C190-E206A

SHIMADZU
Excellence in Science

High Performance Liquid Chromatography Columns

Shim-pack HPLC Column Guidebook

Shimadzu Liquid Chromatographs

Nexera X2

Maximizing the Potential of UHPLC/HPLC Analysis

Meet the Nexera X2, the most advanced UHPLC available today. The flexible system design achieves a true fusion between UHPLC and HPLC technologies, enabling the Nexera X2 to be used for a much broader range of applications. In addition to providing maximum speed, sensitivity, resolution, stability, and reliability, it also features the revolutionary *i*-PDeA* separation technology and an *i*-DReC** function that extends the dynamic range so that both concentrated and trace components can be quantitated simultaneously.

* Intelligent Peak Deconvolution Analysis (patent pending)

** Intelligent Dynamic Range Extension Calculator (patent pending)

Nexera XR

The Most Accessible UHPLC Available

Developed with expandability and compatibility in mind, the Nexera XR ultra high performance liquid chromatograph enables more customers to make use of high-speed, high-resolution systems. Configure the optimal system to meet the specific analysis objective by selecting from among a wide range of highly accurate and reliable modules. The next milestone in the evolution of liquid chromatography, the Nexera XR promises to become an indispensable tool in laboratories in a variety of fields, including pharmaceuticals, biochemistry, chemistry, environmental, and foods.

Contents

i-Series

Prominence-i Nexera-i

New Industry Standard HPLCs

innovative – Realization of Advanced Laboratory

- Advanced functions free operators from the laboratory
- Remote monitoring using a smart device
- Excellent baseline stability unaffected by circumstances
- Ultrafast injection cycle reduces analysis times
- Ultra-low carryover
- Use of multiple detectors expands application range

intuitive – Achieving Easier Operation

- Unified graphical user interface between system and workstation
- Simplified batch file creation
- Displays chromatograms in real time

intelligent – Smart Features Increase Work Efficiency

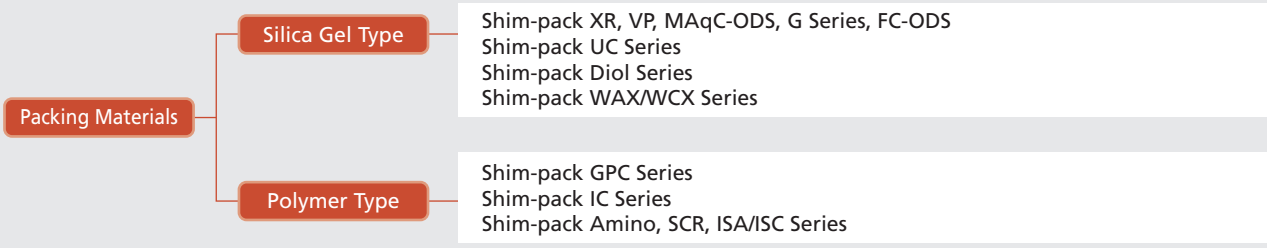
- Fully automated analysis: reliably perform analyses according to prescribed procedures
- Migrate existing methods from either Shimadzu or non-Shimadzu systems

Prominence

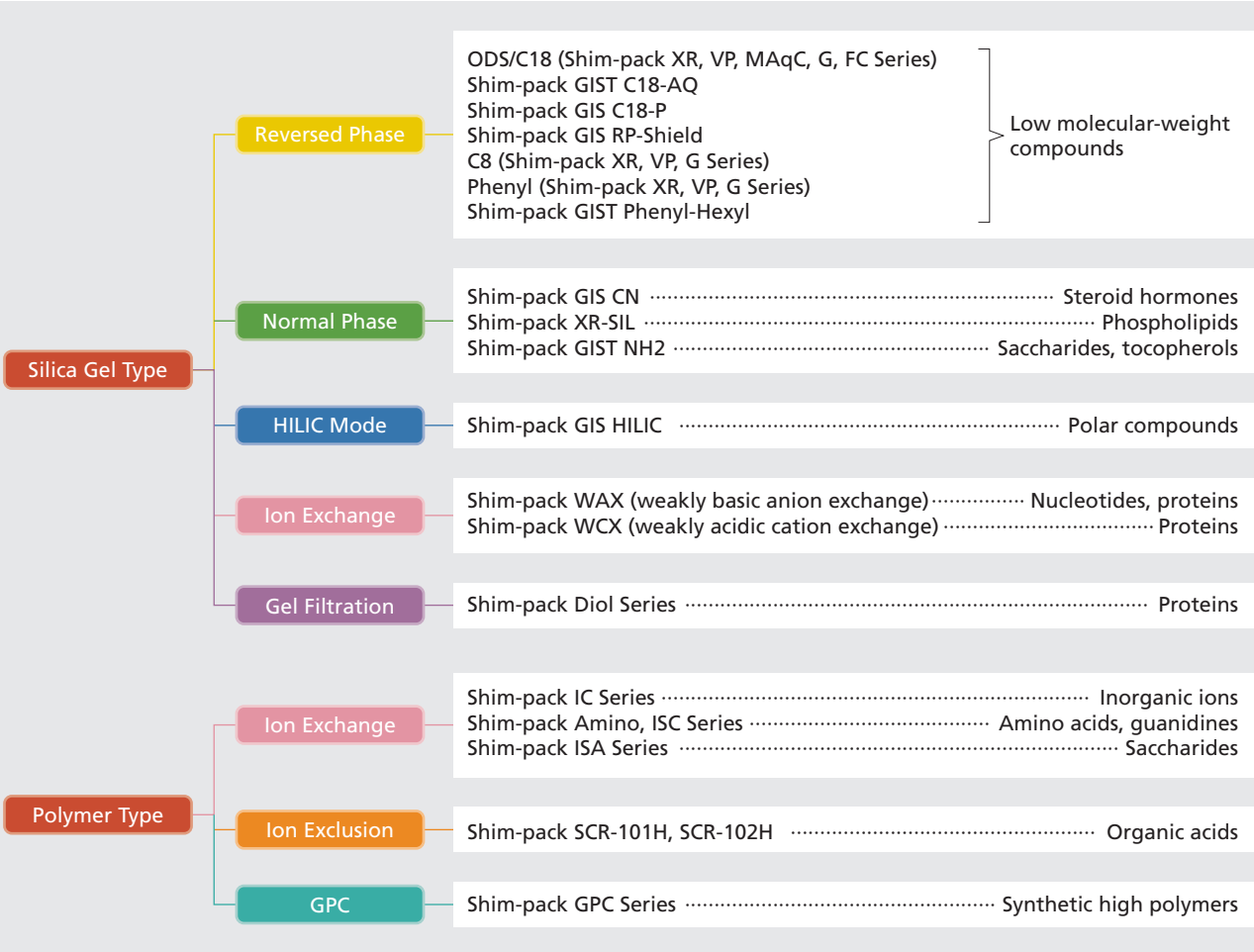
HPLC systems are currently used in a wide variety of fields. Reliable analytical data and a more efficient total analysis workflow are required to achieve faster development of new drugs, ensure food safety, and meet higher standards in environmental regulations. Many analysis techniques use LCMS, which requires a front-end HPLC system to provide solvent delivery performance in the micro to semi-micro range and injectors with low sample carryover. Prominence is a network-ready HPLC system that meets the demands of today's advanced users. Prominence features the world's first Web control, fastest sample injection, and highest detection sensitivity performance…functions that surpass current HPLC technology.

Column Selection Guide

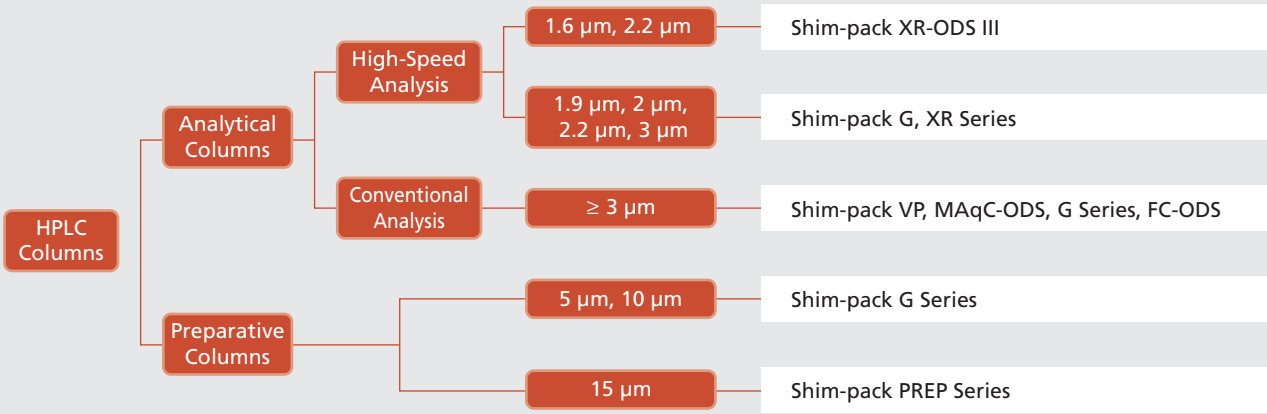
Selection by Support Materials



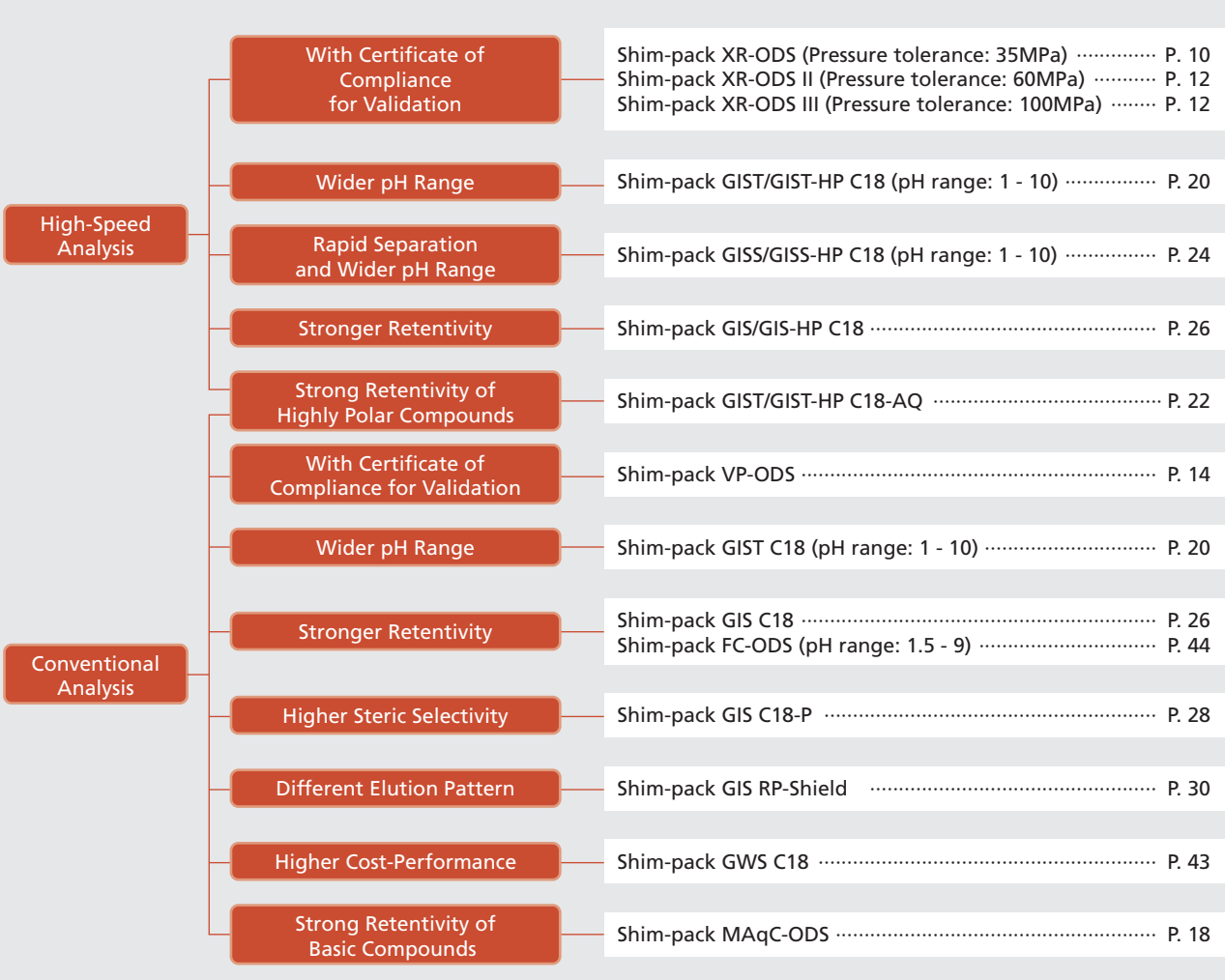
Selection by Separation Modes



Selection by Column Particle Sizes

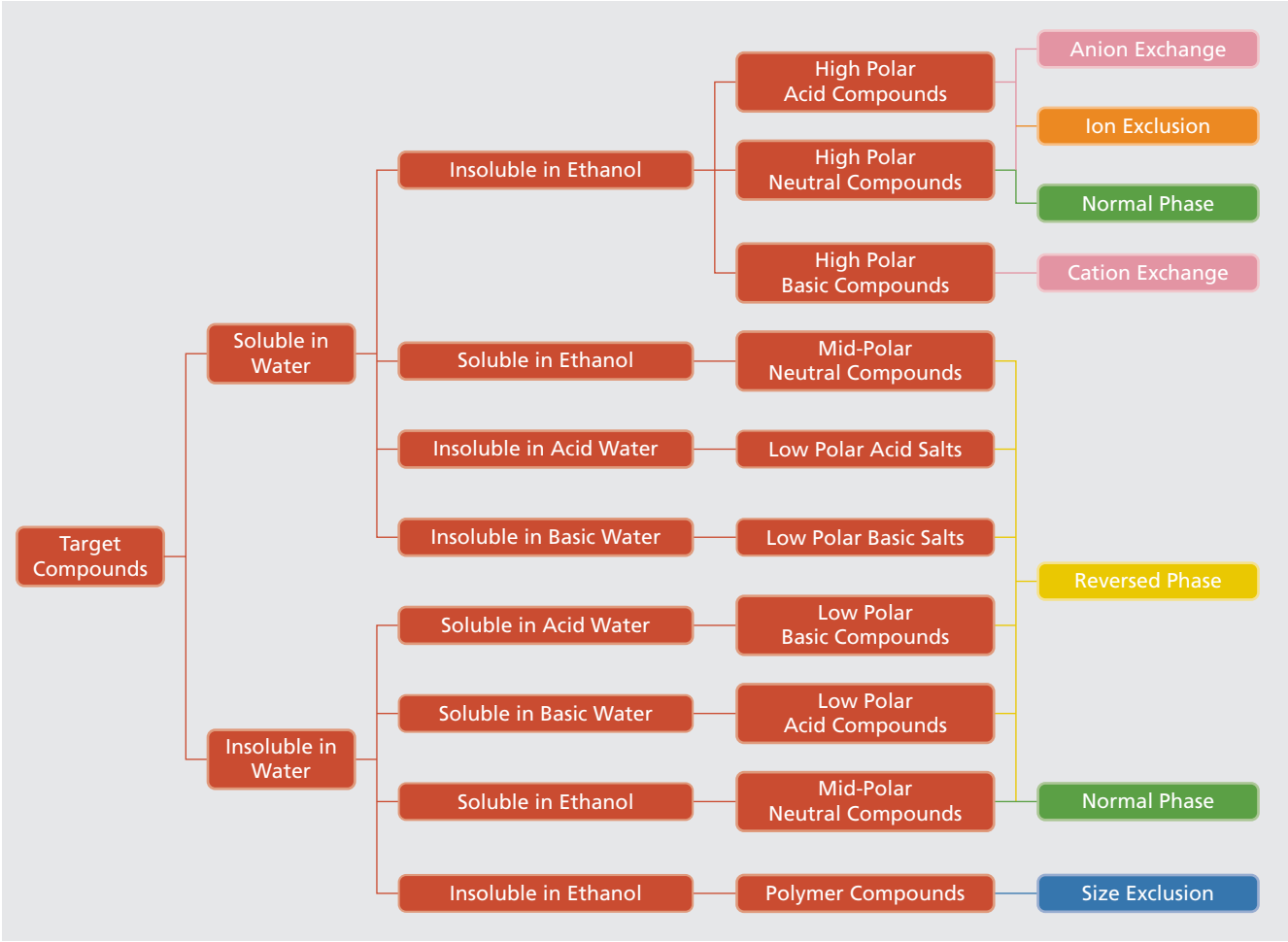


Selection of ODS columns

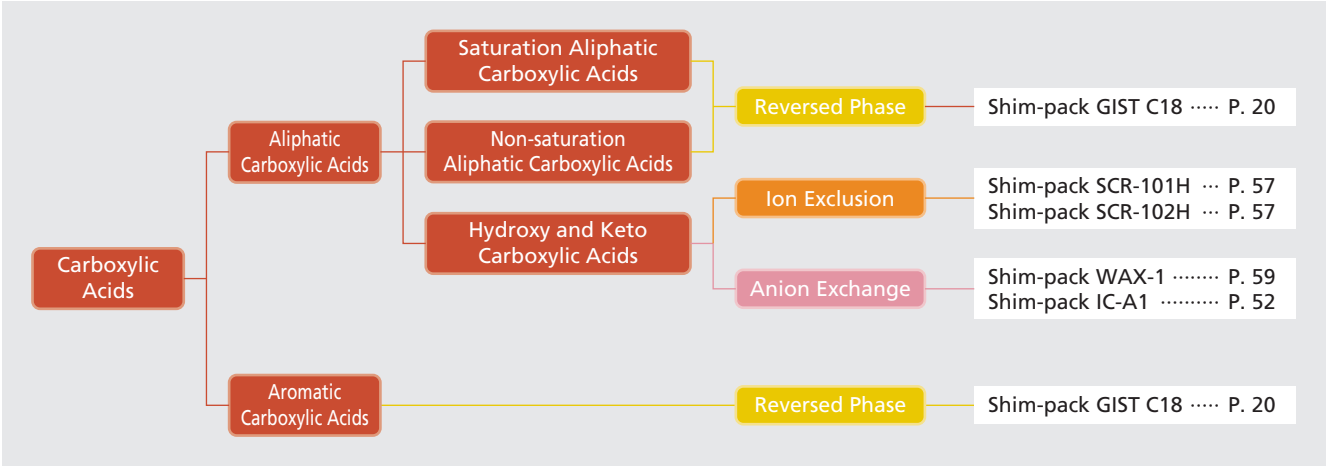


Column Selection Guide

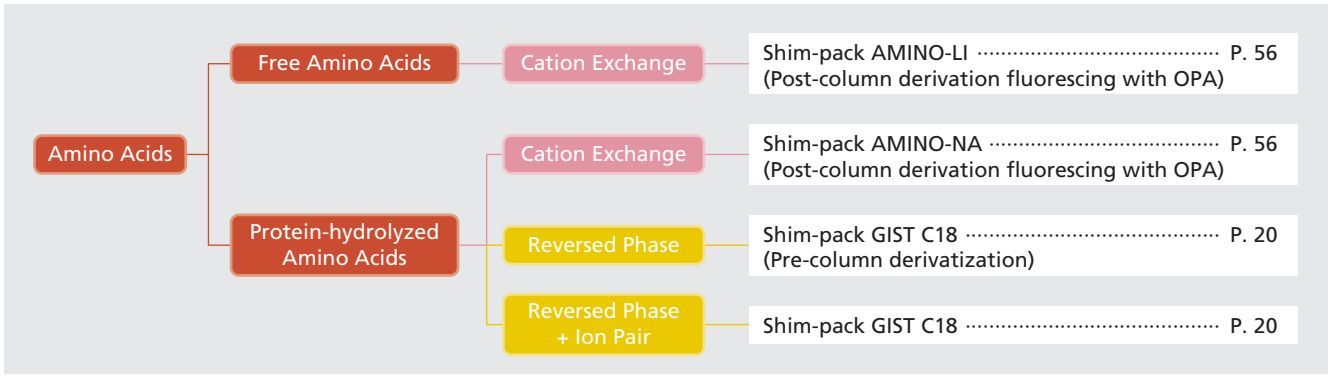
Separation Mode Selection by Target Compounds

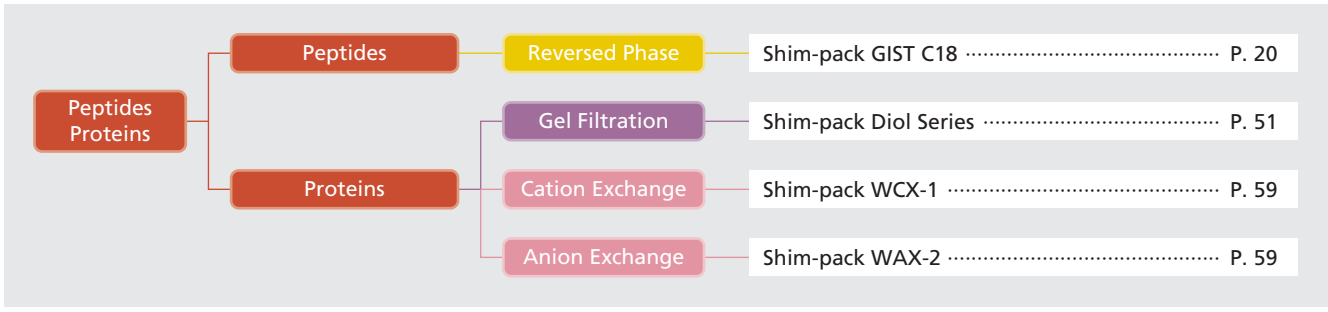


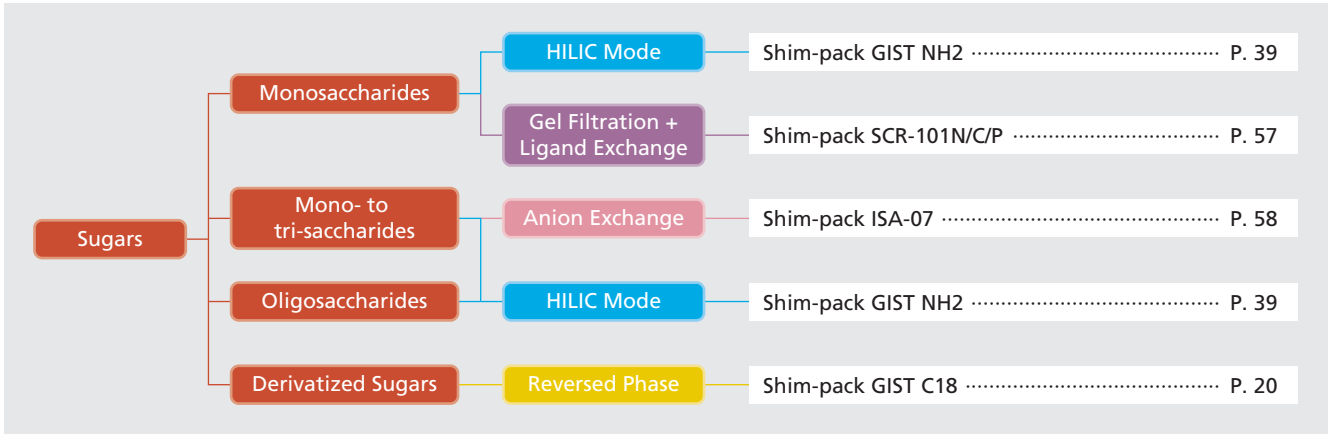
Column Selection by Target Compounds



Column Selection by Target Compounds

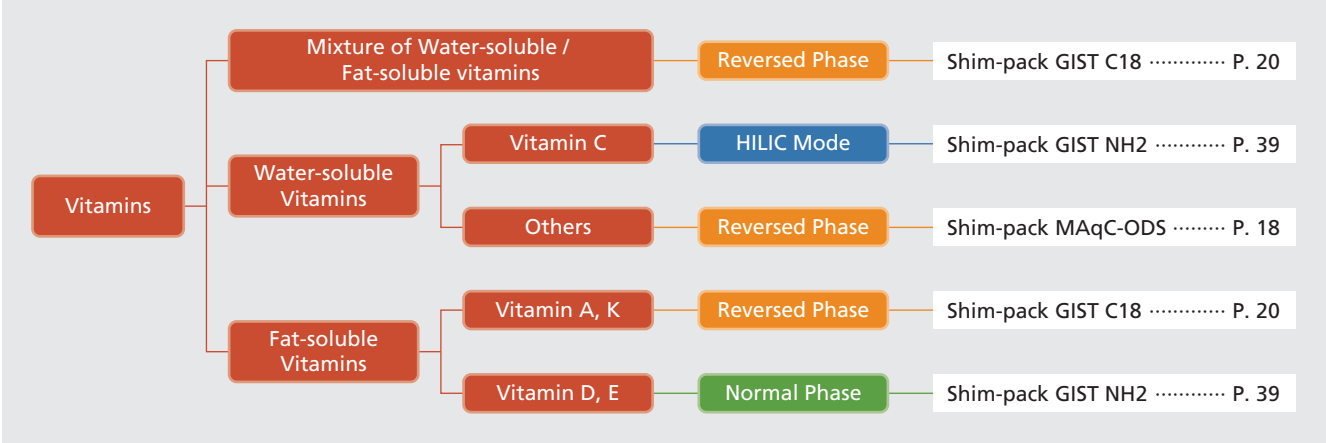






Column Selection Guide

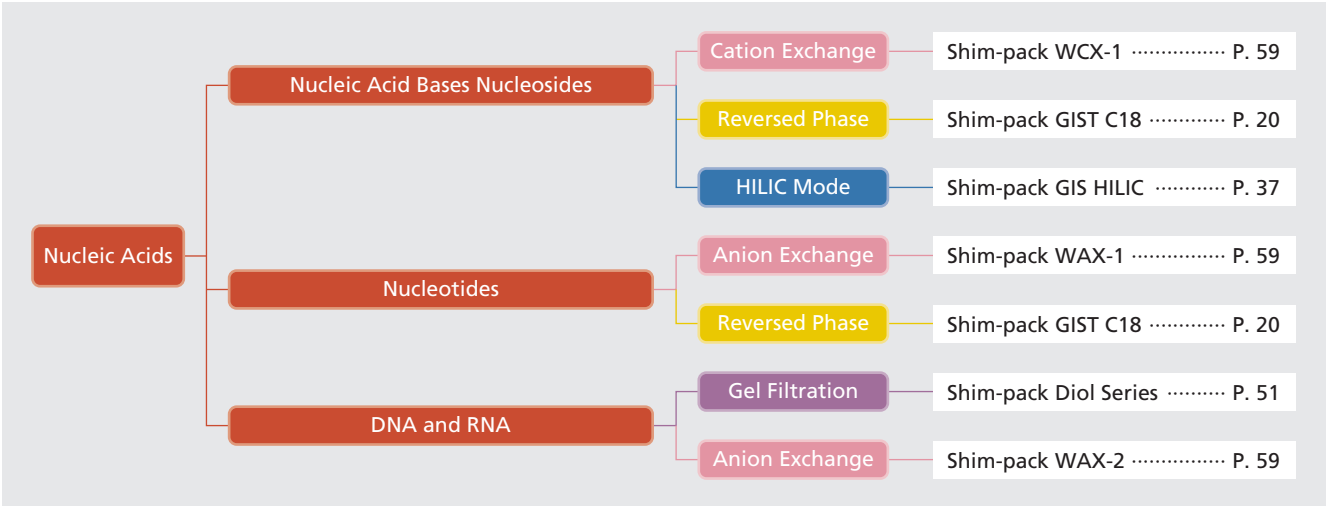
Column Selection by Target Compounds



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.



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	10
		Shim-pack XR-ODS II	12
		Shim-pack XR-ODS III	12
		Shim-pack VP-ODS	14
		Shim-pack GIST C18	20
		Shim-pack GIST-HP C18	20
		Shim-pack GIST C18-AQ	22
		Shim-pack GISS C18	24
		Shim-pack GISS-HP C18	24
		Shim-pack GIS C18	26
		Shim-pack GIS-HP C18	26
		Shim-pack GIS C18-P	28
		Shim-pack GIS RP-Shield	30
		Shim-pack GWS C18	43
		Shim-pack FC-ODS	44
		Shim-pack UC GIS II	46
L3	Porous silica particles, 1.5 to 10 µm in diameter, or a monolithic silica rod.	Shim-pack XR-SIL	10
		Shim-pack UC Sil	46
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	10
		Shim-pack VP-C8	14
		Shim-pack GIST C8	31
		Shim-pack GIST-HP C8	31
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	39
		Shim-pack UC NH2	46
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	41
		Shim-pack UC CN	46
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	10
		Shim-pack VP-Phenyl	14
		Shim-pack GIST Phenyl	33
		Shim-pack GIST-HP Phenyl	33
		Shim-pack UC Phenyl	46
		Shim-pack GIST Phenyl-Hexyl	35
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	57
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	57
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	37
		Shim-pack UC Diol	46
L21	A rigid, spherical styrene-divinylbenzene copolymer, 3 to 30 µm in diameter.	Shim-pack GPC Series	49
L22	A cation-exchange resin made of porous polystyrene gel with sulfonic acid groups, 5 - 15 µm in diameter.	Shim-pack IC-C1	52
		Shim-pack AMINO-LI	56
		Shim-pack AMINO-NA	56
		Shim-pack ISC	58
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	52
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	57
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	51
		Shim-pack Diol-300	51

Shim-pack XR Series

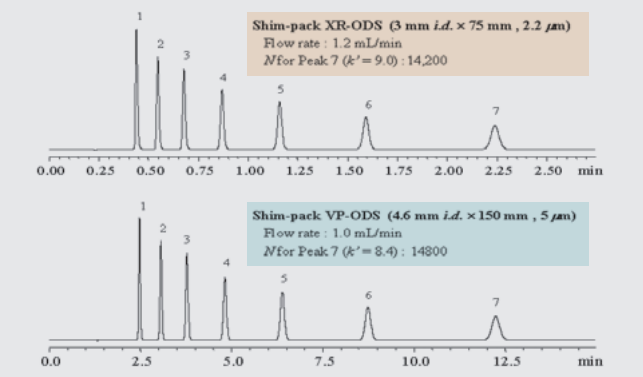
Shim-pack XR Series Columns Offer Versatility and Fast Analysis

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 16.

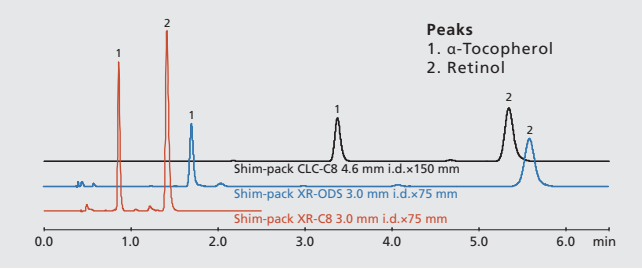
Shim-pack XR Series Comprehensive Product Range

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.

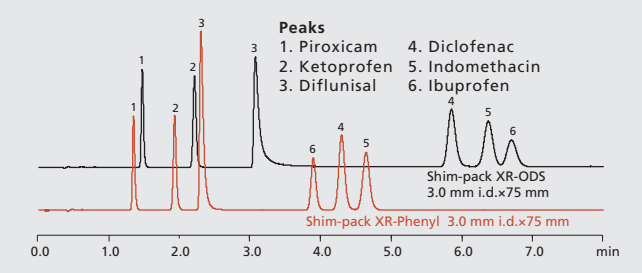


Conditions

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.

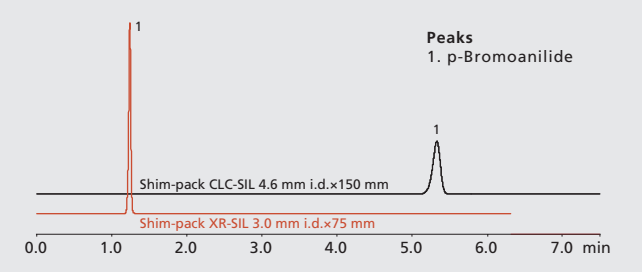


Conditions

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-ODSII and XR-ODS III High-Pressure Columns for Higher Resolution and Sensitivity

While the Shim-pack XR-ODSII 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

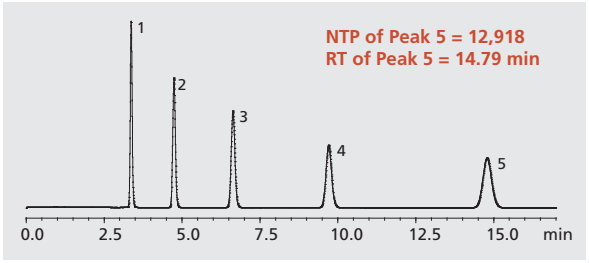
The Shim-pack XR-ODS II range includes a 1.5 mmI.D. model in addition to normal 2 mm and 3 mmI.D. columns. With an optimal flow rate of 0.2 to 0.3 mL/min, the 1.5 mmI.D. column offers the optimal flow rate for LC/MS and reduces mobile phase consumption.

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.

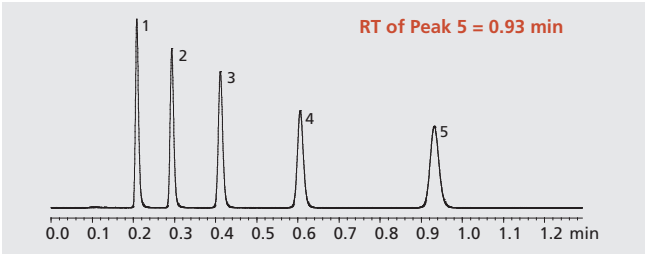
Shim-pack VP-ODS (150 mmL. × 4.6 mmI.D., 5 µm, P/N: 228-34937-91)

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



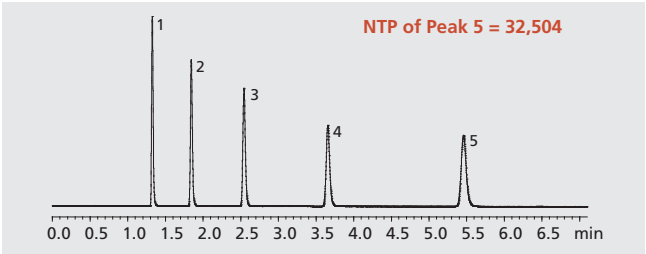
Conditions
Mobile Phase : 55 % Aqueous Acetonitrile Solution
Flow Rate : 1.0 mL/min
Col. Temp. : 40 °C
Injection Vol. : 5 µL

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. : 0.5 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. : 0.5 µL

Product Information

Column	Particle Size (μm)	I.D. (mm) / Length (mm)	1.5	2.0	3.0	4.6	Pressure Tolerance (MPa)
Shim-pack XR-ODS	2.2	20	-	228-50459-91	-	-	35
		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
		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
		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
		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
		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
		75	-	228-59922-92	-	-	
	2.2	150	-	228-59910-91	-	-	
		200	-	228-59910-92	-	-	

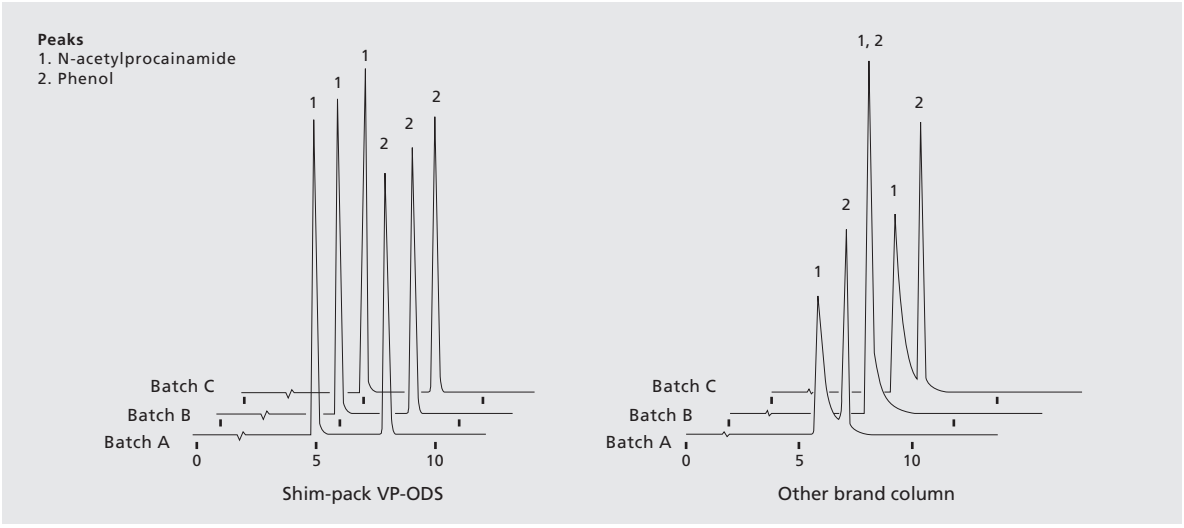
Shim-pack VP Series

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

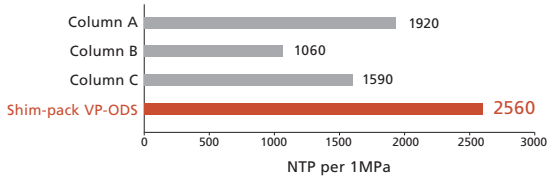
Shim-pack VP series ensures high column-to-column performance reproducibility, which is ideal for method development and validation. Silica-bases, surface treatment and packing procedures are subjected to a strict array of quality criteria tests and controlled respectively. Each column is delivered together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



Comparison of reproducibility between three batches of silica-based materials

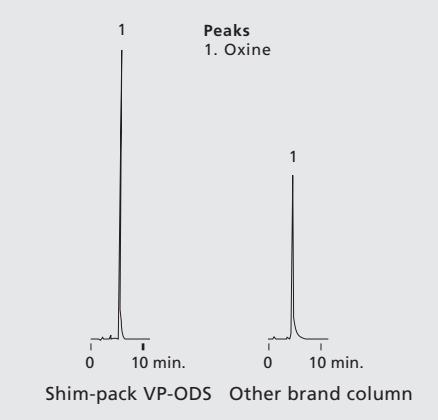
Balance of Column Efficiency and Column Backpressure

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

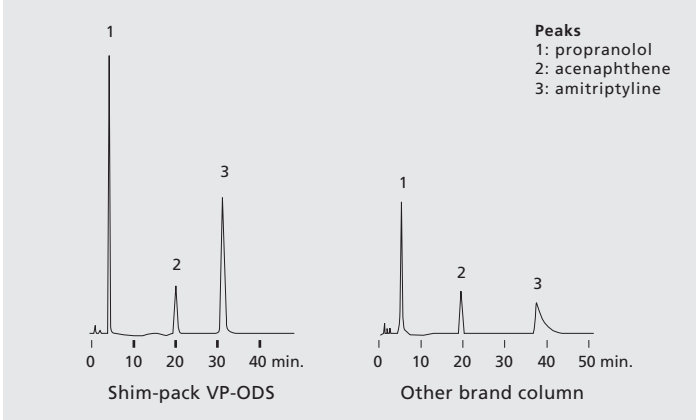


Column Size: 4.6 x 150 mm, Mobile Phase: Methanol/Water=70/30,
Flow Rate: 1.0 mL/min., Sample: Naphthalene

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

Guard 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

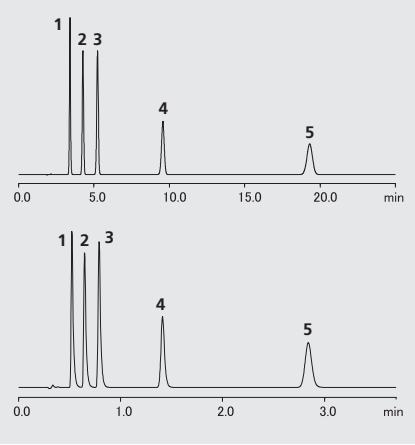
Smooth Transfer of Methods from High-Speed Analysis to Conventional Analysis

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



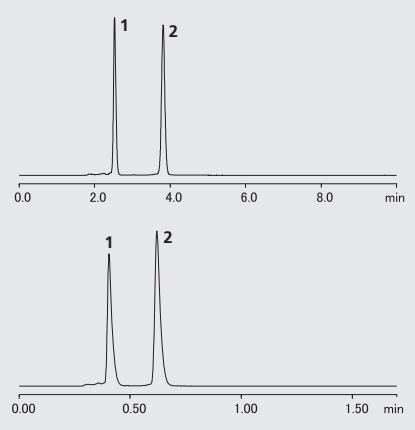
Conditions

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



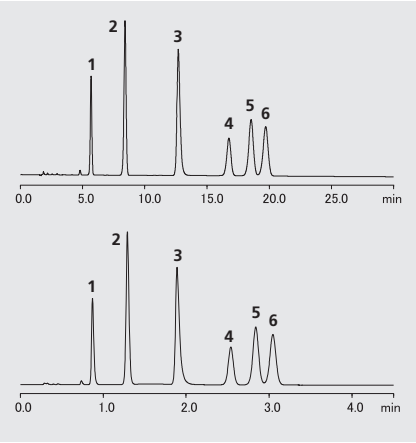
Conditions

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)

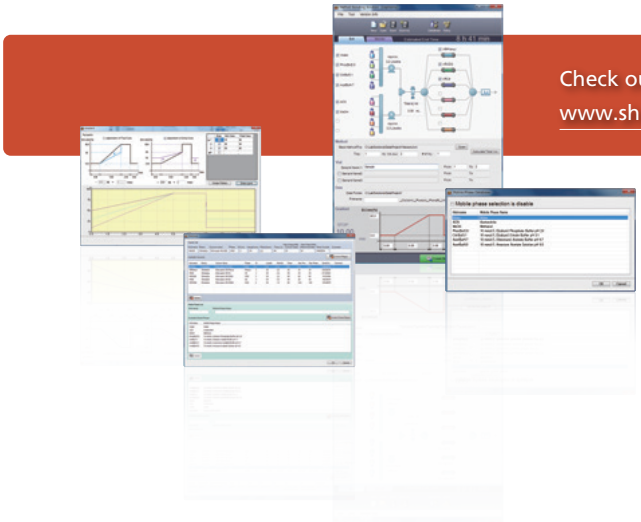
Mobile Phase : A) 20 mmol/L Phosphoric acid (Na) buffer (pH 2.5)
B) Acetonitrile
A/B = 3/7 (v/v)

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
www.shimadzu.com/an/hplc

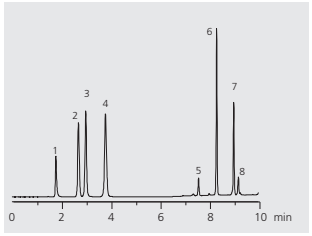
Shim-pack MAqC-ODS

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

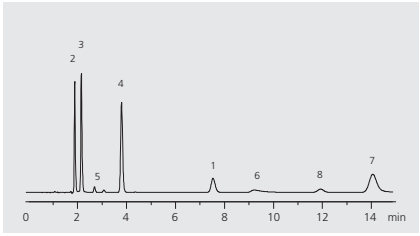


Peaks
1. Thiamine
2. Niacin
3. Nicotinamide
4. Pyridoxine
5. Ca Pantothenate
6. Folic acid
7. Riboflavin
8. Biotin

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



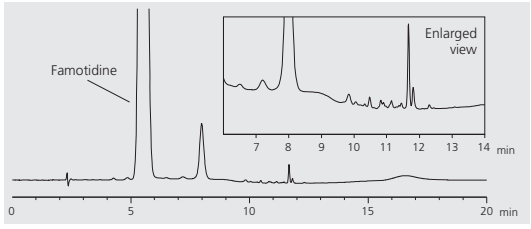
Conditions

Column : IShim-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.

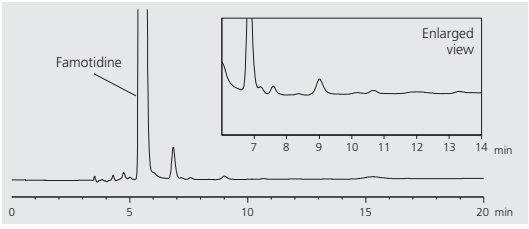
Shim-pack MAqC-ODS I



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

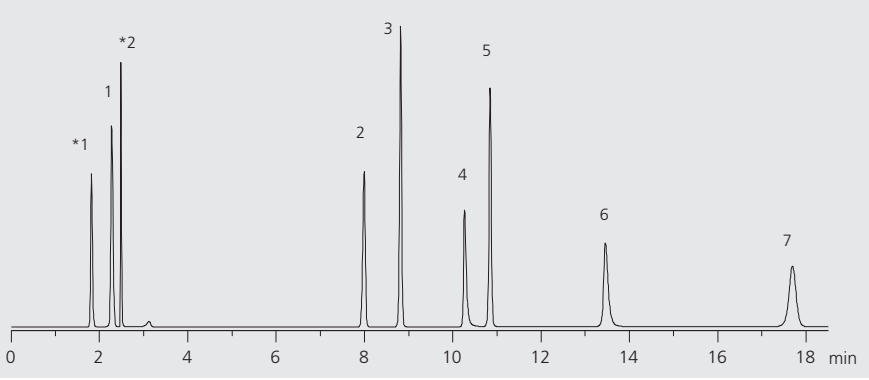


Conditions

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

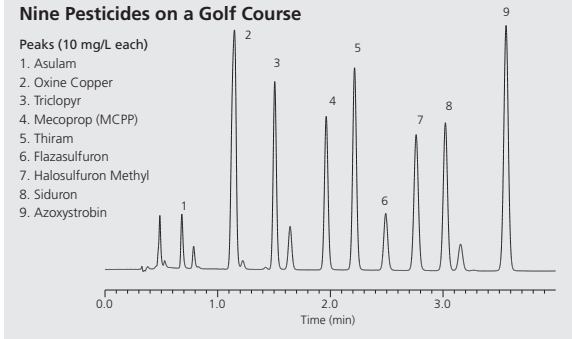
Ultra-High Inertness, High Stability

Shim-pack GIST C18 has superior inertness, which improves analysis precision and increases column stability. 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 m^2/g
Carbon Loading	14 %
End-capping	Yes
pH Range	1 - 10
USP Code	L1

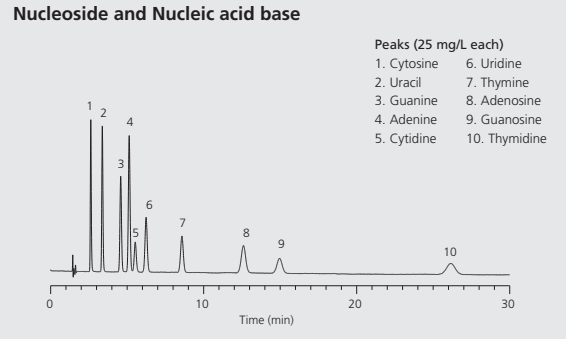
Analysis Examples

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 mmol/L Monopotassium phosphate buffer solution (pH 3.5)
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

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)
2	30	227-30001-01	227-30002-01	-	50
	50	227-30001-02	227-30002-02	-	
	75	227-30001-03	227-30002-03	-	
	100	227-30001-04	227-30002-04	-	80
	150	227-30001-05	227-30002-05	-	
3	30	227-30039-01	227-30040-01	227-30041-01	50
	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)	Holder
		1.5	2.1	3.0		
2	10	227-30042-01	227-30043-01	227-30044-01	80	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)
		1.5	2.1	3.0	
2	10	227-30042-02	227-30043-02	227-30044-02	80
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)
2	30	227-30771-01	227-30772-01	227-30773-01	80
3		227-30774-01	227-30775-01	227-30776-01	50

Shim-pack GIST C18-AQ

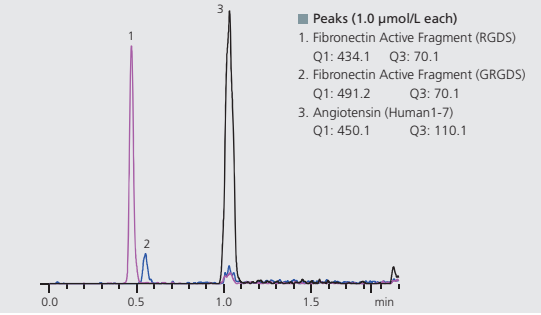
Excellent Retentivity of Highly Polar Compounds

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 - 10
USP Code	L1

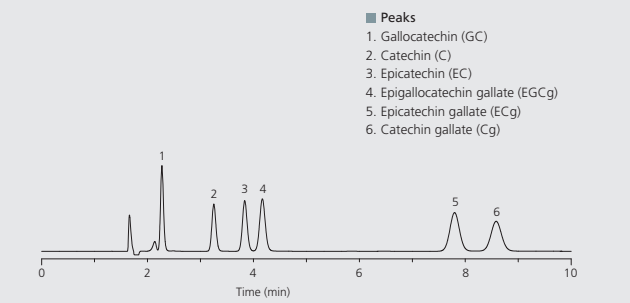
Analysis Example

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

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)
1.9	50	227-30807-01	227-30808-01	-	50
	100	227-30807-02	227-30808-02	-	80
	150	227-30807-03	227-30808-03	-	
3	30	-	227-30766-01	227-30767-01	50
	50	227-30765-01	227-30766-02	227-30767-02	
	75	227-30765-02	227-30766-03	227-30767-03	
	100	227-30765-03	227-30766-04	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)	Holder
		1.5	2.1	3.0		
1.9	10	227-30809-01	227-30810-01	227-30811-01	80	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)
		1.5	2.1	3.0	
1.9	10	227-30809-02	227-30810-02	227-30811-02	80
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)
3	30	227-30801-01	227-30802-01	227-30803-01	50

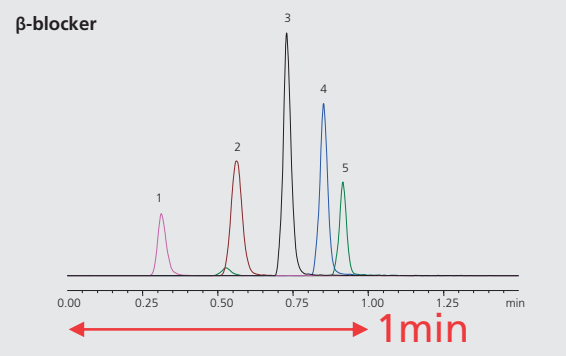
Shim-pack GISS C18

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 - 10
USP Code	L1

Analysis Example



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 mmol/L Ammonium formate in Water
B) 10 mmol/L 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

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)
1.9	50	227-30048-01	227-30049-01	-	50
	100	227-30048-02	227-30049-02	-	80
	150	227-30048-03	227-30049-03	-	
3	50	227-30084-01	227-30085-01	227-30086-01	50
	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)	Holder
		1.5	2.1	3.0		
1.9	10	227-30087-01	227-30088-01	227-30089-01	80	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)
		1.5	2.1	3.0	
1.9	10	227-30087-02	227-30088-02	227-30089-02	80
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)
1.9	30	227-30777-01	227-30778-01	227-30779-01	80
3		227-30780-01	227-30781-01	227-30782-01	50

Shim-pack GIS C18

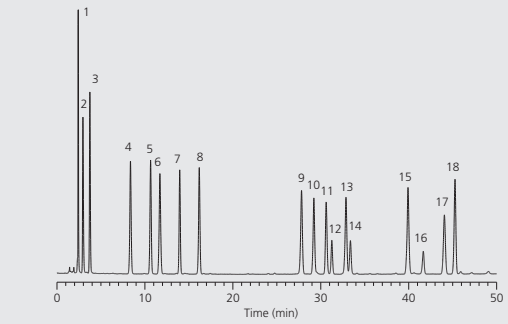
High Retentivity, Lower Column Back Pressure

Widely used octadecyl bonded silica gel enables the Shim-pack GIS C18 to have strong hydrophobic interaction and low adsorption 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	2 µm, 3 µm, 4 µm, 5 µm, 10 µm
Pore Size	10 nm
Surface Area	450 m^2/g
Carbon Loading	15 %
End-capping	Yes
pH Range	2 - 7.5
USP Code	L1

Analysis Example

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
Detection	: UV 270 nm
Col. Temp.	: 40 °C
Injection Vol.	: 10 µL

Analytical Columns

Particle Size (µm)	Length (mm) \ I.D. (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

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)
2	30	227-30093-01	227-30094-01	-	50
	50	227-30093-02	227-30094-02	-	
	75	227-30093-03	227-30094-03	-	
	100	227-30093-04	227-30094-04	-	80
	150	227-30093-05	227-30094-05	-	
3	30	227-30149-01	227-30150-01	227-30151-01	50
	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)	Holder
		1.5	2.1	3.0		
2	10	227-30152-01	227-30153-01	227-30154-01	80	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)
		1.5	2.1	3.0	
2	10	227-30152-02	227-30153-02	227-30154-02	80
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)
2	30	227-30783-01	227-30784-01	227-30785-01	80
3		227-30786-01	227-30787-01	227-30788-01	50

Shim-pack GIS C18-P

High Steric Selectivity

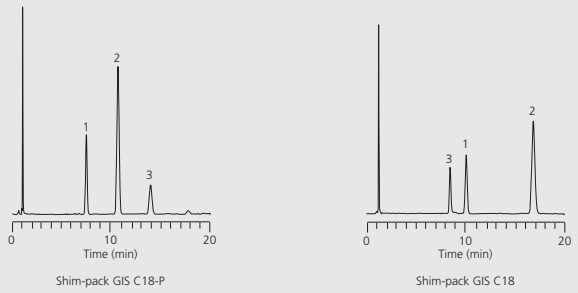
Shim-pack GIS C18-P is designed with a polymerically bonded octadecy group, which provides high steric selectivity for separation of planar and non-planar compounds. It achieves complete baseline separation of structurally similar compounds such as vitamin D2 and D3 because of the planarity recognition 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 m^2/g
Carbon Loading	29 %
End-capping	-
pH range	2 - 7.5
USP Code	L1

Analysis Example

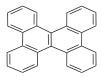
Due to increased retention of planar structural compounds, Shim-pack GIS C18-P shows different selectivity compared to Shim-pack GIS C18.

Analysis of Planar and Non-planar Compounds

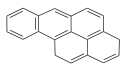


■ Peaks
1. Phenanthro[3,4-c]phenanthrene (PhPh)

2. Tetrabenzonaphthalene (TBN)



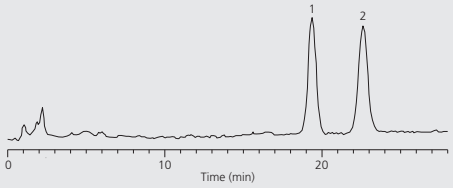
3. Benzo[a]pyrene (BaP)



■ 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 (0.1mg/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

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	1.5	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 63.

Shim-pack GIS RP-Shield

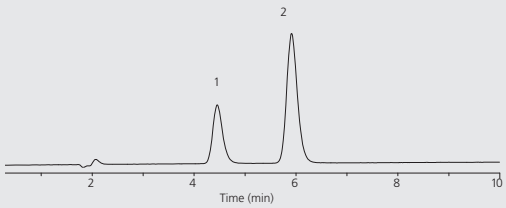
Embedded with a Polar Functional Group

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 m^2/g
Carbon Loading	9 %
End-capping	-
pH Range	2 - 7.5
USP Code	L1

Analysis Example

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

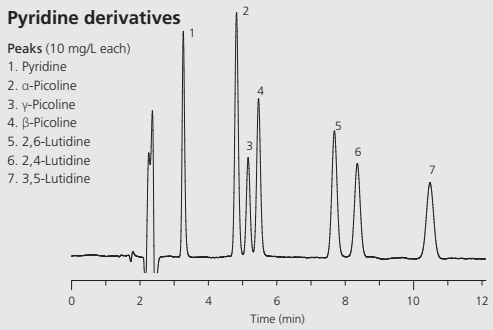
Ultra-High Inertness, High Durability

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 m^2/g
Carbon Loading	8 %
End-capping	Yes
pH Range	1 - 10
USP Code	L7

Analysis Examples

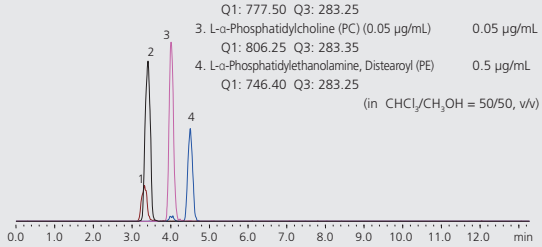
Pyridine derivatives



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

Phospholipids

Peaks
1. Phosphatidyl-L-Serine (PS) 10 µg/mL
Q1: 788.20 Q3: 283.30
2. L-α-Phosphatidyl-DL-glycerol, Distearoyl (PG) 0.2 µg/mL
Q1: 777.50 Q3: 283.25
3. L-α-Phosphatidylcholine (PC) (0.05 µg/mL) 0.05 µg/mL
Q1: 806.25 Q3: 283.35
4. L-α-Phosphatidylethanolamine, Distearoyl (PE) 0.5 µg/mL
Q1: 746.40 Q3: 283.25
(in $CHCl_3/CH_3OH$ = 50/50, v/v)



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)	Length (mm) \ I.D. (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)
2	30	227-30160-01	227-30161-01	-	50
	50	227-30160-02	227-30161-02	-	
	75	227-30160-03	227-30161-03	-	
	100	227-30160-04	227-30161-04	-	80
	150	227-30160-05	227-30161-05	-	
3	30	227-30198-01	227-30199-01	227-30200-01	50
	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)	Holder
		1.5	2.1	3.0		
2	10	227-30201-01	227-30202-01	227-30203-01	80	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)
		1.5	2.1	3.0	
2	10	227-30201-02	227-30202-02	227-30203-02	80
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)
2	30	227-30789-01	227-30790-01	227-30791-01	80
3		227-30792-01	227-30793-01	227-30794-01	50

Shim-pack GIST Phenyl

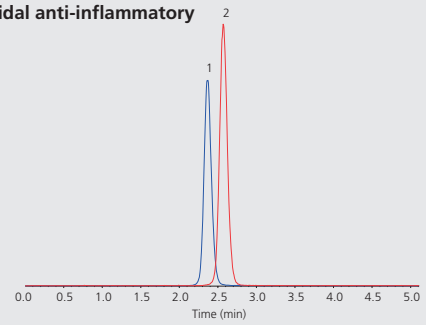
Extremely Strong π-π Interactions

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 m^2/g
Carbon Loading	10 %
End-capping	-
pH Range	2 - 7.5
USP Code	L11

Analysis Example

Steroidal anti-inflammatory drug



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)
2	30	227-30207-01	227-30208-01	-	50
	50	227-30207-02	227-30208-02	-	
	75	227-30207-03	227-30208-03	-	
	100	227-30207-04	227-30208-04	-	80
	150	227-30207-05	227-30208-05	-	
3	30	227-30243-01	227-30244-01	227-30245-01	50
	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)	Holder
		1.5	2.1	3.0		
2	10	227-30246-01	227-30247-01	227-30248-01	80	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)
		1.5	2.1	3.0	
2	10	227-30246-02	227-30247-02	227-30248-02	80
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)
2	30	227-30795-01	227-30796-01	227-30797-01	80
3		227-30798-01	227-30799-01	227-30800-01	50

Shim-pack GIST Phenyl-Hexyl

Alternative Selectivity to C18 Columns

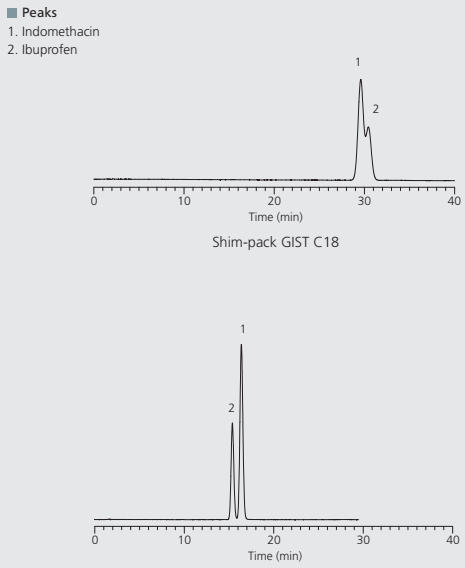
Shim-pack GIST Phenyl-Hexyl columns are bonded with a phenyl ring together with a hexyl (C6) chain, which provides complementary selectivity to straight alkyl-chain columns due to its π-π interactions and hydrophobic interactions. Furthermore, Shim-pack GIST Phenyl-Hexyl maintains the same ultra-high 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 m^2/g
Carbon Loading	9 %
End-capping	Yes
pH Range	1 - 10
USP Code	L11

Analysis Example

Different Selectivity to Shim-pack GIST C18

Analysis of Analgesic Drugs

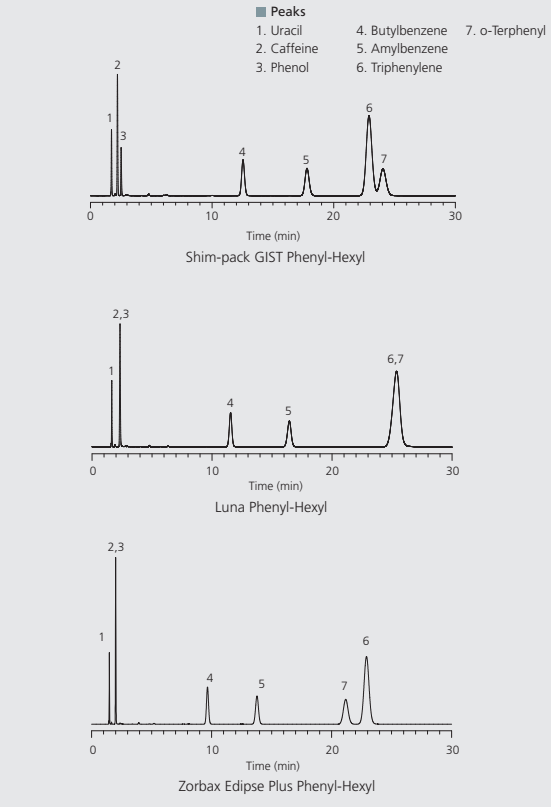


Conditions

Column	: 150 mmL. × 4.6 mmI.D., 5 µm
Mobile Phase	: A) Acetonitrile B) 25 mmol/L Monopotassium phosphate buffer solution (pH 3.0) A/B = 45/55 (v/v)
Flow Rate	: 1.0 mL/min
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			
		1.0	1.5	3.0	4.0
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

Analytical Columns (High-Pressure Series)

Particle Size (µm)	I.D. (mm) / Length (mm)	2.1	3.0	4.6	Pressure Tolerance (MPa)
3	30	-	227-30714-01	227-30715-01	50
	50	227-30713-01	227-30714-02	227-30715-02	
	75	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)	Holder
		1.5	2.1	3.0		
3	10	227-30716-01	227-30717-01	227-30718-01	80	227-30533-01

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

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)
3	30	227-30804-01	227-30805-01	227-30806-01	50

Shim-pack GIS HILIC

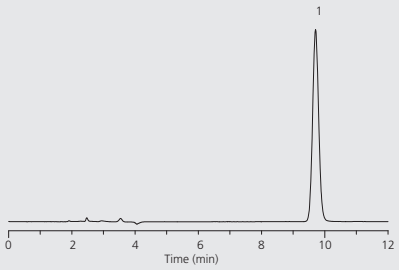
Ideal for the Separation of Highly Polar Basic Compounds

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 - 7.5
USP Code	L20

Analysis Example

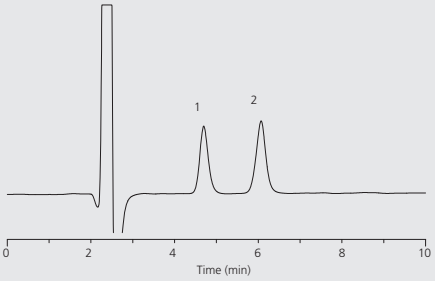
Analysis of Allantoin



■ 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 63.

Shim-pack GIST NH2

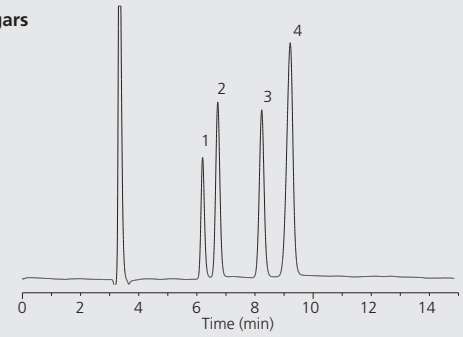
Ideal for Sugar Analysis

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 -7.5
USP Code	L8

Analysis Examples

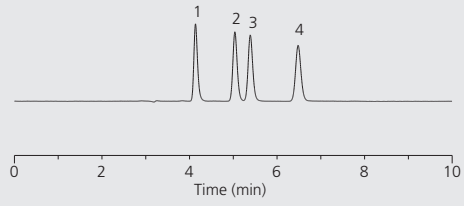
Sugars



■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. : 30 °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

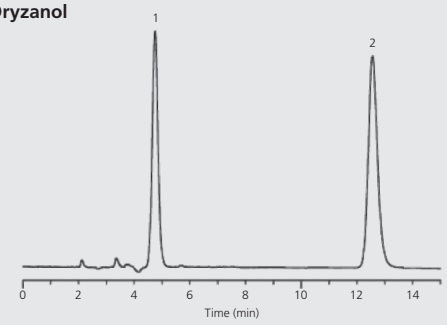
Suitable in Either Reversed Phase or Normal Phase Mode

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 - 7.5
USP Code	L10

Analysis Examples

γ - Oryzanol

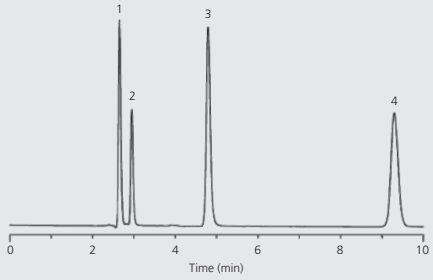


■ Peaks
1. gamma-oryzanol
2. vanillin

■ 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

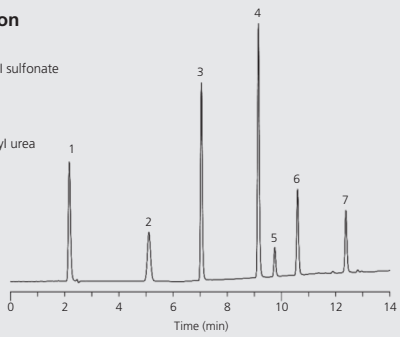
Shim-pack GWS C18 is packed with high-purity silica gel. A uniform pore size ensures low pressure, while complete end-capping makes it possible for analysis of acidic or basic compounds.
Shim-pack GWS series is an ideal choice for cost control.

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 - 7.5
USP Code	L1

Analysis Examples

Cold medication

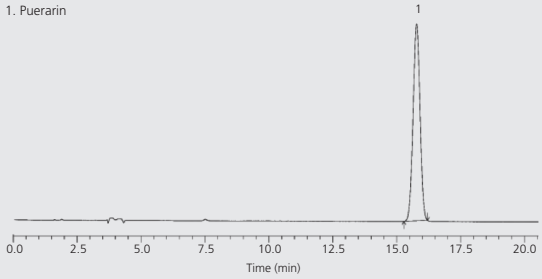
Peaks (10 mg/L each)
1. Potassium Guaiacol sulfonate
2. Acetaminophen
3. Caffeine
4. Ethenzamide
5. Allyl isopropyl acetyl urea
6. Isopropylantipyrine
7. Ibuprofen



■ 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

Peaks
1. Puerarin



■ 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 Column

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 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 m2/g
Carbon Loading	18%
Pressure Tolerance	20 MPa
Pore Volume	1 mL/g
End-capping	Yes
Bonding Type	Monomeric
pH Range	1.5 - 9
USP Code	L1

Analysis Examples

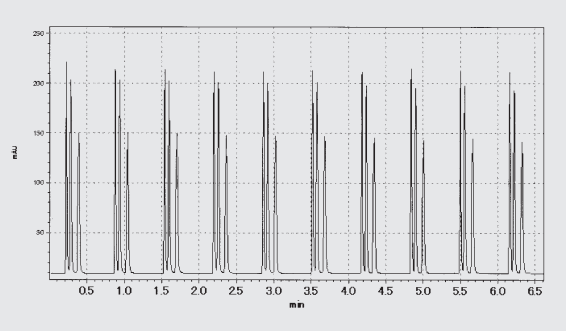
Shim-pack FC-ODS separates components by hydrophobic interaction like other ODS columns. It is possible to change to Shim-pack FC-ODS from other ODS columns under the same analytical conditions. On the other hand, hydrophilic interaction (hydrogen bond, coordination bond) has been restricted to a minimum, 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.

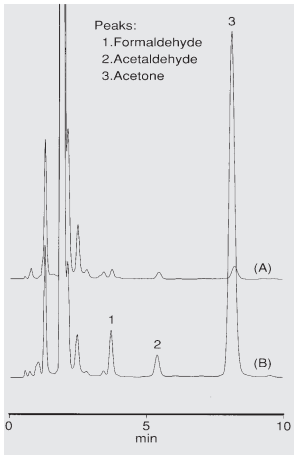
Conditions
Column : Shim-pack FC-ODS (30 mmL. × 4.6 mmI.D., 3 µm)
(P/N: 228-40511-91)
Mobile Phase : Water/Acetonitrile = 55/45 (v/v)
Flow Rate : 3.0 mL/min (Column Pressure ca.8MPa)
Col. Temp. : 50 °C
Detection : 254 nm Response 1, AuxRNG×2
Instrument : LC-2010+C-R8A

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

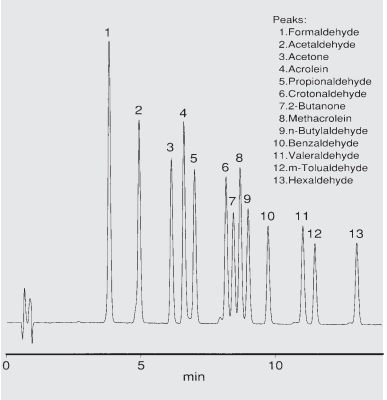
Chromatogram of Standard Sample
(formaldehyde 0.35µg/mL, acetaldehyde 0.55µg/mL, 10µL injected)

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



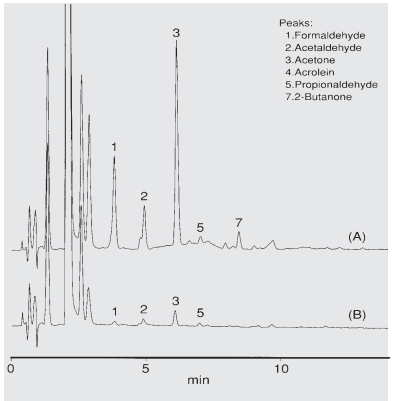
Chromatograms of Environmental Air (A) and Indoor Air at Laboratory (B)



Chromatogram of Standard Sample
(each 0.3µg/mL as carbonyl compounds, 10µL injected)

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.

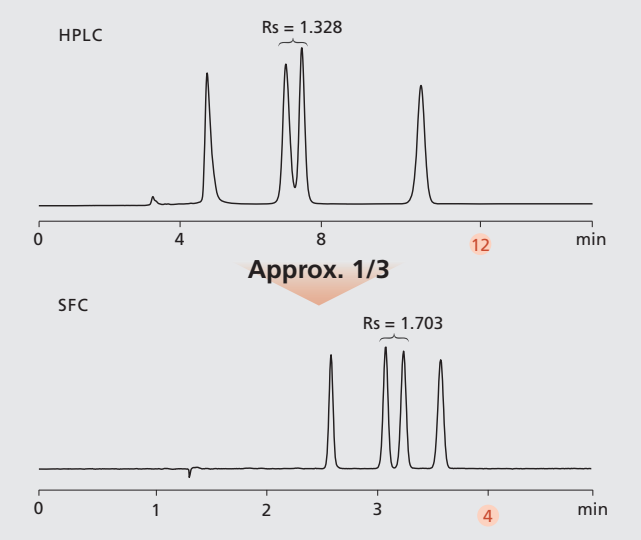
	Shim-pack UC RP	Shim-pack UC GIS II	Shim-pack UC Phenyl	Shim-pack UC CN
Bonded Phase	Octadecyl Groups + Polar Functional Group	Octadecyl Groups	Phenyl Groups	Cyanopropryl Groups
Particle Size (µm)	3, 5	3, 5	3, 5	3, 5
Pore Size (nm)	10	10	10	10
Surface Area (m2/g)	450	450	450	450
Carbon Loading	9%	11%	9.5%	14%
Pressure Tolerance (MPa)	50 (3µm), 30 (5µm)	50 (3µm), 30 (5µm)	50 (3µm), 30 (5µm)	50 (3µm), 30 (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)	50 (3µm), 30 (5µm)	50 (3µm), 30 (5µm)	50 (3µm), 30 (5µm)	50 (3µm), 30 (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

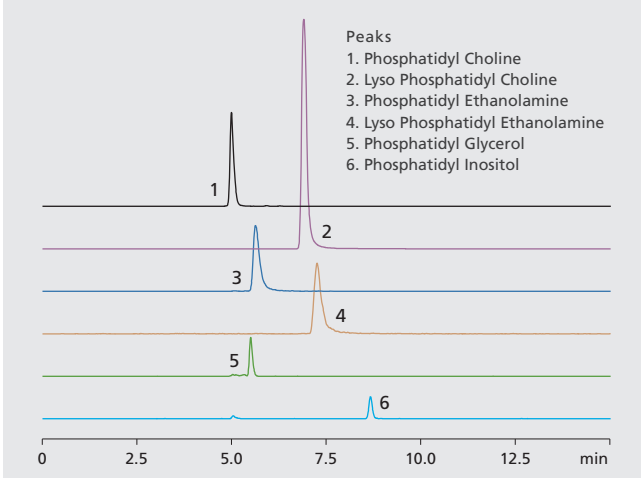
Tocopherol Isomers

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

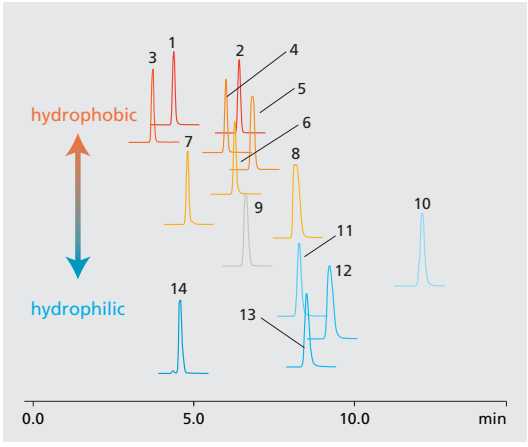


The example above shows the result of the analysis of phospholipid classes using Shim-pack UC Diol with Nexera UC. The ODS-based Shim-pack UC GIS II can also be used to analyze molecular species of phospholipids with the same modifiers. Nexera UC and Shim-pack UC series are ideal for analyzing complex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

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 × 103	300 × 8.0	228-20803-91
Shim-pack GPC-802	5 × 103	300 × 8.0	228-20804-91
Shim-pack GPC-8025	2 × 104	300 × 8.0	228-20805-91
Shim-pack GPC-803	7 × 104	300 × 8.0	228-20806-91
Shim-pack GPC-804	4 × 105	300 × 8.0	228-20807-91
Shim-pack GPC-805	4 × 106	300 × 8.0	228-20808-91
Shim-pack GPC-806	4 × 107	300 × 8.0	228-20809-91
Shim-pack GPC-80M	4 × 107, 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 × 103	300 × 8.0	228-20803-92
Shim-pack GPC-802C	5 × 103	300 × 8.0	228-20804-92
Shim-pack GPC-8025C	2 × 104	300 × 8.0	228-20805-92
Shim-pack GPC-803C	7 × 104	300 × 8.0	228-20806-92
Shim-pack GPC-804C	4 × 105	300 × 8.0	228-20807-92
Shim-pack GPC-805C	4 × 106	300 × 8.0	228-20808-92
Shim-pack GPC-806C	4 × 107	300 × 8.0	228-20809-92
Shim-pack GPC-80MC	4 × 107, 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

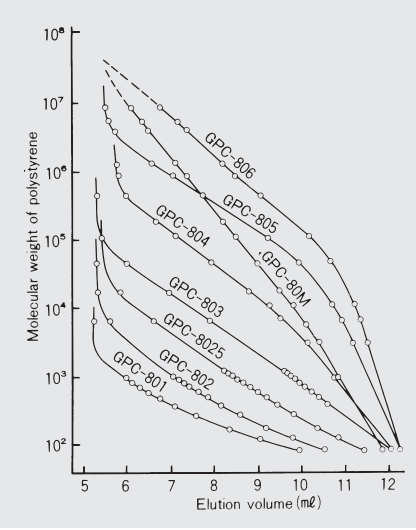
Column	Exclusion Limit (polystyrene)	Dimensions (Length × I.D., mm)	P/N
Shim-pack GPC-801D	1.5×10^3	300 × 8.0	228-20803-93
Shim-pack GPC-802D	5×10^3	300 × 8.0	228-20804-93
Shim-pack GPC-8025D	2×10^4	300 × 8.0	228-20805-93
Shim-pack GPC-803D	7×10^4	300 × 8.0	228-20806-93
Shim-pack GPC-804D	4×10^5	300 × 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

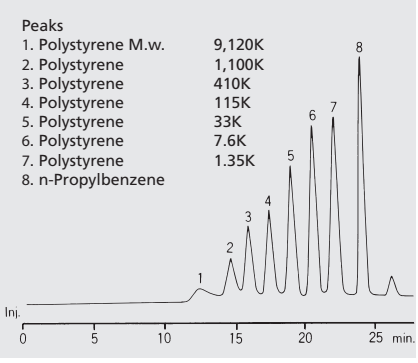
Calibration Curves



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).

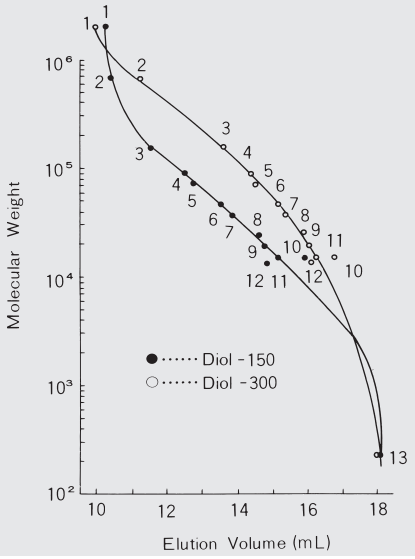
Product Information

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

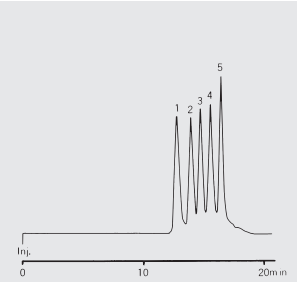


■ Peaks
1. Blue dextran 2000
2. Thyroglobulin
3. y-Globulin
4. Transferrin
5. Human serum albumin
6. Ovalbumin
7. β-Lactoglobulin
8. Chymotrypsin
9. Myoglobin
10. Lysozyme
11. Ribonuclease A
12. Cytochrome C
13. Gly-Tyr

■ **Conditions**

Column : Shim-pack Diol Series (500 mmL. × 7.9 mmI.D., 5 µm)
Mobile Phase : A) 10mmol/L phosphate buffer solution (pH 7)
B) 0.2mol/L 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

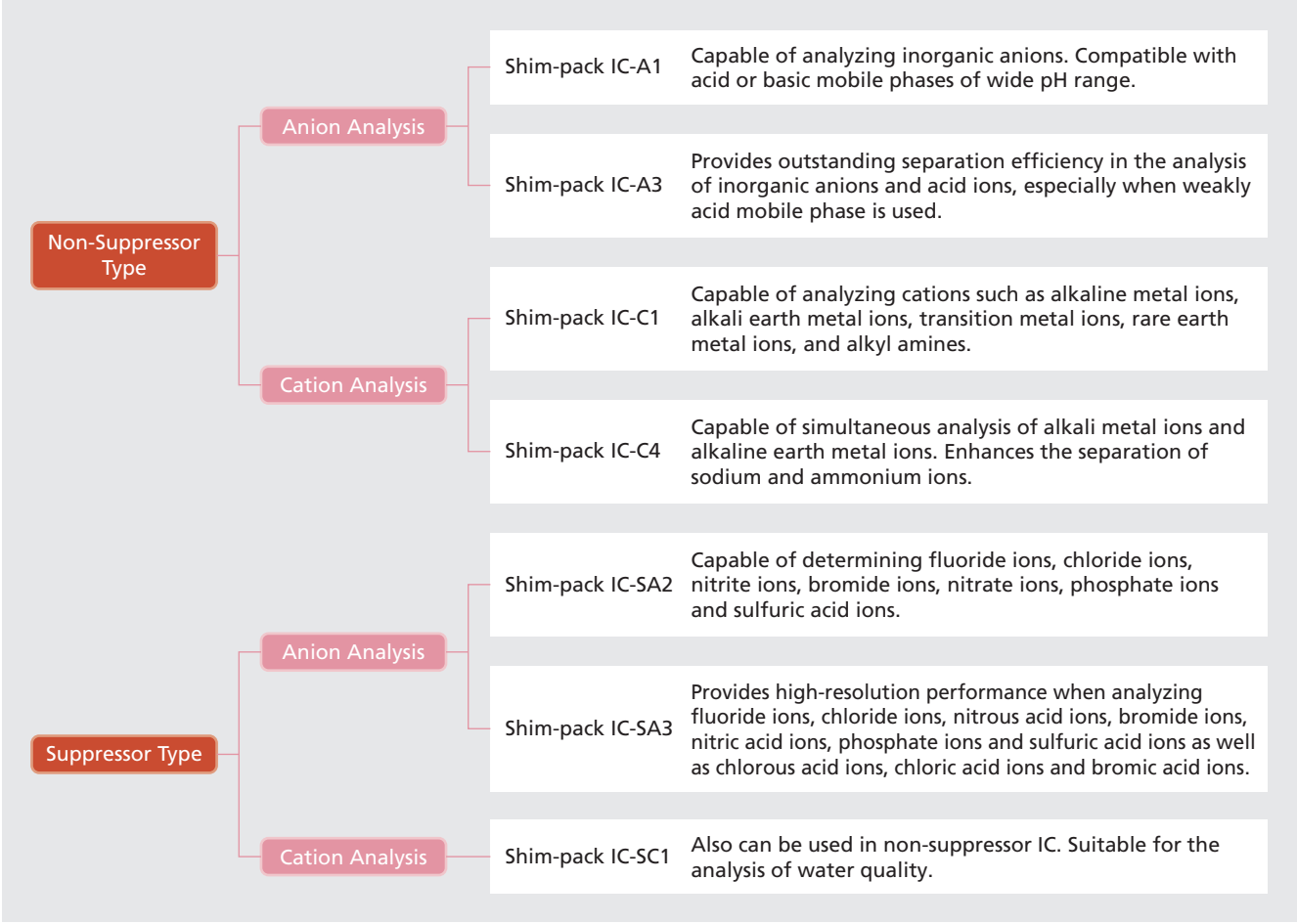
■ **Conditions**

Column : Shim-pack Diol-300 (500 mmL. × 7.9 mmI.D., 5 µm)
(P/N: 228-14776-92)
Mobile Phase : A) 10mmol/L phosphate buffer solution (pH 7)
B) 0.1mol/L 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.



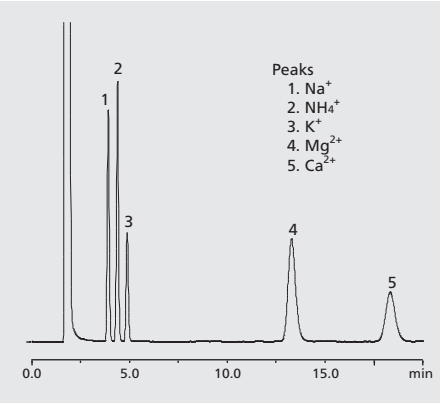
Analysis Examples

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.



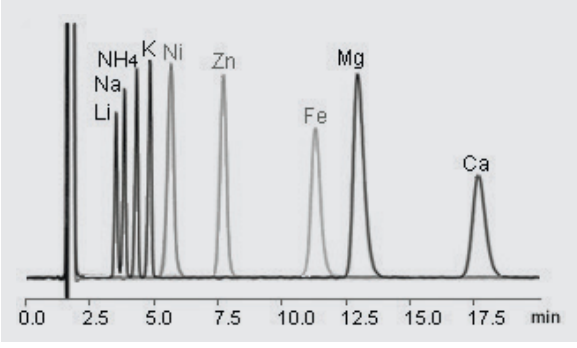
Analyses of a Standard Mixture of 5 Cations

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.



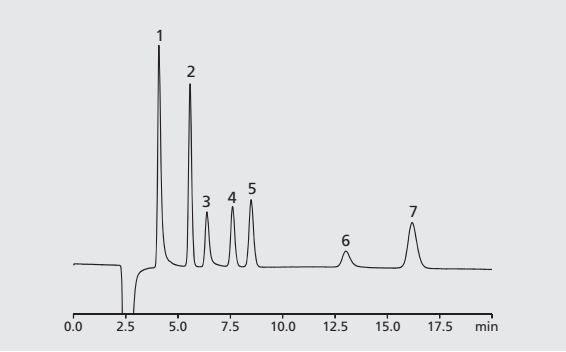
Conditions

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

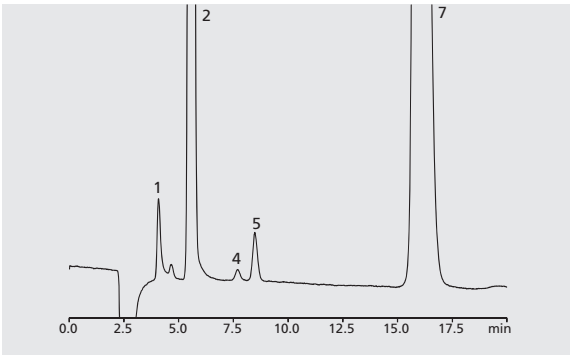
Shim-pack IC Series

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 of Standard Anion Samples



Analysis of Tap Water

Conditions

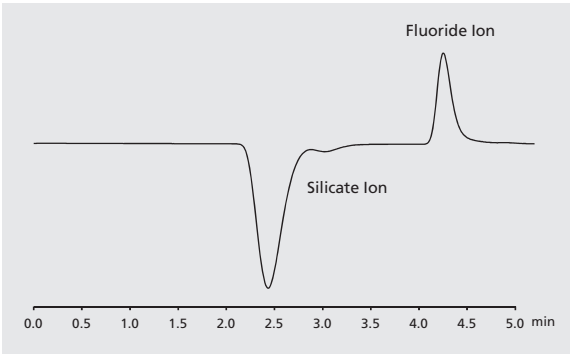
Column : Shim-pack IC-SA2 (250 mmL. × 4.0 mmI.D.)
(P/N: 228-38983-91)
Mobile Phase : A) 12 mmol/L sodium hydrogen carbonate
B) 0.6 mmol/L sodium carbonate
A/B = 60/40 (v/v)
Flow Rate : 1.0 mL/min
Col. Temp. : 30 °C
Detection : CDD
Injection Vol. : 50 µL

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

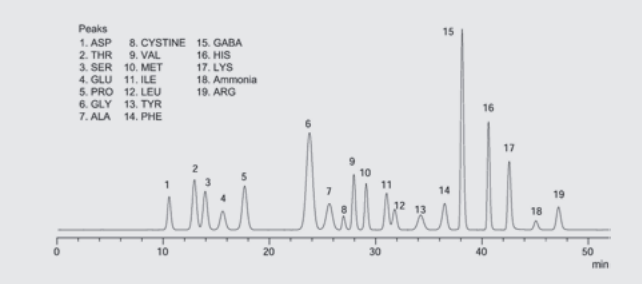
Column	Stationary Phase	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N	Guard Column
Shim-pack IC-A1	Quaternary ammonium group	12.5	100 × 4.6	228-17733-91	228-17734-91
Shim-pack IC-A3	Quaternary ammonium group	5	150 × 4.6	228-31076-91	228-31076-92
Shim-pack IC-A3 (S) *1	Quaternary ammonium group	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	-	250 × 4.0	228-38983-91	228-38983-92
Shim-pack IC-SA3	Quaternary ammonium group	-	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

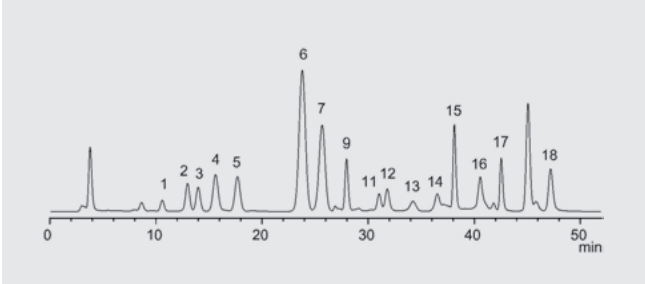
Shim-pack Amino series uses polystyrene gel as solid support, making it possible to utilize both electrostatic reaction and hydrophobic reaction. It is ideal for the analysis of amino acids.



Analysis of Amino Acid Standard

Conditions

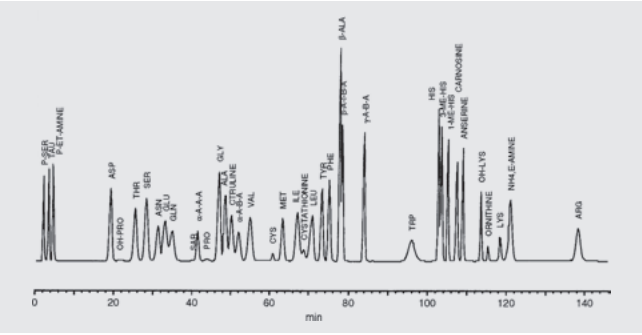
Column : Shim-pack Amino-Na (100 mmL. × 6.0 mmI.D., 5 µm) (P/N: 228-18837-91)
Mobile Phase : Mobile phase kit for amino acid analysis (Na Type) (P/N: 228-21195-94)
Flow Rate : 0.4 mL/min
Col. Temp. : 60 °C
Detection : RF (Post-column derivation)



Analysis of Vinegar

Peaks

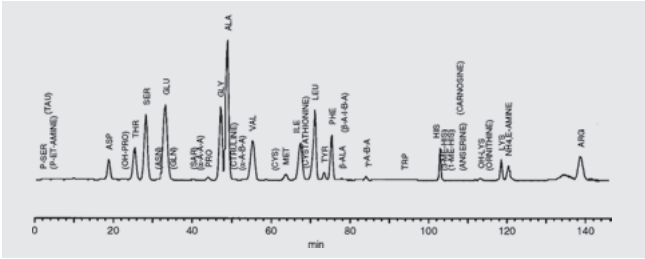
1. ASP	6. GLY	11. ILE	16. HIS
2. THR	7. ALA	12. LEU	17. LYS
3. SER	8. CYSTINE	13. TYR	18. ARG
4. GLU	9. VAL	14. PHE	
5. PRO	10. MET	15. GABA	



Simultaneous Analysis of 38 Amino Acids

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



Analysis of Soy Sauce

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.

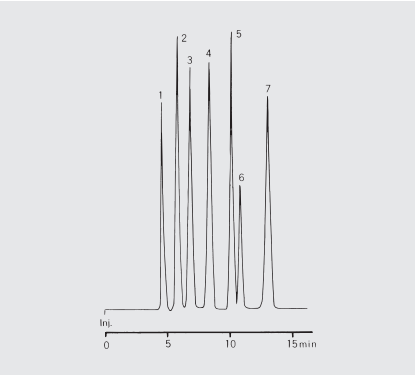
In the analysis of amino acids, the following trap columns are required.

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.

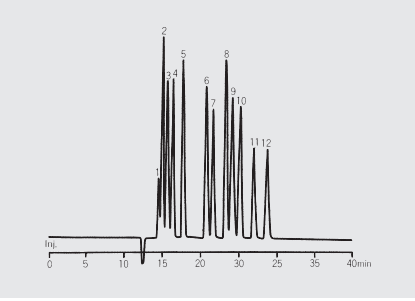


Analysis of Saccharide Standard

■ 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)

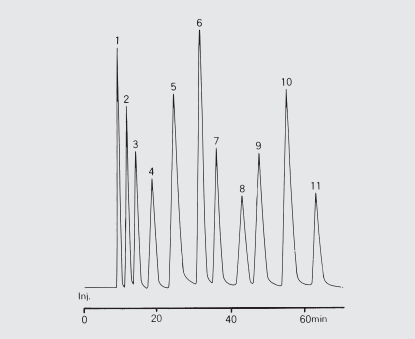
Product Information

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

Analysis of Sugar and Organic Acid

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 Saccharide Standard

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

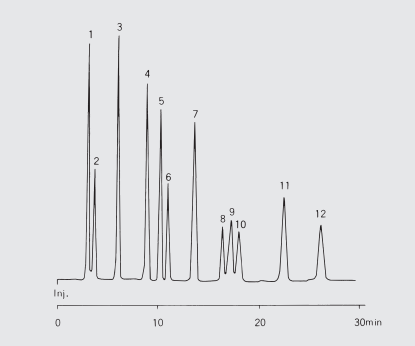
Column	Stationary Phase	Particle Size (µm)	Dimensions (Length × I.D., mm)	P/N	Guard Column
Shim-pack ISA-07/S 2504	Quaternery ammonium group	7	250 × 4.0	228-09699-91	228-00823-91
Shim-pack ISC-05/S 0504	Na type sulfone group	5	38 × 4.6	228-09700-91	228-00802-91
Shim-pack ISC-07/S 1504	Na type sulfone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

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.

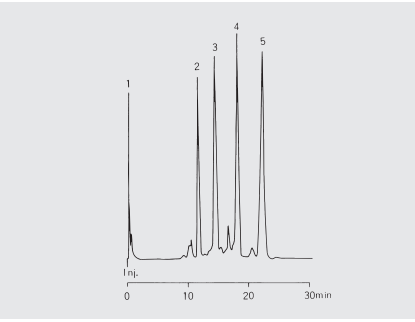


Analysis of Mononucleotides

■ 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	Corboxyl group	5	50 × 4.0	228-16366-91
Pre-column Diol *	Diol group	10	50 × 4.0	228-16367-91

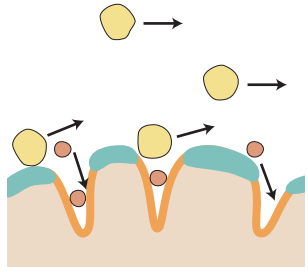
* Installed between the liquid pump and the sample injector to protect the column.

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.

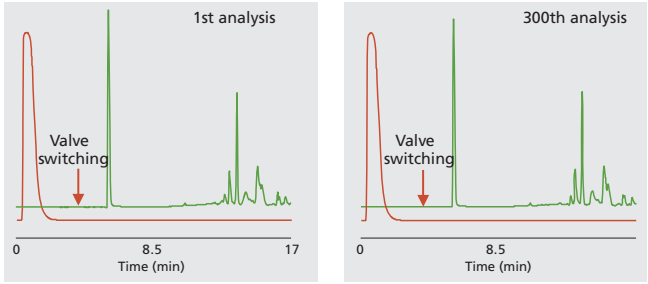


Quick and Reliable Protein Removal

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

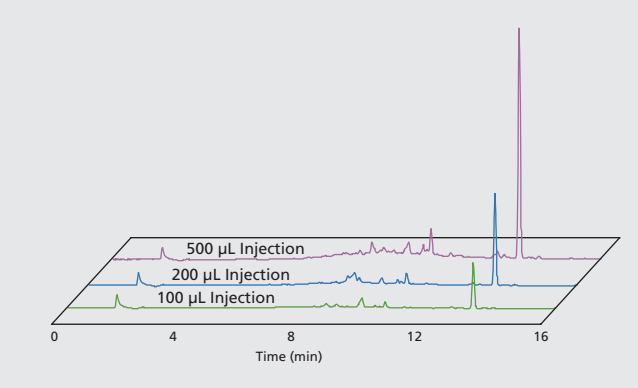
Samples : Isopropylantipyrine added Blood plasma
Sample solution: 0.1% phosphoric acid and acetonitrile mixture (95:5)
Dilution: 8 times
Detection : Analysis: 275 nm, Blood plasma matrix: 280 nm
Injection Vol. : 100 µL

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.shimadzu.com/an/hplc

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 20.)

Columns	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

Preparative Columns

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 mmI.D. preparative columns is 75 mm.

Column Fittings

UHPLC Fittings (Pressure Tolerance: 130MPa)

A UHPLC fitting is installed to the column inlet tubing in a UHPLC system. Not only can it tolerate pressure of 130MPa, it can be re-used when following the proper tightening torque specifications.

228-56867-41

228-56867-42

228-56866

P/N	Description	Pack
228-56867-41	UHPLC Fitting S	1
228-56867-42	UHPLC Fitting L*	1
228-56867-43	UHPLC Fitting S	10
228-56866	Extender Tool for UHPLC Fitting	1

* UHPLC Fitting L is 5 mm longer than UHPLC Fitting S. It is recommended for use when a channel switching valve (FCV-32AH/34AH/36AH) is installed.

Male Nut Fitting Set (Pressure Tolerance: 35MPa)

The male nut fitting set is assembled with two SUS hand-tightened male nuts and two PEEK ferrules with taper-shaped ends. This product can be tightened by hand to connect with columns that tolerate pressure of 35 MPa.

P/N	Description	Pack
228-45717-01	Male Nut Fitting Set	2
228-45717-02	PEEK Ferrule	10

Male Nut PEEK (Pressure Tolerance: 20MPa)

This nut is superior in chemical compatibility and mechanical strength. It is available for 1.6 mmI.D. pipe such as stainless, titanium, teflon, tefzel, PEEK etc. Maximum pressure is 20MPa. Some Shim-pack columns are packed with two piece of PEEK male nuts. Extra nuts can be ordered by referring to the part number on the right.

P/N	Description	Pack
228-18565-84	Male Nut, PEEK	5

Mobile Phase Cleaner for UHPLC/HPLC

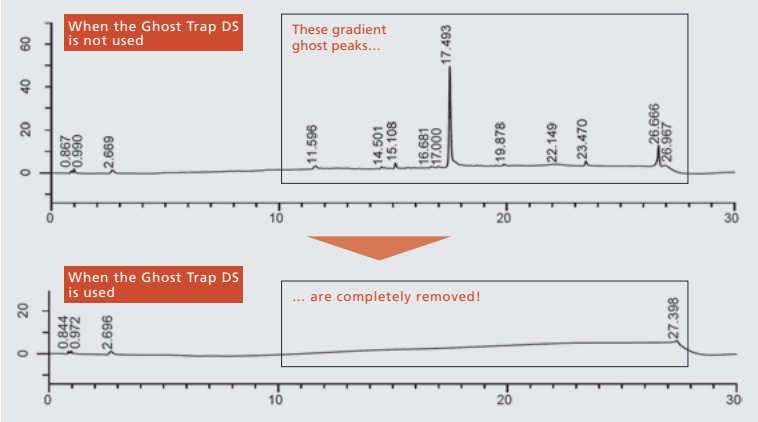
Ghost Trap DS/DS-HP

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	35 MPa
	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	100 MPa

*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).

LabTotal Vial

Are You Losing Precious Samples Because of Your Vials?

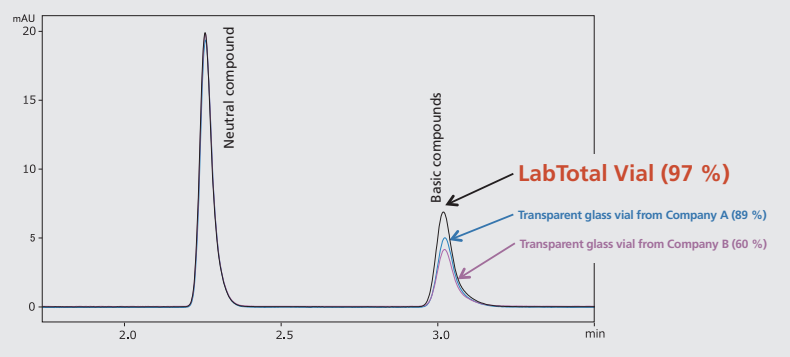
Adsorption of vials affects the accuracy of your analysis results. Some sample vials have low adsorption, but are not consistent. Other sample vials suffer from poor recovery rates.

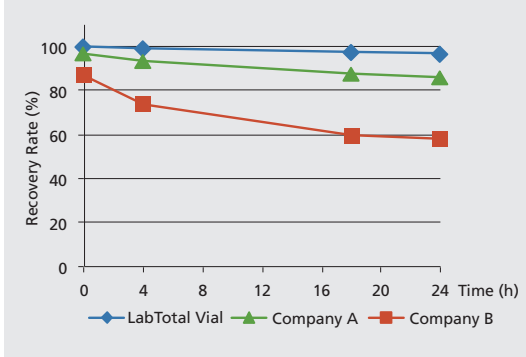
Introducing the Shimadzu LabTotal Vial

P/N	Description	Pack
227-34001-01	LabTotal Vial Certified Kit	100

Reduced Adsorption of Basic Substances

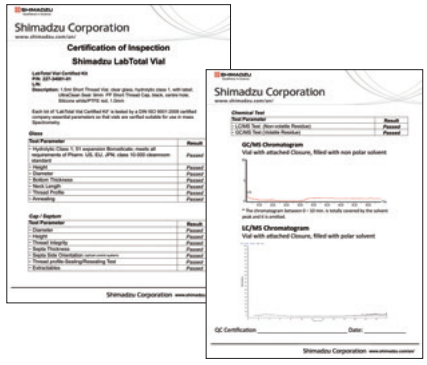
Adsorption of basic substances, a drawback of glass vials, has been reduced as much as possible. As a result, stable recovery rates can be obtained with no changes over time.





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.



Wide-Mouthed Vial, with Preset Septum and Cap

This product is designed so that the corners of the bottom of the vial interior can be reached by inserting a 100 µL scale micropipette tip obliquely, which increases the ease of use when inserting and retrieving samples.
Also, marking labels, handy for note taking, are included with the vials.

Shimadzu Corporation
www.shimadzu.com/an/