

Gas Chromatograph Series Columns

# GC Column Guidebook

**CoreFocus**



## Contents

---

### Fused Silica

SH-I-1MS	P. 7
SH-I-1HT	P. 9
SH-I-5MS	P. 8
SH-I-5Sil MS	P.10
SH-I-5HT	P. 9
SH-I-17	P.12
SH-I-17Sil MS	P.13
SH-I-35Sil MS	P.12
SH-I-624Sil MS	P.14
SH-I-1301Sil MS	P.15
SH-I-PAH	P.13
SH-I-XLB	P.11
SH-1	P.16
SH-1 PONA	P.16
SH-5/5MS	P.17-18
SH-20	P.19
SH-35	P.20
SH-35 MS	P.20
SH-50	P.21
SH-65	P.21
SH-65TG	P.22
SH-200/200MS	P.25
SH-225	P.27
SH-440	P.27
SH-502.2	P.27
SH-624	P.23
SH-1301	P.22
SH-1614	P.31
SH-1701	P.24
SH-2330	P.28
SH-2560	P.28
SH-Wax	P.29
SH-FAME	P.36
SH-PolarWax	P.30
SH-PolarWAX MS	P.41

### Fused Silica PLOT

SH-Alumina BOND/KCl	P.42
SH-Alumina BOND/Na <sub>2</sub> SO <sub>4</sub>	P.42
SH-Msieve 5A	P.43
SH-Q-BOND	P.44
SH-U-BOND	P.44
SH-Particle Trap	P.47

### Stainless Steel (Siltek)

SH-MetalX-1	P.45
SH-MetalX-1HT SimDist	P.45
SH-MetalX-5	P.45
SH-MetalX-1701	P.46
SH-MetalX-WAX	P.46
SH-MetalX Biodiesel TG	P.46

### Specific Use

Acidic Compounds Analysis	
SH-PolarD	P.39
Basic Compounds Analysis	
SH-5 Amine	P.38
SH-35 Amine	P.38
SH-Volatil Amin	P.35
SH-PolarX	P.40
Blood Alcohol Analysis	
SH-BAC Plus1	P.37
SH-BAC Plus2	P.37
Pesticides Analysis	
SH-OPP2	P.32
SH-CLP	P.33
SH-CLP II	P.33
PCBs Analysis	
SH-PCB	P.35
Volatile organic pollutants Analysis	
SH-VRX	P.35
SH-VMS	P.34

### Guard Column

Integrated Guard Columns	P.49
SH-I Guard / Retention Gap Columns	P.47
SH-IP Guard Columns	P.48
SH Guard Column Polar Deactivated	P.48
SH Guard Column Base Deactivated	P.48
SH-MetalX-Siltek Guard Column	P.49

# Capillary Columns

## Column Selection Guide

### 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-35MS 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"> <li>• Samples having a complex mixed system</li> <li>• Suited to split injection</li> </ul>
	0.25 mm 0.32 mm	Has high resolution and a moderate sample load <ul style="list-style-type: none"> <li>• Supports samples having a complex mixed system</li> <li>• Suited to split/splitless injection</li> </ul>
	0.53 mm	Has satisfactory resolution and a large sample load <ul style="list-style-type: none"> <li>• Suited to purity measurement and analysis of trace components</li> <li>• Used in direct injection, on-column injection, and large-volume injection</li> <li>• Can be easily replaced from packed column</li> </ul>
Film Thickness	Thick Film	<ul style="list-style-type: none"> <li>• Good separation of high-concentration components</li> <li>• Suited to purity analysis</li> </ul>
	Thin Film	<ul style="list-style-type: none"> <li>• Fast elution of high boiling point compounds</li> <li>• Suited to the analysis of medium to high boiling point compounds</li> </ul>
Length		When twice as long (for fixed-temperature analysis) <ul style="list-style-type: none"> <li>• The analysis time will be twice</li> <li>• The degree of separation will be 1.4 times</li> </ul>

# Capillary Columns

## Cross-Reference

Shimadzu	Stationary Phase	USP	Similar Phases						Page
			Agilent	Supelco	SGE	Phenomenex	Quadrex	Alltech	
High-Performance Columns									
SH-I-1MS	100% dimethyl polysiloxane	G2	HP-1ms UI, HP-1ms, DB-1ms UI, DB-1ms, Ultra-1, VF-1ms	SPB-1, Equity-1	BP-1	ZB-1, ZB-1ms	007-1	AT-1ms	7
SH-I-5MS	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5ms UI, HP-5ms, DB-5, Ultra-2, CP Sil 8 CB	SPB-5, Equity-5	BP-5	ZB-5, ZB-5ms	007-5	AT-5ms	8
SH-I-1HT	100% dimethyl polysiloxane	–	DB-1HT	–	–	ZB-1HT	–	AT-1ht	9
SH-I-5HT	5% diphenyl / 95% dimethyl polysiloxane	–	DB-5HT, VF-5HT	–	HT-5	ZB-5HT	–	–	9
SH-I-5Sil MS	1,4-bis(dimethylsiloxy)phenylene dimethyl polysiloxane	–	DB-5ms UI, DB-5ms, VF-5ms	SLB-5ms	BPX-5	ZB-5MS, ZB-Semi- Volatiles	007-5MS	–	10
SH-I-XLB	Non-disclosure	–	DB-XLB, VF-Xms	–	–	ZB-MR1, ZB-XLB	–	–	11
SH-I-17	50% diphenyl / 50% dimethyl polysiloxane	G3	HP-17, DB-17, DB-17HT, DB-608	SPB-17	–	ZB-50	–	–	12
SH-I-35Sil MS	Similar to 35% phenyl methyl polysiloxane	–	DB-35ms, DB-35ms UI, VF-35ms	–	BPX-35	ZB-MR2	–	–	12
SH-I-17Sil MS	Similar to 50% phenyl methyl polysiloxane	G3	DB-17ms, HP-17, DB-17, VF-17ms, CP-Sil 24 CB	–	BPX-50	ZB-50	–	–	13
SH-I-PAH	Ideal for EFSA PAH4 analysis	–	–	–	–	–	–	–	13
SH-I-624Sil MS	Similar to 6% cyanopropylphenyl / 94% dimethyl polysiloxane	G43	HP-624, DB-624, VF-624ms, CP-Select 624 CB	–	BP-624	ZB-624	–	–	14
SH-I-1301Sil MS	Similar to 6% cyanopropylphenyl / 94% dimethyl polysiloxane	–	VF-1301ms	–	–	–	–	–	15
General Purpose Columns									
SH-1	100% dimethyl polysiloxane	G1, G2, G38	HP-1, DB-1, CP Sil 5 CB	SPB-1	BP-1	ZB-1	007-1	AT-1, EC-1	16
SH-5	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5, DB-5, CP Sil 8 CB	SPB-5	BP-5	ZB-5	007-5	AT-5, EC-5	17
SH-5MS	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	HP-5, DB-5, CP Sil 8 CB	SPB-5	BP-5	ZB-5	007-5	AT-5, EC-5	18
SH-20	20% diphenyl / 80% dimethyl polysiloxane	G28, G32	–	SPB-20	–	–	007-20	AT-20, EC-20	19

Shimadzu	Stationary Phase	USP	Similar Phases						Page
			Agilent	Supelco	SGE	Phenomenex	Quadrex	Alltech	
SH-35/ SH-35MS	35% diphenyl / 65% dimethyl polysiloxane	G42	HP-35, DB-35	SPB-35, SPB-608	BPX-35, BPX-608	ZB-35	007-35	AT-35, AT-35ms	20
SH-50	100% methyl phenyl polysiloxane	G3	HP-50+, CP-Sil 24 CB	SPB-50	–	–	007-17	AT-50	21
SH-65	65% diphenyl / 35% dimethyl polysiloxane	G17	–	–	–	–	007-65HT	–	21
SH-65TG	65% diphenyl / 35% dimethyl polysiloxane	–	–	–	–	–	–	–	22
SH-1301	6% cyanopropylphenyl / 94% dimethyl polysiloxane	G43	DB-1301, CP-1301	SPB-1301	BP-624	ZB-624	007-1301	AT-1301	22
SH-624	6% cyanopropylphenyl / 94% dimethyl polysiloxane	G43	HP-624, DB-624, DB-624 UI, VF-624ms	SPB-1301	BP-624	ZB-624	007-624	AT-624	23
SH-1701	14% cyanopropylphenyl / 86% dimethyl polysiloxane	G46	DB-1701P, DB-1701, CP Sil 19 CB, VF-1701ms, VF-1701 Pesticides	SPB-1701	BP-10	ZB-1701, ZB-1701P	007-1701	AT-1701	24
SH-200/ SH-200MS	Trifluoropropylmethyl polysiloxane	G6	DB-210, DB-200, VF-200ms	–	–	–	–	AT-210	25
SH-225	50% cyanopropylmethyl / 50% phenylmethyl polysiloxane	G7, G19	DB-225, DB-225MS, CP-Sil 43 CB	SPB-225	BP-225	–	007-225	AT-225	27
SH-440	modified polysiloxane (unique phase)	–	–	–	–	–	–	–	27
SH-502.2	diphenyl / dimethyl polysiloxane	–	DB-502.2	–	–	–	–	–	27
SH-2330	90% biscyanopropyl / 10% cyanopropylphenyl polysiloxane (Non-bonded)	G8, G48	DB-23, VF-23ms	SP-2330, SP-2331, SP-2380	BPX-70	–	007-23	AT-Silar90	28
SH-2560	biscyanopropyl / polysiloxane	–	HP-88	SP-2560	–	–	–	–	28
SH-Wax	Polyethylene glycol	G14, G15, G16, G20, G39	DB-Wax, CP-Wax 52 CB	–	BP-20	ZB-Wax	007-CW	AT-WAXms, EC-WAX	29
SH-PolarWax	Polyethylene glycol	G14, G15, G16, G20, G39	Innowax, CP-Wax 52 CB, VF-WAX MS	Supelcowax-10	–	ZB-Wax Plus	–	AT-WAX	30
Dedicated Columns									
SH-1614	Ideal for analysis of PBDE	–	–	–	–	–	–	–	31
SH-OPP2	Ideal for analysis of organophosphorus pesticides	–	–	–	–	–	–	–	32
SH-CLP/ SH-CLP II	Ideal for analysis of organochlorine pesticides	–	DB-CLP1 / DB-CLP2	–	–	–	–	–	33
SH-VMS	Ideal for analysis of volatile organic pollutants	–	–	–	–	–	–	–	34
SH-Volatil Amin	Ideal for analysis of volatile amines	–	CP-Volamine	–	–	–	–	–	35

Shimadzu	Stationary Phase	USP	Similar Phases						Page
			Agilent	Supelco	SGE	Phenomenex	Quadrex	Alltech	
SH-PCB	Dedicated to PCBs analysis	–	–	–	–	–	–	–	35
SH-VRX	Ideal for analysis of volatile organic pollutants	–	–	–	–	–	–	–	35
SH-FAME	Ideal for analysis of FAMES	G16	Select FAME	Omegawax	–	–	–	AT-AquaWax, AT-FAME	36
SH-BAC Plus 1/ SH-BAC Plus 2	Ideal for analysis of alcohol compounds in blood	–	DB-ALC1 / DB-ALC2	–	–	ZB-BAC-1 / ZB-BAC-2	–	–	37
SH-5 Amine/ SH-35 Amine	Ideal for analysis of amines	–	–	–	–	–	–	–	38
SH-PolarD	Ideal for analysis of free acid	G25, G35	HP-FFAP, DB-FFAP, VF-DA, CP-Wax 58 CB, CP-FFAP CB	Nukol	BP-21	ZB-FFAP	–	AT-AquaWax-DA, AT-1000, EC-1000	39
SH-PolarX	Ideal for analysis of amines	–	CAM, CP-Wax 51 for Amines	Carbowax Amine	–	–	–	AT-CAM	40
SH-PolarWAX MS	Ideal for analyses of food, flavor, fragrance, industrial chemical and solvent	G14, G15, G16, G20, G39	VF-WAXms	–	–	–	–	–	41
PLOT Columns									
SH-Alumina BOND/Na <sub>2</sub> SO <sub>4</sub>	Aluminum oxide with Na <sub>2</sub> SO <sub>4</sub> deactivation	–	GS-ALUMINA, CP-Al <sub>2</sub> O <sub>3</sub> /Na <sub>2</sub> SO <sub>4</sub>	Alumina sulfate PLOT	–	–	–	AT-Alumina	42
SH-Alumina BOND/KCl	Aluminum oxide with KCl deactivation	–	GS-Alumina KCl, HP-PLOT Al <sub>2</sub> O <sub>3</sub> KCl, CP-Al <sub>2</sub> O <sub>3</sub> /KCl	Alumina chloride PLOT	–	–	PLT-AL2O3	–	42
SH-Msieve 5A	Molecular Sieve 5A	–	HP-PLOT Molesieve, CP-Molsieve 5A	Mol Sieve 5A PLOT	–	–	PLT-5A	AT-Mole Sieve	43
SH-Q-BOND	100% divinylbenzene porous polymer	–	HP-PLOT Q, CP-PoraPLOT Q, CP-PoraBOND Q	Supel-Q PLOT	–	–	PLT-Q	AT-Q	44
SH-U-BOND	Divinylbenzene ethylene glycol / dimethylacrylate porous polymer	–	HP-PLOT U, CP-PoraPLOT U, CP-PoraBOND U	–	–	–	–	–	44
Metal Columns									
SH-MetalX-1	100% dimethyl polysiloxane	G1, G2, G38	DB-PS1	–	–	–	UAC-1	–	45
SH-MetalX-1HT SimDist	100% dimethyl polysiloxane	–	CP-SimDist UltiMetal, DB-HT SimDis ProSteel	–	–	ZB-1X SimDist	–	–	45
SH-MetalX-5	5% diphenyl / 95% dimethyl polysiloxane	G27, G36	DB-PS5, VF-5ht UltiMetal	–	–	–	UAC-5	–	45
SH-MetalX-1701	non-disclosure	G46	DB-PS1701	–	–	–	–	–	46
SH-MetalX-WAX	polyethylene glycol	G14, G15, G16, G20, G39	–	–	–	–	–	–	46
SH-MetalX Biodiesel TG	non-disclosure	–	–	MET-Biodiesel	–	–	–	–	46

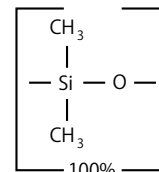
# Capillary Columns

## High-Performance Columns

### SH-I-1MS

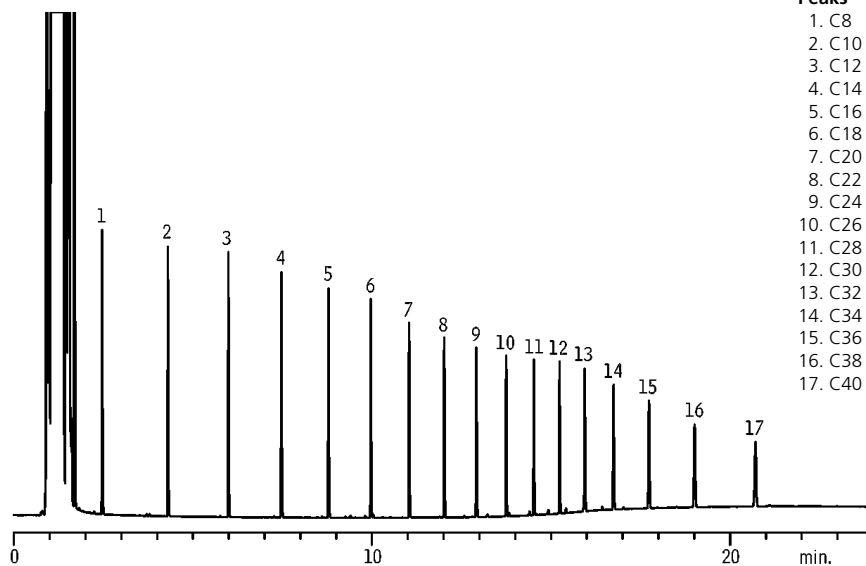
- Non-polar phase: Crossbond™ 100% dimethyl polysiloxane
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- General-purpose columns for arson accelerants, essential oils, hydrocarbons, pesticides, PCB congeners (e.g., Aroclor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

■ SH-I-1MS Structure



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

## Petroleum Hydrocarbons (TPH)



### Peaks

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

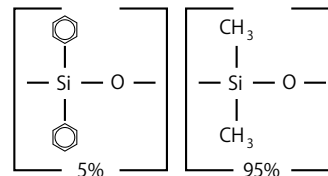
# Capillary Columns

## High-Performance Columns

### SH-I-5MS

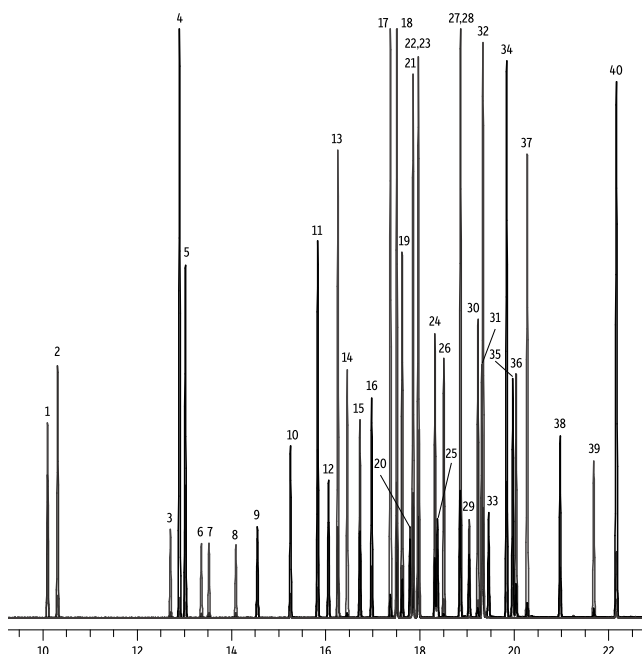
- Low-polarity phase: Crossbond™ 5% diphenyl / 95% dimethyl polysiloxane
- Tested and guaranteed for ultra-low bleed; improved signal-to-noise ratio for better sensitivity and mass spectral integrity.
- General-purpose columns for semi-volatiles, phenols, amines, residual solvents, drugs of abuse, pesticides,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

#### SH-I-5MS Structure



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

### GC Multiresidue Pesticide



#### Peaks

- |                                   |                              |
|-----------------------------------|------------------------------|
| 1. Chloroneb                      | 21. <i>cis</i> -Chlordane    |
| 2. Pentachlorobenzene             | 22. <i>trans</i> -Nonachlor  |
| 3. alpha-BHC                      | 23. Chlorfenson (Ovex)       |
| 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. Pentachlorothioanisole        | 31. 2,4'-DDT                 |
| 12. Aldrin                        | 32. <i>cis</i> -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. <i>trans</i> -Chlordane       | 38. Endrin ketone            |
| 19. 2,4'-DDE                      | 39. Tetradifon               |
| 20. Endosulfan I                  | 40. Mirex                    |

#### Conditions

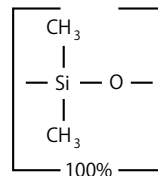
Column: SH-I-5MS, 30 m, 0.25 mm ID, 0.25 µm  
(P/N: 221-75940-30)  
Inj. Vol.: 1 µL split (split ratio 50:1)  
Inj. Temp: 250 °C  
Oven Temp: 90 °C (hold 1 min) to 330 °C at  
8.5 °C/min (hold 5 min)  
Carrier Gas: He, constant flow rate 1.4 mL/min  
Detector: MS-QP  
Transfer Line Temp: 290 °C  
Source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



## 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: DB-1HT, AT-1ht

■ SH-I-1HT Structure

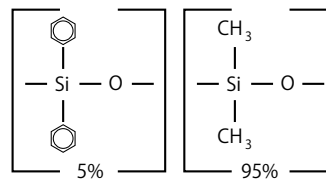


ID	df	Temp. Range	15 m	30 m
0.25 mm	0.10 μm	-60 to 400 °C	227-36087-01	227-36087-02
	0.25 μm	-60 to 400 °C	–	227-36088-01
0.32 mm	0.10 μm	-60 to 400 °C	227-36089-01	227-36089-02
	0.25 μm	-60 to 400 °C	–	227-36090-01

## SH-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: DB-5HT, VF-5HT

■ SH-I-5HT Structure



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



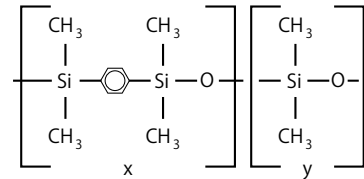
# Capillary Columns

## High-Performance Columns

### SH-I-5SiI MS

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

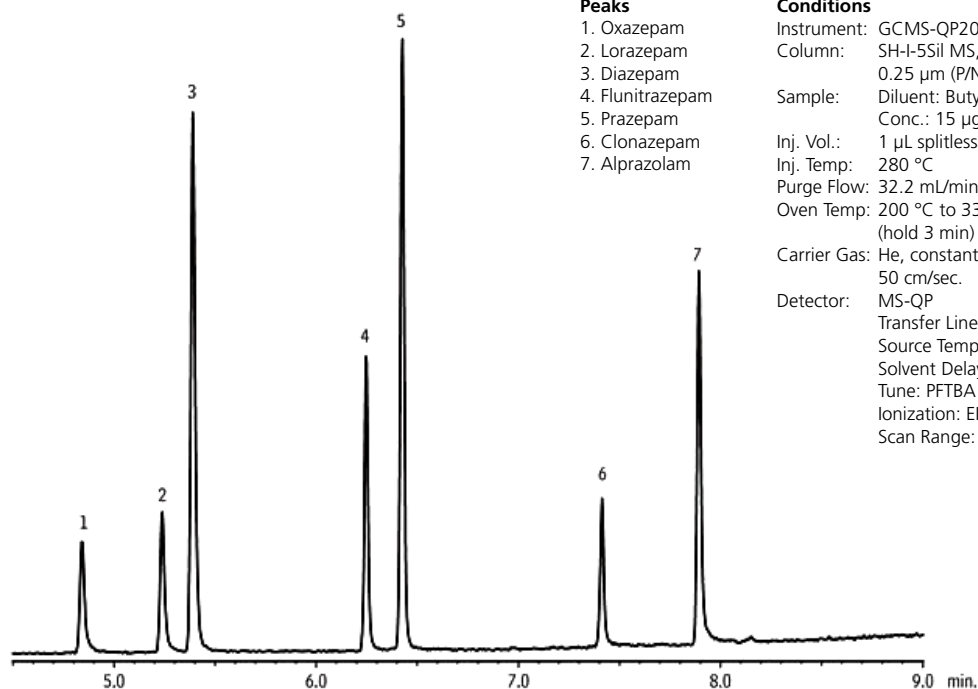
■ SH-I-5SiI MS Structure



For SH-I-5SiI MS columns with Integrated Guard column, please refer to page 49.

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	-60 to 320/350 °C	–	–	227-36030-01	–	–	–
	2.00 µm	-60 to 320/350 °C	–	–	227-36031-01	–	–	–
0.18 mm	0.10 µm	-60 to 320/350 °C	–	–	–	–	–	227-36032-01
	0.18 µm	-60 to 320/350 °C	–	–	227-36033-01	–	227-36033-02	–
	0.36 µm	-60 to 320/350 °C	–	–	227-36034-01	–	–	–
0.25 mm	0.10 µm	-60 to 320/350 °C	–	227-36035-01	–	227-36035-02	–	–
	0.25 µm	-60 to 320/350 °C	–	227-36036-01	–	221-75954-30	–	227-36036-02
	0.50 µm	-60 to 320/350 °C	–	227-36037-01	–	227-36037-02	–	–
	1.00 µm	-60 to 320/350 °C	–	227-36038-01	–	221-75956-30	–	227-36038-02
0.32 mm	0.25 µm	-60 to 320/350 °C	–	227-36039-01	–	227-36039-02	–	–
	0.50 µm	-60 to 320/350 °C	–	–	–	227-36040-01	–	–
0.53 mm	1.00 µm	-60 to 320/350 °C	–	–	–	227-36041-01	–	–
	1.50 µm	-60 to 320/350 °C	–	–	–	227-36032-02	–	–

## Benzodiazepines



#### Peaks

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

#### Conditions

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

# 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: DB-XLB, VF-Xms

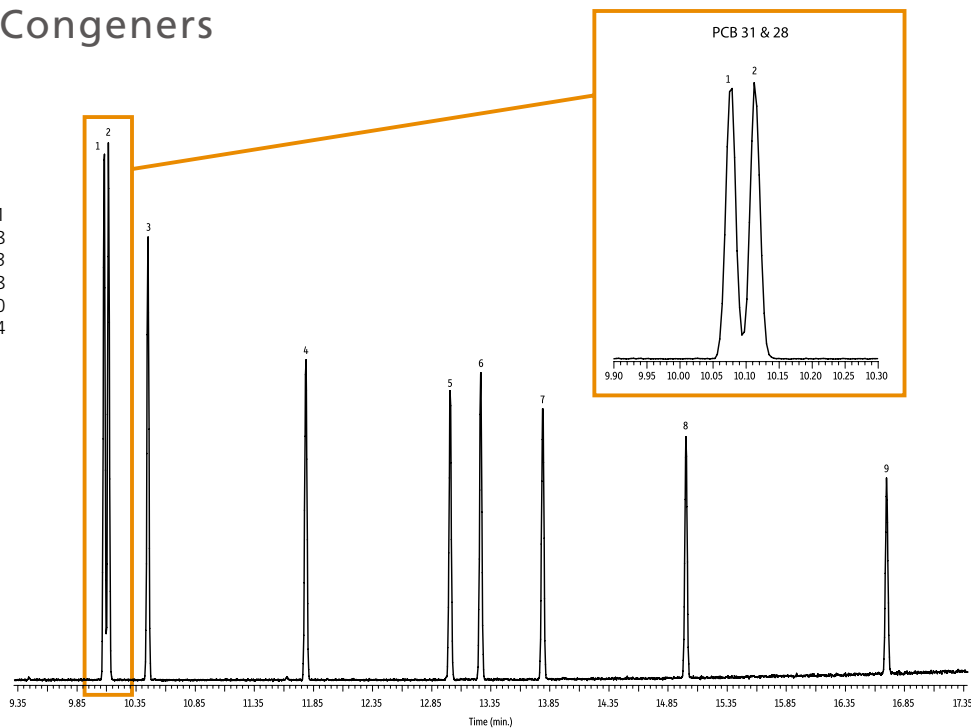
ID	df	Temp. Range	30 m	60 m
0.25 mm	0.10 µm	30 to 340/360 °C	227-36042-01	–
	0.25 µm	30 to 340/360 °C	227-36043-01	227-36043-02
	0.50 µm	30 to 340/360 °C	227-36044-01	–
	1.00 µm	30 to 340/360 °C	227-36045-01	–
0.32 mm	0.25 µm	30 to 340/360 °C	227-36046-01	227-36046-02
	0.50 µm	30 to 340/360 °C	227-36047-01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

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

## EU PCB Congeners

### Peaks

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



### Conditions

Column: SH-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/min

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

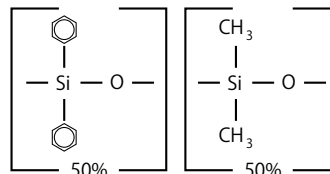
# Capillary Columns

## High-Performance Columns

### SH-I-17

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

■ SH-I-17 Structure

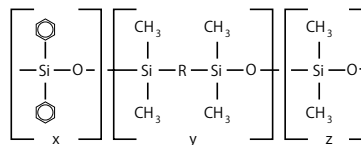


ID	df	Temp. Range	20 m	30 m
0.18 mm	0.18 µm	40 to 280/320 °C	227-36061-01	–
0.25 mm	0.25 µm	40 to 280/320 °C	–	221-75907-30
	0.50 µm	40 to 280/320 °C	–	227-36062-01
	1.00 µm	40 to 280/320 °C	–	227-36063-01
0.32 mm	0.25 µm	40 to 280/320 °C	–	227-36064-01
	0.50 µm	40 to 280/320 °C	–	227-36065-01
	1.00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

### SH-I-35Sil MS

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

■ SH-I-35Sil MS Structure

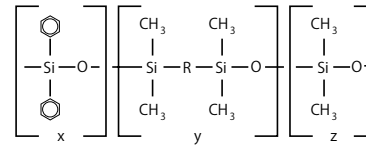


ID	df	Temp. Range	15 m	30 m
0.25 mm	0.25 µm	50 to 340/360 °C	227-36051-01	227-36051-02
	0.50 µm	50 to 340/360 °C	227-36052-01	227-36052-02
	1.00 µm	50 to 320/340 °C	227-36053-01	227-36053-02
0.32 mm	0.25 µm	50 to 340/360 °C	227-36054-01	227-36054-02
	0.50 µm	50 to 340/360 °C	227-36055-01	227-36055-02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

## 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 G3 phase.
- Similar phases: DB-17ms, HP-17, DB-17, VF-17ms, CP-Sil 24 CB

■ SH-I-17Sil MS Structure



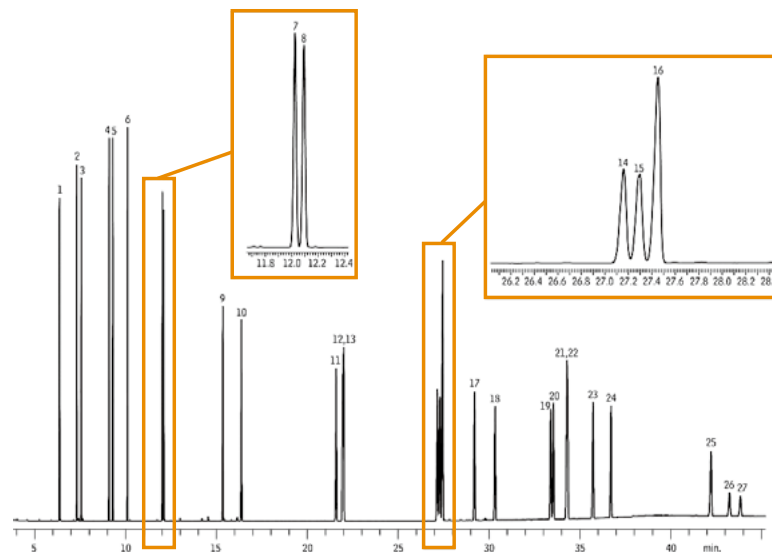
ID	df	Temp. Range	30 m	60 m
0.25 mm	0.25 μm	40 to 340/360 °C	221-75916-30	227-36071-01
0.32 mm	0.25 μm	40 to 340/360 °C	227-36072-01	–

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

## 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

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

## 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.

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

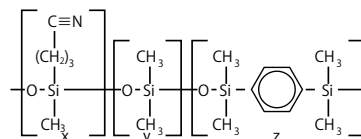
# Capillary Columns

## 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.
- Selective—G43 phase highly selective for volatile organics and residual solvents, great choice for USP<467>.
- Manufactured for column-to-column reproducibility—well-suited for validated methods.
- Similar phases: HP-624, DB-624, VF-624ms, CP-Select 624 CB

SH-I-624Sil MS Structure

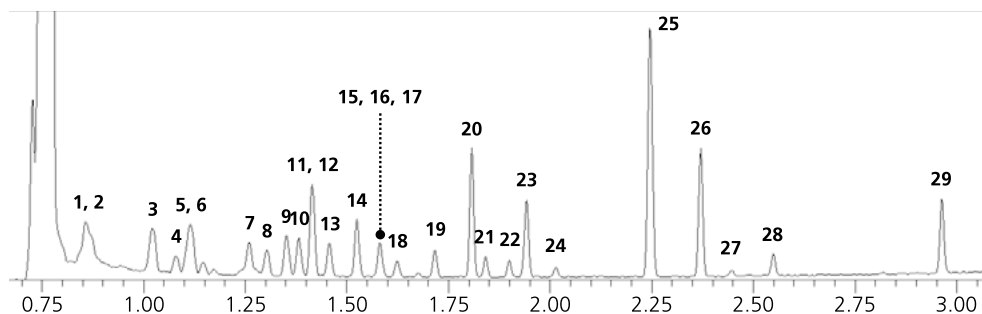


ID	df	Temp. Range	20 m	30 m	60 m	75 m	105 m
0.18 mm	1.00 μm	-20 to 300/320 °C	227-36075-01	–	–	–	–
0.25 mm	1.40 μm	-20 to 300/320 °C	–	221-75962-30	227-36076-01	–	–
0.32 mm	1.80 μm	-20 to 300/320 °C	–	227-36077-01	221-75963-60	–	–
0.53 mm	3.00 μm	-20 to 280/300 °C	–	227-36078-01	227-36078-02	227-36078-03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

## Ultra-Fast Analysis of Volatile Organic Compounds in Water

### Peaks

- |                                |                           |                               |                          |
|--------------------------------|---------------------------|-------------------------------|--------------------------|
| 1. Vinyl chloride-d3 (ISTD)    | 9. 1,1,1-trichloroethane  | 17. 1,4-dioxane               | 25. <i>m,p</i> -xylene   |
| 2. Vinyl chloride              | 10. Carbon tetrachloride  | 18. Bromodichloromethane      | 26. <i>o</i> -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      |                          |



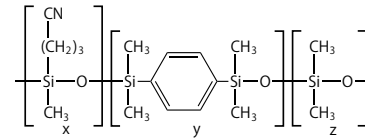
### Conditions

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

## SH-I-1301SiI MS

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

■ SH-I-1301SiI MS Structure



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



Guard columns for SH-I are also available. Please refer to page 47.

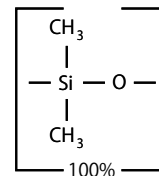
# Capillary Columns

## 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: HP-1, DB-1, CP Sil 5 CB, SPB-1

■ SH-1 Structure



For SH-1 columns with Integrated Guard column, please refer to page 49.

ID	df	Temp. Range	10 m	15 m	20 m	25 m	30 m	60 m	105 m
0.10 mm	0.40 μm	-60 to 330/350 °C	–	–	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	–	–	221-75719-25	221-75719-30	221-75719-60	–
	0.50 μm	-60 to 330/350 °C	–	–	–	–	227-36097-01	227-36097-02	–
	1.00 μm	-60 to 320/340 °C	–	–	–	–	227-36098-01	227-36098-02	221-75721-05
0.32 mm	0.10 μm	-60 to 330/350 °C	–	–	–	–	227-36099-01	227-36099-02	–
	0.25 μm	-60 to 330/350 °C	–	–	–	–	221-75723-30	221-75723-60	–
	0.50 μm	-60 to 330/350 °C	–	–	–	–	221-75724-30	227-36100-01	–
	1.00 μm	-60 to 320/340 °C	–	–	–	–	221-75725-30	221-75725-60	–
	1.50 μm	-60 to 310/330 °C	–	–	–	–	227-36101-01	227-36101-02	–
	3.00 μm	-60 to 280/300 °C	–	–	–	–	227-36102-01	227-36102-02	–
	4.00 μm	-60 to 280/300 °C	–	–	–	–	227-36103-01	–	–
0.53 mm	5.00 μm	-60 to 260/280 °C	–	–	–	–	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	–
	1.00 μm	-60 to 310/330 °C	–	221-75731-15	–	–	221-75731-30	221-75731-60	–
	1.50 μm	-60 to 310/330 °C	–	221-75732-15	–	–	221-75732-30	227-36107-01	–
	3.00 μm	-60 to 270/290 °C	–	–	–	–	221-75733-30	221-75733-60	–
	5.00 μm	-60 to 270/290 °C	–	–	–	–	221-75734-30	221-75734-60	–
	7.00 μm	-60 to 240/260 °C	–	–	–	–	227-36108-01	227-36108-02	–

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

### SH-1 PONA

Compatible with ASTM and CGSB for hydrocarbon analysis.

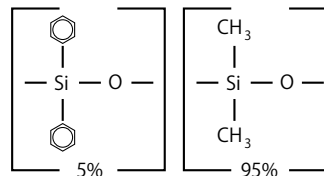
ID	df	Temp. Range	100 m
0.25 mm	0.50 μm	-60 to 300/340 °C	221-76196-00



# 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: HP-5, DB-5, CP Sil 8 CB, SPB-5

■ SH-5 Structure



For SH-5 columns with Integrated Guard column, please refer to page 49.

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

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

Metal columns are also available. Please refer to page 45.

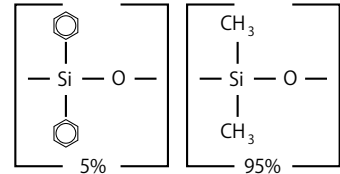
# Capillary Columns

## 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: HP-5, DB-5, CP Sil 8 CB, SPB-5

#### SH-5MS Structure

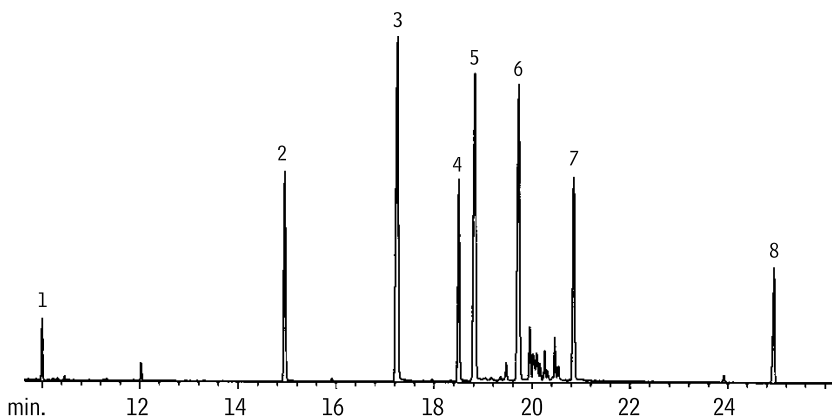


For SH-5MS columns with Integrated Guard column, please refer to page 49.

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

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

## Endocrine Disruptors: Alkyl Phenols



#### Peaks

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

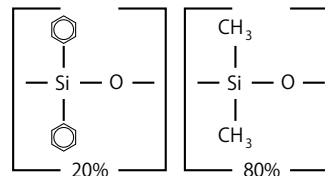
#### Conditions

Column: SH-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

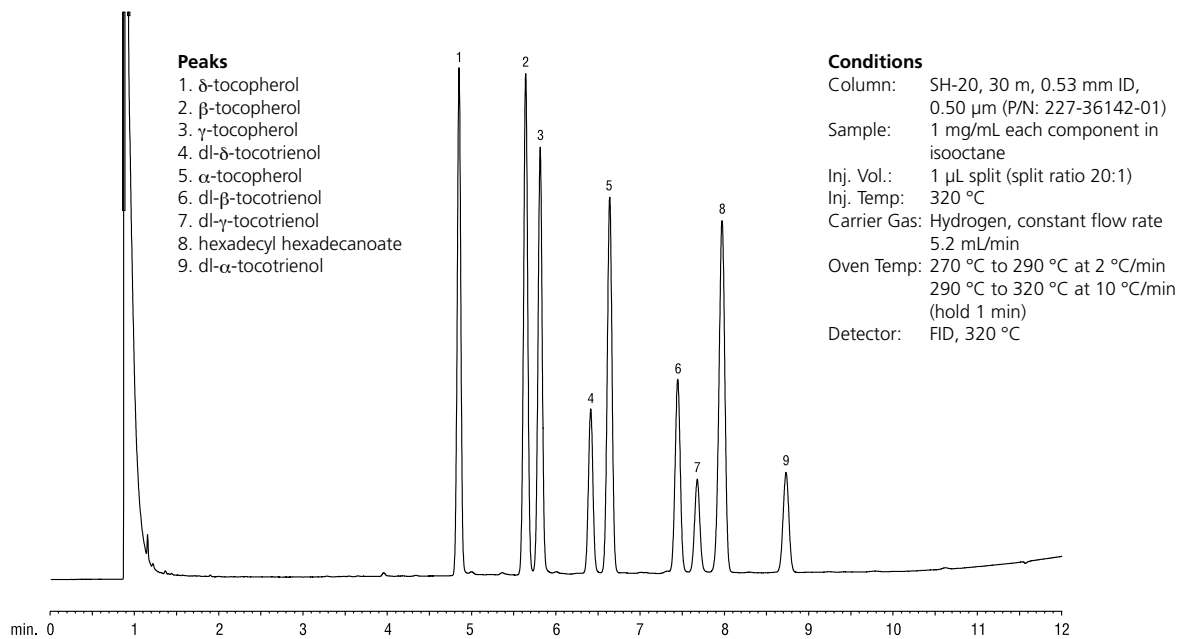
- Mid-polarity phase: Crossbond™ 20% diphenyl / 80% dimethyl polysiloxane
- General-purpose columns for volatile compounds, flavor compounds, alcoholic beverages.
- Equivalent to USP G28 and G32 phases.
- Similar phases: SPB-20, 007-20, AT-20, EC-20

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

## Tocopherols and Tocotrienols



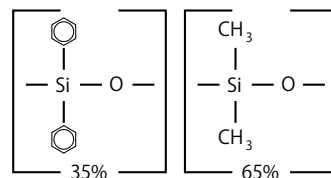
# Capillary Columns

## 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: HP-35, DB-35, SPB-35, SPB-608

■ 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
0.32 mm	0.10 µm	40 to 320 °C	227-36150-01	227-36150-02
	0.25 µm	40 to 320 °C	227-36151-01	227-36151-02
	0.50 µm	40 to 310 °C	227-36152-01	227-36152-02
	1.00 µm	40 to 290 °C	227-36153-01	227-36153-02
	1.50 µm	40 to 270/290 °C	227-36154-01	–
	3.00 µm	40 to 250/270 °C	227-36155-01	227-36155-02
0.53 mm	0.10 µm	40 to 260/280 °C	–	227-36156-01
	0.25 µm	40 to 260/280 °C	–	227-36157-01
	0.50 µm	40 to 300 °C	227-36158-01	227-36158-02
	1.00 µm	40 to 290 °C	227-36159-01	227-36159-02
	1.50 µm	40 to 280 °C	227-36160-01	227-36160-02
	3.00 µm	40 to 240/260 °C	227-36161-01	227-36161-02

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

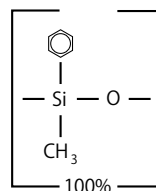
ID	df	Temp. Range	30 m
0.25 mm	0.25 µm	40 to 320 °C	221-75835-30

Download the brochure of GC/GCMS consumables from  
[http://www.shimadzu.com/an/gc/column\\_consumable/index.html](http://www.shimadzu.com/an/gc/column_consumable/index.html)

## 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: HP-50+, CP-Sil 24 CB, SPB-50

■ SH-50 Structure

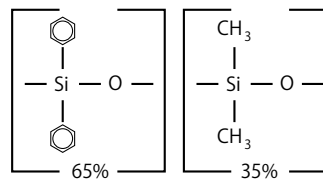


ID	df	Temp. Range	30 m	60 m
0.25 mm	0.25 µm	40 to 300/320 °C	227-36162-01	227-36162-02
	0.50 µm	40 to 290/310 °C	227-36163-01	227-36163-02
	1.00 µm	40 to 280/300 °C	227-36164-01	227-36164-02
0.32 mm	0.25 µm	40 to 300/320 °C	221-76182-30	227-36165-01
	0.50 µm	40 to 290/310 °C	227-36166-01	227-36166-02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

## SH-65

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

■ 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

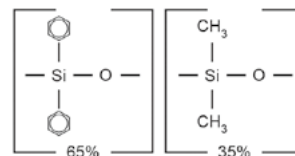
## General-Purpose Columns

### SH-65TG

- Application-specific columns, specially tested for triglycerides.

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

#### SH-65TG Structure

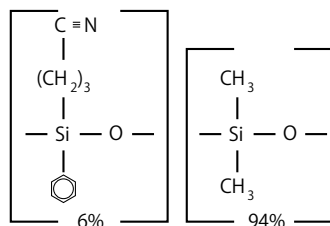


ID	df	Temp. Range	15 m	30 m
0.25 mm	0.10 µm	40 to 370 °C	227-36325-01	227-36325-02

### SH-1301

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

#### SH-1301 Structure



For SH-1301 columns with Integrated Guard column, please refer to page 49.

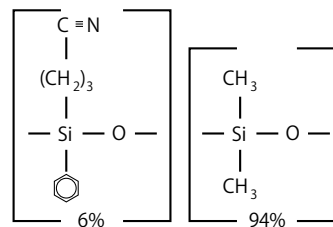
ID	df	Temp. Range	30 m	60 m
0.25 mm	0.25 µm	-20 to 280 °C	221-76194-30	221-76194-60
	0.50 µm	-20 to 270 °C	227-36203-01	-
	1.00 µm	-20 to 260 °C	227-36204-01	227-36204-02
	1.40 µm	-20 to 240 °C	-	227-36205-01
0.32 mm	0.25 µm	-20 to 280 °C	227-36206-01	227-36206-02
	0.50 µm	-20 to 270 °C	227-36207-01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

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

# SH-624

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

■ SH-624 Structure



For SH-624 columns with Integrated Guard column, please refer to page 49.

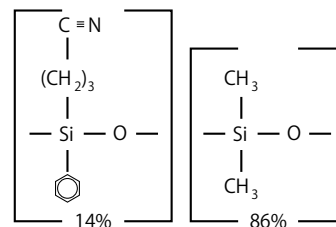
ID	df	Temp. Range	20 m	30 m	60 m	75 m
0.10 mm	0.50 μm	-20 to 240 °C	227-36332-01	-	-	-
0.18 mm	1.00 μm	-20 to 240 °C	227-36259-01	-	-	-
0.25 mm	1.40 μm	-20 to 240 °C	-	221-75863-30	227-36215-01	-
0.32 mm	1.80 μm	-20 to 240 °C	-	221-75864-30	221-75864-60	-
0.53 mm	3.00 μm	-20 to 240 °C	-	221-75865-30	221-75865-60	221-75865-75

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

# 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: DB-1701P, DB-1701, CP Sil 19 CB, VF-1701ms, VF-1701 Pesticides, SPB-1701

SH-1701 Structure



For SH-1701 columns with Integrated Guard column, please refer to page 49.

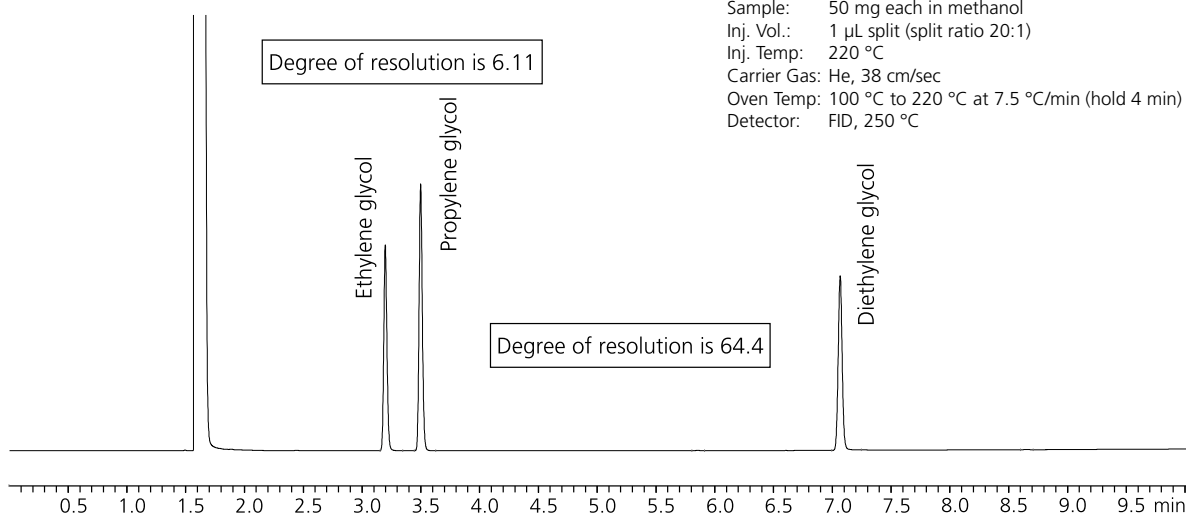
ID	df	Temp. Range	15 m	30 m	60 m
0.25 mm	0.10 µm	-20 to 280 °C	-	227-36216-01	227-36216-02
	0.25 µm	-20 to 280 °C	-	221-75777-30	227-36217-01
	0.50 µm	-20 to 270/280 °C	-	221-75778-30	227-36218-01
	1.00 µm	-20 to 260/280 °C	-	221-75779-30	227-36219-01
0.32 mm	0.10 µm	-20 to 280 °C	-	221-76184-30	227-36220-01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

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

## Analysis of Ethylene Glycol and Diethylene Glycol in Propylene Glycol

### Conditions

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





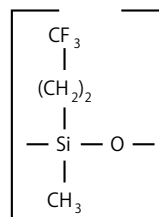
# Capillary Columns

## General-Purpose Columns

### 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: DB-210, DB-200, VF-200ms

■ SH-200 / SH-200MS Structure



#### SH-200

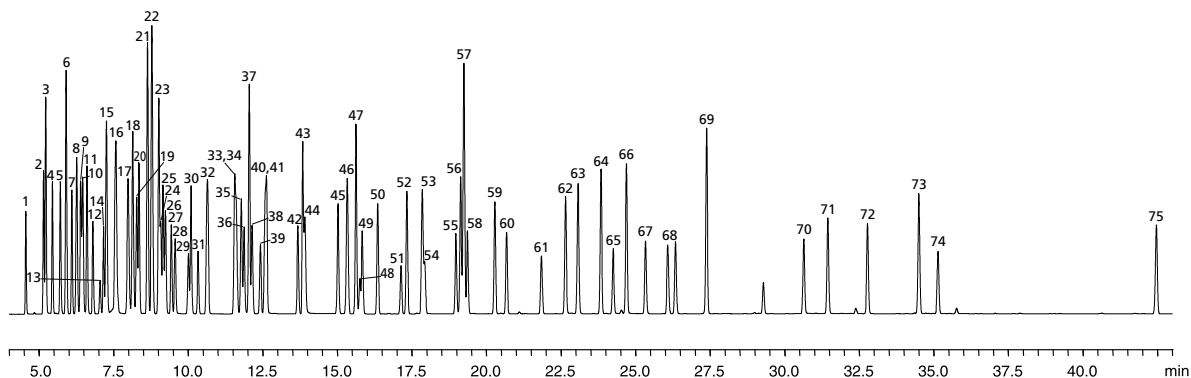
ID	df	Temp. Range	30 m	60 m	105 m
0.25 mm	0.10 μm	-20 to 320/340 °C	227-36179-01	–	–
	0.25 μm	-20 to 320/340 °C	227-36180-01	227-36180-02	–
	0.50 μm	-20 to 310/330 °C	227-36181-01	227-36181-02	–
	1.00 μm	-20 to 290/310 °C	221-75800-30	227-36182-01	–
0.32 mm	0.10 μm	-20 to 320/340 °C	227-36183-01	227-36183-02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

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

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

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

# 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)  
 Injection: Split (split ratio: 50:1)  
 Inj. Temp: 250 °C  
 Carrier Gas: He, constant linear velocity mode, 25 cm/sec  
 Oven Temp: 40 °C (0 min) to 310 °C at 4 °C/min  
 Detector: FID, 330 °C

For information on connection parts for capillary columns,  
 please refer to page 50.

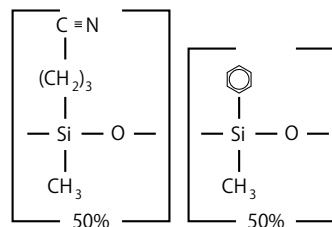
# Capillary Columns

## 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: DB-225, DB-225MS, CP-Sil 43 CB, SPB-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	0.10 μm	40 to 220/240 °C	227-36231-01	–
	0.25 μm	40 to 220/240 °C	227-36232-01	–
	0.50 μm	40 to 220/240 °C	227-36233-01	–
	1.00 μm	40 to 200/220 °C	227-36234-01	227-36234-02
0.53 mm	0.25 μm	40 to 200/220 °C	227-36235-01	–
	0.50 μm	40 to 200/220 °C	227-36236-01	–
	1.00 μm	40 to 200/220 °C	227-36237-01	–

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

### SH-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.

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

### 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: 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	105 m
0.32 mm	1.80 μm	-20 to 250/270 °C	227-36341-01	227-36341-02

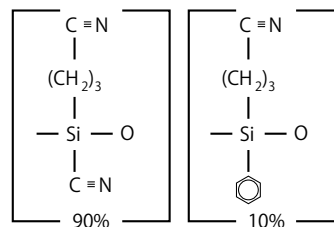
# Capillary Columns

## General-Purpose Columns

### 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 G8 and G48 phase.
- Similar phases: DB-23, VF-23ms, SP-2330, SP-2331, SP-2380

■ SH-2330 Structure



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

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

### SH-2560

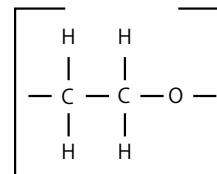
- Highly polar phase; biscyanopropyl polysiloxane—not bonded
- Stationary phase selectivity optimized for isomer separation to ensure accurate quantification of critical cis/trans FAMES.
- Application-specific QC test guarantees consistent, reliable performance for AOAC 996.06 and AOCS Ce 1j-07 methods.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

ID	df	Temp. Range	105 m
0.25 mm	0.20 μm	0 to 260/275 °C	227-36311-01

# 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: DB-Wax, CP-Wax 52 CB

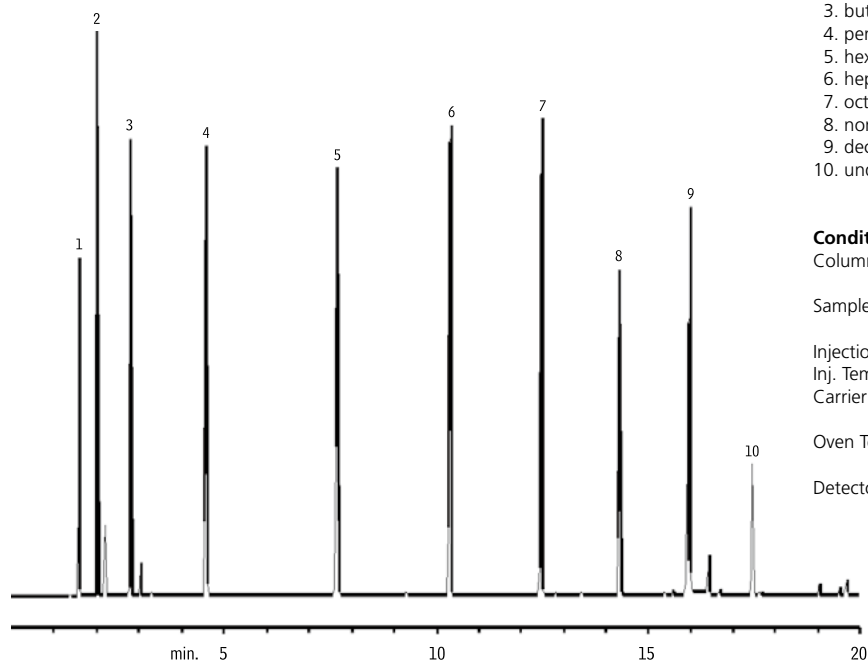
## SH-Wax Structure



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

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

## Aldehydes



### Peaks

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

### Conditions

Column: SH-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  
 Injection: Split (split ratio: 100:1)  
 Inj. Temp: 200 °C  
 Carrier Gas: Hydrogen, linear velocity 35 cm/sec. set at 40 °C  
 Oven Temp: 40 °C (hold 5 min) to 200 °C at 10 °C/min  
 Detector: FID, 200 °C

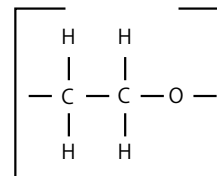
# Capillary Columns

## General-Purpose Columns

### 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: Innowax, CP-Wax 52 CB, VF-WAX MS, Supelcowax-10

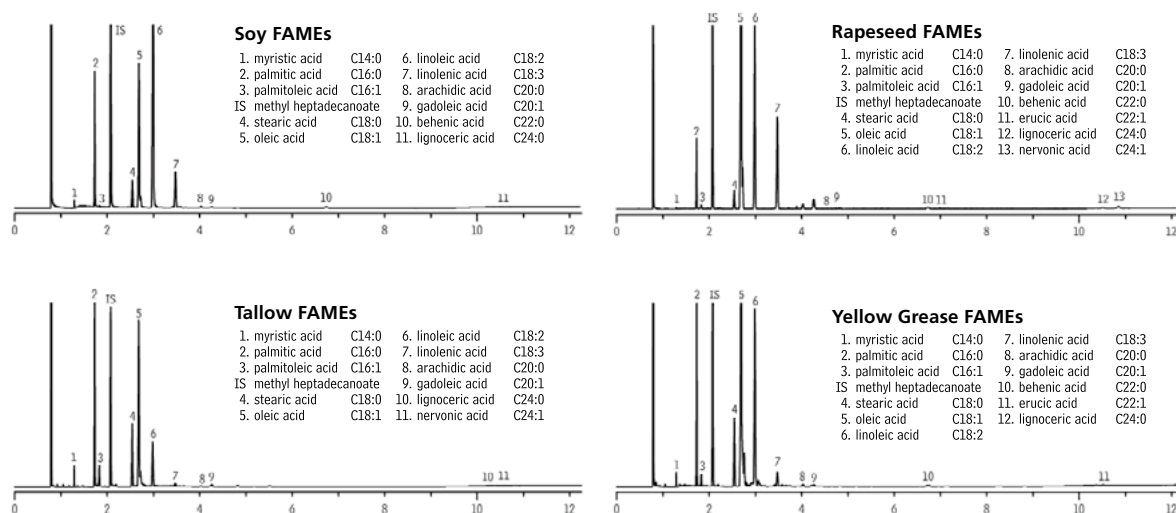
■ SH-PolarWax Structure



ID	df	Temp. Range	10 m	30 m	50 m	60 m
0.10 mm	0.10 µm	40 to 250/260 °C	227-36343-01	–	–	–
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	–	227-36249-02
	0.25 µm	40 to 250/260 °C	–	221-75972-30	–	227-36250-01
	0.50 µm	40 to 250/260 °C	–	227-36251-01	–	221-75975-60
	1.00 µm	40 to 240/260 °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. Vol.: 1 µL split (split ratio 100:1)  
 Inj. Temp: 250 °C  
 Carrier Gas: Hydrogen, constant flow rate 3mL/min, linear velocity 60 cm/sec.  
 Oven Temp: 210 °C (hold 5 min) to 230 °C at 20 °C/min (hold 5 min)  
 Det.: FID, 250 °C

# Capillary Columns

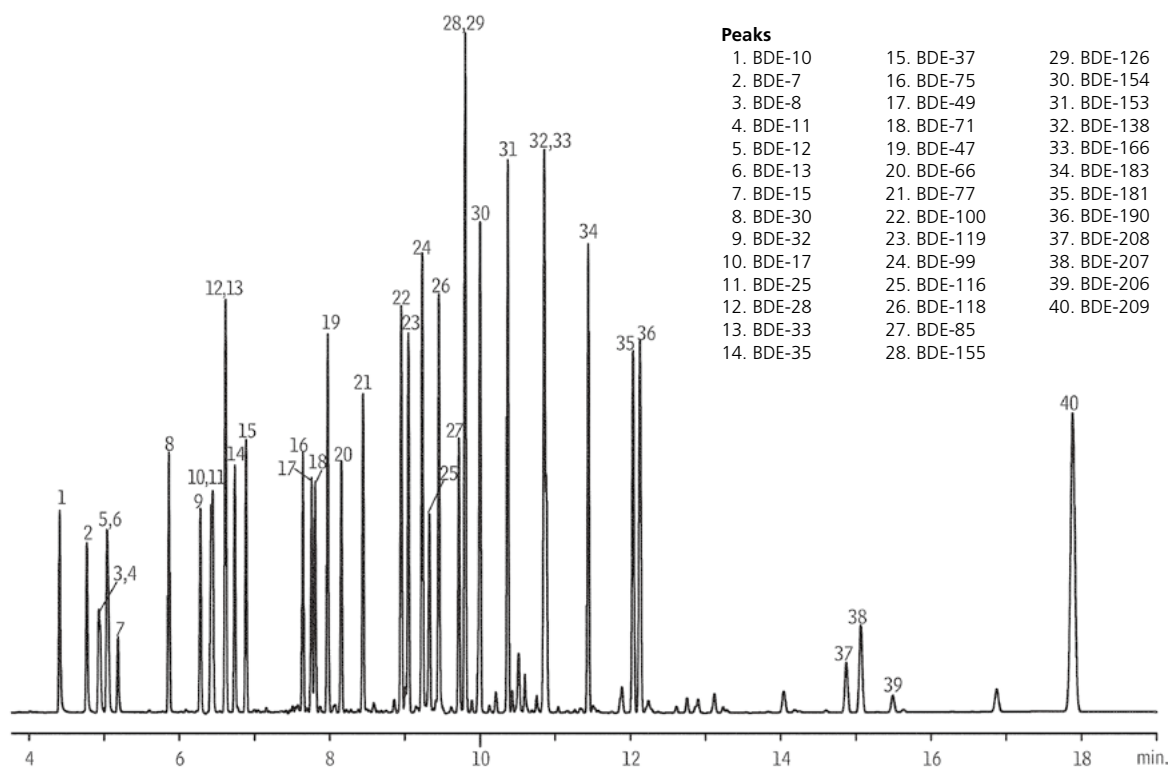
## Dedicated Columns

### 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.

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. Vol.: 1 µL splitless (hold 1 min),  
 Inj. Temp: 340 °C  
 Carrier Gas: He, constant flow, linear velocity 60 cm/sec., 120 °C  
 Oven Temp: 120 °C (hold 1 min) to 275 °C at 15 °C/min to 300 °C at 5 °C/min (hold 5 min)  
 Detector: µ-ECD, 345 °C

# Capillary Columns

## Dedicated Columns

### SH-OPP2

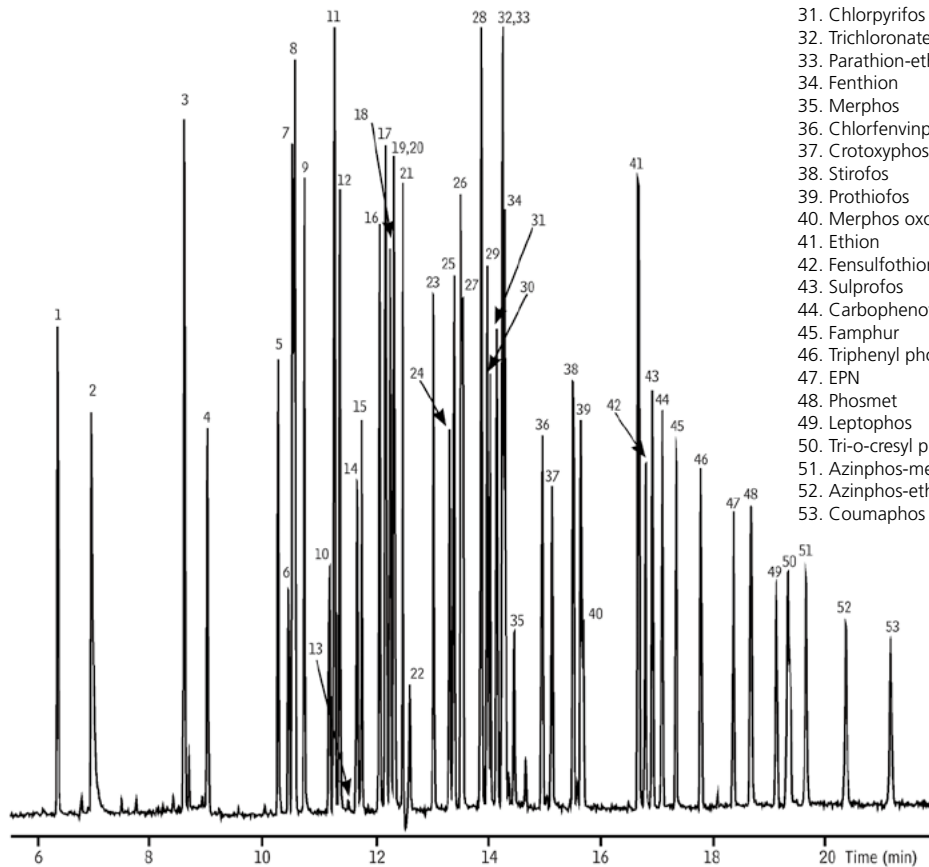
- Dedicated column for organophosphorus pesticides; best column combination for US EPA Method 8141.
- Low bleed - ideal for GC-FPD, GC-NPD, or GCMS analyses.

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

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

### Peaks

- |                            |                   |                |   |
|----------------------------|-------------------|----------------|---|
| 1. Dichlorvos              | 8. Thionazin      | 15. Demeton-S  | 22. Phosphamidon isomer (breakdown product) |
| 2. Hexamethylphosphoramide | 9. Ethoprop       | 16. Terbufos   | 23. Dichlorofenthion                        |
| 3. Mevinphos               | 10. Naled         | 17. Dimethoate | 24. Phosphamidon                            |
| 4. Trichlorfon             | 11. Sulfotepp     | 18. Diazinon   | 25. Chlorpyrifos methyl                     |
| 5. TEPP                    | 12. Phorate       | 19. Dioxathion | 26. Methyl parathion                        |
| 6. Demeton-O               | 13. Dicrotophos   | 20. Fonophos   | 27. Ronnel                                  |
| 7. Tributyl phosphate (SS) | 14. Monocrotophos | 21. Disulfoton | 28. Aspon                                   |



### Conditions

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

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



## 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: DB-CLP1 / DB-CLP2

### SH-CLP

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

### SH-CLP II

ID	df	Temp. Range	30 m
0.32 mm	0.25 $\mu\text{m}$	-20 to 320/340 $^{\circ}\text{C}$	227-36267-01

## Organochlorine Pesticides (US EPA Method 8081)

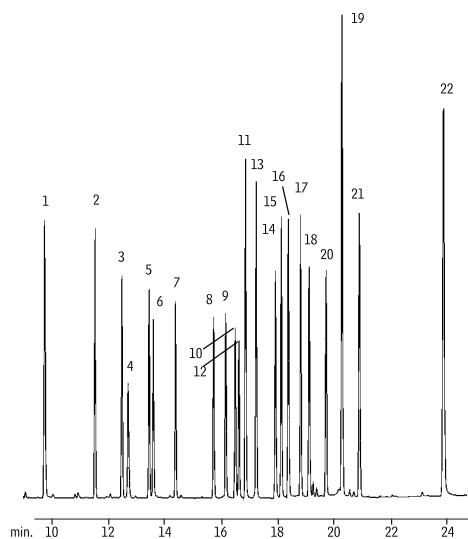
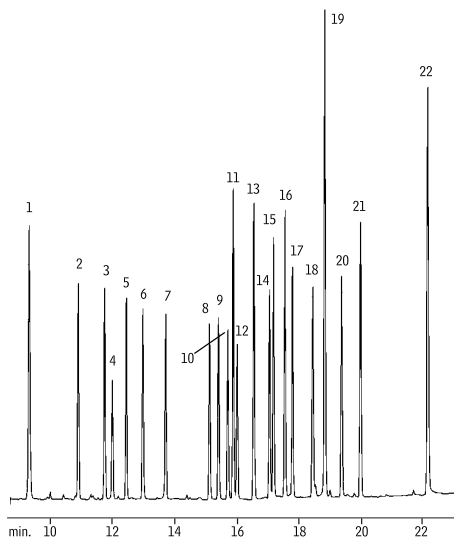
### Peaks

1. 2,4,5,6-tetrachloro-*m*-xylene
2.  $\alpha$ -BHC ( $\alpha$ -HCH)
3.  $\gamma$ -BHC (lindane)
4.  $\beta$ -BHC ( $\beta$ -HCH)

5.  $\delta$ -BHC ( $\delta$ -HCH)
6. heptachlor
7. aldrin
8. heptachlor epoxide
9.  $\gamma$ -chlordane
10.  $\alpha$ -chlordane

11. 4,4'-DDE
12. endosulfan I
13. dieldrin
14. endrin
15. 4,4'-DDD
16. endosulfan II

17. 4,4'-DDT
18. endrin aldehyde
19. methoxychlor
20. endosulfan sulfate
21. endrin ketone
22. decachlorobiphenyl



### Conditions

Column: SH-CLP, 30 m, 0.32 mm ID, 0.50  $\mu\text{m}$   
 (P/N: 221-75879-30)  
 Oven Temp: 120  $^{\circ}\text{C}$  (hold 1 min) to 300  $^{\circ}\text{C}$  (hold 10 min)  
 at 9  $^{\circ}\text{C}/\text{min}$   
 Inj.: Direct  
 Inj. Temp: 200  $^{\circ}\text{C}$   
 Detector: ECD, 300  $^{\circ}\text{C}$  with anode purge  
 Dead time: 1.9 min  
 Head pressure: 8.7 psi (constant)  
 Flow rate: 1.3 mL/min at 120  $^{\circ}\text{C}$ , He

SH-CLP II, 30 m, 0.32 mm ID, 0.25  $\mu\text{m}$   
 (P/N: 227-36267-01)

# Capillary Columns

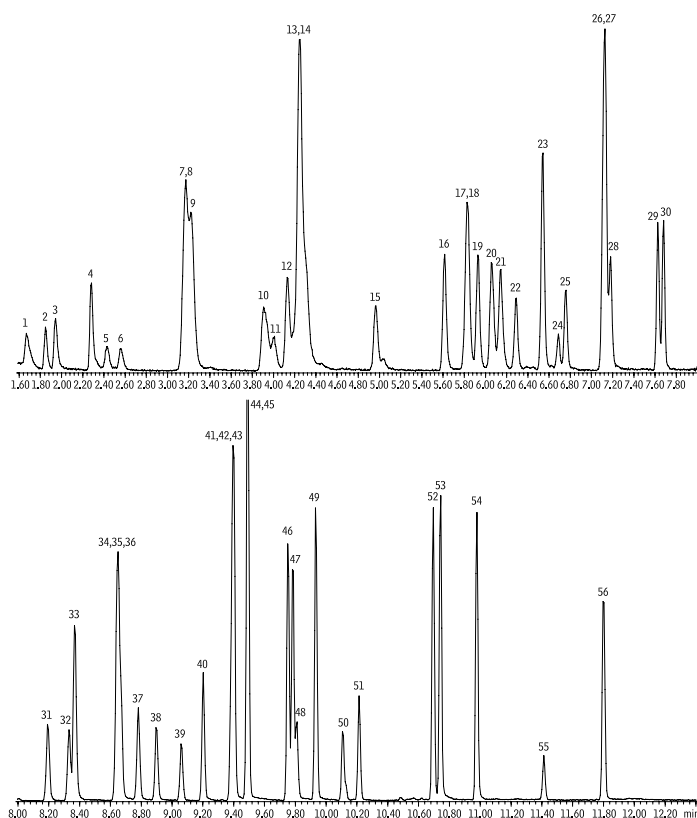
## Dedicated Columns

### 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.

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

## Volatile Organics (US EPA CLP 04.1)



### Peaks

1. dichlorodifluoromethane
2. chloromethane
3. vinyl chloride
4. bromomethane
5. chloroethane
6. 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/silica gel/  
carbon molecular sieve)  
Sample Temp: ambient  
Purge: 11 min at 40 mL/min  
Desorb preheat: 185 °C  
Desorb: 0.5 min at 190 °C  
Desorb flow rate: 35.0 mL/min  
Bake: 8 min at 210 °C  
Interface: split injector  
Transfer Line Temp: 150 °C

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

## SH-Volatil Amin

- 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: 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-PCB

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

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

## SH-VRX

- Application-specific columns for volatile organic pollutants.
- Excellent for U.S. EPA Method 8021 compounds.

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	25 m
0.10 mm	0.50 µm	-40 to 240/260 °C	227-36331-01

# Capillary Columns

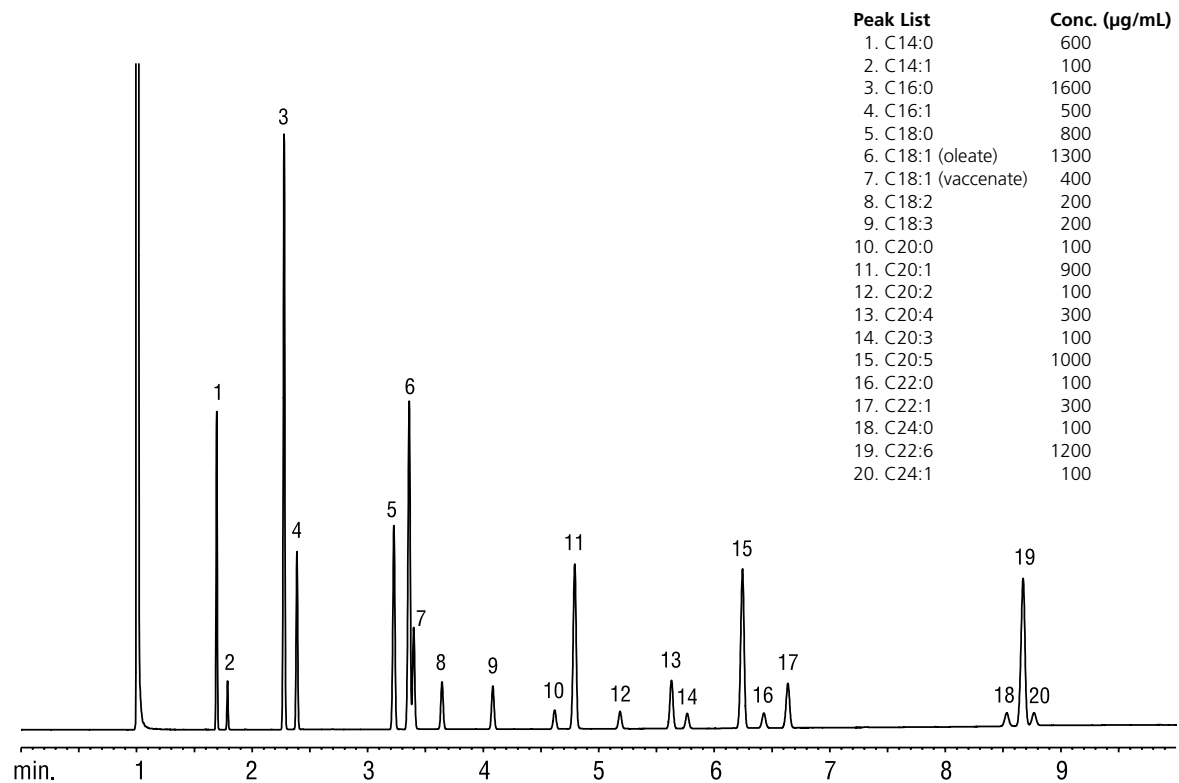
## Dedicated Columns

### SH-FAME

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

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

### FAMES (Marine Oil Standard)



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

## 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.

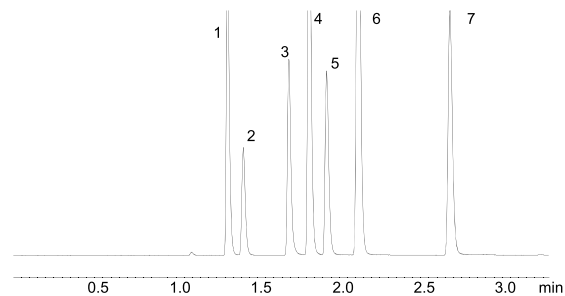
### SH-BAC Plus 1

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	-20 to 240/260 °C	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	-20 to 240/260 °C	227-36264-01

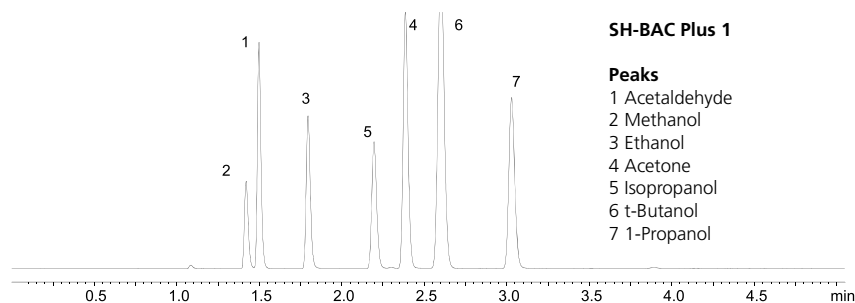
## Analysis of Alcohol Compounds in Blood



### 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

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)  
 Column Temp: 40 °C  
 Inj.: Split (split ratio: 20:1)  
 Carrier Gas: He, 100 kPa  
 Detector: FID, 250 °C  
 Makeup Gas: He, 30 mL/min  
 Hydrogen: 40 mL/min  
 Air: 400 mL/min

# Capillary Columns

## Dedicated Columns

### SH-5 Amine / SH-35 Amine

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

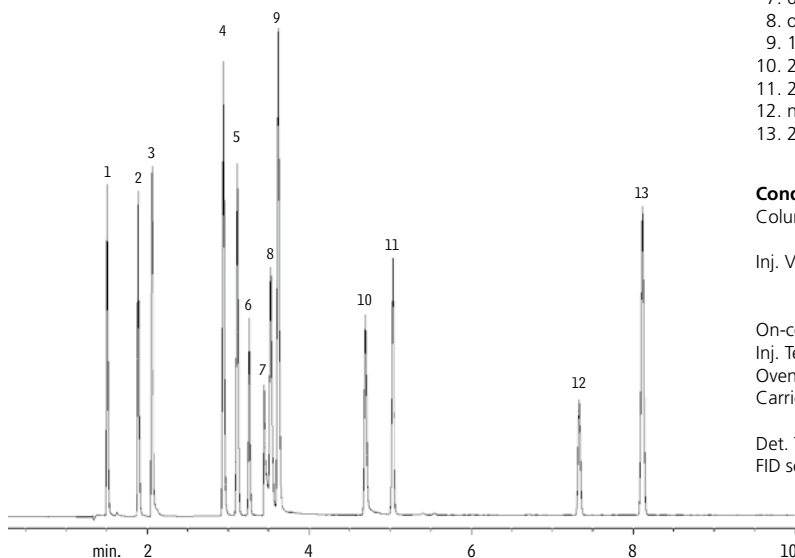
#### SH-5 Amine (Low-polarity phase: Crossbond™ 5% diphenyl / 95% dimethyl polysiloxane)

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	–	227-36332-02
	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	30 m
0.25 mm	0.50 µm	0 to 220 °C	227-36288-01
	1.00 µm	0 to 220 °C	227-36289-01
0.32 mm	1.00 µm	0 to 220 °C	227-36290-01
	1.50 µm	0 to 220 °C	227-36291-01
0.53 mm	1.00 µm	0 to 220 °C	227-36292-01
	3.00 µm	0 to 220 °C	227-36293-01

## Amines & Phenols



#### Peaks

- diethylamine
- pyridine
- morpholine
- phenol
- aniline
- 2-chlorophenol
- diethylenetriamine
- octylamine
- 1-methyl-2-pyrrolidinone
- 2-nitrophenol
- 2,6-dimethylaniline
- nicotine
- 2-nitroaniline

#### Conditions

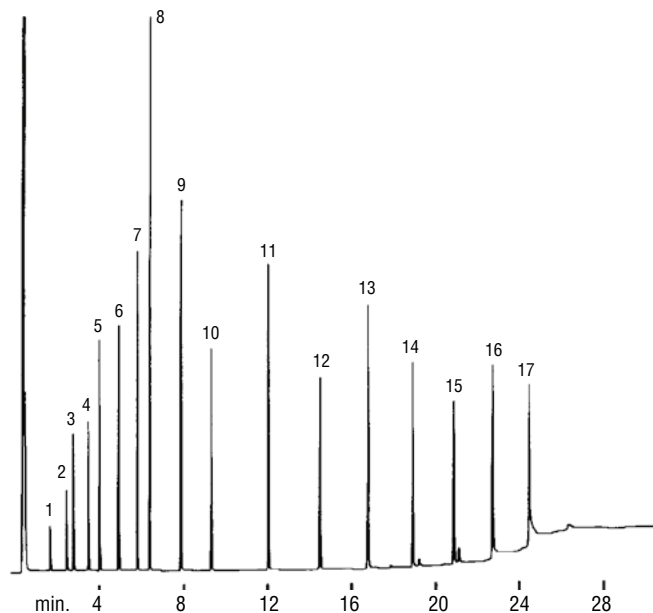
Column: SH-5 Amine, 30 m, 0.32 mm ID, 1.00 µm (P/N: 227-36290-01)  
 Inj. Vol.: 1 µL split injection of miscellaneous amines and phenols in water (split ratio: 25:1)  
 On-column conc.: 22 ng  
 Inj. Temp: 305 °C  
 Oven Temp: 120 °C to 220 °C at 10 °C/min  
 Carrier Gas: Hydrogen, linear velocity 38cm/sec.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

## 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: HP-FFAP, DB-FFAP, VF-DA, CP-Wax 58 CB, CP-FFAP CB, Nukol

ID	df	Temp. Range	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	227-36322-02	–	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	227-36280-01	–	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. Vol.: 0.3 µL direct  
 Inj. Temp: 280 °C  
 Oven Temp: 100 °C (hold 2 min) to 280 °C at 8 °C/min, (hold 10 min)  
 Carrier Gas: Hydrogen, flow rate 10 cc/min, linear velocity 80 cm/sec.  
 Detector: FID, 280 °C

# Capillary Columns

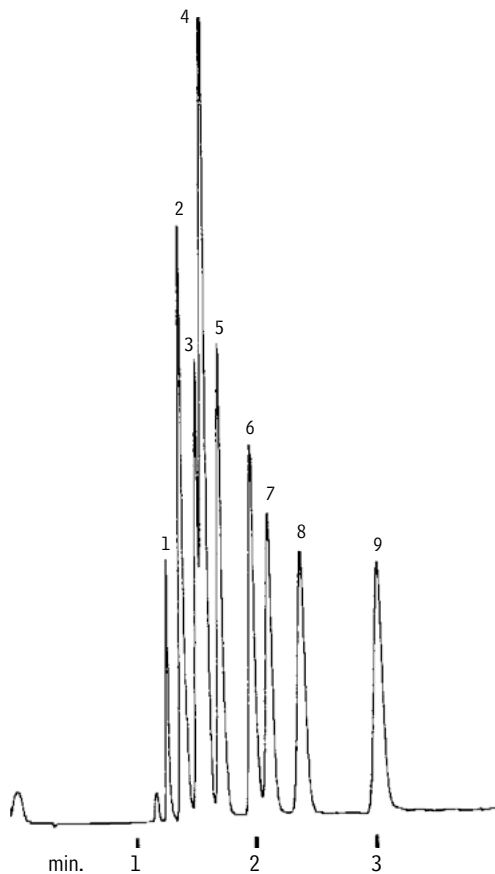
## Dedicated Columns

### 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: CAM, CP-Wax 51 for Amines, Carbowax Amine

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

### Amines (low MW)



#### Peaks

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

#### Conditions

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

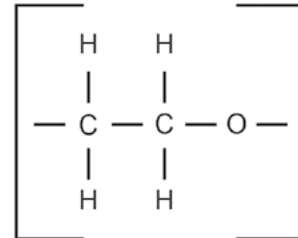


## SH-PolarWAX MS

- 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: VF-WAXms, TR-WaxMS

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.

■ SH-PolarWAX MS Structure



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	40 to 250/260 °C	227-36322-03

# 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/Na<sub>2</sub>SO<sub>4</sub>

- Na<sub>2</sub>SO<sub>4</sub> deactivation
- Acetylene and propadiene elute after butanes.
- Best separation for butene isomers (impurities in butene streams).
- Methyl acetylene elutes after 1,3-butadiene.
- Cyclopropane (impurity in propylene) elutes well before propylene.
- Similar phases: GS-ALUMINA, CP-Al<sub>2</sub>O<sub>3</sub>/Na<sub>2</sub>SO<sub>4</sub>, Alumina sulfate PLOT

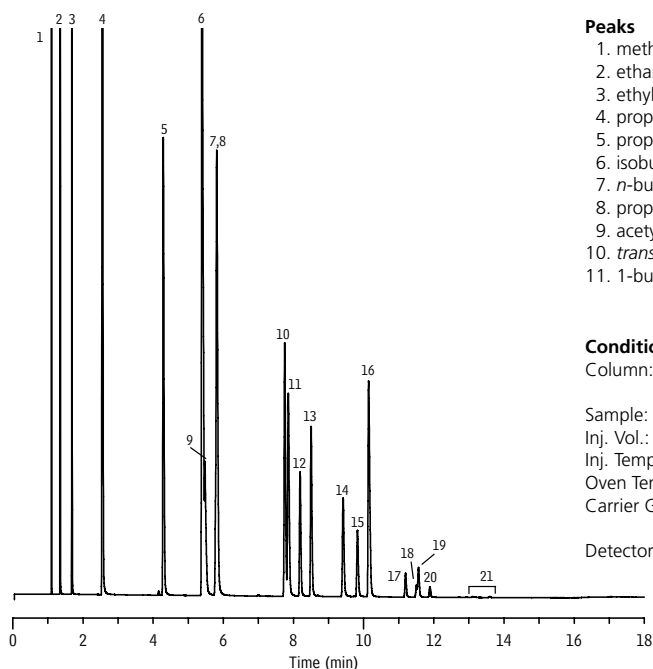
ID	df	Temp. Range	30 m	50 m
0.32 mm	5 µm	-60 to 200 °C	227-36328-01	–
0.53 mm	10 µm	-60 to 200 °C	227-36316-01	227-36301-01

#### 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: GS-Alumina KCl, HP-PLOT Al<sub>2</sub>O<sub>3</sub> KCl, CP-Al<sub>2</sub>O<sub>3</sub>/KCl, Alumina chloride PLOT

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

### Refinery Gas



#### Peaks

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

#### Conditions

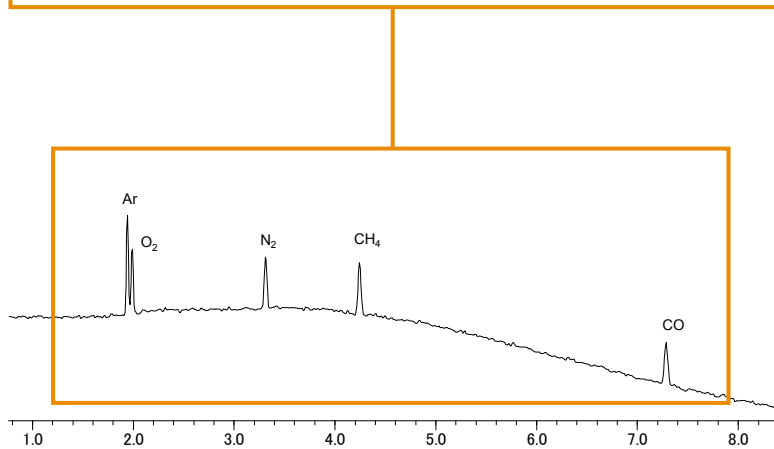
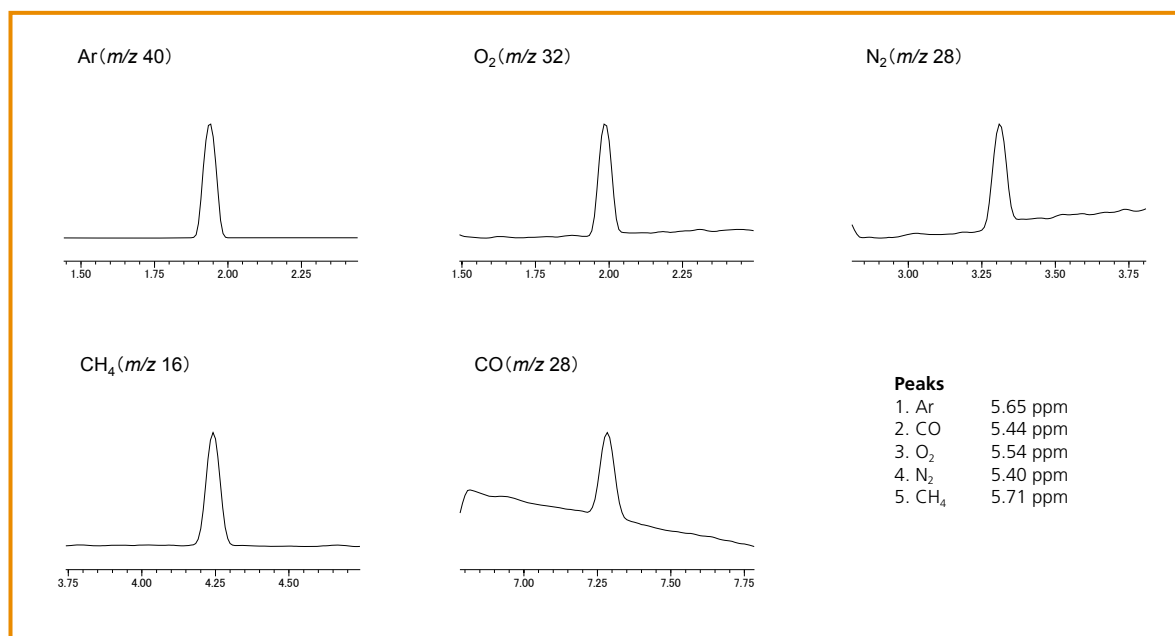
Column: SH-Alumina BOND/KCl, 50 m, 0.53 mm ID, 10 µm (P/N: 221-76139-50)  
Sample: Refinery gas  
Inj. Vol.: 10 µL split (split vent flow 80mL/min)  
Inj. Temp: 200 °C  
Oven Temp: 45 °C (hold 1 min) to 200 °C at 10 °C/min (hold 3.5 min)  
Carrier Gas: Hydrogen, constant pressure, 8.0 psi, linear velocity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

# 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: HP-PLOT Molesieve, CP-Molsieve 5A, Mol Sieve 5A PLOT

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

## Analysis of Inorganic Gas



### Conditions

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

# Capillary Columns

## PLOT Columns

### 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 CO<sub>2</sub> simplifies gas analysis; CO<sub>2</sub> and methane separated from O<sub>2</sub>/N<sub>2</sub>/CO. (Note: O<sub>2</sub>/N<sub>2</sub>/CO not separated at ambient temperature.)
- Use for analysis of oxygenated compounds and solvents.
- Similar phases: HP-PLOT Q, CP-PoraPLOT Q, CP-PoraBOND Q, Supel-Q PLOT

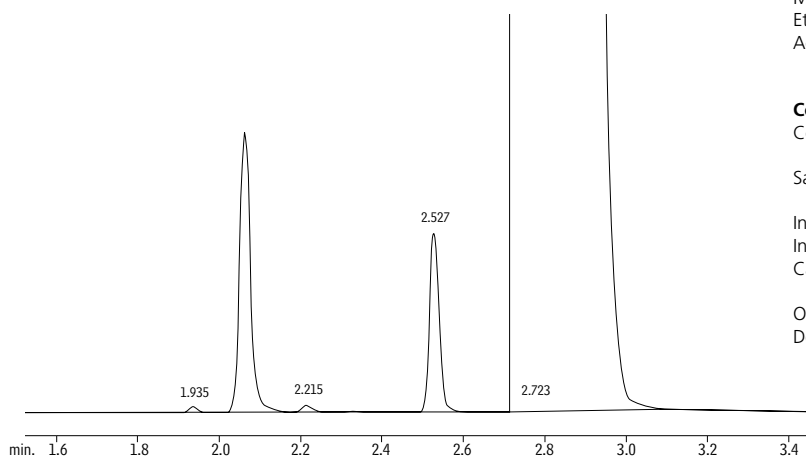
ID	df	Temp. Range	30 m
0.32 mm	10 µm	to 280/300 °C	221-75764-30
0.53 mm	20 µm	to 280/300 °C	221-75765-30

### SH-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 H<sub>2</sub>S, COS, and mercaptans in hydrocarbon streams.
- Similar phases: HP-PLOT U, CP-PoraPLOT U, CP-PoraBOND U

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

### Water and Ethanol in Acetone



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

#### Conditions

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

Trap columns for adhering dislodged particles from PLOT columns are also available. Please refer to page 47.

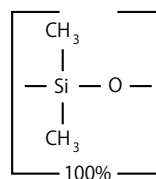
# Capillary Columns

## Metal 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: DB-PS1, UAC-1

■ SH-MetalX-1 Structure



ID	df	Temp. Range	15 m
0.25 mm	0.10 µm	-60 to 360/430 °C	227-36318-01
0.28 mm	0.10 µm	-60 to 360/430 °C	221-75734-15

### SH-MetalX-1HT SimDist

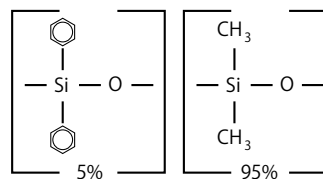
- Nonpolar phase
- Lowest bleed for longest column lifetime.
- Reliably meets all ASTM D2887, D6352, D7169, D7213, and D7500 specifications.
- 100% dimethyl polysiloxane phase allows easy comparisons to historical data.
- Individually tested for guaranteed performance.
- 7" coil diameter.
- Similar phases: 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: DB-PS5, VF-5ht UltiMetal

■ SH-MetalX-5 Structure



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

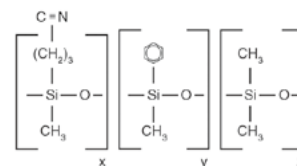
# Capillary Columns

## Metal Columns

### SH-MetalX-1701

- Midpolarity Crossbond™ phase
- General-purpose columns for alcohols, oxygenates, PCB congeners (e.g., Aroclor mixes), and pesticides.
- Equivalent to USP G46 phase.
- 4.5" standard coil diameter.
- Similar phase: DB-PS1701

■ SH-MetalX-1701 Structure

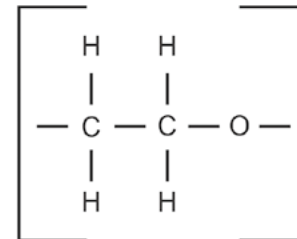


ID	df	Temp. Range	15 m
0.53 mm	1.00 $\mu\text{m}$	-20 to 260 $^{\circ}\text{C}$	227-36336-01

### 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.

■ SH-MetalX-WAX Structure



ID	df	Temp. Range	15 m
0.53 mm	1.00 $\mu\text{m}$	40 to 240/250 $^{\circ}\text{C}$	227-36337-01

### SH-MetalX Biodiesel TG

- Fast analysis times and sharp mono-, di-, and triglyceride peaks.
- Stable at 430  $^{\circ}\text{C}$  for reliable, consistent performance.
- Similar phase: MET-Biodiesel

ID	df	Temp. Range	14 m
0.53 mm	0.16 $\mu\text{m}$	-60 to 380/430 $^{\circ}\text{C}$	227-36315-01

Download more application data of GC/GCMS from  
<http://www.shimadzu.com/an/gc-datasheet.html>  
<http://www.shimadzu.com/an/gcms-datasheet.html>

# Capillary Columns

## Guard Columns

### 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-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 46.

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

# Capillary Columns

## Guard Columns

### 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
SH-IP Guard Column	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

### 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
SH Guard Column Polar Deactivation	0.25 mm	227-36335-01
	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



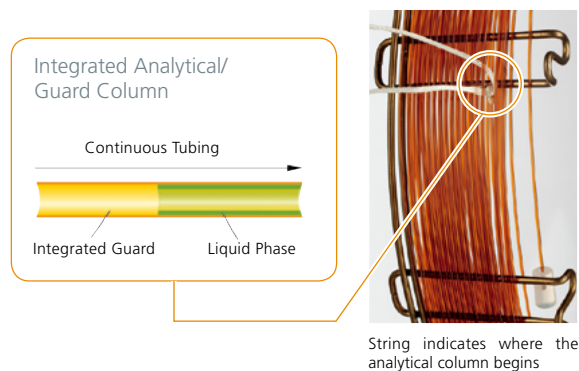
## SH-MetalX-Siltek Guard Column

- 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.

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

## 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-5Sil MS	0.25 mm	0.25 µm	30 m	–	221-76161-30	221-76162-30
SH-I-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-1301	0.32 mm	0.25 µm	30 m	–	221-76190-30	–
	0.53 mm	3.00 µm	30 m	–	221-76164-35	–
SH-624	0.25 mm	1.40 µm	30 m	–	221-76183-30	–
	0.32 mm	1.80 µm	30 m	–	221-76157-35	–
	0.53 mm	3.00 µm	30 m	–	221-76158-30	–
SH-1701	0.25 mm	0.25 µm	30 m	–	221-76185-30	–
SH-I-1MS	0.25 mm	0.10 µm	15 m	227-36346-01	–	–

# Capillary Columns

## Accessories and Supplies

### Connection Parts for Capillary Columns

#### Nuts and Ferrules



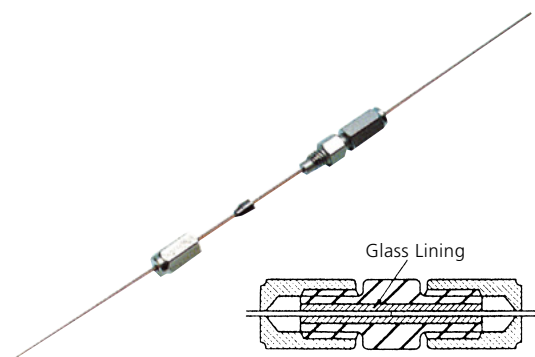
Diag. #	Description	Specification	P/N
1	Nut with slit (5 pcs)	Detector side of GC-2010/2010 Plus/2014/2025	221-32705-84
2	Nut without slit (10 pcs)	Injection unit side of GC-2010/2010 Plus/2014/2025	221-16325-81
	Nut without slit (5 pcs)	For GCMS	670-11009
	Graphite Ferrule 0.5 (10 pcs)	For 0.1 - 0.32 mmID columns	221-32126-05
	Graphite Ferrule 0.8 (10 pcs)	For 0.53 mmID columns	221-32126-08
3	Graphite Vespel® Ferrule (10 pcs)	For 0.1 - 0.25 mmID columns	670-15003-03
	Graphite Vespel® Ferrule (10 pcs)	For 0.32 mmID columns	670-15003-04
	Graphite Vespel® Ferrule (10 pcs)	For 0.53 mmID columns	670-15003-07
4	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
	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



# 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 mmOD 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 storing of capillary columns  
Deterioration by air and contamination can be prevented by connecting the both ends with a capillary tube.

# Capillary Columns

## Accessories and Supplies

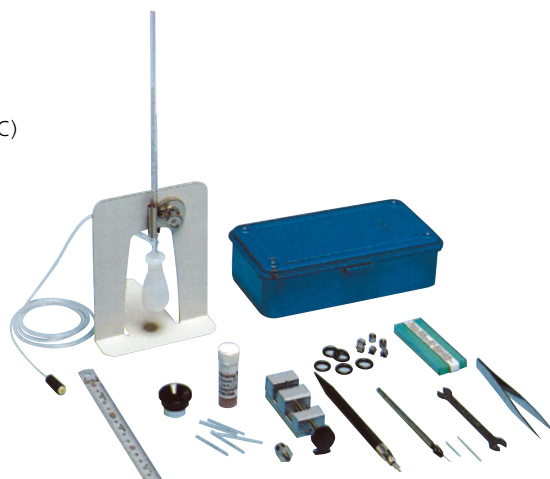
### Capillary Column Accessory Set

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

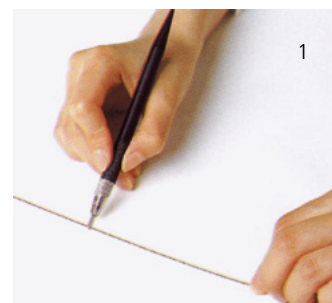


### Capillary Tube Cutters

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.

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



CoreFocus logo, Nexis and AOC are trademarks of Shimadzu Corporation or its affiliated companies in Japan and/or other countries.



Shimadzu Corporation  
[www.shimadzu.com/an/](http://www.shimadzu.com/an/)

#### For Research Use Only. Not for use in diagnostic procedures.

This publication may contain references to products that are not available in your country. Please contact us to check the availability of these products in your country.

Company names, products/service names and logos used in this publication are trademarks and trade names of Shimadzu Corporation, its subsidiaries or its affiliates, whether or not they are used with trademark symbol "TM" or "®".

Third-party trademarks and trade names may be used in this publication to refer to either the entities or their products/services, whether or not they are used with trademark symbol "TM" or "®".

Shimadzu disclaims any proprietary interest in trademarks and trade names other than its own.

The contents of this publication are provided to you "as is" without warranty of any kind, and are subject to change without notice. Shimadzu does not assume any responsibility or liability for any damage, whether direct or indirect, relating to the use of this publication.