

Gas Chromatograph Series Columns

GC Columns Guidebook

CoreFocus

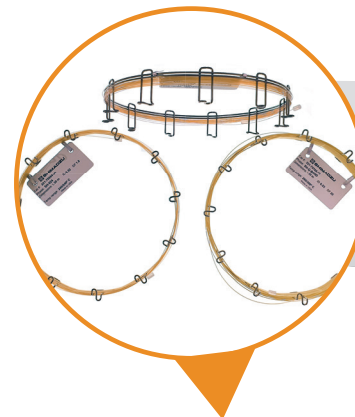


SH-GC-Columns

Shimadzu offers a broad range of columns, suitable for every GC/GCMS-system. Various stationary phases are available in a variety of dimensions, suitable for many different applications.

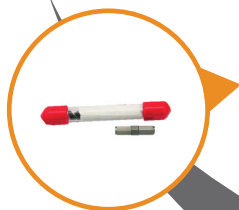
SH-GC column line-up:

- **SH-I** Superior inert, high performance columns
- **SH** Robust and reliable general purpose columns
- **MetalX** Metal column for high temperature applications
- **Dedicated Columns** for specific use, 1614, CLP, BAC, WAX, ...
 - PLOT Columns
 - Fast GC Columns
 - Guard Columns



Genuine Spares and Accessories

Shimadzu approved quality – valves, connectors, nuts ... and further parts from the original instrument manufacturer help you to ensure the best function of your instrument.



Gas Filter

Impurities in gases, such as hydrocarbons, moisture and oxygen, can contaminate the gas line and instrument, cause column degradation and affect the accuracy of your analytical results, which may lead to instrument downtime. Even when using high-purity gases, contaminants may result from pressure regulators or other connections in the gas line. Therefore, an additional gas filter is essential to **ensure highest security and performance**.



Ferrules and Unions

Shimadzu provides an array of connection types to use in the GC, each selected to ensure the best connection solution is achieved. The correct selection of the connection type will eliminate dead volumes, leaks during temperature cycling and problems with mismatched tubing sizes.



Shimadzu Consumables for GC/GCMS Analytics

The One-Stop-Supplier for all Your Needs

Inlet Liner

The GC inlet liner is where the sample is introduced and vaporized into the gaseous phase. The geometry of each Shimadzu inlet liner is important and the correct choice of inlet liner can significantly improve the chromatographic performance. Inlet liner deactivation and quartz wool quantity and position are essential to ensure reproducible and accurate sample introduction of each sample type.



GC Vials and Caps

Shimadzu offers a broad range of vials and caps for GC/GCMS and Headspace applications. You can either assemble your set of vials and caps according to your demands or choose from pre-assembled kits. The portfolio covers vials for all needs, ... from certified GCMS vials, via standard vials to accessories like vial-boxes and crimping-tools.



Syringes

Shimadzu syringes for both manual and autosampler offer a superior performance, with an improved durability, precision and accuracy.



SPME

Solid Phase Microextraction (SPME) is a solvent-free sample preparation technology. The fibers and arrows are coated with a sorbent, which extracts the analytes of interest from the sample. Shimadzu offers a wide variety of SPME fibers and arrows based on the **SMART-technology of our AOC-6000plus autosampler**, suitable for a broad range of applications.



Inlet Septa

Low-bleed septa are not completely free of bleeding. The type of bleeding that occurs varies with the septa, and results in different patterns on chromatograms. Therefore, Shimadzu septa are selected to contribute to low bleed and optimum sealing for many injections.



Find our full portfolio of columns and accessories
www.shimadzu.eu/columns-and-consumables



Find all products 24/7 in our Webshop
www.shimadzu.eu/Shimadzu-goes-webshop

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Capillary Columns

High-Performance Columns

Check the structure of the target components

Investigate the structure (functional group), boiling point, nature, stability, and other properties of the target component.



Select the stationary phase

Selecting a stationary phase of chemical properties close to those of the target component helps increase retention force and prevent drops in separation caused by defective peak shape.

Stationary Phase	100% dimethyl polysiloxane	** % diphenyl / ** % dimethyl polysiloxane	** % cyanopropylphenyl / ** % dimethyl polysiloxane	Trifluoropropyl methyl polysiloxane	Polyethylene glycol
Polarity	Non-polar	Low to Medium	Medium	Medium to High	High
Separation Properties	Elution in boiling point order	Aromatic compounds are retained by phenyl group content	Effective for separation of oxygenated compounds, isomers, etc.	Uniquely retains compounds containing halogens	Strong retention of polar compounds
Applications	Gasoline and solvent related	Flavors, environmental related, aromatic compounds	Pesticides, PCBs, oxygenated compounds	Halogenated compounds, polar compounds, solvents	Polar compounds, solvents, Flavors, FAME
Columns	SH-I-1MS SH-I-1HT SH-1 SH-MetalX	SH-I-5MS SH-I-5HT SH-I-17 SH-5 SH-5MS SH-20 SH-35 SH-65 SH-MetalX-5	SH-1301 SH-624 SH-1701	SH-200 SH-200MS	SH-Wax SH-PolarWax



Determine the column size

Determine the column size according to the sample amount to inject while referring to the following table.

Inner Diameter	0.18 mm	Has extremely high resolution but its sample load is small. <ul style="list-style-type: none"> • Samples having a complex mixed system • Suited to split injection
	0.25 mm 0.32 mm	Has high resolution and a moderate sample load <ul style="list-style-type: none"> • Supports samples having a complex mixed system • Suited to split/splitless injection
	0.53 mm	Has satisfactory resolution and a large sample load <ul style="list-style-type: none"> • Suited to purity measurement and analysis of trace components • Used in direct injection, on-column injection, and large-volume injection • Can be easily replaced from packed column
Film Thickness	Thick Film	<ul style="list-style-type: none"> • Good separation of high-concentration components • Suited to purity analysis
	Thin Film	<ul style="list-style-type: none"> • Fast elution of high boiling point compounds • Suited to the analysis of medium to high boiling point compounds
Length		When twice as long (for fixed-temperature analysis) <ul style="list-style-type: none"> • The analysis time will be twice • The degree of separation will be 1.4 times

Capillary Columns

Cross-Reference

Shimadzu	Stationary Phase	USP	Similar Phases						Page
			Agilent	Restek	SGE	Phenomenex	Supelco	Alltech	
High-Performance Columns									
SH-I-1MS	100% dimethyl polysiloxane	G1, G2, G38	HP-1ms UI HP-1ms, DB-1ms UI DB-1ms Ultra-1 VF-1ms	Rxi-1MS	BP-1	ZB-1 ZB-1ms	SPB-1 Equity-1	At-1ms	9
SH-I-1HT	100% dimethyl polysiloxane	-	DB-1HT	Rxi-1HT	-	ZB-1HT inferno	-	AT-1ht	10
SH-I-5MS	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5ms UI HP-5ms DB-5 Ultra-2 CP Sil 8 CB	Rxi-5MS	BP-5ms	ZB-5 ZB-5msi	SPB-5 Equity-5	AT-5ms	11
SH-I-5Sil MS	1,4-bis(dimethylsiloxy)phenylene di- methyl polysiloxane	G27, G36	DB-5ms UI DB-5ms VF-5ms	Rxi-5Sil MS	BPX-5	ZB-5MS ZB-Semi-Volatiles ZB-5MS plus	SLB-5ms	-	12
SH-I-5HT	5% diphenyl / 95% dimethyl polysiloxane	-	DB-5HT VF-5HT	Rxi-5HT	HT-5	ZB-5HT inferno	-	-	13
SH-I-17	50% diphenyl / 50% dimethyl polysiloxane	G3	HP-17 DB-17 DB-17HT DB-608	Rxi-17	-	ZB-50	SPB-17	-	13
SH-I-17Sil MS	proprietary phase	G17	DB-17ms VF-17ms	Rxi-17Sil MS	BPX-50	-	-	-	14
SH-I-35Sil MS	proprietary phase	G42	DB-35ms DB-35ms UI VF-35ms	Rxi-35Sil MS	BPX-35 BPX608	ZB-MR2	-	-	15
SH-I-624Sil MS	proprietary phase	G43	DB-624 VF-624ms CP-Select 624 CB	Rxi-624Sil MS	BP-624	-	-	-	16
SH-I-1301Sil MS	silylene-based cyano	G43	VF-1301ms	Rxi-1301Sil MS	-	-	-	-	17
SH-I-PAH	proprietary phase	G51	-	Rxi-PAH	-	-	-	-	17
SH-I-XLB	Non-disclosure	-	DB-XLB, VF-Xms	Rxi-XLB	-	ZB-MR1, ZB-XLB	-	-	18
SH-I-SVOC MS	proprietary phase	G27, G36	DB-UI 8270D	Rxi-SVOC ms	-	ZB-SemiVolatiles	-	-	19
SH-I-LAO	proprietary phase	-	-	Rxi-LAO	-	-	-	-	19
General Purpose Columns									
SH-1	100% dimethyl polysiloxane	G1, G2, G38	HP-1 DB-1 CP Sil5CB	Rtx-1	BP-1	ZB-1	SPB-1	AT-1 EC-1	20
SH-1 PONA	100% dimethyl polysiloxane	-	CP-Sil PONA C8, DB-Petro, HP-PONA	Rtx-DHA	BP-1 PONA	-	Petrocol DH	-	20
SH-5	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5 DB-5 CP Sil8CB	Rtx-5	BP-5	ZB-5	SPB-5	AT-5 EC-5	21
SH-5MS	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5 DB-5 CP Sil8CB	Rtx-5MS	BP-5	ZB-5	SPB-5	AT-5 EC-5	22
SH-20	20% diphenyl / 80% dimethyl polysiloxane	G28, G32	-	Rtx-20	-	-	SPB-20	AT-20 EC-20	23
SH-35/ SH-35MS	35% diphenyl / 65% dimethyl polysiloxane	G42	HP-35 DB-35	Rtx-35	BPX-35 BPX-608	ZB-35	SPB-35 SPB-608	AT-35 AT-35ms	24
SH-50	100% methyl phenyl polysiloxane	G3	HP-50+ CP Sil24CB	Rtx-50	-	-	SPB-50	AT-50	25
SH-65	65% diphenyl / 35% dimethyl polysiloxane	-	-	Rtx-65	-	-	-	-	25
SH-65TG	65% diphenyl / 35% dimethyl polysiloxane	-	CP-TAP-CB	Rtx-65TG	-	-	-	-	26

Shimadzu	Stationary Phase	USP	Similar Phases						Page
			Agilent	Restek	SGE	Phenomenex	Supelco	Alltech	
SH-200/ SH-200MS	Trifluoropropylmethyl polysiloxane	G6	DB-210 DB-200 VF-200ms	Rtx-200	-	-	-	AT-210	26/27
SH-225	50% cyanopropylmethyl / 50% phenylmethyl polysiloxane	G7, G19	DB-225 CP Sil43CB	Rtx-225	BP-225	-	SPB-225	AT-225	28
SH-440	modified polysiloxane (unique phase)	-	-	Rtx-440	-	-	-	-	28
SH-502.2	diphenyl / dimethyl polysiloxane	-	DB-502.2	Rtx-502.2	-	-	-	-	28
SH-624	6% cyanopropylphenyl / 94% dimethyl polysiloxane	G43	HP-624 DB-624 DB-624 UI VF-624ms	Rtx-624	BP-624	ZB-624	SPB-624	AT-624	29
SH-1301	6% cyanopropylphenyl / 94% dimethyl polysiloxane	G43	DB-1301 CP-1301 VF-1301ms	Rtx-1301	-	-	-	AT-1301	29
SH-1701	14% cyanopropylphenyl / 86% dimethyl polysiloxane	G46	DB-1701P DB-1701 CP Sil19CB VF-1701ms VF-1701 Pesticides	Rtx-1701	BP-10	ZB-1701 ZB-1701P	SPB-1701	AT-1701	30
SH-2330	90% biscyanopropyl / 10% cyanopropylphenyl polysiloxane (Non-bonded)	G5, G8, G48	VF-23ms	Rtx-2330	BPX-70	-	SP-2330 SP-2331 SP-2380	AT-Silar90	31
SH-2560	biscyanopropyl / polysiloxane	G5	HP-88 CP-Sil88	Rtx-2560	-	-	SP-2560	-	31
SH-2887	dimethyl polysiloxane	G5	DB-2887	Petrocol 2887	-	-	-	-	31
SH-Wax	Polyethylene glycol	G14, G15, G16, G20, G39	DB-Wax	Rtx-Wax	BP-20	ZB-Wax	-	AT-WAXms EC-WAX	32
SH-PolarWax	Polyethylene glycol	G14, G15, G16, G20, G39	HP-Innowax CP-Wax 52CB VF-WAX MS	Stabilwax	-	ZB-Wax Plus	Supelco Wax-10	AT-WAX EC-WAX	33
Dedicated Columns									
SH-PolarD	Ideal for analysis of free acid	G25, G35	HP-FFAP, DB-FFAP, VF-DA, CP-Wax 58 CB, CP-FFAP CB	Stabilwax-DA	BP-21	ZB-FFAP	Nukol	ATAquaWax- DA, AT-1000, EC-1000	34
SH-5 Amine/ SH-35 Amine	Ideal for analysis of amines	-	-	Rtx-5 Amine	-	-	-	-	35
SH-Volatile Amine	Ideal for analysis of volatile amines	-	CP-Volamine	Rtx-Volatile Amine	-	-	-	-	36
SH-PolarX	Ideal for analysis of amines	-	CAM, CP-Wax 51 for Amines	Stabilwax-DB	-	-	Carbowax Amine	AT-CAM	36
SH-PolarWAX MS	Ideal for analyses of food, flavor, frag- rance, industrial chemical and solvent	G14, G15, G16, G20, G39	-	Stabilwax	-	-	-	AT-WAXms	37
SH-BAC Plus 1/ SH-BAC Plus 2	Ideal for analysis of alcohol com- pounds in blood	-	DB-ALC1 / DB-ALC2	Rtx-BAC Plus 1	-	ZB-BAC-1 / ZB-BAC-2	-	-	38
SH-OPP/SH-OPP2	Ideal for analysis of organophosphorus pesticides	-	-	Rtx-OPP2	-	-	-	-	39
SH-CLP/ SH-CLP II	Ideal for analysis of organochlorine pesticides	-	DB-CLP1 /DB-CLP2	Rtx-CLP	-	-	-	-	40
SH-PCB	Dedicated to PCBs analysis	-	-	Rtx-PCB	-	-	-	-	41
SH-VMS	Ideal for analysis of volatile organic pollutants	-	-	Rtx-VMS	-	-	-	-	42
SH-VRX	Ideal for analysis of volatile organic pollutants	-	-	Rtx-VRX	-	-	-	-	43
SH-Volatiles	Application-specific column for volatile organic compounds	-	-	Rtx-Volatiles, VOCOL	-	-	-	-	43
SH-1614	Ideal for analysis of PBDE	-	-	Rtx-1614	-	-	-	-	44

Capillary Columns

Cross-Reference

Shimadzu	Stationary Phase	USP	Similar Phases						Page
			Agilent	Restek	SGE	Phenomenex	Supelco	Alltech	
SH-FAME	Ideal for analysis of FAMES	G16	Select FAME	FameWax	-	-	Omega wax	ATAquaWax, AT-FAME	45
SH-Dioxin	Unique selectivity for toxic dioxin and furan congeners allows	-	-	Rtx-Dioxin2	-	-	-	-	46
SH-Mineral-Oil	Optimized column dimensions for fast mineral oil screening	-	Select Mineral Oil	Rtx-Mineral Oil	-	-	-	-	46
SH-TCEP	Ideal for aromatics and oxygenates in gasoline	-	CP-TCEP	SPB-TCEP	-	-	-	-	46
SH-βDEXse	Ideal for the separation of chiral compounds	-	-	Rtx-βDEXse	-	-	-	-	47
SH-βDEXsm	Ideal for the separation of most chiral compounds in essential oils	-	-	Rtx-βDEXsm	-	-	-	-	48
SH-βDEXsa	Unique selectivity for esters, lactones, and other fruit flavor components	-	-	Rtx-βDEXsa	-	-	-	-	48
SH-Alumina BOND/Na2SO4	Aluminum oxide with Na ₂ SO ₄ deactivation	-	GS-ALUMINA, CP-Al ₂ O ₃ /Na ₂ SO ₄	Rt-Alumina BOND/Na ₂ SO ₄	-	-	Alumina sulfate PLOT	AT-Alumina	49
SH-Alumina BOND/KCl	Aluminum oxide with KCl deactivation	-	GS-Alumina KCl, HP-PLOT Al ₂ O ₃ KCl, CP-Al ₂ O ₃ /KCl	Rt-Alumina BOND/KCl	-	-	Alumina chloride PLOT	-	49
SH-Alumina BOND/CFC	proprietary phase	-	Al ₂ O ₃ MAPD	Rt-Alumina BOND/CFC	-	-	-	-	50
SH-Alumina BOND/MAPD	proprietary phase	-	Al ₂ O ₃ MAPD	Rt-Alumina BOND/MAPD	-	-	-	-	50
SH-Msieve 5A	Molecular Sieve 5A	-	HP-PLOT Molesieve, CP-Molsieve 5A	Rt-Msieve 5A	-	-	Mol Sieve 5A PLOT	AT-Mole Sieve	51
SH-Q-BOND	100% divinylbenzene porous polymer	-	HP-PLOT Q, CP-PoraPLOT Q, CP-PoraBOND Q	Rt-Q-BOND	-	-	Supel-Q PLOT	AT-Q	52
SH-QS-BOND	Intermediate polarity porous polymer	-	GS-Q	Rt-QS-Bond	-	-	-	-	52
SH-U-BOND	Divinylbenzene ethylene glycol / dimethylacrylate porous polymer	-	HP-PLOT U, CP-PoraPLOT U, CP-PoraBOND U	Rt-U-BOND	-	-	-	-	52
Metal Columns									
SH-MetalX-1	100% dimethyl polysiloxane	G1, G2, G38	HP-1 DB-PS1 CP-Sil 5 CB	MXT-1	BP-1	ZB-1	SPB-1	AT-1 EC-1	54
SH-MetalX-1HT SimDist	100% dimethyl polysiloxane	-	CP-SimDist UltiMetal, DB-HT SimDis ProSteel	MXT-1HT SimDist	-	ZB-1X SimDist	-	-	54
SH-MetalX-5	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5 DB-5, CP-Sil 8 CB	MXT-5	BP-5	ZB-5	SPB-5	EC-5 AT-5	54
SH-MetalX-1701	proprietary phase	G46	DB-1701P DB-1701 CP-Sil 19 CB VF-1701ms VF1701 Pesticides	MXT-1701	BP-10	ZB-1701 ZB-1701P	Equity-1701	AT-1701	55
SH-MetalX-WAX	polyethylene glycol	G14, G15, G16, G20, G39	HP-INNOWax CP-Wax 53 CB VF-WAX MS	MXT-Wax	-	ZB-WAXplus	Supelco-wax-10	AT-WAX	55
SH-MetalX Biodiesel TG	proprietary phase	-	-	MXT-Biodiesel TG	-	-	METBiodiesel	-	55
SH-MetalX-Alumina BOND / Na2SO4	proprietary phase	-	CP-Al ₂ O ₃ /Na ₂ SO ₄	MXT-Alumina BOND/Na ₂ SO ₄	-	-	-	-	55
SH-MetalX-Q-BOND	Nonpolar porous polymer	-	PoraPLOT Q UltiMetal Quadrex PLT-Q	MXT-Q-BOND	-	-	-	-	56
SH-MetalX-Msieve 5A PLOT	proprietary phase	-	-	MXT-Msieve 5A	-	-	-	-	56

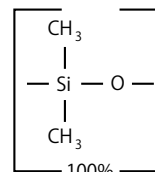
Capillary Columns

High-Performance Columns

SH-I-1MS

- Non-polar phase: Crossbond 100% dimethyl polysiloxane
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- General-purpose columns for arson accelerants, essential oils, hydrocarbons, pesticides, PCB congeners (e.g., Aroclor mixes), sulfur compounds, amines, solvent impurities, simulated distillation, oxygenates, gasoline range organics (GRO), refinery gases.
- Equivalent to USP G1, G2, G38 phase.
- Similar phases: Rxi-1MS, HP-1ms UI, HP-1ms, DB-1ms UI, DB-1ms, Ultra-1, VF-1ms, SPB-1, Equity-1, BP-1, ZB-1, ZB-1ms, AT-1ms

SH-I-1MS Structure

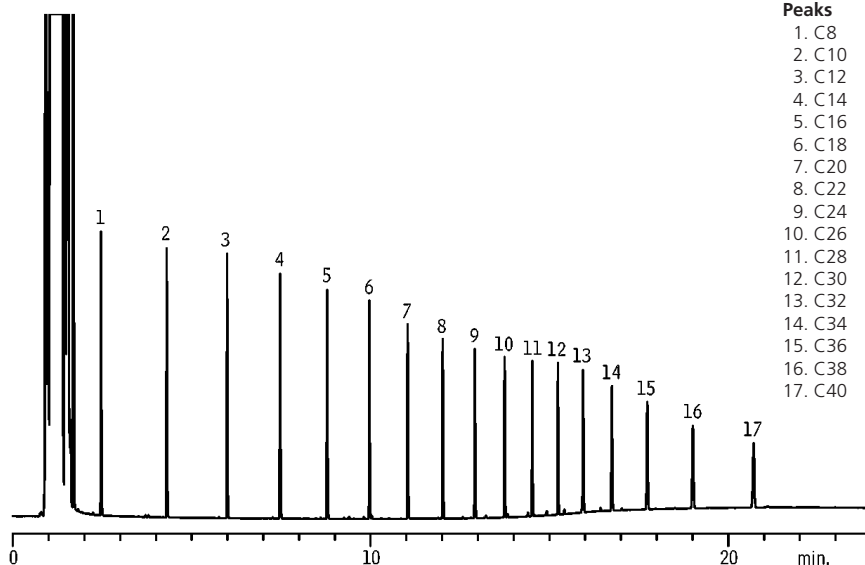


For SH-I-1MS columns with integrated Guard columns, please refer to Page 58

ID	df	Temp. Range	12 m	20 m	25 m	50 m
0.15 mm	0.15 µm	-60 to 330/350 °C	-	227-36001-01	-	-
	2.00 µm		-	227-36002-01	-	-
0.18 mm	0.18 µm		-	221-75921-20	-	-
	0.36 µm		-	227-36003-01	-	-
0.20 mm	0.33 µm		227-36004-03	-	227-36004-01	227-36004-02

ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.25 µm	-60 to 330/350 °C	227-36005-01	221-75923-30	227-36005-02
	0.50 µm		227-36006-01	227-36006-02	221-75924-60
	1.00 µm		227-36007-01	227-36007-02	227-36007-03
0.32 mm	0.25 µm		227-36008-01	221-75926-30	227-36008-02
	0.50 µm		227-36009-01	227-36009-02	227-36009-03
	1.00 µm		-	227-36010-01	221-75928-60
0.53 mm	4.00 µm		-	227-36011-01	-
	0.50 µm		227-36012-01	227-36012-02	-
	1.00 µm		227-36013-01	227-36013-02	-
	1.50 µm	227-36014-01	227-36014-02	227-36014-03	

Petroleum Hydrocarbons (TPH)



Peaks	Conditions
1. C8	Instrument: GC-2010
2. C10	Column: SH-I-1MS, 20m,
3. C12	0.18 mm ID, 0.18 µm
4. C14	(P/N: 221-75921-20)
5. C16	Sample: Florida TRPH
6. C18	Standard, 500 µg/ml
7. C20	each component in
8. C22	hexane
9. C24	Inj. Vol.: 0.5 µL, split (split ratio
10. C26	20:1)
11. C28	Inj. Temp.: 275 °C
12. C30	Carrier Gas: Hydrogen, constant
13. C32	linear velocity mode,
14. C34	55 cm/sec.
15. C36	Oven Temp.: 40 °C (hold 1 min.) to
16. C38	330 °C at 20 °C/min.
17. C40	(hold 10 min.)
	Detector: FID, 350 °C

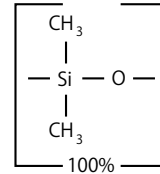
Capillary Columns

High-Performance Columns

SH-I-1HT

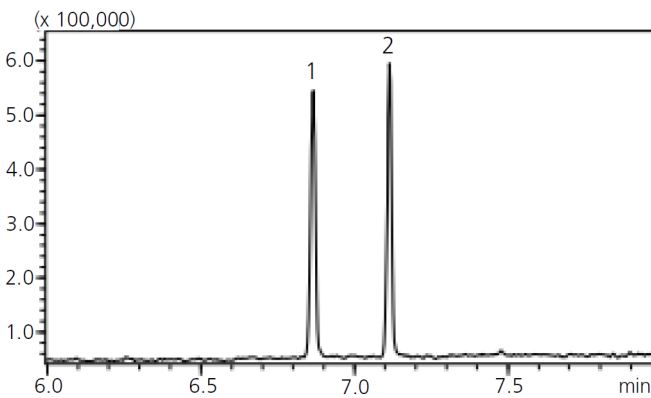
- Non-polar phase: Crossbond 100% dimethyl polysiloxane
- 40% longer lifetime from specially designed fused silica tubing.
- Columns processed for high-temperature applications, such as high molecular weight hydrocarbons.
- Similar phases: Rxi-1HT, DB-1HT, AT-1ht, ZB-1HT inferno

SH-I-1HT Structure



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

Quantitation of 3,3'-Dichloro-4,4'-Diaminodiphenylmethane(MOCA) in the Work Environment



Peaks

1. 3,3'-Dichlorobenzidine-TFA (DCB-TFA)
2. 3,3'-Dichloro-4,4'-diaminodiphenylmethane-TFA (MOCA-TFA) (1 µg/mL each)

Model: GCMS-QP 2020 NX
 Column: SH-I-1HT (15 m x 0.25 mm I.D., 0.1 µm
 P/N : 227-36087-01
 Glass Insert: Topaz 3.5 mm I.D.
 Single taper inlet liner w/wool

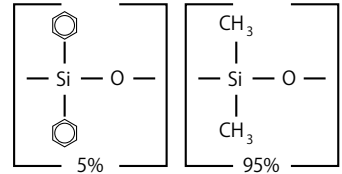
GC
 Inlet Temp.: 280 °C
 Inj. mode: Splitless
 Sampling Time: 1 min.
 Control Mode: Constant linear velocity (60.4 cm/s)
 Carrier Gas: He
 Purge Flow: 5.0 mL/min
 Column
 oven Temp.: 100 °C (1 min) -20 °C /min -300 °C (3 min)
 Inj. Volume: 1.0 µL

MS
 Ion source Temp.: 230 °C
 Interface Temp.: 300 °C
 Measurement Mode: Scan
 Event Time (Scan): 0.2 s
 Mass range (m/z): 40 - 700
 Measurement Mode: SIM
 Event Time (SIM): 0.2 s
 Monitor ions (m/z): DCB-TFA 409, 444, 446
 MOCA-TFA 423, 458, 460

SH-I-5MS

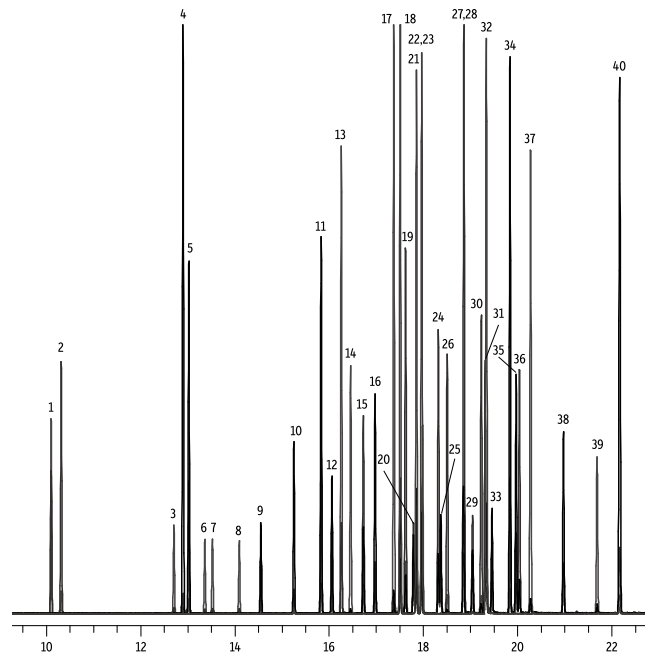
- Low-polarity phase: Crossbond 5% diphenyl / 95% dimethyl polysiloxane
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- General-purpose columns for semi-volatiles, phenols, amines, residual solvents, drugs of abuse, pesticides,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

SH-I-5MS Structure



ID	df	Temp. Range	10 m	12 m	15 m	20 m	25 m	30 m	50 m	60 m
0.10 mm	0.10 µm	-60 to 330/350 °C	227-36342-01	-	-	-	-	-	-	-
0.18 mm	0.18 µm		-	-	-	227-36015-01	-	-	-	-
	0.30 µm		-	-	-	227-36016-01	-	-	-	-
0.20 mm	0.36 µm		-	-	-	227-36017-01	-	-	-	-
	0.33 µm		-	227-36018-03	-	-	227-36018-01	-	227-36018-02	-
0.25 mm	0.25 µm		-	-	221-75940-15	-	-	221-75940-30	-	227-36019-01
	0.40 µm		-	-	-	-	-	227-36020-01	-	-
	0.50 µm		-	-	227-36021-01	-	-	221-75941-30	-	221-75942-60
	1.00 µm		-	-	227-36022-01	-	-	227-36022-02	-	227-36022-03
0.32 mm	0.25 µm		-	-	227-36023-01	-	-	221-75943-30	-	227-36023-02
	0.50 µm		-	-	227-36024-01	-	-	221-75944-30	-	227-36024-02
	1.00 µm		-	-	227-36025-01	-	-	227-36025-02	-	227-36025-03
0.53 mm	0.25 µm		-	-	227-36026-01	-	-	227-36026-02	-	-
	0.50 µm		-	-	227-36027-01	-	-	227-36027-02	-	-
	1.00 µm		-	-	227-36028-01	-	-	227-36028-02	-	-
	1.50 µm		-	-	227-36029-01	-	-	227-36029-02	-	-

GC Multiresidue Pesticide



Peaks

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

Conditions

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

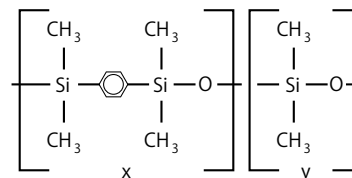
Capillary Columns

High-Performance Columns

SH-I-5Sil MS

- Low-polarity phase: Crossbond silylene phase 1,4-bis(dimethylsiloxy) phenylene dimethyl polysiloxane
- Engineered to be a low-bleed GCMS column.
- Excellent inertness for active compounds.
- General-purpose columns—ideal for GCMS analysis of semi-volatiles, polycyclic aromatic compounds, chlorinated hydrocarbons, phthalates, phenols, amines, organochlorine pesticides, organophosphorus pesticides, drugs, solvent impurities, and hydrocarbons.
- Equivalent to USP G27, G36 phase
- Similar phases: Rxi-5Sil MS, DB-5ms UI, DB-5ms, VF-5ms, SLB-5ms, BPX-5, ZB-5ms, ZB-Semi-Volatiles, ZB-5MS plus

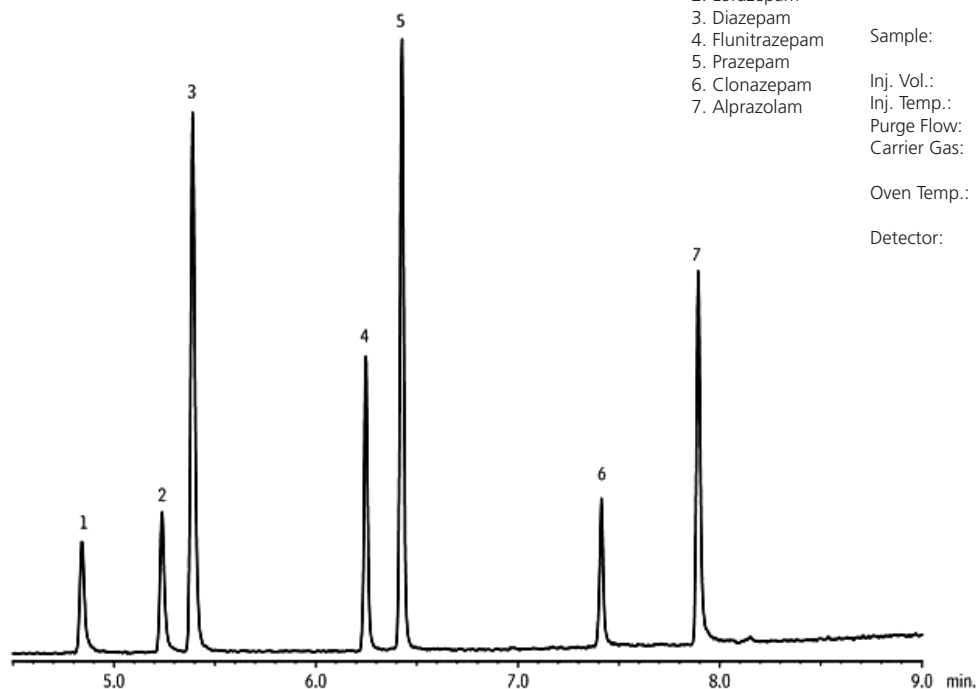
SH-I-5Sil MS Structure



For SH-I-5Sil MS columns with integrated Guard column, please refer to page 58

ID	df	Temp. Range	10 m	15 m	20 m	30 m	40 m	60 m
0.10 mm	0.10 µm	-60 to 320/350 °C	227-36317-01	-	-	-	-	-
0.15 mm	0.15 µm		-	-	227-36030-01	-	-	-
	2.00 µm		-	-	227-36031-01	-	-	-
0.18 mm	0.10 µm		-	-	-	-	-	227-36032-01
	0.18 µm		-	-	227-36033-01	-	227-36033-02	-
	0.36 µm		-	-	227-36034-01	-	-	-
0.25 mm	0.10 µm		-	227-36035-01	-	227-36035-02	-	-
	0.25 µm		-	227-36036-01	-	221-75954-30	-	227-36036-02
	0.50 µm		-	227-36037-01	-	227-36037-02	-	-
	1.00 µm		-	227-36038-01	-	221-75956-30	-	227-36038-02
0.32 mm	0.25 µm		-	227-36039-01	-	227-36039-02	-	227-36039-03
	0.50 µm		-	-	-	227-36040-01	-	-
	1.00 µm		-	-	-	227-36041-01	-	-
0.53 mm	1.50 µm		-	-	-	227-36032-02	-	-

Benzodiazepines



Peaks

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

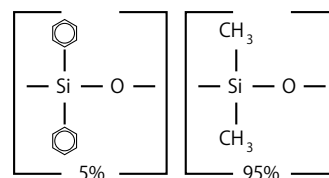
Conditions

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

SH-I-5HT

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

■ SH-I-5HT Structure



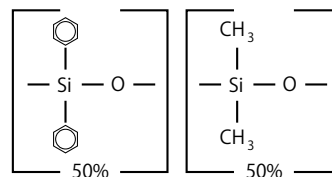
For SH-I-5HT columns with pre-connected Guard column, please refer to page 59

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

SH-I-17

- Mid-polarity phase: Crossbond 50% diphenyl / 50% dimethyl polysiloxane
- General-purpose columns for pesticides, herbicides, rosin acids, phthalate esters, triglycerides, sterols.
- Equivalent to USP G3 phase.
- Similar phases: Rxi-17, HP-17, DB-17, DB-17HT, DB-608, SPB-17, ZB-50

■ SH-I-17 Structure



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

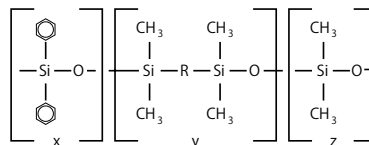
Capillary Columns

High-Performance Columns

SH-I-17Sil MS

- Mid-polarity Crossbond phase (similar to 50% phenyl methyl polysiloxane)
- Low bleed for use with sensitive detectors, such as MS.
- Excellent inertness and selectivity for active environmental compounds, such as PAHs.
- Equivalent to USP G17 phase.
- Similar phases: Rxi-17Sil MS, DB-17ms, VF-17ms, BPX-50

■ SH-I-17Sil MS Structure



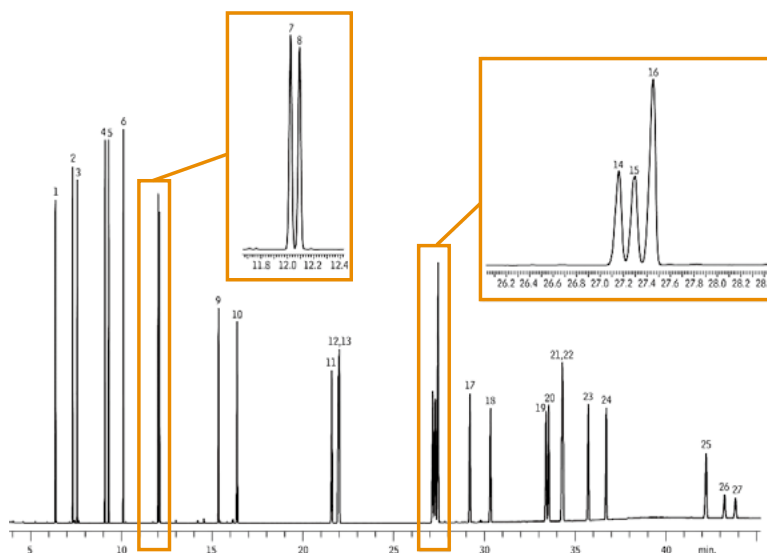
ID	df	Temp. Range	15 m	20 m	30 m	60 m
0.18 mm	0.18 μm	40 to 340/360 °C	-	227-36071-03	-	-
0.25 mm	0.25 μm		227-36071-02	-	221-75916-30	227-36071-01
0.32 mm	0.25 μm		-	-	227-36072-01	-

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

Polycyclic Aromatic Hydrocarbons (US EPA Method 8100)

Peaks

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



Conditions

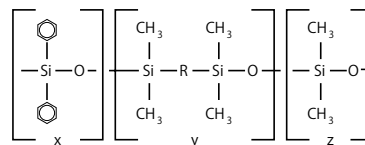
Column SH-I-17Sil MS, 30 m, 0.25 mm ID, 0.25 μm
(P/N: 221-75916-30)
Inj. Vol.: 0.5 μL splitless (hold 1.75 min)
Inj. Temp.: 320 °C
Purge Flow: 75 mL/min

Carrier Gas: He, constant flow rate 2.0 mL/min
Oven Temp.: 65 °C (hold 0.5 min) to 220 °C at 15 °C/min
to 330 °C at 4 °C/min (hold 15 min)
Detector: FID, 320 °C

SH-I-35SiI MS

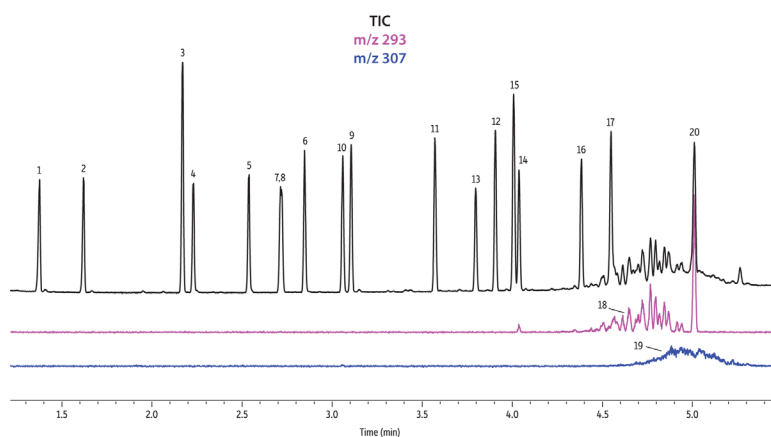
- Mid-polarity: Crossbond phase (similar to 35% phenyl methyl polysiloxane)
- Very low-bleed phase for GCMS analysis.
- Special selectivity and excellent inertness for substituted polar compounds, such as drugs, pesticides, herbicides, PCBs, phenols, etc.
- Provides superior separation for cannabinoids.
- Equivalent to USP G42 phase.
- Similar phases: Rxi-35SiI MS, DB-35ms, DB-35ms UI, VF-35ms, BPX-35, BPX608, ZB-MR2

SH-I-35SiI MS Structure



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

EPA and EU Phthalates



Peaks

1. Dimethyl phthalate
2. Diethyl phthalate
3. Benzyl benzoate
4. Diisobutyl phthalate
5. Di-n-butyl phthalate
6. Bis(2-methoxyethyl) phthalate
7. Bis[4-methyl-2-pentyl] phthalate isomer 1
8. Bis[4-methyl-2-pentyl] phthalate isomer 2
9. Bis(2-ethoxyethyl) phthalate
10. Di-n-pentyl phthalate
11. Di-n-hexyl phthalate
12. Butyl benzyl phthalate
13. Hexyl-2-ethylhexyl phthalate
14. Bis(2-butoxyethyl) phthalate
15. Bis(2-ethylhexyl) phthalate
16. Dicyclohexyl phthalate
17. Di-n-octyl phthalate
18. Diisononyl phthalate
19. Diisodecyl phthalate
20. Dinonyl phthalate

Sample: Benzyl benzoate
EPA Method 8061A phthalate esters mixture
Diisononyl phthalate
Diisodecyl phthalate
Hexyl-2-ethylhexyl phthalate
Diluent: Methylene chloride
Conc.: 50.0 μ g/mL (80 μ g/mL for internal standard benzyl benzoate)

Model: GC 2010 & QP2010+ MS
Column: SH-I-35SiI MS, 30 m, 0.25 mm ID, 0.25 μ m (227-36051-02)

Injection

Inj. Vol.: 1 μ L split (split ratio 20:1)
Liner: Premium 3.5 mm Precision liner w/wool (980-16064)
Inj. Temp.: 280 °C
Split Vent
Flow Rate: 3 mL/min
Oven Temp.: 200 °C (hold 0.5 min) to 330 °C at 30 °C/min (hold 1 min)

Carrier Gas: He, constant linear velocity
Linear Velocity: 66.7 cm/sec, 39.5 psi, 272.3 kPa @ 200 °C

MS

Mode: Scan
Transfer Line Temp.: 300 °C
Analyzer Type: Quadrupole
Source Temp.: 280 °C
Electron Energy: 70 eV
Solvent Delay: 0.9 min
Tune Type: PFTBA
Ionization Mode: EI

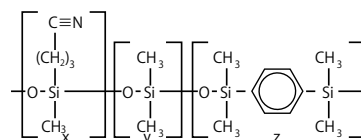
Capillary Columns

High-Performance Columns

SH-I-624Sil MS

- Mid-polarity Crossbond silarylene phase (similar to 6% cyanopropylphenyl / 94% dimethyl polysiloxane)
- Low-bleed, high-thermal stability column—maximum temperatures up to 300–320 °C.
- Inert—excellent peak shape for a wide range of compounds.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.
- Equivalent to USP G13 phase.
- Similar phases: Rxi-624Sil MS, DB-624, VF-624ms, CP-Select 624 CB, BP-624

SH-I-624Sil MS Structure

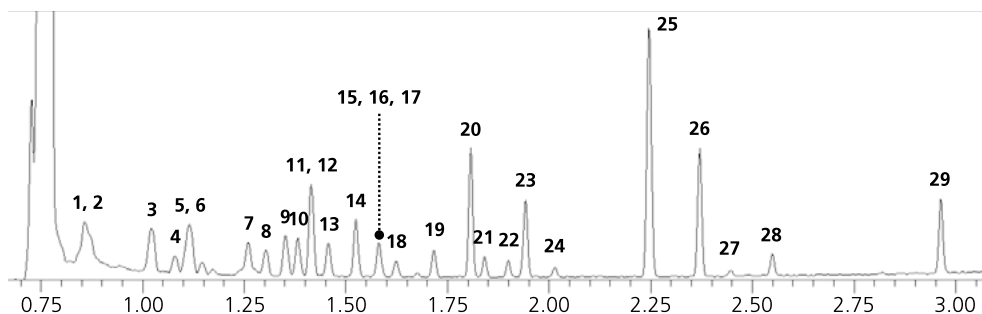


ID	df	Temp. Range	20 m	30 m	60 m	75 m	105 m
0.18 mm	1.00 μm	-20 to 300/320 °C	227-36075-01	-	-	-	-
0.25 mm	1.40 μm		-	221-75962-30	227-36076-01	-	-
0.32 mm	1.80 μm		-	227-36077-01	221-75963-60	-	-
0.53 mm	3.00 μm		-20 to 280/300 °C	-	227-36078-01	227-36078-02	227-36078-03

Ultra-Fast Analysis of Volatile Organic Compounds in Water

Peaks

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



Conditions

Instrument: GCMS-TQ8030 + HS-20 Loop
 Column: SH-I-624Sil MS, 20 m, 0.18 mm ID, 1.00 μm
 (P/N: 227-36075-01)

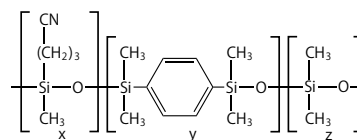
Headspace-Loop: Loop volume: 1 mL
 Sample Equilibration: 70 °C for 30 min
 Vial pressurization: 0.5 min, 50 kPa,
 equilibration 0.05 min
 Needle Flush: 2 min
 Sample Pathway Temp: 200 °C
 Transfer Line Temp: 200 °C

Inj.: Split (split ratio 30:1)
 Oven Temp.: 70 °C, 40 °C/min to 220 °C (hold 0.5 min)
 Carrier Gas: He, constant linear velocity mode, 50 cm/sec
 Detector: MS: SIM
 MS/MS: MRM
 Event (loop) time: 0.15 sec
 Source Temp: 200 °C
 Interface Temp: 230 °C

SH-I-1301Sil MS

- Mid-polarity Crossbond silarylene phase (similar to 6% cyanopropylphenyl / 94% dimethyl polysiloxane)
- Highest thermal stability in the industry ensures dependable, accurate MS results and increased uptime.
- Stabilized cyano phase selectivity improves the performance of existing methods. Ideal for solvents, glycols, and other polar compounds.
- Rigorous QC testing ensures inertness and accurate, reliable data for multiple compound classes.
- Equivalent to USP G43 phase.
- Similar phase: Rxi-1301Sil MS, VF-1301ms

■ SH-I-1301Sil MS Structure



For SH-I-1301Sil columns with integrated Guard column, please refer to page 58

ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.25 μm	-60 to 320 $^{\circ}\text{C}$	-	227-36079-01	227-36079-02
	1.00 μm		-	227-36080-01	227-36080-02
0.32 mm	0.25 μm		-	227-36081-01	-
	1.00 μm		-	227-36082-01	227-36082-02
	1.50 μm		-	227-36083-01	227-36083-02
0.53 mm	1.00 μm		-60 to 280/320 $^{\circ}\text{C}$	227-36084-01	227-36084-02
	3.00 μm	-		227-36086-01	227-36086-02

SH-I-PAH

- Mid-polarity proprietary phase
- Ideal for EFSA PAH4 analysis—separates all priority compounds: benz[a]anthracene, chrysene, benzo[b] fluoranthene and benzo[a] pyrene.
- Best resolution of chrysene from interfering PAHs, triphenylene, and cyclopenta[cd]pyrene.
- Complete separation of benzo [b], [k], [j], and [a] fluoranthenes.
- Equivalent to USP G51 phase.
- Similar phases: Rxi-PAH

ID	df	Temp. Range	30 m	40 m	60 m
0.18 mm	0.07 μm	to 350/360 $^{\circ}\text{C}$	-	227-36073-01	-
0.25 mm	0.10 μm		227-36074-01	-	227-36074-02

Capillary Columns

High-Performance Columns

SH-I-XLB

- Low-polarity proprietary phase
- General-purpose columns exhibiting extremely low bleed. Ideal for many GCMS applications, including pesticides, PCB congeners (e.g., Aroclor mixes), PAHs.
- Unique selectivity.
- Similar phases: Rxi-XLB, DB-XLB, VF-Xms, ZB-MR1, ZB-XLB

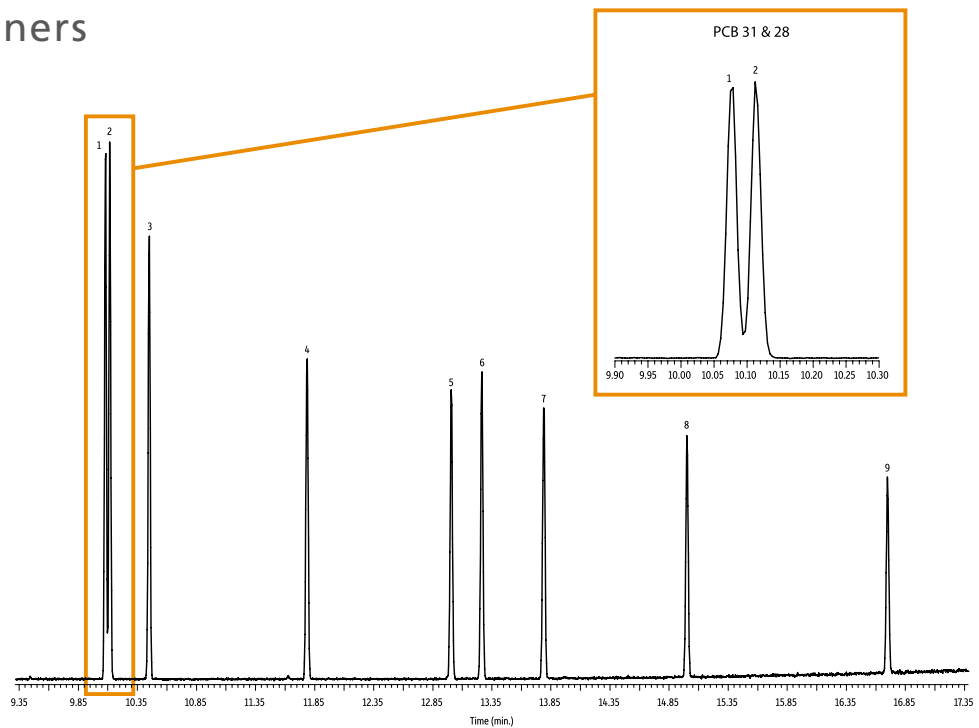
ID	df	Temp. Range	20 m	30 m	60 m
0.18 mm	0.18 µm	30 to 340/360 °C	227-36309-01	-	-
0.25 mm	0.10 µm		-	227-36042-01	-
	0.25 µm		-	227-36043-01	227-36043-02
	0.50 µm		-	227-36044-01	-
	1.00 µm		-	227-36045-01	-
0.32 mm	0.25 µm		-	227-36046-01	227-36046-02
	0.50 µm		-	227-36047-01	-
0.53 mm	1.00 µm		-	227-36048-01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

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

EU PCB Congeners

Peaks

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



Conditions

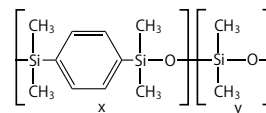
Column: SH-I-XLB, 30 m, 0.25 mm ID, 0.25 µm (P/N: 227-36043-01)
 Sample: PCB congener standard
 Diluent: Dichloromethane
 Conc.: 3.5 ppm
 Inj. Vol.: 0.5 µL splitless (hold 1.75 min.)
 Inj. Temp.: 300 °C
 Purge Flow: 50 mL

Carrier Gas: He, constant flow rate 1 mL/min
 Oven Temp.: 40 °C (hold 2 min) to 240 °C at 30 °C/min
 (hold 2 min) to 340 °C at 10 °C/min (hold 5 min)
 Detector: MS-QP
 Transfer Line Temp: 300 °C
 Source Temp: 280 °C
 Ionization: EI
 Scan Range: 45-550

SH-I-SVOC MS

- Proprietary 5% phenyl-type phase
- Engineered to be a low-bleed GC-MS column.
- SH-I-SVOC MS columns keep your instrument online and analyzing semivolatiles (SVOC) samples instead of offline for time-consuming recalibration or column replacement.
- The best choice for analyzing semivolatiles in environmental samples.
- Similar phase: DB-UI 8270D, ZB-SemiVolatiles

SH-I-SVOC MS Structure



For SH-I-SVOC MS columns with pre-connected Guard column, please refer to page 59

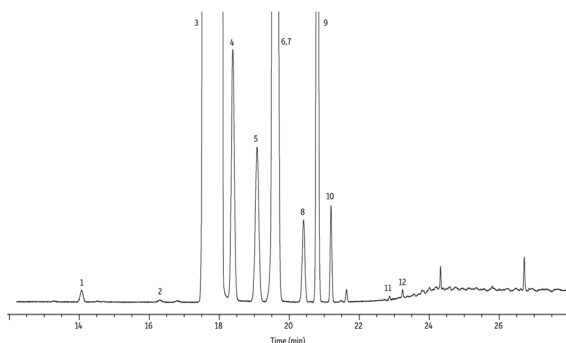
ID	df	Temp. Range	15 m	20 m	30 m
0.15 mm	0.15 μ m	to 340 $^{\circ}$ C	-	227-36362-01	-
0.18 mm	0.18 μ m	to 340 $^{\circ}$ C	-	227-36362-02	-
	0.36 μ m	to 330/340 $^{\circ}$ C	-	227-36362-03	-
0.25 mm	0.25 μ m	to 340 $^{\circ}$ C	227-36362-04	-	227-36362-06
	0.50 μ m	to 330/340 $^{\circ}$ C	-	-	227-36362-08
0.32 mm	0.25 μ m	to 330/340 $^{\circ}$ C	-	-	227-36362-10
	0.50 μ m		-	-	227-36362-11

SH-I-LAO

- Specifically developed for linear alpha olefin (LAO) impurity analysis.
- Unique selectivity enables high resolution of impurities from peaks of interest.
- Engineered to be a low-bleed column.

ID	df	Temp. Range	60 m
0.25 mm	1.4 μ m	-20 to 300/320 $^{\circ}$ C	227-36364-01

1-Hexene on Rxi-LAO



Peaks	t _r (min)
1. 3-Methyl-1-pentene	14.06
2. 3-Methylpentane	16.31
3. 1-Hexene	18.04
4. Hexane	18.39
5. 2-Ethyl-1-butene	19.08
6. cis-3-Hexene	19.61
7. trans-2-Hexene	19.61
8. cis-3-Methyl-2-pentene	20.41
9. cis-2-Hexene	20.81
10. trans-3-Methyl-2-pentene	21.19
11. Methyl-cyclopentene	22.87
12. Cyclohexene	23.24

Sample: 1-Hexene
Hexyl-2-ethylhexyl phthalate
Conc.: Neat solvent

Column: SH-I-LAO, 60 m, 0.25 mm ID, 1.4 μ m
(227-36364-01)

Injection

Inj. Vol.: 1 μ L split (split ratio 100:1)
Liner: Topaz 4.0 mm ID low pressure drop
Precision inlet liner w/wool
Inj. Temp.: 250 $^{\circ}$ C
Split Vent
Flow Rate: 125 mL/min
Oven Temp.: 35 $^{\circ}$ C (hold 20 min) to 160 $^{\circ}$ C at
30 $^{\circ}$ C/min (hold 20 min)
Carrier Gas: He, constant flow
Linear Velocity: 23 cm/sec @ 35 $^{\circ}$ C

Detector FID @ 300 $^{\circ}$ C
Make-up Gas
Flow Rate: 45 mL/min
Make-up Gas: N₂
Hydrogen Flow: 40 mL/min
Air Flow: 400 mL/min
Data Rate: 20 Hz

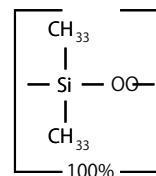
Capillary Columns

General-Purpose Columns

SH-1

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

SH-1 Structure



For SH-1 columns with Integrated Guard column, please refer to page 58.

ID	df	Temp. Range	10 m	15 m	20 m	25 m	30 m	60 m	105 m
0.10 mm	0.10 µm	-60 to 330/350 °C	227-36330-02	-	227-36330-01	-	-	-	-
	0.40 µm	-60 to 330/350 °C	-	-	227-36330-01	-	-	-	-
0.18 mm	0.40 µm	-60 to 330/340 °C	227-36378-01	-	227-36330-01	-	-	-	-
0.25 mm	0.10 µm	-60 to 330/350 °C	-	221-75718-15	-	-	221-75718-30	227-36096-01	-
	0.25 µm	-60 to 330/350 °C	221-75719-10	227-36354-01	-	221-75719-25	221-75719-30	221-75719-60	-
	0.50 µm	-60 to 330/350 °C	-	-	-	-	227-36097-01	227-36097-02	-
	1.00 µm	-60 to 320/340 °C	-	-	-	-	227-36098-01	227-36098-02	221-75721-05
0.32 mm	0.10 µm	-60 to 330/350 °C	-	-	-	-	227-36099-01	227-36099-02	-
	0.25 µm	-60 to 330/350 °C	-	-	-	-	221-75723-30	221-75723-60	-
	0.50 µm	-60 to 330/350 °C	-	-	-	-	221-75724-30	227-36100-01	-
	1.00 µm	-60 to 320/340 °C	-	-	-	-	221-75725-30	221-75725-60	227-36108-03
	1.50 µm	-60 to 310/330 °C	-	-	-	-	227-36101-01	227-36101-02	-
	3.00 µm	-60 to 280/300 °C	-	-	-	-	227-36102-01	227-36102-02	227-36102-03
	4.00 µm	-60 to 280/300 °C	-	-	-	-	227-36103-01	-	-
0.53 mm	5.00 µm	-60 to 260/280 °C	-	227-36108-04	-	-	221-75728-30	221-75728-60	-
	0.10 µm	-60 to 320/340 °C	-	-	-	-	227-36104-01	-	-
	0.25 µm	-60 to 320/340 °C	-	-	-	-	221-75729-30	227-36105-01	-
	0.50 µm	-60 to 310/330 °C	-	221-75730-15	-	-	221-75730-30	227-36106-01	227-36108-05
	1.00 µm	-60 to 310/330 °C	-	221-75731-15	-	-	221-75731-30	221-75731-60	-
	1.50 µm	-60 to 310/330 °C	-	221-75732-15	-	-	221-75732-30	227-36107-01	-
	3.00 µm	-60 to 270/290 °C	-	-	-	-	221-75733-30	221-75733-60	227-36108-06
	5.00 µm	-60 to 270/290 °C	-	227-36108-07	-	-	221-75734-30	221-75734-60	-
7.00 µm	-60 to 240/260 °C	-	-	-	-	227-36108-01	227-36108-02	-	

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

SH-1 PONA

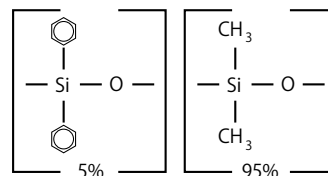
- Compatible with ASTM and CGSB for hydrocarbon analysis.
- Similar phases: CP-Sil PONA C8, DB-Petro, HP-PONA, Rtx-DHA, Petrocol DH, BP1-PONA

ID	df	Temp. Range	50 m	100 m	150 m
0.20 mm	0.50 µm	-60 to 300/340 °C	227-36368-01	-	-
0.25 mm	0.50 µm		221-76196-00	221-76196-00	-
	1.00 µm	-60 to 280/340 °C	-	-	227-36361-01

SH-5

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

■ SH-5 Structure



For SH-5 columns with Integrated Guard column, please refer to page 58.

ID	df	Temp. Range	15 m	25 m	30 m	60 m
0.25 mm	0.10 µm	-60 to 330/350 °C	221-75700-15	-	221-75700-30	227-36109-01
	0.25 µm	-60 to 330/350 °C	227-36313-01	-	221-75701-30	227-36110-01
	0.50 µm	-60 to 330/350 °C	227-36111-02	221-76178-25	221-76178-30	227-36111-01
	1.00 µm	-60 to 320/340 °C	227-36112-02	-	221-75702-30	227-36112-01
0.32 mm	0.10 µm	-60 to 330/350 °C	227-36312-01	-	227-36113-01	-
	0.25 µm	-60 to 330/350 °C	221-75703-15	-	221-75703-30	221-75703-60
	0.50 µm	-60 to 330/350 °C	-	-	221-75704-30	227-36114-01
	1.00 µm	-60 to 320/350 °C	-	227-36352-01	221-75705-30	221-75705-60
	1.50 µm	-60 to 310/330 °C	-	-	221-76181-30	227-36115-01
	3.00 µm	-60 to 280/300 °C	-	-	227-36116-01	227-36116-02
0.53 mm	0.10 µm	-60 to 320/340 °C	227-36117-02	-	227-36117-01	-
	0.25 µm	-60 to 320/340 °C	227-36314-01	-	221-75708-30	227-36118-01
	0.50 µm	-60 to 320/330 °C	227-36119-02	-	221-75709-30	227-36119-01
	1.00 µm	-60 to 320/330 °C	221-75710-15	-	221-75710-30	221-75710-60
	1.50 µm	-60 to 310/330 °C	221-75711-15	-	221-75711-30	227-36120-01
	3.00 µm	-60 to 270/290 °C	-	-	221-75712-30	227-36121-01
	5.00 µm	-60 to 270/290 °C	-	-	221-75713-30	221-75713-60

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

Metal columns are also available. Please refer to page ^54.

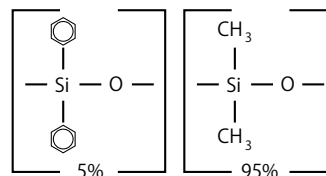
Capillary Columns

General-Purpose Columns

SH-5MS

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

■ SH-5MS Structure



For SH-5MS columns with Integrated Guard column, please refer to page 52.

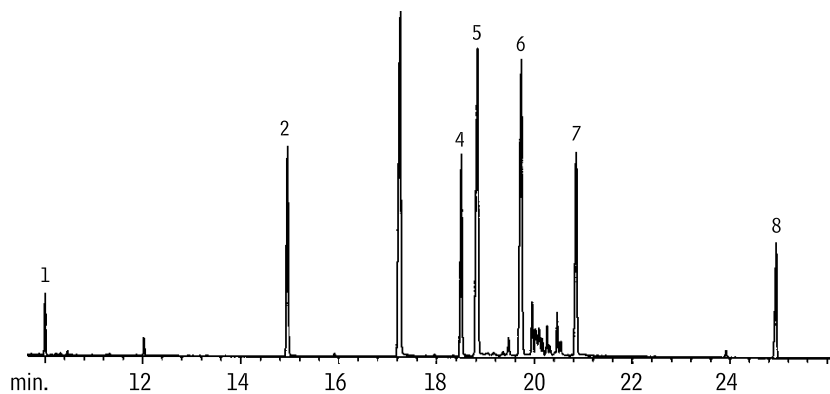
ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.10 µm	-60 to 330/350 °C	221-75854-15	221-75854-30	227-36122-01
	0.25 µm	-60 to 330/350 °C	221-75855-15	221-75855-30	227-36123-01
	0.50 µm	-60 to 330/350 °C	-	227-36124-01	227-36124-02
	1.00 µm	-60 to 330/350 °C	-	221-75857-30	-
0.32 mm	0.10 µm	-60 to 330/350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

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

Endocrine Disruptors: Alkyl Phenols

Peaks

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



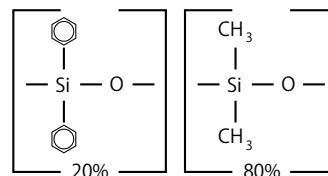
Conditions

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

SH-20

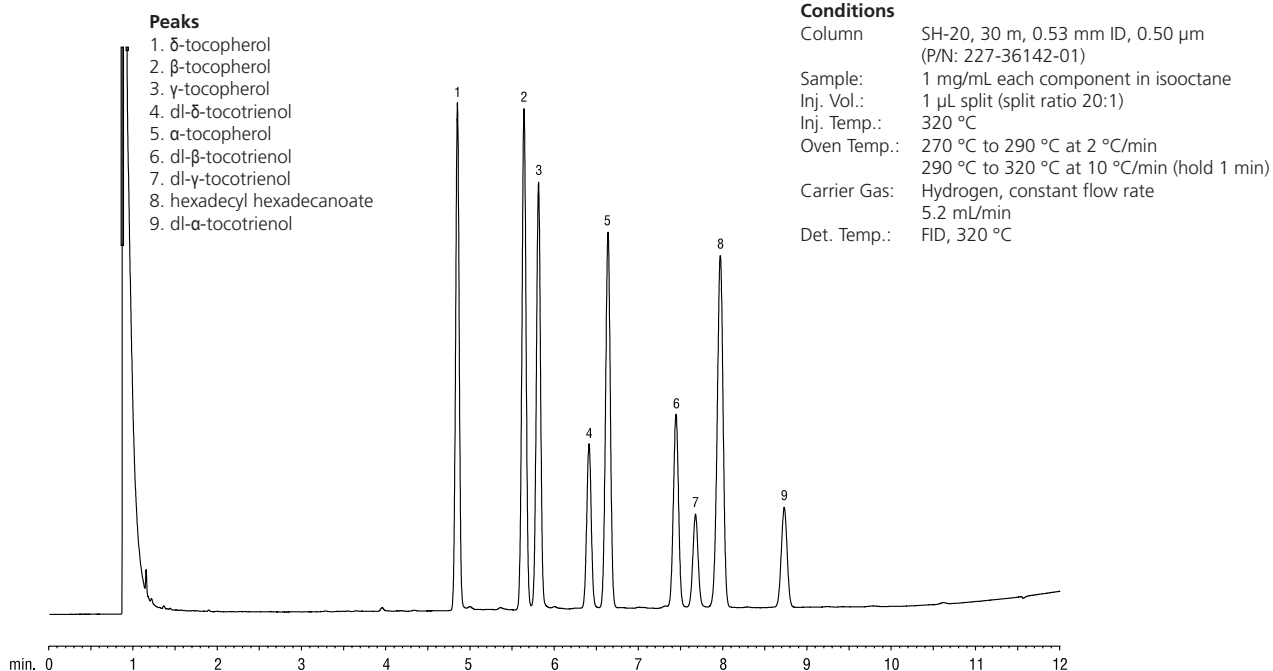
- Mid-polarity phase: Crossbond 20% diphenyl / 80% dimethyl polysiloxane
- General-purpose columns for volatile compounds, flavor compounds, alcoholic beverages.
- Equivalent to USP G28 and G32 phases.
- Similar phases: Rtx-20, SPB-20, AT-20, EC-20

■ SH-20 Structure



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

Tocopherols and Tocotrienols



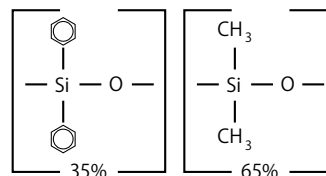
Capillary Columns

General-Purpose Columns

SH-35 / SH-35MS

- Mid-polarity phase: Crossbond 35% diphenyl / 65% dimethyl polysiloxane
- General-purpose columns for organochlorine pesticides, PCB congeners (e.g., Aroclor mixes), herbicides, pharmaceuticals, sterols, rosin acids, phthalate esters.
- Equivalent to USP G42 phase.
- Similar phases: Rtx-35, HP-35, DB-35, SPB-35, SPB-608, BPX-35, BPX608, ZB-35, AT-35, AT35ms

■ SH-35 / SH-35MS Structure



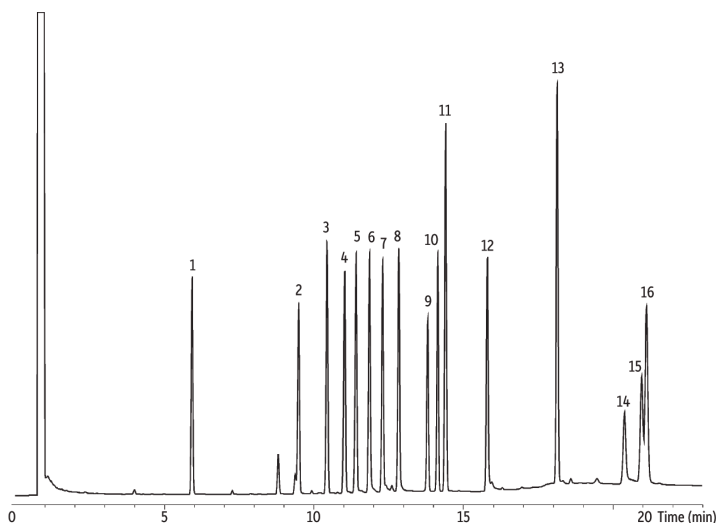
SH-35

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

SH-35MS (Low-bleed phase for GCMS analysis)

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

Underivatized Barbiturates (Acidic/Neutral Drugs)



Peaks

- | | |
|------------------|-----------------------|
| 1. Ethosuximide | 9. Meprobamate |
| 2. Barbitol | 10. Carisoprodal |
| 3. Methpyrilon | 11. Glutethimide |
| 4. Aprobarbital | 12. Phenobarbital |
| 5. Butalbital | 13. Methaqualone |
| 6. Amobarbital | 14. Primidone |
| 7. Pentobarbital | 15. Carbamazepine |
| 8. Secobarbital | 16. Diphenylhydantoin |

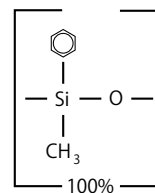
Conditions

Column: SH-35, 30 m, 0.53 mm ID, 1.00 µm (227-36159-01)
 Sample: Acidic/neutral drugs
 Conc.: 5 µg/mL
 Inj. Vol.: 1.0 µL splitless (hold 0.5 min)
 Inj. Temp.: 250 °C
 Oven Temp.: 100 °C to 280 °C at 10 °C/min (hold 5 min)
 Carrier Gas: He, constant pressure
 Det. Temp.: 40 cm/sec @ 100 °C

SH-50

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

■ SH-50 Structure

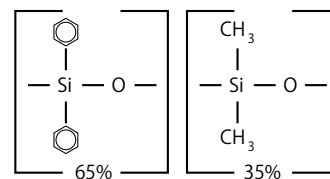


ID	df	Temp. Range	10 m	30 m	60 m
0.25 mm	0.25 µm	40 to 300/320 °C	-	227-36162-01	227-36162-02
	0.50 µm	40 to 290/310 °C	-	227-36163-01	-
	1.00 µm	40 to 280/300 °C	-	227-36164-01	227-36164-02
0.32 mm	0.25 µm	40 to 300/320 °C	-	221-76182-30	227-36165-01
	0.50 µm	40 to 290/310 °C	-	227-36166-01	227-36166-02
	1.00 µm	40 to 280/300 °C	-	227-36167-01	227-36167-02
0.53 mm	0.50 µm	40 to 270/290 °C	-	227-36168-01	227-36168-02
	0.83 µm	40 to 270/290 °C	-	227-36169-01	-
	1.00 µm	40 to 260/280 °C	-	227-36170-01	227-36170-02
	1.50 µm	40 to 250/270 °C	-	227-36171-01	-
	2.00 µm	-	227-36171-03	-	-

SH-65

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

■ SH-65 Structure



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

Capillary Columns

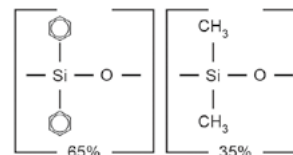
General-Purpose Columns

SH-65TG

- Application-specific columns, specially tested for triglycerides
- Similar phases: CP-TAP-CB

The SH-65TG phase resolves triglycerides by degree of unsaturation as well as by carbon number.

■ SH-65TG Structure

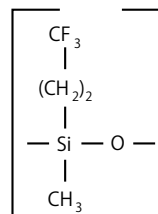


ID	df	Temp. Range	15 m	30 m
0.25 mm	0.10 μm	40 to 370 °C	227-36325-01	227-36325-02

SH-200 / SH-200MS

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

■ SH-200 / SH-200MS Structure



SH-200

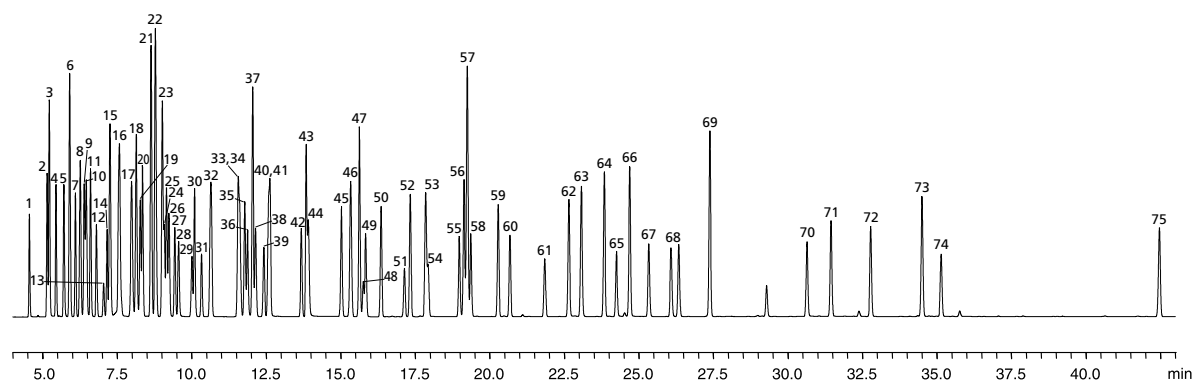
ID	df	Temp. Range	30 m	60 m	105 m
0.25 mm	0.25 μm	-20 to 320/340 °C	227-36180-01	227-36180-02	227-36180-03
	0.50 μm	-20 to 310/330 °C	227-36181-01	227-36181-02	-
	1.00 μm	-20 to 290/310 °C	221-75800-30	227-36182-01	227-36182-02
0.32 mm	0.10 μm	-20 to 320/340 °C	227-36183-01	-	-
	0.25 μm	-20 to 320/340 °C	227-36184-01	227-36184-02	-
	0.50 μm	-20 to 310/330 °C	227-36185-01	227-36185-02	-
	1.00 μm	-20 to 290/310 °C	227-36186-01	227-36186-02	-
	1.50 μm	-20 to 280/300 °C	227-36187-01	227-36187-02	221-75804-15
0.53 mm	0.25 μm	-20 to 310/330 °C	227-36189-01	-	-
	0.50 μm	-20 to 300/320 °C	227-36190-01	227-36190-02	-
	1.00 μm	-20 to 290/310 °C	227-36191-01	227-36191-02	-
	1.50 μm	-20 to 280/300 °C	227-36192-01	227-36192-02	-
	3.00 μm	-20 to 260/280 °C	227-36193-01	227-36193-02	227-36193-03

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

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

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

Analysis of Organic Solvents


Peaks

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

Conditions

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

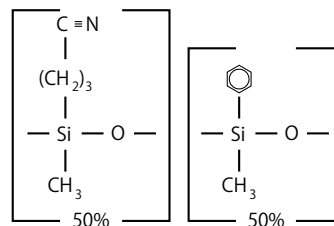
Capillary Columns

General-Purpose Columns

SH-225

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

■ SH-225 Structure



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

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

SH-440

- General-purpose columns with unique selectivity for pesticides, PAHs, or other semivolatiles. Ideal for low/trace-level analyses.
- Low-bleed, high-resolution columns with unique selectivity.
- Similar phases: Rtx-440

ID	df	Temp. Range	20 m	30 m
0.18 mm	0.18 μm	20 to 320 °C	227-36340-02	-
0.25 mm	0.25 μm	20 to 320/340 °C	-	227-36340-01
0.32 mm	0.25 μm		-	227-36340-03

SH-502.2

- Application-specific columns with unique selectivity for volatile organic pollutants. The SH-502.2 column is cited in U.S. EPA Method 502.2 and in many gasoline range organics (GRO) methods for monitoring underground storage tanks.
- Excellent separation of trihalomethanes; ideal polarity for light hydrocarbons and aromatics.
- Similar phase: Rtx-502.2, DB-502.2

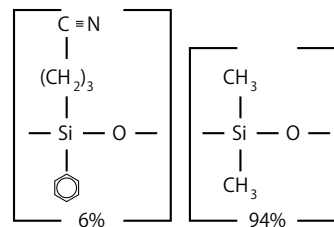
The SH-502.2 column will enable you to quantify all compounds listed in U.S. EPA methods 502.2 or 524.2, whether you use a mass spectrometer or a PID in tandem with an ELCD. The diphenyl/dimethyl polysiloxane based SH-502.2 stationary phase provides low bleed and thermal stability to 270 °C. A 105-meter column can separate the light gases specified in EPA methods without subambient cooling. Narrow bore columns can interface directly in GC/MS systems.

ID	df	Temp. Range	30 m	60 m	75 m	105 m
0.25 mm	1.40 μm	-20 to 250/270 °C	227-36341-04	227-36341-03	-	-
0.32 mm	1.80 μm		227-36341-01	-	-	227-36341-02
0.45 mm	2.55 μm		-	-	227-36341-05	-
0.53 mm	3.00 μm		-	227-36341-06	-	227-36341-07

SH-624

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

SH-624 Structure



For SH-624 columns with Integrated Guard column, please refer to page 58.

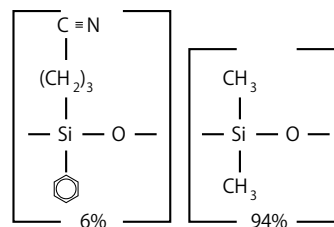
ID	df	Temp. Range	20 m	30 m	40 m	50 m	60 m	75 m	105 m
0.10 mm	0.50 μm	-20 to 240 $^{\circ}\text{C}$	227-36332-01	-	-	-	-	-	-
0.18 mm	1.00 μm		227-36259-01	-	227-36259-02	-	-	-	-
0.25 mm	1.40 μm		-	221-75863-30	-	-	227-36215-01	-	-
0.32 mm	1.80 μm		-	221-75864-30	-	227-36347-01	221-75864-60	-	-
0.53 mm	3.00 μm		-	221-75865-30	-	-	221-75865-60	221-75865-75	227-36215-02

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

SH-1301

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

SH-1301 Structure



For SH-1301 columns with Integrated Guard column, please refer to page 58.

ID	df	Temp. Range	30 m	60 m	105 m	135 m
0.25 mm	0.25 μm	-20 to 280 $^{\circ}\text{C}$	221-76194-30	221-76194-60	-	-
	0.50 μm	-20 to 270 $^{\circ}\text{C}$	227-36203-01	-	-	-
	1.00 μm	-20 to 260 $^{\circ}\text{C}$	227-36204-01	227-36204-02	227-36204-03	227-36204-04
	1.40 μm	-20 to 240 $^{\circ}\text{C}$	-	227-36205-01	-	-
0.32 mm	0.25 μm	-20 to 280 $^{\circ}\text{C}$	227-36206-01	-	-	-
	0.50 μm	-20 to 270 $^{\circ}\text{C}$	227-36207-01	-	-	-
	1.00 μm	-20 to 260 $^{\circ}\text{C}$	227-36208-01	227-36208-02	-	-
	1.50 μm	-20 to 250 $^{\circ}\text{C}$	227-36209-01	227-36209-02	-	-
	1.80 μm	-20 to 240 $^{\circ}\text{C}$	227-36210-01	227-36210-02	-	-
0.53 mm	0.25 μm	-20 to 280 $^{\circ}\text{C}$	227-36211-01	-	-	-
	0.50 μm	-20 to 270 $^{\circ}\text{C}$	227-36212-01	227-36212-02	-	-
	1.00 μm	-20 to 260 $^{\circ}\text{C}$	227-36213-01	227-36213-02	-	-
	1.50 μm	-20 to 250 $^{\circ}\text{C}$	227-36214-01	-	-	-
	3.00 μm	-20 to 240 $^{\circ}\text{C}$	221-75776-30	221-75776-60	-	-

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

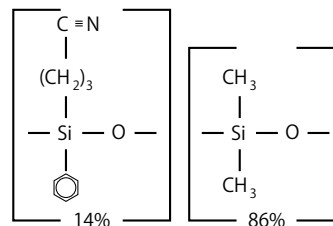
Capillary Columns

General-Purpose Columns

SH-1701

- Mid-polarity phase: Crossbond 14% cyanopropylphenyl / 86% dimethyl polysiloxane
- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g., Aroclor mixes), pesticides, and fragrance compounds.
- Equivalent to USP G46 phase.
- Similar phases: Rtx-1702, DB-1701P, DB-1701, CP Sil 19 CB, VF-1701ms, VF-1701 Pesticides, SPB-1701, BP-10, ZB-1701, ZB-1701P, AT-1701

SH-1701 Structure

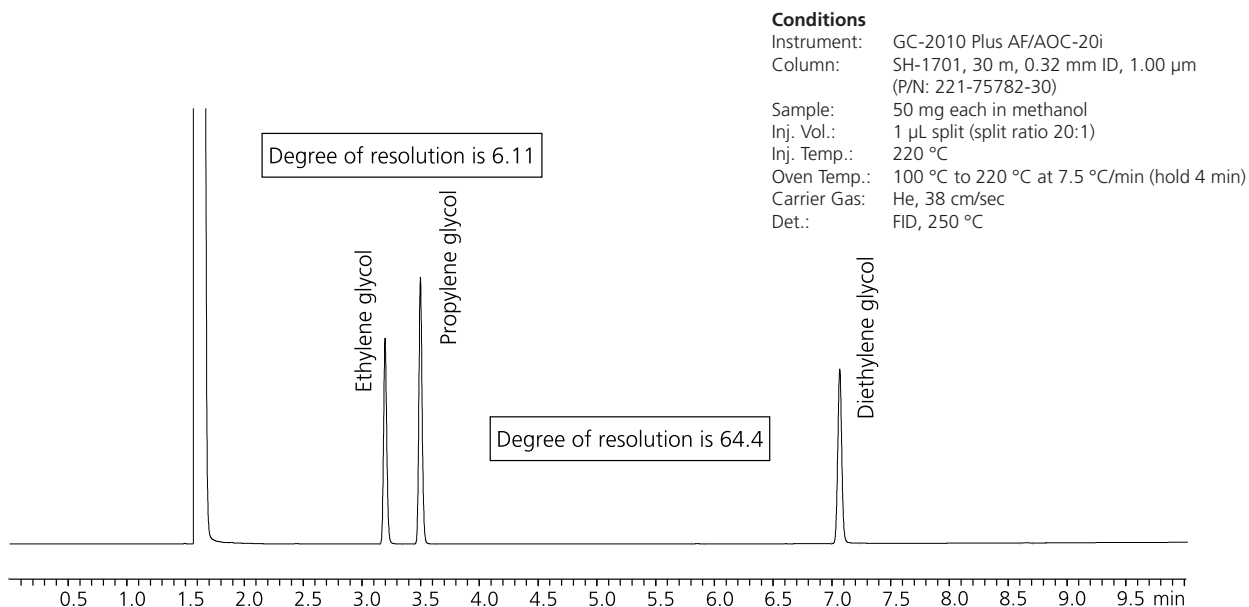


For SH-1701 columns with Integrated Guard column, please refer to page 58.

ID	df	Temp. Range	15 m	30 m	40 m	60 m
0.18 mm	0.20 μm	-20 to 280 °C	-	-	227-36216-03	-
0.25 mm	0.10 μm	-20 to 280 °C	-	227-36216-01	-	227-36216-02
	0.25 μm	-20 to 280 °C	-	221-75777-30	-	227-36217-01
	0.50 μm	-20 to 270/280 °C	-	221-75778-30	-	227-36218-01
	1.00 μm	-20 to 260/280 °C	-	221-75779-30	-	227-36219-01
0.32 mm	0.10 μm	-20 to 280 °C	-	221-76184-30	-	-
	0.25 μm	-20 to 280 °C	221-75780-15	221-75780-30	-	221-75780-60
	0.50 μm	-20 to 270/280 °C	-	221-75781-30	-	227-36221-01
	1.00 μm	-20 to 260/280 °C	-	221-75782-30	-	221-75782-60
	1.50 μm	-20 to 240/260 °C	-	227-36222-01	-	227-36222-02
0.53 mm	0.10 μm	-20 to 270/280 °C	-	227-36223-01	-	-
	0.25 μm	-20 to 270/280 °C	-	227-36224-01	-	-
	0.50 μm	-20 to 260/270 °C	-	227-36225-01	-	-
	1.00 μm	-20 to 250/270 °C	-	221-75785-30	-	227-36226-01
	1.50 μm	-20 to 240/260 °C	-	227-36227-01	-	227-36227-02
	3.00 μm	-20 to 230/250 °C	-	227-36228-01	-	227-36228-02

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

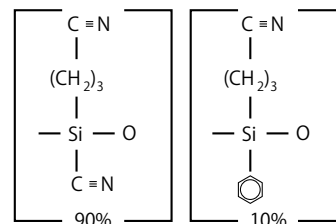
Analysis of Ethylene Glycol and Diethylene Glycol in Propylene Glycol



SH-2330

- Highly polar phase: Crossbond 90% biscyanopropyl / 10% cyanopropylphenyl polysiloxane (Non-bonded)
- General-purpose columns for cis/trans FAMES, dioxin isomers.
- Equivalent to USP G5, G8 and G48 phase.
- Similar phases: Rtx-2330, VF-23ms, SP-2330, SP-2331, SP-2380, BPX-70, AT-Silar90

■ SH-2330 Structure



ID	df	Temp. Range	30 m	60 m	105 m
0.25 mm	0.10 μm	0 to 260/275 °C	227-36238-01	227-36238-02	-
	0.20 μm		227-36239-01	227-36239-02	227-36239-03
0.32 mm	0.20 μm		227-36241-01	227-36241-02	-
0.53 mm	0.20 μm		227-36243-01	-	-

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

SH-2560

- Highly polar phase; biscyanopropyl polysiloxane - not bonded
- Stationary phase selectivity optimized for isomer separation to ensure accurate quantification of critical cis/trans FAMES.
- Application-specific QC test guarantees consistent, reliable performance for AOAC 996.06 and AOCS Ce 1j-07 methods.
- Excellent sample capacity; no peak distortion means easy, accurate peak integration.
- Equivalent to USP G5 phase.
- Similar phases: Rtx-2560, HP-88, CP Sil 88, SBP-2560

ID	df	Temp. Range	50 m	105 m
0.25 mm	0.20 μm	0 to 250 °C	227-36311-04	227-36311-01

SH-2887

- Nonpolar phase: Crossbond™ 100% dimethyl polysiloxane
- Application-specific column for simulated distillation.
- Guarantee a stable baseline with low bleed and reproducible retention times.
- Similar phase: DB-2887, Petrocol 2887, Petrocol EX2887

ID	df	Temp. Range	10 m
0.53 mm	2.65 μm	-60 to 360 °C	227-36373-01

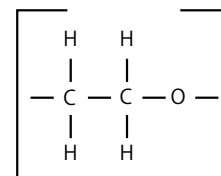
Capillary Columns

General-Purpose Columns

SH-WAX

- Polar phase: Crossbond™ polyethylene glycol
- Best polyethylene glycol (PEG) phase for alkenols, glycols, and aldehydes.
- Equivalent to USP G14, G15, G16, G20, G39 phases.
- Similar phases: Rtx-Wax, DB-Wax, BP-20, ZB-Wax, AT-WAXms, EC-WAX

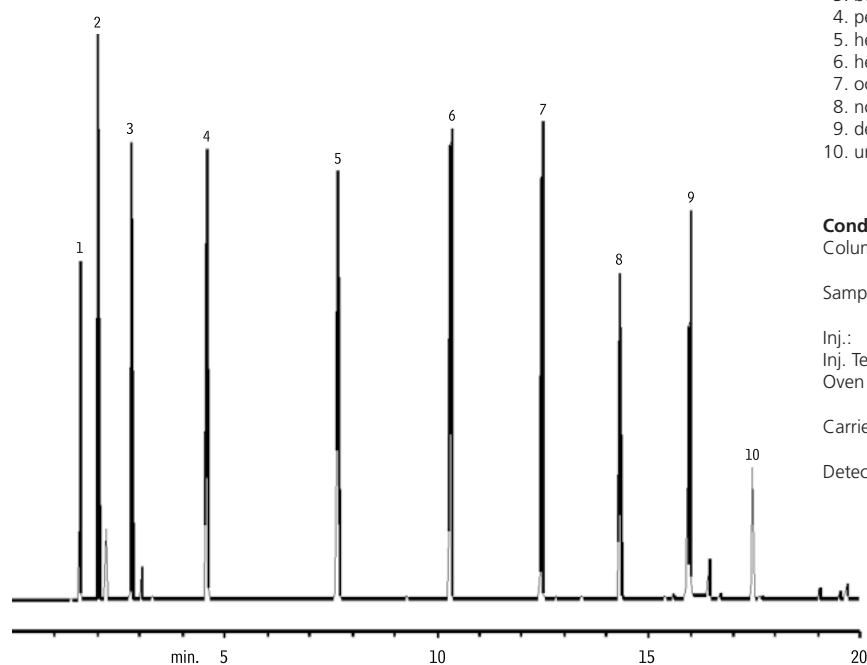
■ SH-Wax Structure



ID	df	Temp. Range	15 m	20 m	30 m	50 m	60 m	
0.10 mm	0.10 μm	20 to 250 °C	-	227-36356-01	-	-	-	
	0.10 μm		-	-	221-76186-30	-	-	
0.25 mm	0.25 μm		-	-	221-75893-30	221-75893-50	221-75893-60	
	0.50 μm		-	-	221-75894-30	-	221-75894-60	
0.32 mm	0.25 μm		-	221-75895-20	221-75895-30	-	221-75895-60	
	0.50 μm		-	-	221-75896-30	221-75896-50	221-75896-60	
	1.00 μm		20 to 240/250 °C	-	-	221-75897-30	-	221-75897-60
0.53 mm	0.25 μm		20 to 250 °C	-	-	227-36244-01	-	-
	0.50 μm		20 to 250 °C	-	-	221-76188-30	-	227-36245-01
	1.00 μm		20 to 240/250 °C	221-75899-15	-	221-75899-30	-	221-75899-60

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

Aldehydes



Peaks

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

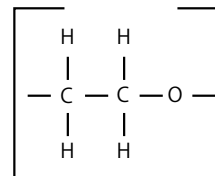
Conditions

Column: SH-Wax, 30 m, 0.25 mm ID, 0.50 μm (P/N: 221-75894-30)
 Samples: C2-C11 aldehydes mixture On-column conc.: 250 ng
 Inj.: Split (split ratio: 100:1)
 Inj. Temp.: 200 °C
 Oven Temp.: 40 °C (hold 5 min) to 200 °C at 10 °C/min
 Carrier Gas: Hydrogen, linear velocity 35 cm/sec. set at 40 °C
 Detector: FID, 200 °C

SH-PolarWax

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

■ SH-PolarWax Structure

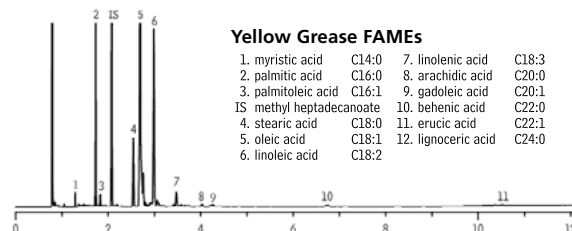
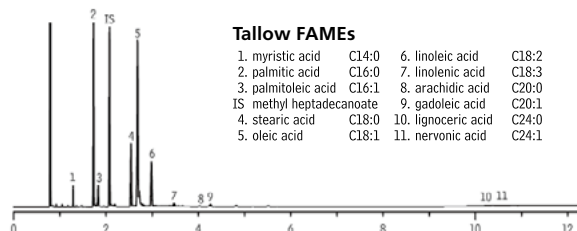
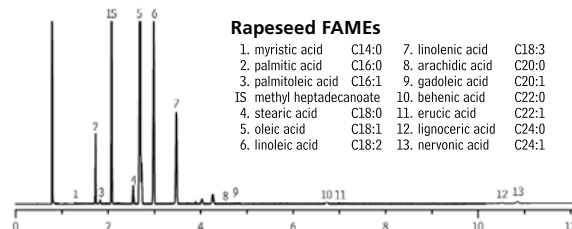
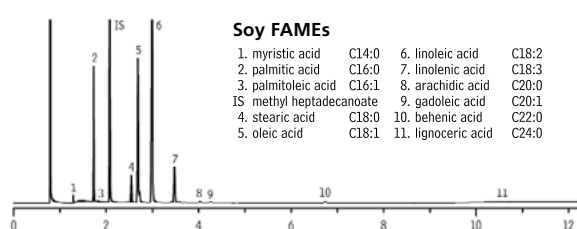


For SH-PolarWax columns with integrated Guard column, please refer to page 58

ID	df	Temp. Range	10 m	15 m	20 m	30 m	50 m	60 m
0.10 mm	0.10 µm	40 to 250/260 °C	227-36343-01	-	-	-	-	-
0.18 mm	0.18 µm	40 to 250 °C	-	-	227-36357-01	-	-	-
0.25 mm	0.10 µm	40 to 250/260 °C	-	-	-	227-36246-01	-	227-36246-02
	0.25 µm	40 to 250/260 °C	-	-	-	227-36305-02	227-36247-01	227-36247-02
	0.50 µm	40 to 250/260 °C	-	-	-	227-36248-01	-	227-36248-02
0.32 mm	0.10 µm	40 to 250 °C	-	-	-	227-36249-01	-	-
	0.25 µm	40 to 250/260 °C	-	-	-	221-75972-30	-	227-36250-01
	0.50 µm	40 to 250/260 °C	-	227-36251-02	-	227-36251-01	-	221-75975-60
	1.00 µm	40 to 240/260 °C	-	-	-	227-36252-01	-	227-36252-02
0.53 mm	0.10 µm	40 to 250 °C	-	-	-	227-36253-01	-	-
	0.25 µm	40 to 250/260 °C	-	-	-	227-36254-01	-	227-36254-02
	0.50 µm	40 to 250/260 °C	-	-	-	227-36255-01	-	227-36255-02
	1.00 µm	40 to 240/250 °C	-	-	-	221-75979-30	-	227-36256-01
	1.50 µm	40 to 230/240 °C	-	-	-	227-36257-01	-	227-36257-02
	2.00 µm	40 to 220/230 °C	-	-	-	227-36258-01	-	-

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

FAMES in Biodiesel Oils



Conditions

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

Capillary Columns

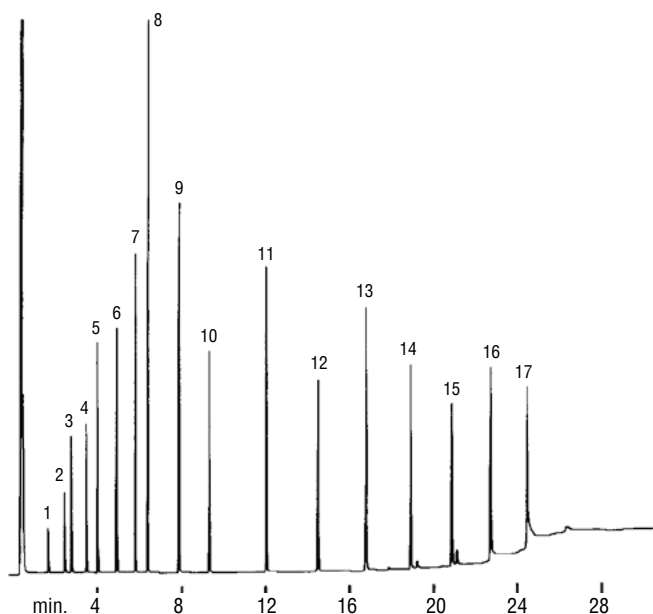
Dedicated Columns - Acidic Compounds

SH-PolarD

- Polar phase: Crossbond acid-deactivated Carbowax polyethylene glycol
- Dedicated columns for free (underivatized) acids, some inorganic acids.
- Resistant to oxidative damage.
- Equivalent to USP G25 and G35 phases.
- Similar phases: Stabilwax-DA, HP-FFAP, DB-FFAP, VF-DA, CP-Wax 58 CB, CP-FFAP CB, Nukol, BP-21, ZB-FFAP, ATAquaWax-DA, AT-1000, EC-1000

ID	df	Temp. Range	15 m	25 m	30 m	50 m	60 m
0.25 mm	0.10 µm	40 to 250/260 °C	-	-	227-36271-01	-	-
	0.25 µm	40 to 250/260 °C	-	-	221-75981-30	-	227-36272-01
	0.50 µm	40 to 250/260 °C	-	-	227-36273-01	-	227-36273-02
0.32 mm	0.10 µm	40 to 250/260 °C	-	-	227-36274-01	-	-
	0.25 µm	40 to 250/260 °C	-	-	227-36321-02	-	227-36275-01
	0.50 µm	40 to 250/260 °C	-	227-36322-04	227-36322-02	-	227-36276-01
	1.00 µm	40 to 240/250 °C	-	-	227-36277-01	227-36277-03	227-36277-02
0.53 mm	0.25 µm	40 to 250/260 °C	-	-	227-36278-01	-	227-36278-02
	0.50 µm	40 to 250/260 °C	-	-	227-36279-01	-	227-36279-02
	1.00 µm	40 to 240/250 °C	227-36280-03	-	227-36280-01	-	227-36280-02
	1.50 µm	40 to 230/240 °C	-	-	227-36281-01	-	227-36281-02

Organic Acids (Free Fatty Acids)



Peaks

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

Conditions

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

Capillary Columns

Dedicated Columns - Basic Compounds

SH-5 Amine / SH-35 Amine

- Dedicated columns for amines and other basic compounds, including alkylamines, diamines, triamines, ethanolamines, and nitrogen-containing heterocyclics.
- Similar phases: Rtx-5 Amine

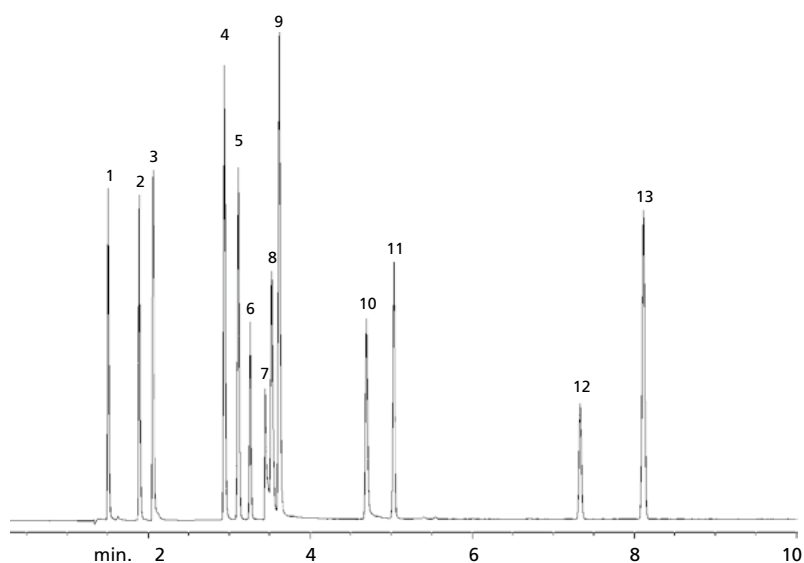
SH-5 Amine (Low-polarity phase: Crossbond 5% diphenyl / 95% dimethyl polysiloxane)

ID	df	Temp. Range	15 m	30 m
0.25 mm	0.25 µm	-60 to 315 °C	-	227-36282-01
	0.50 µm	-60 to 300/315 °C	227-36323-01	227-36283-01
	1.00 µm	-60 to 300/315 °C	227-36323-02	227-36284-01
0.32 mm	1.00 µm	-60 to 300/315 °C	227-36332-03	227-36332-02
	1.50 µm	-60 to 290/305 °C	-	227-36285-01
0.53 mm	1.00 µm	-60 to 290/305 °C	-	227-36286-01
	3.00 µm	-60 to 280/295 °C	-	227-36287-01

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

ID	df	Temp. Range	15 m	30 m
0.25 mm	0.50 µm	0 to 220 °C	-	227-36288-01
	1.00 µm		-	227-36289-01
0.32 mm	1.00 µm		-	227-36290-01
	1.50 µm		-	227-36291-01
0.53 mm	1.00 µm		227-36292-02	227-36292-01
	3.00 µm		-	227-36293-01

Amines & Phenols



Peaks

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

Conditions

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

Capillary Columns

Dedicated Columns

SH-Volatile Amine

- Unique selectivity for baseline resolution of all volatile amines.
- Excellent inertness assures accuracy and sensitivity for volatile amines, including free ammonia.
- Highly robust phase withstands repeated water injections, resulting in longer column lifetime.
- High temperature stability (290 °C) ensures elution of amines up to C16 and allows contaminants to be removed by "baking out" the column.
- Similar phase: Rtx-Volatile Amine, CP-Volamine

The SH-Volatile Amine column was designed specifically for analyzing volatile amines in difficult matrices, such as water. The unique base deactivation creates an exceptionally inert surface for these sensitive compounds, resulting in highly symmetrical peaks, which allow low detection limits. The stable bonded phase yields a column that is not only retentive and highly selective for these compounds but is also very robust and able to withstand repeated water injections.

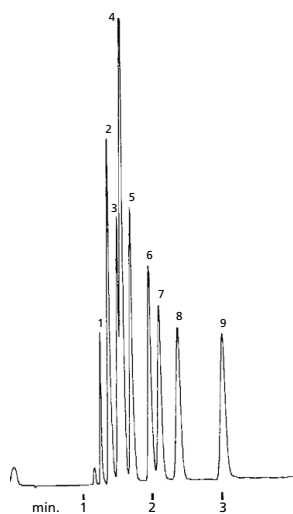
ID	df	Temp. Range	30 m	60 m
0.32 mm	5.00 µm	-60 to 270/290 °C	227-36326-01	227-36326-02

SH-PolarX

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

ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.25 µm	40 to 210/220 °C	227-36359-01	227-36294-01	-
	0.50 µm		-	227-36295-01	-
0.32 mm	0.25 µm		-	227-36296-01	227-36296-02
	0.50 µm		-	227-36297-01	-
	1.00 µm		-	227-36298-01	227-36298-02
0.53 mm	0.50 µm		-	227-36299-01	-
	1.00 µm	-	227-36300-01	227-36300-02	

Amines (low MW)



Peaks

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

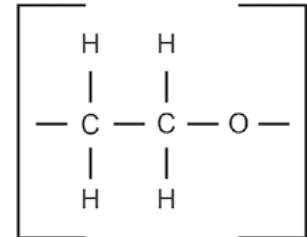
Conditions

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

SH-PolarWAX MS

- High-polarity, stable polyethylene glycol (PEG) stationary phase.
- Low bleed and rugged enough to withstand repeated temperature cycles without retention time shifting.
- Ideal for food, flavor, fragrance, and industrial chemical and solvent analysis.
- Temperature range: 40 °C to 250/260 °C.
- Equivalent to USP G14, G15, G16, G20, and G39 phases.
- Similar Phases: Stabilwax, AT-WAXms

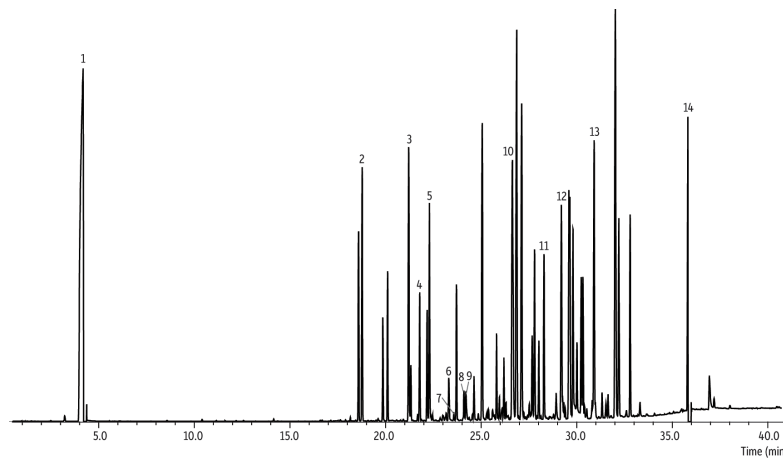
■ SH-PolarWAX MS Structure



The SH-PolarWax MS column ensures reproducible retention times from run to run, even with temperature cycling. When methods require trace analysis, this highly polar, low-bleed stationary phase produces excellent signal-to-noise levels! Ideal for food and flavor analysis (e.g., essential oils), fragrance and allergen analysis, as well as industrial solvent and chemical analysis.

ID	df	Temp. Range	30 m
0.25 mm	0.25 µm	40 to 250/260 °C	227-36322-01
0.32 mm	0.25 µm		227-36322-03

Fragrance Allergens and Common Compounds in Commercial Perfume



Peaks	t _r (min)
1. Ethanol	4.18
2. Linalool*	18.59
3. Terpineol	21.21
4. Benzyl acetate	21.78
5. Citronellol*	22.29
6. Dipropylene glycol isomer 1	23.31
7. Geraniol*	23.57
8. Dipropylene glycol isomer 2	24.10
9. Dipropylene glycol isomer 3	24.20
10. Lilial*	26.63
11. Isoeugenol*	28.29
12. Piperonal	29.20
13. Diethyl phthalate	30.91
14. Benzyl salicylate*	35.81

* Denotes fragrance allergen or suspected allergen

Conditions

Column: SH-PolarWax MS, 30 m, 0.25 mm ID, 0.25 µm (227-36322-01)
 Sample: Commercial perfume A
 Conc.: Neat
 Inj. Vol.: 1 µL split (split ratio 200:1)
 Inj. Temp.: 250 °C
 Liner: Premium 3.5 mm ID single taper w/wool (980-22810)
 Carrier Gas: He, constant linear velocity
 Oven Temp.: 35 °C (hold 5 min) to 250 °C at 7 °C/min (hold 5 min)
 Det.: MS, Scan

Capillary Columns

Dedicated Columns - Blood Alcohol

SH-BAC Plus 1 / SH-BAC Plus 2

- Optimized column selectivities guarantee resolution of ethanol, internal standards, and frequently encountered interferences.
- Robust and reproducible column chemistry ensures longer column lifetime and consistent results.
- Similar phases: Rtx-BAC Plus 1, DB-ALC1, DB-ALC2, ZB-BAC-1, ZB-BAC-2

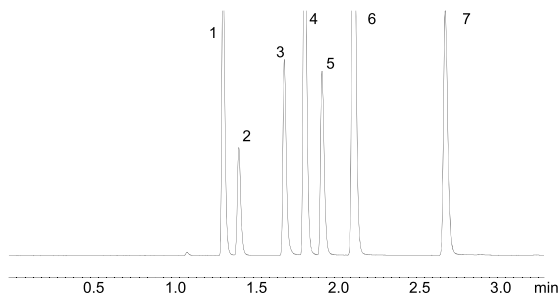
SH-BAC PLUS 1

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

SH-BAC Plus 2

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

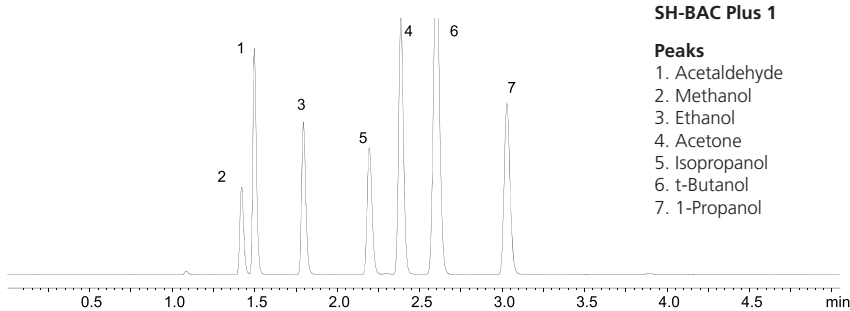
Analysis of Alcohol Compounds in Blood



SH-BAC Plus 2

Peaks

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



SH-BAC Plus 1

Peaks

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

Conditions

Instrument: GC-2010 Plus AF + HS-20
 Headspace: Oven Temp.: 85 °C
 Vial Warming Time: 15 min
 Vial Pressurization Time: 1 min
 Injection Time: 0.5 min
 Sample Line Temp: 150 °C
 Vial Volume: 20 mL
 Vial Agitation: Off
 Vial Pressurization: 100 kPa
 Load Time: 0.5 min
 Needle Flash Time: 0.5 min
 Transfer Line Temp: 150 °C

Conditions

Column: SH-BAC Plus 2, 30 m, 0.32 mm ID, 0.60 µm (P/N: 227-36263-01)
 SH-BAC Plus 1, 30 m, 0.32 mm ID, 1.80 µm (P/N: 227-36260-01)
 Inj.: Split (split ratio: 20:1)
 Col. Temp.: 40 °C
 Carrier Gas: He, 100 kPa
 Det.: FID, 250 °C
 Makeup Gas: He, 30 mL/min
 Hydrogen: 40 mL/min
 Air: 400 mL/min

Capillary Columns

Dedicated Columns - Pesticid Analysis / PCB

SH-OPP

- Application-specific columns for 53 organophosphorus pesticides (OPP) listed in EPA Method 8141.
- Low bleed - ideal for GC-FPD, GC-NPD, or GC-MS analyses.

ID	df	Temp. Range	30 m
0.32 mm	0.50 μ m	-20 to 310/330 $^{\circ}$ C	227-36377-01

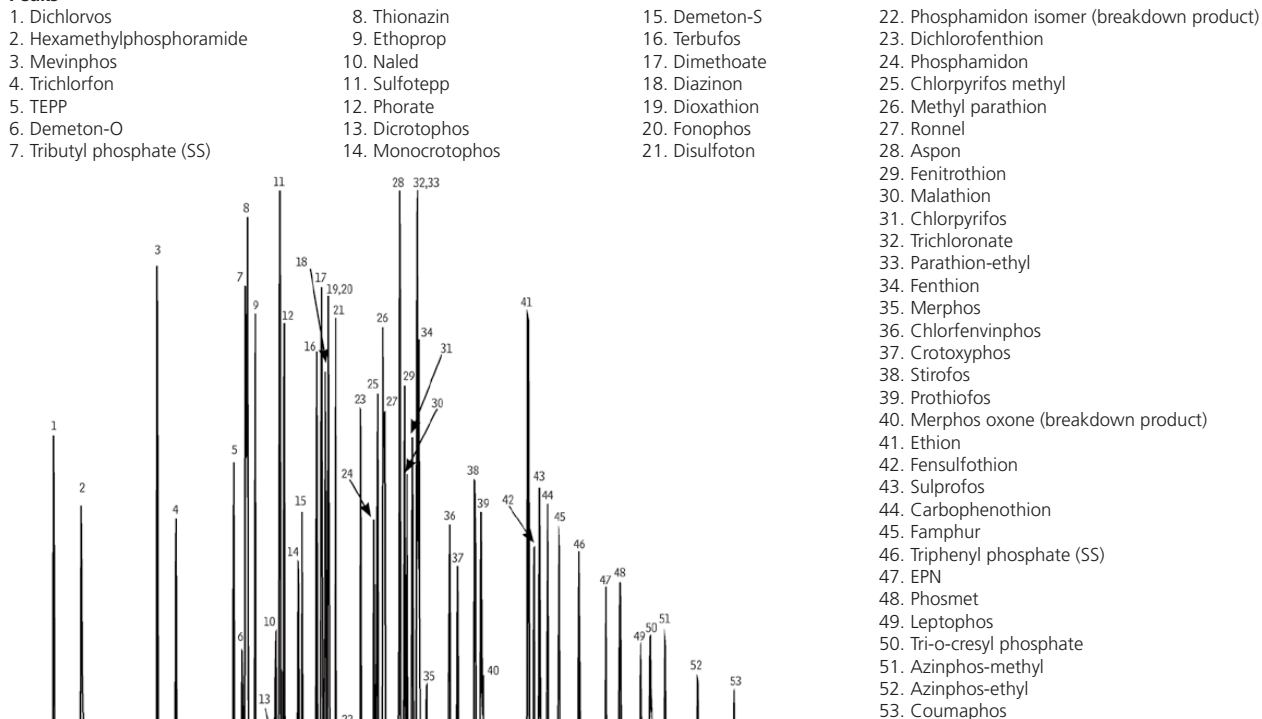
SH-OPP2

- Dedicated column for organophosphorus pesticides; best column combination for US EPA Method 8141.
- Low bleed - ideal for GC-FPD, GC-NPD, or GCMS analyses.
- Similar phases: Rtx-OPP2

ID	df	Temp. Range	30 m
0.32 mm	0.32 μ m	-20 to 310/330 $^{\circ}$ C	221-75887-30

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

Peaks



Conditions

Column: SH-OPP2, 30 m, 0.32 mm ID, 0.32 μ m (P/N: 221-75887-30)
 Inj.: 1 μ L splitless (hold 1 min)
 Inj. Temp.: 200 $^{\circ}$ C
 Oven Temp.: 80 $^{\circ}$ C (hold 0.5 min) to 280 $^{\circ}$ C at 12 $^{\circ}$ C/min (hold 10 min)

Carrier Gas: He.
 Dead Time: 1.03 min at 80 $^{\circ}$ C
 Detector: FPD, 250 $^{\circ}$ C
 Notes: Constant pressure

Capillary Columns

Dedicated Columns - Pesticide Analysis / PCB

SH-CLP / SH-CLP II

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

SH-CLP

ID	df	Temp. Range	20 m	30 m
0.18 mm	0.18 μm	-60 to 320/340 $^{\circ}\text{C}$	227-36266-02	-
0.32 mm	0.32 μm		-	227-36266-01
	0.50 μm		-	221-75879-30

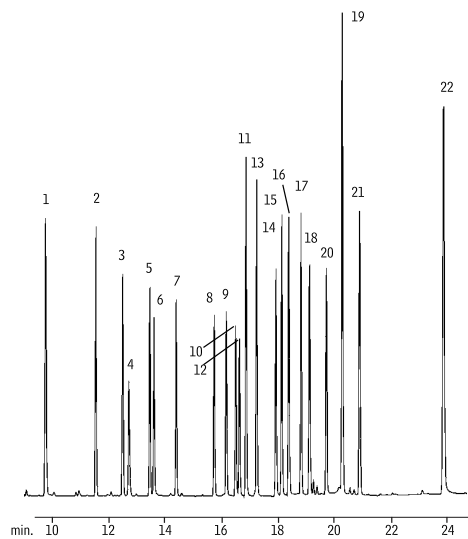
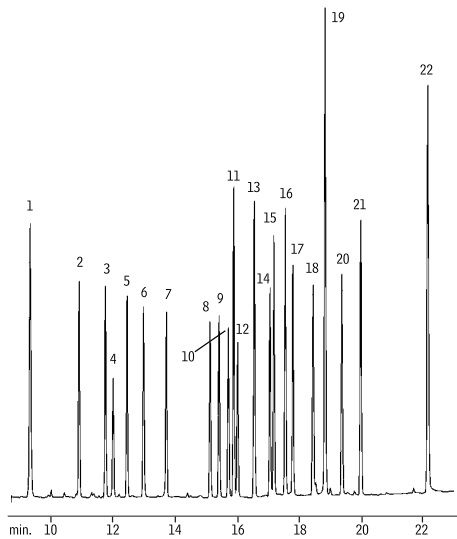
SH-CLP II

ID	df	Temp. Range	30 m
0.25 mm	0.20 μm	-60 to 320/340 $^{\circ}\text{C}$	227-36267-02
0.32 mm	0.25 μm		227-36267-01
	0.50 μm		227-36267-03

Organochlorine Pesticides (US EPA Method 8081)

Peaks

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



Conditions

Column: SH-CLP, 30 m, 0.32 mm ID, 0.50 μm
(P/N: 221-75879-30)

Inj.: Direct

Inj. Temp.: 200 $^{\circ}\text{C}$

Oven Temp.: 120 $^{\circ}\text{C}$ (hold 1 min) to 300 $^{\circ}\text{C}$ (hold 10 min) at 9 $^{\circ}\text{C}/\text{min}$

Head pressure: 8.7 psi (constant)

Dead Time: 1.9 min

Detector: ECD, 300 $^{\circ}\text{C}$ with anode purge

Flow rate: 1.3 mL/min at 120 $^{\circ}\text{C}$, He

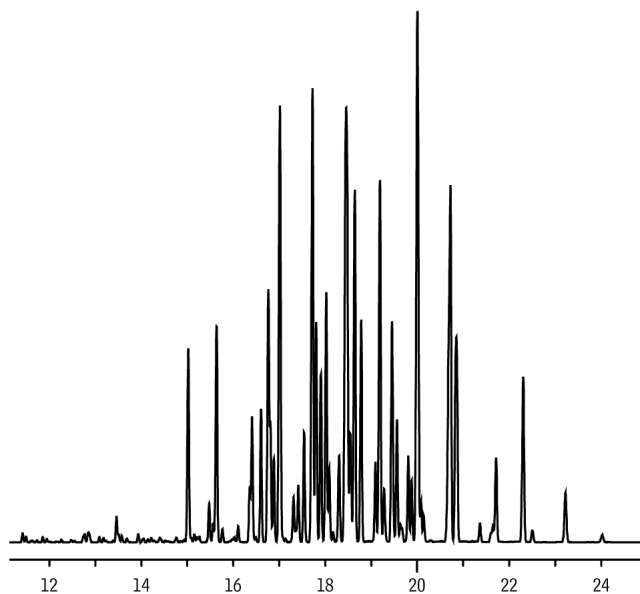
Column: SH-CLP II, 30 m, 0.32 mm ID, 0.25 μm
(P/N: 227-36267-01)

SH-PCB

- Unique polymer for PCBs analysis by GC-ECD or GC-MS.
- Good results for other semivolatiles.
- Low polarity; inert to active compounds.
- Similar phases: Rtx-PCB

ID	df	Temp. Range	30 m	60 m
0.18 mm	0.18 μ m	30 to 320/340 $^{\circ}$ C	-	227-36310-03
0.25 mm	0.25 μ m		227-36310-04	227-36310-01

Organochlorine Pesticides (US EPA Method 8081)



Conditions

Column: SH-PCB, 30 m, 0.25 mm ID, 0.25 μ m (227-36310-04)
Sample: Aroclor 1260
Conc.: 200 ng/mL
Inj. Vol.: 1.0 μ L splitless (hold 0.75 min)
Inj. Temp.: 250 $^{\circ}$ C
Oven Temp.: 100 $^{\circ}$ C (hold 1.0 min) to 300 $^{\circ}$ C at 10 $^{\circ}$ C/min (hold 4 min)
Carrier Gas: H_2 , constant pressure
Linear Velocity: 71 cm/sec @ 110 $^{\circ}$ C
Detector: ECD, 310 $^{\circ}$ C

Capillary Columns

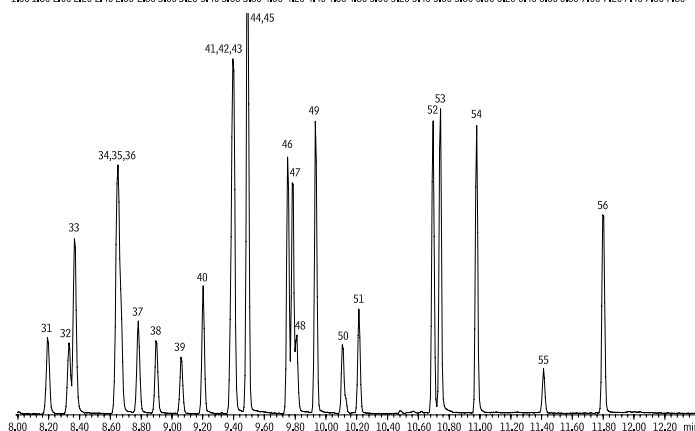
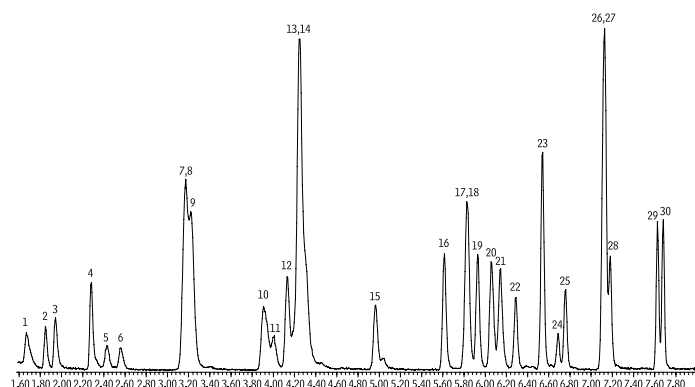
Dedicated Columns - Volatile Compounds

SH-VMS

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

ID	df	Temp. Range	20 m	30 m	40 m	60 m
0.18 mm	1.00 µm	-40 to 240/260 °C	227-36412-01	-	227-36412-02	-
0.25 mm	1.40 µm		-	227-36268-01	-	227-36268-02
0.32 mm	1.80 µm		-	227-36269-01	-	227-36269-02
0.45 mm	2.55 µm		-	-	-	227-36348-01
0.53 mm	3.00 µm		-	227-36353-01	-	-

Volatile Organics (US EPA CLP 04.1)



Peaks

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

Conditions

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

Purge and Trap: Trap: #10 (Tenax_q/silica gel/carbon molecular sieve)

Sample Temp: ambient

Purge: 11 min at 40 mL/min

Desorb preheat: 185 °C

Desorb: 0.5 min at 190 °C

Desorb flow rate: 35.0 mL/min

Bake: 8 min at 210 °C

Interface: split injector

Transfer Line Temp: 150 °C

Inj.: Split (split ratio: 35:1)

Inj. Temp.: 200 °C

Oven Temp.: 40 °C (hold 4 min) to 90 °C at 16 °C/min to 220 °C at 32 °C/min (hold 5 min)

Carrier Gas: He, linear velocity 34 cm/sec.,

40 °C, constant flow

Detector: MS

Transfer Line Temp: 150 °C

Scan Range: 35-300 amu.

Ionization: EI

SH-VRX

- Application-specific columns for volatile organic pollutants.
- Excellent for U.S. EPA Method 8021 compounds.
- Similar phases: Rtx-VRX

The SH-VRX stationary phase and optimized column dimensions provide low bleed, excellent resolution, and fast analysis times for volatile compounds.

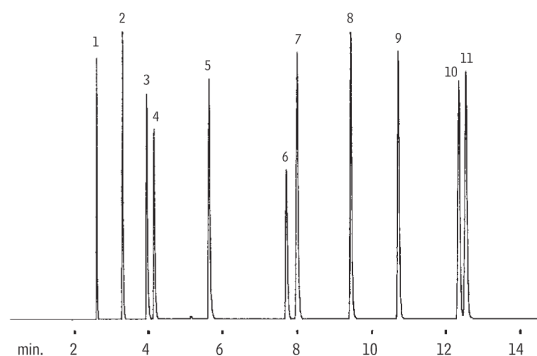
ID	df	Temp. Range	20 m	25 m	30 m	40 m	60 m
0.10 mm	0.50 µm	-40 to 240/260 °C	-	227-36331-01	-	-	-
0.18 mm	1.00 µm		227-36331-02	-	-	227-36331-03	-
0.25 mm	1.40 µm		-	-	227-36355-01	-	227-36355-02
0.32 mm	1.80 µm		-	-	227-36355-03	-	-
0.53 mm	3.00 µm		-	-	227-36355-04	-	-

SH-Volatiles

- Application-specific columns for volatile organic compounds.
- Can be used for alcohols and solvents.
- Low bleed - ideal for GCMS analyses.

ID	df	Temp. Range	30 m	60 m
0.25 mm	1.00 µm	-20 to 270/280 °C	227-36375-01	227-36375-02
0.32 mm	1.50 µm		-	227-36375-03

Alcohols SH-Volatiles



Peaks

1. Methanol
2. Ethanol
3. Isopropanol
4. Acetone
5. 1-Propanol
6. Ethyl Acetate
7. 2-Methyl-1-propanol
8. 1-Butanol
9. 3-Pentanol
10. 3-Methyl-1-butanol
11. 2-Methyl-1-butanol

Conditions

Column: SH-Volatiles, 60 m, 0.32 mm ID, 1.50 µm (227-36375-03)
 Sample: neat alcohols mix
 Inj. Vol: 0.03 µL split (split ratio 40:1)
 Inj. Temp.: 200 °C
 Oven Temp.: 40 °C (hold 4 min) to 80 °C at 8 °C/min (hold 5 min)
 Carrier Gas: H₂, constant flow
 Linear velocity: 40 cm/sec
 Detector: FID @ 200 °C

Capillary Columns

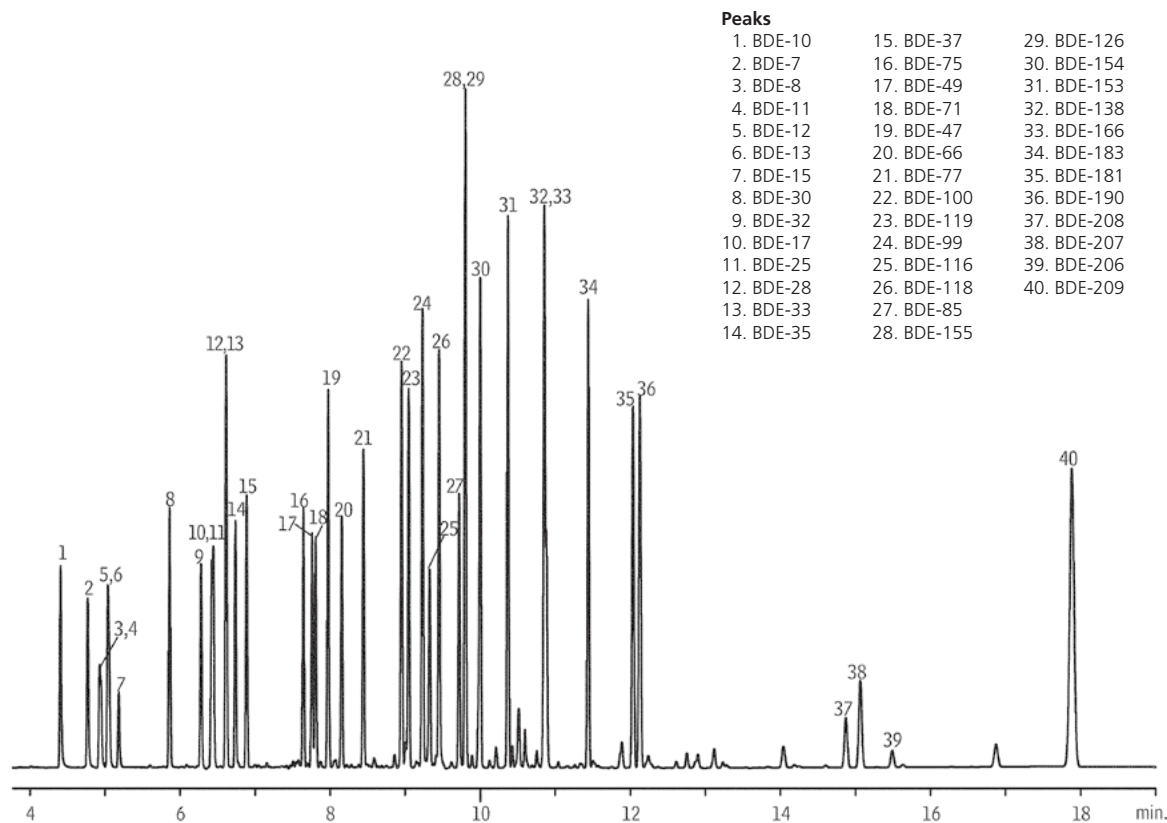
Dedicated Columns - Specific Applications

SH-1614

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

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

Brominated Flame Retardants



Conditions

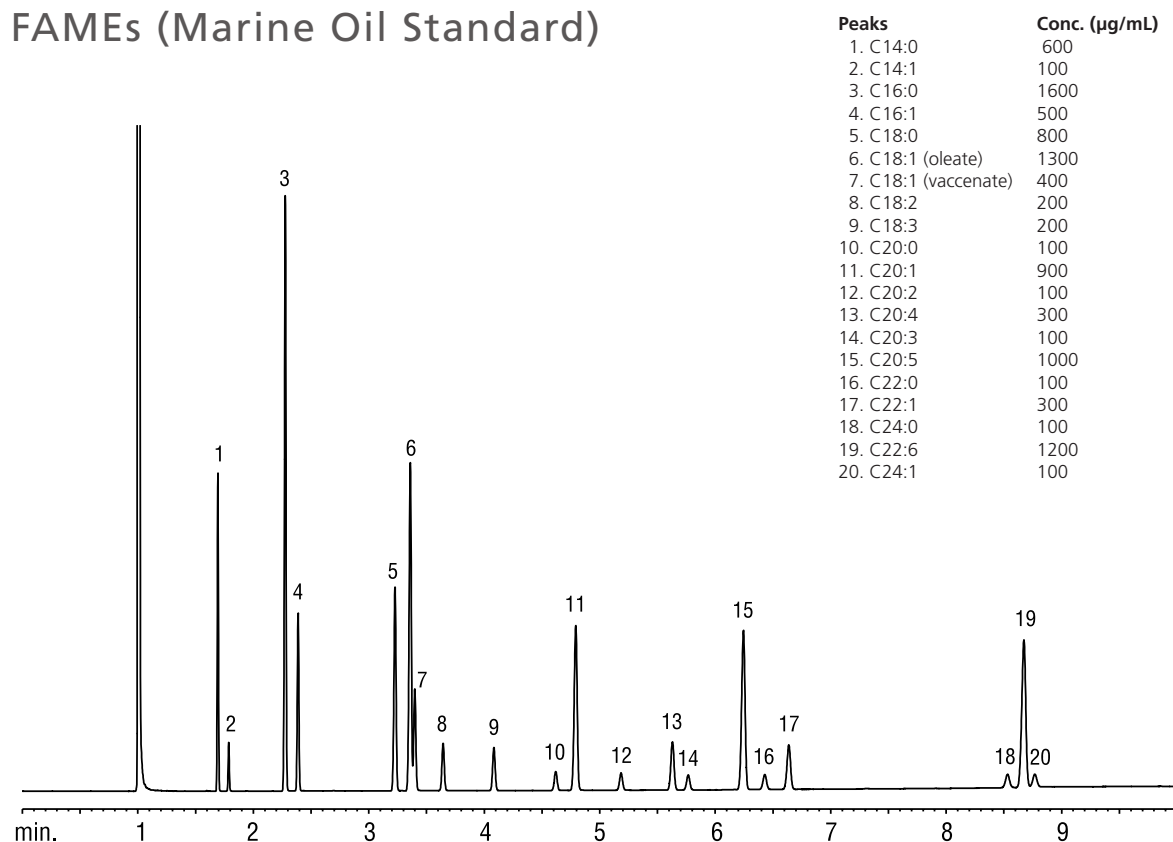
Column: SH-1614, 15 m, 0.25 mm ID, 0.10 µm (P/N: 227-36265-01)
 Sample: 100-300 ppb PBDE PAR Solution 500 ppb decabromodiphenyl ether
 Inj.: 1 µL splitless (hold 1 min)
 Inj. Temp.: 340 °C
 Oven Temp.: 120 °C (hold 1 min) to 275 °C at 15 °C/min to 300 °C at 5 °C/min (hold 5 min)
 Carrier Gas: He, constant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

SH-FAME

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

ID	df	Temp. Range	30 m
0.25 mm	0.25 µm	20 to 240/250 °C	227-36324-01
0.32 mm	0.25 µm		227-36270-01

FAMES (Marine Oil Standard)



Conditions

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

Capillary Columns

Dedicated Columns - Specific Applications

SH-Dioxin

- Isomer separation for for 2,3,7,8-TCDD and 2,3,7,8-TCDF achieved with one GC column.
- Thermally stable to 340 °C for longer lifetime.
- Unique selectivity for toxic dioxin and furan congeners allows use as a confirmation GC column

ID	df	Temp. Range	40 m	60 m
0.18 mm	0.18 µm	20 to 320/340 °C	227-36374-01	-
0.25 mm	0.25 µm		-	227-36374-02

SH-Mineral Oil

- Application specific columns meet DIN EN ISO 9377-2:2000 requirements.
- Optimized column dimensions for fast mineral oil screening.
- Surface linked phase guarantees long lifetime, robustness, and stability to 400 °C

ID	df	Temp. Range	15 m
0.32 mm	0.10 µm	-60 to 380/400 °C	227-36379-02
	0.15 µm		227-36379-01

SH-TCEP

- Highly polar phase; 1,2,3-tris [2-cyanoethoxy] propane - not bonded
- General-purpose columns, ideal for aromatics and oxygenates in gasoline.
- Similar phases: CP-TCEP, SPB-TCEP

ID	df	Temp. Range	60 m
0.25 mm	0.40 µm	0 to 135/150 °C	227-36376-01

Capillary Columns

Dedicated Columns - Chiral Separations

SH-βDEXse

- Phase: 2,3-di-O-ethyl-6-O-tert-butyl dimethylsilyl beta cyclodextrin added into 14% cyanopropylphenyl/86% dimethyl polysiloxane
- Excellent column lifetime by adding β or γ cyclodextrin in stationary phase.
- Ideal for the separation of chiral compounds.
- Provides better resolution for limonene, linalool, linalyl acetate, ethyl-2-methylbutyrate, 2,3-butane diol, and styrene oxides.

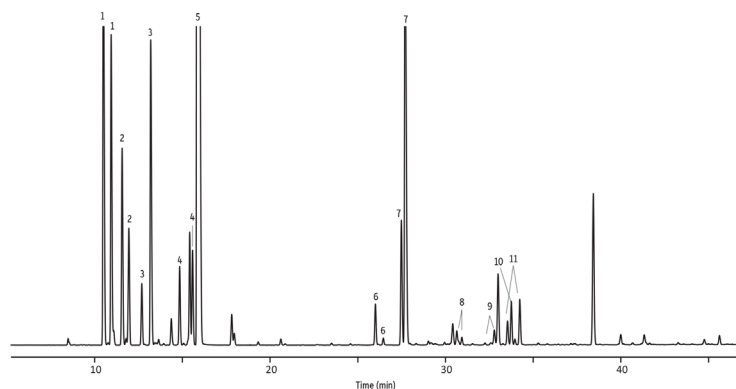
ID	df	Temp. Range	30 m
0.25 mm	0.25 μm	40 to 230 °C	227-36365-01

SH-βDEXsm

- Phase: 2,3-Di-O-methyl-6-O-tert-butyl-dimethylsilyl-beta-cyclodextrin, added to 14% cyanopropylphenyl/86% dimethylpolysiloxane
- Excellent column lifetime by adding β or γ cyclodextrin in stationary phase.
- Ideal for the separation of most chiral compounds in essential oils.

ID	df	Temp. Range	30 m
0.25 mm	0.25 μm	40 to 230 °C	227-36365-02
0.32 mm	0.25 μm	40 to 230 °C	227-36365-03

Rosemary Oil



Peaks	t _R 1	t _R 2
1. α-Pinene (±)	10.500	10.941
2. Camphene (±)	11.566	11.952
3. β-Pinene (±)	12.690	13.200
4. Limonene (±)	14.850	15.585
5. Eucalyptol (1,8-cineole)	15.837	-
6. Linalool (±)	26.011	26.463
7. Camphor (±)	27.492	27.704
8. Terpinen-4-ol (±)	30.647	30.935
9. Isoborneol (±)	32.254	32.786
10. Borneol (±)	33.000	33.756
11. α-Terpineol (±)	33.539	34.237

Conditions

Column: SH-βDEXsm, 30 m, 0.32 mm ID, 0.25 μm (227-36365-03)
 Sample: Rosemary oil
 Diluent: Acetone
 Conc.: 5%
 Inj. Vol.: 1 μL split (split ratio 100:1)
 Inj. Temp.: 210 °C
 Carrier Gas: H₂, constant pressure
 Linear velocity: 80 cm/sec
 Oven Temp.: 40 °C (hold 1 min) to 200 °C at 2 °C/min (hold 3 min)
 Det.: FID, 230 °C
 Make-up Gas: N₂

Capillary Columns

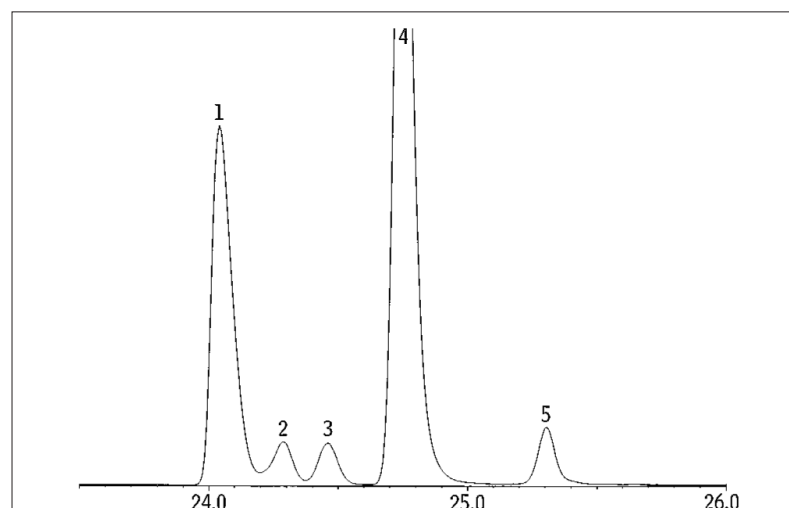
Dedicated Columns Chiral Separations

SH- β DEXsa

- Phase: 2,3-Di-acetoxy-6-O-tert-butyl-dimethylsilyl-beta-cyclodextrin, added to 14% cyanopropylphenyl/86% dimethylpolysiloxane
- Excellent column lifetime by adding β or γ cyclodextrin in stationary phase.
- Unique selectivity for esters, lactones, and other fruit flavor components.

ID	df	Temp. Range	30 m
0.25 mm	0.25 μ m	40 to 230 $^{\circ}$ C	227-36365-04

Commercial Peppermint Oil



Peaks

1. Menthone
2. Menthol
3. Menthone
4. Menthol
5. Menthyl acetate

Conditions

Column: SH- β DEXsa, 30 m, 0.25 mm ID, 0.25 μ m (P/N: 227-36365-04)
Sample: commercial peppermint
Inj.: 1 μ L split (split ratio 150:1)
Inj. Temp.: 230 $^{\circ}$ C
Carrier Gas: He, constant pressure
Linear Velocity: 35 cm/sec. @ 100 $^{\circ}$ C
Oven Temp.: 40 $^{\circ}$ C to 120 $^{\circ}$ C at 5 $^{\circ}$ C/min to 135 $^{\circ}$ C at 3 $^{\circ}$ C/min to 200 $^{\circ}$ C at 5 $^{\circ}$ C/min
Det.: MS, 200 $^{\circ}$ C

Capillary Columns

PLOT Columns

SH-Alumina BOND

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

SH-Alumina BOND/Na₂SO₄

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

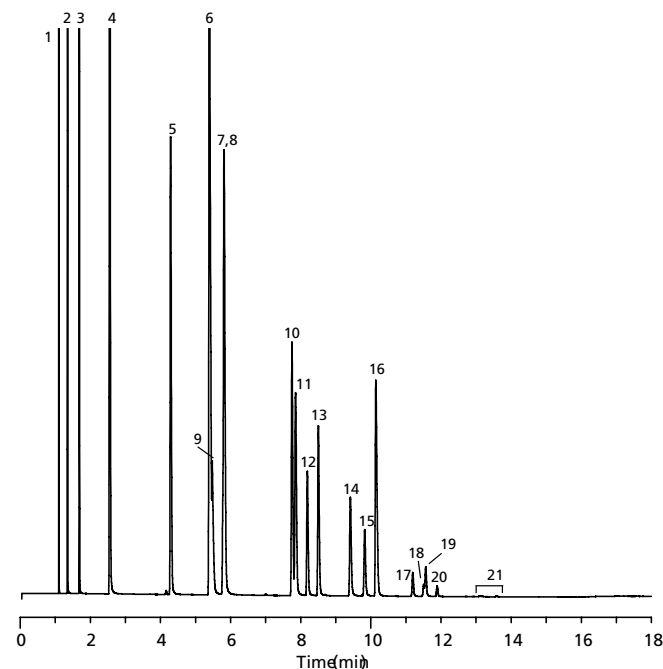
ID	df	Temp. Range	30 m	50 m
0.25 mm	4.00 µm	-60 to 200 °C	227-36328-03	-
0.32 mm	5.00 µm		227-36328-01	227-36328-02
0.53 mm	10 µm		227-36316-01	227-36301-01

SH-Alumina BOND/KCl

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

ID	df	Temp. Range	30 m	50 m
0.25 mm	4.00 µm	-60 to 200 °C	227-36367-01	-
0.32 mm	5.00 µm		-	227-36380-01
0.53 mm	10 µm		-	221-76139-50

Refinery Gas



Peaks

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

Conditions

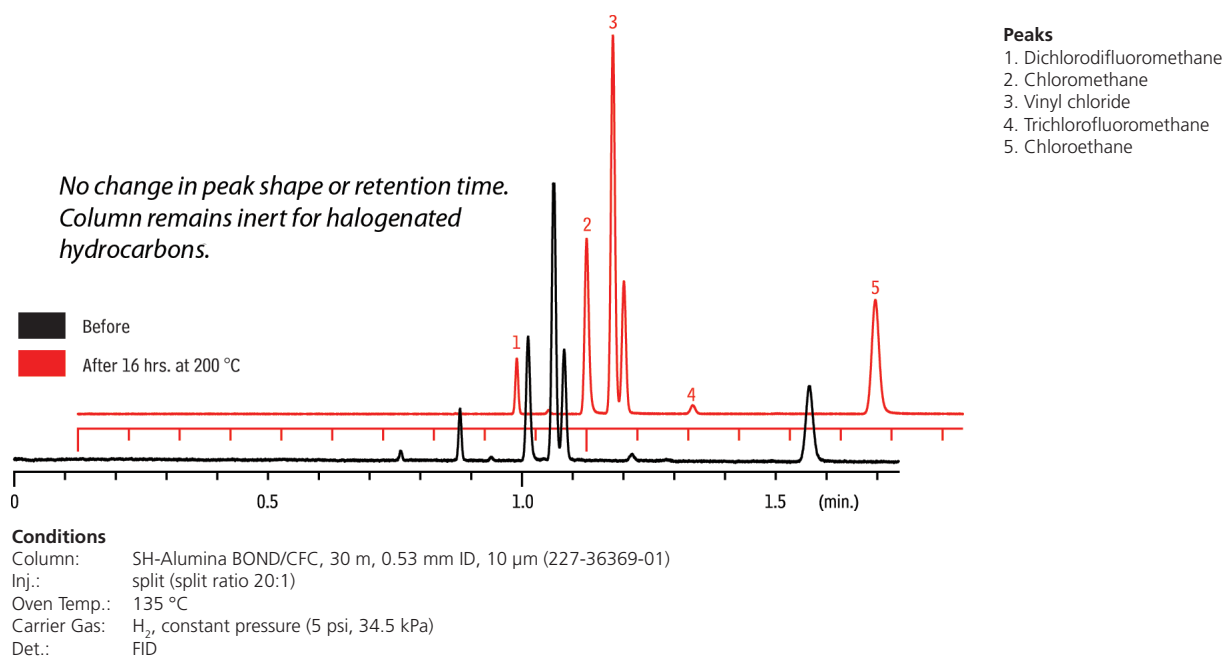
Column: SH-Alumina BOND/KCl, 50 m, 0.53 mm ID, 10 µm (P/N: 221-76139-50)
 Sample: Refinery gas
 Inj.: 10 µL split (split vent flow 80mL/min)
 Inj. Temp.: 200 °C
 Carrier Gas: Hydrogen, constant pressure, 8.0 psi, linear velocity 74 cm/sec. at 45 °C
 Oven Temp.: 45 °C (hold 1 min) to 200 °C at 10 °C/min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

SH-Alumina BOND/CFC

- Highly selective for C1-C5 hydrocarbons and separates all saturated and unsaturated hydrocarbon isomers above ambient temperatures.
- Improved inertness for chlorofluorocarbon (CFC) compounds.
- Highly selective alumina-based column, separates most CFCs.

ID	df	Temp. Range	30 m
0.53 mm	10 µm	-60 to 200 °C	227-36369-01

Stability Test: Halogenated Hydrocarbons on SH-Alumina BOND/CFC (Before & After 16 hrs. at 200 °C)



SH-Alumina BOND/MAPD

- Optimized deactivation produces maximum response when analyzing trace levels of acetylene, methyl acetylene and propadiene.
- Extended temperature range up to 250 °C for fast elution of high molecular weight (HMW) hydrocarbons and accelerated column regeneration after exposure to water.

ID	df	Temp. Range	50 m
0.53 mm	10 µm	-60 to 250 °C	227-36358-01

Capillary Columns

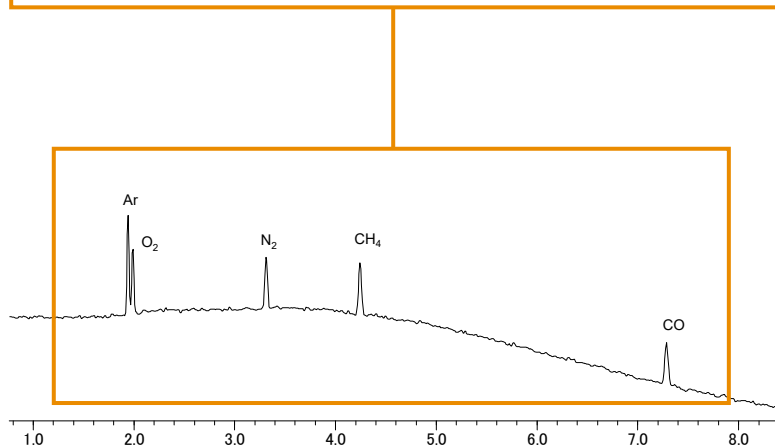
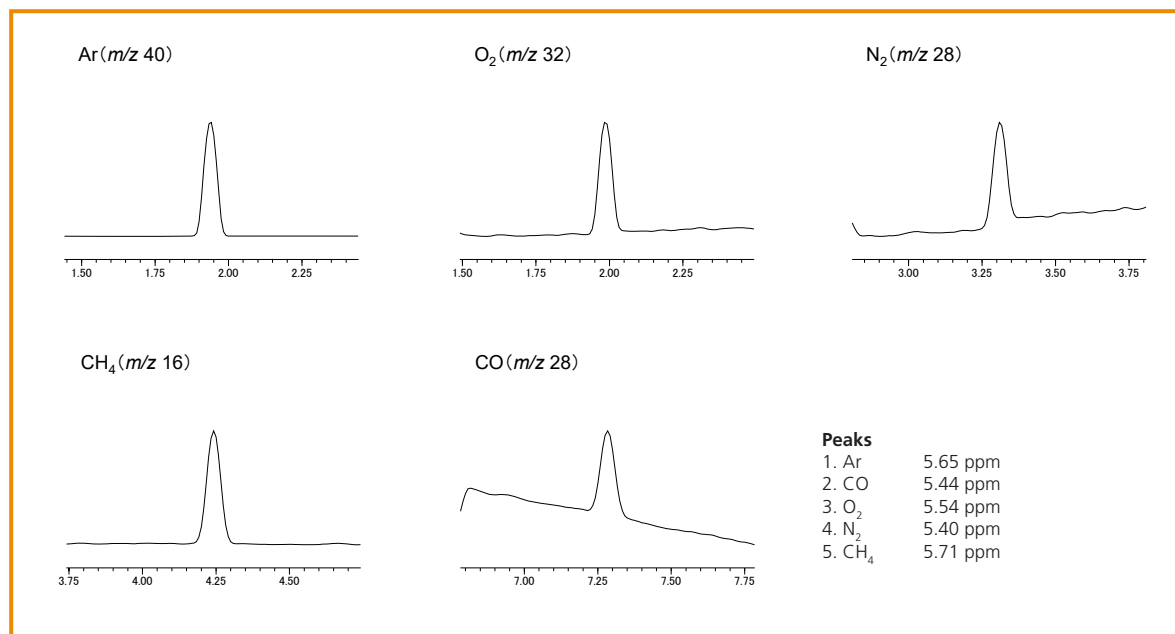
PLOT Columns

SH-Msieve 5A

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

ID	df	Temp. Range	15 m	30 m
0.25 mm	20 µm	-100 to 300 °C	227-36611-01	-
0.32 mm	30 µm		-	227-36611-02
0.53 mm	50 µm		-	221-75763-30

Analysis of Inorganic Gas



Conditions

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

SH-Q-BOND

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

ID	df	Temp. Range	30 m
0.25 mm	8.00 µm	-60 to 280/300 °C	227-36381-01
0.32 mm	10 µm		221-75764-30
0.53 mm	20 µm		221-75765-30

SH-QS-BOND

- Intermediate polarity porous polymer PLOT column incorporating low 4-vinylpyridine.
- Separates ethane, ethylene, and acetylene to baseline.
- Similar phases: Rt-QS-Bond, GS-Q

ID	df	Temp. Range	30 m
0.53 mm	20 µm	-60 to 250 °C	227-36366-01

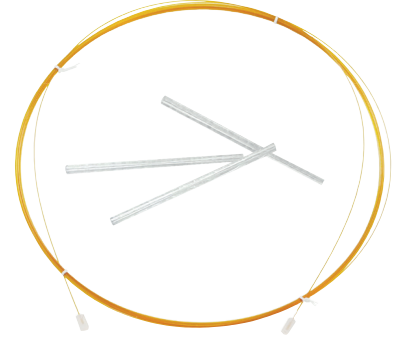
SH-U-BOND

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

ID	df	Temp. Range	15 m	30 m
0.25 mm	8.00 µm	-60 to 190 °C	-	227-36302-03
0.32 mm	10 µm		-	227-36327-01
0.53 mm	20 µm		227-36302-02	227-36302-01

SH-Particle Trap (for PLOT columns)

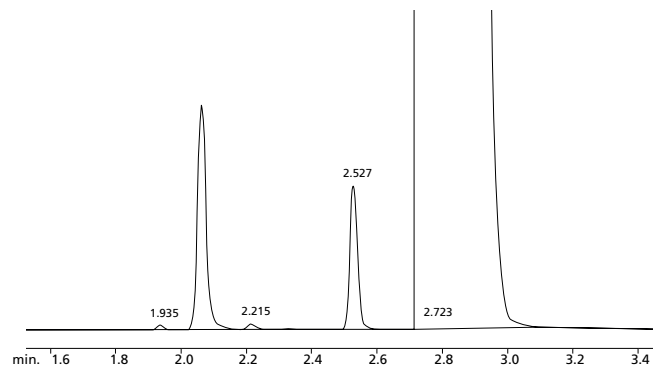
- Includes two Press-Tight connectors and a 2.5 m column.
- Protects detector and valves; connects between column and detector or valve.
- Eliminates detector spikes and scratches in valve rotors.



* For information about Press-Tight® connectors, please refer to page 64.

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

Water and Ethanol in Acetone



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

Conditions

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

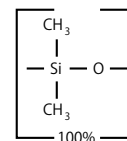
Capillary Columns

Stainless Steel (Siltek) Columns

SH-MetalX-1

- Non-polar phase: Crossbond 100% dimethyl polysiloxane
- General-purpose columns for solvent impurities, PCB congeners (e.g., Aroclor mixes), gases, natural gas odorants, sulfur compounds, essential oils, hydrocarbons, semivolatiles, pesticides, and oxygenates.
- Equivalent to USP G1, G2, G38 phases.
- 4.5" standard coil diameter.
- Similar phases: MXT-1, HP-1, DB-PS1, CP-Sil 5 CB, SPB-1, BP-1, ZB-1, AT-1, EC-1

■ SH-MetalX-1 Structure



ID	df	Temp. Range	7.5 m	15 m	30 m
0.25 mm	0.10 μm	-60 to 360/430 °C	-	227-36318-01	-
0.28 mm	0.10 μm		-	221-75734-15	-
	0.25 μm		-	-	227-36318-02
	3 μm		-	-	227-36363-04
0.53 mm	1.50 μm		227-36363-01	-	-
	1.50 μm		227-36363-02 (2 pcs.)	-	-
	5 μm	-	-	227-36363-05	

SH-MetalX-1HT SimDist

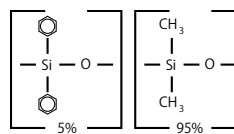
- Nonpolar phase
- Lowest bleed for longest column lifetime.
- Reliably meets all ASTM D2887, D6352, D7169, D7213, and D7500 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.
- Individually tested for guaranteed performance.
- 7" coil diameter.
- Similar phases: MXT-1HT SimDist, DB-HT SimDis ProSteel, CP-SimDist UltiMetal, ZB-1X SimDist

ID	df	Temp. Range	5 m
0.53 mm	0.10 μm	-60 to 430/450 °C	227-36344-01

SH-MetalX-5

- Low-polarity phase: Crossbond 5% diphenyl / 95% dimethyl polysiloxane
- General-purpose columns for drugs, solvent impurities, pesticides, hydrocarbons, PCB congeners (e.g., Aroclor mixes), essential oils, and semivolatiles.
- Equivalent to USP G27 and G36 phases.
- 4.5" standard coil diameter.
- Similar phases: MXT-5, HP-5, DB-5, CP Sil 8 CB, SPB-5, BP-5, ZB-5, EC-5, AT-5

■ SH-MetalX-5 Structure

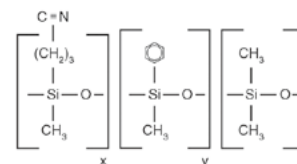


ID	df	Temp. Range	30 m
0.25 mm	0.25 μm	-60 to 430 °C	221-75743-30

SH-MetalX-1701

- Midpolarity Crossbond phase
- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g., Aroclor mixes), and pesticides.
- 4.5" standard coil diameter.
- Equivalent to USP G46 phases
- Similar phase: MXT-1701, DB-1701P, DB-1701, CP-Sil 19 CB, VF-1701ms, VF-1701 pesticides, Equity-1701, BP-10, ZB-1701; ZB-1701P, At-1701

■ SH-MetalX-1701 Structure

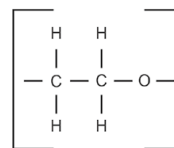


ID	df	Temp. Range	15 m
0.53 mm	1.00 μm	-20 to 260 °C	227-36336-01

SH-MetalX-WAX

- Polar phase; Crossbond Carbowax polyethylene glycol - provides oxidation resistance
- General-purpose columns for FAMES, flavor compounds, essential oils, amines, solvents, xylene isomers, and U.S. EPA Method 603 (acrolein/acrylonitrile).
- Equivalent to USP G14, G15, G16, G20, and G39 phases.
- 4.5" standard coil diameter.
- Similar phases: MXT-Wax, HP-INNOWax, CP-Wax 53 CB, VF-WAX MS, Supelcowax-10, ZB-WAXplus, AT-WAX

■ SH-MetalX-WAX Structure



ID	df	Temp. Range	15 m	30 m	60 m
			-	227-36337-02	-
0.25 mm	0.25 μm	40 to 240/250 °C	-	-	227-36337-03
0.53 mm	1.00 μm	40 to 240/250 °C	227-36337-01	-	-

SH-MetalX Biodiesel TG

- Fast analysis times and sharp mono-, di-, and triglyceride peaks.
- Stable at 430 °C for reliable, consistent performance.
- Similar phase: MXT-Biodiesel TG, MET-Biodiesel

ID	df	Temp. Range	14 m + 2 m	15 m
0.32 mm	0.10 μm	-60 to 380/430 °C	-	227-36315-02
0.53 mm	0.16 μm		227-36315-01	-

SH-MetalX-Alumina BOND / Na₂SO₄

- Can be made in small coil diameters - perfect for tight spaces.
- Na₂SO₄ deactivation
- Best separation for butene isomers (impurities in butene streams)
- Similar Phases: CP-Al₂O₃/Na₂SO₄

ID	df	Temp. Range	30 m
0.53 mm	10 μm	-60 to 200 °C	227-36382-01

Capillary Columns

Stainless Steel (Siltek) Columns

SH-MetalX-Q-BOND

- Phase: Nonpolar porous polymer
- Can be made in small coil diameters - perfect for tight spaces.
- Similar Phases: PoraPLOT Q Ultimetel , Quadrex PLT-Q

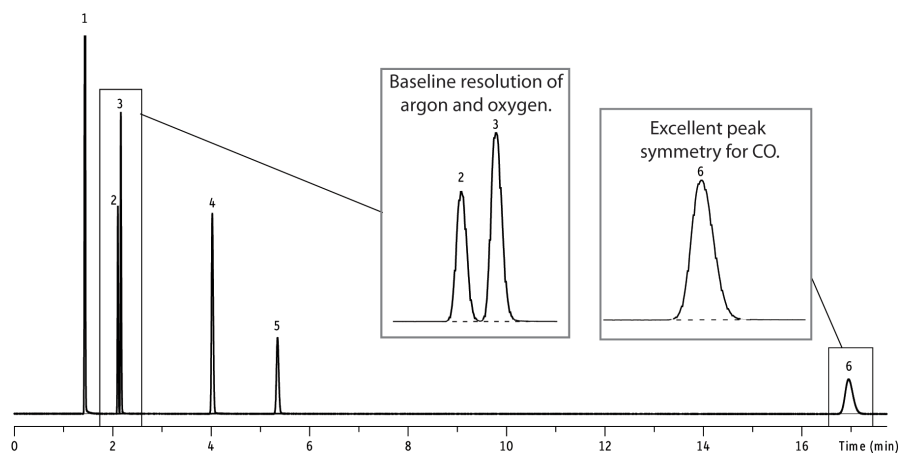
ID	df	Temp. Range	30 m
0.53 mm	20 µm	-60 to 280/300 °C	227-36383-01

SH-MetalX-Msieve 5A PLOT

- Efficient separation of argon/oxygen and other permanent gases, including carbon monoxide.
- Molecular sieves have very high retention, allowing separations of permanent gases at temperatures above ambient.

ID	df	Temp. Range	30 m
0.53 mm	50 µm	-100 to 300 °C	227-36384-01

Permanent Gases



Peaks

1. Helium
2. Argon
3. Oxygen
4. Nitrogen
5. Methane
6. Carbon monoxide

Conditions

Column: SH-MetalX-Msieve 5A, 30 m, 0.53 mm ID, 50 µm (227-36384-01)
 Conc.: 1% in hydrogen
 Inj.: split (split ratio 50:1)
 Carrier Gas: H₂
 Oven Temp.: 30 °C
 Det.: TCD

Capillary Columns

Fast GC Columns

Features

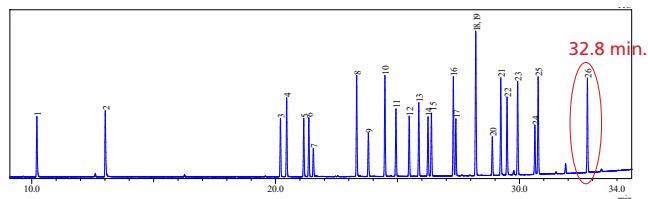
- › Faster Runs with less Resolution
- › More Samples in less Time
- › Best utilization of Hydrogen as Carrier Gas

The objective of Fast GC is to decrease the analysis time needed per chromatographic run. That way the total number of samples that can be analyzed is increased, and a higher throughput is achieved.

The improvement in analysis time is shown in the following chromatograms, which transition from a conventional GC run to a Fast GC run with helium and then to a Fast GC run with hydrogen. While the run time continuously improves, the resolution is maintained.

Conditions

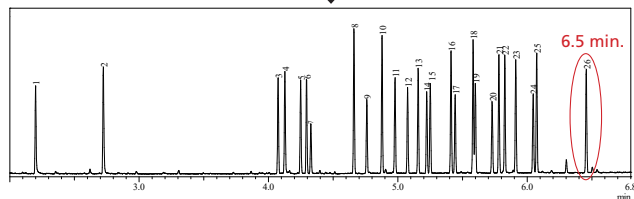
Column: SH-I-5MS (30 m x 0.25 mm ID x 0.25 μ m)
(P/N 221-75940-30)
Oven Temp.: 60 $^{\circ}$ C to 300 $^{\circ}$ C at 6 $^{\circ}$ C/min (hold 2 min.)
Inj. Vol.: 1 μ L splitless
Carrier Gas: He, flow rate: 1.2 mL/min; linear Velocity: 40 cm/s



Fast GC Column

Conditions

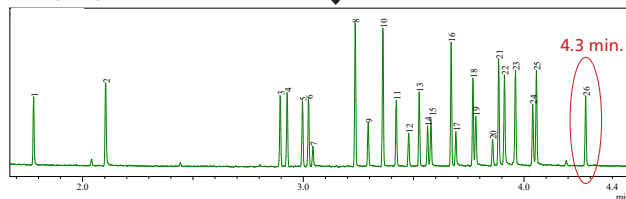
Column: SH-I-5MS (10 m x 0.10 mm ID x 0.10 μ m)
(P/N 227-36342-01)
Oven Temp.: 60 $^{\circ}$ C to 300 $^{\circ}$ C at 32 $^{\circ}$ C/min (hold 2 min.)
Inj. Vol.: 0.5 μ L splitless
Carrier Gas: He, flow rate: 0.8 mL/min; linear Velocity: 56.5 cm/s



Use Hydrogen

Conditions

Column: SH-I-5MS (10 m x 0.10 mm ID x 0.10 μ m)
(P/N 227-36342-01)
Oven Temp.: 60 $^{\circ}$ C (hold 0.5 min.) to 300 $^{\circ}$ C at 55 $^{\circ}$ C/min (hold 2 min.)
Inj. Vol.: 1 μ L split 1:10
Carrier Gas: H₂, flow rate: 0.8 mL/min; linear Velocity: 78.7 cm/s



Selectivity	ID	df	10 m	20 m
SH-1	0.10 mm	0.40 μ m	-	227-36330-01
	0.18 mm		227-36378-01	-
SH-I-1MS	0.15 mm	0.15 μ m	-	227-36001-01
	0.18 mm	0.18 μ m	-	221-75921-20
		0.36 μ m	-	227-36003-01
SH-I-5MS	0.10 mm	0.10 μ m	227-36342-01	-
	0.18 mm	0.18 μ m	-	227-36015-01
		0.30 μ m	-	227-36016-01
	0.36 μ m	-	227-36017-01	
SH-5Sil MS	0.18 mm	0.18 μ m	-	221-76195-20
SH-I-5Sil MS	0.10 mm	0.10 μ m	227-36317-01	-
	0.15 mm	0.15 μ m	-	227-36030-01
	0.18 mm	0.18 μ m	-	227-36033-01
0.36 μ m		-	227-36034-01	
SH-I-XLB	0.18 mm	0.18 μ m	-	227-36309-01
SH-440	0.18 mm	0.18 μ m	-	227-36340-02
SH-624	0.10 mm	0.50 μ m	-	227-36332-01
SH-I-17	0.18 mm	0.18 μ m	-	227-36061-01
SH-I-17Sil	0.18 mm	0.18 μ m	-	227-36071-03
SH-I-SVOC	0.18 mm	0.15 μ m	-	227-36362-01
		0.18 μ m	-	227-36362-02
		0.36 μ m	-	227-36362-03
SH-PolarWax	0.10 mm	0.10 μ m	227-36343-01	-
	0.18 mm	0.18 μ m	-	227-36357-01
SH-WAX	0.10 mm	0.10 μ m	-	227-36356-01
SH-CLP	0.18 mm	0.18 μ m	-	227-36266-02

General parameters

GC: Nexus GC-2030
Inj. Temp.: 250 $^{\circ}$ C
Liner: Shimadzu deactivated liner for splitless
(P/N 227-35008-01)
MS: QP 2020 NX
Transfer Line: 280 $^{\circ}$ C
Source Temp.: 300 $^{\circ}$ C
Ionization: EI

Peaks

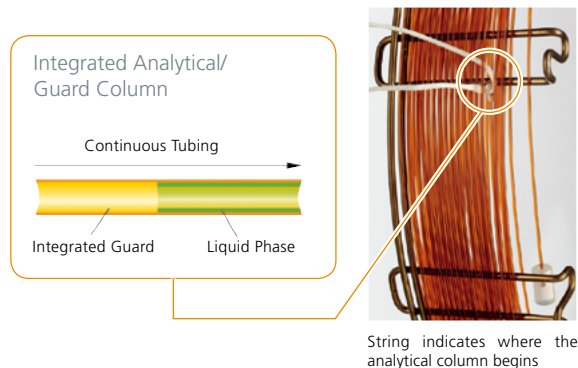
- Hexachloro-1,3-butadiene
- Dichlobenil
- α -HCH
- Hexachlorobenzene
- β -HCH
- γ -HCH
- Quintozen
- PCB 28
- Heptachlor
- PCB 52
- Aldrin
- Telodrin
- Isodrin
- Heptachlor exo-epoxide
- Heptachlor endo-epoxide
- PCB 101
- α -Endosulfan
- 4,4-DDE
- Dieldrin
- Endrin
- PCB 118
- 4,4-DDD
- PCB 153
- 4,4-DDT
- PCB 138
- PCB 180

Capillary Columns

Guard Columns

Integrated Guard Columns

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



Column	ID	df	Length	With 2m Integrated Guard	With 5m Integrated Guard	With 10m Integrated Guard
SH-I-1MS	0.25 mm	0.10 µm	15 m	227-36346-01	-	-
SH-I-5Sil MS	0.25 mm	0.25 µm	15 m	-	-	227-36386-01
	0.25 mm	0.25 µm	30 m	-	221-76161-30	221-76162-30
	0.25 mm	0.50 µm	30 m	-	227-36370-02	-
SH-1	0.25 mm	0.25 µm	30 m	-	221-75719-31	-
	0.53 mm	1.00 µm	30 m	-	221-75731-31	-
	0.53 mm	1.50 µm	30 m	-	227-36333-01	-
	0.53 mm	5.00 µm	30 m	-	221-75734-31	-
SH-5	0.25 mm	0.25 µm	30 m	-	221-76153-05	221-76153-30
	0.25 mm	1.00 µm	30 m	-	221-76179-30	-
	0.32 mm	0.25 µm	30 m	-	221-76177-30	-
	0.32 mm	0.25 µm	60 m	-	221-76177-60	-
	0.32 mm	1.00 µm	30 m	-	221-76180-30	-
SH-5MS	0.53 mm	5.00 µm	30 m	-	221-76154-35	-
	0.25 mm	0.10 µm	30 m	-	221-76189-30	-
	0.25 mm	0.25 µm	15 m	-	221-75861-15	-
	0.25 mm	0.25 µm	30 m	-	221-75861-05	221-75861-10
SH-624	0.25 mm	0.25 µm	30 m	-	221-76190-30	-
	0.25 mm	1.40 µm	30 m	-	221-76183-30	-
	0.32 mm	1.80 µm	30 m	-	221-76157-35	-
SH-1301	0.53 mm	3.00 µm	30 m	-	221-76158-30	-
	0.53 mm	3.00 µm	30 m	-	221-76164-35	-
SH-1701	0.25 mm	0.25 µm	30 m	-	221-76185-30	-
SH-PolarWax	0.25 mm	0.25 µm	30 m	-	227-36360-01	-
	0.53 mm	1.00 µm	30 m	-	227-36360-02	-

Capillary Columns

Guard Columns

Columns with pre-connected guard

- Zero-dead-volume design and deactivated metal construction connector ensures optimal peak shapes
- Since the separation column and guard column are pre-connected, it is possible to avoid the leakage trouble and save labor caused by manually connecting analytical column and guard column.

Column	ID	df	Length	With 5 m pre-connected Guard	With 10 m pre-connected Guard
SH-I-5HT	0.25 mm	0.25 μ m	30 m	227-36345-01	-
SH-I-SVOC MS	0.25 mm	0.25 μ m	15 m	-	227-36362-05
			30 m	227-36362-07	-
		0.50 μ m	30 m	227-36362-09	-

SH-I Guard / Retention Gap Columns

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

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

SH-IP Guard Columns

- Tested with a comprehensive test mix to ensure high inertness.
- Useful for a wide range of applications.
- Use with most common solvents.
- Maximum temperature: 360 °C.

Description	ID	5 m	10 m	30 m
SH-IP Guard Column	0.10 mm	227-36321-06	-	-
	0.15 mm	227-36321-07	-	-
	0.25 mm	227-36320-01	227-36321-03	-
	0.32 mm	227-36320-02	227-36321-04	-
	0.53 mm	227-36320-03	227-36321-01	227-36321-05

SH Guard Columns Polar Deactivation

- Polar polyethylene glycol deactivation
- Tested with a comprehensive test mix to ensure high inertness.
- Polyethylene glycol deactivation layer provides optimum wettability for polar compounds.
- Minimize peak splitting when using polar solvents such as methanol or water.
- Compatible with SH-PolarWax, SH-225 and SH-2330 capillary columns.
- Maximum temperature: 280 °C.

Description	ID	5 m	30 m
SH Guard Column Polar Deactivation	0.25 mm	227-36335-01	227-36335-04
	0.32 mm	227-36335-02	-
	0.53 mm	227-36335-03	-

SH Guard Columns Base Deactivated

- Tested with a basic amine test mix.
- Excellent inertness for basic compounds.
- Recommended for use with SH-5 Amine, SH-35 Amine, SH-Volatile Amine, and SH-PolarX capillary columns.
- Batch test chromatogram included.
- Maximum temperature: 315 °C.

Chemists using guard columns in the analyses of basic compounds frequently observe peak tailing and low recovery. This happens because conventionally deactivated tubing surfaces can be adsorptive to basic compounds. Shimadzu offers base-deactivated guard columns, as well as base-deactivated inlet liners, for completely inert sample pathways.

Description	ID	5 m
SH Guard Column Base Deactivated	0.25 mm	227-36334-01
	0.32 mm	227-36334-02
	0.53 mm	227-36334-03

SH Guard Column Siltek Deactivation

- Revolutionary deactivation process for superior inertness.
- Maximum temperature: 380 °C

Description	ID	5 m
SH Guard Column Siltek Deactivation	0.32 mm	227-36385-01

Capillary Columns

Guard Columns

SH Guard Column NP Deactivation

- Useful as guard columns, transfer lines, or long retention gaps
- Maximum temperature: 325 °C

Description	ID	30 m
SH Guard Column NP Deactivation	0.32 mm	227-36370-01

SH Guard Column Hydroguard Deactivation

- Extend analytical column lifetime by preventing degradation from harsh "steam-cleaning" water injections.
- Maximum temperature: 325 °C

Description	ID	5 m	10 m
SH Guard Column Hydroguard Deactivation	0.25 mm	227-36372-01	227-36372-02

SH-MetalX-Siltek Guard Column

- Tested with a comprehensive test mix to ensure high inertness.
- Revolutionary deactivation process for superior inertness.
- Analyze active samples accurately; ideal for chlorinated pesticide analysis (reduces endrin breakdown to less than 1%)
- Maximum temperature: 380 °C.

ID	ID	10 m
SH-MetalX-Siltek Guard	0.53 mm	227-36319-01

SH MetalX Hydroguard Column

- Extended analytical column lifetime by preventing degradation from harsh "stream-cleaning" water injections.
- Maximum temperature : 325 °C

Column	ID	10 m
SH MetalX Hydroguard Column	0.53 mm	227-36389-01

SH Untreated Fused Silica Tubing

- Flexible polyimide coated fused silica tubing.
- Make your own column or use as a gas line
- Maximum temperature: 350 °C

Column	ID	15 m
SH Untreated Fused Silica Tubing	0.53 mm	227-36371-01

Capillary Columns

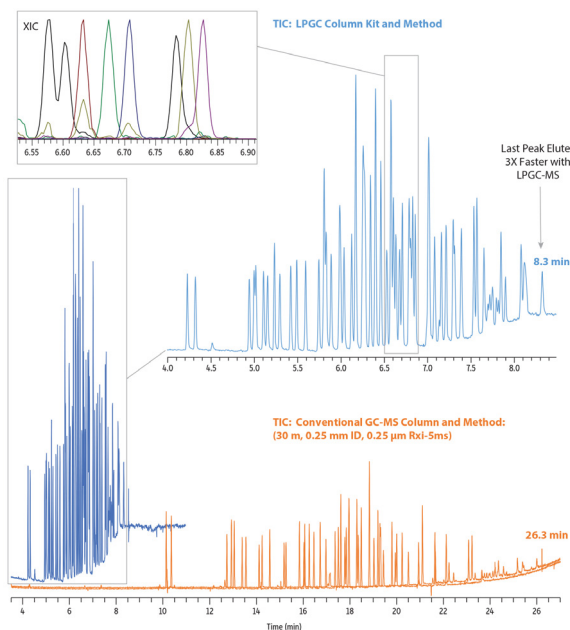
Others

Low-Pressure GC (LPGC) Column Kit

- Pre-connected column by Restrictor column (5 m length of 0.18 mm ID Hydroguard tubing) and SH-5MS with integrated transfer line (15 m, 0.53 mm ID, 1 μ m) plus 1 m integrated transfer lines on the outlet end (16 m total length of 0.53 mm ID tubing).
- Easily install LPGC into GC-MS or GC-MS/MS system as simple as a normal column.
- 3 times faster multiresidue pesticides analysis in foods.

Column	ID	df	Length	Low-Pressure GC (LPGC) Column Kit
Restrictor column	0.18 mm	-	5 m	227-36349-01
SH-5MS*	0.53 mm	1.00 μ m	16 m	

Comparison of Conventional vs. LPGC-MS Pesticides Analysis



Peaks

- | | |
|-------------------------------|------------------------------|
| 1. Chloroneb | 32. Endrin |
| 2. Pentachlorobenzene | 33. Endosulfan II |
| 3. α -BHC | 34. 4,4'-DDD |
| 4. Hexachlorobenzene | 35. 2,4'-DDT |
| 5. Pentachloroisole | 36. cis-Nonachlor |
| 6. β -BHC | 37. Endrin aldehyde |
| 7. δ -BHC | 38. 4,4'-Methoxychlor olefin |
| 8. γ -BHC | 39. Endosulfan sulfate |
| 9. Tefluthrin | 40. 4,4'-DDT |
| 10. Endosulfan ether | 41. 2,4'-Methoxychlor |
| 11. Transfluthrin | 42. Resmethrin |
| 12. Heptachlor | 43. Endrin ketone |
| 13. Pentachlorothioanisole | 44. Tetramethrin 1 |
| 14. Anthraquinone | 45. Tetramethrin 2 |
| 15. Aldrin | 46. Bifenthrin |
| 16. 4,4'-Dichlorobenzophenone | 47. Phenothrin 1 |
| 17. Fenofen | 48. Tetradifon |
| 18. Isodrin | 49. Phenothrin 2 |
| 19. Heptachlor epoxide | 50. Mirex |
| 20. Bioallethrin | 51. lambda-Cyhalothrin |
| 21. Chlorbenside | 52. Acrinathrin |
| 22. trans-Chlordane | 53. cis-Permethrin |
| 23. 2,4'-DDE | 54. trans-Permethrin |
| 24. Endosulfan I | 55. Cyfluthrin |
| 25. cis-Chlordane | 56. Cypermethrins |
| 26. trans-Nonachlor | 57. Flucythrinate 1 |
| 27. Chlorfenson | 58. Flucythrinate 2 |
| 28. 4,4'-DDE | 59. Fenvalerate 1 |
| 29. Dieldrin | 60. tau-Fluvalinate 1 |
| 30. 2,4'-DDD | 61. Fenvalerate 2 |
| 31. Ethylan | 62. tau-Fluvalinate 2 |
| | 63. Deltamethrin |

Conditions

Column Conventional: Column: SH-I-5ms, 30 m, 0.25 mm ID, 0.25 μ m (221-75940-30)

Temp.: Temp. program: 90 $^{\circ}$ C (hold 1 min) to 330 $^{\circ}$ C at 8.5 $^{\circ}$ C/min (hold 5 min)

Flow: 1.4 mL/min

Column LPGC: LPGC column kit, includes 15 m x 0.53 mm ID x 1.00 μ m analytical column w/1 m x 0.53 mm ID integrated transfer line and 5 m x 0.18 mm ID Hydroguard restrictor factory connected via SilTite connector (227-36349-01).

Temp: Temp. program: 80 $^{\circ}$ C (hold 1 min) to 320 $^{\circ}$ C at 35 $^{\circ}$ C/min (hold 5 min)

Flow: 2 mL/min

Sample:

GC multiresidue pesticide standard #2
GC multiresidue pesticide standard #6

Diluent: Acetonitrile

Conc.: 2 μ g/mL

Inj. Vol.: 2 μ L split (split ratio 10:1)

Inj. temp.: 250 $^{\circ}$ C

Detector: TSQ 8000

SIM Program: 35-550 m/z

Transfer Line Temp.: 290 $^{\circ}$ C

Analyzer Type: Quadrupole

Source Temp.: 330 $^{\circ}$ C

Tuner Type: PFTBA

Ionization Mode: EI

Capillary Columns

Accessories and Supplies

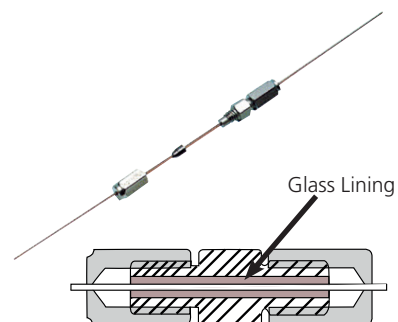
Connection Parts for Capillary Columns Nuts and Ferrules



Picture	Description	Specification	P/N
1	Nut with slit (1 pc)	Detector side of GC-2010/2010 Plus/2014/2025	221-32705
2	Nut without slit (10 pcs)	Injection unit side of GC-2010/2010 Plus/2014/2025	221-16325-81
	Nut without slit (5 pcs)	For GCMS	670-11009
	Graphite Ferrule 0.5 (10 pcs)	For 0.1 - 0.32 mmID columns	221-32126-05
	Graphite Ferrule 0.8 (10 pcs)	For 0.53 mmID columns	221-32126-08
	Graphite Vespel Ferrule (10 pcs)	For 0.1 - 0.25 mmID columns (ideal for GCMS)	670-15003-03
	Graphite Vespel Ferrule (10 pcs)	For 0.32 mmID columns (ideal for GCMS)	670-15003-04
3	Graphite Vespel Ferrule (10 pcs)	For 0.53 mmID columns (ideal for GCMS)	670-15003-07
	SilTite Metal Ferrule (10 pcs)	For 0.1 - 0.25 mmID columns	221-72563-04
	SilTite Metal Ferrule (10 pcs)	For 0.32 mmID columns	221-72563-05
4	SilTite Metal Ferrule (10 pcs)	For 0.53 mmID columns	221-72563-08
	SilTite Metal Ferrule (10 pcs)	For 1/32" ID columns	221-75200-04
	SilTite Kit (10 pcs ferrules, 2 pcs nuts)	For 0.1 - 0.25 mmID columns	221-75200
	SilTite Kit (10 pcs ferrules, 2 pcs nuts)	For 0.32 mmID columns	221-75200-01
	SilTite Kit (10 pcs ferrules, 2 pcs nuts)	For 0.53 mmID columns	221-75200-02
	SilTite Kit (10 pcs ferrules, 2 pcs nuts)	For 1/32" ID columns	221-75200-03
	SilTite Nut (5 pcs)	-	221-75186

Glass-Lined Stainless Steel Joint

This is a compact joint to connect capillary columns. The glass lining minimizes the adsorption of sample components. To ensure a positive connection, it is necessary to cut the ends of capillary columns properly to match each other.



Description	Applicable Capillary OD (mm)	P/N
Mini-union (with 5 pcs graphite ferrules)	0.4	670-11424-11
	0.5	670-11424-12
	0.8	670-11424-13
Graphite Ferrule (10 pcs)	0.4 - 0.5	670-11424-21
	0.8	670-11424-22

Capillary Columns

Accessories and Supplies

Column Connection Parts

SMI Unions are characterized by low leakage, inertness, low dead volume and low heat capacity. Select appropriate components according to the inner diameter of the column to be connected. SMI Unions cannot be used with Metal Columns.

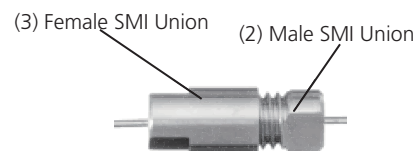
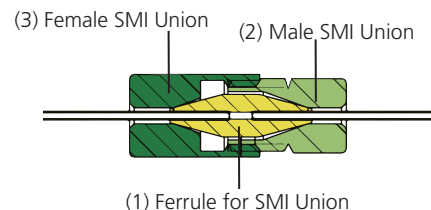
E 0.25mm i.d. column : 0.4*

E 0.32mm i.d. column : 0.5*

E 0.53mm i.d. column : 0.8*

* Inner diameter of ferrule for SMI union (mm)

	Description	P/N	Remarks
-	Press-Tight Connector	221-38102-92	For connecting 0.25 to 0.53 mm I.D. columns
(1)(2)(3)	SMI Union Kit	0.4 - 0.4	227-35024-01
		0.4 - 0.5	227-35024-02
		0.4 - 0.8	227-35024-03
		0.5 - 0.5	227-35024-04
		0.5 - 0.8	227-35024-05
(1)	Ferrule for SMI Union Kit	0.4 - 0.4	227-35025-01
		0.4 - 0.5	227-35025-02
		0.4 - 0.8	227-35025-03
		0.5 - 0.5	227-35025-04
		0.5 - 0.8	227-35025-05
(2)(3)	SMI Union	0.4 - 0.5 / 0.4 - 0.5	227-35026-01
		0.4 - 0.5 / 0.8	227-35026-02
		0.8 - 0.8	227-35026-03



Connection Parts for Capillary Columns

Press-Tight Connectors

This connector is used to connect capillary columns easily by inserting the columns into the connector from both ends. When the columns are coated with polyimide resin, the connection will remain tight almost permanently and will be completely free of leakage. Applicable to 0.35 mm to 0.8 mm OD capillary columns.

Description	P/N
Press-Tight Connector (5 pcs)	221-38102-91
Press-Tight Connector (5 pcs with 5 g polyimide resin)	221-38102-92



Main use of Press-Tight connectors

- Connection of broken capillary columns
The connectors are unobtrusive.
- On-column sample injection
Any capillary columns can be used in on-column injection mode by connecting a short wide-bore capillary columns to the inlet of the column.
- Retention gap method
An about 2 meters long capillary tube with no stationary phase, which is connected to the head of analytical capillary column, prevents peaks from being split.
- Column conditioning
A short capillary tube, which is connected to the outlet of the column, prevents air (oxygen) from diffusing into the column, thus preventing the deterioration of liquid phase which is kept at a high temperature.
- Stable storage of capillary columns
Deterioration by air and contamination can be prevented by connecting the both ends with a capillary tube.

Metal Column Connection Parts

Conventional column connection solutions often don't work for metal columns due to different material properties and their larger outer diameter.

The following solution can be used to connect 2 metal columns:

P/N	Description	Column ID					
		0.53 mm to			0.32 mm to		0.25 mm to
		0.53 mm	0.32 mm	0.25 mm	0.32 mm	0.25 mm	0.25 mm
980-06597	UNION 1/16", .25mm bore, SS	-	-	1	-	1	1
980-03168	Union 1/16" 5mm bore, SS	1	1	-	1	-	-
980-01428	FUSED SILICA ADAPTER 1/16", OD 0.4-0.5MM	-	-	1	-	1	2
980-05636	FUSED SIL. ADAPTER 1/16", OD 0.5-0.8MM	2	2	1	2	1	-

Capillary Column Accessory Set

This set contains tools and supplies which are used to ensure high analytical productivity in capillary gas chromatography.

P/N	221-38652-91
-----	--------------

The set includes:

- Graphite ferrules
- Nuts
- Soap film flow meter
- Capillary tube cutter
- Spanner
- Tweezers
- Magnifying lens
- Ruler (stainless steel, 150mm)
- Accessory Box
- Pin vise
- Drill
- Press-Tight® connectors
- Polyimide resin
- Compact vise
- Adapter Socket (MM-C)
- Magnet grips



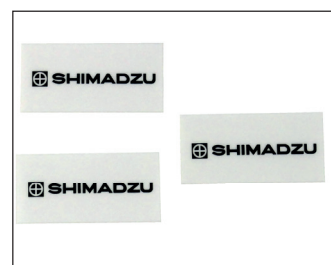
Capillary Tube Cutters

To cut a fused silica capillary tube, score the desired part with the above cutters, which have a ceramic blade, and snap at the position. The figure on the right shows an easy-to-use pen type. A spare blade is included.

Picture	Description	P/N
1	Capillary Tube Cutter (pen type with 1 pc spare blade)	221-50595-91
2	Capillary Tube Ceramic Cutter (3 pcs)	221-75181



1



2

Gas Filter

Description	Filter	P/N
SH Gas Filter Kit - GC-FID/FPD	one Oxygen/Moisture/Hydrocarbon filter for Carrier gas, two Hydrocarbon/Moisture filters for H2 and Air	227-37036-01
SH Gas Filter Kit - Compressed Air	one Oxygen/Moisture/Hydrocarbon filter for Carrier gas, one Hydrocarbon/Moisture filter for H2, one Hydrocarbon filter for Compressed air	227-37036-02
SH Gas Filter Kit - GC-ECD	one Oxygen/Moisture/Hydrocarbon filter for Carrier gas, one Oxygen/Moisture filter for Nitrogen	227-37035-01
SH Gas Filter Kit - Carrier Gas - GC-MS	one Oxygen/Moisture/Hydrocarbon Helium-specific filter	227-37034-03
SH Gas Filter Kit - Makeup Gas	one Hydrocarbon/Moisture filter	227-37034-01
SH Gas Filter Kit - Carrier Gas	one Oxygen/Moisture/Hydrocarbon filter	227-37034-02



Vials

Description	Volume (ml)	Cap	Septum	Content (pcs.)	P/N
Vial Kit for GC/GC-MS, certified	1.5	plastic, white	Silicone/PTFE	100	227-34002-01
Screw Vial Kit, clear glass	1.5	plastic, red centre hole	Silicone /PTFE UltraClean	100	961-10010-06
Screw Vial Kit, clear glass	4.0	plastic, black centre hole	Silicone/PTFE	100	961-10010-05
Screw Vial Kit, clear glass (Headspace)	20	magnetic, silver centre hole	Silicone /PTFE UltraClean	100	961-10010-27
Crimp Vial Kit, clear glass (Headspace)	20	alu, silver centre hole	Silicone /PTFE UltraClean	100	961-10010-29



GC/GC-MS Accessories

Description	Content (pcs.)	P/N
Accessory-Kits		
GC - Consumables Kit	Assortment of: 10 µl Syringe; Graphite Ferrules 0.5; Premium Green Septa; Deactivated Inserts with Wool for Split and for Splitless; O-Rings	227-35012-01
GCMS - Consumables Kit	Assortment of: 10 µl Syringe; Graphite/Vespel Ferrules 0.4 and 0.5; Premium Green Septa; Deactivated Inserts with Wool for Split and for Splitless; O-Rings; Stainless Steel Nut	227-35013-01
Septa		
Premium Green Injector Septa	max. Temp. 350 °C	50 227-35004-01
Syringe		
Syringe, for AOC-30i/20i/20s	10 µl volume	1 221-34618
Liner		
Deactivated Liner	with wool for split	5 227-35007-01
Deactivated Liner	with wool for splitless	5 227-35008-01
O-ring		
O-ring	for insert	10 227-35005-01
Ferrules		
GC-Ferrules	Graphite/Vespel; 0.10-0.32 mm ID; max. Temp. 450 °C	10 227-35006-01
GC-MS Ferrules	Graphite/Vespel GVF-04; 0.10-0.25 mm ID; max. Temp 350 °C	10 670-15003-03
GC-MS Ferrules	Graphite/Vespel GVF-05; 0.32 mm ID; max. Temp. 350 °C	10 670-15003-04





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