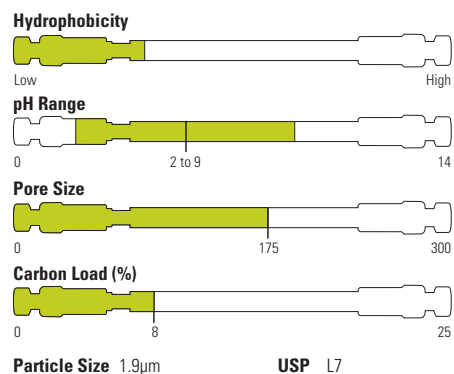




## Hypersil GOLD C8 HPLC Columns

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
- 1.9µm particle size columns improve speed and efficiency



### Hypersil GOLD C8 Analytical HPLC Columns

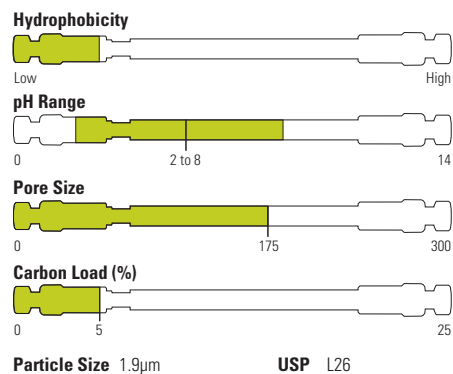
Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>25202-021030</b>	<b>25202-022130</b>	<b>25202-023030</b>	—
	30	<b>25202-031030</b>	<b>25202-032130</b>	<b>25202-033030</b>	—
	50	<b>25202-051030</b>	<b>25202-052130</b>	<b>25202-053030</b>	<b>25202-054630</b>
	100	<b>25202-101030</b>	<b>25202-102130</b>	<b>25202-103030</b>	—
	150	—	<b>25202-152130</b>	—	—
	200	—	<b>25202-202130</b>	—	—



## Hypersil GOLD C4 HPLC Columns

Lower hydrophobicity than C18 or C8 recommended for very hydrophobic analytes

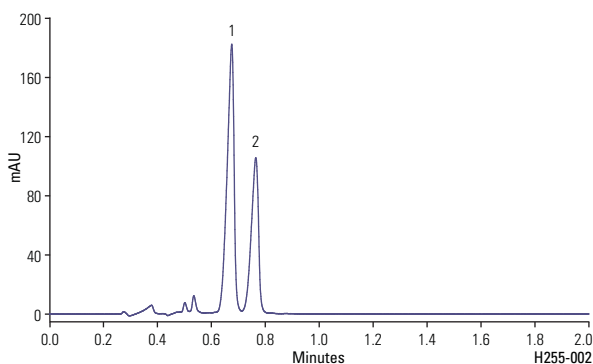
- Lower hydrophobicity
- Faster separations
- Excellent peak shape
- High efficiency
- Outstanding sensitivity
- 1.9µm particle size columns improve speed and efficiency



### Hypersil GOLD C4 Analytical HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	30	<b>25502-031030</b>	<b>25502-032130</b>	<b>25502-033030</b>	—
	50	<b>25502-051030</b>	<b>25502-052130</b>	<b>25502-053030</b>	<b>25502-054630</b>
	100	<b>25502-101030</b>	<b>25502-102130</b>	<b>25502-103030</b>	—
	150	—	<b>25502-152130</b>	—	—
	200	—	<b>25502-202130</b>	—	—

### Fatty Acids

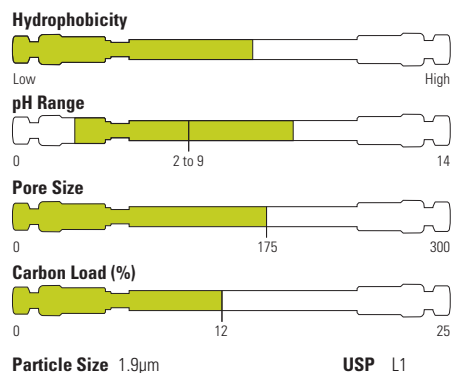


**Column: Hypersil GOLD C4 1.9µm, 100x2.1mm**  
**Part number: 25502-102130**  
 Mobile phase: H<sub>2</sub>O / MeCN (20:80)  
 Flow rate: 0.55mL/min  
 Temperature: 30°C  
 Detection: 200 nm  
 Injection volume: 1µL  
 Sample: 1. Linolenic acid  
2. Linoleic acid

## Hypersil GOLD aQ HPLC Columns

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
- 1.9µm particle size columns improve speed and efficiency

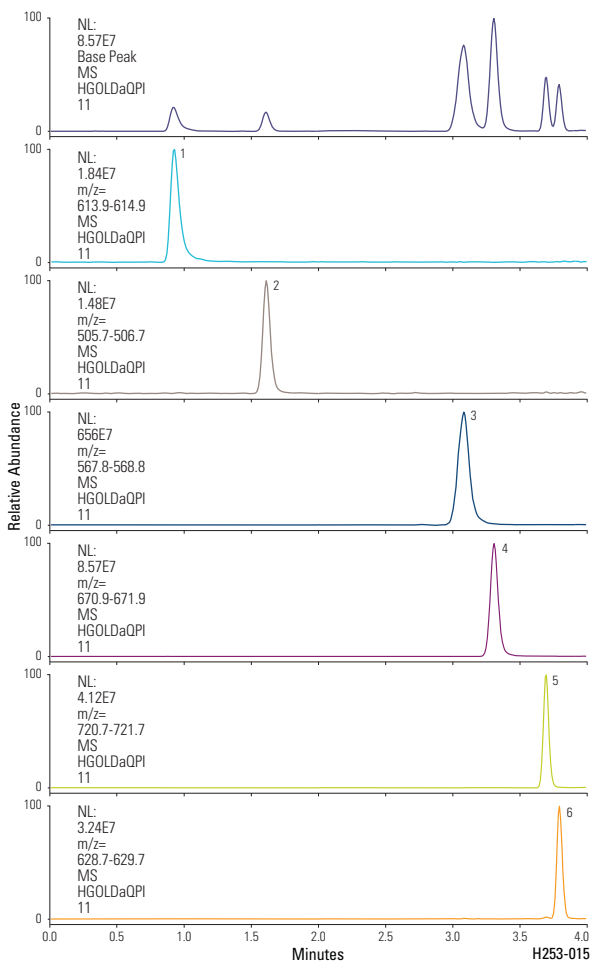


### Hypersil GOLD aQ Analytical HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>25302-021030</b>	<b>25302-022130</b>	<b>25302-023030</b>	–
	30	<b>25302-031030</b>	<b>25302-032130</b>	<b>25302-033030</b>	–
	50	<b>25302-051030</b>	<b>25302-052130</b>	<b>25302-053030</b>	<b>25302-054630</b>
	100	<b>25302-101030</b>	<b>25302-102130</b>	<b>25302-103030</b>	–
	150	–	<b>25302-152130</b>	–	–
200	–	<b>25302-202130</b>	–	–	

Other custom column dimensions are available. Please call your local Customer Service for more information.

### Protease Inhibitors



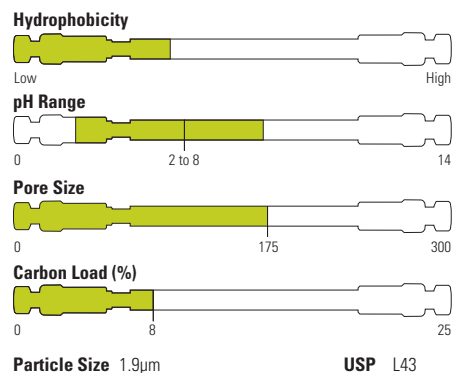
Column: **Hypersil GOLD™ aQ 1.9µm, 50 x 2.1mm**  
 Part number: **25302-052130**

Mobile phase:	A – H <sub>2</sub> O+0.1% Formic Acid
	B – ACN+ 0.1% formic acid
Gradient:	0 – 2.2mins at 35% then to 100% at 4mins
Flow rate:	0.5mL/min
Temperature:	30°C
Detection:	+ ESI-MS
Instrumentation:	Finnigan™ Surveyor™ and Finnigan LCQ™ Deca
Sample:	1. Indinavir 2. Nelfinavir 3. Saquinavir 4. Amprenavir 5. Ritonavir 6. Lopinavir

## Hypersil GOLD PFP HPLC Columns

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
- 1.9µm particle size columns improve speed and efficiency

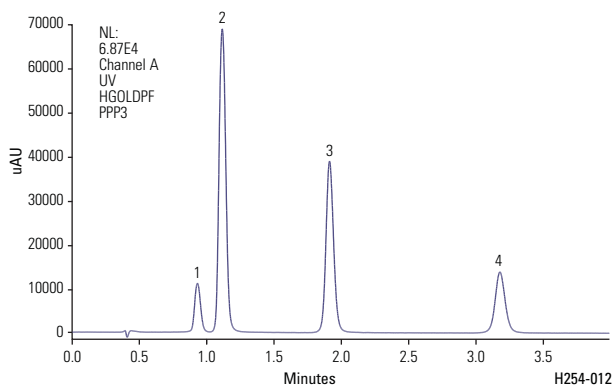


### Hypersil GOLD PFP HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>25402-021030</b>	<b>25402-022130</b>	<b>25402-023030</b>	—
	30	<b>25402-031030</b>	<b>25402-032130</b>	<b>25402-033030</b>	—
	50	<b>25402-051030</b>	<b>25402-052130</b>	<b>25402-053030</b>	<b>25402-054630</b>
	100	<b>25402-101030</b>	<b>25402-102130</b>	<b>25402-103030</b>	—
	150	—	<b>25402-152130</b>	—	—
	200	—	<b>25402-202130</b>	—	—

Other custom column dimensions are available. Please call your local Customer Service for more information.

### Polyphenols



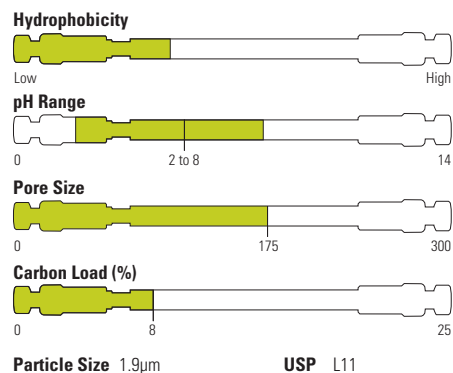
**Column: Hypersil GOLD™ PFP 1.9µm, 50 x 2.1mm**  
**Part number: 25402-052130**

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 HPLC Columns

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
- 1.9µm particle size columns improve speed and efficiency

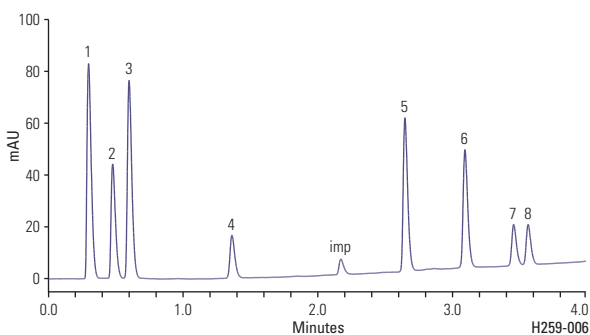


### Hypersil GOLD Phenyl Analytical HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>25902-021030</b>	<b>25902-022130</b>	<b>25902-023030</b>	—
	30	<b>25902-031030</b>	<b>25902-032130</b>	<b>25902-033030</b>	—
	50	<b>25902-051030</b>	<b>25902-052130</b>	<b>25902-053030</b>	<b>25902-054630</b>
	100	<b>25902-101030</b>	<b>25902-102130</b>	<b>25902-103030</b>	—
	150	—	<b>25902-152130</b>	—	—
200	—	<b>25902-202130</b>	—	—	

Other custom column dimensions are available. Please call your local Customer Service for more information.

### 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

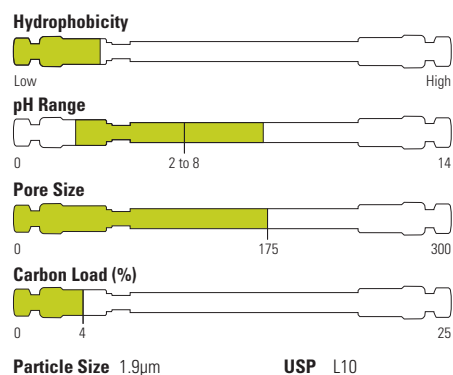
Detection: UV @ 225 and 254 nm

- 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 HPLC Columns

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

- Hypersil GOLD CN columns provide alternative selectivity with lower hydrophobicity
- Excellent peak shape
- Outstanding sensitivity
- Less retention for faster analysis
- 1.9µm particle size columns improve speed and efficiency



### Hypersil GOLD CN Analytical HPLC Columns

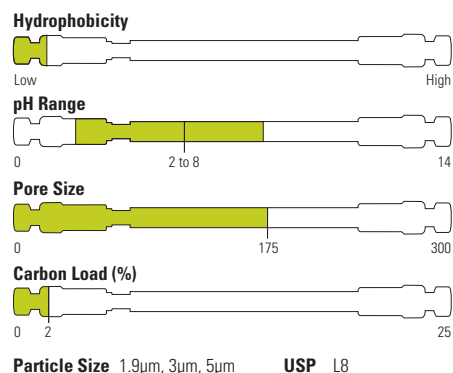
Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>25802-021030</b>	<b>25802-022130</b>	<b>25802-023030</b>	–
	30	<b>25802-031030</b>	<b>25802-032130</b>	<b>25802-033030</b>	–
	50	<b>25802-051030</b>	<b>25802-052130</b>	<b>25802-053030</b>	<b>25802-054630</b>
	100	<b>25802-101030</b>	<b>25802-102130</b>	<b>25802-103030</b>	–
	150	–	<b>25802-152130</b>	–	–
	250	–	<b>25802-202130</b>	–	–

Other custom column dimensions are available. Please call your local Customer Service for more information. Please note that Hypersil GOLD CN columns are shipped in iso-octane:ethanol. For reversed phase applications, flush with ethanol or 2-propanol prior to use.

## Hypersil GOLD Amino HPLC Columns

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
- 1.9µm particle size columns improve speed and efficiency



### Hypersil GOLD Amino HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>25702-021030</b>	<b>25702-022130</b>	<b>25702-023030</b>	–
	30	<b>25702-031030</b>	<b>25702-032130</b>	<b>25702-033030</b>	–
	50	<b>25702-051030</b>	<b>25702-052130</b>	<b>25702-053030</b>	<b>25702-054630</b>
	100	<b>25702-101030</b>	<b>25702-102130</b>	<b>25702-103030</b>	–
	150	–	<b>25702-152130</b>	–	–
	250	–	<b>25702-202130</b>	–	–

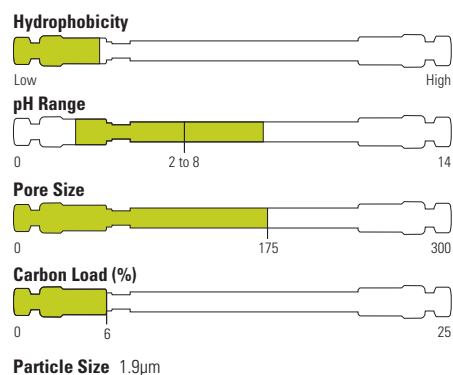
Other custom column dimensions are available. Please call your local Customer Service for more information. Please note that Hypersil GOLD Amino columns are shipped in iso-octane:ethanol. For reversed phase applications, flush with ethanol or 2-propanol prior to use.



## Hypersil GOLD AX HPLC Columns

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
- 1.9µm particle size columns improve speed and efficiency



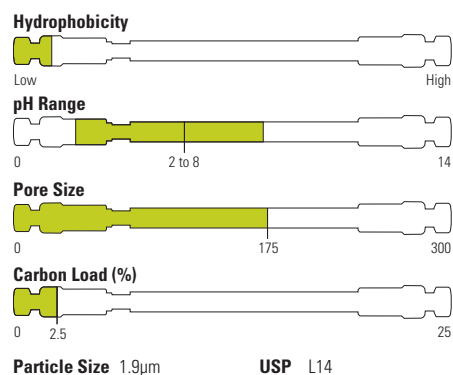
### Hypersil GOLD AX HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>26102-021030</b>	<b>26102-022130</b>	<b>26102-023030</b>	—
	30	<b>26102-031030</b>	<b>26102-032130</b>	<b>26102-033030</b>	—
	50	<b>26102-051030</b>	<b>26102-052130</b>	<b>26102-053030</b>	<b>26102-054630</b>
	100	<b>26102-101030</b>	<b>26102-102130</b>	<b>26102-103030</b>	—
	150	—	<b>26102-152130</b>	—	—
	250	—	<b>26102-202130</b>	—	—

## Hypersil GOLD SAX HPLC Columns

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
- 1.9µm particle size columns improve speed and efficiency



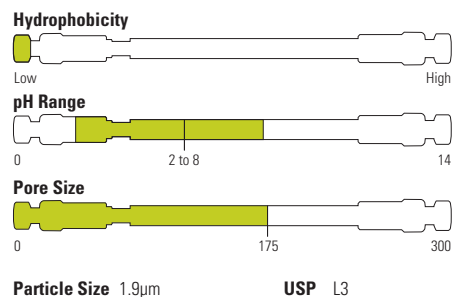
### Hypersil GOLD AX HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>26302-021030</b>	<b>26302-022130</b>	<b>26302-023030</b>	—
	30	<b>26302-031030</b>	<b>26302-032130</b>	<b>26302-033030</b>	—
	50	<b>26302-051030</b>	<b>26302-052130</b>	<b>26302-053030</b>	<b>26302-054630</b>
	100	<b>26302-101030</b>	<b>26302-102130</b>	<b>26302-103030</b>	—
	150	—	<b>26302-152130</b>	—	—
	250	—	<b>26302-202130</b>	—	—

## Hypersil GOLD Silica HPLC Columns

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
- 1.9µm particle size columns improve speed and efficiency



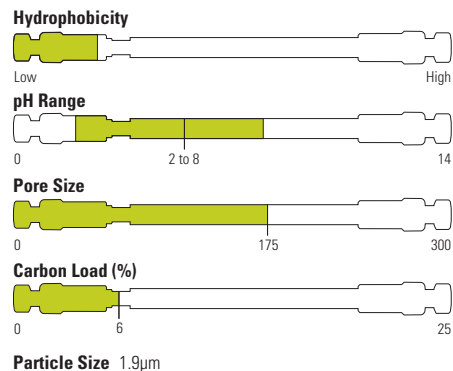
### Hypersil GOLD Silica HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>25102-021030</b>	<b>25102-022130</b>	<b>25102-023030</b>	–
	30	<b>25102-031030</b>	<b>25102-032130</b>	<b>25102-033030</b>	–
	50	<b>25102-051030</b>	<b>25102-052130</b>	<b>25102-053030</b>	<b>25102-054630</b>
	100	<b>25102-101030</b>	<b>25102-102130</b>	<b>25102-101030</b>	–
	150	–	<b>25102-152130</b>	–	–
	250	–	<b>25102-202130</b>	–	–

## Hypersil GOLD HILIC HPLC Columns

Thermo Scientific Hypersil GOLD HILIC HPLC Columns provide enhanced retention of polar and hydrophilic analytes

- Alternative selectivity to C18
- Improved sensitivity with MS detection
- Retains polar analytes with no need for ion-pair or derivatization
- Outstanding peak shape and sensitivity
- 1.9µm particle size columns improve speed and efficiency



### Hypersil GOLD HILIC HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
1.9	20	<b>26502-021030</b>	<b>26502-022130</b>	<b>26502-023030</b>	–
	30	<b>26502-031030</b>	<b>26502-032130</b>	<b>26502-033030</b>	–
	50	<b>26502-051030</b>	<b>26502-052130</b>	<b>26502-053030</b>	<b>26502-054630</b>
	100	<b>26502-101030</b>	<b>26502-102130</b>	<b>26502-103030</b>	–
	150	–	<b>26502-152130</b>	–	–
	250	–	<b>26502-202130</b>	–	–

# Thermo Scientific Accucore HPLC Columns

Ultimate Core Performance to Maximize Your Investment

Based on Core Enhanced Technology™, a unique combination of Thermo Fisher Scientific's state-of-the-art particle technology and vast experience in phase bonding and packing, Accucore™ HPLC columns provide ultimate chromatographic performance without any restriction on the kind of HPLC instrument that can be used. The elements of Core Enhanced Technology are solid core particles, tight control of particle diameter, advanced bonding technology and automated packing processes.

Solid core particles with a tightly controlled diameter of 2.6µm allow high speed, superb resolution separations to be achieved without the backpressures associated with UHPLC columns.

Six 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 selectivity to meet all your separation needs.



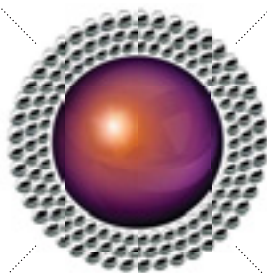
## The key components of Core Enhanced Technology

### Solid Core Particles

2.6µm diameter particles with a solid core 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



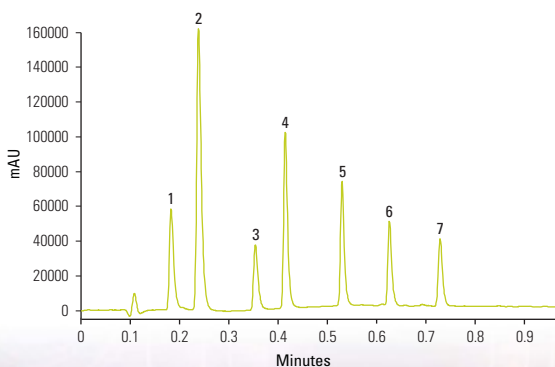
### Tight Control of Particle Diameter

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

## High Throughput Ketones



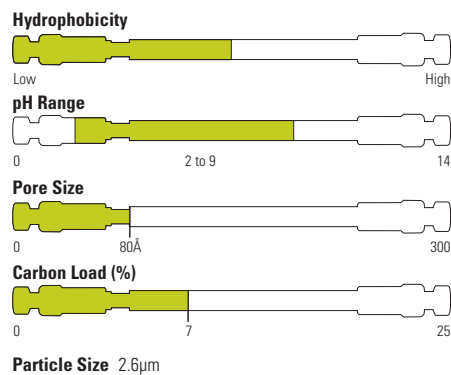
### Accucore C18 2.6µm, 50mm x 2.1mm

Mobile phase:	A – Water; B – Acetonitrile
Gradient:	Min % B
	0 40
	0.4 95
	0.80 95
Flow rate:	1.0mL/min
Temperature:	45°C
Detection:	UV at λ = 258nm
Injection volume:	1µL
Backpressure:	113 bar
Analytes:	1. 2-Pentanone
	2. Acetophenone
	3. 2-Heptanone
	4. Butyrophenone
	5. Hexanophenone
	6. Octanophenone
	7. Decanophenone

## Accucore RP-MS HPLC Columns

Optimized for MS detection, excellent combination of speed and quality of separation


- Optimized alkyl chain length
- Very low peak tailing
- Phase of choice for use with MS detection



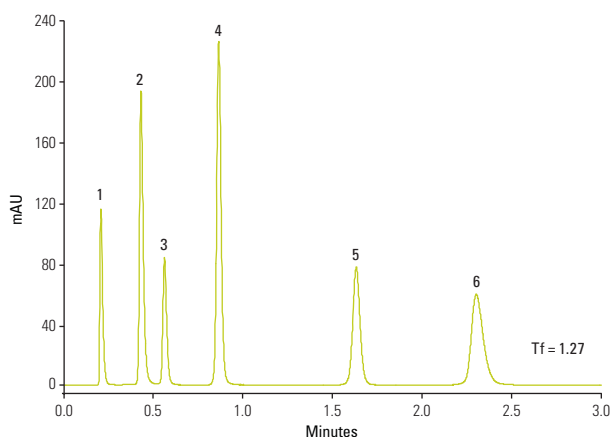
### Accucore RP-MS HPLC Columns

Particle size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.6	30	<b>17626-032130</b>	<b>17626-033030</b>	<b>17626-034630</b>
	50	<b>17626-052130</b>	<b>17626-053030</b>	<b>17626-054630</b>
	100	<b>17626-102130</b>	<b>17626-103030</b>	<b>17626-104630</b>
	150	<b>17626-152130</b>	<b>17626-153030</b>	<b>17626-154630</b>

### Accucore RP-MS Defender Guard Columns

Particle size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
2.6	10	<b>17626-012105</b>	<b>17626-013005</b>	<b>17626-014005</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### Bases



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

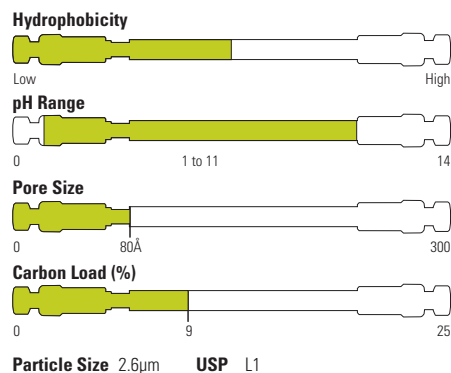
Mobile phase:	65% Methanol / 35% 25mM Potassium Phosphate pH7.0
Flow rate:	500 μL/min
Temperature:	30°C
Detection:	UV at 215nm
Injection volume:	1 μL
Back pressure:	232 bar
Analytes:	1. Uracil 2. Propranolol 3. Butylparaben 4. Naphthalene 5. Acenaphthene 6. Amitriptyline



## Accucore C18 HPLC Columns

Optimum retention for non-polar analytes

- Hydrophobic interaction mechanism
- Ideal for separating a broad range of analytes



### Accucore C18 HPLC Columns

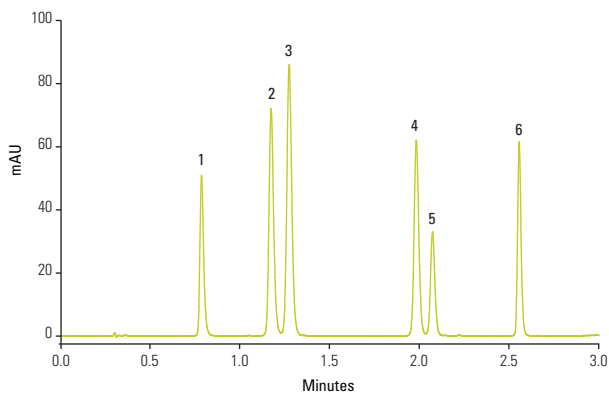
Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.6	30	<b>17126-032130</b>	<b>17126-033030</b>	<b>17126-034630</b>
	50	<b>17126-052130</b>	<b>17126-053030</b>	<b>17126-054630</b>
	100	<b>17126-102130</b>	<b>17126-103030</b>	<b>17126-104630</b>
	150	<b>17126-152130</b>	<b>17126-153030</b>	<b>17126-154630</b>

### Accucore C18 Defender Guard Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
2.6	10	<b>17126-012105</b>	<b>17126-013005</b>	<b>17126-014005</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each



### Triazines



#### Accucore C18 2.6µm, 50mm x 2.1mm

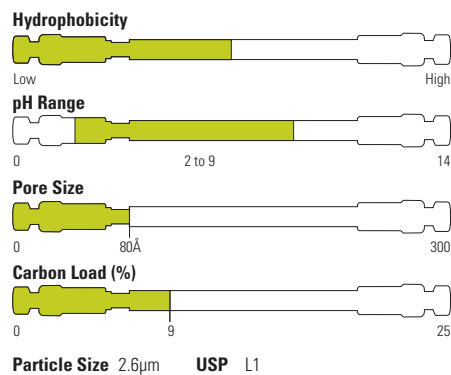
Mobile phase:	A – Water ; B – Acetonitrile
Gradient:	Time (min) %B
	1.0 35
	2.5 70
Flow rate:	600µL/min
Temperature:	25°C
Detection:	UV at 280nm
Injection volume:	2µL
Backpressure:	298 bar
Analytes:	1. Simazine 2. Simetryn 3. Atrazine 4. Ametryn 5. Propazine 6. Prometryn



## Accucore aQ HPLC Columns

Compatible with 100% aqueous mobile phases, special selectivity for polar analytes


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



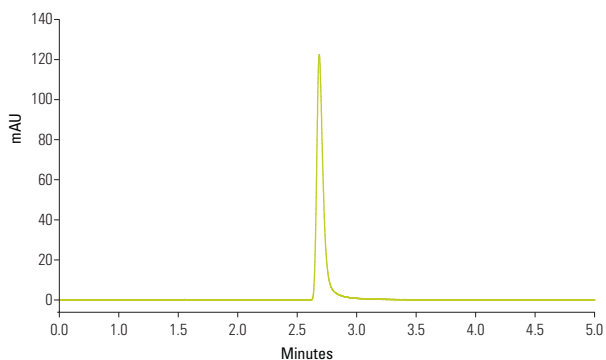
### Accucore aQ HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.6	30	<b>17326-032130</b>	<b>17326-033030</b>	<b>17326-034630</b>
	50	<b>17326-052130</b>	<b>17326-053030</b>	<b>17326-054630</b>
	100	<b>17326-102130</b>	<b>17326-103030</b>	<b>17326-104630</b>
	150	<b>17326-152130</b>	<b>17326-153030</b>	<b>17326-154630</b>

### Accucore aQ Defender Guard Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
2.6	10	<b>17326-012105</b>	<b>17326-013005</b>	<b>17326-014005</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### Lamivudine (USP)



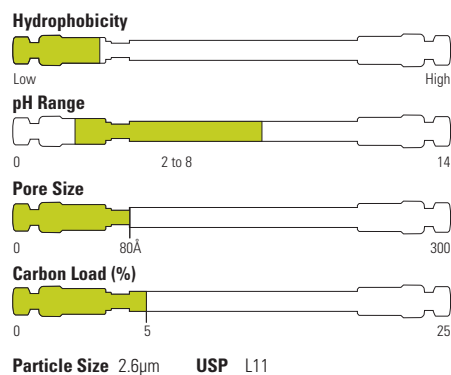
Accucore aQ 2.6µm, 50mm x 2.1mm
Mobile phase: 95:5 (v/v) Ammonium Acetate, pH 3.80 / Methanol
Flow rate: 200µL/min
Temperature: 35°C
Detection: UV at 277nm
Injection volume: 1µL
Analytes: Lamivudine
Asymmetry: 1.36
%RSD $t_r$ : 0.00
%RSD Peak area: 1.72
(%RSD calculated from 6 replicate injections)
USP acceptance criteria: % RSD ( $t_r$ , Peak Area) <2.0



## Accucore Phenyl-Hexyl HPLC Columns

Unique selectivity for aromatic and moderately polar analytes

- Classical RP and special selectivity, while Enhanced Pi-pi interactions with aromatics
- Moderate hydrophobicity



### Accucore Phenyl-Hexyl HPLC Columns

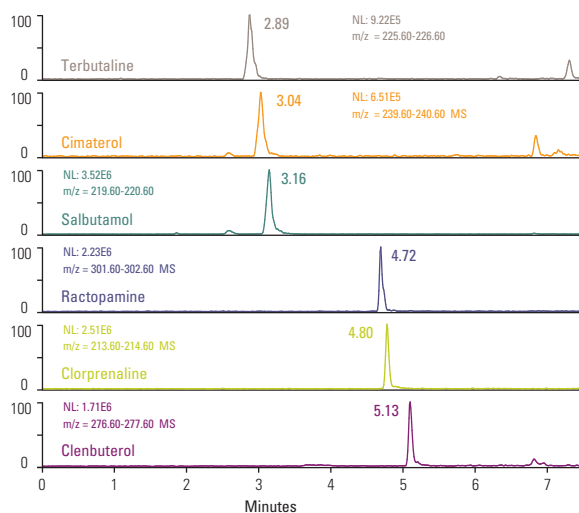
Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.6	30	<b>17926-032130</b>	<b>17926-033030</b>	<b>17926-034630</b>
	50	<b>17926-052130</b>	<b>17926-053030</b>	<b>17926-054630</b>
	100	<b>17926-102130</b>	<b>17926-103030</b>	<b>17926-104630</b>
	150	<b>17926-152130</b>	<b>17926-153030</b>	<b>17926-154630</b>

### Accucore Phenyl-Hexyl Defender Guard Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
2.6	10	<b>17926-012105</b>	<b>17926-013005</b>	<b>17926-014005</b>	4 Pack
		<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

UNIGUARD Drop-in Guard Cartridge Holder

### Beta-agonists



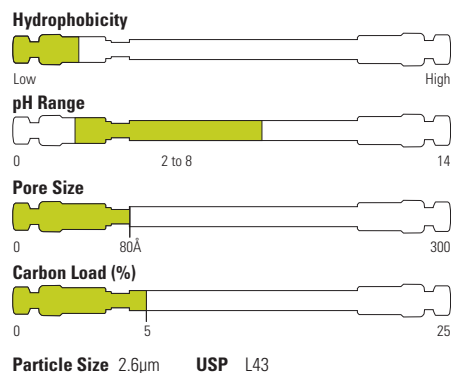
#### Accucore Phenyl-Hexyl 2.6µm, 100mm x 2.1mm

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 PFP HPLC Columns

Alternative selectivity to C18, particularly for halogenated analytes


- Extra retention for halogenated species
- Unique selectivity for non-halogenated compounds



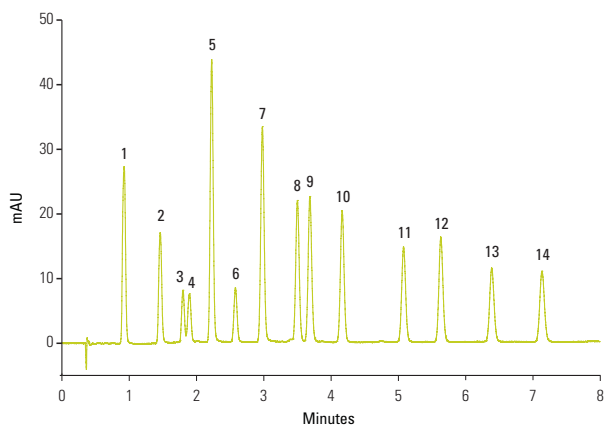
## Accucore PFP HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.6	30	<b>17426-032130</b>	<b>17426-033030</b>	<b>17426-034630</b>
	50	<b>17426-052130</b>	<b>17426-053030</b>	<b>17426-054630</b>
	100	<b>17426-102130</b>	<b>17426-103030</b>	<b>17426-104630</b>
	150	<b>17426-152130</b>	<b>17426-153030</b>	<b>17426-154630</b>

## Accucore PFP Defender Guard Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
2.6	10	<b>17426-012105</b>	<b>17426-013005</b>	<b>17426-014005</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

## Positional Isomers



Accucore PFP 2.6µm, 50mm x 2.1mm

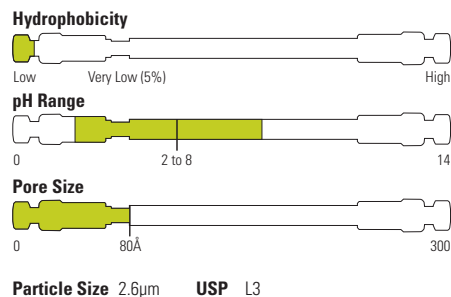
Mobile phase:	A – 0.1% Formic Acid in Water
Mobile phase:	A – 0.1% Formic Acid in Acetonitrile
Gradient:	15-30%B in 7 minutes
Flow rate:	600µL/min
Temperature:	50°C
Detection:	UV at 270nm
Injection volume:	2µL

- 1, 3, 4 – Dimethoxyphenol
- 2, 6 – Dimethoxyphenol
- 2, 6 – Difluorophenol
- 3, 5 – Dimethoxyphenol
- 2, 4 – Difluorophenol
- 2, 3 – Difluorophenol
- 3, 4 – Difluorophenol
- 3, 5 – Dimethylphenol
- 2, 6 – Dimethylphenol
- 2, 6 – Dichlorophenol
- 4 – Chloro-3-Methylphenol
- 4 – Chloro-2-Methylphenol
- 3, 4 – Dichlorophenol
- 3, 5 – Dichlorophenol

## Accucore HILIC HPLC Columns

Enhanced Retention of polar and hydrophilic analytes


- Alternative selectivity to C18 without ion-pair or derivatization
- Improved sensitivity for MS detection



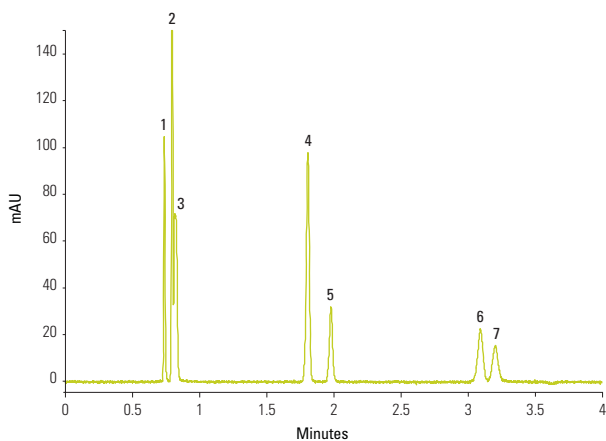
### Accucore HILIC HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.6	30	<b>17526-032130</b>	<b>17526-033030</b>	<b>17526-034630</b>
	50	<b>17526-052130</b>	<b>17526-053030</b>	<b>17526-054630</b>
	100	<b>17526-102130</b>	<b>17526-103030</b>	<b>17526-104630</b>
	150	<b>17526-152130</b>	<b>17526-153030</b>	<b>17526-154630</b>

### Accucore RP-MS Defender Guard Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
2.6	10	<b>17526-012105</b>	<b>17526-013005</b>	<b>17526-014005</b>	4 Pack
 UNIGUARD Drop-in Guard Cartridge Holder		<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### 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 method development and validation kits

In addition to individual columns a number of Accucore kits are also available. These kits allow validation of the performance of Accucore HPLC columns or verification of the optimum Accucore phase to use for a separation.

### Accucore Validation Kit

Validate the reproducibility of Accucore. Contains 3 Accucore C18 columns.

#### Accucore Validation Kit

Particle size (µm)	Length (mm)	2.1mm ID
2.6	50	<b>17126-052130-3V</b>
	100	<b>17126-102130-3V</b>
	150	<b>17126-152130-3V</b>

### Accucore Narrow Selectivity Kit

Verify optimum selectivity over a narrow range. Contains 1 each of Accucore C18, RP-MS and aQ columns.

#### Accucore Validation Kit

Particle size (µm)	Length (mm)	2.1mm ID
2.6	50	<b>17X26-052130-3VA</b>
	100	<b>17X26-102130-3VA</b>
	150	<b>17X26-152130-3VA</b>

### Accucore Wide Selectivity Kit

Verify selectivity over a wide range. Contains 1 each of Accucore C18, Phenyl-Hexyl and PFP columns.

#### Accucore Validation Kit

Particle size (µm)	Length (mm)	2.1mm ID
2.6	50	<b>17X26-052130-3VB</b>
	100	<b>17X26-102130-3VB</b>
	150	<b>17X26-152130-3VB</b>

### Accucore Polar Selectivity Kit

Verify selectivity for polar analytes. Contains 1 each of Accucore aQ, PFP and HILIC columns.

#### Accucore Validation Kit

Particle size (µm)	Length (mm)	2.1mm ID
2.6	50	<b>17X26-052130-3VC</b>
	100	<b>17X26-102130-3VC</b>
	150	<b>17X26-152130-3VC</b>

# Thermo Scientific Synchronis HPLC Columns

Consistent Reproducible Separations, Column after Column, Time after Time

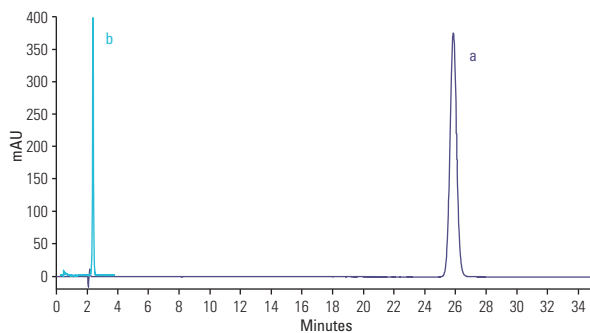
## 1.7 $\mu$ m Particles for UHPLC Applications

With higher efficiency than 3 $\mu$ m or 5 $\mu$ m particles, 1.7 $\mu$ m particles deliver a greater range of optimum linear velocity and make it possible to operate at higher flow rate without losing performance. In addition, shorter columns packed with 1.7 $\mu$ m particles provide the same efficiency as longer columns packed with 5 $\mu$ m particles, resulting in faster analysis and solvent savings for chromatographers.

With 1.7 $\mu$ m particles, analyses can be performed with a high linear velocity through the column without loss in performance, provided the LC system is optimized to operate under these conditions. In order to produce fast, efficient chromatography, all system components for the assay should also be considered. Modern ultra high pressure liquid chromatography (UHPLC) instruments, including the Thermo Scientific Accela High Speed LC, take these factors into account.

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

### Zidovudine



**Column:** Synchronis C18  
**a) 5.0 $\mu$ m, 250 x 4.0mm**  
**b) 1.7 $\mu$ m, 50 x 2.1mm**

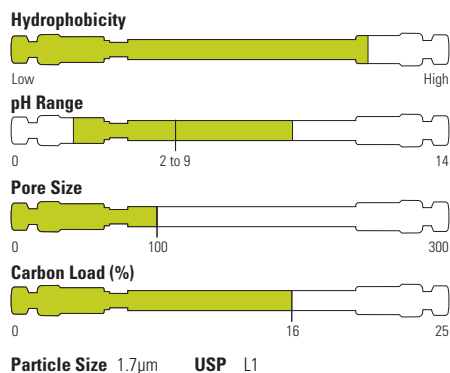
Chromatographic conditions:	
Mobile phase:	1:4 (v/v) MeOH-Water
Flow rate:	a) 1ml min <sup>-1</sup> b) 0.8ml min <sup>-1</sup>
Temperature:	25°C
Detection:	UV at 265nm
Injection volume:	a) 10 $\mu$ l b) 0.5 $\mu$ l



## 1.7µm Synchronis C18 HPLC Columns

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

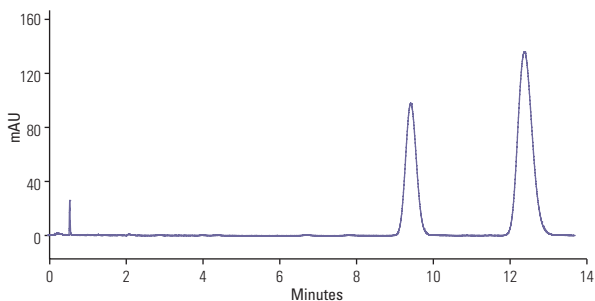
- Highly pure, high surface area silica
- High carbon load for increased retention
- Double endcapped for extra surface coverage
- Highly inert towards basic compounds
- Rigorously tested to ensure quality



### Synchronis C18 HPLC columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
1.7	30	<b>97102-032130</b>	–	–
	50	<b>97102-052130</b>	<b>97102-053030</b>	<b>97102-054630</b>
	100	<b>97102-102130</b>	<b>97102-103030</b>	–

### Ibuprofen



**Column: Synchronis C18, 1.7µm, 50 x 2.1mm**

Mobile phase:	Water phosphoric acid (pH 2.5): Acetonitrile (66.3:33.7)
Flow rate:	0.8mL/min
Temperature:	30°C
Detection:	214nm
Injection volume:	0.5µL
Sample:	1. Valerophenone 2. Ibuprofen

We offer a convenient HPLC method transfer calculator at the Chromatography Resource Center  
[www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)

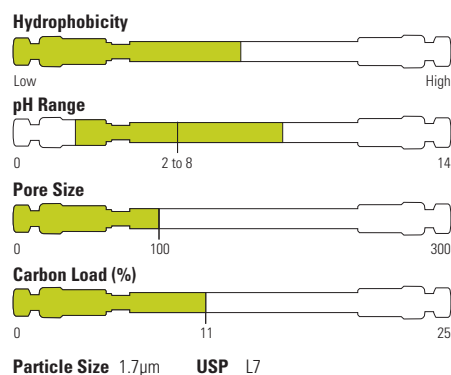




## 1.7µm Synchronis C8 HPLC Columns

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



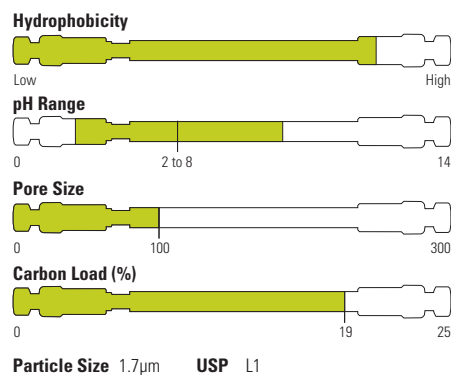
### Synchronis C8 HPLC columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
1.7	30	<b>97202-032130</b>	—	—
	50	<b>97202-052130</b>	<b>97202-053030</b>	<b>97202-054630</b>
	100	<b>97202-102130</b>	<b>97202-103030</b>	—

## 1.7µm Synchronis aQ HPLC Columns

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



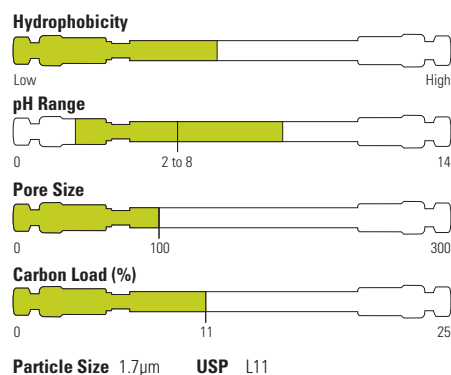
### Synchronis aQ HPLC columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
1.7	30	<b>97302-032130</b>	—	—
	50	<b>97302-052130</b>	<b>97302-053030</b>	<b>97302-054630</b>
	100	<b>97302-102130</b>	<b>97302-103030</b>	—

## 1.7µm Synchronis Phenyl HPLC Columns

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

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



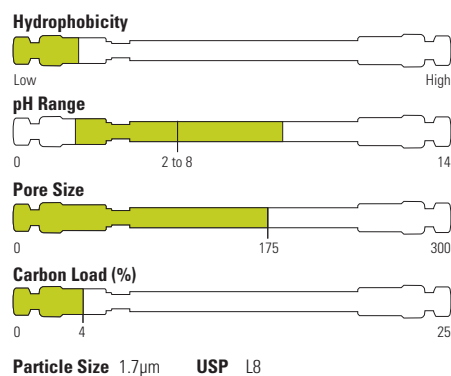
### Synchronis Phenyl HPLC columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
1.7	30	<b>97902-032130</b>	–	–
	50	<b>97902-052130</b>	<b>97902-053030</b>	<b>97902-054630</b>
	100	<b>97902-102130</b>	<b>97902-103030</b>	–

## 1.7µm Synchronis Amino HPLC Columns

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



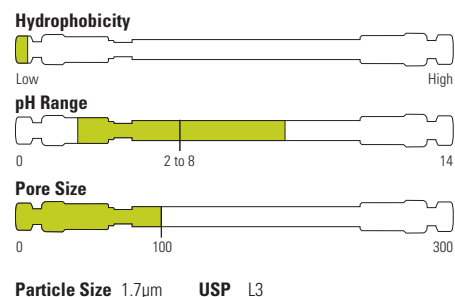
### Synchronis Amino HPLC columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
1.7	30	<b>97702-032130</b>	–	–
	50	<b>97702-052130</b>	<b>97702-053030</b>	<b>97702-054630</b>
	100	<b>97702-102130</b>	<b>97702-103030</b>	–

## 1.7µm Synchronis Silica HPLC Columns

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



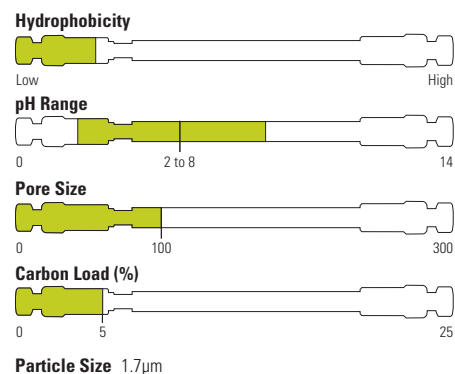
### Synchronis Silica HPLC columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
1.7	30	<b>97002-032130</b>	–	–
	50	<b>97002-052130</b>	<b>97002-053030</b>	<b>97002-054630</b>
	100	<b>97002-102130</b>	<b>97002-103030</b>	–

## 1.7µm Synchronis HILIC HPLC Columns

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



### Synchronis HILIC HPLC columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
1.7	30	<b>97502-032130</b>	–	–
	50	<b>97502-052130</b>	<b>97502-053030</b>	<b>97502-054630</b>
	100	<b>97502-102130</b>	<b>97502-101030</b>	–



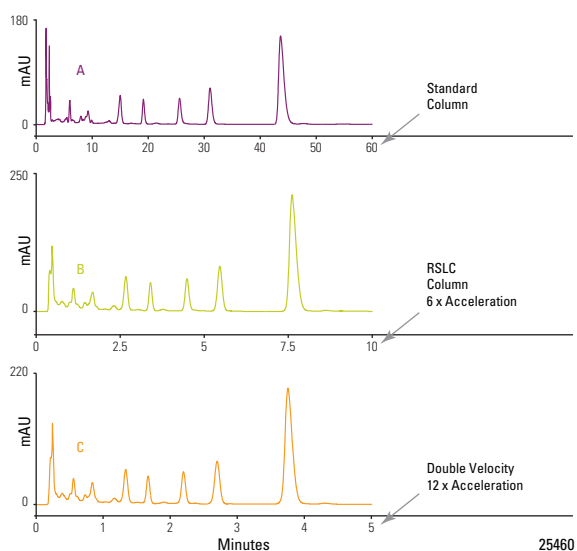
# Thermo Scientific Acclaim RSLC Columns

High-throughput, cost-effective and environment friendly Fast HPLC solution

- High throughput with uncompromised chromatographic performance and reduced solvent consumption
- Accelerate separations up to fifteen-fold compared to conventional LC
- Save up to 92% of solvent with 2.2 $\mu$ m columns
- More resistant to column fouling compared to smaller particle (eg. sub 2 $\mu$ m) columns
- Compatible with both standard HPLC (400 bar) and UHPLC (800 bar) systems
- RSLC Compatible

The Acclaim RSLC 2.2 $\mu$ m columns for Rapid Separation Liquid Chromatography (RSLC) feature a well-balanced integration of high column efficiency, excellent performance, complementary selectivity, as well as stable and rugged column packing. These columns generate 25 to 50% less backpressure compared to sub-2 $\mu$ m particle columns, and are more resistant to column fouling, making them compatible with both standard and ultrahigh pressure LC (UHPLC) instrumentation

## Accelerated Assay of Vanilla Extract



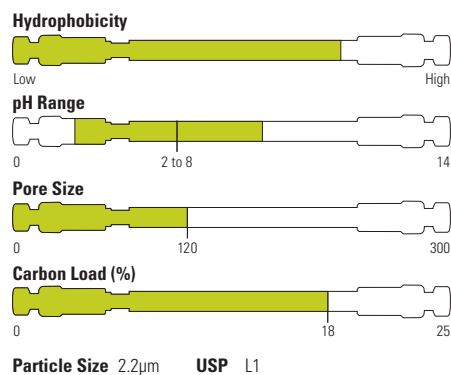
<b>LC System:</b>	<b>Thermo Scientific Dionex UltiMate 3000 RSLC</b>
<b>Column:</b>	<b>Acclaim 120 C18</b>
<b>Dimensions:</b>	A) 5 $\mu$ m, 4.6 x 150mm B, C) 2 $\mu$ m, 2.1 x 50mm RSLC
<b>Mobile Phase:</b>	200mM HOAc in 10% (v/v) MeOH
<b>Flow Rate:</b>	A) 1.0mL/min B) 0.41mL/min C) 0.82mL/min
<b>Temperature:</b>	20°C
<b>Injection:</b>	A) 10 $\mu$ L B, C) 1.2 $\mu$ L
<b>Detector:</b>	UV at 254nm, A) 1Hz data rate B) 5Hz data rate C) 10Hz data rate
<b>Sample:</b>	Commercial vanilla extract in 40% CH <sub>2</sub> OH, filtered
<b>Reference:</b>	AOAC Official Method 990.25
<b>Peaks:</b>	1. p-Hydroxybenzoic acid 2. p-Hydroxybenzaldehyde 3. Vanillin acid 4. Vanillin



## Acclaim RSLC 120 C18 Columns

High performance reversed-phase columns for the separation of small molecules

- Low silanol activity for excellent peak shapes for basic analytes
- High hydrophobic retention
- Available in 2.2µm particle size
- Very high efficiencies for maximum resolution
- Reproducible manufacturing practices for reproducible column-to-column performance
- LC/MS compatible
- High surface coverage, resulting in high-capacity columns



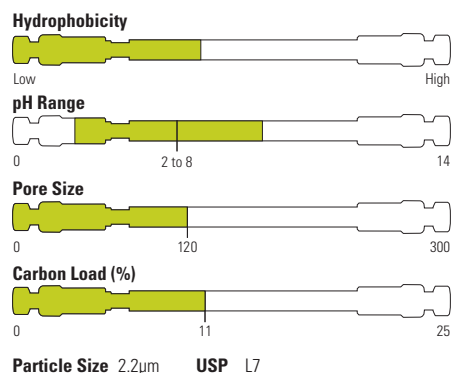
### Acclaim RSLC 120 C18 Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.2	30	<b>071400</b>	<b>071606</b>	—
	50	<b>068981</b>	<b>071605</b>	—
	75	—	<b>075697</b>	—
	100	<b>068982</b>	<b>071604</b>	—
	150	<b>071399</b>	—	—
	250	<b>074812</b>	—	—

## Acclaim RSLC 120 C8 Columns

High performance reversed-phase columns for the separation of more hydrophobic small molecules

- 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



### Acclaim RSLC 120 C8 Columns

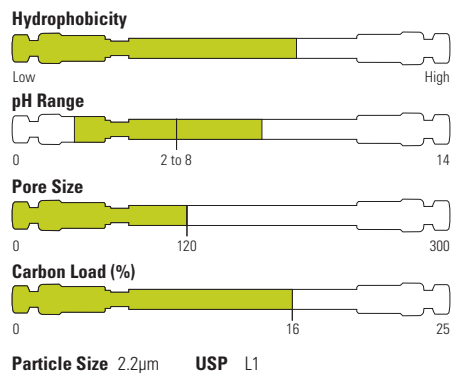
Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.2	30	<b>072614</b>	<b>072618</b>	—
	50	<b>072615</b>	<b>072619</b>	—
	75	—	<b>075696</b>	—
	100	<b>072616</b>	<b>072620</b>	—
	150	<b>072617</b>	—	—
	250	<b>074811</b>	—	—



## Acclaim RSLC PolarAdvantage (PA) Columns

Novel polar-embedded reversed-phase columns with unique selectivity

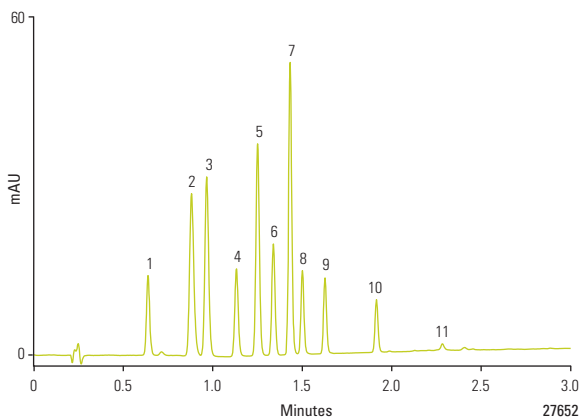
- Selectivity complementary to the C18 column
- Low silanol activity for excellent peak shape with basic compounds
- Compatible with mobile phases from 100% aqueous to 100% organic solvent
- High selectivity for hydrophobic aromatic molecules
- Wide range of applications
- Available in 2.2µm particle size



### Acclaim RSLC PolarAdvantage (PA) Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.2	30	<b>072621</b>	<b>072625</b>	—
	50	<b>072622</b>	<b>072626</b>	—
	75	—	<b>075698</b>	—
	100	<b>072623</b>	<b>072627</b>	—
	150	<b>072624</b>	—	—
	250	<b>074813</b>	—	—

### Phenols EPA 604 fast analysis



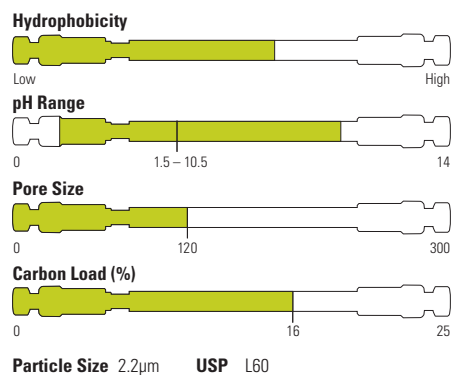
#### Column: Acclaim® RSLC PolarAdvantage, 2.2µm

Dimensions:	3.0 × 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
Injection Volume:	0.5µL
Temperature:	30°C
Detection:	UV at 280nm, 10Hz, 0.5s resp. time
Samples:	Calibration mixes, 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 RSLC PolarAdvantage II (PA2) Columns

For the separation of hydrophilic drugs and drug metabolites

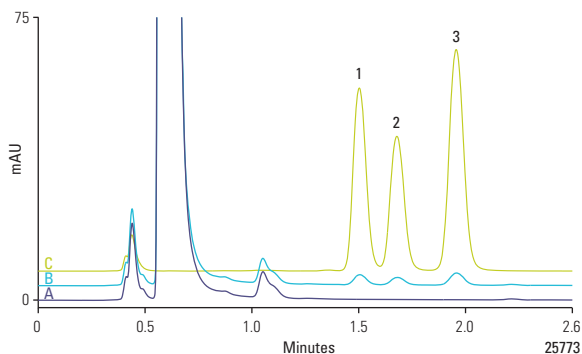
- Unique selectivity, complementary to reversed-phase columns
- Hydrolytically stable
- Rugged column packing
- Broad application range



### Acclaim RSLC PolarAdvantage II (PA2) Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.2	30	<b>071402</b>	<b>071609</b>	—
	50	<b>068989</b>	<b>071608</b>	—
	75	—	<b>075699</b>	—
	100	<b>068990</b>	<b>071607</b>	—
	150	<b>071401</b>	—	—
	250	<b>074814</b>	—	—

### Fast Diisocyanates by OSHA Method 42 on Acclaim RSLC PolarAdvantage II



**Column: Acclaim RSLC PolarAdvantage II, 2.2µm, 2.1 × 100mm**

Mobile Phase: 293g acetonitrile, 625g water, 0.77g NH<sub>4</sub>OAc (10mmol), adj. to pH 6.0–6.2 with acetic acid Isocratic

Temperature: 60°C

Flow: 0.50mL/min (210 bar)

Injection: 2µL

Detector: UV at 254nm (313nm optional)

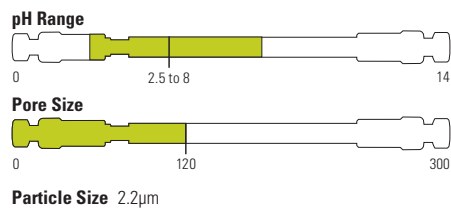
Peaks  
 1. 2,6-Toluenediisocyanate  
 2. 1,6-Hexamethylenediisocyanate  
 3. 2,4-Toluenediisocyanate  
 Derivatives with 1-(2-pyridyl)piperazine, prepared according to OSHA method

Samples:  
 A. Reagent blank  
 B. 0.16µg/mL in matrix  
 C. 8.0µg/mL each in acetonitrile

## Acclaim RSLC Explosives E2 Columns

Acclaim Explosives columns: a total solution for explosives analysis (EPA Method 8330)

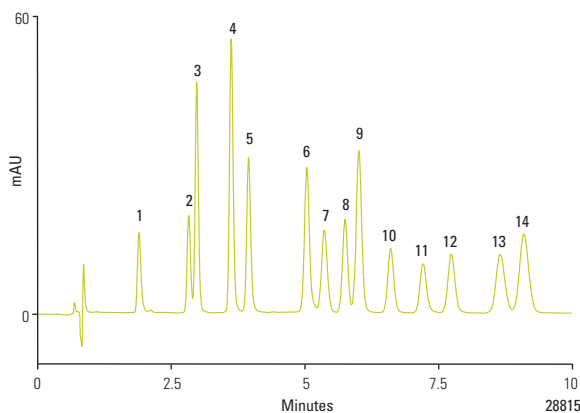
- Achieve baseline resolution of all 14 compounds targeted by EPA Method 8330
- Simple isocratic elution conditions
- Rugged columns with good lot-to-lot reproducibility
- Unique selectivities for separating other nitro-aromatic molecules



### Acclaim RSLC Explosives E2 Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.2	100	<b>076225</b>	<b>076227</b>	–
	150	<b>076226</b>	–	–

### Rapid Determination of EPA 8330A Explosives Using the Acclaim RSLC E2 Column



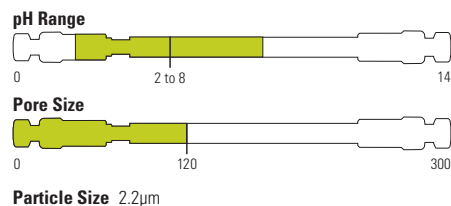
**Column: Acclaim RSLC Explosives E2, 2.2µm**

Dimension:	2.1 × 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:	<table border="0"> <tbody> <tr> <td>1. HMX</td> <td>8. 2,6-DNT</td> </tr> <tr> <td>2. RDX</td> <td>9. 2,4-DNT</td> </tr> <tr> <td>3. 1,3,5-TNB</td> <td>10. 2-NT</td> </tr> <tr> <td>4. 3,5-DNB</td> <td>11. 4-NT</td> </tr> <tr> <td>5. NB</td> <td>12. 3-NT</td> </tr> <tr> <td>6. 2,4,6-TNT</td> <td>13. 4-Am-2,6-DNT</td> </tr> <tr> <td>7. Tetryl</td> <td>14. 2-Am-4,6-DNT</td> </tr> </tbody> </table>	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
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 RSLC Carbamate Columns

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

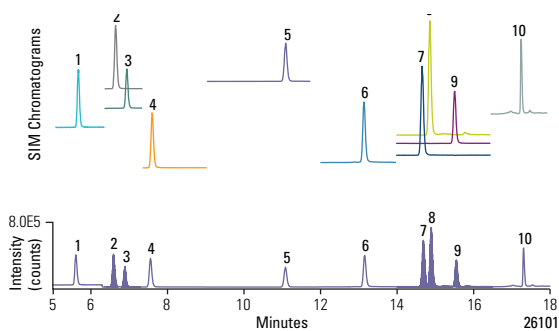
- Baseline separation of carbamate pesticides specified in US EPA Method 531.2
- Use with either LC/postcolumn derivatization/fluorescence or LC/MS detection
- Compatible with both binary (methanol/water) and ternary (acetonitrile/methanol/water) mobile phase gradients
- High-efficiency, extremely low column bleed, and rugged column packing
- Excellent column efficiency and peak shapes for organic acids



### Acclaim RSLC Carbamate Columns

Particle size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
2.2	100	<b>075597</b>	—	—
	150	<b>075596</b>	—	—

### Carbamate pesticides by LC-MS



**System: UltiMate 3000 HPLC system**  
**Column: Acclaim RSLC Carbamate column**  
**(2.1 × 150mm, 3μm)**

Mobile Phase:

Time (min)	A%	B%	C%
-4.0	10	5	85
0.0	10	5	85
2.0	10	5	85
15.0	65	5	30
15.1	90	5	5
20.0	90	5	5

Flow Rate:	300 μL/min
Inj. Volume:	20 μL
Detector:	MSQ Plus™ single quadrupole mass spectrometer

#### Mass Spectrometric Conditions

Ionization interface:	Electrospray Ionization (ESI) positive mode
Detection mode:	Selected Ion Monitoring (SIM)

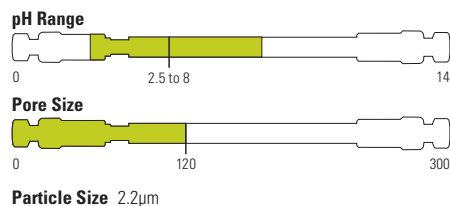
## Acclaim RSLC Carbonyl Columns

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

The Acclaim Carbonyl 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 RSLC Carbonyl Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID
2.2	100	<b>077972</b>	<b>077974</b>
	150	<b>077973</b>	–

# Thermo Scientific Analytical HPLC Columns

We have been at the forefront of chromatography technology for over 35-years. The broad selection of Thermo Scientific HPLC phases coupled with expertise and technical support make us the ideal worldwide source for HPLC columns

## Hypersil GOLD

Based on improved, highly pure silica and a novel proprietary derivatization and endcapping procedure using alkyl chemistry, Hypersil GOLD columns offer next generation silica-based columns with enhanced performance.

»» PAGE 4-054



## Syncronis

Extensive testing and strong quality control procedures ensure the consistency of Syncronis HPLC columns – column after column, time after time.

»» PAGE 4-086



## Hypercarb

A unique porous graphitized carbon phase that provides exceptional retention of very polar analytes, true orthogonality to C18 and separation of structurally related substances. Hypercarb is pH stable from 0 to 14 and is ideal for high temperature applications.

»» PAGE 4-094



## Acclaim

Rugged, reproducible, and reliable chromatographic performance make Acclaim HPLC columns appropriate for pharmaceutical, environmental, food, and other industrial chromatographic separations.

»» PAGE 4-072



## Other Columns

Our older product lines, including Hypersil BDS, Hypersil, Aquasil, Betabasic and Betasil.

»» PAGE 4-106



## Application Specific

A range of columns designed for specific applications, including organic acids, surfactants, explosives residues, carbamate and PAH analysis

»» PAGE 4-098



# Thermo Scientific Hypersil GOLD HPLC Columns

Excellent peak shape for all analyte types

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



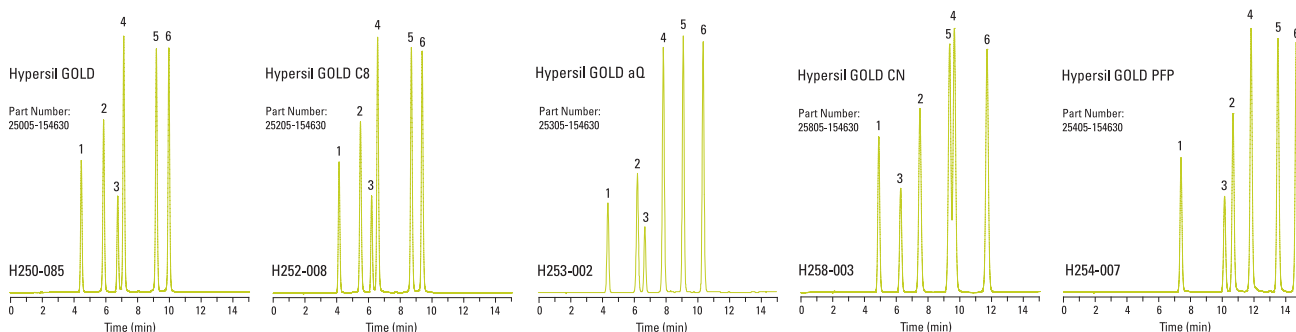
Thermo Scientific Hypersil GOLD columns are exceptionally reproducible for reliable chromatography, column after column. This allows the user to be confident that assays developed with Hypersil GOLD columns will be robust and stable for the life of the assay, making them an ideal choice for new method 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:

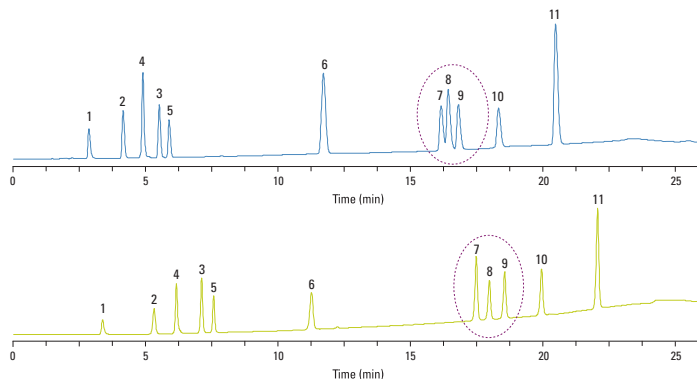
- **Hypersil GOLD** offers outstanding peak shape using generic gradients with C18 selectivity
- **Hypersil GOLD C8** offers similar selectivity but with less retention
- **Hypersil GOLD aQ** can be used for challenging reverse phase separations employing highly aqueous mobile phases
- **Hypersil GOLD 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

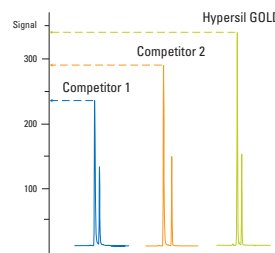
Mobile Phase:	A: H <sub>2</sub> O + 0.1% Formic acid B: MeOH + 0.1% Formic acid
Gradient:	20 to 50% B in 15 min
Flow Rate:	1mL/min
Detection:	UV at 280nm
Temperature:	25°C
Sample:	1. Catechin 2. Epigallocatechin Gallate 3. Epicatechin 4. Gallicocatechin Gallate 5. Epicatechin Gallate 6. Catechin Gallate



**Competitor 18 column**

**Hypersil GOLD column**

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



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

### 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 KAPPA™ capillary columns, PicoFrit™ and IntegraFrit nanobore columns, Javelin™ HTS direct-connection columns and 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, peak height is enhanced and peak integration calculations are optimized.

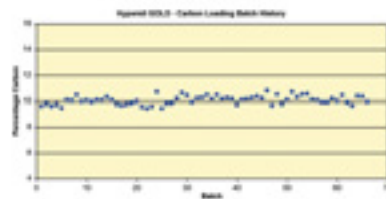
Enhanced peak height can be particularly critical when low concentrations of an analyte are present, for example in an impurity assay. The increase in sensitivity gained with the Hypersil GOLD columns over competitor C18 columns is illustrated above.

### Enhanced Resolution

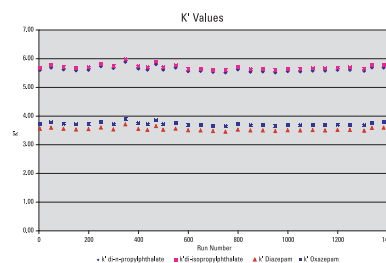
Robust assay development requires a clear definition of resolution expectations. Narrow symmetrical chromatographic peaks ensure that optimum resolution is achieved. Obtaining narrow peak widths is especially challenging for basic pharmaceutical compounds. The figure above shows how Hypersil GOLD columns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

### pH Stability

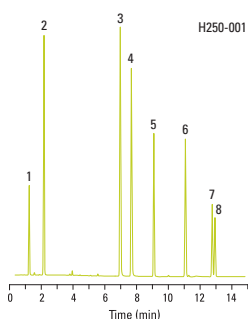
Hypersil GOLD columns are well suited to extended pH applications. Hypersil GOLD columns have been shown to produce robust assays at high pH. At low pH, excellent column stability and reproducibility are illustrated.



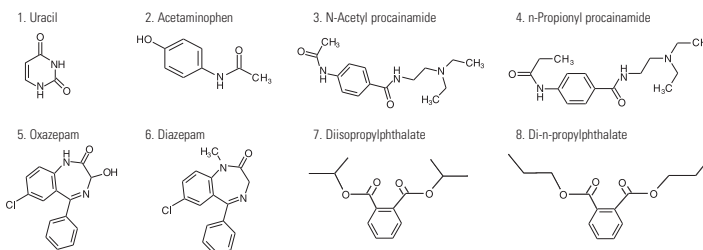
Excellent reproducibility is illustrated with the percent carbon on the Hypersil GOLD media



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



**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

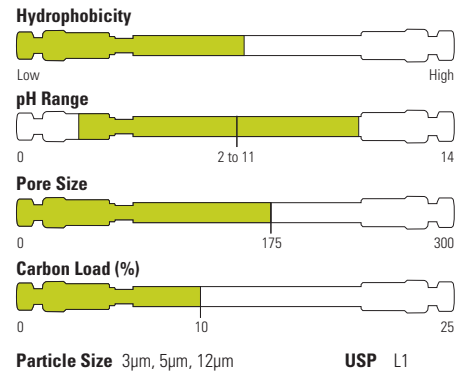


High pH stability assay (pH 10.6) of Hypersil GOLD columns

## Hypersil GOLD HPLC Columns

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




### Hypersil GOLD Analytical HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>25003-031030</b>	<b>25003-032130</b>	<b>25003-033030</b>	<b>25003-034030</b>	<b>25003-034630</b>
	50	<b>25003-051030</b>	<b>25003-052130</b>	<b>25003-053030</b>	<b>25003-054030</b>	<b>25003-054630</b>
	100	<b>25003-101030</b>	<b>25003-102130</b>	<b>25003-103030</b>	<b>25003-104030</b>	<b>25003-104630</b>
	150	<b>25003-151030</b>	<b>25003-152130</b>	<b>25003-153030</b>	<b>25003-154030</b>	<b>25003-154630</b>
5.0	30	<b>25005-031030</b>	<b>25005-032130</b>	<b>25005-033030</b>	<b>25005-034030</b>	<b>25005-034630</b>
	50	<b>25005-051030</b>	<b>25005-052130</b>	<b>25005-053030</b>	<b>25005-054030</b>	<b>25005-054630</b>
	100	<b>25005-101030</b>	<b>25005-102130</b>	<b>25005-103030</b>	<b>25005-104030</b>	<b>25005-104630</b>
	150	<b>25005-151030</b>	<b>25005-152130</b>	<b>25005-153030</b>	<b>25005-154030</b>	<b>25005-154630</b>
	250	<b>25005-251030</b>	<b>25005-252130</b>	<b>25005-253030</b>	<b>25005-254030</b>	<b>25005-254630</b>

Other custom column dimensions are available. Please call your local Customer Service for more information.

### Hypersil GOLD Drop-in Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>25003-011001</b>	<b>25003-012101</b>	<b>25003-013001</b>	<b>25003-014001</b>	<b>4 Pack</b>
5.0	10	<b>25005-011001</b>	<b>25005-012101</b>	<b>25005-013001</b>	<b>25005-014001</b>	<b>4 Pack</b>
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	<b>1 Each</b>

For ordering information about 1.9µm Hypersil GOLD columns, please see the Fast LC section of the catalogue

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### Hypersil GOLD Javelin HTS HPLC Columns

Particle size (µm)	20 x 4.0mm	20 x 2.1mm	10 x 2.1mm	Quantity
1.9	–	–	<b>25002-012135</b>	3 Pack
5.0	<b>25005-024035</b>	<b>25005-022135</b>	–	3 Pack
5.0	<b>25005-024036</b>	<b>25005-022136</b>	–	10 Pack

### Hypersil GOLD DASH HTS HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	Quantity
5.0	20	<b>25005-022151</b>	3 Pack

### Hypersil GOLD Preparative HPLC Columns

Particle size (µm)	Length (mm)	10mm ID	21mm ID	30mm ID	50mm ID
5.0	50	<b>25005-059070</b>	<b>25005-059270</b>	<b>25005-059370</b>	<b>25005-059570</b>
	100	<b>25005-109070</b>	<b>25005-109270</b>	<b>25005-109370</b>	<b>25005-109570</b>
	150	<b>25005-159070</b>	<b>25005-159270</b>	<b>25005-159370</b>	<b>25005-159570</b>
	250	<b>25005-259070</b>	<b>25005-259270</b>	<b>25005-259370</b>	<b>25005-259570</b>
12.0	50	<b>25012-059070</b>	<b>25012-059270</b>	<b>25012-059370</b>	<b>25012-059570</b>
	100	<b>25012-109070</b>	<b>25012-109270</b>	<b>25012-109370</b>	<b>25012-109570</b>
	150	<b>25012-159070</b>	<b>25012-159270</b>	<b>25012-159370</b>	<b>25012-159570</b>
	250	<b>25012-259070</b>	<b>25012-259270</b>	<b>25012-259370</b>	<b>25012-259570</b>

Other custom column dimensions are available. Please call your local Customer Service for more information. Stainless steel internal reducing unions to connect 30 to 50mm ID preparative columns to 1/16in tubing are available.

### Hypersil GOLD Preparative Guard Cartridge Systems

Particle size (µm)	10 x 10mm (ID x L)	20 x 20mm (ID x L)	Quantity
5.0	<b>25005-019023</b>	<b>25005-029223</b>	3 Pack
12.0	<b>25012-019023</b>	<b>25012-029223</b>	3 Pack
Preparative Guard Holder	<b>C-1000</b>	<b>F1403</b>	1 Each

### Hypersil GOLD Preparative HPLC Guard Columns

Particle size (µm)	10mm ID	21mm ID	Quantity
5.0	<b>25005-039022</b>	<b>25005-039222</b>	1 Each
12.0	<b>25012-039022</b>	<b>25012-039222</b>	1 Each



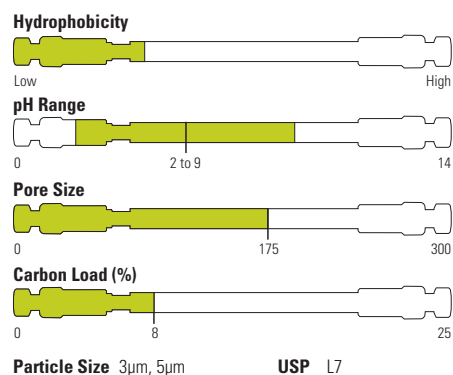
See our range of certified vials

➤ PAGE 2-013

## Hypersil GOLD C8 HPLC Columns

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



### Hypersil GOLD C8 HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>25203-031030</b>	<b>25203-032130</b>	<b>25203-033030</b>	<b>25203-034030</b>	<b>25203-034630</b>
	50	<b>25203-051030</b>	<b>25203-052130</b>	<b>25203-053030</b>	<b>25203-054030</b>	<b>25203-054630</b>
	100	<b>25203-101030</b>	<b>25203-102130</b>	<b>25203-103030</b>	<b>25203-104030</b>	<b>25203-104630</b>
	150	<b>25203-151030</b>	<b>25203-152130</b>	<b>25203-153030</b>	<b>25203-154030</b>	<b>25203-154630</b>
5.0	30	<b>25205-031030</b>	<b>25205-032130</b>	<b>25205-033030</b>	<b>25205-034030</b>	<b>25205-034630</b>
	50	<b>25205-051030</b>	<b>25205-052130</b>	<b>25205-053030</b>	<b>25205-054030</b>	<b>25205-054630</b>
	100	<b>25205-101030</b>	<b>25205-102130</b>	<b>25205-103030</b>	<b>25205-104030</b>	<b>25205-104630</b>
	150	<b>25205-151030</b>	<b>25205-152130</b>	<b>25205-153030</b>	<b>25205-154030</b>	<b>25205-154630</b>
	250	<b>25205-251030</b>	<b>25205-252130</b>	<b>25205-253030</b>	<b>25205-254030</b>	<b>25205-254630</b>

### Hypersil GOLD C8 Drop-in Guard Cartridges Guard Columns

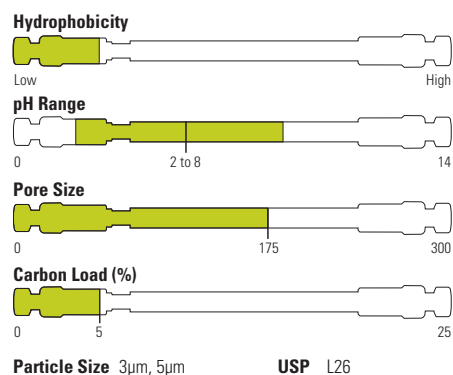
Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>25203-011001</b>	<b>25203-012101</b>	<b>25203-013001</b>	<b>25203-014001</b>	4 Pack
5.0	10	<b>25205-011001</b>	<b>25205-012101</b>	<b>25205-013001</b>	<b>25205-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each



## Hypersil GOLD C4 HPLC Columns

Lower hydrophobicity than C18 or C8 recommended for very hydrophobic analytes


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



### Hypersil GOLD C4 Analytical HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>25503-031030</b>	<b>25503-032130</b>	<b>25503-033030</b>	<b>25503-034030</b>	<b>25503-034630</b>
	50	<b>25503-051030</b>	<b>25503-052130</b>	<b>25503-053030</b>	<b>25503-054030</b>	<b>25503-054630</b>
	100	<b>25503-101030</b>	<b>25503-102130</b>	<b>25503-103030</b>	<b>25503-104030</b>	<b>25503-104630</b>
	150	<b>25503-151030</b>	<b>25503-152130</b>	<b>25503-153030</b>	<b>25503-154030</b>	<b>25503-154630</b>
5.0	30	<b>25505-031030</b>	<b>25505-032130</b>	<b>25505-033030</b>	<b>25505-034030</b>	<b>25505-034630</b>
	50	<b>25505-051030</b>	<b>25505-052130</b>	<b>25505-053030</b>	<b>25505-054030</b>	<b>25505-054630</b>
	100	<b>25505-101030</b>	<b>25505-102130</b>	<b>25505-103030</b>	<b>25505-104030</b>	<b>25505-104630</b>
	150	<b>25505-151030</b>	<b>25505-152130</b>	<b>25505-153030</b>	<b>25505-154030</b>	<b>25505-154630</b>
	250	<b>25505-251030</b>	<b>25505-252130</b>	<b>25505-253030</b>	<b>25505-254030</b>	<b>25505-254630</b>

### Hypersil GOLD C4 Drop-In Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>25503-011001</b>	<b>25503-012101</b>	<b>25503-013001</b>	<b>25503-014001</b>	4 Pack
5.0	10	<b>25505-011001</b>	<b>25505-012101</b>	<b>25505-013001</b>	<b>25505-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

Hypersil GOLD C4 columns provide similar selectivity to C18 and C8 columns but with reduced retention.

For ordering information about 1.9µm Hypersil GOLD columns, please see the Fast LC section of the catalogue

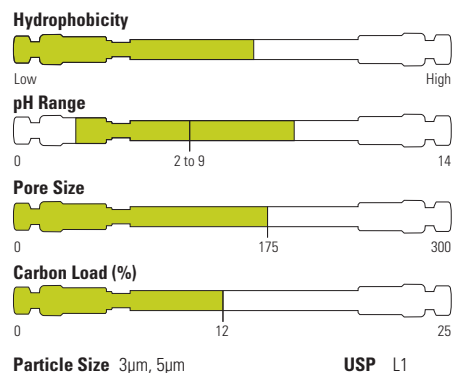
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## Hypersil GOLD aQ HPLC Columns

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




### Hypersil GOLD aQ Analytical HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>25303-031030</b>	<b>25303-032130</b>	<b>25303-033030</b>	<b>25303-034030</b>	<b>25303-034630</b>
	50	<b>25303-051030</b>	<b>25303-052130</b>	<b>25303-053030</b>	<b>25303-054030</b>	<b>25303-054630</b>
	100	<b>25303-101030</b>	<b>25303-102130</b>	<b>25303-103030</b>	<b>25303-104030</b>	<b>25303-104630</b>
	150	<b>25303-151030</b>	<b>25303-152130</b>	<b>25303-153030</b>	<b>25303-154030</b>	<b>25303-154630</b>
5.0	30	<b>25305-031030</b>	<b>25305-032130</b>	<b>25305-033030</b>	<b>25305-034030</b>	<b>25305-034630</b>
	50	<b>25305-051030</b>	<b>25305-052130</b>	<b>25305-053030</b>	<b>25305-054030</b>	<b>25305-054630</b>
	100	<b>25305-101030</b>	<b>25305-102130</b>	<b>25305-103030</b>	<b>25305-104030</b>	<b>25305-104630</b>
	150	<b>25305-151030</b>	<b>25305-152130</b>	<b>25305-153030</b>	<b>25305-154030</b>	<b>25305-154630</b>
	250	<b>25305-251030</b>	<b>25305-252130</b>	<b>25305-253030</b>	<b>25305-254030</b>	<b>25305-254630</b>

Other custom column dimensions are available. Please call your local Customer Service for more information.

### Hypersil GOLD aQ Drop-In Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>25303-011001</b>	<b>25303-012101</b>	<b>25303-013001</b>	<b>25303-014001</b>	4 Pack
5.0	10	<b>25305-011001</b>	<b>25305-012101</b>	<b>25305-013001</b>	<b>25305-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

Hypersil GOLD aQ columns provide enhanced retention and resolution of polar analytes.

### Hypersil GOLD aQ Preparative HPLC Columns

Particle Size (µm)	Length (mm)	10mm ID	21mm ID	30mm ID	50mm ID
5.0	50	<b>25305-059070</b>	<b>25305-059270</b>	<b>25305-059370</b>	<b>25305-059570</b>
	100	<b>25305-109070</b>	<b>25305-109270</b>	<b>25305-109370</b>	<b>25305-109570</b>
	150	<b>25305-159070</b>	<b>25305-159270</b>	<b>25305-159370</b>	<b>25305-159570</b>
	250	<b>25305-259070</b>	<b>25305-259270</b>	<b>25305-259370</b>	<b>25305-259570</b>

Other custom column dimensions are available. Please call your local Customer Service for more information.  
 Stainless steel internal reducing unions to connect 30 to 50mm ID preparative columns to 1/16in tubing are available.

### Hypersil GOLD aQ Preparative Guard Cartridge Systems

Particle Size (µm)	10 x 10mm	20 x 20mm	Quantity
5.0	<b>25305-019023</b>	<b>25305-029223</b>	3 Pack
Preparative Guard Holder	<b>C-1000</b>	<b>F1403</b>	1 Each

### Hypersil GOLD aQ Preparative Guard HPLC Columns

Particle Size (µm)	Length (mm)	10mm ID	21mm ID	Quantity
5.0	30	<b>25305-039022</b>	<b>25305-039222</b>	1 Each

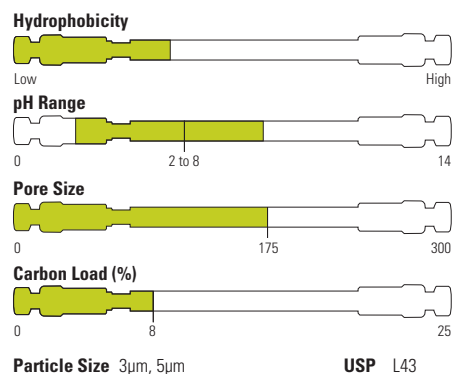
*For ordering information about  
 1.9µm Hypersil GOLD columns,  
 please see the Fast LC section  
 of the catalogue*

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## Hypersil GOLD PFP HPLC Columns

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




### Hypersil GOLD PFP HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>25403-031030</b>	<b>25403-032130</b>	<b>25403-033030</b>	<b>25403-034030</b>	<b>25403-034630</b>
	50	<b>25403-051030</b>	<b>25403-052130</b>	<b>25403-053030</b>	<b>25403-054030</b>	<b>25403-054630</b>
	100	<b>25403-101030</b>	<b>25403-102130</b>	<b>25403-103030</b>	<b>25403-104030</b>	<b>25403-104630</b>
	150	<b>25403-151030</b>	<b>25403-152130</b>	<b>25403-153030</b>	<b>25403-154030</b>	<b>25403-154630</b>
5.0	30	<b>25405-031030</b>	<b>25405-032130</b>	<b>25405-033030</b>	<b>25405-034030</b>	<b>25405-034630</b>
	50	<b>25405-051030</b>	<b>25405-052130</b>	<b>25405-053030</b>	<b>25405-054030</b>	<b>25405-054630</b>
	100	<b>25405-101030</b>	<b>25405-102130</b>	<b>25405-103030</b>	<b>25405-104030</b>	<b>25405-104630</b>
	150	<b>25405-151030</b>	<b>25405-152130</b>	<b>25405-153030</b>	<b>25405-154030</b>	<b>25405-154630</b>
	250	<b>25405-251030</b>	<b>25405-252130</b>	<b>25405-253030</b>	<b>25405-254030</b>	<b>25405-254630</b>

Other custom column dimensions are available. Please call your local Customer Service for more information.

### Hypersil GOLD PFP Drop-In Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>25403-011001</b>	<b>25403-012101</b>	<b>25403-013001</b>	<b>25403-014001</b>	4 Pack
5.0	10	<b>25405-011001</b>	<b>25405-012101</b>	<b>25405-013001</b>	<b>25405-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

For ordering information about 1.9µm Hypersil GOLD columns, please see the Fast LC section of the catalogue

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### Hypersil GOLD PFP Preparative HPLC Columns

Particle Size (µm)	Length (mm)	10mm ID	21mm ID	30mm ID	50mm ID
5.0	50	<b>25405-059070</b>	<b>25405-059270</b>	<b>25405-059370</b>	<b>25405-059570</b>
	100	<b>25405-109070</b>	<b>25405-109270</b>	<b>25405-109370</b>	<b>25405-109570</b>
	150	<b>25405-159070</b>	<b>25405-159270</b>	<b>25405-159370</b>	<b>25405-159570</b>
	250	<b>25405-259070</b>	<b>25405-259270</b>	<b>25405-259370</b>	<b>25405-259570</b>

Other custom column dimensions are available. Please call your local Customer Service for more information.  
 Stainless steel internal reducing unions to connect 30 to 50mm ID preparative columns to 1/16in tubing are available.

### Hypersil GOLD PFP Preparative Guard Cartridges

Particle Size (µm)	10 x 10mm	20 x 20mm	Quantity
5.0	<b>25405-019023</b>	<b>25405-029223</b>	3 Pack
Preparative Guard Holder	<b>C-1000</b>	<b>F1403</b>	1 Each

### Hypersil GOLD PFP Preparative HPLC Guard Columns

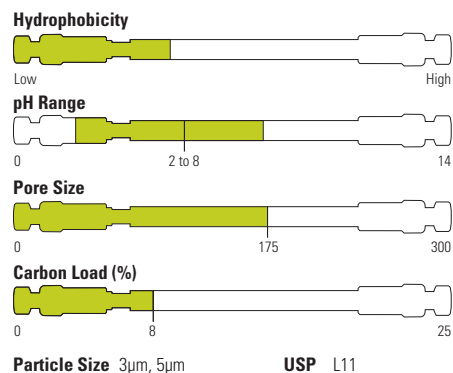
Particle Size (µm)	Length (mm)	10mm ID	21mm ID	Quantity
5.0	30	<b>25405-039022</b>	<b>25405-039222</b>	1 Each



## Hypersil GOLD Phenyl HPLC Columns

Contain 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




### Hypersil GOLD Phenyl Analytical HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>25903-031030</b>	<b>25903-032130</b>	<b>25903-033030</b>	<b>25903-034030</b>	<b>25903-034630</b>
	50	<b>25903-051030</b>	<b>25903-052130</b>	<b>25903-053030</b>	<b>25903-054030</b>	<b>25903-054630</b>
	100	<b>25903-101030</b>	<b>25903-102130</b>	<b>25903-103030</b>	<b>25903-104030</b>	<b>25903-104630</b>
	150	<b>25903-151030</b>	<b>25903-152130</b>	<b>25903-153030</b>	<b>25903-154030</b>	<b>25903-154630</b>
5.0	30	<b>25905-031030</b>	<b>25905-032130</b>	<b>25905-033030</b>	<b>25905-034030</b>	<b>25905-034630</b>
	50	<b>25905-051030</b>	<b>25905-052130</b>	<b>25905-053030</b>	<b>25905-054030</b>	<b>25905-054630</b>
	100	<b>25905-101030</b>	<b>25905-102130</b>	<b>25905-103030</b>	<b>25905-104030</b>	<b>25905-104630</b>
	150	<b>25905-151030</b>	<b>25905-152130</b>	<b>25905-153030</b>	<b>25905-154030</b>	<b>25905-154630</b>
	250	<b>25905-251030</b>	<b>25905-252130</b>	<b>25905-253030</b>	<b>25905-254030</b>	<b>25905-254630</b>

Other custom column dimensions are available. Please call your local Customer Service for more information.

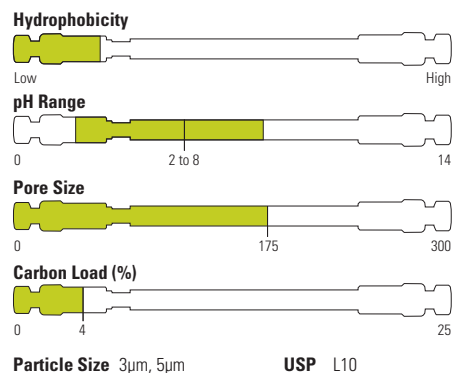
### Hypersil GOLD Phenyl Drop-in Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>25905-011001</b>	<b>25903-012101</b>	<b>25903-013001</b>	<b>25903-014001</b>	4 Pack
5.0	10	<b>25903-011001</b>	<b>25905-012101</b>	<b>25905-013001</b>	<b>25905-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

## Hypersil GOLD CN HPLC Columns

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




### Hypersil GOLD CN Analytical HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>25803-031030</b>	<b>25803-032130</b>	<b>25803-033030</b>	<b>25803-034030</b>	<b>25803-034630</b>
	50	<b>25803-051030</b>	<b>25803-052130</b>	<b>25803-053030</b>	<b>25803-054030</b>	<b>25803-054630</b>
	100	<b>25803-101030</b>	<b>25803-102130</b>	<b>25803-103030</b>	<b>25803-104030</b>	<b>25803-104630</b>
	150	<b>25803-151030</b>	<b>25803-152130</b>	<b>25803-153030</b>	<b>25803-154030</b>	<b>25803-154630</b>
5.0	30	<b>25805-031030</b>	<b>25805-032130</b>	<b>25805-033030</b>	<b>25805-034030</b>	<b>25805-034630</b>
	50	<b>25805-051030</b>	<b>25805-052130</b>	<b>25805-053030</b>	<b>25805-054030</b>	<b>25805-054630</b>
	100	<b>25805-101030</b>	<b>25805-102130</b>	<b>25805-103030</b>	<b>25805-104030</b>	<b>25805-104630</b>
	150	<b>25805-151030</b>	<b>25805-152130</b>	<b>25805-153030</b>	<b>25805-154030</b>	<b>25805-154630</b>
	250	<b>25805-251030</b>	<b>25805-252130</b>	<b>25805-253030</b>	<b>25805-254030</b>	<b>25805-254630</b>

Other custom column dimensions are available. Please call your local Customer Service for more information. Please note that Hypersil GOLD CN columns are shipped in iso-octane:ethanol. For reversed phase applications, flush with ethanol or 2-propanol prior to use.

### Hypersil GOLD CN Drop-in Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>25803-011001</b>	<b>25803-012101</b>	<b>25803-013001</b>	<b>25803-014001</b>	4 Pack
5.0	10	<b>25805-011001</b>	<b>25805-012101</b>	<b>25805-013001</b>	<b>25805-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

For ordering information about 1.9µm Hypersil GOLD columns, please see the Fast LC section of the catalogue

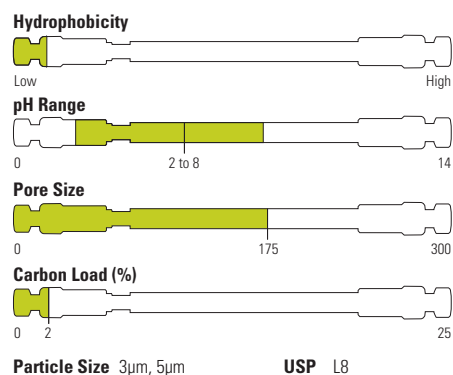
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## Hypersil GOLD Amino HPLC Columns

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




### Hypersil GOLD Amino HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>25703-031030</b>	<b>25703-032130</b>	<b>25703-033030</b>	<b>25703-034030</b>	<b>25703-034630</b>
	50	<b>25703-051030</b>	<b>25703-052130</b>	<b>25703-053030</b>	<b>25703-054030</b>	<b>25703-054630</b>
	100	<b>25703-101030</b>	<b>25703-102130</b>	<b>25703-103030</b>	<b>25703-104030</b>	<b>25703-104630</b>
	150	<b>25703-151030</b>	<b>25703-152130</b>	<b>25703-153030</b>	<b>25703-154030</b>	<b>25703-154630</b>
5.0	30	<b>25705-031030</b>	<b>25705-032130</b>	<b>25705-033030</b>	<b>25705-034030</b>	<b>25705-034630</b>
	50	<b>25705-051030</b>	<b>25705-052130</b>	<b>25705-053030</b>	<b>25705-054030</b>	<b>25705-054630</b>
	100	<b>25705-101030</b>	<b>25705-102130</b>	<b>25705-103030</b>	<b>25705-104030</b>	<b>25705-104630</b>
	150	<b>25705-151030</b>	<b>25705-152130</b>	<b>25705-153030</b>	<b>25705-154030</b>	<b>25705-154630</b>
	250	<b>25705-251030</b>	<b>25705-252130</b>	<b>25705-253030</b>	<b>25705-254030</b>	<b>25705-254630</b>

Other custom column dimensions are available. Please call your local Customer Service for more information. Please note that Hypersil GOLD CN columns are shipped in iso-octane:ethanol. For reversed phase applications, flush with ethanol or 2-propanol prior to use.

### Hypersil GOLD Amino Drop-In Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>25703-011001</b>	<b>25703-012101</b>	<b>25703-013001</b>	<b>25703-014001</b>	4 Pack
5.0	10	<b>25705-011001</b>	<b>25705-012101</b>	<b>25705-013001</b>	<b>25705-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

Hypersil GOLD Amino columns have an aminopropyl ligand bonded to highly pure base deactivated silica.

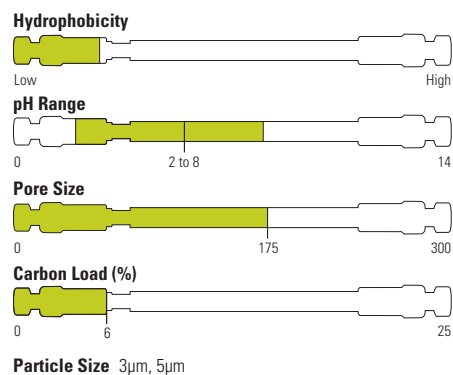
For ordering information about 1.9µm Hypersil GOLD columns, please see the Fast LC section of the catalogue

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## Hypersil GOLD AX HPLC Columns

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



### Hypersil GOLD AX HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>26103-031030</b>	<b>26103-032130</b>	<b>26103-033030</b>	<b>26103-034030</b>	<b>26103-034630</b>
	50	<b>26103-051030</b>	<b>26103-052130</b>	<b>26103-053030</b>	<b>26103-054030</b>	<b>26103-054630</b>
	100	<b>26103-101030</b>	<b>26103-102130</b>	<b>26103-103030</b>	<b>26103-104030</b>	<b>26103-104630</b>
	150	<b>26103-151030</b>	<b>26103-152130</b>	<b>26103-153030</b>	<b>26103-154030</b>	<b>26103-154630</b>
5.0	30	<b>26105-031030</b>	<b>26105-032130</b>	<b>26105-033030</b>	<b>26105-034030</b>	<b>26105-034630</b>
	50	<b>26105-051030</b>	<b>26105-052130</b>	<b>26105-053030</b>	<b>26105-054030</b>	<b>26105-054630</b>
	100	<b>26105-101030</b>	<b>26105-102130</b>	<b>26105-103030</b>	<b>26105-104030</b>	<b>26105-104630</b>
	150	<b>26105-151030</b>	<b>26105-152130</b>	<b>26105-153030</b>	<b>26105-154030</b>	<b>26105-154630</b>
	250	<b>26105-251030</b>	<b>26105-252130</b>	<b>26105-253030</b>	<b>26105-254030</b>	<b>26105-254630</b>

### Hypersil GOLD AX Drop-In Guard Cartridges

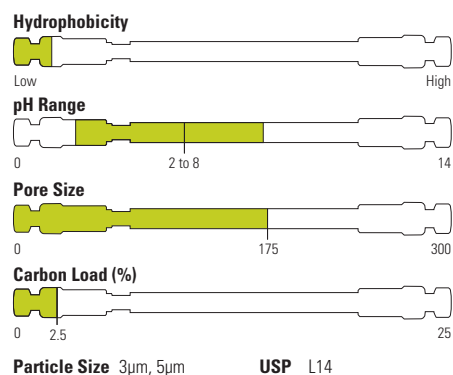
Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>26103-011001</b>	<b>26103-012101</b>	<b>26103-013001</b>	<b>26103-014001</b>	4 Pack
5.0	10	<b>26105-011001</b>	<b>26105-012101</b>	<b>26105-013001</b>	<b>26105-014001</b>	4 Pack
 UNIGUARD Drop-in Guard Cartridge Holder		<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

Hypersil GOLD AX provides separation of smaller proteins, peptides, anionic species and polar molecules.

## Hypersil GOLD SAX HPLC Columns

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



### Hypersil GOLD AX HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>26303-031030</b>	<b>26303-032130</b>	<b>26303-033030</b>	<b>26303-034030</b>	<b>26303-034630</b>
	50	<b>26303-051030</b>	<b>26303-052130</b>	<b>26303-053030</b>	<b>26303-054030</b>	<b>26303-054630</b>
	100	<b>26303-101030</b>	<b>26303-102130</b>	<b>26303-103030</b>	<b>26303-104030</b>	<b>26303-104630</b>
	150	<b>26303-151030</b>	<b>26303-152130</b>	<b>26303-153030</b>	<b>26303-154030</b>	<b>26303-154630</b>
5.0	30	<b>26305-031030</b>	<b>26305-032130</b>	<b>26305-033030</b>	<b>26305-034030</b>	<b>26305-034630</b>
	50	<b>26305-051030</b>	<b>26305-052130</b>	<b>26305-053030</b>	<b>26305-054030</b>	<b>26305-054630</b>
	100	<b>26305-101030</b>	<b>26305-102130</b>	<b>26305-103030</b>	<b>26305-104030</b>	<b>26305-104630</b>
	150	<b>26305-151030</b>	<b>26305-152130</b>	<b>26305-153030</b>	<b>26305-154030</b>	<b>26305-154630</b>
	250	<b>26305-251030</b>	<b>26305-252130</b>	<b>26305-253030</b>	<b>26305-254030</b>	<b>26305-254630</b>

### Hypersil GOLD AX Drop-In Guard Cartridges

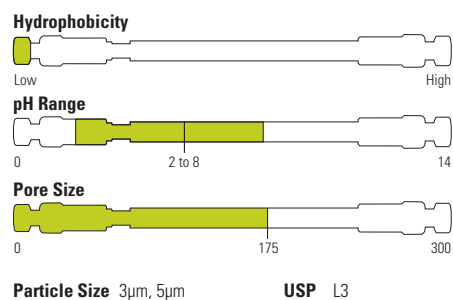
Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>26303-011001</b>	<b>26303-012101</b>	<b>26303-013001</b>	<b>26303-014001</b>	4 Pack
5.0	10	<b>26305-011001</b>	<b>26305-012101</b>	<b>26305-013001</b>	<b>26305-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

Hypersil GOLD SAX columns have a quaternary amine ion exchange ligand bonded to highly pure silica.

## Hypersil GOLD Silica HPLC Columns

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



### Hypersil GOLD Silica HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>25103-031030</b>	<b>25103-032130</b>	<b>25103-033030</b>	<b>25103-034030</b>	<b>25103-034630</b>
	50	<b>25103-051030</b>	<b>25103-052130</b>	<b>25103-053030</b>	<b>25103-054030</b>	<b>25103-054630</b>
	100	<b>25103-101030</b>	<b>25103-102130</b>	<b>25103-103030</b>	<b>25103-104030</b>	<b>25103-104630</b>
	150	<b>25103-151030</b>	<b>25103-152130</b>	<b>25103-153030</b>	<b>25103-154030</b>	<b>25103-154630</b>
5.0	30	<b>25105-031030</b>	<b>25105-032130</b>	<b>25105-033030</b>	<b>25105-034030</b>	<b>25105-034630</b>
	50	<b>25105-051030</b>	<b>25105-052130</b>	<b>25105-053030</b>	<b>25105-054030</b>	<b>25105-054630</b>
	100	<b>25105-101030</b>	<b>25105-102130</b>	<b>25105-103030</b>	<b>25105-104030</b>	<b>25105-104630</b>
	150	<b>25105-151030</b>	<b>25105-152130</b>	<b>25105-153030</b>	<b>25105-154030</b>	<b>25105-154630</b>
	250	<b>25105-251030</b>	<b>25105-252130</b>	<b>25105-253030</b>	<b>25105-254030</b>	<b>25105-254630</b>

### Hypersil GOLD Silica Drop-In Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>25103-011001</b>	<b>25103-012101</b>	<b>25103-013001</b>	<b>25103-014001</b>	4 Pack
5.0	10	<b>25105-011001</b>	<b>25105-012101</b>	<b>25105-013001</b>	<b>25105-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

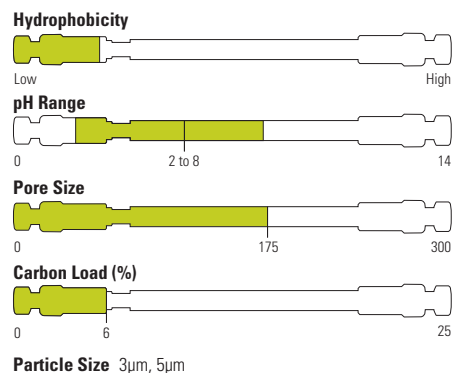
Hypersil GOLD Silica columns are a powerful and efficient tool for the chromatography of nonpolar and moderately polar organic compounds by normal phase chromatography.

*Thermo Scientific high-performance chromatography refrigerators offer close temperature control, instrumentation access and easy set-up.*  
[www.thermoscientific.com/cold](http://www.thermoscientific.com/cold)

## Hypersil GOLD HILIC HPLC Columns

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



### Hypersil GOLD HILIC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
3.0	30	<b>26503-031030</b>	<b>26503-032130</b>	<b>26503-033030</b>	<b>26503-034030</b>	<b>26503-034630</b>
	50	<b>26503-051030</b>	<b>26503-052130</b>	<b>26503-053030</b>	<b>26503-054030</b>	<b>26503-054630</b>
	100	<b>26503-101030</b>	<b>26503-102130</b>	<b>26503-103030</b>	<b>26503-104030</b>	<b>26503-104630</b>
	150	<b>26503-151030</b>	<b>26503-152130</b>	<b>26503-153030</b>	<b>26503-154030</b>	<b>26503-154630</b>
5.0	30	<b>26505-031030</b>	<b>26505-032130</b>	<b>26505-033030</b>	<b>26505-034030</b>	<b>26505-034630</b>
	50	<b>26505-051030</b>	<b>26505-052130</b>	<b>26505-053030</b>	<b>26505-054030</b>	<b>26505-054630</b>
	100	<b>26505-101030</b>	<b>26505-102130</b>	<b>26505-103030</b>	<b>26505-104030</b>	<b>26505-104630</b>
	150	<b>26505-151030</b>	<b>26505-152130</b>	<b>26505-153030</b>	<b>26505-154030</b>	<b>26505-154630</b>
	250	<b>26505-251030</b>	<b>26505-252130</b>	<b>26505-253030</b>	<b>26505-254030</b>	<b>26505-254630</b>

### Hypersil GOLD HILIC Drop-In Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
3.0	10	<b>26503-011001</b>	<b>26503-012101</b>	<b>26503-013001</b>	<b>26503-014001</b>	4 pack
5.0	10	<b>26505-011001</b>	<b>26505-012101</b>	<b>26505-013001</b>	<b>26505-014001</b>	4 pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each







# Thermo Scientific Acclaim HPLC Columns

Optimal selectivity through innovative chemistry

- Ultrapure, porous, spherical silica
- Novel and proprietary surface chemistries for diversified selectivities
- High efficiencies with symmetrical peak shapes
- Low silanol activity for good basic analyte peak shapes
- Reliable manufacturing process with thorough testing for reproducibility
- LC/MS compatible

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 such applications as pharmaceutical, environmental, food and beverage, chemical, and consumer products. General reversed-phase, HILIC phases and Specialty phases are available.

## 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.

## Hydrophilic Interaction Columns

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

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

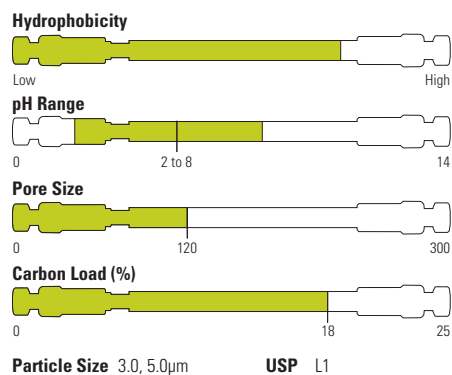
*Acclaim Rapid Separation LC (RSLC) 2.2µm and 3.0µm columns of various surface chemistries for high-throughput, high-resolution analysis with reduced solvent consumption*

➤➤ PAGE 4-046

## Acclaim 120 C18 HPLC Columns

High performance reversed-phase columns for reproducible results

- Low silanol activity for excellent peak shapes for basic analytes
- High hydrophobic retention
- Excellent efficiencies for maximum resolution
- Reproducible manufacturing practices for reproducible column-to-column performance
- Extremely low bleed, fully compatible with MS



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.

### Acclaim 120 C18 HPLC Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	33	—	<b>066272</b>	—
	50	<b>059128</b>	<b>068971</b>	<b>059131</b>
	75	—	<b>066273</b>	—
	100	<b>059129</b>	<b>076186</b>	<b>059132</b>
	150	<b>059130</b>	<b>063691</b>	<b>059133</b>
	250	<b>076187</b>	<b>070077</b>	—
5.0	50	<b>059142</b>	—	<b>059146</b>
	100	<b>059143</b>	—	<b>059147</b>
	150	<b>059144</b>	—	<b>059148</b>
	250	<b>059145</b>	—	<b>059149</b>

Rapid Separation 2.2µm columns are available, see Fast LC section.

### Acclaim 120 C18 HPLC Guards

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	<b>069689</b>	<b>071981</b>	<b>069695</b>

### Acclaim 120 C18 HPLC Guard Holder

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>

**Column:** **A: Acclaim 120 C18, 5µm, 4.6 × 150mm**  
**B, C: Acclaim RSLC C18, 2µm, 2.1 × 50mm**

**Mobile Phase:** 200mM HOAc in 10% (v/v) MeOH

**Flow:** A: 1.00mL/min  
 B: 0.41mL/min  
 C: 0.82mL/min

**Temperature:** 20°C

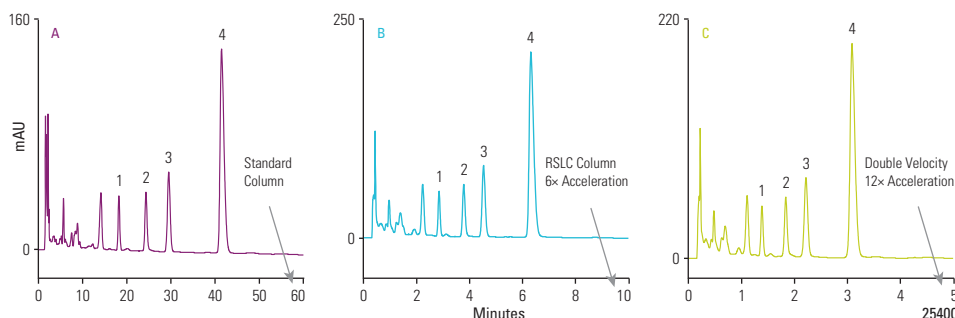
**Injection:** A: 10µL  
 B: 1.2µL  
 C: 1.2µL

**Detector:** UV, 254 nm,  
 A: 1 Hz data rate  
 B: 5 Hz data rate  
 C: 10 Hz data rate

**Peaks:** 1. p-Hydroxybenzoic acid  
 2. p-Hydroxybenzaldehyde  
 3. Vanillic acid  
 4. Vanillin

**Sample:** Commercial vanilla extract in 40% ethanol, filtered

**Reference:** AOAC Official Method 990.25

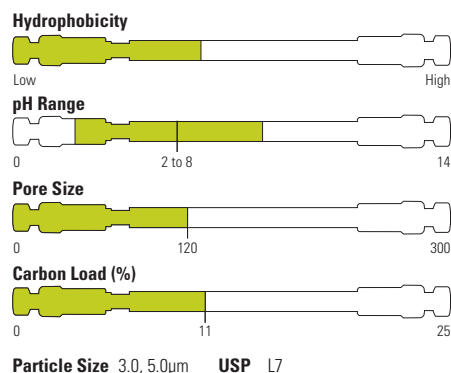


## Acclaim 120 C8 HPLC Columns

High performance reversed-phase columns for 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

Acclaim 120 C8 reversed-phase columns feature a densely bonded monolayer C8 ligands on a pure, 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.



### Acclaim 120 C8 HPLC Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	50	<b>59122</b>	–	<b>59125</b>
	100	<b>59123</b>	<b>076184</b>	<b>59126</b>
	150	<b>59124</b>	<b>68970</b>	<b>59127</b>
	250	<b>076185</b>	<b>70078</b>	–
5.0	50	<b>59134</b>	–	<b>59138</b>
	100	<b>59135</b>	–	<b>59139</b>
	150	<b>59136</b>	–	<b>59140</b>
	250	<b>59137</b>	–	<b>59141</b>

### Acclaim 120 C8 HPLC Guards

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	<b>069688</b>	<b>071979</b>	<b>069696</b>

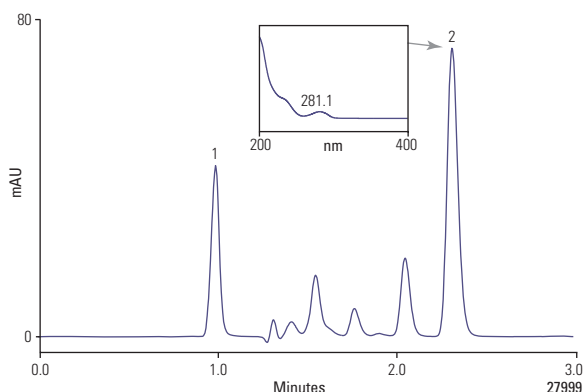
### Acclaim 120 C8 HPLC Guard Holder

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>

For ordering information about 2.2µm Acclaim C8 columns, please see the Fast LC section of the catalogue

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### 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 HPLC Columns

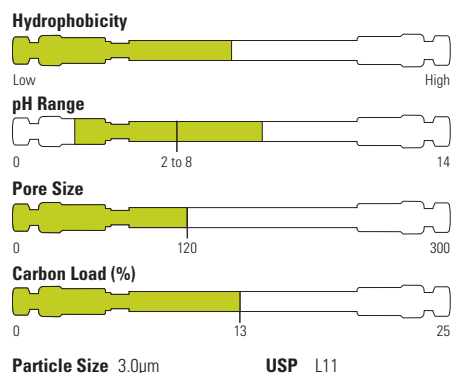
A unique reversed-phase column with high aromatic selectivity

- 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 higher  $\pi$ - $\pi$  interaction than other phenyl phases.

The Acclaim Phenyl-1 column can be used in a wide range of application 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.



### Acclaim Phenyl-1 HPLC Columns

Particle Size ( $\mu\text{m}$ )	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	50	<b>078016</b>	<b>071972</b>	<b>078018</b>
	100	<b>078015</b>	<b>074693</b>	<b>078017</b>
	150	<b>071971</b>	<b>071970</b>	<b>071969</b>
	250	<b>078014</b>	<b>074694</b>	–

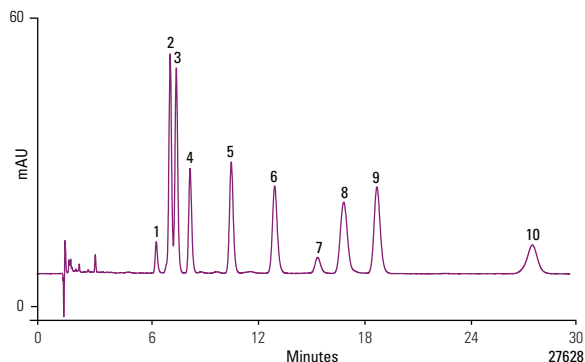
### Acclaim Phenyl-1 HPLC Guards

Particle Size ( $\mu\text{m}$ )	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	10	<b>071975</b>	<b>071974</b>	<b>071973</b>

### Acclaim Phenyl-1 HPLC Guard Holder

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>

### Separation of fat-soluble vitamins



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

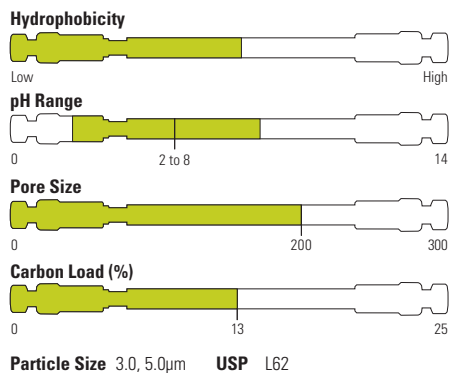
Dimension:	3.0 × 150mm
Mobile Phase:	Methanol/water v/v 90/10
Temperature:	30°C
Flow Rate:	0.5mL/min
Inj. Volume:	2 $\mu\text{L}$
Detection:	UV at 220nm
Peaks:	(100 ppm each)
	1. Retinol acetate (vitamin A acetate)
	2. Vitamin D2
	3. Vitamin D3
	4. -Tocopherol
	5. -Tocopherol
	6. -Tocopherol (vitamin E)
	7. Impurity (unknown)
	8. Vitamin E acetate
	9. Vitamin K2
	10. Vitamin K1

## Acclaim C30 HPLC Columns

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 columns – 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).



### Acclaim C30 HPLC Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	150	<b>075725</b>	<b>075724</b>	<b>075723</b>
	250	–	<b>075726</b>	–
5.0	150	–	–	<b>075719</b>
	250	–	–	<b>075718</b>

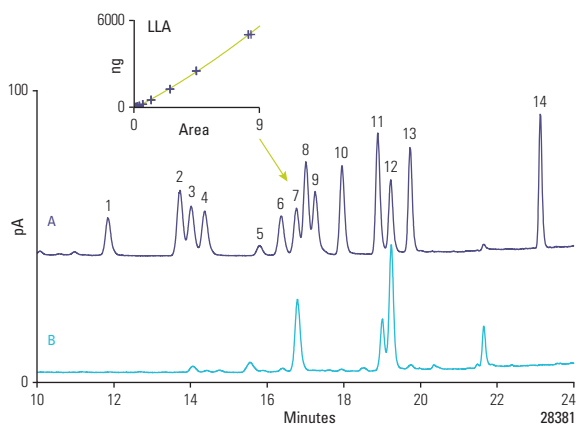
### Acclaim C30 HPLC Guards

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	10	<b>075722</b>	<b>075721</b>	<b>075720</b>

### Acclaim C30 HPLC Guard Holder

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>

### Separation of Omega fatty acids



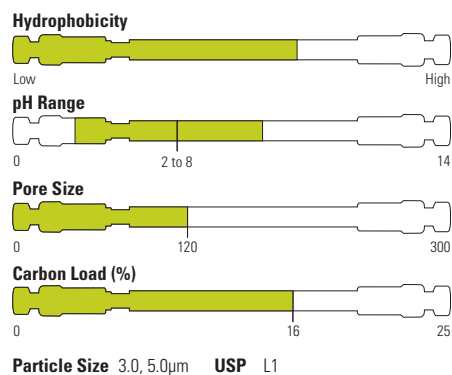
#### Column: Acclaim C30, 5µm (4.6 × 150mm)

LC System:	UltiMate 3000 RS, Dual Gradient	
Mobile Phases:	A. Water:formic acid:mobile phase B 900:3.6:100 (v/v/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 HPLC Columns

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



### Acclaim Polar Advantage (PA) HPLC Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	33	–	<b>066274</b>	–
	50	<b>063174</b>	<b>068972</b>	–
	75	–	<b>066275</b>	–
	100	<b>061316</b>	<b>076214</b>	<b>076216</b>
	150	<b>061317</b>	<b>063693</b>	<b>061318</b>
	250	<b>076215</b>	<b>070079</b>	–
5.0	50	–	–	<b>061319</b>
	150	–	–	<b>061320</b>
	250	–	–	<b>061321</b>

Rapid Separation 2.2µm columns are available, see Fast LC section.

### Acclaim Polar Advantage (PA) HPLC Guards

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	<b>069691</b>	<b>071983</b>	<b>069698</b>

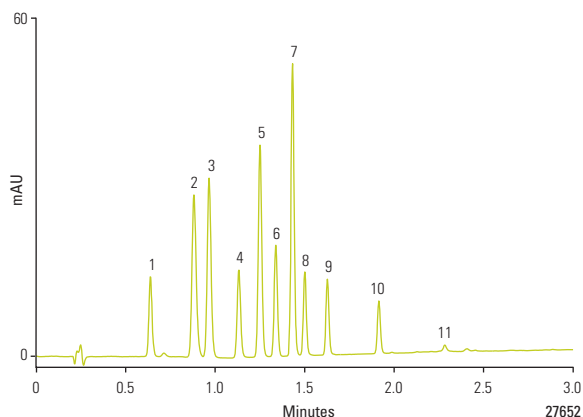
### Acclaim Polar Advantage (PA) HPLC Guard Holder

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 Polar Advantage (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 Separated Using the Acclaim RSLC PolarAdvantage Column



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

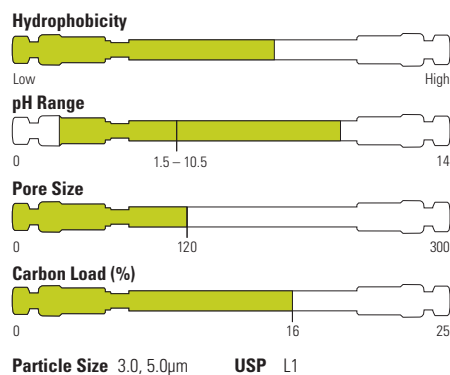
Dimensions:	3.0 × 50mm
System:	UltiMate® 3000 RSLC
Mobile Phases:	A: 10mM formic acid + 10mM ammonium formate, pH 3.75 ± 0.05 B: Acetonitrile
Gradient Time (min):	-1.5 0.0 0.3 2.6 3.0 %A 70 70 70 10 10 %B 30 30 30 90 90
Flow Rate:	1.25mL/min
Temperature:	30°C
Injection Volume:	0.5µL
Detection:	UV at 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 HPLC Columns

Complementary selectivity and enhanced hydrolytic stability

- Novel polar-embedded column chemistry
- Unique selectivity complementary to the C18 column
- Compatible with 100% aqueous mobile phase
- Low bleed for MS compatibility
- Wide range of applications



Acclaim Polar Advantage II (PA2) columns feature a patented surface chemistry that incorporates 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.

### Acclaim Polar Advantage II (PA2) HPLC Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	33	–	<b>066276</b>	–
	50	<b>077999</b>	<b>068973</b>	<b>063189</b>
	75	–	<b>066277</b>	–
	100	<b>077998</b>	<b>078000</b>	<b>078001</b>
	150	<b>063187</b>	<b>063705</b>	<b>063191</b>
	250	<b>077997</b>	<b>070080</b>	–
5.0	150	–	–	<b>063197</b>
	250	–	–	<b>063199</b>

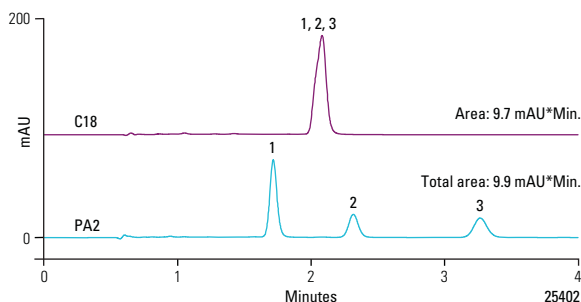
### Acclaim Polar Advantage II (PA2) HPLC Guards

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	<b>069692</b>	<b>071985</b>	<b>069699</b>

### Acclaim Polar Advantage II (PA2) HPLC Guard Holder

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>

### The Acclaim PA2 column provides greater selectivity in this separation of turmeric



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

For ordering information about 2.2µm Acclaim PA2 columns, please see the Fast LC section of the catalogue

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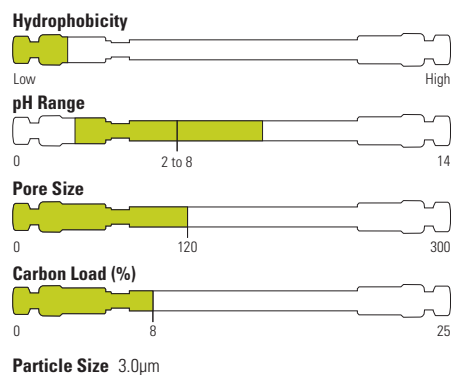
## Acclaim HILIC-10 HPLC Columns

Designed for unique selectivity for hydrophobic 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.

The advantage of the Acclaim HILIC-10 phase is its compatibility with up to 20% aqueous mobile phase, while maintaining affinity for polar analytes.



### Acclaim HILIC-10 HPLC Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	150	<b>074259</b>	<b>074258</b>	<b>074257</b>

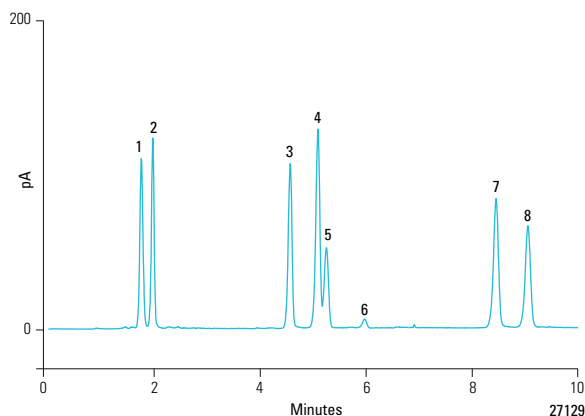
### Acclaim HILIC-10 HPLC Guards

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	10	<b>074263</b>	<b>074261</b>	<b>074262</b>

### Acclaim HILIC-10 HPLC Guard Holder

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>

### Class Separation of Glycerides



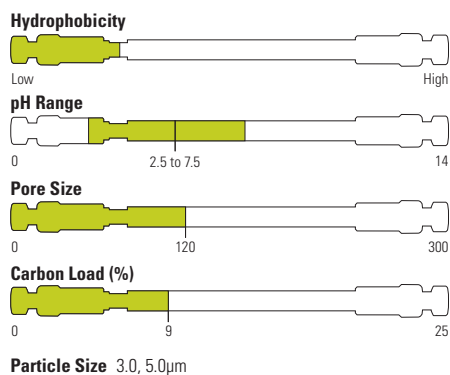
#### Column: Acclaim HILIC-10, 3µm

Dimensions:	3.0 × 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 1.14 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 HPLC Columns

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 to conventional diol-based columns
- High-efficiency column for high-resolution separations



### Acclaim Mixed-Mode HILIC-1 HPLC Columns

Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	50	–	<b>071912</b>	–
	150	<b>070091</b>	<b>070090</b>	–
5.0	150	<b>066847</b>	–	<b>066843</b>
	250	–	–	<b>066844</b>

### Acclaim Mixed-Mode HILIC-1 HPLC Guards

Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	<b>069694</b>	<b>071913</b>	<b>069706</b>

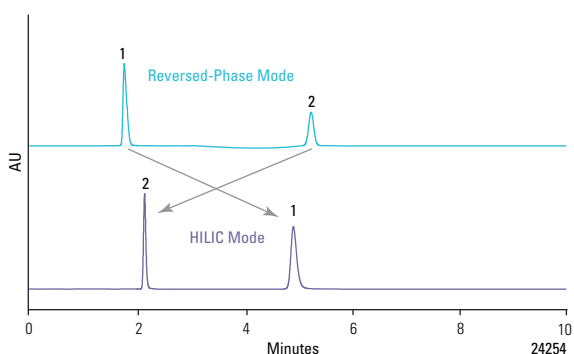
### Acclaim Mixed-Mode HILIC-1 HPLC Guard Holder

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>

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 nonionic ethoxylated surfactants, drug metabolites, lipids, polyethylene glycols (PEGs), ethoxylated surfactants, and more.

### All the advantages of reversed-phase and HILIC compatibilities in one column



#### 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)

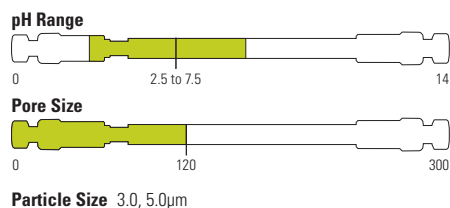
## Acclaim Mixed-Mode WAX-1 HPLC Columns

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, cation-exclusion, 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, cation-exclusion, 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 electro-static interactions.



### Acclaim Mixed-Mode WAX-1 HPLC Columns

Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	50	–	<b>071908</b>	–
	150	<b>070089</b>	<b>070088</b>	–
5.0	150	<b>067084</b>	–	<b>064984</b>
	250	–	–	<b>064985</b>

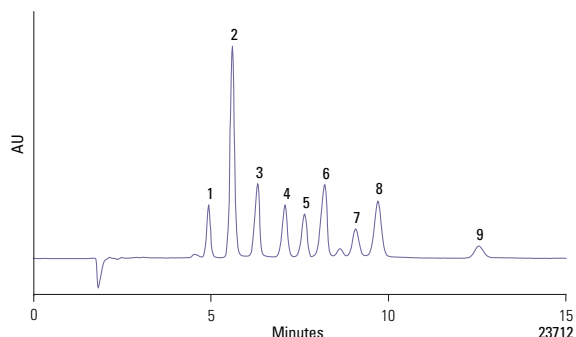
### Acclaim Mixed-Mode WAX-1 HPLC Guards

Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	<b>069686</b>	<b>071909</b>	<b>069704</b>

### Acclaim Mixed-Mode WAX-1 HPLC Guard Holder

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>

### Separation of monocarboxylic acids



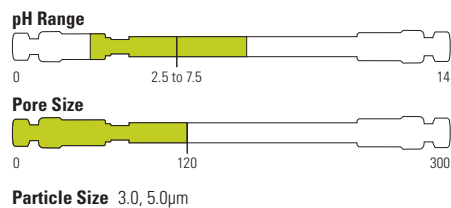
#### Column: Acclaim Mixed-Mode WAX-1, 5 μm

Dimensions:	4.6 × 150mm
Mobile Phase:	25mM phosphate buffer, pH 6
Temperature:	30°C
Flow Rate:	0.8mL/min
Inj. Volume:	10 μL
Detection:	UV, 210nm
Peaks:	1. Quinic acid 2. Shikimic acid 3. Glycolic acid 4. Lactic acid 5. Acetic acid 6. Formic acid 7. Ascorbic acid (Vitamin C) 8. Iso-ascorbic acid 9. Propionic acid

## Acclaim Mixed-Mode WCX-1 HPLC Columns

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



### Acclaim Mixed-Mode WCX-1 HPLC Columns

Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	50	–	<b>071910</b>	–
	150	<b>070093</b>	<b>070092</b>	–
5.0	150	<b>068371</b>	–	<b>068353</b>
	250	–	–	<b>068352</b>

### Acclaim Mixed-Mode WCX-1 HPLC Guards

Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	–	<b>071911</b>	<b>069705</b>

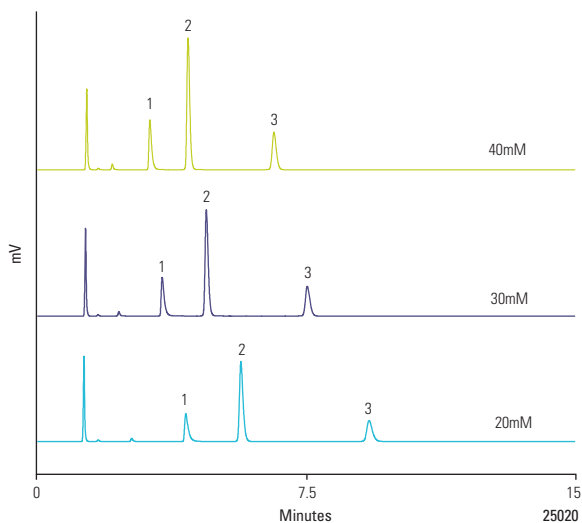
### Acclaim Mixed-Mode WCX-1 HPLC Guard Holder

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>

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.

### Simultaneous separation of pharmaceutical counterions



**Column: Acclaim Mixed-Mode WCX-1, 5.0 μm**  
**Dimension: 4.6 × 150mm**

Mobile Phase: 50/50 v/v CH<sub>3</sub>CN/NH<sub>4</sub>OAc, pH 5.2

Temperature: 30°C

Flow Rate: 1mL/min

Inj. Volume: 5 μL

Detection: ELS detector

Peaks: (300 ppm each)

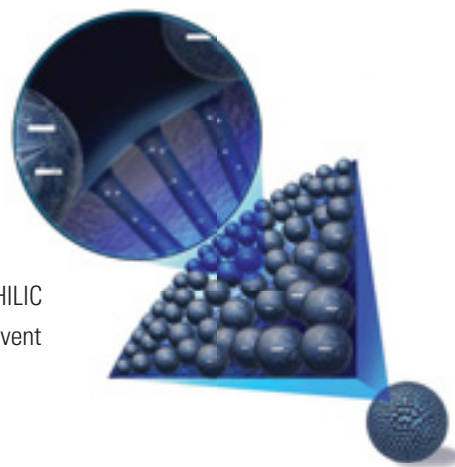
1. (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>)<sub>4</sub>N<sup>+</sup>

2. (CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>)<sub>4</sub>N<sup>+</sup>

3. (CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>)<sub>4</sub>N<sup>+</sup>

## Acclaim Trinity P1 HPLC Columns

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



- Multiple retention mechanisms: anion exchange, cation exchange, reversed-phase, and HILIC
- Adjustable selectivity by mobile phase ionic strength, electrolyte type, pH, and organic solvent
- Ideal selectivity for simultaneous separation of API and counterion
- Low bleed and MS compatible
- Selectivity orthogonal to reversed-phase columns
- Retention of ionic and ionizable analytes without ion-pairing reagents
- Greater flexibility in method development: each retention mechanisms can be controlled independently

### Acclaim Trinity HPLC Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID
3.0	50	<b>075565</b>	<b>071388</b>
	100	<b>071389</b>	<b>071387</b>
	150	<b>075564</b>	<b>075563</b>

### Acclaim Trinity HPLC Guards

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID
3.0	10	<b>071391</b>	<b>071390</b>

### Acclaim Trinity HPLC Guard Holder

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>

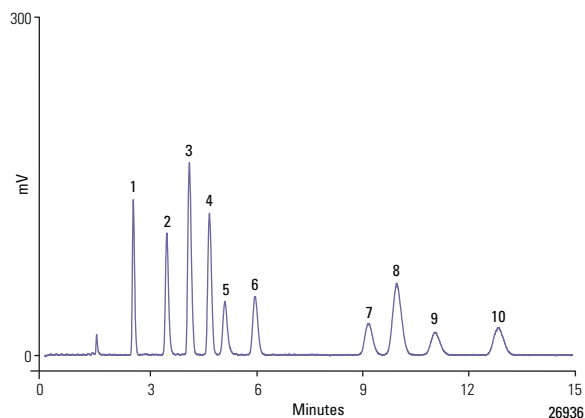
The Acclaim Trinity P1 HPLC column is designed with unique multimode surface chemistry ideal for the simultaneous separation of drugs and their counterions. The surface chemistry concurrently provides reversed-phase, cation exchange, and anion exchange functionalities. The result is maximum flexibility 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.

### Separates Drugs and Counterions

The Acclaim Trinity P1 retains both cations and anions at the same time. Acclaim Trinity P1 can baseline separate both ions and the drug. The adjustable selectivity also allows for separation optimization with increased resolution. This can result in faster separations and higher throughput.

### 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

## Dionex OmniPac HPLC Columns

DBV 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

The Thermo Scientific Dionex OmniPac™ PAX-100 column is 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.

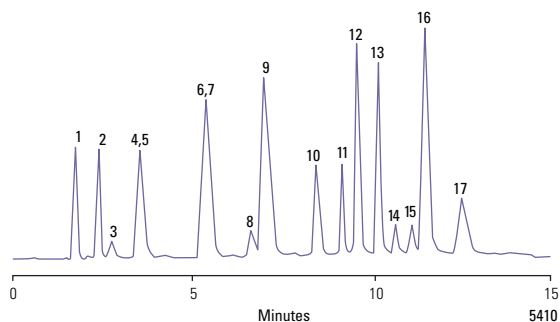
### Dionex OmniPac Anion Exchange HPLC Columns

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

### Dionex OmniPac Cation Exchange-HPLC Columns

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

### Gradient separation of N-containing compounds



**Column: Dionex OmniPac PCX-500 (4 x 250mm)**

Eluent: Acetonitrile/Sodium Chloride/Hydrochloric Acid Gradient

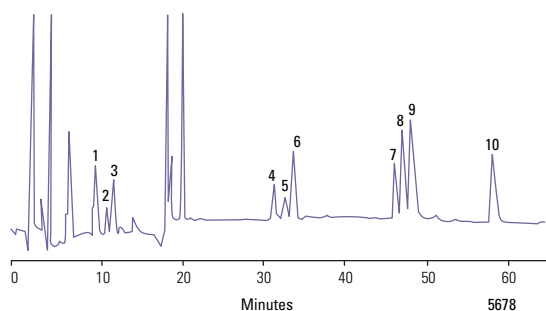
Flow Rate: 1.0mL/min

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 HPLC Columns

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

- 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

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.

### Dionex IonPac Polymeric Reversed-Phase HPLC Columns

Description	Particle Size (µm)	Length (mm)	4.0mm ID
NS1	10.0	35	<b>039567</b>
NS1	10.0	250	<b>035321</b>
NS1	5.0	150	<b>039568</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.

- 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 two particle sizes are: 1.7µm for rapid UHPLC separations 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 stationary phase, measuring hydrophobicity, shape selectivity and secondary interactions with bases, acids and chelators.
- New, enhanced, automated packing methods drive consistency even further and every column is individually tested to ensure that it meets the required quality.

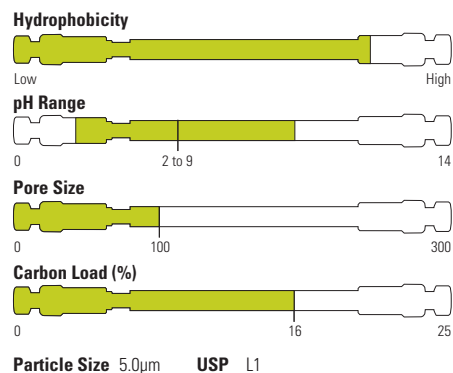
For full details on the Synchronis column range, please request or view a copy of our Synchronis technical guide [www.thermoscientific.com/synchronis](http://www.thermoscientific.com/synchronis)



## Synchronis C18 HPLC Columns

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.

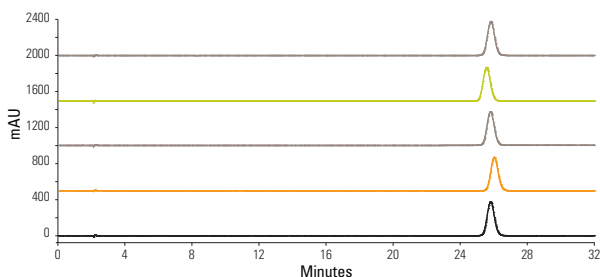
### Synchronis C18 HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	30	<b>97105-032130</b>	<b>97105-033030</b>	<b>97105-034030</b>	<b>97105-034630</b>
	50	<b>97105-052130</b>	<b>97105-053030</b>	<b>97105-054030</b>	<b>97105-054630</b>
	100	<b>97105-102130</b>	<b>97105-103030</b>	<b>97105-104030</b>	<b>97105-104630</b>
	150	<b>97105-152130</b>	<b>97105-153030</b>	<b>97105-154030</b>	<b>97105-154630</b>
	250	<b>97105-252130</b>	<b>97105-253030</b>	<b>97105-254030</b>	<b>97105-254630</b>

### Synchronis C18 Drop-in guard cartridges (4 pack)

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	<b>97105-012101</b>	<b>97105-013001</b>	<b>97105-014001</b>	4 Pack
 UNIGUARD Drop-in Guard Cartridge Holder		<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### Zidovudine

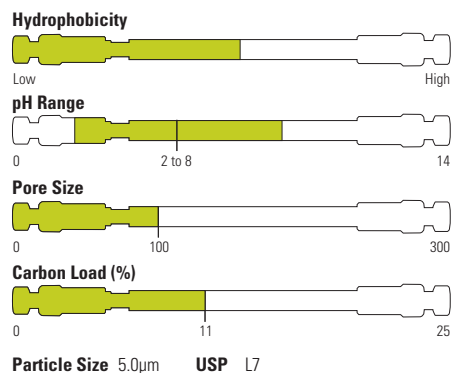


**Column: Synchronis C18, 5µm, 150mm x 4.6mm**  
 Mobile phase: Water:Methanol (4:1)  
 Flow rate: 1.0mL min<sup>-1</sup>  
 Temperature: 25°C  
 Detection: 265nm  
 Injection volume: 10µL  
 1. Zidovudine

## Synchronis C8 HPLC Columns

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



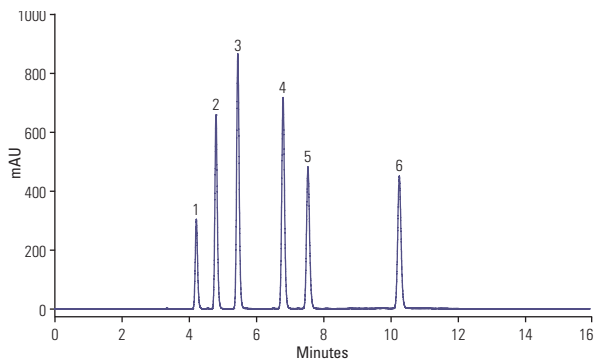
### Synchronis C8 HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	30	97205-032130	97205-033030	97205-034030	97205-034630
	50	97205-052130	97205-053030	97205-054030	97205-054630
	100	97205-102130	97205-103030	97205-104030	97205-104630
	150	97205-152130	97205-153030	97205-154030	97205-154630
	250	97205-252130	97205-253030	97205-254030	97205-254630

### Synchronis C8 Drop-in guard cartridges (4 pack)

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	97205-012101	97205-013001	97205-014001	4 Pack
 UNIGUARD Drop-in Guard Cartridge Holder		852-00	852-00	850-00	1 Each

### 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

For ordering information about 1.7µm Synchronis columns, please see the Fast LC section of the catalogue

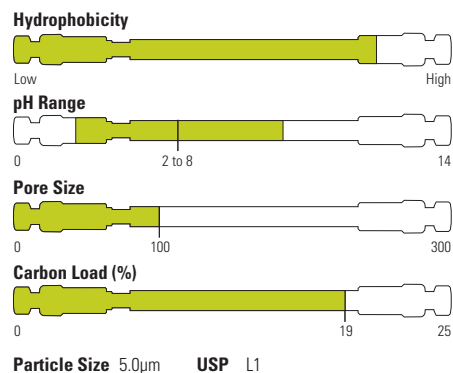
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## Synchronis aQ HPLC Columns

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.



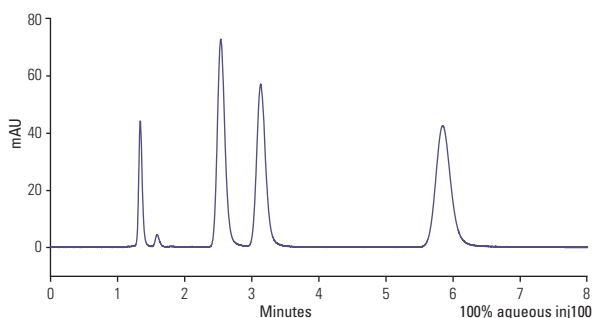
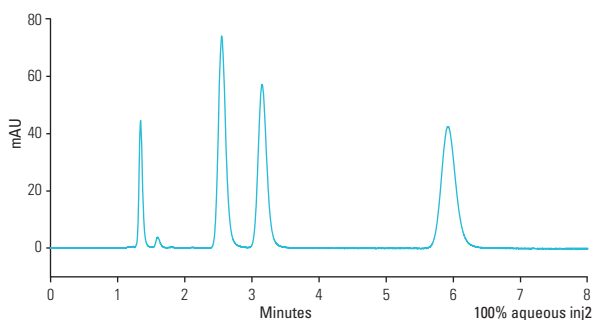
### Synchronis aQ HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	30	<b>97305-032130</b>	<b>97305-033030</b>	<b>97305-034030</b>	<b>97305-034630</b>
	50	<b>97305-052130</b>	<b>97305-053030</b>	<b>97305-054030</b>	<b>97305-054630</b>
	100	<b>97305-102130</b>	<b>97305-103030</b>	<b>97305-104030</b>	<b>97305-104630</b>
	150	<b>97305-152130</b>	<b>97305-153030</b>	<b>97305-154030</b>	<b>97305-154630</b>
	250	<b>97305-252130</b>	<b>97305-253030</b>	<b>97305-254030</b>	<b>97305-254630</b>

### Synchronis aQ Drop-in guard cartridges (4 pack)

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	<b>97305-012101</b>	<b>97305-013001</b>	<b>97305-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

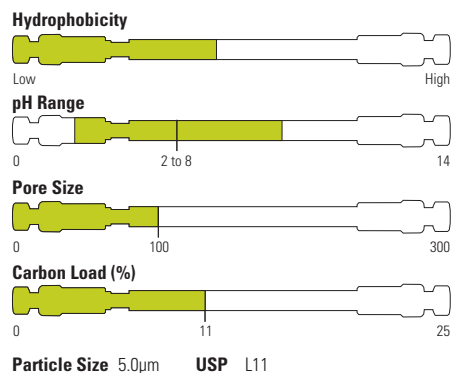
### Stability of Synchronis aQ in 100% aqueous mobile phase



## Synchronis Phenyl HPLC Columns

Provides an alternative to Synchronis C18 and are 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



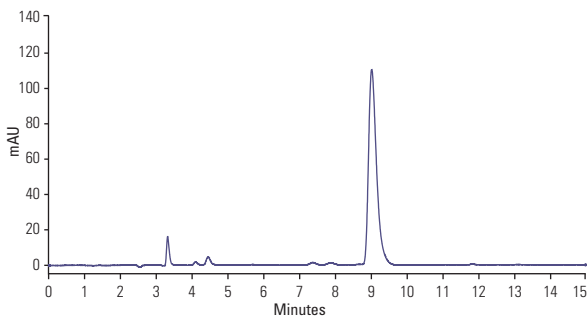
### Synchronis Phenyl HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	30	<b>97905-032130</b>	<b>97905-033030</b>	<b>97905-034030</b>	<b>97905-034630</b>
	50	<b>97905-052130</b>	<b>97905-053030</b>	<b>97905-054030</b>	<b>97905-054630</b>
	100	<b>97905-102130</b>	<b>97905-103030</b>	<b>97905-104030</b>	<b>97905-104630</b>
	150	<b>97905-152130</b>	<b>97905-153030</b>	<b>97905-154030</b>	<b>97905-154630</b>
	250	<b>97905-252130</b>	<b>97905-253030</b>	<b>97905-254030</b>	<b>97905-254630</b>

### Synchronis Phenyl Drop-in guard cartridges (4 pack)

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	<b>97905-012101</b>	<b>97905-013001</b>	<b>97905-014001</b>	4 Pack
 UNIGUARD Drop-in Guard Cartridge Holder		<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### 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

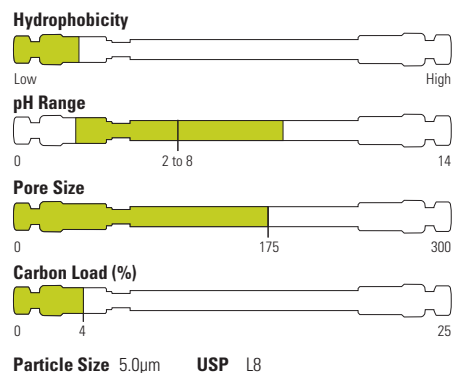
Injection volume: 10µL

1. Oxacillin Sodium (0.11mg/mL)

## Synchronis Amino HPLC Columns

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



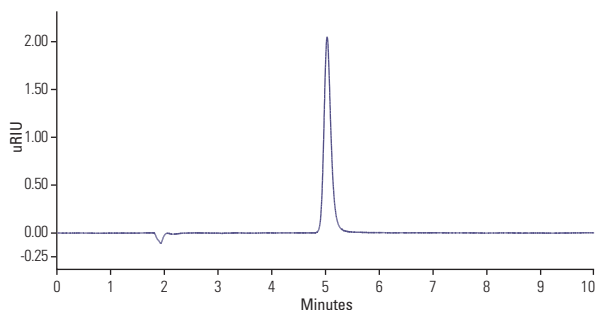
### Synchronis Amino HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	30	<b>97705-032130</b>	<b>97705-033030</b>	<b>97705-034030</b>	<b>97705-034630</b>
	50	<b>97705-052130</b>	<b>97705-053030</b>	<b>97705-054030</b>	<b>97705-054630</b>
	100	<b>97705-102130</b>	<b>97705-103030</b>	<b>97705-104030</b>	<b>97705-104630</b>
	150	<b>97705-152130</b>	<b>97705-153030</b>	<b>97705-154030</b>	<b>97705-154630</b>
	250	<b>97705-252130</b>	<b>97705-253030</b>	<b>97705-254030</b>	<b>97705-254630</b>

### Synchronis Amino Drop-in guard cartridges (4 pack)

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	<b>97705-012101</b>	<b>97705-013001</b>	<b>97705-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### 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

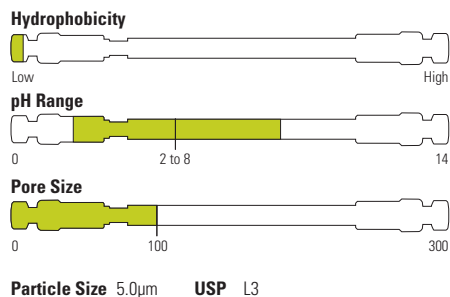
For ordering information about 1.7µm Synchronis columns, please see the Fast LC section of the catalogue

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## Synchronis Silica HPLC Columns

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



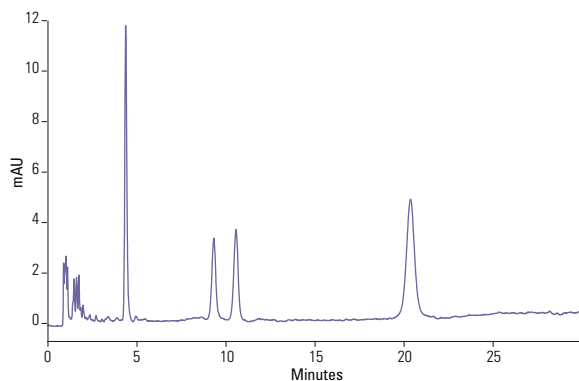
### Synchronis Silica HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	30	<b>97005-032130</b>	<b>97005-033030</b>	<b>97005-034030</b>	<b>97005-034630</b>
	50	<b>97005-052130</b>	<b>97005-053030</b>	<b>97005-054030</b>	<b>97005-054630</b>
	100	<b>97005-102130</b>	<b>97005-103030</b>	<b>97005-104030</b>	<b>97005-104630</b>
	150	<b>97005-152130</b>	<b>97005-153030</b>	<b>97005-154030</b>	<b>97005-154630</b>
	250	<b>97005-252130</b>	<b>97005-253030</b>	<b>97005-254030</b>	<b>97005-254630</b>

### Synchronis Silica Drop-in guard cartridges (4 pack)

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	<b>97005-012101</b>	<b>97005-013001</b>	<b>97005-014001</b>	4 Pack
 UNIGUARD Drop-in Guard Cartridge Holder		<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### Tocopherols



**Column: Synchronis Silica 5µm, 150x4.6mm**  
**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-tocophe

For ordering information about 1.7µm Synchronis columns, please see the Fast LC section of the catalogue

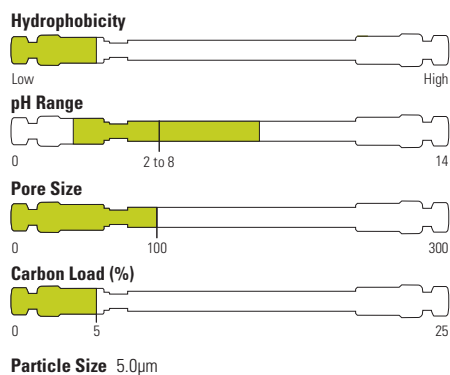
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## Synchronis HILIC HPLC Columns

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



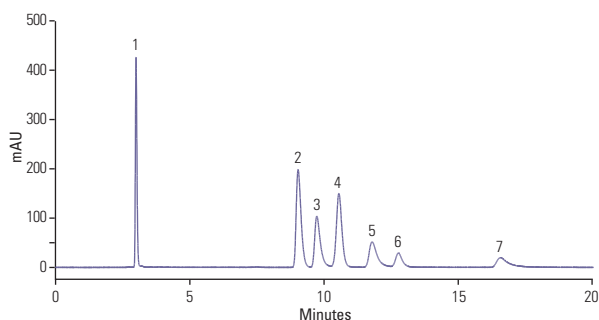
### Synchronis HILIC HPLC Columns

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	30	<b>97505-032130</b>	<b>97505-033030</b>	<b>97505-034030</b>	<b>97505-034630</b>
	50	<b>97505-052130</b>	<b>97505-053030</b>	<b>97505-054030</b>	<b>97505-054630</b>
	100	<b>97505-102130</b>	<b>97505-103030</b>	<b>97505-104030</b>	<b>97505-104630</b>
	150	<b>97505-152130</b>	<b>97505-153030</b>	<b>97505-154030</b>	<b>97505-154630</b>
	250	<b>97505-252130</b>	<b>97505-253030</b>	<b>97505-254030</b>	<b>97505-254630</b>

### Synchronis HILIC Drop-in guard cartridges (4 pack)

Particle size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	<b>97505-012101</b>	<b>97505-013001</b>	<b>97505-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### Catecholamines



Column: Synchronis HILIC, 5µm, 250x4.6mm  
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

# 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

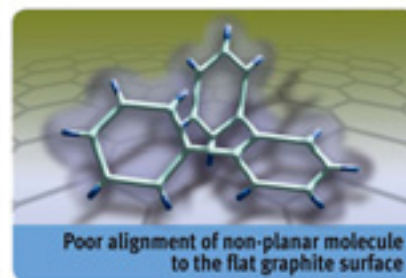
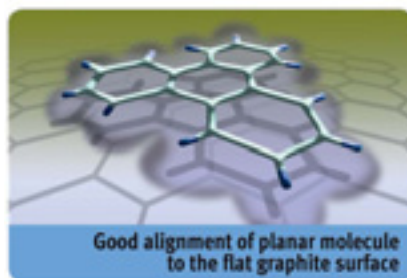
Porous Graphitic Carbon (PGC) is a unique stationary phase composed of flat sheets of hexagonally arranged carbon atoms with a satisfied valence, as in a very large polynuclear aromatic molecule. Hypercarb is unlike traditional silica bonded phases in both its structure and retentive properties, allowing 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

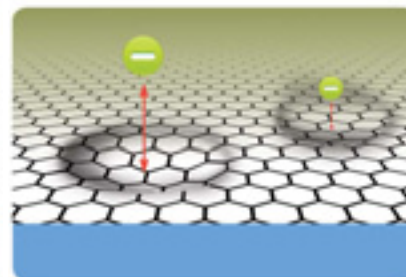
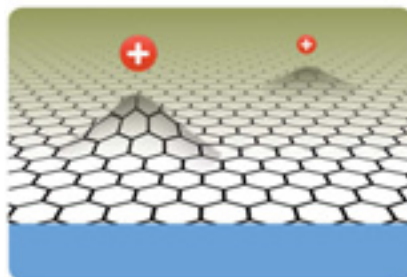
The mechanism of interaction is very dependent upon both the polarity and planarity (shape) of the solute. These specific interaction mechanisms allow the successful retention and resolution of analytes that cannot be separated by typical reversed phase HPLC. Removal of complex buffering systems or ion-pair 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 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. 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.



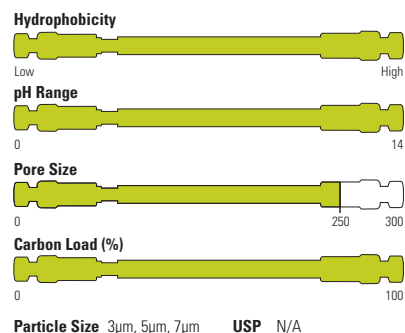
Schematic representation of molecular area of a planar and non-planar molecule interacting with the Hypercarb surface



Schematic representation of a point charge approaching the Hypercarb surface

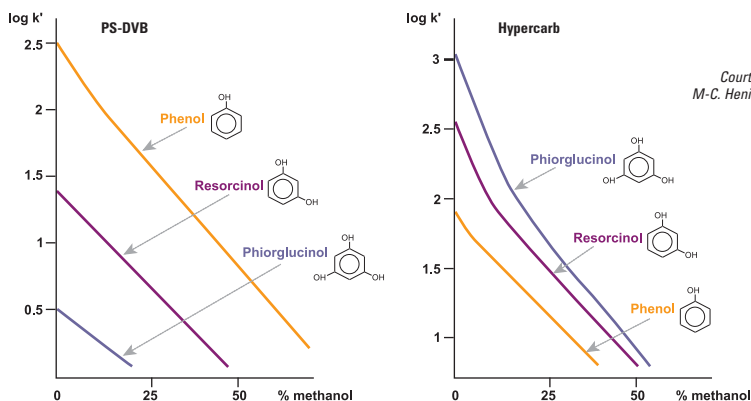
**2) Charge induced interactions of a polar analyte with the polarizable surface of graphite:** The second mechanism, charge-induced dipole, is illustrated above and accounts for the strong retention exhibited by polar analytes. As the polar group with a permanent dipole approaches the surface, an induced 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 usually allow 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, 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 can be achieved without ion pair reagents or complex mobile phase conditions, as illustrated in the chromatogram below.

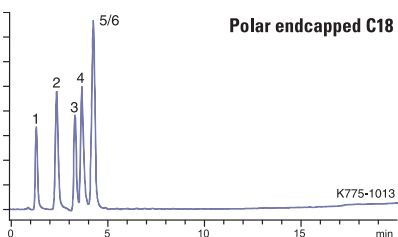


Retention on Hypercarb increases as polarity of the analyte increases, which is the opposite of typical reversed phase materials such as PS-DVB

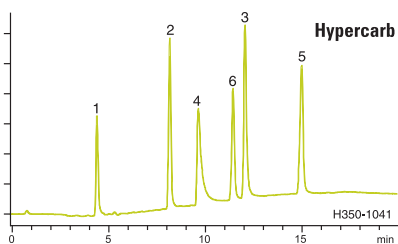
### Extended pH Range

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.

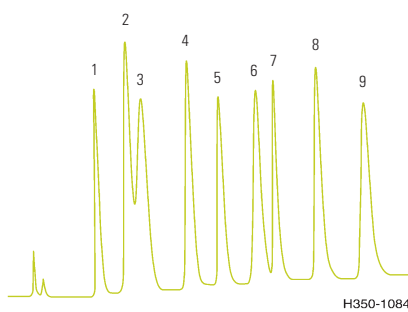


**Hypercarb, 5µm, 100 x 0.32mm**  
Part Number: 35005-100365



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

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

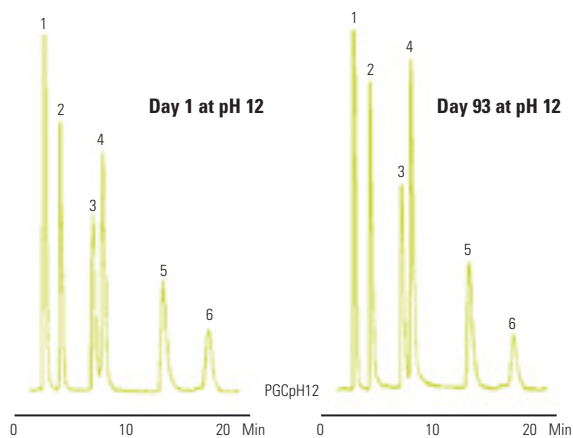


Glucobioses analysis with a mobile phase of NaOH at pH 11

Ref: S. Kitahata et al, Biotechnol. Biochem., 56 (1992) 1386; reproduced with permission

#### Hypercarb, 7µm, 100 x 4.6mm

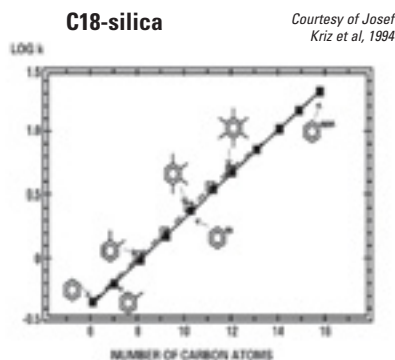
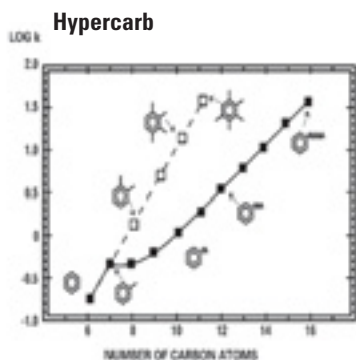
Part Number:	35007-104630
Mobile Phase:	A: 1mM NaOH containing 5% ACN B: 1mM NaOH containing 1.5% ACN
Gradient:	30 to 100% A in 15 min
Flow rate:	1.0mL/min
Detection:	PAD 2
Analytes:	1. Trehalose 2. Nigerose 3. Isomaltose 4. Maltose 5. Kojibiose 6. Laminaribiose 7. Gentiobiose 8. Cellobiose 9. Sophorose



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

#### Hypercarb, 5µm, 100 x 4.6mm

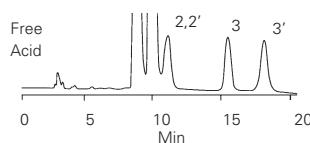
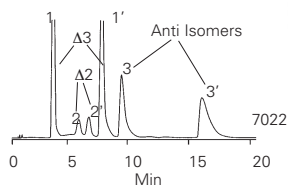
Part Number:	35005-104630
Mobile Phase:	MeOH:H <sub>2</sub> O
Isocratic:	70:30
Flow Rate:	0.7mL/min
Detection:	UV at 254nm
Sample:	1. Acetone 2. Phenol 3. p-Cresol 4. Anisol 5. Phenetole 6. 3,5-Xylenol



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, 5µm, 100 x 4.6mm**

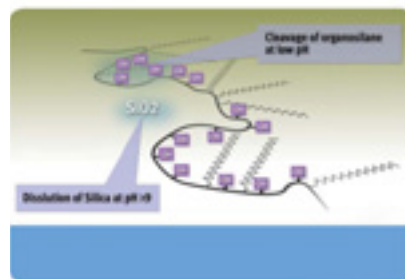
Part Number:	35005-104630
Mobile Phase:	ACN:H <sub>2</sub> O:MeOH:Dioxan
Isocratic:	38:20:35:10
Flow Rate:	1mL/min
Detector:	UV at 254nm

**Hypersil SAS, 5µm, 200 x 4.6mm**

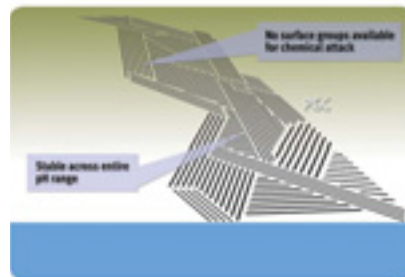
Part Number:	30505-204630
Mobile Phase:	MeOH:0.05M NH <sub>4</sub> H <sub>2</sub> PO <sub>4</sub>
Isocratic:	38:62
Flow Rate:	1mL/min
Detector:	UV at 254nm

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

**Typical C18 silica**



**Hypercarb**



Surface comparison between C18 bonded silica and Hypercarb porous graphitic carbon

**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, on this page. 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 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.

Hypercarb 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


- 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 Hypercarb's porous graphitic surface is not modified.

### Hypercarb HPLC Columns

Particle size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
3.0	30	<b>35003-031030</b>	<b>35003-032130</b>	<b>35003-033030</b>	<b>35003-034630</b>
	50	<b>35003-051030</b>	<b>35003-052130</b>	<b>35003-053030</b>	<b>35003-054630</b>
	100	<b>35003-101030</b>	<b>35003-102130</b>	<b>35003-103030</b>	<b>35003-104630</b>
	150	—	<b>35003-152130</b>	<b>35003-153030</b>	<b>35003-154630</b>
5.0	30	<b>35005-031030</b>	<b>35005-032130</b>	<b>35005-033030</b>	<b>35005-034630</b>
	50	<b>35005-051030</b>	<b>35005-052130</b>	<b>35005-053030</b>	<b>35005-054630</b>
	100	<b>35005-101030</b>	<b>35005-102130</b>	<b>35005-103030</b>	<b>35005-104630</b>
	150	<b>35005-151030</b>	<b>35005-152130</b>	<b>35005-153030</b>	<b>35005-154630</b>

Other column dimensions are also available. Please call Customer Service for more information.

### Hypercarb Drop-In Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
3.0	10	<b>35003-011001</b>	<b>35003-012101</b>	<b>35003-013001</b>	<b>35003-014001</b>	2 Pack
5.0	10	<b>35005-011001</b>	<b>35005-012101</b>	<b>35005-013001</b>	<b>35005-014001</b>	2 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### Hypercarb Javelin HTS HPLC Columns

Particle size (µm)	1.0mm ID	2.1mm ID	4.0mm ID	Quantity
5.0	<b>35005-021035</b>	<b>35005-022135</b>	<b>35005-024035</b>	3 Pack

### Hypercarb DASH HTS HPLC Columns

Particle size (µm)	2.1mm ID	Quantity
5.0	<b>35005-022151</b>	3 Pack

### Hypercarb Preparative HPLC Columns

Particle size (µm)	Length (mm)	10mm ID	21.2mm ID	30mm ID	50mm ID
5.0	50	<b>35005-059070</b>	<b>35005-059270</b>	<b>35005-059370</b>	<b>35005-059570</b>
	100	<b>35005-109070</b>	<b>35005-109270</b>	<b>35005-109370</b>	<b>35005-109570</b>
	150	<b>35005-159070</b>	<b>35005-159270</b>	—	—
	50	<b>35007-059070</b>	<b>35007-059270</b>	<b>35007-059370</b>	<b>35007-059570</b>

### Hypercarb High Temperature HPLC Columns

Particle size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID
3.0	30	<b>35003-031046</b>	<b>35003-032146</b>	<b>35003-033046</b>	<b>35003-034646</b>
	50	<b>35003-051046</b>	<b>35003-052146</b>	<b>35003-053046</b>	<b>35003-054646</b>
	100	<b>35003-101046</b>	<b>35003-102146</b>	<b>35003-103046</b>	<b>35003-104646</b>
5.0	30	<b>35005-031046</b>	<b>35005-032146</b>	<b>35005-033046</b>	<b>35005-034646</b>
	50	<b>35005-051046</b>	<b>35005-052146</b>	<b>35005-053046</b>	<b>35005-054646</b>
	100	<b>35005-101046</b>	<b>35005-102146</b>	<b>35005-103046</b>	<b>35005-104646</b>

Please note that these columns are for use with elevated temperatures. For other dimensions, please inquire.



# Thermo Scientific Application Specific LC Columns

Columns designed and tested for specific applications

- Acclaim Organic Acid column for fast organic acid analysis
- Acclaim Surfactant column for separation of surfactants
- Acclaim Explosives column for separation of explosive residues
- Acclaim Carbamate column for the separation of carbamates
- Acclaim Carbonyl column for aldehyde and ketone separation
- Hypersil Green PAH for polyaromatic hydrocarbon analysis

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

## Acclaim Organic Acid

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

## Acclaim Surfactant

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 Carbamate

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

## Acclaim Carbonyl Column

Designed for separating DNPH derivatives of aldehyds and ketones in air, water and soil.

## Hypersil Green PAH

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



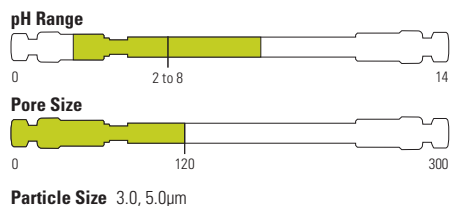
## Acclaim Organic Acid HPLC Columns

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, optimum for reversed-phase retention of organic acids
- 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 HPLC Columns

Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.0mm ID
3.0	150	<b>070087</b>	<b>070086</b>	–
5.0	150	–	–	<b>062903</b>
	250	–	–	<b>062902</b>

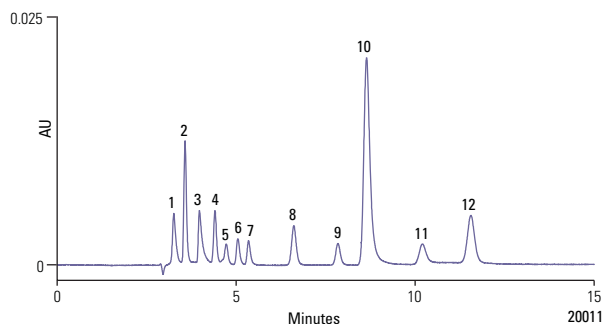
### Acclaim Organic Acid HPLC Guards

Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	–	<b>071987</b>	<b>069700</b>

### Acclaim Guard Holder

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>

### Analysis of organic acids in soft drink



#### Column: Acclaim OA, 5 μm, 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: 5 μL

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 \*

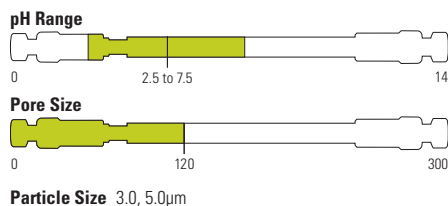
\* 7ppm total for cis and trans isomers



## Acclaim Surfactant HPLC Columns

Unmatched Performance for separating all classes 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



### Acclaim Surfactant HPLC Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	150	<b>070085</b>	<b>070084</b>	—
5.0	150	<b>068123</b>	—	<b>063201</b>
	250	—	—	<b>063203</b>

### Acclaim Surfactant HPLC Guards

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	<b>069693</b>	<b>071991</b>	<b>069701</b>

### Acclaim Surfactant HPLC Guard Holder

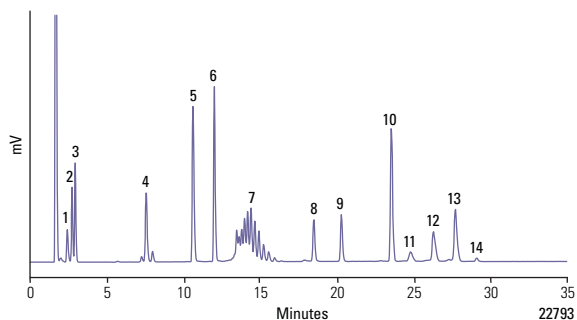
Description	Cat. No.
Acclaim SST Guard Cartridge Holder V-2	<b>069580</b>
Acclaim Guard Kit (Holder and coupler) V-2	<b>069707</b>
Guard to Analytical Column Coupler V-2	<b>074188</b>

The Acclaim Surfactant column is a high-efficiency, silica-based column designed specifically for separating a wide variety of surfactants, including anionic, cationic, nonionic, and amphoteric surfactants. 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.

The Acclaim Surfactant is 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.

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



<b>Column:</b>	<b>Acclaim Surfactant, 5.0µm</b>
Dimensions:	4.6 × 150mm
Mobile Phase:	(A) CH <sub>3</sub> CN, (B) 0.1 M NH <sub>4</sub> OAc, pH 5.4
Gradient:	25% to 85% A in 25min, then hold 85% A for 10min
Temperature:	30°C
Flow Rate:	1mL/min
Inj. Volume:	25µL
Detection:	ELS detector
Peaks:	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 Explosives Columns

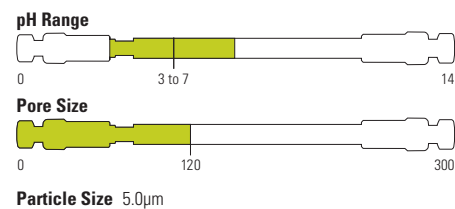
The best solution for explosives analysis (EPA Method 8330)

- Both Acclaim E1 and E2 columns provide baseline resolution of all 14 compounds targeted by EPA Method 8330
- The E1 and E2 columns have mutually complementary selectivity
- Simple isocratic elution conditions
- Rugged columns with good lot-to-lot reproducibility

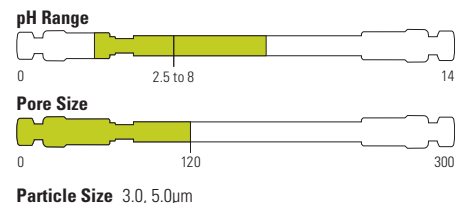
The Acclaim Explosives E1 and E2 columns are specifically designed to resolve all 14 explosives listed in EPA SW-846 Method 8330: Nitroaromatics and Nitramines by HPLC. The novel and unique chemistries of these columns provide superior resolution with complementary selectivities.

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).

Acclaim Explosives E1



Acclaim Explosives E2



### Acclaim Explosives E1 HPLC Columns

Particle Size ( $\mu$ m)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	250	–	–	<b>064305</b>

### Acclaim Explosives E2 HPLC Columns

Particle Size ( $\mu$ m)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	150	<b>070083</b>	<b>070082</b>	–
	250	–	<b>070081</b>	–
5.0	250	–	–	<b>064309</b>

### Acclaim Explosives E1 HPLC Guards

Particle Size ( $\mu$ m)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	–	–	<b>069702</b>

### Acclaim Explosives E2 HPLC Guards

Particle Size ( $\mu$ m)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	–	<b>071989</b>	<b>069703</b>

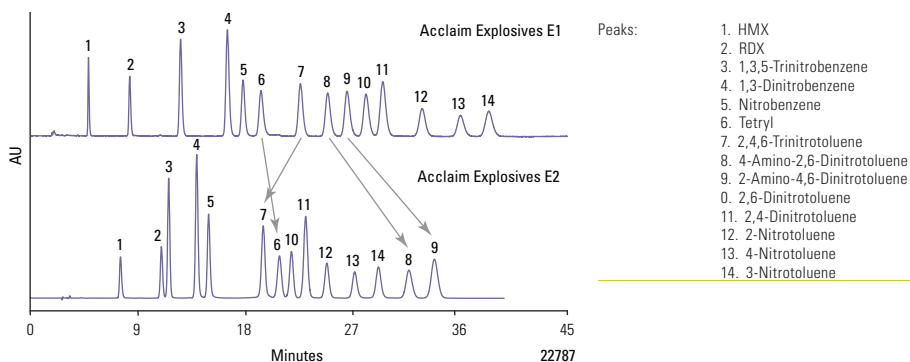
### Acclaim Explosives E1 & E2 HPLC Guard Holder

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

### Acclaim Explosives Kit

Description	Cat. No.
E1 and E2 Analytical Columns (4.6 x 250mm)	064312
E1 and E2 Guard Columns (4.3 x 10mm), pkg of 2	
<b>Requires:</b> Acclaim SST Guard Cartridge Holder V-1 Acclaim SST Guard Cartridge Holder V-1	059456

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



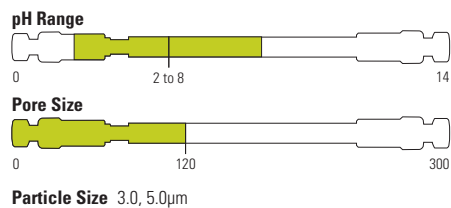
For ordering information about 2.2µm Acclaim Explosives E2 columns, please see the Fast LC section of the catalogue.

➤➤ PAGE 4-050

## Acclaim Carbamate HPLC Columns

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
- 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 HPLC Columns

Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	150	<b>072927</b>	<b>072926</b>	<b>072925</b>
5.0	250	–	–	<b>072924</b>

### Acclaim Carbamate HPLC Guards

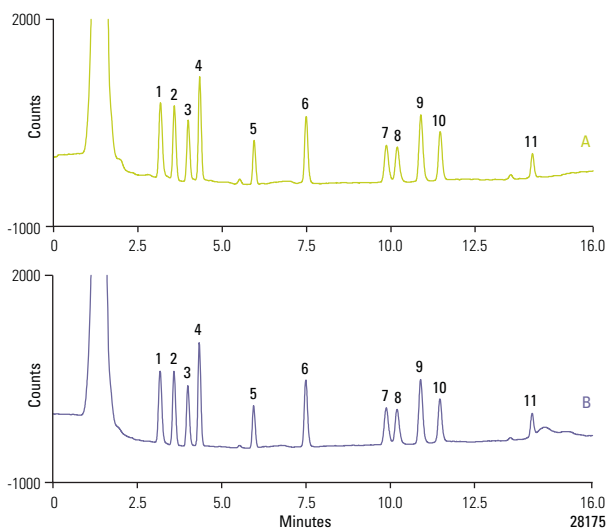
Particle Size (μm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	<b>072930</b>	<b>072929</b>	<b>072928</b>

### Acclaim Carbamate HPLC Guard Holder

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>

The Acclaim Carbamate column is 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.

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



**Guard Column: Acclaim Carbamate, 3.0 × 10mm, 3μm**

**Analytical 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%

Column Temperature: 50°C

Flow Rate: 0.9mL/min

Injection Volume: 50μl

Post Column Reagent 1: 0.2% NaOH, first reaction coil at 100°C

Post Column Reagent 2: OPA reagent, second reaction coil at room temperature

Flow Rate of Reagent 1 and 2: 0.3mL/min

Fluorescence Detection: Excitation, 330nm; emission, 465nm

Chromatograms: (A) without dSPE; and (B) with dSPE using PSA

- 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

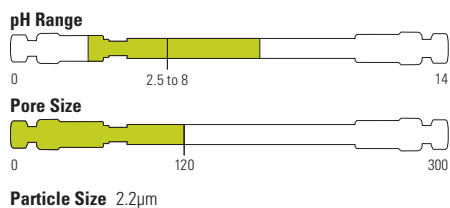
## Acclaim Carbonyl Column

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

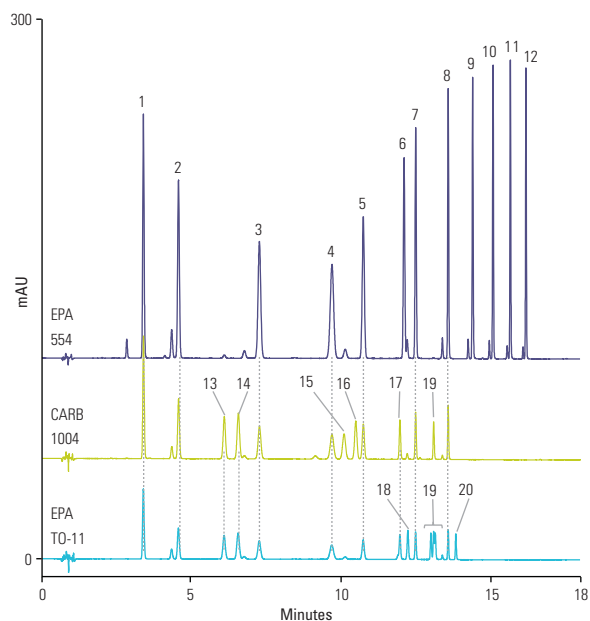
The Acclaim Carbonyl columns are silica-based reversed phase columns designed specifically for separating DNPH derivatives of aldehydes and ketones. They exhibit superior resolution compared with other commercially available columns.

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 Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID
2.2	100	<b>077972</b>	<b>077974</b>
	150	<b>077973</b>	—



**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. Tolualdehyde DNPH
20. Xylaldehyde DNPH

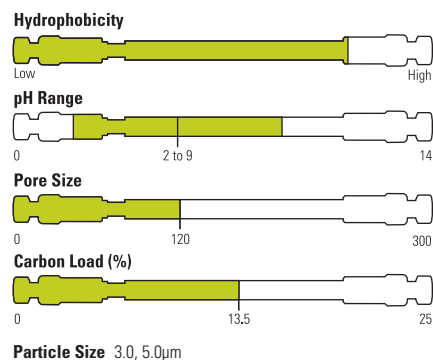
For ordering information about 2.2µm Acclaim C18 columns, please see the Fast LC section of the catalogue

➤ PAGE 4-046

## Hypersil Green PAH Columns

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 Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	2.1	Guard cartridge	<b>31103-012101</b>
	10	3.0	Guard cartridge	<b>31103-013001</b>
	10	4.6	Guard cartridge	<b>31103-014001</b>
	100	2.1	Analytical	<b>31103-102130</b>
	100	3.0	Analytical	<b>31103-103030</b>
	100	4.6	Analytical	<b>31103-104630</b>
	150	2.1	Analytical	<b>31103-152130</b>
5.0	150	4.6	Analytical	<b>31103-154630</b>
	10	4.6	Guard cartridge	<b>31105-014001</b>
	100	4.6	Analytical	<b>31105-104630</b>
	150	4.6	Analytical	<b>31105-154630</b>
	250	4.6	Analytical	<b>31105-254630</b>

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



## Hypersil BDS C18 HPLC Columns

A good choice for QA/QC labs as a robust, general-purpose column in applications where reproducibility and long column lifetimes are required

### Hypersil BDS C18 HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
2.4	10	2.1	Guard cartridge	<b>28102-012101</b>
		4.6	Guard cartridge	<b>28102-014001</b>
	30	2.1	Analytical UHPLC	<b>28102-032130</b>
		4.6	Analytical UHPLC	<b>28102-034630</b>
	50	2.1	Analytical UHPLC	<b>28102-052130</b>
		4.6	Analytical UHPLC	<b>28102-054630</b>
100	2.1	Analytical UHPLC	<b>28102-102130</b>	
	4.6	Analytical UHPLC	<b>28102-104630</b>	
3.0	10	2.1	Guard cartridge	<b>28103-012101</b>
		3.0	Guard cartridge	<b>28103-013001</b>
		4.0 / 4.6	Guard cartridge	<b>28103-014001</b>
	30	2.1	Analytical	<b>28103-032130</b>
	50	2.1	Analytical	<b>28103-052130</b>
		3.0	Analytical	<b>28103-053030</b>
		4.6	Analytical	<b>28103-054630</b>
	100	2.1	Analytical	<b>28103-102130</b>
		3.0	Analytical	<b>28103-103030</b>
		4.0	Analytical	<b>28103-104030</b>
		4.6	Analytical	<b>28103-104630</b>
	150	2.1	Analytical	<b>28103-152130</b>
3.0		Analytical	<b>28103-153030</b>	
4.0		Analytical	<b>28103-154030</b>	
4.6		Analytical	<b>28103-154630</b>	

Other column dimensions are available.  
Please contact Customer Service for more details.

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.	
5.0	10	2.1	Guard cartridge	<b>28105-012101</b>	
		3.0	Guard cartridge	<b>28105-013001</b>	
		4.0 / 4.6	Guard cartridge	<b>28105-014001</b>	
	50	2.1	Analytical	<b>28105-052130</b>	
		3.0	Analytical	<b>28105-053030</b>	
		4.0	Analytical	<b>28105-054030</b>	
		4.6	Analytical	<b>28105-054630</b>	
	100	2.1	Analytical	<b>28105-102130</b>	
		3.0	Analytical	<b>28105-103030</b>	
		4.0	Analytical	<b>28105-104030</b>	
	125	4.6	3.0	Analytical	<b>28105-104630</b>
			4.0	Analytical	<b>28105-123030</b>
4.6			Analytical	<b>28105-124030</b>	
150	4.6	2.1	Analytical	<b>28105-124630</b>	
		3.0	Analytical	<b>28105-152130</b>	
		4.0	Analytical	<b>28105-153030</b>	
		4.6	Analytical	<b>28105-154030</b>	
200	4.6	4.0	Analytical	<b>28105-154630</b>	
		4.6	Analytical	<b>28105-204030</b>	
250	4.6	2.1	Analytical	<b>28105-204630</b>	
		3.0	Analytical	<b>28105-252130</b>	
		4.0	Analytical	<b>28105-253030</b>	
		4.6	Analytical	<b>28105-254030</b>	
				<b>28105-254630</b>	

Other column dimensions are available.  
Please contact Customer Service for more details.





## Hypersil BDS C8 HPLC Columns

High quality base-deactivated, fully endcapped phase with similar selectivity to C18 but slightly less retention

### Hypersil BDS C8 HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
2.4	10	2.1	Guard cartridge	<b>28202-012101</b>
		4.0 / 4.6	Guard cartridge	<b>28202-014001</b>
	50	2.1	Analytical UHPLC	<b>28202-052130</b>
		4.6	Analytical UHPLC	<b>28202-054630</b>
	100	2.1	Analytical UHPLC	<b>28202-102130</b>
		4.6	Analytical UHPLC	<b>28202-104630</b>
150	2.1	Analytical UHPLC	<b>28202-152130</b>	
	2.1	Analytical UHPLC	<b>28202-154630</b>	
3.0	10	2.1	Guard cartridge	<b>28203-012101</b>
		3.0	Guard cartridge	<b>28203-013001</b>
		4.0 / 4.6	Guard cartridge	<b>28203-014001</b>
	50	2.1	Analytical	<b>28203-052130</b>
		4.6	Analytical	<b>28203-054630</b>
	100	4.6	Analytical	<b>28203-104630</b>
150	3.0	Analytical	<b>28203-153030</b>	
	4.6	Analytical	<b>28203-154630</b>	
5.0	10	2.1	Guard cartridge	<b>28205-012101</b>
		3.0	Guard cartridge	<b>28205-013001</b>
		4.0 / 4.6	Guard cartridge	<b>28205-014001</b>
	50	2.1	Analytical	<b>28205-052130</b>
		3.0	Analytical	<b>28205-053030</b>
	4.6	Analytical	<b>28205-054630</b>	
100	2.1	Analytical	<b>28205-102130</b>	
	4.6	Analytical	<b>28205-104630</b>	
150	4.0	Analytical	<b>28205-154030</b>	
	4.6	Analytical	<b>28205-154630</b>	
250	4.0	Analytical	<b>28205-254030</b>	
	4.6	Analytical	<b>28205-254630</b>	

Other column dimensions are available.  
Please contact Customer Service for more details.

## Hypersil BDS Phenyl HPLC Columns

Exceptional stability and alternative selectivity to C18 and C8 columns

### Hypersil BDS Phenyl HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	2.1	Guard cartridge	<b>28903-012101</b>
		4.0 / 4.6	Guard cartridge	<b>28903-014001</b>
	50	2.1	Analytical	<b>28903-052130</b>
	150	4.6	Analytical	<b>28903-154630</b>
5.0	10	4.0 / 4.6	Guard cartridge	<b>28905-014001</b>
		150	4.6	Analytical
	250	4.0	Analytical	<b>28905-254030</b>
		4.6	Analytical	<b>28905-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

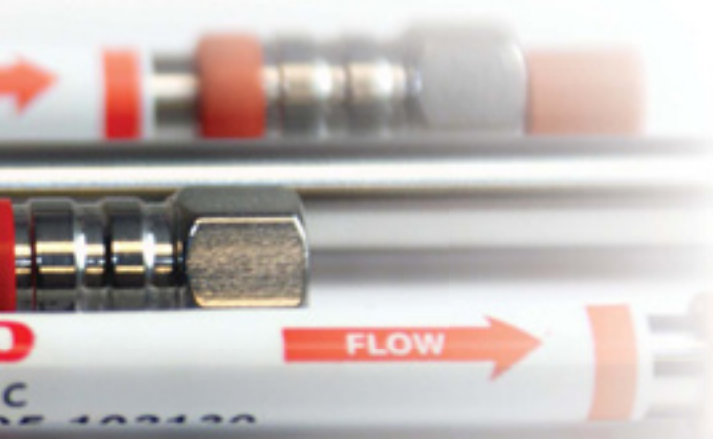
## Hypersil BDS Cyano HPLC Columns

May be used for reversed or normal phase applications

### Hypersil BDS Cyano HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	2.1	Guard cartridge	<b>28803-012101</b>
		4.0 / 4.6	Guard cartridge	<b>28803-014001</b>
	50	2.1	Analytical	<b>28803-052130</b>
		4.6	Analytical	<b>28803-054630</b>
150	4.6	Analytical	<b>28803-154630</b>	
	5.0	10	4.0 / 4.6	Guard cartridge
150	4.6	Analytical	<b>28805-154630</b>	
	250	4.6	Analytical	<b>28805-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.



## Hypersil ODS (C18) HPLC Columns

Provide an excellent C18 phase for a broad range of applications and global standard for many existing methods

### Hypersil ODS (C18) HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	2.1	Guard cartridge	<b>30103-012101</b>
		3.0	Guard cartridge	<b>30103-013001</b>
		4.0/4.6	Guard cartridge	<b>30103-014001</b>
50	100	2.1	Analytical Column	<b>30103-052130</b>
		3.0	Analytical Column	<b>30103-053030</b>
		4.0	Analytical Column	<b>30103-054030</b>
		4.6	Analytical Column	<b>30103-054630</b>
100	125	2.1	Analytical Column	<b>30103-102130</b>
		3.0	Analytical Column	<b>30103-103030</b>
		4.0	Analytical Column	<b>30103-104030</b>
		4.6	Analytical Column	<b>30103-104630</b>
150	150	2.1	Analytical Column	<b>30103-152130</b>
		3.0	Analytical Column	<b>30103-153030</b>
		4.0	Analytical Column	<b>30103-154030</b>
		4.6	Analytical Column	<b>30103-154630</b>
250	250	2.1	Analytical Column	<b>30103-252130</b>
		3.0	Analytical Column	<b>30103-253030</b>
		4.0	Analytical Column	<b>30103-254030</b>
		4.6	Analytical Column	<b>30103-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	2.1	Guard cartridge	<b>30105-012101</b>
		3.0	Guard cartridge	<b>30105-013001</b>
		4.0/4.6	Guard cartridge	<b>30105-014001</b>
50	100	2.1	Analytical Column	<b>30105-052130</b>
		3.0	Analytical Column	<b>30105-053030</b>
		4.0	Analytical Column	<b>30105-054030</b>
		4.6	Analytical Column	<b>30105-054630</b>
100	125	2.1	Analytical Column	<b>30105-102130</b>
		3.0	Analytical Column	<b>30105-103030</b>
		4.0	Analytical Column	<b>30105-104030</b>
		4.6	Analytical Column	<b>30105-104630</b>
150	150	2.1	Analytical Column	<b>30105-152130</b>
		3.0	Analytical Column	<b>30105-153030</b>
		4.0	Analytical Column	<b>30105-154030</b>
		4.6	Analytical Column	<b>30105-154630</b>
200	200	2.1	Analytical Column	<b>30105-202130</b>
		3.0	Analytical Column	<b>30105-203030</b>
		4.0	Analytical Column	<b>30105-204030</b>
		4.6	Analytical Column	<b>30105-204630</b>
250	250	2.1	Analytical Column	<b>30105-252130</b>
		3.0	Analytical Column	<b>30105-253030</b>
		4.0	Analytical Column	<b>30105-254030</b>
		4.6	Analytical Column	<b>30105-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

## Hypersil ODS-2 (C18) HPLC Columns

Offer a well tested, dependable L1 alternative to many older column brands commonly referenced in validated methods

### Hypersil ODS-2 (C18) HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.	
3.0	10	2.1	Guard cartridge	<b>31603-012101</b>	
		3.0	Guard cartridge	<b>31603-013001</b>	
		4.0/4.6	Guard cartridge	<b>31603-014001</b>	
50	2.1	2.1	Analytical Column	<b>31603-052130</b>	
		3.0	Analytical Column	<b>31603-053030</b>	
		4.0	Analytical Column	<b>31603-054030</b>	
		4.6	Analytical Column	<b>31603-054630</b>	
100	2.1	2.1	Analytical Column	<b>31603-102130</b>	
		3.0	Analytical Column	<b>31603-103030</b>	
		4.0	Analytical Column	<b>31603-104030</b>	
		4.6	Analytical Column	<b>31603-104630</b>	
150	2.1	2.1	Analytical Column	<b>31603-152130</b>	
		3.0	Analytical Column	<b>31603-153030</b>	
		4.0	Analytical Column	<b>31603-154030</b>	
		4.6	Analytical Column	<b>31603-154630</b>	
5.0	10	2.1	Guard cartridge	<b>31605-012101</b>	
		3.0	Guard cartridge	<b>31605-013001</b>	
		4.0/4.6	Guard cartridge	<b>31605-014001</b>	
	50	2.1	2.1	Analytical Column	<b>31605-052130</b>
			3.0	Analytical Column	<b>31605-053030</b>
			4.0	Analytical Column	<b>31605-054030</b>
			4.6	Analytical Column	<b>31605-054630</b>
	100	2.1	2.1	Analytical Column	<b>31605-102130</b>
			3.0	Analytical Column	<b>31605-103030</b>
			4.0	Analytical Column	<b>31605-104030</b>
			4.6	Analytical Column	<b>31605-104630</b>
	150	2.1	2.1	Analytical Column	<b>31605-152130</b>
3.0			Analytical Column	<b>31605-153030</b>	
4.0			Analytical Column	<b>31605-154030</b>	
4.6			Analytical Column	<b>31605-154630</b>	
250	2.1	2.1	Analytical Column	<b>31605-252130</b>	
		3.0	Analytical Column	<b>31605-253030</b>	
		4.0	Analytical Column	<b>31605-254030</b>	
		4.6	Analytical Column	<b>31605-254630</b>	

Other column dimensions are available.  
Please contact Customer Service for more details.

## Hypersil MOS (C8) HPLC Columns

Have a monolayer coverage of C8 alkyl chain chemically bonded onto the silica surface for a reproducible and efficient stationary phase

### Hypersil ODS-2 (C18) HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	4.0/4.6	Guard cartridge	<b>30203-014001</b>
	150	4.6	Analytical Column	<b>30203-154630</b>
5.0	10	4.0/4.6	Guard cartridge	<b>30205-014001</b>
	50	4.6	Analytical Column	<b>30205-054630</b>
	100	4.6	Analytical Column	<b>30205-104630</b>
	150	4.0	Analytical Column	<b>30205-154030</b>
		4.6	Analytical Column	<b>30205-154630</b>
	250	4.0	Analytical Column	<b>30205-254030</b>
		4.6	Analytical Column	<b>30205-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

## Hypersil MOS-2 (C8) HPLC Columns

Have a monolayer coverage of C8 alkyl chain chemically bonded onto the silica surface for a reproducible and efficient stationary phase. Hypersil MOS-2 is endcapped

### Hypersil MOS-2 (C8) HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	4.0/4.6	Guard cartridge	<b>30305-014001</b>
	150	4.6	Analytical Column	<b>30305-154630</b>
	250	4.0	Analytical Column	<b>30305-254030</b>
		4.6	Analytical Column	<b>30305-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

## Hypersil SAS (C1) HPLC Columns

The least retentive of the Hypersil alkyl bonded phases

### Hypersil SAS (C1) HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	4.0/4.6	Guard cartridge	<b>30505-014001</b>
	150	4.6	Analytical Column	<b>30505-154630</b>
	250	4.6	Analytical Column	<b>30505-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

## Hypersil Phenyl HPLC Columns

Reversed phase materials with alternative selectivity for the analysis of aromatic and moderately polar compounds

### Hypersil Phenyl HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	4.0/4.6	Guard cartridge	<b>30905-014001</b>
	50	4.6	Analytical Column	<b>30905-054630</b>
	100	4.6	Analytical Column	<b>30905-104630</b>
	150	4.6	Analytical Column	<b>30905-154630</b>
	250	4.0	Analytical Column	<b>30905-254030</b>
		4.6	Analytical Column	<b>30905-254630</b>

Other column dimensions are available. Please contact Customer Service for more details.

## Hypersil Phenyl-2 HPLC Columns

Reversed phase materials with alternative selectivity for the analysis of aromatic and moderately polar compounds. Hypersil Phenyl-2 is endcapped

### Hypersil Phenyl-2 HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	4.0/4.6	Guard cartridge	<b>31905-014001</b>
	150	4.6	Analytical Column	<b>31905-154630</b>
	250	4.6	Analytical Column	<b>31905-254630</b>

Other column dimensions are available. Please contact Customer Service for more details.

## Hypersil CPS HPLC Columns

A cyanopropyl phase for both normal and reversed phase HPLC

### Hypersil CPS HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	4.0/4.6	Guard cartridge	<b>30803-014001</b>
	100	4.6	Analytical Column	<b>30803-104630</b>
	150	4.6	Analytical Column	<b>30803-154630</b>
5.0	10	4.0/4.6	Guard cartridge	<b>30805-014001</b>
	150	4.6	Analytical Column	<b>30805-154630</b>
	250	4.0	Analytical Column	<b>30805-254030</b>
		4.6	Analytical Column	<b>30805-254630</b>

Other column dimensions are available. Please contact Customer Service for more details.

## Hypersil CPS-2 HPLC Columns

A cyanopropyl phase for both normal and reversed phase HPLC. Hypersil CPS-2 is endcapped

### Hypersil CPS-2 HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	4.0/4.6	Guard cartridge	<b>31805-014001</b>
	150	4.6	Analytical Column	<b>31805-154630</b>
	250	4.6	Analytical Column	<b>31805-254630</b>

Other column dimensions are available. Please contact Customer Service for more details.

## Hypersil APS-2 HPLC Columns

Versatile amino propyl phase. Excellent for carbohydrate analysis

### Hypersil APS-2 HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.	
3.0	10	2.1	Guard cartridge	<b>30703-012101</b>	
		4.0/4.6	Guard cartridge	<b>30703-014001</b>	
	50	2.1	Analytical Column	<b>30703-052130</b>	
		4.6	Analytical Column	<b>30703-054630</b>	
	100	2.1	Analytical Column	<b>30703-102130</b>	
	150	2.1	Analytical Column	<b>30703-152130</b>	
4.6		Analytical Column	<b>30703-154630</b>		
5.0	10	2.1	Guard cartridge	<b>30705-012101</b>	
		3.0	Guard cartridge	<b>30705-013001</b>	
		4.0/4.6	Guard cartridge	<b>30705-014001</b>	
	100	2.1	Analytical Column	<b>30705-102130</b>	
		3.0	Analytical Column	<b>30705-103030</b>	
		4.6	Analytical Column	<b>30705-104630</b>	
	150	2.1	Analytical Column	<b>30705-152130</b>	
			Analytical Column	<b>30705-154030</b>	
		4.0	Analytical Column	<b>30705-154630</b>	
			Analytical Column	<b>30705-154630</b>	
		250	2.1	Analytical Column	<b>30705-252130</b>
			3.0	Analytical Column	<b>30705-253030</b>
		4.0	Analytical Column	<b>30705-254030</b>	
		4.6	Analytical Column	<b>30705-254630</b>	

Other column dimensions are available. Please contact Customer Service for more details.

## Hypersil Silica HPLC Columns

An unbonded media for normal phase chromatography of nonpolar and moderately polar organic compounds

### Hypersil Silica HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	2.1	Guard cartridge	<b>30003-012101</b>
		3.0	Guard cartridge	<b>30003-013001</b>
		4.0/4.6	Guard cartridge	<b>30003-014001</b>
	50	2.1	Analytical Column	<b>30003-052130</b>
		3.0	Analytical Column	<b>30003-053030</b>
		4.0	Analytical Column	<b>30003-054030</b>
100	4.6	Analytical Column	<b>30003-054630</b>	
	4.6	Analytical Column	<b>30003-104630</b>	
150	4.0	Analytical Column	<b>30003-154030</b>	
	4.6	Analytical Column	<b>30003-154630</b>	
5.0	10	4.0/4.6	Guard cartridge	<b>30005-014001</b>
		4.6	Analytical Column	<b>30005-054630</b>
	50	2.1	Analytical Column	<b>30005-102130</b>
		4.6	Analytical Column	<b>30005-104630</b>
	150	4.0	Analytical Column	<b>30005-154030</b>
		4.6	Analytical Column	<b>30005-154630</b>
250	4.0	Analytical Column	<b>30005-254030</b>	
	4.6	Analytical Column	<b>30005-254630</b>	

Other column dimensions are available.  
Please contact Customer Service for more details.

## Hypersil SAX HPLC Columns

Highly stable silica-based quarternary amine strong anion exchange columns, designed for aqueous and low pH mobile phases

### Hypersil SAX HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	2.1	Guard cartridge	<b>34105-012101</b>
		3.0	Guard cartridge	<b>34105-013001</b>
		4.0/4.6	Guard cartridge	<b>34105-014001</b>
	50	2.1	Analytical Column	<b>34105-052130</b>
		4.6	Analytical Column	<b>34105-154630</b>
	250	3.0	Analytical Column	<b>34105-253030</b>
4.6		Analytical Column	<b>34105-254630</b>	

Other column dimensions are available.  
Please contact Customer Service for more details.

## Aquasil C18 HPLC columns

Polar endcapped C18 that gives greater retention for polar molecules

### Aquasil C18 HPLC columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.	
3.0	10	2.1	Guard cartridge	<b>77503-012101</b>	
		3	Guard cartridge	<b>77503-013001</b>	
		4.0/4.6	Guard cartridge	<b>77503-014001</b>	
		30	2.1	Analytical Column	<b>77503-032130</b>
		50	2.1	Analytical Column	<b>77503-052130</b>
			4.6	Analytical Column	<b>77503-054630</b>
	100	2.1	Analytical Column	<b>77503-102130</b>	
		4.6	Analytical Column	<b>77503-104630</b>	
	150	2.1	2.1	Analytical Column	<b>77503-152130</b>
			3.0	Analytical Column	<b>77503-153030</b>
		4.0	4.0	Analytical Column	<b>77503-154030</b>
			4.6	Analytical Column	<b>77503-154630</b>
5.0		2.1	Guard cartridge	<b>77505-012101</b>	
		3.0	Guard cartridge	<b>77505-013001</b>	
5.0	10	4.0/4.6	Guard cartridge	<b>77505-014001</b>	
		50	2.1	Analytical Column	<b>77505-052130</b>
			3.0	Analytical Column	<b>77505-053030</b>
		4.6	4.6	Analytical Column	<b>77505-054630</b>
			100	2.1	Analytical Column
		3.0		Analytical Column	<b>77505-103030</b>
	4.6	4.6	Analytical Column	<b>77505-104630</b>	
		150	2.1	Analytical Column	<b>77505-152130</b>
	3.0		Analytical Column	<b>77505-153030</b>	
	4.0	4.0	Analytical Column	<b>77505-154030</b>	
		4.6	Analytical Column	<b>77505-154630</b>	
	250	2.1	Analytical Column	<b>77505-252130</b>	
4.0		Analytical Column	<b>77505-254030</b>		
4.6	Analytical Column	<b>77505-254630</b>			

Other column dimensions are available.  
Please contact Customer Service for more details.





## BetaBasic HPLC columns

### BetaBasic C18 HPLC columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	2.1	Guard cartridge	<b>71503-012101</b>
		3.0	Guard cartridge	<b>71503-013001</b>
		4.0/4.6	Guard cartridge	<b>71503-014001</b>
30	4.6	Analytical	<b>71503-034630</b>	
50	2.1	2.1	Analytical	<b>71503-052130</b>
		3.0	Analytical	<b>71503-053030</b>
		4.0	Analytical	<b>71503-054030</b>
100	2.1	2.1	Analytical	<b>71503-102130</b>
		4.6	Analytical	<b>71503-104630</b>
		150	2.1	Analytical
5.0	10	2.1	Guard cartridge	<b>71505-012101</b>
		3.0	Guard cartridge	<b>71505-013001</b>
		4.0/4.6	Guard cartridge	<b>71505-014001</b>
30	2.1	Analytical	<b>71505-032130</b>	
50	2.1	2.1	Analytical	<b>71505-052130</b>
		3.0	Analytical	<b>71505-053030</b>
		4.6	Analytical	<b>71505-054630</b>
100	2.1	2.1	Analytical	<b>71505-102130</b>
		4.6	Analytical	<b>71505-104630</b>
		150	2.1	Analytical
250	2.1	3.0	Analytical	<b>71505-153030</b>
		4.0	Analytical	<b>71505-154030</b>
		4.6	Analytical	<b>71505-154630</b>
		250	2.1	Analytical
3.0	3.0	3.0	Analytical	<b>71505-253030</b>
		4.0	Analytical	<b>71505-254030</b>
		4.6	Analytical	<b>71505-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

### BetaBasic C8 HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.	
3.0	50	2.1	Analytical	<b>71403-052130</b>	
		4.6	Analytical	<b>71403-054630</b>	
		150	4.6	Analytical	<b>71403-154630</b>
5.0	10	2.1	Guard cartridge	<b>71405-012101</b>	
		4.0/4.6	Guard cartridge	<b>71405-014001</b>	
		50	2.1	Analytical	<b>71405-052130</b>
100	4.6	4.6	Analytical	<b>71405-054630</b>	
		150	4.6	Analytical	<b>71405-104630</b>
		150	4.6	Analytical	<b>71405-154630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

### BetaBasic CN HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	2.1	Guard cartridge	<b>71705-012101</b>
		4.0/4.6	Guard cartridge	<b>71705-014001</b>
		50	2.1	Analytical
100	2.1	Analytical	<b>71705-102130</b>	
150	4.6	Analytical	<b>71705-154630</b>	
250	4.6	Analytical	<b>71705-254630</b>	

Other column dimensions are available.  
Please contact Customer Service for more details.

### BetaBasic Phenyl HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.	
5.0	10	4.0/4.6	Guard cartridge	<b>71805-014001</b>	
		150	4.6	Analytical	<b>71805-154630</b>
		250	4.6	Analytical	<b>71805-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

## BETASIL C18 HPLC columns

### BETASIL C18 HPLC columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	2.1	Guard cartridge	<b>71503-012101</b>
		3	Guard cartridge	<b>71503-013001</b>
		4.0/4.6	Guard cartridge	<b>71503-014001</b>
30	4.6		Analytical	<b>71503-034630</b>
			Analytical	<b>71503-034630</b>
50	2.1		Analytical	<b>71503-052130</b>
		3.0	Analytical	<b>71503-053030</b>
		4.0	Analytical	<b>71503-054030</b>
		4.6	Analytical	<b>71503-054630</b>
100	2.1		Analytical	<b>71503-102130</b>
		4.6	Analytical	<b>71503-104630</b>
150	2.1		Analytical	<b>71503-152130</b>
		4.6	Analytical	<b>71503-154630</b>
5.0	10	2.1	Guard cartridge	<b>71505-012101</b>
		3.0	Guard cartridge	<b>71505-013001</b>
		4.0/4.6	Guard cartridge	<b>71505-014001</b>
30	2.1		Analytical	<b>71505-032130</b>
			Analytical	<b>71505-032130</b>
50	2.1		Analytical	<b>71505-052130</b>
		3.0	Analytical	<b>71505-053030</b>
		4.6	Analytical	<b>71505-054630</b>
100	2.1		Analytical	<b>71505-102130</b>
		4.6	Analytical	<b>71505-104630</b>
150	2.1		Analytical	<b>71505-152130</b>
		3.0	Analytical	<b>71505-153030</b>
		4.0	Analytical	<b>71505-154030</b>
		4.6	Analytical	<b>71505-154630</b>
250	2.1		Analytical	<b>71505-252130</b>
		3.0	Analytical	<b>71505-253030</b>
		4.0	Analytical	<b>71505-254030</b>
		4.6	Analytical	<b>71505-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

### BETASIL C8 HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	2.1	Guard cartridge	<b>70203-012101</b>
		4.0/4.6	Guard cartridge	<b>70203-014001</b>
50	2.1		Analytical	<b>70203-052130</b>
		4.6	Analytical	<b>70203-054630</b>
150	4.6		Analytical	<b>70203-154630</b>
			Analytical	<b>70203-154630</b>
5.0	50	2.1	Analytical	<b>70205-052130</b>
		3.0	Analytical	<b>70205-053030</b>
100	2.1		Analytical	<b>70205-102130</b>
		4.6	Analytical	<b>70205-154630</b>
250	4.6		Analytical	<b>70205-254630</b>
			Analytical	<b>70205-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

### BETASIL Phenyl HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	50	3.0	Analytical	<b>70603-053030</b>
		150	Analytical	<b>70603-152130</b>
5.0	10	2.1	Guard cartridge	<b>70605-012101</b>
		4.0/4.6	Guard cartridge	<b>70605-014001</b>
50	2.1		Analytical	<b>70605-052130</b>
		4.6	Analytical	<b>70605-054630</b>
100	2.1		Analytical	<b>70605-102130</b>
		4.6	Analytical	<b>70605-104630</b>
150	4.6		Analytical	<b>70605-154630</b>
		250	Analytical	<b>70605-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

### BETASIL Phenyl-Hexyl HPLC Columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
3.0	10	2.1	Guard cartridge	<b>73003-012101</b>
		3.0	Guard cartridge	<b>73003-013001</b>
		4.0/4.6	Guard cartridge	<b>73003-014001</b>
50	2.1		Analytical	<b>73003-052130</b>
		3.0	Analytical	<b>73003-053030</b>
100	2.1		Analytical	<b>73003-102130</b>
		3.0	Analytical	<b>73003-103030</b>
		4.6	Analytical	<b>73003-104630</b>
150	2.1		Analytical	<b>73003-152130</b>
		4.6	Analytical	<b>73003-154630</b>
5.0	10	4.0/4.6	Guard cartridge	<b>73005-014001</b>
		150	Analytical	<b>73005-154630</b>
		250	Analytical	<b>73005-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.



**BETASIL CN HPLC Columns**

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	2.1	Guard cartridge	<b>70805-012101</b>
		3.0	Guard cartridge	<b>70805-013001</b>
		4.0/4.6	Guard cartridge	<b>70805-014001</b>
100	100	2.1	Analytical	<b>70805-102130</b>
		3.0	Analytical	<b>70805-103030</b>
150	150	2.1	Analytical	<b>70805-152130</b>
		3.0	Analytical	<b>70805-153030</b>
		4.6	Analytical	<b>70805-154630</b>
250	250	4.6	Analytical	<b>70805-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

**BETASIL Silica HPLC Columns**

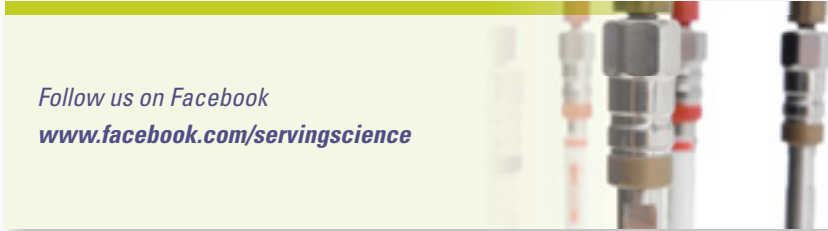
Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	2.1	Guard cartridge	<b>70005-012101</b>
		3	Guard cartridge	<b>70005-013001</b>
		4.0/4.6	Guard cartridge	<b>70005-014001</b>
100	100	2.1	Analytical	<b>70005-102130</b>
		3	Analytical	<b>70005-103030</b>
150	150	2.1	Analytical	<b>70005-152130</b>
		3	Analytical	<b>70005-153030</b>
		4.6	Analytical	<b>70005-154630</b>
250	250	4.6	Analytical	<b>70005-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

**BETASIL Diol HPLC Columns**

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	4.0/4.6	Guard cartridge	<b>72605-014001</b>
		150	Analytical	<b>72605-154630</b>
		250	Analytical	<b>72605-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.



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## HyPURITY HPLC columns

### HyPURITY C18 HPLC columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.			
3.0	10	2.1	Guard cartridge	<b>22103-012101</b>			
		3.0	Guard cartridge	<b>22103-013001</b>			
		4.0/4.6	Guard cartridge	<b>22103-014001</b>			
50	10	2.1	Analytical	<b>22103-052130</b>			
		3.0	Analytical	<b>22103-053030</b>			
		4.6	Analytical	<b>22103-054630</b>			
100	10	2.1	Analytical	<b>22103-102130</b>			
		3.0	Analytical	<b>22103-103030</b>			
		4.6	Analytical	<b>22103-104630</b>			
150	10	2.1	Analytical	<b>22103-152130</b>			
		3.0	Analytical	<b>22103-153030</b>			
		4.6	Analytical	<b>22103-154630</b>			
5.0	10	2.1	Guard cartridge	<b>22105-012101</b>			
		3.0	Guard cartridge	<b>22105-013001</b>			
		4.0/4.6	Guard cartridge	<b>22105-014001</b>			
	30	10	2.1	Analytical	<b>22105-032130</b>		
			50	10	2.1	Analytical	<b>22105-052130</b>
			3.0		Analytical	<b>22105-053030</b>	
			4.0		Analytical	<b>22105-054030</b>	
	4.6	Analytical	<b>22105-054630</b>				
	100	10	2.1	Analytical	<b>22105-102130</b>		
			4.0	Analytical	<b>22105-104030</b>		
			4.6	Analytical	<b>22105-104630</b>		
	150	10	2.1	Analytical	<b>22105-152130</b>		
			3.0	Analytical	<b>22105-153030</b>		
			4.0	Analytical	<b>22105-154030</b>		
			4.6	Analytical	<b>22105-154630</b>		
	250	10	2.1	Analytical	<b>22105-252130</b>		
			4.0	Analytical	<b>22105-254030</b>		
			4.6	Analytical	<b>22105-254630</b>		

Other column dimensions are available.  
Please contact Customer Service for more details.

### HyPURITY C8 HPLC columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.
5.0	10	3.0	Guard cartridge	<b>22205-013001</b>
		4.0/4.6	Guard cartridge	<b>22205-014001</b>
50	10	3.0	Analytical	<b>22205-053030</b>
		4.6	Analytical	<b>22205-054630</b>
100	10	4.6	Analytical	<b>22205-104630</b>
150	10	3.0	Analytical	<b>22205-153030</b>
		4.6	Analytical	<b>22205-154630</b>
250	10	4.6	Analytical	<b>22205-254630</b>

Other column dimensions are available.  
Please contact Customer Service for more details.

### HyPURITY Aquastar HPLC columns

Particle Size (µm)	Length (mm)	ID (mm)	Format	Cat. No.		
3.0	10	2.1	Guard cartridge	<b>22503-012101</b>		
		4.0/4.6	Guard cartridge	<b>22503-014001</b>		
50	10	2.1	Analytical	<b>22503-052130</b>		
		100	2.1	Analytical	<b>22503-102130</b>	
		150	2.1	Analytical	<b>22503-152130</b>	
		4.6	Analytical	<b>22503-154630</b>		
5.0	10	2.1	Guard cartridge	<b>22505-012101</b>		
		4.0/4.6	Guard cartridge	<b>22505-014001</b>		
	50	10	2.1	Analytical	<b>22505-052130</b>	
			100	2.1	Analytical	<b>22505-102130</b>
			150	4.6	Analytical	<b>22505-154630</b>
			250	4.0	Analytical	<b>22505-254030</b>
		4.6	Analytical	<b>22505-254630</b>		

Other column dimensions are available.  
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

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

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

### Ion Exchange

ProPac™ and 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. Applications include analysis of protein variants of monoclonal antibodies, blood and dairy proteins.

BioBasic AX and BioBasic SCX ion exchange columns demonstrate superior reproducibility,

both column-to-column and batch-to-batch because the 5 $\mu$ m, 300Å silica provides very efficiency. Both phases provide superior performance for proteins, peptides and nucleic acids using protein friendly ion exchange conditions. ProSwift IEX monoliths provide the outstanding resolving power of nonporous analytical media combined with fast analysis performance.

### 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 5 $\mu$ m 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, 5 $\mu$ m 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 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 10 $\mu$ m, nonporous, polymeric beads coated with a hydrophilic layer, then grafted with poly(IDA) chains. The poly(IDA) grafts are converted to metal-containing nanoparticles when the column is charged with metal. These nanoparticles act as IMAC interaction sites for individual proteins and provide the ProPac IMAC-10 with its high resolving power and elution peaks of high concentration and low volume.

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.

### Columns for oligonucleotides

DNAPac™ strong anion exchange columns provide unsurpassed high-resolution 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.

DNASwift™ a strong anion exchange monolith column that provides exceptionally high purity and yield of oligonucleotides. This semipreparative column incorporates the high resolution and selectivity of the DNAPac column, providing unsurpassed purity and yields.

## Columns for proteomics

### Nano, capillary and micro 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 Trap columns are typically applied for the desalting and pre-concentration 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. 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, 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.

The BioBasic KAPPA line meets all the sensitivity needs of demanding LC/MS separations. High efficiency capillaries are available in internal diameters ranging from 500µm all the way down to 75µm ID, and lengths of 50mm to 250mm. The BioBasic KAPPA line is ideal for all LC/MS analyses, especially proteomics separations of typically small sample concentrations. BioBasic 18, 8, 4 and SCX columns are also available in nanobore formats for nanospray LC/MS applications, particularly proteomics. At flow rates of nL/min versus mL/min, nanobore columns offer higher sensitivity with greater signal-to-noise ratio than traditional electrospray.

IntegraFrit columns have an integral high porosity frit, behind which is the packed chromatography bed. The frit end of the fused silica column is polished flat to ensure a clean connection to the emitter of choice. PicoFrit columns eliminate post-column performance losses by spraying directly from the column, boosting MS performance compared to that provided by a column attached to a tip.

### Columns for Carbohydrates

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.

## Bio Columns Selection Guide

Analyte	Mode of analysis	Recommended column	
Proteins	Size Exclusion	BioBasic SEC	4-135
		MABPac SEC-1	4-131
	Ion Exchange	BioBasic AX	4-136
		ProPac SCX-10, WCX-10, SAX-10, WAX-10	4-121
		MABPac SCX-10	4-130
		ProSwift IEX	4-127
		BioBasic 18, 8, 4	4-138
	Reversed Phase	Acclaim 300 C18	4-141
		ProSwift RP	4-128
	Hydrophobic Interaction	ProPac HIC-10	4-125
Affinity	ProPac IMAC-10	4-126	
	ProSwift ConA-1S	4-129	
Peptides	Proteomics	Acclaim PepMap	4-142
		PepSwift	4-145
		EASY-Column	4-146
		PicoFrit, IntegraFrit	4-147
	KAPPA	4-148	
	Analytical	BioBasic 18, 8, 4	4-138
		Acclaim 300	4-056
Preparative	BioBasic	Inquire	
Amino Acids (derivatized)	Ion Exchange	AminoPac PA10	Inquire
	Reversed phase	Hypersil GOLD	4-056
Amino Acids (underivatized)	Ion Exchange	AminoPac PA10	Inquire
	Reversed phase	Hypercarb	4-097
Nucleotides	Anion Exchange	BioBasic AX	4-136
	Polar retention	Hypercarb	4-097
Oligonucleotides	Ion Exchange	BioBasic AX	4-136
		DNAPac PA100, PA200	4-132
		DNASwift	4-134
Carbohydrates	Ligand Exchange	HyperREZ XP	4-153
	Ion Exchange	CarboPac	Inquire
	HILIC	Acclaim HILIC	4-079
		Hypersil GOLD HILIC	4-070
		Synchronis HILIC	4-093
Polar retention	Hypercarb	4-097	

## HPLC Phases for Biomolecules

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 PepMap</b>									
100 C18	Spherical, fully porous silica	2, 3, 5	100	300	15	Yes	L1	–	<b>4-142</b>
300 C18	Spherical, fully porous silica	5	300	100	9	Yes	L1	–	<b>4-143</b>
100 C8	Spherical, fully porous silica	3, 5	100	300	9	Yes	L7	–	<b>4-144</b>
300 C4	Spherical, fully porous silica	5	300	300	3	Yes	L26	–	<b>4-144</b>
<b>BioBasic</b>									
18	Spherical, fully porous silica	5	300	100	9	Yes	L1	721	<b>4-138</b>
8	Spherical, fully porous silica	5	300	100	5	Yes	L7	722	<b>4-139</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>4-136</b>
SCX	Spherical, fully porous silica	5	300	100	3	No	L52	733	<b>4-137</b>

## Columns for Protein Separations

### Silica 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</b>								
SEC 60	Aqueous	Spherical, fully porous silica	5	60	0.1 - 6	–	733	<b>4-135</b>
SEC 120	Aqueous	Spherical, fully porous silica	5	120	0.1 - 50	L33	734	<b>4-135</b>
SEC 300	Aqueous	Spherical, fully porous silica	5	300	1 - 500	L33, L59	735	<b>4-135</b>
SEC 1000	Aqueous	Spherical, fully porous silica	5	1000	20 - 4000	L33	736	<b>4-135</b>
<b>MABPac</b>								
SEC-1	Aqueous	Spherical, fully porous silica	5	300	1 - 500	L33, L59		<b>4-131</b>

### Silica 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)	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	2M Ammonium sulfate/ phosphate salts, organic solvent for cleanup	2.5-7.5

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

Column	Phase	Target Applications	Base Matrix Material	Functional Groups	Capacity	Recommended Flow Rate	Solvent Compatibility	Maximum Backpressure	pH Range
MABPac SCX-10	Strong Cation Exchange	High Resolution separation of monoclonal antibody variants	Highly crosslinked divinylbenzene 10µm nonporous particles	Sulfonic	30µg/mL	0.2-2.0 mL/min	50% acetonitrile	3000psi (21 MPa)	2.0-12
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	30µg/mL	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	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	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	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 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 Carbohydrate Separations

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</b>									
Carbohydrate H <sup>+</sup>	spherical, polymer	8.0	–	–	–	–	L17	690	<b>4-152</b>
Carbohydrate Pb <sup>2+</sup>	spherical, polymer	8.0	–	–	–	–	L34	691	<b>4-152</b>
Carbohydrate Ca <sup>2+</sup>	spherical, polymer	8.0	–	–	–	–	L19	692	<b>4-152</b>
Carbohydrate Na <sup>+</sup>	spherical, polymer	10.0	–	–	–	–	–	693	<b>4-152</b>
Organic Acid	spherical, polymer	8.0	–	–	–	–	L17	696	<b>4-152</b>
Sugar Alcohol	spherical, polymer	8.0	–	–	–	–	L19	697	<b>4-152</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	1.5mL/min	0-100%	4000psi (28MPa)	2-12.5
DNAPac PA200	High resolution separations of single and double stranded DNA or RNA oligonucleotides	8µm diameter nonporous substrate agglomerated with alkyl quaternary ammonium functionalized latex 130nm MicroBeads	55%	5%	40µeq	Hydroxide, acetate/hydroxide	1.2mL/min	0-100%	4000psi (28MPa)	2-12.5
DNASwift	High resolution separations for purification of oligonucleotides	Monolith; polymethacrylate substrate agglomerated with quaternary amine functionalized latex	N/A	N/A	50mg, of a 20 mer oligonucleotide	NaClO <sub>4</sub> and NaCl	0.5-2.5mL	Most Common Organic Solvents	1500psi	6.0-12.4

## ProPac SCX-10 and WCX-10

Strong and weak 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 SCX-10 is a strong cation exchange column with sulfonate functional groups
- ProPac WCX-10 is a weak cation exchanger with a carboxylate functional groups

ProPac SCX-10 and WCX-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 Ion Exchange HPLC Columns

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10.0	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 WCX-10 Ion Exchange HPLC Guards

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID
10.0	50	<b>063480</b>	<b>054994</b>

### ProPac SCX-10 Ion Exchange HPLC Columns

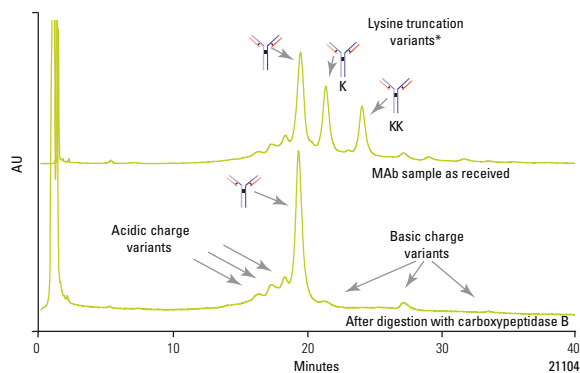
Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10.0	250	<b>063456</b>	<b>054995</b>	<b>063700</b>	<b>SP5522</b>

### ProPac SCX-10 Ion Exchange HPLC Guards

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID
10.0	50	<b>063462</b>	<b>054996</b>



### MAB separation on ProPac WCX-10 column: characterization of lysine truncation variants

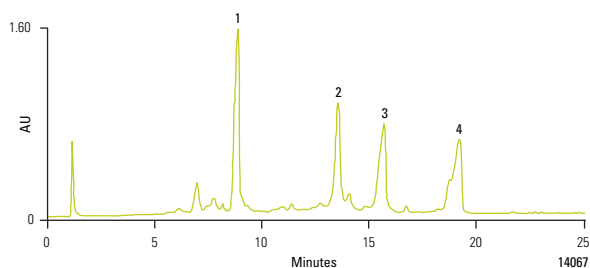


#### Column: ProPac WCX-10 (4 × 250mm)

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 PDL
Flow Rate:	1.0mL/min
λ:	280nm

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

### Separation of hemoglobin variants



#### Column: ProPac SCX-10, 4 × 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.:	10µL
Detection:	220nm
Sample:	1. Fetal hemoglobin 2. Hemoglobin 3. Sickle cell hemoglobin 4. Hemoglobin C

### ProPac Kits

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 SAX-10 and WAX-10

Strong and weak 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 SAX-10 is a strong anion exchange column with quaternary amine functional group
- ProPac WAX-10 column is a weak anion exchanger with a tertiary 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.

### ProPac WAX-10 Ion Exchange HPLC Columns

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10.0	250	<b>063464</b>	<b>054999</b>	<b>063707</b>	<b>SP5598</b>

### ProPac WAX-10 Ion Exchange HPLC Guards

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID
10.0	50	<b>063470</b>	<b>055150</b>

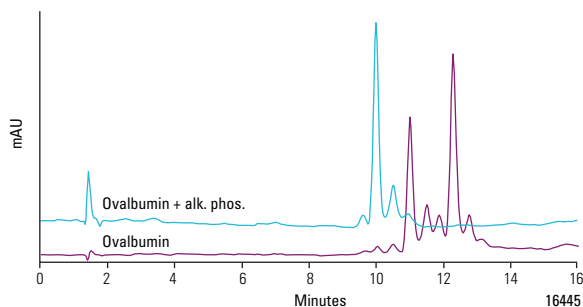
### ProPac SAX-10 Ion Exchange HPLC Columns

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10.0	250	<b>063448</b>	<b>054997</b>	<b>063703</b>	<b>SP5594</b>

### ProPac SAX-10 Ion Exchange HPLC Guards

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID
10.0	50	<b>063454</b>	<b>054998</b>

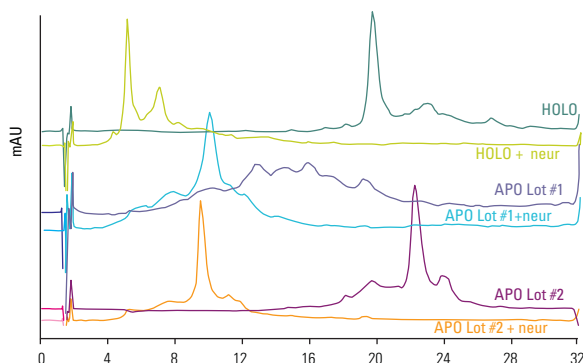
### Resolution of phosphorylation variants of ovalbumin



**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 PA1

For hydrophilic anionic protein separations

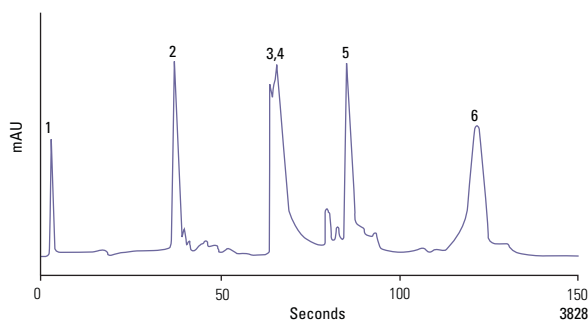
- Good for hydrophilic anionic proteins and peptides
- Ideal for high-resolution separations of proteins with pI values from 3 to 11
- Available in semipreparative format
- Pellicular packing ensures high-efficiency and fast mass transport

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

### ProPac PA1 Ion Exchange HPLC Columns

Particle Size (µm)	Length (mm)	4.0mm ID	9.0mm ID
10.0	50	<b>039657</b>	—
	250	<b>039658</b>	<b>040137</b>

### Gradient separation of protein standards



**Column: ProPac PA1 (4 x 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 Trypsin Inhibitor 66	



## ProPac HIC-10

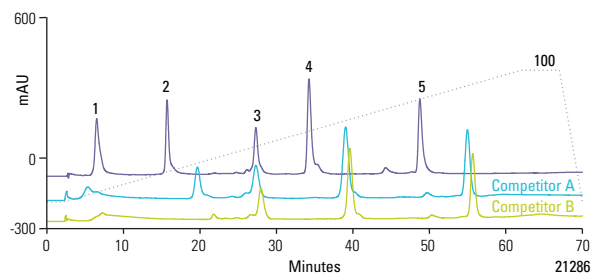
Hydrophobic Interaction Chromatography columns for the high resolution separation of proteins and peptides

- 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 ultrahigh 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 PA1 Ion Exchange HPLC Columns

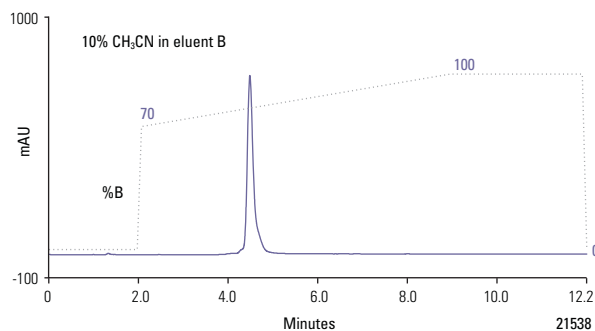
Particle Size (µm)	Length (mm)	2.1mm ID	4.6mm ID	7.8mm ID
10.0	75	—	—	<b>063665</b>
	100	<b>063653</b>	<b>063655</b>	—
	250	—	<b>074197</b>	—



#### 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

Separation of a mixture of proteins using the ProPac HIC-10, compared to the same separation on two competitor columns



#### 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

Gradient separation of a monoclonal antibody using the ProPac HIC-10



## ProPac IMAC-10

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

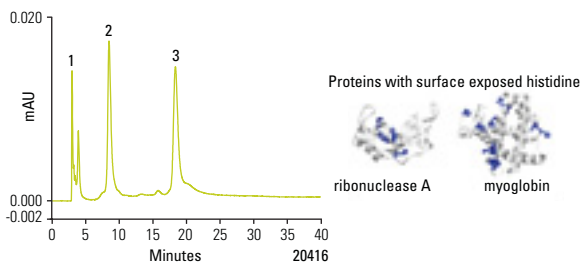
### ProPac IMAC-10 Immobilized Metal Affinity HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
10.0	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>

### Accessories for the ProPac IMAC-10 column

Description	Cat.No.
IMAC Loading Column (4 x 50mm)	<b>063667</b>
IMAC Loading Column (9 x 50mm)	<b>063710</b>
IMAC Loading Column (9 x 250mm)	<b>063718</b>

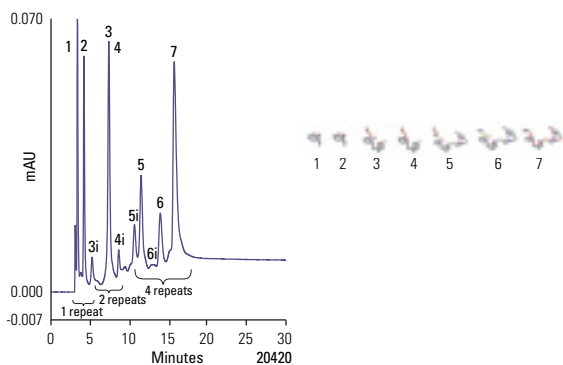
### Separation of standard proteins with surface-exposed histidines



#### 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

### Separation of prion-related peptides using the ProPac IMAC-10



#### 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	PHGGGWGQ
3	KKRPKP(PHGGGWGQ) <sub>2</sub>
4	KKRP(PHG <sup>X</sup> GWGQ) <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

- High resolution
- High loading capacity
- Fast analysis
- Wide range of operational flow rates
- Excellent stability over a wide pH range
- Outstanding reproducibility and ruggedness
- Optimal performance in a broad variety of applications
- High throughput and improved productivity

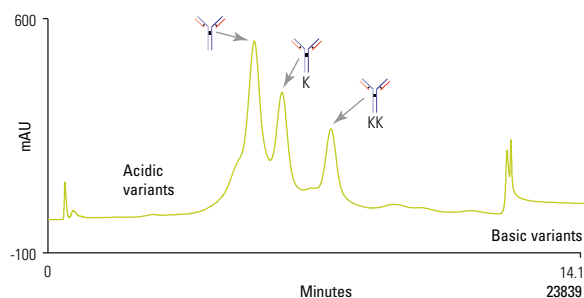
ProSwift IEX monoliths provide the outstanding resolving power of nonporous analytical media combined with fast separation analysis

### ProSwift Ion Exchange Monolith HPLC Columns

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



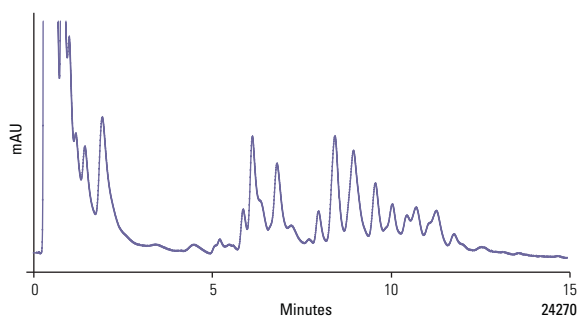
### Separation of monoclonal antibody variants



#### Column: ProSwift WCX-1S (4.6 × 50mm)

Flow rate: 1mL/min  
 Eluents: A. 10mM Sodium phosphate (pH 7.6)  
 B. 1 M Sodium chloride in eluent A  
 Detection: UV, 214nm  
 Sample: MAb 5mg/mL  
 Inj. Volume: 10µL  
 Gradient: 5–10% B in 10 min, 100% B for 4 min

### Protein separation on the ProSwift WAX-1S column



#### 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 *E. coli* protein

## ProSwift RP Columns

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

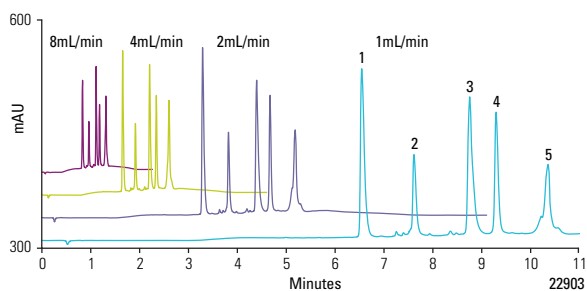
- High resolution at high speed
- Highest operational flow rates available
- High throughput and improved productivity
- Optimal performance in a broad range of applications
- Excellent stability over a wide pH range of 1 to 14
- Outstanding reproducibility and ruggedness
- High stringent wash compatible,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

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



### ProSwift Reversed-Phase Monolith HPLC Columns

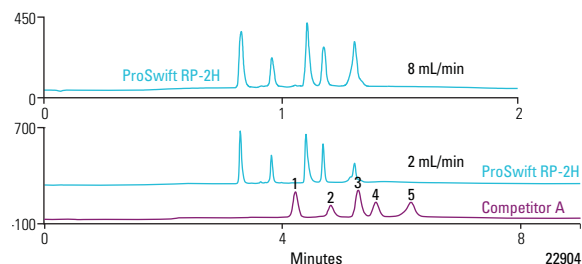
Packing	Functional Group	Length (mm)	1.0mm ID	4.6mm ID
monolith	RP-1S	50	—	<b>064297</b>
monolith	RP-2H	50	—	<b>064296</b>
monolith	RP-3U	50	—	<b>064298</b>
monolith	RP-4H	50	<b>069477</b>	—
monolith	RP-4H	250	<b>066640</b>	—



#### Column: ProSwift RP-2H (4.6 × 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

Separation of proteins at a variety of flow rates



#### Columns: 1. ProSwift RP-2H, 4.6 × 50mm 2. Competitor A, 4.6 × 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

Comparison of ProSwift RP-2H with porous bead-based column of leading competitor A

## ProSwift ConA-1S

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

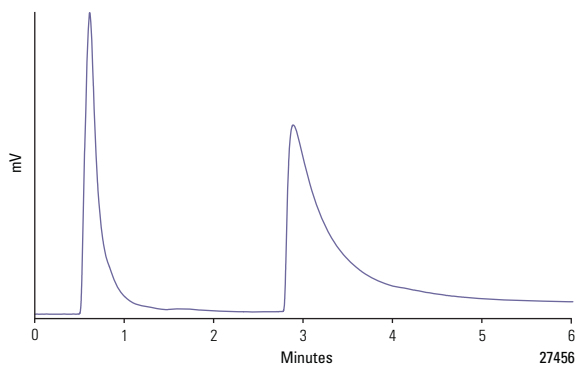
- Highly efficient enrichment and purification
- Highly purified glycan and glycoconjugate products
- High capacity and ligand density
- High sample recovery
- Low elution volumes
- Fast separations
- HPLC compatible
- Reusable for over one hundred purifications

The 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.

### ProSwift Affinity Monolith HPLC Columns

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

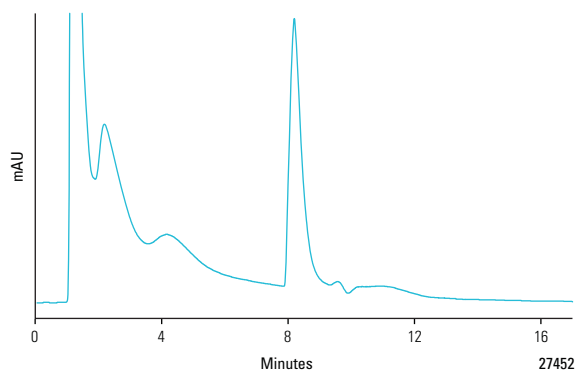
#### Fast, highly efficient enrichment and purification of a group of fluorescently labeled glycans in under 6 min using the ProSwift ConA-1S column



##### Column: ProSwift ConA-1S

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 $\alpha$ -methyl mannoside 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 using the ProSwift ConA-1S column



##### 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 $\alpha$ -methyl-mannopyranoside in eluent A
Flow Rate:	0.5mL/min
Temperature:	25°C
Detection:	UV 214nm
Sample:	Trypsin digested HRP peptides
Inj. Volume:	40 $\mu$ L
Gradient:	100% A from 0-5 min, 100% B from 6-15 min, 100% A from 16-25 min

## 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



### MABPac SCX-10 Ion Exchange HPLC Columns

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID
3.0	50		<b>077907</b>
5.0	50	—	<b>078656</b>
	250	—	<b>078655</b>
10.0	50	—	<b>075603</b>
	150	—	<b>075602</b>
	250	<b>075604</b>	<b>074625</b>

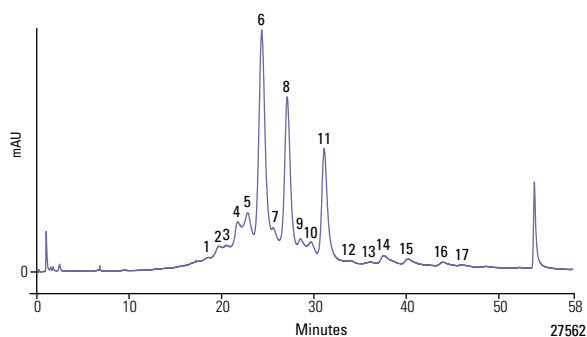
### MABPac SCX-10 Ion Exchange HPLC Guards

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID
10.0	50	<b>075749</b>	<b>074631</b>

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.

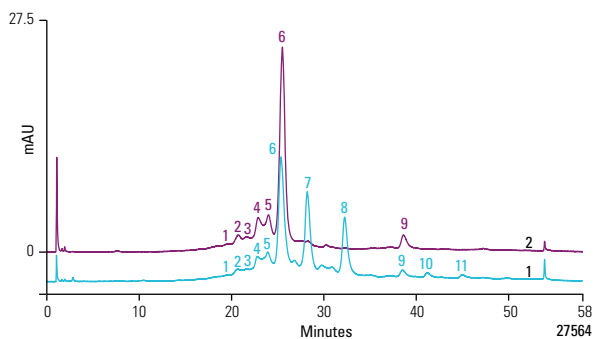
The MABPac SCX-10 column provides high resolution separations of monoclonal antibody variants

Baseline Resolution of C-terminal lysine variants of a monoclonal antibody sample is verified by a second chromatogram after treatment with Carboxypeptidase B



#### 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



#### 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 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 designed for different eluent conditions containing both high and low concentration of salt mobile phases, as well as operates in mass spectrometry friendly volatile eluents.

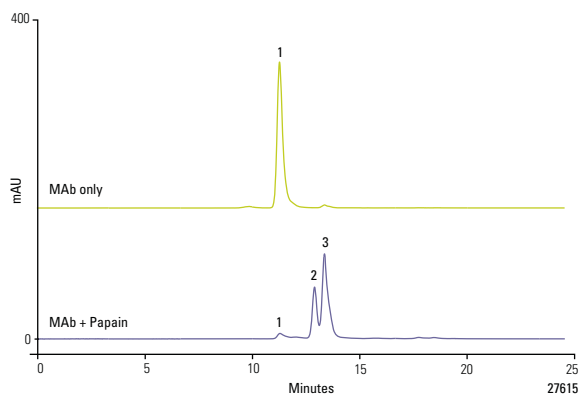
### MABPac SEC-1 Size Exclusion HPLC Columns

Particle Size (µm)	Length (mm)	4.0mm ID
10.0	150	<b>075592</b>
	300	<b>074696</b>

### MABPac SEC-1 Size Exclusion HPLC Guards

Particle Size (µm)	Length (mm)	4.0mm ID
10.0	50	<b>074697</b>

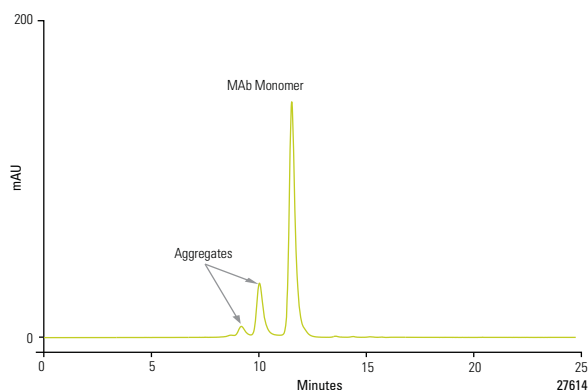
### Monoclonal Antibody (MAb) fragment analysis



#### Column: MABPac SEC-1, 5µm

Dimension:	4.0 × 300mm
Mobile Phase:	0.3 M NaCl in 50mM phosphate buffer pH 6.8
Temperature:	30°C
Flow Rate:	0.20mL/min
Inj. Volume:	1µL
Detection:	UV, 280nm
Samples:	1. MAb (5mg/mL) 2. MAb (5mg/mL) + Papain (10µL/300µL incubation 37°C for 3h)
Peaks:	1. MAb 2. F(ab') <sub>2</sub> 3. Fc

### Size exclusion chromatography column for monoclonal antibodies and aggregates



#### Column: MABPac SEC-1, 5µm

Dimension:	4.0 × 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:	2µL
Detection:	UV, 280nm
Sample:	MAb (10mg/mL)



## DNAPac PA100

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

- Ultrahigh-resolution separations of oligonucleotides
- Capable of n, n-1 resolution for oligonucleotides
- Resolves oligonucleotides with secondary structures
- Compatible with solvent, high pH, and high temperatures
- Analyzes phosphorothioate-based clinical samples
- Provides easy scale-up

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

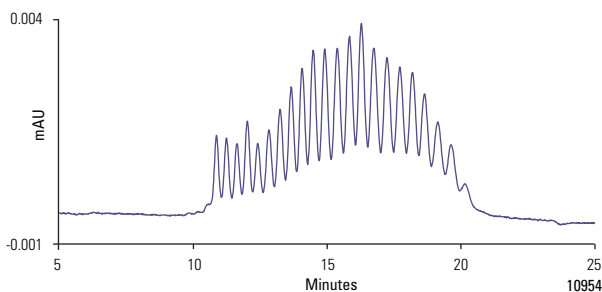
### DNAPac PA100 HPLC Columns

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
13.0	250	<b>SP3686</b>	<b>043010</b>	<b>043011</b>	<b>SP2091</b>

### DNAPac PA100 HPLC Guards

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID
13.0	50	<b>SP4016</b>	<b>043018</b>

### Separation of oligonucleotides using the DNAPac PA100 column



#### Column: DNAPac PA100

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

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Flow Rate: 1.5mL/min

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Detection: UV, 260nm

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Sample: pd(A)<sub>16-50</sub>



## DNAPac PA200

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

- Ultrahigh-resolution separations of oligonucleotides
- 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 (2in–5in) links from normal SS-RNA



DNAPac PA200 can resolve full length from n–1, n+1, and other failure sequences not possible with other columns.

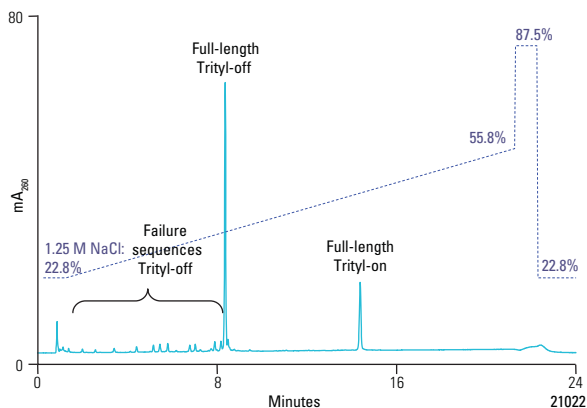
### DNAPac PA200 HPLC Columns

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
8	250	<b>063425</b>	<b>063000</b>	<b>063421</b>	<b>SP6734</b>

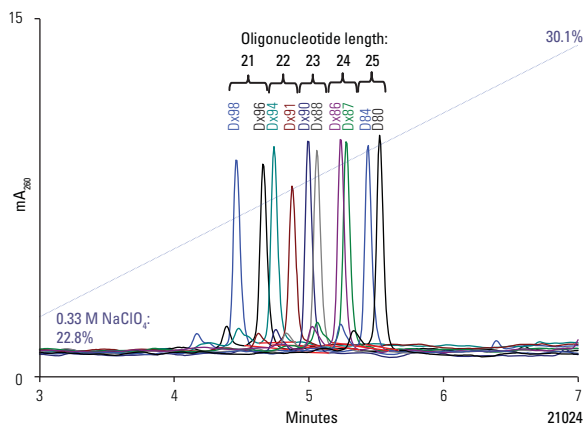
### DNAPac PA200 HPLC Guards

Particle Size (µm)	Length (mm)	2.0mm ID	4.0mm ID	9.0mm ID	22.0mm ID
8	50	<b>063423</b>	<b>062998</b>	<b>063419</b>	<b>SP6731</b>

### Resolution of 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:** 1.2 mL/min  
**Inj. Volume:** 8 µL  
**Detection:** UV, 260nm

## DNASwift SAX-1S

A strong anion exchange monolith column that provides exceptionally high purity and yield of oligonucleotides

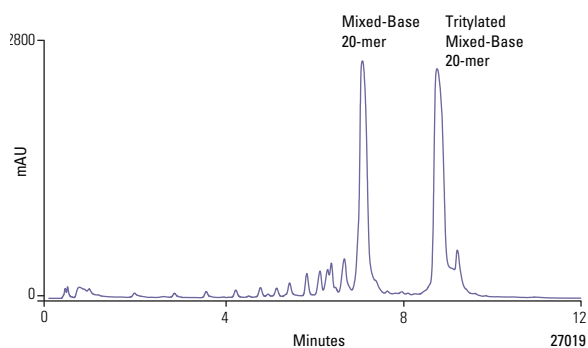
- Highest resolution for oligonucleotide purification available, providing high purity and yields
- Exceptionally high capacity
- Refined selectivity, as with the DNAPac column, for high resolution
- Compatible with high pH mobile phases, solvents, and high temperatures
- Ideal for therapeutic and diagnostic research
- Purify difficult oligonucleotide products

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

### DNASwift Columns

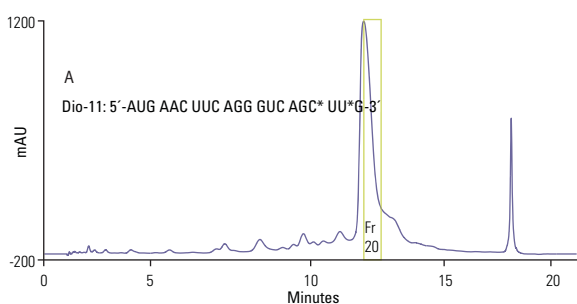
Functional Group	Length (mm)	5.0mm ID
SAX-1S	150	<b>066766</b>

#### Purification of tritylated oligonucleotide using the DNASwift SAX-1S column



<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

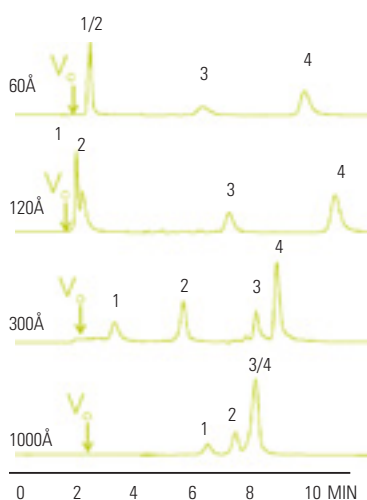
# BioBasic SEC Columns

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

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

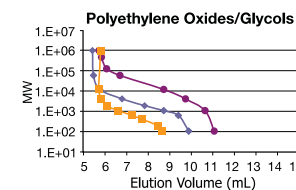
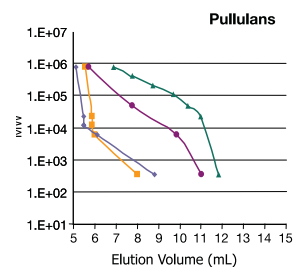
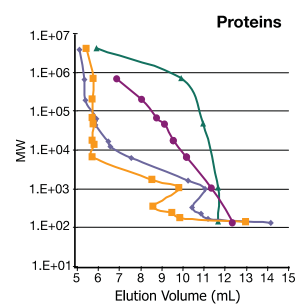
For information on bulk quantities, please inquire.



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>s</sub>) (MW 137)

Effect of pore size on SEC resolution



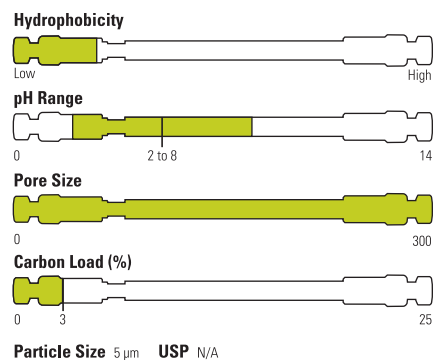
BioBasic SEC,  
 60Å 120Å 300Å 1000Å

Molecular weight calibration curves

## BioBasic AX HPLC Columns

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 AX HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	50	<b>73105-051030</b>	<b>73105-052130</b>	<b>73105-053030</b>	<b>73105-054030</b>	<b>73105-054630</b>
	100	<b>73105-101030</b>	<b>73105-102130</b>	<b>73105-103030</b>	<b>73105-104030</b>	<b>73105-104630</b>
	150	<b>73105-151030</b>	<b>73105-152130</b>	<b>73105-153030</b>	<b>73105-154030</b>	<b>73105-154630</b>
	250	<b>73105-251030</b>	<b>73105-252130</b>	<b>73105-253030</b>	<b>73105-254030</b>	<b>73105-254630</b>

Other column dimensions are available, including preparative columns. Please call Customer Service for more information.

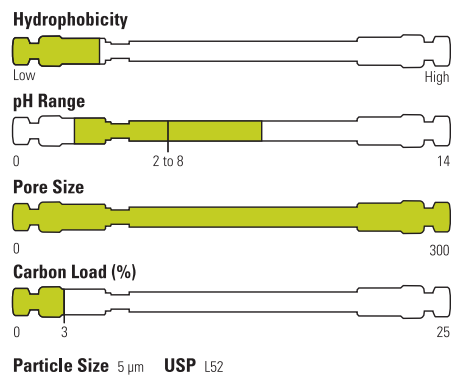
### BioBasic AX Drop-in Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	<b>73105-011001</b>	<b>73105-012101</b>	<b>73105-013001</b>	<b>73105-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

## BioBasic SCX Columns

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 SCX HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	50	<b>73205-051030</b>	<b>73205-052130</b>	<b>73205-053030</b>	<b>73205-054030</b>	<b>73205-054630</b>
	100	<b>73205-101030</b>	<b>73205-102130</b>	<b>73205-103030</b>	<b>73205-104030</b>	<b>73205-104630</b>
	150	<b>73205-151030</b>	<b>73205-152130</b>	<b>73205-153030</b>	<b>73205-154030</b>	<b>73205-154630</b>
	250	<b>73205-251030</b>	<b>73205-252130</b>	<b>73205-253030</b>	<b>73205-254030</b>	<b>73205-254630</b>

Other column dimensions are available, including preparative columns. Please call Customer Service for more information.

### BioBasic SCX Drop-in Guard Cartridges

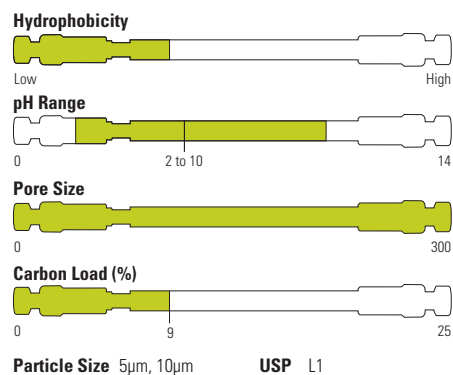
Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	Quantity
5.0	10	<b>73205-011001</b>	<b>73205-012101</b>	<b>73205-013001</b>	<b>73205-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each



## BioBasic 18 HPLC Columns

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 18 HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	50	<b>72105-051030</b>	<b>72105-052130</b>	<b>72105-053030</b>	<b>72105-054030</b>	<b>72105-054630</b>
	100	<b>72105-101030</b>	<b>72105-102130</b>	<b>72105-103030</b>	<b>72105-104030</b>	<b>72105-104630</b>
	150	<b>72105-151030</b>	<b>72105-152130</b>	<b>72105-153030</b>	<b>72105-154030</b>	<b>72105-154630</b>
	250	<b>72105-251030</b>	<b>72105-252130</b>	<b>72105-253030</b>	<b>72105-254030</b>	<b>72105-254630</b>

Other column dimensions are available including preparative columns. Please call Customer Service for more information.

### BioBasic 18 Drop-in Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	<b>72105-011001</b>	<b>72105-012101</b>	<b>72105-013001</b>	<b>72105-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### BioBasic 18 PEEK Bio-Inert HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	100	–	<b>72105-102168</b>	–	–	<b>72105-104668</b>
	150	–	<b>72105-152168</b>	–	–	<b>72105-154668</b>
	250	–	<b>72105-252168</b>	–	–	<b>72105-254668</b>

### BioBasic 18 PEEK Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
5.0	10	–	<b>72105-012103</b>	–	<b>72105-014003</b>	3 Pack
Bio-inert Guard Holder	–	–	<b>Inquire</b>	–	<b>C270-01</b>	1 Each

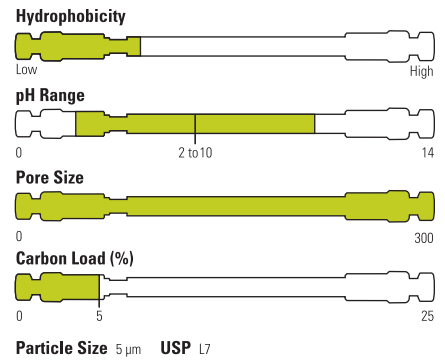
Other column dimensions are available in bio-inert column hardware. Please call Customer Service for more information.

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[www.twitter.com/servingscience](http://www.twitter.com/servingscience)

## BioBasic 8 HPLC Columns

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 8 Analytical HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	50	<b>72205-051030</b>	<b>72205-052130</b>	<b>72205-053030</b>	<b>72205-054030</b>	<b>72205-054630</b>
	100	<b>72205-101030</b>	<b>72205-102130</b>	<b>72205-103030</b>	<b>72205-104030</b>	<b>72205-104630</b>
	150	<b>72205-151030</b>	<b>72205-152130</b>	<b>72205-153030</b>	<b>72205-154030</b>	<b>72205-154630</b>
	250	<b>72205-251030</b>	<b>72205-252130</b>	<b>72205-253030</b>	<b>72205-254030</b>	<b>72205-254630</b>

Other column dimensions are available, including preparative columns. Please call Customer Service for more information.

### BioBasic 8 Drop-in Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm/4.6mm ID	Quantity
5.0	10	<b>72205-011001</b>	<b>72205-012101</b>	<b>72205-013001</b>	<b>72205-014001</b>	4 Pack
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	1 Each

### BioBasic 8 PEEK Bio-Inert Columns

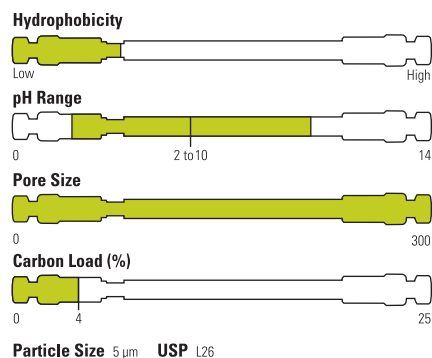
Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	100	–	<b>72205-102168</b>	–	–	<b>72205-104668</b>
	150	–	<b>72205-152168</b>	–	–	<b>72205-154668</b>
	250	–	<b>72205-252168</b>	–	–	<b>72205-254668</b>

### BioBasic 8 PEEK Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.6mm ID	Quantity
5.0	10	–	<b>72205-012103</b>	–	<b>72205-014003</b>	3 Pack
Bio-inert Guard Holder	–	–	<b>Inquire</b>	–	<b>C270-01</b>	1 Each

## BioBasic 4 HPLC Columns

- 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 4 HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	50	<b>72305-051030</b>	<b>72305-052130</b>	<b>72305-053030</b>	<b>72305-054030</b>	<b>72305-054630</b>
	100	<b>72305-101030</b>	<b>72305-102130</b>	<b>72305-103030</b>	<b>72305-104030</b>	<b>72305-104630</b>
	150	<b>72305-151030</b>	<b>72305-152130</b>	<b>72305-153030</b>	<b>72305-154030</b>	<b>72305-154630</b>
	250	<b>72305-251030</b>	<b>72305-252130</b>	<b>72305-253030</b>	<b>72305-254030</b>	<b>72305-254630</b>

Other column dimensions are available, including preparative columns. Please call Customer Service for more information.

### BioBasic 4 Drop-In Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	10	<b>72305-011001</b>	<b>72305-012101</b>	<b>72305-013001</b>	<b>72305-014001</b>	<b>72305-014003</b>
	UNIGUARD Drop-in Guard Cartridge Holder	<b>851-00</b>	<b>852-00</b>	<b>852-00</b>	<b>850-00</b>	<b>850-00</b>

### BioBasic 4 PEEK Bio-Inert HPLC Columns

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0mm ID	4.6mm ID
5.0	100	–	<b>72305-102168</b>	–	–	<b>72305-104668</b>
	150	–	<b>72305-152168</b>	–	–	<b>72305-154668</b>
	250	–	<b>72305-252168</b>	–	–	<b>72305-254668</b>

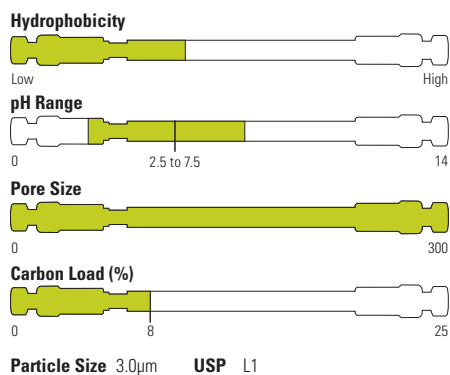
### BioBasic 4 PEEK Guard Cartridges

Particle Size (µm)	Length (mm)	1.0mm ID	2.1mm ID	3.0mm ID	4.0/4.6mm ID	Quantity
5.0	10	–	<b>72305-012103</b>	–	<b>72305-014003</b>	3 Pack
Bio-inert Guard Holder	–	–	–	–	<b>C270-01</b>	1 Each

## 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 HPLC Columns

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
3.0	50	<b>060263</b>	–	<b>060265</b>
	150	<b>060264</b>	<b>063684</b>	<b>060266</b>

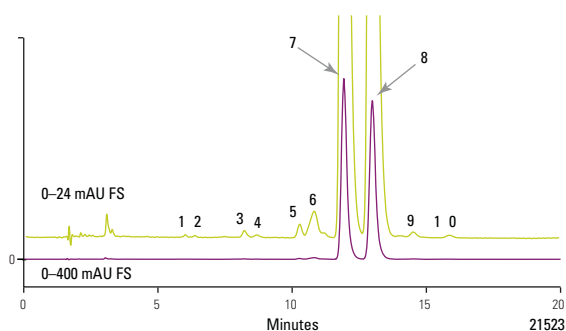
### Acclaim 300 C18 HPLC Guards

Particle Size (µm)	Length (mm)	2.1mm ID	3.0mm ID	4.6mm ID
5.0	10	<b>069690</b>	<b>075721</b>	<b>069697</b>

### Acclaim 300 C18 HPLC Guard Holder

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.

## Acclaim PepMap RSLC C18 & Acclaim PepMap C18, 100Å HPLC Columns, nanoViper and Classic Column Format

- High resolution in protein identification, biomarker discovery, and systems biology
- Highest sensitivity in LC/MS due to unique loadability
- Designed for TFA-free LC-MS, minimizing ion-suppression effects
- Ideally suited for coupling to ESI/MS and MALDI-MS
- Highest column-to-column reproducibility
- Easy-to-use, cutting-edge miniaturized HPLC
- nanoViper™ fingertight connections for easy column installation

### nanoViper

- Easy to use
- Universally applicable to current, legacy and third party common 1/16in hardware
- No column damage by overtightening
- No experimental failure due to bad connections



The Acclaim PepMap stationary phase has become the standard for peptide separations in proteomics and can be used with all modern nano LC systems available in the market.

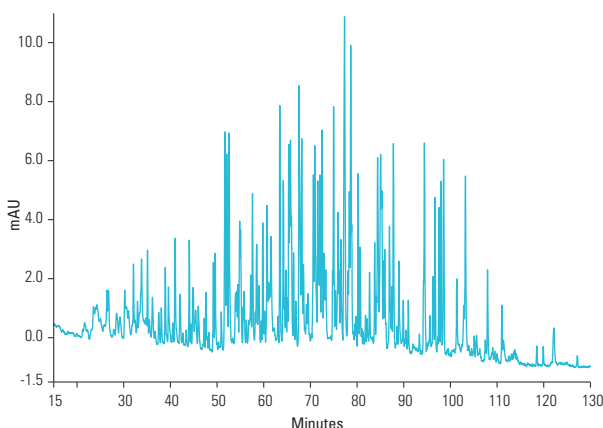
Building on this success, the 2µm Acclaim PepMap RSLC stationary phase has been developed for ultrahigh-resolution peptide separations.

The nanoViper connections pre-installed on these columns eliminate troublesome connections in nano LC. nanoViper is a fingertight, dead volume free connection that holds up to 1000 bar.

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 Trap columns are typically applied for the desalting of peptides before LC separation with MS detection, thus allowing fast sample preconcentration and clean-up of large volume injections. The columns are designed to provide the highest efficiencies for one-dimensional peptide mapping experiments and 2D-LC analyses. Trap columns are available in two formats:

- Fused silica nano trap columns to provide the highest chromatographic performance.
- Stainless steel cartridges to provide maximum robustness.



#### Column: Acclaim PepMap C18 3µm (75µm ID x 50cm)

Flow Rate:	300 nL/min
Mobile Phase:	A: water + 0.1% formic acid B: water/acetonitrile 20/80 v/v% + 0.08% formic acid
Gradient:	4–55% B in 120min, 5 min wash
Detection:	UV, 214nm
Sample:	Protein mixture digest (P/N 161088)
Temperature:	35°C

**Acclaim PepMap C18, 100Å HPLC Columns, nanoViper**

Particle Size (µm)	Length (mm)	50µm ID	75µm ID	100µm ID	300µm ID	1.0mm ID
2.0	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>	–	–	–
3.0	20 (Trap)	–	<b>164535</b>	–	–	–
	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>
	250	<b>164714</b>	<b>164569</b>	–	–	–
5.0	500	<b>164715</b>	<b>164570</b>	–	–	–
	20 (Trap)	–	–	<b>164564</b>	–	–

**Acclaim PepMap Trap Column Holders, nanoViper**

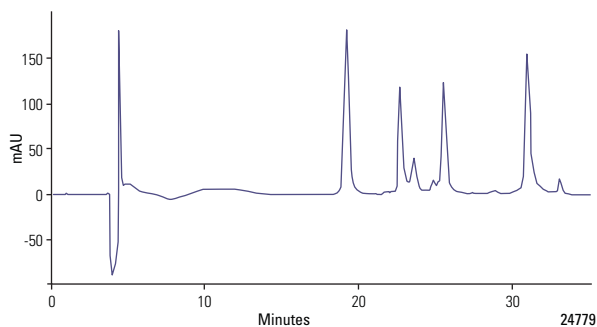
Description	Cat. No.
µ-Precolumn holder, 5mm, with 30µm ID connecting tubing, nanoViper fittings	<b>164649</b>
µ-Precolumn holder, 15mm, with 75µm ID connecting tubing, nanoViper fittings	<b>164650</b>

**Acclaim PepMap C18, 100Å HPLC Columns, Classic**

Particle Size (µm)	Length (mm)	50µm ID	75µm ID	100µm ID	200µm ID	300µm ID	500µm ID	800µm ID	1.0mm ID
3.0	50	<b>161563</b>	<b>160316</b>	–	–	<b>160290</b>	–	–	<b>160277</b>
	150	<b>161574</b>	<b>160321</b>	–	–	<b>160295</b>	–	–	<b>160282</b>
	250	–	<b>164261</b>	–	–	–	–	–	–
	500	–	<b>164451</b>	–	–	–	–	–	–
5.0	1 (Trap)	–	–	–	–	<b>160428</b>	–	–	–
	2 (Trap)	–	–	–	–	–	–	<b>160424</b>	–
	5 (Trap)	–	–	–	–	<b>160454</b>	<b>160446</b>	–	<b>160434</b>
	10 (Trap)	–	–	<b>164197</b>	<b>164212</b>	–	–	–	–
	15 (Trap)	–	–	–	–	–	<b>160450</b>	–	<b>160438</b>
	20 (Trap)	–	–	<b>164199</b>	<b>164213</b>	–	–	–	–
	50	–	<b>160318</b>	–	–	<b>160292</b>	–	–	<b>160279</b>
	150	–	<b>160323</b>	–	–	<b>160297</b>	–	–	<b>160284</b>
250	–	<b>160326</b>	–	–	<b>160300</b>	–	–	<b>160287</b>	

**Acclaim PepMap C18, 300Å HPLC Columns, Classic**

Particle Size (µm)	Length (mm)	50µm ID	75µm ID	100µm ID	200µm ID	300µm ID	500µm ID	800µm ID	1.0mm ID
5.0	1 (Trap)	–	–	–	–	<b>163938</b>	–	–	–
	2 (Trap)	–	–	–	–	–	–	<b>163942</b>	–
	5 (Trap)	–	–	–	–	<b>163589</b>	<b>163945</b>	–	<b>163592</b>
	15 (Trap)	–	–	–	–	–	<b>163946</b>	–	<b>163593</b>
	50	–	<b>163577</b>	–	–	<b>163580</b>	–	–	<b>163584</b>
	150	–	<b>163574</b>	–	–	<b>163581</b>	–	–	<b>163585</b>



**Column: 300µm i.d. x 15cm, PepMap300, C18, 5µm 300Å,**

Temperature: 40°C

Flow Rate: 4µL/min

Mobile Phase: A: H<sub>2</sub>O/acetonitrile  
(90/10 v/v), 0.1% TFA

B: H<sub>2</sub>O/acetonitrile  
(10/90 v/v), 0.08% TFA

Gradient: 5–55% B in 30 min

Detection: UV, 214nm

Sample: Ribonuclease, insulin,  
cytochrome c, myoglobin,  
lysosyme, 40ng/protein

## Acclaim PepMap C8 100Å HPLC Columns

Acclaim PepMap100 C8 is an excellent alternative for the Acclaim PepMap100 C18, when separating very hydrophobic peptides (e.g., non-tryptic peptides). It is available with 3 or 5µm particles, with 100Å pore sizes, and in nano, capillary and micro formats.

### Acclaim PepMap C8, 100Å HPLC Columns, nanoViper

Particle Size (µm)	Length (mm)	75µm ID	300µm ID	500µm ID	800µm ID	1.0mm ID
3.0	150	<b>164706</b>	<b>164722</b>	–	–	<b>164723</b>

### Acclaim PepMap C8, 100Å HPLC Columns, Classic

Particle Size (µm)	Length (mm)	75µm ID	300µm ID	500µm ID	800µm ID	1.0mm ID
3.0	50	<b>161184</b>	<b>161181</b>	–	–	<b>160240</b>
	150	<b>161185</b>	<b>161182</b>	–	–	<b>161179</b>
5.0	1 (Trap)	–	<b>161188</b>	–	–	–
	2 (Trap)	–	–	–	<b>161187</b>	–
	5 (Trap)	–	<b>161194</b>	<b>161192</b>	–	<b>161189</b>
	15 (Trap)	–	–	<b>161193</b>	–	<b>161190</b>
	50	<b>161555</b>	<b>161547</b>	–	–	<b>161539</b>
	150	<b>161553</b>	<b>161545</b>	–	–	<b>161537</b>
	250	<b>161186</b>	–	–	–	–

## Acclaim PepMap C4 300Å HPLC Columns

Acclaim PepMap300 C4 is used for the separation of larger hydrophobic peptides and proteins, providing higher recoveries. It is available in 5µm particle size, with 300Å pore size, and in nano, capillary, and micro formats.

### Acclaim PepMap C4, 300Å HPLC Columns, nanoViper

Particle Size (µm)	Length (mm)	75µm ID	300µm ID	500µm ID	800µm ID	1.0mm ID
5	150	<b>164707</b>	<b>164720</b>	–	–	<b>164721</b>

### Acclaim PepMap C4, 300Å HPLC Columns, Classic

Particle Size (µm)	Length (mm)	75µm ID	300µm ID	500µm ID	800µm ID	1.0mm ID
5.0	1 (Trap)	–	<b>163937</b>	–	–	–
	2 (Trap)	–	–	–	<b>163941</b>	–
	5 (Trap)	–	<b>163591</b>	–	–	<b>163594</b>
	15 (Trap)	–	–	<b>163944</b>	–	<b>163595</b>
	50	<b>163578</b>	<b>163582</b>	–	–	<b>163586</b>
	150	<b>163579</b>	<b>163583</b>	–	–	<b>163587</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 (PS-DVB) HPLC Columns, nanoViper

Particle Size (µm)	Length (mm)	100µm ID	200µm ID	500µm ID
–	5 (Trap)	–	<b>164558</b>	–
	50	<b>164584</b>	<b>164557</b>	<b>164585</b>
	250	<b>164543</b>	<b>164542</b>	–

### PepSwift (PS-DVB) HPLC Columns, Classic

Particle Size (µm)	Length (mm)	100µm ID	200µm ID	500µm ID
–	5 (Trap)	–	<b>163972</b>	–
	50	<b>162348</b>	<b>161409</b>	<b>164087</b>

### ProSwift RP-10R (PS-DVB) HPLC Columns, nanoViper

Particle Size (µm)	Length (mm)	100µm ID	200µm ID	1.0mm ID
–	50	–	–	<b>164586</b>

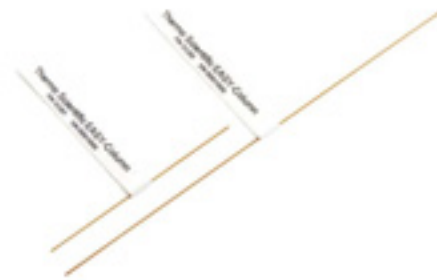
### ProSwift RP-10R (PS-DVB) HPLC Columns, Classic

Particle Size (µm)	Length (mm)	100µm ID	200µm ID	1.0mm ID
–	50	–	–	<b>164397</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

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, 1/32 OD) for 360µm OD fused silica	30	<b>SC603</b>

*Simplify the transfer of methods to UHPLC using isocratic method and gradient method calculators.*  
[www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)



## IntegraFrit and PicoFrit nano columns

Flexible silica packed columns for nanospray LC/MS applications

- 360µm OD fused silica nanobore columns
- IntegraFrit columns polished flat to ensure a clean connection to the emitter
- PicoFrit columns spray directly from the column

### Hypersil GOLD Nanobore HPLC Columns

Particle Size (µm)	Length (mm)	75µm ID	75µm ID Multipack	Quantity	150µm ID	150µm ID Multipack	Quantity
<b>IntegraFrit</b>							
1.9	10	<b>25002-017563</b>	<b>25002-017564</b>	4 Pack	<b>25002-011563</b>	<b>25002-011564</b>	4 Pack
	50	<b>25002-057563</b>	<b>25002-057564</b>	3 Pack	<b>25002-051563</b>	<b>25002-051564</b>	3 Pack
	100	<b>25002-107563</b>	<b>25002-107564</b>	3 Pack	–	–	–
5.0	50	<b>25005-057563</b>	<b>25005-057564</b>	3 Pack	<b>25005-051563</b>	<b>25005-051564</b>	3 Pack
	100	<b>25005-107563</b>	<b>25005-107564</b>	3 Pack	<b>25005-101563</b>	<b>25005-101564</b>	3 Pack
<b>PicoFrit, 15µm Tip</b>							
1.9	10	<b>25002-017581</b>	<b>25002-017583</b>	4 Pack	–	–	–
	50	<b>25002-057581</b>	<b>25002-057582</b>	3 Pack	–	–	–
	100	<b>25002-107581</b>	<b>25002-107582</b>	3 Pack	–	–	–
5.0	50	<b>25005-017581</b>	<b>25005-017583</b>	4 Pack	–	–	–
	100	<b>25005-057581</b>	<b>25005-057582</b>	3 Pack	–	–	–
	150	<b>25005-107581</b>	<b>25005-107582</b>	3 Pack	–	–	–

### BioBasic 18 Nanobore HPLC Columns

Particle Size (µm)	Length (mm)	75µm ID	75µm ID Multipack	Quantity	150µm ID	150µm ID Multipack	Quantity
<b>IntegraFrit</b>							
5.0	50	<b>72105-057563</b>	<b>72105-057564</b>	3 Pack	<b>72105-051563</b>	<b>72105-051564</b>	3 Pack
	100	<b>72105-107563</b>	<b>72105-107564</b>	3 Pack	<b>72105-101563</b>	<b>72105-101564</b>	3 Pack
<b>PicoFrit, 15µm Tip</b>							
5.0	50	<b>72105-057581</b>	<b>72105-057582</b>	3 Pack	–	–	–
	100	<b>72105-107581</b>	<b>72105-107582</b>	3 Pack	–	–	–

### BioBasic 8 Nanobore HPLC Columns

Particle Size (µm)	Length (mm)	75µm ID	75µm ID Multipack	Quantity	150µm ID	150µm ID Multipack	Quantity
<b>IntegraFrit</b>							
5.0	50	<b>72205-057563</b>	<b>72205-057564</b>	3 Pack	<b>72205-051563</b>	<b>72205-051564</b>	3 Pack
	100	<b>72205-107563</b>	<b>72205-107564</b>	3 Pack	<b>72205-101563</b>	<b>72205-101564</b>	3 Pack
<b>PicoFrit, 15µm Tip</b>							
5.0	50	<b>72205-057581</b>	<b>72205-057582</b>	3 Pack	–	–	–
	100	<b>72205-107581</b>	<b>72205-107582</b>	3 Pack	–	–	–

### Hypercarb Nanobore HPLC Columns

Particle Size (µm)	Length (mm)	75µm ID	75µm ID Multipack	Quantity	150µm ID	150µm ID Multipack	Quantity
<b>IntegraFrit</b>							
5.0	10	<b>35005-017563</b>	<b>35005-057564</b>	3 Pack	<b>35005-011563</b>	<b>35005-011564</b>	4 Pack
	50	<b>35005-057563</b>	<b>35005-017564</b>	4 Pack	<b>35005-051563</b>	<b>35005-051564</b>	3 Pack
<b>PicoFrit, 15µm Tip</b>							
5.0	10	<b>35005-017581</b>	<b>35005-017583</b>	4 Pack	–	–	–
	50	<b>35005-057581</b>	<b>35005-057582</b>	3 Pack	–	–	–

Unless otherwise specified, IntegraFrit and PicoFrit are sold in single-column units

## KAPPA Capillary columns

High efficiency capillary and nanobore columns for high performance and sensitivity

- 75 to 500µm columns for reduced sample amounts
- Rugged sleeved design for robustness
- Available in a range of Thermo Scientific phases
- Ideal for LC/MS applications

### Hypersil GOLD KAPPA Capillary HPLC Columns

Particle Size (µm)	Length (mm)	100µm ID	2.1mm ID	180µm ID	320µm ID	500µm ID
1.9	50	–	–	–	<b>25002-050365</b>	–
	100	–	–	–	<b>25002-100365</b>	–
3.0	50	–	–	<b>25003-050265</b>	<b>25003-050365</b>	<b>25003-050565</b>
	100	–	–	<b>25003-100265</b>	<b>25003-100365</b>	<b>25003-100565</b>
	150	–	–	<b>25003-150265</b>	<b>25003-150365</b>	<b>25003-150565</b>
5.0	50	<b>25005-050065</b>	<b>25005-050165</b>	<b>25005-050265</b>	<b>25005-050365</b>	<b>25005-050565</b>
	100	<b>25005-100065</b>	<b>25005-100165</b>	<b>25005-100265</b>	<b>25005-100365</b>	<b>25005-100565</b>
	150	<b>25005-150065</b>	<b>25005-150165</b>	<b>25005-150265</b>	<b>25005-150365</b>	<b>25005-150565</b>

Other custom column dimensions are available. Please call your local Customer Service for more information.

### Hypersil GOLD KAPPA Capillary Guard Columns

Particle Size (µm)	Length (mm)	100µm ID	2.1mm ID	180µm ID	320µm ID	500µm ID
3.0	30	–	–	<b>25003-030215</b>	<b>25003-030315</b>	<b>25003-030515</b>
5.0	30	–	–	<b>25005-030215</b>	<b>25005-030315</b>	<b>25005-030515</b>

### BioBasic 18 KAPPA Capillary HPLC Columns

Particle Size (µm)	Length (mm)	75µm ID	100µm ID	180µm ID	320µm ID	500µm ID
5.0	50	<b>72105-050065</b>	<b>72105-050165</b>	<b>72105-050265</b>	<b>72105-050365</b>	<b>72105-050565</b>
	100	<b>72105-100065</b>	<b>72105-100165</b>	<b>72105-100265</b>	<b>72105-100365</b>	<b>72105-100565</b>
	150	<b>72105-150065</b>	<b>72105-150165</b>	<b>72105-150265</b>	<b>72105-150365</b>	<b>72105-150565</b>
250	–	–	–	<b>72105-250265</b>	<b>72105-250365</b>	<b>72105-250565</b>

### BioBasic 18 KAPPA Capillary Guard Columns

Particle Size (µm)	Length (mm)	75µm ID	100µm ID	180µm ID	320µm ID	500µm ID
5.0	30	–	–	<b>72105-030215</b>	<b>72105-030315</b>	<b>72105-030515</b>

### BioBasic 8 KAPPA Capillary HPLC Columns

Particle Size (µm)	Length (mm)	75µm ID	180µm ID	320µm ID	500µm ID
5.0	50	<b>72205-050065</b>	<b>72205-050265</b>	<b>72205-050365</b>	<b>72205-050565</b>
	100	<b>72205-100065</b>	<b>72205-100265</b>	<b>72205-100365</b>	<b>72205-100565</b>

### BioBasic 8 KAPPA Capillary Guard Columns

Particle Size (µm)	Length (mm)	75µm ID	180µm ID	320µm ID	500µm ID
5.0	30	–	<b>72205-030215</b>	<b>72205-030315</b>	<b>72205-030515</b>

**BioBasic 4 KAPPA Capillary HPLC Columns**

Particle Size (µm)	Length (mm)	75µm ID	180µm ID	320µm ID	500µm ID
5.0	100	<b>72305-050065</b>	<b>72305-050265</b>	<b>72305-050365</b>	<b>72305-050565</b>
	150	<b>72305-100065</b>	<b>72305-100265</b>	<b>72305-100365</b>	<b>72305-100565</b>
	250	<b>72305-150065</b>	<b>72305-150265</b>	<b>72305-150365</b>	<b>72305-150565</b>

**BioBasic 4 KAPPA Guard Columns**

Particle Size (µm)	Length (mm)	75µm ID	180µm ID	320µm ID	500µm ID
5.0	30	–	<b>72305-030215</b>	<b>72305-030315</b>	<b>72305-030515</b>

**BioBasic SCX KAPPA HPLC Columns**

Particle Size (µm)	Length (mm)	75µm ID	180µm ID	320µm ID	500µm ID
5.0	50	<b>73205-050065</b>	<b>73205-050265</b>	<b>73205-050365</b>	<b>73205-050565</b>
	100	<b>73205-100065</b>	<b>73205-100265</b>	<b>73205-100365</b>	<b>73205-100565</b>
	150	<b>73205-150065</b>	<b>73205-150265</b>	<b>73205-150365</b>	<b>73205-150565</b>

**BioBasic SCX KAPPA Guard Columns**

Particle Size (µm)	Length (mm)	75µm ID	180µm ID	320µm ID	500µm ID
5.0	30	–	<b>73205-030215</b>	<b>73205-030315</b>	<b>73205-030515</b>

**BioBasic AX KAPPA Capillary HPLC Columns**

Particle Size (µm)	Length (mm)	75µm ID	100µm ID	180µm ID	320µm ID	500µm ID
5.0	100	<b>73105-100065</b>	<b>73105-100165</b>	<b>73105-100265</b>	<b>73105-100365</b>	<b>73105-100565</b>
	150	<b>73105-150065</b>	<b>73105-150165</b>	<b>73105-150265</b>	<b>73105-150365</b>	<b>73105-150565</b>

**Hypercarb KAPPA capillary columns**

Particle Size (µm)	Length (mm)	75µm ID	100µm ID	180µm ID	320µm ID	500µm ID
5.0	100	<b>35005-050065</b>	<b>35005-050165</b>	<b>35005-050265</b>	<b>35005-050365</b>	<b>35005-050565</b>
	150	<b>35005-100065</b>	<b>35005-100165</b>	<b>35005-100265</b>	<b>35005-100365</b>	<b>35005-100565</b>

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## Capillary and Micro SCX HPLC Columns

- High resolution in protein identification, biomarker discovery, and systems biology
- Highest sensitivity in LC/MS due to unique loadability
- Highest column-to-column reproducibility
- nanoViper™ fingertight connections for easy column installation

For very complex proteomics samples, two-dimensional LC is a powerful tool.

In the first dimension a capillary or Micro SCX column is often used in off-line and on-line 2D-LC separations. These columns are selected to establish a good top down proteomics work flow in combination with the Acclaim PepMap and Acclaim PepMap RSLC columns. Pre-installed nanoViper connection tubings allow for easy installation.

### Polysulfoethyl-Aspartamide 300Å HPLC Columns, nanoViper

Particle Size (µm)	Length (mm)	300µm ID	1.0mm ID
3.0	150	<b>164701</b>	<b>164702</b>
	250	–	<b>164703</b>
5.0	150	<b>164599</b>	<b>164566</b>

### Polysulfoethyl-Aspartamide 300Å HPLC Columns, Classic

Particle Size (µm)	Length (mm)	300µm ID	1.0mm ID
5.0	100	<b>164264</b>	–
	150	<b>164263</b>	<b>164262</b>

### Poros 10S HPLC Columns, nanoViper

Particle Size (µm)	Length (mm)	300µm ID	1.0mm ID
10.0	100	<b>164565</b>	–

### Poros 10S HPLC Columns, Classic

Particle Size (µm)	Length (mm)	300µm ID	1.0mm ID
10.0	100	<b>162152</b>	<b>163030</b>
	150	<b>162122</b>	<b>163031</b>

## Titanium-Dioxide Nano-Trap Columns

Titanium-Dioxide Nano-Trap columns support the enrichment of phosphopeptides. They are available in 100µm and 200µm i.d. format, and are packed with 5µm particle size. In addition, a biphasic combination of Titanium-Dioxide and Acclaim PepMap100 C18 is also available.

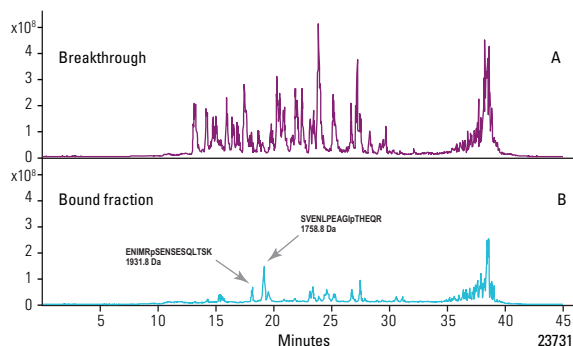
### Titanium-dioxide / Acclaim PepMap C18 Biphasic Nano-Trap column

Particle Size (µm)	Length (mm)	100µm ID	200µm ID
5.0	20 (Trap)	<b>164216</b>	<b>164217</b>

### Titanium-dioxide Nano-Trap column, classic

Particle Size (µm)	Length (mm)	100µm ID	200µm ID
5.0	10 (Trap)	<b>164205</b>	<b>164215</b>
	20 (Trap)	<b>164214</b>	<b>164206</b>

### Isolation of Two Synthetic Phosphopeptides from a BSA Tryptic Digest on a TiO<sub>2</sub> Column



**Column: 200µm ID x 1cm, packed with TiO<sub>2</sub>, 5µm  
100µm ID x 1cm, packed with Acclaim®  
PepMap C18 PM100, 5µm**

Analytical Column: Acclaim PepMap C18 PM100, 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

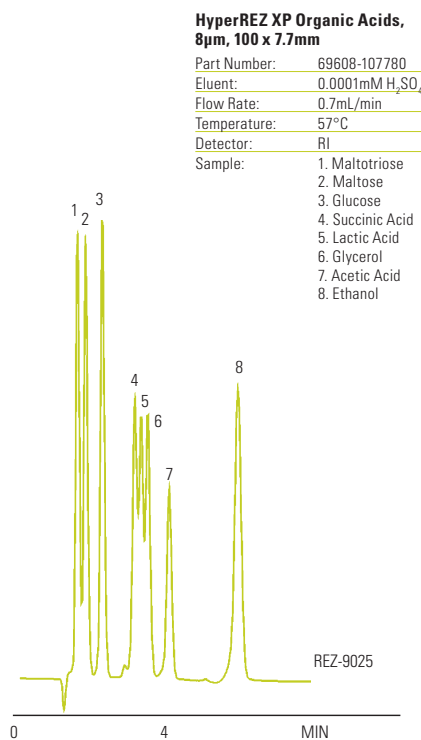
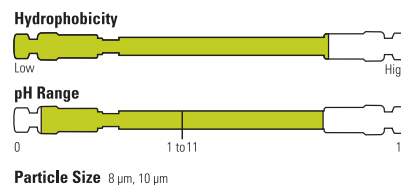


# HyperREZ XP HPLC Columns

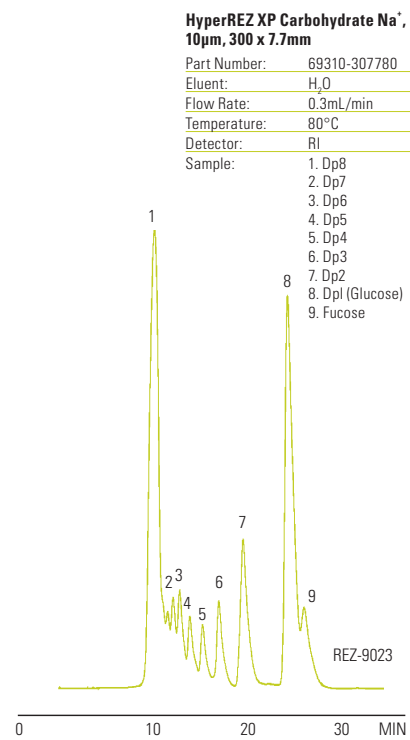
Polymer-based columns for carbohydrate analysis

- 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

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 HPLC Columns**

Particle Size (µm)	Description	ID (mm)	Length (mm)	Cat. No.
<b>HyperREZ XP Carbohydrate H<sup>+</sup></b>				
8.0	Analytical	7.7	300	<b>69008-307780</b>
	Guard	7.7	50	<b>69008-057726</b>
	Guard Cartridge (2 pk)	3.0	5	<b>69008-903027</b>
<b>HyperREZ XP Carbohydrate Ca<sup>2+</sup></b>				
8.0	Analytical	7.7	300	<b>69208-307780</b>
	Guard	7.7	50	<b>69208-057726</b>
	Guard Cartridge (2 pk)	3.0	5	<b>69208-903027</b>
<b>HyperREZ XP Carbohydrate Pb<sup>2+</sup></b>				
8.0	Analytical	7.7	300	<b>69108-307780</b>
	Guard	7.7	50	<b>69108-057726</b>
	Guard Cartridge (2 pk)	3.0	5	<b>69108-903027</b>
<b>HyperREZ XP Carbohydrate Na<sup>+</sup></b>				
10.0	Analytical	7.7	300	<b>69310-307780</b>
	Guard	7.7	50	<b>69310-057726</b>
	Guard Cartridge (2 pk)	3.0	5	<b>69310-903027</b>
<b>HyperREZ XP Organic Acids</b>				
8.0	Analytical	7.7	100	<b>69608-107780</b>
	Guard	–	–	<b>Inquire</b>
	Guard Cartridge (2 pk)	–	–	<b>Inquire</b>
<b>HyperREZ XP Sugar Alcohols</b>				
8.0	Analytical	4.0	250	<b>69708-254080</b>
	Guard	–	–	–
	Guard Cartridge (2 pk)	3.0	5	<b>69208-903027</b>
Guard Cartridge Holder for HyperREZ XP 3.0 x 5.0mm Guard Cartridges				<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 zero-dead volume fingertight connections
- Supports operating pressures up to 1200 bar (17,400 psi)
- Available in different lengths: 65mm and from 150 to 950mm in 100mm steps
- Available in different inner diameters: 0.13mm (0.005in) or 0.18mm (0.007in)
- Easy to use due to stainless steel 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 Viper™ fingertight fitting system provides ease of use and dead-volume free plumbing of every conventional HPLC and modern UHPLC system. Together with flexible stainless steel 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 separational performance 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 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. Viper is included in shipments of all UltiMate 3000 UHPLC+ Systems.

### Viper Fingertight Fitting Systems

Length (mm)	0.13mm ID	0.18mm ID
65	<b>6040.2307</b>	<b>6040.2357</b>
150	<b>6040.2315</b>	<b>6040.2360</b>
250	<b>6040.2325</b>	<b>6040.2385</b>
350	<b>6040.2335</b>	<b>6040.2375</b>
450	<b>6040.2345</b>	<b>6040.2365</b>
550	<b>6040.2305</b>	<b>6040.2355</b>
650	<b>6040.2310</b>	<b>6040.2395</b>
750	<b>6040.2320</b>	<b>6040.2370</b>
850	<b>6040.2330</b>	<b>6040.2380</b>
950	<b>6040.2340</b>	<b>6040.2390</b>

### Viper Fingertight Fittings Kits for UltiMate 3000 UHPLC+ Systems

Description	Analytical and Standard (SD) System Variants	Micro and Rapid Separation (RS) System Variants
Viper Capillary Kit, SD or RS System, LPG, DGP or ISO pump	<b>6040.2302</b>	<b>6040.2301</b>
Viper Capillary Kit, SD or RS System, HPG pump	<b>6040.2309</b>	<b>6040.2308</b>
On-line Sample Preparation, x2 Dual SD or RS Systems	<b>6040.2802</b>	<b>6040.2801</b>
Tandem Operation, x2 Dual SD or RS Systems	<b>6040.2804</b>	<b>6040.2803</b>
Application Switching, x2 Dual SD or RS Systems	<b>6040.2806</b>	<b>6040.2805</b>
Parallel Analyses, x2 Dual SD or RS Systems	<b>6040.2810</b>	<b>6040.2809</b>
Automated Method Scouting, SD or RS Systems	<b>6040.2808</b>	<b>6040.2807</b>

# SLIPFREE HPLC Column Connectors

Universal self-adjusting connections

- Unique self-adjusting design for void-free and leak-free connections
- Universal connectors compatible with all column end-fittings
- Stainless steel threads eliminate particle generation from PEEK™ fittings
- Fingertight connections to 10,000 psi – excellent for SFC
- Convenient SLIPFREE™ sample loop design

## Unique Self-Adjusting Design

Thermo Scientific SLIPFREE connectors offer a rugged and easy way to ensure good column connections. The SLIPFREE connector design provides a void-free connection because it actually pushes the tubing and ferrule into the end-fitting. The separate tube holding and connection-sealing functions provide a better connection and better hardware lifetime. Because pressure is applied to the tubing rather than the ferrule, when the SLIPFREE connector is removed, the ferrule will not become lodged in the end-fitting. The movable Vespel™ front ferrule allows the SLIPFREE connector to easily adjust to any commercially available HPLC or SFC column end-fitting. Used over and over again, the SLIPFREE connector readjusts to fit each new column connection. Even when different column brands are used on a single HPLC system, SLIPFREE connectors provide all the same benefits.

## Choice of Configurations

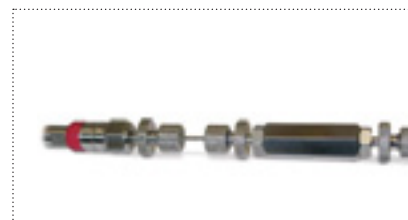
The SLIPFREE connector is available in both single and double configurations. The double SLIPFREE is useful when frequent connections and disconnections will be made between HPLC columns and injectors or detectors. The single SLIPFREE connector is useful when only the column is changed. SLIPFREE connectors are available in flexible 1/32in OD tubing as well as standard 1/16in OD tubing, in various lengths. SLIPFREE connectors come in 0.010in ID for routine work, 0.005in ID for use with small-bore and microbore columns, and 0.020in ID for semi preparative and preparative connections, or for connections ahead of the injector. PEEK-collared SLIPFREE connectors are ideal for higher temperature applications such as SFC. Long-neck SLIPFREE connectors have an extra long nut on the end which allows improved reach into tight spaces. SLIPFREE connectors come standard with Vespel ferrules. SLIPFREE sample loops are compatible with Rheodyne™ and Valco™ injectors. PEEK and Kel-F ferrules are available for applications where Vespel is not suitable, such as with strong acids or bases.

## Where to use a SLIPFREE Connector

Between Guard and Injector



Between Guard and Column



Between Column and Detector



Between Injector and Column







## 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 10,000 psi

### 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>	–

## SLIPFREE Sample Loops

Feature a self-adjusting, leak-free design

- Compatible with Rheodyne™ and Valco™ injectors
- Long-neck design



### SLIPFREE Sample Loops

Description	Length (cm)	ID (in)	Cat. No.	Quantity
10µL, Long-neck	20	0.10	<b>31620</b>	1 Each
20µL, Long-neck	40	0.10	<b>31640</b>	1 Each
50µL, Long-neck	25	0.20	<b>32625</b>	1 Each
100µL, Long-neck	50	0.20	<b>32650</b>	1 Each
250µL, Long-neck	125	0.20	<b>32699</b>	1 Each

## SLIPFREE Ferrules

For use with SLIPFREE connectors for HPLC columns

- Vespel ferrules replace the standard Vespel ferrules supplied with SLIPFREE column connectors
- Kel-F and PEEK are offered for applications in which Vespel is not suitable

### 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



## 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

- Stainless steel 10µm inlet filters for longer lifetime
- No tools required for replacement

### Bottom-of-the-Bottle solvent filters:

- Efficient draw
- 100% PTFE polymer, including 2µm filters
- Built-in helium sparge port and frit

### Solvent Inlet 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  $\frac{1}{16}$ in 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

## 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	P0.72	<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	P0.57	<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	P0.72	<b>P-729</b>	1 Each

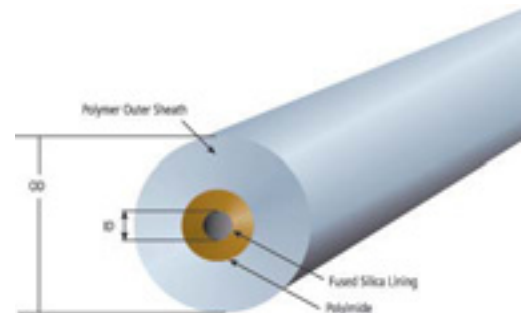
*Simplify the transfer of methods to UHPLC using isocratic method and gradient method calculators.*

[www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography)

## 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)	Colour	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)	Colour	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

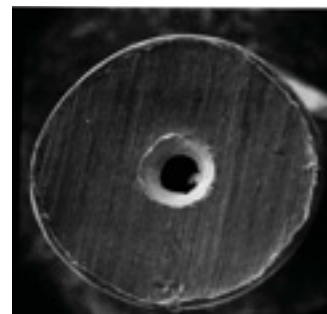
Description	Cat. No.	Quantity
Polymeric Tubing Cutter	<b>A-327</b>	1 Each
Replacement blades	<b>A-328</b>	5 Pack

## 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





## 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

### 1/16in OD Precut PEEK Tubing

Description	Volume	ID (mm / in)	Cat. No.	Quantity
Sample loops for 7010 and 7125 injectors	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	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	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	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
	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
	Sample loops for 9725 and 9725i injectors	50µL	0.51 / 0.020	<b>9055-023</b>
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>VespeI 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
Mounting 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

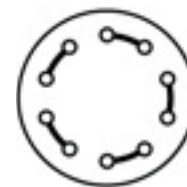
### RheFlex Two-Piece PEEK Fittings

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 loops, 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

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

### Standard Fixed Needle Syringes for Rheodyne/Valco Injectors

Volume (µL)	Needle Length (in)	Needle Gauge	Cat. No.	Quantity
5	2	22	<b>365CL221</b>	1 Each
10	2	22	<b>365DL231</b>	1 Each
25	2	22	<b>365FL241</b>	1 Each
50	2	22	<b>365GL251</b>	1 Each
100	2	22	<b>365HL261</b>	1 Each
250	2	22	<b>365IL271</b>	1 Each
500	2	22	<b>365JL281</b>	1 Each

### Standard PTFE Tipped Removable Needle HPLC Syringes

Volume (µL)	Needle Length (in)	Needle Gauge	Cat. No.	Quantity
10	2	22	<b>365DLG21</b>	1 Each
25	2	22	<b>365FLG31</b>	1 Each
50	2	22	<b>365GLG41</b>	1 Each
100	2	22	<b>365HLG51</b>	1 Each
250	2	22	<b>365ILG61</b>	1 Each
500	2	22	<b>365JLG71</b>	1 Each

### Syringes for Thermo Scientific HPLC Instruments

Volume (µL)	Needle Length (in)	Needle Gauge	Needle Type	Thermo Scientific HPLC Instruments	Thermo Scientific Instrument Part No.	Cat. No.	Quantity
250	2	22	Removable	LCQ	00301-19015	<b>365ILT21</b>	1 Each
500	2	22	Removable	LCQ	00301-19016	<b>365JLT41</b>	1 Each
500	–	–	–	AS1000, AS3000	A3588-010	<b>365JLT61</b>	1 Each
2.5	–	–	–	AS3000, AS3500	A3587-020	<b>365LLT81</b>	1 Each
250	–	–	–	AS1000, AS3000	A3588-020	<b>365ILT91</b>	1 Each

### Syringes for CTC Instruments

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity
10	51	22	Fixed	<b>365DL710</b>	1 Each
25	51	22	Fixed	<b>365FL984</b>	1 Each
<b>Gas Tight</b>					
10	51	22	Fixed	<b>365DL991</b>	1 Each
25	51	22	Fixed	<b>365FL715</b>	1 Each
50	51	22	Fixed	<b>365GL810</b>	1 Each
100	51	22	Fixed	<b>365HL331</b>	1 Each
25	51	22	Removable	<b>365FL985</b>	1 Each
100	51	22	Removable	<b>365HL330</b>	1 Each
250	51	22	Removable	<b>365IL330</b>	1 Each
<b>Gas Tight (0.41)</b>					
100	51	22	Fixed	<b>365HL720</b>	1 Each
250	51	22	Fixed	<b>365IL720</b>	1 Each
500	51	22	Fixed	<b>365JL720</b>	1 Each

## Replacement Needles for LC Syringes

Available for syringes with removable needles

### Replacement Needles for LC Syringes

Replacement for	Needle Length (in)	Needle Gauge	Cat. No.	Quantity
PTFE-tipped needle for Mfr. No. 365DLG21	2	22	<b>365RNL15</b>	5 Pack
25 to 500µL PTFE tipped needles; 365FL985, 365HL330, 365IL330	2	22	<b>365RNL25</b>	5 Pack

### Needles for Luer-LOK Priming Syringes

Replacement for	Needle Length (in)	Needle Gauge	Cat. No.	Quantity
All Thermo Scientific Luer-LOK Priming Syringes	2	22	<b>365RNL22</b>	2 Pack

### Mass Spectrometry Replacement ESI Probe Needles

For Instrument	Thermo Scientific Instrument Part No.	Cat. No.	Quantity
Thermo Scientific LCQ XP, DECA, Advantage	00950-00990	<b>365RNL1</b>	1 Each
Thermo Scientific LCQ MS	00950-00951	<b>365RNL2</b>	1 Each
Thermo Scientific LCQ XSQ	00950-00975	<b>365RNL3</b>	1 Each

### Replacement Plungers for CTC Syringes

For Use with	Cat. No.	Quantity
365DL991	<b>365RP532</b>	1 Each
365FL715	<b>365RP922</b>	1 Each
365GL810	<b>365RP821</b>	1 Each
365HL331, 365HL720 & 365IL330	<b>365RP471</b>	1 Each
365IL720	<b>365RP926</b>	1 Each
365JL720	<b>365RP928</b>	1 Each
365FL985	<b>365RP816</b>	1 Each



## National Target Precision Glass Syringes and Replacement Needles

Configurations to fit every autosampler

### Glass Syringes

Designed for accurate sampling of very small volumes of liquid; ideal for measuring sensitive biological samples



- Precision-bored Duran® borosilicate-glass syringes
- Chromium-plated stainless-steel plungers eliminate leaching of metal ions into the sample solutions
- Syringes with microvolume Zero Dead Volume (ZDV) plunger in needle offer minimal sample waste

#### National Target Precision Glass Syringes

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity
1	70	26s	Bevel	<b>NS200101</b>	1 Each
1	70	26s	90° Blunt End	<b>NS200102</b>	1 Each
2	80	22s	Bevel	<b>NS200201</b>	1 Each
2	80	22s	90° Blunt End	<b>NS200202</b>	1 Each
5	70	25s	Bevel	<b>NS200301</b>	1 Each
5	70	25s	90° Blunt End	<b>NS200302</b>	1 Each

### Extended Handle Syringes for Waters Manual Injection Valves

Extended handle prevents heat transfer from hands to syringe barrel

- 50mm needle length provides accurate injections without damage to valve rotor

#### National Target Precision Glass Extended Handle Syringes for Waters® Manual Injection Valves

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity	Replacement Needle	Quantity
5	50	25	90° Blunt End	<b>NS50230</b>	1 Each	<b>NS832306</b>	3 Pack
10	50	25	90° Blunt End	<b>NS50240</b>	1 Each	<b>NS832406</b>	3 Pack
25	50	25	90° Blunt End	<b>NS50250</b>	1 Each	<b>NS832506</b>	3 Pack
50	50	25	90° Blunt End	<b>NS50260</b>	1 Each	<b>NS832506</b>	3 Pack
100	50	25	90° Blunt End	<b>NS50270</b>	1 Each	<b>NS832506</b>	3 Pack
250	50	25	90° Blunt End	<b>NS50280</b>	1 Each	<b>NS832506</b>	3 Pack

## Extended Handle Syringes

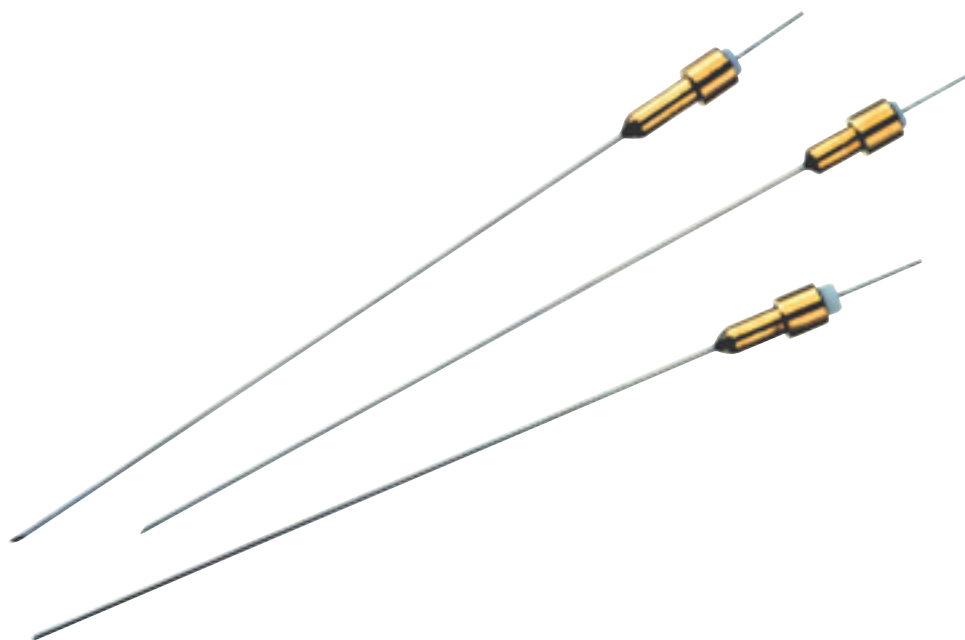
Gas- and liquid-tight syringes for micro volume sampling

- Extended metal handle prevents sensitive samples from thermal transfer from operator to syringe; also protects precision-machined plunger from bending
- PTFE-tipped to prevent plunger freeze-up for longer syringe life
- Removable needle syringes permit easy removal of bent needles for replacement; same syringe can be used with different gauge needles to meet specific application needs



### National Target Precision Glass Extended Handle Syringes

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity	Replacement Needle	Quantity
5	51	26s	Bevel	<b>NS506305</b>	1 Each	<b>NS832301</b>	3 Pack
	51	26s	90° Blunt End	<b>NS506306</b>	1 Each	<b>NS832302</b>	3 Pack
10	51	26s	Bevel	<b>NS506405</b>	1 Each	<b>NS832401</b>	3 Pack
	51	26s	90° Blunt End	<b>NS506406</b>	1 Each	<b>NS832402</b>	3 Pack
25	51	22s	Bevel	<b>NS506505</b>	1 Each	<b>NS832501</b>	3 Pack
	51	22s	90° Blunt End	<b>NS506506</b>	1 Each	<b>NS832502</b>	3 Pack
50	51	22s	Bevel	<b>NS506605</b>	1 Each	<b>NS832501</b>	3 Pack
	51	22s	90° Blunt End	<b>NS506606</b>	1 Each	<b>NS832502</b>	3 Pack



## LC Syringes for Agilent Technologies

Use with 1090A or 1100 autosamplers



### National Target Precision Glass LC Syringes for Agilent Technologies

Volume (µL)	Agilent No.	Cat. No.	Quantity
25	9301-0633	<b>NS606500</b>	1 Each
250	9301-0678	<b>NS606800</b>	1 Each

## LC Syringe for PerkinElmer

Use with PerkinElmer Series 200 autosamplers

### National Target Precision Glass LC Syringe for PerkinElmer

Volume	PerkinElmer No.	Cat. No.	Quantity
25µL	09923304	<b>NS606615</b>	1 Each
250µL	09923270	<b>NS606815</b>	1 Each
500µL	09923306	<b>NS606915</b>	1 Each
1mL	09923307	<b>NS606015</b>	1 Each
2.5mL	09923219	<b>NS606035</b>	1 Each

## LC Syringe for Thermo Scientific

Use with SpectraSYSTEM AS-100/300/1000/3000/3500 autosamplers

### National Target Precision Glass LC Syringe for Thermo Scientific

Volume	Thermo Scientific No.	Cat. No.	Quantity
250µL	A3587-020	<b>NS606814</b>	1 Each
500µL	A3588-010	<b>NS606914</b>	1 Each
1mL	A3587-030	<b>NS606015</b>	1 Each
2.5mL	A3588-020	<b>NS606035</b>	1 Each

## LC Syringes for CTC/Leap

Use with A200LC, HTS, and HTC PAL autosampler models

- For use with CTC/Leap autosamplers
- Fixed needle syringes feature a proprietary process that eliminates cement or epoxy for error-free injections
- PTFE-tip on stainless-steel plungers prevent plunger freeze-up for longer syringe life
- 22 gauge needle, 51mm length with 90° blunt end point style

### National Target Precision Glass LC Syringes for CTC/Leap

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity
25	51	22s	90° Blunt End	<b>NS620502</b>	1 Each
50	51	22s	90° Blunt End	<b>NS620605</b>	1 Each
100	51	22s	90° Blunt End	<b>NS620702</b>	1 Each
250	51	22s	90° Blunt End	<b>NS620805</b>	1 Each

## LC Syringes for Waters WISP

Use with 710, 712, and 715 autosampler models

- 1/4-28UNF front-fitting syringe for use with Waters WISP needle assemblies.

### National Target Precision Glass LC Syringes for Waters WISP

Volume (µL)	Waters No.	Cat. No.	Quantity
25	9301-0633	<b>NS663514</b>	1 Each
250	9301-0678	<b>NS663814</b>	1 Each

## LC Syringes for Water's Injection Valves – Removable Needle

- 25s Gauge needles
- PTFE-tipped stainless-steel plungers
- Use with U6K manual injector

### National Target Precision Glass LC Syringes for Water's Injection Valves – Removable Needle

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity
10	51	25s	90° Blunt End	<b>NS602406</b>	1 Each
25	51	25s	90° Blunt End	<b>NS602506</b>	1 Each
50	51	25s	90° Blunt End	<b>NS602606</b>	1 Each
100	51	25s	90° Blunt End	<b>NS602706</b>	1 Each
250	51	25s	90° Blunt End	<b>NS602806</b>	1 Each

## LC Syringes for Manual Injection Valves

- 22s Gauge fixed needles
- Stainless-steel plungers
- Use with Rheodyne, Altex, Valco, SSI, Knauer



### National Target LC Syringes for Manual Injection Valves

Volume (μL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity
5	51	22s	90° Blunt End	<b>NS101302</b>	1 Each
10	51	22s	90° Blunt End	<b>NS101402</b>	1 Each
25	51	22s	90° Blunt End	<b>NS101502</b>	1 Each
50	51	22s	90° Blunt End	<b>NS101602</b>	1 Each
100	51	22s	90° Blunt End	<b>NS101702</b>	1 Each
250	51	22s	90° Blunt End	<b>NS101802</b>	1 Each
500	51	22s	90° Blunt End	<b>NS101902</b>	1 Each

## LC Syringes for Rheodyne Style Valves

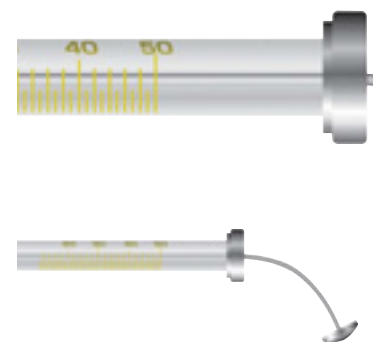
Gas tight with fixed needles

### National Target LC Syringes for Rheodyne Style Valves

Volume (μL)	Needle Length (mm)	Needle Type	Cat. No.	Quantity
5	51	90° Blunt End	<b>NS601302</b>	1 Each
10	51	90° Blunt End	<b>NS601402</b>	1 Each
25	51	90° Blunt End	<b>NS601502</b>	1 Each
50	51	90° Blunt End	<b>NS601602</b>	1 Each
100	51	90° Blunt End	<b>NS601702</b>	1 Each
250	51	90° Blunt End	<b>NS601802</b>	1 Each
500	51	90° Blunt End	<b>NS601902</b>	1 Each

## LC Syringes for Manual Injection Valves – Super Elastic Plunger

- 22s Gauge fixed needles
- Super Elastic plunger
- Use with Rheodyne, Altex, Valco, SSI, Knauer



### National Target LC Syringes for Manual Injection Valves – Super Elastic Plunger

Volume (μL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity
5	51	22s	90° Blunt End	<b>NS161302</b>	1 Each
10	51	22s	90° Blunt End	<b>NS161402</b>	1 Each



## LC Syringes for Manual Injection Valves

- 22s Gauge removable needles
- PTFE-tipped stainless-steel plungers
- Use with Rheodyne, Altex, Valco, SSI, Knauer

### National Target LC Syringes for Manual Injection Valves

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity	Replacement Needle	Quantity
5	51	22s	90° Blunt End	<b>NS601306</b>	1 Each	<b>NS831305</b>	3 Pack
10	51	22s	90° Blunt End	<b>NS601406</b>	1 Each	<b>NS831405</b>	3 Pack
25	51	22s	90° Blunt End	<b>NS601506</b>	1 Each	<b>NS831505</b>	3 Pack
50	51	22s	90° Blunt End	<b>NS601606</b>	1 Each	<b>NS832602</b>	3 Pack
100	51	22s	90° Blunt End	<b>NS601706</b>	1 Each	<b>NS832602</b>	3 Pack
250	51	22s	90° Blunt End	<b>NS601806</b>	1 Each	<b>NS832602</b>	3 Pack
500	51	22s	90° Blunt End	<b>NS601906</b>	1 Each	<b>NS832602</b>	3 Pack

## LC Syringes for Macro Volume Sampling

22s Gauge needles with PTFE tipped stainless-steel plungers

### National Target Precision Glass Large Volume Syringe

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity
<b>Fixed Needle</b>					
1.0	51	22s	Bevel	<b>NS600000</b>	1 Each
2.5	51	22s	Bevel	<b>NS600020</b>	1 Each
5.0	51	22s	Bevel	<b>NS600040</b>	1 Each
10.0	51	22s	Bevel	<b>NS600060</b>	1 Each
<b>Removable Needle</b>					
1.0	51	22s	Bevel	<b>NS600005</b>	1 Each
2.5	51	22s	Bevel	<b>NS600025</b>	1 Each
5.0	51	22s	Bevel	<b>NS600045</b>	1 Each
10.0	51	22s	Bevel	<b>NS600065</b>	1 Each

### National Target Precision Glass Large Volume Syringe – PTFE Luer-Lok

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity
1.0	–	–	–	<b>NS607011</b>	1 Each
2.5	–	–	–	<b>NS607031</b>	1 Each
2.5	–	–	–	<b>NS607051</b>	1 Each
10	–	–	–	<b>NS607071</b>	1 Each
25	–	–	–	<b>NS607091</b>	1 Each

## Gas Tight Syringes for Macro Volume Sampling Replacement Needles

Suitable for liquid or gas samples

- PTFE-tipped stainless-steel plunger tip prevents plunger freeze-up for longer syringe life

### National Target Gas Tight Syringe Replacement Needles

Volume (µL)	Needle Length (mm)	Needle Gauge	Needle Type	Cat. No.	Quantity
<b>For Removable Needle Syringe</b>					
250-10	51	22s	90° Blunt End	<b>NS841014</b>	3 Pack
250-10	51	22s	Side Hole	<b>NS841015</b>	2 Pack
250-10	51	22s	Bevel	<b>NS841013</b>	3 Pack
<b>Metal Luer-Screw for PTFE Luer-Lok</b>					
–	51	26s	90° Blunt End	<b>NS842047</b>	3 Pack
–	51	26s	Bevel	<b>NS840047</b>	3 Pack
–	51	22s	90° Blunt End	<b>NS842070</b>	3 Pack
–	51	22s	Bevel	<b>NS840070</b>	3 Pack

## Syringe Accessories

Syringe storage, cleaning, and dispensing aids

- *Syringe Rack* holds up to three glass syringes, 500µL or smaller to prevent breakage and contact with lab surfaces; made of anodized aluminium
- *Needle Cleaning Wires* remove blockages from syringe needle; promote longer syringe life and prevent contamination in subsequent syringe use
- *Syringe Guide Chaney Adapter* is fitted to manually operated syringes 100uL or smaller to increase precision and reproducibility; made of stainless steel and anodized aluminium

### National Target Syringe Accessories

Type	Cat. No.	Quantity
Three-position Syringe Rack	<b>NS700002</b>	1 Each
Needle Cleaning Wire for 26s gauge needles	<b>NS1018300</b>	12 Pack
Needle Cleaning Wire for 22s and 25s gauge needles	<b>NS1018301</b>	12 Pack
Syringe Guide Chaney Adapter	<b>NS700001</b>	1 Each

## Detector Lamps

### 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 Thermo Scientific Instruments

Description	Model	Cat. No.	Quantity
<b>Piston Seal</b>			
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>			
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 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 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:

100–240V ac, 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
- 5.0mL and 0.5mL 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:

100–240V ac, 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- Dionex AMMS™ 300 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- Dionex CMMS™ 300 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 HOT POCKET and 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

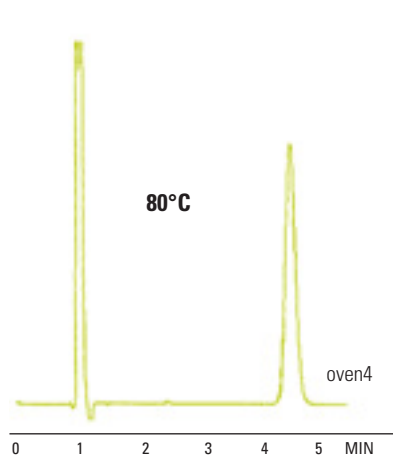
- The Eluent Pre-Heater provides a dramatic improvement in chromatography as demonstrated by the USP method for enalapril maleate at 80°C
- For preheating or precooling Mobile Phase before it enters column
- Use in temperatures above 50°C or below 15°C
- 0.005in ID



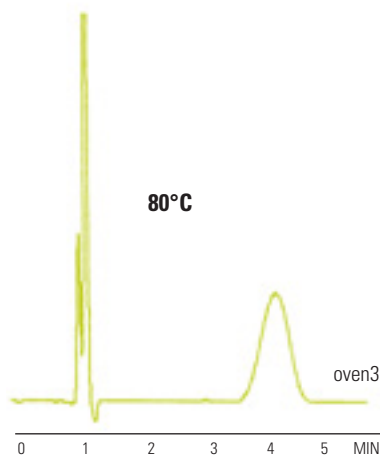
## Product Specifications

	HOTPOCKET	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	24VAC, 25 Watts maximum	15VDC, 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

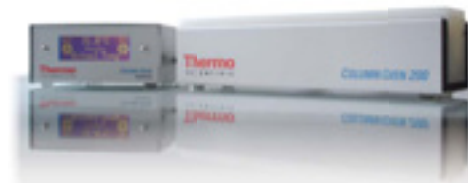
## HOT POCKET Column Heaters, Eluent Preheater/Precooler and COOL POCKET Chiller

Description	Cat. No.	Quantity
HOT POCKET Column Heater	92016	1 Each
HOT POCKET Column Heater	92016-150	1 Each
COOL POCKET Column Chiller	92017	1 Each
Eluent Preheater/Precooler	92018	1 Each

## Column Oven

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 Column Oven 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 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 VAC to 240 VAC	110 VAC to 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 Column Oven

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>

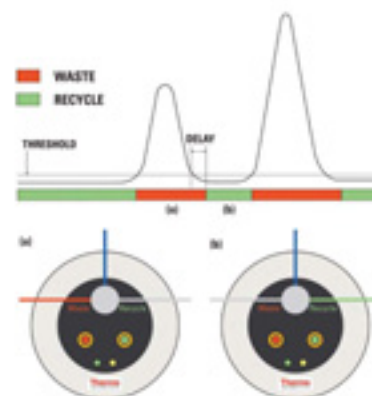
## SRS Pro Solvent Recycling System

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 (1), taking account of the transport time from the detector to the switching valve
- When the signal returns below the threshold (2), 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



### Compatible with:

Any HPLC detector

### 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

### 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 to 240 VAC (±10%), 1A, 50 to 60Hz (±3Hz)
Power Requirement if not using supplied AC Adapter	15 to 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

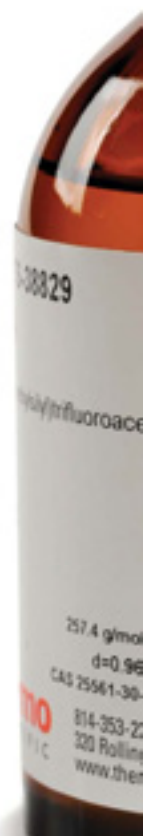
Ambient Temperature	-20 to +60°C
Ambient Relative Humidity	20 to 80% RH (without condensation)
Altitude	0 to 12000M

#### 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

### Derivatization

The chemical literature contains an abundance of data on derivatization, most of which is relevant to particular compounds, classes of compounds and derivatization reagents. Two books are recognized as standards in the field of analytical derivatization. The first book, Handbook of Analytical Derivatization Reactions by Daniel R. Knapp<sup>1</sup>, provides a general collection of analytical derivatization methods for chromatography and mass spectroscopy (MS) that involves formation of covalent derivatives prior to analysis. The second book, Silylation of Organic Compounds by Alan F. Pierce,<sup>2</sup> "was a significant factor in the transfer of silylation reactions from the relatively esoteric field of organosilicon chemistry to the status of perhaps the most widely practiced of derivatization methods."<sup>3</sup>

### Compounds or compound mixtures are derivatized before analysis for the following reasons:

1. To make a compound that otherwise could not be analyzed by a particular method suitable for analysis<sup>4</sup>
2. To improve the analytical efficiency of the compound<sup>5,6</sup>
3. To improve the detectability of the compound<sup>7</sup>

### Suitability

Often compounds cannot be analyzed because they are not in a form that is suitable for the particular analytical technique. Examples include nonvolatile compounds for GC analysis,<sup>8,9,10</sup> insoluble compounds for HPLC analysis and materials that are not stable using the conditions of the technique.<sup>11</sup> The derivatization procedure modifies the chemical structure of the compounds, allowing analysis by a desired technique.<sup>12</sup>

### Efficiency

Direct analysis can be difficult when compounds interact with each other or with the column. These interactions can lead to poor peak resolution and/or asymmetrical peaks that make proper peak integration difficult or impractical. This interference can be reduced with conversion to derivatized products.<sup>13,14</sup> Compounds that exhibit co-elution can often be separated by using the appropriate derivatization methods.

### Detectability

As demand increases for the analysis of increasingly smaller amounts of materials, it becomes important to extend the detectability range of the materials in question. This increased sensitivity can be accomplished by improved detector design that is directed toward specific atoms or functional groups.

Another popular approach to increase detectability is the use of derivatization. Enhanced detectability can be achieved by increasing the bulk of the compound, or by introducing atoms or functional groups that strongly interact with the detector.<sup>16,17</sup> This technique is performed in gas chromatographic applications, with the addition of halogen atoms for electron capture detectors,<sup>18,19</sup> and with the formation of TMS derivatives to produce readily identifiable fragmentation patterns and mass ions.<sup>20</sup>

### Types of Derivatization

Compounds containing functional groups with active hydrogens (-COOH, -OH, -NH and -SH) are usually derivatized prior to analysis by gas chromatography. These functional groups have a tendency to form intermolecular hydrogen bonds that affect the volatility, their tendency to interact deleteriously with column packing materials and their thermal stability. Silylation, acylation and alkylation are derivatization techniques used to alter these functional groups to improve their thermal and chromatographic character.

### The ideal derivatization procedure will:

1. Accomplish the desired modification.
2. Proceed quantitatively, or at least reproducibly.
3. Produce products that are readily distinguishable and separable from the starting materials.
4. Proceed rapidly with simple and straightforward laboratory techniques that will be both selective and applicable to a number of similar compounds.
5. Involve reagents and reactions that present no unusual hazards.





## 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.

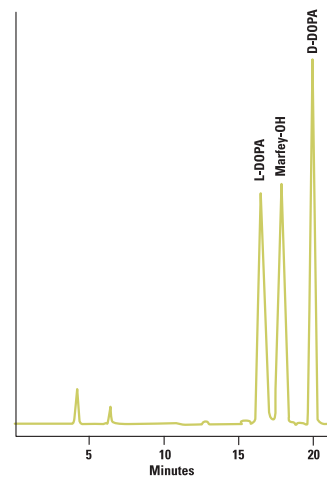
The lack of a universal HPLC detector that provides high sensitivity (as well as some degree of selectivity) established the need for suitable derivatization procedures. Derivatization is the chemical modification of an existing compound, producing a new compound that has properties more suitable for 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.


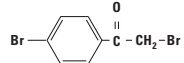

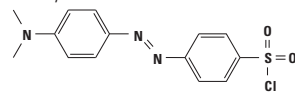
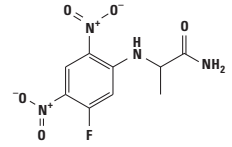
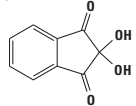
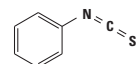
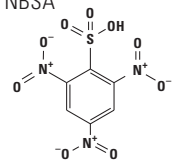

Pre- and post-chromatographic techniques are both used in HPLC derivatization. In addition, off-line and on-line reactions have been employed with both techniques. Pre-chromatographic (or pre-column techniques) offer more than greater selectivity and sensitivity in detection. Pre-column techniques can 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> -Bromophenacylate 	UV	<b>4-XXX</b>	Formulation of 1.0mmol/ml <i>p</i> -bromophenacyl bromide and 0.005mmol/ml crown ether in acetonitrile; pre-column; nanomole detection levels: $\lambda_{\text{max}} = 260\text{nm}^{1-7}$
Primary Amine 	Dabsyl Chloride 	Vis		4-N, N-dimethylaminoazobenzene-4'-sulfonyl chloride (dabsyl chloride); pre-column; nanomole detection levels: $\lambda_{\text{max}} = 436\text{nm}^{8-14}$
	FDAA, Marfey's Reagent 	UV		1-fluoro-2,4-dinitrophenyl-5-L-alanine amide (FDAA); pre-column; nanomole detection levels: $\lambda_{\text{max}} = 340\text{nm}$ . For chiral separations of amino acids. <sup>15, 28-29</sup>
	Ninhydrin 	Vis		Post-column; nanomole detection levels: $\lambda_{\text{max}} = 570\text{nm}^{22}$
	PITC 	UV		Phenylisothiocyanate (PITC); pre-column; picomole detection levels: $\lambda_{\text{max}} = 254\text{nm}^{23-24}$
	TNBSA 	EC, UV		2,4,6-Trinitrobenzene-sulfonic acid (TNBSA); pre- or post-column; nanomole detection levels with EC and UV, GC - 0.85V; $\lambda_{\text{max}} = 250\text{nm}^{25-26}$ TNBSA MW 293.17
Secondary Amine 	Ninhydrin (see structure above)	Vis		Post-column; nanomole detection levels: $\lambda_{\text{max}} = 440\text{nm}^{22}$
	PITC (see structure above)	UV		Phenylisothiocyanate (PITC); pre-column; picomole detection levels: $\lambda_{\text{max}} = 254\text{nm}^{23-24}$

\*EC = electrochemical; F = fluorescence; UV = ultraviolet; Vis = visible.

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## 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 pH 7.<sup>16</sup> Buffers are prepared either with citric acid or an alkali salt, and citrate concentrations of 0.05 to 0.06 M are common.

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.



## 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 inter-actions).

### The techniques commonly used to separate proteins and peptides include:

- Reverse-phase HPLC
- Polyacrylamide gel electrophoresis
- Gel filtration
- Ion exchange chromatography
- Affinity chromatography
- Table 1 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

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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	X	<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.

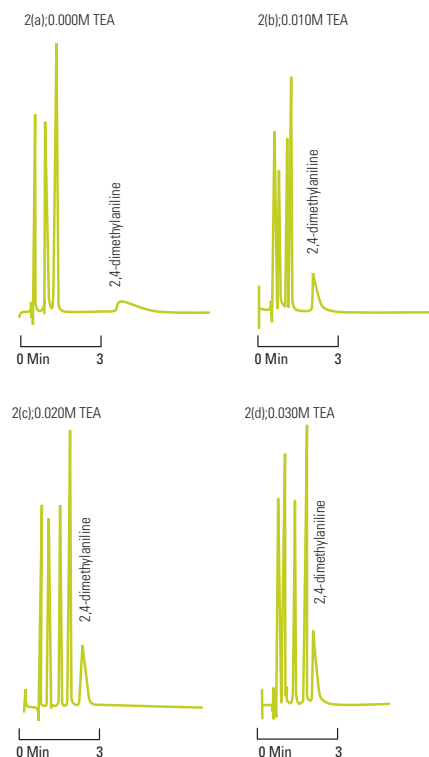
- 99.5% triethylamine purity, allowing sensitive peptide detection at low UV wavelengths in reverse-phase HPLC peptide separation systems
- Packaged in amber glass bottles with protective PTFE-lined fluorocarbon caps for reagent integrity
- Has a low UV absorbance to provide the most sensitive detection 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)

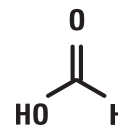
Description	Quantity		Cat. No.	Quantity
Triethylamine, HPLC Grade	25g		<b>TS-53101</b>	1 Each
Triethylamine, Sequencing Grade	100g		<b>TS-25108</b>	1 Each





## 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 X	<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.

X in the ordering table indicates that hazardous shipping charges apply.





## 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)

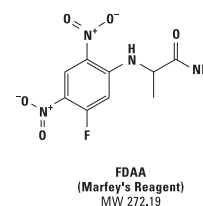
Description	Quantity		Cat. No.	Quantity
Trifluoroacetic Acid, Sequencing Grade	500mL	X	<b>TS-28901</b>	1 Each
Trifluoroacetic Acid, Sequencing Grade	100g	X	<b>TS-28903</b>	1 Each
Trifluoroacetic Acid, Sequencing Grade	10 × 1mL	X	<b>TS-28904</b>	1 Pack
Trifluoroacetic Acid, Sequencing Grade	1g	X	<b>TS-28902</b>	1 Each

X in the ordering table indicates that hazardous shipping charges apply.

### FDAA, Marfey's Reagent

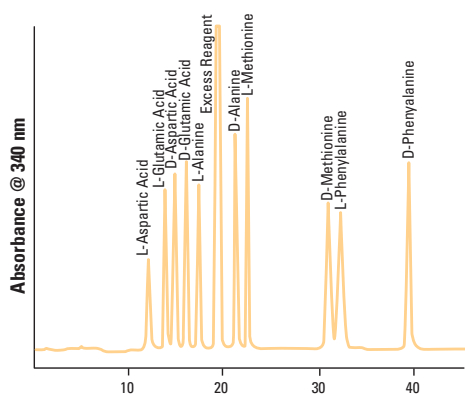
Makes separation and quantitation of optical isomers of amino acids by reverse-phase chromatography quick and easy

- 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

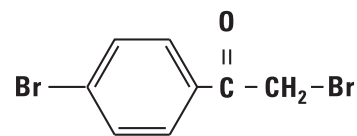
Description	Quantity		Cat. No.	Quantity
FDAA, Marfey's Reagent	50mg		<b>TS-48895</b>	1 Each



## 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,  $O_{max} = 335nm$
- 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 x 10<sup>4</sup>

### TNBSA

Description	Quantity	Cat. No.	Quantity
TNBSA	100mL	<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

## 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	X	<b>TS-24308</b>	1 Each

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.

X in the ordering table indicates that hazardous shipping charges apply.

### 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

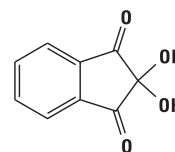
Description	Quantity		Cat. No.	Quantity
Amino Acid Standard H	10 × 1mL		<b>TS-20088</b>	1 Each

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.

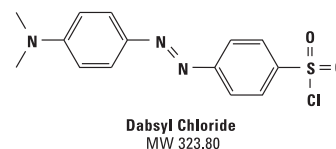


## High-Purity Pre-Column Derivatization Reagents

### 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



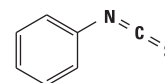
#### Dabsyl Chloride

Description	Quantity	Cat. No.	Quantity
Dabsyl Chloride (4-N,N Dimethylaminoazobenzene-4-sulfonyl chloride)	500g	<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.

### 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 Each

1. Henrikson, R.L. and Meridith, 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.

X in the ordering table indicates that hazardous shipping charges apply.

## 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	50mL	X	<b>TS-20673</b>	1 Each
Dimethyl sulfoxide	950mL		<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 aging
- 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 Instrument Spare Parts

Our HPLC and GC chromatography and mass spectrometry instruments offer solutions to life science, laboratory, and industrial customers to advance scientific knowledge, enable drug discovery improve manufacturing processes, and protect people and the environment. When your instrument is tuned for peak performance with parts, you can expect the best results and highest level of productivity to keep your research or processes moving smoothly.



## Surveyor Plus HPLC

- Precise quaternary gradients
- High throughput analysis and sample capacity
- Patented LightPipe technology provides 5x the sensitivity

### Surveyor Plus Kits

Description	Quantity	Cat. No.
Surveyor LC Pump Plus accessory kit	1	<b>60053-62003</b>
Solvent Interconnect kit	1	<b>F5050-010</b>
MS Pump Plus accessory kit	1	<b>72011-62001</b>
Surveyor Autosampler Plus accessory kit	1	<b>60053-62041</b>
Surveyor PDA Plus accessory kit	1	<b>F3070-010</b>
Surveyor FL Plus accessory kit	1	<b>60153-62001</b>

### Surveyor MS Pump Plus Liquid Displacement Assembly (LDA) Parts

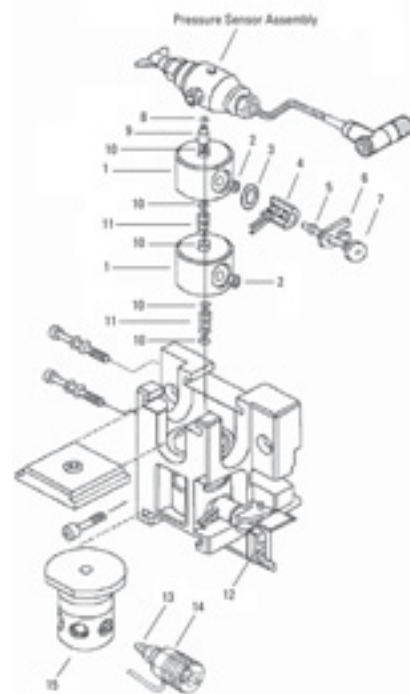
Item	Description	Quantity	Material	Cat. No.
1	Displacement chamber (piston chamber)	2	Ti	<b>00109-03-00001</b>
2	Primary piston seal	2	PTFE/GFP/Ti	<b>00107-18100</b>
3	Seal ring, piston chamber	2	PTFE	<b>60053-01020</b>
4	Piston guide bushing	2	SS/ruby	<b>00201-11330</b>
5	Secondary piston seal	2	PE/SS	<b>00107-18114</b>
6	Backing ring	2	SS	<b>00109-03-00002</b>
7	Piston unit	2	Zirconia	<b>00201-11324</b>
8	Outlet cartridge film seal	1	PEEK	<b>00107-18112</b>
9	Outlet cartridge	1	SS	<b>00109-03-00003</b>
10	Film sealing, check valve	5	PEEK	<b>00107-01-10013</b>
11	Check valve cartridge	2	Ti/ruby	<b>00110-05110</b>
12	Retaining clip	2	SS	<b>00201-11328</b>
13	Proportioning valve	4	Ti/ruby/sapphire	<b>00110-01-00007</b>
14	Coil unit for proportioning valve	4	SS/PEEK	<b>00201-11344</b>
15	Sealing ring, proportioning valve	4	PTFE	<b>00201-11320</b>

### Surveyor PDA Plus 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	<b>803264</b>
10mm flowcell assembly (1cm LightPipe)	1	<b>803265S</b>
Backpressure regulator	1	<b>802259</b>
Flowcell Assembly, with inlet/outlet tubing and fittings (5cm Lightpipe)	1	<b>803237</b>

### Surveyor RI Plus Accessories

Description	Quantity	Cat. No.
Interconnect cable, 7- connector	1	<b>60053-63034</b>
Fuses, T3.15AL250V, 5 x 20mm (for 110 V operation)	1	<b>00006-02-00010</b>
Fuses, T1.6AL250V, 5 x 20mm (for 230 V operation)	1	<b>00006-02-00011</b>
Inlet tubing, 1/16in OD, stainless steel	1	<b>00950-01-00133</b>
Outlet tubing, 0.060in ID x 1/16in OD, Teflon	1	<b>00950-01-00134</b>
Fitting, Luer, 10-32, 1/16in PEEK, syringe adapter	1	<b>00109-02-00014</b>



### Customizable HPLC for a diverse range of applications

The Thermo Scientific Surveyor Plus HPLC is a robust modular system with a suite of integrated features to increase application flexibility and efficiency, permitting full customization for any laboratory. From routine industrial QA/QC to advanced drug discovery, the Surveyor Plus HPLC system is designed for maximum performance and reliability.

**Surveyor Autosampler Plus Consumables**

Description	Quantity	Cat. No.
Assembly, needle	1	<b>60053-60013</b>
Assembly, needle tubing	1	<b>60053-60102</b>
Assembly, wash bottle kit	1	<b>60053-60041</b>
Assembly, syringe valve	1	<b>A3692-010</b>
Assembly, transfer tube, 0.012in ID	1	<b>60053-60014</b>
Cooling Adapter, 96 well	1	<b>60053-20002</b>
Filter, flush solvent	1	<b>A4258-010</b>
Grease, Silicon/Teflon (for lead screw)	1	<b>00301-01910</b>
Kit, maintenance Surveyor AS Plus	1	<b>60053-62044</b>
Kit, needle tubing	1	<b>60053-62043</b>
Lubricant, Triflow	1	<b>1611-0030</b>
Port, needle	1	<b>60053-20031</b>
Syringe, concentric, 100µL	1	<b>F1100-010</b>
Syringe, concentric, 250µL	1	<b>F1100-020</b>
Syringe, concentric, 500µL	1	<b>F1100-030</b>
Plunger, replacement, concentric, 100µL	1	<b>F1123-010</b>
Plunger, replacement, concentric, 250µL	1	<b>F1123-020</b>
Plunger, replacement, concentric, 500µL	1	<b>F1123-030</b>
Reservoir vials, 16mL	1	<b>00301-07527</b>
Retainer, needle port (injection port)	1	<b>60053-10035</b>
Syringe, standard, 2500 µL (with needle tubing extension)	1	<b>60053-62002</b>
Syringe, 2.5mL	1	<b>60053-60006</b>
Sample Loop, 5µL	1	<b>00109-99-00007</b>
Sample Loop, 10µL	1	<b>00109-99-00008</b>
Sample Loop, 20µL	1	<b>00109-99-00009</b>
Sample Loop, 25µL	1	<b>00109-99-00010</b>
Sample Loop, 50µL	1	<b>00109-99-00011</b>
Sample Loop, 100µL	1	<b>00109-99-00012</b>
Sample Loop, 500µL	1	<b>00109-99-00013</b>
Sample Loop, 1000µL	1	<b>00109-99-00014</b>
Stripper	1	<b>F1034-010</b>
Valve, injector	1	<b>60053-30002</b>
Seal, Rotor, PPS	1	<b>00109-03-00007</b>
Tubing assembly, 2.5mL syringe	1	<b>60053-60005</b>

**Surveyor FL Plus Consumables**

Description	Quantity	Cat. No.
Assembly, mercury lamp with holder	1	<b>00950-01-00135</b>
Kit, xenon lamp replacement	1	<b>60153-62002</b>
Xenon lamp	1	<b>00950-01-00009</b>
Video, xenon lamp replacement	1	<b>60153-64002</b>
Guide, xenon lamp replacement	1	<b>60153-97001</b>
Surveyor Plus documentation CD	1	<b>60053-64200</b>
Puncture resistant nitrile gloves, size small, box	1	<b>00301-01-00005</b>
Puncture resistant nitrile gloves, size large, box	1	<b>00301-01-00006</b>
Xenon Lamp Replacement Guide	1	<b>60153-97001</b>

**Surveyor LC Pump Plus Consumables**

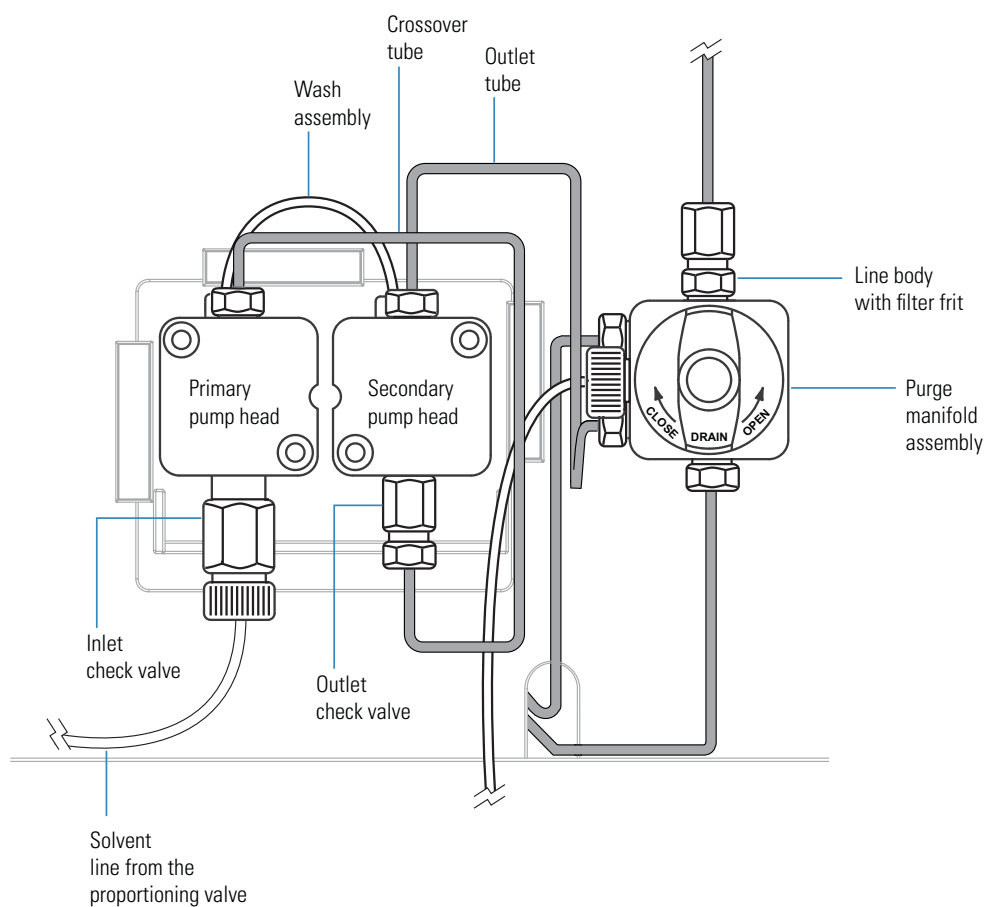
Description	Quantity	Cat. No.
Rinse tube assembly	1	<b>00950-30001</b>
Seal, polyethylene, high pressure, piston	1	<b>00950-30004</b>
Seal, GFP, high pressure, piston	1	<b>00107-18008</b>
Line filter frit	1	<b>00950-30009</b>
Wash tube fitting	1	<b>00950-30018</b>
Wash tube assembly	1	<b>00950-30019</b>
Piston assembly, TZP	1	<b>00950-30020</b>
Check valve assembly, outlet	1	<b>00950-30021</b>
Tubing assembly, pump inlet	1	<b>00950-30022</b>
Spacer, Teflon, large, 3.2mm x 7.7mm	1	<b>00950-30023</b>
Spacer, Teflon, small, 3.2mm x 6.3mm	1	<b>00950-30024</b>
Seal, wash	1	<b>00950-30025</b>
Check valve assembly, Inlet	1	<b>00950-30026</b>
O-ring, drain valve	1	<b>00950-30029</b>
Solvent reservoir filter, Teflon	1	<b>A4258-010</b>
Solvent reservoir filter, stainless steel	1	<b>A4929-010</b>
Kit, seal	1	<b>60053-62020</b>
Kit, maintenance	1	<b>60053-62021</b>

**Surveyor UV/Vis Plus Flow Cells**

Description	Quantity	Cat. No.
Kel-F Bio Cell	1	<b>9550-0103S</b>
3mm Semi-Prep	1	<b>9550-0101S</b>
6mm Analytical	1	<b>9550-0100S</b>
High pressure microbore	1	<b>9550-0150-01S</b>
Titanium Bio Cell	1	<b>9550-0197S</b>
3mm microbore	1	<b>9550-053S</b>
10mm analytical (standard on Surveyor-UV1)	1	<b>9550-0234S</b>
6mm microbore	1	<b>9550-0265S</b>
Cuvette Holder	1	<b>9550-0263S</b>
High pressure standard	1	<b>9550-0267S</b>
50mm LightPipe (Requires F3005-010 LightPipe Mount)	1	<b>803237</b>

Most of the above cells require flow cell cover P/N 60053-40005. The 50mm LightPipe (P/N 803237) requires flow cell cover P/N 60053-40041. The High Pressure Microbore flow cell requires flow cell cover P/N 60053-40006.





### Surveyor L Pump and L Pump Plus (10AT Model)

Description	Quantity	Cat. No.
Rinse Tube assembly		00950-30001
Seal, Polyethylene, High Pressure, Piston		00950-30004
Seal, GFP, High Pressure, Piston		00107-18008
Line Filter Frit		00950-30009
Wash Tube Fitting		00950-30018
Wash Tube Assembly		00950-30019
Piston assembly, TZP		00950-30020
Check Valve assembly, Outlet		00950-30021
Tubing assembly, pump inlet		00950-30022
Spacer, Teflon, large, 3.2mm × 7.7mm		00950-30023
Spacer, Teflon, small, 3.2mm × 6.3mm		00950-30024
Seal, wash		00950-30025
Check Valve assembly, Inlet		00950-30026
O-ring, Drain Valve		00950-30029
Solvent Reservoir Filter, Teflon		A4258-010
Solvent Reservoir Filter, stainless steel		A4929-010
Kit, Seal		60053-62020
Kit, Maintenance		60053-62021

### Surveyor L Pump Plus (20AT Model)

Description	Quantity	Cat. No.
Check valve assembly, inlet		00950-01-00085
Check valve assembly, outlet		00950-01-00086
Kit, Seal		60053-62050
Kit, Maintenance		60053-62051
Line filter frit		00950-30009
O-ring, drain valve		00950-30029
Piston assembly, sapphire		00950-01-00087
Rinse tube assembly		00950-30001
Seal, GFP, high- pressure, piston		00107-18008
Seal, polyethylene, high-pressure, piston		00950-30004
Seal, wash		00950-01-00084
Solvent reservoir filter, Teflon		A4258-010
Solvent reservoir filter, stainless steel		A4929-010
Spacer, Teflon, 4.5mm × 6.3mm		00950-01-00101
Tubing, pump inlet		00950-30022
Wash tube fitting		00950-30018
Wash tube assembly		00950-30019

## Accela High Speed LC

- Conventional HPLC and U-HPLC up to 15,000psi
- Optimizes the performance of sub-2 micron particle columns
- 65 $\mu$ L delay volume with quaternary capability

### 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, 100 $\mu$ L	1	F1100-010
Syringe, concentric, 250 $\mu$ L	1	F1100-020
Syringe, concentric, 500 $\mu$ L	1	F1100-030
Plunger, replacement, concentric, 100 $\mu$ L	1	F1123-010
Plunger, replacement, concentric, 250 $\mu$ L	1	F1123-020
Plunger, replacement, concentric, 500 $\mu$ L	1	F1123-030
Reservoir vials, 16mL	1	00301-07527
Retainer, needle port (injection port)	1	60053-10035
Syringe, standard, 2500 $\mu$ L (with needle tubing ext)	1	60053-62002
Syringe, 2.5mL	1	60053-60006
Sample Loop, 5 $\mu$ L	1	00109-99-00007
Sample Loop, 10 $\mu$ L	1	00109-99-00008
Sample Loop, 20 $\mu$ L	1	00109-99-00009
Sample Loop, 25 $\mu$ L	1	00109-99-00010
Sample Loop, 50 $\mu$ L	1	00109-99-00011
Sample Loop, 100 $\mu$ L	1	00109-99-00012
Sample Loop, 500 $\mu$ L	1	00109-99-00013
Sample Loop, 1000 $\mu$ L	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



### Two systems in one – Conventional analytical HPLC and U-HPLC at 15,000psi

Sample analysis is now faster, easier, and more reliable. The innovative Thermo Scientific Accela LC system performs separations over an expansive range of flow rates and pressures – all with a single instrument.

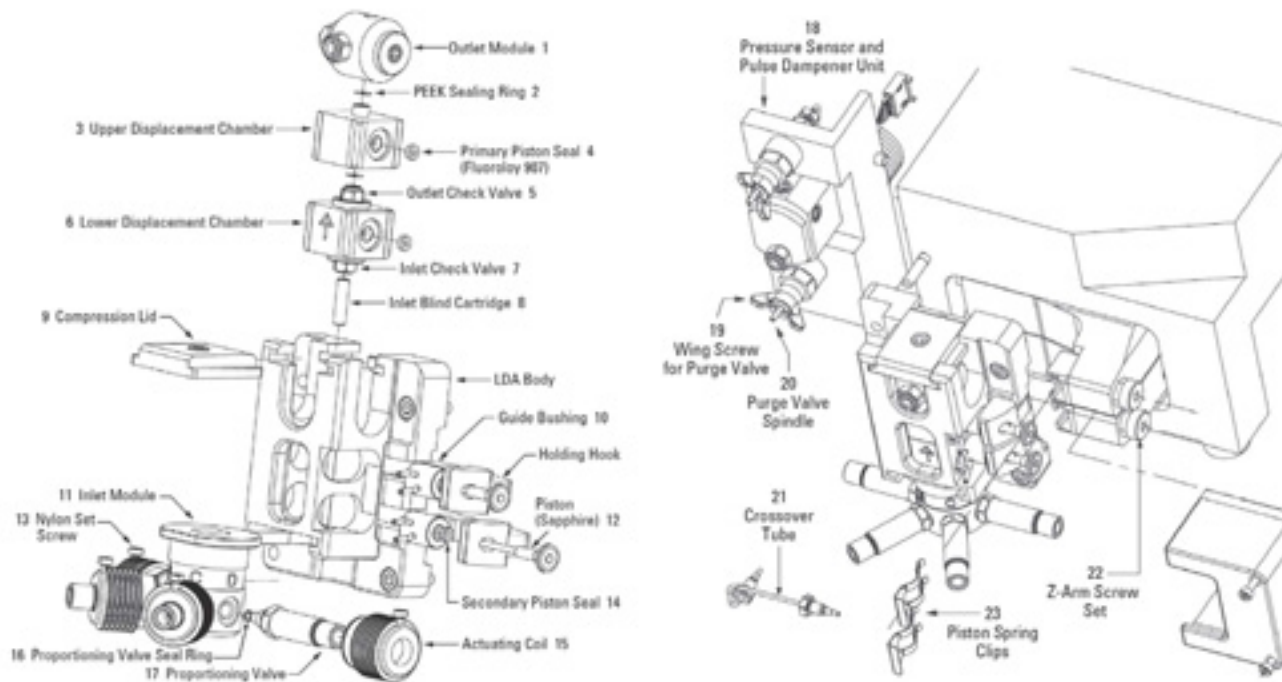


### Accela Open Autosampler Consumables

Kit Description	Cat. No.
Kit, asp tube, Accela Open A/S, RoHS PAL DilAspKit	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

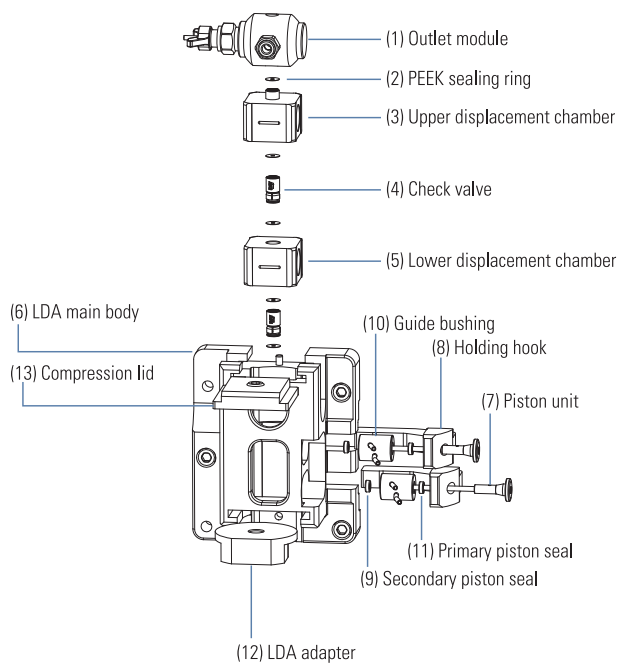
### Accela PDA Accessories

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

Item	Description	Quantity	Material	Cat. No.
1	Outlet module, Accela pump	1	Ti	00950-01-00124
2	Seal, film, PEEK, Accela pump	4	PEEK	00950-01-00122
3	Chamber, displacement, upper, Accela pump	1	Ti	00950-01-00123
4	Seal, high pressure, GFP, Accela pump	2	PTFE/GFP/Ti	00950-01-00129
5	Valve, check, outlet, Accela pump	1	Ti/ruby/sapphire	00950-01-00131
6	Chamber, displacement, lower, Accela pump	1	Ti	00950-01-00121
7	Valve, check, inlet, Accela pump	1	Ti/ruby/sapphire	00950-01-00130
8	Cartridge, blind, inlet, Accela pump	1	PEEK	00950-01-00120
9	Lid, compression, with set screw, Accela pump	1	Ti	00950-01-00125
10	Piston guide bushing	1	Ti/zirconia	00950-01-00127
11	Inlet module	2	Ti	00950-01-00119
12	Piston, sapphire	2	Sapphire	00950-01-00126
13	Nylon screw (for actuating coil)	2	Nylon	00109-04-00005
14	Secondary piston seal (wash seal)	2	PE/SS	00950-01-00128
15	Coil unit for proportioning valve	4	SS/PEEK	00201-11344
16	Proportioning valve	4	Ti/ruby/sapphire/zirconia	00110-01-00007
17	Sealing ring, proportioning valve	2	PTFE	00201-11320
18	Pressure sensor and pulse dampener unit	1	Ti	00201-00112
19	Wing screw for purge valve	2	Ti	00950-01-00117
20	Purge valve spindle	2	Ti/ruby	00950-01-00118
21	Crossover tubing	1	Ti	00950-01-00113
22	Z-arm screw set	2	Ti	00950-01-00115
23	Piston	2	SS	00201-11328



### Accela 1250 Pump Liquid Displacement Assembly (LDA)

Item	Description	Quantity	Cat. No.
1	Outlet module, complete (Accela 600)	1	00950-01-00284
2	UHP PEEK sealing ring	5	00950-01-10013
3	Displacement chamber, upper	1	00950-01-00123
4	Check valve, titanium and ruby	2	00110-05110
5	Displacement chamber, lower	1	00950-01-00121
6	UHP LDA main body	1	N/A
7	Piston unit, sapphire	2	00950-01-00126
8	Holding hook	2	N/A
9	Secondary piston seal, (GFP)	2	00950-01-00129
10	Guide bushing	2	00950-01-00283
11	Primary piston seal, (GFP)	2	00950-01-00129
12	Adapter, LDA (Accela 600)	1	N/A
13	Compression lid including set screw	1	00950-01-00125

### Accela 600 Pump Spare Parts

Description	Quantity	Cat. No.
Chamber, disp, lower, Accela 600 pump	1	00950-01-00281
Chamber, disp, upper, Accela 600 pump	1	00950-01-00282
Bushing, guide, Accela 600 pump	2	00950-01-00283
Module, outlet, Accela 600 pump	1	00950-01-00284
Valve, proportioning, Accela pump	4	00950-01-00285
O-ring, 2.69mm x 1.14mm, perfluor	1	00950-01-00286
Brake, flow, inlet mod, Accela 600 pump	1	00950-01-00287
Kit, prop valve mtg, Accela 600 pump	4	00950-01-00288
Fuseholder, drawer; 5x20mm, 2pole, safe, RoHS	1	2109-0740
Fuse, IEC, 2.0A, 250V, SLO-BLO, 5x20mm, RoHS	2	5120-0025
Kit, inlet tubing, Accela 600 pump	1	60157-62008
Mixer, static, 65 uL, Accela 600 pump, RoHS	1	00950-01-00292
Placeholder, DM, Accela pump, RoHS	1	00950-01-00293
Assy, LDA, Accela 600 pump, RoHS	1	00950-01-00294
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
Spring, piston retaining	2	00201-11328
Seal, piston, secondary	2	00107-18114

### Accela 600 Pump Accessory Kit

Description	Quantity	Cat. No.
Adapter, luer	1	A0796-010
Wrench, 1/4x8/19, Super Krome, RoHS	2	5120-0025
Tubing, convoluted, pump waste	1	5401-0400
Syringe, luer lok, 10cc	1	F5034-040
Screwdriver, Balldriver, HEX, 4mm, Rohs	1	3301-0151
Conn, clb, plug, 8P, 3.81mm, Phoenix, RoHS	1	00725-00032
Cable, USB, A to B, 3.0m, shielded, RoHS	1	00004-02511
Wrench, L HEX, 4mm, RoHS	1	00302-99-00014
Tool, Balldriver, 2.5mm	1	00725-00034
Seal, H/P, Surveyor MS pump	1	00725-01-00002
Tool, fitting extender, Accela 600 pump	2	00107-18110
Tool, Fitting extender, Accela 600 PUMP	1	00725-01-00023

### Accela 600 Pump Accessory Kit

Description	Quantity	Cat. No.
Tubing, FEP, 1/16in ID x 1/8in OD	288in *	3219-2004
Filter, Solvent INLET, SS, 20µM, RoHS	4	00109-02-00022
FTG, Ferrule, 1/8in, SHORT, TEFZEL	4	00101-18223
FTG, Nut, 1/8in, 1/4-28, PEEK, BLU, RoHS	1	00109-02-00023
FTG, Nut, 1/8in, 1/4-28, PEEK, YEL, RoHS	1	00109-02-00024
FTG, Nut, 1/8in 1/4-28, PEEK, GRN, RoHS	1	00109-02-00025
FTG, Nut, 1/8in 1/4-28, PEEK, ORN, RoHS	1	00109-02-00026

\* Cut into 6' lengths

### Accela 600 Pump Tools

Description	Cat. No.
Tool, Fitting Extender, Accela 600 Pump	00725-01-00023
Screwdriver, Ball driver, HEX, 4mm, RoHS	00725-00032
Wrench L HEX 4mmM, RoHS	00725-00034
Tool, Ball driver 2.5mm	00725-01-00002
Wrench 1/4-5/16, Super Krome, RoHS	5401-0400

## MSQ Plus Single Quadrupole LC/MS

- Fastest scanning mass detector for high speed LCMS applications
- Patented ConeWash™ technology for rugged interfaces
- Accurate trace level quantitation

### 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>



The Thermo Scientific MSQ Plus single quadrupole mass spectrometer provides mass confirmation as an LC detector with high sensitivity, fast scan speed and a small footprint. It can analyze a wide range of samples, and is particularly suited for “walk up” environments, high throughput screening, and fast LC applications.

## TSQ Series Triple Quadrupole LC/MS

Quantum Access, Quantum Access MAX, Quantum Discovery, Quantum Discovery Max, Quantum Ultra, Quantum Ultra AM, Quantum Ultra EMR, Vantage

- H-SRM dwell time of 2 ms for quantitation of hundreds of compounds in a single run
- Mass range up to m/z 3000 supports a wide array of applications
- QED-MS/MS facilitates simultaneous quantitation and structural confirmation

The Thermo Scientific TSQ Series of triple quadrupole LC/MS systems are designed for use in both research and routine applications such as proteomics, drug discovery, and analytical quantitation. The TSQ Quantum Access MAX™ offers versatility with its best in class mass range (m/z 10-3000), Quantitation-Enhanced Data-Dependent MS/MS structural quantitation scan mode, and H-SRM capability.

The TSQ Quantum Ultra™ is the best available technology to provide ultimate productivity for a variety of quantitative applications. The TSQ Vantage™ is crafted with Generation Two ion optics, which includes the innovative S-Lens and zero cross-talk collision cell, making it the most sensitive, high-precision triple quad available on the market today.



### 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>

### Ion Transfer Tubes and Graphite Vespel O-ring

Description	Quantity	Cat. No.
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>
Graphite vespel o-ring (all models)	1	<b>97055-20442</b>



### MS Maintenance Kit

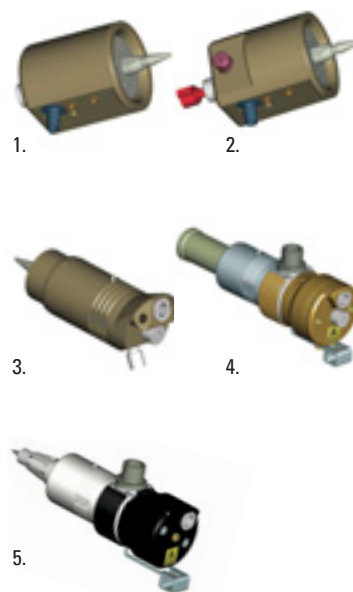
Description	Quantity	Cat. No.
MS maintenance kit	1	<b>70111-62032</b>
Ferrule, 0.008 ID, Kel-F (for fused silica sample tube)	2	<b>00101-18114</b>
Tubing, fused-silica, 0.10 ID x 0.19 OD (fused silica sample tube)	6ft	<b>00106-10499</b>
O-ring, Viton, 0.125 ID x 1/16 (for source mount assembly gas connections)	2	<b>00107-02550</b>
Fitting, HPLC, 10-32, short one-piece, 10/pk, RoHS	3	<b>00109-99-00016</b>
Oil, forepump, inland 19, 1μL	3	<b>00301-15101</b>
Syringe, 500μL, 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>

### Metal Needle Kits *(Note the compatibility numbers refer to the images at right)*

Compatibility Number	Description	Quantity	Cat. No.
1	High flow metal needle kit	1	<b>OPTON-20004</b>
1	Low flow metal needle kit	1	<b>OPTON-20005</b>
2	High flow metal needle kit	1	<b>OPTON-20016</b>
2	Low flow metal needle kit	1	<b>OPTON-20017</b>
3	High flow metal needle kit	1	<b>OPTON-53003</b>
3	Low flow metal needle kit	1	<b>OPTON-30004</b>
4	H-ESI metal needle kit	1	<b>OPTON-20034</b>
5	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>
5	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>

### ESI Needles and Needle Seal *(Note the compatibility numbers refer to the images at right)*

Compatibility Number	Description	Quantity	Cat. No.
1,2,3	ESI needle	1	<b>00950-00990</b>
1,2,3	ESI needle seal	1	<b>00950-00952</b>
4	H-ESI needle	1	<b>97055-20273</b>
4	H-ESI needle seal	1	<b>97055-20271</b>



For use with the metal needle kits and ESI needle & needle seal tables.



## Ion Trap Series and Orbitrap Series

LCQ Fleet, LTQ XL, LTQ Velos, LTQ Orbitrap Discovery, LTQ Orbitrap XL, LTQ Orbitrap Velos, and LTQ FT Ultra

Whether your application is as straightforward as routine HPLC detection and compound identification or as difficult as identification and characterization of low-abundance proteins in complex biological matrices, there is a Thermo Scientific ion trap or ion trap hybrid mass spectrometer to meet your analytical challenge.



### LCQ Fleet

Exceptional Analytical Value

- Excellent full-scan MS<sup>n</sup> sensitivity
- Rugged and reliable
- Cost effective

The Thermo Scientific LCQ Fleet ion trap delivers rich information for routine analysis of complex samples and integrates seamlessly with fast HPLC systems under an easy-to-use single point of control.



### LTQ XL

Exceptional Sensitivity and Flexibility

- Multiple fragmentation modes provide more structural information
- Upgradeable to Orbitrap or FT technology

The Thermo Scientific LTQ XL linear ion trap combines exceptional sensitivity with tremendous flexibility. It applies multistage activation, CID, PQD, and optional ETD to generate extensive structural information for the most demanding applications. Available FAIMS offers greater specificity for complex samples, while the optional MALDI source promises speed and simplicity.



### LTQ Velos

Exceptional Sensitivity and Flexibility

- Dual-pressure linear ion trap for improved scan speed and mass resolution
- S-Lens ion optics for better ion transmission and lower limits of detection
- Upgradeable to Orbitrap technology

With new S-Lens ion guide technology, a revolutionary dual-pressure linear ion trap, and predictive automatic gain control, the Thermo Scientific LTQ Velos is the fastest, most-sensitive ion trap available today. It enables the identification and quantification of low-abundance compounds in half the time.



## Exactive™ High Performance Benchtop LC-MS System

Powered by Orbitrap™ Technology

- High throughput screening with high resolution mass accuracy
- Quantification with superior specificity
- Up to 100,000 resolution for high confidence compound identification
- Walk-up analysis

Powered by patented Thermo Scientific Orbitrap technology, the Exactive provides fast, sensitive, reliable, and confident detection and identification of compounds in complex mixtures while maintaining full compatibility with U-HPLC and fast chromatography. The Exactive supports screening applications, from routine compound identification to the most demanding analysis of trace levels components in complex mixtures. In addition, the Exactive allows an alternate positive-negative scan mode of operation. The optional HCD collision cell adds more functionality to the bench-top system by providing 'All Ion Fragmentation' while maintaining high resolution, accurate mass and high sensitivity.



## LTQ Orbitrap Velos Hybrid FTMS

Ultra-high resolution and accurate mass for confident structural elucidation

- More unique proteins identified in a single experiment
- Multiple fragmentation techniques deliver optimal structural characterization
- Rapid quantitation of low level isobarically labeled peptides
- Precise intact protein analysis

The Thermo Scientific LTQ Orbitrap Velos blends the unsurpassed speed and sensitivity of the LTQ Velos ion trap with the ultra-high resolution and outstanding mass accuracy of Orbitrap technology. The LTQ Orbitrap Velos elevates protein sequencing and the analysis of complex mixtures to previously unseen levels, and delivers results with absolute confidence.



## LTQ FT Ultra

Unprecedented Analytical Power

- Attomole sensitivity, ppb mass accuracy to eliminate false positive identifications
- Parallel acquisition of MSn and high-resolution, full-scan MS spectra
- Widest dynamic range and ultra high resolution for complex sample analysis

The Thermo Scientific LTQ FT Ultra merges advanced ion trap and FT-ICR technologies into a single instrument with unprecedented analytical power. Ultra-high resolution and sensitivity, coupled with sub-ppm mass accuracy and ECD and IRMPD fragmentation capabilities, are available for applications demanding ultimate performance and flexibility, such as top-down protein analysis, PTM analysis, and metabolomics.



## 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>
C apillary 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>

## Method Transfer to Sub-2µm Columns

The use of sub-2µm particles is becoming increasingly popular for applications in either High Throughput Screening (HTS) assays or in Ultra-High Pressure Liquid Chromatography (U-HPLC). Hypersil GOLD columns packed with 1.9µm particles offer advantages over the more traditional systems containing 3 and 5µm particles by allowing operation at higher flow rates without compromising efficiency. This results in shorter analysis times and improvements in resolving power, sensitivity and peak capacity.

When transferring methods from HPLC to U-HPLC several approaches can be taken, depending on the analytical needs. If column dimensions are maintained and only particle size is reduced then an improvement in efficiency and, therefore, resolution and peak capacity is obtained. A second approach is to reduce not only particle size but also column dimensions, which has the benefit of further reducing analysis time.

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.

There are three main considerations when transferring a method to a shorter column using small 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-2µm-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:

Original method		U-HPLC		U-HPLC	
Column I: 150 x 4.6mm, 5µm		Column II: 100 x 2.1mm, 1.9µm		Column III: 50 x 2.1mm, 1.9µm	
Flow rate – 1mL/min		Flow rate – 0.55mL/min		Flow rate – 0.55mL/min	
(Column volume – 1.7mL)		(Column volume – 0.24mL)		(Column volume – 0.12mL)	
Injection volume – 10µL		Injection volume – 1.4µL		Injection volume – 0.7µL	
Gradient time (min)	%B	Gradient time (min)	%B	Gradient time (min)	%B
0	0	0	0	0	0
25	0	6.4	0	3.2	0
55	85	14.1	85	7.1	85
70	85	17.9	85	8.9	85

Method transfer conditions from HPLC (150 x 4.6mm, 5µm columns) to U-HPLC (100 x 2.1mm, 1.9µm and 50 x 2.1mm, 1.9µm columns).

\*We also offer a convenient method transfer calculator at the Chromatography Resource Center ([www.thermo.com/columns](http://www.thermo.com/columns))

### Optimized Method Transfer

The table above lists the equivalent 1.9µm particle packed columns for the most commonly encountered columns packed with 5 and 3µm particles. Perhaps the most significant advantage of 1.9µm particle packed columns is that they allow the chromatographer not only to select the equivalent column for direct method transfer, but also to optimize the column length and flow rate to achieve increased efficiency and speed of separation.

If the analyte peaks are well separated and high throughput is the most important consideration for a method, it is possible to increase the chromatographic speed by further reducing the column length and increasing the flow rate. On the other hand, if it is necessary to further increase resolution for difficult separations in complex matrices, a longer column can be used to increase the efficiency of the separation.

### 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 (such as used in the Thermo Scientific Accela™ HPLC high speed LC system) 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.

Further details on method optimization using 1.9µm Hypersil GOLD columns can be found in Technical Guide TG20338. We also offer a convenient method transfer calculator at the Chromatography Resource Center ([www.thermoscientific.com/chromatography](http://www.thermoscientific.com/chromatography))

Particle Size (µm)	Column Length (mm)	
	Conventional Hypersil GOLD	1.9µm Hypersil GOLD
5.0	250	100
	150	50
	100	30
	50	20
3.0	250	150
	150	100
	100	50
	50	30
	30	20

Column length equivalency to maintain resolution (match column chemistry and transfer method geometrically)



## 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.

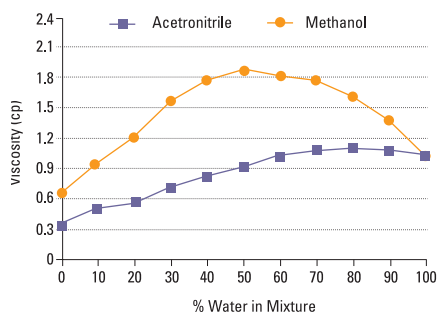
## Scaling Up a Method

### 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.

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➤ PAGE 1-XXX



### 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

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, 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 offers 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, Hypersil GOLD

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  $\pm 1$  pH 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.

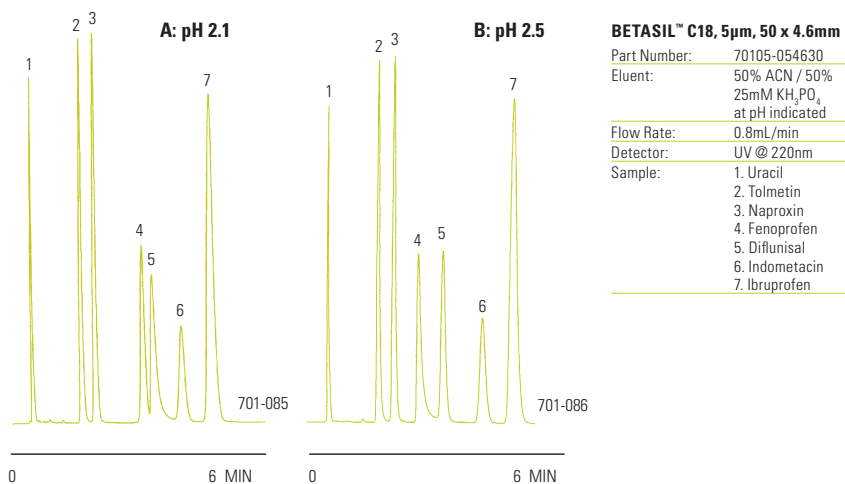
The figure to the right shows the importance of choosing the correct pH for a separation. Even slight changes in pH, either from measuring errors, mixing complications with the pump, or atmospheric water adsorption into the mobile phase, can alter any method if not properly buffered.

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
	pK <sub>2</sub>	7.2	6.2 – 8.2
	pK <sub>3</sub>	12.3	11.3 – 13.3
Citrate	pK <sub>1</sub>	3.1	2.1 – 4.1
	pK <sub>2</sub>	4.7	3.7 – 5.7
	pK <sub>3</sub>	5.4	4.4 – 6.4
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
	pK <sub>2</sub>	10.3	9.3 – 11.3
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

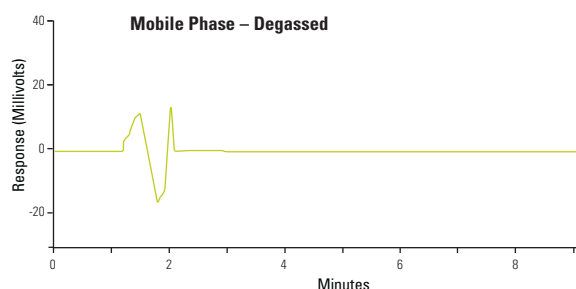
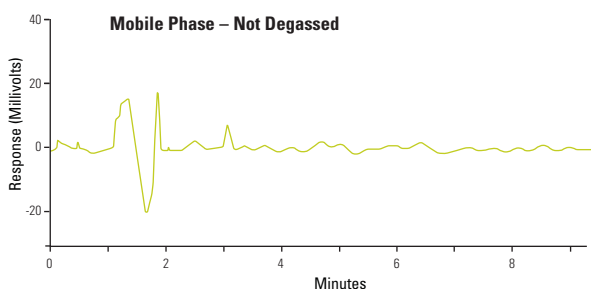
Before the freshly prepared mobile phase is pumped around the HPLC system, it should be thoroughly degassed to remove all dissolved gasses. Dissolved gas can be removed from solution by:

- 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	212	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

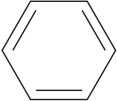
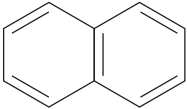
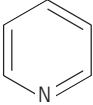
**Immiscible**  
Those squares shaded as "immiscible" refer to solvent mixes where, in some proportions, two phases will be produced

- 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	–
	-ONO	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

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260E336P	3-054	260N298P	3-063	260Y137P	3-060	26105-154030	4-067	26305-104630	4-068
260E470P	3-013	260P123P	3-017	260Y142P	3-060	26105-154630	4-067	26305-151030	4-068
260E470P	3-054	260P123P	3-067	260Y154P	3-060	26105-251030	4-067	26305-152130	4-068
260EC111	3-093	260Q131P	3-058	26102-021030	4-030	26105-252130	4-067	26305-153030	4-068
260F020P	3-055	260Q142P	3-058	26102-022130	4-030	26105-253030	4-067	26305-154030	4-068
260F024P	3-055	260Q143P	3-058	26102-023030	4-030	26105-254030	4-067	26305-154630	4-068
260F035P	3-055	260Q154P	3-058	26102-031030	4-030	26105-254630	4-067	26305-251030	4-068
260F047P	3-055	260Q155P	3-058	26102-032130	4-030	26302-021030	4-030	26305-252130	4-068

26305-253030	4-068	26505-154030	4-070	26M99-2860	3-050	28105-104630	4-106	29004290	3-143
26305-254030	4-068	26505-154630	4-070	26M99-2960	3-018	28105-123030	4-106	29004666	3-145
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26502-021030	4-031	26505-252130	4-070	26M99-2960	3-050	28105-124630	4-106	29007106	3-144
26502-022130	4-031	26505-253030	4-070	26M99-2980	3-050	28105-152130	4-106	29011302	3-144
26502-023030	4-031	26505-254030	4-070	26M99-3360	3-050	28105-153030	4-106	29013417	3-029
26502-031030	4-031	26505-254630	4-070	26M99-3960	3-050	28105-154030	4-106	29013417	3-084
26502-032130	4-031	26AA395P	3-069	26M99-4100	3-050	28105-154630	4-106	29013417	3-144
26502-033030	4-031	26AC497P	3-070	26RC142F	3-071	28105-204030	4-106	29013702	3-144
26502-051030	4-031	26AF024P	3-013	26RC142P	3-071	28105-204630	4-106	29014278	3-144
26502-052130	4-031	26AF024P	3-069	26RD142F	3-071	28105-252130	4-106	29015058	3-145
26502-053030	4-031	26AF047P	3-068	26RD142F	3-072	28105-253030	4-106	29031305	3-144
26502-054630	4-031	26AF059P	3-068	26RF024P	3-014	28105-254030	4-106	29032608	3-145
26502-101030	4-031	26AF130P	3-070	26RF024P	3-069	28105-254630	4-106	29032630	3-146
26502-101030	4-031	26AF154P	3-068	26RF142F	3-071	28107001	3-146	29033037	3-146
26502-102130	4-031	26AJ148P	3-012	26RF142P	3-067	28107100	3-146	29033406	3-024
26502-152130	4-031	26AJ148P	3-068	26RF223P	3-067	28202-012101	4-107	29033406	3-028
26502-202130	4-031	26AX142P	3-069	26RF296P	3-017	28202-014001	4-107	29033406	3-029
26503-031030	4-070	26M88-0350	3-052	26RF296P	3-067	28202-052130	4-107	29033406	3-035
26503-031030	4-070	26M88-1300	3-052	26RV495P	3-014	28202-054630	4-107	29033406	3-068
26503-032130	4-070	26M88-1420	3-052	26RV495P	3-067	28202-102130	4-107	29033406	3-084
26503-032130	4-070	26M88-1440	3-052	26RX142P	3-014	28202-104630	4-107	29033460	3-091
26503-033030	4-070	26M88-1540	3-052	26RX142P	3-067	28202-152130	4-107	29033461	3-091
26503-033030	4-070	26M88-2130	3-052	27000	4-019	28202-154630	4-107	29033471	3-091
26503-034030	4-070	26M88-2230	3-052	27002	4-019	28203-012101	4-107	29033496	3-024
26503-034030	4-070	26M88-2250	3-052	27006	4-019	28203-013001	4-107	29033496	3-028
26503-034630	4-070	26M88-2860	3-052	27700350	3-145	28203-014001	4-107	29033496	3-029
26503-051030	4-070	26M88-2880	3-052	27-CV	2-078	28203-052130	4-107	29033496	3-035
26503-052130	4-070	26M88-3360	3-052	27-CV	2-091	28203-054630	4-107	29033496	3-068
26503-053030	4-070	26M98-0350	3-051	28102-012101	4-106	28203-104630	4-107	29033496	3-070
26503-054030	4-070	26M98-1300	3-051	28102-014001	4-106	28203-153030	4-107	29033496	3-091
26503-054630	4-070	26M98-1420	3-014	28102-032130	4-106	28203-154630	4-107	29033496	3-092
26503-101030	4-070	26M98-1420	3-015	28102-034630	4-106	28205-012101	4-107	29033497	3-091
26503-101030	4-070	26M98-1420	3-016	28102-052130	4-106	28205-013001	4-107	29033497	3-092
26503-101030	4-070	26M98-1420	3-017	28102-054630	4-106	28205-014001	4-107	29033629	3-024
26503-101030	4-070	26M98-1420	3-019	28102-102130	4-106	28205-052130	4-107	29033629	3-028
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26503-151030	4-070	26M98-1440	3-051	28102-152130	4-106	28205-054630	4-107	29033629	3-035
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26503-151030	4-070	26M98-1540	3-015	28103-012101	4-106	28205-104630	4-107	29033629	3-143
26503-151030	4-070	26M98-1540	3-017	28103-013001	4-106	28205-154030	4-107	29033629	3-146
26503-152130	4-070	26M98-1540	3-051	28103-014001	4-106	28205-154630	4-107	29037100	3-146
26505-031030	4-070	26M98-2230	3-017	28103-032130	4-106	28205-254030	4-107	29053486	3-090
26505-031030	4-070	26M98-2250	3-051	28103-052130	4-106	28205-254630	4-107	29053486	3-091
26505-032130	4-070	26M98-2250	3-019	28103-053030	4-106	28600450	3-146	29053487	3-090
26505-032130	4-070	26M98-2250	3-051	28103-054630	4-106	28803-012101	4-107	29053487	3-091
26505-033030	4-070	26M98-2860	3-051	28103-102130	4-106	28803-014001	4-107	29053488	3-024
26505-033030	4-070	26M98-2960	3-015	28103-103030	4-106	28803-052130	4-107	29053488	3-028
26505-034030	4-070	26M98-2960	3-016	28103-104030	4-106	28803-054630	4-107	29053488	3-029
26505-034030	4-070	26M98-2960	3-019	28103-104630	4-106	28803-154630	4-107	29053488	3-035
26505-034630	4-070	26M98-2960	3-051	28103-152130	4-106	28805-014001	4-107	29053488	3-068
26505-051030	4-070	26M98-2980	3-051	28103-153030	4-106	28805-154630	4-107	29053488	3-070
26505-052130	4-070	26M98-3360	3-051	28103-154030	4-106	28805-254630	4-107	29053488	3-090
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26505-054030	4-070	26M99-1300	3-019	28105-012101	4-106	28903-014001	4-107	29053488	3-091
26505-054630	4-070	26M99-1300	3-050	28105-013001	4-106	28903-052130	4-107	290BT239	3-091
26505-101030	4-070	26M99-1420	3-019	28105-014001	4-106	28903-154630	4-107	290GA081	3-087
26505-101030	4-070	26M99-1420	3-050	28105-052130	4-106	28903-154630	4-107	290GA082	3-087
26505-101030	4-070	26M99-1440	3-050	28105-053030	4-106	28905-014001	4-107	290GA083	3-087
26505-101030	4-070	26M99-1540	3-018	28105-054030	4-106	28905-154630	4-107	290GA084	3-087
26505-102130	4-070	26M99-1540	3-050	28105-054630	4-106	28905-254030	4-107	290GA091	3-088
26505-151030	4-070	26M99-2130	3-050	28105-102130	4-106	28905-254630	4-107	290GA092	3-088
26505-152130	4-070	26M99-2230	3-050	28105-103030	4-106	29003420	3-144	290GA093	3-088
26505-153030	4-070	26M99-2250	3-050	28105-104030	4-106	29004277	3-144	290GA094	3-088
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290SG025.....	<b>3-095</b>	30005-154030.....	<b>4-111</b>	30130.....	<b>4-156</b>	30805-154630.....	<b>4-110</b>	31603-104030.....	<b>4-109</b>
290SG032.....	<b>3-095</b>	30005-154630.....	<b>4-111</b>	30140-FLEX.....	<b>4-156</b>	30805-254030.....	<b>4-110</b>	31603-104630.....	<b>4-109</b>
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290ST131.....	<b>3-089</b>	30005-254630.....	<b>4-111</b>	30150-FLEX.....	<b>4-156</b>	30905-014001.....	<b>4-110</b>	31603-153030.....	<b>4-109</b>
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290VP144.....	<b>3-092</b>	30103-012101.....	<b>4-108</b>	30203-154630.....	<b>4-109</b>	30905-254630.....	<b>4-110</b>	31605-014001.....	<b>4-109</b>



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59122	4-074	60103-351	1-041	60105-212	1-059	60107-212	1-012	60108-421	1-030
59123	4-074	60104-230	1-037	60105-213	1-060	60107-214	1-012	60108-422	1-030
59124	4-074	60104-232	1-040	60105-214	1-060	60107-215	1-012	60108-423	1-030
59125	4-074	60104-233	1-040	60105-215	1-058	60107-217	1-012	60108-424	1-034
59126	4-074	60104-234	1-037	60105-215	1-060	60107-218	1-012	60108-425	1-034
59127	4-074	60104-235	1-037	60105-216	1-058	60107-222	1-012	60108-426	1-028
59134	4-074	60104-236	1-038	60105-216	1-059	60107-301	1-013	60108-427	1-026
59135	4-074	60104-240	1-040	60105-217	1-058	60107-302	1-013	60108-431	1-033
59136	4-074	60104-241	1-037	60105-217	1-060	60107-303	1-013	60108-432	1-034
59137	4-074	60104-241	1-040	60105-218	1-058	60107-304	1-013	60108-433	1-030
59138	4-074	60104-241	1-041	60105-218	1-060	60107-305	1-013	60108-434	1-029
59139	4-074	60104-242	1-040	60105-219	1-058	60107-306	1-013	60108-500	1-033
59140	4-074	60104-243	1-037	60105-219	1-060	60107-307	1-013	60108-516	1-027
59141	4-074	60104-243	1-040	60105-220	1-060	60107-308	1-013	60108-517	1-027
5-SV	2-076	60104-243	1-041	60105-221	1-058	60107-311	1-013	60108-518	1-034
5-SV	2-091	60104-244	1-040	60105-221	1-060	60107-312	1-013	60108-519	1-034
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6000-209	4-171	60104-255	1-040	60105-226	1-058	60107-406	1-014	60108-701	1-025
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6000-262	4-171	60104-259	1-040	60105-230	1-060	60107-412	1-014	60108-705	1-026
60053-01020	4-211	60104-259	1-042	60105-231	1-060	60107-414	1-014	60108-706	1-026
60053-10035	4-212	60104-260	1-040	60105-234	1-059	60107-415	1-014	60108-707	1-027
60053-10035	4-214	60104-261	1-040	60105-311	1-059	60107-417	1-014	60108-708	1-027
60053-20002	4-212	60104-262	1-040	60105-312	1-059	60107-419	1-014	60108-709	1-027
60053-20002	4-214	60104-265	1-038	60105-332	1-061	60108-301	1-025	60108-710	1-028
60053-20031	4-212	60104-266	1-038	60105-333	1-061	60108-302	1-025	60108-711	1-028
60053-20031	4-214	60104-267	1-038	60105-334	1-061	60108-303	1-025	60108-712	1-028



60108-713	1-029	60109-203	1-054	60110-110C	1-018	60110-407C	1-019	60110-804C	1-021
60108-714	1-029	60109-204	1-054	60110-111C	1-018	60110-408	1-046	60110-805C	1-021
60108-715	1-029	60109-205	1-054	60110-201	1-045	60110-408C	1-019	60110-806C	1-021
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60108-717	1-030	60109-207	1-054	60110-201P	1-018	60110-409C	1-019	60110-808C	1-021
60108-718	1-030	60109-208	1-054	60110-202	1-045	60110-410C	1-019	60110-809C	1-021
60108-719	1-031	60109-209	1-054	60110-202C	1-018	60110-411C	1-019	60110-810C	1-021
60108-720	1-031	60109-210	1-054	60110-202P	1-018	60110-501	1-046	60110-811C	1-021
60108-721	1-031	60109-211	1-054	60110-203	1-045	60110-501C	1-020	60110-901C	1-022
60108-722	1-031	60109-212	1-054	60110-203C	1-018	60110-501P	1-020	60110-901P	1-022
60108-723	1-031	60109-213	1-054	60110-203P	1-018	60110-502	1-046	60110-902C	1-022
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60108-727	1-032	60109-215	1-054	60110-204C	1-018	60110-502P	1-020	60110-903C	1-022
60108-728	1-032	60109-216	1-054	60110-205	1-045	60110-503	1-046	60110-903P	1-022
60108-729	1-032	60109-217	1-054	60110-205C	1-018	60110-503C	1-020	60110-904C	1-022
60108-730	1-032	60109-218	1-054	60110-206	1-045	60110-503P	1-020	60110-904P	1-022
60108-731	1-032	60109-300-2-7W	1-043	60110-206C	1-018	60110-504	1-046	60110-905C	1-022
60108-732	1-032	60109-300-2-9W	1-044	60110-207	1-045	60110-504C	1-020	60110-906C	1-022
60108-735	1-033	60109-4000-25-7	1-043	60110-207C	1-018	60110-505	1-046	60110-907C	1-022
60108-736	1-033	60109-4000-25-9	1-044	60110-208	1-045	60110-505C	1-020	60111-01001	4-219
60108-737	1-033	60109-400-2-7W	1-043	60110-208C	1-018	60110-506	1-046	60111-101C	1-022
60108-738	1-034	60109-400-2-9W	1-044	60110-209	1-045	60110-506C	1-020	60111-101P	1-022
60108-739	1-034	60109-401	1-055	60110-209C	1-018	60110-507	1-046	60111-102C	1-022
60108-740	1-034	60109-402	1-055	60110-210C	1-018	60110-507C	1-020	60111-102P	1-022
60108-741	1-031	60109-403	1-055	60110-211C	1-018	60110-508	1-046	60111-103C	1-022
60108-742	1-031	60109-404	1-055	60110-301	1-045	60110-508C	1-020	60111-103P	1-022
60108-742	3-070	60109-405	1-055	60110-301C	1-019	60110-509	1-046	60111-104C	1-022
60108-745	1-035	60109-406	1-055	60110-301P	1-019	60110-509C	1-020	60111-104P	1-022
60108-746	1-035	60109-407	1-055	60110-302	1-045	60110-510C	1-020	60111-105C	1-022
60108-747	1-035	60109-408	1-055	60110-302C	1-019	60110-511C	1-020	60111-106C	1-022
60108-748	1-035	60109-409	1-055	60110-302P	1-019	60110-601C	1-020	60111-20055	4-219
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60108-750	1-035	60109-411	1-055	60110-303C	1-019	60110-602C	1-020	60111-201P	1-022
60108-751	1-035	60109-412	1-055	60110-303P	1-019	60110-602P	1-020	60111-202C	1-022
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60108-753	1-035	60109-414	1-055	60110-304C	1-019	60110-603P	1-020	60111-203C	1-022
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60108-764	1-032	60109-418	1-055	60110-306C	1-019	60110-607C	1-020	60111-205C	1-022
60108-765	1-025	60109-419	1-055	60110-307	1-045	60110-608C	1-020	60111-206C	1-022
60108-767	1-032	60109-420	1-055	60110-307C	1-019	60110-609C	1-020	60111-301C	1-023
60108-769	1-031	60109-421	1-055	60110-308	1-045	60110-610C	1-020	60111-301P	1-023
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60108-786	1-025	60109-424	1-055	60110-309	1-045	60110-701C	1-021	60111-302P	1-023
60108-793	1-028	60109-425	1-055	60110-309C	1-019	60110-701P	1-021	60111-303C	1-023
60108-850	1-028	60109-500-2-7W	1-043	60110-310C	1-019	60110-702C	1-021	60111-303P	1-023
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60108-857	1-030	60109-500-6-7	1-043	60110-401P	1-019	60110-704C	1-021	60111-306C	1-023
60108-858	1-030	60109-500-6-9	1-044	60110-402	1-046	60110-705C	1-021	60111-401C	1-023
60109-1000-6-7	1-043	60110-101C	1-018	60110-402C	1-019	60110-706C	1-021	60111-401P	1-023
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60109-200-3-9	1-044	60110-107C	1-018	60110-406	1-046	60110-802P	1-021	60111-501C	1-023
60109-201	1-054	60110-108C	1-018	60110-406C	1-019	60110-803C	1-021	60111-501P	1-023
60109-202	1-054	60110-109C	1-018	60110-407	1-046	60110-803P	1-021	60111-502C	1-023

60111-502P	1-023	60180-550	2-012	60180-771	3-096	60180-874	3-090	60300-488	1-028
60111-503C	1-023	60180-557	2-012	60180-772	3-096	60180-875	3-090	60300-501	1-034
60111-503P	1-023	60180-560	2-007	60180-774	3-096	60180-876	3-090	60300-502	1-034
60111-504C	1-023	60180-561	2-008	60180-775	3-096	60180-877	3-090	60300-503	1-034
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60111-60023	4-219	60180-567	3-024	60180-781	3-096	60180-881	3-090	60300-507	1-034
60111-60049	4-219	60180-567	3-028	60180-782	3-096	60180-882	3-090	60300-508	1-034
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60111-601P	1-024	60180-567	3-035	60180-784	3-096	60180-884	3-090	60300-561	1-029
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60111-605C	1-024	60180-597	2-010	60180-801	3-080	60181-735	3-028	60300-568	1-029
60111-606C	1-024	60180-598	2-010	60180-802	3-080	60181-736	3-024	60300-581	1-030
60111-62010	4-219	60180-599	2-009	60180-803	3-080	60181-737	3-029	60300-582	1-030
60111-62014	4-219	60180-600	2-008	60180-804	3-080	60181-738	3-029	60300-583	1-030
60111-701C	1-024	60180-660	2-007	60180-805	3-080	60181-741	3-070	60300-584	1-030
60111-701P	1-024	60180-661	2-007	60180-806	3-080	60182-357	4-159	60300-585	1-030
60111-702C	1-024	60180-662	2-007	60180-808	3-080	60182-500	4-162	60300-586	1-030
60111-702P	1-024	60180-663	2-007	60180-809	3-080	60182-501	4-162	60300-587	1-030
60111-703C	1-024	60180-664	2-007	60180-810	3-080	60182-502	4-162	60300-588	1-030
60111-703P	1-024	60180-665	2-007	60180-811	3-080	60182-503	4-162	60300-630	1-036
60111-704C	1-024	60180-666	2-007	60180-812	3-080	60182-504	4-162	60300-631	1-036
60111-704P	1-024	60180-667	2-007	60180-813	3-080	60182-505	4-162	60300-632	1-036
60111-705C	1-024	60180-669	2-009	60180-814	3-082	60182-506	4-162	60300-633	1-036
60111-706C	1-024	60180-670	2-009	60180-815	3-082	60182-507	4-162	60300-635	1-036
60140-412	4-019	60180-671	2-009	60180-816	3-082	60182-508	4-162	60300-636	1-036
60153-62001	4-211	60180-672	2-009	60180-817	3-082	60182-509	4-165	60300-637	1-036
60153-62002	4-212	60180-673	2-009	60180-818	3-082	60182-510	4-165	60300-638	1-036
60153-64002	4-212	60180-674	2-009	60180-819	3-081	60201-318	3-096	60300-681	1-027
60153-97001	4-212	60180-676	2-011	60180-820	3-081	60257-62001	4-214	60300-682	1-027
60157-62001	4-214	60180-677	2-011	60180-821	3-081	60300-301	1-042	60300-683	1-027
60157-62002	4-214	60180-678	2-011	60180-822	3-081	60300-303	1-042	60300-684	1-027
60157-62003	4-214	60180-679	2-011	60180-823	3-081	60300-311	1-042	60300-685	1-027
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60180-506	2-012	60180-697	2-009	60180-830	3-081	60300-425	1-025	60300-723	1-033
60180-507	2-008	60180-698	2-009	60180-831	3-081	60300-426	1-025	60300-724	1-033
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60180-521	2-012	60180-729	2-009	60180-860	3-078	60300-482	1-028	60300-808	1-031
60180-525	2-006	60180-740	2-012	60180-861	3-078	60300-482	1-028	60300-809	1-032
60180-526	2-010	60180-741	2-012	60180-870	3-090	60300-483	1-028	60300-810	1-032
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73205-254030	4-137	77505-254630	4-111	850-WT	4-019	8-AC-ST101X	2-062	97002-032130	4-044
73205-254630	4-137	7755-015	4-168	851-00	4-018	8-AC-ST15	2-062	97002-052130	4-044
73305-037821	4-135	7755-020	4-168	851-00	4-056	8-ACT	2-062	97002-053030	4-044
73305-157846	4-135	7755-021	4-168	851-00	4-058	8-AC-TST1	2-062	97002-054630	4-044
73305-307846	4-135	7755-022	4-168	851-00	4-059	8-NPWP	2-077	97002-102130	4-044
73405-037821	4-135	7755-023	4-168	851-00	4-060	8-PEC1	2-062	97002-103030	4-044
73405-157846	4-135	8020	4-168	851-00	4-062	8-PEC1X	2-062	97005-012101	4-092
73405-307846	4-135	8021	4-168	851-00	4-064	8-SC	2-064	97005-013001	4-092
73505-037821	4-135	8022	4-168	851-00	4-065	8-SC(R)	2-064	97005-014001	4-092
73505-157846	4-135	802259	4-211	851-00	4-066	8-SC(W)	2-064	97005-032130	4-092
73505-307846	4-135	802259	4-215	851-00	4-067	8-SC-8RT1	2-064	97005-033030	4-092
73605-037821	4-135	8023	4-168	851-00	4-068	8-SCJ	2-064	97005-034030	4-092
73605-157846	4-135	803237	4-211	851-00	4-069	8-SCJ(W)	2-064	97005-034630	4-092
73605-307846	4-135	803237	4-212	851-00	4-070	8-SC-ST15	3-068	97005-052130	4-092
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7410-075	4-169	803264	4-211	851-00	4-137	8-ST14	2-064	97005-054630	4-092
7410-999	4-168	803264	4-215	851-00	4-138	8-ST143	2-064	97005-102130	4-092
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744860	3-155	803265S	4-211	851-00	4-140	8-ST14X	2-064	97005-104030	4-092
7520-999	4-168	8125	4-166	852-00	4-018	8-ST15	2-064	97005-104630	4-092
76360-0400	3-151	8125-038	4-169	852-00	4-033	8-SV	2-082	97005-152130	4-092
76360-0400	3-154	8125-074	4-170	852-00	4-034	8-SV(A)	2-082	97005-153030	4-092
76461-2002	3-151	8125-084	4-171	852-00	4-035	8-T02	2-064	97005-154030	4-092
76461-2002	3-152	8125-094	4-170	852-00	4-036	8-TST1	2-064	97005-154630	4-092
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76485-0032	3-152	850-00	4-033	852-00	4-059	9055-020	4-168	97055-20199	4-220
76485-0032	3-154	850-00	4-034	852-00	4-060	9055-021	4-168	97055-20271	4-221
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97102-054630	4-041	9725i	4-166	97702-052130	4-043	990-04	1-056	B7807-20	2-050
97102-102130	4-041	97302-032130	4-042	97702-053030	4-043	990-07	1-056	B7807-24	2-050
97102-103030	4-041	97302-052130	4-042	97702-054630	4-043	990-08	1-056	B7807-8	2-050
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97105-014001	4-017	97305-012101	4-017	97705-032130	4-091	9-SC(B)-ST1X	2-067	B7815-24	2-050
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97202-102130	4-042	97502-032130	4-044	97905-011001	4-017	A-302	4-158	B7995-18	2-050
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97205-011001	4-017	97502-053030	4-044	97905-012101	4-090	A-327	4-165	B7995-24	2-050
97205-012101	4-017	97502-054630	4-044	97905-013001	4-017	A-328	4-165	B7995-24	2-052
97205-012101	4-088	97502-101030	4-044	97905-013001	4-090	A3692-010	4-212	B7995-26	2-050
97205-013001	4-017	97502-102130	4-044	97905-014001	4-017	A3692-010	4-214	B7995-8	2-050
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97205-102130	4-088	97505-102130	4-093	97905-104030	4-090	B7800-20	2-051	B7999-6A	2-049
97205-103030	4-088	97505-103030	4-093	97905-104630	4-090	B7800-20A	2-051	C-1000	4-057



C-1000	4-061	C4000-62B	2-023	C4008-741	2-014	C4010-67W	2-029	C4011-50B	2-038
C-1000	4-063	C4000-62P	2-023	C4008-742	2-014	C4010-88	2-029	C4011-50G	2-038
C2-1000	4-172	C4000-64B	2-023	C4010-017AW	2-029	C4010-88AW	2-029	C4011-50R	2-038
C2-1000EP	4-172	C4000-72P	2-023	C4010-017W	2-029	C4010-88W	2-029	C4011-51	2-038
C2-1006	4-172	C4000-75C	2-023	C4010-019	2-029	C4010-93W	2-029	C4011-51B	2-038
C2-1006EH	4-172	C4000-78W	2-024	C4010-057	2-029	C4010-95	2-029	C4011-51BLK	2-038
C2-1340EP	4-172	C4000-80	2-024	C4010-057AW	2-029	C4010-95W	2-029	C4011-51G	2-038
C2-1346EH	4-172	C4000-80P	2-024	C4010-1	2-026	C4010-97W	2-029	C4011-51P	2-038
C270-01	4-138	C4000-80W	2-024	C4010-10	2-028	C4010-98BLK	2-028	C4011-51R	2-038
C270-01	4-139	C4000-82P	2-024	C4010-11	2-026	C4010-98W	2-028	C4011-52	2-038
C270-01	4-140	C4000-82W	2-024	C4010-14	2-026	C4010-99	2-028	C4011-52B	2-038
C4000-1	2-021	C4000-83W	2-024	C4010-17	2-029	C4010-K630	2-021	C4011-52G	2-038
C4000-11	2-021	C4000-86	2-024	C4010-17W	2-029	C4010-K630	2-027	C4011-52R	2-038
C4000-12	2-021	C4000-86W	2-024	C4010-1A	2-028	C4010-K630	2-032	C4011-52Y	2-038
C4000-180	2-025	C4000-87	2-024	C4010-1W	2-026	C4010-K630	2-037	C4011-53	2-038
C4000-180W	2-025	C4000-88W	2-024	C4010-2	2-026	C4010-LV1	2-026	C4011-53B	2-038
C4000-182W	2-025	C4000-9	2-021	C4010-21	2-029	C4010-LV2	2-026	C4011-53R	2-038
C4000-183W	2-025	C4000-91W	2-024	C4010-2W	2-026	C4010-S1	2-026	C4011-53Y	2-038
C4000-184W	2-025	C4000-92	2-024	C4010-30A	2-028	C4010-S1W	2-026	C4011-54	2-038
C4000-186	2-025	C4000-92P	2-024	C4010-35	2-028	C4010-S2W	2-026	C4011-54B	2-038
C4000-186W	2-025	C4000-92W	2-024	C4010-35BLK	2-028	C4010-S629	2-021	C4011-54BLK	2-038
C4000-186WR	2-025	C4000-93P	2-024	C4010-35W	2-028	C4010-S629	2-027	C4011-54G	2-038
C4000-188W	2-025	C4000-93W	2-024	C4010-40	2-028	C4010-S629	2-032	C4011-54P	2-038
C4000-192	2-025	C4000-94P	2-024	C4010-40A	2-028	C4010-S629	2-037	C4011-54R	2-038
C4000-192W	2-025	C4000-94W	2-024	C4010-55	2-028	C4010-S630	2-021	C4011-54Y	2-038
C4000-194W	2-025	C4000-95	2-024	C4010-55A	2-028	C4010-S630	2-027	C4011-55	2-038
C4000-195W	2-025	C4000-95W	2-024	C4010-55BLK	2-028	C4010-S630	2-032	C4011-55B	2-038
C4000-196W	2-025	C4000-97	2-024	C4010-57	2-029	C4010-S630	2-037	C4011-55BLK	2-038
C4000-1B	2-021	C4000-98B	2-022	C4010-57A	2-029	C4010-V1	2-026	C4011-55G	2-038
C4000-1G	2-021	C4000-98P	2-022	C4010-57AW	2-029	C4011-1	2-031	C4011-55R	2-038
C4000-1R	2-021	C4000-99	2-023	C4010-57W	2-029	C4011-10	2-031	C4011-55Y	2-038
C4000-1W	2-021	C4000-9A	2-021	C4010-60	2-028	C4011-11	2-031	C4011-59	2-038
C4000-1Y	2-021	C4000-9TR	2-021	C4010-60A	2-028	C4011-11	2-031	C4011-5W	2-036
C4000-2W	2-021	C4000-LV1	2-021	C4010-60AR	2-028	C4011-11	2-037	C4011-6	2-036
C4000-30	2-022	C4000-LV1W	2-021	C4010-60AW	2-028	C4011-13	2-031	C4011-631	2-021
C4000-40	2-022	C4000-LV2	2-021	C4010-60BLK	2-028	C4011-13	2-036	C4011-631	2-027
C4000-51A	2-023	C4000-LV2W	2-021	C4010-627L	2-021	C4011-14	2-032	C4011-631	2-032
C4000-51B	2-023	C4000-LV3W	2-021	C4010-627L	2-027	C4011-14	2-037	C4011-631	2-037
C4000-51G	2-023	C4000-LV95	2-024	C4010-627L	2-032	C4011-15	2-032	C4011-631P	2-021
C4000-51P	2-023	C4000-MS	2-019	C4010-627L	2-037	C4011-15	2-037	C4011-631P	2-027
C4000-51R	2-023	C4000-MS	2-025	C4010-629	2-021	C4011-16	2-031	C4011-631P	2-032
C4000-51Y	2-023	C4000-MS	2-035	C4010-629	2-027	C4011-16	2-037	C4011-631P	2-037
C4000-53A	2-023	C4000-S1	2-021	C4010-629	2-032	C4011-1A	2-033	C4011-67P	2-038
C4000-53B	2-023	C4000-S1W	2-021	C4010-629	2-037	C4011-1AP	2-033	C4011-688W	2-035
C4000-53G	2-023	C4000-S2W	2-021	C4010-629L	2-021	C4011-1B	2-031	C4011-6A	2-033
C4000-53P	2-023	C4000-S9	2-021	C4010-629L	2-027	C4011-1CV	2-034	C4011-6W	2-036
C4000-53R	2-023	C4000-V1	2-021	C4010-629L	2-032	C4011-1G	2-031	C4011-72	2-039
C4000-53Y	2-023	C4000-V2	2-021	C4010-629L	2-037	C4011-1R	2-031	C4011-72AW	2-039
C4000-54A	2-023	C4008-1	2-014	C4010-629P	2-021	C4011-1W	2-031	C4011-72P	2-039
C4000-54B	2-023	C4008-100	2-006	C4010-629P	2-027	C4011-1Y	2-031	C4011-73	2-039
C4000-54G	2-023	C4008-100	2-015	C4010-629P	2-032	C4011-2	2-031	C4011-73P	2-039
C4000-54P	2-023	C4008-101	2-006	C4010-629P	2-037	C4011-24	2-032	C4011-73W	2-039
C4000-54R	2-023	C4008-101	2-015	C4010-630	2-021	C4011-24	2-037	C4011-77P	2-045
C4000-54Y	2-023	C4008-102	2-006	C4010-630	2-027	C4011-25	2-035	C4011-78P	2-039
C4000-55	2-022	C4008-102	2-015	C4010-630	2-032	C4011-2A	2-033	C4011-7A	2-033
C4000-55A	2-023	C4008-1A	2-015	C4010-630	2-037	C4011-2W	2-031	C4011-7B	2-033
C4000-55B	2-023	C4008-2A	2-015	C4010-630P	2-021	C4011-2WCV	2-034	C4011-7G	2-033
C4000-55G	2-023	C4008-4A	2-015	C4010-630P	2-027	C4011-4	2-036	C4011-7K	2-033
C4000-55P	2-023	C4008-50	2-045	C4010-630P	2-032	C4011-4A	2-033	C4011-7R	2-033
C4000-55R	2-023	C4008-632C	2-014	C4010-630P	2-037	C4011-4B	2-033	C4011-7Y	2-033
C4000-55Y	2-023	C4008-632R	2-014	C4010-65A	2-028	C4011-4G	2-033	C4011-80	2-045
C4000-57B	2-023	C4008-730	2-014	C4010-67	2-029	C4011-4R	2-033	C4011-87	2-034
C4000-57G	2-023	C4008-739	2-014	C4010-67A	2-029	C4011-5	2-036	C4011-87AW	2-034
C4000-60	2-022	C4008-740	2-014	C4010-67AW	2-029	C4011-50	2-038	C4011-87W	2-034

C4011-88	2-034	C4013-12	2-016	C4015-27	2-044	C4020-36	2-047	CH-953288	1-047
C4011-88W	2-034	C4013-13	2-016	C4015-2W	2-042	C4020-36A	2-047	CH-953289	1-047
C4011-89W	2-034	C4013-14	2-018	C4015-30	2-043	C4020-36AP	2-047	CH-953456	1-047
C4011-9	2-031	C4013-15	2-018	C4015-30A	2-043	C4020-38A	2-047	CH-953457	1-047
C4011-95	2-034	C4013-1500	2-016	C4015-4	2-040	C4020-39A	2-047	CH-953586	1-047
C4011-98B	2-033	C4013-15A	2-018	C4015-40	2-043	C4020-3A	2-047	CH-953587	1-047
C4011-98G	2-033	C4013-15P	2-018	C4015-40A	2-043	C4020-40	2-047	CH-953588	1-047
C4011-98R	2-033	C4013-17	2-018	C4015-45	2-043	C4020-410	2-046	CH-953589	1-047
C4011-98Y	2-033	C4013-17A	2-018	C4015-45W	2-043	C4020-42A	2-047	CLS-210003	1-079
C4011-9TR	2-036	C4013-17P	2-018	C4015-46P	2-045	C4020-42AP	2-047	CLS-229070	1-079
C4011-LV1	2-031	C4013-1A	2-017	C4015-47P	2-045	C4020-43AP	2-047	CLS-229074	1-079
C4011-LV1	2-036	C4013-1P	2-017	C4015-48	2-045	C4020-46	2-047	CLS-229203	1-079
C4011-LV1W	2-031	C4013-1W	2-016	C4015-482A	2-044	C4020-48	2-047	CLS-400042	1-079
C4011-LV2	2-031	C4013-2	2-016	C4015-52	2-041	C4020-5A	2-047	CLS-400046	1-079
C4011-LV2	2-036	C4013-2W	2-016	C4015-54	2-041	C4020-6	2-046	CLS-400054	1-079
C4011-LV2W	2-031	C4013-30	2-017	C4015-55BLK	2-043	C4020-60	2-046	CLS-400058	1-079
C4011-S1	2-031	C4013-30A	2-017	C4015-55W	2-043	C4020-6A	2-047	CLS-400062	1-079
C4011-S1W	2-031	C4013-30P	2-017	C4015-5A	2-043	C4075-211	2-025	CLS-400150	1-079
C4011-S2W	2-031	C4013-32	2-017	C4015-60	2-043	C4075-213	2-025	CLS-400156	1-079
C4011-S4	2-036	C4013-32A	2-018	C4015-61	2-043	C4075-219	2-025	CR-11	2-074
C4011-S5	2-036	C4013-36A	2-018	C4015-638	2-040	C4075-380	2-019	CR-20	2-079
C4011-S5W	2-036	C4013-3A	2-017	C4015-638	2-042	C4075-500	2-019	CR-8	2-062
C4011-S631	2-021	C4013-40	2-017	C4015-638	2-045	C4075-500	2-025	CSL10	4-172
C4011-S631	2-027	C4013-40A	2-017	C4015-640	2-040	C4075-500	2-035	CSL100	4-172
C4011-S631	2-032	C4013-40P	2-017	C4015-640	2-042	C6W	4-172	CSL2	4-172
C4011-S631	2-037	C4013-492	2-018	C4015-643	2-040	CERT4000-175W	2-014	CSL20	4-172
C4011-S6W	2-036	C4013-492A	2-018	C4015-643	2-042	CERT4000-176W	2-014	CSL5	4-172
C4011-V1	2-031	C4013-494A	2-018	C4015-66	2-043	CERT4000-193W	2-014	CSL50	4-172
C4012-1	2-030	C4013-57	2-018	C4015-66A	2-043	CERT4000-69LV	2-014	CTCL	2-073
C4012-10	2-030	C4013-58	2-018	C4015-67A	2-043	CERT4000-72LV	2-014	CZSL100PK	4-172
C4012-100	2-034	C4013-60	2-017	C4015-75A	2-043	CERT4000-75W	2-014	CZSL10PK	4-172
C4012-100SS	2-034	C4013-60A	2-017	C4015-75W	2-043	CERT4000-76W	2-014	CZSL50PK	4-172
C4012-101	2-034	C4013-60P	2-017	C4015-88	2-044	CERT4000-78W	2-014	CZSL5PK	4-172
C4012-102	2-034	C4013-61	2-017	C4015-88AW	2-044	CERT4000-79	2-014	DCB-11	2-074
C4012-102SS	2-034	C4013-63A	2-017	C4015-9	2-042	CERT4000-80	2-014	DCB-20	2-079
C4012-15	2-030	C4013-63P	2-017	C4015-94	2-045	CERT4000-80W	2-014	DCB-8	2-062
C4012-15	2-037	C4013-63W	2-017	C4015-95P	2-045	CERT4000-82W	2-014	DCR-11	2-074
C4012-1W	2-030	C4013-64A	2-017	C4015-96	2-045	CERT4000-92W	2-014	DCR-20	2-079
C4012-2	2-030	C4013-64P	2-017	C4015-96A	2-045	CERT4000-93W	2-014	DHI-901	4-182
C4012-25	2-035	C4013-64W	2-017	C4015-96PA	2-045	CERT4000-98PT	2-014	DHI-902	4-182
C4012-2W	2-030	C4013-69A	2-017	C4015-99	2-045	CERT4000-992	2-014	DHI-903	4-182
C4012-465	2-016	C4013-74A	2-017	C4015-S1	2-042	CERT4010-91	2-014	DHI-908	4-182
C4012-465	2-030	C4013-77A	2-017	C4020-10	2-046	CERT4011-89W	2-014	DHI-910	4-182
C4012-529	2-016	C4013-77P	2-017	C4020-100	2-048	CERT4015-83	2-014	DHI-911	4-182
C4012-529	2-030	C4013-95W	2-018	C4020-100SS	2-048	CERT4015-96	2-014	DHP-901	4-182
C4012-529L	2-030	C4013-98W	2-017	C4020-101	2-048	CH-952242	1-047	DHP-902	4-182
C4012-530	2-016	C4013-S1	2-016	C4020-102	2-048	CH-952434	1-047	DHP-903	4-182
C4012-530	2-030	C4015-017	2-044	C4020-102SS	2-048	CH-952605	1-047	DHP-906	4-182
C4012-530P	2-016	C4015-017A	2-044	C4020-139	2-048	CH-952708	1-047	DHP-909	4-182
C4012-530P	2-030	C4015-017W	2-044	C4020-18	2-046	CH-952813	1-047	DHP-910	4-182
C4012-88	2-034	C4015-1	2-042	C4020-180	2-046	CH-952820	1-047	DHP-910LL	4-182
C4012-88A	2-034	C4015-10	2-043	C4020-20	2-046	CH-952979	1-047	DHP-911	4-182
C4012-S530	2-016	C4015-11W	2-042	C4020-20	2-046	CH-953244	1-047	DHP-911LL	4-182
C4012-S530	2-030	C4015-14	2-042	C4020-210	2-046	CH-953275	1-047	DHP-912	4-182
C4013-010A	2-018	C4015-17	2-044	C4020-25	2-046	CH-953276	1-047	DHP-913	4-182
C4013-1	2-016	C4015-17A	2-044	C4020-27	2-046	CH-953277	1-047	DPE-903	4-183
C4013-10	2-017	C4015-17AW	2-044	C4020-30	2-047	CH-953279	1-047	DPE-906	4-183
C4013-100	2-041	C4015-17W	2-044	C4020-32	2-047	CH-953280	1-047	DPE-908	4-183
C4013-100SS	2-041	C4015-1A	2-043	C4020-320	2-048	CH-953281	1-047	DPE-911	4-183
C4013-101	2-041	C4015-1AP	2-041	C4020-32A	2-047	CH-953282	1-047	DPE-913	4-183
C4013-102	2-041	C4015-1W	2-043	C4020-32AP	2-047	CH-953283	1-047	DPE-914	4-183
C4013-102SS	2-041	C4015-2	2-042	C4020-34	2-047	CH-953285	1-047	DPE-915	4-183
C4013-10A	2-018	C4015-21	2-044	C4020-34A	2-047	CH-953286	1-047	DSH-901	4-183
C4013-11	2-016	C4015-25	2-044	C4020-34AP	2-047	CH-953287	1-047	DSH-902	4-183

DSH-903	4-183	F-192x	4-159	F2517-7	1-072	MTPVC(A)-96	1-076	NS200202	4-175
DSH-912	4-183	F-227	4-162	F2517-8	1-072	MTPVC-96	1-076	NS200301	4-175
DSH-913	4-183	F-228	4-162	F2517-9	1-072	MTS-1	2-063	NS200302	4-175
DSH-914	4-183	F-229	4-162	F2519-1	1-073	MTS-1	2-066	NS50230	4-175
DSH-915	4-183	F-230	4-162	F2519-2	1-073	MTS-1	2-070	NS50240	4-175
DSH-916	4-183	F-231	4-162	F2519-3	1-073	MTS-1	2-074	NS50250	4-175
DSH-917	4-183	F-232	4-162	F2519-4	1-073	NS100301	3-109	NS50260	4-175
DSH-918	4-183	F2500-1	1-067	F2519-5	1-073	NS100305	3-109	NS50270	4-175
DSH-918LL	4-183	F2500-10	1-070	F2519-6	1-073	NS100311	3-109	NS50280	4-175
DSP-901	4-182	F2500-12	1-067	F2520-1	1-073	NS100401	3-108	NS506305	4-176
DSP-907	4-182	F2500-13	1-068	F2520-2	1-073	NS100401	3-109	NS506306	4-176
DSP-908	4-182	F2500-14	1-069	F2520-3	1-073	NS100405	3-109	NS506405	4-176
DVA-901	4-183	F2500-15	1-071	F2520-4	1-073	NS100411	3-109	NS506406	4-176
DVA-903	4-183	F2500-16	1-071	F2520-5	1-073	NS100501	3-109	NS506505	4-176
DVA-904	4-183	F2500-17	1-069	F2520-6	1-073	NS100505	3-109	NS506506	4-176
DVA-905	4-183	F2500-18	1-070	F2520-7	1-073	NS100601	3-111	NS506605	4-176
DVA-906	4-183	F2500-19	1-070	F2520-8	1-073	NS100605	3-109	NS506606	4-176
DVA-907	4-183	F2500-2	1-067	F-300x	4-160	NS100701	3-109	NS600000	3-111
DVA-909	4-183	F2500-20	1-070	F3070-010	4-211	NS100705	3-109	NS600000	4-180
DWA-901	4-183	F2500-3	1-068	F5034-040	4-218	NS100801	3-111	NS600001	3-111
DWA-910	4-183	F2500-4	1-068	F5050-010	4-211	NS100805	3-109	NS600002	3-111
DWA-911	4-183	F2500-5	1-068	F5050-010	4-214	NS100901	3-111	NS600002	3-113
DWA-912	4-183	F2500-50	1-067	FM101464	4-219	NS100905	3-109	NS600005	3-110
DWA-913	4-183	F2500-6	1-068	FM102263	4-219	NS101302	4-179	NS600005	4-180
DWA-915	4-183	F2500-7	1-069	FM102521	4-219	NS101402	4-179	NS600006	3-110
DWA-918	4-183	F2500-8	1-069	FM102587	4-219	NS101502	3-109	NS600007	3-110
DWA-918LC	4-183	F2500-9	1-070	FM102591	4-219	NS101502	4-179	NS600013	3-112
DWA-921	4-183	F2502-1	1-067	FM102594	4-219	NS101602	3-109	NS600020	4-180
DWA-921LL	4-183	F2502-2	1-067	FM102595	4-219	NS101602	4-179	NS600022	3-113
DWA-923	4-183	F2502-3	1-068	FM102598	4-219	NS101702	3-109	NS600025	4-180
DWA-926	4-183	F2502-9	1-070	FM103394	4-219	NS101702	4-179	NS600033	3-112
DWA-929	4-183	F2504-1	1-067	FM104284	4-219	NS101802	3-109	NS600040	3-111
DWA-930	4-183	F2504-10	1-070	FM104285	4-219	NS101802	4-179	NS600040	4-180
DWA-930LL	4-183	F2504-15	1-071	HPG	2-073	NS1018300	4-181	NS600041	3-111
ECR-11C	2-094	F2504-16	1-071	HPL	2-073	NS1018301	4-181	NS600042	3-111
ECR-13C	2-094	F2504-2	1-067	HPLS	2-068	NS101902	4-179	NS600042	3-113
ECR-20C	2-094	F2504-3	1-068	LZN1-10	4-172	NS104303	3-106	NS600045	3-110
ECR-8C	2-094	F2504-4	1-068	M-645x	4-160	NS104304	3-106	NS600045	4-180
ECR-CBATT	2-094	F2504-5	1-068	MEL	2-073	NS104305	3-106	NS600046	3-110
EDCB-11C	2-094	F2504-6	1-068	MSCERT4000-134W	2-005	NS104308	3-106	NS600047	3-110
EDCB-13C	2-094	F2504-7	1-069	MSCERT4000-135W	2-005	NS104313	3-106	NS600053	3-112
EDCB-20C	2-094	F2504-8	1-069	MSCERT4000-30LVW	2-005	NS104314	3-106	NS600060	3-111
EPC6W	4-172	F2504-9	1-070	MSCERT4000-31LVW	2-005	NS104315	3-106	NS600060	4-180
F1034-010	4-212	F2513-1	1-067	MSCERT4000-32	2-005	NS104403	3-106	NS600061	3-111
F1034-010	4-214	F2513-10	1-070	MSCERT4000-33TR	2-005	NS104404	3-106	NS600062	3-111
F1100-010	4-212	F2513-14	1-069	MSCERT4000-34W	2-005	NS104405	3-106	NS600065	3-110
F1100-010	4-214	F2513-15	1-071	MSCERT4000-35W	2-005	NS104408	3-106	NS600065	4-180
F1100-020	4-212	F2513-16	1-071	MSCERT4000-36LVW	2-005	NS104413	3-106	NS600066	3-110
F1100-020	4-214	F2513-17	1-069	MSCERT4000-37LVW	2-005	NS104414	3-106	NS600073	3-112
F1100-030	4-212	F2513-2	1-067	MSCERT4000-38	2-005	NS104415	3-106	NS600301	3-111
F1100-030	4-214	F2513-3	1-068	MSCERT4000-39TR	2-005	NS105303	3-107	NS600302	3-111
F1123-010	4-212	F2513-4	1-068	MSCERT4000-40W	2-005	NS105304	3-107	NS600304	3-113
F1123-010	4-214	F2513-5	1-068	MSCERT4000-41W	2-005	NS105403	3-107	NS600305	3-110
F1123-020	4-212	F2513-6	1-068	MSCERT4000-S34W	2-005	NS105404	3-107	NS600306	3-110
F1123-020	4-214	F2513-7	1-069	MSCERT4000-S35W	2-005	NS108302	3-107	NS600309	3-112
F1123-030	4-212	F2513-8	1-069	MSCERT4000-S40W	2-005	NS142304	3-113	NS600401	3-111
F1123-030	4-214	F2513-9	1-070	MSCERT4000-S41W	2-005	NS142404	3-113	NS600402	3-111
F-120x	4-160	F2517-1	1-072	MSCERT4011-73W	2-005	NS161302	4-179	NS600404	3-113
F-130x	4-160	F2517-10	1-072	MSCERT4011-74W	2-005	NS161402	4-179	NS600405	3-110
F1403	4-057	F2517-2	1-072	MSCERT4015-135W	2-005	NS164304	3-106	NS600406	3-110
F1403	4-061	F2517-3	1-072	MSCERT4015-136W	2-005	NS164404	3-106	NS600409	3-112
F1403	4-063	F2517-4	1-072	MTP-96	1-076	NS200101	4-175	NS600501	3-111
F-142x	4-160	F2517-5	1-072	MTPC-1	1-076	NS200102	4-175	NS600502	3-111
F-190	4-159	F2517-6	1-072	MTPC-96	1-076	NS200201	4-175	NS600505	3-110

NS600506	3-110	NS604408	3-106	NS832306	4-175	P-729	4-161	SOT-SH200	4-185
NS600509	3-112	NS604413	3-106	NS832401	3-109	P-742	4-161	SOT-SH202	4-185
NS600511	3-112	NS604414	3-106	NS832401	3-110	PEG	2-073	SOT-SH220	4-185
NS600602	3-111	NS604415	3-106	NS832401	4-176	PEL	2-068	SOT-SH220G	4-185
NS600605	3-110	NS606015	4-177	NS832402	4-176	S7510-1	1-072	SOT-SH420	4-185
NS600606	3-110	NS606015	4-177	NS832406	4-175	S7510-10	1-072	SOT-SH520	4-185
NS600609	3-112	NS606035	4-177	NS832501	3-109	S7510-20	1-072	SOT-SH520G	4-185
NS600611	3-112	NS606035	4-177	NS832501	4-176	S7510-3	1-072	SOT-SSH3001	4-185
NS600701	3-111	NS606401	3-108	NS832501	4-176	S7510-30	1-072	SOT-SSH3002	4-185
NS600702	3-111	NS606405	3-108	NS832502	4-176	S7510-5	1-072	SOT-VA200	4-184
NS600705	3-110	NS606500	4-177	NS832502	4-176	S7510-50	1-072	SOT-VA220	4-184
NS600706	3-110	NS606615	4-177	NS832506	4-175	S7515-10	1-072	SOT-VA320	4-184
NS600709	3-112	NS606800	4-177	NS832506	4-175	S7515-20	1-072	SOT-VA320G	4-184
NS600711	3-112	NS606814	4-177	NS832506	4-175	S7515-3	1-072	SOT-VA400	4-184
NS600804	3-111	NS606815	4-177	NS832506	4-175	S7515-5	1-072	SP2091	4-132
NS600804	3-113	NS606914	4-177	NS832601	3-109	SC001	4-146	SP3686	4-132
NS600805	3-110	NS606915	4-177	NS832602	4-180	SC200	4-146	SP4016	4-132
NS600809	3-112	NS607011	3-112	NS832602	4-180	SC2003	4-146	SP5482	4-121
NS600811	3-112	NS607011	4-180	NS832602	4-180	SC600	4-146	SP5512	4-122
NS600901	3-111	NS607031	3-112	NS832602	4-180	SC601	4-146	SP5513	4-122
NS600902	3-111	NS607031	4-180	NS834307	3-110	SC602	4-146	SP5522	4-121
NS600904	3-111	NS607051	3-112	NS834308	3-106	SC603	4-146	SP5594	4-123
NS600905	3-110	NS607051	4-180	NS834407	3-110	SFS-220	4-184	SP5598	4-123
NS600906	3-110	NS607071	3-112	NS834408	3-106	SFS-220G	4-184	SP5727	4-122
NS600908	3-110	NS607071	4-180	NS840047	3-113	SFS-230	4-184	SP5728	4-122
NS600909	3-112	NS607091	3-112	NS840047	4-181	SFS-3001	4-184	SP5729	4-122
NS600911	3-112	NS607091	4-180	NS840070	3-113	SFS-3002	4-184	SP5730	4-122
NS601302	4-179	NS608302	3-107	NS840070	4-181	SFS-320	4-184	SP5731	4-122
NS601306	4-180	NS608303	3-107	NS841013	3-110	SFS-320U	4-184	SP5732	4-122
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