SHIMADZU
Excellence in Science

SHIMADZU
Shimadzu Consumables Catalog

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Consumables Catalog

SSI – Consumables Catalog 2018-02

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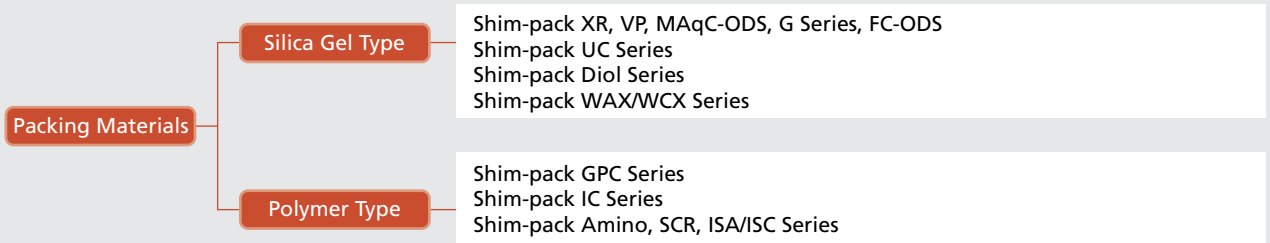

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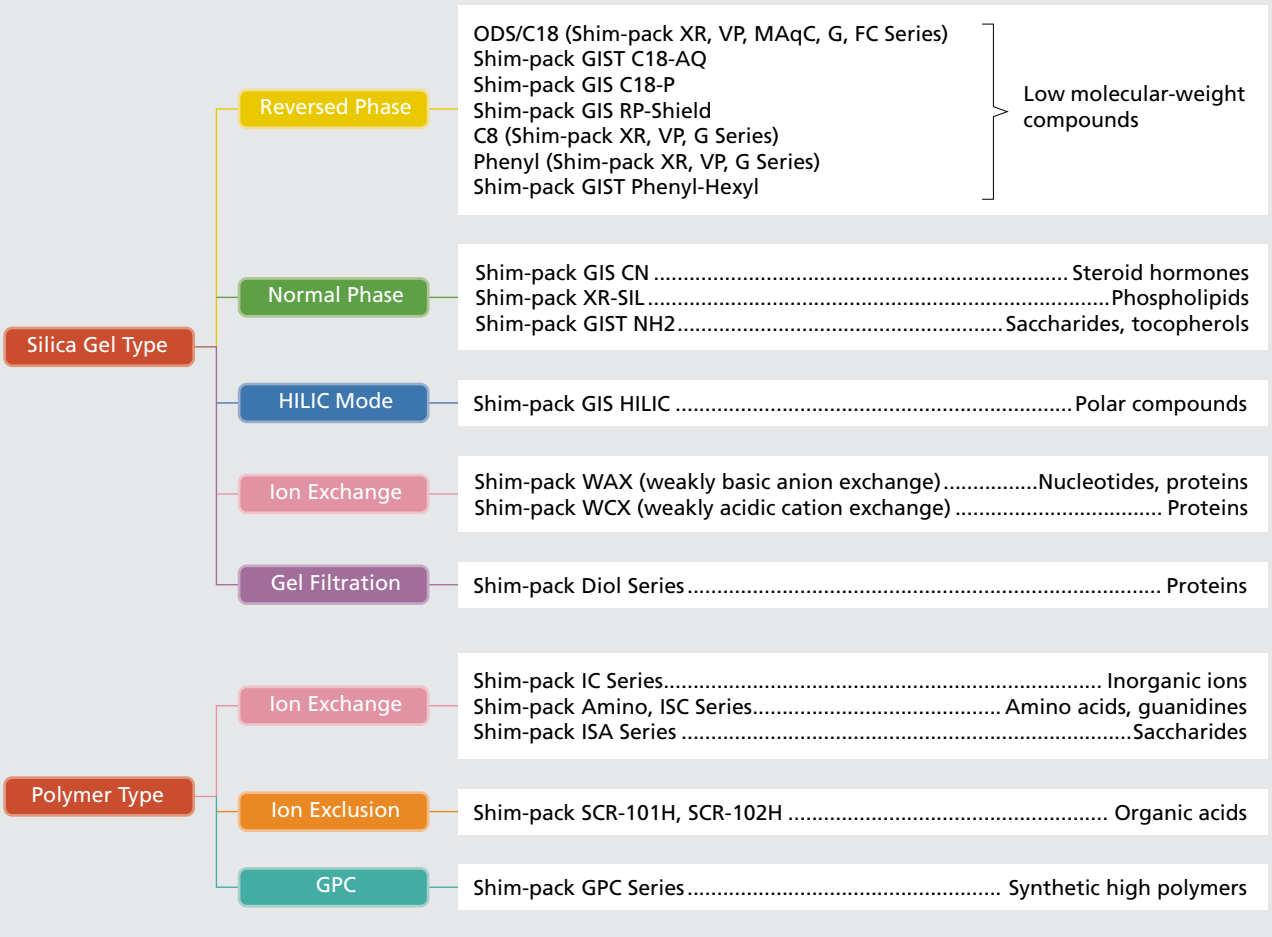
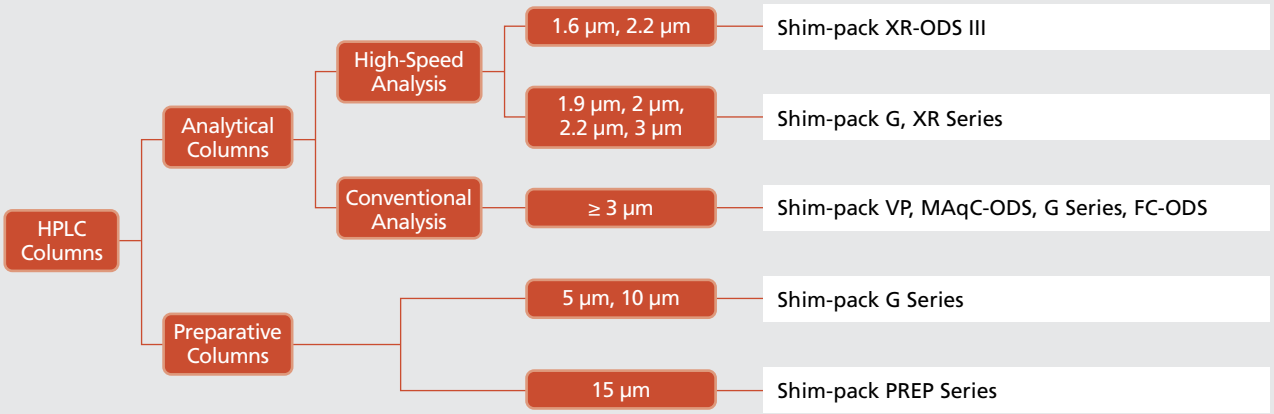
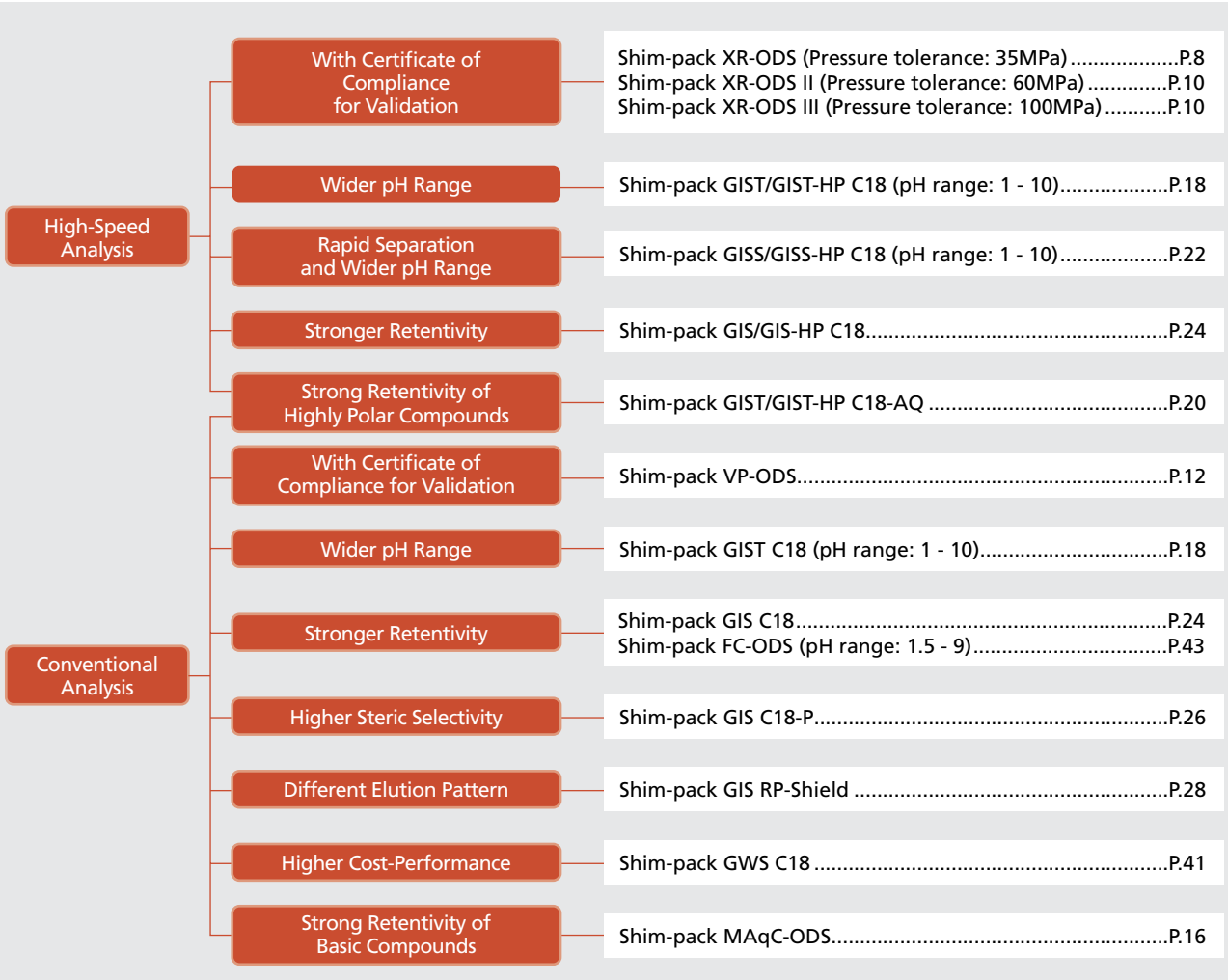


Column Selection Guide

Selection by Support Materials



Selection of ODS columns



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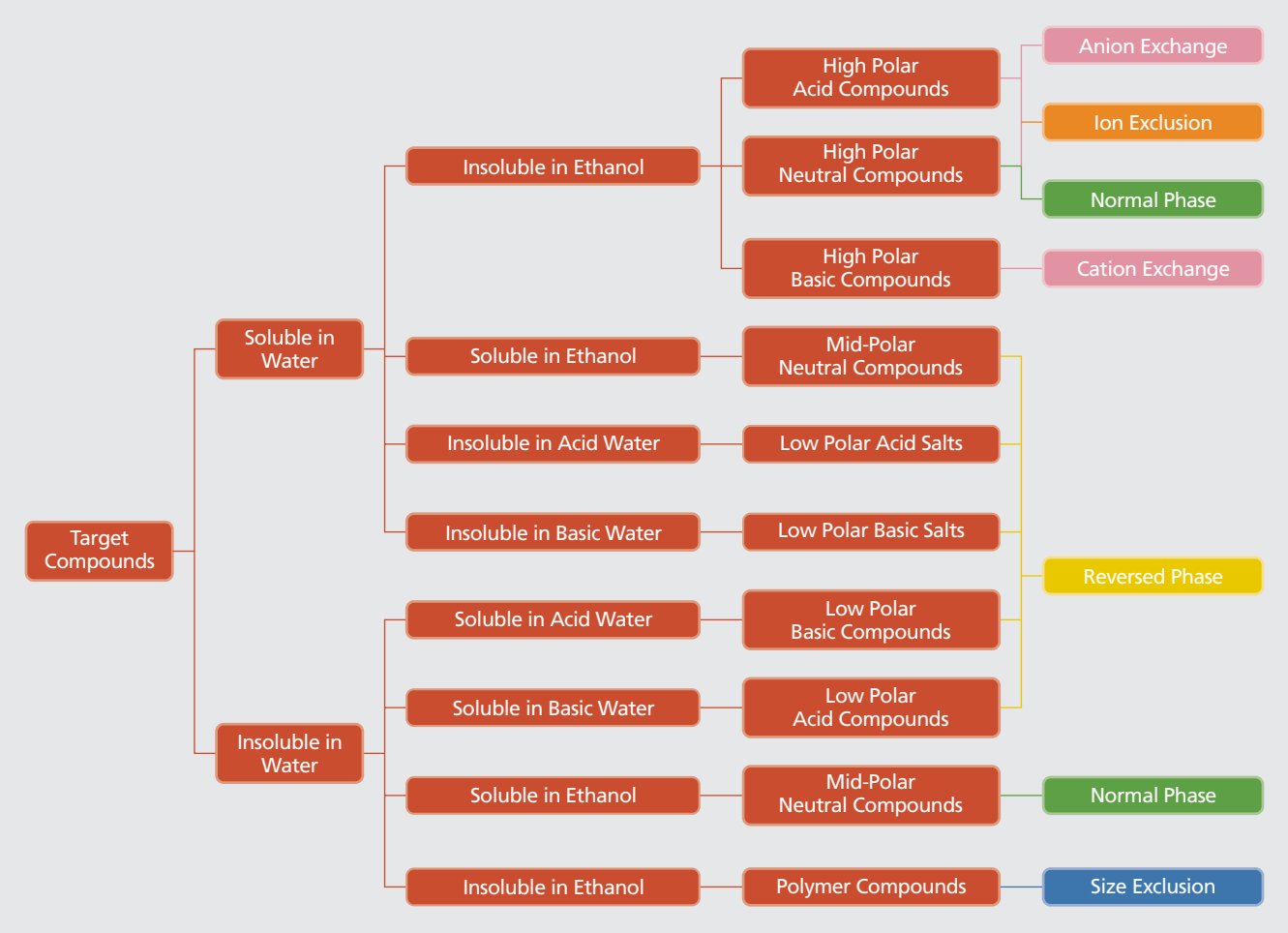
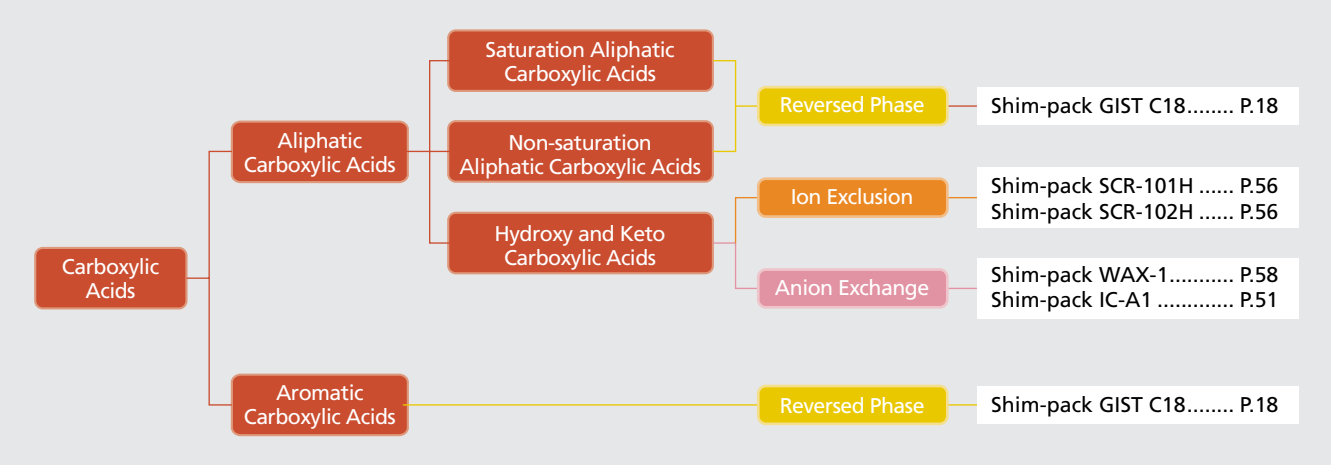


Column Selection by Target Compounds



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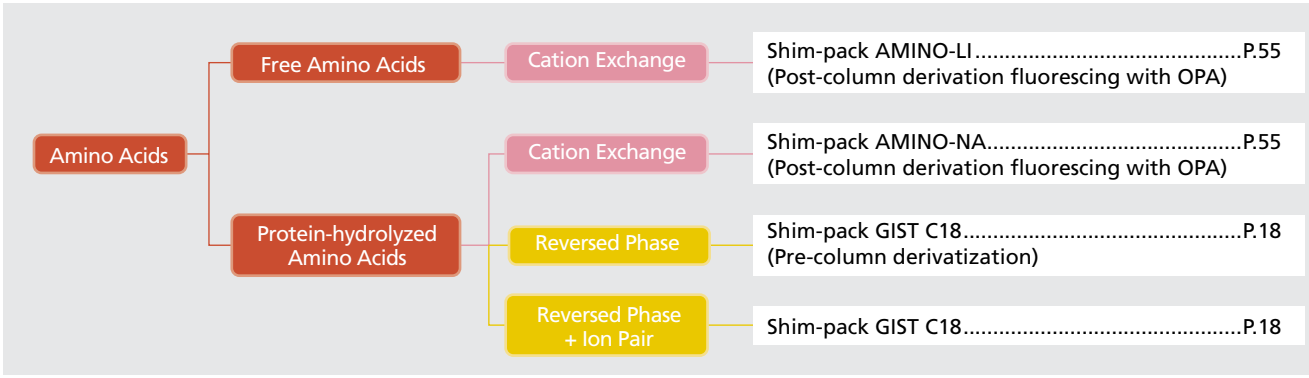

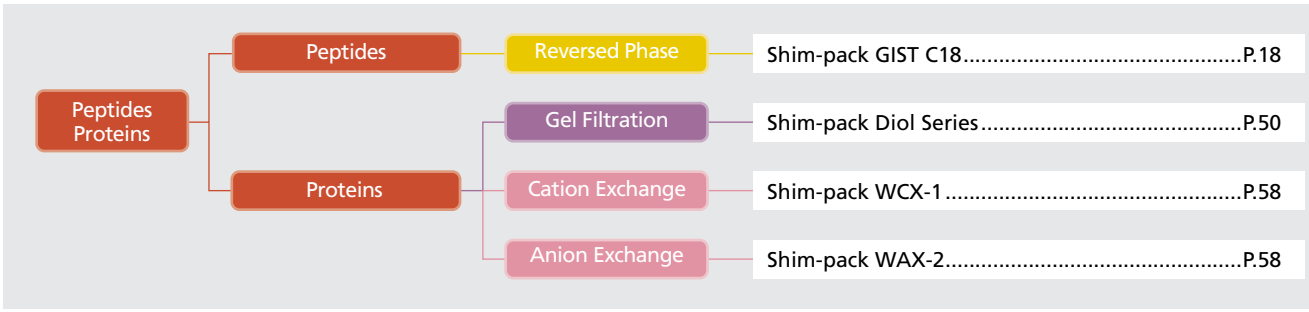

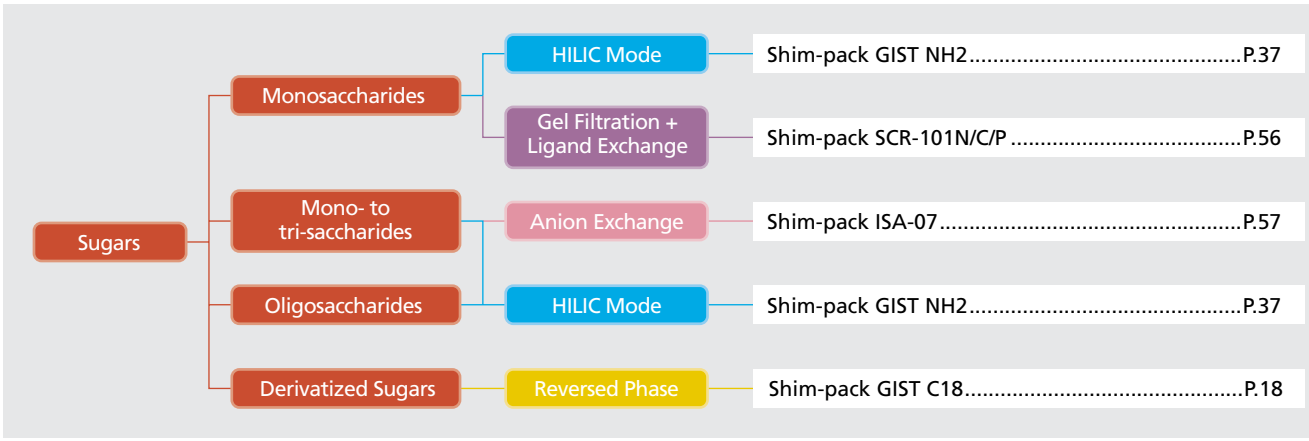

Column Selection Guide

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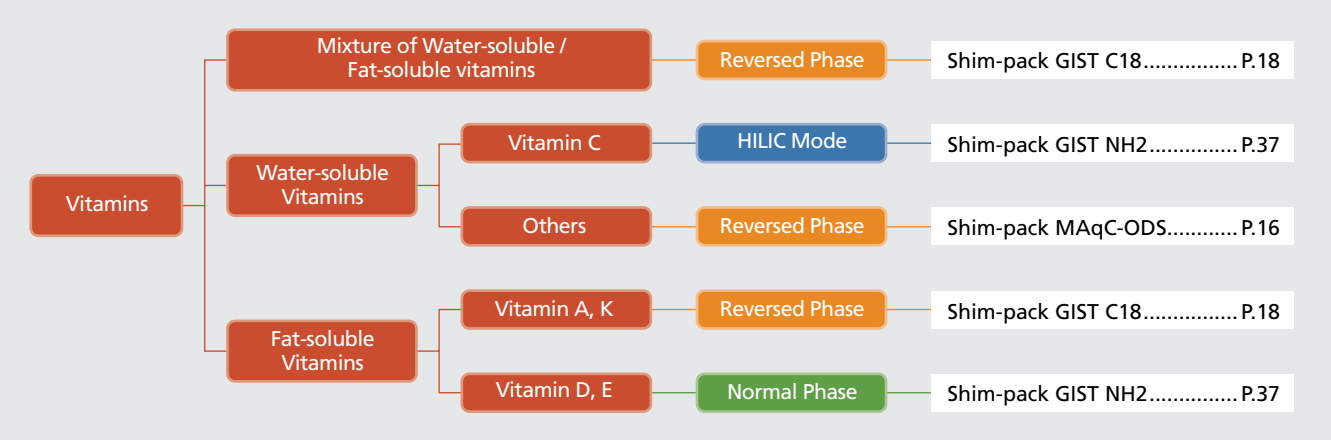
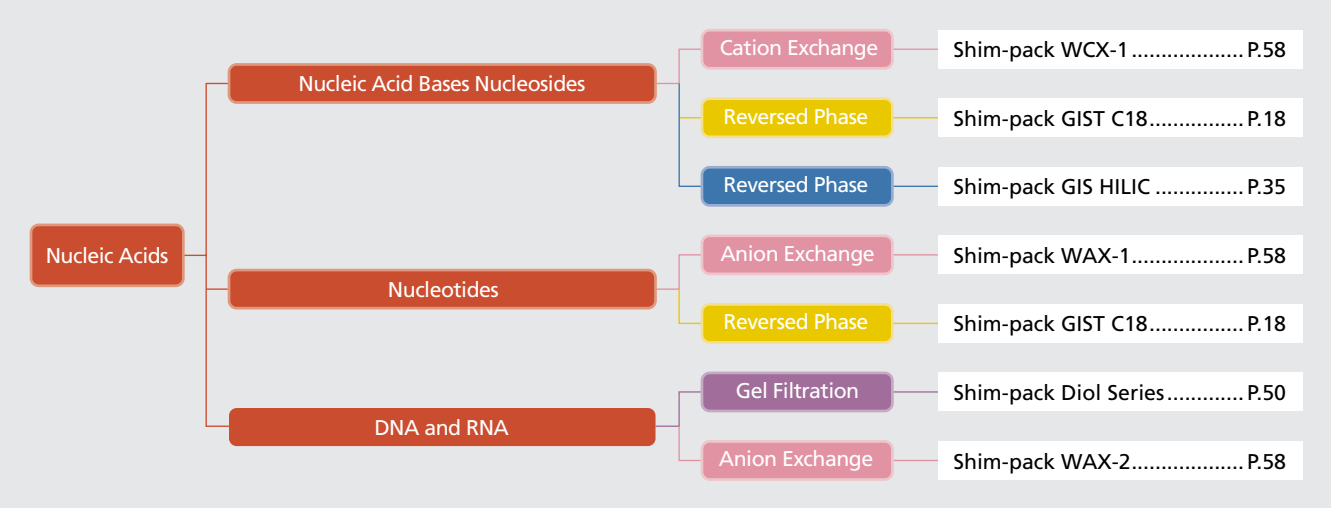


Water-soluble Vitamins	
Vitamin B1 (thiamin)	UV (270 nm) RF (Post-column derivatization)
Vitamin B2 (riboflavin)	UV (270 nm) RF (Post-column derivatization)
Vitamin B3 (niacin)	UV (260 nm)
Vitamin B5 (pantothenic acid)	UV (205 nm)
Vitamin B6 (pyridoxine)	UV (290 nm)
Vitamin B12 (cyanocobalamine)	UV (280 nm)
Vitamin BT (carnitine)	UV (210 nm) RI
Vitamin C (ascorbic acid)	UV (245 nm)
Vitamin H (biotin)	UV (210 nm)
Vitamin M (folic acid)	UV (280 nm)
Vitamin P (hesperidin)	UV (265 nm)

Fat-soluble Vitamins	
Vitamin A (retinol)	UV (325 nm) RF (Ex. 340 nm, Em. 460 nm)
Vitamin D	UV (265 nm)
Vitamin E (tocopherol)	UV (295 nm) RF (Ex. 295 nm, Em. 325 nm)
Vitamin K	UV (250 nm) RF (Post-column derivatization)

* The above wavelength values are approximate values. It is possible to be influenced by the state of mobile phase.



Column Selection Guide

Selection by USP

USP Code	Packing	Shim-pack HPLC Columns	Page
L1	Octadecyl silane chemically bonded to porous or non-porous silica or ceramic micro-particles, 1.5 to 10 µm in diameter, or a monolithic rod.	Shim-pack XR-ODS	8
		Shim-pack XR-ODS II	10
		Shim-pack XR-ODS III	10
		Shim-pack VP-ODS	12
		Shim-pack GIST C18	18
		Shim-pack GIST-HP C18	18
		Shim-pack GIST C18-AQ	20
		Shim-pack GISS C18	22
		Shim-pack GISS-HP C18	22
		Shim-pack GIS C18	24
		Shim-pack GIS-HP C18	24
		Shim-pack GIS C18-P	26
		Shim-pack GIS RP-Shield	28
		Shim-pack GWS C18	41
		Shim-pack FC-ODS	43
		Shim-pack UC GIS II	45
		Shim-pack Solar C18	42
		ULTRON VX-ODS	76
		STR ODS-II	78
		STR ODS-M	79
		Mastro C18	64
L3	Porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod.	Shim-pack XR-SIL	8
		Shim-pack UC Sil	45
		ULTRON VX-SIL	75
L7	Octylsilane chemically bonded to totally or superficially porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod.	Shim-pack XR-C8	8
		Shim-pack VP-C8	12
		Shim-pack GIST C8	29
		Shim-pack GIST-HP C8	29
		Shim-pack Solar C8	42
		ULTRON VX-Octyl	77
L8	An essentially monomolecular layer of aminopropylsilane chemically bonded to totally porous silica gel support, 1.5 to 10 µm in diameter, or a monolithic silica rod.	Shim-pack GIST NH2	37
		Shim-pack UC NH2	45
L10	Nitrile groups chemically bonded to porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod.	Shim-pack GIS CN	39
		Shim-pack UC CN	45
L11	Phenyl groups chemically bonded to porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod.	Shim-pack XR-Phenyl	8
		Shim-pack VP-Phenyl	12
		Shim-pack GIST Phenyl	31
		Shim-pack GIST-HP Phenyl	31
		Shim-pack UC Phenyl	45
		Shim-pack GIST Phenyl-Hexyl	33
L17	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the hydrogen form, 6 to 12 µm in diameter.	Shim-pack SCR-101H	56
		ULTRON PS-80H	72
L19	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the calcium form, 5 - 15 µm in diameter.	Shim-pack SCR-101C	56
		ULTRON PS-80C	73
L20	Dihydroxypropane groups chemically bonded to porous silica or hybrid particles, 1.5 to 10 µm in diameter, or a monolithic silica rod.	Shim-pack GIS HILIC	35
		Shim-pack UC Diol	45
L21	A rigid, spherical styrene-divinylbenzene copolymer, 3 to 30 µm in diameter.	Shim-pack GPC Series	48
L22	A cation-exchange resin made of porous polystyrene gel with sulfonic acid groups, 5 - 15 µm in diameter.	Shim-pack IC-C1	51
		Shim-pack AMINO-LI	55
		Shim-pack AMINO-NA	55
		Shim-pack ISC	57
L23	An anion-exchange resin made of porous polymethacrylate or polyacrylate gel with quartenary ammonium groups, 7 - 12 µm in size.	Shim-pack IC-A1	51
L34	Strong cation exchange resin consisting of sulfonated crosslinked styrene-divinylbenzene copolymer in the lead form, 9µm in diameter.	Shim-pack SCR-101P	56
		ULTRON PS-80P	73
L43	Pentafluorophenyl groups chemically bonded to silica particles by a propyl spacer, 1.5 to 10 µm in diameter.	Mastro PFP	65
L45	Beta cyclodextrin bonded to porous silica particles, 5 to 10 µm in diameter.	ULTRON ES-CD	71
		ULTRON ES-PhCD	71
L57	A chiral-recognition protein, ovomucoid, chemically bonded to silica particles, about 5 µm in diameter, with a pore size of 120 Å.	ULTRON ES-OVM	69
L58	Strong cation-exchange resin consisting of sulfonated cross-linked styrene-divinylbenzene copolymer in the sodium form, about 6 to 30 µm diameter.	Shim-pack SCR-101N	56
		ULTRON PS-80N	73
L59	Packing for the size-exclusion separations of proteins (separation by molecular weight) over the range of 5 to 7000 kDa. The packing is spherical 1.5 - 10 µm, silica or hybrid packing with a hydrophilic coating.	Shim-pack Diol-150	50
		Shim-pack Diol-300	50

Shim-pack XR Series

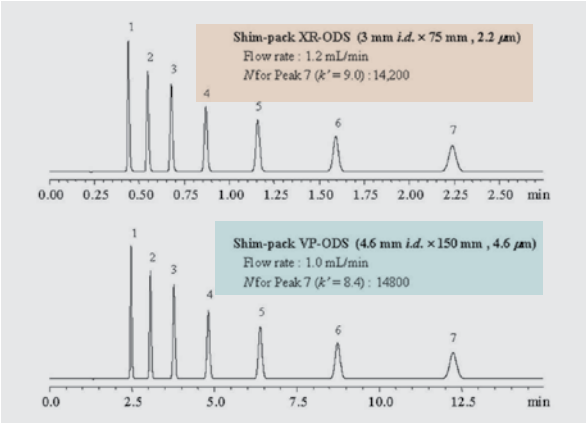
Shim-pack XR Series Columns Offer Versatility and Fast Analysis

Shim-pack XR Series columns use a 2.2 µm packing particle size and offer a skillful balance between resolution efficiency and pressure. An XR Series column provides resolution equivalent to a general-purpose column with 5 µm packing particle size (Shim-pack VP-ODS), but significantly reduces the analysis time. The pressure on the column under many analysis conditions does not exceed 35 MPa. Consequently, ultrafast analysis can be comfortably performed on an existing instrument.

	Shim-pack XR-ODS	Shim-pack XR-C8	Shim-pack XR-Phenyl	Shim-pack XR-SIL
Particle Size (µm)	2.2	2.2	2.2	2.2
Pore Size (nm)	12	12	12	12
Surface Area (m2/g)	340	340	340	340
Carbon Loading	18%	11%	11%	–
Pressure Tolerance (MPa)	35	35	35	20
Pore Volume (mL/g)	1.05	1.05	1.05	1.05
End-capping	Yes	Yes	Yes	–
Bonding Type	Monomeric	Monomeric	Monomeric	–
pH Range	2 - 7.5	2 - 7.5	2 - 7.5	–
USP Code	L1	L7	L11	L3

Shim-pack XR-ODS Permits Simple Switching from Conventional Analysis

The two chromatograms to the right show differences in analysis times when using different columns. The lower chromatogram is the result of analysis using a Shimadzu Shim-pack VP-ODS general-purpose column. The upper chromatogram is from analysis with a Shim-pack XR-ODS fast analysis column. As both Shim-pack VP-ODS and Shim-pack XR-ODS offer identical resolution properties, Shim-pack XR-ODS maintains the resolution while significantly reducing analysis times.



For more information of smooth transfer of methods from high-speed analysis to conventional analysis, please refer to page 14

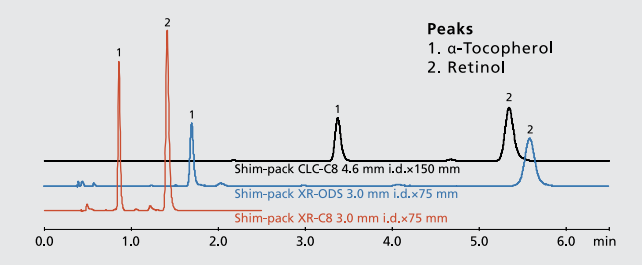
Shim-pack XR Series Comprehensive Product Range

In addition to the versatile Shim-pack XR-ODS that is bonded with the C18 group, the comprehensive Shim-pack XR Series product range includes the Shim-pack XR-C8 that is bonded with the C8 group to give different retention behavior to ODS, Shim-pack XR-Phenyl that is bonded with the phenylpropyl group, and the normal-phase Shim-pack XR-SIL silica column that achieves higher speeds.

Analysis Examples

Analysis of Fat-Soluble Vitamins

The fat-soluble vitamins E (tocopherol) and A (retinol) were analyzed. The Shim-pack XR-C8 column achieves higher speed than a conventional C8 column.

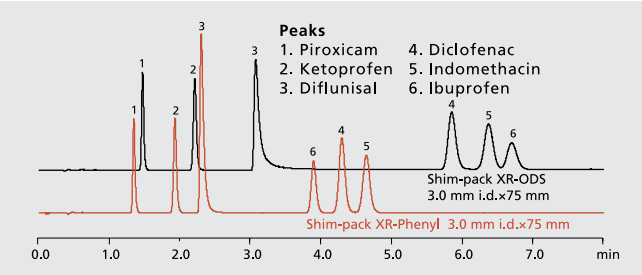


Conditions

Column	:	Shim-pack XR-C8 (75 mmL. × 3.0 mmI.D., 2.2 µm) (P/N: 228-59902-93)
Mobile Phase	:	Methanol
Flow Rate	:	1.0 mL/min
Col. Temp.	:	40 °C
Detection	:	UV 290 nm

Analysis of Non-Steroidal Anti-Inflammatory Drug

The column was switched from Shim-pack XR-ODS to Shim-pack XR-Phenyl to improve the resolution.
The difference in retention properties between the ODS group and the phenylpropyl group improves the peak shape, controls the resolution, and reduces the analysis time.

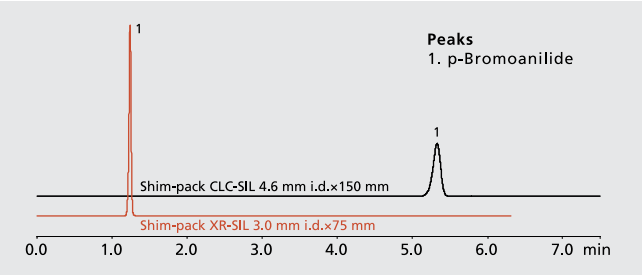


Conditions

Column	:	Shim-pack XR-Phenyl (75 mmL. × 3.0 mmI.D., 2.2 µm) (P/N: 228-59904-93)
Mobile Phase	:	A) 20 mmol/L Phosphate buffer solution (pH 2.5) B) Acetonitrile A/B = 30/20 (v/v)
Flow Rate	:	1.0 mL/min
Col. Temp.	:	40 °C
Detection	:	UV 220 nm

Fast Normal-Phase Analysis

Organic solvents are used as the mobile phase for normal-phase analysis. Due to environmental considerations, it is necessary to reduce the consumption of mobile phase compared with normal reversed-phase analysis. The Shim-pack XR-SIL silica column increases the speed of normal-phase analysis while reducing the consumption of mobile phase. In this example, the analysis time is reduced by 80 % while maintaining the flow rate, thereby reducing the overall mobile phase consumption to 20 % or less.



Conditions

Column	:	Shim-pack XR-SIL (75 mmL. × 3.0 mmI.D., 2.2 µm) (P/N: 228-59906-92)
Mobile Phase	:	Hexane / Ethanol = 90/10 (v/v)
Flow Rate	:	1.0 mL/min
Col. Temp.	:	40 °C
Detection	:	UV 254 nm

Shim-pack XR Series

Shim-pack XR Series, Shim-pack XR-ODS II and XR-ODS III High-Pressure Columns for Higher Resolution and Sensitivity

While the Shim-pack XR-ODS II and XR-ODS III use the same 2.2 µm packing particle size as the Shim-pack XR Series columns, they have higher 60 and 100MPa pressure tolerance. This allows them to achieve high-resolution fast analysis in a long column using a water/methanol mobile phase. This column significantly extends the range of applications of high-resolution fast analysis to include analysis near room temperature. The Shim-pack XR-ODSII and XR-ODS III columns are ideal for the Nexera UHPLC or Prominence UFLC. This combination achieves both faster speed and higher resolution.

	Shim-pack XR-ODS II	Shim-pack XR-ODS III	
Length (mm)	30, 50, 75, 100, 150	50, 75	150, 200
Particle Size (µm)	2.2	1.6	2.2
Pore Size (nm)	8	7.5	8
Surface Area (m2/g)	470	500	470
Carbon Loading	20%	22%	20%
Pressure Tolerance (MPa)	60	100	100
Pore Volume (mL/g)	1	0.95	1
End-capping	Yes	Yes	Yes
Bonding Type	Monomeric	Monomeric	Monomeric
pH Range	2 - 7.5	2 - 7.5	2 - 7.5
USP Code	L1	L1	L1

Extensive product range, including 1.5 mmI.D. column to reduce mobile phase consumption

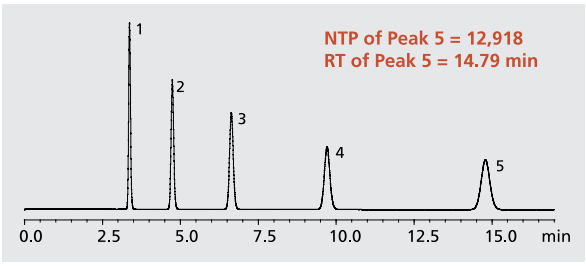
The Shim-pack XR-ODS II range includes a 1.5 mmI.D. model in addition to normal 2 mm and 3 mmI.D. columns. With an optimal flow rate of 0.2 to 0.3 mL/min, the 1.5 mmI.D. column offers the optimal flow rate for LC/MS and reduces mobile phase consumption.

Select a column to suit your purpose, whether shorter analysis times or high resolution

The Shim-pack XR-ODS III lineup features two columns: a short one utilizing a packing material with a particle size of 1.6 µm and a long one utilizing a 2.2 µm particle size, which is equivalent to the conventional XR column. This extensive lineup allows users to select a column according to analysis objectives, whether it's a short size to further shorten analysis times, or a long size to achieve high resolution while retaining the ease of use of the conventional XR column.

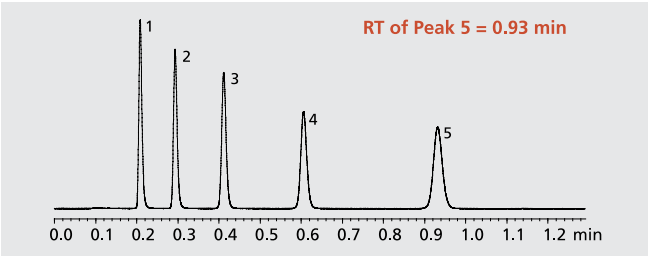
Shim-pack VP-ODS (150 mmL. × 4.6 mmI.D., 5 µm, P/N: 228-34937-91)

Peaks
1. Acetophenone
2. Propiophenone
3. Butyrophenone
4. Valerophenone
5. Hexanophenone



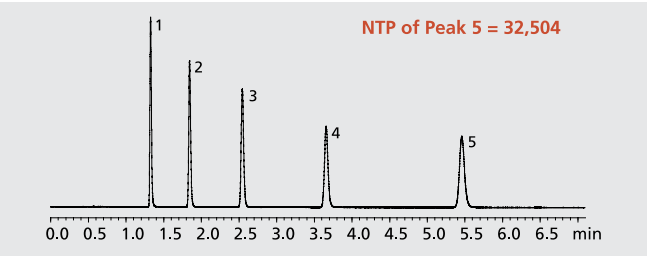
Conditions
Mobile Phase : 55 % Aqueous Acetonitrile Solution
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Injection Vol. : 5 µL

Shim-pack XR-ODS III (50 mmL. × 2 mmI.D., 1.6 µm, P/N: 228-59922-91)



Conditions
Mobile Phase : 55 % Aqueous Acetonitrile Solution
Flow Rate : 1.1 mL/min
Col. Temp. : 40 °C
Injection Vol. : 5 µL

Shim-pack XR-ODS III (200 mmL. × 2 mmI.D., 2.2 µm, P/N: 228-59910-92)



Conditions
Mobile Phase : 55 % Aqueous Acetonitrile Solution
Flow Rate : 0.6 mL/min
Col. Temp. : 50 °C
Injection Vol. : 5 µL

Product Information

Column	Particle Size (µm)	I.D. (mm) / Length (mm)	1.5	2.0	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
Shim-pack XR-ODS	2.2	20	-	228-50459-91	-	-	35/5000
		30	-	228-41605-91	228-41606-91	228-41607-91	
		50	-	228-41605-92	228-41606-92	228-41607-92	
		75	-	228-41605-93	228-41606-93	228-41607-93	
		100	-	228-41605-94	228-41606-94	228-41607-94	
Shim-pack XR-C8	2.2	30	-	228-59901-91	228-59902-91	-	35/5000
		50	-	228-59901-92	228-59902-92	-	
		75	-	228-59901-93	228-59902-93	-	
		100	-	228-59901-94	228-59902-94	-	
Shim-pack XR-Phenyl	2.2	30	-	228-59903-91	228-59904-91	-	35/5000
		50	-	228-59903-92	228-59904-92	-	
		75	-	228-59903-93	228-59904-93	-	
		100	-	228-59903-94	228-59904-94	-	
Shim-pack XR-Sil	2.2	50	-	228-59905-91	228-59906-91	-	20/2900
		75	-	228-59905-92	228-59906-92	-	
		100	-	228-59905-93	228-59906-93	-	
Shim-pack XR-ODS II	2.2	30	228-59907-91	-	-	-	60/8700
		50	228-59907-92	228-41623-94	-	-	
		75	228-59907-93	228-41623-91	228-41624-91	-	
		100	228-59907-94	228-41623-92	228-41624-92	-	
		150	228-59907-95	228-41623-93	228-41624-93	-	
Shim-pack XR-ODS III	1.6	50	-	228-59922-91	-	-	100/14500
		75	-	228-59922-92	-	-	
	2.2	150	-	228-59910-91	-	-	
		200	-	228-59910-92	-	-	

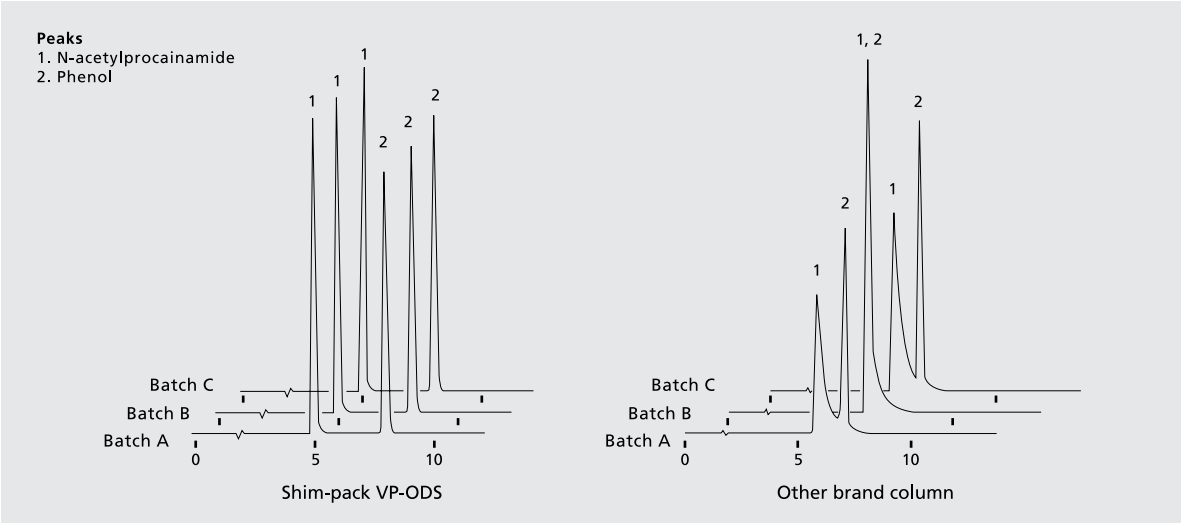
Shim-pack VP Series

Shim-pack VP series is designed for the development and validation of analytical methods.

	Shim-pack VP-ODS	Shim-pack VP-C8	Shim-pack VP-Phenyl
Particle Size (µm)	5	5	5
Pore Size (nm)	12	12	12
Surface Area (m2/g)	410	410	410
Carbon Loading	20%	12.5%	12.3%
Pressure Tolerance (MPa)	Approx. 20	Approx. 20	Approx. 20
Pore Volume (mL/g)	1.25	1.25	1.25
End-capping	Yes	Yes	Yes
Bonding Type	Monomeric	Monomeric	Monomeric
pH Range	2 - 7.5	2 - 7.5	2 - 7.5
USP Code	L1	L7	L11

Strict Manufacturing Uniformity

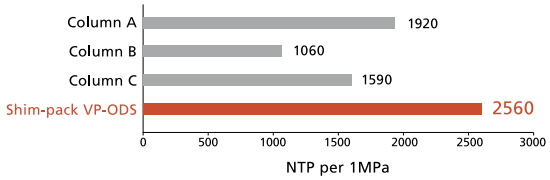
Shim-pack VP series ensures high column-to-column performance reproducibility, which is ideal for method development and validation. Silica-bases, surface treatment and packing procedures are subjected to a strict array of quality criteria tests and controlled respectively. Each column is delivered together with Certificate of Compliance and Column Performance Report.



Comparison of reproducibility between three batches of silica-based materials

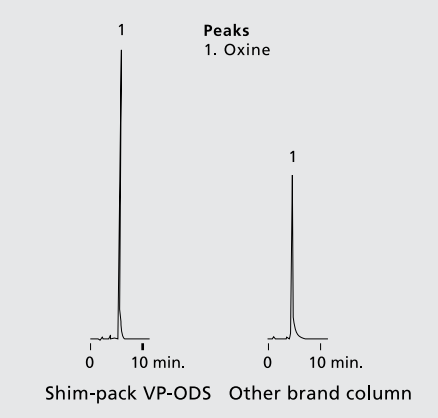
Balance of Column Efficiency and Column Backpressure

Shim-pack VP series achieves a higher column efficiency while maintaining low pressure. It provides superior performance shown by NTP (Number of Theoretical Plates) per 1MPa.

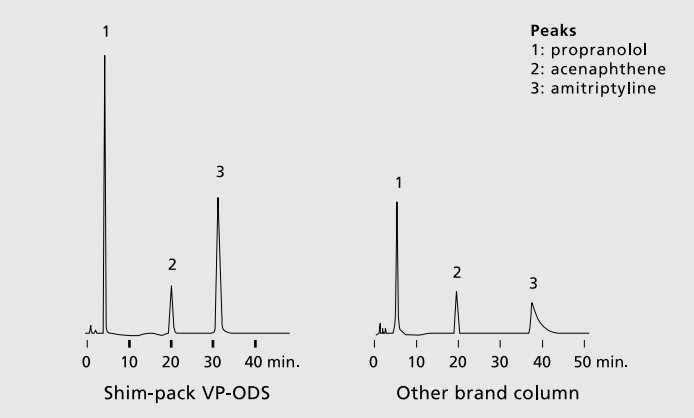


Column Size: 4.6 x 150 mm, Mobile Phase: Methanol/Water=70/30,
Flow Rate: 1.0 mL/min., Sample: Naphthalene

Excellent Peak Shape



Packing materials with less metal impurities achieve excellent peak shape of coordination compounds.



Completed end-capping achieves excellent peak shape of basic compounds.

Product Information

Analytical Columns

Column	Particle Size (µm)	I.D. (mm) / Length (mm)	2.0	4.6	6.0
Shim-pack VP-ODS	5	50	-	228-36849-91	-
		150	228-34937-94	228-34937-91	228-34937-93
		250	228-34937-95	228-34937-92	-
Shim-pack VP-C8	5	150	228-59927-93	228-59927-91	-
		250	228-59927-94	228-59927-92	-
Shim-pack VP-Phenyl	5	150	228-59928-93	228-59928-91	-
		250	228-59928-94	228-59928-92	-

Cartridge Guard Columns

Column	I.D. (mm) / Length (mm)	2.0	4.6
Guard Column Holder	-	228-34938-94	228-34938-92
GVP-ODS Cartridges (2 pcs)	5	228-34938-93	-
	10	-	228-34938-91

Shim-pack VP Series

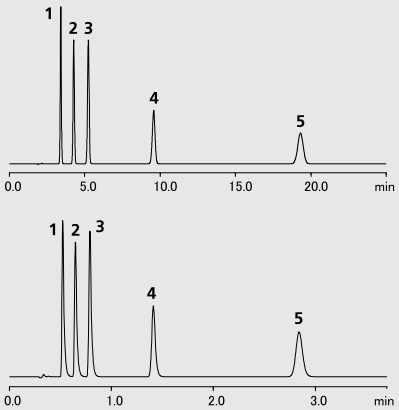
Smooth Transfer of Methods from High-Speed Analysis to Conventional Analysis

By using the Shim-pack VP series of conventional columns in combination with the Shim-pack XR series of high-speed columns, which offer the equivalent separation performance, it is possible to perform method development via high-speed analysis, and then smoothly transfer to conventional analysis. Utilizing these columns with Nexera Method Scouting provides strong support for method development.

Example of High-Speed/Conventional Analysis Using Columns with Equivalent Retention Behavior

Examples of analysis with the Shim-pack VP and Shim-pack XR columns are shown below. In each example, analysis was achieved while maintaining essentially the same relative retention time. In method transfer, this equivalency is important, making the combination of the Shim-pack VP series and Shim-pack XR series optimal for method development.

Example of the Batch Analysis of 6 Sulfa Drugs



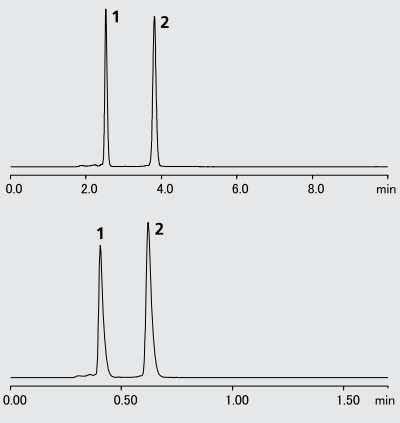
Conditions

Column : Top : Shim-pack VP-ODS (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 228-34937-91)
Bottom : Shim-pack XR-ODS (50 mmL. × 3.0 mmI.D., 2.2 µm) (P/N: 228-41606-92)
Mobile Phase : A) 0.1 % formic acid
B) Acetonitrile
A/B = 8/2 (v/v)
Flow Rate : Top : 1.0 mL/min
Bottom : 1.0 mL/min

Relative Retention Times

Peak	Shim-pack VP-ODS	Shim-pack XR-ODS
1. Sulfadiamine	1.000	1.000
2. Sulfamerazine	1.252	1.238
3. Sulfadimidine	1.537	1.509
4. Sulfamethoxazole	2.809	2.699
5. Sulfaquinoxaline	5.668	5.432

Example of the Analysis of Fat-Soluble Vitamins



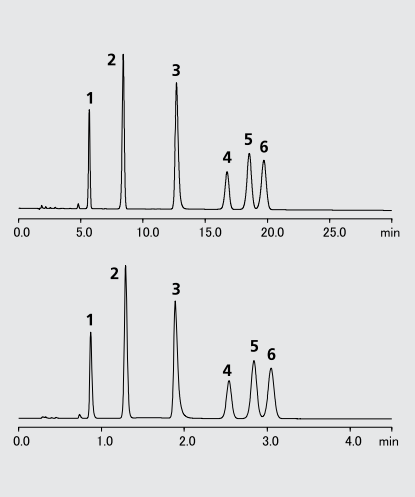
Conditions

Column : Top : Shim-pack VP-C8 (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 228-59927-91)
Bottom : Shim-pack XR-C8 (50 mmL. × 3.0 mmI.D., 2.2 µm) (P/N: 228-59902-92)
Mobile Phase : Methanol
Flow Rate : Top : 1.0 mL/min
Bottom : 1.0 mL/min

Relative Retention Times

Peak	Shim-pack VP-C8	Shim-pack XR-C8
1. Retinol	1.000	1.000
2. α±-tocopherol	1.509	1.531

Example of the Batch Analysis of Non-Steroidal Anti-Inflammatory Drugs (NSAIDs)



■ **Conditions**

Column : Top : Shim-pack VP-Phenyl (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 228-59928-91)
Bottom : Shim-pack XR-Phenyl (50 mmL. × 3.0 mmI.D., 2.2 µm) (P/N: 228-59904-92)

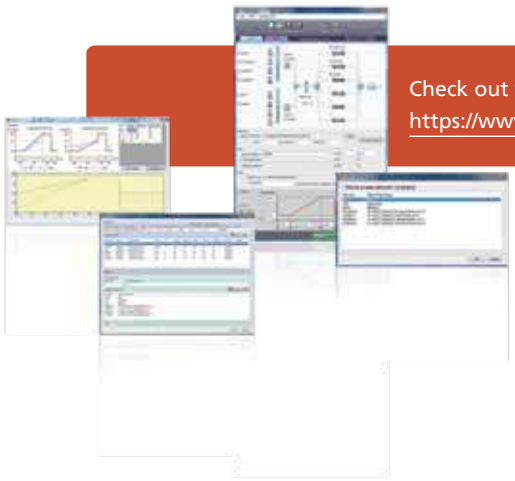
Mobile Phase : A) 20 mmol/L Phosphoric acid (Na) buffer (pH 2.5)
B) Acetonitrile
A/B = 3/7 (v/v)

Flow Rate : Top : 1.0 mL/min
Bottom : 1.0 mL/min

Relative Retention Times

Peak	Shim-pack VP-Phenyl	Shim-pack XR-Phenyl
1. Piroxicam	1.000	1.000
2. Ketoprofen	1.480	1.483
3. Diflunisal	2.233	2.172
4. Diclofenac	2.949	2.916
5. Indomethacin	3.263	3.262
6. Ibuprofen	3.470	3.501

Columns with the same size but different bonded phases are available as a set for the purpose of method development. Please contact your local Shimadzu representative for details.



Check out the Nexera Method Scouting System at
https://www.ssi.shimadzu.com/products/liquid-chromatography/nexera-x2/method-scouting.html

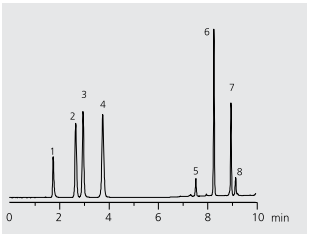
Shim-pack MAqC-ODS

Shim-pack MAqC-ODS I reversed-phase columns are packed with a silica gel containing metal and bonded octadecylsilyl group. In addition to the hydrophobic characteristics of the ODS, the metal content also provides cation-exchange effects. This increases the retention of basic compounds. Therefore, this allows use with only a buffer solution as the mobile phase for analyses that previously required using an ion pair reagent and enables using gradient elution. These characteristics are especially beneficial for analyzing water soluble vitamins and pharmaceuticals that contain a large amount of basic compounds.

Example of Simultaneous Analysis of Water Soluble Vitamins

Water soluble vitamins contain many highly polar basic components, which are known to exhibit weak retention in the reversed-phase mode. Consequently, with typical ODS columns, such as the Shim-pack VP-ODS, an ion pair reagent is added to the mobile phase for analysis. However, using an ion pair reagent makes gradient elution difficult, resulting in peak broadening for components that take longer to elute and making it difficult to improve sensitivity. In addition, the effort required to prepare the mobile phases and condition the column is also an issue. However, because the Shim-pack MAqC-ODS I enables using gradient elution, it can shorten analysis times and result in sharp peaks even for components that elute slowly. For example, riboflavin, which elutes as the final peak with a typical ODS column, is detected with approx. 2.3 times higher sensitivity by the Shim-pack MAqC-ODS I.

Shim-pack MAqC-ODS I

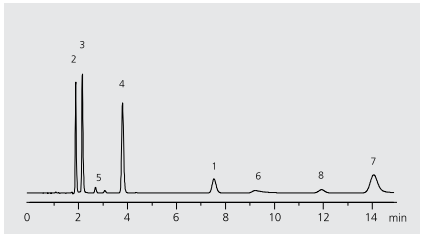


Peaks
1. Thiamine
2. Niacin
3. Nicotinamide
4. Pyridoxine
5. Ca Pantothenate
6. Folic acid
7. Riboflavin
8. Biotin

Conditions

Column	:	Shim-pack MAqC-ODS I (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 228-59936-91)
Mobile Phase	:	A) 10 mmol/L phosphate (Na) buffer solution (pH 2.6) B) Acetonitrile A/B = 99/1 - 2.5min - 99/1 - 7.5min - 50/50 - 0.01min - 99/1 - 5 min
Flow Rate	:	1.2 mL/min
Col. Temp.	:	40 °C
Detection	:	UV 210 nm
Injection Vol.	:	10 µL

Shim-pack VP-ODS



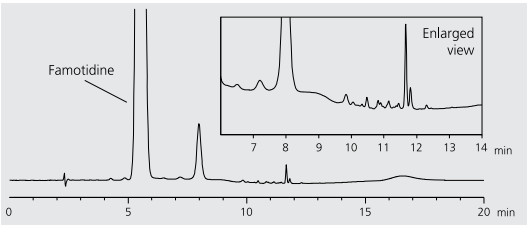
Conditions

Column	:	Shim-pack VP-ODS (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 228-34937-91)
Mobile Phase	:	A) 100 mmol/L phosphate (Na) buffer solution (pH 2.1) containing 0.8 mmol/L sodium 1-octanesulfonate B) Acetonitrile A/B = 10/1 (v/v)
Flow Rate	:	1.2 mL/min
Col. Temp.	:	40 °C
Detection	:	UV 210 nm
Injection Vol.	:	10 µL

Example of Analyzing Impurities in a Pharmaceutical

Many pharmaceuticals are basic compounds. The majority of impurities in pharmaceuticals, such as unreacted ingredients, by-products, and decomposition products, are highly polar basic substances. Consequently, analyzing impurity peaks using LC/MS can be difficult if a non-volatile ion pair reagent is contained. In the following example of analyzing famotidine, using a Co-Sense for LC/MS automatic pretreatment system to desalt the mobile phase used with the Shim-pack MAqC-ODS I column enabled analysis by LC/MS. While a typical ODS column (Shim-pack VP-ODS) detects 12 types of impurities, the Shim-pack MAqC-ODS I detects 20 types of impurities due to separation specificity and gradient elution.

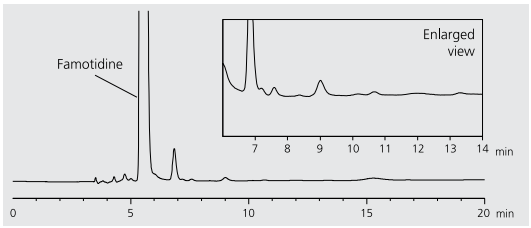
Shim-pack MAqC-ODS I



Conditions

Column	:	Shim-pack MAqC-ODS I (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 228-59936-91)
Mobile Phase	:	A) 10 mmol/L phosphate (Na) buffer solution (pH 2.6) B) Acetonitrile A/B = 92/8 - 5min - 92/8 - 7min - 50/50 - 0.01min - 92/8 - 8 min
Flow Rate	:	1.0 mL/min
Col. Temp.	:	25 °C
Detection	:	UV 254 nm
Injection Vol.	:	5 µL

Shim-pack VP-ODS

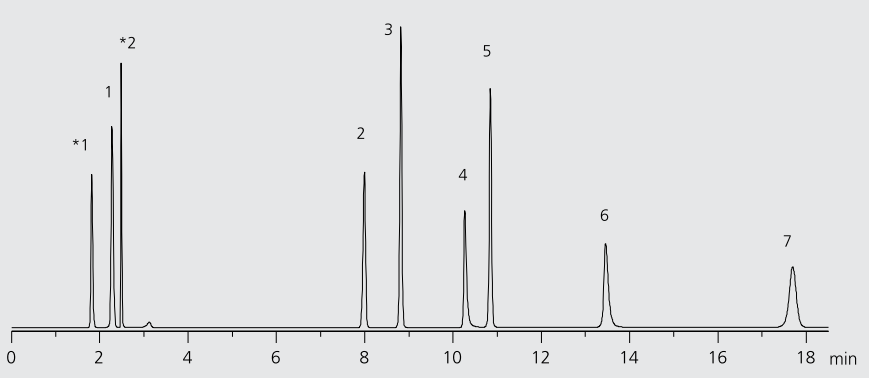


Conditions

Column	:	Shim-pack VP-ODS (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 228-34937-91)
Mobile Phase	:	2 g of sodium 1-heptanesulfonate was dissolved in 900 mL of water and acetic acid (100) was added to produce a pH of 3.0. Then water was added to make 1000 mL. 240 mL of acetonitrile and 40 mL of methanol were added to this solution.
Flow Rate	:	0.5 mL/min
Col. Temp.	:	25 °C
Detection	:	UV 254 nm
Injection Vol.	:	5 µL

Example of Analyzing a Cold Remedy

Gradient elution with a Shim-pack MAqC-ODS I column was used for simultaneous analysis of components contained in an over-the-counter commercial cold remedy. The ability to use gradient elution enables the acquisition of sharp peaks, even for components that eluted slowly, similar to the water soluble vitamin and drug impurity examples on the prior page.



Peaks

1. Thiamine
2. Acetaminophen
3. Caffeine
4. Chlorpheniramine
5. Ethenzamide
6. Isopropylantipyrine
7. Ibuprofen

*1 Nitric acid
*2 Maleic acid

Conditions

Column : Shim-pack MAqC-ODS I (150 mmL. × 4.6 mmI.D., 5 µm)
(P/N: 228-59936-91)
Mobile Phase : A) 20 mmol/L phosphate (Na) buffer solution (pH 2.5)
B) Acetonitrile
A/B = 99/1 - 2min – 99/1 – 6min – 50/50 – 10min – 50/50 - 0.01min - 99/1 - 5 min
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Detection : UV 220 nm
Injection Vol. : 10 µL

Product Information

Particle Size (µm)	I.D. (mm) / Length (mm)	2.0	4.6
5	150	228-59936-94	228-59936-91

* To use this column efficiently:
1) To increase the retention of basic compounds, please use a buffer solution within the pH 2 to 4 range.
2) In the case of a basic substance tailing, it may be possible to improve the peak shape by increasing the salt concentration of a buffer solution.
3) The elution of basic compounds is faster by increasing the salt concentration, and it is possible to adjust retention by salt concentration.

This product developed by collaboration with Eisai Co., Ltd.

Shim-pack GIST C18

Ultra High Inertness, High Durability

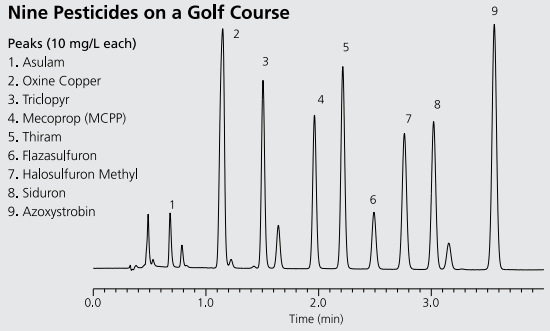
Shim-pack GIST C18 has superior inertness, which improves analysis precision and increases column durability. In addition, it can be used to analyze strong ionic compounds and difficult to absorb samples, which helps to obtain symmetrical peaks and high reproducibility.

Furthermore, because of the new silica gel, Shim-pack GIST C18 is suitable for wider pH (1-10) analysis at a consistent performance. This enables use of a silica-based column under alkaline conditions.

Bonded Phase	Octadecyl Groups
Particle Size	2 µm, 3 µm, 5 µm
Pore Size	10 nm
Surface Area	350 m²/g
Carbon Loading	14 %
End-capping	Yes
pH Range	1 to 10
USP Code	L1

Analysis Examples

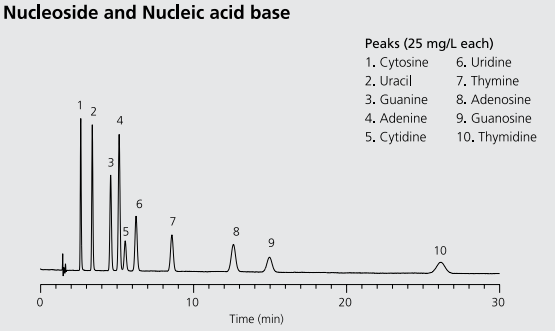
Nine Pesticides on a Golf Course



Conditions

Column : Shim-pack GIST-HP C18 (150 mmL. × 3.0 mmI.D., 3 µm) (P/N: 227-30040-05)
Mobile Phase : A) 50 mM KH2PO4 (pH 3.5, H3PO4)
B) Acetonitrile
A/B = 60/40 - 4 min - 40/60
Flow Rate : 1.5 mL/min
Col. Temp. : 40 °C
Detection : UV 235 nm
Injection Vol. : 5.0 µL

Nucleoside and Nucleic acid base



Conditions

Column : Shim-pack GIST C18 (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 227-30017-07)
Mobile Phase : 0.1 mol/L Ammonium phosphate, 0.2 mol/L Sodium perchlorate buffer solution (pH 2.0)
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Detection : UV 260 nm
Injection Vol. : 1 µL

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	20	-	-	227-30008-01	227-30009-01	227-30010-01	227-30011-01
	30	227-30006-01	227-30007-01	227-30008-02	227-30009-02	227-30010-02	227-30011-02
	50	227-30006-02	227-30007-02	227-30008-03	227-30009-03	227-30010-03	227-30011-03
	75	227-30006-03	227-30007-03	227-30008-04	227-30009-04	227-30010-04	227-30011-04
	100	227-30006-04	227-30007-04	227-30008-05	227-30009-05	227-30010-05	227-30011-05
	125	-	-	227-30008-06	227-30009-06	227-30010-06	227-30011-06
	150	227-30006-05	227-30007-05	227-30008-07	227-30009-07	227-30010-07	227-30011-07
	250	227-30006-06	227-30007-06	227-30008-08	227-30009-08	227-30010-08	227-30011-08
5	20	-	-	227-30014-01	227-30015-01	227-30016-01	227-30017-01
	30	227-30012-01	227-30013-01	227-30014-02	227-30015-02	227-30016-02	227-30017-02
	50	227-30012-02	227-30013-02	227-30014-03	227-30015-03	227-30016-03	227-30017-03
	75	227-30012-03	227-30013-03	227-30014-04	227-30015-04	227-30016-04	227-30017-04
	100	227-30012-04	227-30013-04	227-30014-05	227-30015-05	227-30016-05	227-30017-05
	125	-	-	227-30014-06	227-30015-06	227-30016-06	227-30017-06
	150	227-30012-05	227-30013-05	227-30014-07	227-30015-07	227-30016-07	227-30017-07
	250	227-30012-06	227-30013-06	227-30014-08	227-30015-08	227-30016-08	227-30017-08

UHPLC/HPLC Columns

Cartridge Guard Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30023-01	227-30024-01	227-30025-01	227-30027-01	227-30532-01
	20	-	-	227-30026-01	227-30028-01	227-30532-02
5	10	227-30029-01	227-30030-01	227-30031-01	227-30032-03	227-30532-01
	20	-	-	227-30032-01	227-30033-01	227-30532-02

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			
		1.0	1.5	3.0	4.0
3	10	227-30023-02	227-30024-02	227-30025-02	227-30027-02
	20	-	-	227-30026-02	227-30028-02
5	10	227-30029-02	227-30030-02	227-30031-02	227-30032-04
	20	-	-	227-30032-02	227-30033-02

Analytical Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
2	30	227-30001-01	227-30002-01	-	50/7200
	50	227-30001-02	227-30002-02	-	
	75	227-30001-03	227-30002-03	-	
	100	227-30001-04	227-30002-04	-	80/11600
	150	227-30001-05	227-30002-05	-	
3	30	227-30039-01	227-30040-01	227-30041-01	50/7200
	50	227-30039-02	227-30040-02	227-30041-02	
	75	227-30039-03	227-30040-03	227-30041-03	
	100	227-30039-04	227-30040-04	227-30041-04	
	150	227-30039-05	227-30040-05	227-30041-05	
	250	227-30039-06	227-30040-06	227-30041-06	

Cartridge Guard Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)			Pressure Tolerance (MPa)/(PSI)	Holder
		1.5	2.1	3.0		
2	10	227-30042-01	227-30043-01	227-30044-01	80/11600	227-30533-01
3	10	227-30045-01	227-30046-01	227-30047-01		

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			Pressure Tolerance (MPa)/(PSI)
		1.5	2.1	3.0	
2	10	227-30042-02	227-30043-02	227-30044-02	80/11600
3	10	227-30045-02	227-30046-02	227-30047-02	

Pre-column Type Guard Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
2	30	227-30771-01	227-30772-01	227-30773-01	80/11600
3		227-30774-01	227-30775-01	227-30776-01	50/7200

Shim-pack GIST C18-AQ

Excellent Retentivity of Highly Polar Compounds

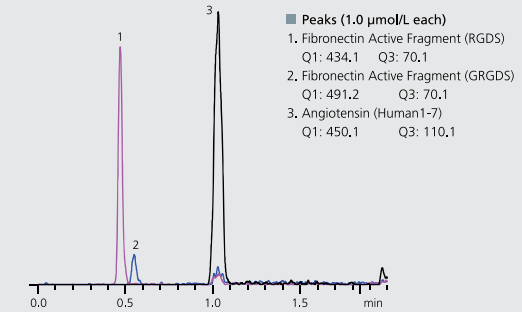
Shim-pack GIST C18-AQ achieves strong retention of hydrophilic highly polar compounds compared to general C18 columns, while maintaining high inertness and durability in highly or 100% aqueous mobile phases.

Shim-pack GIST C18-AQ is also able to reduce the absorption of basic and acidic compounds and achieve superior peak shapes in the analysis of metal complexes.

Bonded Phase	Octadecyl Groups
Particle Size	1.9 µm, 3 µm, 5 µm
Pore Size	10 nm
Surface Area	350 m^2/g
Carbon Loading	13 %
End-capping	Yes
pH Range	1 to 10
USP Code	L1

Analysis Examples

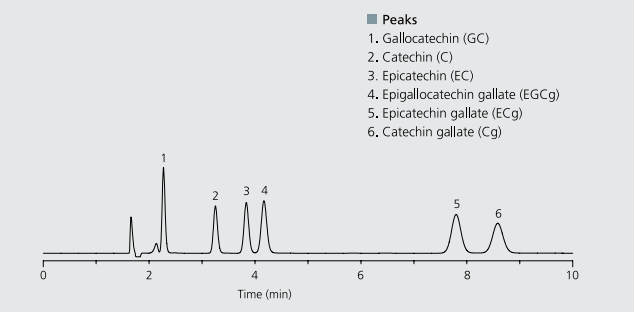
Analysis of Polar Peptides



Conditions

Column : Shim-pack GIST C18-AQ (100 mmL.× 2.1 mmI.D., 1.9 µm) (P/N: 227-30807-02)
Mobile Phase : A) 0.1 % Formic acid in Water
B) Acetonitrile
A/B = 100/0 - 0.2 min - 100/0 - 0.5 min - 15/85 - 1.5 min - 15/85 - 1.52 min - 100/0 - 2.5 min - 100/0 (v/v)
Flow Rate : 0.8 mL/min
Col. Temp. : 40 °C
Detection : LC/MS/MS (LCMS-8030, ESI, Positive, SRM)
Injection Vol. : 2 µL

Analysis of Catechin



Conditions

Column : Shim-pack GIST C18-AQ (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 227-30742-07)
Mobile Phase : A) 0.1 % Formic acid in Water
B) Acetonitrile
A/B = 80/20 (v/v)
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Detection : UV 280 nm

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	20	-	-	227-30721-01	227-30722-01	227-30723-01	227-30724-01
	30	227-30719-01	227-30720-01	227-30721-02	227-30722-02	227-30723-02	227-30724-02
	50	227-30719-02	227-30720-02	227-30721-03	227-30722-03	227-30723-03	227-30724-03
	75	227-30719-03	227-30720-03	227-30721-04	227-30722-04	227-30723-04	227-30724-04
	100	227-30719-04	227-30720-04	227-30721-05	227-30722-05	227-30723-05	227-30724-05
	125	-	-	227-30721-06	227-30722-06	227-30723-06	227-30724-06
	150	227-30719-05	227-30720-05	227-30721-07	227-30722-07	227-30723-07	227-30724-07
	250	227-30719-06	227-30720-06	227-30721-08	227-30722-08	227-30723-08	227-30724-08
5	20	-	-	227-30739-01	227-30740-01	227-30741-01	227-30742-01
	30	227-30737-01	227-30738-01	227-30739-02	227-30740-02	227-30741-02	227-30742-02
	50	227-30737-02	227-30738-02	227-30739-03	227-30740-03	227-30741-03	227-30742-03
	75	227-30737-03	227-30738-03	227-30739-04	227-30740-04	227-30741-04	227-30742-04
	100	227-30737-04	227-30738-04	227-30739-05	227-30740-05	227-30741-05	227-30742-05
	125	-	-	227-30739-06	227-30740-06	227-30741-06	227-30742-06
	150	227-30737-05	227-30738-05	227-30739-07	227-30740-07	227-30741-07	227-30742-07
	250	227-30737-06	227-30738-06	227-30739-08	227-30740-08	227-30741-08	227-30742-08

UHPLC/HPLC Columns

Cartridge Guard Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30731-01	227-30732-01	227-30733-01	227-30735-01	227-30532-01
	20	-	-	227-30734-01	227-30736-01	227-30532-02
5	10	227-30759-01	227-30760-01	227-30761-01	227-30763-01	227-30532-01
	20	-	-	227-30762-01	227-30764-01	227-30532-02

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			
		1.0	1.5	3.0	4.0
3	10	227-30731-02	227-30732-02	227-30733-02	227-30735-02
	20	-	-	227-30734-02	227-30736-02
5	10	227-30759-02	227-30760-02	227-30761-02	227-30763-02
	20	-	-	227-30762-02	227-30764-02

Analytical Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
1.9	50	227-30807-01	227-30808-01	-	50/7200
	100	227-30807-02	227-30808-02	-	80/11600
	150	227-30807-03	227-30808 -03	-	
3	30	-	227-30766-01	227-30767-01	50/7200
	50	227-30765-01	227-30766-02	227-30767-02	
	75	227-30765-02	227-30766-03	227-30767-03	
	100	227-30765-03	227-30085-04	227-30767-04	
	150	227-30765-04	227-30766-05	227-30767-05	
	250	227-30765-05	227-30766-06	227-30767-06	

Cartridge Guard Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)			Pressure Tolerance (MPa)/(PSI)	Holder
		1.5	2.1	3.0		
1.9	10	227-30809-01	227-30810-01	227-30811-01	80/11600	227-30533-01
3	10	227-30768-01	227-30769-01	227-30770-01		

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			Pressure Tolerance (MPa)/PSI)
		1.5	2.1	3.0	
1.9	10	227-30809-02	227-30810-02	227-30811-02	80/11600
3	10	227-30768-02	227-30769-02	227-30770-02	

Pre-column Type Guard Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/PSI)
3	30	227-30801-01	227-30802-01	227-30803-01	50/7200

Shim-pack GISS C18

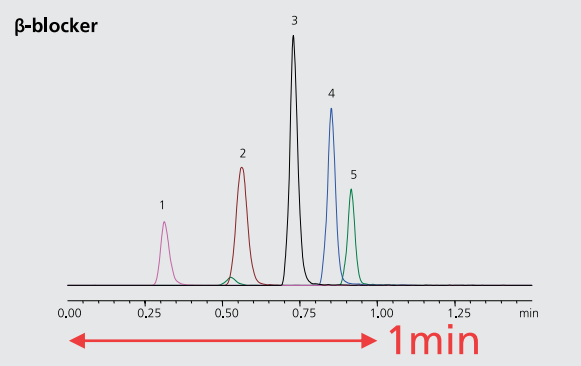
Ideal for Rapid Analysis

Shim-pack GISS C18 maintains the same ultra-high inertness and wider pH range as the Shim-pack GIST C18, while providing rapid separations with symmetrical peaks.

The optimization of surface area, pore size and chemical bonding delivers superior peak shapes. It is ideal for LC/MS/MS analysis and enables MS-compatible buffers to be used due to extremely inert silica gel.

Bonded Phase	Octadecyl Groups
Particle Size	1.9 µm, 3 µm, 5 µm
Pore Size	20 nm
Surface Area	200 m^2/g
Carbon Loading	9 %
End-capping	Yes
pH Range	1 to 10
USP Code	L1

Analysis Examples



Peaks (100 µg/L each)

	Q1 > Q3
1. Acebutolol	337.10 > 116.05 (+)
2. Atenolol	267.25 > 145.00 (+)
3. Labetalol	329.00 > 161.95 (+)
4. Nadolol	310.05 > 254.00 (+)
5. Pindolol	249.80 > 116.00 (+)

Conditions

Column : Shim-pack GISS C18 (50 mmL × 2.1 mmI.D., 1.9 µm) (P/N: 227-30048-01)
Mobile Phase : A) 10 mM Ammonium Formate in Water
B) 10 mM Ammonium Formate in Methanol
A/B = 70/30 - 0.3 min - 40/60 - 0.5 min - 0/100 - 0.1 min - 0/100 - 0.01 min - 70/30 - 0.5 min - 70/30, v/v
Flow Rate : 0.6 mL/min
Col. Temp. : 40 °C
Detection : LC/MS/MS (ESI, Positive, Negative MRM)

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	30	227-30050-01	227-30051-01	227-30052-01	227-30053-01	227-30054-01	227-30055-01
	50	227-30050-02	227-30051-02	227-30052-02	227-30053-02	227-30054-02	227-30055-02
	75	227-30050-03	227-30051-03	227-30052-03	227-30053-03	227-30054-03	227-30055-03
	100	227-30050-04	227-30051-04	227-30052-04	227-30053-04	227-30054-04	227-30055-04
	125	-	-	227-30052-05	227-30053-05	227-30054-05	227-30055-05
	150	227-30050-05	227-30051-05	227-30052-06	227-30053-06	227-30054-06	227-30055-06
	250	227-30050-06	227-30051-06	227-30052-07	227-30053-07	227-30054-07	227-30055-07
5	30	227-30056-01	227-30057-01	227-30058-01	227-30059-01	227-30060-01	227-30061-01
	50	227-30056-02	227-30057-02	227-30058-02	227-30059-02	227-30060-02	227-30061-02
	75	227-30056-03	227-30057-03	227-30058-03	227-30059-03	227-30060-03	227-30061-03
	100	227-30056-04	227-30057-04	227-30058-04	227-30059-04	227-30060-04	227-30061-04
	125	-	-	227-30058-05	227-30059-05	227-30060-05	227-30061-05
	150	227-30056-05	227-30057-05	227-30058-06	227-30059-06	227-30060-06	227-30061-06
	250	227-30056-06	227-30057-06	227-30058-07	227-30059-07	227-30060-07	227-30061-07

UHPLC/HPLC Columns

Cartridge Guard Columns

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30067-01	227-30068-01	227-30069-01	227-30070-01	227-30532-01
	20	-	-	227-30071-01	227-30072-01	227-30532-02
5	10	227-30073-01	227-30074-01	227-30075-01	227-30077-01	227-30532-01
	20	-	-	227-30076-01	227-30078-01	227-30532-02
Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder				
		1.0	1.5	3.0	4.0	
3	10	227-30067-02	227-30068-02	227-30069-02	227-30070-02	
	20	-	-	227-30071-02	227-30072-02	
5	10	227-30073-02	227-30074-02	227-30075-02	227-30077-02	
	20	-	-	227-30076-02	227-30078-02	

Analytical Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
1.9	50	227-30048-01	227-30049-01	-	50/7200
	100	227-30048-02	227-30049-02	-	80/11600
	150	227-30048-03	227-30049-03	-	
3	50	227-30084-01	227-30085-01	227-30086-01	50/7200
	100	227-30084-02	227-30085-02	227-30086-02	
	150	227-30084-03	227-30085-03	227-30086-03	
	250	227-30084-04	227-30085-04	227-30086-04	

Cartridge Guard Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)			Pressure Tolerance (MPa)/(PSI)	Holder
		1.5	2.1	3.0		
1.9	10	227-30087-01	227-30088-01	227-30089-01	80/11600	227-30533-01
3	10	227-30090-01	227-30091-01	227-30092-01		
Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			Pressure Tolerance (MPa)/(PSI)	
		1.5	2.1	3.0		
1.9	10	227-30087-02	227-30088-02	227-30089-02	80/11600	
3	10	227-30090-02	227-30091-02	227-30092-02		

Pre-column Type Guard Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
1.9	30	227-30777-01	227-30778-01	227-30779-01	80/11600
3		227-30780-01	227-30781-01	227-30782-01	50/7200

Shim-pack GIS C18

High Retentivity, Lower Column Back Pressure

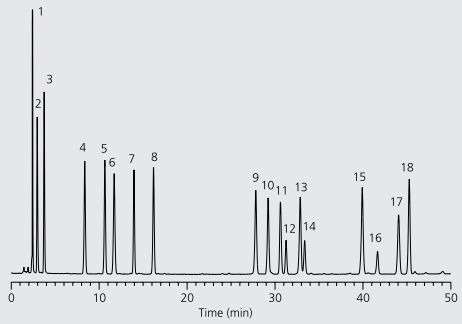
Widely used octadecyl bonded silica gel enables the Shim-pack GIS C18 to have strong hydrophobic interaction and low absorption of ionic compounds. In addition, highly uniform particles ensure stable mobile phase delivery and outstanding low pressure.

Shim-pack GIS C18 is ideal for preparative separations. Higher surface area silica and strong retentivity provide high preparative loading capacity without sacrificing peak shape.

Bonded Phase	Octadecyl Groups
Particle Size	2µm, 3µm, 4µm, 5µm, 10µm
Pore Size	10 nm
Surface Area	450 m²/g
Carbon Loading	15%
End-capping	Yes
pH Range	2 to 7.5
USP Code	L1

Analysis Examples

Food Dyes



Peaks

1. Tartrazine	7.6 mg/L	10. Ponceau SX	5.3 mg/L
2. Amaranth	3.8 mg/L	11. Orange I	5.3 mg/L
3. Ingigocarmine	7.6 mg/L	12. Fast green FCF	3.0 mg/L
4. New coccine	3.8 mg/L	13. Brilliant blue FCF	3.0 mg/L
5. Sunset Yellow FCF	5.3 mg/L	14. Ponceau 3R	7.6 mg/L
6. Naphthol Yellow S	7.6 mg/L	15. Erythrosine	5.3 mg/L
7. Uranine	3.8 mg/L	16. Azure Blue VX	3.0 mg/L
8. Allura Red AC	5.3 mg/L	17. Orange II	7.6 mg/L
9. Ponceau R	7.6 mg/L	18. Acid red	3.0 mg/L

Conditions

Column : Shim-pack GIS C18 (150 mmL. × 4.6 mmI.D, 4 µm)
(P/N: 227-30100-07)
Mobile Phase : A) 10 mmol/L Disodium phosphate buffer solution (pH 6.9)
B) Acetonitrile
A/B = 90/10 - 50 min - 65/35
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Detection : UV 270 nm
Injection Vol. : 10 µL

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	33	227-30095-01	227-30096-01	227-30096-05	227-30096-12	227-30096-19	227-30096-26
	50	227-30095-02	227-30096-02	227-30096-06	227-30096-13	227-30096-20	227-30096-27
	75	227-30095-03	227-30096-03	227-30096-07	227-30096-14	227-30096-21	227-30096-28
	100	227-30095-04	227-30096-04	227-30096-08	227-30096-15	227-30096-22	227-30096-29
	125	-	-	227-30096-09	227-30096-16	227-30096-23	227-30096-30
	150	-	-	227-30096-10	227-30096-17	227-30096-24	227-30096-31
	250	-	-	227-30096-11	227-30096-18	227-30096-25	227-30096-32
4	30	-	-	227-30097-01	227-30098-01	227-30099-01	227-30100-01
	33	-	-	227-30097-02	227-30098-02	227-30099-02	227-30100-02
	50	-	-	227-30097-03	227-30098-03	227-30099-03	227-30100-03
	75	-	-	227-30097-04	227-30098-04	227-30099-04	227-30100-04
	100	-	-	227-30097-05	227-30098-05	227-30099-05	227-30100-05
	125	-	-	227-30097-06	227-30098-06	227-30099-06	227-30100-06
	150	-	-	227-30097-07	227-30098-07	227-30099-07	227-30100-07
	250	-	-	227-30097-08	227-30098-08	227-30099-08	227-30100-08
5	30	-	-	227-30103-01	227-30104-01	227-30105-01	227-30106-01
	33	227-30101-01	227-30102-01	227-30103-02	227-30104-02	227-30105-02	227-30106-02
	50	227-30101-02	227-30102-02	227-30103-03	227-30104-03	227-30105-03	227-30106-03
	75	227-30101-03	227-30102-03	227-30103-04	227-30104-04	227-30105-04	227-30106-04
	100	227-30101-04	227-30102-04	227-30103-05	227-30104-05	227-30105-05	227-30106-05
	125	-	-	227-30103-06	227-30104-06	227-30105-06	227-30106-06
	150	227-30101-05	227-30102-05	227-30103-07	227-30104-07	227-30105-07	227-30106-07
	250	227-30101-06	227-30102-06	227-30103-08	227-30104-08	227-30105-08	227-30106-08

UHPLC/HPLC Columns

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	4.0	4.6
10	150	227-30111-01	227-30112-01
	250	227-30111-02	227-30112-02

Cartridge Guard Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30117-01	227-30118-01	227-30119-01	227-30121-01	227-30532-01
	20	-	-	227-30120-01	227-30123-01	227-30532-02
4	10	227-30124-01	227-30125-01	227-30126-01	227-30128-01	227-30532-01
	20	-	-	227-30127-01	227-30129-01	227-30532-02
5	10	227-30130-01	227-30131-01	227-30132-01	227-30134-01	227-30532-01
	20	-	-	227-30133-01	227-30135-01	227-30532-02

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			
		1.0	1.5	3.0	4.0
3	10	227-30117-02	227-30118-02	227-30119-02	227-30122-02
	20	-	-	227-30120-02	227-30123-02
4	10	227-30124-02	227-30125-02	227-30126-02	227-30128-02
	20	-	-	227-30127-02	227-30129-02
5	10	227-30130-02	227-30131-02	227-30132-02	227-30134-02
	20	-	-	227-30133-02	227-30135-02

Analytical Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
2	30	227-30093-01	227-30094-01	-	50/7200
	50	227-30093-02	227-30094-02	-	
	75	227-30093-03	227-30094-03	-	
	100	227-30093-04	227-30094-04	-	80/11600
	150	227-30093-05	227-30094-05	-	
3	30	227-30149-01	227-30150-01	227-30151-01	50/7200
	50	227-30149-02	227-30150-02	227-30151-02	
	75	227-30149-03	227-30150-03	227-30151-03	
	100	227-30149-04	227-30150-04	227-30151-04	
	150	227-30149-05	227-30150-05	227-30151-05	
	250	227-30149-06	227-30150-06	227-30151-06	

Cartridge Guard Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)			Pressure Tolerance (MPa)/(PSI)	Holder
		1.5	2.1	3.0		
2	10	227-30152-01	227-30153-01	227-30154-01	80/11600	227-30533-01
3	10	227-30155-01	227-30156-01	227-30157-01		

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			Pressure Tolerance (MPa)/(PSI)
		1.5	2.1	3.0	
2	10	227-30152-02	227-30153-02	227-30154-02	80/11600
3	10	227-30155-02	227-30156-02	227-30157-02	

Pre-column Type Guard Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
2	30	227-30783-01	227-30784-01	227-30785-01	80/11600
3		227-30786-01	227-30787-01	227-30788-01	50/7200

Shim-pack GIS C18-P

High Steric Selectivity

Shim-pack GIS C18-P is designed with a polymerically bonded octadecy group, which provides high steric selectivity for separation of planar and non-planar compounds. It achieves complete baseline separation of structurally similar compounds such as vitamin D2 and D3 because of the planarity recognition capability.

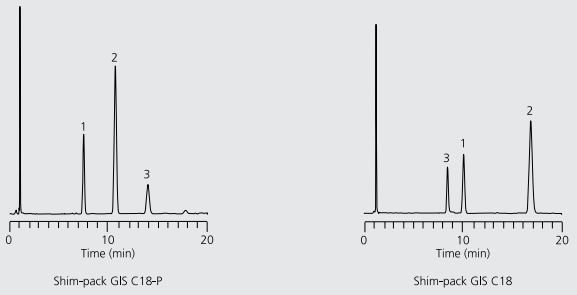
Shim-pack GIS C18-P is also ideal for the HPLC analysis of 16 PAH compounds listed as target pollutants by the U.S. EPA.

Bonded Phase	Octadecyl Groups
Particle Size	3 µm, 5 µm
Pore Size	10 nm
Surface Area	450 m²/g
Carbon Loading	29 %
End-capping	-
pH Range	2 - 7.5
USP Code	L1

Analysis Examples

Due to increased retention of planar structural compounds, Shim-pack GIS C18-P shows different selectivity compared to Shim-pack GIS C18.

Analysis of Planar and Non-planar Compounds

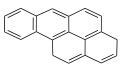


Peaks

1. Phenanthro[3,4-c]phenanthrene (PhPh)

2. Tetrabenzonaphthalene (TBN)

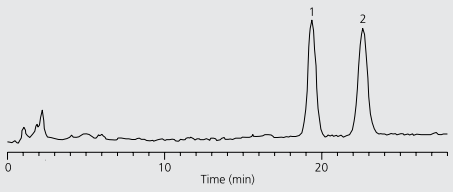
3. Benzo[a]pyrene (BaP)



Conditions

Column : 250 mmL. × 4.6 mmI.D., 5 µm
Mobile Phase : A) Water
B) Acetonitrile
A/B = 15/85 (v/v)
Flow Rate : 2.0 mL/min
Col. Temp. : 30 °C
Detection : UV 254 nm
Samples : Standard Reference Material 869

Analysis of Vitamin D in Food



Peaks (100 µg/L each)

1. Vitamin D2 (Calciferol)
2. Vitamin D3 (Cholecarciferol)

Conditions

Column : Shim-pack GIS C18-P (250 mmL. × 4.6 mmI.D., 5 µm)
(P/N: 227-30557-07)
Mobile Phase : Acetonitrile
Flow Rate : 1.5 mL/min
Col. Temp. : 40 °C
Detection : UV 265 nm
Injection Vol. : 200 µL

UHPLC/HPLC Columns

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	30	-	-	227-30536-01	227-30537-01	227-30538-01	227-30539-01
	33	227-30534-01	227-30535-01	227-30536-02	227-30537-02	227-30538-02	227-30539-02
	50	227-30534-02	227-30535-02	227-30536-03	227-30537-03	227-30538-03	227-30539-03
	75	227-30534-03	227-30535-03	227-30536-04	227-30537-04	227-30538-04	227-30539-04
	100	227-30534-04	227-30535-04	227-30536-05	227-30537-05	227-30538-05	227-30539-05
	150	227-30534-05	227-30535-05	227-30536-06	227-30537-06	227-30538-06	227-30539-06
	250	227-30534-06	227-30535-06	227-30536-07	227-30537-07	227-30538-07	227-30539-07
5	30	-	-	227-30554-01	227-30555-01	227-30556-01	227-30557-01
	33	227-30552-01	227-30553-01	227-30554-02	227-30555-02	227-30556-02	227-30557-02
	50	227-30552-02	227-30553-02	227-30554-03	227-30555-03	227-30556-03	227-30557-03
	75	227-30552-03	227-30553-03	227-30554-04	227-30555-04	227-30556-04	227-30557-04
	100	227-30552-04	227-30553-04	227-30554-05	227-30555-05	227-30556-05	227-30557-05
	150	227-30552-05	227-30553-05	227-30554-06	227-30555-06	227-30556-06	227-30557-06
	250	227-30552-06	227-30553-06	227-30554-07	227-30555-07	227-30556-07	227-30557-07

Cartridge Guard Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	21.5	3.0	4.0	
3	10	227-30546-01	227-30547-01	227-30548-01	227-30550-01	227-30532-01
	20	-	-	227-30549-01	227-30551-01	227-30532-02
5	10	227-30578-01	227-30579-01	227-30580-01	227-30582-01	227-30532-01
	20	-	-	227-30581-01	227-30583-01	227-30532-02

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			
		1.0	1.5	3.0	4.0
3	10	227-30546-02	227-30547-02	227-30548-02	227-30550-02
	20	-	-	227-30549-02	227-30551-02
5	10	227-30578-02	227-30579-02	227-30580-02	227-30582-02
	20	-	-	227-30581-02	227-30583-02

For preparative columns, please refer to page 69

Shim-pack GIS RP-Shield

Embedded with a Polar Functional Group

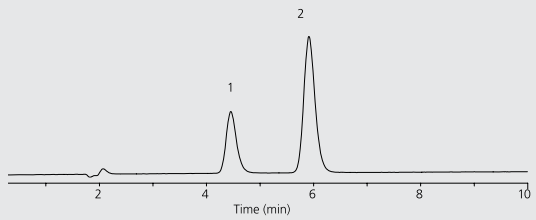
Shim-pack GIS RP-Shield contains a polar functional group embedded between silica surface and an octadecyl group, making it stable in 100% aqueous mobile phases without phase collapse. The embedded polar functional group is also extremely base deactivated, which enables the column to provide superior peak shape for acids.

Shim-pack GIS RP-Shield provides unique selectivity as hydrogen bonding interactions, making it suitable for separations that cannot be achieved by other modes, such as hydrophobic interactions or π-π interactions.

Bonded Phase	Octadecyl Groups
Particle Size	5 µm
Pore Size	10 nm
Surface Area	450 m²/g
Carbon Loading	9 %
End-capping	-
pH Range	2 - 7.5
USP Code	L1

Analysis Examples

Analysis of Phenoxyacetic Acid and Benzoic Acid



Peaks
1. Phenoxyacetic acid
2. Benzoic acid

Conditions

Column : Shim-pack GIS RP-Shield (150 mmL. × 3.0 mmI.D., 5 µm) (P/N: 227-30587-06)
Mobile Phase : A) 0.1 % Formic acid in Water
B) Acetonitrile
A/B = 50/50 (v/v)
Flow Rate : 0.4 mL/min
Col. Temp. : 40 °C
Detection : UV 254 nm

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
5	30	-	-	227-30586-01	227-30587-01	227-30588-01	227-30589-01
	33	227-30584-01	227-30585-01	227-30586-02	227-30587-02	227-30588-02	227-30589-02
	50	227-30584-02	227-30585-02	227-30586-03	227-30587-03	227-30588-03	227-30589-03
	75	227-30584-03	227-30585-03	227-30586-04	227-30587-04	227-30588-04	227-30589-04
	100	227-30584-04	227-30585-04	227-30586-05	227-30587-05	227-30588-05	227-30589-05
	150	227-30584-05	227-30585-05	227-30586-06	227-30587-06	227-30588-06	227-30589-06
	250	227-30584-06	227-30585-06	227-30586-07	227-30587-07	227-30588-07	227-30589-07

Cartridge Guard Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
5	10	227-30612-01	227-30613-01	227-30614-01	227-30616-01	227-30532-01
	20	-	-	227-30615-01	227-30617-01	227-30532-02

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			
		1.0	1.5	3.0	4.0
5	10	227-30612-02	227-30613-02	227-30614-02	227-30616-02
	20	-	-	227-30615-02	227-30617-02

Shim-pack GIST C8

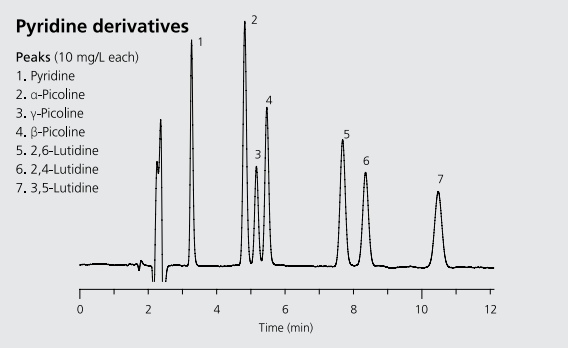
Ultra-High Inertness, High Durability

Shim-pack GIST C8 is packed with high-purity porous spherical silica for delivering the same extreme inertness to elute either basic or acidic compounds without undesired adsorption. Low retentivity and no sample adsorption enable analysis of natural samples.

Shim-pack GIST C8 is the ideal choice for the rapid analysis of hydrophobic compounds.

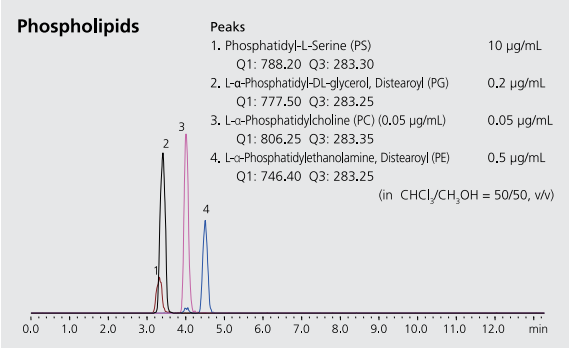
Bonded Phase	Octyl Group
Particle Size	2 µm, 3 µm, 5 µm
Pore Size	10 nm
Surface Area	350 m²/g
Carbon Loading	8 %
End-capping	Yes
pH Range	1 to 10
USP Code	L7

Analysis Examples



Conditions

Column : Shim-pack GIST C8 (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 227-30137-07)
Mobile Phase : A) 10 mmol/L Disodium phosphate buffer solution (pH 8.0)
B) Tetrahydrofuran
A/B = 87/13, v/v
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Detection : UV 260 nm
Injection Vol. : 5 µL



Conditions

Column : Shim-pack GIST C8 (150 mmL. × 2.1 mmI.D., 3 µm) (P/N: 227-30164-07)
Mobile Phase : 0.1 % Formic acid, 5 mmol/L Ammonium formate in Methanol
Flow Rate : 0.2 mL/min
Col. Temp. : 40 °C
Detection : LC/MS/MS (ESI, Negative, MRM)
Injection Vol. : 2 µL

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	20	-	-	227-30164-01	227-30165-01	227-30166-01	227-30167-01
	30	227-30162-01	227-30163-01	227-30164-02	227-30165-02	227-30166-02	227-30167-02
	50	227-30162-02	227-30163-02	227-30164-03	227-30165-03	227-30166-03	227-30167-03
	75	227-30162-03	227-30163-03	227-30164-04	227-30165-04	227-30166-04	227-30167-04
	100	227-30162-04	227-30163-04	227-30164-05	227-30165-05	227-30166-05	227-30167-05
	125	-	-	227-30164-06	227-30165-06	227-30166-06	227-30167-06
	150	227-30162-05	227-30163-05	227-30164-07	227-30165-07	227-30166-07	227-30167-07
	250	227-30162-06	227-30163-06	227-30164-08	227-30165-08	227-30166-08	227-30167-08
5	20	-	-	227-30170-01	227-30171-01	227-30172-01	227-30173-01
	30	227-30168-01	227-30169-01	227-30170-02	227-30171-02	227-30172-03	227-30173-02
	50	227-30168-02	227-30169-02	227-30170-03	227-30171-03	227-30172-04	227-30173-03
	75	227-30168-03	227-30169-03	227-30170-04	227-30171-04	227-30172-05	227-30173-04
	100	227-30168-04	227-30169-04	227-30170-05	227-30171-05	227-30172-06	227-30173-05
	125	-	-	227-30170-06	227-30171-06	227-30172-07	227-30173-06
	150	227-30168-05	227-30169-05	227-30170-07	227-30171-07	227-30172-08	227-30173-07
	250	227-30168-06	227-30169-06	227-30170-08	227-30171-08	227-30172-09	227-30173-09

Shim-pack GIST C8

Cartridge Guard Columns

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30179-01	227-30180-01	227-30181-01	227-30183-01	227-30532-01
	20	-	-	227-30182-01	227-30184-01	227-30532-02
5	10	227-30185-01	227-30187-01	227-30188-01	227-30190-01	227-30532-01
	20	-	-	227-30189-01	227-30191-01	227-30532-02

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			
		1.0	1.5	3.0	4.0
3	10	227-30179-02	227-30180-02	227-30181-02	227-30183-02
	20	-	-	227-30182-02	227-30184-02
5	10	227-30186-02	227-30187-02	227-30188-02	227-30190-02
	20	-	-	227-30189-02	227-30192-02

Analytical Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
2	30	227-30160-01	227-30161-01	-	50/7200
	50	227-30160-02	227-30161-02	-	
	75	227-30160-03	227-30161-03	-	
	100	227-30160-04	227-30161-04	-	80/11600
	150	227-30160-05	227-30161-05	-	
3	30	227-30198-01	227-30199-01	227-30200-01	50/7200
	50	227-30198-02	227-30199-02	227-30200-02	
	75	227-30198-03	227-30199-03	227-30200-03	
	100	227-30198-04	227-30199-04	227-30200-04	
	150	227-30198-05	227-30199-05	227-30200-05	
	250	227-30198-06	227-30199-06	227-30200-06	

Cartridge Guard Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)			Pressure Tolerance (MPa)/(PSI)	Holder
		1.5	2.1	3.0		
2	10	227-30201-01	227-30202-01	227-30203-01	80/11600	227-30533-01
3	10	227-30204-01	227-30205-01	227-30206-01		

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			Pressure Tolerance (MPa)/(PSI)
		1.5	2.1	3.0	
2	10	227-30201-02	227-30202-02	227-30203-02	80/11600
3	10	227-30204-02	227-30205-02	227-30206-02	

Pre-column Type Guard Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
2	30	227-30789-01	227-30790-01	227-30791-01	80/11600
3		227-30792-01	227-30793-01	227-30794-01	50/7200

Shim-pack GIST Phenyl

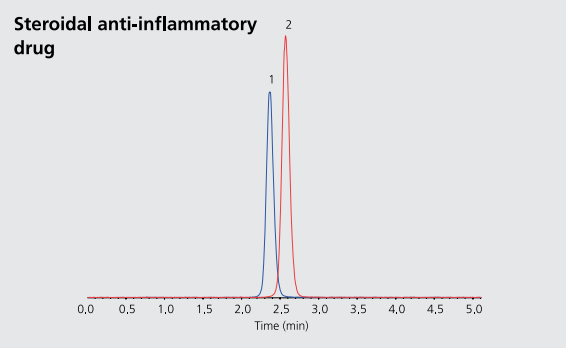
Extremely Strong π-π Interactions

The extremely unique phase characteristics of Shim-pack GIST Phenyl are critical to resolving compounds that could not be separated with a C18 or C8 phase column.

In addition to π-π interactions, Shim-pack GIS Phenyl provides hydrogen bonding secondary interactions, which results in retaining polar compounds at the same time. As the phenyl groups are directly bonded to the silica gel, Shim-pack GIS Phenyl is also capable of the analysis of structural isomers due to its high stereo-selectivity.

Bonded Phase	Phenyl Group
Particle Size	2 µm, 3 µm, 5 µm
Pore Size	10 nm
Surface Area	350 m²/g
Carbon Loading	10 %
End-capping	-
pH Range	2 to 7.5
USP Code	L11

Analysis Examples



Peaks (0.1 mg/L each)
1. Hydrocortisone
2. Prednisolone

Conditions

Column : Shim-pack GIST Phenyl (50 mmL. × 2.1 mmI.D., 2 µm) (P/N: 227-30207-02)
Mobile Phase : A) 0.05 % Formic acid in Water
B) 0.05 % Formic acid in Methanol
A/B = 60/40, v/v
Flow Rate : 0.6 mL/min
Col. Temp. : 40 °C
Detection : LC/MS/MS (ESI, Positive, MRM)
Injection Vol. : 5 µL

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	20	-	-	227-30211-01	227-30212-01	227-30213-01	227-30214-01
	30	227-30209-01	227-30210-01	227-30211-02	227-30212-02	227-30213-02	227-30214-02
	50	227-30209-02	227-30210-02	227-30211-03	227-30212-03	227-30213-03	227-30214-03
	75	227-30209-03	227-30210-03	227-30211-04	227-30212-04	227-30213-04	227-30214-04
	100	227-30209-04	227-30210-04	227-30211-05	227-30212-05	227-30213-05	227-30214-05
	150	227-30209-05	227-30210-05	227-30211-06	227-30212-06	227-30213-06	227-30214-06
	250	227-30209-06	227-30210-06	227-30211-07	227-30212-07	227-30213-07	227-30214-07
5	20	-	-	227-30217-01	227-30218-01	227-30219-01	227-30220-01
	30	227-30215-01	227-30216-01	227-30217-02	227-30218-02	227-30219-02	227-30220-02
	50	227-30215-02	227-30216-02	227-30217-03	227-30218-03	227-30219-03	227-30220-03
	75	227-30215-03	227-30216-03	227-30217-04	227-30218-04	227-30219-04	227-30220-04
	100	227-30215-04	227-30216-04	227-30217-05	227-30218-05	227-30219-05	227-30220-05
	150	227-30215-05	227-30216-05	227-30217-06	227-30218-06	227-30219-06	227-30220-06
	250	227-30215-06	227-30216-06	227-30217-07	227-30218-07	227-30219-07	227-30220-08

Shim-pack GIST Phenyl

Cartridge Guard Columns

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30226-01	227-30227-01	227-30228-01	227-30230-01	227-30532-01
	20	-	-	227-30229-01	227-30231-01	227-30532-02
5	10	227-30232-01	227-30233-01	227-30234-01	227-30236-01	227-30532-01
	20	-	-	227-30235-01	227-30237-01	227-30532-02
Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder				
		1.0	1.5	3.0	4.0	
3	10	227-30226-02	227-30227-02	227-30228-02	227-30230-02	
	20	-	-	227-30229-02	227-30231-02	
5	10	227-30232-02	227-30233-02	227-30234-02	227-30236-02	
	20	-	-	227-30235-02	227-30237-02	

Analytical Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
2	30	227-30207-01	227-30208-01	-	50/7200
	50	227-30207-02	227-30208-02	-	
	75	227-30207-03	227-30208-03	-	
	100	227-30207-04	227-30208-04	-	80/11600
	150	227-30207-05	227-30208-05	-	
3	30	227-30243-01	227-30244-01	227-30245-01	50/7200
	50	227-30243-02	227-30244-02	227-30245-02	
	75	227-30243-03	227-30244-03	227-30245-03	
	100	227-30243-04	227-30244-04	227-30245-04	
	150	227-30243-05	227-30244-05	227-30245-05	
	250	227-30243-06	227-30244-06	227-30245-06	

Cartridge Guard Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)			Pressure Tolerance (MPa)/(PSI)	Holder
		1.5	2.1	3.0		
2	10	227-30246-01	227-30247-01	227-30248-01	80/11600	227-30533-01
3	10	227-30249-01	227-30250-01	227-30251-01		
Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			Pressure Tolerance (MPa)/(PSI)	
		1.5	2.1	3.0		
2	10	227-30246-02	227-30247-02	227-30248-02	80/11600	
3	10	227-30249-02	227-30250-02	227-30251-02		

Pre-column Type Guard Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
2	30	227-30795-01	227-30796-01	227-30797-01	80/11600
3		227-30798-01	227-30799-01	227-30800-01	50/7200

Shim-pack GIST Phenyl-Hexyl

Alternative Selectivity to C18 Columns

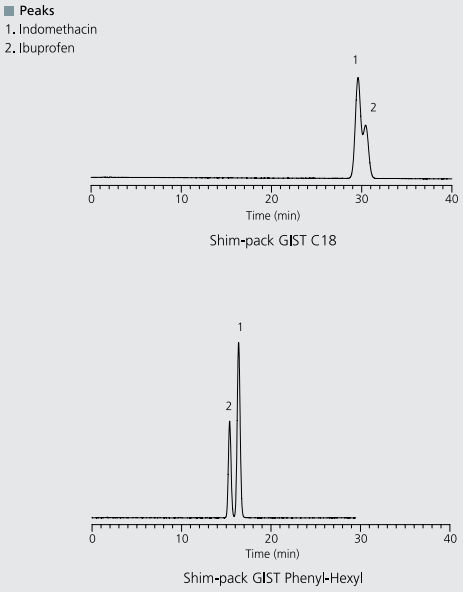
Shim-pack GIST Phenyl-Hexyl columns are bonded with a phenyl ring together with a hexyl (C6) chain, which provides complementary selectivity to straight alkyl-chain columns due to its π-π interactions and hydrophobic interactions. Furthermore, Shim-pack GIST Phenyl-Hexyl maintains the same ultra-high inertness, wide pH range and high durability as the Shim-pack GIST C18, achieving stronger retention than other phenyl columns as well as reducing or eliminating adsorption of polar compounds.

Bonded Phase	Phenylhexyl Groups
Particle Size	3 µm, 5 µm
Pore Size	10 nm
Surface Area	350 m²/g
Carbon Loading	9 %
End-capping	Yes
pH Range	1 to 10
USP Code	L11

Analysis Examples

Different Selectivity to Shim-pack GIST C18

Analysis of Analgesic Drugs

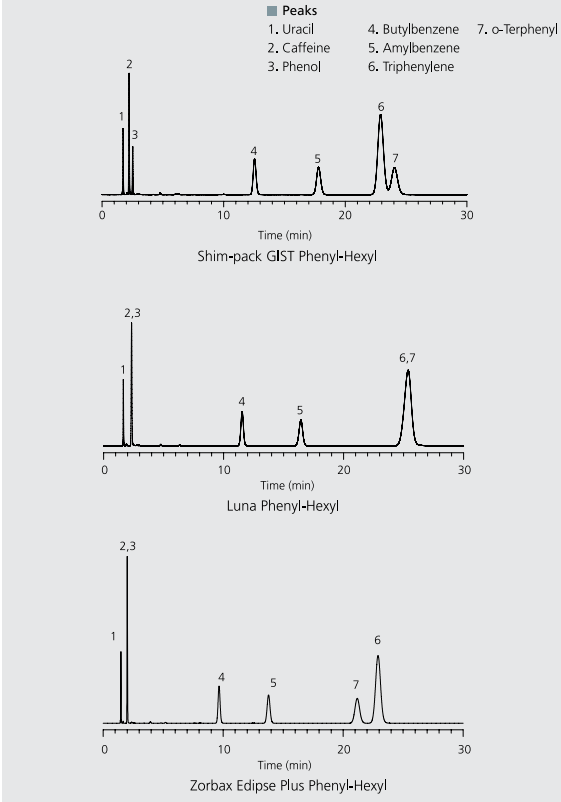


Conditions

Column : 150 mmL. × 4.6 mmI.D., 5 µm
Mobile Phase : A) Acetonitrile
B) 25 mmol/L Monopotassium phosphate buffer solution (pH 3.0)
Flow Rate : A/B=45/55 (v/v)
Col. Temp. : 40 °C
Detection : UV 230 nm

Stronger Retentivity Than Other Phenyl Phase

Analysis of Samples for Column Selectivity



Conditions

Column : 150 mmL. × 4.6 mmI.D., 5 µm
Mobile Phase : A) Water
B) Methanol
A/B = 30/70 (v/v)
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Detection : UV 254 nm

Shim-pack GIST Phenyl-Hexyl

Analytical Columns

Particle Size (μm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	30	227-30667-01	227-30668-01	227-30669-01	227-30670-01	227-30671-01	227-30672-01
	50	227-30667-02	227-30668-02	227-30669-02	227-30670-02	227-30671-02	227-30672-02
	75	227-30667-03	227-30668-03	227-30669-03	227-30670-03	227-30671-03	227-30672-03
	100	227-30667-04	227-30668-04	227-30669-04	227-30670-04	227-30671-04	227-30672-04
	150	227-30667-05	227-30668-05	227-30669-05	227-30670-05	227-30671-05	227-30672-05
	250	227-30667-06	227-30668-06	227-30669-06	227-30670-06	227-30671-06	227-30672-06
5	30	227-30685-01	227-30686-01	227-30687-01	227-30688-01	227-30689-01	227-30690-01
	50	227-30685-02	227-30686-02	227-30687-02	227-30688-02	227-30689-02	227-30690-02
	75	227-30685-03	227-30686-03	227-30687-03	227-30688-03	227-30689-03	227-30690-03
	100	227-30685-04	227-30686-04	227-30687-04	227-30688-04	227-30689-04	227-30690-04
	150	227-30685-05	227-30686-05	227-30687-05	227-30688-05	227-30689-05	227-30690-05
	250	227-30685-06	227-30686-06	227-30687-06	227-30688-06	227-30689-06	227-30690-06

Cartridge Guard Columns

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30679-01	227-30680-01	227-30681-01	227-30683-01	227-30532-01
	20	-	-	227-30682-01	227-30684-01	227-30532-02
5	10	227-30707-01	227-30708-01	227-30709-01	227-30711-01	227-30532-01
	20	-	-	227-30710-01	227-30712-01	227-30532-02

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			Pressure Tolerance (MPa)
		1.0	1.5	3.0	
3	10	227-30679-02	227-30680-02	227-30681-02	227-30683-02
	20	-	-	227-30682-02	227-30684-02
5	10	227-30707-02	227-30708-02	227-30709-02	227-30711-02
	20	-	-	227-30710-02	227-30712-02

Cartridge Guard Columns

Particle Size (μm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
3	30	-	227-30714-01	227-30715-01	50/7200
	50	227-30713-01	227-30714-02	227-30715-02	
	70	227-30713-02	227-30714-03	227-30715-03	
	100	227-30713-03	227-30714-04	227-30715-04	
	150	227-30713-04	227-30714-05	227-30715-05	
	250	227-30713-05	227-30714-06	227-30715-06	

Cartridge Guard Columns (High Pressure series)

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)			Pressure Tolerance (MPa)/(PSI)	Holder
		1.5	2.1	3.0		
3	10	227-30716-01	227-30717-01	227-30718-01	80/11600	227-30533-01

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			Pressure Tolerance (MPa)/(PSI)
		1.5	2.1	3.0	
3	10	227-30716-02	227-30717-02	227-30718-02	80/11600

Pre-column Type Guard Columns (High-Pressure Series)

Particle Size (μm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)/(PSI)
3	30	227-30804-01	227-30805-01	227-30806-01	50/7200

Shim-pack GIS HILIC

Ideal for the Separation of Highly Polar Basic Compounds

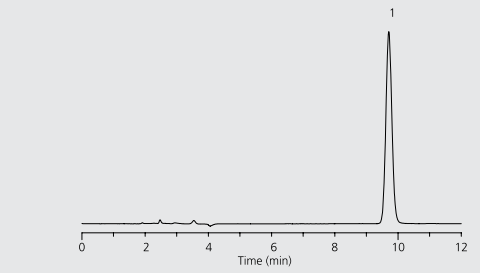
Shim-pack GIS HILIC is designed for Hydrophilic Interaction Liquid Chromatography (HILIC). It is chemically bonded with a diol group, which provides excellent peak shape for basic and neutral polar compounds.

In addition, HILIC is a variation of normal phase mode. It is capable of using organic solvents mixed with water as mobile phase, while normal phase mode uses non-aqueous organic solvents. In HILIC, the higher the organic concentration in the solvents, the greater is the retention of highly polar compounds.

Bonded Phase	Diol Groups
Particle Size	3 µm, 5 µm
Pore Size	10 nm
Surface Area	450 m^2/g
Carbon Loading	20 %
End-capping	-
pH Range	2 to 7.5
USP Code	L20

Analysis Examples

Analysis of Allantoin

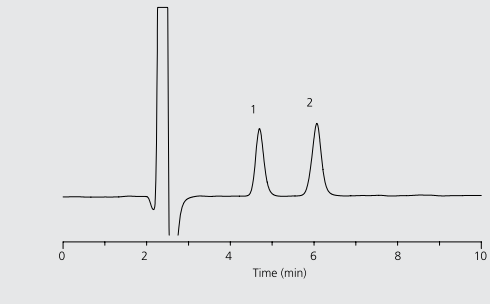


Peaks
1. Allantoin

Conditions

Column	:	Shim-pack GIS HILIC (250 mmL. × 3.0 mmI.D., 5 µm) (P/N: 227-30639-07)
Mobile Phase	:	A) 10 mmol/L Ammonium acetate B) Acetonitrile A/B = 5/95 (v/v)
Flow Rate	:	0.4 mL/min
Col. Temp.	:	40 °C
Detection	:	UV 210 nm

Analysis of Taurine and Inositol



Peaks (500 mg/L each)
1. Taurine
2. Inositol

Conditions

Column	:	Shim-pack GIS HILIC (150 mmL. × 3.0 mmI.D., 5 µm) (P/N: 227-30639-06)
Mobile Phase	:	A) Water B) Acetonitrile A/B = 20/80 (v/v)
Flow Rate	:	0.4 mL/min
Col. Temp.	:	40 °C
Detection	:	RID (35 °C, positive)
Injection Vol.	:	20 µL

Shim-pack GIS HILIC

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	30	-	-	227-30620-01	227-30621-01	227-30622-01	227-30623-01
	33	227-30618-01	227-30619-01	227-30620-02	227-30621-02	227-30622-02	227-30623-02
	50	227-30618-02	227-30619-02	227-30620-03	227-30621-03	227-30622-03	227-30623-03
	75	227-30618-03	227-30619-03	227-30620-04	227-30621-04	227-30622-04	227-30623-04
	100	227-30618-04	227-30619-04	227-30620-05	227-30621-05	227-30622-05	227-30623-05
	150	227-30618-05	227-30619-05	227-30620-06	227-30621-06	227-30622-06	227-30623-06
	250	227-30618-06	227-30619-06	227-30620-07	227-30621-07	227-30622-07	227-30623-07
5	30	-	-	227-30638-01	227-30639-01	227-30640-01	227-30641-01
	33	227-30636-01	227-30637-01	227-30638-02	227-30639-02	227-30640-02	227-30641-02
	50	227-30636-02	227-30637-02	227-30638-03	227-30639-03	227-30640-03	227-30641-03
	75	227-30636-03	227-30637-03	227-30638-04	227-30639-04	227-30640-04	227-30641-04
	100	227-30636-04	227-30637-04	227-30638-05	227-30639-05	227-30640-05	227-30641-05
	150	227-30636-05	227-30637-05	227-30638-06	227-30639-06	227-30640-06	227-30641-06
	250	227-30636-06	227-30637-06	227-30638-07	227-30639-07	227-30640-07	227-30641-07

Cartridge Guard Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30630-01	227-30631-01	227-30632-01	227-30634-01	227-30532-01
	20	-	-	227-30633-01	227-30635-01	227-30532-02
5	10	227-30661-01	227-30662-01	227-30663-01	227-30665-01	227-30532-01
	20	-	-	227-30664-01	227-30666-01	227-30532-02

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			
		1.0	1.5	3.0	4.0
3	10	227-30630-02	227-30631-02	227-30632-02	227-30634-02
	20			227-30633-02	227-30635-02
5	10	227-30661-02	227-30662-02	227-30663-02	227-30665-02
	20			227-30664-02	227-30666-02

For preparative columns, please refer to page 69

Shim-pack GIST NH2

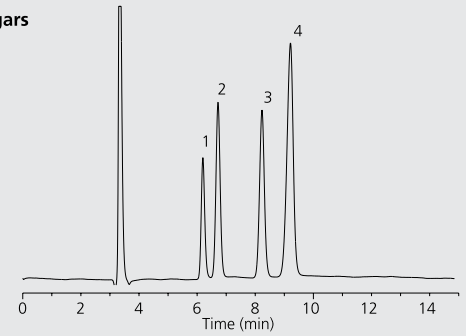
Ideal for Sugar Analysis

New high-purity porous spherical silica chemically bonded with the aminopropyl group ensures the superior stability of Shim-pack GIST NH2. It is capable of the analysis of vitamin E or simultaneous analysis of sugars that are hard to separate in reversed phase mode. In addition, due to being primarily amine-bound, Shim-pack GIST NH2 can analyze sugars with no separation of anomers, even under low-temperature conditions. Furthermore, Shim-pack GIST NH2 delivers highly reliable reproducibility and stability with accurate qualitative and quantitative results.

Bonded Phase	Aminopropyl Group
Particle Size	3 µm, 5 µm
Pore Size	10 nm
Surface Area	350 m^2/g
Carbon Loading	7 %
End-capping	-
pH Range	2 to 7.5
USP Code	L8

Analysis Examples

Sugars

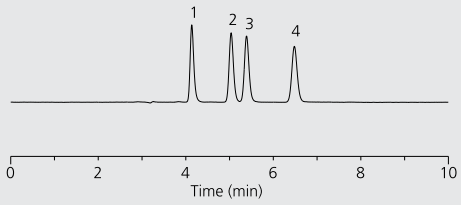


Peaks
1. Fructose
2. Glucose
3. Sucrose
4. Maltose

Conditions

Column : Shim-pack GIST NH2 (250 mmL. × 4.6 mmI.D., 5 µm) (P/N: 227-30302-08)
Mobile Phase : A) Water
B) Acetonitrile
A/B = 25/75, v/v
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Detection : RID
Injection Vol. : 5 µL

Vitamin E



Peaks (25 mg/L each)
1. α-Tocopherol
2. β-Tocopherol
3. γ-Tocopherol
4. δ-Tocopherol

Conditions

Column : Shim-pack GIST NH2 (250 mmL. × 4.6 mmI.D., 5 µm) (P/N: 227-30302-08)
Mobile Phase : A) *n*-Hexane
B) Ethyl acetate
A/B = 70/30, v/v
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Detection : UV 290 nm
Injection Vol. : 10 µL

Shim-pack GIST NH2

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	20	-	-	227-30293-01	227-30294-01	227-30295-01	227-30296-01
	30	227-30291-01	227-30292-01	227-30293-02	227-30294-02	227-30295-02	227-30296-02
	50	227-30291-02	227-30292-02	227-30293-03	227-30294-03	227-30295-03	227-30296-03
	75	227-30291-03	227-30292-03	227-30293-04	227-30294-04	227-30295-04	227-30296-04
	100	227-30291-04	227-30292-04	227-30293-05	227-30294-05	227-30295-05	227-30296-05
	150	227-30291-05	227-30292-05	227-30293-06	227-30294-06	227-30295-06	227-30296-06
	250	227-30291-06	227-30292-06	227-30293-07	227-30294-07	227-30295-07	227-30296-07
5	20	-	-	227-30299-01	227-30300-01	227-30301-01	227-30302-01
	30	227-30297-01	227-30298-01	227-30299-02	227-30300-02	227-30301-02	227-30302-02
	50	227-30297-02	227-30298-02	227-30299-03	227-30300-03	227-30301-03	227-30302-03
	75	227-30297-03	227-30298-03	227-30299-04	227-30300-04	227-30301-04	227-30302-04
	100	227-30297-04	227-30298-04	227-30299-05	227-30300-05	227-30301-05	227-30302-05
	150	227-30297-05	227-30298-05	227-30299-06	227-30300-06	227-30301-06	227-30302-06
	250	227-30297-06	227-30298-06	227-30299-07	227-30300-07	227-30301-07	227-30302-08

Cartridge Guard Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30308-01	227-30308-03	227-30309-01	227-30310-01	227-30532-01
5	10	227-30311-01	227-30312-01	227-30313-01	227-30315-01	
	20	-	-	227-30314-01	227-30316-01	227-30532-02

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			
		1.0	1.5	3.0	4.0
3	10	227-30308-02	227-30308-04	227-30309-02	227-30310-02
5	10	227-30311-02	227-30312-02	227-30313-02	227-30315-02
	20	-	-	227-30314-02	227-30316-02

Shim-pack GIS CN

Suitable in Either Reversed Phase or Normal Phase Mode

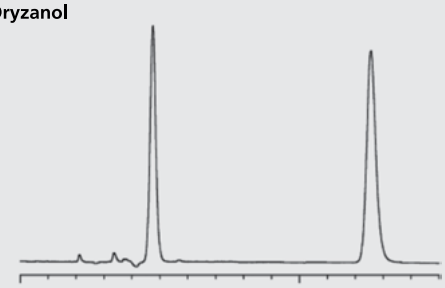
Shim-pack GIS CN is capable of either normal phase or reversed phase analysis. Cyanopropryl groups bonded to silica gel with high density increases the difference recognition of hydrophilicity and the stability. Due to no end-capping, it is capable of analysis utilizing cyano group characteristics.

In reversed phase mode, separation can be achieved for those compounds that could not be separated on straight-chain-alkyl columns, such as C18 or C8 bonded phases. When using the column for reversed phase mode, fully equilibrate the column before use.

Bonded Phase	Cyanopropryl Group
Particle Size	3 µm, 5 µm
Pore Size	10 nm
Surface Area	450 m^2/g
Carbon Loading	14 %
End-capping	-
pH Range	2 to 7.5
USP Code	L10

Analysis Examples

γ-Oryzanol

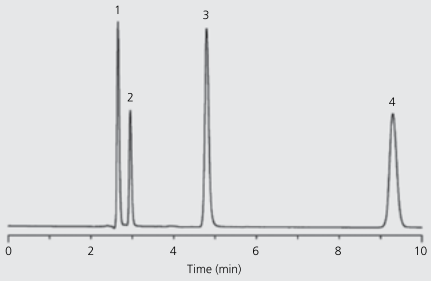


Peaks
1. gamma-oryzanol
2. vanillin

Conditions

Column	:	Shim-pack GIS CN (150 mmL. × 4.6 mmI.D, 5 µm) (P/N: 227-30263-06)
Mobile Phase	:	A) Hexane B) 2-Propanol C) Acetic acid A/B/C = 94/5/1 (v/v/v)
Flow Rate	:	1.0 mL/min
Col. Temp.	:	30 °C
Detection	:	UV 320 nm
Injection Vol.	:	1 µL

Free Amino acids and Organic acids



Peaks
1. Asparagine • H_2O (0.75 mg/mL)
2. Aspartic acid (0.75 mg/mL)
3. Fumaric acid (0.01 mg/mL)
4. Maleic acid (0.01 mg/mL)

Conditions

Column	:	Shim-pack GIS CN (250 mmL. × 4.6 mmI.D., 5 µm) (P/N: 227-30263-07)
Mobile Phase	:	20 mmol/L Monopotassium phosphate buffer solution (pH 4.0)
Flow Rate	:	1.0 mL/min
Col. Temp.	:	40 °C
Detection	:	UV 210 nm
Injection Vol.	:	5 µL

Shim-pack GIS CN

Analytical Columns

Particle Size (μm)	I.D. (mm) / Length (mm)	1.0	1.5	2.1	3.0	4.0	4.6
3	30	-	-	227-30254-01	227-30255-01	227-30256-01	227-30257-01
	33	227-30252-01	227-30253-01	227-30254-02	227-30255-02	227-30256-02	227-30257-02
	50	227-30252-02	227-30253-02	227-30254-03	227-30255-03	227-30256-03	227-30257-03
	75	227-30252-03	227-30253-03	227-30254-04	227-30255-04	227-30256-04	227-30257-04
	100	227-30252-04	227-30253-04	227-30254-05	227-30255-05	227-30256-05	227-30257-05
	150	227-30252-05	227-30253-05	227-30254-06	227-30255-06	227-30256-06	227-30257-06
	250	227-30252-06	227-30253-06	227-30254-07	227-30255-07	227-30256-07	227-30257-07
5	30	-	-	227-30260-01	227-30261-01	227-30262-01	227-30263-01
	33	227-30258-01	227-30259-01	227-30260-02	227-30261-02	227-30262-02	227-30263-02
	50	227-30258-02	227-30259-02	227-30260-03	227-30261-03	227-30262-03	227-30263-03
	75	227-30258-03	227-30259-03	227-30260-04	227-30261-04	227-30262-04	227-30263-04
	100	227-30258-04	227-30259-04	227-30260-05	227-30261-05	227-30262-05	227-30263-05
	150	227-30258-05	227-30259-05	227-30260-06	227-30261-06	227-30262-06	227-30263-06
	250	227-30258-06	227-30259-06	227-30260-07	227-30261-07	227-30262-07	227-30263-07

Cartridge Guard Columns

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)				Holder
		1.0	1.5	3.0	4.0	
3	10	227-30270-01	227-30271-01	227-30272-01	227-30274-01	227-30532-01
	20	-	-	227-30273-01	227-30275-01	227-30532-02
5	10	227-30276-01	227-30277-01	227-30278-01	227-30280-01	227-30532-01
	20	-	-	227-30279-01	227-30281-01	227-30532-02

Particle Size (μm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs) and Holder			
		1.0	1.5	3.0	4.0
3	10	227-30270-02	227-30271-02	227-30272-02	227-30274-02
	20	-	-	227-30273-02	227-30275-02
5	10	227-30276-02	227-30277-02	227-30278-02	227-30280-02
	20	-	-	227-30279-02	227-30281-02

Shim-pack GWS C18

Economical Choice

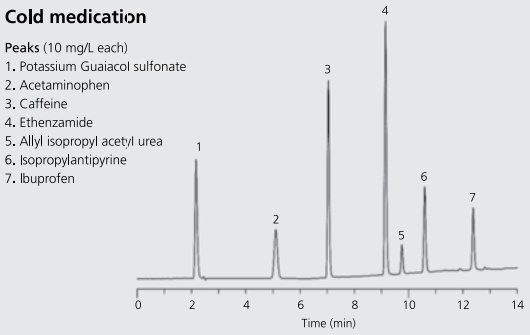
Shim-pack GWS C18 is packed with high-purity silica gel. A uniform pore size ensures low pressure, while complete end-capping makes it possible for analysis of acidic or basic compounds.

Shim-pack GWS series is an ideal choice for cost control.

Bonded Phase	Octadecyl Groups
Particle Size	5 µm
Pore Size	10 nm
Surface Area	450 m^2/g
Carbon Loading	9.5 %
End-capping	Yes
pH Range	2 to 7.5
USP Code	L1

Analysis Examples

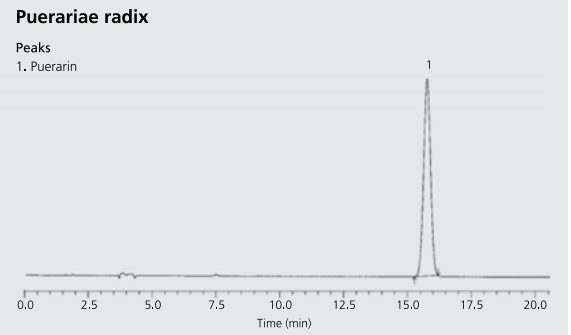
Cold medication



Conditions

Column : Shim-pack GWS C18 (150 mmL. × 4.6 mmI.D., 5 µm) (P/N: 227-30158-01)
Mobile Phase : A) 0.1 % Phosphoric acid in Water
B) Acetonitrile
A/B = 90/10 - 2 min - 90/10 - 10 min - 0/100
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Detection : UV 210 nm
Injection Vol. : 10 µL

Puerariae radix



Conditions

Column : Shim-pack GWS C18 (250 mmL. × 4.6 mmI.D., 5 µm) (P/N: 227-30158-03)
Mobile Phase : A) Water
B) Acetonitrile
A/B = 89/11
Flow Rate : 1.0 mL/min
Col. Temp. : 20 °C
Detection : UV 250 nm
Injection Vol. : 10 µL

Analytical Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	4.6
5	150	227-30158-01
	200	227-30158-02
	250	227-30158-03

Cartridge Guard Columns

Particle Size (µm)	I.D. (mm) / Length (mm)	Cartridge Guard Column (2pcs)	Holder	Cartridge Guard Column (2pcs) and Holder
		4.0		4.0
5	10	227-30159-01	227-30532-01	227-30159-02

Shim-pack Solar

Good hydrophobic retention, low absorption of ionic compounds

Shim-pack Solar C18 and C8 columns are packed with high purity silica gel or inertness. The silica gel has higher surface area and fully end-capped with good hydrophobic retention, low absorption of ionic compounds and good peak shapes. Highly uniform particles ensure stable mobile phase delivery and low pressure. The Shim-pack Solar LC columns have a wide pH range of 2 to 9, suitable for a wide range of method development.

	Solar C18	Solar C8
Bonded Phase	Octadecyl Groups	Octyl Groups
Analysis Mode	Reversed Phase	Reversed Phase
Particle Size	5 µm	5 µm
Max. Operating Pressure	20 MPa / 2900 PSI	20 MPa / 2900 PSI
Carbon Loading	15%	9%
Pore Size	1.0mL/g	1.0mL/g
End Cap	Y	Y
pH Range	2-9	2-9
USP Code	L1	L7

Analytical Columns

Particle Size (µm)	I.D. (mm)	Length (mm)	Solar C18	Solar C8
5	4.6	150	227-30600-01	227-30601-01
		250	227-30600-02	227-30601-02

Shim-pack FC-ODS

Shortens the Analysis Time Using a Conventional System

Shim-pack FC-ODS is an ideal column to shorten your analysis time using conventional HPLC. Its innovative surface structure and optimized packing method also enable outstanding resolution. Particle size is 3 µm, but the performance of a Shim-pack FC-ODS is equivalent to a 2 µm column while the resolution is twice as that of a 5 µm column. Therefore, Shim-pack FC-ODS can not only shorten analysis times, but also provide a higher number of theoretical plates.

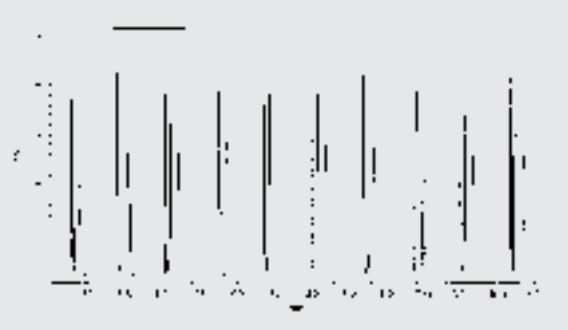
Particle Size	3 µm
Pore Size	12 nm
Surface Area	315 m^2/g
Carbon Loading	18%
Pressure Tolerance	20 MPa / 2900 PSI
Pore Volume	1 mL/g
End-capping	Yes
Bonding Type	Monomeric
pH Range	1.5 - 9
USP Code	L1

Analysis Examples

Shim-pack FC-ODS separates components by hydrophobic interaction like other ODS columns. It is possible to change to Shim-pack FC-ODS from other ODS columns under the same analytical conditions. On the other hand, hydrophilic interaction (hydrogen bond, coordination bond) has been restricted to a minimum, which ensures significant efficiency when analyzing basic compounds. In addition, Shim-pack FC-ODS has higher steric selectivity (capability to recognize the difference of steric structures), making it possible to separate some components that are difficult to retain in other ODS columns.
Shim-pack FC-ODS is available in three lengths to suit analysis objectives.

- **30mm**
  Recommended for use in high-throughput analysis of samples that do not have a complex matrix.
- **75mm**
  Recommended for shortening the analysis time to that of a 150 mm column. Because Shim-pack FC-ODS retains a similar number of theoretical plates as a 150 mm column, it is possible to obtain the same result within about half of the time without changing the conditions. (In the case of gradient analysis, it is necessary to change the concentration.)
- **150mm**
  Recommended for analyzing samples that are difficult to be retained in other 150 mm ODS columns.

High-Throughput Analysis



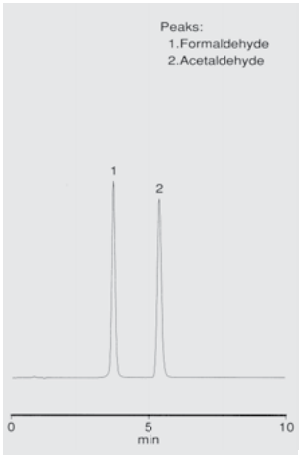
10 times repeated analysis in 6.5 minutes is possible.

Conditions

Column	:	Shim-pack FC-ODS (30 mmL. × 4.6 mmI.D., 3 µm) (P/N: 228-40511-91)
Mobile Phase	:	Water/Acetonitrile = 55/45 (v/v)
Flow Rate	:	3.0 mL/min (Column Pressure ca.8MPa)
Col. Temp.	:	50 °C
Detection	:	254 nm Response 1, AuxRNG×2
Instrument	:	LC-2010+C-R8A

Shim-pack FC-ODS

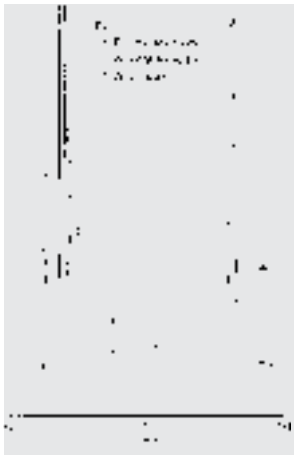
High-speed analysis of 2,4-DNPH derivatized aldehydes / ketones



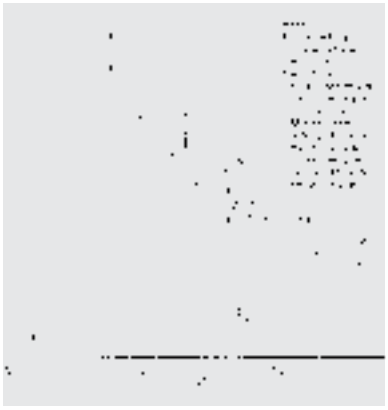
Chromatogram of Standard Sample
(formaldehyde 0.35µg/mL, acetaldehyde 0.55µg/mL, 10µL injected)

Conditions

Column	:	Shim-pack FC-ODS (75 mmL. × 4.6 mmI.D., 3 µm) (P/N: 228-40511-92)
Mobile Phase	:	Water/Acetonitrile = 55/45 (v/v)
Flow Rate	:	1.0 mL/min
Col. Temp.	:	40 °C
Detection	:	UV 360 nm



Chromatograms of Environmental Air (A) and Indoor Air at Laboratory (B)



Chromatogram of Standard Sample
(each 0.3 ug/mL as carbonyl compounds, 10uL injection)

Conditions

Column	:	Shim-pack FC-ODS (75 mmL. × 4.6 mmI.D., 3 µm) (P/N: 228-40511-92)
Mobile Phase	:	A) Water/Tetrahydrofuran = 8/2 (v/v) B) Acetonitrile A/B = 80/20 - 14min - 40/60 - 0.01min - 80/20 - 6min
Flow Rate	:	1.2 mL/min
Col. Temp.	:	40 °C
Detection	:	UV 365 nm

Chromatograms of Indoor Air at Laboratory (A) and Operation blank (B)

Product Information

Particle Size (µm)	I.D. (mm) / Length (mm)	2.0	4.6
3	30	-	228-40511-91
	75	228-40511-94	228-40511-92
	150	228-40511-95	228-40511-93

Shim-pack UC Series

Packed Columns for Supercritical Fluid Chromatograph

When conducting analysis with the Nexera UC supercritical fluid chromatography system, because diffusion of the sample band in the mobile phase is high compared with liquid chromatography, separation behavior changes significantly depending on the types of columns used. Shim-pack UC series was designed with a variety of stationary phases, making it suitable for analysis of various compounds.

Achieve high speed and high performance

Shim-pack UC series offers various stationary phases suitable for the mobile phase of high diffusion and low-viscosity liquid carbon dioxide. Analysis time can be reduced at a high flow rate without impairing the separation performance. In addition, analysis speed, which is limited in HPLC, can be increased.

Wide range of stationary phases meets diverse needs

Shim-pack UC series was designed with eight types of stationary phases and sizes to meet diverse research and development needs.

High durability and stable reproducibility

Shim-pack UC series achieves high inertness for improved analysis precision and increased column durability. Its uniform silica surface and stable chemical modification also ensure high analysis reproducibility.

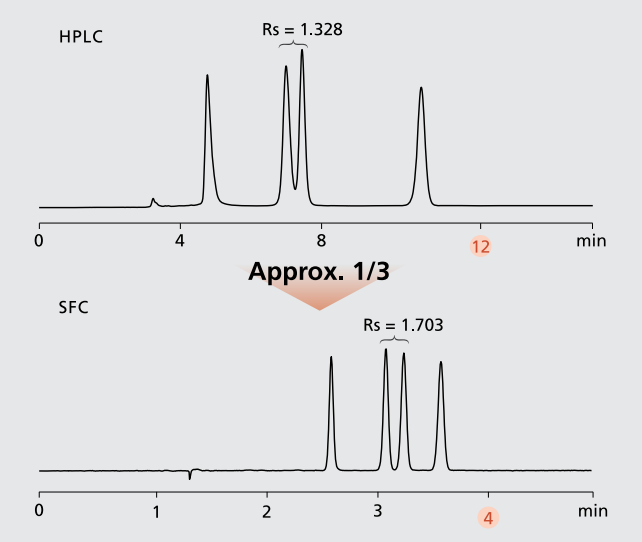
	Shim-pack UC RP	Shim-pack UC GIS II	Shim-pack UC Phenyl	Shim-pack UC CN
Bonded Phase	Octadecyl Groups + Polar Functional Group	Octadecyl Groups	Phenyl Groups	Cyanopropryl Groups
Particle Size (µm)	3, 5	3, 5	3, 5	3, 5
Pore Size (nm)	10	10	10	10
Surface Area (m2/g)	450	450	450	450
Carbon Loading	9%	11%	9.5%	14%
Pressure Tolerance (MPa/PSI)	50/7200 (3µm), 30/4500 (5µm)	50/7200 (3µm), 30/4500 (5µm)	50/7200 (3µm), 30/4500 (5µm)	50/7200 (3µm), 30/4500 (5µm)
Pore Volume (mL/g)	1.05	1.05	1.05	1.05
End-capping	-	Yes	-	-
pH Range	2 - 7.5	2 - 7.5	2 - 7.5	2 - 7.5
USP Code	L1	L1	L11	L10

	Shim-pack UC Diol	Shim-pack UC Sil	Shim-pack UC Amide	Shim-pack UC NH2
Bonded Phase	Diol Group	-	Carbamoyl Groups	Aminopropyl Groups
Particle Size (µm)	3, 5	3, 5	3, 5	3, 5
Pore Size (nm)	10	10	10	10
Surface Area (m2/g)	450	450	450	450
Carbon Loading	20%	-	18%	8%
Pressure Tolerance (MPa/PSI)	50/7200 (3µm), 30/4500 (5µm)	50/7200 (3µm), 30/4500 (5µm)	50/7200 (3µm), 30/4500 (5µm)	50/7200 (3µm), 30/4500 (5µm)
Pore Volume (mL/g)	1.05	1.05	1.05	1.05
End-capping	-	-	-	-
pH Range	2 - 7.5	2 - 7.5	2 - 7.5	2 - 7.5
USP Code	L20	L3	-	L8

Analysis Examples

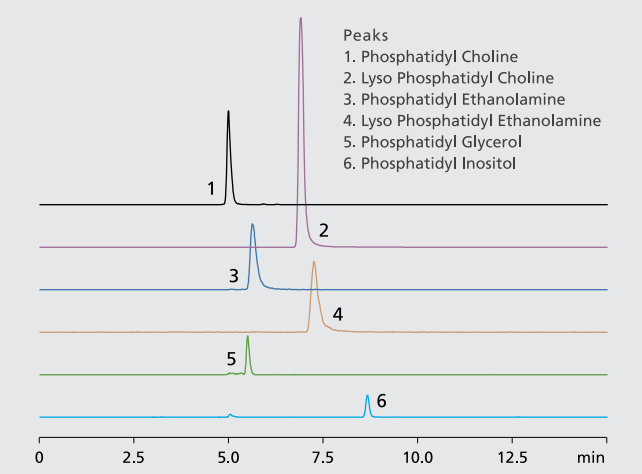
Tocopherol Isomers

Isomers and structurally similar compounds that are difficult to separate can be analyzed by Nexera UC and Shim-pack UC series at a high speed. In the example below, four kinds of tocopherol isomers were analyzed by Nexera UC and Shim-pack UC Sil. As shown below, analysis time was reduced to one-third the time analysis takes with a conventional HPLC method while resolution was improved.



Comparison of retention and resolution of tocopherol isomers between LC conditions and SFC ones

Phospholipid Classes



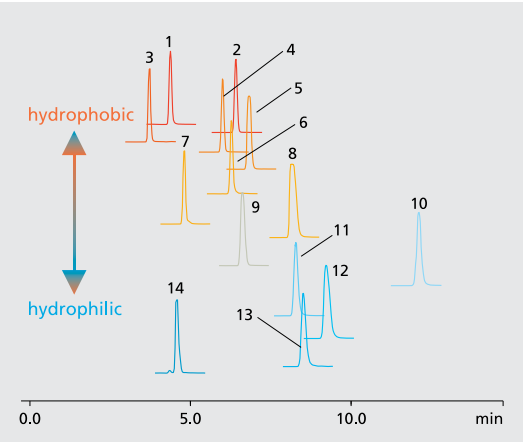
The example above shows the result of the analysis of phospholipid classes using Shim-pack UC Diol with Nexera UC. The ODS-based Shim-pack UC GIS II can also be used to analyze molecular species of phospholipids with the same modifiers. Nexera UC and Shim-pack UC series are ideal for analyzing complex samples.

Multiple Pesticides with a Wide Polarity Range

Simultaneous analysis of multiple pesticides with a wide polarity range from hydrophobic to hydrophilic has been achieved using the Nexera UC and Shim-pack UC RP. Shim-pack UC RP contains a polar functional group embedded between the silica surface and the C18 group. This allows the column to analyze a wide range of components from hydrophobic to hydrophilic ones.

Simultaneous analysis of multiple components can now be performed more efficiently using the Nexera UC and Shim-pack UC series.

No.	Components	log P
1	Carbofuran	7.4
2	Ethofenprox	6.9
3	Fenpropathrin	6.0
4	Pyriproxyfen	5.0
5	Pyraclostrobin	4.0
6	Linuron	3.0
7	Aminocarb	1.9
8	Ethoxysulfuron	1.0
9	Halosulfuron methyl	0.0
10	Bentazone	–0.5
11	Chlorsulfuron	–1.0
12	Rimsulfuron	–1.5
13	Nicosulfuron	–1.8
14	Vamidothion	–4.2



Shim-pack UC Series

Product Information

Column	Particle Size (µm)	I.D. (mm) / Length (mm)	2.1	4.6
Shim-pack UC RP	3	150	227-30400-03	227-30401-03
		250	227-30400-04	227-30401-04
	5	150	227-30402-03	227-30403-03
		250	227-30402-04	227-30403-04
Shim-pack UC GIS II	3	150	227-30404-03	227-30405-03
		250	227-30404-04	227-30405-04
	5	150	227-30406-03	227-30407-03
		250	227-30406-04	227-30407-04
Shim-pack UC Phenyl	3	150	227-30424-03	227-30425-03
		250	227-30424-04	227-30425-04
	5	150	227-30426-03	227-30427-03
		250	227-30426-04	227-30427-04
Shim-pack UC CN	3	150	227-30428-03	227-30429-03
		250	227-30428-04	227-30429-04
	5	150	227-30430-03	227-30431-03
		250	227-30430-04	227-30431-04
Shim-pack UC Diol	3	150	227-30408-03	227-30409-03
		250	227-30408-04	227-30409-04
	5	150	227-30410-03	227-30411-03
		250	227-30410-04	227-30411-04
Shim-pack UC Sil	3	150	227-30412-03	227-30413-03
		250	227-30412-04	227-30413-04
	5	150	227-30414-03	227-30415-03
		250	227-30414-04	227-30415-04
Shim-pack UC Amide	3	150	227-30416-03	227-30417-03
		250	227-30416-04	227-30417-04
	5	150	227-30418-03	227-30419-03
		250	227-30418-04	227-30419-04
Shim-pack UC NH2	3	150	227-30420-03	227-30421-03
		250	227-30420-04	227-30421-04
	5	150	227-30422-03	227-30423-03
		250	227-30422-04	227-30423-04

Nexera UC Columns

Packed Columns for Supercritical Fluid Chromatograph

When conducting analysis with the Nexera UC supercritical fluid chromatography system, because diffusion of the sample band in the mobile phase is high compared with liquid chromatography, separation behavior changes significantly depending on the types of columns used. Shim-pack UC series was designed with a variety of stationary phases, making it suitable for analysis of various compounds.

Features

- Achieve high speed and high performance

  Shim-pack UC series offers various stationary phases suitable for the mobile phase of high diffusion and low-viscosity liquid carbon dioxide. Analysis time can be reduced at a high flow rate without impairing the separation performance. In addition, analysis speed, which is limited in HPLC, can be increased.

- Wide range of stationary phases meets diverse needs

  Nexera UC series was designed with fourteen Achiral and ten Chiral types of stationary phases with a range of sizes to meet diverse research and development needs. Columns are available is Sub-2, 3, and 5 micron particle sizes.

- High durability and stable reproducibility

  Nexera UC series achieves high inertness for improved analysis precision and increased column durability. Its uniform silica surface and stable chemical modification also ensure high analysis reproducibility.

Nexera Method Scouting Kits

The high-speed performance of SFC can shorten the time required for method scouting. It automatically generates a large number of methods by utilizing combinations of up to 12 columns, four modifiers, and different ratios of modifiers to mobile phase. Shimadzu currently offers Nexera UC Scouting Kits for chiral and achiral compounds.

Nexera UC Chiral Method Scouting Kit

The Nexera UC Chiral Scouting Kit includes one column each of the following stationary phases:

- CCA
- CCO
- CCJ
- CCS
- CC3
- CC4

3.0mm X 150mm, 5 micron particle size

Part number: 220-91625-00

Nexera UC SFC Method Scouting Kit

The Nexera UC SFC Scouting Kit includes one column each of the following stationary phases:

- Basic
- Ethyl Pyridine
- PFP
- Nitro
- Naphthyl
- Diol

3.0mm X 100mm, 3 micron particle size

Part number: 220-91627-00

Chiral Separation Columns

Nexera UC Chiral CCA Columns

The Nexera UC Chiral CCA column consists of a polysaccharide coated chiral stationary phase, tris-(3,5-di-methylphenyl) carbamoyl amylose, on high-purity silica gel. Similar in selectivity to ChiralPak® AD, Nexera UC Chiral CCA columns can be used for both HPLC and SFC applications.

Nexera UC Chiral CCC Columns

The Nexera UC Chiral CCC column consists of a modified cellulose, including the combination of 3-chloro-4-methylphenylcarbamate and 3,5-dichlorophenylcarbamate bonding groups coated on high-purity, high-performance spherical silica particles. The combination of bonded groups stabilizes the solubility of coated phase making for a durable phase similar to other widely used coated phases. The use of cellulose modified with chlorinated phenyl groups provides for separation of many previously unresolved/poorly resolved chiral mixtures.

Nexera UC Chiral CCJ Columns

The Nexera UC Chiral CCJ (cellulose 4-methylbenzoate) is a robust column for high-resolution chiral separations based on a halogenated carbohydrate based chiral stationary phase and is similar in selectivity to ChiralPak® OJ-H.

Nexera UC Chiral CCO Columns

The Nexera UC CCO column is a polysaccharide-coated chiral stationary phase produced by a unique process of coating the proven chiral selector, tris-(3,5-di-methylphenyl) carbamoyl cellulose onto high-purity, high-performance silica. Nexera UC CCO columns are similar in selectivity to ChiralPak® OD and can be used for both HPLC and SFC applications.

Nexera UC Chiral CCO F2 Columns

The Nexera UC Chiral CCO F2 incorporates a fluoro group in its phenyl carbamate cellulose structure, which is useful in promoting fluorophilic retention mechanisms. Fluorophilic retention can be particularly useful in medicinal chemistry and drug discovery where more than a third of newly approved small molecule drugs contain fluorine. The Nexera UC Chiral CCO F2 columns are similar to CCO F4 but with a 2-fluoro 5-methylphenyl cellulose structure that can be used for SFC or HPLC.

Nexera UC Chiral CCO F4 Columns

The Nexera UC Chiral CCO F4 incorporates a fluoro group in its phenyl carbamate cellulose structure, which is useful in promoting fluorophilic retention mechanisms. Fluorophilic retention can be particularly useful in medicinal chemistry and drug discovery where more than a third of newly approved small molecule drugs contain fluorine. The Nexera UC Chiral CCO F4 columns are similar to CCO F2 but with a 4-fluoro 3-methylphenyl cellulose structure that can be used for SFC or HPLC.

Nexera UC Chiral CCS Columns

The Nexera UC Chiral CCS (amylose tris [(S)-⍰-methylbenzylcarbamate]) permits the enantiomeric separation of 1-Indanol and other similar compounds without the addition of DEA (diethyl amine) as in traditional methods. The Nexera UC Chiral CCS columns are similar in selectivity to ChiralPak® AS-H.

Nexera UC Chiral CC2 Columns

The Nexera UC Chiral CC2 is a modified cellulose with 3-chloro-4 methylphenyl-carbamate bonding groups coated on high-purity, high-performance spherical silica particles. The Nexera UC Chiral CC2 columns are similar to Phenomenex Lux Cellulose-2.

Nexera UC Chiral CC3 Columns

The Nexera UC Chiral CC3 (amylose tris(5-chloro-2-methyl- phenylcarbamate) is ideal for high-resolution chiral separations based on a new halogenated carbohydrate-based chiral stationary phase. The Nexera UC Chiral CC3 columns are similar in selectivity to ChiralPak® AY-H.

Nexera UC Chiral CC4 Columns

The Nexera UC Chiral CC4 is a modified cellulose coated on high-purity, high-performance spherical silica particles. The chemical modification includes the chemical bonding of 4-chloro-3 methylphenylcarbamate to cellulose. The use of cellulose modified with chlorinated phenyl groups provides a separation opportunity for many previously unresolved and poorly resolved chiral mixtures. The Nexera UC Chiral CC4 columns are similar in selectivity to ChiralPak® OZ-H.

Column	Particle Size (um)	Length (mm)	Inner Diameter (mm)		
			2.1	3	4.6
Nexera UC Chiral CCA	3	50	220-91625-01	220-91625-02	220-91625-03
		100	220-91625-04	220-91625-05	220-91625-06
		150	220-91625-07	220-91625-08	220-91625-09
	5	100	-	-	220-91625-10
		150	-	220-91625-11	220-91625-12
		250	-	-	220-91625-13

Chiral Separation Columns

Column	Particle Size (um)	Length (mm)	Inner Diameter (mm)		
			2.1	3	4.6
Nexera UC Chiral CCC	3	50	220-91625-14	220-91625-15	220-91625-16
		100	220-91625-17	220-91625-18	220-91625-19
		150	220-91625-20	220-91625-21	220-91625-22
	5	100	-	-	220-91625-23
		150	-	220-91625-24	220-91625-25
		250	-	-	220-91625-26
Nexera UC Chiral CCJ	3	50	220-91625-27	220-91625-28	220-91625-29
		100	220-91625-30	220-91625-31	220-91625-32
		150	220-91625-33	220-91625-34	220-91625-35
	5	100	-	-	220-91625-36
		150	-	220-91625-37	220-91625-38
		250	-	-	220-91625-39
Nexera UC Chiral CCO	3	50	220-91625-40	220-91625-41	220-91625-42
		100	220-91625-43	220-91625-44	220-91625-45
		150	220-91625-46	220-91625-47	220-91625-48
	5	100	-	-	220-91625-49
		150	-	220-91625-50	220-91625-51
		250	-	-	220-91625-52
Nexera UC Chiral CCO F2	5	100	-	-	220-91625-53
		150	-	220-91625-54	220-91625-55
		250	-	-	220-91625-56
Nexera UC Chiral CCO F4	5	100	-	-	220-91625-57
		150	-	220-91625-58	220-91625-59
		250	-	-	220-91625-60
Nexera UC Chiral CCS	3	50	220-91625-61	220-91625-62	220-91625-63
		100	220-91625-64	220-91625-65	220-91625-66
		150	220-91625-67	220-91625-68	220-91625-69
	5	100	-	-	220-91625-70
		150	-	220-91625-71	220-91625-72
		250	-	-	220-91625-73
Nexera UC Chiral CC2	3	50	220-91625-74	220-91625-75	220-91625-76
		100	220-91625-77	220-91625-78	220-91625-79
		150	220-91625-80	220-91625-81	220-91625-82
	5	100	-	-	220-91625-83
		150	-	220-91625-84	220-91625-85
		250	-	-	220-91625-86
Nexera UC Chiral CC3	3	50	220-91625-87	220-91625-88	220-91625-89
		100	220-91625-90	220-91625-91	220-91625-92
		150	220-91625-93	220-91625-94	220-91625-95
	5	100	-	-	220-91625-96
		150	-	220-91625-97	220-91625-98
		250	-	-	220-91625-99
Nexera UC Chiral CC4	3	50	220-91626-00	220-91626-01	220-91626-02
		100	220-91626-03	220-91626-04	220-91626-05
		150	220-91626-06	220-91626-07	220-91626-08
	5	100	-	-	220-91626-09
		150	-	220-91626-10	220-91626-11
		250	-	-	220-91626-12

Achiral Separation Columns

Nexera UC Amino

Nexera UC Amine columns contain a high-density NH2 bonded material specifically designed for SFC analysis requiring higher sample loading.

Nexera UC Amino Phenyl

Nexera UC Amino Phenyl columns are a specialty SFC stationary phase that has proven superiority to conventional stationary phases in the areas of separation selectivity and loading capacity which was designed for the separation of amines, alcohols and acids by SFC without the use of additives. Nexera UC Amino Phenyl columns work well under normal phase mixed mode conditions, offering π-π interactions and good base deactivation.

Nexera UC Basic

Nexera UC Basic columns exhibit a highly basic character and are ideally suited to performance/high-speed SFC chromatograohy applications of chemicals containing amine groups.

Nexera UC Cyano

Nexera UC Cyano columns are a high-surface area cyano stationary phase designed for SFC analysis and allow for higher sample loading.

Nexera UC DEAP

Nexera UC DEAP (diethylaminopropyl) columns allow for separation of compounds that would normally require the addition of an amine modifying agent to the mobile phase. Nexera UC DEAP columns are ideal for chemicals containing strong amine groups and provide flexibility to the SFC chromatographer with mobile phase composition and fraction collection greatly simplified without the use of amino additives.

Nexera UC Diol

Nexera UC Diol columns are a specialty phase designed for SFC with high-density diol surface coverage, ensuring better and more reproducible separations compared to conventional unbonded silica. Nexera UC Diol columns are particularly suitable for acidic and basic analytes.

Nexera UC Ethyl Pyridine

Nexera UC Ethyl Pyridine columns are ideal for chemicals that are functionalized with strong amine groups and provide flexibility for the SFC chromatographer with mobile phase composition and fraction collection greatly simplified without the use of amino additives.

Nexera UC Ethyl Pyridine II

Nexera UC Ethyl Pyridine II columns are ideally suited for the retention and rapid separation of chemicals containing acidic groups.

Nexera UC 4-Ethyl Pyridine

Nexera UC 4-Ethyl Pyridine columns are an alternative to, and provide, different selectivity to Nexera UC Ethyl Pyridine (2-ethyl pyridine) columns.

Nexera UC HILIC

Nexera UC HILIC columns are composed of a polyhydroxylated polymer that is coated and bound to silica. This composition provides hydroxyl levels that are well above conventional silica and diol type stationary phases, permitting higher sample loading.

Nexera UC Naphthyl

Nexera UC Naphthyl columns contain a naphthalene-based SFC material with high bonding density and intrinsic base deactivation due to a rigid structure that also enables the shape selectivity needed for many of the diastereomeric separations. Nexera UC naphthyl columns exhibit strong π-π interactions and charge transfer properties and perform well for diastereomer separations as well as non-polar compounds. Selectivity of this column is between graphitized carbon and alkyl- type stationary phases.

Nexera UC Nitro

Nexera UC Nitro columns are specifically designed for the separation of geometrical isomers as well as diastereomers. They are the columns of choice in separating compounds containing double bonds, aromatic groups, polarizable electrons and conjugated systems and exhibit a strong charge transfer system.

Nexera UC PFP

Nexera UC PFP (pentafluorophenyl) columns are specifically designed for the separation of geometrical isomers as well as diastereomers. They are the columns of choice in separating compounds containing aromatic groups, polarizable electrons and conjugated systems as well as halogenated compounds.

Achiral Separation Columns

Nexera UC Pyridyl Amide

Nexera UC Pyridyl Amide columns allow for separation of compounds that would normally require the addition of TFA or an amine modifying agent to the mobile phase. Nexera UC Pyridyl Amide columns are ideal for chemicals that contain both basic and acidic groups and provide flexibility to the SFC chromatographer with mobile phase composition and fraction collection greatly simplified without the use of amino additives.

Nexera UC Silica

Nexera UC Silica columns are a metal-free, ultra-high-purity stationary phase that is pressure stable and specifically engineered for high-performance SFC applications. The surface is treated to produce optimum SFC separation interactions and loading capacity while maintaining superior peak shape performance for many chemicals.

Column	Particle Size (um)	Length (mm)	Inner Diameter (mm)		
			2.1	3	4.6
Nexera UC Amino Phenyl	1.8	30	220-91629-08	220-91629-09	-
		50	220-91629-10	220-91629-11	-
		100	220-91629-12	220-91629-13	-
		150	220-91629-14	220-91629-15	-
	3	100	-	220-91627-01	220-91627-15
		150	-	220-91627-29	220-91627-38
	5	150	-	-	220-91627-47
		250	-	-	220-91627-61
Nexera UC Basic	1.8	30	220-91629-16	220-91629-17	-
		50	220-91629-18	220-91629-19	-
		100	220-91629-20	220-91629-21	-
		150	220-91629-22	220-91629-23	-
	3	100	-	220-91627-02	220-91627-16
		150	-	220-91627-30	220-91627-39
	5	150	-	-	220-91627-48
		250	-	-	220-91627-62
Nexera UC Basic	1.8	30	220-91629-24	220-91629-25	-
		50	220-91629-26	220-91629-27	-
		100	220-91629-28	220-91629-29	-
		150	220-91629-30	220-91629-31	-
	3	100	-	220-91627-03	220-91627-17
		150	-	-	-
	5	150	-	-	220-91627-49
		250	-	-	220-91627-63
Nexera UC DEAP	1.8	30	220-91629-32	220-91629-33	-
		50	220-91629-34	220-91629-35	-
		100	220-91629-36	220-91629-37	-
		150	220-91629-38	220-91629-39	-
	3	100	-	220-91627-04	220-91627-18
		150	-	220-91627-31	220-91627-40
	5	150	-	-	220-91627-50
		250	-	-	220-91627-64

Achiral Separation Columns

Column	Particle Size (um)	Length (mm)	Inner Diameter (mm)		
			2.1	3	4.6
Nexera UC Diol	1.8	30	220-91629-40	220-91629-41	-
		50	220-91629-42	220-91629-43	-
		100	220-91629-44	220-91629-45	-
		150	220-91629-46	220-91629-47	-
	3	100	-	220-91627-05	220-91627-19
	5	150	-	-	220-91627-51
		250	-	-	220-91627-65
Nexera UC Ethyl Pyridine	1.8	30	220-91629-64	220-91629-65	-
		50	220-91629-66	220-91629-67	-
		100	220-91629-68	220-91629-69	-
		150	220-91629-70	220-91629-71	-
	3	100	-	220-91627-06	220-91627-20
		150	-	220-91627-32	220-91627-41
	5	150	-	-	220-91627-52
		250	-	-	220-91627-66
Nexera UC Ethyl Pyridine II	3	100	-	220-91627-07	220-91627-21
	5	150	-	-	220-91627-53
		250	-	-	220-91627-67
Nexera UC 4-Ethyl Pyridine	3	100	-	220-91627-08	220-91627-22
	5	150	-	-	220-91627-54
		250	-	-	220-91627-68
Nexera UC HILIC	3	100	-	220-91627-09	220-91627-23
	5	150	-	-	220-91627-55
		250	-	-	220-91627-69
Nexera UC Naphthyl	1.8	30	220-91629-48	220-91629-49	-
		50	220-91629-50	220-91629-51	-
		100	220-91629-52	220-91629-53	-
		150	220-91629-54	220-91629-55	-
	3	100	-	220-91627-10	220-91627-24
		150	-	220-91627-33	220-91627-42
	5	150	-	-	220-91627-56
		250	-	-	220-91627-70
Nexera UC Nitro	1.8	30	220-91629-80	220-91629-81	-
		50	220-91629-82	220-91629-83	-
		100	220-91629-84	220-91629-85	-
		150	220-91629-86	220-91629-87	-
	3	100	-	220-91627-11	220-91627-25
		150	-	220-91627-34	220-91627-43
	5	150	-	-	220-91627-57
		250	-	-	220-91627-71

Achiral Separation Columns

Column	Particle Size (um)	Length (mm)	Inner Diameter (mm)		
			2.1	3	4.6
Nexera UC PFP	1.8	30	220-91629-72	220-91629-73	-
		50	220-91629-74	220-91629-75	-
		100	220-91629-76	220-91629-77	-
		150	220-91629-78	220-91629-79	-
	3	100	-	220-91627-12	220-91627-26
		150	-	220-91627-35	220-91627-44
	5	150	-	-	220-91627-58
		250	-	-	220-91627-72
Nexera UC Pyridyl Amide	1.8	30	220-91629-56	220-91629-57	-
		50	220-91629-58	220-91629-59	-
		100	220-91629-60	220-91629-61	-
		150	220-91629-62	220-91629-63	-
	3	100	-	220-91627-13	220-91627-27
		150	-	220-91627-36	220-91627-45
	5	150	-	-	220-91627-59
		250	-	-	220-91627-73
Nexera UC Silica	1.8	30	220-91629-88	220-91629-89	-
		50	220-91629-90	220-91629-91	-
		100	220-91629-92	220-91629-93	-
		150	220-91629-94	220-91629-95	-
	3	100	-	220-91627-14	220-91627-28
		150	-	220-91627-37	220-91627-46
	5	150	-	-	220-91627-60
		250	-	-	220-91627-74
Nexera UC Amine	1.8	30	220-91629-00	220-91629-00	-
		50	220-91629-02	220-91629-02	-
		100	220-91629-04	220-91629-04	-
		150	220-91629-06	220-91629-07	-

Shim-pack GPC Series

Shim-pack GPC series columns are used for the determination of tetrahydrofuran (800 Series), chloroform (800C Series), and dimethylformamide (800D series).

The technique of GPC does not utilize such chemical reactions as partition, adsorption, and ion exchange, but a physical reaction consisting of a separation based on molecular size of the sample components. Therefore, this method is suitable for the measurement of molecular weight distribution of high polymers and oligomers.

Shim-pack GPC series are packed with polystyrene polymers with respective degrees of cross-linking in order to meet exact analysis requirements, ranging from analysis of high polymers to that of oligomers. GPC-80M (80MC, 80MD) are mixed gel columns.

Determination of Tetrahydrofuran

Analytical Columns

Column	Exclusion Limit (polystyrene)	Dimensions (Length × I.D., mm)	P/N
Shim-pack GPC-801	1.5×10^3	300 × 8.0	228-20803-91
Shim-pack GPC-802	5×10^3	300 × 8.0	228-20804-91
Shim-pack GPC-8025	2×10^4	300 × 8.0	228-20805-91
Shim-pack GPC-803	7×10^4	300 × 8.0	228-20806-91
Shim-pack GPC-804	4×10^5	300 × 8.0	228-20807-91
Shim-pack GPC-805	4×10^6	300 × 8.0	228-20808-91
Shim-pack GPC-806	4×10^7	300 × 8.0	228-20809-91
Shim-pack GPC-80M	4×10^7, Mixed gel	300 × 8.0	228-20810-91

Guard Columns

Guard Column	Dimensions (Length × I.D., mm)	P/N
Shim-pack GPC-800P	10 × 4.6	228-20812-91

Determination of Chloroform

Analytical Columns

Column	Exclusion Limit (polystyrene)	Dimensions (Length × I.D., mm)	P/N
Shim-pack GPC-801C	1.5×10^3	300 × 8.0	228-20803-92
Shim-pack GPC-802C	5×10^3	300 × 8.0	228-20804-92
Shim-pack GPC-8025C	2×10^4	300 × 8.0	228-20805-92
Shim-pack GPC-803C	7×10^4	300 × 8.0	228-20806-92
Shim-pack GPC-804C	4×10^5	300 × 8.0	228-20807-92
Shim-pack GPC-805C	4×10^6	300 × 8.0	228-20808-92
Shim-pack GPC-806C	4×10^7	300 × 8.0	228-20809-92
Shim-pack GPC-80MC	4×10^7, Mixed gel	300 × 8.0	228-20810-92

Guard Columns

Guard Column	Dimensions (Length × I.D., mm)	P/N
Shim-pack GPC-800CP	10 × 4.6	228-20812-92

Shim-pack GPC Series

Determination of Dimethylformamide

Analytical Columns

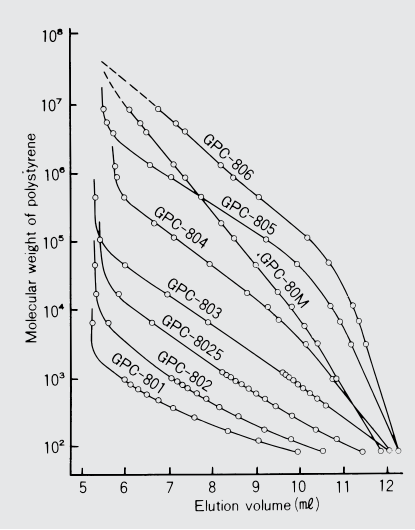
Column	Exclusion Limit (polystyrene)	Dimensions (Length × I.D., mm)	P/N
Shim-pack GPC-801D	1.5×10^3	300 × 8.0	228-20803-93
Shim-pack GPC-802D	5×10^3	300 × 8.0	228-20804-93
Shim-pack GPC-8025D	2×10^4	300 × 8.0	228-20805-93
Shim-pack GPC-803D	7×10^4	300 × 8.0	228-20806-93
Shim-pack GPC-804D	4×10^5	300 × 8.0	228-20807-93
Shim-pack GPC-805D	4×10^6	300 × 8.0	228-20808-93
Shim-pack GPC-806D	4×10^7	300 × 8.0	228-20809-93
Shim-pack GPC-80MD	4×10^7, Mixed gel	300 × 8.0	228-20810-93

Guard Columns

Guard Column	Dimensions (Length × I.D., mm)	P/N
Shim-pack GPC-800DP	10 × 4.6	228-20812-93

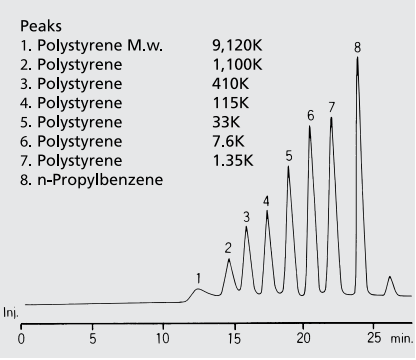
Analysis Examples

Calibration Curves



Conditions
Mobile Phase : Tetrahydrofuran
Flow Rate : 1.0 mL/min
Col. Temp. : Ambient
Detection : UV 254 nm

Analysis of Polystyrene Standard



Conditions
Column : Shim-pack GPC-80M (2 columns in series) (P/N: 228-20810-91)
Mobile Phase : Tetrahydrofuran
Flow Rate : 1.0 mL/min
Col. Temp. : Ambient
Detection : UV 254 nm

Shim-pack Diol Series

Shim-pack Diol series is a kind of gel filtration chromatography (GFC) column. GFC is used to separate water-soluble high polymers such as polysaccharides, proteins, and nucleic acids according to their molecular sizes by using hydrophilic packing materials and aqueous mobile phase.

Shim-pack Diol series is packed with porous spherical silica gel chemically bonded with a hydroxyl group. Due to the hydrophilic hydroxyl group, Shim-pack Diol series can be used in high-speed GFC and provide sharp peaks during the analysis of protein and biochemicals (such as enzymes).

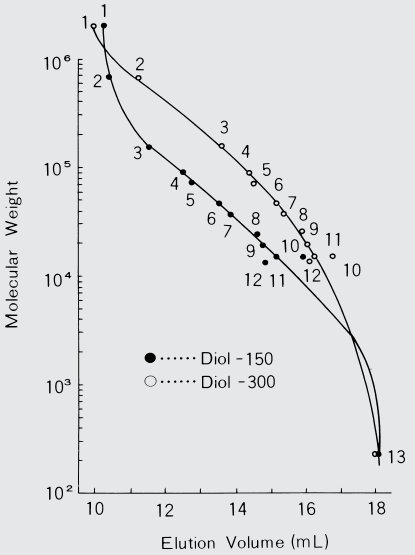
Product Information

Column	Stationary Phase	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N
Shim-pack Diol-150	Diol group	5	250 × 7.9	228-14775-91
			500 × 7.9	228-14775-92
Shim-pack Diol-300	Diol group	5	250 × 7.9	228-14776-91
			500 × 7.9	228-14776-92
Pre-column Diol *	Diol group	10	50 × 4.0	228-16367-91

* Installed between the liquid pump and the sample injector to protect the Shim-pack Diol column.

Analysis Examples

Calibration Curves

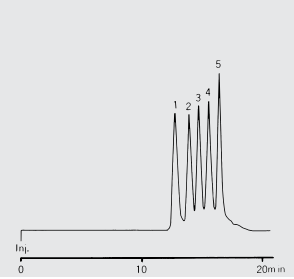


Peaks
1. Blue dextran 2000
2. Thyroglobulin
3. γ-Globulin
4. Transferrin
5. Human serum albumin
6. Ovalbumin
7. β-Lactoglobulin
8. Chymotrypsin
9. Myoglobin
10. Lysozyme
11. Ribonuclease A
12. Cytochrome C
13. Gly-Tyr

Conditions

Column : Shim-pack Diol Series (500 mmL × 7.9 mmI.D., 5 µm)
Mobile Phase : A) 10mM phosphate buffer solution (pH 7)
B) 0.2M sodium sulfate
Flow Rate : 1.0 mL/min
Col. Temp. : Ambient
Detection : UV 280 nm

Analysis of Protein Standard



Peaks
1. Glutamate dehydrogenase
2. Lactate dehydrogenase
3. Enolase
4. Adenylate kinase
5. Cytochrome C

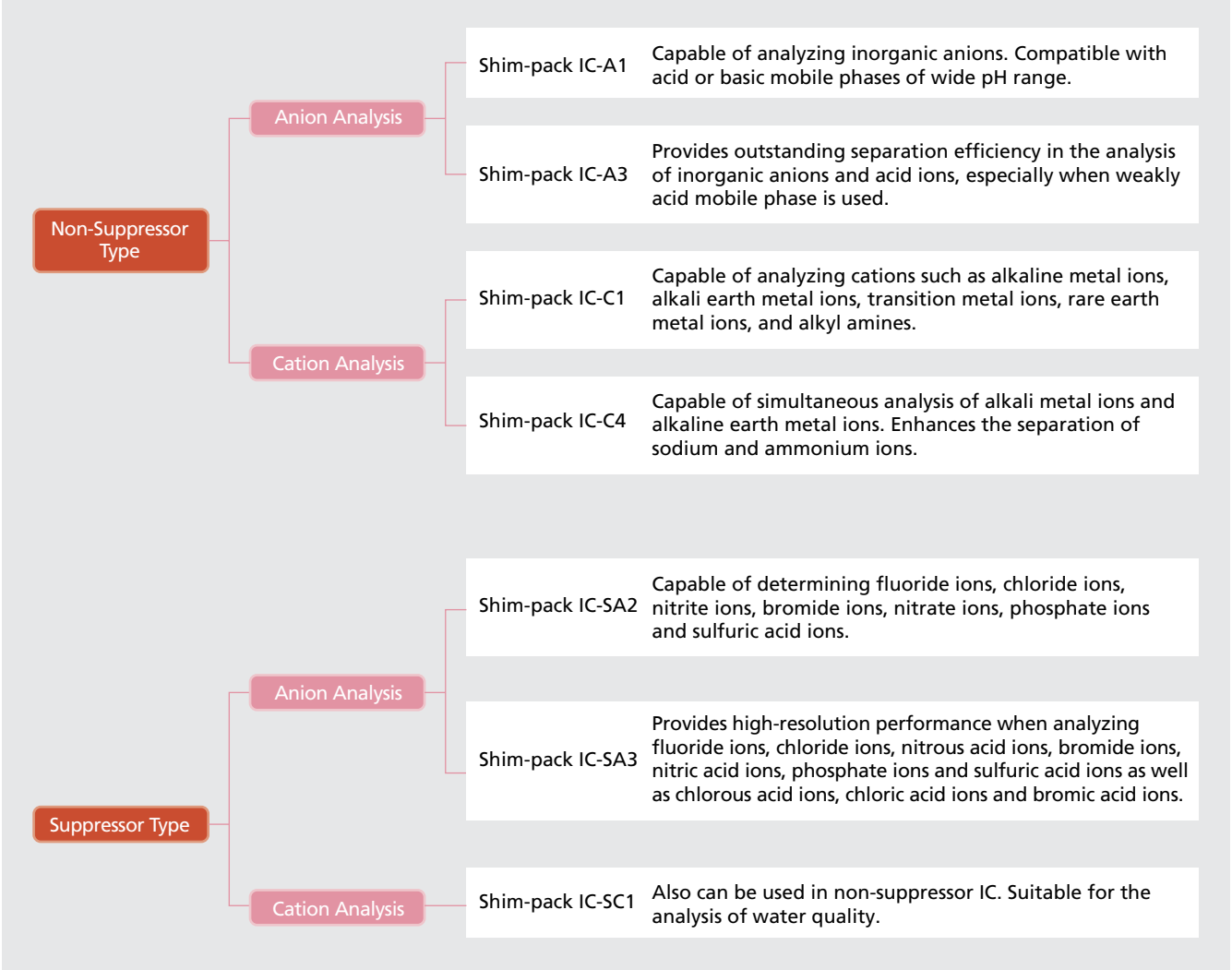
Conditions

Column : Shim-pack Diol-300 (500 mmL × 7.9 mmI.D., 5 µm)
(P/N: 228-14776-92)
Mobile Phase : A) 10mM phosphate buffer solution (pH 7)
B) 0.1M sodium chloride
Flow Rate : 1.0 mL/min
Col. Temp. : Ambient
Detection : UV 280 nm

Ion Chromatography Columns

Shim-pack IC Series

Ion chromatography (IC) is used for analysis of inorganic and organic ions. It is categorized as suppressor IC and non-suppressor IC. Non-suppressor IC is composed of a conventional HPLC system combined with a conductivity detector, while suppressor IC requires an extra suppressor.



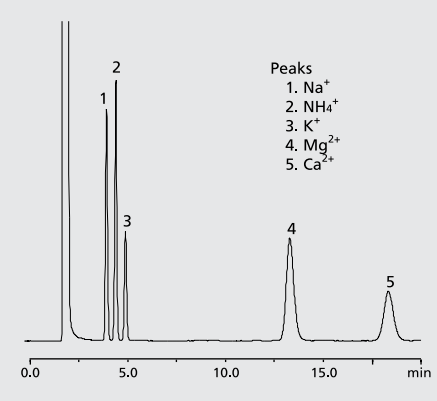
Analysis Examples

Examples of Cation Analysis

Shim-pack IC-C4 is a cation analysis column for non-suppressor IC. Because the pH of the mobile phase can be changed by selecting a different combination of acid and base in eluent, non-suppressor IC enables various kinds of analysis.

High Resolution of Na+ and NH4+

High resolution of Na+ and NH4+ has been achieved by improving the peak shape of Na+. The influence on the peak shape of NH4+ from a high concentration of Na+ has been reduced, making it possible to analyze tap water of normal concentration under standard mobile phase conditions. The resolution can be further improved by using a mobile phase treated with 18-crown-6 additive.



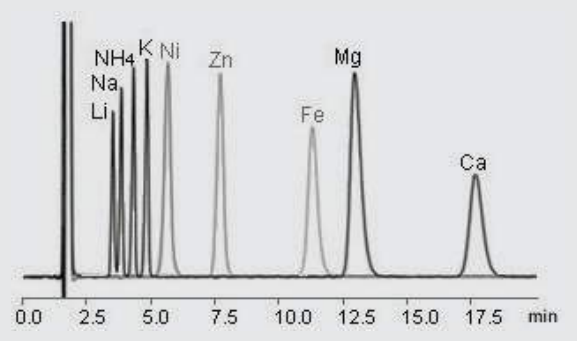
Analyses of a Standard Mixture of 5 Cations

Conditions

Column	:	Shim-pack IC-C4 (150 mmL × 4.6 mmI.D., 7 µm) (P/N: 228-41616-91)
Mobile Phase	:	2.5 mmol/L oxalic acid
Flow Rate	:	1.0 mL/min
Col. Temp.	:	40 °C
Detection	:	CDD
Injection Vol.	:	50 µL

Flexible Mobile Phase Selection

Due to the features of non-suppressor IC, flexible mobile phase composition can be used. Besides normal inorganic cations, Shim-pack IC-C4 is capable of analyzing transition metals by using a mixed mobile phase.



Conditions

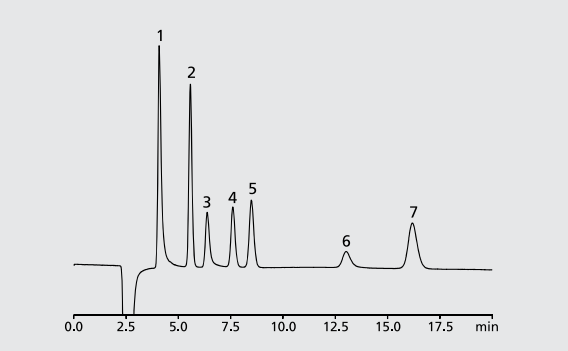
Column	:	Shim-pack IC-C4 (150 mmL × 4.6 mmI.D., 7 µm) (P/N: 228-41616-91)
Mobile Phase	:	A) 2.5 mmol/L oxalic acid B) 2.5 mmol/L methanesulfonic acid A/B = 60/40 (v/v)
Flow Rate	:	1.0 mL/min
Col. Temp.	:	40 °C
Detection	:	CDD
Injection Vol.	:	50 µL

Shim-pack IC Series

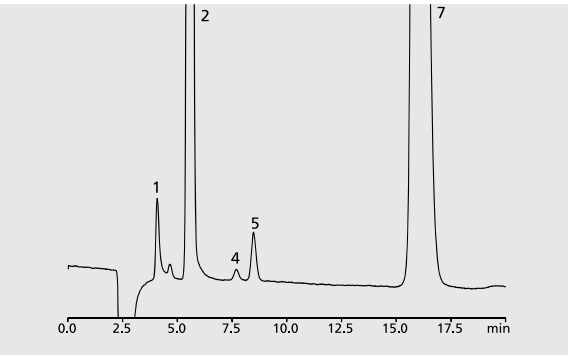
Analysis of Anions in Water

Shim-pack IC-SA2 was developed for anion analysis with a Shimadzu Ion Chromatograph HIC-SP (suppressor type). It is capable of analyzing fluoride ions, chloride ions, nitrite ions, bromide ions, nitrate ions, phosphate ions, sulfate ions, etc., making it possible to be used in both tap water and environmental water analysis.

Analysis Examples



Analysis of Standard Anion Samples



Analysis of Tap Water

Conditions

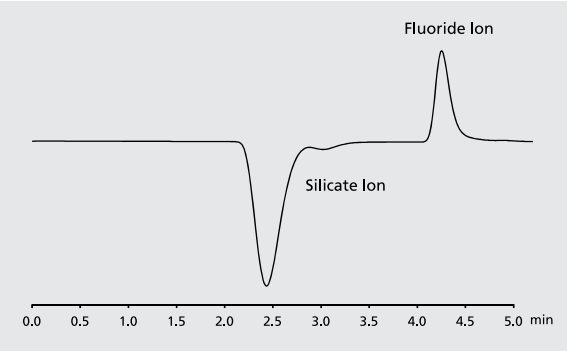
Column	:	Shim-pack IC-SA2 (250 mmL. × 4.0 mmI.D.) (P/N: 228-38983-91)
Mobile Phase	:	A) 12 mmol/L sodium hydrogen carbonate B) 0.6 mmol/L sodium carbonate A/B = 60/40 (v/v)
Flow Rate	:	1.0 mL/min
Col. Temp.	:	30 °C
Detection	:	CDD
Injection Vol.	:	50 µL

Peaks (1 mg/L each)

1. F
2. Cl
3. NO_2
4. Br
5. NO_3
6. PO_4
7. SO_4

High-Resolution Determination of the Components in Water-Quality Analysis

Environmental water and mineral water usually contain silicate. In this kind of analysis, although the water sample contains a large amount of silicic acid, fluoride ions can still be separated and determined with high resolution (same mobile phase as above was used).



Product Information

Column	Stationary Phase	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N	Guard Column
Shim-pack IC-A1	Quaternary ammonium group	12.5	100 × 4.6	228-17733-91	228-17734-91
Shim-pack IC-A3	Quaternary ammonium group	5	150 × 4.6	228-31076-91	228-31076-92
Shim-pack IC-A3 (S) *1	Quaternary ammonium group	5	150 × 2.0	228-33366-91	
Shim-pack IC-C1 *2	Sulfone group	10	150 × 5.0	228-17737-91	228-17738-91
Shim-pack IC-C1 PEEK	Sulfone group	10	100 × 4.6	228-33497-91	228-33497-92
Shim-pack IC-C4	Carboxyl group	7	150 × 4.6	228-41616-91	228-59900-91 (Cartridge + Holder) 228-59900-92 (Cartridge only)
Shim-pack IC-SA2	Quaternary ammonium group	9	250 × 4.0	228-38983-91	228-38983-92
Shim-pack IC-SA3	Quaternary ammonium group	5	250 × 4.0	228-41600-91	228-41600-92
Shim-pack IC-SC1	Carboxylic group	6	150 × 4.6	228-36605-91	228-36605-92

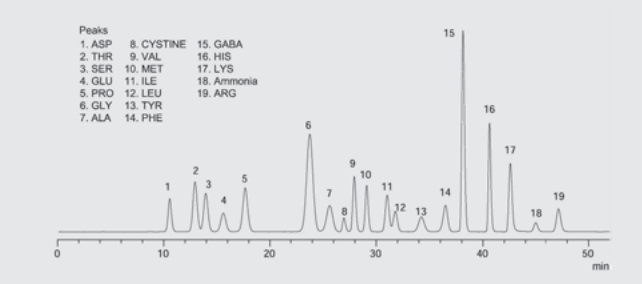
*1 Shim-pack IC(S) series are for semi-micro LC. PIA-1000 is required.
*2 During the analysis of alkali metal ions with the Shim-pack IC-C1, it is recommended to use a pre-column Shim-pack IC-PC1 (P/N:228-17744-91) installed between the liquid pump and the sample injector.

Analysis of Amino Acids

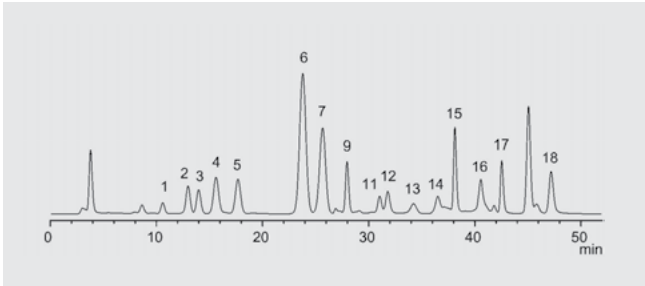
Shim-pack Amino Series

Examples of Cation Analysis

Shim-pack Amino series uses polystyrene gel as solid support, making it possible to utilize both electrostatic reaction and hydrophobic reaction. It is ideal for the analysis of amino acids.



Analysis of Amino Acid Standard



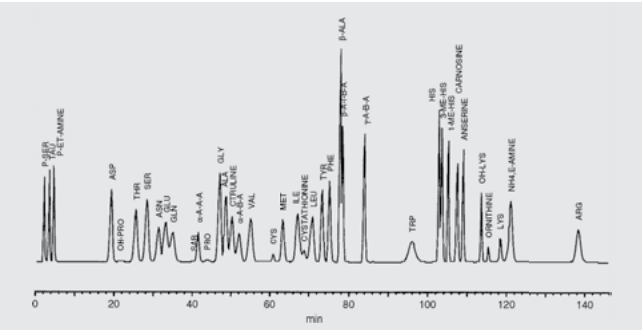
Analysis of Vinegar

Conditions

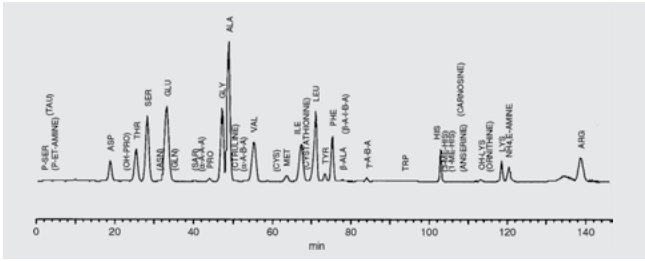
Column	:	Shim-pack Amino-Na (100 mmL × 6.0 mmI.D., 5 µm) (P/N: 228-18837-91)
Mobile Phase	:	Mobile phase kit for amino acid analysis (Na Type) (P/N: 228-21195-94)
Flow Rate	:	0.4 mL/min
Col. Temp.	:	60 °C
Detection	:	RF (Post-column derivation)

Peaks

1. ASP	6. GLY	11. ILE	16. HIS
2. THR	7. ALA	12. LEU	17. LYS
3. SER	8. CYSTINE	13. TYR	18. ARG
4. GLU	9. VAL	14. PHE	
5. PRO	10. MET	15. GABA	



Simultaneous Analysis of 38 Amino Acids



Analysis of Soy Sauce

Conditions

Column	:	Shim-pack Amino-Li (100 mmL × 6.0 mmI.D., 5 µm) (P/N: 228-18837-92)
Mobile Phase	:	Mobile phase kit for amino acid analysis (Li Type) (P/N: 228-21195-95)
Flow Rate	:	0.6 mL/min
Col. Temp.	:	39 °C
Detection	:	RF-10AXL Ex. 350 nm, Em. 450 nm

Product Information

Column	Stationary Phase	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N	Guard Column
Shim-pack AMINO-NA	Na type sulfone group	5	100 × 6.0	228-18837-91	228-18837-93 *
Shim-pack AMINO-LI	Li type sulfone group	5	100 × 6.0	228-18837-92	-

* Dedicated for the analysis of cyanide. Please do not use it in the analysis of amino acids.

In the analysis of amino acids, the following trap columns are required.

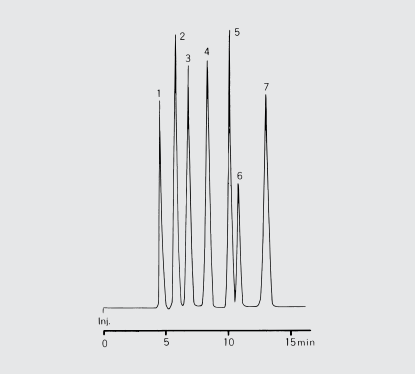
Description	Dimensions (Length × I.D., mm)	P/N
ISC-30/S 0504 NA (For trapping Na type ammonia)	50 × 4.0	228-14206-91
ISC-30/S 0504 LI (For trapping Li type ammonia)	50 × 4.0	228-00821-91

Analysis of Sugar and Organic Acid

Shim-pack SCR Series

Shim-pack SCR-101N/C/P are suitable for the analysis of monosaccharides. Since the samples are separated under a mixed mode of gel filtration and ligand exchange, the selectivity differs depending on the type of cation.

Shim-pack SCR-101H and SCR-102H are ion exclusion chromatography columns, using H type sulfonated styrene polymer as stationary phase. They are ideal for analysis of organic acids using an acid aqueous solution (e.g. aqueous solution of perchloric acid) as mobile phase.



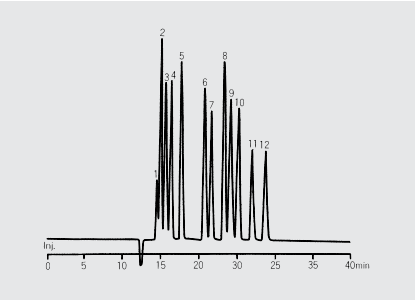
Analysis of Saccharide Standard

Peaks

1. PEG 4000
2. Maltose
3. Glucose
4. Fructose
5. Glycerol
6. Ethanol
7. Sorbitol

Conditions

Column : Shim-pack SCR-101C (300 mmL × 7.9 mmI.D., 10 µm) (P/N: 228-17889-91)
Mobile Phase : Water
Flow Rate : 1.0 mL/min
Col. Temp. : 80 °C
Detection : RID



Analysis of Organic Acids

Peaks

1. Phosphoric acid
2. α-Ketoglutaric acid
3. Citric acid
4. Pyruvic acid
5. Malic acid
6. Succinio acid
7. Lactic acid
8. Formic acid
9. Fumaric acid
10. Acetic acid
11. Levulinic acid
12. Pyroglutamic acid

Conditions

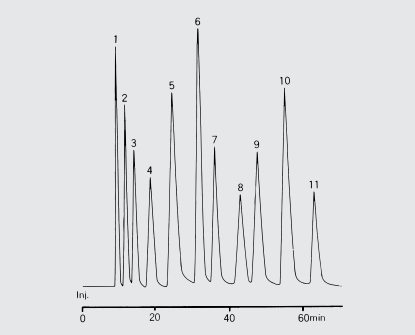
Column : Shim-pack SCR-102H (2 columns in series) (P/N: 228-17893-91)
Mobile Phase : 5 mM p-Toluene sulfonic acids aqueous solution
Flow Rate : 0.8 mL/min
Col. Temp. : 40 °C
Detection : CDD (pH buffer organic acids analysis system)

Product Information

Column	Stationary Phase	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N	Guard Column
Shim-pack SCR-101N	Na type sulfone group	10	300 × 7.9	228-07730-92	228-09619-92
Shim-pack SCR-101C	Ca type sulfone group	10	300 × 7.9	228-17889-91	228-17891-91
Shim-pack SCR-101P	Pb type sulfone group	10	300 × 7.9	228-17890-91	228-17892-91
Shim-pack SCR-101H	H type sulfone group	10	300 × 7.9	228-07730-93	228-09619-93
Shim-pack SCR-102H	H type sulfone group	7	300 × 8.0	228-17893-91	228-17924-91

Shim-pack ISA/ISC Series

Shim-pack ISA/ISC series uses polystyrene gel as solid support, making it possible to utilize both electrostatic reaction and hydrophobic reaction. They are suitable for the analysis of sugars (ISA) and guanidiono compounds (ISC-05).



Analysis of Saccharides Standards

Peaks

1. Sucrose
2. Cellobiose
3. Maltose
4. Lactose
5. Rhamnose
6. Ribose
7. Mannose
8. Fructose
9. Galactose
10. Xylose
11. Giucose

Conditions

Column : Shim-pack ISA-07/S2504 (250 mmL × 4.0 mmI.D., 7 µm) (P/N: 228-09699-91)
Mobile Phase : Potassium borate buffer solution
gradient elution
Flow Rate : 0.6 mL/min
Col. Temp. : 65 °C
Detection : RF EX. 348 nm, Em. 430 nm
(Post-column derivatization with arginine)

Product Information

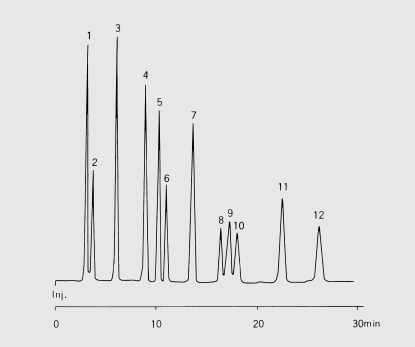
Column	Stationary Phase	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N	Guard Column
Shim-pack ISA-07/S 2504	Quaternery ammonium group	7	250 × 4.0	228-09699-91	228-00823-91
Shim-pack ISC-05/S 0504	Na type sulfone group	5	38 × 4.6	228-09700-91	228-00802-91
Shim-pack ISC-07/S 1504	Na type sulfone group	7	150 × 4.0	228-09328-91	
Shim-pack ISC-07/S 1504 Li	Li type sulfone group	7	150 × 4.0	228-00796-91	228-00797-91

Check out more Application Systems at
www.ssi.shimadzu.com/products/liquid-chromatography/index.html

Analysis of Nucleotides, Oligonucleotides and Protein

Shim-pack WAX/WCX Series

Shim-pack WAX/WCX series columns are chemically-bonded hydrophilic silica gel based ion exchange columns. Shim-pack WAX-1 is ideal for analysis of nucleotides and oligonucleotides while Shim-pack WAX-2 and WCX-1 is ideal for analysis of proteins.



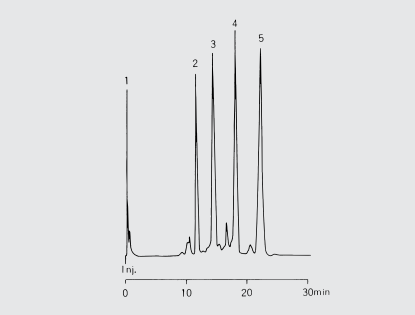
Analysis of Mononucleotides

Peaks

1. UMP
2. CMP
3. AMP
4. GMP
5. UDP
6. CDP
7. ADP
8. UTP
9. GDP
10. CTP
11. ATP
12. GTP

Conditions

Column : Shim-pack WAX-1 (50 mmL × 4.0 mmI.D., 3 µm) (P/N: 228-16225-91)
Mobile Phase : A) 20mM phosphate buffer solution (pH 7)
B) 480mM phosphoric acid buffer solution (pH 6.85)
gradient elution
Flow Rate : 1.0 mL/min
Col. Temp. : 45 °C
Detection : UV 260 nm



Analysis of Protein Standard

Peaks

1. Ovalbumin
2. Myoglobin
3. α-Chymotrypsinogen A
4. Ribonuclease A
5. Lysozyme

Conditions

Column : Shim-pack WCX-1 (50 mmL × 4.0 mmI.D., 5 µm) (P/N: 228-16366-91)
Mobile Phase : A) 20mM phosphate buffer solution (pH 6.0)
B) Sodium sulfate
gradient elution
Flow Rate : 1.0 mL/min
Col. Temp. : Ambient
Detection : UV 415 nm

Product Information

Column	Stationary Phase	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N
Shim-pack WAX-1	Tertiary amino group	3	50 × 4.0	228-16225-91
Shim-pack WAX-1	Tertiary amino group	3	150 × 4.6	228-16225-92
Shim-pack WAX-1T	Tertiary amino group	3	50 × 4.6	228-18257-91
Shim-pack WAX-2	Tertiary amino group	5	50 × 4.0	228-16365-91
Shim-pack WCX-1	Carboxyl group	5	50 × 4.0	228-16366-91
Pre-column Diol *	Diol group	10	50 × 4.0	228-16367-91

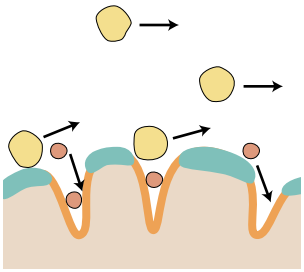
* Installed between the liquid pump and the sample injector to protect the column.

Shim-pack MAYI Series

Due to optimized particle size and a newly developed coating technology, the MAYI series online pretreatment column is highly effective in deproteinization and offers long-term stability. It provides excellent reproducibility even for continuous analysis of multiple analytes.

How the Shim-pack MAYI Series Works

The outer surfaces of silica gel (50 µm) are coated with a hydrophilic polymer, so that only the interior of pores are chemically modified by octadecyl radicals (ODS). Since proteins and other macromolecules cannot enter the pores and are blocked by the hydrophilic polymer on the outer surfaces, they are quickly eluted without being retained by the ODS solid phase. In contrast, pharmaceuticals and other induced low molecular weight compounds penetrate the pores and are retained by the inner surfaces of the stationary phase.

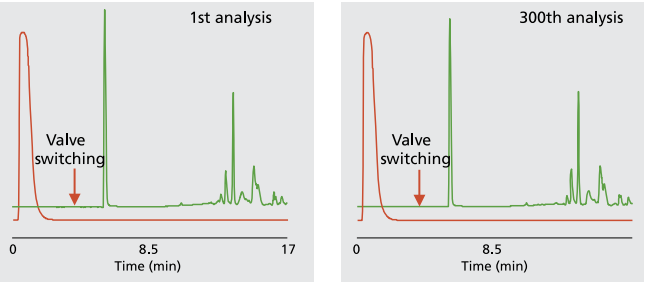


Quick and Reliable Protein Removal

The newly developed hydrophilic polymer coating technology quickly and reliably removes macromolecules, such as protein, from injected biological samples to achieve high recovery rates for target components. In addition to securely protecting analytical columns and LC/MS interfaces, this also helps reduce the time required for finishing the analysis.

Outstanding Durability

Due to the polymer coating technology and particle size optimization, stable data can be obtained for long periods. The figure below shows results from 300 consecutive injections of 100 µL of blood plasma. No decrease in the deproteinization rate or degradation of peak shape was observed.



Comparison of 1st and 300th Analyses

Conditions

Samples	:	Isopropylantipyrine added Blood plasma Sample solution: 0.1% phosphoric acid and acetonitrile mixture (95:5) Dilution: 8 times
Detection	:	Analysis: 275 nm, Blood plasma matrix: 280 nm
Injection Vol.	:	100 µL

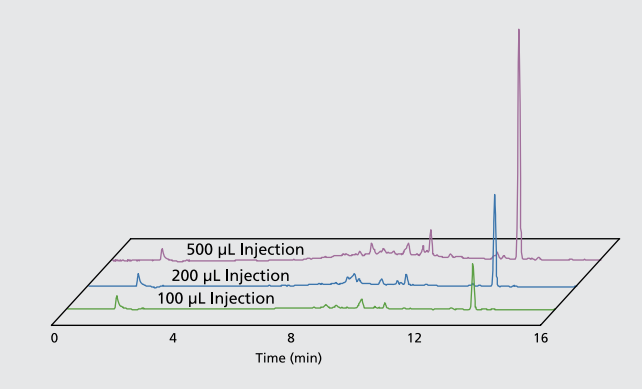
Stable Trap Even for Large Injection Volumes

The Shim-pack MAYI-ODS column provides stable component recovery rates and protein removal, even when injecting large volumes. Even when 500 µL of blood plasma was directly injected, a high recovery rate was obtained and no peak distortion was observed.

Conditions

Samples : Indomethacin added Blood plasma
Sample solution: 0.1% phosphoric acid and acetonitrile mixture (95:5)
Dilution: 8 times

Detection : UV 315 nm



Comparison Data for Injecting 100, 200, and 500 µL

Product Information

Column	Stationary Phase	Separation Mode
Shim-pack MAYI-ODS(G)	Octadecyl group	Strongest retentivity in reversed phase mode
Shim-pack MAYI-C14(G)	Tetradecyl group	Retentivity next to ODS in reversed phase mode
Shim-pack MAYI-C8(G)	Octyl group	Retentivity next to C14 in reversed phase mode
Shim-pack MAYI-C4(G)	Butyl group	Retentivity next to C8 in reversed phase mode
Shim-pack MAYI-C1(G)	Methyl group	Weakest retentivity in reversed phase mode
Shim-pack MAYI-SCX(G)	Sulfonic acid group	Strong acid cation exchange mode
Shim-pack MAYI-SAX(G)	Trimethylammonium group	Weakly basic anion exchange mode

Cartridge

Column	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N
Shim-pack MAYI-ODS	50	5 × 2.0	228-40835-93
		10 × 2.0	228-40835-95
		10 × 4.6	228-40835-91
		30 × 4.6	228-40835-97
Shim-pack MAYI-C1	50	10 × 4.6	228-46185-91
Shim-pack MAYI-C4	50	10 × 4.6	228-46186-91
Shim-pack MAYI-C8	50	10 × 4.6	228-46187-91
Shim-pack MAYI-C14	50	10 × 4.6	228-46188-91
Shim-pack MAYI-SAX	50	10 × 4.6	228-45366-91
		30 × 4.6	228-45366-93
Shim-pack MAYI-SCX	50	10 × 4.6	228-45370-91
		30 × 4.6	228-45370-93

Column Holder

Dimensions (Length × I.D., mm)	P/N
5 × 2.0	228-34938-94
10 × 2.0	228-34938-98
10 × 4.6	228-34938-92
30 × 4.6	228-34938-96

Shim-pack SPC Series

Shim-pack SPC series is specifically developed for online sample preparation systems that utilize a column switching method.

Shim-pack SPC-RP column is packed with polymer particles and used for reversed phase LC.

Shim-pack SPC-AE1 column is packed with fully porous silica gel particles on which weakly basic anion exchange functions are chemically bonded.

Product Information

Column	Stationary Phase	Separation Mode	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N
Shim-pack SPC-RP3	Polymer	Reversed phase	9	30 × 4.0	228-33713-91
Shim-pack SPC-RP2	Polymer	Reversed phase	10	10 × 4.6	228-18838-91
Shim-pack SPC-AE1	Tertiary amino group	Anion exchange	10	10 × 4.0	228-17990-91

Check out Online Sample Preparation Co-Sense Series at
www.ssi.shimadzu.com/products/liquid-chromatography/2d-hplc-bioanalysis.html

Shim-pack PREP Series

Shim-pack PREP Series

Shim-pack PREP series is packed with fully porous spherical silica particles on which respective stationary phases are chemically bonded. (Except the PREP-SIL which is packed with silica particles without any surface treatment.)

The residual silanol groups are end-capped by the unique silylation method (except the PREP-SIL).

Column	Particle Size (µm)	I.D. (mm) / Length (mm)	20	30	Guard Column	
Shim-pack PREP-ODS	15	250	228-00815-91	228-18319-91	228-18246-92	228-18321-91
Shim-pack PREP-C8	15	250	228-00816-91	-	228-18248-92	-
Shim-pack PREP-CN	15	250	228-00818-91	-	228-18266-92	-
Shim-pack PREP-SIL	15	250	228-00814-91	-	228-18270-92	-
Shim-pack PREP-NH2	15	250	228-17879-91	-	228-18268-92	-

Shim-pack G Series

Shim-pack G series is also available in preparative columns. (For information of analytical columns, please refer to page 18.)

Column	Particle Size (µm)	I.D. (mm) / Length (mm)	6.0	7.6	10	14	20
Shim-pack GIST C18	5	50	227-30018-01	227-30019-01	227-30020-01	227-30021-01	227-30022-01
		100	227-30018-02	227-30019-02	227-30020-02	227-30021-02	227-30022-02
		150	227-30018-03	227-30019-03	227-30020-03	227-30021-03	227-30022-03
		250	227-30018-04	227-30019-04	227-30020-04	227-30021-04	227-30022-04
└ Guard Column	5	50	227-30034-01	227-30035-01	227-30036-01	227-30037-01	227-30038-01
Shim-pack GIST C18-AQ	5	50	227-30743-01	227-30744-01	227-30745-01	227-30746-01	227-30747-01
		100	227-30743-02	227-30744-02	227-30745-02	227-30746-02	227-30747-02
		150	227-30743-03	227-30744-03	227-30745-03	227-30746-03	227-30747-03
		250	227-30743-04	227-30744-04	227-30745-04	227-30746-04	227-30747-04
└ Guard Column	5	50	227-30748-01	227-30749-01	227-30750-01	227-30751-01	227-30752-01
Shim-pack GISS C18	5	50	227-30062-01	227-30063-01	227-30064-01	227-30065-01	227-30066-01
		100	227-30062-02	227-30063-02	227-30064-02	227-30065-02	227-30066-02
		150	227-30062-03	227-30063-03	227-30064-03	227-30065-03	227-30066-03
		250	227-30062-04	227-30063-04	227-30064-04	227-30065-04	227-30066-04
└ Guard Column	5	50	227-30079-01	227-30080-01	227-30081-01	227-30082-01	227-30083-01
Shim-pack GIST C8	5	50	227-30174-01	227-30175-01	227-30176-01	227-30177-01	227-30178-01
		100	227-30174-02	227-30175-02	227-30176-02	227-30177-02	227-30178-02
		150	227-30174-03	227-30175-03	227-30176-03	227-30177-03	227-30178-03
		250	227-30174-04	227-30175-04	227-30176-04	227-30177-04	227-30178-04
└ Guard Column	5	50	227-30193-01	227-30194-01	227-30195-01	227-30196-01	227-30197-01
Shim-pack GIST Phenyl	5	50	227-30221-01	227-30222-01	227-30223-01	227-30224-01	227-30225-01
		100	227-30221-02	227-30222-02	227-30223-02	227-30224-02	227-30225-02
		150	227-30221-03	227-30222-03	227-30223-03	227-30224-03	227-30225-03
		250	227-30221-04	227-30222-04	227-30223-04	227-30224-04	227-30225-04
└ Guard Column	5	50	227-30238-01	227-30239-01	227-30240-01	227-30241-01	227-30242-01
Shim-pack GIST Phenyl-Hexyl	5	50	227-30691-01	227-30692-01	227-30693-01	227-30694-01	227-30695-01
		100	227-30691-02	227-30692-02	227-30693-02	227-30694-02	227-30695-02
		150	227-30691-03	227-30692-03	227-30693-03	227-30694-03	227-30695-03
		250	227-30691-04	227-30692-04	227-30693-04	227-30694-04	227-30695-04
└ Guard Column	5	50	227-30696-01	227-30697-01	227-30698-01	227-30699-01	227-30700-01
Shim-pack GIST NH2	5	50	227-30303-01	227-30304-01	227-30305-01	227-30306-01	227-30307-01
		100	227-30303-02	227-30304-02	227-30305-02	227-30306-02	227-30307-02
		150	227-30303-03	227-30304-03	227-30305-03	227-30306-03	227-30307-03
		250	227-30303-04	227-30304-04	227-30305-04	227-30306-04	227-30307-04
└ Guard Column	5	50	227-30317-01	227-30318-01	227-30319-01	227-30320-01	227-30321-01

Shim-pack G Series

Column	Particle Size (µm)	I.D. (mm) / Length (mm)	6.0	7.6	10	14	20
Shim-pack GIS C18	5	50	227-30107-01	227-30107-05	227-30108-01	227-30108-05	227-30109-01
		100	227-30107-04	227-30107-06	227-30108-02	227-30108-08	227-30109-02
		150	227-30107-02	227-30107-07	227-30108-03	227-30108-06	227-30109-03
		250	227-30107-03	227-30107-08	227-30108-04	227-30108-07	227-30109-04
	10	50	-	-	227-30113-01	227-30114-01	227-30115-01
		100	-	-	227-30113-02	227-30114-02	227-30115-02
		150	-	-	227-30113-03	227-30114-03	227-30115-03
		250	-	-	227-30113-04	227-30114-04	227-30115-04
└ Guard Column	5	50	227-30137-01	227-30138-01	227-30139-01	227-30140-01	227-30141-01
	10	50	-	-	227-30144-01	227-30145-01	227-30146-01
Shim-pack GIS C18-P	5	50	227-30558-01	227-30559-01	227-30560-01	227-30561-01	227-30562-01
		100	227-30558-02	227-30559-02	227-30560-02	227-30561-02	227-30562-02
		150	227-30558-03	227-30559-03	227-30560-03	227-30561-03	227-30562-03
		250	227-30558-04	227-30559-04	227-30560-04	227-30561-04	227-30562-04
└ Guard Column	5	50	227-30565-01	227-30566-01	227-30567-01	227-30568-01	227-30569-01
Shim-pack GIS RP-Shield	5	50	227-30590-01	227-30591-01	227-30592-01	227-30593-01	227-30594-01
		100	227-30590-02	227-30591-02	227-30592-02	227-30593-02	227-30594-02
		150	227-30590-03	227-30591-03	227-30592-03	227-30593-03	227-30594-03
		250	227-30590-04	227-30591-04	227-30592-04	227-30593-04	227-30594-04
└ Guard Column	5	50	227-30597-01	227-30598-01	227-30599-01	227-30602-01	227-30603-01
Shim-pack GIS HILIC	5	50	227-30642-01	227-30643-01	227-30644-01	227-30645-01	227-30646-01
		100	227-30642-02	227-30643-02	227-30644-02	227-30645-02	227-30646-02
		150	227-30642-03	227-30643-03	227-30644-03	227-30645-03	227-30646-03
		250	227-30642-04	227-30643-04	227-30644-04	227-30645-04	227-30646-04
└ Guard Column	5	50	227-30648-01	227-30649-01	227-30650-01	227-30651-01	227-30652-01
Shim-pack GIS CN	5	50	227-30264-01	227-30265-01	227-30266-01	227-30267-01	227-30268-01
		100	227-30264-02	227-30265-02	227-30266-02	227-30267-02	227-30268-02
		150	227-30264-03	227-30265-03	227-30266-03	227-30267-03	227-30268-03
		250	227-30264-04	227-30265-04	227-30266-04	227-30267-04	227-30268-04
└ Guard Column	5	50	227-30284-01	227-30285-01	227-30286-01	227-30287-01	227-30288-01

Column	Particle Size (µm)	I.D. (mm) / Length (mm)	30	50
Shim-pack GIS C18	5	50	227-30110-01	-
		100	227-30110-02	-
		150	227-30110-03	-
		250	227-30110-04	227-30110-05
	10	50	227-30116-01	-
		100	227-30116-02	-
		150	227-30116-03	-
		250	227-30116-04	227-30116-05
└ Guard Column	5	50*	227-30142-01	227-30143-01
	10	50*	227-30147-01	227-30148-01
Shim-pack GIS C18-P	5	50	227-30563-01	-
		250	227-30563-02	227-30564-01
└ Guard Column	5	50*	227-30570-01	227-30571-01
Shim-pack GIS RP-Shield	5	50	227-30595-01	-
		250	227-30595-02	227-30596-01
└ Guard Column	5	50*	227-30604-01	227-30605-01
Shim-pack GIS HILIC	5	50	227-30647-01	-
		250	227-30647-02	227-30647-03
└ Guard Column	5	50*	227-30653-01	227-30654-01
Shim-pack GIS CN	5	50	227-30269-01	-
		250	227-30269-02	227-30269-03
└ Guard Column	5	50*	227-30289-01	227-30290-01

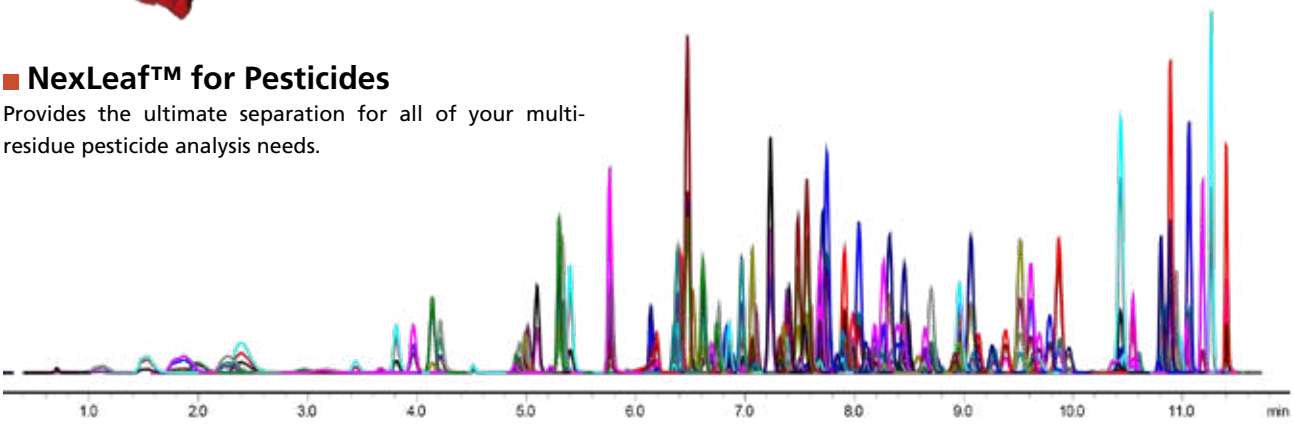
* Length of guard columns for 50 mm I.D. preparative columns is 75 mm.

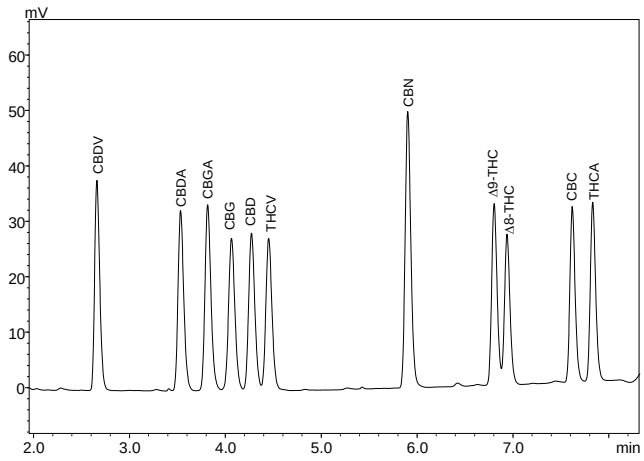
NexLeaf™ Columns
Separating the Impossible

NexLeaf™, a superficially porous series of HPLC columns engineered to achieve the ultimate in resolution and sensitivity in the most challenging cannabis matrix. Each NexLeaf™ column has both analytical and guard columns available.

NexLeaf™ for Pesticides

Provides the ultimate separation for all of your multi-residue pesticide analysis needs.





NexLeaf™ CBX™ for Potency

Designed for the best separations of cannabinoids allowing for accurate potency determination of each analyte.

Part Number	Description
220-91525-70	Column, LC, NexLeaf CBX for Potency, 2.7um, 4.6 X 150mm
220-91525-71	Column, LC, NexLeaf CBX for Potency, 2.7um, 2.1 X 100mm
220-91525-72	Column, LC, NexLeaf CBX for Potency, 2.7um, Guard Cartridge, 3/pk
220-91525-73	Column, LC, NexLeaf Guard Column Cartridge Holder
220-91525-74	Column, LC, NexLeaf for Pesticides, 2.7um, 2.1 X 150mm

Ghost Trap DS/DS-HP

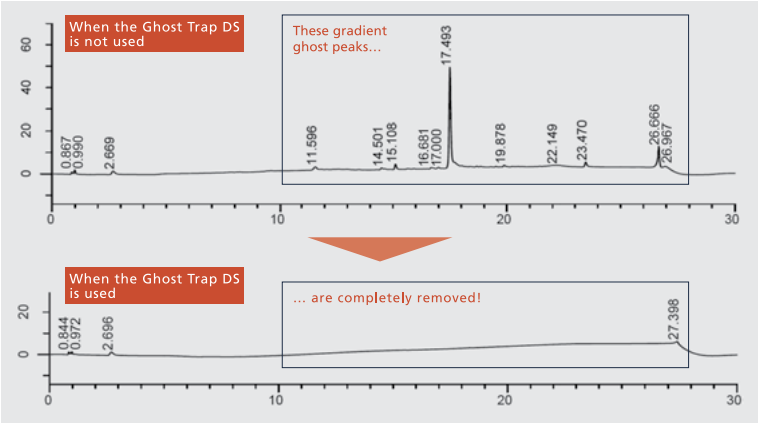
A new high-pressure model for the elimination of impurities from organic solvents has been added to the Ghost Trap DS* lineup. The Ghost Trap DS was co-developed with Daiichi Sankyo Co., Ltd. It has been designed to effectively adsorb impurities in the mobile phase in order to reduce the time required for method development and impurity analysis.

The 100 MPa pressure tolerance of the Ghost Trap DS-HP allows it to be used with UHPLC systems. This permits the effective use of the Ghost Trap DS for method development by UHPLC and subsequent transfer to conventional analysis.

* DS: Abbreviation of Daiichi Sankyo (D) and Shimadzu (S)

Consistently Traps Impurities, Even in Organic Solvents

A major feature of the Ghost Trap DS is the ability to remove impurities, even in organic solvents. When the Ghost Trap DS is installed between the gradient mixer and autosampler in reversed phase gradient analysis, it can trap impurities from the piping and gradient mixer in addition to those from the mobile phase. The example on the right shows that it can effectively trap impurities in mobile phase when the Ghost Trap DS is installed just downstream of the gradient mixer.



Example of removing ghost peaks by Ghost Trap DS
(The data is provided by Daiichi Sankyo Co., Ltd.)

Column : ODS column
Mobile Phase : A) 25 mmol/L Phosphate (Potassium) buffer solution (pH 4.0) / Acetonitrile = 9/1
B) Water/Acetonitrile = 1/9
Flow Rate : 0.65 mL/min
Col. Temp. : 45 °C
Detection : UV 210 nm

Product Information

Item	P/N	Description	Dimensions	Internal Volume *1	Pressure Tolerance
Ghost Trap DS	228-59921-91	Cartridge (2pcs)	30 mmL. × 7.6 mmI.D.	Approx. 700 µL	**5000 psi**
	228-59921-92	Cartridge (2pcs) + Holder			
	228-59921-93	Cartridge (2pcs)	4.0 mmI.D. × 20 mmL.	Approx. 150 µL	
	228-59921-94	Cartridge (2pcs) + Holder			
Ghost Trap DS-HP	228-59931-91	Packed type	2.1 mmI.D. × 30 mmL.	Approx. 60 µL	**14500 psi**

*1 Note that a delay volume equivalent to the internal volume of the product occurs if the product is installed downstream of the gradient mixer or the confluence of two pumps.
* The product service life differs according to analysis conditions, such as the mobile phase used.
* In analysis using an ion-pairing reagent, the ion-pairing reagent may be retained in the product, influencing the retention time and peak shape.
* Before connecting the analytical column, be sure to thoroughly clean the flow path with mobile phase (close to the final concentration for gradient analysis).
* Note that some impurities may not be removed.
* When performing high-pressure analysis exceeding 35 MPa with a UHPLC system, connect the gradient mixer to the Ghost Trap DS-HP with a pipe for UHPLC (e.g.228-53137-97).

SHIMADZU
Excellence in Science

Vials, Accessories, Solvent Kits, & Fittings

Features of Shimadzu Vials and Septa

- 1st hydrolytic class and silanized glass
- Vials are packaged in a cleanroom
- Contamination-free septa production

1.5mL screw vials, 100/pack



Part number	220-97331-25	220-91521-03	220-97331-26
Type	Clear, screw vial	Clear, screw vial with integrated 0.2mL micro-insert	Amber, screw vial
Write on spot	√	√	√
Min. Vol / uL	200	25	200
Max. Vol / mL	1.5	0.2	1.5
Dimension	32 x 12mm	32 x 12mm	32 x 12mm
Size	ND 9, wide opening	ND 9, wide opening	ND 9, wide opening

1.5mL screw plastic micro-vials

Part number	220-91521-05	220-97331-00**	228-31600-91
Type	PP micro-vial, transparent	PP micro-vial	PP micro-vial
Write on spot	X	X	X
Min. Vol / uL	30	200	200
Max. Vol / uL	300	750	1 mL
Dimension	32 x 12mm	32 x 12mm	32 x 12mm
Size	ND 9, wide opening	ND 9, wide opening	ND 9, wide opening
Qty	100	100	200

***Must order 220-97331-01 (Caps & Silicone/PTFE Septa)*

Caps/Septa for 1.5mL screw vials, 100/pack

Temperature limit for PTFE/Rubber septa: -40°C up to 110°C
Temperature limit for PTFE/Silicone septa: -60°C up to 200°C

Part number	Cap	Septa Material & Color	Septa Thickness	Septa Durometer	Size
220-97331-27	Red PP, Center hole	Silicone (White)/PTFE (Red)	1.3 mm	45° shore A	ND 9 (9mm)
220-97331-28	Red PP, Center hole	PTFE (Red)/Silicone (White)/PTFE (Red), Slit	1.0 mm	45° shore A	ND 9 (9mm)
220-97331-29	Red PP, Center hole	Red Rubber/PTFE (Beige)	1.0 mm	45° shore A	ND 9 (9mm)
220-91521-12	Polyethylene	Septumless Cap	-	-	ND 9 (9mm)
220-91521-13	Polyethylene Plug Cap	-	-	-	8 x 40 (1mL)

* UltraBond seal, cap & septa form an inseparable unit, so that septa cannot fall out.

1.5mL screw vial kit, including vial, cap and septa, 100/pack

Kit part number	Vial	Vial part number	Septa material	Cap/Septa part number
220-97331-30	Clear with write on spot	220-97331-25	PTFE/Silicone, ultra-clean	220-97331-27
228-45451-91	Clear Silanized	-	PTFE/Silicone, ultra-clean	-
220-97331-31	Amber with write on spot	220-97331-26	PTFE/Silicone, ultra-clean	220-97331-27
228-45453-91	Amber Silanized	-	PTFE/Silicone, ultra-clean	-

Micro-insert for 1.5mL screw vials, 100/pack

Part number	Min. sample vol	Max. sample vol	Usage	Assembled plastic spring	Type	
220-91521-04	30 uL	200 ul	ND9 wide opening vials	√	Conical	

1.5 mL amber screw vial kit

1.5 mL clear screw vial kit

4mL screw vials, 100/pack

Part number	220-97331-17	220-97331-18
Type	Clear, screw	Amber, screw
Write on spot	X	√
Min. Vol / uL	800	800
Max. Vol / mL	4.1	4.1
Dimension	45 x 15mm	45 x 15mm
Size	ND 13	ND 13

Caps/Septa for 4mL vials, 100/pack

Temperature limit for Silicone/PTFE septa: -60°C up to 200°C

Part number	Cap	Septa Material & Color	Septa Thickness	Septa Durometer	Size
220-97331-19	Black PP, Solid Cap	Silicone (Cream)/PTFE (Red)	1.5 mm	55° shore A	ND 13 (13mm)
220-97331-20	Black PP, Center hole	Silicone (Cream)/PTFE (Red)	1.5 mm	55° shore A	ND 13 (13mm)
220-97331-21	Black PP, Center hole	Silicone (White)/PTFE (Blue), Cross Slit	1.5 mm	55° shore A	ND 13 (13mm)

4mL screw vial kit, including vial, cap and septa, 100/pack

Kit part number	Vial	Vial part number	Septa Material	Cap/Septa part number
220-91521-10	Clear - Low Volume	-	PTFE/Silicone, ultra-clean	-
220-97331-23	Clear with write on spot	220-97331-17	PTFE/Silicone, ultra-clean	220-97331-20
220-97331-23	Amber with write on spot	220-97331-18	PTFE/Silicone, ultra-clean	220-97331-20
220-97331-24	Amber with write on spot	220-97331-18	Solid Cap, PTFE/Silicone	220-97331-19

10mL and 20mL Headspace screw vials, 100/pack

Part number	220-97331-09	220-97331-10	220-97331-11	220-97331-12
Volume / mL	10	20	10	20
Type	Round bottom	Round bottom	Flat bottom	Flat bottom
Dimension	46 x 22.5mm	75.5 x 22.5mm	46 x 22.5mm	75.5 x 22.5mm
For use on instrument	HS-10, HS-20, AOC-5000, AOC-6000	HS-10, HS-20, AOC-5000, AOC-6000	AOC-5000, AOC-6000	AOC-5000, AOC-6000

For TurboMatrixTM 16, 40 and 110, produced after 01.09.2006

Cap/septa for 10mL and 20mL screw vials

Temperature limit for PTFE/Silicone septa: -60°C up to 200°C
Temperature limit for Butyl/PTFE septa: -40°C up to 120°C

Part number	Cap	Septa Material	Septa Thickness	Septa Durometer	Picture
220-97331-04	Magnetic Screw	Silicone/PTFE	1.3 mm	45° shore A	

10mL and 20mL screw vial kits, including vial, cap and septa, 100/pack

Kit part number	Vial	Vial part number	Septa material	Cap/Septa part number
220-97331-14	Clear, Round Bottom	220-97331-09	Magnetic Cap, Silicone (Transparent Blue)/PTFE (White)	220-97331-04
220-97331-16	Clear, Round Bottom	220-97331-10	Magnetic Cap, Silicone (Transparent Blue)/PTFE (White)	220-97331-04

10mL and 20mL Headspace crimp vials, 100/pack

Part number	220-97331-50	220-97331-51	220-97331-07	220-97331-08
Volume / mL	10	20	10	20
Type	Round bottom	Round bottom	Flat bottom	Flat bottom
Dimension	46 x 22.5mm	75.5 x 22.5mm	46 x 22.5mm	75.5 x 22.5mm
For use on instrument	HS-10, HS-20, AOC-5000, AOC-6000	HS-10, HS-20, AOC-5000, AOC-6000	AOC-5000, AOC-6000	AOC-5000, AOC-6000

** not suitable for Thermo Scientific HS250/HS500

Cap/septa for 10mL and 20mL crimp vials

Part number	Cap	Septa Material	Septa Thickness	Septa Durometer	Temperature limit	Picture
220-97331-05	Silver magnetic	Silicone/PTFE, ultra-clean	3.0 mm	45° shore A	-60°C up to 200°C	
220-97331-06	Aluminum silver	Silicone/PTFE	3.2 mm	45° shore A	-60°C up to 200°C	
220-94906-32	-	Silicone/PTFE, ultra-clean	3.0 mm	45° shore A	Up to 300°C	
220-94906-33	Aluminum silver	–	-	-	-	

10mL and 20mL crimp vial kit, including vial, cap and septa, 100/pack

Kit part number	Vial	Vial part number	Septa material	Cap/Septa part number
220-97331-13	Clear, Flat Bottom	220-97331-07	Aluminum Crimp, Silicone (White)/PTFE (Beige)	220-97331-06
220-97331-15	Clear, Flat Bottom	220-97331-08	Aluminum Crimp, Silicone (White)/PTFE (Beige)	220-97331-06
220-97331-52	Clear, Round Bottom	220-97331-50	Aluminum Crimp, Silicone (White)/PTFE (Beige)	220-97331-06
220-97331-53	Clear, Round Bottom	220-97331-51	Aluminum Crimp, Silicone (White)/PTFE (Beige)	220-97331-06

Crimper/Decapper for 10mL and 20mL crimp vials

Part number	Description
REST-23398	20mm Crimper
REST-23399	20mm Decapper
REST-23396	11mm Crimper
REST-23397	11mm Decapper

EPA screw vials, 72/pack

Part number	Volume	Vial	Size
220-90613-01	40 mL	Clear	ND 24
220-90613-02	40 mL	Amber	ND 24

Shimadzu LabTotal Vial MS Certified Kit

- Reduces the Adsorption of Basic Compounds on the Surface of the Glass Vial.
  – This improves quantitative accuracy in the analysis of trace basic compounds.

- Quality certificate proving suitability to LCMS / GCMS
  – This product can be used as a vial for high-sensitivity analysis in GCMS and LCMS

- Wide Mouth with Preset Cap and Septum Improves Ease of Use
  – This shortens the time needed for sample preparation and reduces human error.

Part number	Description
227-34001-01	LabTotal Vial Certified Kit for LCMS, 100/pk
227-34001-02	Blue PP cap, Silicone white/PTFE red for LabTotal vial LCMS, 50/pk
226-84340-01	Black PP cap, Silicone white/PTFE red for LabTotal vial LCMS, 100/pk
227-34002-01	LabTotal Vial Certified Kit for GCMS, 100/pk

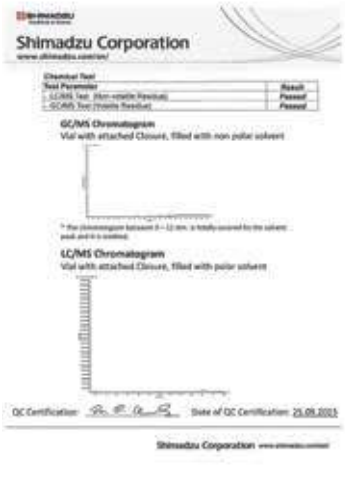
Mass Spec Quality Certificate Provided

This confirms that there was an absence of elution components from the vial in random inspections using LC/MS and GC/MS. Therefore, this product can be used with confidence, with no concern for ghost peaks originating from the vial.


Shimadzu Corporation

Certification of Inspection

Shimadzu LabTotal Vial


Shimadzu Corporation

GC/MS Chromatogram

LC/MS Chromatogram

Dedicated Pretreatment Vials for CLAM-2000

CLAM-2000 is compatible with dedicated disposable pretreatment vials from Shimadzu. Filteration and Collection vials are used as a pair.

Part number	Description		
241-16531-41	Vial set	Set of 100	* Sold as a set
241-16531-42	Vial set	Set of 500	* Sold as a set

Dedicated Filteration Vial

Dedicated Collection Vial

Specifications of Applicable Sample and Reagent Vials

Sample Containers	13 mm body diameter × 75 mm tall Examples: BD brand Vacutainer blood collection tubes Terumo brand Venoject II blood collection tubes Nipro brand Neotube blood collection tubes, etc.	
	2 mL cup P/N 038-00180 Sample Cup, 1270016HIT	
	X Micro-volume cup P/N 241-94045-01 Sample Cup, Micro	
Reagent Vials	2 mL vial P/N 038-00083-01 Vial, 2.0mL Glass Shell Vial	
	6 mL vial P/N 038-00199-04 Vial, SCREW NO.2-C	
	12 mL vial P/N 038-00199-06 Vial, SCREW NO.4-C	

Deep Well Plates - PCR Clean

	EPPE-951031801	EPPE-951032204	EPPE-951032603	EPPE-951033006	EPPE-951033405	EPPE-951033600	EPPE-951031003	EPPE-951031402
# of wells	96		96		96		384	
Working Volume	30-550uL		30-1000uL		50-2000uL		20-225uL	
Total Volume	700ul		1200uL		2400uL		240uL	
Nominal Volume	500uL		1000uL		2000uL		200uL	
Material	Polypropylene							
Bottom Shape	V Well (Conical)							
Dimensions (W x D x H) mm	127.8 x 85.5 x 27.1		127.8 x 85.5 x 44.1		127.8 x 85.5 x 44.1		127.8 x 85.5 x 25.1	
# of Plates/ box	40	120	20	80	20	80	40	120

Microplates

	EPPE-951040005	EPPE-951040021	EPPE-951040188	EPPE-951040227	EPPE-951040048	EPPE-951040081
# of wells	96		96		96	
Working Volume	50-350uL		20-320uL		20-320uL	
Total Volume	400ul		360uL		350uL	
Material	Polypropylene					
Bottom Shape	Flat Well		V Well (Conical)		U Well	
Dimensions (W x D x H) mm	127.8 x 85.5 x 14.4					
Type	PCR	Sterile	PCR	Sterile	PCR	Sterile
# of Plates/ box	80		80		80	

	EPPE-951040341	EPPE-951040383	EPPE-951040421	EPPE-951040464
# of wells	384		384	
Working Volume	10-120uL		5-120uL	
Total Volume	150uL		140ul	
Material	Polypropylene			
Bottom Shape			V Well (Conical	
Dimensions (W x D x H) mm	127.8 x 85.5 x 14.4			
Type	PCR	Sterile	PCR	Sterile
# of Plates/ box	80		80	

Deep Well Plate Covers

Item Number	Description
EPPE-0030127838	Deepwell Plate Storage Film - Heat Sealed, 100pcs
EPPE-0030127854	Deepwell Plate Storage Foil - Heat Sealed, 100pcs
EPPE-0030127960	Deepwell Plate Sealing Mat for 96DWP 2000uL, 50pcs
EPPE-0030127978	Deepwell Plate Sealing Mat for 96DWP 1000uL & 500uL, 50pcs

Solvent Bottles and Caps

Features

- Minimize release of solvent odors
- One-way emission control valve allows air to enter the reservoir as solvent is removed
- Valve opens at a low 0.07psi to minimize back pressure

Item	Part number	Description	Consists of
①	220-91411-00	1 L Bottle Cap Assy	For standard 1L Pyrex or Schott type bottles with GL-45 threads. Includes 1 solid plug and 1 filter plug with stainless steel frit. Filter plug included for use with He sparge.
②	220-91412-00	4 L Bottle Cap.	For standard 4L solvent bottles with GL-38 threads. Includes 1 solid plug and 1 filter plug with stainless steel frit. Filter plug included for use with He sparge.
③	220-91413-01	1L Bottle/Cap PKG	Set of (5) 1-L solvent bottles and (5) 3-hole caps. Caps include a solid plug and a filter plug with a stainless steel frit. Filter plug included with caps for use with He sparge.
④	228-38583-91	HPLC Reservoir Tray Bottles, 1L, Set of 5	Set of (5) 1-L solvent bottles

①

②

③

④

⑤

⑥

LC/LCMS Solvent Waste Kits

Features

- Enclose your LC solvents in the reagent bottles and trap solvent vapours in the waste container
- Collect solvent waste and reduce solvent emissions from HPLC and other laboratory instruments
- Convert an open, venting waste collection point to a "Closed System"
- Can be used with a broad array of standard laboratory solvent container
- Designed for ease of use and adaptability

A color marker label at the top of the indicator tube, marked "EXPOSED," shows the color at which the indicator has been fully exposed. When the color approximates this label, the filter should be changed. If the indicator changes to a light yellow color, it designates a prolonged exposure to solvent and should be replaced immediately.

	Part number	Description	Consists of
①	220-91494-01	HPLC Startup Kit #1 W/2-GA Poly Waste Can	Complete installation kit for HPLC that includes a solvent reservoir tray, set of 5 1-L bottles with 3-hole caps, PEEK tubing and fittings kit, and a 2-gallon (8L) PE waste can with polypropylene quick-disconnect manifold fittings.
①	220-91494-02	HPLC Startup Kit #2 W/5-GAL Poly Waste Can	Complete installation kit for HPLC that includes a solvent reservoir tray, set of 5 1-L bottles with 3-hole caps, PEEK tubing and fittings kit, and a 5-gallon (20 L) PE waste can with polypr pylene quick-disconnect manifold fittings.
①	220-91494-03	HPLC Startup Kit #3 W/ 2-GAL SS Waste Can For Normal Phase HPLC	Complete installation kit for HPLC that includes a solvent reservoir tray, set of 5 1-L bottles with 3-hole caps, tubing and fittings kit, and a 2-gallon (8L) PE waste can with stainless steel quick-disconnect manifold fittings. This type of waste can is REQUIRED for normal phase solvents.
①	220-91494-04	HPLC Startup Kit #4 W/ 5-GAL SS Waste Can For Normal Phase HPLC	Complete installation kit for HPLC that includes a solvent reservoir tray, set of 5 1-L bottles with 3-hole caps, tubing and fittings kit, and a 5-gallon (20L) PE waste can with stainless steel quick-disconnect manifold fittings. This type of waste can is REQUIRED for normal phase solvents.
②	220-91447-00	Vapor Filter for waste can	One filter
③	220-91440-30	Plastic Jug, 3.7L for LCMS Spray Chamber Waste	One 3.7L plastic jug

Ultrashield UHPLC/HPLC Pre-column Filter

Stainless steel filter with a 0.5um frit that protects UFLC columns while maintaining excellent column performance. Easily installs on any column and is leak tight to 15,000 psi (1034 bar).

Recommended for Premier, Premier II, XR-ODS, XR-ODS II and XR-ODS III columns.

Frit Dimensions : 0.062" dia.
Frit Material : 316 Stainless Steel
Frit Porosity : 0.5 micron
Inlet/Outlet : Female/Male 10-32

Part number	Description	Pack Size
220-91539-01	Ultrashield UHPLC/HPLC Pre-Column Filter	1
220-91539-03	Ultrashield UHPLC/HPLC Pre-Column Filter	3
220-91539-10	Ultrashield UHPLC/HPLC Pre-Column Filter	10

Male

Port

Fittings for HPLC and UHPLC

These innovative fittings solve all of the difficulties of cumbersome LC plumbing issues. Forget cutting old fittings off your SS tubing. Throw away your spanners, make column changes in seconds.

With an innovative design utilizing stainless steel or a proprietary PEEK™ polymer blend (PK), Shimadzu's fittings ensure outstanding performance for both conventional and demanding analyses. These reusable fittings, including the new Nexlock Finger-Tight fittings, range in pressure ratings from 5,000 to 25,000 psi, allowing analysts to select the best option for their low-pressure HPLC or ultra high pressure liquid chromatography (UHPLC) application.

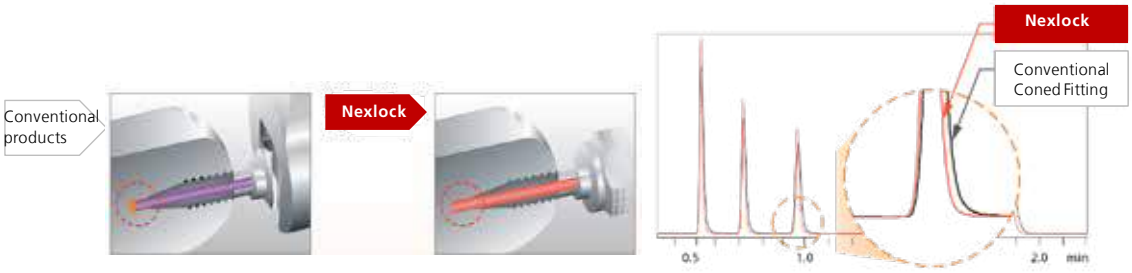
Nexlock Finger-Tight Fittings

Nexlock is a reusable finger-tight fitting that is easy to use, providing excellent pressure capacity, durability and reliability. The fitting and tube combination ensures proper sealing to achieve a zero dead volume connection, thus minimizing peak broadening and tailing. It withstands pressures up to 130 MPa without the use of tools.

Features

- Minimized dispersion

  Connection ports vary in depth, but Nexlock ensures zero dead volume every time by removing human error, resulting in improved peak shapes.



- Reusable up to 100 times

  Tubes can be connected and disconnected 100 times. Note: this is standard in use of installation method.

- Compatible with UHPLC

  Working pressures up to 19,000 psi.

- Table of Nexlock UHPLC Fittings and Tubing

Part Number	ID	OD	Port	Length	Description
228-62544-11	0.1mm	1/16"	10-32 coned	600mm	Nexlock SS Tubing with two fittings
228-62544-13	0.1mm	1/16"	10-32 coned	800mm	Nexlock SS Tubing with two fittings
228-62544-61	0.1mm	1/16"	---	600mm	Nexlock SS Tubing only, no fittings
228-62544-63	0.1mm	1/16"	---	800mm	Nexlock SS Tubing only, no fittings
228-62544-90	---	1/16"	10-32 coned	---	Nexlock Fitting Only (1 piece); no tools required

Pressure rated up to 25,000 psi (1,720 bar)

- Patent pending innovative design
- Capable of up to ten repeat assembly cycles with no impact on pressure holding ability or carry-over;
- Available in multiple threaded configurations for use with 1/16 in (1.6 mm) and 1/32 in (0.79 mm) OD tubing
- Materials of construction: Stainless Steel and Proprietary PEEK™ polymer blend (PK)

Shimadzu introduces an innovative line of UHP & VHP fittings, designed to withstand extreme pressures. This patent-pending line of ground-breaking fitting systems is perfect for use within the increasingly demanding requirements of today's high performance analytical systems. The fittings are reusable when following the proper tightening torque specification. With a polymer front ferrule, there is no damage to the tubing or receiving port, also increasing the life of these components.

Selection of Prominence HPLC and Nexera UHPLC Fittings

Type of Fitting	Can be reused (re swaged)	Pressure rating (psi)	Spanner tightened	Tubing used on	Suitable for	One or two piece system
Ultra High Pressure Fitting Stainless Steel nut with patented PEEK polymer blend ferrule. 220-91522-05 	Yes	25,000	Yes 8mm hex spanner.	S/S	All high pressure 1/16" S/S fittings up to 25,000 psi.	Separate nut and "captured" ferrule.
Ultra High Pressure Fitting Long bodied version of one above for injection valves. 220-91522-03 	Yes	25,000	Yes 8mm hex spanner.	S/S	Particularly suitable for LC injection ports.	Separate nut and "captured" ferrule.
Ultra High Pressure Fitting With fingertight head and integrated ferule, 10-32 thread. 220-91522-04 	Yes	25,000	Finger tightened.	S/S and PEEK	All fittings up to 25,000 psi. Good fitting especially for changing columns- fast and reusable with no spanners.	Two piece- S/S nut and "captured" PEEK polymer blend ferrule.

Selection of Prominence HPLC and Nexera UHPLC Fittings

Type of Fitting	Can be reused (re swaged)	Pressure rating (psi)	Spanner tightened	Tubing used on	Suitable for	One or two piece system
Fingertight - Peek Two piece, cone tip, 10-32 thread. 228-54455-01 (Nut) 228-54455-03 (Ferrule) 	Yes	16,500	Finger tightened	S/S and PEEK	All fittings up to 12,000 psi. Good fitting for when you are in a hurry.	Two piece nut & ferrule, PEEK
228-18565-84 (5 pack) 	Yes	5,000	Finger tightened	PEEK	Good fitting for column connection in low pressure systems	One Piece
220-91469-01 (10 pack) 	Yes	5,000	Finger tightened	PEEK Longhead Type	Good fitting for valve connection in low pressure systems	One Piece
228-35403-00 	Yes	5,000	Finger tightened	PEEK	1.6mn PEEK male nut for LC-20/30 drain line and plumbing line between inlet block and check valve for LC-20AD/AB and LC-10ADvp	One Piece

Eppendorf Research Plue Pipettes - Single Channel - Variable

	EPPE-3123000900	EPPE-2231300002	EPPE-3123000012	EPPE-3123000020	EPPE-3123000039	EPPE-3123000047	EPPE-3123000055	EPPE-3123000063
Volume Range (uL)	0.5-10, 10-100, & 100-1000	0.1-2.5, 0.5-10, 10-100, & 100-1000	0.1 - 2.5	0.5 - 10	2 - 20	10 - 100	20 - 200	100 - 1000
Color Code	Varies	Varies	Dark Grey	Medium Grey	Yellow	Yellow	Yellow	Blue
Number of Pipettes	3 Pack	4 Pack	1	1	1	1	1	1

Other options available

Pipette Tips - Reloads

	EPPE-022491504	EPPE-022493018	EPPE-022491512	EPPE-022491521	EPPE-022493020
Tip Volume (uL)	0.1-10	0.1-10	0.1-20	0.5-20	0.5-20
Tip Type	Eppendorf Quality	LoRetention	Eppendorf Quality	Eppendorf Quality	LoRetention
Length (mm)	34		40	46	
Number of Tips	960 total tips (10 trays of 96 tips)				

	EPPE-022491539	EPPE-022493022	EPPE-022491555	EPPE-022493024
Tip Volume (uL)	2-200	2-200	50-1000	50-1000
Tip Type	Eppendorf Quality	LoRetention	Eppendorf Quality	LoRetention
Length (mm)	53		71	
Number of Tips	960 total tips (10 trays of 96 tips)			

Other options available

Conical Tubes

	EPPE-022363611	EPPE-0030122305	EPPE-0030119401	EPPE-0030122151	EPPE-0030122178
Volume (mL)	1.5	5	5	15	50
Bottom Shape	Conical	Conical	Conical	Conical	Conical
Color	Clear	Clear	Clear	Clear	Clear
Cap Type	Safe-Lock Snap Cap	Screw	Safe-Lock Snap Cap	Screw	Screw
Quantity/Pack	500	200	200, 2 bags x 100 Tubes	500, 10 bags x 50 Tubes	500, 20 bags x 25 Tubes

Other options available

Syringe Filters

Part number	Material	Pore Size / um	Diameter / mm	Quantity	Remarks
220-97330-06	CA	0.22	4	200/pk	Non-sterile
220-97330-36	CA	0.22	13	100/pk	Non-sterile
220-97330-38	CA	0.22	25	100/pk	Non-sterile
220-97330-07	CA	0.45	4	200/pk	Non-sterile
220-97330-37	CA	0.45	13	100/pk	Non-sterile
220-97330-39	CA	0.45	25	100/pk	Non-sterile
220-97330-00	Nylon	0.22	4	200/pk	Non-sterile
220-97330-12	Nylon	0.22	13	100/pk	Non-sterile
220-97330-14	Nylon	0.22	25	100/pk	Non-sterile
220-97330-01	Nylon	0.45	4	200/pk	Non-sterile
220-97330-13	Nylon	0.45	13	100/pk	Non-sterile
220-97330-15	Nylon	0.45	25	100/pk	Non-sterile
220-97330-10	PES	0.22	4	200/pk	Non-sterile
220-97330-24	PES	0.22	13	100/pk	Non-sterile
220-97330-26	PES	0.22	25	100/pk	Non-sterile
220-97330-11	PES	0.45	4	200/pk	Non-sterile
220-97330-25	PES	0.45	13	100/pk	Non-sterile
220-97330-27	PES	0.45	25	100/pk	Non-sterile
220-97330-04	Hydrophilic PTFE	0.22	4	200/pk	Non-sterile
220-97330-20	Hydrophilic PTFE	0.22	13	100/pk	Non-sterile
220-97330-22	Hydrophilic PTFE	0.22	25	100/pk	Non-sterile
220-97330-05	Hydrophilic PTFE	0.45	4	200/pk	Non-sterile
220-97330-21	Hydrophilic PTFE	0.45	13	100/pk	Non-sterile
220-97330-23	Hydrophilic PTFE	0.45	25	100/pk	Non-sterile
220-97330-02	Hydrophobic PTFE	0.22	4	200/pk	Non-sterile
220-97330-16	Hydrophobic PTFE	0.22	13	100/pk	Non-sterile
220-97330-18	Hydrophobic PTFE	0.22	25	100/pk	Non-sterile
220-97330-03	Hydrophobic PTFE	0.45	4	200/pk	Non-sterile
220-97330-17	Hydrophobic PTFE	0.45	13	100/pk	Non-sterile
220-97330-19	Hydrophobic PTFE	0.45	25	100/pk	Non-sterile
220-97330-08	PVDF	0.22	4	200/pk	Non-sterile
220-97330-09	PVDF	0.45	4	200/pk	Non-sterile
220-97330-32	Hydrophilic PVDF	0.22	13	100/pk	Non-sterile
220-97330-34	Hydrophilic PVDF	0.22	25	100/pk	Non-sterile
220-97330-33	Hydrophilic PVDF	0.45	13	100/pk	Non-sterile
220-97330-35	Hydrophilic PVDF	0.45	25	100/pk	Non-sterile
220-97330-28	Hydrophobic PVDF	0.22	13	100/pk	Non-sterile
220-97330-30	Hydrophobic PVDF	0.22	25	100/pk	Non-sterile
220-97330-29	Hydrophobic PVDF	0.45	13	100/pk	Non-sterile
220-97330-31	Hydrophobic PVDF	0.45	25	100/pk	Non-sterile

SHIMADZU
Excellence in Science

GC Columns and Consumables

Shimadzu offers a wide range of GC columns:

Fused silica capillary

Suitable for general purpose through to specific GC and GC/MS applications.

- SH-Rxi™, SH-Rtx™
- SH-Stabilwax™, SH- FameWax™, SH- Stabilwax™

PLOT – Fused silica and metal

Ideal for efficient, reproducible analyses of permanent gases, solvents, and hydrocarbons

- SH-Rt™-Alumina BOND/NaSO4, Alumina BOND/KCl
- SH-Rt™-Msieve 5A
- SH-Rt™-Q-BOND, SH-Rt™-U-BOND
- SH-Rt™-Silica

MXT – Metal capillary

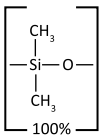
Ideal for High-Temperature GC Analysis. General-purpose column for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, and semi-volatiles.

Shimadzu GC columns undergo rigorous testing to ensure they provide you with the best separation possible. Every GC column is tested at the maximum operating temperature for the column, and specific tests are undertaken based on the application the column is targeted for. This means you can be confident of a reliable separation, column after column.

GC Columns

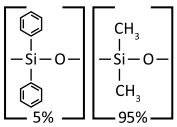
Structures, polarities, properties, and uses for Shimadzu capillary column phases, in order of increasing polarity

SH-Rxi™-1ms, SH-Rxi™-1HT, SH-Rtx™-1
Dimethyl polysiloxane



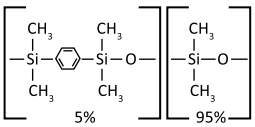
Similar to: (100%-methyl)-polysiloxane Polarity: nonpolar
Uses: solvents, petroleum products, pharmaceutical samples, waxes

SH-Rxi™-5ms, SH-Rxi™-5HT, SH-Rtx™-5, SH-Rtx™-5MS
Diphenyl dimethyl polysiloxane



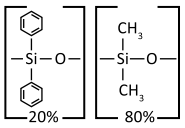
Similar to: (5%-phenyl)-methylpolysiloxane Polarity: slightly polar
Uses: flavors, environmental, aromatic hydrocarbons

SH-Rxi™-5Sil MS
1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane



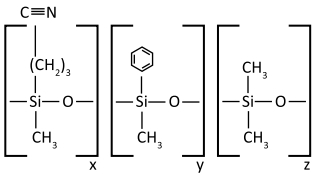
Similar to: (5%-phenyl)-methylpolysiloxane Polarity: slightly polar
Uses: flavors, environmental, pesticides, PCBs, aromatic hydrocarbons

SH-Rtx™-20
Diphenyl dimethyl polysiloxane



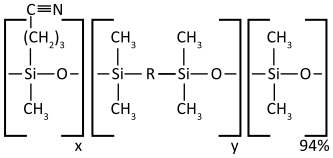
Similar to: (20%-phenyl)-methylpolysiloxane Polarity: slightly polar
Uses: vo latile compounds, alcohols

SH-Rtx™-1301, SH-Rtx™-624
Cyanopropylphenyl dimethyl polysiloxane



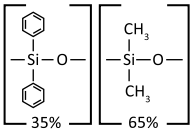
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: volatile compounds, insecticides

SH-Rtx™-624Sil MS



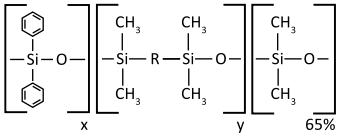
Similar to: (6%-cyanopropylphenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: volatile compounds, insecticides, residue solvents in pharmaceutical products

SH-Rtx™-35
Diphenyl dimethyl polysiloxane



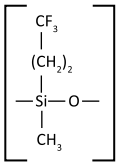
Similar to: (35%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: pesticides, PCBs, amines, nitrogen-containing herbicides

SH-Rtx™-35Sil MS



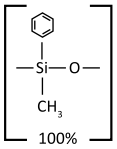
Similar to: (35%-phenyl)-methylpolysiloxane Polarity: intermediately polar
Uses: pesticides, PCBs, amines, nitrogen-containing herbicides

SH-Rtx™-200
Trifluoropropylmethyl polysiloxane



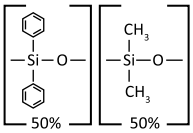
Similar to: (trifluoropropyl)-methylpolysiloxane
Polarity: selective for lone pair electrons Uses: environmental, solvents, Freon® gases, drugs, ketones, alcohols

SH-Rtx™-50
Phenyl methyl polysiloxane



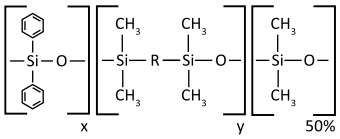
Similar to: (50%-phenyl)-methylpolysiloxane Polarity: intermediately polar
Uses: FAMEs, carbohydrates

SH-Rxi™-17
Diphenyl dimethyl polysiloxane



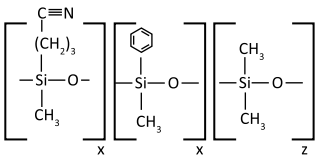
Similar to: (50%-phenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: triglycerides, phthalate esters, steroids, phenols

SH-Rxi™-17Sil MS



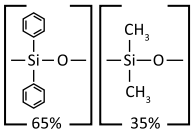
Similar to: (50%-phenyl)-methylpolysiloxane Polarity: intermediately polar
Uses: triglycerides, phthalate esters, steroids, phenols

SH-Rtx™-1701



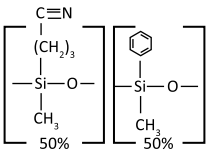
Similar to:
(14%-cyanopropylphenyl)-methylpolysiloxane
Polarity: intermediately polar
Uses: pesticides, PCBs, alcohols, oxygenates

SH-Rtx™-65
Diphenyl dimethyl polysiloxane



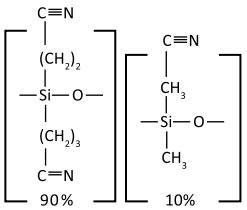
Similar to: (65%-phenyl)-methylpolysiloxane Polarity: intermediately polar
Uses: triglycerides, rosin acids, free fatty acids

SH-Rtx™-225
Cyanopropylmethyl phenylmethyl polysiloxane



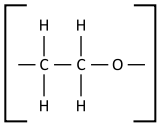
Similar to:
(50%-cyanopropylmethyl)-methylphenylpolysiloxane
Polarity: polar
Uses: FAMEs, carbohydrates

SH-Rtx™-2330
Biscyanopropyl cyanopropylphenyl polysiloxane



Similar to: (95%-cyanopropyl)-phenyl polysiloxane Polarity: polar
Uses: cis/trans FAMEs, dioxin isomers, rosin acids

SH-Stabilwax™, SH-Rtx™-Wax
Polyethylene glycol



Polarity: polar
Uses: FAMEs, flavors, acids, amines, solvents, xylene isomers

**Structures, polarities, and properties also apply to metal MXT® stationary phases.

Capillary Columns

Cross-Reference

Shimadzu	Stationary Phase	USP	Similar Phases						Page
			Agilent	Supelco	SGE	Phenomenex	Quadrex	Alltech	
High-Performance Columns									
SH-Rxi™-1MS	100% dimethyl polysiloxane	G2	HP-1ms UI, HP-1ms, DB-1ms UI, DB-1ms, Ultra-1, VF-1ms	SPB-1, Equity-1	BP-1	ZB-1, ZB-1ms	007-1	AT-1ms	106
SH-Rxi™-1HT	100% dimethyl polysiloxane	–	DB-1HT	–	–	ZB-1HT		AT-1ht	108
SH-Rxi™-5MS	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5ms UI, HP-5ms, DB-5, Ultra-2, CP Sil 8 CB	SPB-5, Equity-5	BP-5	ZB-5, ZB-5ms	007-5	AT-5ms	107
SH-Rxi™-5HT	5% diphenyl / 95% dimethyl polysiloxane	–	DB-5HT, VF-5HT	–	HT-5	ZB-5HT	–	–	108
SH-Rxi™-5Sil MS	1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane	–	DB-5ms UI, DB-5ms, VF-5ms	SLB-5ms	BPX-5	ZB-5MS, ZB-Semi-Volatiles	007-5MS	–	109
SH-Rxi™-XLB	Unique phase	–	DB-XLB, VF-Xms	–	–	ZB-MR1, ZB-XLB	–	–	110
SH-Rxi™-17	50% diphenyl / 50% dimethyl polysiloxane	G3	HP-17, DB-17, DB-17HT, DB-608	SPB-17	-	ZB-50	–	–	111
SH-Rxi™-35Sil MS	Similar to 35% phenyl methyl polysiloxane	–	DB-35ms, DB-35ms UI, VF-35ms	–	BPX-35	ZB-MR2	–	–	112
SH-Rxi™-17Sil MS	Similar to 50% phenyl methyl polysiloxane	G3	DB-17ms, HP-17, DB-17, VF-17ms, CP-Sil 24 CB	–	BPX-50	ZB-50	–	–	112
SH-Rxi™-PAH	Ideal for EFSA PAH4 analysis	–	–	–	–	–	–	–	112
SH-Rxi™-624Sil MS	Similar to 6% cyanopropylphenyl / 94% dimethyl polysiloxane	G43	HP-624, DB-624, VF-624ms, CP-Select 624 CB	–	BP-624	ZB-624	–	–	113
SH-Rxi™-1301Sil MS	Similar to 6% cyanopropylphenyl / 94% dimethyl polysiloxane	–	VF-1301ms	–	–	–	–	–	114
General-Purpose Columns									
SH-Rtx™-1	100% dimethyl polysiloxane	G1, G2, G38	HP-1, DB-1, CP Sil 5 CB	SPB-1	BP-1	ZB-1	007-1	AT-1, EC-1	115
SH-Rtx™-5	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5, DB-5, CP Sil 8 CB	SPB-5	BP-5	ZB-5	007-5	AT-5, EC-5	116
SH-Rtx™-5MS	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5, DB-5, CP Sil 8 CB	SPB-5	BP-5	ZB-5	007-5	AT-5, EC-5	117
SH-Rtx™-20	20% diphenyl / 80% dimethyl polysiloxane	G28, G32	–	SPB-20	–	–	007-20	AT-20, EC-20	118
SH-Rtx™-35 / SH-Rtx™-35MS	35% diphenyl / 65% dimethyl polysiloxane	G42	HP-35, DB-35	SPB-35, SPB-608	BPX-35, BPX-608	ZB-35	007-35	AT-35, AT-35ms	119
SH-Rtx™-50	100% methyl phenyl polysiloxane	G3	HP-50+, CP-Sil 24 CB	SPB-50	–	–	007-17	AT-50	120
SH-Rtx™-65	65% diphenyl / 35% dimethyl polysiloxane	G17	–	–	–	–	007-65HT	–	120
SH-Rtx™-1301	6% cyanopropylphenyl / 94% dimethyl polysiloxane	G43	DB-1301, CP-1301	SPB-1301	BP-624	ZB-624	007-1301	AT-1301	121
SH-Rtx™-624	6% cyanopropylphenyl / 94% dimethyl polysiloxane	G43	HP-624, DB-624, DB-624 UI, VF-624ms	SPB-1301	BP-624	ZB-624	007-624	AT-624	121
SH-Rtx™-1701	14% cyanopropylphenyl / 86% dimethyl polysiloxane	G46	DB-1701P, DB-1701, CP Sil 19 CB, VF-1701ms, VF-1701 Pesticides	SPB-1701	BP-10	ZB-1701, ZB-1701P	007-1701	AT-1701	122

GC Columns

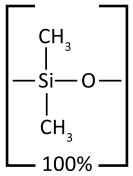
Shimadzu	Stationary Phase	USP	Similar Phases						Page
			Agilent	Supelco	SGE	Phenomenex	Quadrex	Alltech	
SH-Rtx™-200 / SH-Rtx™-200MS	Trifl uoropropylmethyl polysiloxane	G6	DB-210, DB-200, VF-200ms	–	–	–	–	AT-1701	123
SH-Rtx™-225	50% cyanopropylmethyl / 50% phenylmethyl polysiloxane	G7, G19	DB-225, DB-225MS, CP-Sil 43 CB	SPB-225	BP-225	–	007-225	AT-225	125
SH-Rtx™-2330	90% biscyanopropyl / 10% cyanopropylphenyl polysiloxane (Non-bonded)	G8, G48	DB-23, VF-23ms	SP-2330, SP-2331, SP-2380	BPX-70	–	007-23	AT-Silar90	125
SH-Rt™-2560	Biscyanopropyl polysiloxane	–	HP-88, CP-Sil 88	SP-2560	–	–	–	–	126
SH-Rtx™-Wax	Polyethylene glycol	G14, G15, G16, G20, G39	DB-Wax, CP-Wax 52 CB	–	BP-20	ZB-Wax	007-CW	AT-WAXms, EC-WAX	127
SH-Stabilwax™	Polyethylene glycol	G14, G15, G16, G20, G39	Innowax, CP-Wax 52 CB, VF-WAX MS	Supelcowax-10	–	ZB-Wax Plus	–	AT-WAX	128
Dedicated Columns									
SH-Rtx™-1614	Ideal for analysis of PBDE	–	–	–	–	–	–	–	129
SH-Rtx™-OPP2	Ideal for analysis of organophosphorus pesticides	–	–	–	–	–	–	–	130
SH-Rtx™-CLP / SH-Rtx™-CLP II	Ideal for analysis of organochlorine pesticides	–	DB-CLP1 / DB-CLP2	–	–	–	–	–	131
SH-Rtx™-VMS	Ideal for analysis of volatile organic pollutants	–	–	–	–	–	–	–	132
SH-Rtx™-PCB	Ideal for analysis of PCB congeners	–	–	–	–	–	–	–	133
SH-FAMEWAX™	Ideal for analysis of FAMEs		Select FAME	Omegawax	–	–	–	AT-AquaWax, AT-FAME	134
SH-Rtx™-BAC Plus 1 / SH-Rtx™-BAC Plus 2	Ideal for analysis of alcohol compounds in blood	–	DB-ALC1 / DB-ALC2	–	–	ZB-BAC-1 / ZB-BAC-2	–	–	135
SH-Rtx™-5 Amine / SH-Rtx™-35 Amine	Ideal for analysis of amines	–	–	–	–	–	–	–	136
SH-Stabilwax™-DA	Ideal for analysis of free acid		HP-FFAP, DB-FFAP, VF-DA, CP-Wax 58 CB, CP-FFAP CB	Nukol	BP-21	ZB-FFAP	–	AT-AquaWax-DA, AT-1000, EC-1000	137
SH-Stabilwax™-DB	Ideal for analysis of amines	–	CAM, CP-Wax 51 for Amines	Carbowax Amine	–	–	–	AT-CAM	138
PLOT Columns									
SH-Rt™-Silica BOND	Bonded silica	–	GS-GASPRO, CP-SilicaPLOT	–	–	–	–	–	139
SH-Rt™-Alumina BOND / Na2SO4	Aluminum oxide with Na2SO4 deactivation	–	GS-ALUMINA, CP-Al2O3/ Na2SO4	Alumina sulfate PLOT	–	–	–	AT-Alumina	140
SH-Rt™-Alumina BOND / KCl	Aluminum oxide with KCl deactivation	–	GS-Alumina KCl, HP-PLOT Al2O3 KCl, CP-Al2O3/KCl	Alumina chloride PLOT	–	–	PLT-AL2O3	–	140
SH-Rt™-Msieve 5A	Molecular Sieve 5A	–	HP-PLOT Molesieve, CP-Molsieve 5A	Mol Sieve 5A PLOT	–	–	PLT-5A	AT-Mole Sieve	141
SH-Rt™-Q-BOND	100% divinylbenzene porous polymer	–	HP-PLOT Q, CP-PoraPLOT Q, CP-PoraBOND Q	Supel-Q PLOT	–	–	PLT-Q	AT-Q	142
SH-Rt™-U-BOND	Divinylbenzene ethylene glycol / dimethylacrylate porous polymer	–	HP-PLOT U, CP-PoraPLOT U, CP-PoraBOND U	–	–	–	–	–	142
Metal Columns									
SH-MXT™-1	100% dimethyl polysiloxane	G1, G2, G38	DB-PS1	–	–	–	UAC-1	–	143
SH-MXT™-5	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	DB-PS5, VF-5ht UltiMetal	–	–	–	UAC-5	–	143
SH-MXT™ Biodiesel TG	Propietary phase	–	Bioiesel, Select Biodiesel	–	–	ZB-Bioethanol	–	–	143

High-Performance Capillary Columns

SH-Rxi™-1MS

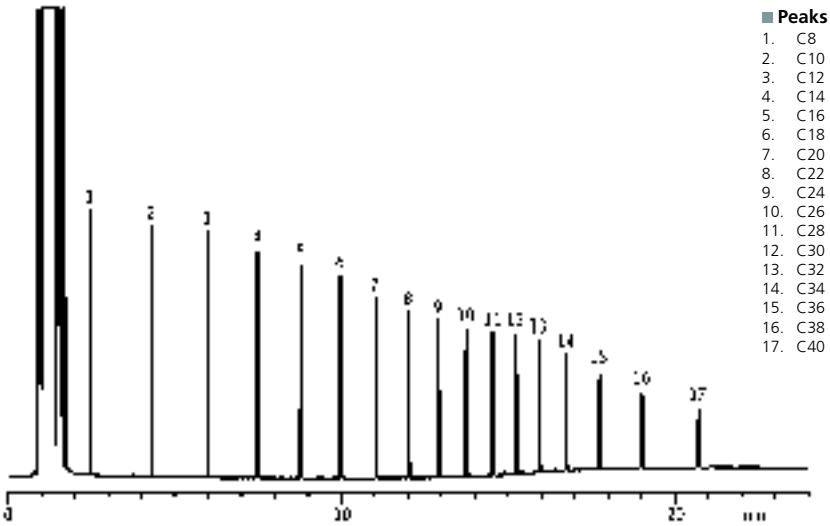
- Non-polar phase: Crossbond™ 100% dimethyl polysiloxane
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- General-purpose columns for arson accelerants, essential oils, hydrocarbons, pesticides, PCB congeners (e.g., Aroclor mixes), sulfur compounds, amines, solvent impurities, simulated distillation, oxygenates, gasoline range organics (GRO), refinery gases.
- Equivalent to USP G2 phase.
- Similar phases: HP-1ms UI, HP-1ms, DB-1ms UI, DB-1ms, Ultra-1, VF-1ms, SPB-1, Equity-1

SH-Rxi™-1MS Structure



ID	df	Temp. Range	20 m	25 m	50 m
0.15 mm	0.15 µm	-60 to 330/350 °C	227-36001-01	–	–
	2.00 µm	-60 to 330/350 °C	227-36002-01	–	–
0.18 mm	0.18 µm	-60 to 330/350 °C	221-75921-20	–	–
	0.36 µm	-60 to 330/350 °C	227-36003-01	–	–
0.20 mm	0.33 µm	-60 to 330/350 °C	–	227-36004-01	227-36004-02
ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.25 µm	-60 to 330/350 °C	227-36005-01	221-75923-30	227-36005-02
	0.50 µm	-60 to 330/350 °C	227-36006-01	227-36006-02	221-75924-60
	1.00 µm	-60 to 330/350 °C	227-36007-01	227-36007-02	227-36007-03
0.32 mm	0.25 µm	-60 to 330/350 °C	227-36008-01	221-75926-30	227-36008-02
	0.50 µm	-60 to 330/350 °C	227-36009-01	227-36009-02	227-36009-03
	1.00 µm	-60 to 330/350 °C	–	227-36010-01	221-75928-60
	4.00 µm	-60 to 330/350 °C	–	227-36011-01	–
0.53 mm	0.50 µm	-60 to 330/350 °C	227-36012-01	227-36012-02	–
	1.00 µm	-60 to 330/350 °C	227-36013-01	227-36013-02	–
	1.50 µm	-60 to 330/350 °C	227-36014-01	227-36014-02	227-36014-03

Petroleum Hydrocarbons (TPH)



Peaks

1. C8
2. C10
3. C12
4. C14
5. C16
6. C18
7. C20
8. C22
9. C24
10. C26
11. C28
12. C30
13. C32
14. C34
15. C36
16. C38
17. C40

Conditions

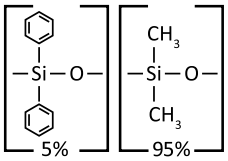
Instrument : GC-2010
Column : SH-Rxi™-1ms, 20 m, 0.18 mm ID, 0.18 µm (P/N: 221-75921-20)
Sample : Florida TRPH Standard, 500 µg/mL each component in hexane
Inj. Vol. : 0.5 µL, split (split ratio 20:1)
Inj. Temp : 275 °C
Carrier Gas : Hydrogen, constant linear velocity mode, 55 cm/sec.
Oven Temp : 40 °C (hold 1 min) to 330 °C at 20 °C/min (hold 10 min)
Detector : FID, 350 °C

High-Performance Capillary Columns

SH-Rxi™-5MS

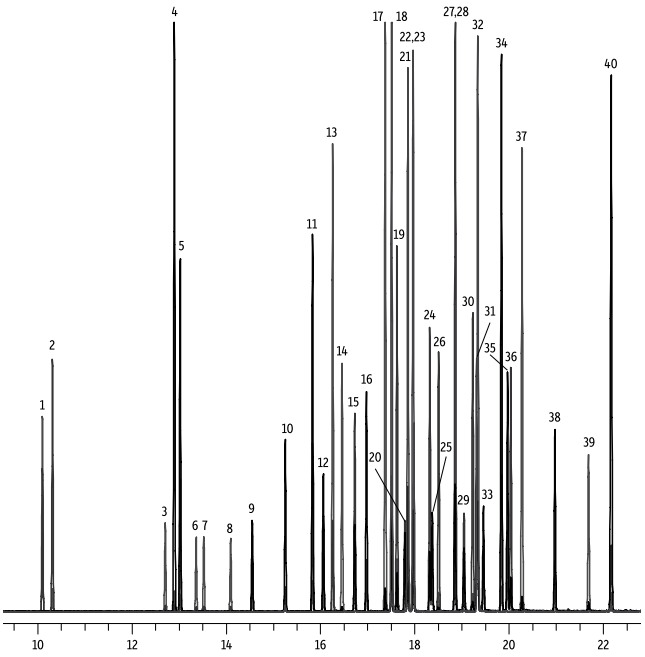
- Low-polarity phase: Crossbond™ 5% diphenyl / 95% dimethyl polysiloxane
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- General-purpose columns for semi-volatiles, phenols, amines, residual solvents, drugs of abuse, pesticides, PCB congeners (e.g., Aroclor mixes), solvent impurities.
- Equivalent to USP G27 and G36 phases.
- Similar phases: HP-5ms UI, HP-5ms, DB-5, Ultra-2, CP Sil 8 CB, SPB-5, Equity-5

SH-Rxi™-5MS Structure



ID	df	Temp. Range	20 m	25 m	50 m
0.18 mm	0.18 µm	-60 to 330/350 °C	227-36015-01	–	–
	0.30 µm	-60 to 330/350 °C	227-36016-01	–	–
	0.36 µm	-60 to 330/350 °C	227-36017-01	–	–
0.20 mm	0.33 µm	-60 to 330/350 °C	–	227-36018-01	227-36018-02
ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.25 µm	-60 to 330/350 °C	221-75940-15	221-75940-30	227-36019-01
	0.40 µm	-60 to 330/350 °C	–	227-36020-01	–
	0.50 µm	-60 to 330/350 °C	227-36021-01	221-75941-30	221-75942-60
	1.00 µm	-60 to 330/350 °C	227-36022-01	227-36022-02	227-36022-03
0.32 mm	0.25 µm	-60 to 330/350 °C	227-36023-01	221-75943-30	227-36023-02
	0.50 µm	-60 to 330/350 °C	227-36024-01	221-75944-30	227-36024-02
	1.00 µm	-60 to 330/350 °C	227-36025-01	227-36025-02	227-36025-03
0.53 mm	0.25 µm	-60 to 330/350 °C	227-36026-01	227-36026-02	–
	0.50 µm	-60 to 330/350 °C	227-36027-01	227-36027-02	–
	1.00 µm	-60 to 330/350 °C	227-36028-01	227-36028-02	–
	1.50 µm	-60 to 330/350 °C	227-36029-01	227-36029-02	–

GC Multiresidue Pesticide



Peaks

1. Chloroneb
2. Pentachlorobenzene
3. alpha-BHC
4. Hexachlorobenzene
5. Pentachloroanisole
6. beta-BHC
7. gamma-BHC (Lindane)
8. delta-BHC
9. Endosulfan ether
10. Heptachlor
11. Pentachlorothioanisole
12. Aldrin
13. 4,4'-Dichlorobenzophenone
14. Fenson
15. Isodrin
16. Heptachlor epoxide (Isomer B)
17. Chlorbenside
18. *trans*-Chlordane
19. 2,4'-DDE
20. Endosulfan I
21. *cis*-Chlordane
22. *trans*-Nonachlor
23. Chlorfenson (Ovex)
24. 4,4'-DDE
25. Dieldrin
26. 2,4'-DDD
27. Endrin
28. Ethylan (Perthane)
29. Endosulfan II
30. 4,4'-DDD
31. 2,4'-DDT
32. *cis*-Nonachlor
33. Endrin aldehyde
34. 4,4'-Methoxychlor olefin
35. Endosulfan sulfate
36. 4,4'-DDT
37. 2,4'-Methoxychlor
38. Endrin ketone
39. Tetradifon
40. Mirex

Conditions

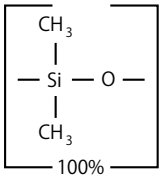
Column : SH-Rxi™-5ms, 30 m, 0.25 mm ID, 0.25 §m (P/N: 221-75940-30)
Inj. Vol. : 1 µL split (split ratio 50:1)
Inj. Temp : 250 °C
Oven Temp : 90 °C (hold 1 min) to 330 °C at 8.5 °C/min (hold 5 min)
Carrier Gas : He, constant flow rate 1.4 mL/min
Detector : MS-QP
Transfer Line Temp: 290 °C
Source Temp: 325 °C
Solvent Delay Time: 5 min
Ionization: EI

High-Performance Capillary Columns

SH-Rxi™-1HT

- Non-polar phase: Crossbond™ 100% dimethyl polysiloxane
- 40% longer lifetime from specially designed fused silica tubing.
- Columns processed for high-temperature applications, such as high molecular weight hydrocarbons.
- Similar phases: DB-1HT, AT-1ht

SH-Rxi™-1HT Structure

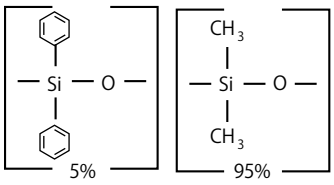


ID	df	Temp. Range	15 m	30 m
0.25 mm	0.10 µm	-60 to 400 °C	227-36087-01	227-36087-02
	0.25 µm	-60 to 400 °C	–	227-36088-01
0.32 mm	0.10 µm	-60 to 400 °C	227-36089-01	227-36089-02
	0.25 µm	-60 to 400 °C	–	227-36090-01

SH-Rxi™-5HT

- Non-polar phase: Crossbond™ 5% diphenyl / 95% dimethyl polysiloxane
- 40% longer lifetime from specially designed fused silica tubing.
- Columns processed for high-temperature applications, such as mineral oil hydrocarbons.
- Similar phases: DB-5HT, VF-5HT

SH-Rxi™-5HT Structure



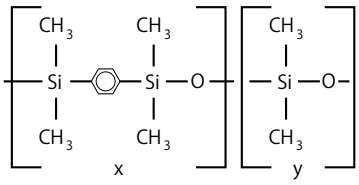
ID	df	Temp. Range	15 m	30 m
0.25 mm	0.10 µm	-60 to 400 °C	221-75933-15	227-36091-01
	0.25 µm	-60 to 400 °C	227-36092-01	221-75934-30
0.32 mm	0.10 µm	-60 to 400 °C	227-36093-01	227-36093-02
	0.25 µm	-60 to 400 °C	–	227-36094-01
0.53 mm	0.15 µm	-60 to 380/400 °C	–	227-36095-01

High-Performance Capillary Columns

SH-Rxi™-5Sil MS

- Low-polarity phase: Crossbond™ silarylene phase 1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane
- Engineered to be a low-bleed GCMS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GCMS analysis of semi-volatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Similar phases: DB-5ms UI, DB-5ms, VF-5ms, SLB-5ms

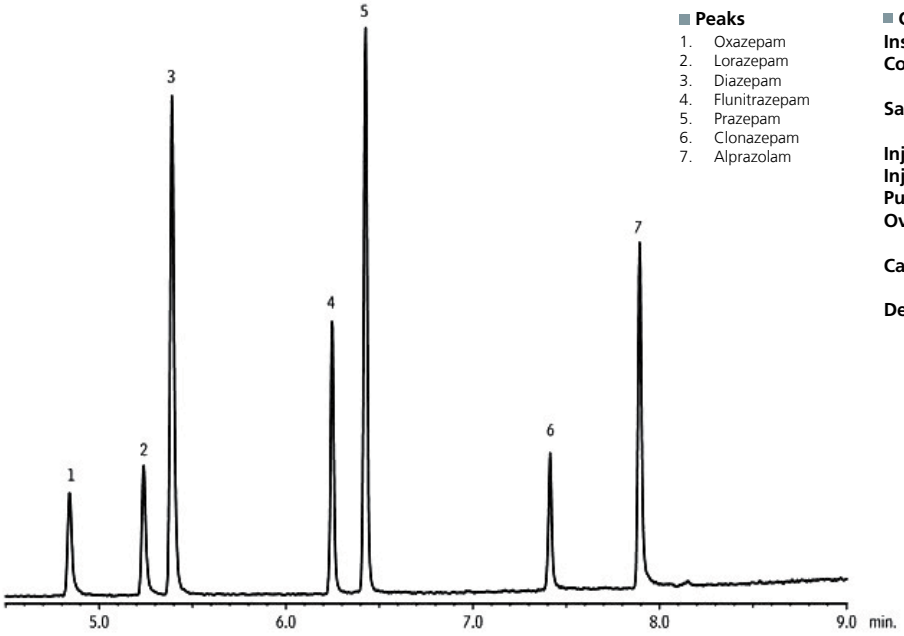
SH-Rxi™-5Sil MS Structure



For SH-Rxi™-5Sil MS columns with Integra-Guard™ column, please refer to page 144.

ID	df	Temp. Range	10 m	20 m	40 m	60 m
0.10 mm	0.10 µm	-60 to 330/350 °C	227-36317-01	–	–	–
0.15 mm	0.15 µm	-60 to 320/350 °C	–	227-36030-01	–	–
	2.00 µm	-60 to 320/350 °C	–	227-36031-01	–	–
0.18 mm	0.10 µm	-60 to 320/350 °C	–	–	–	227-36032-01
	0.18 µm	-60 to 320/350 °C	–	227-36033-01	227-36033-02	–
	0.36 µm	-60 to 320/350 °C	–	227-36034-01	–	–
ID	df	Temp. Range		15 m	30 m	60 m
0.25 mm	0.10 µm	-60 to 320/350 °C	–	227-36035-01	227-36035-02	–
	0.25 µm	-60 to 320/350 °C	–	227-36036-01	221-75954-30	227-36036-02
	0.50 µm	-60 to 320/350 °C	–	227-36037-01	227-36037-02	–
	1.00 µm	-60 to 320/350 °C	–	227-36038-01	221-75956-30	227-36038-02
0.32 mm	0.25 µm	-60 to 320/350 °C	–	227-36039-01	227-36039-02	–
	0.50 µm	-60 to 320/350 °C	–	–	227-36040-01	–
	1.00 µm	-60 to 320/350 °C	–	–	227-36041-01	–
0.53 mm	1.50 µm	-60 to 320/350 °C	–	–	227-36032-02	–

Benzodiazepines



Peaks

1. Oxazepam
2. Lorazepam
3. Diazepam
4. Flunitrazepam
5. Prazepam
6. Clonazepam
7. Alprazolam

Conditions

Instrument : GCMS-QP2010
Column : SH-Rxi™-5Sil MS, 30 m, 0.25 mm ID, 0.25 µm (P/N: 221-75954-30)
Sample : Diluent: Butyl chloride
Conc.: 15 µg/mL
Inj. Vol. : 1 µL splitless (hold 1 min)
Inj. Temp : 280 °C
Purge Flow : 32.2 mL/min (20:1 split)
Oven Temp : 200 °C to 330 °C at 15 °C/min (hold 3 min)
Carrier Gas : He, constant linear velocity mode, 50 cm/sec.
Detector : MS-QP
Transfer Line Temp: 280 °C
Source Temp: 200 °C
Solvent Delay Time: 4 min
Tune: PFTBA
Ionization: EI
Scan Range: 50-350

High-Performance Capillary Columns

SH-Rxi™-XLB

- Low-polarity proprietary phase
- General-purpose columns exhibiting extremely low bleed. Ideal for many GCMS applications, including pesticides, PCB congeners (e.g., Aroclor mixes), PAHs.
- Unique selectivity.
- Similar phases: DB-XLB, VF-Xms

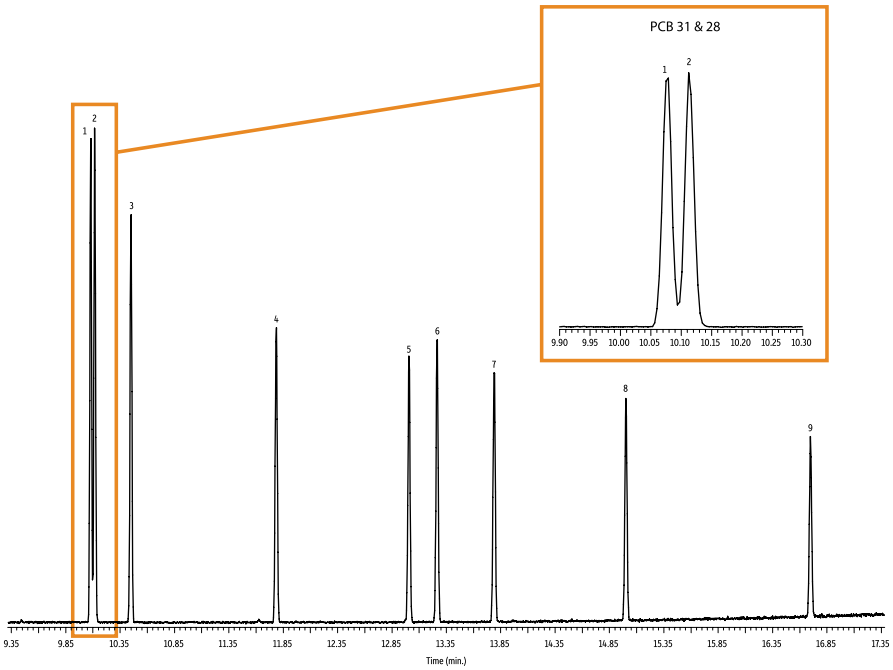
ID	df	Temp. Range	20 m	30 m	60 m
0.18 mm	0.18 µm	30 to 340/360 °C	227-36309-01	–	–
0.25 mm	0.10 µm	30 to 340/360 °C	–	227-36042-01	–
	0.25 µm	30 to 340/360 °C	–	227-36043-01	227-36043-02
	0.50 µm	30 to 340/360 °C	–	227-36044-01	–
	1.00 µm	30 to 340/360 °C	–	227-36045-01	–
0.32 mm	0.25 µm	30 to 340/360 °C	–	227-36046-01	227-36046-02
	0.50 µm	30 to 340/360 °C	–	227-36047-01	–
	1.00 µm	30 to 340/360 °C	–	227-36048-01	–
0.53 mm	0.50 µm	30 to 320/360 °C	–	227-36049-01	–
	1.50 µm	30 to 320/360 °C	–	227-36050-01	–

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

EU PCB Congeners

Peaks

1. PCB 31
2. PCB 28
3. PCB 52
4. PCB 101
5. PCB 118
6. PCB 153
7. PCB 138
8. PCB 180
9. PCB 194



Conditions

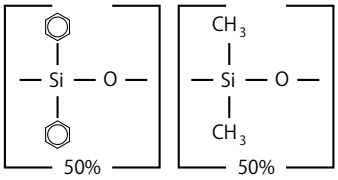
Column : SH-Rxi™-XLB, 30 m, 0.25 mm ID, 0.25 µm (P/N: 227-36043-01)
Sample : PCB congener standard
Diluent: Dichloromethane
Conc.: 3.5 ppm
Inj. Vol. : 0.5 µL splitless (hold 1.75 min)
Inj. Temp : 300 °C
Purge Flow : 50 mL/min
Oven Temp : 40 °C (hold 2 min) to 240 °C at 30 °C/min (hold 2 min) to 340 °C at 10 °C/min (hold 5 min)
Carrier Gas : He, constant flow rate 1 mL/min
Detector : MS-QP
Transfer Line Temp: 300 °C
Source Temp: 280 °C
Ionization: EI
Scan Range: 45-550

High-Performance Capillary Columns

SH-Rxi™-17

- Mid-polarity phase: Crossbond™ 50% diphenyl / 50% dimethyl polysiloxane
- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, sterols.
- Similar phases: HP-17, DB-17, DB-17HT, DB-608, SPB-17

SH-Rxi™-17 Structure

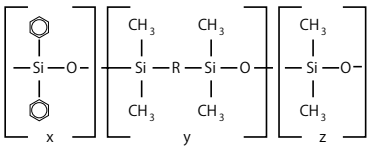


ID	df	Temp. Range	20 m	40 m
0.18 mm	0.18 µm	40 to 280/320 °C	227-36061-01	–
0.25 mm	0.25 µm	40 to 280/320 °C	–	221-75907-30
	0.50 µm	40 to 280/320 °C	–	227-36062-01
	1.00 µm	40 to 280/320 °C	–	227-36063-01
0.32 mm	0.25 µm	40 to 280/320 °C	–	227-36064-01
	0.50 µm	40 to 280/320 °C	–	227-36065-01
	1.00 µm	40 to 280/320 °C	–	227-36066-01
0.53 mm	0.25 µm	40 to 280/320 °C	–	227-36067-01
	0.50 µm	40 to 280/320 °C	–	227-36068-01
	0.83 µm	40 to 280/320 °C	–	227-36069-01
	1.00 µm	40 to 280/320 °C	–	221-76193-30
	1.50 µm	40 to 280/320 °C	–	227-36070-01

SH-Rxi™-35Sil MS

- Mid-polarity: Crossbond™ phase (similar to 35% phenyl methyl polysiloxane)
- Very low-bleed phase for GCMS analysis.
- Special selectivity and excellent inertness for substituted polar compounds, such as drugs, pesticides, herbicides, PCBs, phenols, etc.
- Provides superior separation for cannabinoids.
- Similar phases: DB-35ms, DB-35ms UI, VF-35ms

SH-Rxi™-35Sil MS Structure

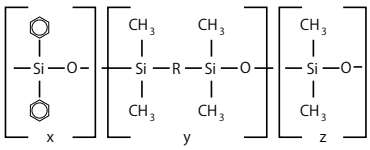


ID	df	Temp. Range	15 m	30 m
0.25 mm	0.25 µm	50 to 340/360 °C	227-36051-01	227-36051-02
	0.50 µm	50 to 340/360 °C	227-36052-01	227-36052-02
	1.00 µm	50 to 320/340 °C	227-36053-01	227-36053-02
0.32 mm	0.25 µm	50 to 340/360 °C	227-36054-01	227-36054-02
	0.50 µm	50 to 340/360 °C	227-36055-01	227-36055-02
	1.00 µm	50 to 320/340 °C	227-36056-01	227-36056-02
0.53 mm	0.50 µm	50 to 340/360 °C	227-36057-01	227-36057-02
	1.00 µm	50 to 320/340 °C	227-36058-01	227-36058-02
	1.50 µm	50 to 310/330 °C	227-36059-01	227-36059-02
	3.00 µm	50 to 280/300 °C	227-36060-01	227-36060-02

High-Performance Capillary Columns

SH-Rxi™-17Sil MS

SH-Rxi™-17Sil MS Structure



- Mid-polarity Crossbond™ phase (similar to 50% phenyl methyl polysiloxane)
- Low bleed for use with sensitive detectors, such as MS.
- Excellent inertness and selectivity for active environmental compounds, such as PAHs.
- Equivalent to USP G3 phase.
- Similar phases: DB-17ms, HP-17, DB-17, VF-17ms, CP-Sil 24 CB

ID	df	Temp. Range	30 m	60 m
0.25 mm	0.25 µm	40 to 340/360 °C	221-75916-30	227-36071-01
0.32 mm	0.25 µm	40 to 340/360 °C	227-36072-01	–

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

SH-Rxi™-PAH

- Mid-polarity proprietary phase
- Ideal for EFSA PAH4 analysis—separates all priority compounds: benz[a]anthracene, chrysene, benzo[b]fluoranthene and benzo[a] pyrene.

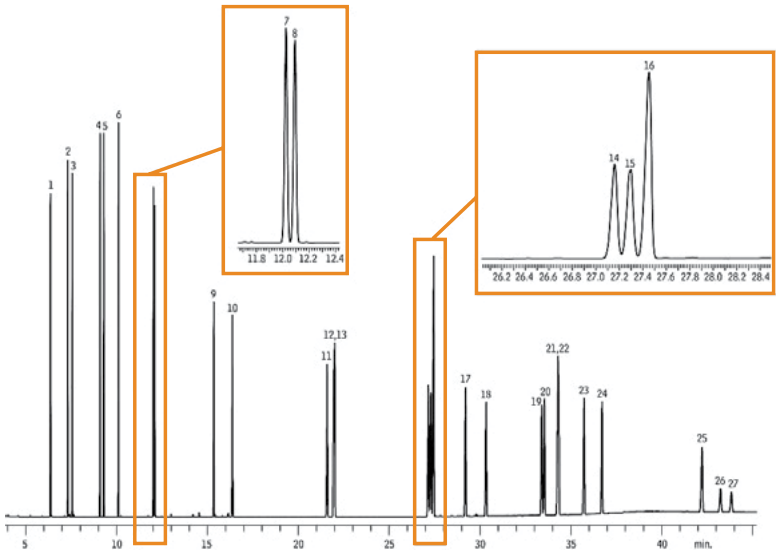
ID	df	Temp. Range	30 m	40 m	60 m
0.18 mm	0.07 µm	to 360 °C	–	227-36073-01	–
0.25 mm	0.10 µm	to 360 °C	227-36074-01	–	227-36074-02

- Best resolution of chrysene from interfering PAHs, triphenylene, and cyclopenta[cd]pyrene.
- Complete separation of benzo [b], [k], [j], and [a] fluoranthenes.

Polycyclic Aromatic Hydrocarbons (US EPA Method 8100)

Peaks

1. Naphthalene
2. 2-Methylnaphthalene
3. 1-Methylnaphthalene
4. Acenaphthylene
5. Acenaphthene
6. Fluorene
7. Phenanthrene
8. Anthracene
9. Fluoranthene
10. Pyrene
11. Benz[a]anthracene
12. Chrysene
13. Triphenylene
14. Benzo[b]fl uoranthene
15. Benzo[k]fl uoranthene
16. Benzo(j)fl uoranthene
17. Benzo[a]pyrene
18. 3-Methylcholanthrene
19. Dibenz(a,h)acridine
20. Dibenz[a,j]acridine
21. Indeno[1,2,3-cd]pyrene
22. Dibenz[a,h]anthracene
23. Benzo[ghi]perylene
24. 7H-Dibenzo[c,g]carbazole
25. Dibenzo[a,e]pyrene
26. Dibenzo(a,i)pyrene
27. Dibenzo(a,h)pyrene



Conditions

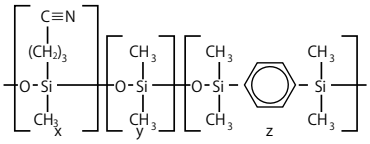
Column : SH-Rxi™-17Sil MS, 30 m, 0.25 mm ID, 0.25 ¨m (P/N: 221-75916-30)
Inj. Vol. : 0.5 µL splitless (hold 1.75 min)
Inj. Temp : 320 °C
Purge Flow : 75 mL/min
Oven Temp : 65 °C (hold 0.5 min) to 220 °C at 15 °C/min to 330 °C at 4 °C/min (hold 15 min)
Carrier Gas : He, constant flow rate 2.0 mL/min
Detector : FID, 320 °C

High-Performance Capillary Columns

SH-Rxi™-624Sil MS

- Mid-polarity Crossbond™ silarylene phase (similar to 6% cyanopropylphenyl / 94%dimethyl polysiloxane)
- Low-bleed, high-thermal stability column—maximum temperatures up to 300–320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.
- Similar phases: HP-624, DB-624, VF-624ms, CP-Select 624 CB

SH-Rxi™-624Sil MS Structure

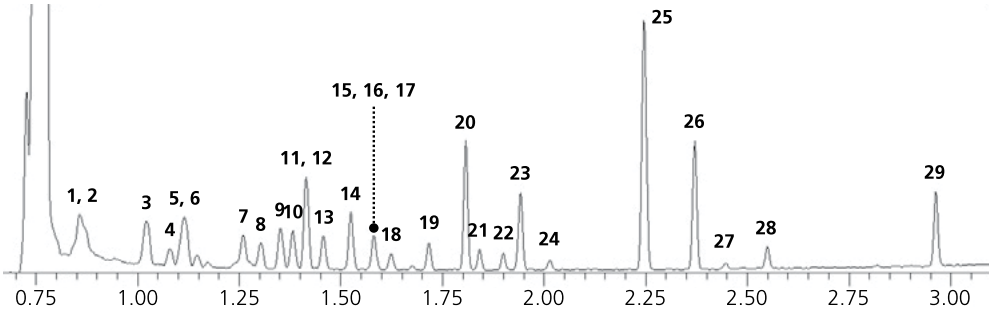


ID	df	Temp. Range	20 m	30 m	60 m	75 m	105 m
0.18 mm	1.00 µm	-20 to 300/320 °C	227-36075-01	–	–	–	–
0.25 mm	1.40 µm	-20 to 300/320 °C	–	221-75962-30	227-36076-01	–	–
0.32 mm	1.80 µm	-20 to 300/320 °C	–	227-36077-01	221-75963-60	–	–
0.53 mm	3.00 µm	-20 to 280/300 °C	–	227-36078-01	227-36078-02	227-36078-03	227-36078-04

Ultra-Fast Analysis of Volatile Organic Compounds in Water

Peaks

1. Vinyl chloride-d3 (ISTD)
2. Vinyl chloride
3. 1,1-dichloroethylene
4. Dichloromethane
5. Methyl-t-butyl ether (MTBE)
6. Trans-1,2-dichloroethylene
7. Cis-1,2-dichloroethylene
8. Trichloromethane
9. 1,1,1-trichloroethane
10. Carbon tetrachloride
11. 1,2-dichloroethane
12. Benzene
13. Fluorobenzene (ISTD)
14. Trichloroethylene
15. 1,4-dioxane-d8 (ISTD)
16. 1,2-dichloropropane
17. 1,4-dioxane
18. Bromodichloromethane
19. Cis-1,3-dichloropropene
20. Toluene
21. Trans-1,3-dichloropropene
22. 1,1,2-trichloroethane
23. Tetrachloroethylene
24. Dibromochloromethane
25. m-,p-xylene
26. o-xylene
27. Bromoform
28. 4-bromofl uorobenzene
29. 1,4-dichlorobenzene



Conditions

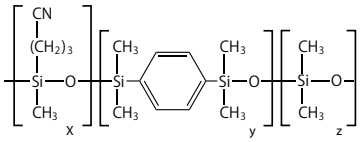
Instrument	: GCMS-TQ8030 + HS-20 Loop	**Inj.**	: Split (split ratio 30:1)
Column	: SH-Rxi™-624Sil MS, 20 m, 0.18 mm ID, 1.00 µm (P/N: 227-36075-01)	**Oven Temp**	: 70 °C, 40 °C/min to 220 °C (hold 0.5 min)
		Carrier Gas	: He, constant linear velocity mode, 50 cm/sec
Headspace-Loop	: Loop volume: 1 mL	**Detector**	: MS: SIM
Sample Equilibration	: 70 °C for 30 min		MS/MS: MRM
Vial pressurization	: 0.5 min, 50 kPa, equilibration 0.05 min		Event (loop) time: 0.15 sec
Needle Flush	: 2 min		Source Temp: 200 °C
Sample Pathway Temp	: 200 °C		Interface Temp: 230 °C
Transfer Line Temp	: 200 °C		

High-Performance Capillary Columns

SH-Rxi™-1301Sil MS

- Mid-polarity Crossbond™ silarylene phase (similar to 6% cyanopropylphenyl / 94%dimethyl polysiloxane)
- Highest thermal stability in the industry ensures dependable, accurate MS results and increased uptime.
- Stabilized cyano phase selectivity improves the performance of existing methods. Ideal for solvents, glycols, and other polar compounds.
- Rigorous QC testing ensures inertness and accurate, reliable data for multiple compound classes.
- Similar phase: VF-1301ms

SH-Rxi™-1301Sil MS Structure



ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.25 µm	-60 to 320 °C	–	227-36079-01	227-36079-02
	1.00 µm	-60 to 320 °C	–	227-36080-01	227-36080-02
0.32 mm	0.25 µm	-60 to 320 °C	–	227-36081-01	–
	1.00 µm	-60 to 320 °C	–	227-36082-01	227-36082-02
	1.50 µm	-60 to 320 °C	–	227-36083-01	227-36083-02
0.53 mm	1.00 µm	-60 to 320 °C	227-36084-01	227-36084-02	–
	1.50 µm	-60 to 320 °C	–	227-36085-01	–
	3.00 µm	-60 to 320 °C	–	227-36086-01	227-36086-02

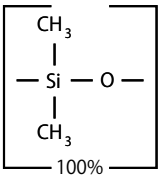
Guard columns for SH-Rxi™ are also available. Please refer to page 136.

General-Purpose Capillary Columns

SH-Rtx™-1

- Non-polar phase: Crossbond™ 100% dimethyl polysiloxane
- General-purpose columns for solvent impurities, PCB congeners (e.g., Aroclor mixes), simulated distillation, arson accelerants, gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semi-volatiles, pesticides, oxygenates.
- Equivalent to USP G1, G2, G38 phases.
- Similar phases: HP-1, DB-1, CP Sil 5 CB, SPB-1

SH-Rtx™-1 Structure



For SH-Rtx™-1 columns with Integra-Guard™ column, please refer to page 135.

ID	df	Temp. Range	10 m	15 m	25 m	30 m	60 m	105 m
0.25 mm	0.10 µm	-60 to 330/350 °C	–	221-75718-15	–	221-75718-30	227-36096-01	–
	0.25 µm	-60 to 330/350 °C	221-75719-10	–	221-75719-25	221-75719-30	221-75719-60	–
	0.50 µm	-60 to 330/350 °C	–	–	–	227-36097-01	227-36097-02	–
	1.00 µm	-60 to 320/340 °C	–	–	–	227-36098-01	227-36098-02	221-75721-05
0.32 mm	0.10 µm	-60 to 330/350 °C	–	–	–	227-36099-01	227-36099-02	–
	0.25 µm	-60 to 330/350 °C	–	–	–	221-75723-30	221-75723-60	–
	0.50 µm	-60 to 330/350 °C	–	–	–	221-75724-30	227-36100-01	–
	1.00 µm	-60 to 320/340 °C	–	–	–	221-75725-30	221-75725-60	–
	1.50 µm	-60 to 310/330 °C	–	–	–	227-36101-01	227-36101-02	–
	3.00 µm	-60 to 280/300 °C	–	–	–	227-36102-01	227-36102-02	–
	4.00 µm	-60 to 280/300 °C	–	–	–	227-36103-01	–	–
	5.00 µm	-60 to 260/280 °C	–	–	–	221-75728-30	221-75728-60	–
0.53 mm	0.10 µm	-60 to 320/340 °C	–	–	–	227-36104-01	–	–
	0.25 µm	-60 to 320/340 °C	–	–	–	221-75729-30	227-36105-01	–
	0.50 µm	-60 to 310/330 °C	–	221-75730-15	–	221-75730-30	227-36106-01	–
	1.00 µm	-60 to 310/330 °C	–	221-75731-15	–	221-75731-30	221-75731-60	–
	1.50 µm	-60 to 310/330 °C	–	221-75732-15	–	221-75732-30	227-36107-01	–
	3.00 µm	-60 to 270/290 °C	–	–	–	221-75733-30	221-75733-60	–
	5.00 µm	-60 to 270/290 °C	–	–	–	221-75734-30	221-75734-60	–
	7.00 µm	-60 to 240/260 °C	–	–	–	227-36108-01	227-36108-02	–

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

SH-Rtx™-1 PONA

Compatible with ASTM and CGSB for hydrocarbon analysis.

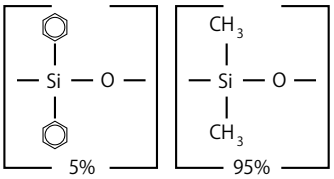
ID	df	Temp. Range	100 m
0.25 mm	0.50 µm	-60 to 300/340 °C	221-76196-00

General-Purpose Capillary Columns

SH-Rtx™-5

- Low-polarity phase: Crossbond™ 5% diphenyl / 95% dimethyl polysiloxane
- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, semi-volatiles.
- Equivalent to USP G27 and G36 phases.
- Similar phases: HP-5, DB-5, CP Sil 8 CB, SPB-5

SH-Rtx™-5 Structure



For SH-Rtx™-5 columns with Integra-Guard™ column, please refer to page 135.

ID	df	Temp. Range	15 m	25 m	30 m	60 m
0.25 mm	0.10 µm	-60 to 330/350 °C	221-75700-15	–	221-75700-30	227-36109-01
	0.25 µm	-60 to 330/350 °C	227-36313-01	–	221-75701-30	227-36110-01
	0.50 µm	-60 to 330/350 °C	–	221-76178-25	221-76178-30	227-36111-01
	1.00 µm	-60 to 320/340 °C	–	–	221-75702-30	227-36112-01
0.32 mm	0.10 µm	-60 to 330/350 °C	227-36312-01	–	227-36113-01	–
	0.25 µm	-60 to 330/350 °C	221-75703-15	–	221-75703-30	221-75703-60
	0.50 µm	-60 to 330/350 °C	–	–	221-75704-30	227-36114-01
	1.00 µm	-60 to 320/340 °C	–	–	221-75705-30	221-75705-60
	1.50 µm	-60 to 310/330 °C	–	–	221-76181-30	227-36115-01
	3.00 µm	-60 to 280/300 °C	–	–	227-36116-01	227-36116-02
0.53 mm	0.10 µm	-60 to 320/340°C	–	–	227-36117-01	–
	0.25 µm	-60 to 320/340 °C	227-36314-01	–	221-75708-30	227-36118-01
	0.50 µm	-60 to 320-330 °C	–	–	221-75709-30	227-36119-01
	1.00 µm	-60 to 320/330 °C	221-75710-15	–	221-75710-30	221-75710-60
	1.50 µm	-60 to 310/330 °C	221-75711-15	–	221-75711-30	227-36120-01
	3.00 µm	-60 to 270/290 °C	–	–	221-75712-30	227-36121-01
	5.00 µm	-60 to 270/290 °C	–	–	221-75713-30	221-75713-60

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

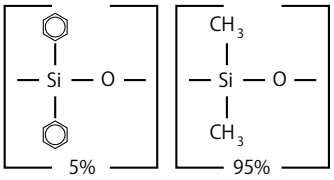
Metal columns are also available. Please refer to page 134.

General-Purpose Capillary Columns

SH-Rtx™-5MS

- Low-polarity phase: Crossbond™ 5% diphenyl / 95% dimethyl polysiloxane
- Column specifically tested for low-bleed performance.
- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, semi-volatiles.
- Equivalent to USP G27 and G36 phases.
- Similar phases: HP-5, DB-5, CP Sil 8 CB, SPB-5

SH-Rtx™-5MS Structure

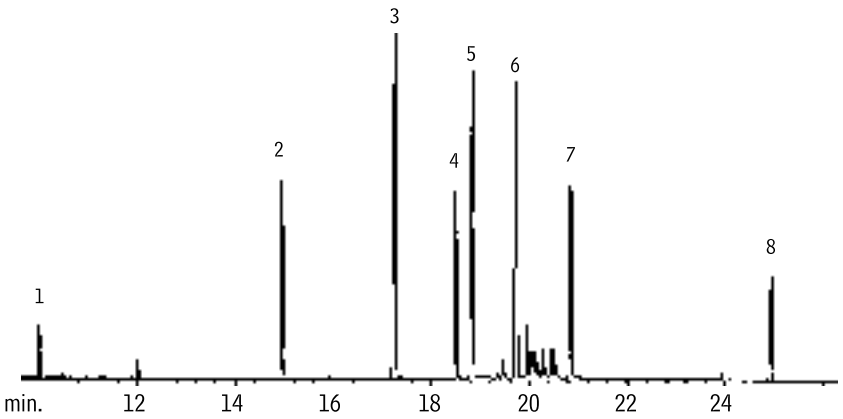


For SH-Rtx™-5MS columns with Integra-Guard™ column, please refer to page 135.

ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.10 µm	-60 to 330/350 °C	221-75854-15	221-75854-30	227-36122-01
	0.25 µm	-60 to 330/350 °C	221-75855-15	221-75855-30	227-36123-01
	0.50 µm	-60 to 330/350 °C	–	227-36124-01	227-36124-02
	1.00 µm	-60 to 325/350 °C	–	221-75857-30	–
0.32 mm	0.10 µm	-60 to 330/350 °C	–	227-36125-01	227-36125-02
	0.25 µm	-60 to 330/350 °C	–	221-75858-30	221-75858-60
	0.50 µm	-60 to 330/350 °C	–	227-36126-01	227-36126-02
	1.00 µm	-60 to 325/350 °C	–	227-36127-01	–
0.53 mm	0.50 µm	-60 to 320/340 °C	–	221-76191-30	–
	1.00 µm	-60 to 320/340 °C	–	227-36128-01	–
	1.50 µm	-60 to 310/330 °C	–	227-36129-01	–

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Endocrine Disruptors: Alkyl Phenols



Peaks

1. *tert*-butyl phenol
2. *n*-pentyl phenol
3. *n*-hexyl phenol
4. *n*-heptyl phenol
5. *tert*-octyl phenol
6. *n*-octyl phenol
7. *n*-nonyl phenol
8. bisphenol A

Conditions

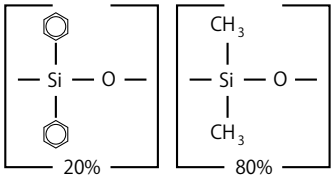
Column : SH-Rtx™-5MS, 30 m, 0.25 mm ID, 0.25 µm (P/N: 221-75855-30).
Conc. : 5–10 ng on-column
Inj. : Splitless, purge on at 1 min
Inj. Temp : 275 °C
Purge Flow : 32.2 mL/min (20:1 split)
Oven Temp : 35 °C (hold 1 min) to 300 °C at 10 °C/min (hold 15 min)
Carrier Gas : He
Det. Temp : **310 °C**

General-Purpose Capillary Columns

SH-Rtx™-20

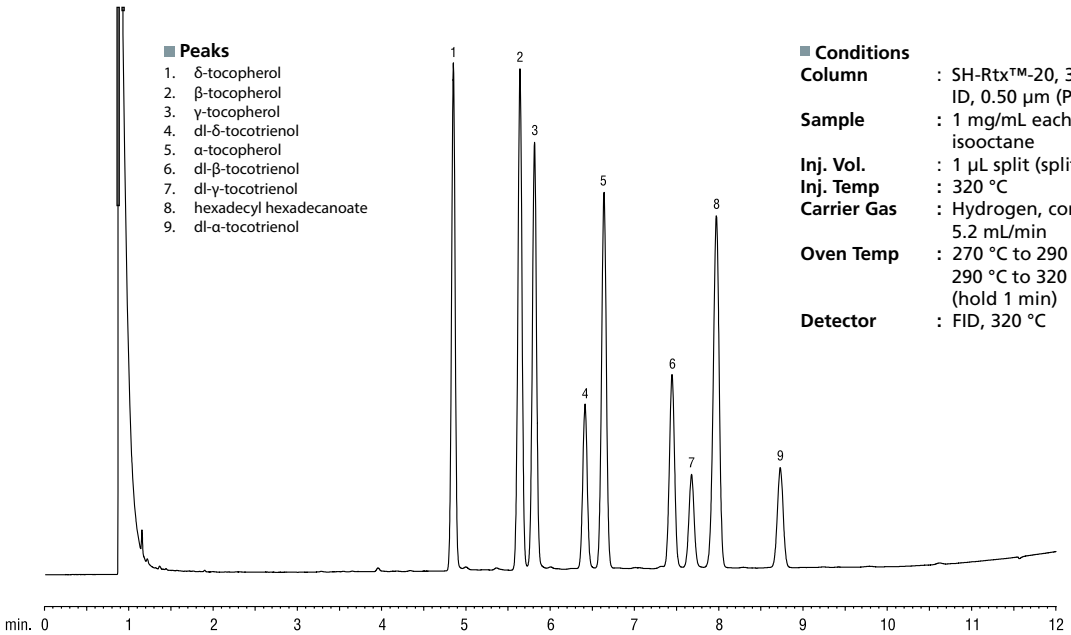
- Mid-polarity phase: Crossbond™ 20% diphenyl / 80% dimethyl polysiloxane
- General-purpose columns for volatile compounds, flavor compounds, alcoholic beverages.
- Equivalent to USP G28 and G32 phases.
- Similar phases: SPB-20, 007-20, AT-20, EC-20.

SH-Rtx™-20 Structure



ID	df	Temp. Range	30 m	60 m
0.25 mm	0.10 µm	-20 to 300/320 °C	227-36130-01	227-36130-02
	0.25 µm	-20 to 300/320 °C	227-36131-01	227-36131-02
	0.50 µm	-20 to 290/310 °C	227-36132-01	227-36132-02
	1.00 µm	-20 to 280/300 °C	227-36133-01	227-36133-02
0.32 mm	0.10 µm	-20 to 300/320 °C	227-36134-01	227-36134-02
	0.25 µm	-20 to 300/320 °C	227-36135-01	227-36135-02
	0.50 µm	-20 to 290/310 °C	227-36136-01	227-36136-02
	1.00 µm	-20 to 280/300 °C	227-36137-01	227-36137-02
	1.50 µm	-20 to 270/290 °C	227-36138-01	227-36138-02
	3.00 µm	-20 to 250/270 °C	227-36139-01	227-36139-02
0.53 mm	0.10 µm	-20 to 260/280 °C	227-36140-01	227-36140-02
	0.25 µm	-20 to 260/280 °C	–	227-36141-01
	0.50 µm	-20 to 260/280 °C	227-36142-01	–
	1.00 µm	-20 to 260/280 °C	227-36143-01	227-36143-02
	1.50 µm	-20 to 250/270 °C	227-36144-01	–
	3.00 µm	-20 to 240/260 °C	227-36145-01	227-36145-02

Tocopherols and Tocotrienols

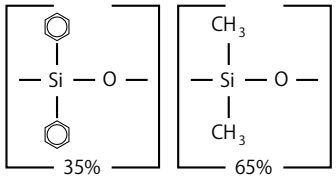


General-Purpose Capillary Columns

SH-Rtx™-35/SH-Rtx™-35MS

- Mid-polarity phase: Crossbond™ 35% diphenyl / 65% dimethyl polysiloxane
- General-purpose columns for organochlorine pesticides, PCB congeners (e.g., Aroclor mixes), herbicides, pharmaceuticals, sterols, rosin acids, phthalate esters.
- Equivalent to USP G42 phase.
- Similar phases: HP-35, DB-35, SPB-35, SPB-608

SH-Rtx™-35 / SH-Rtx™-35MS Structure



SH-Rtx™-35

ID	df	Temp. Range	30 m	60 m
0.25 mm	0.10 µm	40 to 320 °C	227-36146-01	227-36146-02
	0.25 µm	40 to 320 °C	227-36147-01	227-36147-02
	0.50 µm	40 to 310 °C	227-36148-01	227-36148-02
	1.00 µm	40 to 290 °C	227-36149-01	227-36149-02
0.32 mm	0.10 µm	40 to 320 °C	227-36150-01	227-36150-02
	0.25 µm	40 to 320 °C	227-36151-01	227-36151-02
	0.50 µm	40 to 310 °C	227-36152-01	227-36152-02
	1.00 µm	40 to 290 °C	227-36153-01	227-36153-02
	1.50 µm	40 to 270/290 °C	227-36154-01	–
	3.00 µm	40 to 250/270 °C	227-36155-01	227-36155-02
0.53 mm	0.10 µm	40 to 260/280 °C	–	227-36156-01
	0.25 µm	40 to 260/280 °C	–	227-36157-01
	0.50 µm	40 to 300 °C	227-36158-01	227-36158-02
	1.00 µm	40 to 290 °C	227-36159-01	227-36159-02
	1.50 µm	40 to 280 °C	227-36160-01	227-36160-02
	3.00 µm	40 to 240/260 °C	227-36161-01	227-36161-02

SH-RTX™-35MS (Low-bleed for GCMS analysis)

ID	df	Temp. Range	30 m
0.25 mm	0.25 µm	40 to 320 °C	221-75835-30

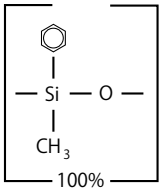
Download the brochure of GC/GCMS consumables from
https://store.shimadzu.com/c-827-gcms.aspx

General-Purpose Capillary Columns

SH-Rtx™-50

- Mid-polarity phase: Crossbond™ 100% methyl phenyl polysiloxane
- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, sterols.
- Equivalent to USP G3 phase.
- Similar phases: HP-50+, CP-Sil 24 CB, SPB-50

SH-Rtx™-50 Structure

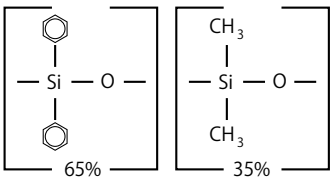


ID	df	Temp. Range	30 m	60 m
0.25 mm	0.25 µm	40 to 300/320 °C	227-36162-01	227-36162-02
	0.50 µm	40 to 290/310 °C	227-36163-01	227-36163-02
	1.00 µm	40 to 280/300 °C	227-36164-01	227-36164-02
0.32 mm	0.25 µm	40 to 300/320 °C	221-76182-30	227-36165-01
	0.50 µm	40 to 290/310 °C	227-36166-01	227-36166-02
	1.00 µm	40 to 280/300 °C	227-36167-01	227-36167-02
0.53 mm	0.50 µm	40 to 270/290 °C	227-36168-01	227-36168-02
	0.83 µm	40 to 270/290 °C	227-36169-01	–
	1.00 µm	40 to 260/280 °C	227-36170-01	227-36170-02
	1.50 µm	40 to 250/270 °C	227-36171-01	227-36171-02

SH-Rtx™-65

- Mid-polarity phase: Crossbond™ 65% diphenyl / 35% dimethyl polysiloxane
- General-purpose columns for phenols, fatty acids, triglycerides.
- Equivalent to USP G17 phase.

SH-Rtx™-65 Structure



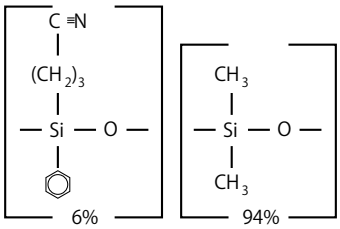
ID	df	Temp. Range	30 m
0.25 mm	0.25 µm	50 to 300 °C	227-36172-01
	0.50 µm	50 to 280/300 °C	227-36173-01
	1.00 µm	50 to 260/280 °C	227-36174-01
0.32 mm	0.25 µm	50 to 300 °C	227-36175-01
	0.50 µm	50 to 280/300 °C	227-36176-01
	1.00 µm	50 to 260/280 °C	227-36177-01
0.53 mm	1.00 µm	50 to 250/270 °C	227-36178-01

General-Purpose Capillary Columns

SH-Rtx™-1301

- Mid-polarity phase: Crossbond™ 6% cyanopropylphenyl / 94% dimethyl polysiloxane
- General-purpose columns for residual solvents, alcohols, oxygenates, and volatile organic compounds.
- Equivalent to USP G43 phase.
- Similar phases: DB-1301, CP-1301, SPB-1301

SH-Rtx™-1301 Structure



For SH-Rtx™-1301 columns with Integra-Guard™ column, please refer to page 135.

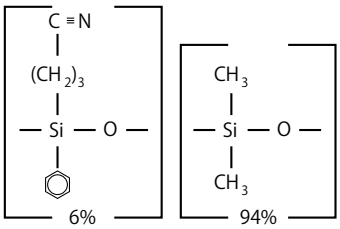
ID	df	Temp. Range	30 m	60 m
0.25 mm	0.25 µm	-20 to 280 °C	221-76194-30	221-76194-60
	0.50 µm	-20 to 270 °C	227-36203-01	–
	1.00 µm	-20 to 260 °C	227-36204-01	227-36204-02
	1.40 µm	-20 to 240 °C	–	227-36205-01
0.32 mm	0.25 µm	-20 to 280 °C	227-36206-01	227-36206-02
	0.50 µm	-20 to 270 °C	227-36207-01	227-36207-02
	1.00 µm	-20 to 260 °C	227-36208-01	227-36208-02
	1.50 µm	-20 to 250 °C	227-36209-01	227-36209-02
	1.80 µm	-20 to 240 °C	227-36210-01	227-36210-02
0.53 mm	0.25 µm	-20 to 280 °C	227-36211-01	–
	0.50 µm	-20 to 270 °C	227-36212-01	227-36212-02
	1.00 µm	-20 to 260 °C	227-36213-01	227-36213-02
	1.50 µm	-20 to 250 °C	227-36214-01	–

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

SH-Rtx™-624

- Mid-polarity phase: Crossbond™ 6% cyanopropylphenyl / 94% dimethyl polysiloxane
- Application-specific columns for volatile organic pollutants. Recommended in U.S. EPA methods for volatile organic pollutants.
- Equivalent to USP G43 phase.
- Similar phases: HP-624, DB-624, DB-624 UI, VF-624ms, SPB-1301

SH-Rtx™-624 Structure



For SH-Rtx™-624 columns with Integra-Guard™ column, please refer to page 135.

ID	df	Temp. Range	20 m	30 m	60 m	75 m
0.18 mm	1.00 µm	-20 to 240 °C	227-36259-01	–	–	–
0.25 mm	1.40 µm	-20 to 240 °C	–	221-75863-30	227-36215-01	–
0.32 mm	1.80 µm	-20 to 240 °C	–	221-75864-30	221-75864-60	–
0.53 mm	3.00 µm	-20 to 240 °C	–	221-75865-30	221-75865-60	221-75865-75

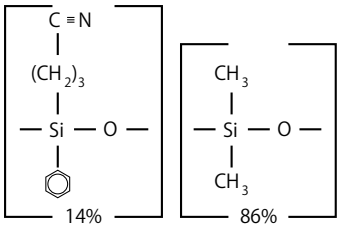
* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

General-Purpose Capillary Columns

SH-Rtx™-1701

- Mid-polarity phase: Crossbond™ 14% cyanopropylphenyl / 86% dimethyl polysiloxane
- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g., Aroclor mixes), pesticides, and fragrance compounds.
- Equivalent to USP G46 phase.
- Similar phases: DB-1701P, DB-1701, CP Sil 19 CB, VF-1701ms, VF-1701 Pesticides, SPB-1701

SH-Rtx™-1701 Structure

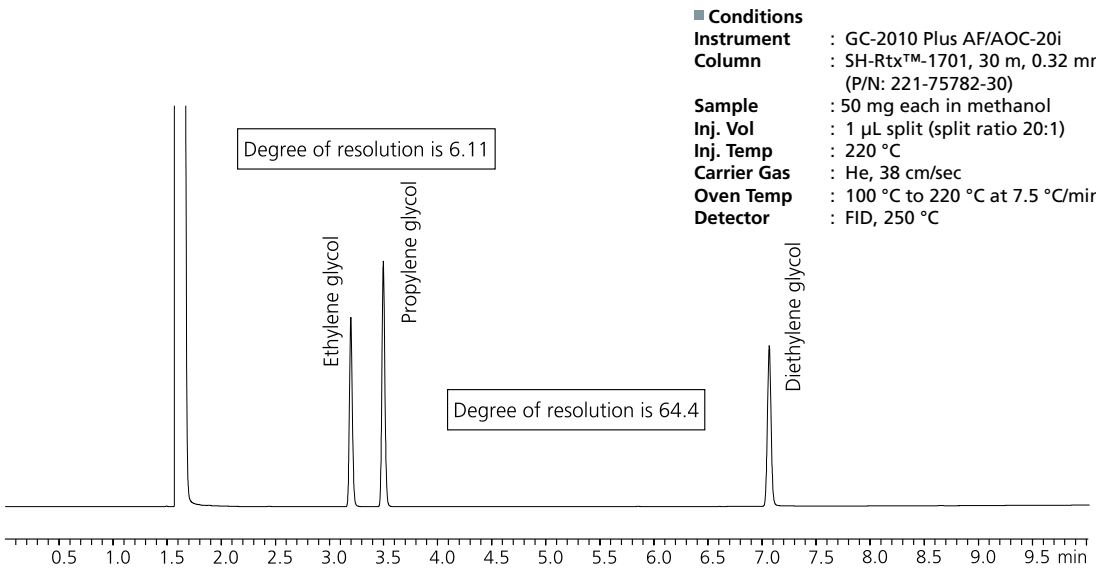


For SH-Rtx™-1701 columns with Intega-Guard™ column, please refer to page 135.

ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.10 µm	-20 to 280 °C	–	227-36216-01	227-36216-02
	0.25 µm	-20 to 280 °C	–	221-75777-30	227-36217-01
	0.50 µm	-20 to 270/280 °C	–	221-75778-30	227-36218-01
	1.00 µm	-20 to 260/280 °C	–	221-75779-30	227-36219-01
0.32 mm	0.10 µm	-20 to 280 °C	–	221-76184-30	227-36220-01
	0.25 µm	-20 to 280 °C	221-75780-15	221-75780-30	221-75780-60
	0.50 µm	-20 to 270/280 °C	–	221-75781-30	227-36221-01
	1.00 µm	-20 to 260/280 °C	–	221-75782-30	221-75782-60
	1.50 µm	-20 to 240/260 °C	–	227-36222-01	227-36222-02
0.53 mm	0.10 µm	-20 to 270/280 °C	–	227-36223-01	227-36223-02
	0.25 µm	-20 to 270/280 °C	–	227-36224-01	–
	0.50 µm	-20 to 260/270 °C	–	227-36225-01	–
	1.00 µm	-20 to 250/270 °C	–	221-75785-30	227-36226-01
	1.50 µm	-20 to 240/260 °C	–	227-36227-01	227-36227-02
	3.00 µm	-20 to 230/250 °C	–	227-36228-01	227-36228-02

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Analysis of Ethylene Glycol and Diethylene Glycol in Propylene Glycol



Conditions

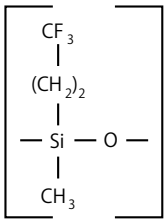
Instrument	: GC-2010 Plus AF/AOC-20i
Column	: SH-Rtx™-1701, 30 m, 0.32 mm ID, 1.00 µm (P/N: 221-75782-30)
Sample	: 50 mg each in methanol
Inj. Vol	: 1 µL split (split ratio 20:1)
Inj. Temp	: 220 °C
Carrier Gas	: He, 38 cm/sec
Oven Temp	: 100 °C to 220 °C at 7.5 °C/min (hold 4 min)
Detector	: FID, 250 °C

General-Purpose Capillary Columns

SH-Rtx™-200/SH-Rtx™-200MS

- Mid-polarity phase: Crossbond™ trifluoropropyl methyl polysiloxane
- General-purpose columns for solvents, Freon® fluorocarbons, alcohols, ketones, silanes, glycols, and drugs of abuse.
- Equivalent to USP G6 phase.
- Similar phases: DB-210, DB-200, VF-200ms

SH-Rtx™-200 / SH-Rtx™-200MS Structure



SH-Rtx™-200

ID	df	Temp. Range	30 m	60 m	105 m
0.25 mm	0.10 µm	-20 to 320/340 °C	227-36179-01	227-36179-02	–
	0.25 µm	-20 to 320/340 °C	227-36180-01	227-36180-02	–
	0.50 µm	-20 to 310/330 °C	227-36181-01	227-36181-02	–
	1.00 µm	-20 to 290/310 °C	221-75800-30	227-36182-01	–
0.32 mm	0.10 µm	-20 to 320/340 °C	227-36183-01	227-36183-02	–
	0.25 µm	-20 to 320/340 °C	227-36184-01	227-36184-02	–
	0.50 µm	-20 to 310/330 °C	227-36185-01	227-36185-02	–
	1.00 µm	-20 to 290/310 °C	227-36186-01	227-36186-02	–
	1.50 µm	-20 to 280/300 °C	227-36187-01	227-36187-02	221-75804-15
0.53 mm	0.10 µm	-20 to 310/330 °C	227-36188-01	227-36188-02	–
	0.25 µm	-20 to 310/330 °C	227-36189-01	227-36189-02	–
	0.50 µm	-20 to 300/320 °C	227-36190-01	227-36190-02	–
	1.00 µm	-20 to 290/310 °C	227-36191-01	227-36191-02	–
	1.50 µm	-20 to 280/300 °C	227-36192-01	227-36192-02	–
	3.00 µm	-20 to 260/380 °C	227-36193-01	227-36193-02	–

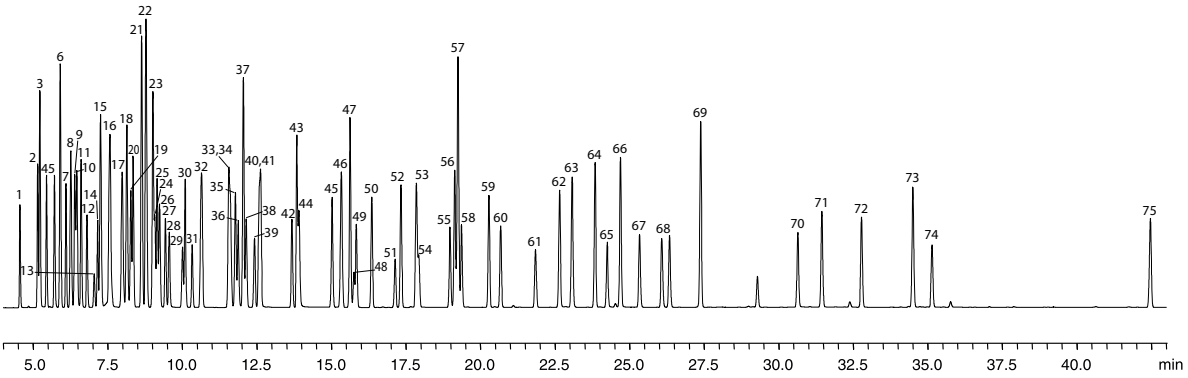
* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

SH-Rtx™-200MS (Low-bleed phase for GCMS analysis)

ID	df	Temp. Range	30 m
0.25 mm	0.10 µm	-20 to 320/340 °C	227-36194-01
	0.25 µm	-20 to 320/340 °C	221-75811-30
	0.50 µm	-20 to 310/330 °C	227-36195-01
	1.00 µm	-20 to 290/310 °C	227-36196-01
0.32 mm	0.10 µm	-20 to 320/340 °C	227-36197-01
	0.25 µm	-20 to 320/340 °C	221-75814-30
	0.50 µm	-20 to 310/330 °C	227-36198-01
	1.00 µm	-20 to 290/310 °C	227-36199-01
0.53 mm	0.50 µm	-20 to 300/320 °C	227-36200-01
	1.00 µm	-20 to 290/310 °C	227-36201-01
	1.50 µm	-20 to 280/300 °C	227-36202-01

General-Purpose Capillary Columns

Analysis of Organic Solvents



Peaks

1. Methanol
2. Ethanol
3. Acetaldehyde + Ethyl Ether
4. 1,1-Dichloroethylene
5. Isopropanol
6. Dichloromethane + Hexane
7. trans-1,2-Dichloroethylene
8. tert.-Butanol
9. tert.-Butyl Methyl Ether
10. Isopropyl Ether
11. n-Propanol
12. Ethyl Formate
13. Chloroform
14. Methyl Acetate
15. Cyclohexane
16. Tetrachloromethane + sec.-Butanol
17. Isooctane
18. Isobutanol + 1,1,1-Trichloroethane
19. Acetonitrile
20. Acrylonitrile
21. Benzene
22. Tetrahydrofuran + methylcyclohexane
23. Methyl Acrylate + 1,2-Dichloroethane
24. Trichloroethylene
25. n-Butanol
26. Ethyl Acetate
27. 1,2-Dimethoxyethane
28. Ethylene Glycol Monomethyl Ether
29. Ethylenechlorohydrin
30. Methyl Ethyl Ketone
31. Nitromethane
32. Propylene Glycol Monomethyl Ether + Isopropyl Acetate
33. Ethyl Acrylate
34. Isoamyl Alcohol
35. Methyl Methacrylate
36. Ethylene Glycol Monoethyl Ether
37. Toluene
38. 1,4-Dioxane
39. tetrachloroethylene
40. n-Propyl Acetate
41. n-Amyl Alcohol
42. Epichlorohydrin
43. Pyridine
44. Ethylene Glycol Monoisopropyl Ether
45. Isobutyl Acetate
46. Methyl Isobutyl Ketone + Ethylbenzene
47. Chlorobenzene
48. p-Xylene
49. m-Xylene
50. n-Butyl Acetate
51. o-Xylene
52. Methyl Butyl Ketone
53. Cyclohexanol
54. 1,1,2,2-Tetrachloroethane
55. Isoamyl Acetate
56. Butyl Acrylate
57. Ethylene Glycol Monobutyl Ether
58. Anisole + Propylene Glycol Monomethyl Ether Acetate
59. n-Amyl Acetate
60. Ethylene Glycol Monoethyl Ether Acetate
61. N,N-Dimethylformamide
62. Isooctanol
63. Cyclohexanone
64. o-Dichlorobenzene
65. Diethylene Glycol Monoethyl Ether
66. Benzyl Alcohol
67. N,N-Dimethylacetamide
68. Dimethyl Sulfoxide
69. Tetralin
70. Diethylene Glycol Monobutyl Ether
71. 2-Ethylhexyl Acrylate
72. N-Methylpyrrolidone
73. Isophorone
74. 1,3-Dimethyl-2-Imidazolidinone
75. Sulfolane

Conditions

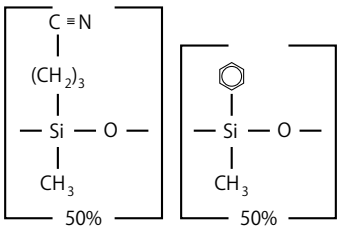
Instrument : GC-2010
Column : SH-Rtx™-200, 60 m, 0.32 mm ID, 1.00 µm (P/N: 227-36186-02)
Injection : Split (split ratio: 50:1)
Inj. Temp : 250 °C
Carrier Gas : He, constant linear velocity mode, 25 cm/sec
Oven Temp : 40 °C (0 min) to 310 °C at 4 °C/min
Detector : FID, 330 °C

General-Purpose Capillary Columns

SH-Rtx™-225

- Polar phase: Crossbond™ 50% cyanopropylmethyl / 50% phenylmethyl polysiloxane
- General-purpose columns for FAMEs, carbohydrates, sterols, flavor compounds.
- Equivalent to USP G7 and G19 phases.
- Similar phases: DB-225, DB-225MS, CP-Sil 43 CB, SPB-225

SH-Rtx™-225 Structure



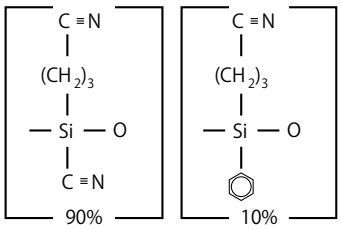
ID	df	Temp. Range	30 m	60 m
0.25 mm	0.25 µm	40 to 220/240 °C	227-36229-01	227-36229-02
	0.50 µm	40 to 220/240 °C	227-36230-01	–
0.32 mm	0.10 µm	40 to 220/240 °C	227-36231-01	–
	0.25 µm	40 to 220/240 °C	227-36232-01	–
	0.50 µm	40 to 220/240 °C	227-36233-01	–
	1.00 µm	40 to 200/220 °C	227-36234-01	227-36234-02
0.53 mm	0.25 µm	40 to 200/220 °C	227-36235-01	–
	0.50 µm	40 to 200/220 °C	227-36236-01	–
	1.00 µm	40 to 200/220 °C	227-36237-01	–

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

SH-Rtx™-2330

- Highly polar phase: Crossbond™ 90% biscyanopropyl / 10% cyanopropylphenyl polysiloxane (Non-bonded)
- General-purpose columns for cis/trans FAMEs, dioxin isomers.
- Equivalent to USP G8 and G48 phase.
- Similar phases: DB-23, VF-23ms, SP-2330, SP-2331, SP-2380

SH-Rtx™-2330 Structure



ID	df	Temp. Range	30 m	60 m
0.25 mm	0.10 µm	0 to 260/275 °C	227-36238-01	227-36238-02
	0.20 µm	0 to 260/275 °C	227-36239-01	227-36239-02
0.32 mm	0.10 µm	0 to 260/275 °C	227-36240-01	227-36240-02
	0.20 µm	0 to 260/275 °C	227-36241-01	227-36241-02
0.53 mm	0.10 µm	0 to 260/275 °C	–	227-36242-01
	0.20 µm	0 to 260/275 °C	227-36243-01	227-36243-02

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

General-Purpose Capillary Columns

SH-Rt™-2560

- Highly polar phase; biscyanopropyl polysiloxane—not bonded
- Stationary phase selectivity optimized for isomer separation to ensure accurate quantification of critical cis/trans FAMEs.
- Application-specific QC test guarantees consistent, reliable performance for AOAC 996.06 and AOCS Ce 1j-07 methods.
- Excellent sample capacity; no peak distortion means easy, accurate peak integration.
- Similar Phase(s): HP-88, CP-Sil 88, SP-2560, BPX-90, MEGA-10

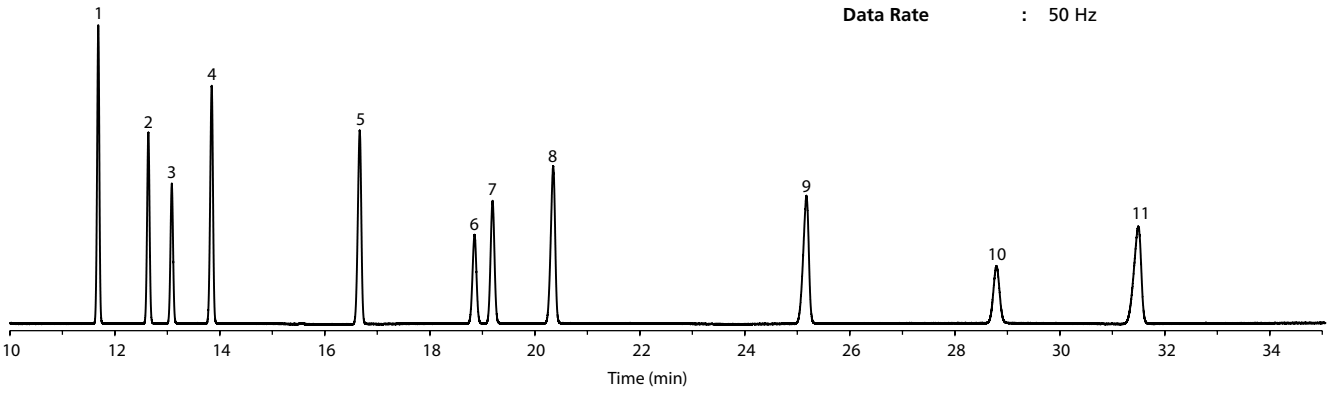
ID	df	Temp. Range	100 m
0.25 mm	0.20 µm	20 to 250 °C	227-36311-01

Unsaturated FAMES QC Test Mix on SH-Rt™-2560

Peaks	tR (min)	Conc. (µg/mL)	Structural Nomenclature
1. Methyl octadecanoate	11.68	1.1	C18:0
2. Methyl elaidate	12.64	0.8	C18:1 (t9)
3. Methyl oleate	13.09	0.6	C18:1 (c9)
4. Methyl nonadecanoate	13.84	1.1	C19:0
5. Methyl eicosanoate	16.66	1.1	C20:0
6. Methyl eicosenoate	18.85	0.6	C20:1 (c11)
7. Methyl linolenate	19.20	0.8	C18:3 (c9,c12,c15)
8. Methyl heneicosanoate	20.35	1.1	C21:0
9. Methyl docosanoate	25.17	1.1	C22:0
10. Methyl eicosatrienoate	28.79	0.6	C20:3 (c11,c14,c17)
11. Methyl tricosanoate	31.49	1.1	C23:0

Conditions

Column	:	SH-Rt-2560, 2560, 100 m, 0.25 mm ID, 0.20 µm (227-36311-01)
Sample	:	Unsaturated FAMES QC test mix
Diluent	:	Hexane
Injection	:	1 µL split (split ratio 200:1)
Liner	:	Premium 4 mm Precision liner w/wool (cat.# 23305.1)
Inj. Temp	:	250 °C
Oven Temp	:	180 °C (hold 40 min)
Carrier Gas	:	H_2, constant flow
Flow Rate	:	2.5 mL/min
Detector	:	FID, 275 °C
Make-up Gas Type	:	N_2
Hydrogen flow	:	40 mL/min
Air flow	:	400 mL/min
Data Rate	:	50 Hz

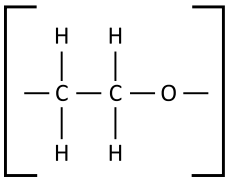


General-Purpose Capillary Columns

SH-Rtx™-Wax

- Polar phase: Crossbond™ polyethylene glycol
- Best polyethylene glycol (PEG) phase for alkenols, glycols, and aldehydes.
- Equivalent to USP G14, G15, G16, G20, G39 phases.
- Similar phases: DB-Wax, CP-Wax 52 CB

SH-Rtx™-Wax Structure



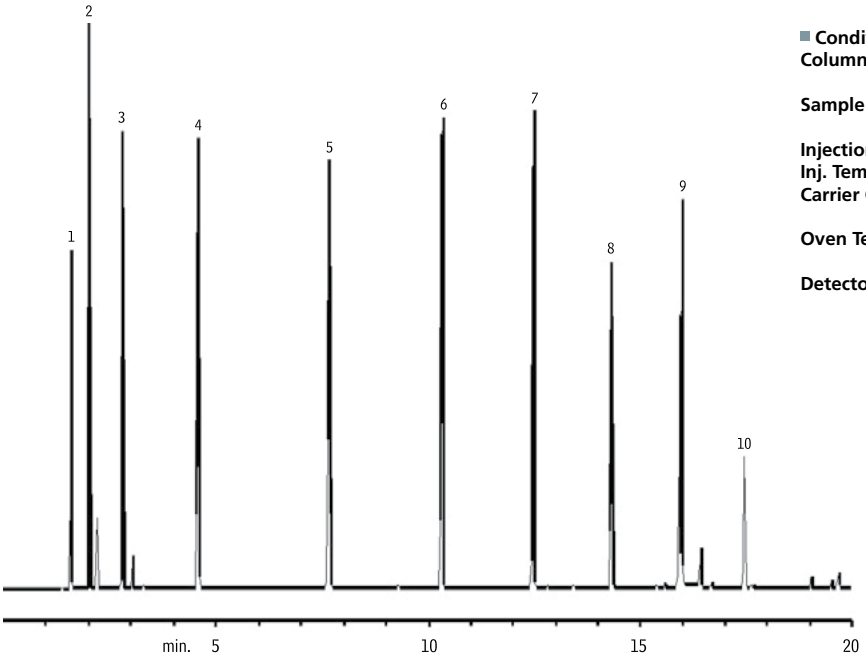
ID	df	Temp. Range	15 m	20 m	30 m	50 m	60 m
0.25 mm	0.10 µm	20 to 250 °C	–	–	221-76186-30	–	–
	0.25 µm	20 to 250 °C	–	–	221-75893-30	221-75893-50	221-75893-60
	0.50 µm	20 to 250 °C	–	–	221-75894-30	–	221-75894-60
0.32 mm	0.25 µm	20 to 250 °C	–	221-75895-20	221-75895-30	–	221-75895-60
	0.50 µm	20 to 250 °C	–	–	221-75896-30	221-75896-50	221-75896-60
	1.00 µm	20 to 240/250 °C	–	–	221-75897-30	–	221-75897-60
0.53 mm	0.25 µm	20 to 250 °C	–	–	227-36244-01	–	–
	0.50 µm	20 to 250 °C	–	–	221-76188-30	–	227-36245-01
	1.00 µm	20 to 240/250 °C	221-75899-15	–	221-75899-30	–	221-75899-60

* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

Aldehydes

Peaks

1. ethanal
2. propanal
3. butenal
4. pentanal
5. hexanal
6. heptanal
7. octanal
8. nonanal
9. decanal
10. undecanal



Conditions

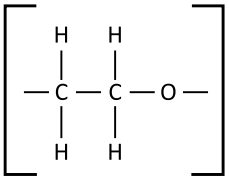
Column	:	SH-Rtx™-Wax, 30 m, 0.2 5mm ID, 0.50 µm (P/N: 221-75894-30)
Sample	:	C2-C11 aldehydes mixture On-column conc.: 250 ng
Injection	:	Split (split ratio: 100:1)
Inj. Temp	:	200 °C
Carrier Gas	:	Hydrogen, linear velocity 35 cm/sec. set at 40 °C
Oven Temp	:	40 °C (hold 5 min) to 200 °C at 10 °C/min
Detector	:	FID, 200 °C

General-Purpose Capillary Columns

SH-Stabilwax™

- Polar phase: Crossbond™ polyethylene glycol
- Low-bleed PEG column ensures long column lifetimes.
- Rugged enough to withstand repeated water injections.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.
- Similar phases: Innowax, CP-Wax 52 CB, VF-WAX MS, Supelcowax-10

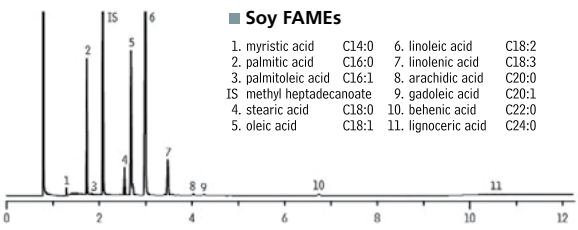
SH-Stabilwax™ Structure



ID	df	Temp. Range	30 m	50 m	60 m
0.25 mm	0.10 µm	40 to 250/260 °C	227-36246-01	–	227-36246-02
	0.25 µm	40 to 250/260 °C	227-36305-02	227-36247-01	227-36247-02
	0.50 µm	40 to 250/260 °C	227-36248-01	–	227-36248-02
0.32 mm	0.10 µm	40 to 250/260 °C	227-36249-01	–	227-36249-02
	0.25 µm	40 to 250/260 °C	221-75972-30	–	227-36250-01
	0.50 µm	40 to 250/260 °C	227-36251-01	–	221-75975-60
	1.00 µm	40 to 240/250 °C	227-36252-01	–	227-36252-02
0.53 mm	0.10 µm	40 to 250/260 °C	227-36253-01	–	–
	0.25 µm	40 to 250/260 °C	227-36254-01	–	227-36254-02
	0.50 µm	40 to 250/260 °C	227-36255-01	–	227-36255-02
	1.00 µm	40 to 240/250 °C	221-75979-30	–	227-36256-01
	1.50 µm	40 to 230/240 °C	227-36257-01	–	227-36257-02
	2.00 µm	40 to 220/230 °C	227-36258-01	–	–

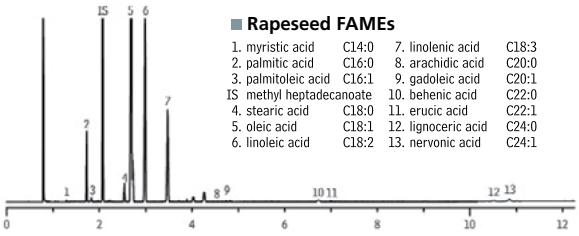
* Maximum temperatures listed are for shorter length columns. Longer columns may have a different maximum temperature.

FAMEs in Biodiesel Oils



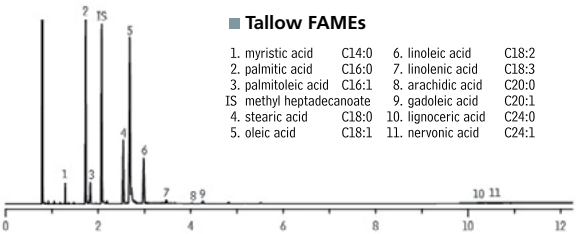
Soy FAMEs

1. myristic acid	C14:0	6. linoleic acid	C18:2
2. palmitic acid	C16:0	7. linolenic acid	C18:3
3. palmitoleic acid	C16:1	8. arachidic acid	C20:0
IS methyl heptadecanoate		9. gadoleic acid	C20:1
4. stearic acid	C18:0	10. behenic acid	C22:0
5. oleic acid	C18:1	11. lignoceric acid	C24:0



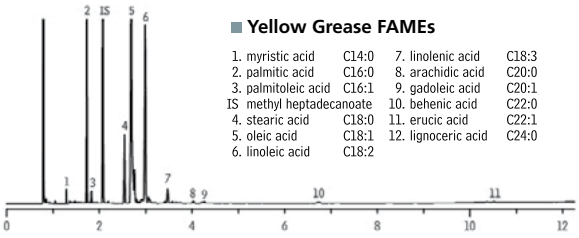
Rapeseed FAMEs

1. myristic acid	C14:0	7. linolenic acid	C18:3
2. palmitic acid	C16:0	8. arachidic acid	C20:0
3. palmitoleic acid	C16:1	9. gadoleic acid	C20:1
IS methyl heptadecanoate		10. behenic acid	C22:0
4. stearic acid	C18:0	11. erucic acid	C22:1
5. oleic acid	C18:1	12. lignoceric acid	C24:0
6. linoleic acid	C18:2	13. nervonic acid	C24:1



Tallow FAMEs

1. myristic acid	C14:0	6. linoleic acid	C18:2
2. palmitic acid	C16:0	7. linolenic acid	C18:3
3. palmitoleic acid	C16:1	8. arachidic acid	C20:0
IS methyl heptadecanoate		9. gadoleic acid	C20:1
4. stearic acid	C18:0	10. lignoceric acid	C24:0
5. oleic acid	C18:1	11. nervonic acid	C24:1



Yellow Grease FAMEs

1. myristic acid	C14:0	7. linolenic acid	C18:3
2. palmitic acid	C16:0	8. arachidic acid	C20:0
3. palmitoleic acid	C16:1	9. gadoleic acid	C20:1
IS methyl heptadecanoate		10. behenic acid	C22:0
4. stearic acid	C18:0	11. erucic acid	C22:1
5. oleic acid	C18:1	12. lignoceric acid	C24:0
6. linoleic acid	C18:2		

Conditions

Column : SH-Stabilwax™, 30 m, 0.32 mm ID, 0.25 µm (P/N: 221-75972-30)
Inj. Vol. : 1 µL split (split ratio 100:1)
Inj. Temp : 250 °C
Carrier Gas : Hydrogen, constant flow rate 3mL/min, linear velocity 60 cm/sec.
Oven Temp : 210 °C (hold 5 min) to 230 °C at 20 °C/min (hold 5 min)
Detector : FID, 250 °C

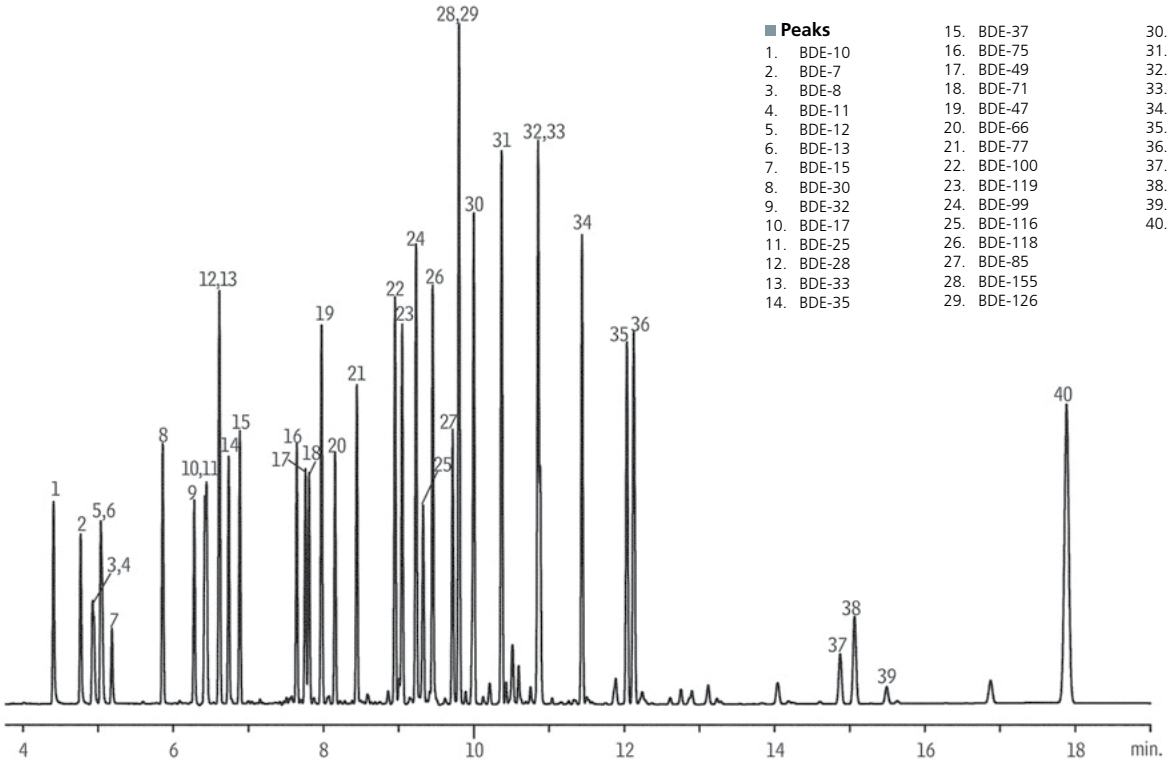
Dedicated Capillary Columns

SH-Rtx™-1614

- 5% diphenyl / 95% dimethyl polysiloxane
- Optimized for PBDE analysis by EPA Method 1614.
- Short column option resolves BDE-209 three times faster, with less thermal breakdown.
- Unique deactivation gives higher BDE-209 response than competitor columns, for greater analytical sensitivity.
- Exceeds EPA Method 1614 resolution criteria for BDE-49 and BDE-71.

ID	df	Temp. Range	15 m	30 m
0.25 mm	0.10 µm	-60 to 330/360 °C	227-36265-01	227-36265-02

Brominated Flame Retardants



Peaks

1. BDE-10
2. BDE-7
3. BDE-8
4. BDE-11
5. BDE-12
6. BDE-13
7. BDE-15
8. BDE-30
9. BDE-32
10. BDE-17
11. BDE-25
12. BDE-28
13. BDE-33
14. BDE-35
15. BDE-37
16. BDE-75
17. BDE-49
18. BDE-71
19. BDE-47
20. BDE-66
21. BDE-77
22. BDE-100
23. BDE-119
24. BDE-99
25. BDE-116
26. BDE-118
27. BDE-85
28. BDE-155
29. BDE-126
30. BDE-154
31. BDE-153
32. BDE-138
33. BDE-166
34. BDE-183
35. BDE-181
36. BDE-190
37. BDE-208
38. BDE-207
39. BDE-206
40. BDE-209

Conditions

Column : SH-Rtx™-1614, 15 m, 0.25 mm ID, 0.10 µm (P/N: 227-36265-01)
Sample : 100-300 ppb PBDE PAR Solution
500 ppb decabromodiphenyl ether
Inj. Vol. : 1 µL splitless (hold 1 min)
Inj. Temp : 340 °C
Carrier Gas : He, constant flow, linear velocity 60 cm/sec., 120 °C
Oven Temp : 120 °C (hold 1 min) to 275 °C at 15 °C/min to 300 °C at 5 °C/min (hold 5 min)
Detector : µ-ECD, 345 °C

Dedicated Capillary Columns

SH-Rtx™-OPP2

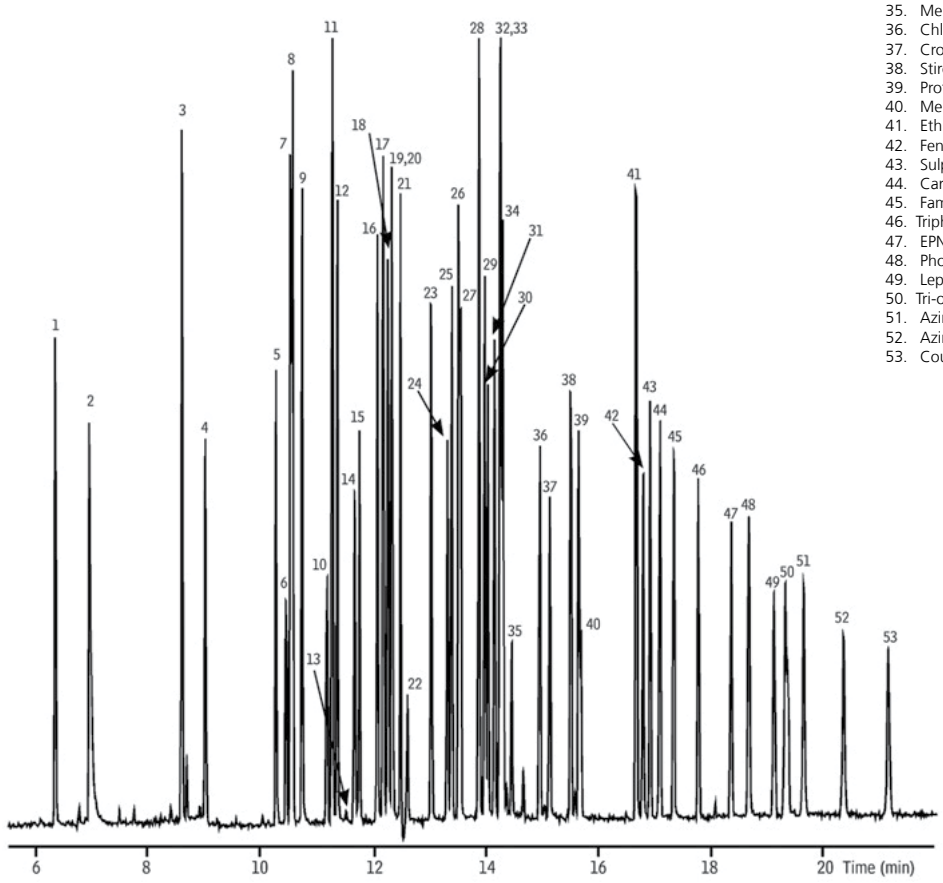
- Dedicated column for organophosphorus pesticides; best column combination for US EPA Method 8141.
- Low bleed - ideal for GC-FPD, GC-NPD, or GCMS analyses.

ID	df	Temp. Range	30 m
0.32 mm	0.32 µm	-20 to 310/330 °C	221-75887-30

Organophosphorus Pesticides (U.S. EPA Method 8141A)

Peaks

1. Dichlorvos
2. Hexamethylphosphoramide
3. Mevinphos
4. Trichlorfon
5. TEPP
6. Demeton-O
7. Tributyl phosphate (SS)
8. Thionazin
9. Ethoprop
10. Naled
11. Sulfotepp
12. Phorate
13. Dicrotophos
14. Monocrotophos
15. Demeton-S
16. Terbufos
17. Dimethoate
18. Diazinon
19. Dioxathion
20. Fonophos
21. Disulfoton
22. Phosphamidon isomer (breakdown product)
23. Dichlorofenthion
24. Phosphamidon
25. Chlorpyrifos methyl
26. Methyl parathion
27. Ronnel
28. Aspon
29. Fenitrothion
30. Malathion
31. Chlorpyrifos
32. Trichloronate
33. Parathion-ethyl
34. Fenthion
35. Merphos
36. Chlorfenvinphos
37. Crotoxyphos
38. Stirofos
39. Prothiofos
40. Merphos oxone (breakdown product)
41. Ethion
42. Fensulfothion
43. Sulprofos
44. Carbophenothion
45. Famphur
46. Triphenyl phosphate (SS)
47. EPN
48. Phosmet
49. Leptophos
50. Tri-o-cresyl phosphate
51. Azinphos-methyl
52. Azinphos-ethyl
53. Coumaphos



Conditions

Column : SH-Rtx™-OPP2, 30 m, 0.32 mm ID, 0.32 µm (P/N: 221-75887-30)
Inj. Vol. : 1 µL splitless (hold 1 min)
Inj. Temp : 200 °C
Oven Temp : 80 °C (hold 0.5 min) to 280 °C at 12 °C/min (hold 10 min)

Carrier Gas : He
Dead Time : 1.03 min at 80 °C
Detector : FPD, 250 °C
Notes : Constant pressure

Dedicated Capillary Columns

SH-Rtx™-CLP / SH-Rtx™-CLP II

- Dedicated columns for organochlorine pesticides and herbicides.
- Low bleed - ideal for high-sensitivity GC-ECD or GCMS analyses.
- Baseline separations in less than 10 minutes.
- Analyze EPA Method 8081B, 8082A, 8151A, 504.1, 515, 508.1, and 552.2 compounds without time-consuming column changes.
- Similar phases: DB-CLP1 / DB-CLP2

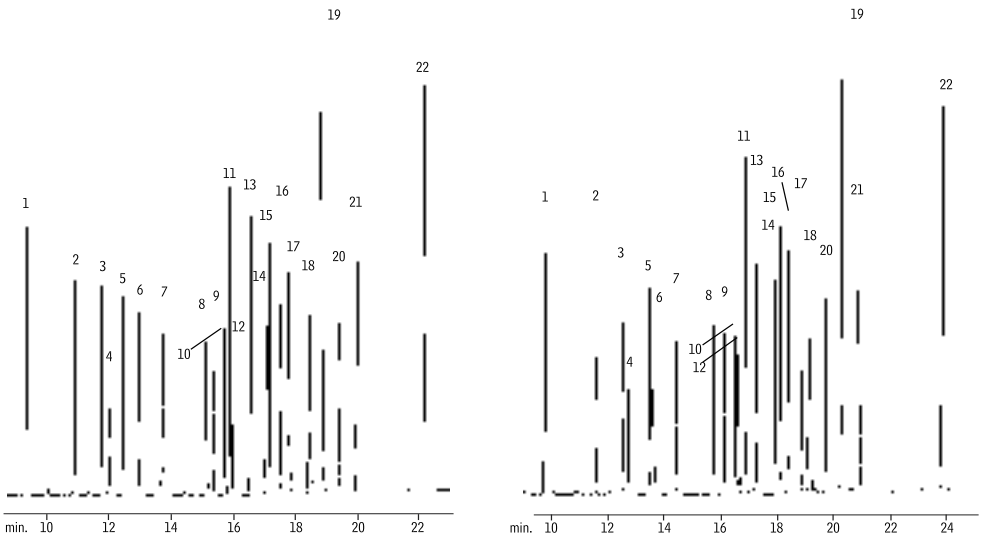
SH-Rtx™-CLP

ID	df	Temp. Range	30 m
0.32 mm	0.32 µm	-20 to 320/340 °C	227-36266-01
	0.50 µm	-20 to 320/340 °C	221-75879-30

SH-Rtx™-CLP II

ID	df	Temp. Range	30 m
0.32 mm	0.25 µm	-20 to 320/340 °C	227-36267-01

Organochlorine Pesticides (US E PA Method 8081)



Peaks

1. 2,4,5,6-tetrachloro-m-xylene
2. α-BHC (α-HCH)
3. γ-BHC (lindane)
4. β-BHC (β-HCH)
5. δ-BHC (δ-HCH)
6. heptachlor
7. aldrin
8. heptachlor epoxide
9. γ-chlordane
10. α-chlordane
11. 4,4'-DDE
12. endosulfan I
13. dieldrin
14. endrin
15. 4,4'-DDD
16. endosulfan II
17. 4,4'-DDT
18. endrin aldehyde
19. methoxychlor
20. endosulfan sulfate
21. endrin ketone
22. decachlorobiphenyl

Conditions

Column : SH-Rtx™-CLP, 30 m, 0.32 mm ID, 0.50 µm (P/N: 221-75879-30)
SH-Rtx™-CLP2, 30 m, 0.32 mm ID, 0.25 µm (P/N: 227-36267-01)

Oven Temp : 120 °C (hold 1 min) to 300 °C (hold 10 min) at 9 °C/min
Inj. : Direct
Inj. Temp : 200 °C
Detector : ECD, 300 °C with anode purge
Dead time : 1.9 min
Head pressure : 8.7 psi (constant)
Flow rate : 1.3 mL/min at 120 °C, He

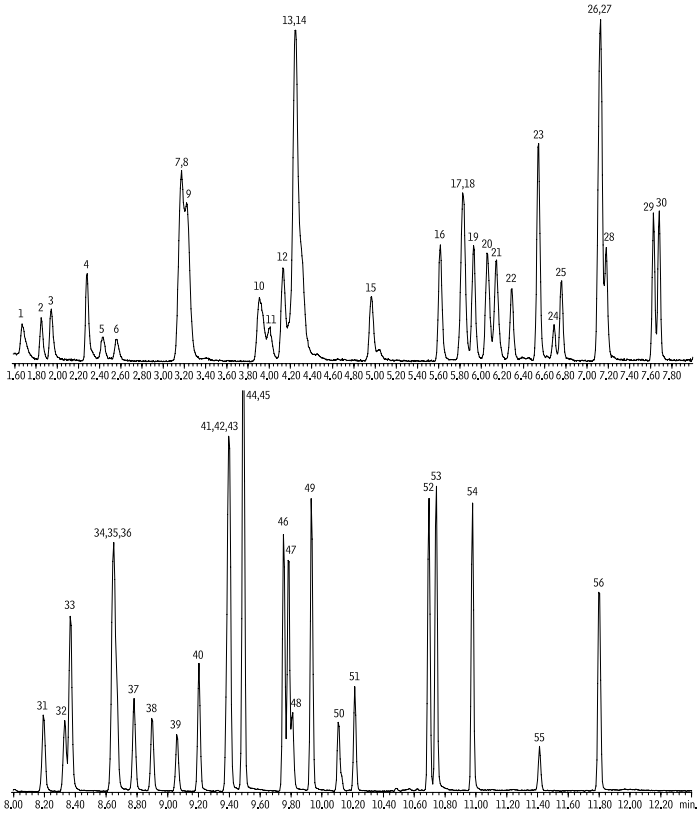
Dedicated Capillary Columns

SH-Rtx™-VMS

- Dedicated columns for analyzing volatile organic pollutants by GCMS including methods TO-15, TMS, and EPA 8260.
- Complete separation of U.S. EPA Method 8260 compounds in less than 10 minutes.

ID	df	Temp. Range	20 m	30 m	60 m
0.18 mm	1.00 µm	-40 to 240/260 °C	227-36412-01	–	–
0.25 mm	1.40 µm	-40 to 240/260 °C	–	227-36268-01	227-36268-02
0.32 mm	1.80 µm	-40 to 240/260 °C	–	227-36269-01	227-36269-02

Volatile Organics (US EPA CLP 04.1)



Peaks

1. dichlorodifluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. trichlorofl uoromethane
7. 1,1-dichloroethene
8. carbon disulfi de
9. 1,1,2-trichloro-1,2,2-trifl uoroethane
10. methylene chloride
11. acetone
12. trans -1,2-dichloroethene
13. methyl acetate
14. methyl tert-butyl ether
15. 1,1-dichloroethane
16. cis-1,2-dichoroethane
17. cyclohexane
18. bromochloromethane (IS)
19. chloroform
20. carbon tetrachloride
21. 1,1,1-trichloroethane
22. 2-butanone
23. benzene
24. 1,2-dichloroethane-d4 (SS)
25. 1,2-dichloroethane
26. methylcyclohexane
27. trichloroethene
28. 1,4-difl uorobenzene (IS)
29. 1,2-dichloropropane
30. bromodichloromethane
31. cis -1,3-dichloropropene
32. toluene d8 (SS)
33. toluene
34. tetrachloroethane
35. 4-methyl-2-pentanone
36. trans -1,3-dichloropropane
37. 1,1,2-trichloroethane
38. dibromochloromethane
39. 1,2-dibromoethane
40. 2-hexanone
41. chlorobenzene d5 (IS)
42. chlorobenzene
43. ethylbenzene
44. m -xylene
45. p -xylene
46. o -xylene
47. styrene
48. bromoform
49. isopropylbenzene
50. 4-bromofl uorobenzene (SS)
51. 1,1,2,2-tetrachloroethane
52. 1,3-dichlorobenzene
53. 1,4-dichlorobenzene
54. 1,2-dichlorobenzene
55. 1,2-dibromo-3-chloropropane
56. 1,2,4-trichlorobenzene

Conditions

Column : SH-Rtx™-VMS, 30 m, 0.25 mmID, 1.40 µm (P/N: 227-36268-01)

Purge and Trap : Trap: #10 (Tenax$_R$/silica gel/carbon molecular sieve)
Sample Temp: ambient
Purge: 11 min at 40 mL/min
Desorb preheat: 185 °C
Desorb: 0.5 min at 190 °C
Desorb flow rate: 35.0 mL/min
Bake: 8 min at 210 °C
Interface: split injector
Transfer Line Temp: 150 °C

Inj. : Split (split ratio: 35:1)
Inj. Temp : 200 °C
Carrier Gas : He, linear velocity 34 cm/sec., 40 °C, constant flow
Oven Temp : 40 °C (hold 4 min) to 90 °C at 16 °C/min to 220 °C at 32 °C/min (hold 5 min)
Detector : MS
Transfer Line Temp: 150 °C
Scan Range: 35-300 amu.
Ionization: EI

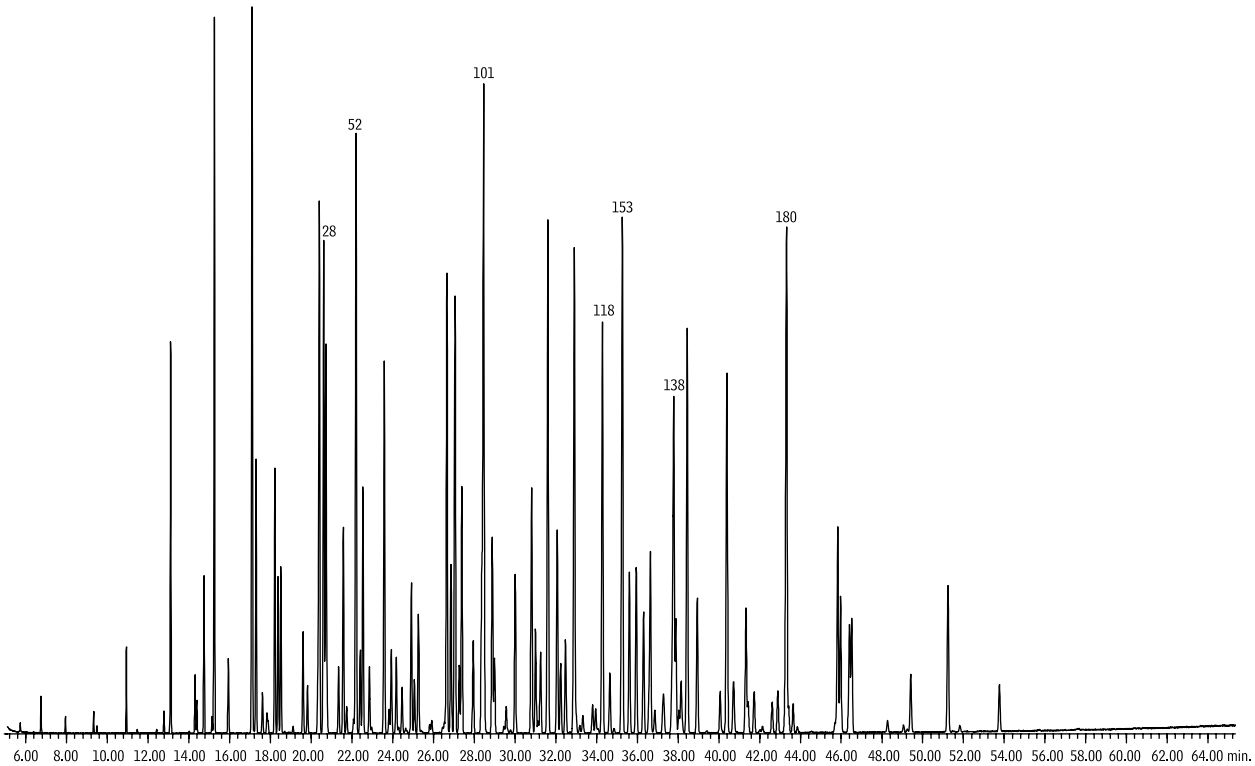
Dedicated Capillary Columns

SH-Rtx™-PCB

- Proprietary Crossbond phase
- Unique polymer for PCBs analysis by GC-ECD or GC-MS.
- Good results for other semi-volatiles.
- Low polarity; inert to active compounds.
- Stable to 340 °C.

ID	df	Temp. Range	60 m
0.25 mm	0.25 µm	30 to 320/340 °C	227-36310-01

Aroclor PCBs



Conditions

Column	:	SH-RtxTM-PCB 60m, 0.25mm ID, 0.25µm (227-36310-01)
Sample	:	Aroclor® 1242 (cat.# 32009), 1254 (cat.# 32011), 1262 (cat.# 32409), 333ppm each
Inj.	:	1.0µL splitless (hold 0.75 min.), 4mm single gooseneck inlet liner w/ wool (cat.# 22405)
Inj. temp.	:	280°C
Carrier gas	:	helium, constant flow
Flow rate	:	1.1mL/min.
Oven temp.	:	100°C (hold 1 min.) to 200°C @ 30°C/min., to 320°C @ 2°C/min. (hold 1 min.)
Det.	:	MS
Transfer line	:	280°C
Scan range	:	50 to 550amu
Ionization	:	EI
Mode	:	scan

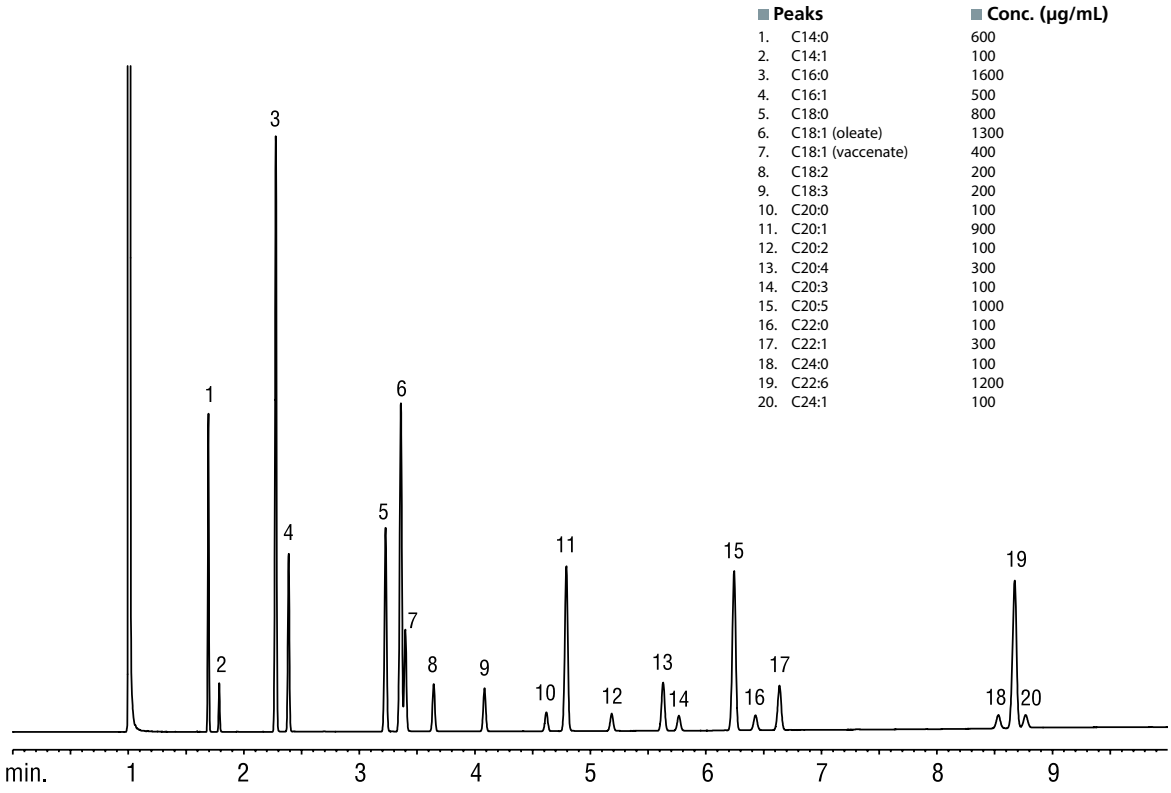
Dedicated Capillary Columns

SH-FAMEWAX™

- Dedicated column for FAMEs, specially tested with a FAME mixture.
- Equivalent to USP G16 phase.
- Similar phases: Select FAME, Omegawax

ID	df	Temp. Range	30 m
0.32 mm	0.25 µm	20 to 320/340 °C	227-36270-01

FAMEs (Marine Oil Standard)



Peaks		Conc. (µg/mL)
1.	C14:0	600
2.	C14:1	100
3.	C16:0	1600
4.	C16:1	500
5.	C18:0	800
6.	C18:1 (oleate)	1300
7.	C18:1 (vaccenate)	400
8.	C18:2	200
9.	C18:3	200
10.	C20:0	100
11.	C20:1	900
12.	C20:2	100
13.	C20:4	300
14.	C20:3	100
15.	C20:5	1000
16.	C22:0	100
17.	C22:1	300
18.	C24:0	100
19.	C22:6	1200
20.	C24:1	100

Conditions

Column : SH-FAMEWAX™, 30 m, 0.32 mm ID, 0.25 µm (P/N: 227-36270-01)
Inj. Vol. : 1 µL split (split ratio: 100:1)
Conc : 10,000 µg/mL in isooctane (total FAMEOs)
Inj. Temp : 250 °C
Carrier Gas : Hydrogen, constant flow rate 3 mL/min
Oven Temp : 195 - 240 °C at 5 °C/min (hold 1 min)
Detector Temp : 275 °C

Dedicated Capillary Columns

SH-Rtx™-BAC Plus 1 / SH-Rtx™-BAC Plus 2

- Optimized column selectivities guarantee resolution of ethanol, internal standards, and frequently encountered interferences.
- Robust and reproducible column chemistry ensures longer column lifetime and consistent results.

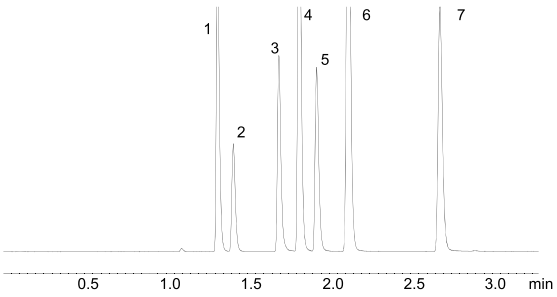
SH-Rtx™-BAC Plus 1

ID	df	Temp. Range	30 m
0.32 mm	1.80 µm	-20 to 240/260 °C	227-36260-01
0.53 mm	3.00 µm	-20 to 240/260 °C	227-36261-01

SH-Rtx™-BAC Plus 2

ID	df	Temp. Range	30 m
0.32 mm	0.60 µm	-20 to 240/260 °C	227-36263-01
0.53 mm	1.00 µm	-20 to 240/260 °C	227-36264-01

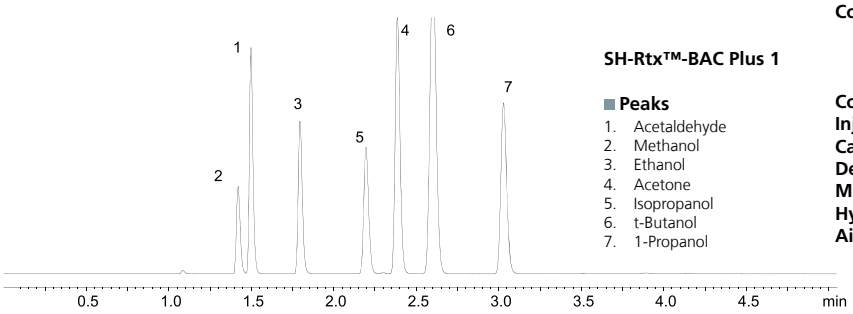
Analysis of Alcohol Compounds in Blood



SH-Rtx™-BAC Plus 2

Peaks

1. Acetaldehyde
2. Methanol
3. Ethanol
4. Acetone
5. Isopropanol
6. t-Butanol
7. 1-Propanol



SH-Rtx™-BAC Plus 1

Peaks

1. Acetaldehyde
2. Methanol
3. Ethanol
4. Acetone
5. Isopropanol
6. t-Butanol
7. 1-Propanol

Conditions

Instrument	:	GC-2010 Plus AF + HS-20
Headspace	:	Oven Temp.: 85 °C Vial Warming Time: 15 min Vial Pressurization Time: 1 min Injection Time: 0.5 min Sample Line Temp: 150 °C Vial Volume: 20 mL Vial Agitation: Off Vial Pressurization: 100 kPa Load Time: 0.5 min Needle Flash Time: 0.5 min Transfer Line Temp: 150 °C
Column	:	SH-Rtx™-BAC Plus 2, 30 m, 0.32 mm ID, 0.60 µm (P/N: 227-36263-01) SH-Rtx™-BAC Plus 1, 30 m, 0.32 mm ID, 1.80 µm (P/N: 227-36260-01)
Column Temp	:	40 °C
Inj.	:	Split (split ratio: 20:1)
Carrier Gas	:	He, 100 kPa
Detector	:	FID, 250 °C
Makeup Gas	:	He, 30 mL/min
Hydrogen	:	40 mL/min
Air	:	400 mL/min

Dedicated Capillary Columns

SH-Rtx™-5 Amine / SH-Rtx™-35 Amine

Dedicated columns for amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines, and nitrogen-containing heterocyclics.

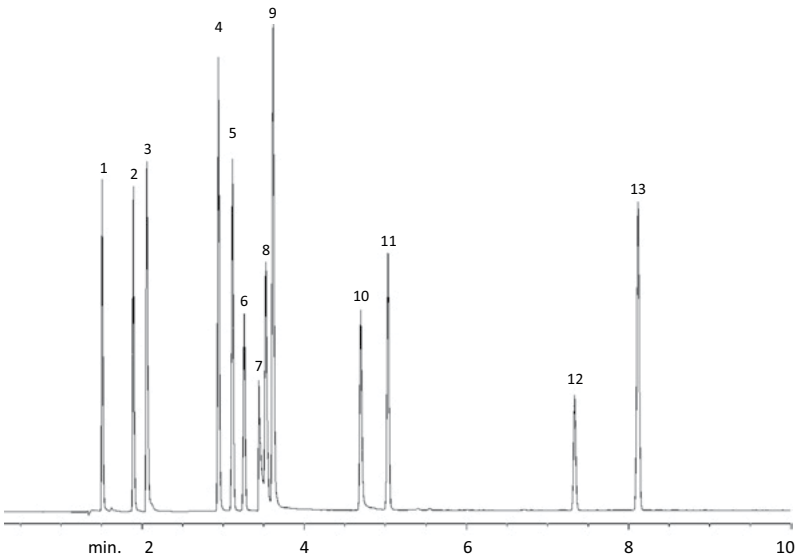
SH-Rtx™-5 Amine (Low-polarity phase: Crossbond™ 5% diphenyl / 95% dimethyl polysiloxane)

ID	df	Temp. Range	30 m
0.25 mm	0.25 µm	-60 to 300/315 °C	227-36282-01
	0.50 µm	-60 to 300/315 °C	227-36283-01
	1.00 µm	-60 to 300/315 °C	227-36284-01
0.32 mm	1.00 µm	-60 to 300/315 °C	227-36332-02
	1.50 µm	-60 to 290/305 °C	227-36285-01
0.53 mm	1.00 µm	-60 to 290/305 °C	227-36286-01
	3.00 µm	-60 to 280/295 °C	227-36287-01

SH-Rtx™-35 Amine (Mid-polarity phase: Crossbond™ 35% diphenyl / 65% dimethyl polysiloxane)

ID	df	Temp. Range	30 m
0.25 mm	0.50 µm	0 to 220 °C	227-36288-01
	1.00 µm	0 to 220 °C	227-36289-01
0.32 mm	1.00 µm	0 to 220 °C	227-36290-01
	1.50 µm	0 to 220 °C	227-36291-01
0.53 mm	1.00 µm	0 to 220 °C	227-36292-01
	3.00 µm	0 to 220 °C	227-36293-01

Amines & Phenols



Peaks

1. diethylamine
2. pyridine
3. morpholine
4. phenol
5. aniline
6. 2-chlorophenol
7. diethylenetriamine
8. octylamine
9. 1-methyl-2-pyrrolidinone
10. 2-nitrophenol
11. 2,6-dimethylaniline
12. nicotine
13. 2-nitroaniline

Conditions

Column	:	SH-Rtx™-5 Amine, 30 m, 0.32 mm ID, 1.00 µm (P/N: 227-36290-01)
Inj. Vol.	:	1 µL split injection of miscellaneous amines and phenols in water (split ratio: 25:1)
On-column conc.	:	22 ng
Inj. Temp	:	305 °C
Oven Temp	:	120 °C to 220 °C at 10 °C/min
Carrier Gas	:	Hydrogen, linear velocity 38cm/sec. set at 120 °C
Detector Temp	:	305 °C
FID sensitivity	:	6.4 × 10-11 AFS

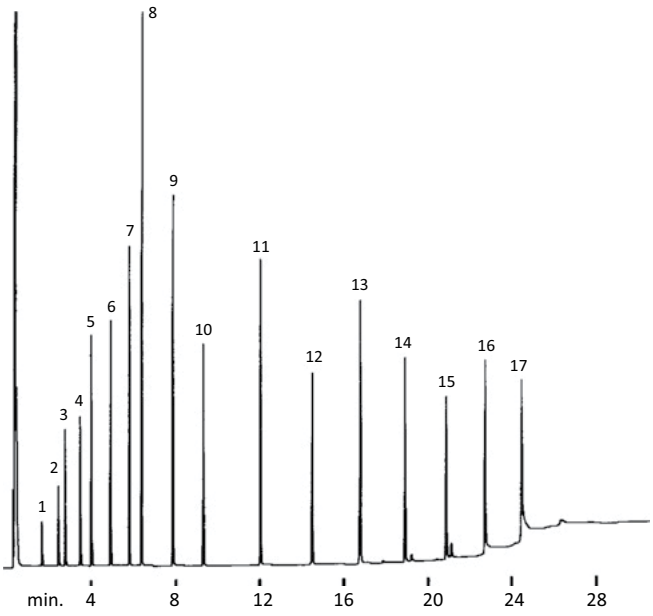
Dedicated Capillary Columns

SH-Stabilwax™-DA

- Polar phase: Crossbond™ acid-deactivated Carbowax™ polyethylene glycol
- Dedicated columns for free (underivatized) acids, some inorganic acids.
- Resistant to oxidative damage.
- Equivalent to USP G25 and G35 phases.
- Similar phases: HP-FFAP, DB-FFAP, VF-DA, CP-Wax 58 CB, CP-FFAP CB, Nukol

ID	df	Temp. Range	30 m	60 m
0.25 mm	0.10 µm	40 to 250/260 °C	227-36271-01	–
	0.25 µm	40 to 250/260 °C	221-75981-30	227-36272-01
	0.50 µm	40 to 250/260 °C	227-36273-01	227-36273-02
0.32 mm	0.10 µm	40 to 250/260 °C	227-36274-01	–
	0.25 µm	40 to 250/260 °C	227-36321-02	227-36275-01
	0.50 µm	40 to 250/260 °C	227-36322-02	227-36276-01
	1.00 µm	40 to 240/250 °C	227-36277-01	227-36277-02
0.53 mm	0.25 µm	40 to 250/260 °C	227-36278-01	227-36278-02
	0.50 µm	40 to 250/260 °C	227-36279-01	227-36279-02
	1.00 µm	40 to 240/250 °C	227-36280-01	227-36280-02
	1.50 µm	40 to 230/240 °C	227-36281-01	227-36281-02

Organic Acids (Free Fatty Acids)



Peaks

1. acetic acid
2. propionic acid
3. isobutyric acid
4. n-butyric acid
5. isovaleric acid
6. n-valeric acid
7. isocaproic acid
8. caproic acid
9. heptanoic acid
10. caprylic acid
11. capric acid
12. lauric acid
13. myristic acid
14. palmitic acid
15. stearic acid
16. arachidic acid
17. behenic acid

Conditions

Column : SH- Stabilwax™-DA, 30 m, 0.53 mm ID, 0.25 µm (P/N: 227-36278-01)
Sample : free acid standard Conc.: 25 ng/µL.
Inj. Vol. : 0.3 µL direct
Inj. Temp : 280 °C
Oven Temp : 100 °C (hold 2 min) to 280 °C at 8 °C/min, (hold 10 min)
Carrier Gas : Hydrogen, flow rate 10 cc/min, linear velocity 80 cm/sec.
Detector : FID, 280 °C

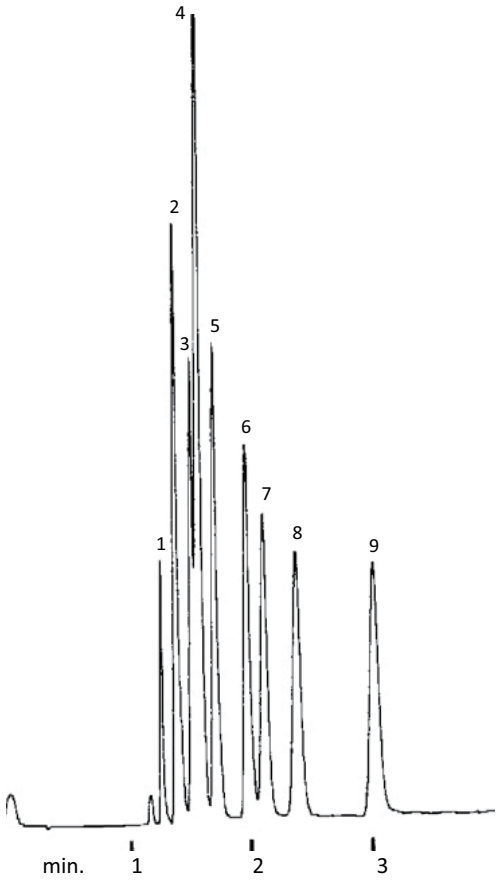
Dedicated Capillary Columns

SH-Stabilwax™-DB

- Polar phase: Crossbond™ base-deactivated Carbowax™ polyethylene glycol
- Dedicated columns for underivatized amines and other basic compounds, including alkylamines, diamines, triamines, nitrogen-containing heterocyclics. No need for column priming.
- Similar phases: CAM, CP-Wax 51 for Amines, Carbowax Amine

ID	df	Temp. Range	30 m	60 m
0.25 mm	0.25 µm	40 to 210/220 °C	227-36294-01	–
	0.50 µm	40 to 210/220 °C	227-36295-01	–
0.32 mm	0.25 µm	40 to 210/220 °C	227-36296-01	227-36296-02
	0.50 µm	40 to 210/220 °C	227-36297-01	–
	1.00 µm	40 to 210/220 °C	227-36298-01	–
0.53 mm	0.50 µm	40 to 210/220 °C	227-36299-01	–
	1.00 µm	40 to 210/220 °C	227-36300-01	227-36300-02

Amines (low MW)



Peaks

1. trimethylamine
2. dimethylamine
3. ethylamine
4. methylamine
5. isopropylamine
6. n-propylamine
7. tert-butylamine
8. diethylamine
9. sec-butylamine

Conditions

Column : SH-Stabilwax™-DB, 30 m, 0.53 mm ID, 1.00 µm (P/N: 227-36300-01)
Inj. Vol. : 1 µL direct injection of amines in water
Inj. Temp : 250 °C
Carrier Gas : Hydrogen, flow rate 5 cc/min, linear velocity 40 cm/sec.
Oven Temp : 45 °C
Detector : FID, 250 °C

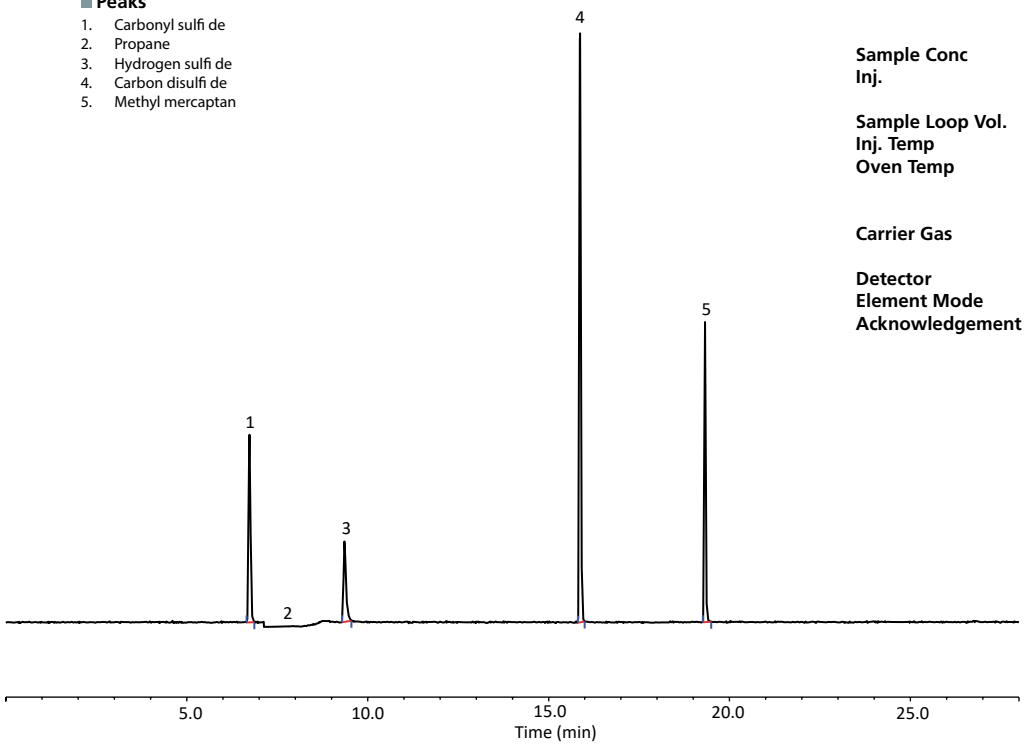
PLOT Capillary Columns

SH-Rt™-Silica BOND

- Bonded silica stationary phase minimizes impact of water, resulting in reproducible retention times for water-containing samples.
- Versatile column ideal for analysis of light hydrocarbons, sulfur gases, halocarbons, and carbon dioxide.
- Individually QC tested with sensitive C4 probes to ensure consistent selectivity.
- Proprietary manufacturing process practically eliminates particle release, reducing downtime due to obstructed FID jets.
- Similar phases: GS-GASPRO, CP-SilicaPLOT

ID	Temp. Range	30 m
0.32 mm	-80 to 260 °C	227-36620-02

Sulfur Compounds in Propane



Conditions

Column	:	SH-Rt™-Silica BOND, 30 m, 0.32 mm ID (P/N: 227-36620-02)
Sample Conc	:	6 ppm in 100% propane
Inj.	:	Sample valve, split (split fl ow: 40 mL/min)
Sample Loop Vol.	:	250 µL
Inj. Temp	:	250 °C
Oven Temp	:	35 °C (hold 8 min) to 200 °C at 10 °C/min (hold 5 min)
Carrier Gas	:	He, constant flow rate 2 mL/min
Detector	:	PFPD, 250 °C
Element Mode	:	sulfur
Acknowledgement	:	Chromatogram courtesy of Brix and Joeri Vercammen (Global Analyser Solutions, Belgium)

Trap columns for adhering dislodged particles from PLOT columns are also available.
Please refer to page 136.

PLOT Capillary Columns

SH-Rt™-Alumina BOND

- The reactivity of the aluminum oxide stationary phase is minimized to improve column response for polar unsaturates, such as dienes, and the column's sensitivity (or response) ensures linear and quantitative chromatographic analysis for these compounds.
- Highly selective for C1–C5 hydrocarbons
- Separate all saturated and unsaturated hydrocarbon isomers above ambient temperatures.

SH-Rt™-Alumina BOND/NA_2SO_4

- Na_2SO_4 deactivation
- Acetylene and propadiene elute after butanes.
- Best separation for butene isomers (impurities in butene streams).
- Methyl acetylene elutes after 1,3-butadiene.
- Cyclopropane (impurity in propylene) elutes well before propylene.
- Similar phases: GS-ALUMINA, CP-Al2O3/Na2SO4, Alumina sulfate PLOT

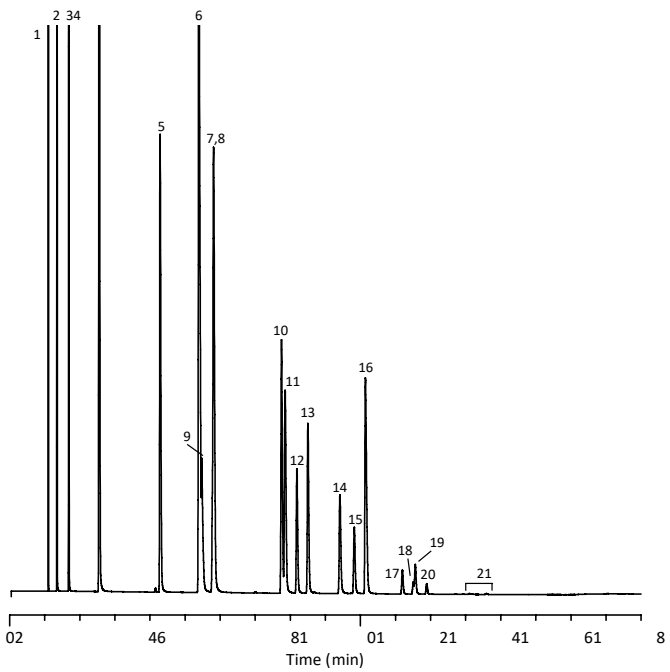
ID	df	Temp. Range	50 m
0.53 mm	10 µm	to 200 °C	227-36301-01

SH-Rt™-Alumina BOND/KCl

- KCl deactivation
- Lowest polarity alumina column in Shimadzu PLOT columns.
- Low moisture sensitivity reduces the need for frequent regeneration.
- Acetylene elutes before n-butane.
- Methyl acetylene (impurity in 1,3-butadiene) elutes before 1,3-butadiene.
- Similar phases: GS-Alumina KCl, HP-PLOT Al2O3 KCl, CP-Al2O3/KCl, Alumina chloride PLOT

ID	df	Temp. Range	50 m
0.53 mm	10 µm	to 200 °C	221-76139-50

Refinery Gas



Peaks

1. methane
2. ethane
3. ethylene
4. propane
5. propylene
6. isobutane
7. n-butane
8. propadiene
9. acetylene
10. trans-2-butene
11. 1-butene
12. isobutylene
13. cis-2-butene
14. isopentane
15. n-pentane
16. 1,3-butadiene
17. trans-2-pentene
18. 2-methyl-2-butene
19. 1-pentene
20. cis-2-pentene
21. hexanes

Conditions

Column	:	SH-Rt™-Alumina BOND/KCl, 50 m, 0.53 mm ID, 10 µm (P/N: 221-76139-50)
Sample	:	Refinery gas
Inj. Vol	:	10 µL split (split vent flow 80mL/min)
Inj. Temp	:	200 °C
Oven Temp	:	45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 3.5 min)
Carrier Gas	:	Hydrogen, constant pressure, 8.0 psi, linear velocity 74 cm/sec. at 45 °C
Detector	:	FID, 200 °C

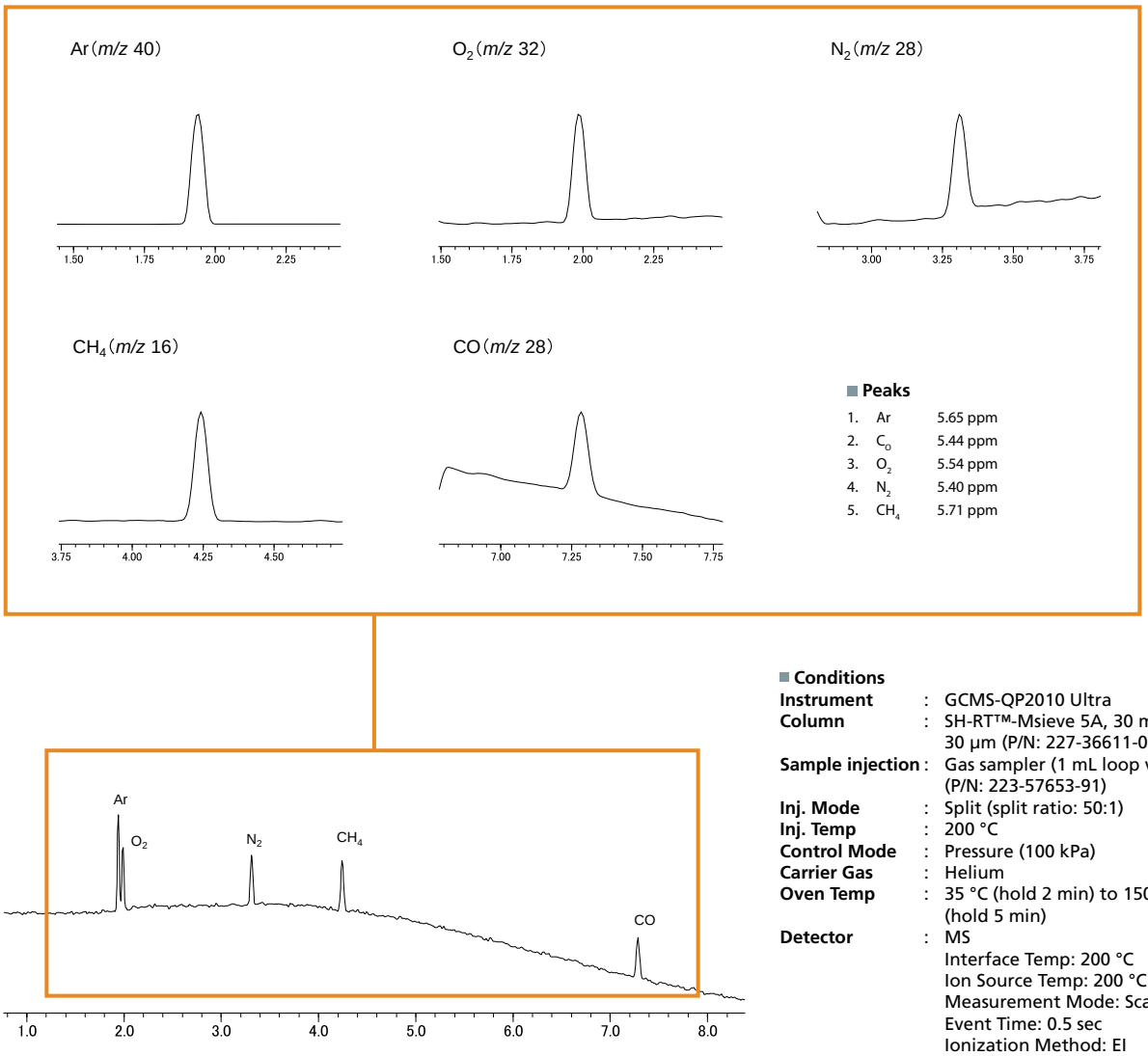
PLOT Capillary Columns

SH-Rt™-Msieve 5A

- Stationary phase: Molecular sieve 5A
- Easily separate permanent gases at temperatures above ambient.
- Improve accuracy with sharp, symmetrical peaks for argon, oxygen, and carbon monoxide.
- Similar phases: HP-PLOT Molesieve, CP-Molsieve 5A, Molsieve 5A PLOT

ID	df	Temp. Range	30 m
0.32 mm	30 µm	to 300 °C	227-36611-02
0.53 mm	50 µm	to 300 °C	221-75763-30

Analysis of Inorganic Gas



Conditions

Instrument	:	GCMS-QP2010 Ultra
Column	:	SH-RT™-Msieve 5A, 30 m, 0.32 mm ID, 30 µm (P/N: 227-36611-02)
Sample injection	:	Gas sampler (1 mL loop volume) (P/N: 223-57653-91)
Inj. Mode	:	Split (split ratio: 50:1)
Inj. Temp	:	200 °C
Control Mode	:	Pressure (100 kPa)
Carrier Gas	:	Helium
Oven Temp	:	35 °C (hold 2 min) to 150°C at 10°C/min (hold 5 min)
Detector	:	MS Interface Temp: 200 °C Ion Source Temp: 200 °C Measurement Mode: Scan (m/z 10 to100) Event Time: 0.5 sec Ionization Method: EI Emission Current:150 µA

PLOT Capillary Columns

SH-Rt™-Q-BOND

- Non-polar PLOT column incorporating 100% divinylbenzene
- Excellent for analysis of C1 to C3 hydrocarbons as well as isomers and alkanes up to C12
- High retention for CO2 simplifies gas analysis; CO2 and methane separated from O2/N2/CO. (Note: O2/N2/CO not separated at ambient temperature.)
- Use for analysis of oxygenated compounds and solvents.
- Similar phases: HP-PLOT Q, CP-PoraPLOT Q, CP-PoraBOND Q, Supel-Q PLOT

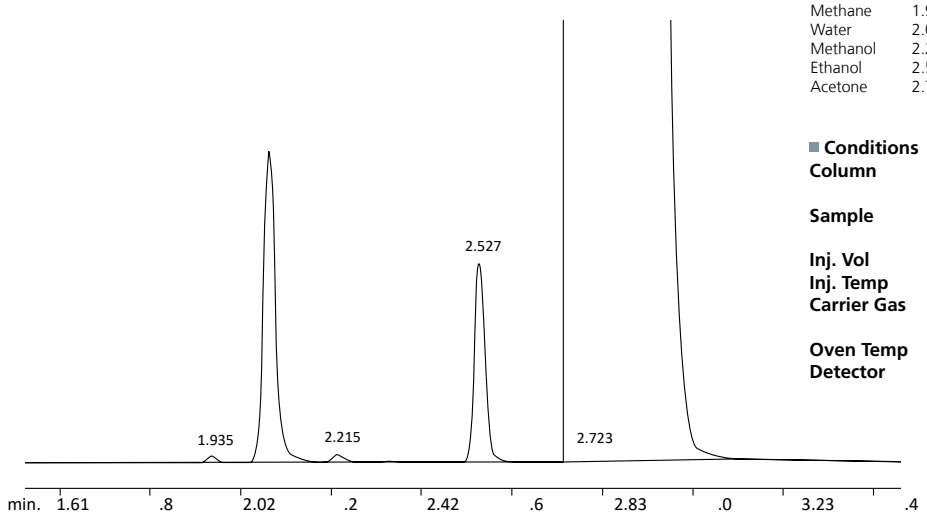
ID	df	Temp. Range	30 m
0.32 mm	10 µm	to 280/300 °C	221-75764-30
0.53 mm	20 µm	to 280/300 °C	221-75765-30

SH-Rt™-U-BOND

- Polar PLOT column, incorporating divinylbenzene ethylene glycol / dimethylacrylate.
- Highest polarity porous polymer column in Shimadzu PLOT columns.
- Highly inert for the analysis of polar and nonpolar compounds.
- Ideal for trace H2S, COS, and mercaptans in hydrocarbon streams.
- Similar phases: HP-PLOT U, CP-PoraPLOT U, CP-PoraBOND U

ID	df	Temp. Range	30 m
0.53 mm	20 µm	to 190 °C	227-36302-01

Water and Ethanol in Acetone



Peaks	Ret. Time
Methane	1.935
Water	2.063
Methanol	2.215
Ethanol	2.527
Acetone	2.723

Conditions

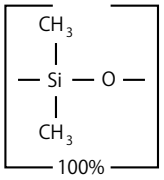
Column : SH-Rt™-Q-BOND, 30 m, 0.53 mm ID, 20 µm (P/N: 221-75765-30)
Sample : 0.5% water and ethanol in acetone
Inj. Vol : 3 µL split (split ratio 11:1)
Inj. Temp : 250 °C
Carrier Gas : He, constant flow, linear velocity 28.7 cm/sec. @ 200 °C
Oven Temp : 200 °C, isothermal
Detector : TCD, 260 °C

Metal Capillary Columns

SH-MXT™-1

- Non-polar phase: Crossbond™ 100% dimethyl polysiloxane
- General-purpose columns for solvent impurities, PCB congeners (e.g., Aroclor mixes), gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, and oxygenates.
- Equivalent to USP G1, G2, G38 phases.
- 4.5" standard coil diameter.
- Similar phases: DB-PS1, UAC-1

SH-MXT™-1 Structure

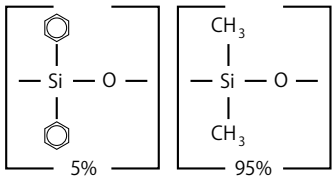


ID	df	Temp. Range	15 m
0.28 mm	0.10 µm	-60 to 430 °C	221-75734-15

SH-MXT™-5

- Low-polarity phase: Crossbond™ 5% diphenyl / 95% dimethyl polysiloxane
- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, and semivolatiles.
- Equivalent to USP G27 and G36 phase
- 4.5" standard coil diameter.
- Similar phases: DB-PS5, VF-5ht UltiMetal

SH-MXT™-5 Structure



ID	df	Temp. Range	30 m
0.25 mm	0.25 µm	-60 to 430 °C	221-75743-30

SH-MXT™ Biodiesel TG Column

- (Siltek-treated stainless steel)
- Fast analysis times and sharp mono-, di-, and triglyceride peaks
- Stable at 430 °C for reliable, consistent performance

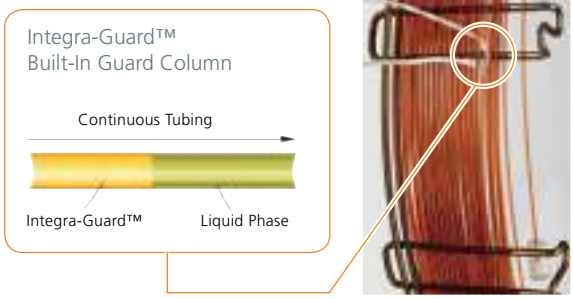
ID	df	Temp. Range	14m
0.53 mm	0.16 µm	-60 to 430 °C	227-36315-01

Download more application data of GC/GCMS from
https://www.ssi.shimadzu.com/literature/index.html

Guard Capillary Columns

Integra-Guard™ Columns

- No leaks for a more robust method.
- No column connections for easier, faster maintenance.
- No peak distortions due to connector dead volume and thermal capacity.



String indicates where the analytical column begins

Column	ID	df	Length	With 5 m Integra-Guard™	With 10 m Integra-Guard™
SH-Rxi™-5Sil MS	0.25 mm	0.25 µm	30 m	221-76161-30	221-76162-30
SH-Rtx™-1	0.25 mm	0.25 µm	30 m	221-75719-31	–
	0.53 mm	1.00 µm	30 m	221-75731-31	–
	0.53 mm	5.00 µm	30 m	221-75734-31	–
SH-Rtx™-5	0.25 mm	0.25 µm	30 m	221-76153-05	221-76153-30
	0.25 mm	1.00 µm	30 m	221-76179-30	–
	0.32 mm	0.25 µm	30 m	221-76177-30	–
	0.32 mm	0.25 µm	60 m	221-76177-60	–
	0.32 mm	1.00 µm	30 m	221-76180-30	–
	0.53 mm	5.00 µm	30 m	221-76154-35	–
SH-Rtx™-5MS	0.25 mm	0.10 µm	30 m	221-76189-30	–
	0.25 mm	0.25 µm	15 m	221-75861-15	–
	0.25 mm	0.25 µm	30 m	221-75861-05	221-75861-10
	0.32 mm	0.25 µm	30 m	221-76190-30	–
SH-Rtx™-1301	0.53 mm	3.00 µm	30 m	221-76164-35	–
SH-Rtx™-624	0.25 mm	1.40 µm	30 m	221-76183-30	–
	0.32 mm	1.80 µm	30 m	221-76157-35	–
	0.53 mm	3.00 µm	30 m	221-76158-30	–
SH-Rtx™-1701	0.25 mm	0.25 µm	30 m	221-76185-30	–

Guard Capillary Columns

SH-Rxi™ Guard / Retention Gap Columns

- Extend column lifetime.
- Excellent inertness—obtain lower detection limits for active compounds.
- Sharper chromatographic peaks by utilizing retention gap technology.
- Maximum temperature: 360 °C.

ID	5 m	10 m
0.25 mm	227-36303-01	227-36304-01
0.32 mm	227-36305-01	227-36306-01
0.53 mm	227-36307-01	227-36308-01

SH-Particle Trap (for PLOT columns)

- Includes two Press-Tight® connectors and a 2.5 m column.
- Protects detector and valves; connects between column and detector or valve.
- Eliminates detector spikes and scratches in valve rotors.

Description	P/N
SH-Particle Trap for 0.32 mmID PLOT Columns	227-36800-01
SH-Particle Trap for 0.53 mmID PLOT Columns	227-36800-02

GC Packed Columns

The Shimadzu a wide selection of packed columns that fits in most GC instruments in the market.

Some of the more commonly used columns below:

ShinCarbon ST Columns (packed & micropacked)

- Rapid separations of permanent gas/light hydrocarbon mixtures.
- Separate permanent gases, including carbon monoxide and carbon dioxide, without cryogenic cooling.
- Excellent compatibility with most GC detectors—minimal bleed, minimal baseline rise.
- Preconditioned, less than 30 minutes to stabilize.
- Maximum temperature of 280 °C/300 °C.

Molecular Sieve Columns

- Molecular sieve packed columns easily separate permanent gases at above-ambient temperatures. In addition, our molecular sieves are pre-activated and ready to use.

Micropacked GC Columns

- Higher capacity than PLOT columns.
- Increased efficiency over traditional packed columns.
- Made from inert, flexible SilcoSmooth tubing.
- Wide range of packings available.

Rt-XLSulfur Columns (packed & micropacked)

- Optimized columns for low ppbv sulfur analyses.
- Eliminate the need for PTFE tubing.
- Column and end fittings are Sulfinert treated for maximum inertness.
- Maximum temperature of 290 °C.

Porous Polymer Columns (packed)

- Available in both glass and stainless steel tubing.

For availability and ordering information on custom columns, please contact your representative direct sales/distributors.

ShinCarbon ST Columns

Analyzing the permanent gases oxygen, nitrogen, methane, carbon monoxide, and carbon dioxide has been virtually impossible for a single gas chromatography (GC) or gas-solid chromatography (GSC) column, without sub-ambient temperatures.

ShinCarbon ST material, a high surface area carbon molecular sieve (~1500 m2/g), is the ideal medium for separating gases and highly volatile compounds by GSC. A 2 m x 1 mm ID micropacked column containing ShinCarbon ST separates the permanent gases in 10 minutes, without cryogenic cooling (Figure 1).

ShinCarbon ST columns can also separate light hydrocarbon / permanent gas mixtures. Figure 2 shows an analysis of permanent gases plus acetylene, ethylene, and ethane, completed in less than 20 minutes. Natural gas components (70% methane) also are cleanly separated (Figure 3). Other potential applications for ShinCarbon ST include analyses of sulfur dioxide and Freon® fluorocarbons (Figure 4).*

Figure 1 Separate permanent gases in 10 minutes, without cryogenic cooling.

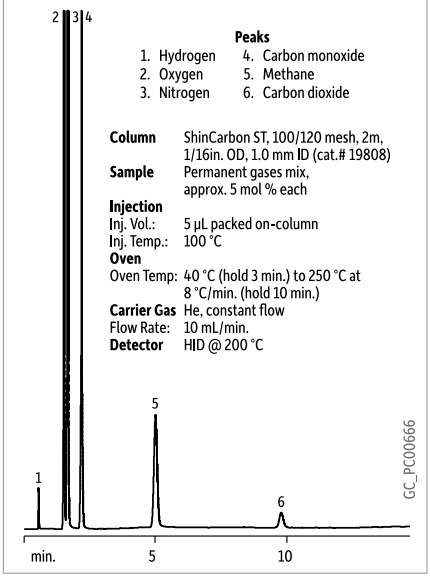


Figure 2 Rapidly analyze light hydrocarbon/permanent gas mixtures.

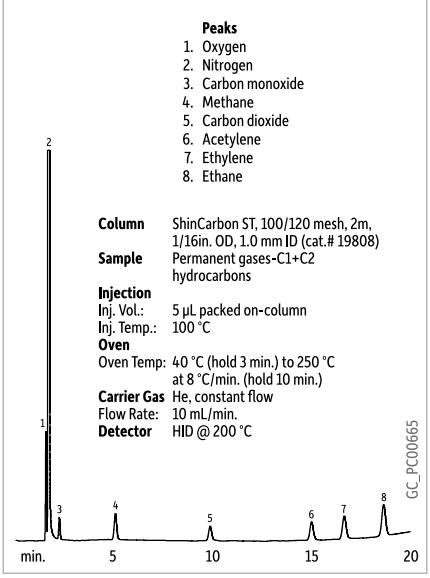
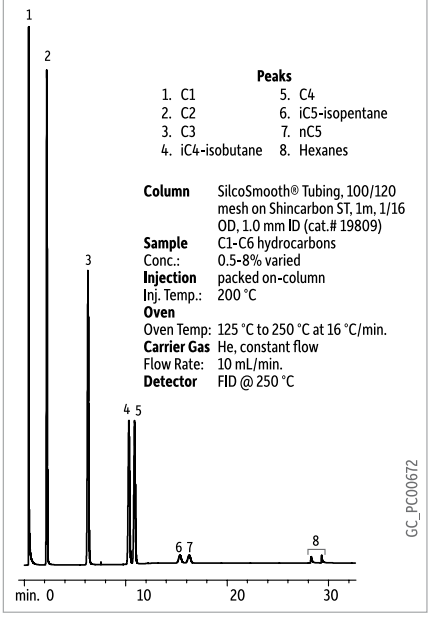


Figure 3 Separate components in natural gas.



ShinCarbon ST Columns (micropacked)

(SilcoSmooth® Stainless Steel)**

OD	ID / mm	Mesh	Length / m
1/16"	1.0	80/100 100/120	1.0
			2.0
			3.0

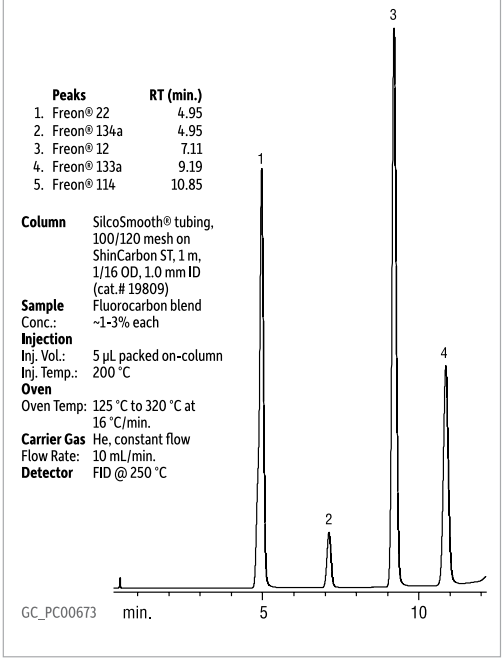
ShinCarbon ST Columns (packed)

(SilcoSmooth® Stainless Steel)*

OD	ID / mm	Mesh	Length / m
1/8"	2.1	80/100 or 100/120	2.0

For availability and ordering information on custom columns, please contact your representative direct sales/distributors.

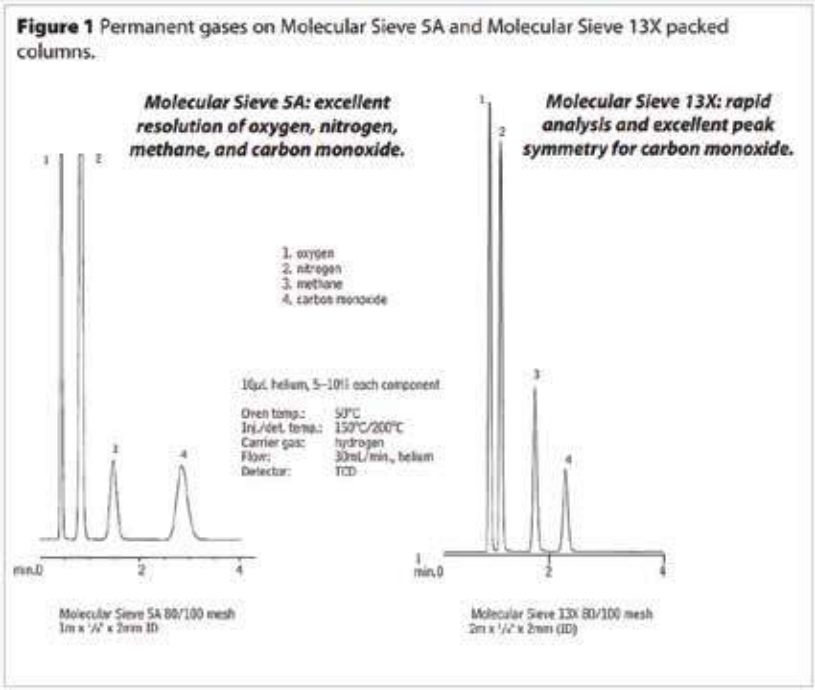
Figure 4 Fluorocarbon analysis completed in 11 minutes on ShinCarbon ST column.



Molecular Sieve 5A / 13X

Molecular sieve packed columns easily separate permanent gases at above-ambient temperatures. The two most common molecular sieves used are 5A and 13X.

Molecular sieve 5A and 13X packings differ in pore size and composition, causing differences in retention and selectivity for many gases. The 5A packing provides greater retention, which improves the separation of argon, oxygen, and nitrogen, and is a better choice for analyzing the trace impurities in inert gases typically used in the semiconductor industry. The 13X packing often is preferred for analysis of carbon monoxide, particularly at trace concentrations, because lower retention results in sharper chromatographic peaks and improved detection limits.



Molecular Sieve Packed Columns

Molesieve	OD	ID / mm	Mesh	Length / m
Molesieve 5A Molesieve 13X	1/8”	2.1	60/80 80/100	1.0
				2.0
				3.0

Molecular Sieve Micropacked Columns

Molesieve	OD	ID / mm	Mesh	Length / m
Molesieve 5A Molesieve 13X	1/16”	1.0	80/100	1.0
				2.0

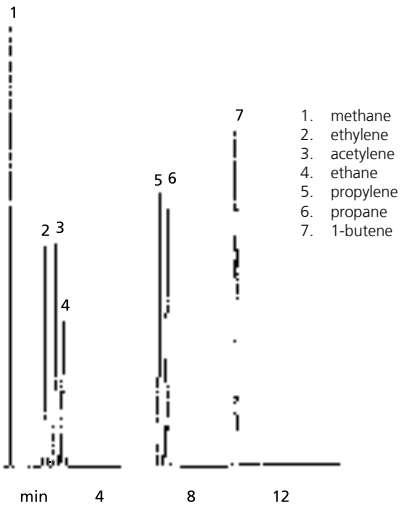
Molecular Sieve 5A and 13X are available in both stainless steel and glass column.

For availability and ordering information on custom columns, please contact your representative direct sales/distributors.

Micropacked GC Columns

Micropacked columns are highly efficient and provide good sample capacity, resulting in a powerful tool for solving many difficult application problems. The unsurpassed inertness of SilcoSmooth tubing is based on Siltek deactivation, which allows the column to be flexed and coiled without any fear of chipping or cracking the inert surface.

Hydrocarbon Gases
HayeSep® S
(micropacked)

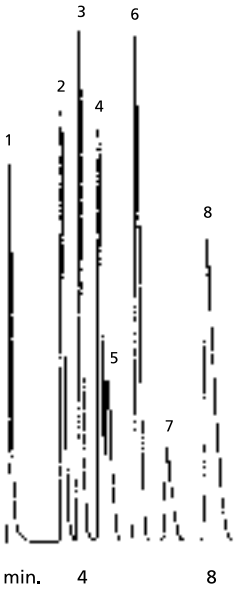


1. methane
2. ethylene
3. acetylene
4. ethane
5. propylene
6. propane
7. 1-butene

2m, 0.75mm ID HayeSep S micropacked column
500µL split injection of a light hydrocarbon gas mixture

Oven temp. : 40°C (hold 3 min.) to 150°C @ 15°C/min. (hold 5 min.)
Inj. & det. temp. : 220 °C
Carrier gas : helium
Flow : 20mL/min. set @ 40 °C
FID sensitivity : 32 x 10-11 AFS
Split ratio: : 10:1

Solvents
HayeSep® Q



1. methanol
2. ethanol
3. acetonitrile
4. acetone
5. methylene chloride
6. n-pentane
7. chloroform
8. n-hexane

2m, 1mm ID HayeSep® Q
1µL direct injection of a neat solvent mixture

Oven temp. : 80°C to 180°C @ 16°C/min. (hold 5 min.)
Inj. & det. temp. : 200 °C
Carrier gas : helium
Flow : 20mL/min. set @ 40 °C
FID sensitivity : 512 x 10-11 AFS

Types of micropacked columns available:

Mesh	Packing material
80/100	HayeSep Q
	Molesieve 5A
	Molesieve 13X
	ShinCarbon ST
100/120	HayeSep Q
	HayeSep R
	HayeSep N
	Rt-XLSulfur Micropacked Column
20% TCEP on 80/100 Chromosorb PAW	

For availability and ordering information on custom columns, please contact your representative direct sales/distributors.

Rt-XLSulfur Columns (Packed and Micropacked)

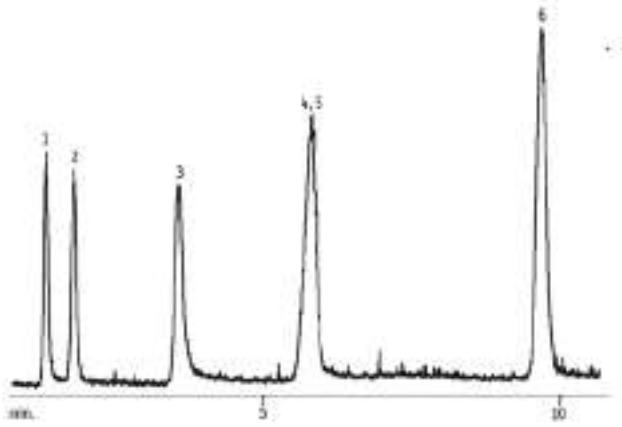
Rt®-XLSulfur packed and micropacked columns are designed for ppb-level sulfur analysis. Every component of the sample pathway is treated to provide the highest degree of inertness for reactive, low-level sulfur compounds. The porous polymer phase features a unique surface modification, which results in excellent peak symmetry and thermal stability to 300 °C.

The high performance and reproducibility of the Rt®-XLSulfur column enables resolution and quantitation of COS, H2S, SO2, CH3SH, (CH3)2S2 at low ppb concentrations. These sulfur compounds typically are found in pulp mill byproducts, natural gas, and petroleum products.

Features:

- Optimized columns for low pbbv sulfur analyses.
- Eliminate the need for PTFE tubing.
- Column and end-fittings are Sulfinert® treated for maximum inertness.

Figure 1 The Rt®-XLSulfur column analyzes 50 ppb levels of sulfur compounds, providing low bleed and good symmetry.



Peaks

1. Hydrogen sulfide
2. Carbonyl sulfide
3. Methyl mercaptan
4. Ethyl mercaptan
5. Dimethyl sulfide
6. Dimethyl disulfide

Conditions

Column : Rt®-XLSulfur, 1 m, 0.75 mm ID
Sample conc. : 1 mL of 50ppbv each sulfur compound
Injection : sample valve
Oven Temp. : 60 °C to 230 °C at 15 °C/min.
Carrier Gas : He, constant flow
Flow Rate: : 9 mL/min.
Detector : SCD

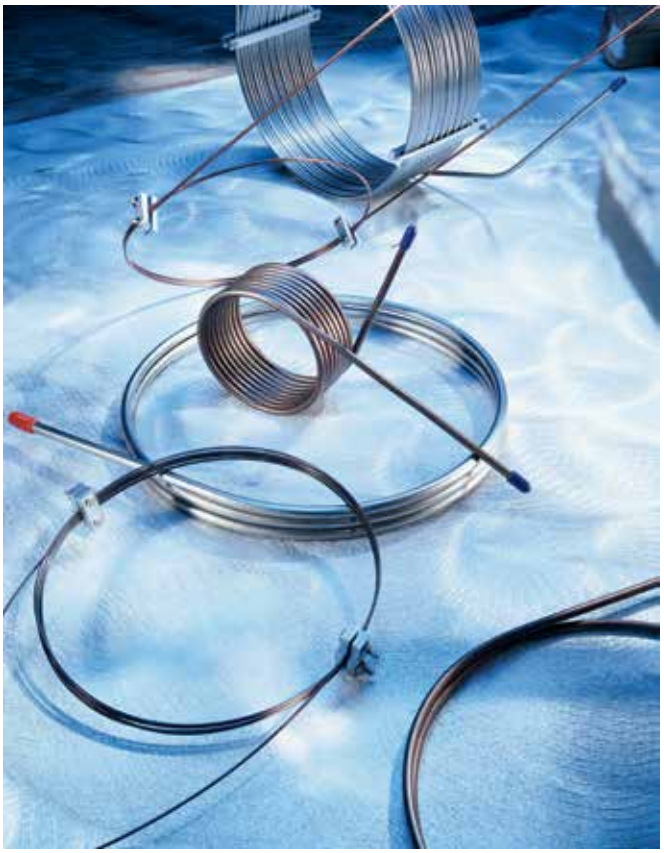
Column	OD	ID / mm	Length / m
Rt®-XLSulfur Columns (packed)	1/8”	2.0	1.0
			2.0
	1/16”	3.2	1.0
			2.0
Rt®-XLSulfur Columns (micropacked)	1/16”	1.0	1.0
			2.0
	0.95mm	0.75mm	1.0
			2.0

For availability and ordering information on custom columns, please contact your representative direct sales/distributors.

Porous Polymer Columns (Packed)

Types of packing material available:

- Activated Charcoal
- HayeSep A
- HayeSep C
- HayeSep D
- HayeSep N
- HayeSep Q
- HayeSep T
- Porapak Q
- Porapak QS
- Porapak R
- Porapak N
- Porapak T
- Shimalite Q
- Silica Gel



Available in both glass and stainless steel tubing.

For availability and ordering information on custom columns, please contact your representative direct sales/distributors.

SAMPLE INTRODUCTION – Syringes

Shimadzu Diamond syringes are the result of technological advancements in materials, design, and engineering. Designed to meet the ever increasing levels of sensitivity required by today's analyses, Shimadzu Diamond syringes give you a new level of accuracy and precision.

LONGER LIFE

Shimadzu Diamond syringes have a longer life. The improved solvent resistance and maximized operational temperature range along with the smoothest available internal glass surface ensure you receive the longest lifetime from your Shimadzu syringe.

SUPERIOR PERFORMANCE AND ROBUSTNESS

Shimadzu Diamond syringes have superior performance and robustness with unsurpassed levels of operational strength and durability. Potential for contamination is significantly reduced by the near-zero syringe dead volume and minimized adhesive in the flow path.

REDUCED CARRYOVER

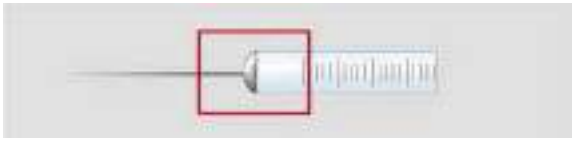
Engineering enhancements have eliminated areas where fluid can become trapped and potentially cause carryover, improving accuracy, precision and analysis results.

Syringes

Syringe Selection Guide
If a syringe is being used by hand, a manual syringe should be selected. If a syringe is installed in an AOC autosampler, then choose the appropriate syringe and volume to suit your instrument and application.

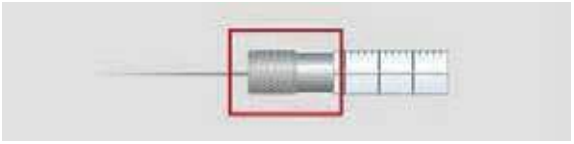
Syringe Style

Fixed Needle



- Better option for experienced users or for applications requiring trace sample levels
- Recommended for use with an autosampler because the probability of needle bending is minimal
- Minimal sample carryover

Removable Needle



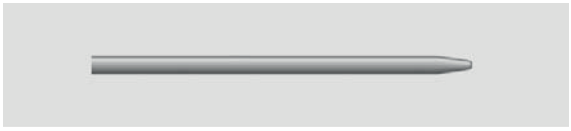
- Better option for inexperienced users
- Reduce cost if used in precipitation of salts or in situations in which it may bend easily (such as thick septum) Available for many methods by changing needles

Gas Tight

- For Luer Lock needles and fittings
- Specifically designed to install and secure Luer Lock needles easily

Needle Tip Style

Cone: Autosampler

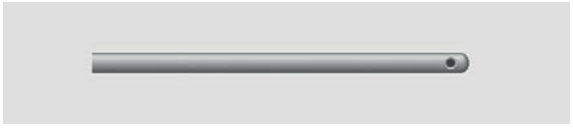


The cone-shaped needle tip is specially developed to withstand multi- injection demands and improve septum lifetime when used with an autosampler. The cone design effectively “parts” the septum during piercing instead of cutting it, as would a bevel needle.

Bevel: Manual Injection

The standard general-purpose needle tip style supplied with many syringes is a 20 ° bevel tip. It is the preferred option for manual injection when piercing the septum in exactly the same place is difficult. The bevel tip is designe d for optimum septum penetration and prevention of septum coring.

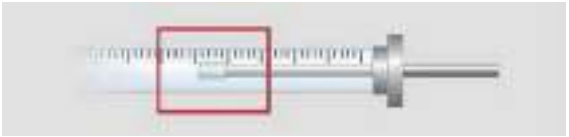
Side Hole Dome



Samples are filled and dispensed through the side hole , eliminating septum plugging of the needle. Ideal for large-volume gas injections. The solid domed tip minimizes septum damage.

Plunger Style

PTFE Tipped Plunger



- PTFE Tip enables gastight analysis
- Suitable for both liquid and gas samples
- Ideal for analysis of highly viscous liquid because it reduces the possibility of the plunger sticking due to micro particles (samples should have no effects with PTFE)
- Plunger is replaceable

Manual Autosampler or Instrument Syringes

If a syringe is being used by hand, a manual syringe should be selected. If a syringe is installed in an AOC autosampler then choose the appropriate syringe and volume to suit your instrument and application.

Shimadzu autosampler syringes are specifically designed to meet instrument dimensional specifications, have an accuracy of better than ± 1 % and are designed for precise, worry-free overnight sampling.

Needle Tip Styles

Cone: GC Autosampler

The cone shaped needle tip is specially developed to withstand multi injection demands and improve septum lifetime when used with the AOC autosampler. The cone design effectively "parts" the septum during piercing instead of cutting it, as would a bevel needle.

LC: HPLC

These needles are used for LC and HPLC valve injection and have a 90 ° square tip with rounded and polished edges. This eliminates damage to the valve's rotor seal and stator face. This needle tip style is a good choice for general liquid dispensing.

Bevel: Manual GC

The standard general purpose needle tip style supplied with many Shimadzu syringes is a 20 ° bevel tip. It is the preferred option for manual injection where piercing the septum in exactly the same place is difficult. The bevel tip is designed for optimum septum penetration and prevention of septum coring.

Side Hole Dome:

Samples are filled and dispensed through the side hole eliminating septum plugging of the needle. Ideal for large volume gas injection. The solid domed tip minimizes septum damage.

Dome:

This style needle is recommended for use with predrilled septa. The tip is rounded and polished to help septum penetration.

Valves

OPEN ⟷ CLOSED

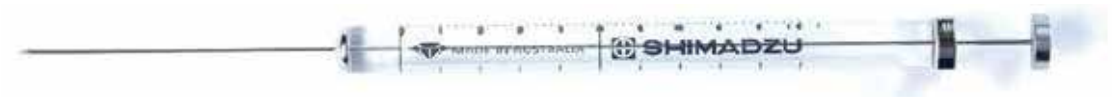
The push-button valve attaches directly to any luer lock 1 mL – 100 mL Shimadzu syringe.

OPEN ⟷ CLOSED

The push-button valve attaches to any luer lock 5 mL – 100 mL Shimadzu syringe.

Syringe for AOC-20i/20s and AOC-20i Plus / 20s Plus

Syringe Volume	PTFE Tipped Plunger	Needle Length (mm)	Needle Gauge	Needle OD (mm)	Needle Tip	Needle ID (mm)	P/N	Replacement Needle P/N
5 µL	–	42	23	0.63	Cone	0.11	221-75173-00	–
10 µL	√	42	23	0.63	Cone	0.11	221-74469-00	–
10 µL	–	42	23	0.63	Cone	0.11	221-34618-00	–
10 µL	√	42	23	0.63	Cone	0.11	221-75174-00	221-75174-01



Description	P/N	Syringe Volume
Elastic Syringe for AOC *	221-49548	10 µL

* Plunger is made of titanium. It has less wear debris compared to metal, making it less hard and ideal for hydrous sample.

Syringe for AOC-5000 Plus

Syringe Volume	PTFE Tipped Plunger	Needle Length (mm)	Needle Gauge	Needle OD (mm)	Needle ID (mm)	Needle Tip	Type	P/N	Removable Tip
1.2uL	Stainless-Steel	51	26	0.47	0.13	Cone	Liquid	220-94500-10	Yes
5.0uL	Stainless-Steel	51	26	0.47	0.13	Cone	Liquid	220-94500-12	--
10uL	Stainless-Steel	51	23	0.64	0.25	Cone	Liquid	220-94500-71	--
25uL	Yes	51	26	0.47	0.13	Cone	Gas Tight	220-94500-16	--
100uL	Yes	51	26	0.47	0.13	Cone	Gas Tight	220-94500-18	--
250uL	Yes	51	26	0.47	0.13	Cone	Gas Tight	220-94500-20	--
500uL	Yes	51	26	0.47	0.13	Cone	Gas Tight	220-94500-22	--
1.0mL	Yes	51	23	0.64	0.20	Cone	Gas Tight	220-94500-05	--
2.5mL	Yes	51	23	0.64	0.20	Cone	Gas Tight	220-94500-04	--
5.0mL	Yes	51	23	0.64	0.20	Cone	Gas Tight	220-94500-02	--

Syringe for AOC-6000

Syringe Volume	PTFE Tipped Plunger	Needle Length (mm)	Needle Gauge	Needle OD (mm)	Needle Tip	P/N
1 µL	-	57	23	0.63	Cone	225-19744-01
5 µL	-	57	26	0.47	Cone	225-19744-02
10 µL	-	57	26	0.47	Cone	225-19744-03
10 µL	√	57	26	0.47	Cone	225-19744-04
25 µL	√	57	26	0.47	Cone	225-19744-05
50 µL	√	57	26	0.47	Cone	225-19744-06
100 µL	√	57	26	0.47	Cone	225-19744-07
250 µL	√	57	26	0.47	Cone	225-19744-08
500 µL	√	57	26	0.47	Cone	225-19744-09
1 mL	√	57	23	0.63	Side Hole Dome	225-19744-10
2.5 mL	√	65	23	0.63	Side Hole Dome	225-19744-11

Manual Syringe

Shimadzu manual syringes are available from 5µL to 500µL, and can be widely used in your laboratory work.

Fixed Needle Style

Syringe Volume	PTFE Tipped Plunger	Needle Length (mm)	Needle Gauge	Needle OD (mm)	Needle ID (mm)	Needle Tip	P/N	Replacement Plunger	
								P/N	Qty
10 µL	–	51	22	0.028"	0.17	LC	670-12554-01	–	–
25 µL	–	51	22	0.028"	0.37	LC	670-12554-02	–	–
50 µL	–	51	22	0.028"	0.37	LC	670-12554-03	–	–
100 µL	–	51	22	0.028"	0.37	LC	670-12554-04	–	–
250 µL	–	51	22	0.028"	0.37	LC	670-12554-05	–	–
500 µL	–	51	22	0.028"	0.37	LC	670-12554-06	–	–

Removable Needle Style

Syringe Volume	PTFE Tipped Plunger	Needle Length (mm)	Needle Gauge	Needle OD (mm)	Needle Tip	P/N	Replacement Plunger P/N	Replacement Needle P/N
10 µL	√	50	26	0.47	Bevel	670-12553-21	670-12553-33	670-12510-95
25 µL	–	50	25	0.5	Bevel	670-12510-74	–	670-12510-96
50 µL	–	50	25	0.5	Bevel	670-12510-75	–	
100 µL	–	50	25	0.5	Bevel	670-12510-76	–	
250 µL	–	50	25	0.5	Bevel	670-12510-77	–	
500 µL	–	50	25	0.5	Bevel	670-12510-78	–	

Syringe for Gas Analysis

Luer Lock Needle Style

Syringe Volume	PTFE Tipped Plunger	P/N	Replacement Plunger P/N
50 mL	√	221-54778-05	221-54778-15

Luer Lock Needle

Needle Length (mm)	Needle Gauge	Needle OD (mm)	Needle Tip	Qty	P/N
50	14	2.1	Bevel	5	221-54778-54

Syringe Valve

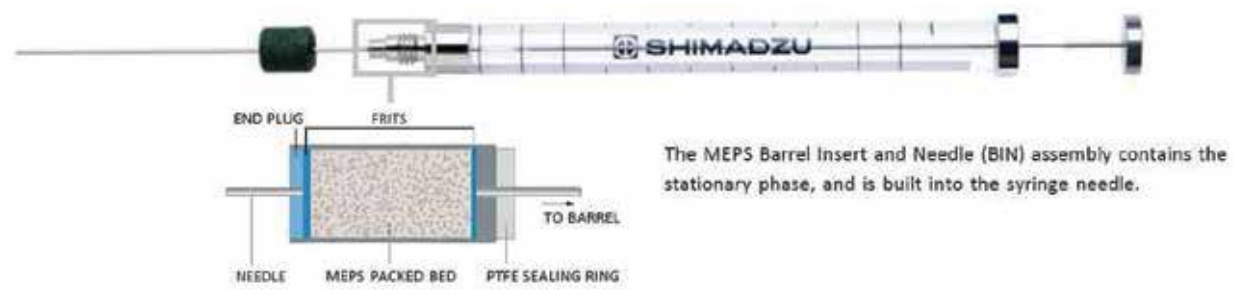
Syringe Volume	Description	Qty	P/N
50 µL to 2 L	Push Button Valve for Luer Lock Needle and Tip Syringe	1	221-54778-50

OPEN ⟷ CLOSED

Micro Solid Phase Extraction Syringe MEPS™

MEPS™ is Micro Extraction by Packed Sorbent and is used for sample preparation and handling. MEPS is the miniaturization of conventional SPE packed bed devices from milliliter bed volumes to microliter volumes. The MEPS approach to sample preparation is suitable for reversed phases, normal phases, mixed mode or ion exchange chemistries. MEPS is available in a variety of common SPE pha ses.

Meps Barrel Insert And Needle



SAMPLE SIZE AND SENSITIVITY

Sample volumes may be as little as 10 µL, or by taking multiple aliquots of 100 µL or 250 µL, samples of 1 mL or larger may be concentrated.

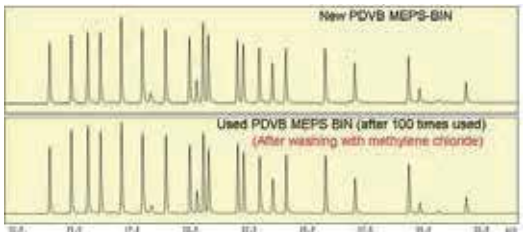
AUTOMATION

Extract samples and make injections on-line using a single device, reducing sample processing times and the need for operator intervention.

SORBENT LIFE

BIN life is dependent on the specific matrix being analyzed. For example, C18 analysis of whole plasma samples is conservatively 25-100 samples before the BIN needs to be changed. BIN life of cleaner samples is significantly longer.

Chromatogram of 22 pesticides standard solution (40 ng/mL)



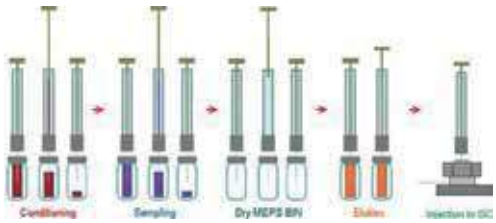
CARRYOVER

The small quantity of phase in the MEPS BIN is easily and effectively washed between samples to reduce the possibility of carryover. This washing process is not practical with off-line SPE devices. With automated MEPS, washing occurs while the previous sample is running.

FLEXIBLE AND EASY TO USE

The dimensions of the sorbent bed ensure performance remains identical to conventional SPE devices when used for extraction of similar samples. The AOC-MEPS system was developed to incorporate MEPS into a process automation workflow, combining sample preparation and analysis in a single platform.

AOC-MEPS System



When automated by an AOC-MEPS system, the injection volume is much larger compared to the commonly used GC injection volumes of 1 - 2 µL. With AOC-MEPS, the typical injections are 50 to 200 µL of elution solvent.

A large volume injection technique that removes the solvent volume from inside the injector unit while condensing the target compounds should be employed.

MEPS™ Syringe for AOC-20i/20s and AOC-20i Plus/ AOC-20s Plus

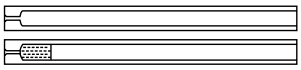
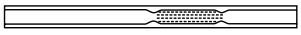
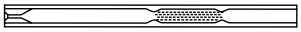
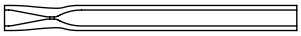
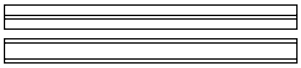
Syringe Volume	PTFE Tipped Plunger	P/N	Replacement Plunger	
			P/N	Qty
100 µL	√	221-74830-01	221-74830-10	1

Base	P/N	Qty
C18	221-74830-03	5
Silica	221-74830-04	5
C8 + SCX	221-74830-05	5
C2	221-74830-06	5
C8	221-74830-07	5
PDVB	221-74830-02	5
Development Kit	221-74830-08	1 each of C18, C8, Silica, C8+SCX, C2

GC Inlet Liners

The GC inlet functions as the interface between the syringe and the GC capillary column, where the sample is introduced, vaporized, mixed with carrier gas and transferred to the column. Shimadzu instruments offer several types of inlets - split, splitless, programmable temperature vaporization (PTV) and on-column.

The inlet liner prevents the sample contacting the metal walls of the injector block. Inlet liner geometry and packing materials enable the inlet liner to achieve greater heated surface area; this additional surface area can often improve sample vaporization. Conversely, choosing the wrong inlet liner geometry can significantly decrease the reproducibility and quality of analysis.

Injection Technique	Sample Types	Inlet Liner Geometry	Function
Splitless	Trace Level Analyses/ Active Compounds	Taper 	A bottom taper focuses sample onto the head of the column and minimizes sample contact with metal parts of the inlet. The addition of quartz wool to your inlet liner promotes mixing of analytes, aids the vaporization of liquid samples, and works as a trap to collect non-volatile residue in the sample (i.e. protects capillary column from 'dirty' samples).
Split	General Purpose/ Concentrated Samples/ Dirty Samples	FocusLiner™ 	Ensures quartz wool remains in the correct position in the liner. Excellent reproducibility results from the wiping of the sample from the syringe needle and the prevention of droplet formation. Minimizes high molecular weight discrimination.
Splitless	Trace Level Analyses/ Dirty Samples/ Wide Boiling Point Range	Taper FocusLiner™ 	Bottom taper focuses sample onto the head of the column and minimizes contact with metal parts of the inlet. Excellent reproducibility results from the wiping of the sample from the syringe needle and the prevention of droplet formation. Minimizes high molecular weight discrimination.
Direct	Trace Level Analyses/ Active Compounds	Direct Taper 	Direct inlet liners facilitate maximum transfer of sample by connecting directly to the GC column and inhibiting sample degradation due to hot metal components inside inlet.
Split/Splitless	General Purpose/ Concentrated Samples/ Dirty Samples (only if quartz wool is present)/ Gaseous Samples (also purge & trap, headspace)	Straight 	Straight inlet liners facilitate higher split flows. Narrow bore straight inlet liners facilitate fast GC work. Small injection volumes of less than 0.5 µL are best used with a narrow bore. Narrow bore straight inlet liners improve focussing of gaseous samples (purge, trap & headspace).

Inlet Liner Deactivation

Every batch of inlet liners are tested for inertness using the EPA 8081B method. This standard method ensures that each batch of inlet liners has less than 3 % Endrin breakdown from a 1 ppm injection.

Glass Insert for Capillary Column Analysis

Glass insert is very important to prevent the column from being contaminated by sample components. Please choose an appropriate insert according to your system model, injection port and injection method, and exchange it regularly to avoid poor reproducibility and peak shape caused by the crossover of residual samples, etc.

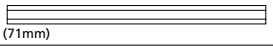
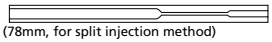
S: Standard; O: Option

			P/N	Specification	Nexis GC-2030	GC-2010 Plus GC-2010 GC-2025	GC-2014	GC-17A ver. 1-3 GC-1700 GC-18A	GC-14A GC-14B	GC-8A
				Injection Unit →	SPL-2030	SPL-2010 Plus SPL-2010 SPL-2025	SPL-2014	SPL-17	SPL-14	SPL-G9
Injection Port Side	Split/Splitless Injection Method	For Split	221-41444	(ID 3.5mm; OD 5mm; Length 95mm)	O	O	S	S		
			221-41444-01	(ID 3.5mm; OD 5mm; Length 95mm)	O	S		O		
			221-37574-01	(99mm)					S	
			221-25822-03	(87mm)						S
			227-35007-01	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, with wool, 5pcs)	S	O	O	O		
		For Splitless	221-48335-01	(ID 3.5mm; OD 5mm; Length 95mm)		S	S	O		
			221-41544	(95mm)		O	O	S		
			221-75192	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, 5pcs)		O	O			
			221-32544	(99mm)					S	
			221-25944-03	(87mm)						S
			227-35008-01	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, with wool*2, 5pcs)	S	O	O	O		
		For Split and Splitless	221-75187	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, with wool, 5pcs)	O	O	O			
			221-75188	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, needle onto wool, 5pcs)	O	O	O			
			221-75189	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, needle into wool, 5pcs)	O	O	O			
			221-75190	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, Straight Through, 5pcs)	O	O	O			
			221-75191	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, needle into wool, 5pcs)	O	O	O			
			221-75193	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, with wool, 5pcs)	O	O				
			221-75194	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, 5pcs)	O	O				
			221-41444-05	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, 5pcs)			O			
			221-41544-05	(ID 2.6mm; OD 5mm; Length 95mm, Deactivated, 5pcs)			O			
			221-75195	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, with wool, 5pcs)			O			
				Injection Unit →	WBI-2030	WBI-2010 Plus WBI-2010	WBI-2014	WBI-17		
	Direct Injection Method (WBI)		221-41599	(95mm)	O	O	O	S		
			221-48335-01	(ID 3.5mm; OD 5mm; Length 95mm)	S	S (WBI-2010)	S	O		
			221-75197	(ID 3.4mm; OD 5mm; Length 95mm, Deactivated, with wool*2, 5pcs)		O	O			
			221-41599-05	(ID 2.6mm; OD 5mm; Length 95mm, Deactivated, for 0.53mmID column, 5pcs)			O			
			P/N	Specification	Nexis GC-2030	GC-2010 Plus GC-2010 GC-2025	GC-2014	GC-17A ver. 1-3 GC-1700 GC-18A	GC-14A GC-14B	GC-8A
				Injection Unit →	SPL-2030	SPL-2010 Plus	SPL-2014	SPL-17	SPL-14	SPL-G9
	For SPME		221-75196*	(ID 0.75mm; OD 5mm; Length 95mm, Deactivated, 5pcs)	O	O	O			
	For HS 10		221-76863-73	(ID 1.2mm; OD 5mm, Length 95mm, Deactivated, 5pcs)	S	S	S			
	WBC Attachment		221-38107 *1	(139mm)			S		S	
			221-39148	(86 mm)						S

*1 Required if the WBC Attachment is used for a packed column injection in GC-2014, INsert for GC-14 septum purge unit is P/N: 221-38151-04
*2 Wool is 25mm from the top of insert.
* Can be used for AOC-6000 SPME

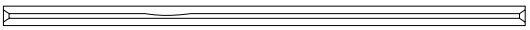
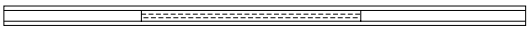
Glass Insert for Capillary Column Analysis

S: Standard; O: Option

			Injection Unit →	WBI-2030	WBI-2010 Plus WBI-2010	WBI-2014	WBI-17	ISPL-14	SPL-G9
For CLH-14	Injection Port Side	221-32998-01	 (123mm)					S	
For CLH-14	Detector Side	221-33000	 (71mm)					S	
For CLH-800	Injection Port Side	221-18384-04	 (78mm, for split injection method)						S
For CLH-800	Detector Side	221-18756-02	 (78mm)						S

Glass Insert for OCI / PTV

S: Standard; O: Option

	P/N	Injection Unit →	Nexis GC-2030	GC-2010 / GC-2010 Plus	GC-17
			OCI-2030	OCI/PTV-2010 *1	OCI/PTV-17 *2
Simple On-column Injection Method	221-49381-01		O	O	
Simple On-column Injection Method	221-49381-02	 (deactivated)	O	O	
	P/N	Specification / Injection Unit →	PTV-2030	OCI/PTV-2010*1	OCI/PTV-17*2
PTV Injection Method	221-42223				S
PTV Injection Method	221-49300	 (ID 1.5mm; OD 3.5mm; Length 95mm, quartz)	S	S	
PTV Injection Method	221-48335-01	 (for AOC-MEPS™ system, deactivated, with wool, 5 pcs)	O	O	

*1 GC-2010 OCI requires an additional adapter (P/N: 221-49298-91).
*2 GC-17 OCI requires an additional adapter (P/N: 221-42222-91).

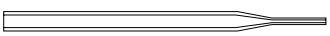
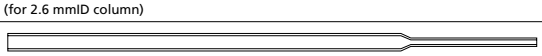
Glass Insert for Packed Column Analysis

When using a glass column, one may add a glass insert to prevent the column from accumulating non-volatile components. Please choose a proper insert according to the inter diameter of the glass column.

When using a stainless column, it is necessary to connect a glass insert to a 3.0 mmID column at the side of the injection unit. Please exchange it regularly to avoid poor reproducibility and peak shape caused by the crossover of residual sample, etc.

Note: Glass insert cannot be used in a GC-8A Series instrument when using glass columns.

S: Standard; O: Option

	P/N	Specification	GC-2014	GC-17A ver. 1-3	GC-14A/B
Injection Port Side	221-41484			O	
Injection Port Side	221-14093	 (for 3.0 mmID column)	S		S
Injection Port Side	221-14093-84	 (for 3.0 mmID column, 5 pcs)	O		O
Injection Port Side	221-14094	 (for 2.6 mmID column)	S		S
Injection Port Side	221-14094-84	 (for 2.6 mmID column, 5 pcs)	O		O

* GC for packed column analysis includes one insert for a 3.0 mmID column and one insert for a 2.6 mmID column as standard accessories.

GC Consumables Kit

P/N	Components	Quantity
221-76650-01	Septum	1
227-35008-01	Split Liner	3
036-11203-84	O-rings	3
221-34618-00	Autosampler syringe, 10uL	1
220-97331-30	1.5mL clear sample vials	3
220-97331-23	4mL clear solvent vials	1

This is for liquid injection in split mode only.
Recommend adding column ferrules and gas filter cartridge specific to your GC system.

Injection Port Septum

Description	P/N	Color	Description
Standard type (20 pcs) 	201-35584	White	• General-purpose septum • Maximum temperature (INJ setting temperature): 250 °C
LL Septum (long life type, 20 pcs) 	221-48972-91	Blue	Provides significant durability improvements compared to a conventional low-bleed septum, offering both low bleed and long life. The problem of sticking to the vaporizing chamber during continuous use at high temperatures experienced with a conventional septum has also been eliminated. • Suitable for high-sensitivity analysis • Maximum temperature (INJ setting temperature): 450°C
HT Septum (high temp type, 20 pcs) 	221-48398-91	Brown	Using this septum alleviates the problem of reduced durability when the vaporizing chamber is used continuously at 450°C. Compared to the LL septum, the increase in bleed when used at high temperatures is kept at a lower level. The problem of sticking to the vaporizing chamber during continuous use at high temperatures experienced with a conventional septum has also been eliminated. • Suitable for high-sensitivity analysis at high temperatures • Maximum temperature (INJ setting temperature): 450°C
Low-bleed Septum (25 pcs) 	221-76650-01	Green	This septum is least influenced by a plasticizer. Better prevents septum coring. • Low-bleed, suitable for high-sensitivity analysis
Enduro Blue Septum (50 pcs) 	221-75180	Light Blue	• Low-bleed, suitable for high-sensitivity analysis at high temperatures • Maximum temperature (INJ setting temperature): 350°C
Premium Green Septa (50 pcs) 	227-35004-01	Light green	• Low bleed, highly robust (max. usable temp. 350°C) • High durability, proper sealing and good resistance to most chemical solvents. • Useful for trace analysis and other applications where high sensitivity is critical
Perforated septum for HS-10 	221-76863-96	White	• For HS-10 only • To ensure cleanliness and inertness • Maximum temperature (INJ setting temperature): 250 °C

Low-bleed septum is not completely free of bleeding. The type of bleeding that occurs varies with the septum, and results in different patterns on chromatograms. In the case of high-sensitivity analysis, it is necessary to select a septum whose bleeding will not occur at a point that interferes with the peak of the target compound. Conditioning for several hours between 200°C and 250°C after extraction with hexane may help to reduce bleeding.

In the case of using a syringe for AOC, it is recommended to exchange the septum after about 100 injections. If the outside diameter of a needle of a gastight syringe is thick, it is recommended to exchange after about 50 injections.

Ferrules

Ferrules are available in a variety of different materials, shapes and sizes depending on their use, the instrument and the size of the capillary column being used. Probably the most important but difficult aspect of choosing a ferrule is the selection of the material type. The table below will help you choose the appropriate ferrule material for your application.

When choosing ferrules ensure you consider the following:

1) The material that best suits your application.

2) The connection type you want.

The following selection table will assist with your decision.

Ferrule Material Type	Graphite	Graphite Vespel®	SilTite™ Metal	ClickTek Ferrule
				
Features	• Easy to use. • Forms a stable seal. • Soft material. • Porous to oxygen. • Can be reused. • Forms a soft grip with capillary column. • Low emissions.	• A composite of graphite and Vespel®. • Mechanically robust. • Hard material, long lifetime. • Forms a strong grip with capillary column. • Cannot be reused with another capillary column. • Requires re-tightening.	• Specifically developed to overcome the problems associated with the use of 100% graphite and composite ferrules. • Strong seal on capillary columns. • Leak free - The ferrule and nut expand and contract at the same rate eliminating any chance of leaks with temperature cycling. • Nut does not need re-tightening after initial temperature cycles.	• Easy to use • Leak free • Specially designed to use with ClickTek Connector on Nexis GC-2030 • Cannot be reused with another capillary column • Not suitable for stainless steel column
Suitable Uses	• Column to injector connection. • Non-mass spectrometer detectors (FID, TCD, FTD, FPD, ECD, BID).	MS interfaces, although even with a good seal will leak air compared to SilTite™ ferrules.	Ideal for MS interfaces and advanced flow technology due to leak-free	• Column to injector connection • Non-mass spectrometer detectors (FID, TCD, FTD, FPD, ECD, BID).
Not Suitable For	Connecting columns to mass spectrometers, as porous to oxygen.	High temperature applications.	–	–
Risks	• Can leave residue inside your column. • Can extrude into the injector or detector if it is over-tightened.	If not re-tightened after installation and temperature cycles of the GC, air may enter the column or detector decreasing sensitivity of the analysis and possibly degrading the column as well as components of the system.	Over-tightening of the seal can introduce leaks into the system. Follow the recommended installation instructions to avoid this problem.	–
Operating Temperature	Upper limit of 450 °C	Upper limit of 325 °C	No temperature limit in GC use.	–

Ferrules

Description	Specification	P/N
Graphite Ferrule (10 pcs)	For 5 mmOD packed columns	221-46403-92
Graphite Ferrule (10 pcs)	For 0.25 - 0.32 mmID columns	221-32126-05
Graphite Ferrule (10 pcs)	For 0.53 mmID columns	221-32126-08
Graphite Vespel® Ferrule (10 pcs)	No hole	670-15003-01
Graphite Vespel® Ferrule (10 pcs)	For 0.32 mmID columns	220-90418-15
Graphite Vespel® Ferrule (10 pcs)	For 0.53 mmID columns	220-90418-18
Graphite Vespel® Ferrule (10 pcs)	For 0.05 - 0.25 mmID columns	220-90418-14
SilTite™ Metal Ferrule (10 pcs)	For 0.05 - 0.25 mmID columns	220-94820-25
SilTite™ Metal Ferrule (10 pcs)	For 0.32 mmID columns	220-94820-32
SilTite™ Kit (10 pcs ferrules, 2 pcs nuts)	For 0.05 - 0.25 mmID columns	220-94773-00
ClickTek Ferrule Kit	Narrow bore 0.43, includes 6 ferrules and prefixing tool (for 0.05 - 0.25 mmID columns)	221-81162-11
ClickTek Ferrule Kit	Middle bore 0.50, includes 6 ferrules and prefixing tool (for 0.32 mmID columns)	221-81162-12
ClickTek Ferrule Kit	Wide bore 0.73, includes 6 ferrules and prefixing tool (for 0.53 mmID columns)	221-81162-13
ClickTek Ferrule	No Hole (for blinding)	221-81162-00

Other Accessories	
Description	P/N
Capillary Ceramic Tube Cutter (3 pc)	220-94702-00
Stainless Steel Nut/ SSNE-16-012S (Pk 5)	670-11009-00
O-ring for insert, Max. Temp. 350 °C (10pcs)	036-11201-84
Filter for split, for Nexis GC-2030	221-77580-42

O-ring for insert

Capillary Ceramic tube cutter

Stainless Steel Nut

Filter for split, for Nexis GC-2030

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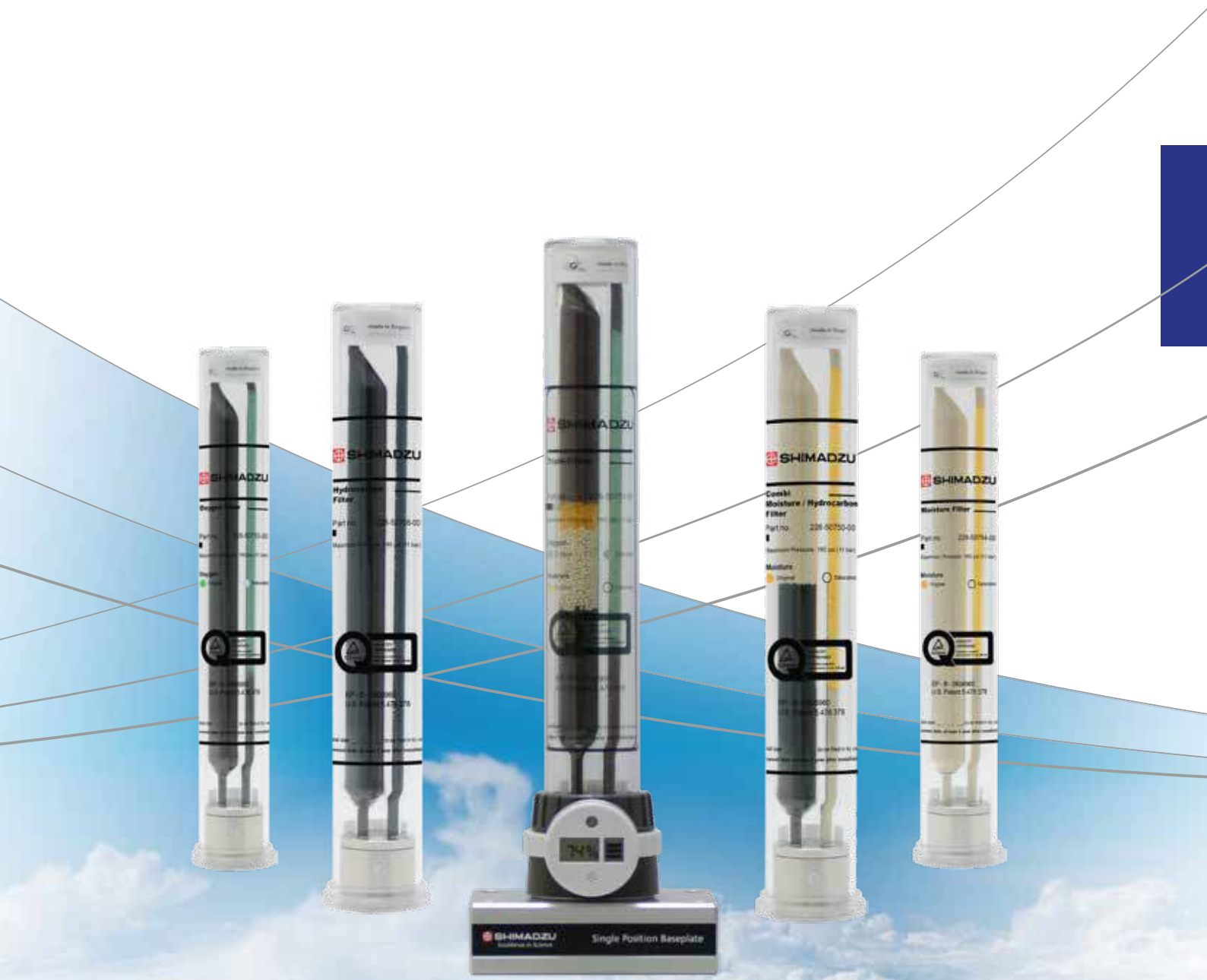
Gas Filtration



Ensuring a Super-Clean Analytical Journey

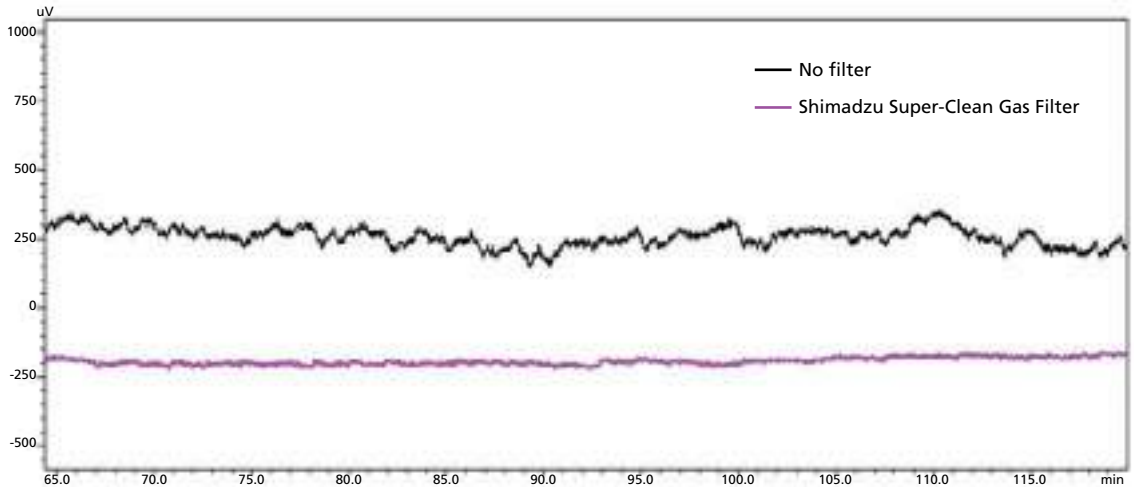
Impurities in gases, such as hydrocarbons, moisture and oxygen, can contaminate the gas line and instrument, cause column degradation and affect the accuracy of your analysis results, which may lead to instrument downtime. Even though high-purity gases are used, contaminants may result from pressure regulators or other parts of the gas line. Therefore, an additional gas filter is essential.

Introducing the *Shimadzu Super-Clean Gas Filter!*

Example of Shimadzu Gas Filter Kit for GC-FID

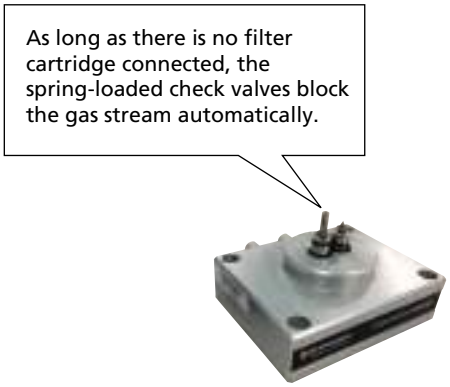
Ensure High-purity Gas

The Shimadzu Super-Clean Gas Filter can remove the impurities (hydrocarbons, moisture and oxygen) and outlet 99.9999% pure gas. The use of high-purity and contaminant-free gases reduces column degradation, prevents ghost peaks and baseline fluctuations, eliminates excessive detector noise, and keeps your instrument in good working performance.



Using the Shimadzu Super-Clean Gas Filter results in significantly lower detector noise.

Easy and Leak-tight Replacement



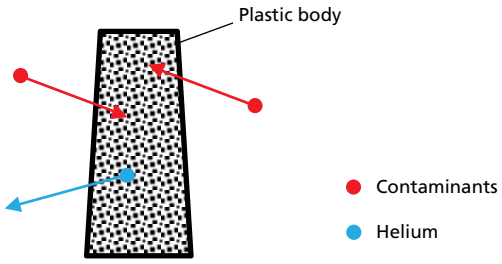
Installing the filter

The design of the Shimadzu Super-Clean Gas Filter makes it possible to replace filter cartridges quickly and easily without any tools. Spring-loaded check valves seal when a cartridge is removed and open only when a new cartridge has been locked in place, which prevents contamination of the system during the replacement process.

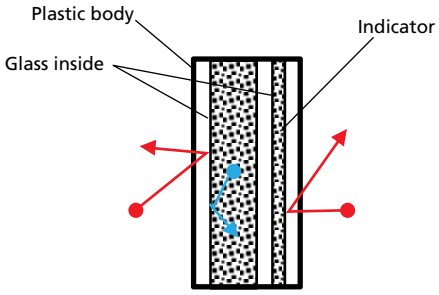
Swagelok connector can be connected directly to the Shimadzu gas supply pipe, ensuring a leak free and completely clean gas line

Unique Body Design

A plastic body helps with checking the indicators and replacing the filter cartridges. However, it also allows contaminants to diffuse into the instrument and cause helium to leak. To address this issue, the Shimadzu Super-Clean Gas Filter has been designed to pack the absorbents in glass inside the plastic body, thereby preventing diffusion.



Other filter with plastic body



Shimadzu Super-Clean Gas Filter

Easy-to-read Indicator

The Shimadzu Super-Clean Gas Filter is designed with an easy-to-read indicator. It changes color when the absorbent is saturated, indicating when filter cartridges should be replaced.

Before using

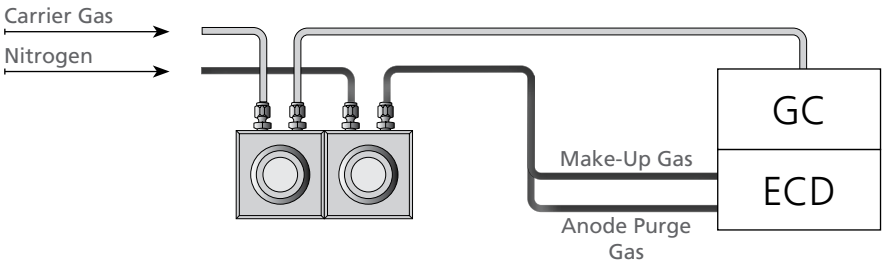
If absorbent is saturated, the indicator changes color

Connection Diagrams

GC / MS (ITD/MSD)

Product	Part No.	Qty
Triple Filter	227-37011-01	1
1 Position Base plate	227-37021-01	1
Replacement Filter Kit	227-37001-02	

GC / ECD

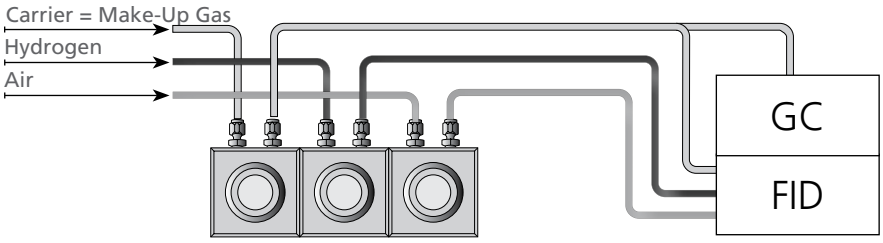


Product	Part No.	Qty
Triple Helium Filter	227-37011-01	1
Oxygen/Moisture Filter	227-37011-04	1
2 Position Base plate	227-37022-01	1
Replacement Filter Kit	227-37012-01	

Connection Diagrams

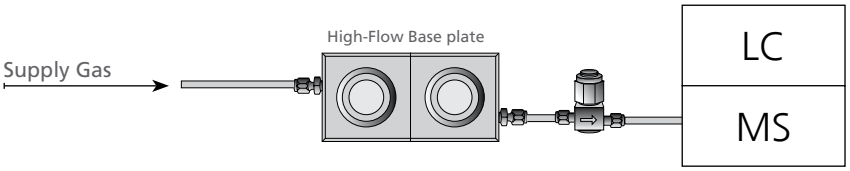
GC / FID

GC/FID Solution 2 (Carrier Gas = Make-Up Gas)

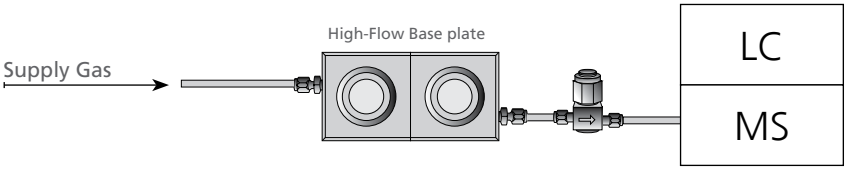


Product	Part No.	Qty
Triple Filter	227-37011-01	1
Hydrocarbon/ Moisture Filter	227-37011-02	2
3 Position Base plate	227-37023-01	1
Replacement Filter Kit	227-37013-01	

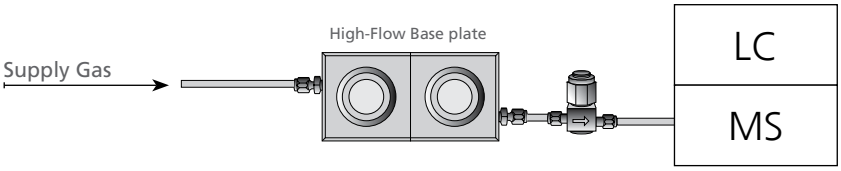
LC/MS



Product	Part No.	Qty
High Flow Hydrocarbon Filter Bundle	220-97332-14	1
Particle Filter	220-97332-07	1
High Flow Base plate	220-97332-09	1
Replacement Filter Kit	220-97332-11	



Product	Part No.	Qty
High Flow Moisture Filter Bundle	220-97332-15	1
Particle Filter	220-97332-07	1
High Flow Base plate	220-97332-09	1
Replacement Filter Kit	220-97332-12	



Product	Part No.	Qty
High Flow Hydrocarbon/ Moisture Filter Bundle	220-97332-16	1
Particle Filter	220-97332-07	1
High Flow Base plate	220-97332-09	1
Replacement Filter Kit	220-97332-13	

Installation Kits

Catalog No.	227-37001-02 227-37001-03 (Helium)
Usable for	**Benefit**
GC/MS	Higher data accuracy and less maintenance
GC/TCD	Greater sensitivity and less maintenance

GC/MS TRIPLE FILTER KIT

The triple combination filter kit is ideal for purifying GC/MS carrier gases. It contains oxygen, moisture and hydrocarbon scrubbers in one easy to change economical cartridge

Catalog No.	227-37002-01
Usable for	**Benefit**
GC/ECD	Greater sensitivity

GC/ECD FILTER KIT

Removes oxygen, moisture and hydrocarbons from the carrier gas and removes moisture and oxygen from the make-up and purge gas.

Installation Kits

Catalog No.	227-37003-01
Usable for	**Benefit**
GC/FID	Greater sensitivity

FID
3 POSITION KIT

The FID Filter kit is the perfect all-in-one solution for purifying flame ionization detector (FID) fuel gases together with the carrier gas.
This kit removes hydrocarbons, moisture and oxygen from the carrier gas and removes both moisture and hydrocarbons from the Hydrogen and Air fuel gases.

Catalog No.	220-97332-11
Usable for	**Benefit**
LC/MS	Greater sensitivity

LC/MS
HYDROCARBON KIT

Up to 20 L/min. of hydrocarbon-free nitrogen per minute with this LC/MS High Flow Kit

Catalog No.	220-97332-12
Usable for	**Benefit**
LC/MS	Greater sensitivity

LC/MS
MOISTURE KIT

Up to 20 L/min. of moisture-free nitrogen per minute with this LC/MS High Flow Kit

Catalog No.	220-97332-13
Usable for	**Benefit**
LC/MS	Greater sensitivity

LC/MS COMBI (HYDROCARBON/MOISTURE) KIT

Removes Moisture and Hydrocarbons from high flow gas streams.

Replacement Filters

Replacement Filter for	GC/MS Triple Filter Kit (227-37001-02)
Catalog No.	229-37011-01 227-37011-05 (Helium)

GC/MS TRIPLE (OXYGEN/MOISTURE/ HYDROCARBON) FILTER

The Triple trap is ideal for purifying carrier gas. It contains oxygen, moisture and hydrocarbon scrubbers in one easy to change economical cartridge

Capacity	
H_2O	1.8 g
O_2	75 mL
HC	4 g (as n-butane)

Replacement Filters for	GC/ECD Filter Kit (227-37002-01)
Catalog No.	227-37012-01 includes: (1) 227-37011-04 and (1) 227-37011-01

GC/ECD FILTER BUNDLE

Removes oxygen, moisture and hydrocarbons from the carrier gas and removes moisture and oxygen from the make-up and purge gas.

Capacity	
H_2O	1.8 g / 3.5
O_2	75 mL / 75 mL
HC	4 g (as n-butane)

Replacement Filters

Replacement Filter for	FID 3 Position Filter Kit (227-37003-01)
Catalog No.	227-37013-01 includes: (1) 227-37011-01 and (2) 227-37011-02

FID FILTER BUNDLE OF 3

Removes Oxygen and Moisture from high flow gas streams. To be used in combination with a high flow base plate.

Capacity	
H_2O	7.2 g
O_2	150 mL

Replacement Filter for	LC/MS Hydrocarbon Filter Kit (220-97332-11)
Catalog No.	220-97332-14

LC/MS HIGH FLOW HYDROCARBON FILTER BUNDLE

Up to 20 L/min. of hydrocarbon-free nitrogen per minute. To be used in combination with a high flow base plate.

Capacity	
HC	24 g (as n-butane)

Replacement Filters for	LC/MS Moisture Filter Kit (220-97332-12)
Catalog No.	220-97332-15

LC/MS HIGH FLOW MOISTURE FILTER BUNDLE

Removes moisture from high flow gas streams. To be used in combination with a high flow base plate.

Capacity	
H_2O	14.4 g

Replacement Filters for	LC/MS Combi (hydrocarbon/moisture) Filter Kit (220-97332-13)
Catalog No.	220-97332-16

LC/MS HIGH FLOW COMBI (HYDROCARBON/ MOISTURE) FILTER BUNDLE

Removes Moisture and Hydrocarbons from high flow gas streams. To be used in combination with a high flow base plate.

Capacity	
HC	12 g (as n-butane)
H_2O	7.2 g

COMBI Filters

Catalog No.	227-37011-02
Specifications	
Outlet Gas Quality (%)	> 99.9999
Maximum Pressure	11 bar (160 psi)
Maximum Flow	7 L/min.
Usable For	Inert carrier gas, He, H2, N2, AR, Air
Dimensions	24 cm x Ø 4.4 cm
Weight	0.26 Kg
Estimated Lifetime	> 2 years

COMBI (HYDROCARBON/MOISTURE) FILTER

The Fuel Gas Filter is perfect for purifying flame ionization detector (FID) fuel gases, removing both moisture and hydrocarbons. Using the Fuel Gas Filter for FID Hydrogen and air will produce a stable baseline, improving overall reproducability and sensitivity.

Capacity	
H_2O	3.5 g
HC	6 g (as n-butane)

Catalog No.	227-37011-04
Specifications	
Outlet Gas Quality (%)	> 99.9999
Maximum Pressure	11 bar (160 psi)
Maximum Flow	7 L/min.
Usable For	Inert carrier gas, He, H2, N2, AR
Dimensions	24 cm x Ø 4.4 cm
Weight	0.26 Kg
Estimated Lifetime	> 2 years

COMBI (OXYGEN/MOISTURE) FILTER

This Combi trap is ideal for purifying carrier gas. It contains oxygen and moisture scrubbers in one easy to change economical cartridge

Capacity	
H_2O	3.5 g
HC	75 mL

Catalog No.	227-37011-01 227-37011-05 (Helium Specfic)
Specifications	
Outlet Gas Quality (%)	> 99.9999
Maximum Pressure	11 bar (160 psi)
Maximum Flow	7 L/min.
Usable For	Inert carrier gas, He, H2, N2, AR
Dimensions	24 cm x Ø 4.4 cm
Weight	0.26kg
Estimated Lifetime	> 2 years

TRIPLE (OXYGEN/MOISTURE/ HYDROCARBON) FILTER

The Triple trap is ideal for purifying carrier gas. It contains oxygen, moisture and hydrocarbon scrubbers in one easy to change economical cartridge

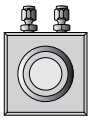
Capacity	
H2O	1.8 g
O2	75 mL
HC	4 g (as n-butane)

Base Plates

Catalog No.	Fitting Type
227-37021-01	1/8" SS

1 POSITION BASE PLATE

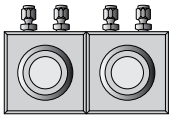
Single position base plate



Catalog No.	Fitting Type
227-37022-01	1/8" SS

2 POSITION BASE PLATE

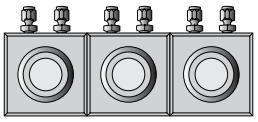
Double position base plate



Catalog No.	Fitting Type
227-37023-01	1/8" SS

3 POSITION BASE PLATE

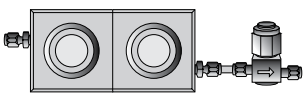
Three position base plate



Catalog No.	Fitting Type
220-97332-09	1/4" Brass
220-97332-10	1/4" SS

LC/MS
HIGH FLOW BASE PLATE

High Flow double position base plate (in parallel)



Base Plate Accesories

Catalog No.	Clip Type
227-37033-01	Electronic Indicator Kit

Usable for

All base plates with Universal Ring Nut

ELECTRONIC INDICATOR

Electronic Maintenance Indicator device warns when scheduled filter replacement or base plate maintenance is due.

Catalog No. 227-37031-01

Usable for

All base plates

UNIVERSAL RING NUT

Universal Ring Nut to mount a filter or flush-cap on a base plate.

Catalog No. 227-37031-02

Usable for

All base plates

O-RING REPLACEMENT SET

O-ring replacement set for replacing the O-rings on the in- and outlet valves on a base plate.

Catalog No.	Connection Type
220-97332-01	1/4" Brass
220-97332-02	1/8" Brass
220-97332-03	1/4" SS
220-97332-04	1/8" SS

Usable for

1, 2, 3 and 4 position base plates

STANDARD BASE PLATE CONNECTOR SET

Replacement connectors for standard base plates.

Catalog No.	Connection Type
220-97332-05	1/4" Brass
220-97332-06	1/4" SS

Usable for

High flow base plates

HIGH FLOW BASE PLATE CONNECTOR SET

Replacement connector for high flow base plates.

Catalog No.	Description
220-97332-07	0.5 Micron Particle Filter (1/4" Brass)
220-97332-08	0.5 Micron Particle Filter Cup Replacement Pack

PARTICULATE FILTER

Particulate filter for high flow base plates.

Gas Filter System Components

Base Plate

Connecting unit with in- and outlet connectors for the gas line and two spring-loaded check valves that automatically start the flow of gas once a filter is installed.

Filter Cartridge

The filter cartridges are made of glass to prevent diffusion, and protected by a plastic housing for safety. The PTFE seals at the base of the Filter will only be punctured during installation on the base plate.

Universal Ring Nut

The Universal Ring Nut is used for mounting a filter cartridge or flush-cap to a base plate. It can also serve as a mounting point for the Electronic Maintenance Indicator device.

Electronic Indicator

Optional Electronic Maintenance Indicator device warns when scheduled replacement or maintenance is due.

Wall Mount Bracket Set

Optional wall mounting brackets to mount a base plate to a wall.

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Spectroscopy Consumables

Lamps

UV-Vis-NIR

Instrument	Tungsten Lamp (WI) Part Number	Deuterium Lamp (D2) Part Number
UV-1201	062-65005-00	062-65055-05
UV-1240	062-65005-00	062-65055-05
UV-1280	062-65005-00	062-65055-05
UV-1700	062-65005-00	062-65055-05
UV-1800	062-65005-00	062-65055-05
UV-1900	062-65005-00	062-65055-05
UV-160	062-65004-06	062-65055-05
UV-1601	062-65004-06	062-65055-05
UV-2101	062-65004-06	062-65055-05
UV-2401	062-65004-06	062-65055-05
UV-2501	062-65004-06	062-65055-05
UV-3101	062-65004-06	062-65055-05
UV-2600/2700	062-65004-06	062-65055-05
UV-3600	062-65004-06	062-65055-05
UV-3600Plus	062-65004-06	062-65055-05
SolidSpec-3700	062-65004-06	062-65055-05
SolidSpec-3700DUV	062-65004-06	206-20729-00

Fluorescence

Instrument	Xenon Lamp Part Number
RF-1501	200-81500-01
RF-5301	200-81500-01
RF-6000	228-51511-95

Cuvettes

Standard Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-01	Quartz	10 mm	No	3.5 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid
220-92910-02	Quartz 2	10 mm	No	3.5 mL	200 - 3500 nm	12.5x12.5x45 mm	PTFE lid
220-92910-03	Glass	10 mm	No	3.5 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid
220-92910-04	Quartz	10 mm	No	3.5 mL	320 - 2500 nm	12.5x12.5x46 mm	PTFE Stopper
220-92910-05	Glass	10 mm	No	3.5 mL	320 - 2500 nm	12.5x12.5x46 mm	PTFE Stopper


220-92910-01


220-92910-02


220-92910-03


220-92910-04


220-92910-05

Semi-Micro Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-15	Quartz	10 mm	No	1.4 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid, Black mask Inside width = 4 mm
220-92910-16	Quartz	10 mm	No	1.0 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid, Black mask Inside width = 4 mm
220-92910-17	Quartz	10 mm	No	1.4 mL	200-2500 nm	12.5x12.5x45 mm	PTFE stopper Black mask Inside width = 4 mm


220-92910-15


220-92910-16


220-92910-17

Rectangular Long Pathlength Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-21	Quartz 2	20 mm	YES Part number: 204-23118-01	7 mL	200 - 3500 nm	22.5x12.5x45 mm	PTFE lid
220-92910-23	Quartz 2	50 mm	YES Part number: 204-23118-01	17.5 mL	200 - 3500 nm	52.5x12.5x45 mm	PTFE lid
220-92910-25	Quartz 2	100 mm	YES Part number: 204-23118-01	35.0 mL	200 - 3500 nm	102.5x12.5x45 mm	PTFE lid Cannot be used with the UVmini Series
220-92910-22	Glass	20 mm	YES Part number: 204-23118-01	7 mL	320 - 2500 nm	22.5x12.5x45 mm	PTFE lid
220-92910-24	Glass	50 mm	YES Part number: 204-23118-01	17.5 mL	320 - 2500 nm	52.5x12.5x45 mm	PTFE lid
220-92910-26	Glass	100 mm	YES Part number: 204-23118-01	35.0 mL	320-2500 nm	102.5x12.5x45 mm	PTFE lid Cannot be used with the UVmini Series


220-92910-21


220-92910-23


220-92910-25


220-92910-22


220-92910-24


220-92910-26


204-23118--01

Short Pathlength Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-41	Quartz	1 mm	YES Part number: 204-21473-03	350 µL	200 - 2500 nm	3.5x12.5x45 mm	PTFE lid
220-92910-43	Quartz	2 mm	YES Part number: 204-21473-01	700 µL	200 - 2500 nm	4.5x12.5x45 mm	PTFE lid
220-92910-45	Quartz	5 mm	YES Part number: 204-21473-02	1.75 mL	200 - 2500 nm	7.5x12.5x45 mm	PTFE lid
220-92910-42	Glass	1 mm	YES Part number: 204-21473-03	350 µL	200 - 2500 nm	3.5x12.5x45 mm	PTFE lid
220-92910-44	Glass	2 mm	YES Part number: 204-21473-01	700 µL	200 - 2500 nm	4.5x12.5x45 mm	PTFE lid
220-92910-46	Glass	5 mm	YES Part number: 204-21473-02	1.75 mL	200 - 2500 nm	7.5x12.5x45 mm	PTFE lid


220-92910-41

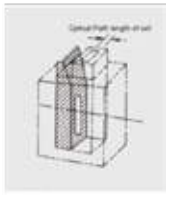

220-92910-43


220-92910-45


220-92910-42


220-92910-44


220-92910-46


204-21473-xx

Micro Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-11	Quartz	10 mm	YES Part number: 204-06896-00 Alternate sample compartment (206-60184-07) needed for UVmini-1240	300 µL	200 - 2500 nm	12.5x12.5x25 mm	PTFE Lid Aperture width = 2 mm
220-92910-14	Quartz	10 mm	NO	400 µL	200 - 2500 nm	12.5x12.5x40 mm	PTFE Stopper Aperture width = 2 mm
220-92910-13	Quartz	10 mm	NO	500 µL	200 - 2500 nm	12.5x12.5x45 mm	PTFE Lid Aperture width = 2 mm Base thickness = 9 mm
220-92910-12	Quartz	10 mm	NO	700 µL	200 - 2500 nm	12.5x12.5x45mm	PTFE Stopper Aperture width = 2 mm Base thickness = 3.2 mm


220-92910-11


220-92910-14


220-92910-13


220-92910-12


204-06896-00

Ultra Micro Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-20	Quartz	5 mm	NO	5 µL	200 - 2500 nm	12.5x12.5x40 mm	Pipette tips at the top to dispense solution into cell Aperture Diam. = 0.8 mm
220-92910-19	Quartz	10 mm	NO	10 µL	200 - 2500 nm	12.5x12.5x45 mm	Pipette tips at the top to dispense solution into cell Aperture Diam. = 1.5 mm
220-92910-18	Quartz	10 mm	NO	50 µL	200 - 2500 nm	12.5x12.5x45 mm	PE Stopper Aperture Diam. = 2.5 mm
220-92910-27	Quartz	10 mm	NO	50 µL	200 - 2500 nm	12.5x12.5x45 mm	PE Stopper Aperture = 2.5x2 mm
220-92931-00	Quartz	10 mm	YES Part number: 206-14334-00 Contact Shimadzu for UVmini-1240 part numbers.	50 µL	200 - 2500 nm	12.5x12.5x25 mm	Black Masked, 2 mm width


220-92910-20


220-92910-19


220-92910-18


220-92910-27


220-92931-00


206-14334-00

Cylindrical Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Length	Details
220-92910-31	Quartz	10 mm	YES P/N: 204-06216-03 Alternate sample compartment (206-60184-07) needed for UVmini-1240	2.8 mL	200 - 2500 nm	12.5 mm	1 port, PTFE stopper, Inner diameter = 19 mm Outer diameter = 22 mm
220-92910-33	Quartz	20 mm	YES P/N: 204-06216-03 Alternate sample compartment (206-60184-07) needed for UVmini-1240	5.6 mL	200 - 2500 nm	25 mm	1 port, PTFE stopper, Inner diameter = 19 mm Outer diameter = 22 mm
220-92910-35	Quartz	50 mm	YES P/N: 204-06216-03 Alternate sample compartment (206-60184-07) needed for UVmini-1240	14 mL	200 - 2500 nm	62.5 mm	2 ports, PTFE stopper, Inner diameter = 19 mm Outer diameter = 22 mm
220-92910-37	Quartz	100 mm	YES P/N: 204-06216-03 Alternate sample compartment (206-60184-07) needed for UVmini-1240	28 mL	200 - 2500 nm	125 mm	2 ports, PTFE stopper, Inner diameter = 19 mm Outer diameter = 22 mm
220-92910-32	Glass	10 mm	YES P/N: 204-06216-03 Alternate sample compartment (206-60184-07) needed for UVmini-1240	2.8 mL	200 - 2500 nm	12.5 mm	1 port, PTFE stopper, Inner diameter = 19 mm Outer diameter = 22 mm
220-92910-34	Glass	20 mm	YES P/N: 204-06216-03 Alternate sample compartment (206-60184-07) needed for UVmini-1240	5.6 mL	200 - 2500 nm	25 mm	1 port, PTFE stopper, Inner diameter = 19 mm Outer diameter = 22 mm
220-92910-36	Glass	50 mm	YES P/N: 204-06216-03 Alternate sample compartment (206-60184-07) needed for UVmini-1240	14 mL	200 - 2500 nm	62.5 mm	2 ports, PTFE stopper, Inner diameter = 19 mm Outer diameter = 22 mm
220-92910-38	Glass	100 mm	YES P/N: 204-06216-03 Alternate sample compartment (206-60184-07) needed for UVmini-1240	28 mL	200 - 2500 nm	125 mm	2 ports, PTFE stopper, Inner diameter = 19 mm Outer diameter = 22 mm


220-92910-31


220-92910-33


220-92910-35


220-92910-37


220-92910-32


220-92910-34


220-92910-36


220-92910-38


204-06216-03

Flow Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-61	Quartz	0.1 mm	NO	6.2 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dim. 17.5 x 3.5 mm
220-92910-62	Quartz	0.2 mm	NO	12.4 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dim. 17.5 x 3.5 mm
220-92910-63	Quartz	0.5 mm	NO	31 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dim. 17.5 x 3.5 mm
220-92910-64	Quartz	1.0 mm	NO	62 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dim. 17.5 x 3.5 mm
220-92910-65	Quartz	2.0 mm	NO	124 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dim. 17.5 x 3.5 mm
220-92910-71	Quartz	5 mm	NO	195 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dim. 11.5 x 3.5 mm
220-92910-78	Quartz	10 mm	NO	30 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dia. 2 mm
220-92910-74	Quartz	10 mm	NO	80 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dia. 3 mm
220-92910-75	Glass	10 mm	NO	80 µL	320 - 2500 nm	12.5x12.5x35 mm	Aperture dia. 3 mm
220-92910-72	Quartz	10 mm	NO	390 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dim. 11.5 x 3.5 mm
220-92910-76	Quartz	50 mm	NO	370 µL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dia. 3 mm
220-92910-73	Quartz	50 mm	NO	1.95 mL	200 - 2500 nm	12.5x12.5x35 mm	Aperture dim. 11.5 x 3.5 mm

220-92910-61 220-92910-62 220-92910-63 220-92910-64 220-92910-65 220-92910-71

220-92910-78 220-92910-74 220-92910-75 220-92910-72 220-92910-73 220-92910-76

Cuvettes

Stirrer Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-51	Quartz	10 mm	NO	1.5 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid, magnetic base Inside width = 4 mm One stirrer bar included
220-92910-52	Quartz	10 mm	NO	3.5 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid, magnetic base Inside width = 9.5 mm One stirrer bar included
220-92910-53	Quartz	10 mm	NO	3.5 mL	200 - 2500 nm	12.5x12.5x49.5 mm	PTFE stopper, magnetic base Inside width = 9.5 mm One stirrer bar included


220-92910-51


220-92910-52


220-92910-53

Stirrer Assembly (220-92280-00)

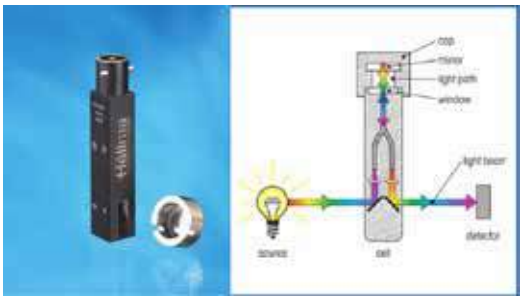
A single bottom stirrer that sits under the standard cuvette is also available. The assembly includes a motor to drive the stirrer connected by a ribbon. Stir bars are not provided.

Tray Cell

The Hellma Tray Cell is designed for measurements e.g. of DNA/RNA or protein samples and enables highly accurate analysis of extremely small samples with remarkable reproducibility. Using the 1 mm or 0.2 mm cap creates a defined optical light path of 1 mm and 0.2 mm, respectively. This generates virtual dilution factors of 1:10 or 1:50 in comparison to a measurement with a standard 10 mm cuvette. This feature saves time and avoids dilution errors. If desired, samples can be retrieved after the measurement for further processing. The required sample volume for the 1 mm cap is 3 µl to 5 µl, and for the 0.2 mm cap 0.7 µl to 4 µl.

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92788-00	Quartz	1 mm or 0.2mm	NO	3-5 µL for 1 mm cap 0.7 to 4 µl for 0.2mm cap	200-900 nm	12.5x12.5x69.5 mm	Contains fiber optic cables thus reducing the wavelength range of quartz

1 mm cap: 220-92788-01
0.2 mm cap: 220-92788-02



Starna DMV-Bio Demountable Micro-Volume Cell

The Starna Demountable Micro-Volume (DMV) Bio Cell uses advanced precision micro-machining techniques and materials to produce a patented high energy optical system which ensures that sufficient energy is available to measure low volume samples accurately and reproducibly across a wide absorbance range. The cell is ideal for biological applications where DNA and proteins measurements are routinely performed and allows for measurements of sample volumes as low as 0.6 µL. The patented cell design utilizes a magnetic closure mechanism to facilitate rapid filling/emptying plus easy cleaning of the cell for convenience and to prevent carryover. This cell combined with the Shimadzu UV-1900 is an excellent choice for biological laboratories needing routine analysis of micro-volume samples.

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)
220-93619-01	Quartz	0.5 mm	NO	2.5 µL	200-900 nm	12.5x12.5x61.0 mm
220-93619-02	Quartz	0.2 mm	NO	1 µL	200-900 nm	12.5x12.5x61.0 mm
220-93619-03	Quartz	0.125 mm	NO	0.6 µL	200-900 nm	12.5x12.5x61.0 mm

BioSpec-nano 5mm Pathlength Cuvette

Part No.	Material	Pathlength	Special Adapter Needed	Volume	Wavelength Range	Exterior (LxWxH)
220-92671-00	Quartz	5 mm	YES Part Number: 206-26513-00	1.75 mL	200 - 2500 nm	12.5x7.5x46 mm

Disposable Cuvettes

Standard Disposable Cuvettes

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92957-02 Eppendorf Uvette	UV transparent plastic	10 mm or 2mm	YES: For 70 µL or lower use 220-92957-01 For volumes above 70 µL, no holder is needed	50 µL – 2 ml	220 – 1600 nm	12.5x12.5x36 mm	Available as pack of 80
220-92787-00	Polystyrene	10 mm	NO	3.5 mL	Cutoff – 340 nm	12.5x12.5x45 mm	Available as pack of 100
220-92787-01	Polymethyl methacrylate (PMMA or "acrylic")	10 mm	NO	3.5 mL	Cutoff – 300 nm	12.5x12.5x45 mm	Available as pack of 100

220-92957-02

220-92957-01

Capillary Disposable Cuvettes

Provides a cuvette set for use in Hoescht Dye and Ethidium Bromide assays. Set consists of capillary cell holder, set of quartz capillary cells, Allen wrench, and Critoseal. The adapter fits in the standard cell holder.

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume (theoretical)	Wavelength Range	Details
220-92209-01	Quartz	Effective optical path length is typically about 1/20 of 10mm square cell.	No. Holder is supplied as part of kit.	3µL with tube closure used.	200 - 2500 nm	For fluorescence only. Has single holder. Supplied with 100 capillaries (made of quartz) and a tube closure
220-92209-02	Quartz	Effective optical path length is typically about 1/20 of 10mm square cell.	No. Holder is supplied as part of kit.	3µL with tube closure used.	200 - 2500 nm	For UV/Vis only. Has dual holder. Supplied with 100 capillaries (made of quartz) and a tube closure
220-92209-00	Quartz	Effective optical path length is typically about 1/20 of 10mm square cell.	No. Holder is supplied as part of kit.	3µL with tube closure used.	200 - 2500 nm	For UV/Vis only. Has single holder. Supplied with 100 capillaries (made of quartz) and a tube closure

Cuvettes

Multicells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Number of Channels	Details
208-92086-00	Quartz	5 mm	YES: 206-23680-91 Or 206-23690-91 where temperature control is used.	50 µl	200 - 2500 nm	8	Reference side of holder cannot be used for the UVmini-1240
208-92085-00	Quartz	5 mm	YES: 206-23680-91 Or 206-23690-91 where temperature control is used.	50 µl	200 - 2500 nm	16	Reference side of holder cannot be used for the UVmini-1240
220-92404-00	Quartz	10 mm	YES: 206-23680-91 Or 206-23690-91 where temperature control is used	100 µl	200 - 2500 nm	8	Reference side cannot be used for the UVmi-ni-1240
220-92403-00	Quartz	10 mm	YES: 206-23680-91 Or 206-23690-91 where temperature control is used.	100 µl	200 - 2500 nm	16	Reference side of holder cannot be used for the UVmini-1240
208-92097-11	Quartz	10mm	YES: For use with the TMSPC-8 thermal melt system only (206-24350-91)	100 µl	200 - 2500 nm	8	Reference side of holder cannot be used for the UVmini-1240


208-92086-00


208-92085-00


220-92404-00


220-92403-00


8/16 Series Micro Multi-Cell Holder (206-23690-91)

Hellmanex III - Cleaning Solution

Liquid concentrate low in phosphates. All organic active cleaning ingredients are over 80 % biodegradable according to the OECD guideline 302 B. This product therefore complies with the most recent requirements for the reduction of environmental pollution. Highly corrosive and etching substances such as potassium hydroxide and chlorine were specifically replaced with cleaning agents which are gentle on materials and skin. 1.3kg (1L) in PE bottle. (P/N: 220-92910-95)

Cuvettes – For Fluorescence Only

Standard Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-81	Quartz	10x10 mm	NO	3.5 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid
220-92910-82	Quartz	10x10 mm	NO	3.5 mL	200 - 2500 nm	12.5x12.5x46 mm	PTFE stopper
220-92910-88	Quartz	10x10 mm	NO	3.5 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid, Mirror coated outer surfaces

220-92910-81 220-92910-82 220-92910-88

Semi Micro Cells

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-83	Quartz	10x4 mm	NO	1.4 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid
220-92910-84	Quartz	10x4 mm	NO	1.4 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE stopper
220-92910-85	Quartz	3x3 mm	NO	45 µL	200 - 2500 nm	12.5x12.5x45 mm	PE threaded stopper, Only 3 windows polished

220-92910-81 220-92910-82 220-92910-88

Stirrer Cells

These cells are often used when measurements must be taken from a sample being stirred.
Note: Each cell includes one magnetic stirrer.

Part No.	Material	Pathlength	Special Holder or Spacer Needed	Volume	Wavelength Range	Exterior (LxWxH)	Details
220-92910-86	Quartz	10x10 mm	NO	3.5 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid, magnetic base Inside width =10 mm
220-92910-87	Quartz	10x4 mm	NO	1.5 mL	200 - 2500 nm	12.5x12.5x45 mm	PTFE lid, magnetic base Inside width = 4 mm One stirrer bar included

Other Consumables

Part No.	Item Description	Description	Picture
202-30242-04	Neutral Density Filter 10% (Photometric Accuracy Standard, UV)	10% Neutral Density Filter for Photometric Accuracy checks. This is a non-certified standard meant to be used for quick tests only	
202-30242-05	Holmium Oxide Filter (Wavelength Accuracy Standard, UV)	Holmium Oxide Filter for Wavelength Accuracy checks. This is a non-certified standard meant to be used for quick tests only	
220-92220-00	Barium Sulfate ($BaSO_4$) 500g	Barium Sulfate powder for reflectance plates used in Integrating Spheres	
204-04691-00	Long Pass Filter Set for Fluorescence	Set contains seven cut-off filters for use in Standard Solid Sample Holders of Shimadzu Fluorescence Spectrophotometer: IHU-310, U-340, L-42, Y-50, O-56, R-60, and B-390.	

Note: For a wider selection of accessories and small parts, refer to Shimadzu UV-Vis and Fluorescence accessories brochures or contact your local Shimadzu representative.

FTIR Consumables

Part No.	Item Description	Description	Picture
200-53655-00	Silica Gel, Desiccant for FTIR	High performance silica gel desiccant with superior moisture-absorbing properties. Packages have moisture indicating beads to alert the user when it is necessary to change the desiccant. Packaged as 30 individual packs of 10 grams each.	
220-92837-00	Polystyrene Film Standard, NIST Traceable	Standard Reference Material for use in the calibration and checks of the wavelength accuracy of FTIR spectrometers. Contains 3 matte-finish polystyrene film standards of 38 µm thickness	
202-30689-01	Polystyrene Film Standard (Shimadzu), non-certified	Non-certified Polystyrene Standard for use in the quick checks of the wavelength accuracy of FTIR spectrometers. Contains 1 polystyrene film with polystyrene spectrum printed on the hard paper around the film	

Part No.	Item Description	Description	Picture
220-93614-01	Basic Solid Sample Preparation Pack	The Pack includes a 2 Ton Manual Hydraulic Press, a Pestle and Mortar, a 50g tub of KBr Powder, a 7mm Pellet Die with Pellet Ring Holder, a 7mm Disc Holder with Rectangular Mount and a Spare Pellet Ring Holder.	
Individual Items			
220-93202-51	KBr Salt Plates (Pack of 6)	KBr Salt Plates for FTIR, 25mm dia, 4mm thickness (Pack of 6). For FTIR liquid and nujol analysis where samples are sandwiched between two plates	
220-93614-06	Mini Mortar and Pestle	Mini mortar and pestle for FTIR. 4cm diameter bowl	
220-93079-30	KBr Powder (100g)	KBr powder for FTIR Analysis	
220-93614-07	KBr Powder (50g)	KBr powder for FTIR Analysis	

FTIR Consumables

Part No.	Item Description	Description	Picture
220-93615-01	Basic Liquid Pack	Kit includes a 2mL luer syringe, the Omni Cell assembly, KBr and CaF2 windows - drilled (pair each), KBr and CaF2 windows - plane (pair each), KBr mull cell windows (pair). Also contains Packet of ten assorted rectangular PTFE spacers – two each of 0.05mm, 0.1mm, 0.2mm, 0.5mm and 1.00mm thickness. The pack also contains a packet of five circular spacers for mull cell assemblies - 0.1 thickness, Luer syringe (2mL volume), Bottle of Nujol (25 mL) and bottle of fluourolube (25 mL).	
Individual Items			
220-93615-03	Liquid Cell Assembly only	Liquid Cell (Omni Cell) Assembly only. Does not include windows or spacers	
220-93615-04	Liquid Cell Windows (pair) - KBr	KBr Windows (pair drilled and non-drilled) for Liquid Cell (Omni Cell)	
220-93615-05	Liquid Cell Windows (pair) – CaF2	CaF2 Windows (pair drilled and non-drilled) for Liquid Cell (Omni Cell)	
220-93615-07	Assorted PTFE Spacers for Liquid cell	Two each of 0.05mm, 0.1mm, 0.2mm, 0.5mm and 1.00mm thickness	

Part No.	Item Description	Description	Picture
220-93218-14	Short Gas Cell, 50mm pathlength	Include the glass body, o-rings and cell holder. Requires selection of two 38 x 6 mm windows (not included). See below for windows selection	
220-93218-13	Short Gas Cell, 100mm pathlength	Include the glass body, o-rings and cell holder. Require selection of two 38 x 6 mm windows (not included). See below for windows selection	
Individual Items			
220-93218-22	KBr Window for Short Gas Cell	KBr Window for 100mm and 50mm Gas cells. Window size 38x6mm. Contains one window, must buy two for both sides	
220-93218-23	ZnSe Window for Short Gas Cell	ZnSe Window for 100mm and 50mm Gas cells. Window size 38x6mm. Contains one window, must buy two for both sides	
220-92882-19	CaF2 Window for Short Gas Cell	CaF2 Window for 100mm and 50mm Gas cells. Window size 38x6mm. Contains one window, must buy two for both sides	

Note: For a wider selection of accessories, small parts, windows, temperature control and long pathlength options (pathlength up to 30m), refer to Shimadzu FTIR accessories brochure or contact your local Shimadzu representative.

Septa Selection Guide

Septum Material	Description	Temperature (°C)
PTFE/Red Rubber	Most popular and economical choice for general GC and HPLC applications. Used for routine analysis in GC with FID, TCD and FPD detectors or HPLC with UV/Vis and RI detectors. They offer moderate resealability and excellent chemical inertness prior puncture. Low durometer of rubber allows ease of needle penetration. PTFE/Red Rubber septa are not recommended for multiple injections or storage of samples.	-40 to 110
PTFE/Silicone	Ideal for use in GC and HPLC applications for its high resealability even after repeated punctures. Good for sensitive analysis (lower background) and storage of samples. PTFE/Silicone septa are soft and more easily punctured, and protects the needle in autosampler.	-60 to 200
PTFE/Silicone, pre-slit	Share the same chromatographic characteristics, physical and chemical property as non-slit PTFE/Silicone septa. The cross-slit aid in needle penetration for low coring, and prevent formation of vacuum when multiple injection or large volume of sample is withdrawal from vial. However, the pre-slit septa are not recommended for storage of samples due to evaporation of volatile organic solvents through the slit.	-60 to 200
PTFE/Silicone/PTFE	Recommended for ultra trace analysis, or where there is a longer time between injections. PTFE liners on both sides of Silicone resist coring during penetration, and protects Silicone from chemical attacks.	-60 to 200
Butyl/PTFE	The PTFE barrier provides excellent chemical resistance to most solvents. Butyl/PTFE septa has good resealability and suitable for gas sampling due to low permeability.	-40 to 120

Physical Characteristic and Solvent Compatibility of Materials used for Caps and Septa.

The chart below displayed the physical characteristic and solvent compatibility of materials used for caps and septa. You might want to test your product under actual conditions of use as there are many factors that can affect chemical resistance.

Physical Characteristic of Caps and Septa

Code	Description	Appearance	Temp. MAX °C	Temp. MIN °C	Autoclavable	Dry Heat	Gamma	Microwavable	Ethylene Oxide	Analytical Purity	Fragmentation*	Hardness†	Resealability‡
PP	Polypropylene	Translucent	135	-20	Yes	No	No	Yes	Yes	Method Dependent	Low	Medium hard	No resealability
PTFE	Polytetra-fluorethylene	White	260	-200	Yes	Yes	Yes	Yes	Yes	Very high	Low	Very hard (Very thin)	No resealability
RR	Synthetic Red Rubber/PTFE	Red/beige	110	-30	No	No	No	No	No	Medium	Medium	Medium hard	Medium
Butyl	Grey Butyl	Opaque grey	125	-20	Yes	No	Yes	Yes	Yes	Method Dependent	Low to Medium	Soft to medium	Highly resealable
T/S	Silicone/PTFE	White/Red	200	-60	Yes	Yes	Yes	Yes	Yes	High	Low to Medium	Soft	Highly resealable
T/S/T	PTFE/Silicone/PTFE	Red/White/Red	200	-60	Yes	Yes	Yes	Yes	Yes	High	Very low	Soft	Good

* Due to hardness and molecular structure (coring)

† Needle penetration

‡ In case of multiple injection

Chemical Resistance of Vials and Caps

Chemical	Glass	PP	Chemical	Glass	PP	Chemical	Glass	PP
1,2-Dichloroethane	EE	NN	Diacetone	EE	GF	n-Amyl Acetate	EE	GF
1,2,4-Trichlorobenzene	EE	NN	Diacetone Alcohol	EE	EF	n-Butanol	EE	EE
1,4-Dioxane	EE	GF	Dibutylphthalate	EE	NN	n-Butyl Acetate	EE	GF
2,2,4-Trimethylpentane	EE	FN	Diethyl Benzene	EE	NN	n-Decane	EE	FN
2,4 Dichlorophenol	EE	NN	Diethyl Ether	EE	NN	n-Heptane	EE	FF
2-Butanol	EE	EE	Diethyl Ketone	EE	GG	Nitric Acid, 10%	EE	EE
2-Methoxyethanol	EE	EE	Diethyl Malonate	EE	EE	Nitric Acid, 20%	EE	FF
2-Propanol	EE	EE	Diethylamine	EE	GN	Nitric Acid, 50%	EE	FN
Acetaldehyde	EE	GN	Diethylene Dioxide	EE	GF	Nitric Acid, 70%	EE	NN

Acetamide, Sat.	EE	EE	Diethylene Glycol	EE	EE	Nitrobenzene	EE	NN
Acetic Acid, 5%	EE	EE	Dimethyl Acetamide	EE	EE	Nitromethane	EE	FN
Acetic Acid, 50%	EE	EE	Dimethyl Formamide	EE	EE	n-Octane	EE	EE
Acetic Acid, Glacial	EE	EG	Dimethylsulphoxide (DMSO)	EE	EE	o-Dichlorobenzene	EE	FN
Acetic Anhydride	EE	GF	Dioxane	EE	GF	Oil, Mineral	EE	EE
Acetone	EE	EG	Dipropylene Glycol	EE	EE	Oxalic Acid, 10%	EE	EE
Acetonitrile	EE	FN	Ether	EE	NN	Ozone	EE	EG
Acetophenone	EE	FN	Ethyl acetate	EE	EG	p-Chloroacetophenone	EE	EE
Acrylonitrile	EE	EE	Ethyl Alcohol (Absolute)	EE	EG	p-Dichlorobenzene	EE	GF
Adipic Acid	EE	EE	Ethyl Alcohol, 40%	EE	EG	Perchloric Acid	EE	GN
Allyl Alcohol	EE	EE	Ethyl Alcohol, 96%	EE	EE	Perchloric Acid, 70%	EE	GN
Aluminum Hydroxide	SS	EG	Ethyl Benzene	EE	NN	Perchloroethylene	EE	NN
Amino Acids	EE	EE	Ethyl Benzoate	EE	GF	Phenol, 100%	EE	NN
Ammonia	SS	EE	Ethyl Butyrate	EE	GN	Phenol, 50%	EE	NN
Ammonia, 25%	SS	EE	Ethyl Chloride	EE	FN	Phenol, Crystals	EE	GN
Ammonium Glycolate	EE	EG	Ethyl Chloride, Liquid	EE	FN	Phenol, Liquid	EE	NN
Ammonium Hydroxide, 30%	SS	EG	Ethyl Cyanoacetate	EE	EE	Phosphoric Acid, 5%	EE	EE
Ammonium Hydroxide, 5%	SS	EE	Ethyl Lactate	EE	EE	Phosphoric Acid, 85%	EE	EG
Ammonium Oxalate	EE	EG	Ethylene Chloride	EE	FN	Picric Acid	EE	NN
Ammonium Salts	EE	EE	Ethylene Glycol	EE	EE	Potassium Hydroxide, 1%	SS	EE
Amyl Alcohol	EE	EE	Ethylene Oxide Gas	EE	FF	Potassium Hydroxide, 30%	SS	EE
Amyl Chloride	EE	NN	Ethylene Oxide, 100%	EE	FF	Potassium Permanganate	EE	EE
Aniline	EE	GF	Fatty Acids	EE	EG	Propane Gas	EE	NN
Aqua Regia	SS	NN	Fluorine	EE	FN	Proprionic Acid	EE	EG
Arsenic Acid	EE	EE	Formaldehyde, 10%	EE	EE	Propylene Glycol	EE	EE
Benzaldehyde	EE	EG	Formaldehyde, 40%	EE	EG	Propylene Oxide	EE	EG
Benzenamine	EE	GF	Formalin, 10%	EE	EE	Pyridine	EE	NN
Benzene	EE	NN	Formalin, 40%	EE	EG	Resorcinol, 5%	EE	EE
Benzoic Acid, Sat.	EE	EG	Formic Acid	EE	EG	Resorcinol, Sat.	EE	EE
Benzyl Acetate	EE	EG	Formic Acid, 100%	EE	EG	Salicylaldehyde	EE	EG
Benzyl Alcohol	EE	NN	Formic Acid, 3%	EE	EG	Salicylic Acid, Sat.	EE	EE
Boric Acid	EE	EE	Formic Acid, 50%	EE	EG	Salt Solutions, Metallic	SS	EE
Bromine	EE	NN	Formic Acid, 85%	EE	EG	Silicone Oil	EE	EE
Bromobenzene	EE	NN	Freon TF	EE	EG	Silver Nitrate	EE	EG
Bromoform	EE	NN	Glutaraldehyde	EE	EE	Sodium Dichromate	EE	EE
Butadiene	EE	NN	Glycerine (Glycerol)	EE	EE	Sodium Hydroxide, 50%	SS	EE
Butyl Acetate	EE	FF	Hexane	EE	GF	Sodium Hydroxide, 1%	SS	EE
Butyl Chloride	EE	NN	Hydrazine	EE	NN	Sodium Hydroxide, 10%	SS	EE
Butyric Acid	EE	NN	Hydrobromic Acid, 4%	EE	EG	Sodium Hypochlorite, 15%	EE	GF
Calcium Hydroxide	SS	EE	Hydrobromic Acid, 48%	EE	EE	Stearic Acid	EE	EE
Calcium Hypochlorite	EE	EE	Hydrobromic Acid, 69%	EE	EG	Sulfur dioxide	EE	NN
Carbazole	EE	EE	Hydrochloric Acid, 20%	EE	EE	Sulfur Dioxide, wet or dry	EE	EE
Carbon Disulphide	EE	NN	Hydrochloric Acid, 35%	EE	EG	Sulfur Salts	FE	FN
Carbon Tetrachloride	EE	GF	Hydrochloric Acid, 5%	EE	EE	Sulfuric Acid, (96%)	EE	FN
Cellosolve Acetate	EE	EG	Hydrogen Peroxide, 3%	EE	EE	Sulfuric Acid, 20%	EE	EG
Chlorine Water	EE	FN	Hydrogen Peroxide, 30%	EE	EG	Sulfuric Acid, 30%	EE	EG
Chlorine, 10% (Moist)	EE	FN	Hydrogen Peroxide, 90%	EE	EG	Sulfuric Acid, 6%	EE	EE
Chlorine, 10% in air	EE	FN	Isobutanol	EE	EE	Sulfuric Acid, 60%	EE	EG
Chlorine, wet gas	EE	FN	Isopropanol, 100%	EE	EE	Sulfuric Acid, 98%	EE	FN
Chloroacetic Acid	EE	EG	Isopropyl Acetate	EE	GF	Tartaric Acid	EE	EE
Chlorobenzene	EE	NN	Isopropyl Benzene	EE	FN	Tetrahydrofuran	EE	GF
Chloroform	EE	NN	Isopropyl Ether	EE	NN	Thionyl Chloride	EE	NN
Chromic Acid, 10%	EE	EE	Lactic Acid, 3%	EE	EG	Tincture of Iodine	EE	GG
Chromic Acid, 20%	EE	GG	Lactic Acid, 85%	EE	EG	Toluene	EE	FN
Chromic Acid, 50%	EE	GF	Mercury	EE	EE	Tributyl Citrate	EE	GF
Chromic:Surfuric Acid Mixture,96%	EE	NN	Methanol, 100%	EE	EE	Trichloroacetic Acid (TCA)	EE	FN
			Methoxyethyl Oleate	EE	EG	Trichloroethane	EE	NN
Citric Acid, 10%	EE	EE	Methyl Acetate	EE	GF	Trichloroethylene	EE	NN
Cresol	EE	GF	Methyl Ethyl Ketone	EE	EG	Triethylene Glycol	EE	EE
Cyclohexane	EE	FN	Methyl Isobutyl Ketone	EE	GF	Tripropylene Glycol	EE	EE
Cyclohexanone	EE	FN	Methyl Propyl Ketone	EE	GF	Tris Buffer, Solution	EE	EG
Cyclopentane	EE	FN	Methylene Chloride	EE	FN	Urea	EE	EE
Decahydronaphtalene	EE	GF	Methyl-t-Butyl Ether	EE	FN	Xylene	EE	FN

The first character indicates the characteristics of vials and cap at low temperature; the second character indicates the characteristics at high temperature conditions.

E = No damage after 30 days of constant exposure; G = Little of no damage after 30 days of constant exposure; F = Some effect after 7 days of constant exposure; N = Immediate damage may occur. Not recommended for continuous use; S = Surface.

Solvent Compatibility of Materials Used for Septa

Solvent	PTFE/Red Rubber	PTFE/Silicone	PTFE/Silicone/PTFE	PTFE/Butyl
Acetic Acid Aqueous	A(A)	A(A)	A(A)	A(A)
Acetone	A(A)	A(A)	A(B)	A(A)
Acetonitrile	A(A)	A(A)	A(–)	A(A)
Alcohols (Aromatic)	A(B)	A(A)	A(–)	A(B)
Alcohols (Aliphatic)	A(A)	A(A)	A(–)	A(A)
Amyl Acetate	A(A)	A(C)	A(D)	A(A)
Aqueous Solution Dilute	A(A)	A(A)	A(–)	A(A)
Benzene	A(D)	A(C)	A(D)	A(D)
Butyl Alcohol	A(B)	A(B)	A(B)	A(B)
Carbon Disulphide	A(D)	A(A)	A(–)	A(D)
Carbon Tetrachloride	A(D)	A(C)	A(D)	A(D)
Chloroform	A(D)	A(C)	A(D)	A(D)
Cyclohexane	A(D)	A(C)	A(D)	A(D)
Cyclohexanol	A(D)	A(B)	A(–)	A(D)
Diethyl Ether	A(D)	A(B)	A(–)	A(D)
Dimethyl Sulphoxide	A(C)	A(A)	A(–)	A(C)
Dioxane	A(B)	A(C)	A(D)	A(B)
Esters	A(B)	A(B)	A(–)	A(B)
Ethyl Acetate	A(B)	A(B)	A(B)	A(B)
Ethyl Alcohol	A(A)	A(A)	A(B)	A(A)
Ethylene Chloride	A(D)	A(C)	A(D)	A(D)
Ethylene Glycol	A(A)	A(A)	A(A)	A(A)
Formaldehyde	A(B)	A(A)	A(B)	A(B)
Glycol	A(A)	A(A)	A(A)	A(A)
Halogenated Hydrocarbons	A(D)	A(A)	A(–)	A(D)
Hexane	A(D)	A(C)	A(D)	A(D)
Hydrochloric Acid Dilute	A(A)	A(A)	A(–)	A(A)
Iso-Octane	A(D)	A(C)	A(D)	A(D)
Ketones	A(A)	A(B)	A(–)	A(A)
MeOH/H_2O/Acetonitrile	A(A)	A(B)	A(–)	A(A)
Methanol	A(A)	A(A)	A(A)	A(A)
Methyl Chloride	A(C)	A(A)	A(D)	A(C)
Methyl Acetate	A(B)	A(B)	A(D)	A(B)
Methyl Ethyl Ketone	A(A)	A(A)	A(D)	A(A)
Methyl Chloride	A(D)	A(B)	A(–)	A(D)
Nitric Acid Dilute	A(A)	A(B)	A(B)	A(A)
Pentane	A(D)	A(C)	A(–)	A(D)
Petroleum Ether	A(D)	A(C)	A(–)	A(D)
Sodium Hydroxide	A(A)	A(A)	A(B)	A(A)
Sulphuric Acid Dilute	A(D)	A(B)	A(D)	A(D)
Surfactants	A(A)	A(A)	A(–)	A(A)
Toluene	A(D)	A(C)	A(D)	A(D)
Trichloroethylene	A(D)	A(C)	A(D)	A(D)
Water	A(A)	A(A)	A(A)	A(A)

The first character indicates the characteristics of septa prior puncture. The second character indicates the characteristics of septa after puncture.

A = Recommended; B = Suitable for most purposes; C = Use with care; D = Not advisable; - = Not tested.

Product Description

1) **Seal**
   A seal is an already assembled closure consisting of a cap and septum.

2) **Rubber**
   Red Rubber/PTFE is a synthetic rubber which is softer and show less fragmentation than Natural Rubber/PTFE. It has better cleanliness and purity then Natural Rubber/PTFE but inferior than Silicone. Nevertheless, it does not have the outstanding resealability property like Natural Rubber for multiple injections.

3) **Pre-slit septa**
   The septa are cross-slit to aid in the needle penetration. The Septa are only cut through the Silicone layer, but not the PTFE layer to avoid the risk of concentration changes due to solvent loss or contamination from the environment.

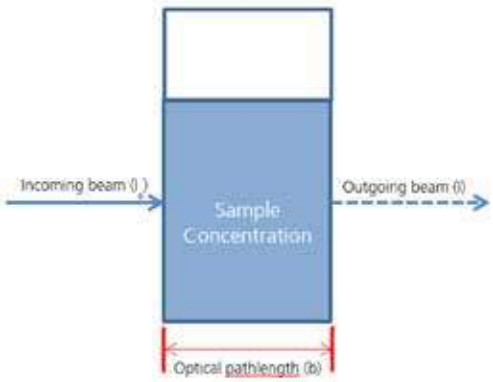
4) **Ultrabond**
   The Ultrabond seal is that the septa and screw cap form an inseparable unit. The molecular structure of the contact areas of the PP screw cap and the septa are modified such that it requires no glue or adhesive between the two to form a firm unit. The Ultrabond products is recommended over a general cap/septa assembly:
   - To avoid pushing the septa into the vial when use with very thick and dull needles
   - For screw caps with a wide diameter, where a septum cannot achieve any press-fit in the cap

5) **Micro-insert**
   A Micro-insert is different from a Micro-vial where it cannot be sealed on its own. The diameter of the Micro-insert is depending on the size of vial opening. A Micro-insert reduces the volume of sample needed and allow the needle to pick up even the smallest sample quantities.

Bouguer-Lambert-Beer's Law

Light incident on a sample (Io) can be reflected, absorbed, or transmitted. The ratio of light transmitted through the sample to the light incident on the sample, I/I_o, is defined as the transmittance through the sample (T). Absorbance (A) can be calculated from transmittance using the following relationships:

$$T = \frac{I}{I_o} = 10^{-kcb} \text{ and } \%T = \frac{I}{I_o} * 100 \qquad A = -\log\frac{I}{I_o} = kcb$$



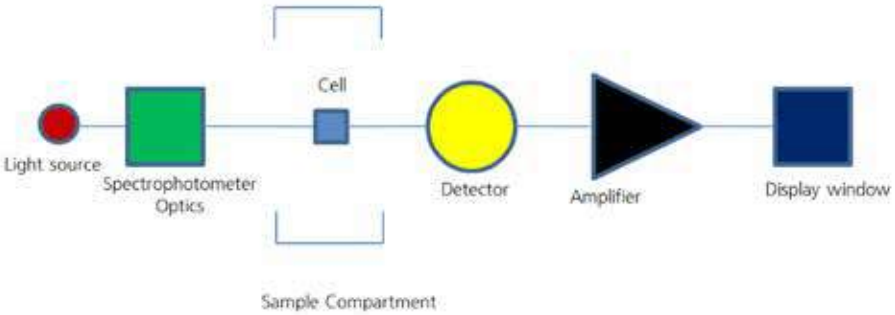
Samples are routinely measured in absorbance because absorbance is proportional to the concentration of the sample (Beer's law) and is proportional to the optical path length (Bouguer's law). The proportionality constant (k) is unique for every species. When the optical path length is 1 cm and the sample concentration is 1 mole/L, the proportionality constant (k) for a given species becomes the molar absorptivity(ε)yielding the more commonly seen equation relating absorbance and concentration:

$$A = \varepsilon bc$$

For the Bouguer-Beer's law to remain valid, it is necessary to satisfy certain sampling conditions such as being free from stray light, emission, scattering, and reflection.

Single-beam Configuration

In a Single-Beam design, only one beam passes through the sample compartment. The Baseline and Reference are combined into one measurement and are measured first. Measurement of the baseline in a single beam unit may or may not include a cuvette with solvent depending on the user's preference. After the baseline is acquired, the sample is placed in the beam path and a sample acquisition is acquired. The transmittance is the ratio of the intensity of the sample against the intensity of the baseline/reference at any given wavelength.



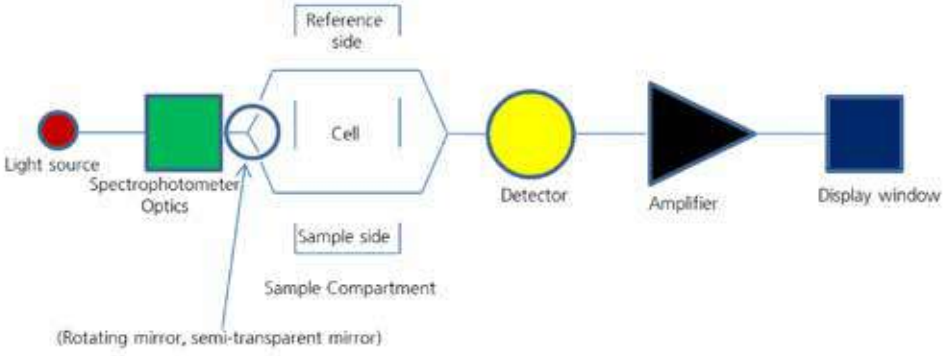
Basic Layout of a Single-Beam Spectrophotometer

$$\%T(\lambda) = \frac{I_{Sample(\lambda)}}{I_{baseline(\lambda)}} \times 100$$

Transmittance Equation for a Single-Beam Spectrophotometer

Double-beam Configuration (Single Detector)

In a Dual-Beam design, the monochromatic light coming from the monochromator is divided into two paths using either a rotating sector mirror or a semi-transparent beam-splitter. The split light beam is passed through the sample compartment in two paths, one passing through the sample cell and the other passing through a reference cell. After passing through the sample compartment the beams are focused onto the detector(s). Dual-Beam designs can have either a single detector (PMT; 190-900nm) or dual detectors (silicon diode; 190-1100nm). In a dual-beam system a baseline measurement is acquired prior to sample analysis, just like in a single-beam system. This is the spectral information that is ratioed against the sample beam to calculate transmittance. In addition, in a dual-beam system, the reference beam is also ratioed against the sample beam. This second comparison serves to compensate for any variation in temperature, voltage, or lamp intensity that may occur as the measurement is acquired. The result is a very accurate and stable acquisition of the sample spectrum over the full wavelength range.



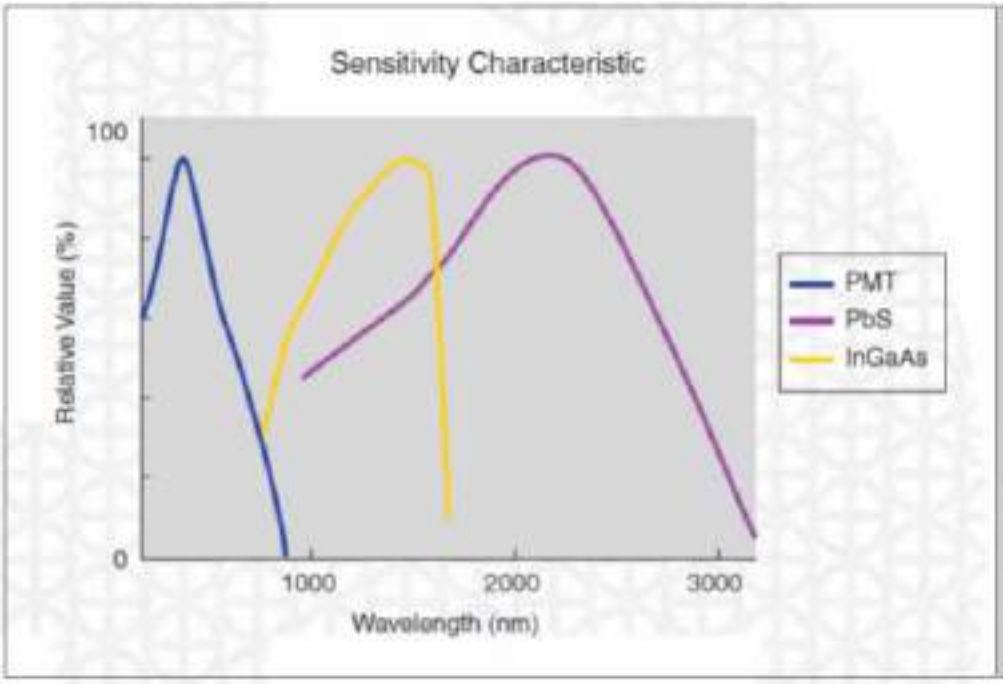
Basic Layout of a Double-Beam Spectrophotometer

$$\%T(\lambda) = \frac{\frac{I_{Sample(\lambda)}}{I_{Reference(\lambda)}}}{\frac{I_{Baseline\ sample(\lambda)}}{I_{Baseline\ reference(\lambda)}}} \times 100$$

Transmittance Equation for a Double-Beam Spectrophotometer

Detector Transition Wavelengths

Until recently, conventional spectrophotometers used a PMT (photomultiplier tube) for the ultraviolet and visible region and a PbS detector for the near-infrared region. Neither detector, however, is very sensitive near the detector-switchover region. This prevents high-sensitivity measurement in this range. The Shimadzu UV-3600 makes it possible to take high-sensitivity measurements in the switchover range by using an InGaAs detector.



Absorption Bands for Common Functional Groups*

Chromophore	System	λ_{max} (nm)	ε_{max}
Aldehyde	—CHO	210	strong
		280-300	11-18
Amine	—NH_2	195	2800
Bromide	—Br	208	300
Carbonyl	>C=O	195	1000
		270-285	18-30
Carboxyl	—COOH	200-210	50-70
Disulfide	—S—S—	194	5500
		255	400
Ester	—COOR	205	50
Ether	—O—	185	1000
Ethylene	—C=C—	190	8000
Iodide	—I	260	400
Nitrate	—ONO_2	270 (shoulder)	12
Nitrile	—C≡N	160	-
Nitrite	—ONO	220-230	1000-2000
		300-400	10
Nitro	—NO_2	210	strong
Nitroso	—NO	302	100
Sulfoxide	>S=O	210	1500
Benzene		184	46700
		204	6900
		255	170
Diphenyl		246	20,000

*Adapted from Lange's Handbook of Chemistry by James A. Dean, 14th Edition, McGraw Hill

World Map of Shimadzu Sales, Service, Manufacturing, and R&D Facilities

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